CONTROL ASSEMBLY, GUNNER
CRITICAL ITEM
PRODUCT FABRICATION SPECIFICATION

1. SCOPE

1.1 Scope. This specification establishes the manufacturing and acceptance of the Gunner Control Assembly Critical Item.

1.2 Classification. The assembly is of the following types:

a. Type I - Type I is defined on Drawing 12283113 as 12283113-1.
b. Type II - Type II is defined on Drawing 12283113 as 12283113-2 and 12283113-3.

2. APPLICABLE DOCUMENTS

2.1 Government documents. The following documents of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein. In the event of conflict between documents referenced herein and this specification, this specification shall be considered a superseding requirement.

SPECIFICATIONS

Military

MIL-C-22520	-	Crimping Tool, Terminal, Hand or Power Actuated, Wire Termination, and Tool Kit General
MIL-M-81594	-	Marking Foil, Hot Stamp Printing of Electrical Insulating Materials
MIL-P-14232	-	Parts, Equipment and Tools for Army Material, Packaging and Packing of
MIL-R-46846	-	Rubber, Synthetic, Heat Shrinkable

STANDARDS

Military

MIL-STD-105	-	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	-	Marking for Shipment and Storage
MIL-STD-454	-	Standard General Requirements for Electronic Equipment
MIL-STD-45662	-	Calibration Systems Requirements

DRAWINGS

Ordnance

12283113	Control Assembly, Gunner's

OTHER PUBLICATIONS

ATPD-2167	Environmental Test Methods, M1 Tank Program (for the M1 Weapon System only).

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

3. REQUIREMENTS

3.1 Item definition. The control, gunner's, herein referred to as the assembly, is an electro-mechanical device which translates input mechanical movements of its handles into proportional electrical signals.

3.2 Characteristics.

3.2.1 Performance

3.2.1.1 General requirements.

a. AC input power: 26 ± 0.1 vrms. 400 ± 8.0 Hertz (Hz) sine wave between J1-A to J1-B.

b. Load: 10,000 ± 100 ohms between J1-C to J1-D and J1-E to J1-F.

3.2.1.2 Dielectric withstanding voltage. With no input voltage applied and when 500 Vac electrical potential is applied between isolated circuits and between each isolated circuit except 50 Vac ± 10 Vac to pins J1-H to J1-K (for Type II only) and case for a period of 5 seconds, the leakage current shall be no more than 500 microamperes in any rotated position (clockwise (CW), counterclockwise (CCW), elevate or depress).

3.2.1.3 Insulation resistance. With no input voltage applied, the insulation resistance of the assembly shall be not less than 10 megohms at 500 volts dc, except 50 Vdc ± 10 Vdc to pins J1-H to J1-K (for Type II only), measured between each terminal and case at any rotated position (CW, CCW, elevate or depress).

3.2.1.4 Torque. The torque required to obtain maximum handle travel shall be:

	Traverse	Elevation
+ 170°F	40 ± 10 in-lb	25 (+5, -10) in-lb
+140°F*	40 ± 10 in-lb	25 (+5, -10) in-lb
-25°F*	60 in-lb max	35 in-lb max

*Temperature extremes in 3.2.3.2.

3.2.1.5 Switch actuation travel.

3.2.1.5.1 Palm switch. The palm switch shall actuate .05 to .25 inches from the free position.

3.2.1.5.2 Trigger switch. The trigger switch shall actuate .04 to .01 inches before full travel.

3.2.1.5.3 Range switch. The range switch shall actuate .04 to .01 inches before full travel.

3.2.1.6 Switch logic and continuity. The switch logic and continuity requirement shall be:

Switch Activated	Circuit Continuity
None	J1-G to P, R, & T for Type I only and J1-K to J1-H for Type II only greater than 5 megohms
L Palm or R Palm	J1-G to P less than 0.5 ohms for Type I only and J1-H to J1-K for Type II only
L Palm or R Palm and L or R Trigger	J1-G to T less than 0.5 ohms
L or R Palm and L or R Range	J1-G to R less than 0.5 ohms
L or R Trigger and L or R Range	J1-G to R or T Greater than 5 megohms

The assembly shall conform to the above values in any rotated position (CW, CCW, elevate or depress).

