

ADMIRALTY SURFACE WEAPONS ESTABLISHMENT

Specification AD/CV4110 incorporating MIL-E-1/1301B/NAVY Issue 1 dated 1.10.1962 To be read in conjunction with K1006 and BS.448	<u>SECURITY</u> <u>Specification</u> <u>Valve</u> Unclassified Unclassified
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<u>TYPE OF VALVE:</u> Medium Mu Low Noise Double Triode <u>CATHODE:</u> Indirectly heated <u>ENVELOPE:</u> Glass <u>PROTOTYPE:</u> 7308				<u>MARKING</u> See K1001/4 Additional marking: 7308 <u>BASE</u> BS448/B9A		
<u>RATING</u> (All limiting values are absolute)				<u>CONNECTIONS</u> Pin. Electrode		
Heater Voltage (V) 6.3 Heater Current (A) .335 Amdt.1 { Max. Anode Voltage (V) 100. -A Max. "No-Load" Anode Voltage (V) 250. A Max. Anode Dissipation (W) 1.65 A Max. Heater-Cathode Voltage (V) (+ 70 A (-135 Max. Negative Grid Voltage (V) 110 A Amplification Factor 33 B Mutual Conductance (mA/V) 12.5 B Max. Bulb Temperature (°C) 165 Max. Noise Factor (dB) 2.2 D Amdt.1 Max Peak Anode Voltage (Ia=0) (V) 440				1. Anode" a" 2. Grid" g" 3. Cathode" k" 4. Heater h 5. Heater h 6. Anode' a' 7. Grid' g' 8. Cathode' k' 9. Internal Shield		
				<u>DIMENSIONS</u>		
				Dimensions (mm)	Min.	Max.
				A. Seated Height	-	55.6 44.2
				B. Diameter	19	22.2
				C. Overall Length	-	62.7 55.6
<u>CAPACITANCES (Nom.)</u>				<u>MOUNTING POSITION</u> Any		
C ag (pF) 1.4 A,C. C in (pF) 3.3 A,C. C out' (pF) 1.8 C C out" (pF) 1.7 C Cg' to g" (Max.) (pF) .008 C Ca' to a" (Max.) (pF) .060 C				Amdt.3		

NOTES

- A. Per section.  
 B. At  $V_a(b) = 100V$ ;  $V_g(b) = +9V$ ;  $R_k = 680 \text{ ohm}$ .  
 C. Without external shield.  
 D. See test on page B  
 E. The Joint Services Catalogue Number is:- 5960-99-037-2504

