VALVE ELECTRONIC CV6158

Specification MOA/ CV6158
Issue 1 dated 7th October 1965
To be read in conjunction with K1001
except where otherwise stated.

SECURITY	
SPECIFICATION	VALVE
Unclassified	Unclassified

TYPE OF VALVE - Velocity modulated oscillator with tunable integral cavity and waveguide output
CATHODE - Indirectly heated
ENVELOPE - Metal/Glass
PROTOTYPE - RVTS 0016

MARKING
See K1001/4

RATING AND CHARACTERISTICS
All limiting values are absolute

			NOTE
Heater Voltage	(V)	6.3	J
Heater Current	(A)	0.72	
Maximum Resonator Voltage	(KV)	2200	A
Maximum Resonator Dissipation	(W)	40	B.C
Resonator Current Range	(mA)	12-18	C
Negative Grid Voltage Range	(V)	0-200	A.C
Negative Reflector Voltage Range	(V)	100-425	A.H
Minimum R.F. Power Output	(mW)	30	D.H
Mechanical Tuning Range	(mm)	8.43-8.77	
Minimum Electronic Tuning Range	(Mc/s)	50	G.H
Nominal Reflector voltage change	(V)	80	G
Maximum Total Impedance in Reflector to Cathode Circuit	(kohm)	75	
Maximum Mechanical Tuning Torque	(oz.in.)	50	
Minimum overall Tuning rate	(Mc/s Rev)	200	E.F
Maximum Temperature frequency drift	(Mc/s)	100	K

CONNECTIONS - FLYING LEADS

ELECTRODE	
Grid	Blue
Heater	Green
Reflector	Yellow
Heater and Cathode	Red
Mounting Plate-Resonator	Black

DIMENSIONS
See drawing on page 7

MOUNTING POSITION
Any

CLIMATIC
Non Tropical

A. The voltages quoted in this specification are relative to cathode. The valve is normally operated with the resonator at earth potential. One side of the heater is joined internally to cathode. The cathode shall be preheated at normal heater voltage for a minimum period of 1 minute before resonator voltage is applied. Precautions should be taken to prevent damage to the valve in the event of an internal flash-over, especially when the valve is warming up. The use of a 100 ohm limiting resistor is recommended, the valve should not be operated from a low impedance source and, if possible, the resonator potential should be increased gradually to the specified value.

B. The temperature of the valve envelope should not at any point exceed 150°C. Forced air cooling may be needed if the valve is used in a confined space.

C. Grid voltage should be adjusted to give maximum power output, provided that limits of Resonator current and dissipation are not exceeded.

D. The valve is designed to operate into a load having a reflection coefficient not greater than .05.

E. Measured over $\pm \frac{1}{2}$ turn of the tuning spindle within the specified range.

F. At optimum fixed reflector voltage. Power shall be greater than half its peak value for $\pm \frac{1}{2}$ turn of tuning spindle from optimum.

G. Between $\frac{1}{2}$ power points.

H. The same oscillatory mode is used over the whole wavelength range of the valve.

J. To ensure freedom from frequency modulation in the output a D.C. heater supply should be used.

K. The time to reach nominal operating frequency can readily be reduced by forced air cooling.

L. NATO Stock Number:- 5960-99-037-4316

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TESTS

To be performed in addition to those applicable in K1001

TEST CONDITIONS

Vh (V)	Vg (V)	Vres (KV)	Vref (V)	LOAD	Tamb °C
6.3	Note 1	2	Adjust for Max P_o	VSWR 1.1:1 max W.G.No.22	Room Temperature

The heater voltage shall be applied for 1 minute before the resonator volts are applied.

K1001 5B	TEST	TEST CONDITIONS	AQL %	Insp. Level	Sym.	LIMITS Min.	LIMITS Max.	Unit
	GROUP A							
	Heater Current			100%	Ih	0.70	0.76	A
	Oscillation (1) Adjust for max.P_o	λ = 8.6 m.m. Note 2 with I_{res} in range 12-18 mA						
	Negative grid voltage				Vg	-	200	V
3.2	Grid current				Ig	-	25	µA
	Negative Reflector Voltage				Vref	See Fig 1		V
3.3	Reflector Current				Iref	-	5	µA
4.1	Power Output	V.S.W.R.= 1.1 max.			P_o	30	250	mW
4.2.6	Electronic Tuning	Adjust Vref to give half power points			Δf	50	-	Mc/s
	Oscillation (2)	λ = 8.43 m.m. Note 2		100%				
	Tests, Test conditions and limits as for oscillation (1)							
	Oscillation (3)	λ = 8.77 m.m. Note 2		100%				
	Tests, Test conditions and limits as for oscillation (1)							
3.4	Emission	As for Oscillation(1)		100%	Ires	-	15	%
					ΔP_o		10	%
	As change of Ires and output power	except Vh varied from 5.8V to 6.8V						
4.2.5	Tuning Hysteresis	Note 3. As for Oscillation (1)		100%	Δf	-	350	Mc/s