3.2.1.7 Self-test circuit. The continuity from J1-L to J1-S shall be less than 0.25 ohms.

3.2.1.8 Null and hysteresis. With the conditions of 3.2.1.1, the output signal at neutral position measured between J1-C and J1-D after rotating the handles to full elevate and depress or the output signal at neutral position measured between J1-E and J1-F after rotating the handles to full CW and CCW shall be as stated below:

Output	Temperature	VRMS Max.	Phase Sensitive VRMS Max.
J1-C to J1-D	+70°F	.057	± .030
	+140°F*	.066	± .050
	-25°F*	.13	± .120
J1-E to J1-F	+70°F	.057	± .030
	+140°F*	.066	± .050
	-25°F*	.13	± .120

* Temperature extremes in 3.2.3.2.1 and 3.2.3.2.2.

3.2.1.9 Threshold and mechanical dead band.

3.2.1.9.1 Elevation. The phase sensitive vrms at J1-C to J1-D for a handle displacement of 1.5° elevate and depress shall be the null voltage plus .01 vrms minimum. The phase sensitive vrms at J1-C to J1-D for a handle displacement of 2° elevate and depress shall be 0.285 to 0.560 vrms. The handle displacement is defined as degrees rotation from neutral-center position.

3.2.1.9.2 Traverse. The phase sensitive vrms at J1-E to J1-F for a handle displacement of 2° CW and CCW shall be the null voltage plus .01 vrms minimum. The phase sensitive vrms at J1-E to J1-F for a handle displacement of 4° CW and CCW shall be .225 to .360 vrms. The handle displacement is defined as degrees rotation from neutral-center position.

3.2.1.10 Scale factor. With the conditions of 3.2.1.1, the scale factor shall be as specified below.

Output	Handle Displacement	Slope
J1-C to J1-D	From Threshold thru ± 22°	.24 to .29 vrms per degree
J1-E to J1-F	From Threshold thru ± 60°	.078 to .088 vrms per degree

Output	VRMS at Extreme Handle Position
J1-C to J1-D	7.50 to 7.95 vrms elevate & depress
J1-E to J1-F	7.50 to 7.95 vrms CW and CCW

The output from ± 22° elevation and ± 60 traverse to each extreme position shall be smooth and continuous.

3.2.1.11 Output phasing. With the conditions of 3.2.1.1, the output phasing with the input voltage in each handle direction shall be as specified below.

Output	Handle Direction	Phasing with Input Voltage
J1-C to J1-D	Depress	180° out-of-phase
	Elevate	in-phase
J1-E to J1-F	CW	in-phase
	CCW	180° out-of-phase

3.2.1.12 Traverse and elevation nulling potentiometers.

3.2.1.12.1 Traverse. Rotational adjustment of the traverse nulling potentiometer (T) shall cause the output at J1-N to vary from .062 ± 10% VAC in phase to .062 ± 10% VAC out of phase (phase is with respect to J1-A and J1-B).

3.2.1.12.2 Elevation. Rotational adjustment of the elevation nulling potentiometer (E) shall cause the output at J1-M to J1-U to vary from .062 ± 10% VAC in phase to .062 ± 10% VAC out of phase (phase is with respect to J1-A and J1-B).

3.2.1.13 Palm switch electrical suppression (for Type II only).

3.2.1.13.1 Circuit capacitance. The circuit capacitance between J1-H and J1-K, with the palm actuator not actuated, shall be 1500 picofarad (pf) ± 30%.

3.2.2 Physical characteristics.

3.2.2.1 Weight. The weight of the assembly shall not exceed 15 pounds.

3.2.3 Environmental conditions.

3.2.3.1 Humidity. The assembly shall meet the requirements of 3.2.1 after exposure to relative humidity within the range of 5 to 100 percent.

3.2.3.2 Operating temperature.

3.2.3.2.1 Low temperature. The assembly shall meet the requirements of 3.2.1 during and after exposure to a temperature extreme of minus 25°F maximum.

3.2.3.2.2 High temperature. The assembly shall meet the requirements of 3.2.1 during and after exposure to a temperature of plus 140°F maximum.

3.2.3.3 Storage temperature. The assembly shall meet the requirements of 3.2.1 after exposure to ambient air temperatures of minus 70°F to plus 160°F.

3.2.3.4 Basic shock. The assembly shall meet the requirements of 3.2.1 after exposure to three shock impulses of 30 ± 3 g, 11 ± 1.1 milliseconds (ms) half sine wave applied in each direction of three mutually perpendicular axes for a total of 18 impulses.

3.2.3.5 Gunfiring shock. The assembly shall meet the requirements of 3.2.1 after exposure to shock impulses of 100 ± 10% g's, 1.0 ± 0.2 milliseconds (ms) half sine wave, applied in each direction of three mutually perpendicular axes.

