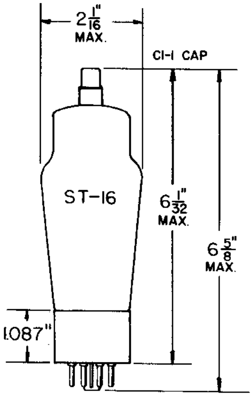
TUNG-SOL

THYRATRON

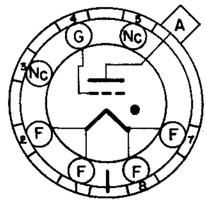
ARGON AND MERCURY VAPOR



FILAMENT

2.5±0.125 VOLTS 7 AMP.

MOUNTING POSITION
VERTICAL, BASE DOWN



BOTTOM VIEW
MEDIUM SHELL OCTAL
7 PIN BASE

GLASS BULB

THE 393A IS A THREE ELECTRODE, ARGON AND MERCURY-VAPOR FILLED THYRATRON WITH NEGATIVE CONTROL CHARACTERISTIC DESIGNED FOR GRID CONTROLLED RECTIFIER, MOTOR CONTROL, OR RELAY SERVICE. THE ADDITION OF ARGON GAS TO THE MERCURY-VAPOR ATMOSPHERE PERMITS THE TUBE TO START CONDUCTION AT LOW TEMPERATURES.

THE 393A EMPLOYS A 7 PIN OCTAL BASE.

ELECTRICAL DATA

FILAMENT VOLTAGE	2.5±0.125	VOLTS
FILAMENT CURRENT @ Ef =2.5 VOLTS	7	AMP.
CATHODE HEATING TIME -MINIMUM	15	SECONDS
ANODE TO CONTROL GRID CAPACITANCE	1.8	$\mu\mu$f
DE-IONIZATION TIME -APPROXIMATE		
ANODE VOLTS = 120 ANODE CURRENT = 1.5 AMP. GRID VOLTS =- 20, GRID RESISTOR = 10,000 OHMS	360	μSEC.
ANODE VOLTS = 120, ANODE CURRENT =1.5 AMP. GRID VOLTS =-500, GRID RESISTOR = 100,000 OHMS	60	μSEC.
ANODE VOLTAGE DROP – APPROXIMATE		
INITIAL	10	VOLTS
END OF LIFE	20	VOLTS

MECHANICAL DATA

MOUNTING POSITION	VERTICAL, BASE DOWN
TYPE OF COOLING	CONVECTION
BULB	ST16
BASE	B7-12 MEDIUM SHELL OCTAL
CAP	C1-1 SMALL
NET WEIGHT	3 OUNCES MAXIMUM
SOCKET	OCTAL

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RATINGS

ABSOLUTE VALUES

	MIN.	MAX.	
PEAK ANODE VOLTAGE			
FORWARD	---	1250	VOLTS
REVERSE	---	1250	VOLTS
GRID VOLTAGE			
PEAK OR DC BEFORE TUBE CONDUCTION	---	-500	VOLTS
AVERAGE DURING TUBE CONDUCTION --NOTE 1	---	-10	VOLTS
ANODE CURRENT			
PEAK	---	6	AMP.
AVERAGE – NOTE 2	---	1.5	AMP.
FAULT–FOR DURATION OF 0.1 SEC. MAX. –NOTE 3	---	120	AMP.
GRID CURRENT			
AVERAGE – NOTE 4	---	+0.01	AMP.
OPERATING FREQUENCY (PER SEC)	---	420	CYCLES
ALTITUDE	---	10,000	FEET
TEMPERATURE RANGE – NOTE 5	40	80	°C
FILAMENT VOLTAGE	2.37	2.63	VOLTS

