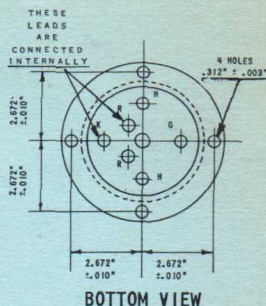
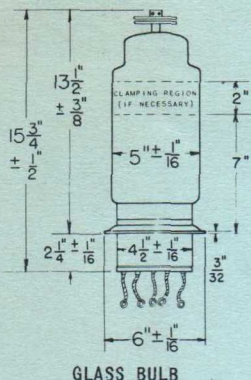


TUNG-SOL

THYRATRON



THE 5948 IS A THREE ELECTRODE, HYDROGEN FILLED, ZERO BIAS THYRATRON DESIGNED FOR THE GENERATION OF HIGH POWER PULSES. THE PRIMARY APPLICATION OF THE TUBE IS IN HIGH POWER, HIGH VOLTAGE RADAR MODULATORS. THE 5948 IS CAPABLE OF SUPPLYING 12 MEGAWATT PULSES IN THIS SERVICE. AN INTERNAL HYDROGEN RESERVOIR PROMOTES LONG LIFE AND PERMITS OPTIMUM PRESSURE ADJUSTMENT FOR VARIOUS CONDITIONS OF OPERATION. THE CATHODE IS UNIPOTENTIAL AND IS CONNECTED TO THE ELECTRICAL CENTER OF THE CATHODE HEATER CIRCUIT IN ORDER TO MINIMIZE TIME JITTER.

FIRM ELECTRICAL CONNECTIONS ARE MADE TO THE CATHODE HEATERS, GRID AND RESERVOIR BY MEANS OF FLEXIBLE CABLES FITTED WITH LUGS. THE TUBE IS RIGIDLY SUPPORTED BY A BASE WITH A FLANGE CONTAINING BOLT HOLES.

ELECTRICAL DATA

	SYMBOL	MIN.	BOGIE	MAX.	
HEATER VOLTAGE	E_f	5.83	6.3	6.77	VOLTS
HEATER CURRENT (WITH BOGIE HEATER AND RESERVOIR VOLTAGE)	I_f	25	29	33	AMPS.
CATHODE HEATING TIME	t_k	15			MINUTES
RESERVOIR VOLTAGE (SEE APPLICATION NOTES)	E_{res}	2.5	MARKED ON BASE	5.5	VOLTS
RESERVOIR CURRENT	I_{res}			11.0	AMPS.
RESERVOIR HEATING TIME	t_{res}	15			MINUTES
ANODE VOLTAGE DROP	e_{td}	100	200	400	VOLTS

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MECHANICAL DATA

TYPE OF COOLING	CONVECTION
[FORCED AIR COOLING ACROSS THE RADIATOR IS RECOMMENDED FOR MAXIMUM TUBE LIFE]	
MOUNTING POSITION	VERTICAL, BASE DOWN
MAXIMUM NET WEIGHT	4 LBS., 10 OZ.
DIMENSIONS:	SEE OUTLINE DRAWING

RATINGS

ABSOLUTE VALUES

	SYMBOL	MIN.	MAX.	
PEAK ANODE VOLTAGE				
INVERSE (NOTE 1)	epx	5% epy	25	KVOLTS
FORWARD (SEE APPLICATION NOTES FOR STARTING PROCEDURE)	epy	10	25	KVOLTS
CATHODE CURRENT				
PEAK	ib		1000	AMPS.
AVERAGE	ib		1	AMPS.
RMS (FOR SQUARE PULSE APPLICATIONS $I_p = \sqrt{I_b \times ib}$)	I_p		33	AMPS.
DC ANODE VOLTAGE	Ebb	5.0		KVOLTS
OPERATING FREQUENCY	prr		1500	CFS
(THIS IS NOT NECESSARILY THE UPPER OPERATING FREQUENCY LIMIT OF THE 5948 BUT REPRESENTS THE HIGHEST REPETITION RATE EXTENSIVELY LIFE TESTED TO DATE.)				
PEAK GRID VOLTAGE (NOTE 2)	egy	700	1800	VOLTS
PEAK INVERSE GRID VOLTAGE	egx		650	VOLTS
GRID PULSE RISE TIME (NOTE 5)	tr		0.35	μSEC.
GRID PULSE WIDTH AT 70.7% POINT		2.0		μSEC.
HEATING FACTOR (epy x ib x prr. SEE PAGE 3)	Pb		9×10^9	
CURRENT RATE OF RISE (NOTE 5)			5000	AMP/μSEC.
ANODE DELAY TIME (NOTE 3)	tad		1.0	μSEC.
TIME JITTER (NOTE 4)	tj		0.01	μSEC.
AMBIENT TEMPERATURE	TA	-55	+75	°C

