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MILITARY SPECIFICATION

DISPLAY GROUP, TACTICAL DATA

AN/ASA-70

This specification has been approved by the Naval Air Systems Command, Department of the Navy. Asterisks indicate paragraphs changed from previous issue (see 6.7).

1. SCOPE

1.1 Scope - The equipment covered by this specification shall display alphanumeric symbols, tactical configurations, radar, and television patterns as required for the Tactical Coordinator (TACO) and other crew members of anti-submarine warfare (ASW) patrol aircraft.

* 1.2 Classification - The equipment covered by this specification shall consist of the following items:

Item	Type Designation	Applicable Paragraph
Display, Multipurpose Data (MDD)	IP-917/ ASA-70	3.5.1
Power Supply	PP-4986/ ASA-70	3.5.2
Display, Sensor Data (SDD)	IP-918/ ASA-70	3.5.3
Display, Auxiliary Readout (ARD)	IP-919/ ASA-70	3.5.4
Power Supply	PP-4987/ ASA-70	3.5.5

* 1.3 Associated Equipment - This equipment shall operate with the associated equipment listed in paragraph 6.8.

FSC 5895

2. APPLICABLE DOCUMENTS

* 2.1 General - The following documents of the issue in effect on the date of invitation for bids form a part of this specification to the extent specified herein.

SPECIFICATIONS

Military

MIL-E-5400	Electronic Equipment, Aircraft, General Specification for
MIL-T-5422	Testing, Environmental, Aircraft Electronic Equipment
MIL-P-7788	Plate, Plastic Lighting
MIL-M-7793	Meter, Time Totalizing
MIL-E-17555	Electronic and Electrical Equipment and Associated Repair Parts, Preparation for Delivery of
MIL-T-18303	Test Procedures: Preproduction and Acceptance for Aircraft Electronic Equipment, Format for
MIL-N-18307	Nomenclature and Nameplates for Aeronautical Electronic and Associated Equipment
MIL-C-21617	Connector, Plug and Receptacle, Electrical, Rectangular, Polarized Shell, Miniature Type
MIL-C-26482	Connector, Electrical, Circular, Miniature, Quick Disconnect

MIL-C-81511	Connector Electric, Circular, High Density, Quick Disconnect, Environment Resisting, General Specification for

Naval Air System Command

AR-5	Microelectronic Devices Used in Avionic Equipment Procedures for Selection and Approval of
WR-101	Weapon Requirement for Advanced ASW Electronic Systems Part I - Electromagnetic Control Requirements for Advanced ASW Avionics Systems

STANDARDS

Federal

FED-STD-595	Colors

Military

MIL-STD-415	Test Points and Test Facilities Design, Standard for
MIL-STD-470	Maintainability Program Requirements (for Systems and Equipment)
MIL-STD-704	Electric Power, Aircraft Characteristics and Utilization of
MIL-STD-756	Reliability Prediction
MIL-STD-781	Test Levels and Accept/Reject Criteria for Reliability of Nonexpendable Electronic Equipment
MIL-STD-785	Requirements of Reliability Program (for Systems and Equipments)

MIL-STD-794	Part and Equipment, Procedure for Packaging and Packing of
MIL-STD-831	Test Reports, Preparation of
MS17321	Meter, Time Totalizing, 28 VDC, Miniature Digital
MS17322	Meter, Time Totalizing, 115 Volt, 400 Cycle

PUBLICATIONS
Military

MIL-HDBK-217	Reliability Stress and Failure Rate Data for Electronic Equipment

* 2.1.1 Availability of Documents - (1) When requesting specifications, standards, drawings, and publications refer to both title and number. Copies of this specification and applicable specifications required by contractors in connection with specific procurement functions may be obtained upon application to the Commanding Officer, Naval Supply Depot, Code 105, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

3. REQUIREMENTS

3.1 Preproduction - This specification makes provision for preproduction testing.

* 3.2 Parts and Materials - In the selection of parts and materials, fulfillment of major design objectives shall be the prime consideration. In so doing, the following shall govern:

(1) Microelectronic technology shall conform to AR-5 and WR-101, Part II, and the requirements specified herein.

(2) Other parts and materials requirements shall conform to Specification MIL-E-5400.

(3) Nonrepairable subassemblies, as outlined in Specification MIL-E-5400. shall be used when practicable. The general size of the subassembly and the amount of circuitry to be included therein shall be approved by the Procuring Activity. Nonrepairable subassemblies must be reliable (see paragraph 6.4).

(4) When previously produced models of this equipment do not use nonrepairable subassemblies, the design shall not be changed to employ nonrepairable assemblies without the approval of the Procuring Activity.

(5) All chassis wiring shall be identification coded by a wire insulation color system. All single wires with the same specified function shall have a common insulation color. In general, the identification system will distinguish, one from another and from signal circuits, those circuits whose primary purpose is the supply power.

(6) The use of dip brazing in accordance with Requirement 59 of MIL-STD-454B and MIL-B-7883 is permitted.

(7) Use of unsealed variable transformers to provide lamp power is permitted. If such transformers are used they must be protected by a suitable housing.

* 3.2.1 Nonstandard Parts and Materials Approval - Approval for the use of nonstandard parts and materials (including electron tubes, transistors, and diodes) other than microelectronic devices shall be obtained as outlined in Specification MIL-E-5400. Microelectronic devices shall be approved in general accordance with WR-101, Part II, and AR-5.

* 3.2.2 Microelectronic Modular Assemblies - When used, microelectronic module assemblies shall meet the requirements of Specification AR-5.

* 3.2.3 Maintenance Module - A maintenance module is defined as the least complex segment of the contract end article(s) that is capable of being removed and replaced with organizational level maintenance on the P3-C aircraft using tools, support equipment, and procedures approved for the end article(s). Further, it is the segment to which the Contractor will provide fault detection and isolation techniques consistent with scheduled and unscheduled organizational level maintenance requirements.

3.3 Design and Construction - The equipment shall conform with all the applicable requirements of Specification MIL-E-5400 for design, construction, and workmanship, except as otherwise specified herein.

* 3.3.1 Total Weight - The total weight of the equipment excluding external cables shall be a minimum consistent with good design and shall not exceed the following:

(1) Multipurpose Data Display IP-917/ASA-70 . . 260 pounds

(2) Sensor Data Display IP-918/ASA-70 . . . . . 235 pounds

(3) Auxiliary Readout Display IP-919/ASA-70 . . 55 pounds

(4) Power Supply PP-4986/ASA-70 . . . . . 86 pounds

(5) Power Supply PP-4987/ASA-70 . . . . . 24 pounds

3.3.2 Reliability - The contractor shall conduct a reliability program using MIL-STD-785 as a guide. On a reorder from a supplier who has previously produced the equipment, the program previously used may be continued unless otherwise indicated in the contract or order.

3.3.2.1 Operational Stability - The equipment shall operate with satisfactory performance, continuously or intermittently, for a period of at least 300 hours without the necessity for readjustment of any controls that are inaccessible to the operator during normal use.

3.3.2.2 Operating Life - The equipment shall have a total operating life of 40,000 hours with reasonable servicing and replacement of parts. Parts requiring scheduled replacement shall be specified by the Contractor.

* 3.3.2.3 Reliability in Mean Time Between Failure (MTBF) - The specified mean (operating) time between failures for the equipments listed, when tested and accepted as outlined under the requirements of paragraph 4.4.3, are as follows:

(1) The MDD and Power Supply PP-4986/ASA-70 together shall meet or exceed 715 hours.

(2) The SDD and Power Supply PP-4986/ASA-70 together shall meet or exceed 715 hours.

(3) The ARD and Power Supply PP-4987/ASA-70 together shall meet or exceed 1000 hours.

(4) The MDD tray excluding Government specified items (projection readouts, switches, lamps, and track ball) shall meet or exceed 1000 hours.

(5) The SDD tray excluding Government specified items (projection readouts, switches, lamps, and track ball) shall meet or exceed 2000 hours.

* 3.3.2.4 Time Totalizing Meter - The following units shall contain time totalizing meters in accordance with Specification MIL-M-7793.

Unit	Type of Meter
(1) Multipurpose Data Display	MS 17322

Unit	Type of Meter
(2) Sensor Data Display	MS 17322
(3) Auxiliary Readout Display	MS 17322
(4) Power Supply PP-4986/ASA-70	MS 17322
(5) Power Supply PP-4987/ASA-70	MS 17322

3.3.3 Cabling and Connections-

* 3.3.3.1 Cables and Connectors - The equipment shall provide for the use of cables and connectors in accordance with WR-101, Part I, and MIL-C-81511, MIL-C-21617, and MIL-C-26482.

* 3.3.3.2 Interconnection Cabling - The equipment shall be capable of satisfactory operation using external wiring in accordance with the applicable requirements of WR-101, Part I. The external wiring shall be unshielded except that a minimum number of the individual wires may be shielded when demonstrated as necessary to meet interference control requirements and provided the assembly of the cable to its plugs may be easily accomplished. External cables and that portion of the connectors attached to the cables shall not be supplied as part of the equipment.

* 3.3.4 Control Panels - All permanently mounted control panels shall conform to the applicable requirements of Specification MIL-P-7788 except that control panels shall be gray per FED-STD-595 (Color No. 36231) with green lighting. The configuration of all control panels must be approved by the Procuring Activity prior to preproduction testing.

* 3.3.5 Interchangeability of Reordered Equipment - For reordered equipment, interchangeability shall exist between units and all replaceable assemblies, subassemblies, and parts of a designated model of any previously manufactured equipment supplied or designated by the Procuring Activity, per MIL-E-5400.

* 3.3.6 Interference Control - The level of interference control provided by the equipment produced under this contract will be the same as that demonstrated in the First Article Test after the incorporation of ECP 1001 and 1001-1.

*3.3.7 Maintainability-

*3.3.7.1 Maintainability Program - The Contractor shall establish and conduct a maintainability program in accordance with MIL-STD-470. All maintenance actions shall be capable of being performed by a technician with a comprehensive ability level as follows:

(1) Civilian education - High school graduate or equivalent.

(2) Technical training - Navy, Class A technician school appropriate to the maintenance task.

(3) Experience - Two years of technical experience in addition to technical training.

(4) Maintenance training - Successful completion of Display Group Tactical Data maintenance training course.

3.3.7.1.1 Readiness Measurement Requirements - Suitable features shall be incorporated in the equipment to provide the operator, while airborne and while on the ground, with GO/NO-GO indication of equipment readiness. These features may be in conjunction with, but not necessarily as part of, the fault isolation features.

3.3.7.1.2 Maintainability Requirements-

*3.3.7.1.2.1 Operational Maintainability Requirements - The time to perform unscheduled maintenance actions shall be composed of:

(1) Recognition of a fault.

(2) Isolation of the fault to a maintenance module.

(3) Maintenance module replacement.

(4) Realignment, as required.

(5) Retest for system readiness.

It shall be possible to perform 90 percent of all maintenance actions within 30 minutes at the organizational maintenance level.

* 3.3.7.1.2.2 Packaging Requirements - The equipment shall be packaged in modular form so that, to the maximum extent practical, all subassemblies shall be the plug-in type and should be easily removable. If a special tool is required for removal, it shall be provided and attached to the equipment.

3.3.7.1.2.3 Module Commonality - The number of different modules will be kept to an absolute minimum. This standardization is mandatory to ease the testing and spares requirements at all levels of maintenance.

3.3.7.1.2.4 Module Accessibility - Module arrangement will be such that access to each module does not require the removal of adjacent modules or parts other than access panels.

* 3.3.7.1.2.5 Keying - Modules and connectors shall be keyed to prevent the insertion of a connector or module into an improper location within or on the equipment, with the exception of high-voltage, coaxial, and triaxial connectors.

3.3.7.1.2.6 Part Replacement - Part replacement on the analog modules shall be possible by skilled technicians working in a designated service area such as an intermediate maintenance activity. Use of potting compounds, excessive moisture/fungus proofing compounds, or any other substance to mechanically support piece parts is forbidden.

Conformal coatings are permitted, provided:

(1) A 30-mil thickness is not exceeded.

(2) Reference designators and/or part identification remain clearly legible.

(3) Compliance with paragraph 3.2.1.1.9 of MIL-E-5400 is maintained.

(4) Part placement is not impeded.

3.3.7.1.2.7 Nonrepairable Assemblies - All designs for nonrepairable assemblies shall be submitted to the Procuring Activity, for approval, prior to release for fabrication.

3.3.7.1.2.8 Adjustments - Procuring Activity approval is required for design and use of all periodic adjustment, alignment, or calibration functions except for those specified herein. Adjustments shall be capable of being made in the aircraft using simple hand tools and/or general and standard test equipment. Adjustments shall be identified and accessible without a requirement to remove or relocate the module.

3.3.7.1.2.9 Access Panels - Access panels shall be retained by quick-disconnect fasteners, i.e., hand-operated slide, dzus type, etc.

* 3.3.7.1.2.10 Service Access - Devices requiring removal periodically for inspection and/or servicing shall be retained by quick-disconnect fasteners, i.e., hand-operated slide, dzus type. etc.

3.3.7.1.2.11 Mounting Devices - Connectors, receptacles, fuses, circuit breakers, or any other electronic part shall not be a part of any mounting device associated with the equipment.

* 3.3.7.1.2.12 Aircraft Connectors - Aircraft connectors shall mount directly on the equipment using quick-disconnect type connectors as specified in MIL-C-81511, MIL-C-21617, and MIL-C-26482.

* 3.3.7.1.2.13 Protective Devices - Circuit breakers shall be used in lieu of fuses whenever possible. Fuses, if used, shall be of types and ratings readily available from U. S. Navy Supply. Fuse holders and/or circuit breaker reset mechanisms shall be accessible from the exterior of the equipment, plainly marked as to rating and size, and shall be of the fault-indicating type and/or have access for quick voltage checks.

* 3.3.7.1.2.14 Access - It shall be possible to perform 90 percent of the anticipated maintenance action by access to the front of the equipment only.

3.3.7.1.2.15 Handles - A handle or handles shall be provided if required to afford one man optimum handling. Handle location shall be appropriate for ease of handling, installation, and removal.

* 3.3.7.1.3 Fault Isolation-

3.3.7.1.3.1 Fault Isolation - In conjunction with, but not necessarily as part of the performance/readiness testing features, there shall be features incorporated that will permit fault isolation to the module level. These features shall include

the necessary switching arrangements with a GO/NO-GO readout device that will clearly indicate whether or not the function selected is within minimum performance standards. If a built-in readout device is not feasible, means shall be provided to use general or standard test equipment, i.e., oscilloscope, VTVM, etc. This fault isolation may be performed in conjunction with the associated equipment of paragraph 6.8. The display tube is a suitable readout device.

3.3.7.1.3.2 Diagnostic Ability - If feasible, the equipment shall be logically and electrically designed to facilitate the location of malfunctioning modules through diagnostic programming in conjunction with the aircraft computer and/or other installed electronic equipment. Test points shall be made available from the front of the equipment or maintenance module to assist diagnosis of malfunctions.

