INCH-POUND

MIL-C-38286B(USAF)

16 May 1990

SUPERSEDING
MIL-C-38286A(USAF)
15 DECEMBER 1977

MILITARY SPECIFICATION

COMPUTER, FLIGHT DIRECTOR
CPU-65/A

This specification is approved for use by the Department of the Air Force and is available for use by all Departments and Agencies of the Department of Defense.

1. Scope

1.1 Scope. This specification covers the requirements for one type of universal flight director computer, designated CPU-65/A.

2. APPLICABLE DOCUMENTS

2.1 Government Documents.

2.1.1 Specifications, standards and handbooks. The following specifications, standards and handbook form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Oklahoma City Air Logistics Center/MMEOR, Tinker AFB, OK 73145-5990 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 6610

DISTRIBUTION STATEMENT X. Distribution authorized to U. S. Government agencies and private individuals or enterprises eligible to obtain export-controlled technical data in accordance with regulations implementing 10 U.S.C. 140c. 11 April 1988. Controlling DoD Office is OC-ALC/MMEOR, Tinker AFB, OK 73145-5990.

WARNING. This document contains technical data, whose export is restricted by the Arms Export Control Act (Title 22, U. S. C., Sec. 2751 et seq.) or Executive Order 12470. Violations of these export laws are subject to severe criminal penalties.

DESTRUCTION NOTICE. For classified documents, follow the procedures in DoD 5200.22-M, Industrial Security Manual, Section II-19 for DoD 5200.1-R, Information Security Program Regulation, Chapter IX. For unclassified, limited documents, destroy by any method that will present disclosure of contents or reconstruction of the document.

Specifications

Federal

PPP-B-601	Box, Wood, Cleated-Plywood
PPP-B-636	Box, Shipping, Fiberboard

Military

MIL-P-116	Preservation, Method Of
MIL-E-5400	Electronic Equipment, Aircraft, General Specification For
MIL-C-5541	Chemical Conversion Coatings On Aluminum And Alloys
MIL-A-8625	Anodic Coatings, For Aluminum And Aluminum Alloys
MIL-G-25597	Gyroscope, Displacement, Roll And Pitch, Type MD-1
MIL-I-26689	Indicator, Horizontal Situation AQU-2/A
MIL-I-27193	Indicator, Attitude ARU-2B/A
MIL-C-27205	Control Assembly, Gyroscopic, Attitude Heading A/A24G-5A
MIL-I-27619	Indicator, Attitude ARU-11/A
MIL-H-27848	Horizontal Situation Indicator AQU-4/A
MIL-C-83488	Coating, Aluminum, Ion Vapor Deposited

Standards

Military

MIL-STD-100	Engineering Drawing Practices
MIL-STD-129	Marking For Shipment And Storage
MIL-STD-130	Identification Marking Of U. S. Military Property
MIL-STD-454L	Standard General Requirement For Electronic Equipment
MIL-STD-461	Electromagnetic Emission And Susceptibility Requirements For The Control Electromagnetic Interference
MIL-STD-462	Electromagnetic Interference Characteristics, Measurement Of
MIL-STD-704	Electric Power, Aircraft, Characteristics, And Utilization Of
MIL-STD-781	Reliability Testing For Engineering Development Qualification, And Production
MIL-STD-810C	Environmental Test Methods And Engineering Guidelines
MIL-STD-889	Dissimilar Metals
MIL-STD-970	Standards And Specification, Order Of
MIL-STD-1686A	Electrostatic Discharge Control Program For The Protection Of Electronic Parts, Assemblies and

	Equipment (Excluding Electrically Initiated Explosive Devices)
DOD-STD-1866	Soldering Process, General (Non Electrical) (Metric)
MIL-STD-2073-1	DoD Material Procedures For Development And Application Of Packaging Requirements

Military Handbook

MIL-HDBK-781	Reliability Test Methods, Plans, and Environments For Engineering Development, Qualification And Production

(Unless otherwise indicated, copies of federal and military specification, Standards, and drawings are available from the Naval Publications and Forms Center, (ATTN: NPODS), Bldg 4D, 700 Robbins Ave, Philadelphia, PA 19111-5094.)

(Copies of MIL-STD-810C is available from Director, Naval Publications & Printing Service Office, 700 Robbins Avenue, Bldg 4 Section D, Philadelphia, PA 19111).

2.1.2 Other government documents, drawings, and publications. The following other Government documents, drawing, and publications form a part of this document tuo the extent specified here. Unless otherwise specified, the issues are those cited in the solicitation.

AF Drawing 64F1866 Block Diagram - Computer CPU-65/A

(Copies of AF Drawing 64F1866 is available from OC-ALC/MMDDOS, Tinker AFB, OK 73145-5990.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DODISS are the issues of the documents cited in the solicitation.

American Society For Testing And Material (ASTM)

ASTM D3951 Packaging, Commercial

(Application for copies should be addressed to: ASTM, 1916 Race St, Philadelphia PA 19103.)

(Non-Government standards and other publications are normally available from the organizations that prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the test of this document and the reference cited herein (except for related associated detail specifications, specification sheets or MS standards), the text of this document take precedence. Nothing in this document however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First Article. When specified, a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.4.

3.2 Selection of Specifications and Standards. Specifications and standards for necessary commodities and services not specified herein shall be in accordance with MIL-STD-970.

3.3 MATERIALS

3.3.1 Fungus-proof materials. Materials that are nutrients for fungi shall not be used where it is practicable to avoid them. Where used and not hermetically sealed, they shall be treated with a fungicidal agent acceptable to the contracting activity. However, if they will be used in a hermetically sealed inclosure, fungicidal treatment will not be necessary.

3.3.2 Nonmagnetic materials. Nonmagnetic materials shall be used for all parts except where magnetic materials are essential.

3.3.3 Toxic and Corrosive Fumes. The materials, as installed in the computer and under the service conditions specified herein, shall not liberate deleterious or corrosive fumes. This shall include any fungicidal agents that are used.

3.3.4 Nonferrous materials. Nonferrous materials shall be used for all parts except where ferrous materials are essential.

a. Nonferrous materials contained within hermetically sealed inclosures shall be considered suitably protected against corrosion. Requirements specified for fungicidal and corrosion protective treatment and anodizing of aluminum alloy parts shall not be applicable for parts within hermetically sealed inclosures.

3.3.5 Metals. Metals shall be corrosion-resistant or suitably treated to resist corrosion from fuel, salt fog, or atmospheric conditions likely to be met in storage or normal service.

3.3.6 Dissimilar metals. Unless suitable protected against electrolytic corrosion, dissimilar metals shall not be used in intimate contact with each other. Dissimilar metals are defined in MIL-STD-889.

3.3.7 Protective treatment. When materials are used in the construction of the computer that are subject to deterioration when exposed to climatic and environmental conditions likely to occur during service usage, they shall be protected against such deterioration in a manner that will in no way prevent compliance with the performance requirements of this specification. The use of any protective coating that will crack, chip, or scale with age or extremes of climatic and environmental conditions shall be avoided.

3.4 Design and construction. The computer shall be designed to provide computed flight director signals to flight director indicators. The computer shall be so designed and constructed that no parts will work loose in service. It shall be built to with-stand the strains, jars, vibrations, and other conditions incident to shipping, storage, installation, and service.

3.4.1 Reliability. The computer shall have a mean-time-between failures (MTBF) of 600 hours when tested in accordance with MIL-STD-781D, Test Plan II criteria.

3.4.2 Maintainability. The computer shall be so designed that overhaul, including replacement of worn parts, adjustment, balance, and calibration may be accomplished

by instrument and electronic repairmen provided with simplified tools and equipment, trained in the repair of electronic and similar equipment.

3.4.3 Hermetic sealing. The method of hermetic sealing and mounting of the components in the sealed chamber of the case shall be such that the case can be unsealed and the complete assembly of components removed as a unit, replaced, and the case resealed. This shall be accomplished without the use of special tools and fixtures unless they are approved by the contracting activity. The case and seal (see 6.4.1) shall be designed to meet the pressure requirements specified herein.

3.4.3.1 Filling medium. The filling medium shall be at least 90 percent pure, free of dust particles, and shall contain no more than 0.006 milligram of water vapor per liter (dewpoint -65°C) at the filling pressure. The filling medium shall be either 100 percent helium or a mixture of 88 to 92 percent nitrogen and the remainder helium. The absolute pressure of the filling medium in the case shall be approximately 1 atmosphere. Where practicable, the 100 percent helium filling medium shall be utilized.

3.5 Performance. The computer shall be capable of satisfactory operation when subjected to the following conditions:

a. Temperatures - operating temperatures ranging from -54° to 71°C and storage temperatures ranging from -65° to +98°C.

b. Humidity - relative humidity up to 100 percent.

c. Altitude - pressures ranging from 30 inches Hg down to 0.315 inch Hg (approximately 100,000 feet).

d. Salt Fog - exposure to simulated salt sea atmosphere for 48 hours.

e. Vibration - vibration with an applied double amplitude of 0.060 inch through the frequency range of 10 to 55 Hz and 30g input from 55 to 500 Hz.

f. Fungus - fungus growth as encountered in tropical climate.

g. Dust (fine sand) - dust (fine sand) as encountered in desert areas.

h. Rain - rainfall as encountered in any locale.

i. Temperature Shock - alternate immersions in water maintained at 85° +4°C and 5°+ 4°C for a total of 8 cycles without leakage.

j. Acceleration - acceleration forces of 20g without damage.

k. Extreme voltage and frequency variation - applied voltages of 105V at 320 Hz and 125V at 480 Hz.

l. External pressure - external pressure of 26.5 psia with no power applied.

3.5.1 Electromagnetic interference. The computer shall comply with the requirements of MIL-STD-461A, Notice 3, for Class A1 equipment for test methods CE03, CE04, CS01, CS02, CS06, RE02, RS02 and RS03.