NOTES

- 1: IN PULSED OPERATION, THE PEAK INVERSE VOLTAGE, EXCLUSIVE OF A SPIKE OF 0.05 μSEC. MAXIMUM DURATION, SHALL NOT EXCEED 5.0 KILOVOLTS DURING THE FIRST 25 μSEC. FOLLOWING THE ANODE PULSE.
- 2: THE GRID DRIVE REQUIREMENTS OF A 5948 CHANGE CONSIDERABLY DURING THE FIRST FEW MINUTES OF TUBE OPERATION. IN ORDER TO RELIABLY TRIGGER A COLD TUBE, THE GRID PULSE VOLTAGE AND DURATION AND THE GRID CIRCUIT IMPEDANCE SHOULD BE CHOSEN ACCORDING TO THE LIMITING CURVES.
- 3: ANODE DELAY TIME IS DEFINED AS THE TIME INTERVAL BETWEEN THE POINT ON THE RISING PORTION OF THE GRID VOLTAGE PULSE WHICH IS 26 PERCENT OF THE MAXIMUM UNLOADED PULSE AMPLITUDE AND THE POINT WHERE ANODE CONDUCTION TAKES PLACE.
- 4: TIME JITTER IS MEASURED AT 50 PERCENT OF THE PULSE AMPLITUDE AFTER THE TUBE HAS BEEN OPERATING FOR AT LEAST 60 SECONDS. THE LIMIT OF 0.01 μSEC. SHOWN IS THE MAXIMUM ALLOWABLE UNDER SPECIFIED UNFAVORABLE OPERATING CONDITIONS. WITH SUFFICIENT GRID DRIVE AND WITH ANODE VOLTAGES OF 15 KV AND ABOVE, JITTER NOT EXCEEDING 0.005 μSEC. CAN BE EASILY ACHIEVED.
- 5: MEASUREMENT MADE BETWEEN 26% AND 70.7% POINTS.

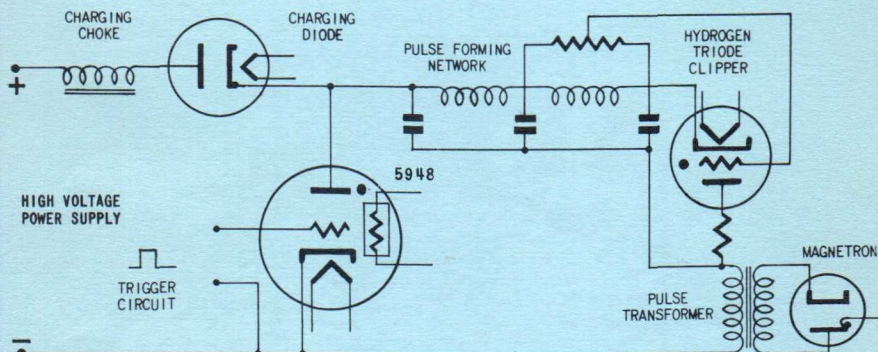
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APPLICATION NOTES

THE 5948 HYDROGEN THYRATRON IS DESIGNED PRIMARILY FOR USE IN HIGH POWER RADAR MODULATOR SERVICE. A BASIC CIRCUIT FOR SUCH SERVICE IS ILLUSTRATED BELOW. IN SUCH A CIRCUIT, THE HYDROGEN THYRATRON SERVES AS A SWITCH TO RELEASE INTO THE MAGNATRON OR OTHER RADIO FREQUENCY GENERATOR, THE ENERGY STORED IN THE PULSE FORMING NETWORK. THE 5948 IS ADMIRABLY SUITED FOR SUCH SERVICE BY ITS ABILITY TO HOLD OFF HIGH VOLTAGE, AND TO PASS HIGH PEAK CURRENTS WITH RELATIVELY LOW TUBE VOLTAGE DROP. THE TUBE WILL OPERATE OVER A WIDE RANGE OF PULSE REPETITION RATES, PULSE WIDTHS AND PEAK CURRENTS, THUS PROVIDING A VERY FLEXIBLE CIRCUIT ELEMENT. TRIGGERING REQUIREMENTS ARE SIMPLIFIED SINCE THE TUBE OPERATES WITH ZERO BIAS.