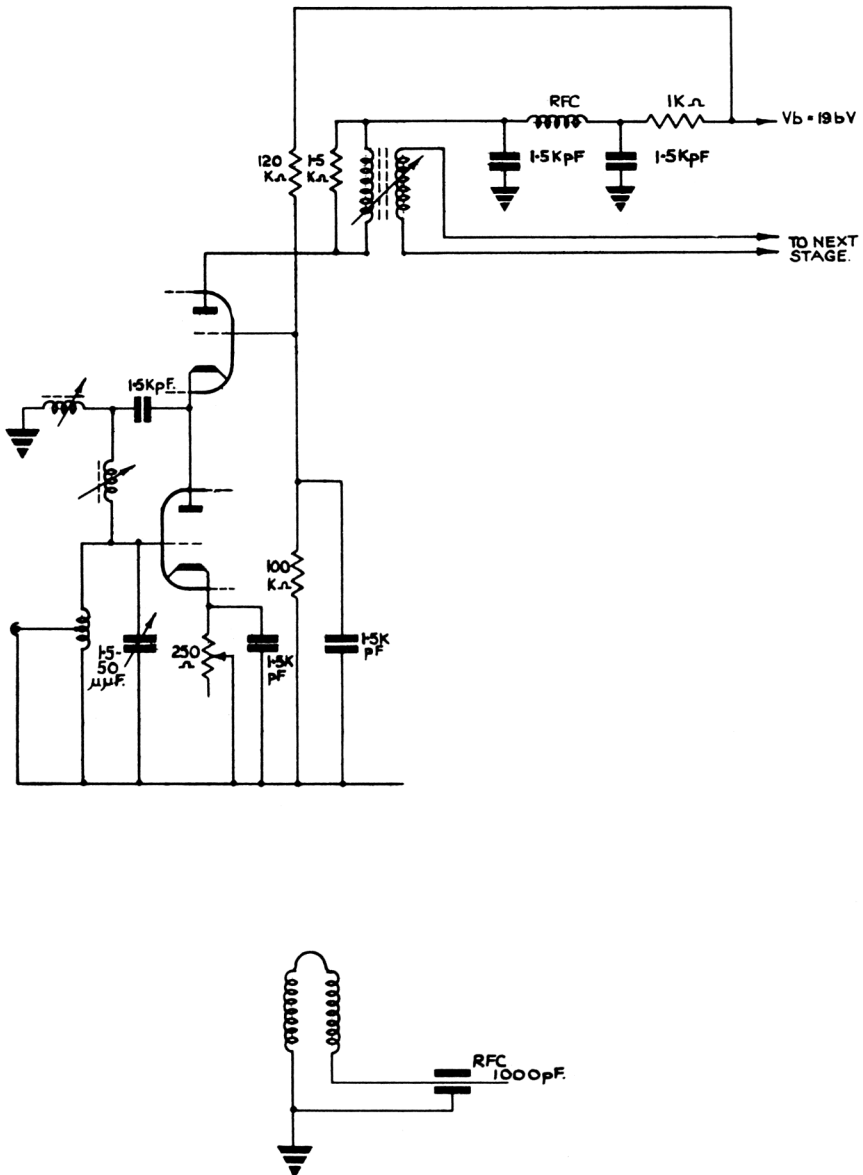
TESTS

Additional to and in place of 4.10.3.1 and 4.10.3.4 in MIL-E-1/1301B (NAVY) specification.

Ref.	Test	Conditions	AQL %	Insp. Level	Sym.	LIMITS						Units
						Min.	LAL	Bogie	UAL	Max.	ALD	
	Noise Factor <del>Note 1</del>	$V_h = 6.3V$ $V_a (b) = 196V$ $I_a = 15 \text{ mA}$ $R_k = \text{adj.}$ $R_a = 1000 \text{ ohm}$ Note 26	4	I	N.F.		-	-	-	2.2	-	dB

## NOTES

Ampl-2 26. Valves shall be tested at a convenient frequency within the range 40-50 Mc/s in an approved head amplifier (see circuit diagram on page C). The noise factor of the complete unit shall be measured for a bandwidth not exceeding 1 Mc/s. The noise contributed by the second stage shall not exceed 3% of the total noise. The input circuit losses measured at the grid shall not exceed an equivalent conductance of 3 micro-mhos at the test frequency. The transformed source of resistance shall be such that a minimum value of noise factor is obtained for a representative value of this type (approx. 15,000 ohms).



CIRCUIT FOR CV4110 AND CV4111 NOISE FACTOR MEASUREMENTS.

MILITARY SPECIFICATION SHEET  
ELECTRON TUBE, TYPE 7308

CV4110

The requirements and tests of the latest issue of Specification MIL-E-1 shall apply, except as otherwise required herein.

Description: Twin Triode. Medium  $\mu$ 

Ratings:	Ef V	Ebb Vdc	Eb Vdc	Ecc Vdc	Ec Vdc	Ehk v	Rk/k ohms
Absolute							
Maximum:	6.6	--	250	--	--	70	--
Minimum:	6.0	--	--	--	-110	-135	--
Test Cond:	6.3	100	Approx.90	+ 9	--	--	680

Ratings:	Rg/g Meg	Ik/k mAdc	Ic/g mAdc	Pp/p W	T envelope °C	Alt. ft.
Absolute						
Maximum:	0.5	22	--	1.65	165	60,000
Minimum	--	--	--	--	--	--
Test Cond.:	--	--	--	--	--	--

## Note 1

Cathode: Coated unipotential

Base: Miniature Button, 9 pin,

Pin No: 1 2 3 4 5 6 7 8 9

Element: 2p 2g 2k h h lp lg lk sd

Diameter: 7/8 inch max.

Height: 2-3/16 in. max.

Envelope: T-6-1/2

For the purposes of acceptance inspection, use applicable reliable paragraphs of Specification MIL-E-1.

