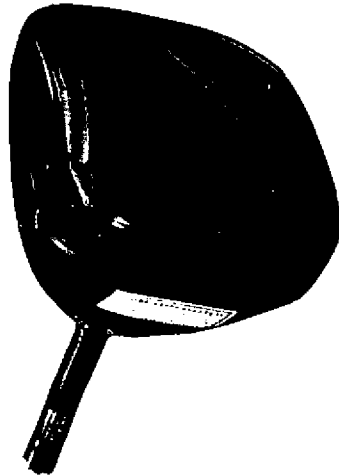


VACUUM TUBE PRODUCTS



VTP 16AF

The VTP 16AF cathode ray tube is an electro magnetic deflection and electrostatic focus type tube, providing high definition and intensity. The 16AF is designed with a zero focus type electron gun affording substantially automatic focus, independent of accelerator voltage variations. A metal backed screen is used to provide the ultimate when viewing is required at high ambient light levels. The metallic coating also provides freedom from ion burns. Assurance of long life is had through the exclusive Vacuum Tube Products method of long and careful exhaust. The VTP 16AF cathode ray tube is available with the following phosphors:

P 1, 2, 3, 4, 5, 11, 12, 15, 16, 18, 19; 20.

GENERAL CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	0.6 Amperes
Anode Voltage (conductive inner wall coating and G #3).....	16,000 Max. Volts D.C.
Grid #2 Voltage (accelerating electrode)	410 Max. Volts D.C.
Grid #1 Voltage (control electrode)	
Negative Bias Value	125 Max. Volts D.C.
Positive Bias Value	0 Max. Volts D.C.
Positive Peak Value	2 Max. Volts D.C.
Peak Heater to Cathode Voltage	
Heater Negative with respect to Cathode	125 Max. Volts D.C.
Heater Positive with respect to Cathode	125 Max. Volts D.C.
Focus	Electrostatic
Focus Voltage Range (Max.).....	plus or minus 500 Volts
Deflection	Magnetic
Deflection Angle (approximate).....	65 Degrees
Basing (RTMA) 12L	Small Shell Duodecal 7 Pin
Anode contact is small recessed cavity in bulb wall.	

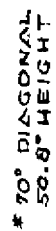
TYPICAL OPERATION

Pin No.	1	2	6	7	10	11	12
Element	H	G #1	Focus	NC	G #2	K	H
Heater Voltage	6.3 Volts						
Anode Voltage	12,000 Volts D.C.						
Grid #2 Voltage	250 Volts D.C.						
Grid #1 Voltage	-27 to -63 Volts						
Focus Voltage	Zero						
Grid #1 Circuit Resistance							
Maximum	1.5 Megohms						
Minimum	150 Ohms						
Grid #2 Circuit Resistance	470 Min. Ohms						
Anode Circuit Resistance	15,000 Min. Ohms						

Note: Type VTP 16AF tube operates from power supplies that are dangerous.

The above circuit values are recommended as a safety measure.

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Note: Type VTP 16AF Tube does not regularly employ internal pole pieces.

VACUUM TUBE PRODUCTS



VTP 17BC

The VTP 17BC cathode ray tube is an electro magnetic deflection and electrostatic focus type tube, providing high definition and intensity. The 17BC is designed with a zero focus type electron gun affording substantially automatic focus, independent of accelerator voltage variations. A metal backed screen is used to provide the ultimate when viewing is required at high ambient light levels. The metallic coating also provides freedom from ion burns. Assurance of long life is had through the exclusive Vacuum Tube Products method of long and careful exhaust. The VTP 17BC cathode ray tube is available with the following phosphors:

P 1, 2, 7, 11, 15, 19.

GENERAL CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	0.6 Amperes
Anode Voltage (conductive inner wall coating and G#3).....	16,000 Max. Volts D.C.
Grid #2 Voltage (accelerating electrode)	500 Max. Volts D.C.
Grid #1 Voltage (control electrode)	
Negative Bias Value	125 Max. Volts D.C.
Positive Bias Value	0 Max. Volts D.C.
Positive Peak Value	2 Max. Volts D.C.
Peak Heater to Cathode Voltage	
Heater Negative with respect to Cathode	125 Max. Volts D.C.
Heater Positive with respect to Cathode	125 Max. Volts D.C.
Focus	Electrostatic
Focus Voltage Range (Max.).....	plus or minus 500 Volts
Deflection	Magnetic
Deflection Angle (approximate).....	65 Degrees
Basing (RTMA) 12L	Small Shell Duodecal 7 Pin
Pin No.	1 2 6 7 10 11 12
Element	H G#1 Focus NC G#2 K H

Anode contact is small recessed cavity in bulb wall.

TYPICAL OPERATION

Heater Voltage	6.3 Volts
Anode Voltage	12,000 Volts D.C.
Grid #2 Voltage	250 Volts D.C.
Grid #1 Voltage	-27 to -63 Volts
Focus Voltage	Zero
Grid #1 Circuit Resistance	
Maximum	1.5 Megohms
Minimum	150 Ohms
Grid #2 Circuit Resistance	470 Min. Ohms
Anode Circuit Resistance	15,000 Min. Ohms

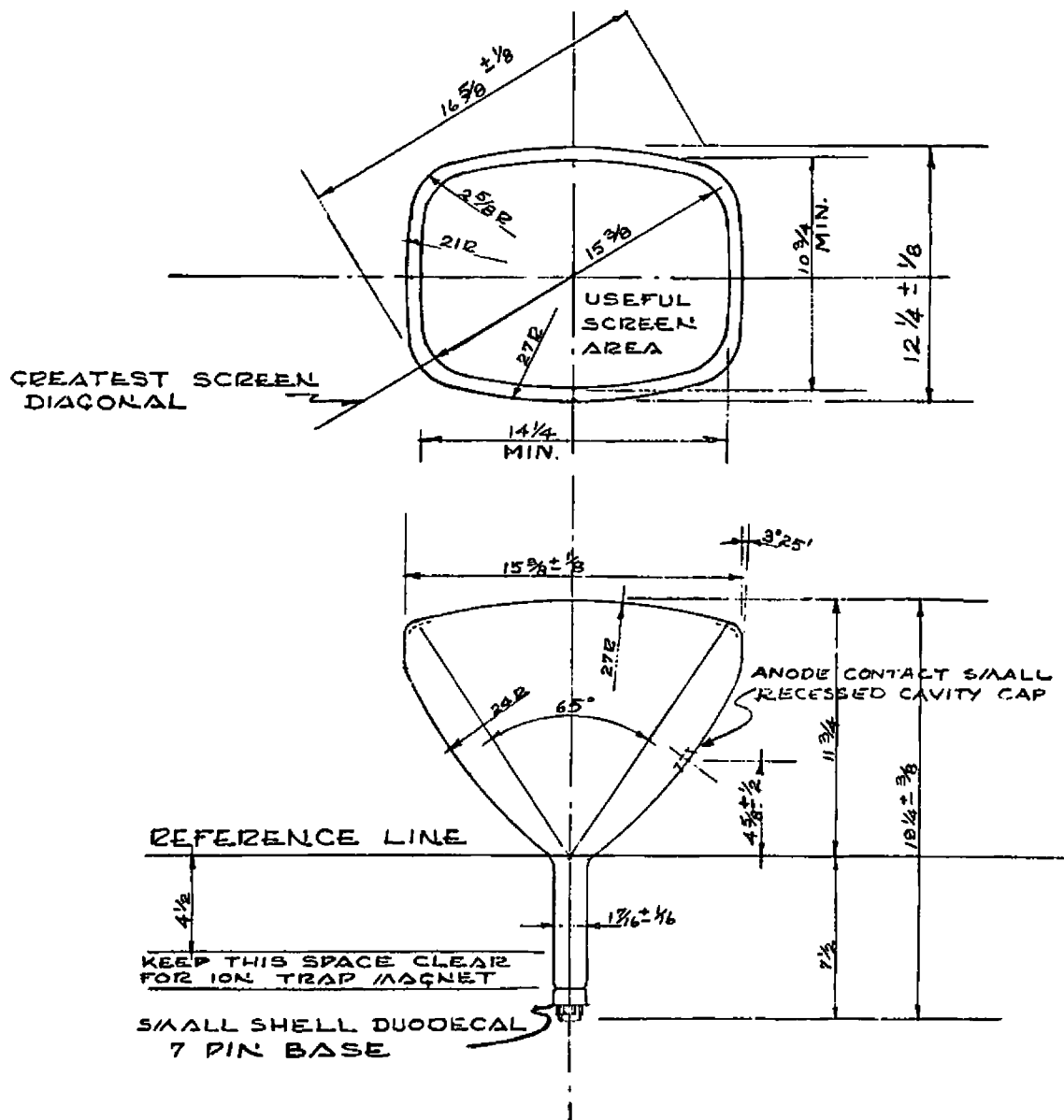
Note: Type VTP 17BC tube operates from power supplies that are dangerous.

The above circuit values are recommended as a safety measure.

VACUUM TUBE PRODUCTS, 506 SOUTH CLEVELAND STREET, OCEANSIDE, CALIFORNIA

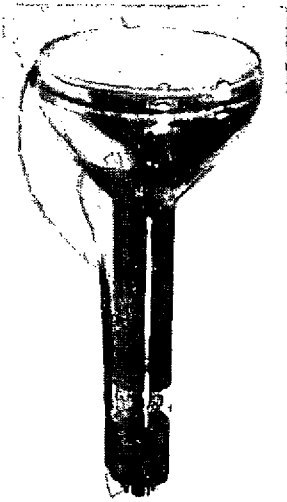
FEB. 55

TELEPHONE: SARatoga 2-6567



NOTE: An ion trap is not required for 17BC types.

VACUUM TUBE PRODUCTS



VTP 5ACP4

The VTP 5ACP4 cathode ray tube is an electro-magnetic deflection and electro-static focus tube of the zero focus voltage type providing high definition and intensity. A metal backed screen is used to provide the ultimate conditions when viewing is required at high ambient light levels. The metallic coating also provides freedom from ion burns. A high quality optical glass face plate is used to allow full benefit of the excellent signal presentation. Assurance of long life is had through the exclusive Vacuum Tube Products method of long and careful exhaust.

The VTP 5ACP4 tube is interchangeable with the old style 5F tube by merely removing the focus coil and connecting a jumper between pin 6 and 7 in equipment designed for the 5F. An improvement in equipment operation will be noticed in any units operating above 3000 anode volts.

GENERAL CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	0.6 Amperes
Anode Voltage (conductive inner wall coating and G#3)	18,000 Max Volts D.C.
Grid #2 Voltage (Accelerating Electrode)	410 Max Volts D.C.
Grid #1 Voltage (Control Electrode)	
Negative Bias Value	125 Max. Volts D.C.
Positive Bias Value	0 Max Volts D.C.
Positive Peak Value	2 Max. Volts D.C.
Peak Heater to Cathode Voltage	
Heater Negative with respect to Cathode	125 Max. Volts D.C.
Heater Positive with Respect to Cathode	125 Max. Volts D.C.
Focus	Electro Static
Focus Voltage range (Max.)	plus or minus 500 Volts
Deflection	Magnetic
Deflection Angle (Approximate)	53 Degrees
Basing (RTMA 8EQ)	Medium Shell Octal 8 Pin
Pin No.	1 2 3 4 5 6 7 8
Element	NC H G#2 NC G#1 F K H

Anode contact is small recessed ball cap in bulb wall.