3.3.7.1.4 Test Points-

* 3.3.7.1.4.1 Test Point Requirements - All test points shall be in accordance with MIL-STD-415 and shall accommodate standard Navy-approved test equipment, i.e., multimeter, oscilloscope probes. In the event test points cannot accommodate standard probes, use of adapters will be permitted. These adapters are to be provided with and secured to the set.

3.3.7.1.4.2 Power Supply Test Points - Accessible external individual test points shall be provided on the equipment to measure the output voltages. The test points shall be identified as to the voltage normally present.

* 3.3.7.1.4.3 Chassis Test Points - Test points shall be chosen to provide a straightforward, logical, step-by-step troubleshooting sequence, as well as to provide a single end-to-end performance check, and shall be in accordance with MIL-STD-415.

3.3.7.2 Maintainability Assurance - Testing to demonstrate the achievement of the maintainability requirement specified herein shall be in accordance with paragraph 4.5.

* 3.3.7.3 Special Support Equipment - There shall be no special support equipment for support of the Tactical Data Display Group except as authorized by the Procuring Activity.

3.3.8 Nomenclature and Nameplates - Nomenclature assignment and nameplate approval for equipment identification shall be in accordance with Specification MIL-N-18307.

* 3.3.9 Standard Conditions - The following conditions shall be used to establish normal performance characteristics under standard conditions and for making laboratory bench tests.

(1)	Temperature	Room ambient (25±5°C)
(2)	Altitude	Normal ground
(3)	Vibration	None
(4)	Humidity	Room ambient up to 90 percent relative humidity
(5)	Input Power Voltage	115 ±1.0 VAC, 3-phase, 400 Hz ± 1 percent

3.3.10 Service Conditions - The equipment shall operate satisfactorily under any of the environmental service conditions or reasonable combination of these conditions as specified in Specification MIL-E-5400 for Class 1A equipment, except as modified herein.

3.3.10.1 Vibration - The equipment shall operate satisfactorily when subjected to the vibration requirements of Curve I, Figure 5 of Specification MIL-E-5400H or ±2g, whichever is less.

3.3.10.2 Temperature - The equipment shall perform satisfactorily when operated within the temperature range of -25°C to +55°C. Degraded performance may occur when operating within the temperature range of -54°C to -25°C.

* 3.3.11 Warm-up Time - The time required for equipment warm-up shall be kept to a minimum and shall not exceed 3 minutes under standard conditions and 10 minutes at -25°C. Turn-on capability shall be maintained down to a temperature of -54°C with no damage to the equipment.

3.3.12 Input Electrical Power-

* 3.3.12.1 Operating Power - The equipment shall meet all applicable requirements of MIL-STD-704 and shall give specified performance from the following power source with characteristics as defined in MIL-STD-704 having limits as defined herein. The equipment shall operate within the bounds of limits 2 and 3 of Figure 3

of MIL-STD-704A except that the upper operating limit shall not be greater than 130 volts and the lower operating limit shall not be less than 100 volts. Degraded operation may occur when the input exceeds the above limits but remains within limits 1 and 4 of Figure 3 of MIL-STD-704A. However, no damage shall be suffered by the equipment and normal operation shall automatically resume upon return of the input voltage to levels within the operating limits as defined above. The power required shall not exceed the following specified amounts.

(1) MDD, including power supply: AC power, 115/200V, 3-phase, 400-Hz, category B, 2250VA.

(2) SDD, including power supply: AC power, 115/200V, 3-phase, 400-Hz, category B, 2250VA.

(3) ARD, including power supply: AC power, 115/200V, 3-phase, 400-Hz, category B, 405VA.

The equipment shall meet the input frequency requirements of MIL-STD-704A within the bounds of limits 2 and 3 of Figure 5.

*3.3.12.2 Lighting Power - The power for lighting shall be derived from the same source as the operating power. The power required for lighting shall be included in the amounts specified in paragraph 3.3.12.1.

*3.3.12.3 Standby Power - Standby power shall not be provided.

*3.3.12.4 Degraded Performance - Degraded performance will be permitted for voltage transients, having amplitudes as defined in paragraph 3.3.12.1. not exceeding 0.5 second during normal electric system operation. Operation shall return to normal with no resulting damage to the equipment.

*3.3.13 Cooling - The equipment shall operate satisfactorily under the specific thermal characteristics described in 3.5.1.6 and 3.5.3.6.

3.4 Performance - Unless otherwise specified, values set forth to establish the requirements of satisfactory performance apply to performance under both standard and extreme service conditions. When reduced performance under the extreme conditions is acceptable, tolerances or values setting forth acceptable variations from the performance under the standard conditions will be specified.

*3.4.1 Operation - The operation of the equipment shall be as follows:

*3.4.1.1 Multipurpose Data Display - By use of controls interfacing with the associated equipment of paragraph 6.8, the MDD shall be capable of displaying computer-generated data consisting of the alphanumeric characters and symbols of Table I, vectors, ellipses. and circles in such a way that a true tactical plot of the ASW situation will be displayed. Television (paragraph 6.8) and scan-converted radar presentations shall be displayed upon command. The capability to superimpose the radar presentation on the ASW plot shall be provided. A track ball and hook symbol shall provide the capability to identify targets and insert their positions into the computer.

*3.4.1.2 Sensor Data Display - By use of controls interfacing with the associated equipment of paragraph 6.8, the SDD shall be capable of displaying the alphanumeric characters and symbols of Table III, television presentations, and scan-converted or raw radar presentations. The capability to superimpose the scan-converted radar on the ASW plot shall be provided. A track ball and hook symbol shall provide the capability to identify targets and insert their positions into the computer.

*3.4.1.3 Auxiliary Readout Display - The ARD shall display the computer-generated alphanumeric characters and symbols shown in Table IV, teletype messages and computer-generated tableau consisting of information on navigation, sensor, and armament conditions. These displays shall be presented either automatically or on command through the controls that interface with the Data Processing System (DPS), paragraph 6.8.

3.5 Detailed Requirements -

*3.5.1 Multipurpose Data Display IP-917/ASA-70 - The MDD shall meet the following requirements:

*3.5.1.1 MDD Function - The MDD display shall be capable of being interfaced with the equipments listed in paragraph 6.8. The display shall be capable, via self-contained controls, of commanding the display of data as described in paragraph 3.4.1.1

*3.5.1.2 MDD Form Factor - The display shall be enclosed in a console that has the following maximum outline dimensions including controls and

connectors: 24.5 inches high, 45 inches deep, and 36 inches wide. Console profile and configuration will require Procuring Activity approval prior to release for fabrication.

* 3.5.1.3 MDD Weight - The weight of the MDD display shall be a minimum consistent with good design and shall not exceed 260 pounds.

* 3.5.1.4 MDD Contents - The MDD console shall contain the functional subassemblies, circuits, modules, etc. described in the following paragraphs.

Item		Applicable Paragraph
(1)	Display Tube Module	3.5.1.4.1
(2)	Video System	3.5.1.4.2
(3)	X and Y Axis Deflection Units	3.5.1.4.3
(4)	Selection and Reference Unit	3.5.1.4.4
(5)	Lens Amplifier Unit	3.5.1.4.5
(6)	High Voltage Power Supplies	3.5.1.4.6
(7)	Analog Vector Generator	3.5.1.4.7
(8)	MDD Logic Interface	3.5.1.4.8
(9)	Distribution Panel	3.5.1.4.9
(10)	MDD Console Indicator Lights	3.5.1.4.10
(11)	Analog Interface	3.5.1.4.11
(12)	MDD Maintenance Controls	3.5.1.5.5
(13)	Control Tray	3.5.1.5.6

* 3.5.1.4.1 Display Tube Module - The display tube module consists of the display tube with its internally mounted electron gun, electrostatic deflecting selection plates, etched character matrix plate, electrostatic referencing plates,

and externally mounted magnetic deflection yoke. The deflection yoke is driven by the deflection power amplifier, whose output determines the position of the electron beam impingement on the viewing screen. The selection and reference plates are driven in such a manner that the electron beam is shaped by the character matrix into the desired character. The electron gun elements are interconnected with the lens amplifier unit and the Z-axis circuitry. The high voltage power supplies provide the final electron acceleration.

* 3.5.1.4.1.1 Display Tube - Pertinent display tube characteristics are:

(1)	Maximum Overall Length	28 inches
(2)	Maximum Tube Diameter	16 inches
(3)	Minimum Useable Tube Diameter.	14 inches
(4)	Phosphor	P28
(5)	Maximum Spot Size	0.015 inch at 2 foot-lamberts measured using TV merge raster techniques. Spot size growth shall be no more than 50%.

The transmittance of the material used for the implosion shield of the display tube shall be greater than 45 percent when measured with a light source color temperature of 2854 ±50 degrees Kelvin.

* 3.5.1.4.1.2 Display Tube Character Matrix - The display tube character matrix shall contain 64 character positions. The characters and associated codes shall be as specified in Table I. The nominal character block height as displayed on the face of the tube shall be 0.125 inch. The size of the cursor symbol (Table I, Code 36) shall be large enough to encircle any other symbol. Character referencing shall be within 10 percent of the nominal character block height for all characters except the four corner characters (Table I, Codes 07, 35, 42, 70). Character referencing of

OCTAL CODE	CHARACTER
0 0	(Spot)
0 1	1
0 2	2
0 3	3
0 4	4
0 5	5
0 6	6
0 7	7
1 0	8
1 1	9
1 2	0
1 3	-
1 4	T
1 5	V
1 6	E
1 7	M
2 0	R
2 1	I
2 2	P
2 3	C
2 4	L
2 5	J

OCTAL CODE	CHARACTER
2 6	D
2 7	
3 0	S
3 1	B
3 2	
3 3	
3 4	
3 5	
3 6	
3 7	
4 0	D
4 1	
4 2	N
4 3	
4 4	
4 5	
4 6	
4 7	
5 0	R
5 1	S
5 2	A

OCTAL CODE	CHARACTER
5 3	B
5 4	C
5 5	E
5 6	F
5 7	G
6 0	H
6 1	I
6 2	J
6 3	K
6 4	L
6 5	M
6 6	P
6 7	Q
7 0	T
7 1	U
7 2	V
7 3	W
7 4	X
7 5	Y
7 6	Z
7 7	+

TABLE I
MDD CHARACTER MATRIX AND OCTAL CODE

these four corner characters shall be within ±15 percent of the nominal character block height. The character block height is the height of the □ symbol (Table I, Code 41).

*3.5.1.4.2 Video System - The video system shall be designed to provide output signals to the control grid of the display tube (3.5.1.4.1.1). The system gain, from the MDD input to the display tube grid, shall be constant, ±3dB, over a frequency range of 2 Hz to 31 MHz. The video system shall have the following functional units.

(1) Video Amplifier

(2) Unblank Amplifier

*3.5.1.4.2.1 Video Amplifier - The video amplifier shall process the following type of data (see paragraph 6.8):

(1) Scan Converter . . . . . Analog 1

(2) Television Camera Set . . . . . Analog 2

(3) Spare Scan Converter . . . . . Analog 3

(4) Function Generator . . . . . Analog 4

*3.5.1.4.2.1.1 Video Amplifier Functional Units - The video amplifier shall have suitable functional units and controls as follows:

(1) The video amplifier functional unit shall have 4 video amplifiers to accommodate 4 analog input channels. The amplifier input shall accommodate video signals from 0 to between +2 to +2.5 volts maximum and unblank signals from 0 ±0.5 to +5 ±1 volts maximum. Positive input signal shall represent white and ground shall represent black. The dynamic range of the video amplifier will be such that a minimum of 10 shades will be discernible at the output screen of the cathode ray tube in an ambient light of 0.4 foot-candle. Each amplifier shall have a control for varying the pedestal and a constant impedance input attenuator of 95 ±5 ohms.

(2) Circuits shall be provided to control the video pedestal amplitude in compensation for the inherent brightness variations of the spiral raster. Manual controls shall be provided to adjust the slope and amplitude of the pedestal for individual compensation of the spiral raster. The slope shall be adjustable to zero for non-spiral raster inputs.

(3) Tube brightness controls shall be provided for characters, vectors, the cursor, and the analog signals as required to produce uniform display presentation.

(4) Peripheral blanking or clamping shall be provided to blank the tube whenever the beam is deflected beyond the useful display area of the display tube.

* 3.5.1.4.2.2 Unblank Amplifier - The unblank amplifier, in response to signals from the video amplifier, shall provide a linear, capacitively coupled output to drive the grid of the display tube and shall reference the unblank gate/video signal at the display tube grid to the high,negative voltage developed in the high voltage power supply of paragraph 3.5.1.4.6. The unblank amplifier shall be mounted on the display tube module chassis.

* 3.5.1.4.2.3 Video System Test Points - As a minimum, test points shall be provided on the video amplifier front panel for monitoring the following signals:

(1) Analog (1) Video Input

(2) Analog (2) Video Input

(3) Analog (3) Video Input

(4) Analog (4) Video Input

(5) Character Brightness

(6) Vector Brightness

(7) Cursor (Code 36, Table I) Brightness

(8) Output Unblank/Video Signal

(9) Ground

* 3.5.1.4.3 X and Y Deflection Units - The X and Y axis deflection units shall be designed to provide output signals to the magnetic deflection yoke of the display tube. Input signals from 6 to 8 volts peak shall deflect the beam one display radius. The large signal (one display diameter deflection) bandwidth, measured at the 3dB points, shall be 50 KHz minimum. The small signal (less than 0.5-inch deflection) bandwidth, measured at the 3dB points, shall be 150 KHz minimum.

The difference in phase between the X and Y axis deflection unit output signals shall be less than 0.5 degree at 16 KHz. The total phase error shall be adjustable to less than ± 1.0 degree provided the phase shift due to differential time delays between the video and deflection signals at the input to the MPD does not exceed ± 1.0 degree. The deflection units shall have the following capability:

(1) Full-scale (one display diameter) random settling time maximum 16 microseconds.

(2) Tabular spacing (less than 0.5 inch) settling time maximum 4 microseconds.

(3) Spiral scan frequency maximum 16 KHz.

(4) Function generator frequency maximum 12 KHz.

(5) Horizontal display sweep time minimum 30 microseconds.

(6) Horizontal flyback time maximum 10 microseconds.

Each deflection unit shall have four functional subassemblies as follows:

(1) Digital-to-Analog Conversion Subassembly

(2) Analog Gating Subassembly

(3) Deflection Preamplifier

(4) Deflection Power Amplifier

* 3.5.1.4.3.1 Deflection Unit Digital-to-Analog Conversion Subassembly - The digital-to-analog conversion subassembly shall convert the X or Y position bits into deflection voltages suitable for driving the deflection preamplifier (3.5.1.4.3.3). The digital-to-analog conversion subassembly shall contain switching circuits, a binary attenuator ladder, and a reference power supply as necessary to produce 511 output voltage levels for inputs into the deflection preamplifier. The switching circuits shall be controlled by digital input bits and shall switch the precision reference voltage into appropriate legs of the ladder from which the analog output is derived.