THE 5948 CONTAINS A HYDROGEN RESERVOIR THAT MAINTAINS THE GAS PRESSURE WITHIN THE TUBE IN ACCORDANCE WITH THE VOLTAGE IMPRESSED ACROSS IT. SINCE THE RESERVOIR CAN HOLD MANY TUBE VOLUMES OF GAS, LONG TUBE LIFE IS INSURED. IN ADDITION IT IS POSSIBLE TO SET THE GAS PRESSURE AT THE OPTIMUM VALUE FOR ANY PARTICULAR SET OF OPERATING CONDITIONS. THE RESERVOIR HEATER VOLTAGE STAMPED ON THE TUBE BASE HAS BEEN DETERMINED FOR A PARTICULAR SET OF CONDITIONS SOMEWHAT BEYOND THE MAXIMUM TUBE RATINGS AND WILL BE SATISFACTORY FOR MOST APPLICATIONS. IN GENERAL, IT IS DESIRABLE TO OPERATE AT AS HIGH A RESERVOIR VOLTAGE AS POSSIBLE WITHOUT OBTAINING SPURIOUS DISCHARGES IN THE GRID-ANODE REGION. WHEN THE 5948 IS OPERATED AT OR NEAR MAXIMUM RATINGS, THE RESERVOIR VOLTAGE REGULATION SHOULD NOT EXCEED $\pm 2.5\%$. IF THE 5948 IS OPERATED AT REDUCED DUTY A WIDER RESERVOIR OPERATING RANGE CAN BE EXPECTED. HOWEVER, CARE SHOULD BE TAKEN WHEN DETERMINING THE RESERVOIR VOLTAGE TO INSURE SATISFACTORY OPERATION WITH THE ANTICIPATED RESERVOIR VOLTAGE REGULATION. UNDER NO CIRCUMSTANCES SHOULD THE RESERVOIR VOLTAGE BE REDUCED TO SUCH AN EXTENT THAT THE ANODE SHOWS COLOR.

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APPLICATION NOTES -CONT'D.

THE INSTANTANEOUS APPLICATION OF ANODE VOLTAGE (INSTANTANEOUS STARTING OR "SLAP ON") IS NOT RECOMMENDED. WHEN IT IS ABSOLUTELY NECESSARY, THE MAXIMUM PERMISSIBLE EPY IS 18 KV AND THIS VALUE SHALL NOT BE ATTAINED IN LESS THAN 0.04 SEC. FOR INITIAL APPLICATION OF MAXIMUM RATED ANODE VOLTAGE, IT IS RECOMMENDED THAT THE FOLLOWING STARTING METHODE BE USED:

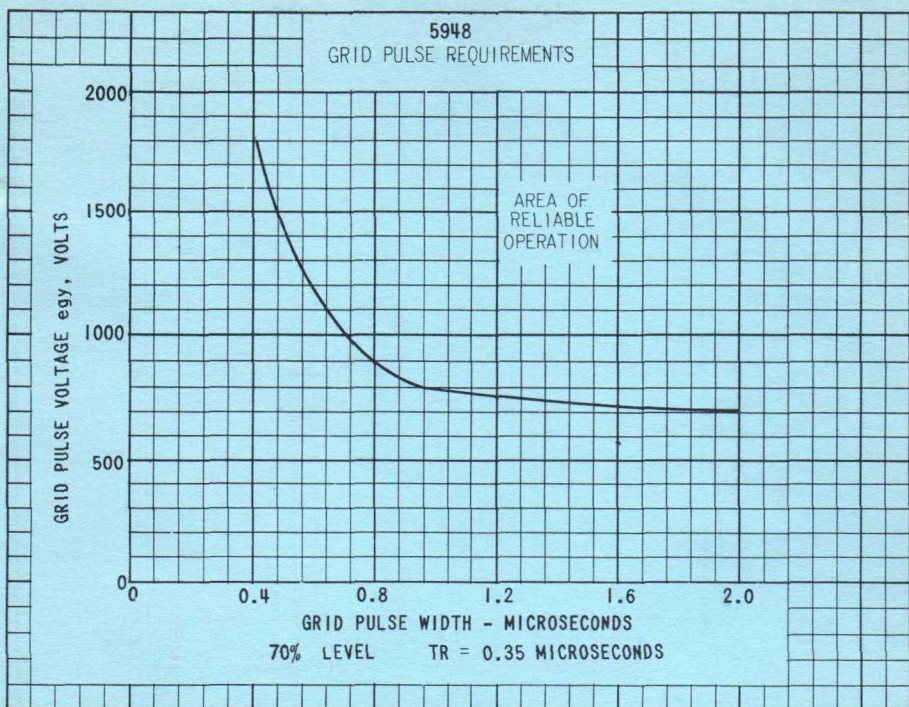
APPLY NO MORE THAN 18 KV EPY INITIALLY.
DO NOT INCREASE IN STEPS GREATER THAN 5 KV PER MINUTE.