TYPICAL OPERATION

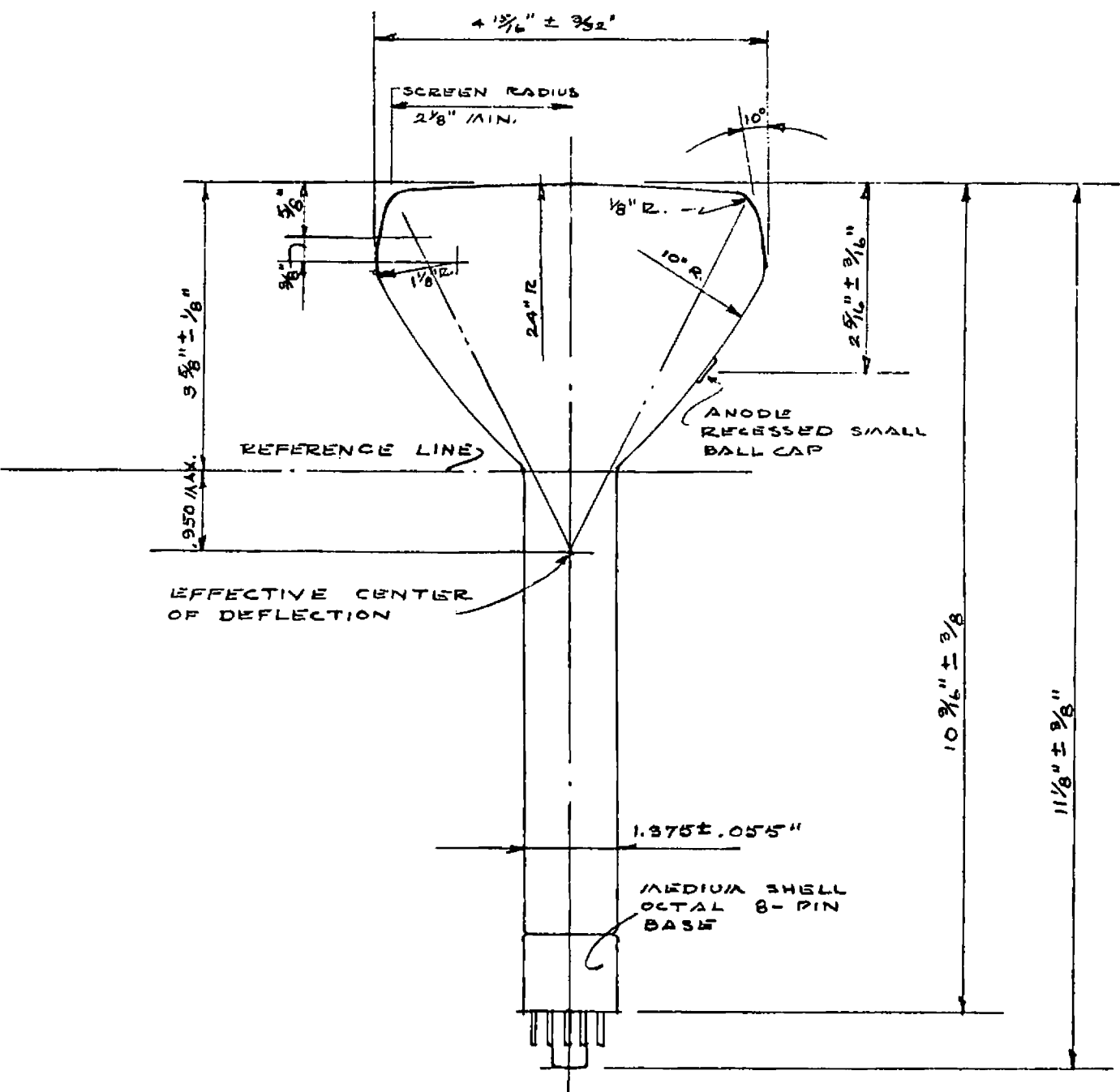
Heater Voltage	6.3 Volts
Anode Voltage	12,000 Volts
Grid #2 Voltage	250 Volts
Grid #1 Voltage	-27 to -63 Volts
Focus Voltage	Zero
Grid #1 Circuit resistance	
Maximum	1.5 Megohms
Minimum	150 Ohms
Grid #2 Circuit Resistance	470 Min Ohms
Anode Circuit Resistance	15,000 Min Ohms

Note: Type VTP 5ACP4 tube operates from power supplies that are dangerous.
The above circuit values are recommended as a safety measure.

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Distributed by:

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PHONE: TEXAS 0-5135



VACUUM TUBE PRODUCTS

VTP 5AJ



The VTP 5AJ cathode ray tube is an electro-static deflection and focus type tube for general oscillographic and other applications requiring relatively large screen size with a minimum overall length. The tube is designed with a high voltage post-deflection accelerator electrode making possible a high intensity spot with a minimum loss of deflection sensitivity. A special feature of the tube lies in the design of the intensifier together with the electrically conductive screen to provide an anode for the electron beam. This type of operation allows the use of a soft main beam to provide high deflection sensitivity while allowing the use of intensifier voltages up to ten times the beam voltage. The above operation provides excellent signal presentation with high deflection sensitivity and intensity with an excellent spot characteristic in a minimum overall length. Assurance of long life is had through the exclusive Vacuum Tube Products method of long and careful exhaust. The VTP 5AJ cathode ray tube is available with the following phosphors:

P 1, 2, 3, 4, 5, 7, 11, 12, 14, 15, 16; 17; 18; 19; 20.

MAXIMUM RATINGS — DESIGN CENTER VALUES

Heater Voltage	6.3 Volts
Heater Current	0.6 Amperes
Anode #3 Voltage (Accelerator Electrode)	10,000 Max. Volts D.C.
Anode #2 Voltage (High Voltage Electrode)	2500 Max. Volts D.C.
Anode #1 Voltage (Focusing Electrode)	1500 Max. Volts D.C.
Grid #1 Voltage (Control Electrode)	
Negative Bias Value	200 Max. Volts D.C.
Positive Bias Value	0 Max. Volts D.C.
Positive Peak Value	2 Max. Volts D.C.
Peak Voltage between Anode #2 and any deflecting Electrode	500 Max. Volts D.C.
Peak Heater to Cathode Voltage	
Heater Negative with respect to Cathode.....	125 Max. Volts D.C.
Heater Positive with respect to Cathode.....	125 Max. Volts D.C.
Basing.....	Small shell duodecal 12 pin
Pin No. 1 2 3 4 5 6 7 8 9 10 11 12	
Element H K NC D1 F D4 A#2 D2 D3 NC G#1 H	

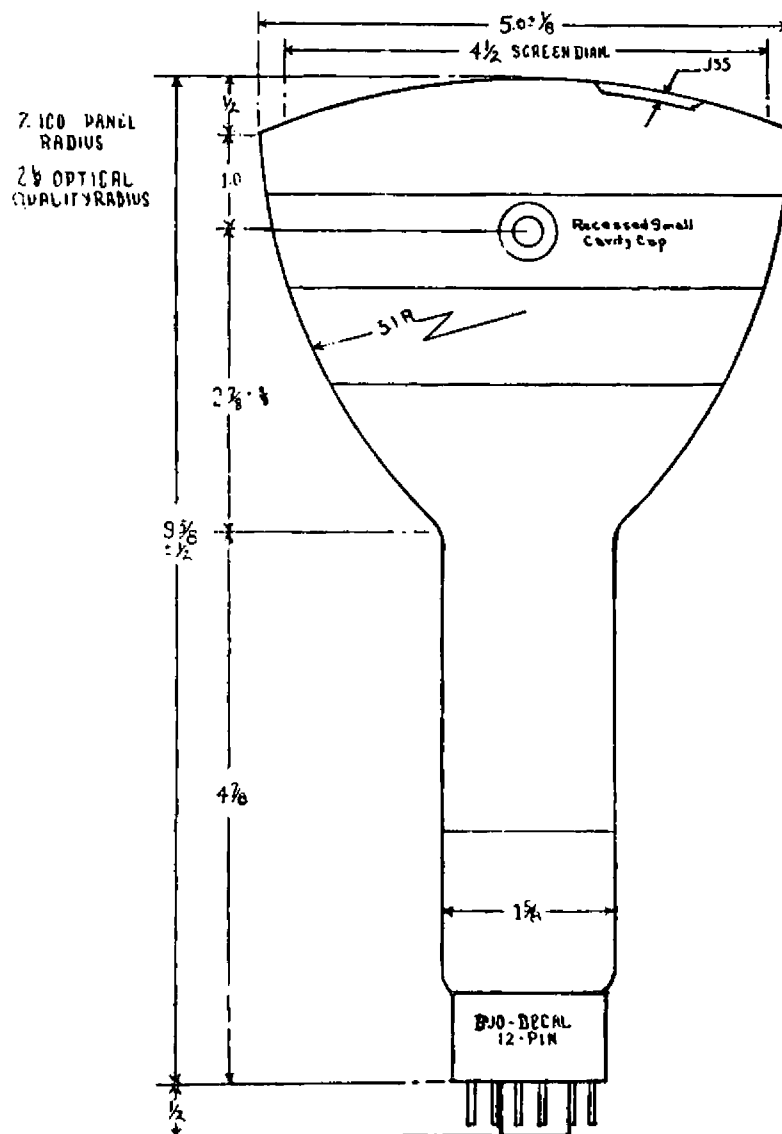
TYPICAL OPERATING CONDITIONS

Heater Voltage	6.3 Volts
Anode #3 Voltage	6000 Volts D.C.
Anode #2 Voltage	750 Volts D.C.
Anode #1 Voltage Range	400 to 900 Volts D.C.
Grid #1 Voltage Range	-30 to -60 Volts
Deflection Sensitivity	230 Volts D.C./Inch

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting Electrode Circuit	3.0 Max. Megohms
Note: Type VTP 5AJ tube operates from power supplies that are dangerous.	
The above circuit values are recommended as a safety measure.	

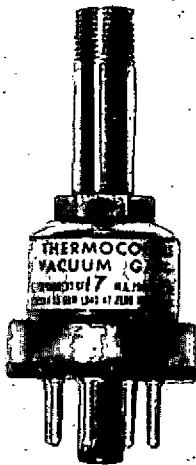
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 PHONE: OCEANSIDE 6567



VACUUM TUBE PRODUCTS

THERMOCOUPLE VACUUM GAUGE TUBE

Type VTP 6343



The VTP 6343 is a vacuum gauge tube of the thermocouple type used for measuring pressures in the range of .1 to 1000 microns. The VTP 6343 is a thermal conductivity gauge that provides an output E.M.F. determined by the operating current and the heat conductivity of the residual gas. A reliable pressure reading is obtained when the heater is supplied from a stabilized source.