3.5.1.4.3.2 Deflection Unit Analog Gating Subassembly - The analog gating subassembly shall contain circuits to gate one of four analog deflection signals with an analog enable signal from the DPS (6.8). The analog selection signal shall then be routed to the deflection preamplifier.

3.5.1.4.3.3 Deflection Unit Deflection Preamplifier Subassembly - The deflection preamplifier subassembly shall be a high-gain DC differential amplifier suitable for driving the deflection power amplifier. The deflection preamplifier shall utilize high-gain feedback for stability. Provisions shall be made for combining signals from the decoding and analog gating subassemblies as required to drive the deflection power amplifier. Deflection limiting circuits shall be provided to prevent overdriving the deflection amplifiers.

3.5.1.4.3.4 Deflection Power Amplifier - The deflection power amplifier shall be a high-current power amplifier for the deflection yoke of the display tube module. The amplifier shall form an integral high-gain feedback amplifying system with the deflection preamplifier subassembly.

* 3.5.1.4.4 Selection and Reference Units - The selection and reference units shall be designed to convert the 6-bit character selection codes, as received from the DPS (6.8), into push-pull differential signals for the electrostatic selection and reference plates of the display tube. The selection and reference units shall contain four identical circuit assemblies, two for the X and two for the Y selection and reference.

* 3.5.1.4.5 Lens Amplifier Unit - The lens amplifier unit shall provide appropriate voltage levels to the electron optical system of the display tube module, in consonance with the requirements established by the signals received from the DPS (6.8). The lens amplifier power supplies shall be referenced to the outputs of the high voltage power supplies and the unblank amplifier and shall be adjustable automatically as required to provide a proper beam size and intensity for the varied purposes of character, cursor vector, conic, radar, and TV presentations.

* 3.5.1.4.6 High Voltage Power Supplies (HVPS) - The high voltage power supply shall be designed to provide the voltages for the electron gun and acceleration anodes of the display tube. Reference levels from the high voltages shall be supplied to the unblank amplifier and to the lens amplifier unit. Primary power to the high voltage power supply shall be furnished by Power Supply PP-4986/ASA-70. Overload protection shall be provided to protect all circuits and units using the high voltages. The HVPS shall be shielded, replaceable modules that can be replaced quickly and easily. All electrical connections between the HVPS and other display modules shall be via connectors.

3.5.1.4.7 Analog Vector Generator Unit - The analog vector generator subassembly shall contain the necessary logic, sweep generator, D-to-A converters, and divider network to generate a vector in response to data and control signals received from the DPS (6.8).

* 3.5.1.4.7.1 Sweep Generator - The sweep generator shall supply the reference voltage to the two 10-bit D-to-A converters. This reference voltage shall be linear and shall supply the voltage necessary to generate full-diameter vectors within 256 microseconds. The time the sweep voltage is present shall be dependent on the time duration of the sweep enable line originating from the DPS (6.8). The sweep enable and vector unblank input lines shall be terminated at the MDD with differential amplifiers as per 3.5.1.4.11.

* 3.5.1.4.7.2 D-to-A Converters - The two 10-bit converters shall supply output voltages to "push" input of the X and Y axis deflection preamplifiers that are proportional to the reference voltage multiplied by the binary number applied to the inputs of the converters.

* 3.5.1.4.7.3 Divider Network - The divider network shall provide one-half of the sweep voltage to the "pull" input of the X and Y axis deflection preamplifiers.

* 3.5.1.4.8 MDD Logic Interface - The MDD logic interface units shall contain the necessary input amplifiers, with characteristics as described below, to accept the logic signals originating in the DPS (6.8). These input amplifiers may be contained within one unit or distributed among the various subassemblies as necessary.

(1) Voltage Level Inputs - The logic one state will be 0 ±0.5 volts and the logic zero state is +4 ±1 volts as measured at the input amplifier in the MDD.

(2) Noise Rejection - The circuit shall be designed for ±5 volts common mode noise rejection. It shall be capable of handling common mode noise levels up to ±5 volts peak, without any change in output level.

(3) Input Impedance - The input amplifier circuit shall have the following nominal values:

(a) 130 ohms AC high input to low input

(b) 1200 ohms DC high input to ±2 volts DC

(c) 1200 ohms DC low input to -2 volts DC

* 3.5.1.4.9 Distribution Panel - The distribution panel shall provide for external connectors for all signals and power lines and shall provide for their distribution to the subassemblies of the MDD consoles.

* 3.5.1.4.10 MDD Console Indicator Lights - Mounted on the MDD console in a position convenient for observation by the display operator during normal operations, shall be the following indicator lights:

(1) OVERFLOW

(2) TEST

* 3.5.1.4.10.1 Overflow Indicator Light - The overflow indicator light shall be illuminated by a signal from the DPS (6.8).

* 3.5.1.4.10.2 Test Indicator Light - The test indicator light shall be illuminated by the MDD whenever the mode selector switch is not in the on-line position.

* 3.5.1.4.11 Analog Interface - The MDD shall contain four analog input channels. These channels shall accept X deflection, Y deflection, video, and unblank signals from the associated equipment of paragraph 6.8.

Each analog input shall be terminated at the MDD with a differential amplifier. These amplifiers shall provide grounding isolation between the MDD and the associated equipment of paragraph 6.8 and shall be capable of tolerating a voltage difference of ±4 volts DC minimum between the triaxial inner conductor shield and the airframe.

The input impedance of these amplifiers shall be 95 ±5 ohms and 100 picofarads maximum.

* 3.5.1.4.11.1 Analog 1 Inputs - The analog 1 channel shall be capable of receiving signals from the scan converter and direct them to the video amplifier and to the X and Y deflection units so that a radar presentation is displayed, centered about the X and Y position specified by the set position word containing the analog code. The inputs shall be X and Y axis deflection signals, Z axis video modulation signal as specified in MIL-S-81343, Scan Converter Set, and the radar unblank signal from Master Timing, DPS, MIL-D-81347.

* 3.5.1.4.11.2 Analog 2 Inputs - The analog 2 channel shall be capable of receiving signals from the television camera set (MIL-C-81457). The input shall include X and Y axis deflection signals, Z axis video modulation signal, and an unblank signal. The video and unblank signals shall be routed to the video amplifier for control of the Z axis modulation while X and Y axis deflection signals are directed to the X and Y deflection units.

* 3.5.1.4.11.3 Analog 3 Inputs - The analog 3 channel shall be capable of receiving and processing input signals identical to those analog 1 signals described in paragraph 3.5.1.4.11.1.

* 3.5.1.4.11.4 Analog 4 Inputs - Analog channel 4 shall be capable of receiving signals from either the function generator or raw radar video. The function generator will provide the necessary X and Y deflection, unblank, and video signals to generate and display conics within the timing constraints as specified in MIL-D-81347A. These signals will be routed to the X and Y axis deflection units and the video amplifier. The amplitude of the X and Y deflection outputs shall be ±1 display diameter at 12 KHz. The raw radar presentation shall be in one of two formats, PPI or A-scan. For both PPI and A-scan presentations, the analog input signals shall be from the radar interface unit and shall be as described in Scan Converter Specification, MIL-S-81343.

* 3.5.1.4.11.5 Open Analog Input - If an analog input circuit wire is disconnected, the effect will be as though zero volts were present at the input.

* 3.5.1.4.11.6 Analog Channel Enable Signals - Each analog channel shall have separate video and deflection enable signals. The deflection enable shall precede the video enable by 16 microseconds.

* 3.5.1.5 MDD Controls-

* 3.5.1.5.1 MDD Video Amplifier Controls - The following controls shall

be provided for control of the MDD video amplifier:

(1) MDD Front Panel Console Controls

(a) Channel 1 Brightness

(b) Channel 2 Brightness

(c) Channel 3 Brightness

(d) Channel 4 Brightness

(e) Character Brightness

(f) Vector Brightness

(2) Video Amplifier Front Panel Alignment Controls

(a) Cursor Brightness

(b) Pedestal Amplitude . . . . . Analog 1

(c) Pedestal Amplitude . . . . . Analog 2

(d) Pedestal Amplitude . . . . . Analog 3

(e) Pedestal Amplitude . . . . . Analog 4

3.5.1.5.2 MDD Deflection Unit Controls - The X and Y axis deflection units shall each be identical and interchangeable and shall each contain on the module front panel the following controls and test points accessible for maintenance and alignment functions:

(1) Four analog gain controls with input signal test points.

(2) Deflection gain control with D-to-A converter and yoke signal test points.

(3) D-to-A converter on-off switch.

* 3.5.1.5.3 MDD Selection and Reference Unit Controls - The circuit assemblies shall contain features as required to provide for the following controls and functions. The controls shall be mounted on the front of the unit chassis so as to be accessible for maintenance and adjustment purposes. The controls and associated test points for maintenance shall be:

(1) X and Y amplifier output gain controls and associated output test points for adjusting and measuring the signal outputs from the amplifier.

(2) X and Y axis centering controls for centering of the selection and reference voltages on the matrix center.

(3) X and Y axis cross coupling controls for parallelogram correction.

(4) Astigmatism control for adjustment of the beam shape.

(5) X and Y axis D-to-A converter output test points to check the push-pull output levels to the high-gain DC amplifier as furnished to the selection and reference plates of the display tube.

* 3.5.1.5.4 MDD Lens Amplifier Unit Controls - Controls and test points shall be provided on the module front panel and shall be accessible for maintenance and adjustment purposes. The controls and test points as a minimum shall be as follows:

Controls

(1) Spot Focus

(2) Character Size

(3) Spot Beam Size

(4) Character/Cursor Beam Size

(5) Beam Convergence

Test Points

(1) Focus

(a) Spot

(b) Cursor

(c) Character

(2) Character Unblank

(3) Composite Focus

(4) Beam Size

(5) Heater Confidence Check

* 3.5.1.5.5 MDD Maintenance Controls - The MDD maintenance panel shall contain the following controls, mounted such that they shall be easily accessible during flight:

(1) Mode selector switch to select the following functions:

(a) On-Line

(b) Analog Test

(c) Matrix Test

(d) Registration Test

(e) Vector Test

(f) Type Test

(g) Function Generator Test

(h) Off-Line/Analog

(2) Off-line/analog switch to select:

(a) Channel 1

(b) Channel 2

(c) Channel 3

(d) Channel 4

(e) Channel 1 & 4

* 3.5.1.5.5.1 Mode Selector Switch - The mode selector switch shall control the functioning of the MDD and the DPS (paragraph 6.8) when placed in the

indicated positions in conformance with the following:

(1) On-Line - The MDD shall perform the operations controlled by the appropriate signals from the DPS (6.8).

(2) Analog Test - When the mode selector switch is in this position, the DPS shall transmit the proper control signals to the MDD to enable the analog presentation as selected by the off-line/analog switch.

(3) Matrix Test - The MDD shall display a matrix test pattern that shall provide a visual check of the display tube character matrix.

(4) Registration Test - The MDD shall display a registration test pattern that shall provide a visual check of the display tube character registration.

(5) Vector Test - The MDD shall display a vector test pattern that shall provide a complete visual check of the vector generator.

(6) Type Test - The MDD shall display a type test pattern that shall provide a visual check of the typewriter formatting circuitry.

(7) Function Generator Test - The MDD shall display a function generator conic test pattern that shall provide a complete visual check of the function generator.

(8) Off-Line/Analog - The MDD shall display the information present at the analog channel inputs, as selected by the off-line/analog switch, bypassing the DPS. This presentation shall be on a full-time basis.

* 3.5.1.5.5.2 Off-Line/Analog Switch - The off-line/analog switch shall select the display of the analog information when the mode selector switch is in either the off-line/analog or analog test position. The analog channel selected shall have its X and Y deflection, video, and unblank lines enabled by the MDD.

* 3.5.1.5.6 MDD Display Control Trays - The operator control trays shall meet the following requirements:

* 3.5.1.5.6.1 Function - The MDD control tray shall be furnished as part of and installed in the MDD console to provide the controls necessary for decision making and the implementation of tactics in the aircraft operational environment. The control keys shall be used to command and/or communicate with the computer via the DPS (6.8), so as to control the MDD presentations. Additionally, the control keys shall be utilized to insert tactical data into the computer in response to computer-generated cues and alerts.

* 3.5.1.5.6.2 Form Factor - The general physical configuration of the MDD control is shown in Figure 1.

* 3.5.1.5.6.2.1 Control Placement - The MDD controls (other than display maintenance and adjustment types) shall be arranged per Figure 1 and as follows:

(1) The horizontal tray section shall contain the track ball assembly, the alphanumeric keyboard, and 23 push button switches.

(2) The turret tray section (inclined 30° from the horizontal) shall contain 3 groups of 12 projection readout assemblies identified as MATRIX A, MATRIX B, and MATRIX C on Figure 1. Located below the projection readout banks shall be 3 corresponding groups of 12 each push button switch assemblies identified as MATRIX SELECT A, MATRIX SELECT B, and MATRIX SELECT C on Figure 1. Between MATRIX A / MATRIX SELECT A and MATRIX B / MATRIX SELECT B sections shall be located 8 push button switches relatively positioned as shown on Figure 1. Between MATRIX B / MATRIX SELECT B and MATRIX C / MATRIX SELECT C sections shall be located 4 push button switches relatively positioned as shown in Figure 1.

(3) The two "vertical" (inclined 16±2° from the vertical) tray sections shall be located adjacent to and on either side of the MDD tube module. The vertical section to the operator's left shall contain 11 push button

NOTE: MATRIX and MATRIX SELECT shown on tray shall not be printed on panel.