3.5.2 Dielectric strength. There shall be no insulation break-down when 500V dc is

applied between isolated pins and between pins and the case for a period of 10 seconds.

3.5.3 Leakage. The initial maximum leak rate at a pressure differential of approximately 1 atmosphere shall not permit a loss of more than 10 percent of the total filling medium after 1,000 hours.

3.6 Part numbering of interchangeable parts. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of MIL-STD-100 shall govern the manufacturer's part numbers and changes thereto.

3.6.1 Drawings. All electronic parts shall be annotated on engineering drawings (DOD-STD-100) indicating their electrostatic discharge (ESD) sensitivity in accordance with MIL-STD-1686A (Full Scale Development) and qualified parts list documentation.

3.7 Electronic parts. Electronic parts and application thereof shall be in accordance with MIL-E-5400. Parts that do not appear on approved lists shall not be used unless approved by the contracting activity. Electronic tubes shall not be used.

3.7.1 Electronic Components. Requirement 64, MIL-STD-454L, shall be invoked when selecting electronic parts for development/production. The least ESD sensitive parts shall be used that are identified on the qualified parts list for electronic components.

3.7.2 Other components. All other components in the electronic system shall conform to applicable specifications, where existent.

3.8 Mechanical design. The computer shall be composed of one module for each flight mode listed in 3.10 plus any other components required to provide the operation specified herein. Functionally related modes of simple form may be combined in one module if approved by the contracting activity. Modern techniques of miniaturization and modular construction shall be exploited to the greatest extent of possible without sacrificing ruggedness, reliability, and service life. Transistorized components shall be used throughout the computer.

3.9 Case. The computer case shall be in accordance with figure 1 and shall be hermetically sealed except for external adjustments which shall be gasket sealed under a dust cover.

3.9.1 Adjustment panel. An adjustment panel shall be located on the front of the computer case as shown on figure 1. The potentiometer adjustment specified in table I and Drawing 64F1866 shall be located on this panel. Each potentiometer shall be properly number in accordance with table I. The test points shown on Drawing 64F1866 shall also be located on the adjustment panel to permit isolation of failures within the computer. The test points shall also provide for shorting out of various circuits in the computer for test purposes. Prior to fabrication, the design of the adjustment panel shall be approved by the contracting activity.

3.9.1.1 Test points. The test points shall be as follows:

a. TJ1 - Shorts out direct roll when connected to TJ6 to allow for measurement of roll rates.

b. TJ2 - Shorts out radio displacement when connected to TJ6 to allow for measurement of radio rates.

c. TJ3 - When shorted to TJ6, vertical pointer flag comes into view.

d. TJ4 - Shorts out course-zero and rates when connected to TJ6 to permit measurement of course gain. Also, shorts out roll rates for measurement of roll displacement.

e. TJ5 - Shorts out pitch-zero when connected to TJ6 to allow for measurement of direct pitch gain.

f. TJ6 - Signal Ground.

g. TJ7 - When shorted to TJ3, vertical pointer flag comes into view (reserved for systems where multiple logic is available for testing vertical pointer warning flag (circuit) - Manufacturers option).

h. TJ8 - Spare.

3.9.2 Mounting base. The computer shall incorporate a mounting base as shown on figure 1 for quick disconnect from the airframe. The mount shall be affixed to the computer case by means of screws and shall incorporate a thumb-screw adjustment so that it may be rigidly clamped to a mounting bracket. The mounting bracket shall be furnished by the airframe contractor shall conform to figure 3. The quick-disconnect mount shall be such that it can be removed from the computer case and reversed in direction with respect to the case.

3.9.3 Electric connectors. Two hermetically sealed connectors shall be affixed to the computer as shown on figure 1. The pin connections shall be in accordance with Drawing 64F1866 Connector 3J1 shall be a Bendix PT02H-20-41P, or equal, which mates with a PT06-20-41S, or equal. Connector 3J2 shall be a Bendix PT02H-22P, or equal, which mates with a PT06-22-55S, or equal.

3.10 Functional design. The computer shall supply proper signals to remote flight director indicators such as the ARU-11/A conforming to MIL-I-27619 and ARU-2B/A conforming to MIL-I-27193 attitude director indicators. The computer shall calculate the proper signals for display on the attitude director to enable the pilot to perform proper control action to intercept and maintain the desired course of flight path for the major modes of VOR, TACAN, doppler, data link, and ILS, and in the submodes of MANUAL HEADING and ALTITUDE HOLD. The submodes may be energized during any major mode operation. A NAV mode shall be provided in the computer for biasing all computed information out of view in the attitude director. The computer design shall be such that the final approach mode may be selected either externally by means of a 28V d-c signal or internally by means of a beam sensor when a jumper is provided between pins s and t of plug 3J1.

3.10.1 Mode relays. Mode relays shall be incorporated into the circuitry in such manner as to provide the various modes of operation specified herein when the respective relay is energized by 28V dc and controlled by an external switch. Momentary interruption of the relay circuit shall not result in unsatisfactory signal output when power is reapplied. The beam sensor design shall trigger the final approach mode when the aircraft is on the glide-slope beam and the signal is within $\pm$15 mv of zero.

3.10.2 Flight modes. The computer shall provide the following modes of operations:

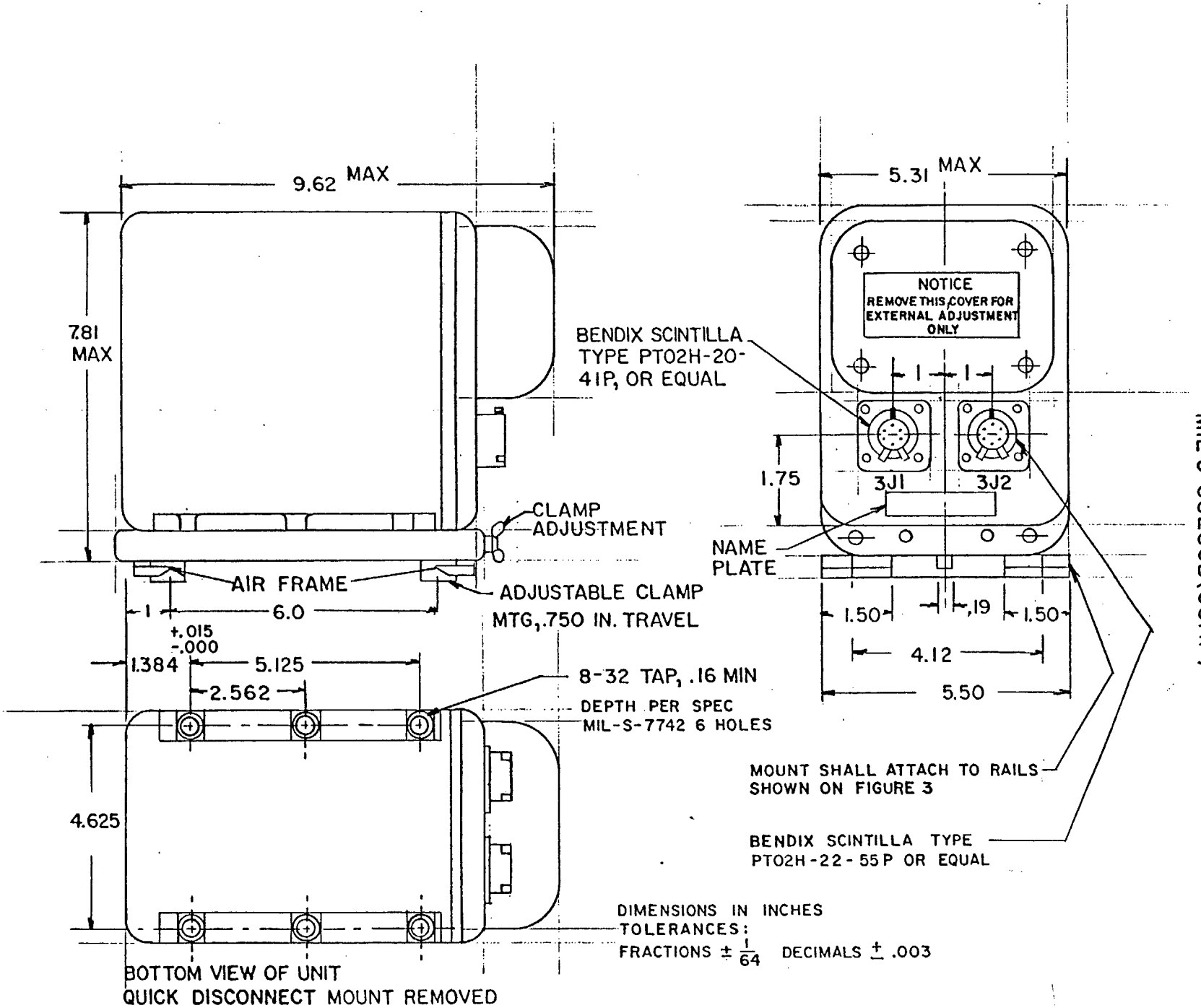


FIGURE 1. Coumputer flight director CPU-65/A

TABLE I. Potentiometers located on front panel. (See notes)