The VTP 6343 is of all metal construction and is assembled by projection welding methods. The internal structure is ruggedized by design and is assembled by special fusing techniques, providing excellent sensitivity and very fast response.

Due to the speed of detecting changes in pressures, the VTP 6343 finds use in leak detecting as well as absolute pressure measuring. Vacuum systems may be probed with materials such as acetone to detect leaks due to the variation of thermal conductivity between acetone and air. When leaks are encountered the VTP 6343 will detect the vapor, and a decrease in output E.M.F. can be measured due to the acetone entering the system.

OPERATING CHARACTERISTICS

Heater Current Normal (Note 1).....	Approx. 17.0 ma.
Heater Current Maximum (Note 3).....	100 ma.
Heater Resistance (Cold) Nominal.....	8 1/2 ohms
Heater Resistance (Hot) Nominal.....	18 ohms
Heater to Thermocouple Resistance (Note 2).....	Less than 100 ohms
Thermocouple Output — with 55 ohm Load (Meter Internal Resistance)	
Hard Vacuum	10 Millivolts
Air	.1 Millivolts
Thermocouple Resistance (Cold).....	8 1/2 ohms
Speed of Response.....	Faster than .1 second
Basing	RETMA 8FR

Pin No.	1	3	5	7
Element	Heater	Neg. Thermocouple	Pos. Thermocouple	Heater

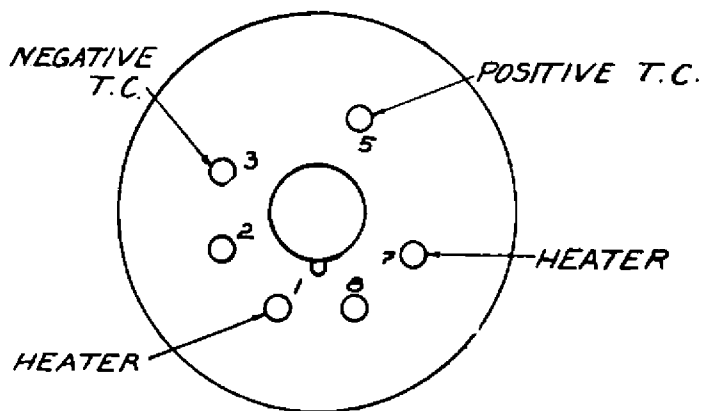
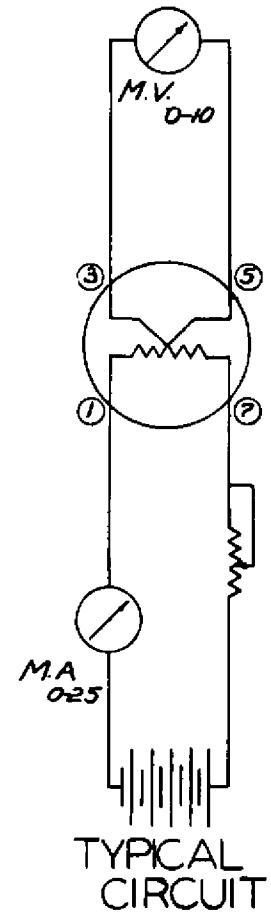
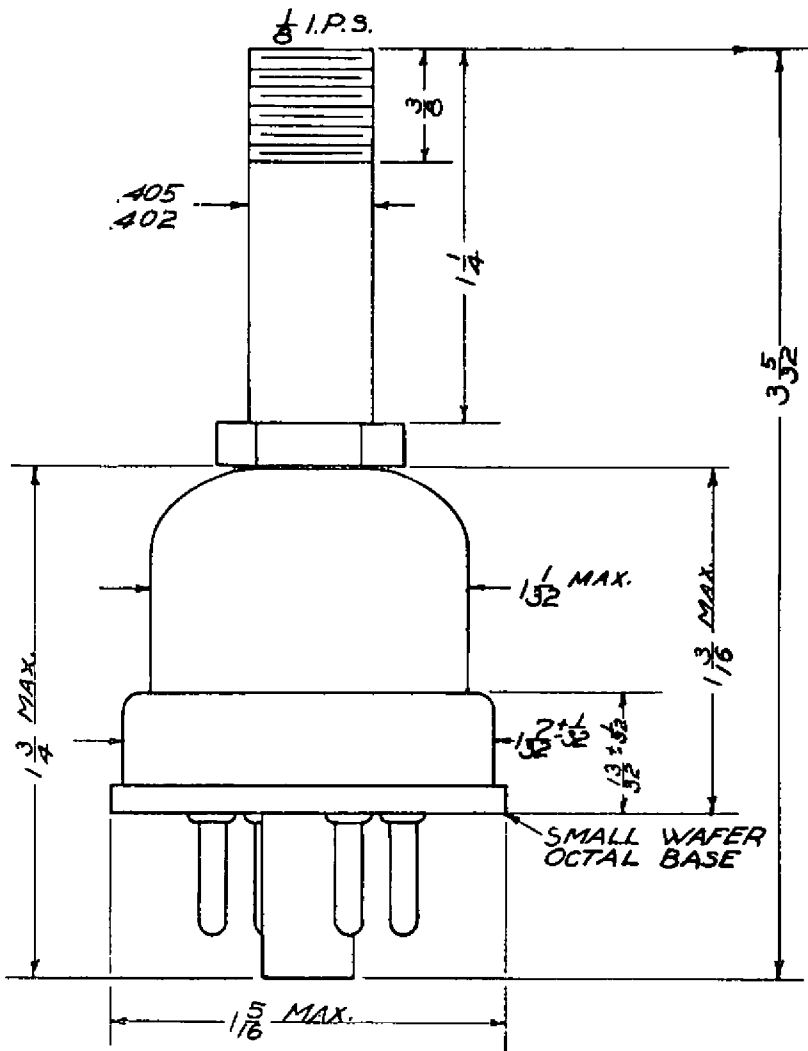
Note 1: While either A.C. or D.C. may be used, D.C. is recommended due to availability of less expensive and more accurate meters in this range. All gauge tubes are individually calibrated and marked with the heater current required to provide 10 millivolts output across 55 ohms when the gauge is under hard vacuum.

Note 2: While the heater and the thermocouple are in direct contact to provide maximum speed of response, use of this electrical circuit is not recommended unless the current is maintained below 50 ua.

Note 3: The heater may be operated at such a current and absolute pressure that the thermocouple output does not exceed 10 millivolts across a 55 ohm load. The internal elements will then remain below 200° C.

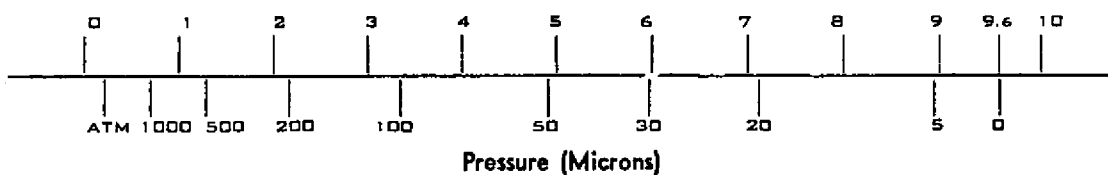
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TELEPHONE: OCEANSIDE 6567



BASING 8FR

Typical Calibration Curve
Meter Millivolts



VACUUM TUBE PRODUCTS



THERMOCOUPLE VACUUM GAUGE TUBE Type VTP 6416

The VTP 6416 is a vacuum gauge tube of the thermocouple type, used for measuring pressures in the range of .1 to 1000 microns. The VTP 6416 is a thermal conductivity gauge that provides an output E.M.F. determined by the operating current and the heat conductivity of the residual gas. A reliable pressure reading is obtained when the heater is supplied from a stabilized source.

The VTP 6416 is of all metal construction and is assembled by projection welding methods. The internal structure is designed for maximum ruggedness, and all connections are electrically welded. This tube may be operated indefinitely at air pressure without damage to either the heater or thermocouple.

The VTP 6416 finds use in fore vacuum monitoring on large systems such as cyclotrons and accelerators, where a long pumping cycle is common and long life rather than response speed is the prime requirement.

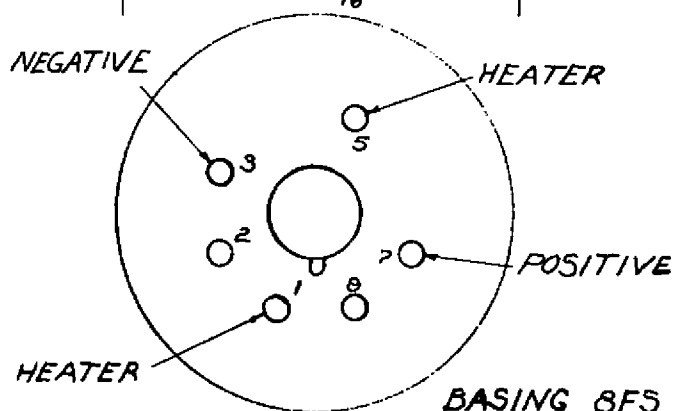
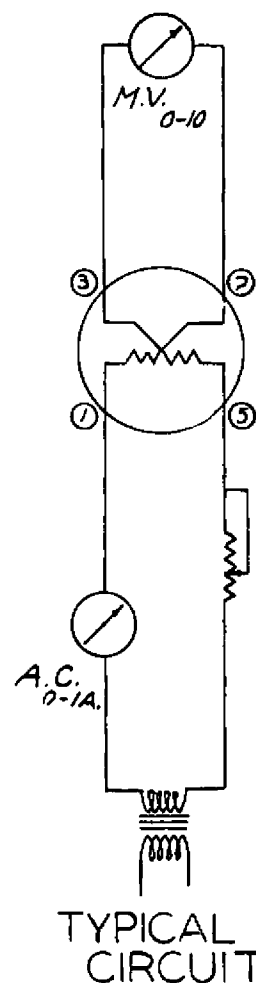
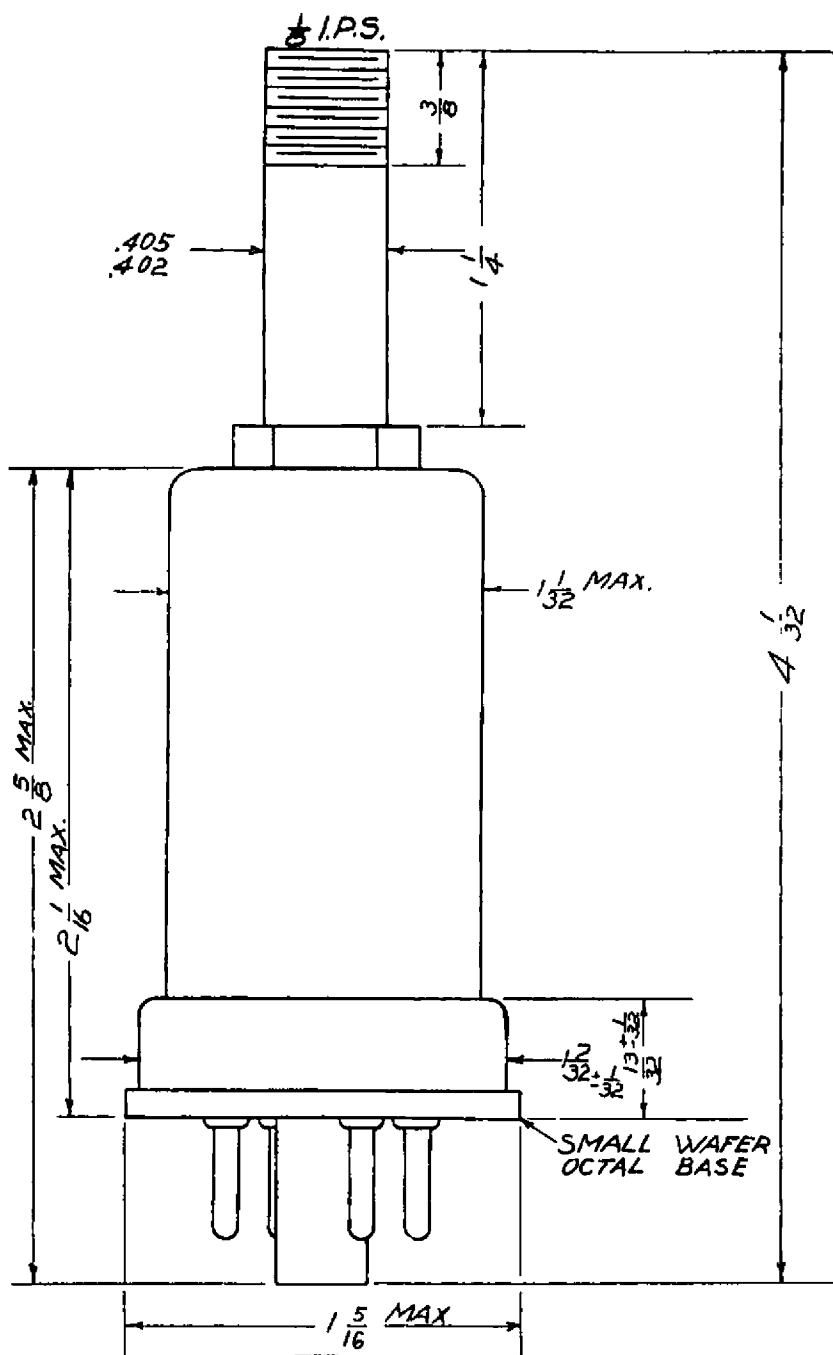
OPERATING CHARACTERISTICS