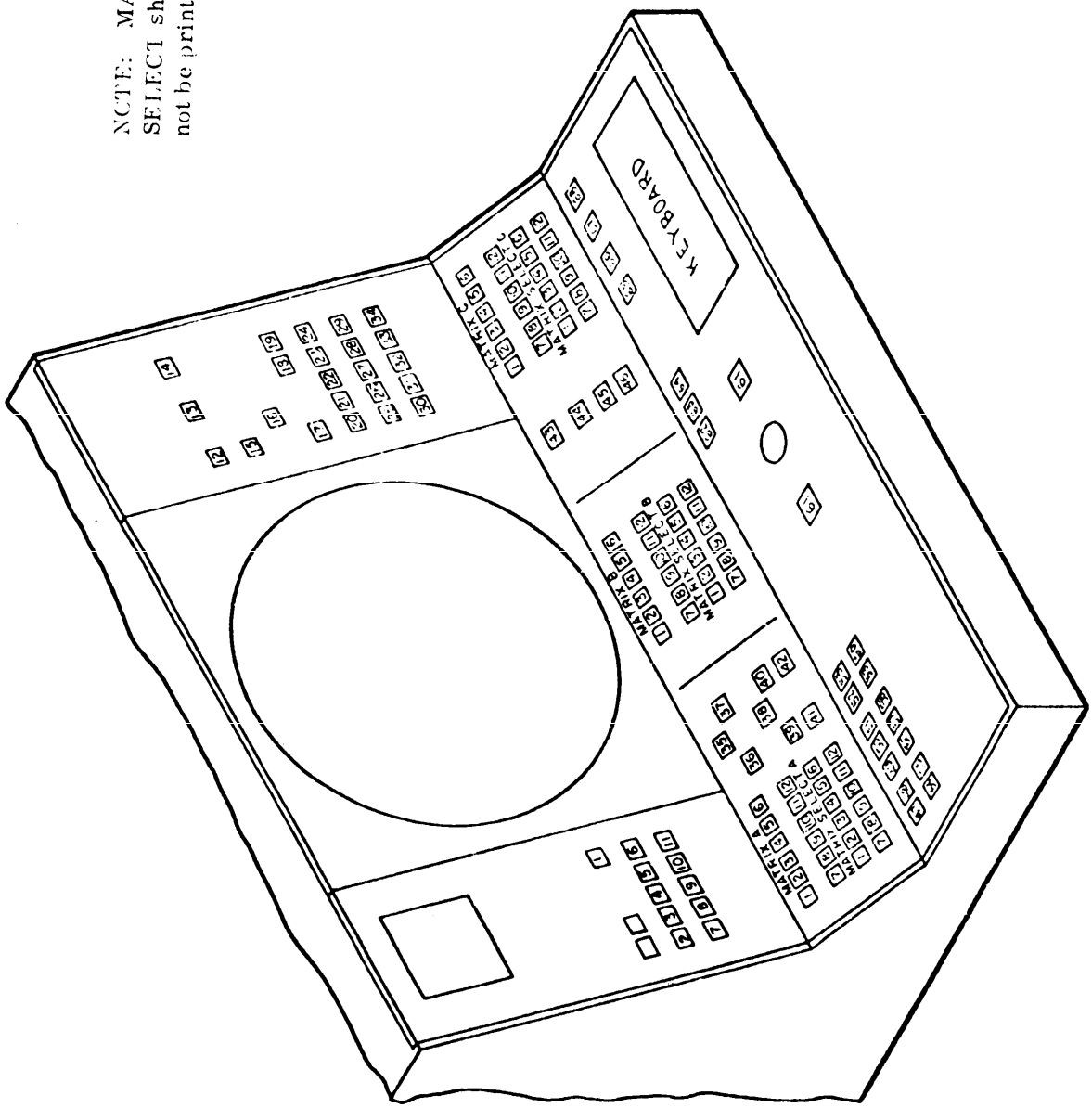

Figure 1. MDD CONTROL PLACEMENT

switches, the maintenance controls, and the test and overflow lights: the vertical section to the operator's right shall contain 23 push button switches. The relative positions of the switches on the vertical panels shall be as shown in Figure 1.

* 3.5.1.5.6.2.2 Mechanical Assembly - The tray assembly shall consist of a tray mounting plate, upon which the controls enumerated in paragraph 3.5.1.5.6.2.1 are mounted,and a tray overlay panel. The tray panels shall be hinge-attached to allow access to the tray components and assemblies and when in the closed position to preclude inadvertent control actuation. Provision shall be made to lock both the mounting place and the overlay panel in the open position during maintenance activities. Captive quick-disconnect fasteners shall be provided to secure the tray panels in the closed positions.

* 3.5.1.5.6.2.2.1 Switch and PRO Mounting - Switches shall be hard mounted on the tray mounting plate in such a manner that the viewing screens protrude through the overlay panel 0.047 ± 0.016 inch. Projection readouts shall be hard mounted so that the viewing screens are approximately flush with the front surface of the mounting plate. The hole pattern of the overlay panel shall be such as to encompass the PRO's and push button switches in such a manner that unobstructed visibility and facility of switch actuation is afforded.

* 3.5.1.5.6.3 Controls - The individual control types to be located on the MDD control tray include (1) projection readout assemblies, (2) monofunction switches, (3) a track ball assembly, and (4) an alphanumeric keyboard assembly. The following paragraphs describe the individual control characteristics.

* 3.5.1.5.6.3.1 Projection Readout Assembly - The projection readout assemblies shall be of modular construction capable of push button action utilizing a readout module in conformance with MIL-R-39027/3, style RP-02, Class B and two push button, momentary action, DPDT switches per MS25085. The readout modules shall be capable of rear projection onto the front viewing screen of 12 visual display messages made up of words, letters, numerals, symbols, and/or colors. The momentary push button switches shall be actuated by depression of the readout module front viewing screen. Maximum force required for switch actuation shall not exceed 5 pounds.

* 3.5.1.5.6.3.1.1 Legend Location and Legibility - The projected messages or characters shall be centrally positioned in the viewing screen with message-to-message centers not to vary more than ±0.035 inch. The readout shall remain clear

and legible when viewed from distances of up to 3 feet at any angle up to 60 degrees from a line perpendicular to the viewing surface. The readouts shall be legible, under rated DC voltage application, at a minimum distance of 18 inches when viewed in an ambient light of 5.0 foot-candles.

* 3.5.1.5.6.3.1.2 Lamps - The projection readout assembly shall contain twelve 5-VDC subminiature lamps per MS24515-8. Lamp replacement shall be capable of being accomplished from the front of the mounting panel without assembly demounting and without the use of tools.

* 3.5.1.5.6.3.2 Push Button Switch Assembly - The switch assemblies shall be push button, 2-lamp illuminated switches of modular construction. The switch display screen module shall be designed and constructed so as to internally illuminate a single, fixed-function message composed of letters, numbers, words, or symbols. A 2-color (green and amber) filter shall be utilized so as to provide a lighted legend on an opaque background. Switch actuation shall occur upon depression of the switch viewing screen. Maximum force required for this action shall not exceed 5 pounds.

* 3.5.1.5.6.3.2.1 Legend Location and Legibility - The message to be displayed shall remain clear and legible when viewed from distances of up to 3 feet at any angle up to 60 degrees from a line perpendicular to the viewing surface. The lighted legend shall be legible, under rated DC voltage application at a minimum distance of 18 inches when viewed in an ambient light of 5.0 foot-candles.

* 3.5.1.5.6.3.2.2 Lamps - The monofunction switch assemblies shall each contain two 5-volt subminiature lamps. Lamp replacement shall be capable of being accomplished from the front of the mounting panel without assembly demounting and without the use of tools.

* 3.5.1.5.6.3.3 Track Ball Assembly-

* 3.5.1.5.6.3.3.1 Function - The track ball assembly, in conjunction with other system equipments, shall provide the display operator with the capability to move the MDD hook symbol (Table I, Code 36) to any location on the display tactical plot. Targets and/or chosen points may be hooked and information pertinent thereto either obtained from the computer or identifying information inserted into computer memory. The track ball assembly generates synchro signals, which may be further utilized for purposes of centering or recentering TV and radar displays about desired targets or geographic points. In an off-line mode, the track ball assembly may be utilized for the purpose of manually controlling and directing the TV camera.

* 3.5.1.5.6.3.3.2 Contents - The track ball assembly shall consist of a housing assembly containing a 3-inch phenolic composition ball, two control transmitter synchros, and a friction disk drive mechanism. The assembly shall be centrally mounted in the horizontal portion of the MDD tray assembly so that approximately 13/16 inch (diameter) of the sphere protrudes for operator manual rotation. The ball shall be capable of free rotation about any axis through its center and lying in a plane parallel to the mounting plate. The ball shall be retained in the chosen position by a light friction force, resisting coasting of the ball after controlled movement.

* 3.5.1.5.6.3.4 Alphanumeric Keyboard Assembly - The keyboard assembly shall meet the following requirements:

* 3.5.1.5.6.3.4.1 Function - The MDD unit shall contain a 44-key, self-encoding, manually operated keyboard to be utilized by the operator for message composition for communications with other weapon system equipments via the DPS.

* 3.5.1.5.6.3.4.2 Form Factor and Contents - The keyboard assembly shall be mounted with only the upper horizontal surface and keys exposed. Figure 2 illustrates the keyboard layout: Figure 1 the relative position of MDD tray installation. The keyboard shall contain interlock provisions to preclude erroneous signals resulting from simultaneous key actuation and accidental repetition of a code character.

* 3.5.1.5.6.3.4.3 Keys - The 44 keys shall be made up of 38 A size, 0.700 inch by 0.700 inch, and 6 B size, 1.076 inches wide by 0.700 inch high. The keys shall be translucent with black letters and shall be illuminated by a luminescent base panel. Table II outlines the binary output coding applicable to each key. Actuating key pressure shall not exceed 7 ounces.

* 3.5.1.5.6.4 MDD Dimming Controls - Separate dimming controls shall be provided on each tray for separately adjusting the light output of:

(1) The projection readouts.

(2) The switch display screens and luminescent panels.

* 3.5.1.6 MDD Cooling - The MDD shall be designed to provide satisfactory operation in a temperature environment of +55°C maximum. Air circulating fans are permitted if required for operation at the high-temperature extremes; however, they must be located internal to the MDD consoles. Provisions must be incorporated to prevent hot air egress toward the MDD operators.

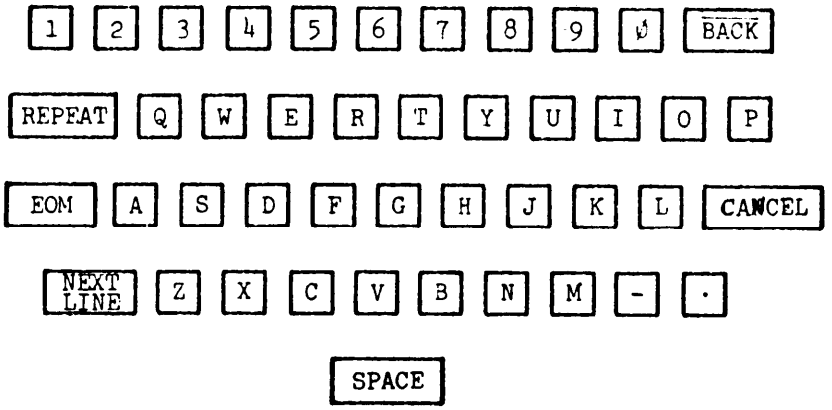

FIGURE 2. MDD KEYBOARD

KEY			KEYBOARD CODING					
No.	Engraving	Size	6	5	4	3	2	1
1	BACK	B	0	1	0	1	1	1
2	CANCEL	B	0	1	0	1	1	0
3	P	A	1	0	1	0	0	1
4	Y	A	0	0	1	0	1	0
5	Ø	A	1	1	0	0	0	1
6	L	A	0	1	1	1	1	1
7	O	A	1	0	1	0	0	0
8	-	A	0	0	1	0	0	1
9	9	A	1	1	0	0	0	0
10	K	A	1	1	1	1	1	0
11	I	A	1	1	0	1	1	1
12	M	A	0	0	1	0	0	0
13	8	A	1	0	1	1	1	1
14	J	A	1	1	1	1	0	1
15	U	A	1	1	0	1	1	0
16	N	A	0	0	0	1	1	1
17	7	A	1	0	1	1	1	0
18	H	A	1	1	1	1	0	0
19	.	A	0	1	1	1	1	0
20	B	A	0	0	0	1	1	0
21	6	A	1	0	1	1	0	1
22	G	A	1	1	1	0	1	1
23	T	A	1	0	0	0	1	0
24	V	A	0	0	0	1	0	1
25	5	A	1	0	0	0	0	0
26	F	A	1	1	1	0	1	0
27	R	A	1	1	0	1	0	1
28	C	A	0	0	0	1	0	0
29	4	A	1	0	1	1	0	0
30	D	A	1	1	1	0	0	1
31	E	A	1	1	0	1	0	0
32	X	A	0	0	0	0	1	1
33	3	A	1	0	1	0	1	1
34	S	A	1	1	1	0	0	0
35	W	A	1	1	0	0	1	1
36	Z	A	0	0	0	0	1	0
37	2	A	1	0	1	0	1	0
38	A	A	0	0	1	0	1	1
39	Q	A	1	1	0	0	1	0
40	NEXT LINE	B	0	0	0	0	0	1
41	1	A	0	1	0	1	0	1
42	EOM	B	0	1	0	1	0	0
43	REPEAT	B	0	1	0	0	1	1
44	SPACE	B	0	1	0	0	1	0

TABLE II. MDD KEYBOARD CODES

* 3.5.2 Low Voltage Power Supply PP-4986/ASA-70 - Low voltage Power Supply PP-4986/ASA-70 shall meet the following requirements:

* 3.5.2.1 Function - Power Supply PP-4986/ASA-70 shall convert 3-phase, 115-volt, 400-Hz electrical power into the DC voltages as required to operate an MDD display and its associated controls.

* 3.5.2.2 Form Factor - Power Supply PP-4986/ASA-70 shall be enclosed in a case suitable for hard mounting, with maximum dimensions including controls and connectors of: 18.5 inches wide, 17 inches high, and 18.25 inches deep. Additional requirements are as follows:

(1) The power supply shall be of modular design and construction with the various circuits being logically grouped into plug-in modules easily accessible from the front of the unit.

(2) A fan or fans may be utilized for internal air circulation; however, the fan (fans) must be located within the unit enclosure and may not exhaust heated air from either the front or bottom surfaces of the power supply.

* 3.5.2.3 Weight - The weight of Power Supply PP-4986/ASA-70 shall be a minimum consistent with good design and shall not exceed 86 pounds.

* 3.5.2.4 Protective Features - A 3-phase circuit breaker or equivalent shall be included in the power supply for input power surge protective purposes. The power supply shall be designed so as to insure against excessive output overvoltage conditions resulting from internal power supply failure or failures.

* 3.5.2.5 Indicator Lights - "Push-to-test" type indicator lights shall be furnished and located on the front of the power supply for each DC output to indicate overload conditions except where circuit design is such that automatic recovery occurs when the overload condition is removed.

* 3.5.2.6 Test Points - Test points shall be provided on the front of the power supply to allow measurements of each DC output voltage. Standard instruments such as voltmeter and/or oscilloscope shall be utilized in the measurement process.

* 3.5.3 Sensor Data Display IP-918/ASA-70 - The SDD shall meet the following requirements:

* 3.5.3.1 SDD Function - The SDD display shall be capable of being interfaced with the equipments listed in paragraph 6.8. The display shall be capable, via self-contained controls, of commanding the display of data as described in paragraph 3.4.1.2.

* 3.5.3.2 SDD Form Factor - The display shall be enclosed in a console that has the following maximum outline dimensions including controls and connectors: 24.5 inches high, 45 inches deep, and 36 inches wide. Console profile and configuration will require Procuring Activity approval prior to release for fabrication.

* 3.5.3.3 SDD Weight - The weight of the SDD display shall be a minimum consistent with good design and shall not exceed 235 pounds.

