

RELIABLE HARD GLASS BEAM TETRODE FOR HIGH VOLTAGE PULSE AND REGULATOR SERVICE

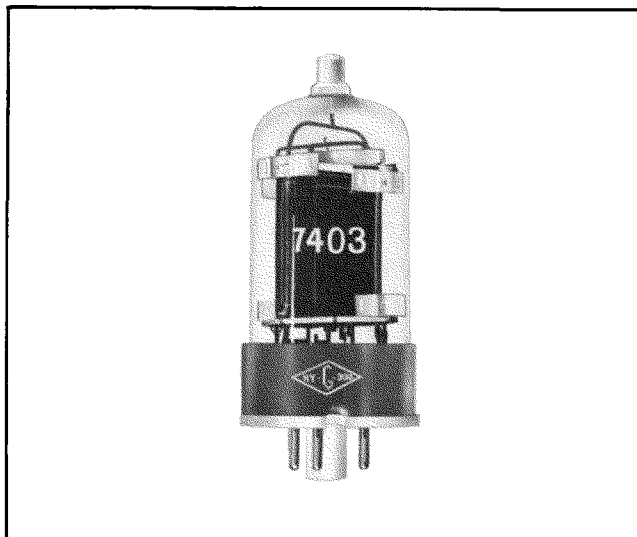
DESCRIPTION

This high perveance beam power amplifier tube is one of the Bendix line of  tubes. It has been designed for high voltage pulse modulator use in aircraft, military, and industrial applications where long pulse life, reliable operation at high voltages during vibration and shock, and freedom from internal arcing are important. Its ability to operate at 4000 volts without arcing and to deliver 10 ampere peaks of cathode current make it ideal for use in such applications or pulse modulators, blocking oscillators, high voltage regulators, switching, deflection amplifiers, etc. The reliable design and processing techniques provide the above characteristics in a package that will operate reliably in military environments.

Each tube is subjected to a high voltage, high energy lint and particle elimination process, and a minimum of 24 hours of pulse operation run-in at high peak cathode currents. This run-in serves to eliminate early failure under operating conditions and to stabilize tubes under pulse operating conditions.

Since this tube is designed for use in equipment with high voltage and where high levels of vibration and shock are encountered, special materials, and processing techniques are employed. Inasmuch as destructive internal arcing usually culminates in ionization, it is important that tubes used at high voltages be extremely well evacuated at high temperatures to remove residual gases which may ionize. The transmitting tube type materials and processing utilized in the Bendix HY-G-300® line result in tubes that are inherently gas free and capable of high dissipation.

The addition of a titanium insert to the anode structure performs a dual function: (1) the gettering capability of



titanium permits the elimination of gettering by conventional barium flash which may induce arcing by coating various insulating surfaces; (2) titanium has the advantage of absorbing contaminants on its surface which may otherwise dissociate during operation to cause emission slump.

The barrier type glass bonded mica base used on the 7403 not only provides greater arc resistance, but also will not carbonize during a possible arc preventing the build up of a permanently conductive path.

Other special features include a rugged, pure tungsten, helical heater which is used with a high purity aluminum oxide insulator, enabling reliable operation at high heater-cathode voltages.

The design of this tube is a result of extensive engineering evaluation on special impact vibration equipment in which the accelerations equal or exceed those encountered in severe aircraft applications. The shake table used for these studies shock excites the tubes at a repetition rate of 15 cycles per second with a minimum peak acceleration of 50G. These tests indicate that the Bendix 7403 will survive many hours longer, under extremely adverse conditions.

CHART 1. ELECTRICAL RATINGS*

Heater Voltage (AC or DC).....	6.3 volts
Heater Current	1.7 amps
Plate Voltage (Max DC).....	4000 volts
Screen Voltage (Max DC).....	850 volts
Plate Dissipation (Absolute Max).....	40 watts
Screen Dissipation (Absolute Max).....	3.5 watts
Cathode Current (Max DC Value).....	175 mA
Cathode Current (Max Inst. Peak value—of continuous sine wave).....	350mA
Cathode Current (Max Inst. Peak Value) Pulse***	10 amps
Heater-Cathode Voltage (Max).....	± 450 volts
Grid Resistance (Max).....	0.1 megohm
Grid Voltage (Max DC).....	+5.0 volts
(Min DC)	— 200 volts
(Max Inst. Peak Value) Pulse***	+220 volts
Cathode Warm-up Time.....	45 seconds

*To obtain greatest life expectancy from tube, avoid designs where the tube is subjected to all maximum ratings simultaneously. See application notes.