POT NO.	CONTROL	MODE	MINIMUM RANGE	NOM SET	TOL AT 20° C	TEMP TOL	REMARKS	TOLERANCES FOR VOLTAGE AND FREQUENCY VARIATIONS			
								480 Hz 125V	320 Hz 105V	420 Hz 125V	380 Hz 105V
R_1	Approach V.P. Centering Trim	Approach	±0.25 ma	0	±0.02 ma	±0.06 ma		±0.03 ma	±0.03 ma	±0.03 ma	±0.03 ma
R_2	LP Pitch Zero	Approach	±0.06 ma	0	±0.03 ma		Pitch Input 3° (0.6V)	±0.12 ma	±0.09 ma	±0.09 ma	±0.075 ma
R_3	Altitude Error Gain	Altitude Hold	0.24 to 0.75 ma	0.485 ma	0.06 ma		Altitude Input 250 ft (2.48V)	±0.08 ma	±0.08 ma	±0.07 ma	±0.07 ma
R_4	Radio Track Course Cut	VOR	20° to 65° (7.7 to 20.2V)	45° (15.9V)	±3° (±0.8V)	±4°	Radio Input 1.0V	±5° (1.4V)	±5° (1.4V)	±5° (1.4V)	±5° (1.4V)
R_5	Vertical Centering	Heading	±0.25 ma	0	±0.02 ma			±0.03 ma	±0.03 ma	±0.03 ma	±0.03 ma
R_6	Horizontal Centering	Approach Altitude Hold	±0.25 ma	0	±0.02 ma	±0.06 ma		±0.03 ma	±0.03 ma	±0.03 ma	±0.03 ma
R_7	Heading Error Gain	Heading	0.05 to 1.1	0.28 ma	±0.06 ma	±0.12 ma	Heading Input 6.6 (2.58V)	±0.1 ma	±0.1 ma	±0.08 ma	±0.08 ma
R_8	Course Error Gain	Approach	0.025 to 0.55 ma	0.18 ma	±0.02 ma	±0.04 ma	Course Error Input 5° (1.95V)	±0.05 ma	±0.05 ma	±0.030 ma	±0.030 ma

TABLE I. Potentiometers located on front panel. (Continued)

POT NO.	CONTROL	MODE	MINIMUM RANGE	NOM SET	TOL AT 20° C	TEMP TOL	REMARKS	TOLERANCES FOR VOLTAGE AND FREQUENCY VARIATIONS			
								480 Hz 125V	320 Hz 105V	420 Hz 125V	380 Hz 105V
R_9	ILS Course Cut Limit	ILS	20° to 50° (7.7 to 17.2V)	45° (15.9V)	±2°	±4°	Loc Input 1.0V	±5° (1.4V)	±5° (1.4V)	±5° (1.4V)	±5° (1.4V)
R_{10}	Radio Rate Gain	ILS	0.125 to 0.375 ma	0.325 ma	±0.03 ma	±0.06 ma	Loc Input 30 mv at 0.0159 Hz	±0.06 ma	±0.06 ma	±0.04 ma	±0.04 ma
R_{11}	Bank Rate Gain	ILS	0.016 to 0.48 ma	0.32 ma	±0.05 ma	±0.1 ma	Bank Input 10° (2.0V) at 0.0159 Hz	±0.07 ma	±0.07 ma	±0.06 ma	±0.06 ma
R_{12}	Course Rate Gain	ILS	0.125 to 0.375 ma	0.25 ma	±0.03 ma	±0.06 ma	Course Error Input 5° (1.95V) at 0.0159 Hz	±0.04 ma	±0.04 ma	±0.03 ma	±0.03 ma
R_{13}	Beam Sensor Trip Level	ILS Approach	+10 to +50 mv and -10 to -50 mv	+15 mv and -15 mv	+1.5 mv -1.5 mv	±3 mv		±5 mv	±5 mv	±5 mv	±5 mv
R_{14}	Radio Track Bank Limit	VOR	20° to 50° (4.0 to 9.05V)	25° (5.0V)	+3° (.6V)		Course Error 90° (22.5V)	+5° (±0.95V)	+5° (±0.95V)	+5° (±0.95V)	+4° (0.8V)

TABLE I. Potentiometers located on front panel. (Continued)

POT NO.	CONTROL	MODE	MINIMUM RANGE	NOM SET	TOL AT 20° C	TEMP TOL	REMARKS	TOLERANCES FOR VOLTAGE AND FREQUENCY VARIATIONS			
								480 Hz 125V	320 Hz 105V	420 Hz 125V	380 Hz 105V
R_{15}	Altitude Hold Pitch Limit	Altitude Hold	5° to 20° (1.0 to 4.0V)	12° (2.4V)	±2° (±0.4V)		Altitude Input (11.8V)	±3° (0.6V)	±2° (0.4V)	±2.5° (0.5V)	±2° (0.4V)
R_{16}	Approach Pitch Limit	Approach	5° to 20° (1.0 to 4.0V)	10° (2.0V)	±1° (±0.2V)	±1.5°	G.S. Input 1.0V	±1.5° (0.3V)	±1.5° (0.3V)	±1.5° (0.3V)	±1.5° (0.3V)
R_{17}	Data Link Bank Limit	Data Link	30° to 60° (5.9 to 10.2V)	60° (10.2V)	±4° (0.41V)	±5°	Heading Input 90° (22.5V)	±5° (±0.5V)	±5° (0.5V)	±5° (±0.5V)	±5° (±0.5V)
R_{18}	Manual Heading Bank Limit	Manual Heading	20° to 60° (±4 to 10.2V)	25° (5.0V)	±2° (0.4V)	±3°	Heading Input 90° (22.5V)	±3° (0.6V)	±3° (0.6V)	±3° (0.6V)	±3° (0.6V)
R_{19}	ILS Bank Limit	ILS	20° to 40° (4 to 7.6V)	25° (5.0V)	±2° (0.4V)	±3°	Course Error 90° (22.5V)	±5° (0.95V)	±3° (0.6V)	±5° (0.95V)	±3° (0.6V)
R_{20}	ILS APPR Bank Limit	ILS Approach	10° to 30° (2.0 to 5.9V)	15° (3.0V)	±1.0° (0.2V)	±1.5°	Course Error 90° (22.5V)	±2° (0.4V)	±2° (0.4V)	±2° (0.4V)	±2° (0.4V)

TABLE I. Potentiometer located on front panel. (Continued)

POT NO.	CONTROL	MODE	MINIMUM RANGE	NOM SET	TOL AT 20° C	TEMP TOL	REMARKS	TOLERANCES FOR VOLTAGE AND FREQUENCY VARIATIONS			
								480 Hz 125V	320 Hz 105V	420 Hz 125V	380 Hz 105V
R_{21}	Doppler Track Angle Error	Doppler	0.05 to 1.1 ma	0.36 ma	±0.04 ma		Doppler Track Angle Error Input 5° (1.95V)	±0.1 ma	±0.1 ma	±0.1 ma	±0.1 ma
R_{22}	ILS Appr Pitch Trim	ILS Approach	±15°	-3°	±0.5°		Nose Down				

NOTES: 1. Bank, altitude, and pitch voltage analogs based on 11.8V maximum output at 90° (270°).

2. Heading and course error and doppler track angle error voltage analogs based on 22.5V maximum output at 90° (270°).

3. Specifications in "ma" are requirements to dirve each load.

4. Test equipment error is not considered in the establishment of these values.

3.10.2.1 Basic nav mode. During this operating mode, no external 28V relay excitation shall feed the computer. The following functions shall be displayed:

a. Vertical steering pointer - out of view to right

b. Horizontal steering pointer - out of view to bottom

c. Glideslope displacement bar - out of view to top

d. Vertical pointer warning flag - out of view

e. Glideslope warning flag - out of view

f. HSI warning flag - out of view.

3.10.2.2 Manual heading mode. The flight director shall be placed in this mode when relay K-1 is excited with 28V dc from an external source. The following functions shall be displayed:

a. The vertical steering pointer shall receive a signal of heading error and bank angle. The correct zeroing action shall achieve the desired heading. The amount of required bank angle shall be limited. All sensitivities and limits shall be in accordance with tables I and II.

b. Vertical pointer warning flag - computer signal valid

c. All other pointers and flags shall be out of view as specified in 3.10.2.1 except when placed in view by excitation of a major mode.

3.10.2.2.1 Fire control mode. The flight director shall contain provisions for increasing the sensitivity of the vertical pointer to 0.875 inch deflection for 12° roll. This shall be accomplished by connecting a shunt resistance external to the computer in parallel with the roll circuitry as shown on Drawing 64F1866. The shunt resistance shall consist of a nominal 3K-ohm fixed resistor in series with a 10K-ohm potentiometer and a relay. When required, the shunt resistor and relay shall be the responsibility of the airframe manufacturer. Both input wires from the shunt shall be shielded and both wires shall be disconnected when not in the fire control mode. The heading error signal shall also be shorted out external from the computer when in this mode. Operation of this mode shall result when the external relay and relay K-1 are energized.