Heater Current Normal (Note 1).....	Approx. 600 ma.			
Heater Current Maximum.....	1000 ma.			
Heater Resistance (Cold) Nominal.....	.2 ohms			
Heater Resistance (Hot) Nominal.....	.25 ohms			
Heater to Thermocouple Resistance (Note 2).....	0			
Thermocouple Output — with 55 ohm Load (Meter Internal Resistance)				
Hard Vacuum	10 Millivolts			
Air	1.0 Millivolts			
Thermocouple Resistance (Cold).....	3 1/2 ohms			
Speed of Response.....	Approx. 15 seconds			
Basing	RETMA 8FS			
Pin No.	1	3	5	7
Element	Heater	Neg. Thermocouple	Heater	Pos. Thermocouple

Note 1: While either A.C. or D.C. may be used, A.C. is recommended due to ease of supply adjustment from a variable transformer. All gauge tubes are individually calibrated and marked with the heater current required to provide 10 millivolts output across 55 ohms when the gauge is under hard vacuum.

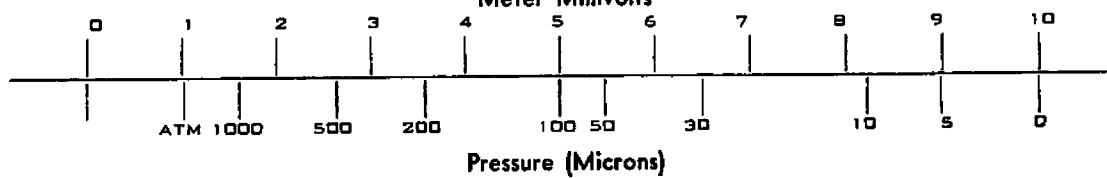
Note 2: Heater and thermocouple are electrically welded together at the thermocouple junction.

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TELEPHONE: OCEANSIDE 6567



BASING 8FS

Typical Calibration Curve
Meter Millivolts



VACUUM TUBE PRODUCTS

PIRANI VACUUM GAUGE TUBES TYPES

VTP 6440

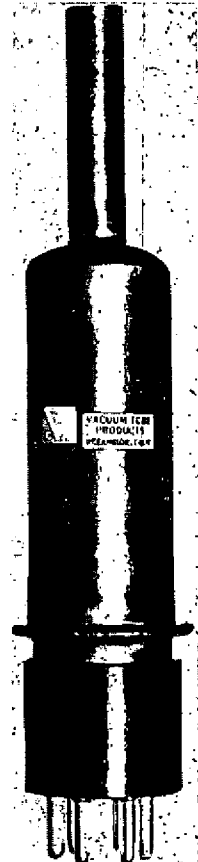
VTP 6441

Pirani Vacuum Gauge Tubes, Type 6440 and 6441, are tubes of the thermal conductivity type, and are used for measurement of pressures in the range of .1 to 5000 microns. Both tube types are electrically identical and vary only in the exhaust tube structure. Type VTP 6440 uses an exhaust tube connection of approximately .4" diameter, with $\frac{3}{8}$ " pipe threads, for attachment to the vacuum system. Type VTP 6441 uses an exhaust tube connection of .5" O.D., suitable for connection with the system by means of either a rubber hose or a compression fitting.

These VTP Pirani tubes are designed for extreme ruggedness and versatility, having the features of an all-metal welded construction and platinum filament with a high coefficient of thermal resistivity. Dual filaments are incorporated to provide double output and increased sensitivity when operating each filament in opposite legs of a Wheatstone bridge circuit.

Due to the all-metal construction, these VTP Pirani tubes are relatively non-sensitive to radiant heat from open flames or glow coils and compensating tubes are not normally used such as required when using glass type pirani tubes. Ambient temperature variations normally do not unduly affect the gauge calibration due to the low sensitivity in this temperature range.

The platinum ribbon structure used in the VTP 6440 and VTP 6441 provides extremely fast response to pressure changes, and operation at air pressure for indefinite periods will not damage the tube or change its calibration.



OPERATING CHARACTERISTICS

Heater Resistance Cold, Zero Current:

Heater #1 (Pins #1 and #3).....37 1/2 ohms
Heater #2 (Pins #4 and #6).....37 1/2 ohms

Heater Resistance Hot, with 100 ma. Current in air (Note 1):

Heater #1 (Pins #1 and #3).....42 ohms
Heater #2 (Pins #4 and #6).....42 ohms

Heater Resistance Hot, with 100 ma. Current in Hard Vacuum (Note 1):

Heater #1 (Pins #1 and #3).....60 ohms
Heater #2 (Pins #4 and #6).....60 ohms

Heater Resistance Characteristics:

Heater Current	Resistance in Air	Resistance in Hard Vacuum
0 ma.	37.5 ohms	37.5 ohms
50 ma.	38 ohms	39 ohms
100 ma.	42 ohms	60 ohms
150 ma.	43 ohms	78 ohms
200 ma.	54 ohms	81 ohms
250 ma.	57 ohms	83 ohms
300 ma.	60 ohms	84 ohms

Heater Current Normal.....100 ma.

Heater Current Maximum.....300 ma.

Heater Voltage (Note 2).....10 volts

Speed of Response.....600 Milliseconds

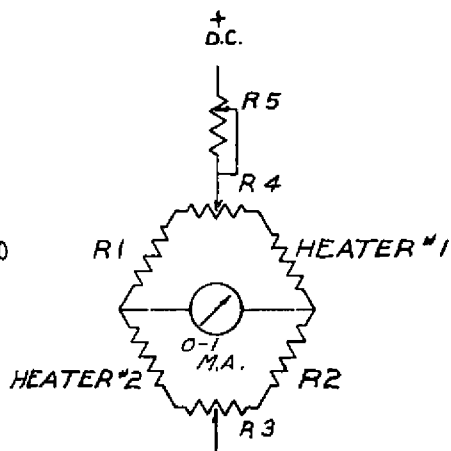
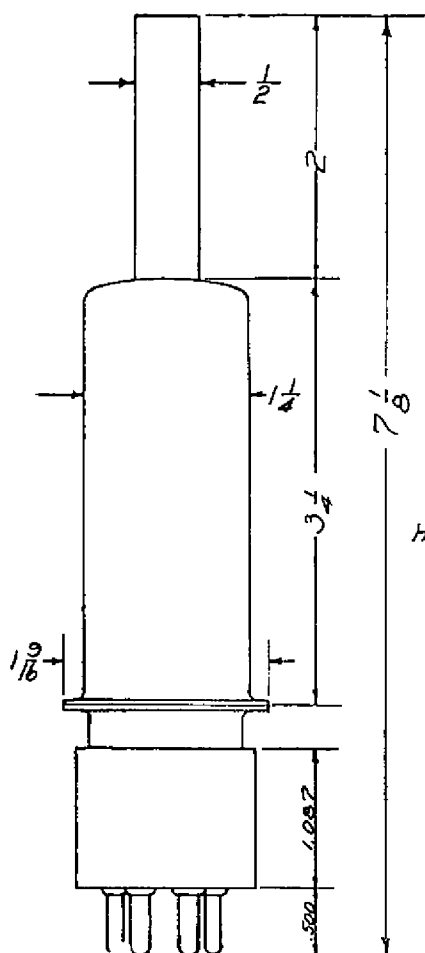
Basing.....RETMA 6CQ

Pin No.	1	2	3	4	5	6
Element	Htr. #1	Gnd.	Htr. #1	Htr. #2	Gnd.	Htr. #2

Note 1: Heater resistance is dependent upon circuit use and absolute pressure. Data is supplied for 100 ma. current inasmuch as these values are obtained when using the recommended circuit.

Note 2: Heater voltage is dependent upon circuit use and value noted is as used in recommended circuit with resistance values noted.