* 3.5.3.4 SDD Contents - The SDD console shall contain the functional subassemblies, circuits, modules, etc. described in the following paragraphs.

Item	Applicable Paragraph
(1) Display Tube Module	3.5.3.4.1
(2) Video System	3.5.3.4.2
(3) X and Y Axis Deflection Units	3.5.3.4.3
(4) Selection and Reference Unit	3.5.3.4.4
(5) Lens Amplifier Unit	3.5.3.4.5
(6) High Voltage Power Supplies	3.5.3.4.6
(7) Analog Vector Generator	3.5.3.4.7
(8) SDD Logic Interface	3.5.3.4.8
(9) Distribution Panel	3.5.3.4.9
(10) SDD Console Indicator Lights	3.5.3.4.10
(11) Analog Interface	3.5.3.4.11

Item		Applicable Paragraph
(12)	SDD Maintenance Controls	3.5.3.5.5
(13)	SDD Control Tray	3.5.3.5.6

* 3.5.3.4.1 Display Tube Module - The display tube module consists of the display tube with its internally mounted electron gun, electrostatic deflecting selection plates, etched character matrix plate, electrostatic referencing plates, and externally mounted magnetic deflection yoke. The deflection yoke is driven by the deflection power amplifier, whose output determines the position of the electron beam impingement on the viewing screen. The selection and reference plates are driven in such a manner that the electron beam is shaped by the character matrix into the desired character. The electron gun elements are interconnected with the lens amplifier unit and the Z-axis circuitry. The high voltage power supplies provide the final electron acceleration.

* 3.5.3.4.1.1 Display Tube - Pertinent display tube characteristics are:

(1)	Maximum Overall Length.	28 inches
(2)	Maximum Tube Diameter.	16 inches
(3)	Minimum Useable Tube Diameter	14 inches
(4)	Phosphor	P28
(5)	Maximum Spot Size	0.015 inch at 2 foot-lamberts measured using TV merge raster techniques. Spot size growth shall be no more than 50%.

The transmittance of the material used for the implosion shield of the display tube

shall be greater than 45 percent when measured with a light source color temperature of 2854 ±50 degrees Kelvin.

* 3.5.3.4.1.2 Display Tube Character Matrix - The display tube character matrix shall contain 64 character positions. The characters and associated codes shall be as specified in Table III. The nominal character block height as displayed on the face of the tube shall be 0.125 inch. The size of the cursor symbol (Table III, Code 36) shall be large enough to encircle any other symbol. Character referencing shall be within 10 percent of the nominal character block height for all characters except the four corner characters (Table III. Codes 07. 35. 42. 70). Character referencing of these four corner characters shall be within ±15 percent of the nominal character block height. The character block height is the height of the □ symbol (Table III. Code 41).

* 3.5.3.4.2 Video System - The video system shall be designed to provide output signals to the control grid of the display tube (paragraph 3.5.3.4.1.1). The system gain, from the SDD input to the display tube grid, shall be constant, ±3dB, over a frequency range of 2 Hz to 31 MHz. The video system shall have the following functional units.

(1) Video Amplifier

(2) Unblank Amplifier

* 3.5.3.4.2.1 Video Amplifier - The video amplifier shall process the following type data (see paragraph 6.8):

(1) Scan Converter . . . . . Analog 1

(2) Television Camera Set . . . . . Analog 2

(3) Spare Scan Converter . . . . . Analog 3

(4) Raw Radar . . . . . Analog 4

* 3.5.3.4.2.1.1 Video Amplifier Functional Units - The video amplifier shall have suitable functional units and controls as follows:

(1) The video amplifier functional unit shall have 4 video amplifiers to accommodate 4 analog input channels. The amplifier input shall accommodate video signals

OCTAL CODE	CHARACTER
0 0	(Spot)
0 1	1
0 2	2
0 3	3
0 4	4
0 5	5
0 6	6
0 7	7
1 0	8
1 1	9
1 2	0
1 3	-
1 4	T
1 5	V
1 6	E
1 7	M
2 0	R
2 1	I
2 2	P
2 3	C
2 4	L
2 5	J

OCTAL CODE	CHARACTER
2 6	D
2 7	
3 0	S
3 1	B
3 2	
3 3	
3 4	
3 5	
3 6	
3 7	
4 0	D
4 1	
4 2	N
4 3	
4 4	
4 5	
4 6	
4 7	
5 0	R
5 1	S
5 2	A

OCTAL CODE	CHARACTER
5 3	B
5 4	C
5 5	E
5 6	F
5 7	G
6 0	H
6 1	I
6 2	J
6 3	K
6 4	L
6 5	M
6 6	P
6 7	Q
7 0	T
7 1	U
7 2	V
7 3	W
7 4	X
7 5	Y
7 6	Z
7 7	+

TABLE III
SDD CHARACTER MATRIX AND OCTAL CODE

from 0 to between +2 to +2.5 volts maximum and unblank signals from 0 ±0.5 to +5 ±1 volts maximum. Positive input signal shall represent white and ground shall represent black. The dynamic range of the video amplifier will be such that a minimum of 10 shades will be discernible at the output screen of the cathode ray tube in an ambient light of 0.4 foot-candle. Each amplifier shall have a control for varying the pedestal and a constant impedance input attenuator of 95 ±5 ohms.

(2) Circuits shall be provided to control the video pedestal amplitude in compensation for the inherent brightness variations of the spiral raster. Manual controls shall be provided to adjust the slope and amplitude of the pedestal for individual compensation of the spiral raster. The slope shall be adjustable to zero for non-spiral raster inputs.

(3) Tube brightness controls shall be provided for characters, vectors, the cursor, and the analog signals as required to produce uniform display presentation.

(4) Peripheral blanking or clamping shall be provided to blank the tube whenever the beam is deflected beyond the useful display area of the display tube.

* 3.5.3.4.2.2 Unblank Amplifier - The unblank amplifier, in response to signals from the video amplifier, shall provide a linear, capacitively coupled output to drive the grid of the display tube and shall reference the unblank gate/video signal at the display tube grid to the high, negative voltage developed in the high voltage power supply of paragraph 3.5.3.4.6. The unblank amplifier shall be mounted on the display tube module chassis.

* 3.5.3.4.2.3 Video System Test Points - As a minimum, test points shall be provided on the video amplifier front panel for monitoring the following signals:

(1) Analog (1) Video Input

(2) Analog (2) Video Input

(3) Analog (3) Video Input

(4) Analog (4) Video Input

(5) Character Brightness

(6) Vector Brightness

(7) Cursor (Code 36, Table III) Brightness

(8) Output Unblank/Video Signal

(9) Ground

* 3.5.3.4.3 X and Y Deflection Units - The X and Y axis deflection units shall be designed to provide output signals to the magentic deflection yoke of the display tube. Input signals from 6 to 8 volts peak shall deflect the beam one display radius. The large signal (one display diameter deflection) bandwidth, measured at the 3dB points, shall be 50 KHz minimum. The small signal (less than 0.5 inch deflection) bandwidth, measured at the 3dB points, shall be 150 KHz minimum.

The difference in phase between the X and Y axis deflection unit output signals shall be less than 0.5 degree at 16 KHz. The total phase error shall be adjustable to less than $\pm$ 1.0 degree provided the phase shift due to differential time delays between the video and deflection signals at the input to the MPD does not exceed $\pm$ 1.0 degree. The deflection units shall have the following capability:

(1) Full-scale (one display diameter) random settling time maximum 16 microseconds.

(2) Tabular spacing (less than 0.5 inch) settling time maximum 4 microseconds.

(3) Spiral scan frequency maximum 16 KHz.

(4) Function generator frequency maximum 12 KHz.

(5) Horizontal display sweep time minimum 30 microseconds.

(6) Horizontal flyback time maximum 10 microseconds.

Each deflection unit shall have four functional subassemblies as follows:

(1) Digital-to-Analog Conversion Subassembly

(2) Analog Gating Subassembly

(3) Deflection Preamplifier

(4) Deflection Power Amplifier

* 3.5.3.4.3.1 Deflection Unit D-to-A Conversion Subassembly - The D-to-A conversion subassembly shall convert the X or Y position bits into deflection voltages suitable for driving the deflection preamplifier (3.5.3.4.3.3). The D-to-A conversion subassembly shall contain switching circuits, a binary attenuator ladder, and a reference power supply as necessary to produce 511 output voltage levels for inputs into the deflection preamplifier. The switching circuits shall be controlled by digital input bits and shall switch the precision reference voltage into appropriate legs of the ladder from which the analog output is derived.

* 3.5.3.4.3.2 Deflection Unit Analog Gating Subassembly - The analog gating subassembly shall contain circuits to gate one of four analog deflection signals with an analog enable signal from the DPS (6.8). The analog selection signal shall then be routed to the deflection preamplifier.

* 3.5.3.4.3.3 Deflection Unit Deflection Preamplifier Subassembly - The deflection preamplifier subassembly shall be a high-gain DC differential amplifier suitable for driving the deflection power amplifier. The deflection preamplifier shall utilize high-gain feedback for stability. Provisions shall be made for combining signals from the decoding and analog gating subassemblies as required to drive the deflection power amplifier. Deflection limiting circuits shall be provided to prevent overdriving and deflection amplifiers.

* 3.5.3.4.3.4 Deflection Power Amplifier - The deflection power amplifier shall be a high-current power amplifier for the deflection yoke of the display tube module. The amplifier shall form an integral high-gain feedback amplifying system with the deflection preamplifier subassembly.

* 3.5.3.4.4 Selection and Reference Units - The selection and reference units shall be designed to convert the 6-bit character selection codes, as received from the DPS (6.8), into push-pull differential signals for the electrostatic selection and reference plates of the display tube. The selection and reference units shall

contain four identical circuit assemblies, two for the X and two for the Y selection and reference.

* 3.5.3.4.5 Lens Amplifier Unit - The lens amplifier unit shall provide appropriate voltage levels to the electron optical system of the display tube module, in consonance with the requirements established by the signals received from the DPS (6.8). The lens amplifier power supplies shall be referenced to the outputs of the high voltage power supplies and the unblank/amplifier and shall be adjustable automatically as required to provide a proper beam size and intensity for the varied purposes of character, cursor vector, conic, radar, and TV presentations.

* 3.5.3.4.6 High Voltage Power Supplies (HVPS) - The high voltage power supply shall be designed to provide the voltages for the electron gun and acceleration anodes of the display tube. Reference levels from the high voltages shall be supplied to the unblank amplifier and to the lens amplifier unit. Primary power to the high voltage power supply shall be furnished by Power Supply PP-4986/ASA-70. Overload protection shall be provided to protect all circuits and units using the high voltages. The HVPS shall be shielded, replaceable modules that can be replaced quickly and easily. All electrical connections between the HVPS and other display modules shall be via connectors.

* 3.5.3.4.7 Analog Vector Generator Unit - The analog vector generator subassembly shall contain the necessary logic, sweep generator, D-to-A converters, and divider network to generate a vector in response to data and control signals received from the DPS (6.8).

* 3.5.3.4.7.1 Sweep Generator - The sweep generator shall supply the reference voltage to the two 10-bit D-to-A converters. This reference voltage shall be linear and shall supply the voltage necessary to generate full-diameter vectors within 256 microseconds. The time the sweep voltage is present shall be dependent on the time duration of the sweep enable line originating from the DPS (6.8). The sweep enable and vector unblank input lines shall be terminated at the SDD with differential amplifiers as per paragraph 3.5.3.4.11.

* 3.5.3.4.7.2 D-to-A Converters - The two 10-bit converters shall supply output voltages to "push" input of the X and Y axis deflection preamplifiers that are proportional to the reference voltage multiplied by the binary number applied to the inputs of the converters.

* 3.5.3.4.7.3 Divider Network - The divider network shall provide one-half of the sweep voltage to the "pull" input of the X and Y axis deflection preamplifiers.

* 3.5.3.4.8 SDD Logic Interface - The SDD logic interface units shall contain the necessary input amplifiers, with characteristics as described below to accept the logic signals originating in the DPS (6.8). These input amplifiers may be contained within one unit or distributed among the various subassemblies as necessary.

(1) Voltage Level Inputs - The logic one state will be 0 ±0.5 volts and the logic zero state is +4 ±1 volts as measured at the input amplifier in the SDD.

(2) Noise Rejection - The circuit shall be designed for ±5 volts common mode noise rejection. It shall be capable of handling common mode noise levels up to ±5 volts peak, without any change in output level.

(3) Input Impedance - The input amplifier circuit shall have the following nominal values:

(a) 130 ohms AC high input to low input

(b) 1200 ohms DC high input to ±2 volts DC

(c) 1200 ohms DC low input to -2 volts DC

* 3.5.3.4.9 Distribution Panel - The distribution panel shall provide for external connectors for all signals and power loads and shall provide for their distribution to the subassemblies of the SDD display console.

* 3.5.3.4.10 SDD Console Indicator Lights - Mounted on the SDD console, in a position convenient for observation by the display operator during normal operations, shall be the following indicator lights:

(1) OVERFLOW

(2) TEST

* 3.5.3.4.10.1 Overflow Indicator Light - The overflow indicator light shall be illuminated by a signal from the DPS (6.8).

* 3.5.3.4.10.2 Test Indicator Light - The test indicator light shall be illuminated by the SDD whenever the mode selector switch is not in the on-line position.

* 3.5.3.4.11 Analog Interface - The SDD shall contain four analog input channels. These channels shall accept X deflection, Y deflection, video, and unblank signals from the associated equipment of paragraph 6.8.

Each analog input shall be terminated at the SDD with a differential amplifier. These amplifiers shall provide grounding isolation between the SDD and the associated equipment of paragraph 6.8 and shall be capable of tolerating a voltage difference of ±4 volts DC minimum between the triaxial inner conductor shield and the airframe. The input impedance of these amplifiers shall be 95 ±5 ohms and 100 picofarads maximum.

* 3.5.3.4.11.1 Analog 1 Inputs - The analog 1 channel shall be capable of receiving signals from the scan converter and direct them to the video amplifier and to the X and Y deflection units so that a radar presentation is displayed, centered about the X and Y position specified by the set position word containing the analog code. The inputs shall be X and Y axis deflection signals, Z axis video modulation signal as specified in MIL-S-81343, Scan Converter Set, and the radar unblank signal from Master Timing, DPS, MIL-D-81347.

* 3.5.3.4.11.2 Analog 2 Inputs - The analog 2 channel shall be capable of receiving signals from the television camera set (MIL-D-81457). The input shall include X and Y axis deflection signals, Z axis video modulation signal, and an unblank signal. The video and unblank signals shall be routed to the video amplifier for control of the X axis modulation while X and Y axis deflection signals are directed to the X and Y deflection units.

* 3.5.3.4.11.3 Analog 3 Inputs - The analog 3 channel shall be capable of receiving and processing input signals identical to those analog 1 signals described in paragraph 3.5.3.4.11.1.