K1001	TEST	TEST CONDITIONS	AQL %	Insp. Level	Sym-bol	Limits Min.	Limits Max.	Unit
	GROUP B & C Omitted							
	GROUP D Frequency Drift	As for Oscillation (1) Note 4		Q.A.	Δf	-	100	Mc/s
4.2.2	Electronic Tuning Hysteresis Note 5	As for Oscillation (1) with the addition of a low frequency sweep voltage applied between Reflector and Cathode of such amplitude as to suppress oscillation at peak sweep voltages				-	10	dB
4.3.1	Temperature Co-efficient (~~Negative~~)	As for Oscillation (1) Tamb varied over that range which produces a body change of 20°C Notes 10.& 11		Q.A.	$\frac{\Delta f}{\Delta T}$	-	±1.2	Mc/s/°C
	Tuning Torque	No voltages. Tuner set for min λ Tamb = -40°C Tamb=+150°C				-	50 50	oz/ins oz/ins
4.2.4	Tuning Rate (1)	As for Oscillation (1)		Q.A.	Δf	200	800	Mc/s/ turn
4.2.3	Tuning Range (1) Ratio of min to max power in range	As for Oscillation (1) Notes 6 and 7		Q.A.		50	-	%
4.2.4	Tuning Rate (2)	As for Oscillation (2)		Q.A.				
4.2.3	Tuning Range (2)	Tests, test conditions and limits as for TUNING RATE and RANGE (1)		Q.A.				
4.2.4	Tuning Rate (3)	As for Oscillation (3)		Q.A.				
4.2.3	Tuning Range (3)	Tests, Test conditions and limits as for TUNING RATE & RANGE (1)		Q.A.				
	Vibration	2g from 100-1000 c/s Note	9.			-	5	Mc/s
	GROUP E - deleted							
A VI /5.3	GROUP F Intermittent Life Life test end point 500 hours As ratio of change in power output	As for Oscillation(1) 1 minute heater preheating time permitted before each H.T. switch on.		Note 8	P_o	-	2	dB

K1001	TEST	TEST CONDITIONS	AQL %	Insp. Level	Sym-bol	Limits Min.	Limits Max.	Unit
	GROUP G							
	Electrical re-test after 28 days storage		Record rejects					
	Inoperatives	No voltages						
	Power Output	As for Oscillation(1) in Group A		100%	P_o	30	-	mW
	Reflector Current			100%	Iref	-	30	µA

NOTES

1. Grid voltage should be adjusted to give maximum power output, provided that limits of Resonator Current and dissipation are not exceeded.

2. The same reflector mode shall be used for all oscillatory tests.

3. The valve shall be cycled over the complete tuning range 3 times, after all pre-set adjustments have been made, the tuning spindle being returned to its mid point. The frequency is then measured, and the spindle turned in the same direction to the end of the range, and again returned to the mid position. The frequency is again measured. The difference between these frequencies is the turning hysteresis. Valves which fail this test are acceptable provided they pass the Type Approval test for mechanical tuning rate.

4. The valve shall be connected by its flange to WG22 and with full ventilation, but without forced cooling, the valve shall be within 100 Mc/s of its final frequency, in about 15 minutes after all supplies have been switched on.

5. Any interval over which oscillation is observed for one direction of sweep only shall be considered as exhibiting hysteresis. Hysteresis shall be expressed as the ratio of the highest power level at which hysteresis occurs to the maximum power level obtained during the sweep.

6. If the stops limit the travel of the tuner spindle to less than $\frac{1}{2}$ turn beyond the setting giving the required nominal wavelength, measurements of tuning range and rate shall be made between the limit setting of the tuner and that with the spindle turned one full turn towards the mid-band position.

7. The tuning spindle shall be rotated through $\pm \frac{1}{2}$ turn about the position giving the nominal test frequency. This shall be continued until substantially repeatable frequency changes are observed. The reflector voltage may then be adjusted if necessary to give optimum power output over this mechanical tuning range. The values of power output and frequency with fixed electrode voltages, at the $\pm \frac{1}{2}$ turn settings of the mechanical tuning shall be observed.

8. At least one valve per month of contract period shall be life tested and the results recorded and supplied to the Q.A. Authority.