Ref.	Test	Conditions	AQL % Defec- tive	Insp. Level or Code	Sym	Limits (See Note 3)						Units
						Min.	LAL	Bogie	UAL	Max.	ALD	
3.1	<u>General</u> Qualification	Required Note 22	--	--	--	--	--	--	--	--	--	--
3.6	Performance		--	--	--	--	--	--	--	--	--	--
3.7	Marking	Note 21	--	--	--	--	--	--	--	--	--	--
	<u>Qualification</u> <u>Tests (see</u> <u>Note 17)</u>											
--	Cathode	Coated uni- potential	--	--	--	--	--	--	--	--	--	--
3.4.3	Base connections	Outline E9-1	--	--	--	--	--	--	--	--	--	--
4.9.19.9	Vibration:	Rp=2,000 Ck=1,000 uf Note 16	--	--	Ep	--	--	--	--	100		mVac

Ref.	Test	Conditions	AQL (% Defec- tive)	Insp. Level or Code	Sym	Limits, Note 4						Units
						Min.	LAL	Bogie	UAL	Max	ALD	
<u>Measurements acceptance tests, part 1, Note 3</u>												
4.10.8	Heater Current:		---	---	If: ---	320	335	350	---	28	mA	
4.10.8	Heater Current		0.65	II	If: 305	---	---	---	365	---	mA	
4.10.15	Heater Cathode Leakage:	Ehk= +100V dc	0.65	II	(Ihk: ---	---	---	---	10	---	µAdc	
		Ehk= -100V dc Note 2			(Ihk: ---	---	---	---	10	---	µAdc	
4.10.6.1	+ Grid Current (1)	Note 2	0.65	II	Io: 0	---	---	---	-0.1	---	µAdc	
4.10.4.1	Plate Current (1)	Ebb= 90V dc: Ecc=0: Rk=80 Note 2	---	--	Ib: ---	13.3	15.0	16.7	---	5.4	mAdc	
4.10.4.1	+Plate Current (1)	Ebb=90V dc: Ecc=0: Rk=80: Note 2	0.65	II	Ib: 11.3	---	---	---	18.7	---	mAdc	
4.10.4.1	Plate Current (2)	Ec= -15 Eb= 150V Note 2 <i>Rk/Rk = 80 ohms</i>	0.65	II	Ib: ---	---	---	---	5	---	µAdc	
4.10.9	Trans- conductance (1):	Note 2	---	---	Sm: ---	11700	12500	13300	---	2500	µmhos	
4.10.9	Trans- conductance (1):	Note 2	0.65	II	Sm: 10400	---	---	---	14600	---	µmhos	
4.7.5	Continuity and Shorts (Inoper- atives)		0.4	II		---	---	---	---			
4.9.1	Mechan- ical	Envelope Outline No. (6-7)	---	---		---	---	---	---		---	
<u>Measurements acceptance tests, part 2</u>												
4.8	Insulation of Electrodes	Note 2 g-all:10 meg p-all in series	2.5	I6	(R: 100	---	---	---	---	---	Meg	
					(R: 100	---	---	---	---	---	Meg	
4.10.9	Trans- conductance (2)	Ef=5.7 Vac; Note 2.	2.5	I	ΔSm: Ef:	---	---	---	15	---	%	