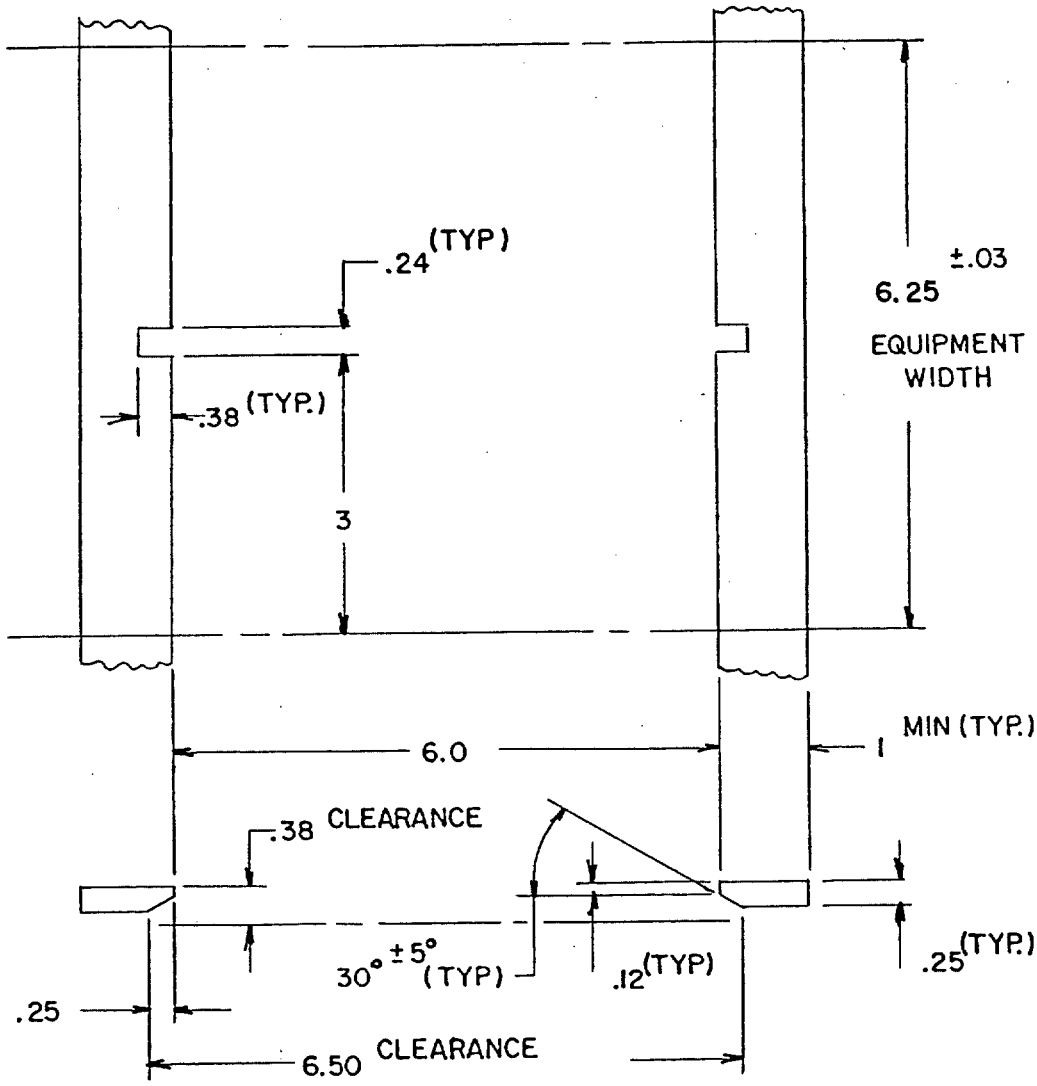
3.10.2.3 Data link mode. The flight director shall be placed in the data link mode when relay K-4 is excited. The pointers shall operate as follows:

a. The vertical steering pointer shall receive a signal of heading error and bank angle as in the manual heading mode. The bank angle limit required shall be as indicated in table I.

b. Vertical pointer warning flag - computer signal valid.

c. All other pointers and flags out of view as specified in 3.10.2.1.

3.10.2.4 Radio track mode. The computer shall provide tracking of VOR, TACAN, or doppler courses. The amount of bank angle required shall be limited. All sensitivities and limits shall be in accordance with tables I, II, and III. A



MOUNTING RAILS TO BE SUPPLIED BY AIRFRAME MANUFACTURE.

DIMENSIONS IN DECIMALS
TOLERANCE: ± .02

FIGURE 2. Mounting rails.

TABLE II. Internal controls. (See notes)

CONTROL	MODE	MINIMUM RANGE	NOM SET	TOL AT 20° C.	TEMP	REMARKS	TOLERANCES FOR VOLTAGE AND FREQUENCY VARIATIONS			
							480 Hz 125V	320 Hz 105V	420 Hz 125V	380 Hz 105V
Pitch Gain	Approach	0.5 to 0.72 ma	0.66 ma	±0.06 ma		Pitch Input 4° (0.8V)	±0.12 ma	±0.09 ma	±0.09 ma	±0.075 ma
Bank Gain	Heading	0.35 to 0.55 ma	0.50 ma	±0.06 ma		Bank Input 20° (4.0V)	±0.09 ma	±0.09 ma	±0.075ma	±0.075 ma
Course Zero	Approach	±0.05 ma	0	±0.04 ma	±0.05 ma	Course Error Input 10° (3.9V)	±0.07 ma	±0.07 ma	±0.07 ma	±0.07 ma
Localizer Radio Gain	ILS	0.3 to 0.37 ma	0.34 ma	±0.04 ma	±0.08 ma	Loc Input 60 mv	±0.06 ma	±0.06 ma	±0.05 ma	±0.05 ma
Glideslope Gain	Approach	0.4 to 0.48 ma	0.44 ma	±0.06 ma		G.S. Input 60 mv	±0.07 ma	±0.07 ma	±0.06 ma	±0.06 ma
Approach Radio Rate Gain	Approach	0.145 to 0.250 ma	0.22 ma	±0.02 ma		Loc Input 15 mv at 0.08 cps				
Approach Bank Rate Gain	Approach	0.2 to 0.24 ma	0.22 ma	±0.02 ma		Bank Input 20° (4.0V) at 0.08 cps				

TABLE II. Internal controls. (Continued)

CONTROL	MODE	MINIMUM RANGE	NOM SET	TOL AT 20° C	TEMP	REMARKS	TOLERANCES FOR VOLTAGE AND FREQUENCY VARIATIONS			
							480 Hz 125V	320 Hz 105V	420 Hz 125V	380 Hz 105V
Approach Course Rate Gain	Approach	0.25 to 0.32 ma	0.28 ma	±0.02 ma		Course Error Input 3° (1.17V) at 0.08 Hz				
Time Constant	Approach	8 to 15 sec	13 sec	±2 sec			±2 sec	±2 sec	±2 sec	±2 sec

NOTES: 1. Bank, altitude, and pitch voltage analogs based on 11.8V maximum output at 90° (270°).

2. Heading and course error and doppler track angle error voltage analogs based on 22.5V maximum output at 90° (270°).

3. Specifications in "ma" are requirements to drive each load.

4. Test equipment error is not considered in the establishment of these values.

separate mode relay shall be provided for each navigational aid with the following excitation:

a. VOR - 28V dc on pin B of connector 3J2.

b. TACAN - 28V dc on pin B of connector 3J2 and 28V dc on pin d of connector 3J2.

c. Doppler - 28V dc on pin B of connector 3J2 and 28V dc on pin CC of connector 3J2 if a doppler set without a warning flag signal is used. If a warning flag signal is used, 28V dc on pins B and U of connector 3J2. The following functions shall be displayed in radio track mode:

(1) The vertical steering pointer shall receive a computer signal composed of radio deviation (VOR, TACAN or doppler) plus course error and bank angle. When the deviation signal is high, the zeroing action called for shall result in a course-cut intercept angle, as specified in table I. The signal shall be such that the pointer will deflect in the direction in which control action must be taken and will center when the aircraft is flying on the desired track or on the programmed flight path to attain the desired track. Crosswind compensation shall be provided so that the tract can be maintained.

(2) Vertical pointer warning flag - computer signal is valid.

(3) HSI warning flag - 28V dc on 3J2-CC-255±0245 ua (off scale voltage); 28V dc on 3J2-U-connected to AN/ASN-35 computer warning flag.

(4) The remaining pointers and flags shall be out of view as specified in 3.10.2.1.

3.10.2.5 Altitude hold. This mode shall provide ease in maintaining a desired altitude. The altitude hold mode shall be so designed that it may be selected optionally as a submode during any of the major modes in which the horizontal steering pointer is driven out of view. In the ILS mode, means shall be included for automatic override of altitude hold information at glideslope interception and glideslope beam flying thereafter without manual switching by the pilot. The following functions shall be displayed:

(a) The horizontal steering pointer shall receive a signal of altitude error and pitch angle. The correct zeroing action shall cause the selected altitude to be maintained. The sensitivities and limits shall be as specified in tables I and II.

(b) All other pointers and flags shall be out of view as specified in 3.10.2.1 except when place in view by excitation of a major mode.

3.10.2.6 ILS Mode. The computer shall be established in this mode when 28V dc is on pin K of connector 3J1 and when the radio track function is deactivated in the computer as a function of ILS. The following information shall be displayed on each pointer and flag:

(a) The vertical pointer steering signal shall mix localizer deviation, course error, and bank angle. When the localizer deviation is high, the zeroing action called for shall result in a course-cut intercept angle as specified in

TABLE III. Dependent gains. (See Notes)

CONTROL	MODE	MINIMUM RANGE	NOMINAL SETTING	TOL AT 20° C	REMARKS
VOR Radio Rate Gain	VOR	0.15 to 0.43 ma	0.38 ma	±0.15 ma	VOR input 30 mv at 0.0159 Hz. Set by the ILS radio rate gain control
TACAN Radio Rate Gain	TACAN	0.15 to 0.43 ma	0.38 ma	±0.15 ma	TACAN input 30 mv at 0.0159 Hz. Set by the ILS radio rate gain control
Radio Track Bank Rate Gain	VOR	0.17 to 0.51 ma	0.34 ma	±0.13 ma	Bank input 20° (4.0V) at 0.0159 Hz. Set by ILS bank rate gain control
Radio Track Course Rate Gain	VOR	0.27 to 0.81 ma	0.54 ma	±0.06 ma	Course input 20° (7.7V) at 0.0159 Hz. Set by ILS course rate gain control
VOR Radio Gain	VOR	0.30 to 0.37 ma	0.34 ma	±0.07 ma	VOR input 60 mv. Set by loc radio gain control
TACAN Radio Gain	TACAN	0.30 to 0.37 ma	0.34 ma	±0.07 ma	TACAN input 60 mv. Set by loc radio gain control
Doppler Radio Gain	DOP	0.22 to 0.27 ma	0.25 ma	±0.03 ma	Doppler input 15 mv. Set by loc radio gain control
VOR and TACAN Course Error Gain	VOR/TAC	0.05 to 0.15 ma	0.10 ma		Course input 10 mv (3.9V). Set by ILS course rate gain control

NOTES: 1. Bank and Pitch voltage analogs based on 11.8V maximum output at 90° (270°)

2. Headings and course error and doppler track angle error voltage analogs based on 22.5V maximum output at 90° (270°).

3. Specifications in "ma" are requirements to drive each load.

4. Test equipment error is not considered in the establishment of these values.

table I. The correct zeroing action shall result in an intercept of the localizer beam. Crosswind compensation shall be provided. Sensitivities and limits shall be as defined in tables I and II.