**Voltage should not fluctuate more than ±5%.

***See pulse rating chart.

CHART 2. MECHANICAL DATA

Base	Large wafer octal, with metal sleeve, 6 pin Glass bonded mica
Bulb	Nonex Glass—T-12
Max Overall Length.....	4-9/32"
Max Seated Height.....	3-3/4"
Max Diameter	1-23/32"
Mounting Position	Any
Max Altitude	80,000 feet
Max Bulb Temperature.....	300°C
Max Impact Shock.....	500G
Max Vibration Acceleration.....	50G
(100-hour shock excited fatigue test, sample basis)	
Life Expectancy	5,000 Hours

THE Bendix CORPORATION

Red Bank DIVISION, EATONTOWN, NEW JERSEY

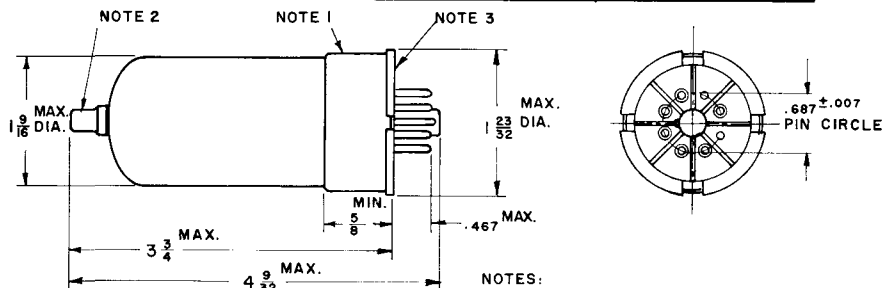
ELECTRICAL CHARACTERISTICS AND ENVIRONMENTAL TESTS

CHARACTERISTIC TESTS

CHART 3.

CHARACTERISTIC	SYMBOL	MIN	DESIGN CENTER	MAX	UNITS
PRODUCTION TESTS					
Short and Continuity					
Heater Current	If	1.55	1.70	1.85	A
Heater Cathode Leakage (Ehk = ± 450 Vdc)	Ihk	—	—	50	μAdc
Grid Current	Ic1	—	—	—5.0	μAdc
Plate Current	Ib	28	32.5	37	mAdc
Screen Grid Current	Ic2	—	1.5	3.0	mAdc
Transconductance (1)	Sm	5000	6000	7000	μmhos
Cut off Plate Current (Ec1 = — 180 Vdc, Eb = 4000 Vdc, Ec2 = 800 Vdc)	Ib	—	—	300	μAdc
Pulsed Operation	ib	6.0	—	—	a
Pulsed Operation	ic2	—	—	3	a
Pulsed Operation	ic1	—	—	2	a

ELECTRODE	Ef	Eb	Ec2	Ec1	Rk	Egk
TEST CONDITIONS	6.3 volts	600 Vdc	300 Vdc	0	825 ohms	—
PULSE TEST CONDITIONS	6.3 volts	600 Vdc	800 Vdc	—180 Vdc	0	+150 v



NOTES:

1. LARGE WAFER OCTAL, WITH METAL SLEEVE.
2. CAP IS JEDEC CI-2 (MODIFIED)
3. WAFER IS GLASS BONDED MICA.
4. ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.

OUTLINE DRAWING

ENVIRONMENTAL TESTS

CHART 4.

TEST	CONDITIONS	DURATION
Heater Cycling Life Test	On 1 Min Off 4 Min Ef = 7.0 Ehk = 300	2,000 On-Off Cycles
Pulse Life Test	ib = 6.5	500 Hours
Life "Expectancy" Test	Under "Test Conditions"	5,000 Hours
High Level Fatigue Test	50G—Shock Excitation 15 Cycles/Sec.	100 Hours
Shock	500 G	20 Impacts
Altitude Test	80,000 Feet	5 Minutes
Glass Strain Test	Boiling Water to Ice Water	3 Minutes in Each
Swept Freq Fatigue	5G—F = 50—500 CPS	96 Hours

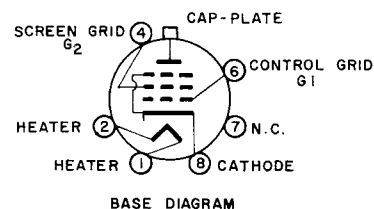


CHART 5.