Ref.	Test	Conditions	AQL (% Defec- tive)	Insp. Level or Code	Sym	Limits, Note 4						Units
						Min.	LAL	Bogie	UAL	Max	ALD	
4.10.11.2	Amplifica- tion Factor		6.5	1	Mu	26.5	--	--	--	39.5	---	
4.10.6.1	Grid Current (2)	Notes 2 and 15	2.5	1	Ig	0	--	--	--	0.5	---	$\mu$ Adc
4.10.3.1	R.F.Noise	Ecal=30 mV Notes 16 and 18	2.5	1				--	--	--	---	
4.10.3.4	Noise and Micro- phonics This test may be carried out on alter- native approved test gear to that called up in Note 20	Ebb=250 Vdc: Rk=680 ohms Ecal = 5 mVac: Ck=100uf Rp=10,000 Notes 2 and 20	2.5	1		--	--	--	--	--	---	
4.10.14	Capacitance No Shield	Note 2	6.5	Code E	Gsp: 1.2	--	--	--	--	1.6	---	pf
	No Shield	Note 2			Cin: 2.7	--	--	--	--	3.9	---	pf
	No Shield	Sect 1			Cout: 1.6	--	--	--	--	2.0	---	pf
	No Shield	Sect 2			Cout: 1.5	--	--	--	--	1.9	---	pf
	No Shield				Ggg: --	--	--	--	--	.008	---	pf
	No Shield				Cpp: --	--	--	--	--	.060	---	pf
4.9.12.1	Low Pres- sure Voltage Breakdown	Pressure = 55+ 5 mmHg: Voltage= 300 Vac	6.5	Note 19	--	--	--	--	--	--	--	--
4.9.19.1	Vibration (2)	Rp=2,000 Ck=1,000 Note 16	6.5	Code 1	Ep: --	--	--	--	--	50	--	mVac
<u>Degradation Rate Acceptance Tests Note 6</u>												
4.9.20.5	Shock	Hammer Angle = 30° Enh = + 100V dc Note 5:										
4.9.20.6	Fatigue	G= 2.5 Fixed Frequency 50 c.p.s.	6.5	Note 19		--	--	--	--	--	--	
---	Post Shock and Fatigue Test End Points:	Vibration (2) Heater- Cathode Leakage Enh= +100 Enh=-100	---	--	Ep: --	--	--	--	--	75	--	mVac
			---	--	Ihk: --	--	--	--	--	15	--	$\mu$ Adc
			---	--	Ihk: --	--	--	--	--	15	--	$\mu$ Adc

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Ref.	Test	Conditions	AQL (% Defec- tive)	Insp. Level or Code	Sym.	Limits Note 4						Units
						Min.	LAL	Bogis	UAL	Max	ALD	
4.9.6.1	Miniature Tube Base Strain:	Trans- conductance (1)	---	---	Sm:	9,000	--	---	---	16,500	---	μmhos
		Grid Current (1)	---	---	Ic:	0	--	---	---	-0.2	---	μAdc
4.9.6.3	Glass Strain		2.5	I								

Anlt 2

Ref.	Test	Conditions	AQL (% Defec- tive)	Insp. Level or Code	Allowable defectives per character- istics		Sym	Limits		Units
					1st sample	Com- bined samples		Min	Max	
<u>Acceptance Life Tests. Note 6</u>										
4.11.7	Heater-Cycling Life Test:	Ef=7.5V Ehk:= +100Vdc Ec=Eb=0: 1 min. on, 4 min. off. Note 7	---	---	---	---		--	--	
4.11.4	Heater Cycling Life Test End Points	Heater Cathode Leakage Ehk=+100V dc Ehk=-100V dc	---	---	---	---	Thk: Thk:	-- --	20 20	μAdc μAdc
4.11.3.1 (a)	Stability Life Test	Ehk=+135V dc Rg=47,000 TA=Room Notes 2 and 8	1.0	Code I	---	---		--	--	
4.11.4	Stability Life Test End Points (2 and 20 hours)	Change in Transconduct- ance (1) of individual tubes	---	---	---	---	ΔSm: t	--	10	%
4.11.3.1 (b)	Survival Rate Life Tests	Stability Life Test Conditions or Equivalent Notes 2, 9 and 10.	---	II	---	---		--	--	
4.11.4	Survival Rate Life Test End Points (100 hours)	Continuity and Shorts (Inoper- atives)	0.65	---	---	---		--	--	
		Trans- conductance (1)	1.0	---	---	---	Sm:	9000	--	μmhos