(b) Horizontal steering pointer - out of view at bottom.

(c) Glideslope displacement bar - directly connected to glideslope receiver.

(d) Glideslope warning flag - directly connected to glideslope receiver.

(e) Vertical pointer warning flag - affected by localizer radio signal and computer.

3.10.2.7 ILS approach. The computer shall be established in this mode when three conditions are satisfied, namely, when 28V dc is on pin K of 3J1 to K-2 (ILS) relay, when 28V dc is on pin s of 3J1 to K-3 (ILS approach) relay, and when the radio track function is deactivated in the computer as a function of ILS. Relay K-3 may be excited externally or by the internal beam sensor when jumped between two pins as shown on Drawing 64F1866. The ILS approach mode shall override the altitude hold mode. The functions displayed shall be as follows:

a. The vertical steering pointer shall mix localizer deviation and course error rate, radio rate, and bank rate through the crosswind filter and bank angle as shown on Drawing 64F1866. The bank angle limits and sensitivities shall be as defined in tables I and II.

b The horizontal steering pointer shall mix glideslope deviation and pitch as shown on Drawing 64F1866. Pitch limit and sensitivities shall be as defined in tables I and II.

c All other pointers and flags shall operate as in the ILS mode.

3.10.3 Beam sensor. The computer shall contain an internal beam sensor to automatically switch from the ILS normal to the ILS approach mode when the glidepath is intercepted from above or below the beam. The beam sensor output shall be 28V dc and shall provide proper operation when a wire is jumpered between pins s and t of plug 3J1. A logic circuit shall be incorporated that will require the following conditions to be satisfied before switching. When these conditions are met, the beam sensor output will remain at pin t until either condition a or f is no longer met.

a. Computer in ILS - normal mode.

b. Usable glideslope signal (glideslope flag-alarm signal tie-in).

c. Usable localizer signal (localizer flag-alarm signal)

d. Aircraft within ±2 dots deviation (±150mv) of the center of the localizer team.

e. Switching shall occur only a specified deviation from center of glideslope beam (see table I).

f. Radio receiver tuned to localizer frequency (28V dc output from VOR/LOC receiver).

3.10.3.1 Horizontal steering pointer out of view. After switching to the ILS approach mode, the horizontal steering pointer shall be in view or out of view in accordance with the following conditions. Under the horizontal-steering out-of-view conditions, the computer will continue to function in the ILS approach mode.

a. Glideslope and localizer flag signal - The horizontal steering pointer shall be biased out of view with no delay with an invalid flag signal and driven into view with no delay with a valid flag signal. An invalid flag signal is 180 mv or less and a valid flag signal is 255 mv or greater. These values are based on the operation of the ADI and correspond with operation of the flags in the actual aircraft.

b. Glideslope deviation signal - The horizontal steering pointer will remain in view with increasing glideslope deviation signal up to 150 mv and will be out of view when the signal exceeds 190mv. After the horizontal steering pointer goes out of view (due to glideslope deviation), reduction of the glideslope deviation signal to less than the value specified in table I will allow the horizontal pointer to return to view.

c. Localizer deviation signal - The horizontal steering pointer will remain in view with increasing localizer deviation signal up to 150 mv and will be out of view when the signal exceeds 190 mv. After the horizontal steering pointer goes out of view (due to localizer deviation), it shall return to view when the localizer deviation is reduced to 150 mv provided the glideslope deviation signal is less than the value specified in table I.

3.10.3.2 Incoming radio signals. The incoming radio signals shall be sufficiently filtered within the computer to eliminate carrier noise interference and to provide proper switching when operating with the receivers specified in 3.11.3. Neither false nor nuisance switching shall occur.

3.11 Input signals. Input signals shall have the characteristics specified herein and loading shall be as follows:

3.11.1 Roll and pitch angle signals. Roll and pitch angle input signals shall be in the form of separate transmitter-synchro 3-wire stator outputs in accordance with the standard test transmitter specified in 3.11.4, with dial readings set at 180° for zero roll and pitch displacement. Increasing dial readings shall correspond to right roll and pitchup maneuvers. Decreasing dial readings shall correspond to opposite maneuvers. The load placed on these signals within the computer shall be equivalent to high impedance, balanced loads. The loads measured between any 2 lines of these inputs shall be at least 5K ohms. The computer shall operate satisfactorily with the MD-1 (MIL-G-25597), AF/A24G-1 (MIL-C-26485), or A/A24G-5 (MIL-C-27205) gyroscope.

3.11.2 Heading and course error signals. Heading and course error signals shall be in the form of separate synchro rotor outputs from the heading datum and course datum control transformers of the AQU-2/A and AQU-4/A horizontal situation indicators in accordance with MIL-H-26689 and MIL-H-27848, or equivalent. The output voltage shall be zero for zero heading error and zero course error. If the actual heading is to the left of the selected heading course error. If the actual heading is to the left of the selected heading and course, voltage H prime to C shall be in phase with power excitation ground-to-phase. If the actual heading is to the right of the selected heading and course, voltage C to H prime shall be in phase with power excitation ground-to-phase. Loading of these input signals shall

be 10,000 ohms, or greater. The datum control transformers shall be Clifton Precision CTC-8-A-4, or equal.

3.11.3 Radio signal inputs. Computer loading of radio-deviation, flag, and displacement signals shall be 1,000 ±3 percent ohms each. The computer shall operate satisfactorily with input signals from the following equipment:

a. Glideslope receiver, Radio Receiving Set AN/ARN-18, or Receiving Set, Radio AN/ARN-67 and standard ARINC glideslope receivers.

b. VOR/localizer receiver. Radio Receiving Set AN/ARN-14 and standard ARINC VOR receivers.

c. Radio set AN/ARN-21 plus Collins Radio Company 161B-1 TACAN coupler, or equal, Radio Set AN/ARN-65, or OSTER 9616-13 TACAN coupler or equal.

d. Standard ARINC doppler computer.

3.11.4 Standard synchro test transmitter. The standard calibrated synchro, with minimum and known errors, shall be an Eclipse-Pioneer type AY201-1, or equal, high-precision transmitting synchro. A 0°to 360° dial clamped to the rotor of the synchro shall be settable, rotatable, and readable through 360° or rotation to 6 minutes of arc. The following procedure shall be used to calibrate the test synchro:

a. The rotor leads designated H and C and with one stator lead designated Z and connected to C, 26V shall be applied to H and C (C being grounded). The dial shall be positioned on 0° and clamped to the rotor when:

b. The voltage across H and Y is maximum.

c. The voltage across the remaining two stator leads (X and Y) is minimum.

d. The voltage across X and Z increases before it decreases for increasing heading indication of the dial. The voltage X to Z and Y to Z shall be in phase with the excitation voltage C to H when the dial reading is zero. For increasing heading indications of the dial, the voltage X to Y shall increase and be in phase with the excitation voltage C to H. The test transmitter shall be set at an index reference to zero and positive rotation reference XYZ.

3.11.5 Altitude Error. The altitude error input signal shall be in the form of separate transmitter-synchro, 3-wire stator outputs in accordance with the standard test transmitter specified in 3.11.4. The remote altitude hold sensor shall be synchro driven from the altitude shaft through a clutch so that the synchro will remain in the index reference position except when the altitude hold-energize lead is excited with 28V dc from the external mode selector switch. The output shall be 1.0 ±0.1V at 100 feet measured across 5,000 ohms. The range of the snychro shall be p to ±500 feet. The computer shall be fully compatible with ARINC standard altitude hold signals provided for flight director and autopilot operation.

3.12 Output signals. The computer output signals shall not be affected by those input signals that are not used in the particular mode of operation. To determine the affect of unused input signals not being used in the selected mode shall be set to their maximum value, the input signals used in the selected mode set to zero, and the output shall be measured. There shall be no signal outputs when the above

conditions exist. The computer output signals shall have the following characteristics when loaded as specified.

3.12.1 Vertical and horizontal pointer signals. Each vertical and horizontal pointer output signal shall drive two meter movements. The signal shall be direct current with instantaneous polarity and magnitude, as required for the particular mode activated. No a-c ripple voltage of the on-scale signal (as read on a ballantine Model 300A voltmeter, or equivalent) shall be greater than 0.43 times the d-c output voltage or 150 mv, whichever is greater. The off-scale current shall be so filtered that the ripple voltage peak-to-peak shall not exceed 10 percent of the average d-c value. The attitude-director meter-movement loads applied to the output signals shall be driven out of view when supplied with 11.0, -1.0 and +2.5 ma. The resistance of each meter movement shall be 1,000 ±3 percent ohms. A deflection of 0.875 inch from the center position shall require 2.2 ±percent ma and shall be the normal full-scale command. The nominal output impedance for the vertical and horizontal steering signals shall be approximately 50 to 100 ohms.

3.12.2 Flag output signals. Each flag output signal shall be that required to operate 2 meter movement flags having the following characteristics. In those modes in which the flags are driven out of view, the computer shall supply a signal of 255, +245 and .0 u. In the ILS and ILS approach modes, the glideslope warning flag shall be connected directly to the glideslope receiver. In the event of (1) a failure of the B+ voltage to an amplifier, (2) an internal short of an amplifier, or (3) inadequacy of the radio deviation signal, the output power normally supplied to pull the vertical pointer warning flag out of view shall cease and allow the flag to appear. The vertical pointer warning flag shall be in view with a radio deviation signal input of 180 ua of less and shall be out of view with a radio signal input of 275 ua or more. This shall be applicable to all modes except the NAV and altitude hold modes. The resistance across each flag alarm circuit shall be two 1,000-ohm loads in parallel ±3 percent. Test points shall be brought incorporated within the computer.

3.12.3 Displacement pointer. The displacement pointer output signal shall drive 2 meter movements requiring 500±500 ua, each to be driven completely out of view. The sensitivity shall be 75 ua per dot with a total of 2 dots. The load of each meter movement shall be 1,000 ±3 percent ohms. In the ILS mode, the glideslope receiver shall provide the signal directly to the displacement pointer through the computer.