* 3.5.3.4.11.4 Analog 4 Inputs - Analog channel 4 shall be capable of receiving signals from either the function generator or raw radar video. The function generator will provide the necessary X and Y deflection, unblank, and video signals to generate and display conics within the timing constraints as specified in MIL-D-81347A. These signals will be routed to the X and Y axis deflection units and the video amplifier. The amplitude of the X and Y deflection outputs shall be ±1 display diameter at 12 KHz. The raw radar presentation shall be in one of two formats, PPI or A-scan. For both PPI and A-scan presentations, the analog input signals shall be from the radar interface unit and shall be as described in Scan Converter Specification, MIL-S-81343.

* 3.5.3.4.11.5 Open Analog Input - If an analog input circuit wire is disconnected, the effect will be as though zero volts were present at the input.

* 3.5.3.4.11.6 Analog Channel Enable Signals - Each analog channel shall have separate video and deflection enable signals. The deflection enable shall precede the video enable by 16 microseconds.

* 3.5.3.5 SDD Controls-

* 3.5.3.5.1 SDD Video Amplifier Controls - The following controls shall be provided:

(1) Front Panel Console Controls

(a) Channel 1 Brightness

(b) Channel 2 Brightness

(c) Channel 3 Brightness

(d) Channel 4 Brightness

(e) Character Brightness

(f) Vector Brightness

(2) Video Amplifier Front Panel Alignment Controls

(a) Cursor Brightness

(b) Pedestal Amplitude . . . . . Analog 1

(c) Pedestal Amplitude . . . . . Analog 2

(d) Pedestal Amplitude . . . . . Analog 3

(e) Pedestal Amplitude . . . . . Analog 4

* 3.5.3.5.2 SDD Deflection Unit Controls - The X and Y axis deflection units shall each be identical and interchangeable and shall each contain on the module front panel the following controls and test points accessible for maintenance and alignment functions:

(1) Four analog gain controls with input signal test points.

(2) Deflection gain control with D-to-A converter and yoke signal test points.

(3) D-to-A converter on-off switch.

* 3.5.3.5.3 SDD Selection and Reference Unit Controls - The circuit assemblies shall contain features as required to provide for the following controls and functions. The controls shall be mounted on the front of the unit chassis so as to be accessible for maintenance and adjustment purposes. The controls and associated test points for maintenance shall be:

(1) X and Y amplifier output gain controls and associated output test points for adjusting and measuring the signal outputs from the amplifier.

(2) X and Y axis centering controls for centering of the selection and reference voltages on the matrix center.

(3) X and Y axis cross coupling controls for parallelogram correction.

(4) Astigmatism control for adjustment of the beam shape.

(5) X and Y axis D-to-A converter output test points to check the push-pull output levels to the high-gain DC amplifier as furnished to the selection and reference plates of the display tube.

* 3.5.3.5.4 SDD Lens Amplifier Unit Controls - Controls and test points shall be provided on the module front panel and shall be accessible for maintenance and adjustment purposes. The controls and test points as a minimum shall be as follows:

Controls

(1) Spot Focus

(2) Character Size

(3) Spot Beam Size

(4) Character/Cursor Beam Size

(5) Beam Convergence

Test Points

(1) Focus

(a) Spot

(b) Cursor

(c) Character

(2) Character Unblank

(3) Composite Focus

(4) Beam Size

(5) Heater Confidence Check

* 3.5.3.5.5 SDD Maintenance Controls - The SDD maintenance panel shall contain the following controls, mounted such that they shall be easily accessible during flight:

(1) Mode selector switch to select the following functions:

(a) On-Line

(b) Analog Test

(c) Matrix Test

(d) Registration Test

(e) Vector Test

(f) Type Test

(g) Function Generator Test

(h) Off-Line/Analog

(2) Off-line/analog switch to select:

(a) Channel 1

(b) Channel 2

(c) Channel 3

(d) Channel 4

(e) Channel 1 & 4

* 3.5.3.5.5.1 Mode Selector Switch - The mode selector switch shall control the functioning of the SDD and the DPS (paragraph 6.8) when placed in the indicated positions in conformance with the following:

(1) On-Line - The SDD shall perform the operations controlled by the appropriate signals from the DPS (6.8).

(2) Analog Test - When the mode selector switch is in this position, the DPS shall transmit the proper control signals to the SDD to enable the analog presentation as selected by the off-line/analog switch.

(3) Matrix Test - The SDD shall display a matrix test pattern that shall provide a visual check of the display tube character matrix.

(4) Registration Test - The SDD shall display a registration test pattern that shall provide a visual check of the display tube character registration.

(5) Vector Test - The SDD shall display a vector test pattern that shall provide a complete visual check of the vector generator.

(6) Type Test - The SDD shall display a type test pattern that shall provide a visual check of the typewriter formatting circuitry.

(7) Function Generator Test - The SDD shall display a function generator conic test pattern that shall provide a complete visual check of the function generator.

(8) Off-Line/Analog - The SDD shall display the information present at the analog channel inputs, as selected by the off-line/analog switch, bypassing the DPS. This presentation shall be on a full-time basis.

* 3.5.3.5.5.2 Off-Line/Analog Switch - The off-line/analog switch shall select the display of the analog information when the mode selector switch is in either the off-line/analog or analog test position. The analog channel selected shall have its X and Y deflection, video, and unblank lines enabled by the SDD.

* 3.5.3.5.6 SDD Display Control Tray - The operator control tray shall meet the following requirements:

* 3.5.3.5.6.1 Function - The SDD control tray shall be furnished as part of and installed in the SDD console to provide the controls necessary for decision making and the implementation of tactics in the aircraft operational environment. The control keys shall be used to command and/or communicate with the computer via the DPS (6.8) so as to control the SDD presentations. Additionally, the control keys shall be utilized to insert tactical data into the computer in response to computer-generated cues and alerts.

* 3.5.3.5.6.2 Form Factor - The general physical configuration of the SDD control tray is shown in Figure 3.

* 3.5.3.5.6.2.1 Control Placement - The SDD controls (other than display maintenance and adjustment types) shall be arranged per Figure 3 and as follows:

(1) The horizontal tray section shall contain the track ball assembly and 2 push button switches relatively positioned as shown in Figure 3.

(2) The turret tray section (inclined 30° from the horizontal) shall contain one group of 8 projection readout assemblies identified as MATRIX. Located below the projection readout group shall be a group of 6 push button switches in a horizontal line and identified MATRIX SELECT. To the left of the MATRIX and MATRIX SELECT groups shall be 10 push button switches and to the right shall be 13 push button switches relatively positioned as shown on Figure 3.

(3) Vertical tray sections shall not be utilized for control placement on the SDD.

* 3.5.3.5.6.2.2 Mechanical Assembly - The tray assembly shall consist of a tray mounting plate, upon which the controls enumerated in paragraph 3.5.3.5.6.2.1

NOTE: MATRIX and MATRIX SELECT shown on tray shall not be printed on panel.

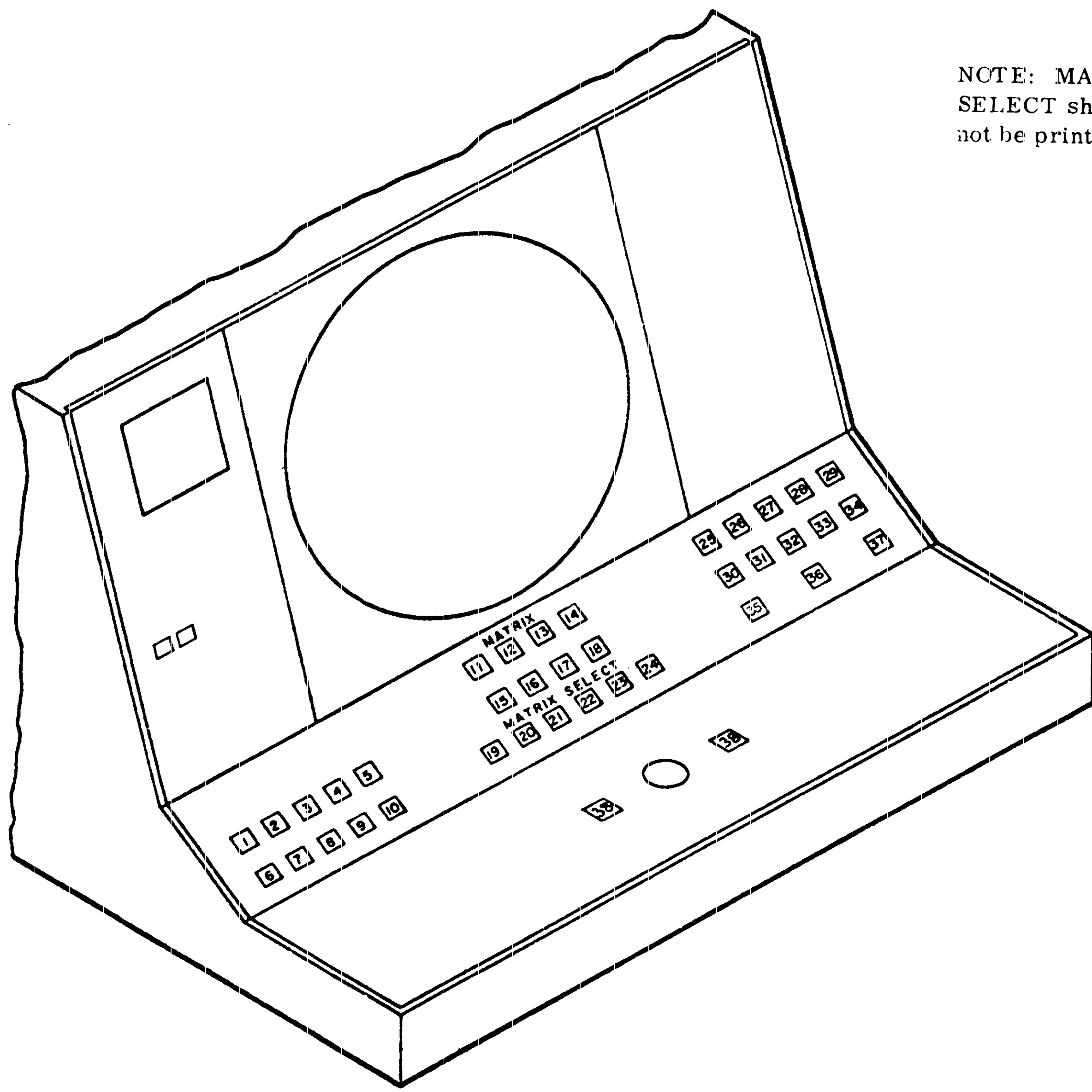

Figure 3. SDD CONTROL PLACEMENT

are mounted, and a tray overlay panel. The tray panels shall be hinge-attached to allow access to the tray components and assemblies and when in the closed position to preclude inadvertent control actuation. Provision shall be made to lock both the mounting plate and the overlay panel in the open position during maintenance activities. Captive quick-disconnect fasteners shall be provided to secure the tray panels in the closed positions.

* 3.5.3.5.6.2.2.1 Switch and PRO Mounting - Switches shall be hard mounted on the tray mounting plate in such a manner that the viewing screens protrude through the overlay panel 0.047 ±0.016 inch. Projection readouts shall be hard mounted so that the viewing screens are approximately flush with the front surface of the mounting plate. The hole pattern of the overlay panel shall be such as to encompass the PRO's and push button switches in such a manner that unobstructed visibility and facility of switch actuation is afforded.

* 3.5.3.5.6.3 Controls - The individual control types to be located on the SDD control trays include (1) projection readout assemblies, (2) nonofunction switches, (3) a track ball assembly, and (4) an alphanumeric keyboard assembly. The following paragraphs describe the individual control characteristics.

* 3.5.3.5.6.3.1 Projection Readout Assembly - The projection readout assemblies shall be of modular construction capable of push button action utilizing a readout module in conformance with MIL-R-39027/3, style RP-02, Class B and two push button, momentary action, DPDT switches per MS25085 (ASG). The readout modules shall be capable of rear projection onto the front viewing screen of 12 visual display messages made up of words, letters, numerals, symbols and/or colors. The momentary push button switches shall be actuated by depression of the module front viewing screen. Maximum force required for switch actuation shall not exceed 5 pounds.

* 3.5.3.5.6.3.1.1 Legend Location and Legibility - The projected messages or characters shall be centrally positioned in the viewing screen with message-to-message centers not to vary more than ±0.035 inch. The readouts shall remain clear and legible when viewed from distances of up to 3 feet at any angle up to 60 degrees from a line perpendicular to the viewing surface. The readouts shall be legible, under rated DC voltage application, at a minimum distance of 18 inches when viewed in an ambient light of 5.0 foot-candles.

* 3.5.3.5.6.3.1.2 Lamps - The projection readout assembly shall contain twelve 5-VDC subminiature lamps per MS24515-8 (USAF). Lamp replacement shall be capable of accomplishment from the front of the mounting panel without assembly demounting and without the use of tools.

* 3.5.3.5.6.3.2 Push Button Switch Assembly - The switch assemblies shall be push button, 2-lamp illuminated switches of modular construction. The switch display screen module shall be designed and constructed so as to internally illuminate a single, fixed-function message composed of letters, numbers, words, or symbols. A 2-color (green and amber) filter shall be utilized so as to provide a lighted legend on an opaque background. Switch actuation shall occur upon depression of the switch viewing screen. Maximum force required for this action shall not exceed 5 pounds.

* 3.5.3.5.6.3.2.1 Legend Location and Legibility - The message to be displayed shall remain clear and legible when viewed from distances of up to 3 feet at any angle up to 60 degrees from a line perpendicular to the viewing surface. The lighted legend shall be legible, under rated DC voltage application at a minimum distance of 18 inches when viewed in an ambient light of 5.0 foot-candles.

* 3.5.3.5.6.3.2.2 Lamps - The monofunction switch assemblies shall each contain two 5-volt subminiature lamps. Lamp replacement shall be capable of accomplishment from the front of the mounting panel without assembly demounting and without the use of tools.

* 3.5.3.5.6.3.3 SDD Track Ball Assembly-

* 3.5.3.5.6.3.3.1 Function - The track ball assembly, in conjunction with other system equipments, shall provide the display operator with the capability to move the SDD hook symbol (Table III, Code 36) to any location on the display tactical plot. Targets and/or chosen points may be hooked and information pertinent thereto either obtained from the computer or identifying information inserted into computer memory. The track ball assembly generates synchro signals, which may be further utilized for purposes of centering or recentering TV and radar display about desired targets or geographic points. In an off-line mode, the track ball assembly may be utilized for the purpose of manually controlling and directing the TV camera.

* 3.5.3.5.6.3.3.2 Contents - The track ball assembly shall consist of a housing assembly containing a 3-inch phenolic composition ball, two control transmitter synchros, and a friction disk drive mechanism. The assembly shall be centrally mounted in the horizontal portion of the SDD tray assembly so that approximately 13/16 inch (diameter) of the sphere protrudes for operator manual rotation. The ball shall be capable of free rotation about any axis through its center and lying in a plane parallel to the mounting plate. The ball shall be retained in the chosen position by a light friction force, resisting coasting of the ball after controlled movement.