AVERAGE PLATE CHARACTERISTICS

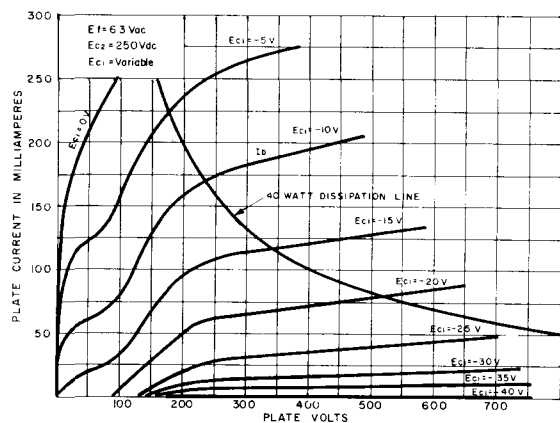
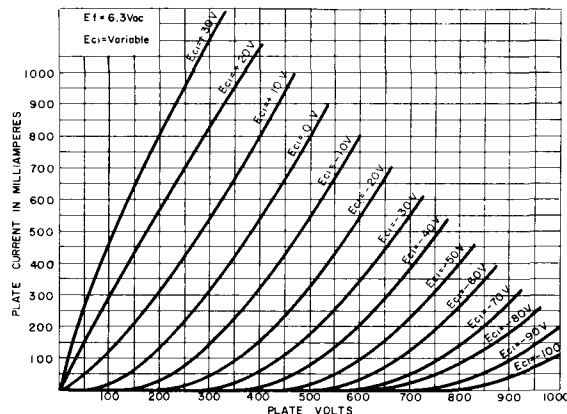


CHART 6.

TYPICAL TRIODE CHARACTERISTICS SCREEN TIED TO PLATE



ADDITIONAL CHARACTERISTICS

PULSE CHARACTERISTICS

See CHART 13 page 4 (Pulse Ratings)

CHART 7.

TYPICAL PLATE CHARACTERISTICS

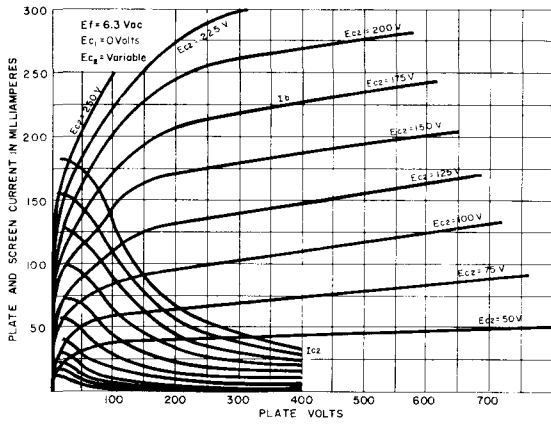


CHART 10.

TYPICAL PULSE CHARACTERISTICS

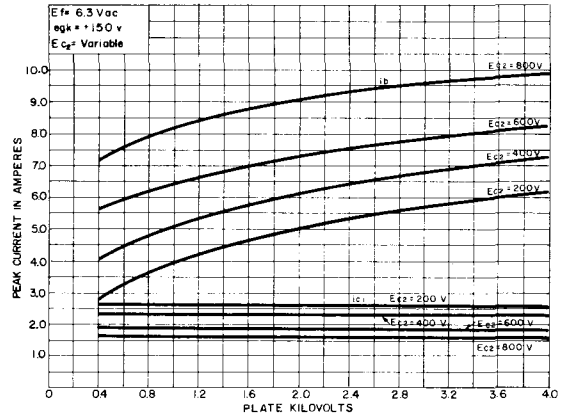


CHART 8.

TYPICAL PLATE CHARACTERISTICS
SCREEN TIED TO CATHODE

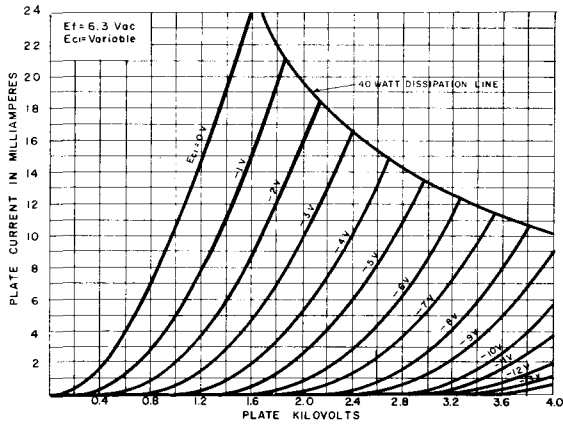


CHART 11.

TYPICAL PULSE CHARACTERISTICS

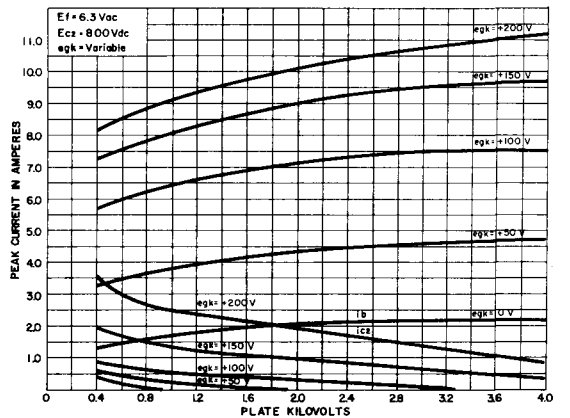


CHART 9.