3.13 Power. The computer shall operate from single-phase, 115V, 400-Hz power supplied from an a-c aircraft electrical system in accordance with MIL-STD-704. In addition, the computer shall comply with the requirements of MIL-STD-704 for utilization equipment. The computer shall function satisfactorily with variations in voltage and frequency from 105 to 125V and 320 to 480 Hz. An external 28V d-c source shall supply mode relay requirements. The a-c power consumption shall not exceed 16 va at rated voltage and frequency. The power factor shall be not less than 0.85. The d-c power consumption required for relay excitation shall not exceed the following values for each mode at rated voltage:

NAV	0w
Data line	2.3w
Manual heading	2.3w
Radio track	10.0w
Altitude hold	4.5w
ILS	8.5
ILS approach	13.0w

3.14 Dimensions and tolerances. Dimensions and tolerances not specified shall be as close as is consistent with best shop practices. Where dimensions and tolerances may affect the interchangeability, operation, or performance of the computer, they shall be held or limited accordingly.

3.15 Weight. The weight of the computer, with the quick-disconnect mount attached, shall not exceed 12.0 pounds.

3.16 Soldering. Soldering shall be accomplished in accordance with DOD-STD-1866.

3.17 Screw threads. Unless otherwise specified, the threads of all machine screws shall conform to MIL-S-7742.

3.18 Finishes and protective coatings

3.18.1 Aluminum alloy parts. Aluminum alloy parts shall be covered with an anodic film conforming to MIL-A-8625, except as follows:

a. Small holes and case inserts need not be anodized.

b. Aluminum alloys which do not anodize satisfactory shall be coated with a chemical film in accordance with MIL-C-5541.

c. Where the primary purpose of the treatment is to afford a suitable paint base, chemical treatment in accordance with MIL-C-5541 may be used in lieu of anodizing.

d. Castings containing nonaluminum alloy intergral inserts may be treated with a chemical film in accordance with MIL-C-5541 in lieu of anodizing.

e. When abrasion resistance is a factor, chemical film in accordance with MIL-C-5541 shall not be used in lieu of anodizing.

f. Parts enclosed in hermetically sealed containers need not be anodized or plated.

g. When the part is plated with tin over a copper flash, the part need not be anodized.

h. When necessary for electrical bonding, parts need not be anodized.

3.18.2 Steel parts. Steel parts shall be coated with ion vapor deposited aluminum, where practicable, in accordance with MIL-C-83488 type I or II as applicable and of a class that is adequate to achieve the degree of protection required. Other protective coatings, in lieu of MIL-C-83488, may be used if demonstrated to be satisfactory and approved by the preparing activity. Cadmium plating must be avoided when satisfactory alternative processes can be used.

3.19 Identification of product. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130.

3.20 Workmanship. The computer, including all parts and accessories, shall be constructed and finished in a thoroughly workmanlike manner in accordance to MIL-STD-454L, requirement 9. Particular attention shall be given to neatness and thoroughness of soldering, brazing, painting, riveting, machine-screw assemblies, and freedom of parts from burrs and sharp edges.

3.20.1 Screw assemblies. Assembly screws and bolts shall be tight. The word tight means that the screw or bolt cannot be appreciably tightened further without damange or injury to the screw or bolt or threads.

3.20.2 Riveting. Riveting operations shall be carefully performed to insure that the rivets are tight and satisfactorily headed.

3.20.3 Gears. Gear assemblies shall be properly aligned and meshed and shall operate without interference, tight spots, loose spots, or other irregularities. Where required for accuracy adjustment, gear assemblies shall be free from backlash.

3.20.4 Cleaning. Before insertion in the case, he computer shall be thoroughly cleaned of loose, spattered, or excess solder, metal chips, or other foreign material after assembly. Burrs and sharp edges as well as resin flash that might crumble shall be removed.

3.21 Recycled and reclaimed materials. Recycled and reclaimed materials shall be encouraged to the maximum extent possible without jeopardizing the intended end use of the item.

4. Quality assurance provisions

4.1 Responsibilities for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.4)

b. Quality conformance inspection (see 4.5)

4.3 Inspection condition. Unless otherwise specified all inspections shall be performed in accordance with the test condition specified in 4.3.1 of this inspection.

4.3.1 Standard atmospheric conditions. Whenever the pressure and temperature existing at the time of the test are not specified definitely, it is understood that

the test is to be made at atmospheric pressure (approximately 29.92 inches Hg) and at room temperature (approximately 25° C). When tests are made with atmospheric pressure or room temperature differing materially from the above values, proper allowance shall be made for the difference from the specified condition.

4.3.2 Attitude. Unless otherwise specified, the computer shall be tested in normal operating position.

4.3.3 Supply voltage. Unless otherwise specified, all tests shall be conducted with 115 ±5V ac single phase, 400 ±10 Hz.

4.3.4 Connections. Whenever it is specified that the computer shall be properly connected, it shall be understood that the computer connector terminals shown on Drawing 64F1866 are connected to a test fixture that provides the required inputs, performs the mode relay excitation connections, and provides the required loads on the output as specified in section 3.

4.3.4.1 Test fixture inputs to computer. Inputs from the test fixture to the computer shall simulate the radio signals required by the computer, the pitch and roll signals, the heading and course error signals, and the altitude error signals.

4.3.4.1.1 Test fixture loads on computer. Shunt resistance in series with an external relay shall be provided for the fire-control-mode input. The cables shall be shielded.

4.3.4.1.2 Simulated radio deviation signals. Simulated radio deviation signals shall have manually variable magnitudes from 0 to ±1,000 mv at 0 frequency and 0 to ±100 mvg at frequencies of 0.08 to 0.0159 cps where the signal varies sinusoidally. The radio flag signals shall be adjustable from 150 to 285 mv when connected to the computer.

4.3.4.1.3 Roll and pitch signals. Roll and pitch signals shall be provided from standard transmitters as specified in 3.11.4. Heading error and course error signals shall be from a control transformer as specified in 3.11.2. The test transmitters shall be manually settable to fixed displacements. The roll and course error signals shall provide 0.08 to 0.0159 cps oscillation when testing the rate circuits.

4.3.4.1.4 Error signal. The altitude error signal shall be in accordance with 3.11.5.

4.3.4.2 Test fixture loads on computer. Two 1,000-ohm loads ±3 percent, in parallel, shall be utilized on each output signal. For each output, the basic load shall be a meter movement in accordance with design criteria specified herein.

4.3.4.3 Test fixture mode relay. The test fixture shall provide switching so that the various mode relays can be energized individually or in the combinations listed in section 3.

4.3.5 Environmental stress screening (ESS). Environmental stress screening (ESS) shall be in accordance with MIL-STD-781D and MIL-HDBK-781.

4.4 First article inspection

4.4.1 Inspection samples. The test samples shall consist of three computers representative of the production equipment. The samples shall be identified with

the manufacturer's part number and such other information as required by the contracting activity.

4.4.2 First article inspection. The first article inspection shall consist of all tests specified under 4.6.

4.5 Quality conformance inspection. Quality conformance shall consist of:

a. Individual tests

b. Sampling plans and tests

4.5.1 Individual tests. Each computer shall be subjected to the following tests as described under 4.6:

a. Examination of product

b. Leakage

c. Signal adjustments

d. Basic Nav mode

e. Manual heading mode

f. Fire control mode

g. Data link mode

h. Radio track mode

(1) VOR

(2) TACAN

(3) Doppler

i. Altitude hold

j. ILS mode

k. ILS approach

l. Beam sensor

m. Early failure detection

4.5.2 Sampling plans and tests.

4.5.2.1 Sampling plan A. Sample computers shall be selected at random in accordance with the following schedule and subjected to the tests listed below, as described under 4.6:

Production Quantity	No. of Sample Computers
1 to 100	1
11 to 100	2
101 to 200	1
Each additional 200	1 for each 200

a. Individual tests

b. Dielectric strength

c. Low temperature operation

d. High temperature interference

e. Extreme voltage and frequency variation

f. Vibration error

g. Power

4.5.2.2 Sampling plan B. Unless otherwise specified, 3 computers shall be selected at random from the first 15 on the contract or order and subjected to the following tests as described under 4.6:

a. Sampling plan A tests

b. Electromagnetic interference

c. Vibration failure

d. High temperature exposure

e. High altitude - low temperature

f. Dust (fine sand)

g. Rain

h. Fungus

i. Humidity

j. Salt fog

k. Thermal shock

l. Sealing thermal shock

m. Shock

n. Signal characteristics

o. Reliability

p. Acceleration

q. External pressure

4.5.2.2.1 Computer test. At the option of the contracting activity and with the exception of sampling plan A tests, tests may be divided into 3 groups, as follows, to be conducted on 3 sets of computers if a need exists to expedite tests. Each computer shall meet the requirements of sampling plan A tests after completing the group of specific tests to which submitted. At the option of the contracting activity, group II may be conducted on empty cases which have all external parts installed or attached as on a completed computer.

Group I	Group II	Group III
Electromagnetic interference	Humidity	Vibration failure
High temperature exposure	Fungus	Acceleration
Low temperature	Rain	Shock
Thermal shock	Salt fog	Reliability
Signal characteristics	Sand and dust	External Pressure
	Sealing thermal shock	

4.5.2.3 Sampling plan C. Unless otherwise specified, three computers shall be selected at random from the first 20 computers of each production quantity of 100 and subjected to the test specified in 4.6.21.2.

4.5.2.4 Rejection and retest. When one item selected from a production run fails to meet the specification, no items still on hand or later produced shall be accepted until the extent and cause of failure are determined. After corrections have been made, all necessary tests shall be repeated.

4.5.2.4.1 Individual tests may continue. For operational and production reasons, individual tests may be continued pending the investigation of a sampling test failure. But final acceptance of items on hand or later produced shall not be made until it is determined that items meet all the requirements of the specification.