3.2.3.6 Vibration. The assembly shall meet the requirements of 3.2.1 after exposure to sinusoidal vibration in accordance with Table I for a period of 180 minutes in each of the three mutually perpendicular axes. The vibration shall be imposed at a logarithmic sweep rate of 15 minutes per sweep cycle from 5 to 500 to 5 Hertz (Hz).

3.2.3.7 Submergence. The assembly shall meet the requirements of 3.2.1 after submergence to a depth of 1 inch for 30 minutes minimum. Submergence depth shall be measured between the water surface and the top surface of the assembly. A 5 minute drip dry period is permissible prior to performance within the specified limits. Installation of standard connector caps is permissible during submergence.

TABLE I Vibration Levels.

Axis	Frequency (Hz)	Amplitude
Vertical	5 to 25 25 to 36 36 to 500	±1 g 0.030 inch D.A. ±2 g
Longitudinal and Latitudinal	5 to 500	±1 g

3.3 Design and construction.

3.3.1 Production drawings. This assembly shall be fabricated and assembled in accordance with Drawing 12283113, as applicable.

3.3.2 Standards of manufacture.

3.3.2.1 Crimp contacts. Crimp type connector contacts shall be crimped using tools and procedures defined in MIL-C-22520.

3.3.2.2 Heat shrinking. Rubber tubing per MIL-R-46846 shall be uniformly heat shrunk until the tubing configuration reflects the contour of the surface it is intended to insulate.

3.3.2.3 Wire marking. All wires shall be marked with the applicable circuit number identified on the wiring diagram. Individual wires shall be marked at three inch intervals expect individual wires which are within multiconductor cables may be marked only within three inches of the wire termination. Marking shall be in accordance with MIL-M-81594.

3.3.2.4 Optional wire. A mixture of optional wire types shall not be used within any single assembly.

3.3.2.5 Wire stripping. Thermal stripping is mandatory for removal of outer jacket insulation of shielded cables and wires of No. 12 AWG and smaller diameters.

3.3.3 Workmanship. The assembly shall meet the requirements of MIL-STD-454, Requirement 9.

3.4 Special tests and examinations.

3.4.1 Initial production. (see 6.3) Initial production units shall be subjected to inspections and tests conforming to the requirements specified herein. During production, units shall be subjected to quality conformance inspections to assure continued conformance to the requirements specified herein.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspections. Unless otherwise specified (see 4.1.2) in the contract or purchase order, the supplier is responsible for the performance of all Quality Assurance Provisions specified herein (Section 4) to determine conformance with the requirements of Sections 3 and 5. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the procuring activity (see 6.2). The procuring activity reserves the right to perform or witness any of the inspections set forth in this document where such inspections are deemed necessary to assure supplies and service conform to the prescribed requirements. The supplier will not be restricted to the inspections or the methods of inspection defined herein, provided that an equivalent control, approved by the procuring activity, is utilized.

4.1.1 Inspection equipment. Unless otherwise specified in the contract, the supplier is responsible for the provision and maintenance of all inspection and test equipment necessary to assure that supplies conform to contract requirements. Commercial, modified commercial, or supplier designed inspection equipment or measuring set-ups must be capable of repetitive measurements to an accuracy of 10 percent of the component tolerance. Calibration of inspection and test equipment shall be in accordance with MIL-STD-45662. Where compliance with MIL-STD-45662 is not possible, special calibration requirements shall be prepared for approval by the procuring activity.

4.1.2 Special tests and examinations. Special tests and examinations (see 6.3) when required by contract or purchase order, shall be performed in accordance with Tables II and III. The recommended inspection sequence shall be in accordance with Table II.

NOTE: Assemblies subjected to special tests and examinations shall not be used for any other purposes and shall be indelibly marked, DO NOT USE.

4.1.2.1 Initial production. Unless otherwise specified in the contract or purchase order, the procuring activity shall select two assemblies from the first ten assemblies produced under a production contract (see 6.2). Two additional samples of the first ten assemblies may be selected by the procuring activity in order to expedite completion of testing. Once verification and validation of compliance with the requirements has been accomplished, quality conformance inspection of the remainder of the production contract shall be as specified (see 4.2).

4.1.2.1.1 Initial production failure. Deficiencies found during, or as a result of, the initial production test shall be cause for rejection of the initial production sample until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiency. Any deficiency found during, or as a result of, the initial production test shall be evidence that all items already produced prior to completion of the initial production test are similarly deficient unless contrary evidence satisfactory to the contracting officer is furnished by the contractor. Such

TABLE II. Recommended Sequence And Inspection Applied To Each Sample.