NOTES

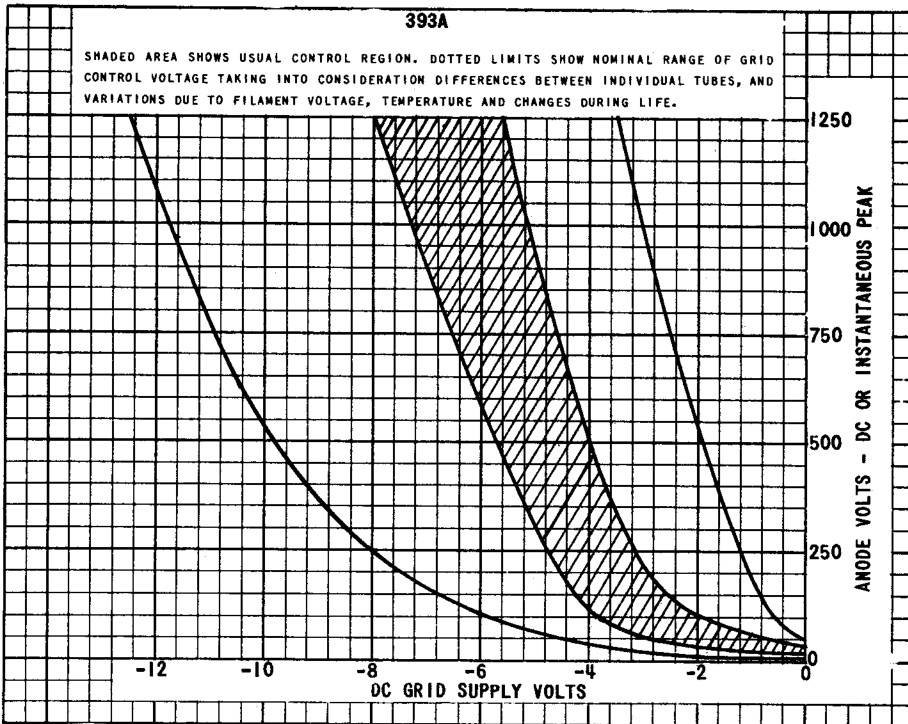
1. AVERAGED OVER ONE CONDUCTING PERIOD.

2. AVERAGED OVER ANY INTERVAL OF FIVE SECONDS.

3. THE EQUIPMENT DESIGNER SHOULD LIMIT THE SHORT CIRCUIT CURRENT TO 120 AMPERES CIRCUITWISE. IT SHOULD BE UNDERSTOOD THAT WHILE THE TUBE MAY STAND SEVERAL FAULTS AT THIS MAGNITUDE OF CURRENT, EACH FAULT WILL ADVERSELY AFFECT TUBE LIFE.

4. AVERAGED OVER THE PERIOD OF GRID CONDUCTION.

5. THE RECOMMENDED OPERATING RANGE FOR THIS TUBE IS FROM 40° TO 80° CENTIGRADE. OPERATION BETWEEN -55° AND +40° CENTIGRADE AT REDUCED RATINGS OR "STARTS" IN THIS TEMPERATURE RANGE ARE PERMISSIBLE, BUT WILL RESULT IN CONSIDERABLY SHORTENED LIFE.



APPLICATION NOTES

THYRATRON TUBES, IF CORRECTLY USED, WILL GIVE MANY THOUSANDS OF HOURS OF RELIABLE SERVICE. THE CORRECT USE OF A TUBE INVOLVES AMONG OTHER THINGS ADHERENCE TO THE FOLLOWING RULES:

1. AVOID COLD STARTS. THE HEAT SHIELDED, OXIDE COATED FILAMENT SHOULD BE ENERGIZED BEFORE THE ANODE VOLTAGE IS APPLIED IN ORDER TO OBTAIN MAXIMUM LIFE.

2. AVOID OPERATING THE TUBE OUTSIDE OF THE SPECIFIED FILAMENT VOLTAGE RANGE.

3. AVOID EXCEEDING THE RATED PEAK INVERSE VOLTAGE. EXCESS INVERSE VOLTAGE CAN CAUSE EITHER AN IMMEDIATE FAILURE OR A RAPID DECLINE IN USEFUL LIFE.

NO CLEAR CUT METHOD OF FORETELLING TUBE FAILURE HAS BEEN DEVISED. PERIODIC REPLACEMENT OF A TUBE AS A ROUTINE PREVENTIVE MAINTENANCE DEVICE IS NOT RECOMMENDED AS A TUBE THAT HAS OPERATED FOR SEVERAL THOUSAND HOURS MAY BE GOOD FOR SEVERAL MORE THOUSAND HOURS OF USEFUL OPERATION. QUITE OFTEN MAINTENANCE PERSONNEL CAN, AFTER SOME EXPERIENCE WITH A PIECE OF EQUIPMENT, ANTICIPATE TUBE FAILURE BY OBSERVATION. VISUAL CHECKS OF TUBE (ARC) DROP WILL INDICATE TUBES APPROACHING END OF LIFE. TUBE DROP VOLTAGES CONSIDERABLY HIGHER THAN THAT OF THE LAST READINGS, OR READINGS ABOVE 20 VOLTS INDICATE TUBES THAT MAY SOON FAIL. WHILE SUCH A READING CAN BE TAKEN DIRECTLY AT THE TUBE IN THE OPERATING EQUIPMENT, IT IS A DANGEROUS PRACTICE. THE VOLTAGES AT WHICH THIS TUBE NORMALLY OPERATES ARE LETHAL.