* 3.5.3.5.6.4 SDD Dimming Controls - Separate dimming controls shall be provided on each tray for separately adjusting the light output of:

(1) The projection readout.

(2) The switch display screens and luminescent panels.

* 3.5.3.6 SDD Cooling - The SDD shall be designed to provide satisfactory operation in a temperature environment of +55°C maximum. Air circulating fans are permitted if required for operation at the high-temperature extremes; however, they must be located internal to the SDD console. Provisions must be incorporated to prevent hot air egress toward the SDD operators.

* 3.5.4 Auxiliary Readout Display System IP-919/ASA-70 - The ARD shall meet the following requirements:

* 3.5.4.1 ARD Function - The ARD shall operate in a slave mode to the computer, MIL-C-81332 (AS), via the DPS, MIL-D-81347 (AS). The ARD shall display computer-generated, fixed-format, tabular information upon operator command via an operator's keyset and the DPS or via the MDD controls. The ARD shall also be utilized for display of teletype messages both as received and in the composition stage. The ARD's shall be capable of displaying patterns that shall provide visual checks of the display tube character matrix and 20-by-20 position formatting circuitry. Test patterns are generated by the DPS.

* 3.5.4.2 ARD Form Factor - The ARD shall be designed to allow slide rail type installation in a standard aircraft console per MIL-C-6781. Provisions shall be included for quick-disconnect fasteners on the ARD mounting panel to afford console installation. The console shall have the following maximum outline dimensions: 12.75 inches high, 24 inches deep, and 11.52 inches wide.

* 3.5.4.3 ARD Weight - The weight of the ARD shall be a minimum consistent with good design and shall not exceed 55 pounds.

* 3.5.4.4 ARD Contents - The ARD shall consist of the functional subassemblies and controls listed below. All subassemblies described in paragraphs 3.5.4.4.1 through 3.5.4.4.5 shall be pluggable, that is, all electric connections to these modules shall be via connectors.

(1) X and Y Axis Digital-to-Analog Converters

(2) X and Y Axis Deflection Amplifiers

(3) Unblank Amplifier

(4) High Voltage Power Supplies

(5) Character Display Tube

(6) Alignment Controls and Indicators

3.5.4.4.1 X and Y Axis Digital-to-Analog Converters - The X and Y axis digital-to-analog converters shall contain circuitry for selection decoding, reference decoding, deflection decoding, deflection preamplifiers, and accurate reference voltage regulators, as well as alignment controls and switches as required to accomplish the following:

(1) Convert the 3 bits of digital data representing the horizontal or vertical selection plate voltages required for the desired character selection into 8-level, push-pull deflection voltages suitably amplified and referenced to the electron optics and acceleration voltages of the display tube (3.5.4.4.5) to provide electrostatic deflection signals for character selection and to provide reference correction voltages for the display positioning electromagnetic deflection signals. Suitable selection centering controls, cross-coupling controls, selection gain controls, and reference gain controls shall be provided according to 3.5.4.4.6.

(2) Convert the 5 bits of data representing the X or Y axis position for character presentation into suitably amplified signals, properly referenced with respect to the character selection voltages developed as described in 3.5.4.4.1(1) for driving the X or Y axis deflection amplifiers (3.5.4.4.2). Suitable deflection centering controls shall be provided according to 3.5.4.4.6).

3.5.4.4.2 X and Y Axis Deflection Amplifiers - The X and Y axis deflection amplifiers shall contain circuitry to convert the signals received from

the X and Y axis digital-to-analog converters (3.5.4.4.1) into drive currents for the X and Y axis windings of the deflection yoke of the display tube (3.5.4.4.5).

* 3.5.4.4.3 Unblank Amplifier - The unblank amplifier shall amplify the unblank gate received from the DPS and shall reference the unblank gate to the high, negative voltage developed in the high voltage power supply (3.5.4.4.4) for the cathode of the electron gun of the display tube (3.5.4.4.5) as required to provide proper blanking of the characters to be displayed under control of the DPS. Brightness and astigmatism controls (3.5.4.4.6) shall be provided to vary width and amplitude of the unblank pulse and the voltage applied to the character matrix of the display tube (3.5.4.4.5) respectively as required to adjust the brightness and clarity of the character display.

3.5.4.4.4 High Voltage Power Supplies - The high voltage power supplies shall provide the DC power as required for the cathode and anode voltages of the display tube and as required for referencing and further subdividing by the unblank amplifier, for conversion into voltage levels and signals for the electron gun and grids of the tube. Automatic overload protection shall be provided.

* 3.5.4.4.5 Character Display Tube - The display tube shall be a cathode ray tube employing a shaped-beam character matrix containing the characters and symbols shown in Table IV containing electrostatic deflection plates for character selection and an electromagnetic yoke for character positioning. The interconnection of the tube elements shall be similar to that of the MDD console display tube, as described in 3.5.1.4.1.1. It shall have a 5.5-inch-square tube face with a 4.0 by 4.0-inch useable viewing area. The phosphor shall be P28. The character height shall be 0.125 inch within ±10 percent. Character refereneing shall be within 15 percent of the nominal character height.

The transmittance of the material used for the implosion shield of the display tube shall be greater than 45 percent when measured with a light source color temperature of 2854 ±50 degrees Kelvin.

* 3.5.4.4.6 ARD Alignment Controls - The alignment controls for the display tube module shall be accessible behind a hinged front cover plate surrounding the face of the display tube (3.5.4.4.5) and shall consist of the following items:

Item	Applicable Paragraph
(1) Selection Centering Control	X and Y Axis Digital-to-Analog Converter, 3.5.4.4.1

CODE	CHARACTER
00	BLANK
01	1
02	2
03	3
04	4
05	5
06	6
07	7
10	8
11	9
12	0
13	-
14	Ø
15	$
16	!
17	&
20	'
21	(
22	)
23	Ⓒ
24	Ⓛ
25	Ⓙ

CODE	CHARACTER
26	Ⓓ
27	#
30	Ⓢ
31	Ⓑ
32	⊗
33	"
34	◎
35	?
36	BLANK
37	.
40	D
41	□
42	N
43	/
44	ⓩ
45	:
46	;
47	,
50	R
51	S
52	A

CODE	CHARACTER
53	B
54	C
55	E
56	F
57	G
60	H
61	I
62	J
63	K
64	L
65	M
66	P
67	Q
70	T
71	U
72	V
73	W
74	X
75	Y
76	Z
77	+

TABLE IV

ARD CHARACTER MATRIX SYMBOLS AND OCTAL CODE

Item		Applicable Paragraph
(2)	Deflection Centering Control	X and Y Axis Digital-to-Analog Converter, 3.5.4.4.1
(3)	Selection Cross-Coupling Control for Parallelogram Correction	X and Y Axis Digital-to-Analog Converter, 3.5.4.4.1
(4)	Selection Gain Control and On-Off Switch	X and Y Axis Digital-to-Analog Converter, 3.5.4.4.1
(5)	Reference Gain Control and On-Off Switch	X and Y Axis Digital-to-Analog Converter, 3.5.4.4.1
(6)	Deflection Gain Control and On-Off Switch	X and Y Axis Digital-to-Analog Converter, 3.5.4.4.1
(7)	Brightness Control	
	(a) Pulse Amplitude	Unblank Amplifier, 3.5.4.4.3
	(b) Pulse Width	Unblank Amplifier, 3.5.4.4.3
(8)	Beam Size Adjustment	Unblank Amplifier, 3.5.4.4.3
(9)	Astigmatism Adjustment	Unblank Amplifier, 3.5.4.4.3

* 3.5.4.5 ARD Display Module Indicator Lights - Mounted on the front of each ARD shall be the following indicator lights:

(1) ON

(2) TEST

* 3.5.4.5.1 On Indicator Light - The on indicator light shall be illuminated whenever power is applied to the ARD.

* 3.5.4.5.2 Test Indicator Light - The test indicator light shall be illuminated in response to contact closure in the DPS.

* 3.5.5 Low Voltage Power Supply PP-4987/ASA-70 - The characteristics of low voltage Power Supply PP-4987/ASA-70 shall be identical to those of low voltage Power Supply PP-4986/ASA-70, paragraph 3.5.2, except as follows:

* 3.5.5.1 Function - Output power provided by Power Supply PP-4987/ASA-70 will be as required to electrically support one ARD unit.

* 3.5.5.2 Form Factor - Each Power Supply PP-4987/ASA-70 shall be enclosed in a case, suitable for hard mounting, with maximum dimensions including controls and excluding connectors of: 11.375 inches wide, 7.125 inches high, and 11.75 inches deep.

* 3.5.5.3 Weight - The weight of Power Supply PP-4987/ASA-70 shall be a minimum consistent with good design and shall not exceed 24 pounds.

* 3.5.5.4 Protective Features - Similar to those described in 3.5.2.4 as applicable to low voltage Power Supply PP-4986/ASA-70.

* 3.5.5.5 Indicator Lights - Similar to those described in 3.5.2.5 as applicable to low voltage Power Supply PP-4986/ASA-70.

* 3.5.5.6 Test Points - Similar to those described in 3.5.2.6 as applicable to low voltage Power Supply PP-4986/ASA-70.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

* 4.1.1 Classification of Tests - Items covered by this specification shall be subjected to the following tests to determine compliance with all applicable requirements.

(1) Preproduction (First Article) Tests

(2) Initial Production Tests

(3) Acceptance Tests

(4) Life Tests

4.2 Preproduction (First Article) Tests - Preproduction tests shall be made on equipments representative of the production equipments to be supplied under the contract. Preproduction tests shall be accomplished under the responsibility of the Contractor and shall be conducted in accordance with the approved test procedure of 4.6. The Government inspector and the Procuring Activity shall be advised when tests are to be conducted so that a representative may be designated to witness or supervise the tests when so desired. A Contractor not having adequate facilities to conduct all required tests shall obtain the services of a commercial testing laboratory acceptable to the Government.

4.2.1 Preproduction (First Article) Test Data - The Contractor shall submit all data collected in conducting these tests to the Procuring Activity for review.

* 4.2.2 Scope of Tests - Preproduction tests shall include all tests deemed necessary by the Procuring Activity to determine that the equipment meets all the requirements of this specification, other applicable specifications, and the contract. Unless otherwise specified, preproduction tests shall include environmental tests in accordance with the procedures of Specification MIL-T-5422.

* 4.2.3 Preproduction (First Article) Approval - Approval of the preproduction sample shall be by the Procuring Activity upon satisfactory completion of all tests. No production equipments shall be delivered prior to the approval of the preproduction sample. Prefabrication of production equipment prior to the approval of the preproduction sample is at the Contractor's own risk. The approved preproduction sample shall be retained by the Contractor for his use in the fabrication and testing of equipment to be submitted for acceptance. The preproduction sample shall not be considered as one of the equipments under the contract.

* 4.2.4 Production Equipments - Equipments supplied under the contract shall in all respects including design, construction, workmanship, performance, and quality be equivalent to the approved preproduction sample or configuration approved for production equipments. Each equipment shall be capable of successfully passing the same tests as imposed on the preproduction sample. Evidence of noncompliance with the above shall constitute cause for rejection; and for equipment already accepted by the Government, it shall be the obligation of the Contractor to make necessary corrections as approved by the Procuring Activity.

* 4.3 Initial Production Tests - One of the first ten production equipments shall be selected and sent at the Contractor's expense to a designated Government laboratory for tests. This equipment shall be selected by the Procuring Activity after the equipment has successfully passed all individual tests defined in paragraph 4.4.1. No other tests shall be conducted on the equipment prior to starting the initial production tests. The preproduction sample shall not be selected for this test.

4.3.1 Scope of Tests - This equipment may be subjected to any and all tests the Procuring Activity deems necessary to assure that the production equipment is equivalent to the previously approved preproduction sample or configuration approved for production equipments in design, construction, workmanship, performmance, and quality and that it meets all applicable requirements.

4.3.2 Accessory Material - In addition to the complete equipment submitted for initial production tests, the Contractor shall also submit such accessory material and data necessary to test the equipment when specified in the contract or purchase order.

* 4.3.3 Initial Production Sample Approval - Approval of the initial production sample shall be by the Procuring Activity upon satisfactory completion of all tests. Any design, material, or performance defect made evident during this test shall be corrected by the Contractor to the satisfaction of the Procuring Activity. Failure of the initial production sample to pass any of the tests shall be cause for deliveries of equipment under the contract to cease until proper corrective action is approved and accomplished. Corrective action shall also be accomplished on equipment previously accepted when requested by the Procuring Activity.

4.3.4 Reconditioning of Initial Production Test Sample - On completion of the initial production test, the equipment shall be reworked by the Contractor by replacing all worn or damaged items. After reworking, the Contractor shall resubmit the equipment for acceptance.

* 4.4 Acceptance Tests - The Contractor shall furnish all samples and shall be responsible for accomplishing the acceptance tests. All inspection and testing shall be under the supervision of the Government inspector. Contractors not having adequate facilities for conducting all required tests shall engage the service of a commercial testing laboratory acceptable to the Procuring Activity. The Contractor shall furnish test reports showing quantitative results for all acceptance tests. Such reports shall be signed by an authorized representative of the Contractor or laboratory, as applicable. Acceptance or approval of material during the course of manufacture shall not be construed as a guarantee of the acceptance of the finished product. Acceptance tests shall consist of the following:

(1) Individual Tests

(2) Sampling Tests

(3) Reliability Assurance Tests

(4) Special Tests

* 4.4.1 Individual Tests - Each equipment submitted for acceptance shall be subjected to the individual tests. These tests shall be adequate to determine compliance with the requirements of material, workmanship, operational adequacy, and reliability. As a minimum, each equipment accepted shall have passed the following tests:

(1) Examination of Product

(2) Operational Test

(3) Manufacturing Run in Test

4.4.1.1 Examination of Product - Each equipment shall be examined carefully to determine that the material and workmanship requirements have been met.

* 4.4.1.2 Operational Test - Each equipment shall be operated long enough to permit the equipment temperature to stabilize and to check sufficient characteristics and record adequate data to assure satisfactory equipment operation.

* 4.4.1.3 Manufacturing Run in Test - Each equipment shall be operated under the conditions specified herein for a period of 10 hours without failure. A failure shall be defined as anything which causes malfunctioning of the equipment. Only those adjustments will be permitted which can be made by using such controls and adjustments that are accessible to the operator during the normal use of the equipment. This test shall be deleted if the reliability test includes a test on each equipment which consumes at least 10 hours of operation.