Test Sequence	Paragraph Number	Initial Production Sample	
		1	2
Design & construction 1/	4.3	x	x
Physical characteristics 1/	4.2.2	x	x
Performance 1/	4.2.1	x	x
Humidity 2/	4.2.3.1	x	x
Operating temperature	4.2.3.2	x	x
Storage temperature	4.2.3.3	x	x
Basic shock	4.2.3.4	x	x
Gunfiring shock	4.2.3.5	x	x
Vibration	4.2.3.6	x	x
Submergence 1/ 3/	4.2.3.7	x	x
Prep for delivery 3/	4.4	x	

1/ These tests shall also be performed on additional sample(s), if used.

2/ If additional sample(s) are selected, the tests indicated shall be performed on the additional sample(s) only (i.e., the indicated tests shall not be performed on samples 1 and 2).

3/ Inspections shall be performed in sequence only after all other inspections have been completed.

TABLE III. Category of Inspection.

Description	Requirements	Method	Special Tests & Exams	Quality Conformance Inspection		
				Class of Characteristics		
			Initial Prod	Critical	Major	Minor
Performance	3.2.1	4.2.1				
General requirements	3.2.1.1	4.2.1.1	x		100%	
Dielectric withstanding voltage	3.2.1.2	4.2.1.2	x		100%	
Insulation resistance	3.2.1.3	4.2.1.3	x		100%	
Torque	3.2.1.4	4.2.1.4	x		100%	
Switch actuation travel	3.2.1.5	4.2.1.5				
Palm switch	3.2.1.5.1	4.2.1.5.1	x		100%	
Trigger switch	3.2.1.5.2	4.2.1.5.2	x		100%	
Range switch	3.2.1.5.3	4.2.1.5.3	x		100%	
Switch logic & contin.	3.2.1.6	4.2.1.6	x		100%	
Self test circuit	3.2.1.7	4.2.1.7	x		100%	
Null and hysteresis	3.2.1.8	4.2.1.8				
Threshold & mechanical deadband	3.2.1.9	4.2.1.9				
Elevation	3.2.1.9.1	4.2.1.9.1	x		100%	
Traverse	3.2.1.9.2	4.2.1.9.2	x		100%	
Scale factor	3.2.1.10	4.2.1.10	x		100%	
Output phasing	3.2.1.11	4.2.1.11	x		100%	
Trav & elev nulling potentiometers	3.2.1.12	4.2.1.12				
Traverse	3.2.1.12.1	4.2.1.12.1	x		100%	
Elevation	3.2.1.12.2	4.2.1.12.2	x		100%	
Palm switch electrical suppression	3.2.1.13	4.2.1.13				
Circuit capacitance	3.2.1.13.1	4.2.1.13.1	x		100%	
Physical characteristics	3.2.2	4.2.2				
Weight	3.2.2.1	4.2.2.1	x			
Environmental conditions	3.2.3	4.2.3				
Humidity	3.2.3.1	4.2.3.1	x		1/200	
Operating temperature	3.2.3.2	4.2.3.2				
Low temperature	3.2.3.2.1	4.2.3.2.1	x		1/200	
High temperature	3.2.3.2.2	4.2.3.2.2	x		1/200	
Storage temperature	3.2.3.3	4.2.3.3	x		1/200	
Basic shock	3.2.3.4	4.2.3.4	x		1/200	
Gunfiring shock	3.2.3.5	4.2.3.5	x		1/200	
Vibration	3.2.3.6	4.2.3.6	x		1/200	
Submergence	3.2.3.7	4.2.3.7	x		1/50	
Design & construction	3.3	4.3				
Production dwgs	3.3.1	4.3.1	x			4.0

TABLE III. Category of Inspection (Cont'd)

Description	Require-ments	Method	Special Tests & Exams	Quality Conformance Inspection		
				Class of Characteristics		
			Initial Prod	Critical	Major	Minor
Stds of mfg	3.3.2	4.3.2				
Crimp contacts	3.3.2.1	4.3.2.1	x			4.0
Heat shrinking	3.3.2.2	4.3.2.2	x			4.0
Wire marking	3.3.2.3	4.3.2.3	x			4.0
Optional wire	3.3.2.4	4.3.2.4	x			4.0
Wire stripping	3.3.2.5	4.3.2.5	x			4.0
Workmanship	3.3.3	4.3.3	x			4.0
Prep for delivery	5.0	4.4	x			

deficiencies on all items shall be corrected by the contractor. The government reserves the right not to accept products until initial production test is completed to the satisfaction of the government.