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APPLICATION NOTES - CONT'D.

A MORE PRACTICAL AND EXACT MEASUREMENT IS OBSERVING THE TUBE VOLTAGE DROP IN A TEST JIG WHILE IT PASSES ONE OR TWO HIGH CURRENT PULSES. SUCH A JIG IS ILLUSTRATED IN FIGURE 1. THE OSCILLOSCOPE IS CALIBRATED BY FIRST SETTING SWITCH S2 TO CURRENT CHECK. MOMENTARY CONTACT SWITCH S1 IS THEN TAPPED WHILE CURRENT SET RESISTOR R2 IS ADJUSTED UNTIL A PATTERN 8 VOLTS HIGH APPEARS ON THE OSCILLOSCOPE SCREEN. THIS INDICATES THAT A PEAK CURRENT OF EIGHT AMPERES IS FLOWING THROUGH THE TUBE UNDER TEST AND THROUGH CALIBRATING RESISTOR R3. THE TUBE VOLTAGE DROP CAN THEN BE READ DIRECTLY IN VOLTS ON THE OSCILLOSCOPE SCALE BY SETTING SWITCH S2 TO THE TEST POSITION AND TAPPING SWITCH S1. A NEW TUBE WILL HAVE A VOLTAGE DROP OF APPROXIMATELY 10 VOLTS. A TUBE APPROACHING THE END OF LIFE MAY HAVE A VOLTAGE DROP OF 20 VOLTS.

GRID-CONTROLLED THYRATRONS CAN BE INCORPORATED INTO CIRCUITS TO PROVIDE NUMEROUS SERVICES INCLUDING THE SPEED CONTROL OF DC MOTORS, DC TO AC INVERSION, AC TO DC RECTIFICATION, AND SUPPLYING VARIABLE AC POWER FROM AN AC SOURCE.

FIGURE 2 ILLUSTRATES ONE METHOD OF CONVERTING AC TO DC. THE MAGNITUDE OF THE DC OUTPUT VOLTAGE IS CONTROLLED BY THE VARIABLE RESISTOR WHICH CONTROLS THE FIRING ANGLE, OR GRID VOLTAGE PHASE, OF THE THYRATRONS. THE USE OF THYRATRONS TO SUPPLY A VARIABLE AC OUTPUT FROM A FIXED AC SOURCE IS SHOWN IN FIGURE 3. AGAIN, THE VARIABLE RESISTOR SERVES TO CONTROL THE PHASE ANGLE OF THE APPLIED GRID VOLTAGE AND THUS THE OUTPUT VOLTAGE.