Ref.	Test	Conditions	AQL (% Defec- tive)	Insp. Level or Code	Allowable defectives per characteristics		Sym.	Limits		Units
					1st sample	Comb- ined samples		Min	Max	
Acceptance Life Tests Note 6 (Cont'd)										
4.11.3.1	Intermittent Life Test	Stability Life Test Conditions: T Bulb=165°C Min. Notes 2, 11 and 12	---	---	---	---		---	---	---
4.11.4	Intermittent Life Test End Points: (500 hours)	Note 13 Inoperatives (Note 14) Grid Current (1) Heater Current Change in Transconduct- ance (1) of individual tubes	---	---	1	3	Ic:	0	-0.9	$\mu$ Adc
		Heater Current Change in Transconduct- ance (1) of individual tubes	---	---	1	3	If	305	365	mA
4.11.4		Transconduct- ance (2) Heater Cathode Leakage Ehk=+100V dc Ehk=-100V dc Insulation of Electrodes g-all p-all Transconduct- ance (1) average change Total Defectives	---	---	1	3	$\Delta S_m$ t $\Delta S_m$ Rf	--	15	%
		Transconduct- ance (2) Heater Cathode Leakage Ehk=+100V dc Ehk=-100V dc Insulation of Electrodes g-all p-all Transconduct- ance (1) average change Total Defectives	---	---	2	5	$\Delta S_m$ t $\Delta S_m$ Rf	--	15	%
4.11.4	Intermittent Life Test End Points (1000 hours)	Note 13 Inoperatives Note 14 Grid Current (1) Heater Current Change in Transconduct- ance (1) of individual tubes	---	---	1	3	(Ihk: (Ihk:	--	20	$\mu$ Adc $\mu$ Adc
		Heater Current Change in Transconduct- ance (1) of individual tubes	---	---	2	5	(R: (R:	50 50	--	Meg Meg
4.11.4.		Heater- Cathode Leakage Ehk=+100V dc Ehk=-100V dc Insulation of Electrodes g-all p-all Total Defectives	---	---	2	5	(Ihk: (Ihk:	--	20	$\mu$ Adc $\mu$ Adc
		Heater- Cathode Leakage Ehk=+100V dc Ehk=-100V dc Insulation of Electrodes g-all p-all Total Defectives	---	---	3	6	(R: (R:	50 50	--	Meg Meg
4.9.18.1.1	Con- tainer Drop:	Notes 23 & 24	---	---	5	10		--	--	
5.1	Preparation for delivery	Note 25								



# CV4110

MIL-E-1301B (NAVY)

- Note 1: This value is for operation under fixed bias conditions. With cathode bias,  $R_g$  may be 1 megohm maximum.
- Note 2: Test each unit separately.
- Note 3: The AQL for the combined defectives for attributes in measurements acceptance tests, part 1, excluding inoperatives and mechanical shall be 1.0 per cent. A tube having one or more defects shall be counted as one defective. Standard MIL-STD-105, inspection level II shall apply.
- Note 4: Variables sampling procedures: (See 4.1.1.7).
- Note 5: A grid resistor of 0.1 megohm shall be added; however, this resistor will not be used when a thyratron type short indicator is employed.
- Note 6: Destructive tests: Tubes subjected to the following destructive tests are not to be accepted under this specification:
- |          |                          |
|----------|--------------------------|
| 4.9.20.5 | Shock                    |
| 4.9.20.6 | Fatigue                  |
| 4.11.7   | Heater-Cycling Life Test |
| 4.11.5   | Intermittent Life Test   |
- Note 7: The no load to steady full load regulation of the heater voltage supply shall be not more than 3.0 per cent. This test shall be made on a lot by lot basis. A failure or defect shall consist of an open heater, open cathode circuit, heater cathode short, or heater cathode leakage current in excess of the heater cycling life test end point limit specified herein.
- Note 8: The sampling and testing procedure for the Stability life test shall be in accordance with paragraph 20.2.5.1 of Appendix C of Specification MIL-E-1.
- Note 9: The sampling and testing procedure for the Survival rate life test shall be in accordance with paragraphs 20.2.5.2 through 20.2.5.2.4 of Appendix C of Specification MIL-E-1.
- Note 10: The equivalent stability life test conditions for Survival rate life test shall be in accordance with paragraph 20.2.5.2.5 of Appendix C of Specification MIL-E-1.
- Note 11: Sampling and acceptance procedures for Intermittent life tests shall be in accordance with paragraph 20.2.5.3 of Appendix C of Specification MIL-E-1.
- Note 12: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of  $\frac{1}{16}$  40BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze in contact with the envelope. Envelope temperature requirements will be satisfied if tube, having bogie 1b ( $\pm 5\%$ ) under normal test conditions, is determined to operate at minimum specified temperature at any point in the life test rack.
- Note 13: For order for evaluation of life test defects, see paragraph 4.11.3.1.2 of Specification MIL-E-1.
- Note 14: An inoperative as referenced in life test is defined as a tube having one or more of the following defects: discontinuity (ref. Specification MIL-E-1 par. 4.7.1), shorts (ref. Specification MIL-E-1, par. 4.7.2), air leaks (ref. Specification MIL-E-1, par. 4.7.6).
- Note 15: Prior to this test, tubes shall be preheated a minimum of 5 minutes with all sections operating at the conditions indicated below. A 3 minute test is not permitted. Test at preheat conditions within 3 seconds after preheating. Grid current (2) shall be the last test performed on the sample selected for the grid current (2) test.