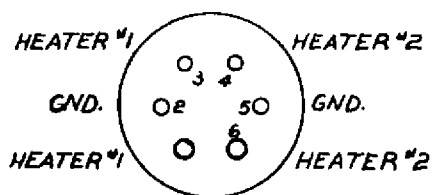
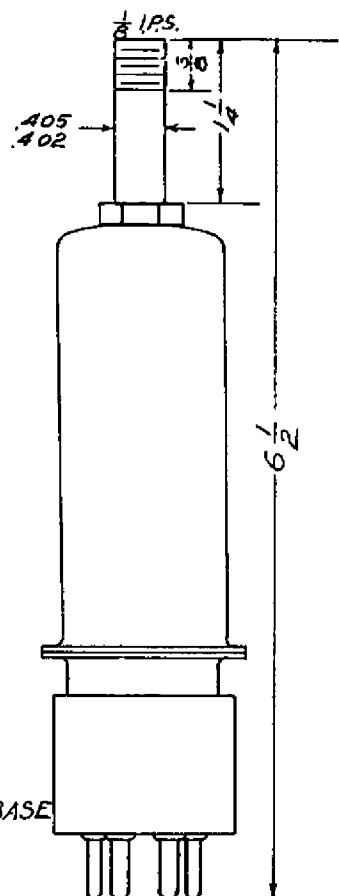
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TELEPHONE: OCEANSIDE 6567



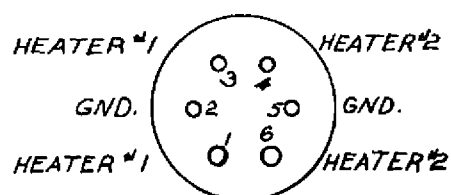
TYPICAL CIRCUIT

R1-R2 50 OHMS
R3-R4 5 OHMS
R5 AS REQUIRED
D.C. 10 VOLTS

MEDIUM SHELL REGULAR BASE

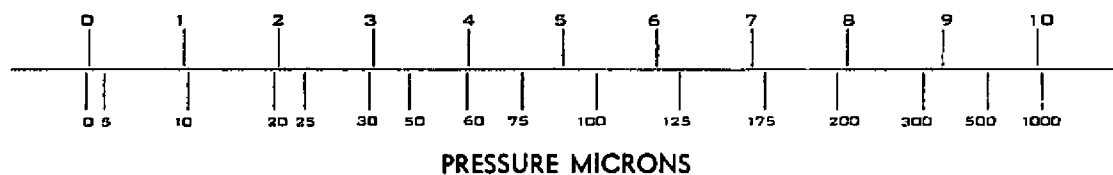


BASING 6CQ



BASING 6CQ

Typical Calibration Curve
Meter Scale 0-1 Ma.



VACUUM TUBE PRODUCTS

THERMOCOUPLE VACUUM GAUGE TUBE

Type VTP 6535



VTP 6535 is a thermal conductivity gauge that provides an output used for measuring pressures in the range of .1 to 1000 microns. The VTP 6535 is a thermal conductivity gauge that provides an output E.M.F. determined by the operating current and the heat conductivity of the residual gas. A reliable pressure reading is obtained when the heater is supplied from a stabilized source.

The VTP 6535 is made of Pyrex #774 glass and finds use on vacuum systems of all-glass construction where the excellent features of this gauge are required. Attachment can be made to soft glass systems by means of a glass graded seal. The VTP 6535 is identical electrically with the VTP 6343 and has excellent sensitivity with very fast response.

Due to the speed of detecting changes in pressures, the VTP 6535 finds use in leak detecting as well as absolute pressure measuring. Vacuum systems may be probed with materials such as acetone to detect leaks due to the variation of thermal conductivity between the acetone and air. When leaks are encountered the VTP 6535 will detect the vapor, and a decrease in output E.M.F. can be measured due to the acetone entering the system.

OPERATING CHARACTERISTICS

Heater Current Normal (Note 1).....	Approx 17.0 ma
Heater Current Maximum (Note 3)	100 ma.
Heater Resistance (Cold) Nominal	8 1/2 ohms
Heater Resistance (Hot) Nominal	18 ohms.
Heater to Thermocouple Resistance (Note 2).....	Less than 100 ohms.
Thermocouple Output—with 55ohm Load (Meter Internal Resistance)	
Hard Vacuum	10 Millivolts
Air	.1 Millivolts

Thermocouple Resistance (Cold).....	8 1/2 ohms
Speed of Response	Faster than .1 second
Basing	RETMA 8FR

Pin No.
Element

1	3	5	7
Heater	Neg. Thermocouple	Pos. Thermocouple	Heater

Note 1: While either A.C. or D.C. may be used, D.C. is recommended due to availability of less expensive and more accurate meters in this range. All gauge tubes are individually calibrated and marked with the heater current required to provide 10 millivolts output across 55 ohms when the gauge is under hard vacuum.

Note 2: While the heater and the thermocouple are in direct contact to provide maximum speed of response, use of this electrical circuit is not recommended unless the current is maintained below 50 ua.

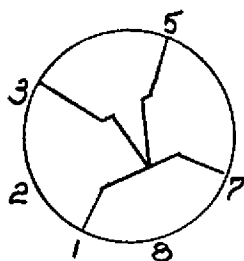
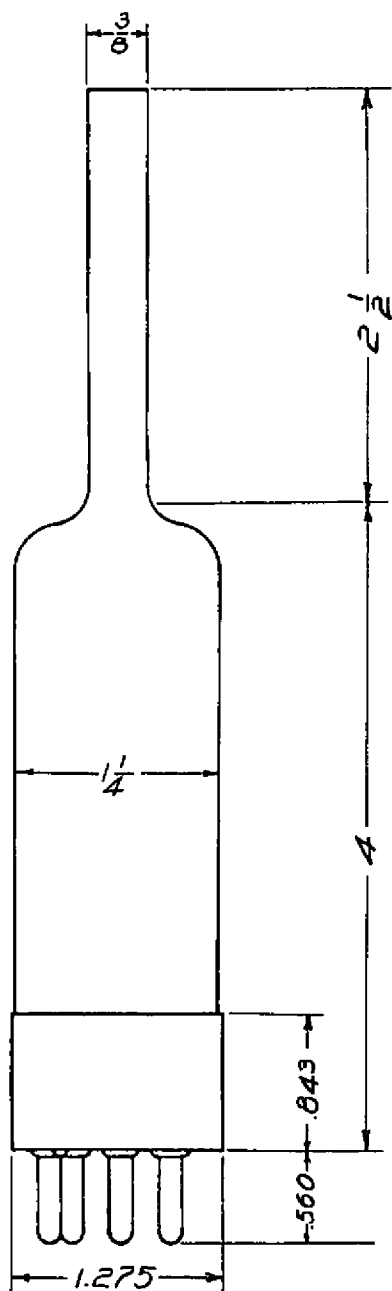
Note 3: The heater may be operated at such a current and absolute pressure that the thermocouple output does not exceed 10 millivolts across a 55 ohm load. The internal elements will then remain below 200° C.

VACUUM TUBE PRODUCTS, 506 SOUTH CLEVELAND STREET, OCEANSIDE, CALIFORNIA

TELEPHONE: SARatoga 2-6567

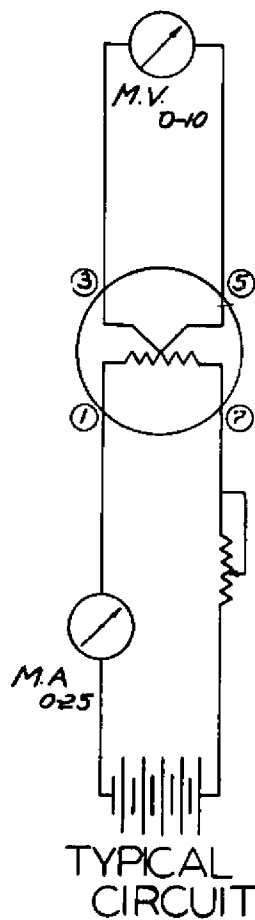
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THERMOCOUPLE VACUUM GAUGE TUBE TYPE VTP 6535

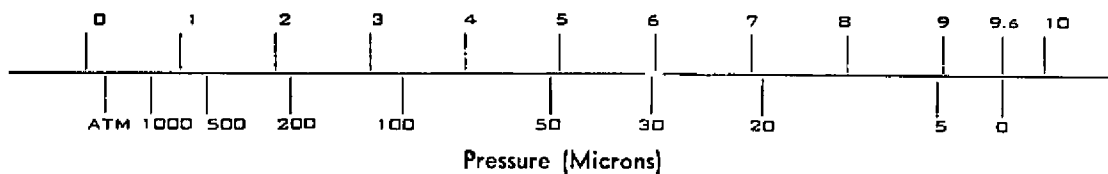


BASING 8FR

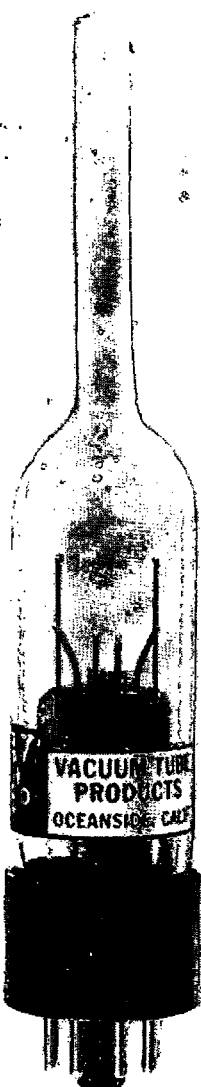
PIN 1 - - - HEATER
PIN 3 - NEGATIVE T.C.
PIN 5 - POSITIVE T.C.
PIN 7 - - - - HEATER



Typical Calibration Curve
Meter Millivolts



VACUUM TUBE PRODUCTS



THERMOCOUPLE VACUUM GAUGE TUBE Type VTP 6536

The VTP 6536 is a vacuum gauge tube of the thermocouple type, used for measuring pressures in the range of .1 to 1000 microns. The VTP 6536 is a thermal conductivity gauge that provides an output E.M.F. determined by the operating current and the heat conductivity of the residual gas. A reliable pressure reading is obtained when the heater is supplied from a stabilized source.

The VTP 6536 is made of Pyrex #774 glass and finds use on vacuum systems of all glass construction where the excellent features of this gauge are required. Attachment can be made to soft glass systems by means of a glass graded seal. The VTP 6536 is identical electrically with the VTP 6416 and incorporates a structure designed for maximum ruggedness. This tube may be operated indefinitely at air pressure without damage to either the heater or thermocouple.

The VTP 6536 finds use in fore vacuum monitoring on large systems such as cyclotrons and accelerators, where a long pumping cycle is common and long life rather than response speed is the prime requirement. Application is also found where it is desirable to use glass sealed gauge tubes to replace compression coupled metal gauge tubes on all-glass systems.

OPERATING CHARACTERISTICS

Heater Current Normal (Note 1)	Approx. 600 ma.
Heater Current Maximum	1000 ma.
Heater Resistance (Cold) Nominal	.2 ohms
Heater Resistance (Hot) Nominal	.25 ohms
Heater to Thermocouple Resistance (Note 2)	0
Thermocouple Output—with 55 ohm Load (Meter Internal Resistance)	
Hard Vacuum	10 Millivolts
Air	1.0 Millivolts
Thermocouple Resistance (Cold)	3 1/2 ohms
Speed of Response	Approx. 15 seconds
Basing	RETMA 8FS

Element Pin No.	Heater 1	Neg. Thermocouple 3	Heater 5	Pos. Thermocouple 7
--------------------	-------------	------------------------	-------------	------------------------

Note 1: While either A.C. or D.C. may be used, A.C. is recommended due to ease of supply adjustment from a variable transformer. All gauge tubes are individually calibrated and marked with the heater current required to provide 10 millivolts output across 55 ohms when the gauge is under hard vacuum.