TYPICAL OPERATION

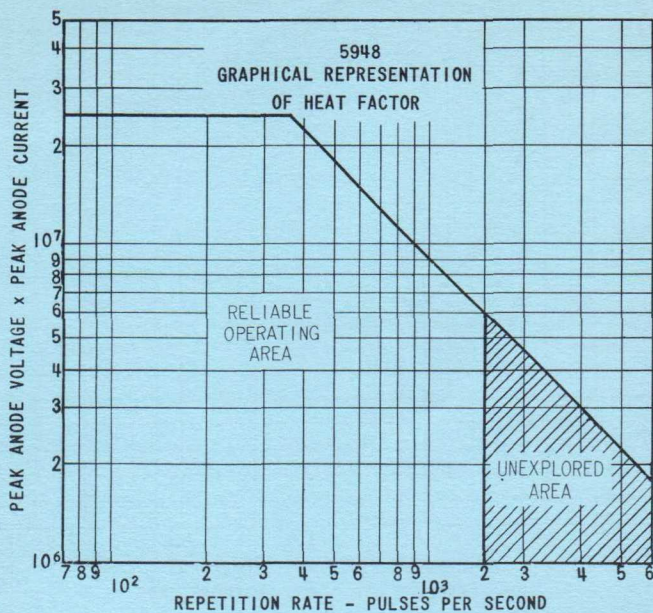
VARIATIONS IN THE OPERATING PARAMETERS AFFECT THE LIFE EXPECTANCY OF HYDROGEN THYRATRONS; THEREFORE, A SIMPLE METHOD OF RATING FOR ALL CONDITIONS IS DIFFICULT. UNTIL SUCH TIME AS SUFFICIENT INFORMATION IS AVAILABLE TO PREPARE COMPLETE OPERATION RATING CHARTS, WE LIST THE FOLLOWING TYPICAL CONDITIONS OF OPERATION UNDER WHICH CONSIDERABLE TUBE LIFE HAS BEEN OBTAINED. IF THE 5948 IS TO BE EMPLOYED IN AN OPERATION DIFFERING WIDELY FROM THESE CONDITIONS (UNLESS THE REQUIREMENTS ARE OBVIOUSLY LESS SEVERE) IT IS SUGGESTED THAT THE CUSTOMER REQUEST A RECOMMENDATION FOR THE SPECIFIC APPLICATION.

Prr pps	PEAK ANODE VOLTAGE		PEAK CURRENT Amps	PULSE WIDTH 70% POINT μ S	di/dt AMPS/ μ S
	FORWARD kv	INVERSE kv			
360	25	3	1000	2.5	5000
1500	15	5	500	1.3	5000

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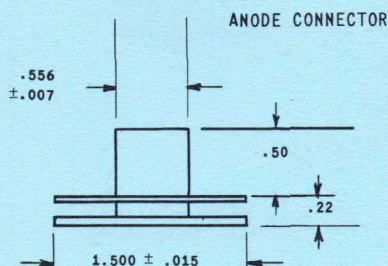


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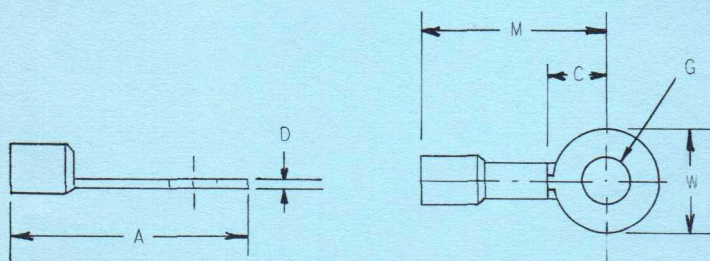
LEAD CONNECTIONS

LEAD	FUNCTION	LEAD COLOR	LUG COLOR	LUG
1	GRID	GREEN	GREEN	S
2	CATHODE & HEATER C-T	BLACK	BLACK	L
3	HEATER	YELLOW	YELLOW	L
4	HEATER	YELLOW	BLACK	L
5	RESERVOIR	RED	YELLOW	S
6	RESERVOIR	RED	RED	S

LEADS ARE FLEXIBLE $5 \frac{1}{2} \pm \frac{1}{2}$ " LONG FROM BOTTOM OF BASE TO CENTER OF LUG HOLE. COLOR CODING AS WELL AS BASE MARKING IDENTIFIES THE LEADS.



LUG DIMENSIONS



LUG	G STUD	A MAX.	W MAX.	C MIN.	D	M MAX.
L	1/4"	1.21"	.53"	.41"	.04"	.94"
S	#10	.90"	.31"	.30"	.03"	.74"