4.1.3 Quality conformance conditions and controls. Quality conformance inspections shall consist of the inspections and tests specified in Table III as indicated by the existence of an acceptable quality level (AQL) or frequency of inspection number in one of the classification of characteristics columns. Examples of the numbers to be used are: 100%, 4.0, and 1/200. Quality conformance inspection shall be performed in accordance with the methods specified in 4.2.

NOTES:

1. 100% means each unit produced shall be inspected for the indicated characteristics (see 4.1.3.1.2).

2. 4.0 signifies an AQL number and indicates the characteristic may be sample inspected (see 4.1.3.1.1).

3. 1/200 or 1/50 in the control column signifies a control inspection (see 4.1.3.2).

4.1.3.1. Lot-by-lot inspection. Lot-by-lot inspection shall consist of sampling and acceptance (100%) inspection as specified in Table III. An inspection lot shall consist of all assemblies of one type, submitted at one time for Quality Conformance Inspection.

4.1.3.1.1 Sampling. Sampling and inspection shall be conducted in accordance with MIL-STD-105 on the basis of percent defective for those characteristics of Table III assigned on Acceptable Quality Level (AQL). Except as specifically designated in Table III characteristics having the same AQL shall be treated as a group.

4.1.3.1.1.1 AQL Validation. Before sampling can commence for any production contract, a minimum of 20 assemblies shall be subjected to 100% inspection to verify conformance to

requirements listed in Table III. Process average for each requirement shall be computed as specified below. If the computed process average for the requirements exceed the specified AQL, 100% inspection shall be continued until the process average for twenty consecutive assemblies is less than the specified AQL.

$$\text{Process average} = \frac{\text{Number of Defects}}{\text{Number of Assemblies Inspected}} \times 100$$

4.1.3.1.1.2 Sampling failures. Rejected assemblies or lots shall be processed in accordance with the acceptance and rejection criteria of MIL-STD-105.

4.1.3.1.2 Acceptance (100%) inspection. For the requirements specified for acceptance (100%) inspection in Table III, each assembly of the inspection lot shall be subjected to the tests specified therein. Inspection shall be performed by the supplier at the place of manufacture except as specified in 4.1.

4.1.3.1.2.1 Acceptance (100%) inspection failures. Any assembly that fails to conform to any acceptance (100%) inspection shall be rejected. The rejected assembly may be repaired or corrected and resubmitted for inspection.

4.1.3.2 Control inspection. Control inspection shall be conducted by the supplier to maintain control of the characteristics which require prolonged test periods, are expensive to conduct or are destructive in nature thereby prohibiting their inclusion in lot-by-lot inspection. These inspections need not be performed on the first control inspection quantity when initial production inspection has been satisfactorily accomplished.

4.1.3.2.1 Frequency. Control inspections as specified in Table III shall be conducted at a rate of one assembly from each lot of two-hundred (200) assemblies (1/200) consecutively produced, except that no more than one (1) test shall be performed in a 6 month period, nor less than one (1) test in a 12 month period. Control inspections for submergence (see 4.2.3.7) shall be conducted at a rate of one assembly from each lot of fifty (50) assemblies (1/50) consecutively produced.

4.1.3.2.2 Failure. Failure of the assembly to meet specified control inspections shall be considered cause for rejection of the entire lot represented. When the cause for control test failure is identified and corrective action is necessary, corrections shall be made and proven by inspecting three randomly selected assemblies from the lot represented. When corrective action is implemented, one of the three assemblies shall be subjected to all specified inspections. The remaining two assembly inspections shall be limited to the parameters directly related to the failure cause and the parameters affected by the corrective action.

4.1.3.3 Test conditions. Unless otherwise specified, all tests shall be conducted under the following conditions:

Air temperature	73 ± 18°F
Barometric pressure	28.5 (+2.0 -3.0) inches of mercury
Relative humidity	50 ± 30 percent

4.2 Quality conformance inspections.

4.2.1 Performance.

4.2.1.1 General requirements. Unless otherwise specified, the inspections herein shall be performed with the AC input power and loads specified in 3.2.1.1 applied to the respective connections specified in 3.2.1.1.