Note 2: Heater and thermocouple are electrically welded together at the thermocouple junction.

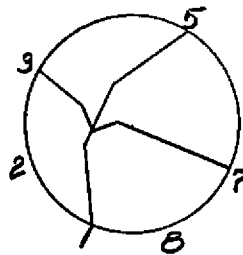
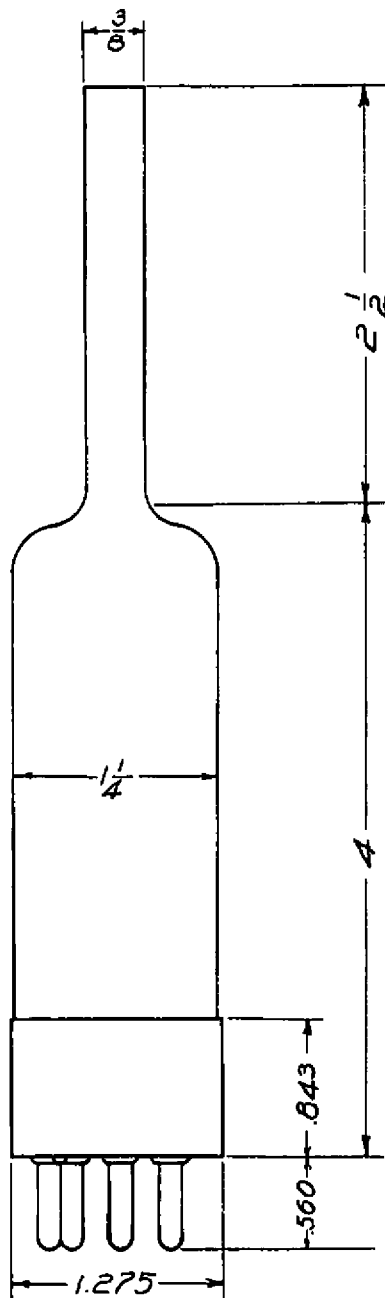
VACUUM TUBE PRODUCTS, 506 SOUTH CLEVELAND STREET, OCEANSIDE, CALIFORNIA

FEB. 55

TELEPHONE: SARatoga 2-6567

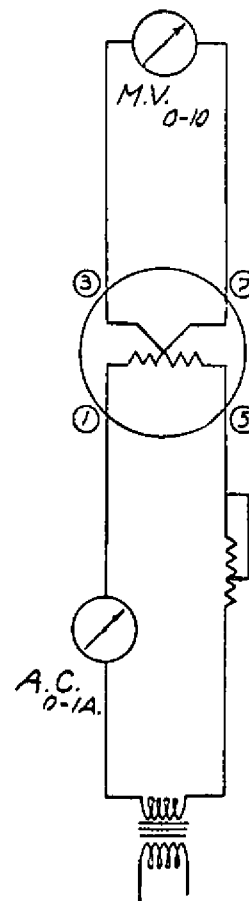
THERMOCOUPLE VACUUM GAUGE TUBE

TYPE VTP 6536

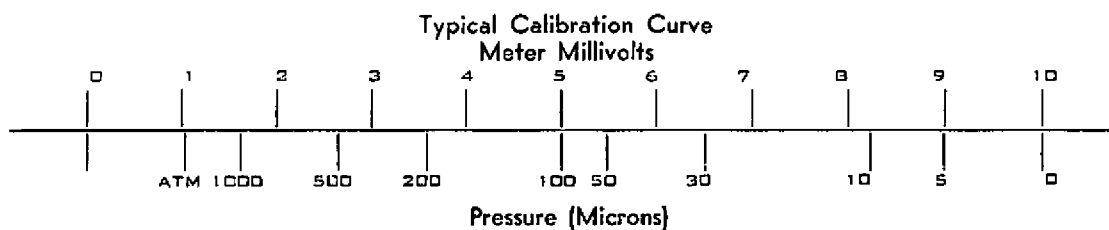


BASING 8FS

PIN 1 HEATER
 PIN 3 NEGATIVE T.C.
 PIN 5 HEATER
 PIN 7 POSITIVE T.C.



**TYPICAL
CIRCUIT**

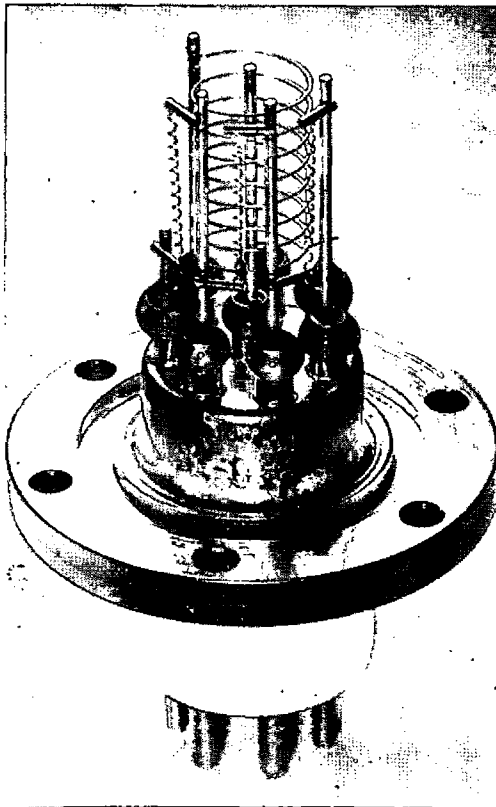


VACUUM TUBE PRODUCTS, 506 SOUTH CLEVELAND STREET, OCEANSIDE, CALIFORNIA

VACUUM TUBE PRODUCTS

VTP IONIZATION GAUGE TUBE TYPE 6578

The VTP 6578 Ionization Gauge Tube is the ultimate in reliability and accuracy for measuring vacuum in large metal systems. The inherent design incorporating the use of pure metals, accurate electrode positioning and freedom from connecting tube restrictions allow a precise measurement of low pressures. By utilizing a design with the grid surrounding the collector, the absolute minimum of errors in gas pressure are obtained, inasmuch as the collector is physically small and few gas molecules are released by collector ion bombardment. The VTP 6578 is constructed with three separately connected filaments providing the maximum in gauge reliability when used on large systems and where a shutdown for gauge tube replacement is costly. Provision is also made for outgassing the grid by direct heating by applying a voltage to the two end connections brought out to separate base pins. Grid out gassing may be done while the tube is in operation, if desired.



SCALE FULL SIZE

NOTE: The collector of the VTP 6578 does not require outgassing due to its small size and the radiation heating from the grid outgas operation.

GENERAL CHARACTERISTICS

Filaments	Three.
Note: Use filaments individually for maximum life.	
Filament Voltage (Single Filament)	5.0 Max. Volts
Filament Current	6.0 Max. Amps
Grid Voltage (Referenced to Filament)	500 Max. Volts
Grid Voltage (Referenced to Flange)	500 Max. Volts
Grid Current (Emission Current)	15 Max. Ma
Grid Voltage (Pin 3 to Pin 5)	5 Max. Volts
Grid Current (Pin 3 through Pin 5 circuit)	4 1/4 Max. Amps
Collector Voltage (Referenced to Filament)	500 Max. Volts
Collector Voltage (Referenced to Flange)	500 Max. Volts
Collector Current	Varies directly with gas pressure and directly with grid current

When filament is hot do not exceed following pressures
 Pressure Maximum (Corrosive Gasses or Nitrogen) 5 Microns
 Pressure Maximum (Noble gasses or Hydrogen) 2 Atmospheres

NOTE: It is not necessary to remove the VTP 6578 when pressure testing metal systems for leaks.

Case	Ceramic RETMA A7.14						
Basing	RETMA 7EH						
Pin No.	1	2	3	4	5	6	7
Element	F1F2	F1	G	C	G	F3	F2F3
Mounting (Mechanical)	6 equally spaced 13/64" holes on 2 1/4" hole circle						
Mounting Position	Any						
Maximum Flange Temperature	180°C						

TYPICAL OPERATION

Filament Voltage	Single Filament.	
(Adjust to provide 5 ma Emission to Grid)	Approx. 3.0 Volts	
Filament Current		
(when obtaining emission from 1 filament)	Approx. 4.0 Amps	
Grid Voltage (Use voltage regulated supply)	150 Volts	
Grid Current (Adjust filament voltage to obtain this value)	5 Ma	
Collector Voltage	30 Volts	
Collector Current		
(Depends on gas and on gas pressure)	60 Microamps/micron for Dry Air	
Grid Outgassing Operation	Apply 5 volts at approx 4 amps between pins 3 and 5 until gas pressure measured is stable.	

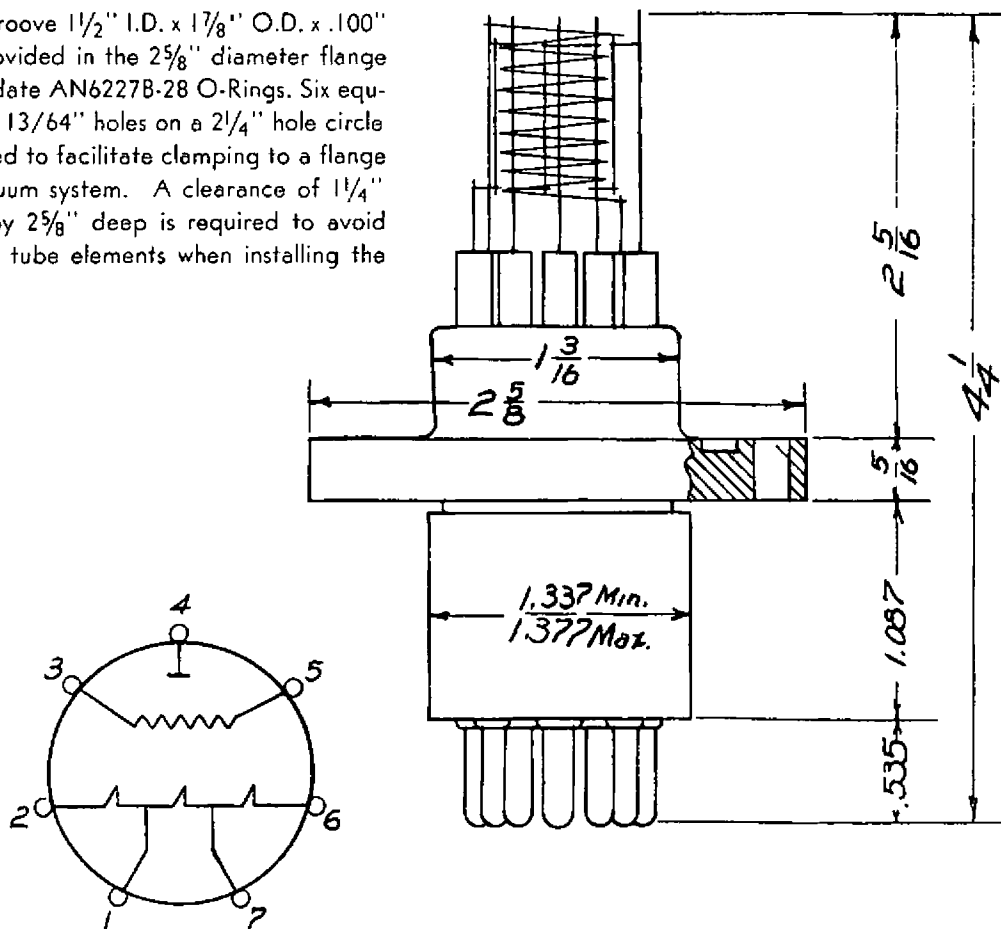
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Feb. 1955

TELEPHONE: SARatoga 2-6567

IONIZATION GAUGE TUBE TYPE 6578

A gasket groove $1\frac{1}{2}$ " I.D. x $1\frac{7}{8}$ " O.D. x .100" deep is provided in the $2\frac{5}{8}$ " diameter flange to accommodate AN6227B-28 O-Rings. Six equally spaced $13/64$ " holes on a $2\frac{1}{4}$ " hole circle are provided to facilitate clamping to a flange on the vacuum system. A clearance of $1\frac{1}{4}$ " diameter by $2\frac{5}{8}$ " deep is required to avoid damage to tube elements when installing the VTP 6578.