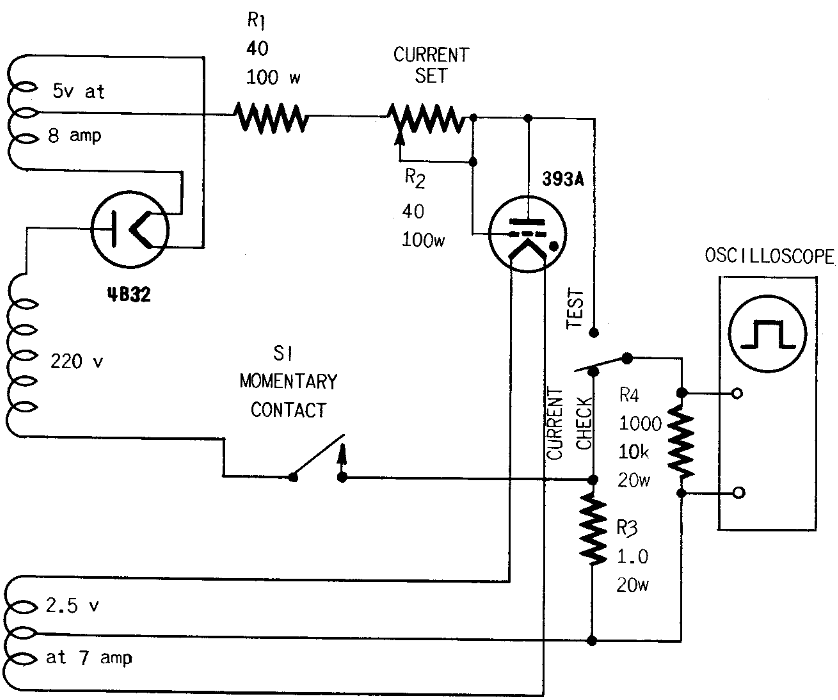

FIG. 1 TEST JIG FOR MEASURING EMISSION BY TUBE VOLTAGE DROP

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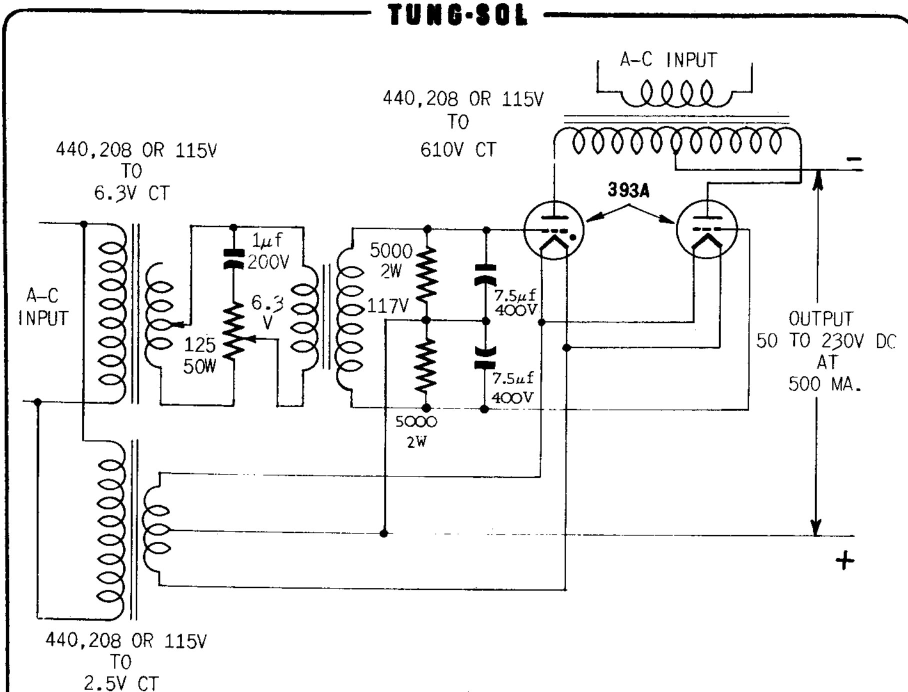

FIG. 2 THYRATRON POWER SUPPLY PROVIDING VARIABLE D-C OUTPUT FROM A-C INPUT

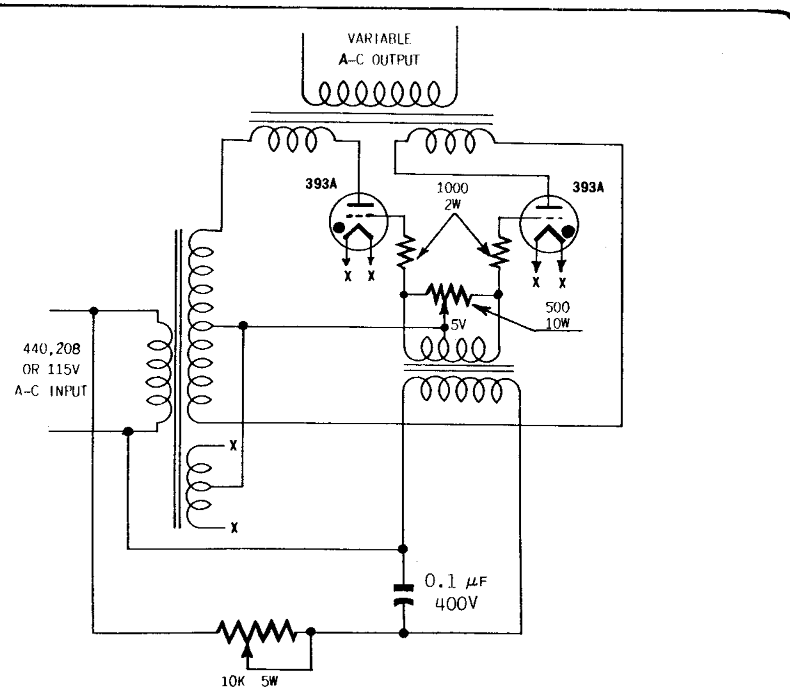

FIG. 3 THYRATRON POWER SUPPLY PROVIDING VARIABLE A-C OUTPUT FROM A-C INPUT