4.5.3 Defects in items already accepted. The investigation of a test failure could indicate that defects may exist in items already accepted. If so, the contractor shall fully advise the procuring activity of all defects likely to be found and methods of correcting them.

4.6 Test methods

4.6.1 Examination of product. The computer shall be inspected to determine compliance with the requirements herein with respect to materials, workmanship, marking, and design.

4.6.2 Leakage. The computer shall be tested for leakage by means of a mass-spectrometer-type helium leak-detector. The initial maximum detected leak rate, at a pressure differential of one atmosphere, shall not permit more than 10 percent loss of the total filling medium after 1,000.

4.6.3 Signal adjustments. The computer shall be properly connected with all input signals initially set at zero signal or displacement. Each of the adjustments shall be checked for range and specified setting. The values shall be as specified in tables I, II, III, and IV. This test shall not be repeated under sampling plan A or B.

TABLE IV. Pointer and flag indicators.

MODE	SUBMODE	VERTICAL STEERING POINTER	HORIZONTAL STEERING POINTER	HSI WARNING FLAG	GLIDESLOPE WARNING FLAG	GLIDESLOPE DISPLACEMENT BAR	VERTICAL POINTER WARNING FLAG
Basic Nav	None	$11^{+2.5}_{-1.0}$ ma (Off Scale Supply)	$11^{+2.5}_{-1.0}$ ma (Off Scale Supply)	255^{+245}_{-0} ua (Off Scale Supply)	255^{+245}_{-0} ua (Off Scale Supply)	500^{+500}_{-0} ua (Off Scale Supply)	255^{+245}_{-0} ua (Off Scale Supply)
Manual Heading	None	Computed Signal					
	Altitude Hold		Computed Signal				255^{+245}_{-0} ua (When Computed Signal is Valid)
	Optional Fire Control	Computed Signal (Sensitive Bank Angle)	$11^{+2.5}_{-1.0}$ ma (Off Scale Supply)				
Data Link	None	Computed Signal					
	Manual Heading	Computed Signal Heading Bank Limit					
	Altitude Hold	Computed Signal.	Computed Signal				

4.6.4 Basic nav mode. The computer shall be properly connected with power applied and with all input signals initially set at zero signal or displacement. Operation of the computer shall be as specified in 3.10.2.1. The computer outputs shall not exceed the tolerances for each setting specified in tables I and II.

4.6.5 Manual heading mode. The computer shall be properly connected with power applied and all input signals initially set at zero signal or displacement. Operation of the computer shall be as specified in 3.10.2.2. The computer outputs shall not exceed the tolerances for each setting specified in tables I and II.

4.6.5.1 Fire control mode. The computer shall be properly connected with power applied and all inputs initially set at zero signal or displacement. No heading error signal shall be applied to the computer during this test. Operation of the computer shall be as specified in 3.10.2.2.1. The computer outputs shall not exceed the tolerances for each setting specified in tables I and II.

4.6.6 Data link mode. The computer shall be properly connected with power applied and all input signals initially set at zero signal or displacement.

4.6.7 Radio track mode. The computer shall be properly connected with power applied and all input signals initially set at zero signal or displacement. The three modes of VOR, TACAN, and doppler shall be individually tested under the conditions specified in 3.10.2.4. Computer outputs shall not exceed the tolerances for each setting specified in tables I and II.

4.6.8 Altitude hold. The computer shall be properly connected with power applied and all input signals initially set a zero signal or displacement. Operation of the computer shall be as specified in 3.10.2.5. Computer outputs shall not exceed the tolerances for each setting specified in tables I and II.

4.6.9 ILS mode. The computer shall be properly connected with power applied and all input signals initially set a zero signal or displacement. Operation of the computer shall be as specified in 3.10.2.6. Computer outputs shall not exceed the tolerances for each setting specified in tables I and II.

4.6.10 ILS approach. The computer shall be properly connected with power applied and all input signals initially set at zero signal or displacement. Operation of the computer shall be as specified in 3.10.2.7. Computer outputs shall not exceed the tolerances for each setting specified in tables I and II.

4.6.10.1 Beam sensor. The computer shall be properly connected with power applied. To simulate tuning of the VOR/LOC radio to a localizer frequency, 28V dc shall be supplied to pin 3J2-n. The computer shall operate as specified in 3.10.3.

4.6.11 Early failure detection. This test shall not be repeated under sampling plans A and B. The computer shall be properly connected with power applied and operated for minimum of 10 hours. All components of the computer shall be energized and operated throughout the test. No failures shall occur. At the completion of this test, the vertical-pointer warning flag circuitry shall be tested and shall meet the requirements of 3.12.2.

4.6.12 Dielectric strength. A potential of 500V dc shall be applied between isolated pins and between pins and the case for a period of 10 seconds. There shall be no breakdown of insulation.

TABLE IV. Pointer and flag indications.(Continued)

MODE	SUB-MODE	VERTICAL STEERING POINTER	HORIZONTAL STEERING POINTER	HSI WARNING FLAG	GLIDESLOPE WARNING FLAG	GLIDESLOPE DISPLACEMENT BAR	VERTICAL POINTER WARNING FLAG
ILS	None	Computed Signal	$11^{+2.5}_{-1.0}$ ma (Off Scale Supply)	Connected to VOR/Loc Receiver	Connected to Glideslope Receiver	Connected to Glideslope Receiver	255^{+245}_{-0} ua (When Computed Signal is Valid)
	Manual Heading	Computed Signal (Heading Mode)					
	Altitude Hold	Computed Signal (ILS Mode)	Computed Signal				
ILS APPROACH	None	Computed Signal					

TABLE IV. Pointer and flag indications. (Continued)

MODE	SUB-MODE	VERTICAL STEERING POINTER	HORIZONTAL STEERING POINTER	HSI WARNING FLAG	GLIDESLOPE WARNING FLAG	GLIDESLOPE DISPLACEMENT BAR	VERTICAL POINTER WARNING FLAG
Radio Track VOR	None	Computed Signal	$11^{+2.5}_{-1.0}$ ma (Off Scale Supply)	Connected to VOR/Loc Receiver			
	Manual Heading	Computed Signal (Heading Mode)					
	Altitude Hold	Computed Signal (Radio Track VOR)	Computed Signal				
Radio Track TACAN	None	Computed Signal	$11^{+2.5}_{-1.0}$ ma (Off Scale Supply)	Connected to TACAN Receiver	255^{+245}_{-0} ua (Off Scale Supply)	500^{+500}_{-0} ua (Off Scale Supply)	255^{+245}_{-0} ua (When Computed Signal is Valid)
	Manual Heading	Computed Signal (Heading Mode)					
	Altitude Hold	Computed Signal (Radio Track TACAN)	Computed Signal				
Radio Track Doppler	None	Computed Signal	$11^{+2.5}_{-1.0}$ ma (Off Scale Supply)	28V dc on 3J2-CC 255^{+245}_{-0} ua (Off Scale Voltage) 28V dc on 3J2-U Connected to AN/ASN-24(V) and AN/ASN-35 Computer Warning Flag			
	Manual Heading	Computed Signal (Heading Mode)					
	Altitude Hold	Computed Signal (Doppler Mode)	Computed Signal				

4.6.13 Environmental stability. After completion of the following tests (4.6.13.2 through 4.6.13.4.1), the computer shall be subjected to and shall meet the individual tests.

4.6.13.1 Low temperature operation. The computer shall be properly connected with no power applied, and subjected to a temperature of -54° ±2° C for a period of 4 hours. At the end of this period and while still at the low temperature, power shall be applied. The computer shall meet all of the individual tests, except sealing. Immediately following removal from the temperature chamber, the computer shall be subjected to the sealing test.

4.6.13.2 High temperature operation. The computer shall be properly connected, with no power applied,placed in a chamber, and maintained at a temperature of 71° ±2 C for a period of 4 hours. While still at the high temperature, power shall be applied and the computer shall meet all individual tests, except sealing. The temperature shall be increased to 98° for a period of 10 minutes with the computer operating. The computer shall meet the requirements of 3.10.2.4 and immediately following removal from the chamber shall meet the tests specified in 4.6.2.

4.6.13.3 Extreme voltage and frequency variation. The computer shall be properly connected and with input power applied, shall meet the individual tests at all combinations of 105V 380Hz and 125V 420Hz. With input power applied, the computer shall then meet the individual tests at all combinations of 105V 320 Hz and 125V 480 Hz, except that the tolerances shall be within those specified in tables I and II for extreme voltage and frequency variations.

4.6.13.4 Vibration error. The computer shall be properly connected with power applied and subjected to vibration error tests consisting of a frequency survey with vibration applied to the longitudinal, lateral, and vertical axes of the computer. The computer shall be subjected to vibration with a constant applied double amplitude of 0.060 inch through the frequency range of 10 to 55 Hz and 10g input from 55 to 500 Hz in each of the 3 mutually perpendicular axes. This test may be conducted with vibration applied in a circular motion in a plane 45° to the horizontal plane of the computer. Duration of vibration shall be 1 minute in each axis for 1 complete cycle of frequency range or 1 minute with vibration applied in a circular motion for 1 complete frequency range.

4.6.13.4.1 Signal continuity. During vibration, there shall be no transients or discontinuity in output for any mode of operation.

4.6.14 Power consumption. The computer shall be properly connected with power applied. The a-c and d-c power consumption for each mode shall not exceed the values specified in 3.13.

4.6.15 Electromagnetic interference. The computer shall be tested in accordance with MIL-STD-462, Notice 2, Tests Methods CE03, CE04, CS01, CS02, CS06, RE02, RS02, and RS03 to demonstrate compliance with the requirements of paragraph 3.5.1 of this equipment specification.

4.6.16 Environmental. The computer shall be subjected to the following tests, conducted in accordance with MIL-STD-810C and as specified.