4.2.1.2 Dielectric withstanding voltage. With no input voltage (4.2.1.1) applied and using a megger, apply a 500 ± 50 Vac electrical potential for a period of 5 seconds minimum between circuits and between circuits and assembly case as specified below, except m., which will have 50 Vac ± 10 Vac applied.

a. J1-A to C, E, G, J, L, M, P, R, T and case (and H and K for Type II only)
b. J1-C to E, G, J, L, M, P, R, T and case (and H and K for Type II only)
c. J1-E to G, J, L, M, P, R, T and case (and H and K for Type II only)
d. J1-G to J, L, M, P, R, T and case (and H and K for Type II only)
e. J1-J to L, M, P, R, T and case (and K for Type II only)
f. J1-L to M, P, R, T and case
g. J1-M to P, R, T and case
h. J1-P to R, T and case
i. J1-R to T and case
j. J1-T to case
k. J1-H to J, L, M, P, R, T and case (for Type II only)
l. J1-K to L, M, P, R, T and case (for Type II only)
m. J1-H to J1-K (for Type II only)

Using the megger microammeter, measure the current leakage between all above circuits. Values shall be in accordance with 3.2.1.2.

4.2.1.3 Insulation resistance. With no input voltage (4.2.1.1) applied and using a megger, measure the insulation resistance between assembly pins and between pins and case as specified below at 500 ± 50 Vdc, except m., which will have 50 Vdc ± 10 Vdc applied.

a. J1-A to C, E, G, L, M, P, R, T and case
b. J1-C to E, G, J, L, M, P, R, T and case
c. J1-E to G, J, L, M, P, R, T and case
d. J1-G to J, L, M, P, R, T and case
e. J1-J to L, M, P, R, T and case
f. J1-L to M, P, R, T and case
g. J1-M to P, R, T and case
h. J1-P to R, T and case
i. J1-R to T and case
j. J1-T to case
k. J1-H to J, L, M, P, R, T and case (for Type II only)
l. J1-K to L, M, P, R, T and case (for Type II only)
m. J1-H to J1-K (for Type II only)

Values shall be in accordance with 3.2.1.3.

4.2.1.4 Torque. Mount a torque sensor to measure CW and CCW torque values. Measure torque at each CW and CCW extreme handle positions. Values shall be in accordance with

3.2.1.4. Remount torque sensor to measure elevate and depress torque values. Measure torque at each elevate and depress extreme handle positions. Values shall be in accordance with 3.2.1.4.

4.2.1.5 Switch actuation travel.

4.2.1.5.1 Palm switch. Using a volt-ohm meter between pins J1-G to J1-P (for Type I only), and between pins J1-G to J1-P and pins J1-K to J1-H (for Type II only), the resistance shall decrease from greater than 5 megohms to less than 0.5 ohms when the palm switch actuator is depressed .15 to .35 inches from the free position. Switch actuation travel shall be measured at the farthest point from the switch actuator folcrum.

4.2.1.5.2 Trigger switch. With the palm and trigger switch fully depressed and a volt-ohm meter attached between pins J1-G and J1-T, slowly release the trigger switch. The resistance shall increase from less than 0.5 ohms to greater than 5 megohms when the trigger switch is released .04 to .01 inches from the fully depressed position. Switch actuation travel shall be measured at the farthest point from the switch actuator folcrum.

4.2.1.5.3 Range switch. With the palm and range switch fully depressed and a volt-ohm meter attached between pins J1-G and J1-R, slowly release the range switch. The resistance shall increase from less than 0.5 ohms to greater than 5 megohms when the range switch is released .04 to .01 inches from the fully depressed position. Switch actuation travel shall be measured at the farthest point from the switch actuator folcrum.

4.2.1.6 Switch logic and continuity. With a volt-ohm meter measure each of the circuits with the conditions specified in 3.2.1.6. All values shall be in accordance with 3.2.1.6.

4.2.1.7 Self-test circuit. With a volt-ohm meter, measure the resistance between J1-L to J1-S. The value shall be in accordance with 3.2.1.7.

4.2.1.8 Null and hysteresis. Using a phase angle voltmeter between pins J1-C and J1-D, the Vrms max and the maximum phase sensitive voltage measured after each of three full elevate and full depress back to neutral position shall be in accordance with 3.2.1.8. Using a phase angle voltmeter between pins J1-E and J1-F, the Vrms max and the maximum phase sensitive voltage measured after each of three full CW and CCW back to neutral position shall be in accordance with 3.2.1.8.

4.2.1.9 Threshold and mechanical deadband.

4.2.1.9.1 Elevation. With a phase angle voltmeter connected between J1-C and J1-D and a protractor mounted to indicate elevate and depress degrees of rotation, the phase sensitive output measured at 1.5° and 2.0° elevate and depress shall be in accordance with 3.2.1.9.

4.2.1.9.2 Traverse. With a phase angle voltmeter connected between J1-E and J1-F and a protractor mounted to indicate CW and CCW degrees of rotation, the phase sensitive output measured at 2° and 4° CW and CCW shall be in accordance with 3.2.1.9.