9. The valve shall be mounted by means of the normal fixing mount and vibrated in each of two perpendicular axis, one of which shall be in line with the electron beam. The vibration frequency shall be swept over the vibration frequency range at a rate not exceeding one octave per minute. The frequency spectrum of the output of the valve shall be observed and the extremity of the frequency deviations measured. The limit of frequency deviation shall not be exceeded at any point of the vibration frequency range, nor shall the limit be exceeded when the valve is vibrated for a period not less than five minutes at the frequency of vibration which produces the maximum value of output frequency deviation.

NOTES (Cont'd)

10. The valve shall initially be allowed to stabilise in operation under normal ambient temperature conditions. The ambient temperature shall then be increased at a slow rate which will permit a series of measurements to be made of the body temperature, measured at a convenient point near the resonator cavity remote from the waveguide output coupler, and the corresponding output frequency. Using the Frequency/ Temperature characteristic so obtained, the temperature coefficient of the valve shall be quoted as the average slope of the characteristic taken over a 20°C change in body temperature. The temperature coefficient of the valve shall be defined as the ratio of:-

(1) Change in frequency

to (2) The body temperature change causing that frequency change.

Amdt. 1 11. The max peak-to-peak change in frequency shall not exceed 40 Mc/s over the 20°C temperature range.