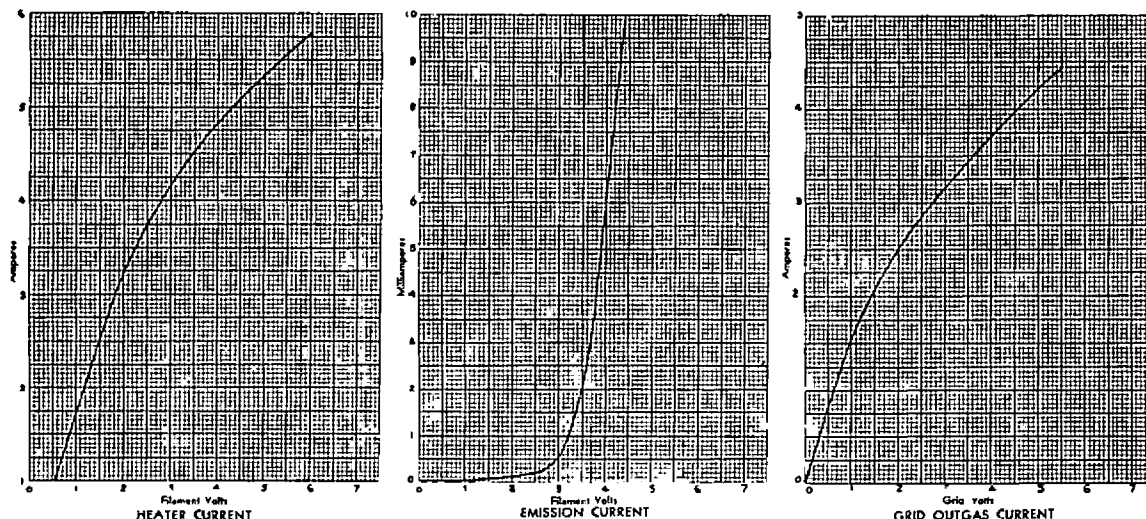
Base—Ceramic RETMA A7-14

BASING PEH

Typical curves with $E_g = +150$ $E_p = -30$

Note: Do not exceed 10 ma grid current to obtain maximum filament life.

5 ma I_g is normal operating current.



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Feb. 1955

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VACUUM TUBE PRODUCTS

THERMISTOR VACUUM GAUGE

TYPE VTP 6579



The VTP 6579 is a vacuum gauge of the Thermal conductivity type incorporating a small thermistor as the sensing element. The VTP 6579 is designed to operate in the range of .1 to 1000 microns. The pressure reading is determined by the change in cooling on the platinum heater. A reliable pressure reading is obtained when the heater is supplied from a stabilized source and excessive changes in ambient temperature are not encountered.

The VTP 6579 is of all metal construction and is assembled by projection welding methods. The internal structure is ruggedized by design and is assembled by special fusing techniques, providing excellent sensitivity and fast response.

The VTP 6579 has been designed specifically for use with vacuum controls. The change in resistance of the thermistor unit, due to changes in pressure, provides an excellent means of changing the bias voltage of a vacuum or gas filled amplifier tube. The amplification obtained may then operate relays, alarms or process controls.

OPERATING CHARACTERISTICS

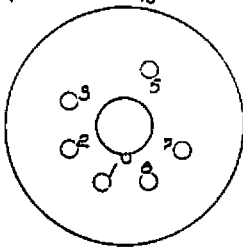
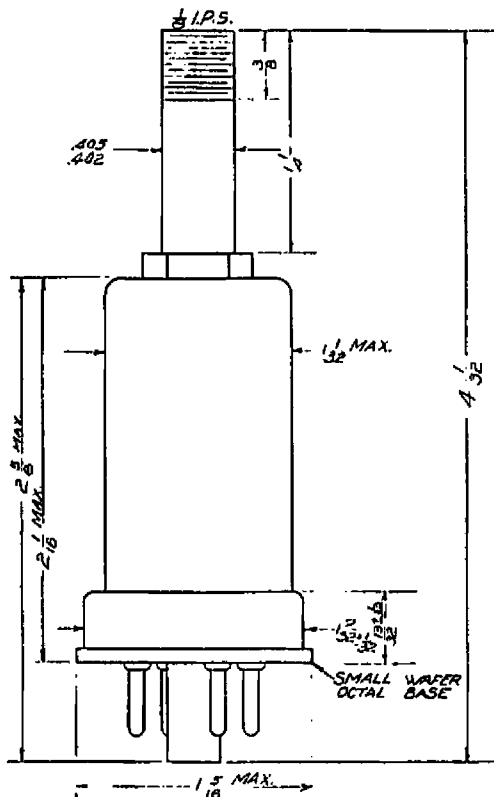
Heater Current Normal (Note 1.)	Approx. 350 ma			
Heater Current Maximum	500 ma			
Heater Resistance (cold) Nominal	.32 ohms			
Heater Resistance (hot) Nominal	.40 ohms			
Heater to Thermistor Resistance	10 Min. MegOhms			
Heater to Thermistor Voltage	75 max. volts			
Maximum Voltage permissible across Thermistor	75 Volts			
Maximum Wattage permissible in Thermistor	35 Milli Watts			
Thermistor Resistance with 0.5 ma flowing in circuit:				
Hard Vacuum	6.6 K ohms			
1000 Microns	22.0 K ohms			
Air	31.0 K ohms			
Thermistor Resistance with 1.5 ma flowing in circuit				
Hard Vacuum	3.2 K ohms			
1000 Microns	8.0 K ohms			
Air	10.3 K ohms			
Thermistor Circuit Current	20.0 Max. ma			
Base	Octal			
Basing	RETMA 8GP			
Pin No.	1	3	5	7
Element	Heater	Thermistor # 1	Heater	Thermistor # 2

NOTE 1. All gauge tubes are individually calibrated to provide a resistance in the thermistor circuit of 6.6 K ohms with 0.5 ma flowing in the measuring circuit. The heater current required is marked on each tube.

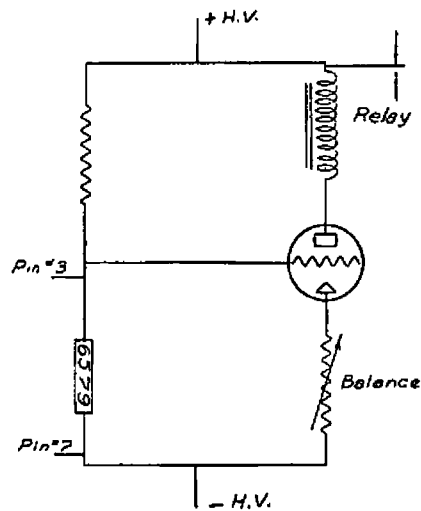
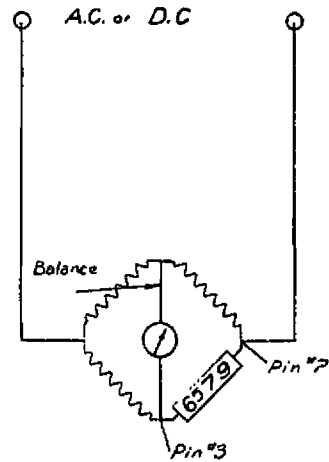
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Feb. 1955

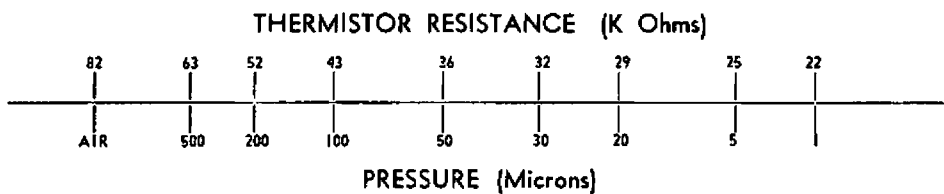
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Pin #1 HEATER
 Pin #3 THERMISTOR #1
 Pin #5 HEATER
 Pin #7 THERMISTOR #2



Typical Circuits





PRODUCT DATA SHEET



TYPE VTP 6990

5" TONE DISPLAY STORAGE TUBE

The VTP 6990 is a storage type cathode ray tube designed to present bright visual displays of television, radar or other types of electronically written information. Special features of this tube are its ability to display tones and to write, hold and erase at the operator's option. Brightness is sufficiently high for easy viewing in bright daylight, and writing and erasure speeds are fast enough to present excellent displays of high speed data with good contrast.

The VTP 6990 contains a storage structure mounted internally near the panel, a flood gun or viewing gun mounted axially at the rear of the tube, and an electrostatically focused and deflected writing gun protruding downward at an angle of approximately 15° at the rear and below the flood gun.

DATA

General	Writing Gun	Viewing Gun
Heater—Unipotential Cathode		
Voltage AC or DC	6.3	6.3 volts
Current	0.6	0.6 Amp
Focus Method	Electrostatic	Electrostatic
Deflection Method	Electrostatic	None
Phosphor — Aluminized — As specified	Standard P20	
Minimum useful screen diameter	4 inches	
Maximum overall length	12 1/4 inches	
Maximum tube radius	4 1/2 inches	
Maximum bulb diameter	5-5/16 inches	
Bases	12 pin Duo Decal	9 pin Miniature
Bulb Terminals	Recessed small ball caps (6) J1-22	
Mounting Position	Any	



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May 1957 Rev 0

TYPE V T P 6990

MAXIMUM RATINGS—All voltages are referenced to Viewing Gun cathode unless otherwise specified.