4.2.1.10 Scale factor. With a volt-ohm meter connected between J1-C and J1-D and a protractor mounted to indicate elevate and depress degrees of rotation, the output measured per degree of rotation shall be in accordance with 3.2.1.10. With a volt-ohm meter connected between J1-E to J1-F and a protractor mounted to indicate CW and CCW degrees of rotation, the output measured per degree of rotation shall be in accordance with 3.2.1.10. Place this assembly in an

environmental chamber and repeat the above tests at minus 25°F and at plus 140°F to verify conformance to 3.2.1.10.

4.2.1.11 Output phasing. With a phase angle voltmeter connected between J1-C and J1-D, depress the handle assembly. Phasing shall be in accordance with 3.2.1.11. Elevate the handle assembly. Phasing shall be in accordance with 3.2.1.11. With a phase angle voltmeter connected between J1-E and J1-F, rotate the handle assembly CW. Phasing shall be in accordance with 3.2.1.11. Rotate the handle assembly CCW. Phasing shall be in accordance with 3.2.1.11.

4.2.1.12 Traverse and elevation nulling potentiometers.

4.2.1.12.1 Traverse. With a phase angle voltmeter connected between J1-J and J1-N, the measured output shall be in accordance with 3.2.1.12.1.

4.2.1.12.2 Elevation. With a phase angle voltmeter connected between J1-M and J1-U, the measured output shall be in accordance with 3.2.1.12.2.

4.2.1.13 Palm switch electrical suppression (for Type II only).

4.2.1.13.1 Circuit capacitance. With the palm switch in its free position (undepressed), verify that the capacitance between J1-H and J1-K is 1500 picofarad (pf) ± 30%.

4.2.2 Physical characteristics.

4.2.2.1 Weight. The assembly shall be weighed to verify conformance to the weight requirements of 15 pounds maximum.

4.2.3 Environmental conditions.

NOTE:

a. Assemblies undergoing initial production tests of Tables II and III shall be subjected to the performance tests (specified in applicable paragraphs) before and during (where required) environmental tests. Performance testing between environments shall be at the option of the contractor. After all environmental tests have been completed, the assemblies shall be tested to the post environmental performance tests.

b. Assemblies undergoing the quality conformance control inspections of Table III shall have passed the acceptance test indicated therein. After all environmental tests have been completed, the assemblies shall be tested only once for the post-environmental performance test specified.

c. Compliance with the selected performance tests during exposure to environments as specified herein provides evidence of conformance to the requirements of 3.2.1.

4.2.3.1 Humidity. Place the assembly in a humidity chamber and subject it to the humidity test specified in ATPD-2167 to verify conformance to 3.2.3.1. After exposure (see 4.2.3a), subject the assembly to the performance tests of 4.2.1.

4.2.3.2 Operating temperature.

4.2.3.2.1 Low temperature. The assembly shall be subjected to the low temperature test of ATPD-2167 to verify conformance to 3.2.3.2.1 and 3.2.3.3. The assembly shall be subjected to the tests of 4.2.1 both during and after (see 4.2.3a) exposure.

4.2.3.2.2 High temperature. The assembly shall be subjected to the high temperature test of ATPD-2167 to verify conformance to 3.2.3.2.2 and 3.2.3.3. The assembly shall be subjected to the tests of 4.2.1 both during and after (see 4.2.3a) exposure.

4.2.3.3 Storage temperature. Successful completion of the tests of 4.2.3.1 shall verify conformance to 3.2.3.3.

4.2.3.4 Basic shock.

4.2.3.4.1 Initial production. The assembly shall be mounted using the installed interface configuration for its intended application or equivalent and subjected to the shock test of ATPD-2167 to verify conformance to 3.2.3.4. After exposure (see 4.2.3a), the assembly shall be subjected to the tests of 4.2.1.

4.2.3.4.2 Control tests. The assembly shall be subjected to the tests of 4.2.3.4.1 except the shock pulse shall be 25.0 ± 2.5 g, 11.0 ± 1.1 ms.

4.2.3.5 Gunfiring shock.

4.2.3.5.1 Initial production. The assembly shall be mounted using the installed interface configuration for its intended application or equivalent and subjected to the shock test of ATPD-2167 to verify conformance to 3.2.3.5. After exposure (see 4.2.3a), the assembly shall be subjected to the tests of 4.2.1.

4.2.3.5.2 Control test. The assembly shall be subjected to the test of 4.2.3.5.1 except the peak amplitude shall be reduced to 75 percent of the value(s) specified in 3.2.3.5.