4.6.16.1 High temperature exposure. This test shall be conducted in accordance with method 501. The period of exposure shall be 24 hours. The computer shall be properly connected, with no power applied during exposure. At the end of the

24-hour period and while still at the high temperature, power shall be applied for 1 hour. The computer shall meet the individual tests specified herein. The computer shall operate without sticking or erratic performance during this test.

4.6.16.2 Temperature-altitude. The high altitude-low temperature test shall be conducted in accordance with method 504.1.1 of MIL-STD-810C for equipment category 6, except that the altitude shall be 100,000 feet. The computer shall be connected with no power applied. At the end of the 72-hour period, pressure in the chamber shall be reduced to the equivalent of 100,000 ±500 feet, and power applied. The computer shall operate immediately and its operation shall be observed for 1 hour. There shall be no evidence of erratic performance. All mode relays and rate circuits shall be tested. Pressure in the test chamber shall be increased to atmospheric and, after the computer has returned to room temperature, it shall meet all individual tests.

4.6.16.3 Dust (fine sand). The dust (fine sand) test shall be conducted in accordance with method 510. Upon completion of this test, the computer shall be examined to determine that no dust (fine sand) has entered the adjustment dust cover. The computer shall then meet the individual tests.

4.6.16.4 Humidity. The computer shall be subjected to a humidity test in accordance with method 507 after which it shall meet the individual tests. There shall be no evidence of corrosion or rust which will affect subsequent operation.

4.6.16.5 Fungus. The fungus test shall be conducted in accordance with method 508, procedure I. Upon completion of this test, the computer shall meet the individual tests. There shall be no deterioration nor shall any part of the computer support fungus growth.

4.16.16.6 Rain. The rain test shall be conducted in accordance with method 506 in its normal operating position. The computer shall then meet the individual tests.

4.6.16.7 Salt fog. The computer shall be subjected to a salt fog test in accordance with method 509. At the end of the 48-hour period, the computer shall be subjected to and shall meet the individual tests.

4.6.16.8 Vibration failure. The computer shall be properly connected with power applied and subjected to a vibration test in accordance with method 514, 1B1C. At the end of this test, the computer shall be subjected to and shall meet the individual tests. The computer shall then be subjected to a vibration of 0.4 inch double amplitude or 1.0g (whichever is less) within the frequency range of 1 Hz to 10Hz for a period of 15 minutes. There shall be no transients or discontinuity in outputs for any mode of operation. No damage to the computer shall occur as a result of this test.

4.6.17 Acceleration. The computer, not operating, shall be mounted on a centrifuge in its normal operating position and subjected to an acceleration of 20g for a period of 1 minute in each axis, first along the vertical axis and then along each of two axis that are perpendicular to the vertical axis and to each other. At the end of this acceleration, the computer shall meet the individual tests. No damage to the computer shall result from this test.

4.6.18 Temperature shock. The computer shall be properly connected with power applied and subjected to a vibration test in accordance with method 514.2, equipment category b.2. After the computer has turned to room temperature, connectors and

seals shall be examined. There shall be no evidence of cracked terminals or leaks in the seals. The computer shall then meet the individual tests.

4.6.19 Sealing temperature shock. The computer shall be immersed alternately in tap water maintained at 85° +4° C and 5° +4°C for a total of 8 cycles. The length of time for each bath immersion shall be 30 minutes and no more than 5 seconds shall elapse between bath immersions. The forward 0.50 inch of the front adjustment panel need not be submerged. No damage shall result to the hermetic seal as a result of this test. Following the immersions, the computer shall be tested for leaks by means of a mass-spectrometer-type helium leak detector. The initial maximum detected leak rate, at a pressure differential of 1 atmosphere, shall not permit more than 10 percent loss of the total filling medium after 1,000 hours.

4.6.19.1 External pressure. With no power applied, the computer, shall be cycled 6 times from atmospheric pressure to 26.4 psia. At the completion of this test, the computer shall pass all the individual tests.

4.6.20 Shock. The computer shall be subjected to a shock test in accordance with method 516, procedure 8. The equipment shall not be damaged or subsequently fail as a result of this test.

4.6.21 Reliability. Three computers (from each production "run" or single contractual "buy") shall be subjected to a reliability qualification test in accordance with MIL-STD-781D, Task 301, Reliability Qualification Test. Test Plan II-D, MIL-HDBK-781 shall be used to demonstrate a lower test MTBF (0_1) of 3500 hours. The qualification test will be conducted in combined environments as specified in MIL-HDBK-781, paragraph 5.8.1, Turbopropeller aircraft environments. Environmental conditions specified in MIL-STD-810C Test Method 519.3, Gunfire Vibration aircraft, will be utilized for any equipment that could possibly be used on AC-130 aircraft. Each mode of operation covered in paragraph 3.10.2.1 through 3.10.2.7 of this specification shall be switched at 1 hour intervals during the ON time of this test. All inputs shall be applied to the computer at their maximum value during the test. The output loads shall be 500 ohms.

a. An acceptance reliability test shall be conducted to demonstrate a computer minimum acceptable MTBF of 600 hours. Acceptance shall be based on MIL-STD-781D, Test Plan XXVII and the test environment of Test Level E. Each mode covered in 3.10.2.1 through 3.10.2.7 shall be switched at 1 hour intervals during the ON time of this test. All inputs shall be applied to the computer at their maximum value during test. The outputs shall be 500 ohms.

4.6.22 Signal characteristics. Vertical and horizontal output signal characteristics shall be tested to determine that the requirements of 3.12 and 3.12.1 are fulfilled.

a. Computer loading of input signals shall be tested. Input impedence for attitude signals, heading and course error signals, and radio signals shall be as specified in 3.11.

4.7 Packaging Inspection

4.7.1 Quality conformance. The inspection of the preservation-packaging and interior package marking shall be in accordance with group A and B quality conformance inspection requirements, section 4 of MIL-P-116, The sampling and inspection of the packing and marking for shipment and storage shall be in accordance with the quality assurance provisions of applicable container

specification and the marking requirements of MIL-STD-129.

5. Packaging

5.1 Preservation. Preservation shall be level A, C, or Industrial, IAW MIL-STD-2073-1, as specified (see 6.2).

5.1.1 Level A.

5.1.1.1 Cleaning. Computers shall be cleaned in accordance with process C-1 or MIL-P-116.

5.1.1.2 Drying. Computers shall be dried in accordance with D-4 of MIL-P-116.

5.1.1.3 Preservation application. Preservative shall not be used.

5.1.1.4 Unit Packaging. Unless otherwise specified by the contracting activity, each computer shall be packaged in quantity unit packs of one each in accordance with Method IIC of MIL-P-116. Each computer shall be placed in a PPP-B-636 Fiberboard container weather resistant, with sufficient cushioning material between bag and unit container of a type, density, and thickness to insure shock transmission does not exceed peak values in G's established for the computer when completed packs are subjected to the rough handling drop tests of MIL-P-116.

5.1.2 Level C. Each computer shall be clean, dry, and individually packaged in a manner that will afford adequate protection against corrosion, deterioration, and physical damage during shipment from supply source to the first receiving activity.

5.1.3 Industrial. The Industrial preservation of computer shall be in accordance with ASTM D3951.

5.1.3.1 Components. The preservation of units/boards/assemblies which contain electrostatic discharge sensitive components shall be packaged in accordance with MIL-STD-2073-1.

5.2 Packing. Packing shall be level A, B, C, or Industrial as specified (see 6.2).

5.2.1 Level A. Computers packaged as specified in 5.1.1 shall be packed in shipping containers conforming to PPP-B-601, Styles A or B, Class overseas, unless otherwise specified by the contracting activity. Insofar as practical, exterior shipping container shall be of uniform shape, size,minimum tare and cube consistent with the protection required.

5.2.2 Level B. Computers packaged as specified in 5.1.1 shall be packed in shipping containers conforming to PPP-B-636, class weather-resistant, unless otherwise specified by the contracting activity. Other requirements as specified in 5.2.1 apply.

5.2.3 Level C. Packing shall be applied which affords adequate protection during domestic shipment from the supply source to the first receiving activity for immediate use. This level shall conform to applicable carrier rules and regulations.

5.2.4 Industrial. The packaged computer shall be packed in accordance with ASTM D3951.

5.3 Marking. In addition to any other markings required by the contract or order (see 6.2), interior containers shall be marked in accordance with MIL-STD-129.

5.3.1 Components. Units/boards/assemblies which contain electrostatic discharge sensitive components shall be marked in accordance with MIL-STD-129.

6. Notes

(This section contain information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The CPU-65/A computer covered by this specification is intended for universal use in all types of military fixed-wing aircraft, such as cargo, bomber, and high-performance fighters, to provide computer flight director signals to flight director indicators.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification

b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual individual documents referenced (see 2.1)

c. When sampling plan B and C tests will not be conducted

d. Selection of applicable levels of packaging and packing

e. Reinspection date markings.

6.3 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item(s) should be preproduction sample, a first article sample, a first production item, a sample selected from the first article production items, a standard production item from the contractor's current 1 inventory (see 3.1), and the number of items to be tested as specified in 4.4. The contracting officer should also include specific instruction in acquisition documents regarding arrangements for examination, approval of first article test results, and disposition of first article. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or tests, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 DEFINITION

6.4.1 Hermetic seal. A hermetic seal is defined as perfectly closed and airtight seal made between vitric or metallic, or both materials. A hermetic seal is not intended to include seals accomplished by gaskets.

6.5 Subject term (key word) listing.

Gyroscope, MD1
Indicator, Altitude, ARU-2B/A
Indicator, Horizontal Situation, AQU-2/A

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodian:
Air Force - 99

Preparing Activity:
Air Force - 71

Reviewer:
DepSo - 01

Project No:
6610-F266

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-C-38286 B	2. DOCUMENT DATE (YYMMDD)

3. DOCUMENT TITLE

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER		
a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY	
a. NAME	b. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON
c. ADDRESS (Include Zip Code)	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340