TYPICAL PULSE CHARACTERISTICS

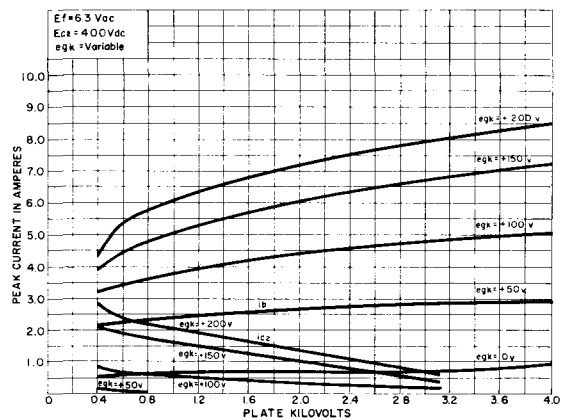


CHART 12.

TYPICAL PULSE CHARACTERISTICS

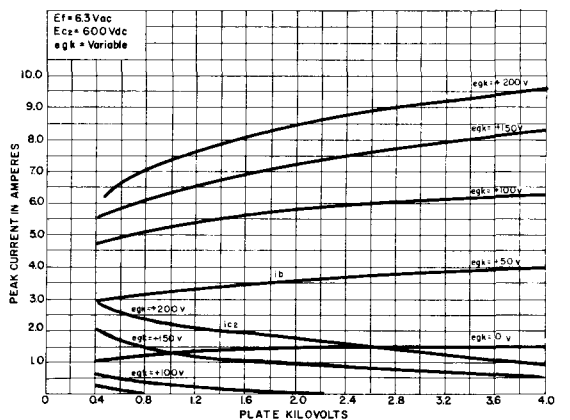


CHART 13. PULSE RATING

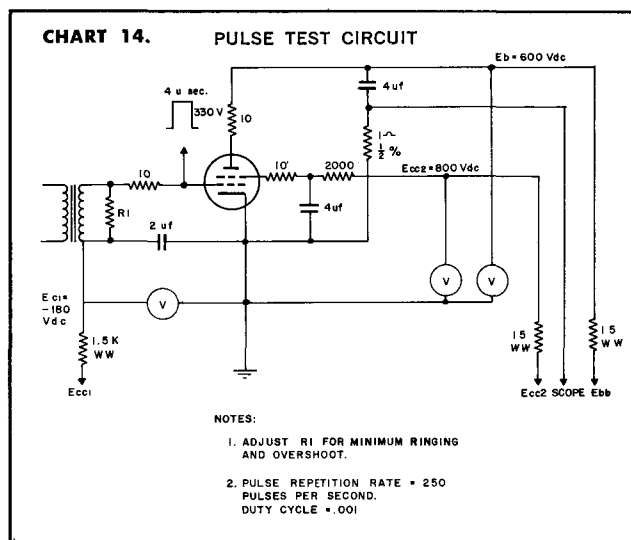
RATING CHART

MAX. PEAK CATHODE CURRENT - AMPERES

DUTY FACTOR

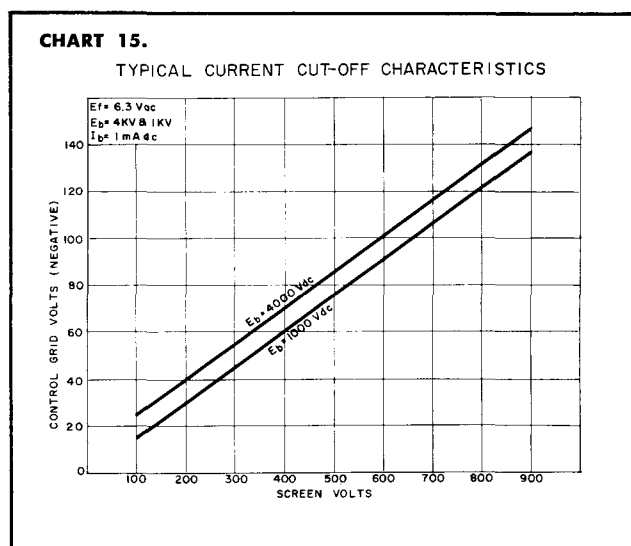
DUTY FACTOR (10,000 MICROSECOND AVERAGING TIME) FOR THE 7403 IS DEFINED AS THE RATIO OF "ON" TIME IN MICROSECONDS TO 10,000 MICROSECONDS.

"ON" TIME IS DEFINED AS THE SUM OF THE DURATION OF ALL INDIVIDUAL PULSES WHICH OCCUR DURING ANY 10,000 MICROSECOND INTERVAL.



The plate voltage rating and high-perveance of the 7403 make it readily adaptable to varied pulse applications. In order to insure maximum reliability in pulse service the peak plate current should not exceed the value shown in Chart 13 for the required duty factor.

For $I_b = 1.0 \text{ mA}$



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