4.2.3.6 Vibration.

4.2.3.6.1 Initial production. The assembly shall be mounted using the installed interface configuration for its intended application or equivalent and subjected to the vibration test of ATPD-2167 to verify conformance to 3.2.3.6. After exposure (see 4.2.3a), the assembly shall be subjected to the tests of 4.2.1.

4.2.3.6.2 Control test. The assembly shall be subjected to the test of 4.2.3.6.1 except the exposure time shall be reduced to 90 minutes.

4.2.3.7 Submergence. The assembly shall be submerged in clean water to a depth of 1 inch, measured between the water surface and the top surface of the assembly for a period of 30 minutes minimum to verify conformance to 3.2.3.7 and Table II. Installation of standard connector caps is permissible. After exposure, the assembly shall be subjected to the tests of 4.2.1. A 5 minute drip dry period is permissible prior to performing the tests of 4.2.1.

4.3 Design and construction.

4.3.1 Production drawings. Visual examination shall be performed during fabrication and assembly to verify conformance to drawing 12283113.

4.3.2 Standards of manufacture.

4.3.2.1 Crimp contacts. The assembly shall be inspected for crimp type connector contacts, that they are crimped using tools and procedures defined in MIL-C-22520.

4.3.2.2 Heat shrinking. Rubber tubing per MIL-R-46846 inspected for uniform heat shrink until the tubing configuration reflects the contour of the surface it is intended to insulate.

4.3.2.3 Wire marking. All wires shall be inspected for marking with the applicable circuit number identified on the wiring diagram. Individual wires shall be marked at three inch intervals except individual wires which are within multiconductor cables may be marked only within three inches of the wire termination. Marking shall be in accordance with MIL-M-81594.

4.3.2.4 Optional wire. The assembly shall be inspected to assure that a mixture of optional wire types are not be used within any single assembly.

4.3.2.5 Wire stripping. The assembly shall be inspected for mandatory thermal stripping, for removal of outer jacket insulation of shielded cables and wires of No. 12 AWG and smaller diameters.

4.3.3 Workmanship. Workmanship examinations shall be performed at all phases of fabrication, assembly and test shall conform to MIL-STD-454, Requirement 9.

4.4 Preparation for delivery. The assembly shall be visually and dimensionally inspected to verify conformance to 5.

5. PREPARATION FOR DELIVERY

5.1 General. Levels of preservation, packaging and packing of the assembly shall be as specified by the procuring activity (see 6.2).

5.1.1 Definitions.

LEVEL A — Preservation, packaging and packing which will afford adequate protection against corrosion, deterioration and damage during shipment, handling, indeterminate storage and worldwide redistribution.

LEVEL B — Preservation, packaging and packing which will afford adequate protection against corrosion, deterioration and damage during reshipment, handling and known storage conditions for periods normally not exceeding 1 year.

LEVEL C — Preservation, packaging and packing which will afford adequate protection against corrosion, deterioration and damage during shipment from supply source to the first receiving activity for immediate use (vendor to user).

5.2 Requirements.

5.2.1 Preservation, packaging, and packing. Unless otherwise specified, the method and materials used in preservation, packaging and packing of the assembly shall be as specified in MIL-P-14232.

5.2.2 Marking for shipment and storage. Unless otherwise specified, interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The assembly is intended to provide an electrical signal proportional to mechanical movements of the handle.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number and date of this specification.

b. Special tests and examinations:

1. Initial production. (see 6.3.a) if required for this procurement, specific request must be included in the purchase order or contract (see 4.1.2.1).

2. Activity and facility responsible for special tests and examinations. (see 4.1) The purchase order or contract should specify the name of the activity and the facility responsible for special tests and examinations.

NOTE: Units subjected to these tests, which are destructive in nature, shall not be delivered for use as defined in 6.1 and shall be indelibly marked: DO NOT USE.

c. Applicable levels of packaging, packing, and marking instructions (see 5.1).

d. Additional components required to perform control tests.

6.3 Definitions. The following definitions explain the tests specified herein and when the tests are to be run:

a. Initial production. These inspections verify the production tooling, methods, and processes used to manufacture a component. They are required on selected first articles produced in a production run. These inspections shall be repeated once every three years on continuing contracts.

b. Quality conformance inspection.

1. Sampling. These inspections verify that physical and configuration characteristics are maintained during the production run.

2. Control. These inspections verify that the integrity of the quality level proven by initial production inspection is maintained during the production run.

3. Acceptance. These inspections are performed on each manufactured item to verify its functional performance against specification requirements.