Ef	Ecc	Ebb	Rk	Rg
V	Vdc	Vdc	ohms	Meg
(7.0)	(+9)	(100)	(680)	(0.047)

- Note 16: Tie 1k to 2k; 1g to 2g and 1p to 2p. Parasitic suppressors of 50 ohms permitted.
- Note 17: All tests listed hereon shall be performed during qualification; however, these three tests are normally performed for qualification inspection only.
- Note 18: In addition to the rejection criteria of paragraph 4.10.3.1 of Specification MIL-E-1, the output shall be read on a VU meter using a rejection limit of 5 VU. Five VU is the meter deflection obtained with a steady state output of 3 Mw from the amplifier.
- Note 19: This test shall be conducted on the initial lot and thereafter on a lot approximately every 30 days. Once a lot has passed, the 30-day rule shall apply. In the event of lot failures the lot shall be rejected and the succeeding lots shall be subjected to this test until a lot passes. Standard MIL-STD-105, sample size code letter F, shall apply.
- Note 20: The rejection level shall be set at the VU meter reading obtained during calibration. Test Gear other than the VU meter may be used if approved by the Specification Authorities.
- Note 21: Omitted.
- Note 22: Omitted.
- Note 23: Not required during qualification of tube.
- Note 24: Rough handling (container drop) test (d) and container size B shall apply.
- Note 25: Preservation, packaging and packing - Unless otherwise specified in the contract or order, preservation, packaging and packing shall be as follows:-
- (a) Preservation and packaging shall be sufficient to afford adequate protection against corrosion and deterioration during shipment from the supply source to the using activity and until installation.
  - (b) Packing shall be accomplished in a manner which will insure acceptance and protection against physical or mechanical damage during direct shipment from the supply source to the using activity.

Note 26:  
Note 27

See page B

in the case of valves with gold plated pins the AQL (4% defective) 7308 shall be 6.5

ELECTRONIC VALVE SPECIFICATIONS  
SPECIFICATION AD/CV 4110 ISSUE No. 1. DATED 1.10.62  
AMENDMENT No. 1.

Page 4. RATINGS

Amend the Ratings columns as follows:-

- (i) Delete all reference to "Max. Anode Voltage"
- (ii) Delete "No Load" in "Max. No Load Anode Voltage" and substitute "d.c." in lieu.
- (iii) Insert new rating:-  
"Max. Peak Anode Voltage ( $I_a = 0$ ), (V), 440"

Page 2 (of 7 pages)

Measurements acceptance tests, part 1. Plate Current (2)

In column headed "Conditions" add  $R_k/k = 680$  ohms.

December, 1962

(152446)

T.V.C. Office for  
A.S.W.E.

✓  
5/16/63

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION AD/CV4110 ISSUE 1. DATED 1.10.1962

AMENDMENT NO.2

- (i) Page B. Following 'Noise Factor' in column headed 'Test' delete all reference to 'Note 1'.
- (ii) Page B Notes. Renumber the note to read '26' in lieu of '1'
- (iii) Page 4. 4.9.6.3. Glass Strain Following '2.5' in the column headed 'AQL (% Defective)' insert 'Note 27'.
- (iv) Page 7. Insert additional 'Notes 26 and 27' as follows:-
  - (a) 26 See Page B.
  - (b) 27 In the case of valves with gold plated pins the AQL (% Defective) shall be 6.5.

July 1964.

T.V.C. for A.S.W.E.

N.222389

*Handwritten signature*  
20/10/64

ELECTRONIC VALVE SPECIFICATIONS.  
SPECIFICATION AD/CV.4110 ISSUE No. 1 DATED 1.10.62  
AMENDMENT NO. 3

Page A DIMENSIONS.

- (i) 'A' Seated Height, Max. Amend "55.6" to read "49.2".
- (ii) 'C' Overall Length, Max. Amend "62.7" to read "55.6".

October, 1964

T.V.C. for A.S.W.E.

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TAS  
5/10/64