Temperature	Ambient room
Humidity	Ambient room
Vibration	Any selected frequency within the range of 20 to 30 cps (excluding resonant points) and a minimum amplitude of ±3g's

The equipment shall be vibrated (without vibration isolators) for a period of 10 minutes prior to the beginning of the 10 hour period of operation. Where feasible, the equipment shall be operated during this vibration period for the purpose of detecting flaws and imperfect workmanship. Operation within the specified limits of satisfactory performance is not necessarily required during the vibration period. The direction of vibration should be vertical to the normal mounting plane for 5 minutes and lateral to the plane for 5 minutes. Where it is not feasible to vibrate the equipment in 2 directions the vertical direction shall be used. During the 10 hour period of operation following the 10 minute vibration period, the equipment shall be mechanically cycled periodically through its various phases of operation. Should a failure occur, it should be repaired and the test started over, except that the 10 minute vibration period need not be repeated when it is certain the failure was not a result of the vibration. Should repetitive failures occur, corrective action shall be taken to eliminate this defect from future equipment. A record shall be kept of all failures. The 10 hour period specified above may be composed of two 5 hour periods to conform with standard working hours.

*4.4.2 Sampling Tests - Equipments selected for sampling tests shall first have passed the individual tests. Equipments shall be selected for sampling tests by the Government Inspector in accordance with the following:

Quantity of Equipments Offered for Acceptance	Quantity to be Selected for Sampling Test
First 10	0
Next 50	1
Next 75	1
Next 100	1
	1 for each additional 200 or fraction thereof

Sampling Tests are not required when Reliability Assurance Tests are conducted.

4.4.2.1 Scope of Tests - As a minimum, each equipment selected for sampling tests shall be subjected to the following tests:

(1) Complete operational test at ambient room conditions, making all necessary measurements to assure that all applicable specification requirements have been met.

(2) Operational test at certain environmental conditions. The conditions may vary for each equipment tested and should be based on results of the preproduction, initial production, individual and special tests.

(3) Manufacturing run in test specified in 4.4.1.3 except that the test duration shall be 120 hours with no restriction on the number of failures. However, each failure shall be analyzed as to cause and remedial action necessary to reduce the possibility of its recurrance in future equipment.

*4.4.3 Reliability Assurance Tests - Reliability assurance tests shall be conducted using MIL-STD-781. Equipments selected for reliability assurance tests shall have first passed the individual tests.

*4.4.3.1 Qualification Phase - Two equipments shall be subjected to reliability testing in accordance with MIL-STD-781 and the following conditions:

(1) Test Specimen -

Quantity

1 . . . . . MDD IP-917/ASA-70

1 . . . . . MDD Tray (TACO Tray)

1 . . . . . SDD IP-918/ASA-70

1 . . . . . SDD Tray (Sensor Station Tray)

2 . . . . . Power Supply PP-4986/ASA-70

1 . . . . . ARD IP-919/ASA-70

1 . . . . . Power Supply PP-4987/ASA-70

(2) Test Level - The test level shall be test level F in accordance with MIL-STD-781, except that the low temperature will be -25°C instead of -54°C, the vibration level upper limit shall not exceed that specified in paragraph 4.2.2.1(1), and input voltage cycling is not applicable.

(3) Accept/Reject Criteria - The accept/reject criteria shall be in accordance with Test Plan IV in accordance with MIL-STD-781.

(4) Test Cycle - The test cycle to be used shall be a 12 hour cycle in accordance with Figure 1 of MIL-STD-781. Equipment "on" time shall include 5 to 9 hours for the "A" heating period and 1 to 5 hours for the stabilized "B" heating period.

(5) Performance Testing - The performance characteristics shall be measured by a series of functional tests, exercising all portions of the equipment in a manner as stringent as that required during its ultimate applications in accordance with paragraph 4.4.1.2.

(6) Length of Test - The MTBF length of the test (not calendar time) in accordance with Test Plan IV of MIL-STD-781 shall be 4.9 times the specified MTBF for MDD ' PS PP-4986, SDD ' PS PP-4986, and ARD ' PS PP-4987 in accordance with paragraph 3.3.2.4.

(7) Nonchargeable Failures - The Contractor will receive approval to eliminate a failure from the reliability computation from the Procuring Activity when any of the following conditions apply:

(a) The Contractor analytically and by test establishes the effectiveness of the corrective action (or change) to the satisfaction of the Procuring Activity and the corrective action or change is scheduled for introduction and/or retrofit by the Contractor as approved by the Procuring Activity. Approval of any change by the Procuring Activity shall not protect any subsequent failure for classification.

(b) The Contractor demonstates to the satisfaction of the Procuring Activity that the failure was a dependent failure.

(c) The failure cannot be verified.

(d) Improper test or test equipment can be verified as the cause of failure to the satisfaction of the Procuring Activity.

(e) Approved preventive maintenance can be verified as being past due and the preventive maintenance action has been waived for the test by the Procuring Activity.

(8) Chargeable Failures - All failures that are not classified as nonchargeable failures shall be considered chargeable failures.

4.4.3.2 Reliability Production Acceptance (Sampling) Phase Tests - The equipment, throughout production, shall be tested as outlined in MIL-STD-781 (as modified herein) under the section entitled "Production Acceptance (Sampling) Phase of Production Reliability Tests". Test level E shall be used.

*4.4.3.2.1 All Equipment Test - Each production MDD ≠ PS PP-4986/ASA-70. SD ≠ PS PP-4986/ASA-70, or ARD ≠ PS PP-4987/ASA-70 produced shall be tested for 50 hours. In addition, a burn-in period may be used at the option of the Contractor. If used, the burn-in must be the same for each equipment, in time and severity. To determine whether the MTBF is being met at any time during the contract, the operating test hours and the failures thereon (not counting burn-in failures or burn-in operating time) shall be totaled and the results compared with the reject line of Test Plan IV of MIL-STD-781. (Extend the line as necessary to accommodate the data.) The totals shall accumulate so that at any one time the experience from the beginning of the contract is included. At the conclusion of each month, the test results shall be sent to the Procuring Activity and to the Naval Air Systems Command, Attn: Avionics Division. At any time time that the current totals of test hours and test failures plotted on Test Plan IV curves show a reject situation, the Procuring Activity shall be notified. The Procuring Activity reserves the right to stop the acceptance of equipment at any time that a reject situation exists pending a review of the Contractor's efforts to improve the equipment, the equipment parts, the equipment workmanship, etc., so that the entire compilation will show other than a reject decision. Test level, test cycle, performance testing, and failure criteria shall be in accordance with paragraph 4.4.3.1.

*4.4.3.3 Test Details - The test details such as the length of the test cycle, the length of the heat portion of the cycle, the performance characteristics to be measured, special failure criteria, preventative maintenance to be allowed during the test, etc., shall be part of the test procedures to be submitted and approved by the procuring activity prior to the beginning of the Qualification Test Phase of the Reliability Assurance Tests.

*4.4.4 Special Tests - Special tests shall be conducted on a quantity of equipments for the purpose of checking the effect of any design material change on the performance of the equipment and to assure adequate quality control. The equipment selected for special tests may be selected from equipments previously subjected to the sampling or reliability assurance tests.

* 4.4.4.1 Special Test Schedule - Selection of equipments for special tests shall be made as follows:

(1) On an early equipment after an engineering or material change.

(2) Whenever failure reports or other information indicate additional tests are required. (This will be determined by the Procuring Activity.)

* 4.4.4.2 Scope of Tests - Special tests shall consist of such tests as approved by the Procuring Activity. Test procedures previously approved for the preproduction tests shall be used where applicable. When not applicable, the Contractor shall prepare a test procedure and submit it to the Procuring Activity for approval prior to conducting the tests.

* 4.4.5 Equipment Failure - Should a failure occur during either the sampling, reliability assurance or special tests, the following action shall be taken:

(1) Determine the cause of failure.

(2) Determine if the failure is an isolated case or design defect.

(3) Submit to the procuring activity for approval, proposed corrective action intended to reduce the possibility of the same failure(s) occurring in future tests.

(4) Where practical, include a test in the individual test to check all equipment for this requirement until reasonable assurance is obtained that the defect has been satisfactorily corrected.

* 4.5 Life Test - The contractor shall furnish all samples and shall be responsible for accomplishing the life tests. The test shall be of 300 hours duration and shall be conducted on equipments that have passed the individual test. The life test shall be performed under the conditions specified in 4.5.1. The life test sample shall be selected by the Government inspector in accordance with the following. (Equipments which have successfully passed the Initial Production Test. Sampling Tests, Reliability Tests, or Special Tests may be selected for life tests.) When reliability tests are conducted, the life test shall be omitted if, during the reliability

tests, a quantity of equipments equal to, or more than, that listed below receive at least 300 hours each of test time.

Quantity of Equipments Offered for Acceptance	Quantity to be Selected for Life Test
First 25	1
Next 175	1
Next 300	1
	1 for each additional 500 or fraction thereof

* 4.5.1 Test Conditions - The life test shall be conducted under the following simulated service conditions:

Temperature	Normal room
Altitude	Normal ground (0-5000 ft.)
Humidity	Room ambient
A.C. Voltage	115 ±5 volts (at lowest applicable frequency)
D.C. Voltage	27.5 ± 2.0 volts

* 4.5.2 Test Periods - The test may be run continuously or intermittently. Any period of operation shall be of sufficient duration to permit the equipment temperature to stabilize. Periodically, the equipment shall be turned on and off several times and put through its various phases of operation.

* 4.5.3 Performance Check - At approximately 8 hour intervals during the test, a limited performance check shall be made. The performance check proposed by the Contractor shall be subject to approval by the Procuring Activity.

* 4.5.4 Test Data - The Contractor shall keep a daily record of the performance of the equipment, making particular note of any deficiencies or failures. In the event of part failures, the defective part shall be replaced and the operation resumed for the balance of the test period. A record shall be kept of all failures throughout the test. This record shall indicate the following:

(1) Part type number

(2) The circuit reference symbol number

(3) The part function

(4) Name of the manufacturer

(5) Nature of the failure

(6) The number of hours which the part operated prior to failure

* 4.5.4.1 Failure Report - In the event of a failure, the Government inspector shall be notified immediately. A report shall be submitted to the Procuring Activity upon completion of test. In this report, the Contractor shall propose suitable and adequate design or material corrections for all failures which occurred. The Procuring Activity will review such proposals and determine whether they are acceptable.

* 4.6 Test Procedures - The procedures used for conducting all tests required by this specification shall be prepared by the Contractor and submitted to the Procuring Activity for review and approval. The right is reserved by the Procuring Activity to modify the tests or require any additional tests deemed necessary to determine compliance with the requirements of this specification or the contract. Specification MIL-T-18303 shall be used as a guide for preparation of test procedures. When approved test procedures are available from previous contracts, such procedures will be provided and may be used when their use is approved by the Procuring Activity. However, the right is reserved by the Procuring Activity to require modification of such procedures, including additional tests, when deemed necessary.

* 4.7 Reconditioning of Tested Equipment - Equipment that has been subjected to preproduction, reliability assurance, and/or maintainability tests shall be reconditioned by the Contractor by replacing all worn or damaged items. After reworking, the Contractor shall resubmit the equipment for acceptance.

* 4.8 Presubmission Testing - No item, part, or complete equipment shall be submitted by the Contractor until it has been previously tested and inspected by the Contractor and found to comply, to the best of his knowledge and belief, with all applicable requirements.

4.9 Rejection and Retest - Equipment that has been rejected may be reworked or have parts replaced to correct the defects and resubmitted for acceptance. Before resubmitting, full particulars concerning previous rejection and the action taken to correct the defects found in the original shall be furnished the Government inspector.

5. PREPARATION FOR DELIVERY

* 5.1 General - All major units and parts of the equipment shall be preserved, packaged, packed and marked for the level of shipment specified in the contract or order in accordance with Specification MIL-E-17555 and MIL-STD-794. In the event the equipment is not covered in Specification MIL-E-17555, the method of preservation for Level A shall be determined in accordance with the selection chart in Appendix D of MIL-STD-794.

6. NOTES

6.1 Intended Use - The equipment covered by this specification is intended to display computer-generated tableaux information and display conics, vectors, scan-converted radar, and television camera set (6.8) patterns in association with sonobuoy and other symbols in such a manner that a true tactical plot of the ASW situation will be presented.

* 6.2 Ordering Data - Purchasers should exercise any desired options offered herein, and procurement documents should specify the following:

(1) Title, number, and date of this specification

(2) Selection of applicable levels of packaging and packing (See 5.1)

6.3 Precedence of Documents - When the requirements of the contract, this specification, or applicable subsidiary specifications are in conflict, the following precedence shall apply:

(1) Contract - The contract shall have precedence over any specification.

(2) This Specification - This specification shall have precedence over all applicable subsidiary specifications. Any deviation from this specification, or from subsidiary specifications where applicable, shall be specifically approved in writing by the procuring activity.

(3) Referenced Specifications - Any referenced specification shall have precedence over all applicable subsidiary specifications referenced therein. All referenced specifications shall apply to the extent specified.

6.4 Performance Objectives - Minimum size and weight, simplicity of operation, ease of maintenance, and an improvement in the performance and reliability of the specific functions beyond the requirements of this specification are objectives which shall be considered in the production of this equipment. Where it appears a substantial reduction in size and weight or improvement in simplicity of design, performance, ease of maintenance or reliability will result from the use of materials, parts and processes other than those specified in Specification MIL-E-5400, it is desired their use be investigated. When investigation shows advantages can be realized, a request for approval shall be submitted to the procuring activity for consideration. Each request shall be accompanied by complete supporting information.

* 6.5 Non-Repairable Subassemblies - As a general rule, non-repairable subassemblies should be encapsulated or hermetically-sealed. The number of connections internal to the subassembly should be held to a minimum. Detail parts tolerances and ratings should be so selected that the life of the subassembly is greater than that of a similar repairable one. With few exceptions (such as high voltage power supplies), the non-repairable subassembly should eveidence a Mean-Time-to-Failure greater than 5000 hours, and for many applications this figure must be nearer 50,000 hours.

6.6 Type Designations - The parentheses ( ) when used in the equipment type designation, will be deleted or replaced by either a number or letter furnished by the procuring activity upon application by the contractor for assignment of nomenclature in accordance with 3.3.8. The complete type number shall be used on nameplates, shipping records and instruction books, as applicable.

6.7 Revisions - In specification revisions and superseding amendments an asterisk "*" preceding a paragraph number denotes paragraphs in which changes have been made from the previous issue. This has been done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content as written, irrespective of the asterisk notations and relationship to the last previous issue.

* 6.8 Associated Equipment - The equipment shall operate with the following associated equipment:

Data Processing System MIL-D-81347

Computer, Avionics Unit MIL-C-81332

Camera Set, Television MIL-C-81457

Radar Set AN/APS-115 (*)

Scan Converter MIL-R-81343

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SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

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

SPECIFICATION

MIL-D-81357A(AS) DISPLAY GROUP, TACTICAL DATA AN/ASA-70

ORGANIZATION *(Of submitter)*	CITY AND STATE

CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT
		$

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

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

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

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

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

DD, FORM, 1 APR 63 1426

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