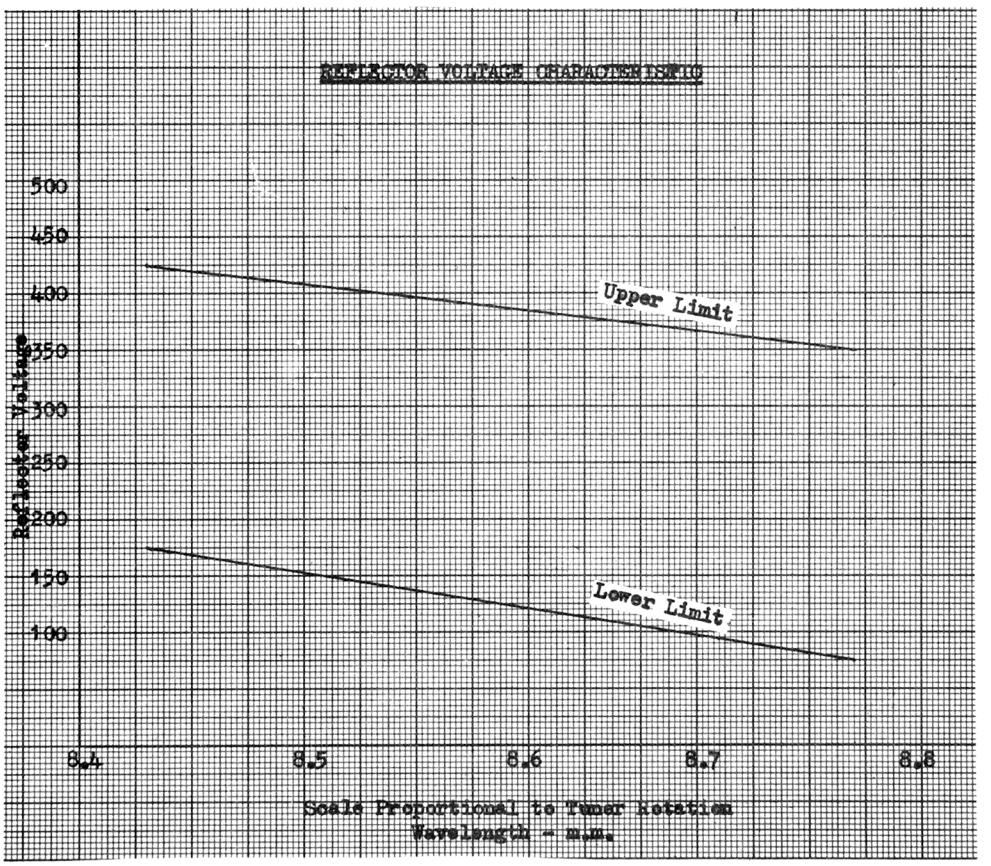

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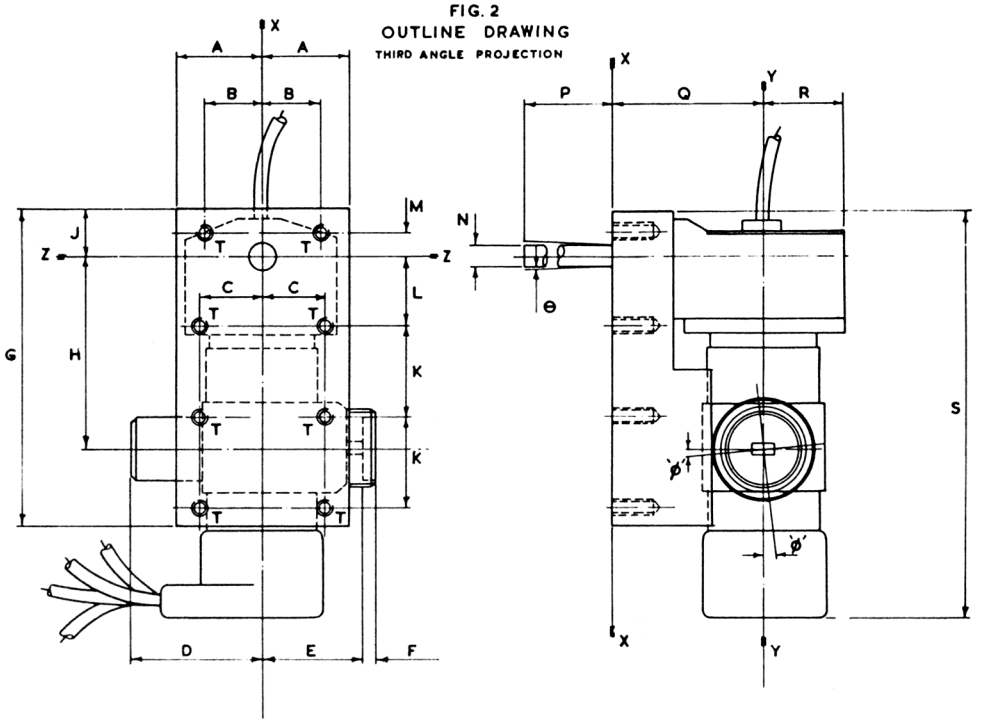
FIG. 2
OUTLINE DRAWING
THIRD ANGLE PROJECTION



Waveguide output mates with a standard Interservice Coupler Locating Ring Ref Z830017 and Ring Nut Ref Z930020 to W.G.22

X-X, Y-Y, Z-Z are reference axes only. The plane X-Z is the plane of the mounting surface.
See dim Q holes T being the mounting holes.
X-X & Z-Z pass through the nominal axis of the spindle, the plane through X-X & Y-Y is perpendicular to the plane X-Z, the axis X-X & Y-Y are Q apart as shown.

Flying Leads to be 12 inches min.

CONNECTOR COLOUR CODE	
REFLECTOR	YELLOW
HEATER	GREEN
HEATER CATHODE	RED
GRID	BLUE
RESONATOR	BLACK

SYMBOL	DIM.	TOL.	REMARKS
A	·945"	MAX.	
B	·625"	T.P.	
C	·6875"	T.P.	
D	1·453"	MAX.	
E	1·063"	±·020"	
F	·180"	±·002"	
G	3·504"	MAX.	
H	2·105"	T.P.	
J	·551"	MAX.	
K	·9845"	T.P.	
L	·750"	T.P.	
M	·275"	T.P.	
N	·250"	$+0^{\circ}_{-.005}$"	
P	2·250"	±·250"	SPINDLE MOVES AXIALY WHEN ROTATED
Q	1·625"	T.P.	
R	·847"	MAX.	
S	4·470"	MAX.	
T	4 B.A.	·010" POSITION	TAPPED ½" DEEP $+\frac{1}{64}$" DRILLED ·149" DIA. ¼" DEEP $+\frac{1}{32}$"
ø	—	3°	ANGULAR TOLERANCE OF WAVEGUIDE OUTPUT
θ	—	¼°	IN ANY DIRECTION MAY OCCUR WITH SPINDLE ROTATION.

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION MOA/CV6158, ISSUE 1 DATED 7th October, 1965

AMENDMENT No. 1

Page 4 K1001 Ref:4.3.1. Temperature Coefficient (Negative)

Amend to read as follows:-

K1001 Ref:	Test	Test Condition	AQL %	Insp. level	Symbol	Limits Min.	Limits Max.	Units
4.3.1.	Temperature Coefficient	As for oscillation (1) T_{amb} varied over that range which produces a body change of 20°C Notes 10 and 11.		Q.A.	$\Delta f / \Delta T$	-	±1	Mc/s

Page 6 Insert the following new note

11. The max peak-to-peak change in frequency shall not exceed 40 Mc/s over the 20°C temperature range.

February, 1966
(319559)

T.V.C. for R.R.E. 31/3/66