	Writing Gun	Viewing Gun
Screen Voltage		12,000 Max Volts
Storage Mesh (Peak)		25 Max Volts
Collector Mesh		500 Max Volts
Collimating Cylinder		500 Max Volts
Anode	+100	500 Max Volts
Cathode	-2500	500 Max Volts
Grid #1 Voltage (Reference to Cathode)		
Negative bias value	200	200 Max Volts
Positive bias value	0	0 Max Volts
Positive Peak value	2	0 Max Volts
Peak voltage between reference and any deflecting electrode	500	Max Volts
Maximum resistance in deflecting electrode circuit	5.0 meg	Max Ohms
Peak Heater — Cathode Voltage		
Heater negative reference cathode	125	125 max volts
Heater positive reference cathode	125	125 max volts
Grid Control		
Cutoff (Reference to cathode)	-20 to -70	-30 to -100 volts

TYPICAL OPERATION — Suggested values

Screen Voltage	8,000 volts
Storage Mesh	0* volts
Storage Mesh Series resistance	5 K ohms
Collector Mesh	200 volts
Collector Mesh Series resistance	None
Collimating Cylinder	120 (Adj) volts
Collimating Cylinder Series Resistance	None
Anode	0 to +20(Adj) 185 (Adj) volts
Cathode	-1400 0 volts
Grid #1 (Reference to Cathode)	-20 to -30(Adj) -30 to -50 volts
Deflection D1 - D2	37 to 57 v/in
Deflection D3 - D4	28 to 48 v/in
Focus	-1100 (Adj) volts

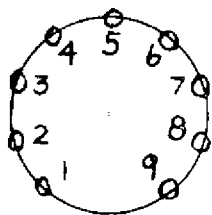
* **Note:** Zero volts is the black storage condition. Normal usage is to increase storage mesh positive approximately 20 volts to erase, then reduce to approximately zero volts, placing screen in the unwritten condition. Application of the writing gun beam will now present a display on the screen which will be stored. This display may be erased by repeating above procedure.

Pulse erasure: Pulse erasure may be accomplished by the application of pulses of +10 to +25 volts with a pulse width of 1 to 10 microseconds and a repetition rate of 400 to 3000pps. For this application the storage mesh receives the pulse through an .01 mfd capacitor. The storage mesh is tied to ground by means of a 5 K resistor.

Displays of variable or selectable persistence may be presented by varying the pulse erasure in either pulse width or repetition rate, and applying this erasure continuously during writing. Persistence may be varied from about 1 second to several minutes.

V T P 6990

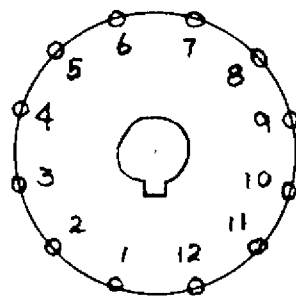
5" TWO NECKED TONE STORAGE TUBE BASE PIN CONNECTIONS



Viewing Gun Bottom View

Pin# Element

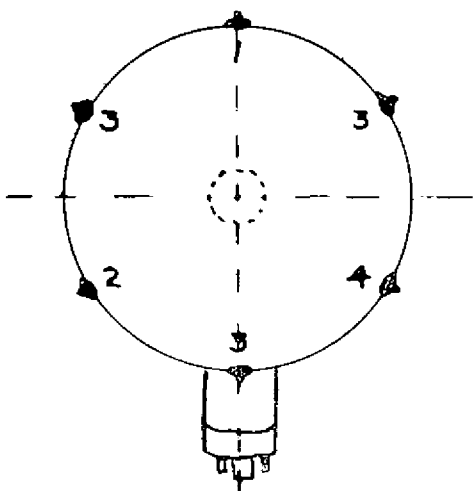
1	Heater
2	No Connection
3	Grid #1
4	Cathode
5	No Connection
6	Anode (Grid #2)
7	No Connection
8	Grid #1
9	Heater



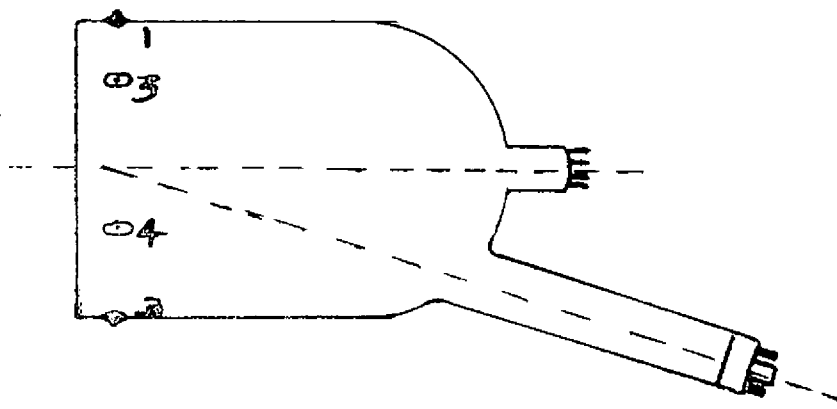
Writing Gun Bottom View

Pin# Element

1	Heater
2	Grid #1
3	No Connection
4	Focus
5	Deflection #1
6	Deflection #3
7	Anode
8	Deflection #4
9	Deflection #3
10	No Connection
11	Cathode
12	Heater



Panel View — Neck Down



Side View

Note: Terminal 4 (H.V.) is 120° clockwise from top of bulb viewing panel.

Bulb Terminal Connections:

Viewing bulb from panel end, Terminal 1 is at top of bulb, Terminal 3 is 60° clockwise, Terminal 4 is 120° clockwise, Terminal 3 is at bottom or 180° clockwise, Terminal 2 is 240° clockwise, and Terminal 3 is 300° clockwise. Note: All three Terminal 3 connections are internally connected.

Terminals

Electrode

1	Storage Mesh
2	Collector Mesh
3	Collimating Cylinder
4	Screen H. V.

V T P 6990

- Note
1. Internal conductive Aquadag coating and pin #7 of the writing gun are internally connected.
 2. With positive voltage on deflection plate D1, beam is deflected between bulb terminals #3 and #2, (90° to terminal #1) and approximately towards writing gun pin #5.
 3. With positive voltage on deflection plate D3, beam is deflected towards bulb terminal #1, and approximately towards writing gun pin #2.



PRODUCT DATA SHEET



TYPE V T P 6991

5" TONE DISPLAY STORAGE TUBE

The VTP 6991 is a storage type cathode ray tube designed to present bright visual displays of television, radar or other types of electronically written information. Special features of this tube are its ability to display tones and to write, hold and erase at the operator's option. Brightness is sufficiently high for easy viewing in bright daylight, and writing and erasure speeds are fast enough to present excellent displays of high speed data with good contrast.

The VTP 6991 contains a storage structure mounted internally near the panel, and both a flood gun and an electrostatically deflected and focused writing gun supported in a single neck axially aligned at the rear of the tube. All gun connections are terminated in a diheptal base attached to the tube neck.

DATA

General	Writing Gun	Viewing Gun
Heater—Unipotential Cathode		
Voltage AC or DC	6.3	6.3 volts
Current	0.6	0.6 Amp
Focus Method	Electrostatic	Electrostatic
Deflection Method	Electrostatic	None
Phosphor — Aluminized — As specified		Standard P20
Minimum useful screen diameter		4 ¹ / ₄ inches
Maximum overall length		13 ¹ / ₂ inches
Maximum tube radius		2 ⁷ / ₈ inches
Maximum bulb diameter		5-9/16 inches
Base	B14—38 Med Shell Diheptal 14 pin	
Bulb Terminals	Recessed small ball caps (6) J1-22	
Mounting Position		Any



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May 1957 Rev 0

VTP 6991

MAXIMUM RATINGS—All voltages are referenced to Viewing gun cathode unless otherwise specified.

	Writing Gun	Viewing Gun
Screen Voltage		12,000 Max Volts
Storage Mesh (Peak)		25 Max Volts
Collector Mesh		500 Max Volts
Collimating Cylinder		500 Max Volts
Anode	+100	500 Max Volts
Cathode	-2500	500 Max Volts
Grid #1 Voltage (Reference to Cathode)		
Negative bias value	200	200 Max Volts
Positive bias value	0	0 Max Volts
Positive Peak value	2	0 Max Volts
Peak voltage between reference and any deflecting electrode	500	Max Volts
Maximum resistance in deflecting electrode circuit	5.0 meg	Max Ohms
Peak Heater — Cathode Voltage		
Heater negative reference cathode	125	125 max volts
Heater positive reference cathode	125	125 max volts
Grid Control		
Cutoff (Reference to cathode)	-20 to -70	-30 to -100 volts

TYPICAL OPERATION — Suggested values

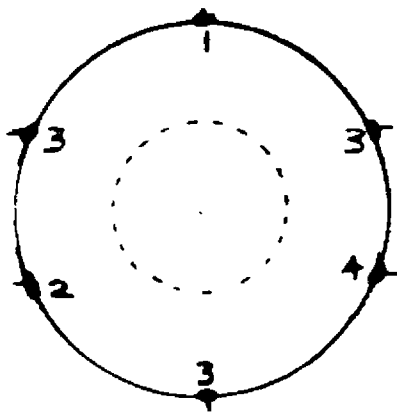
Screen Voltage	8,000 volts
Storage Mesh	0* volts
Storage Mesh Series resistance	5 K ohms
Collector Mesh	200 volts
Collector Mesh Series resistance	None
Collimating Cylinder	20 (Adj) volts
Collimating Cylinder Series Resistance	None
Anode	0 to +20(Adj) 185 (Adj) volts
Cathode	-1400 0 volts
Grid #1 (Reference to Cathode)	-20 to -30(Adj) -30 to -50 volts
Deflection D1 - D2	37 to 57 v/in
Deflection D3 - D4	28 to 48 v/in
Focus	-1100 (Adj) volts

* **Note:** Zero volts is the black storage condition. Normal usage is to increase storage mesh positive approximately 20 volts to erase, then reduce to approximately zero volts, placing screen in the unwritten condition. Application of the writing gun beam will now present a display on the screen which will be stored. This display may be erased by repeating above procedure.

Pulse erasure: Pulse erasure may be accomplished by the application of pulses of +10 to +25 volts with a pulse width of 1 to 10 microseconds and a repetition rate of 400 to 3000pps. For this application the storage mesh receives the pulse through an .01 mfd capacitor. The storage mesh is tied to ground by means of a 5 K resistor.

VTP 6991

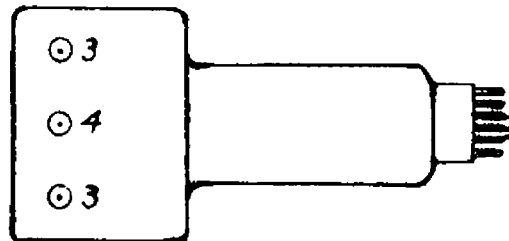
5". TONE DISPLAY STORAGE TUBE BASE PIN CONNECTIONS



Panel View

Panel and Bulb Terminals

Terminal	Element
1	Storage Mesh
2	Collector Mesh
3	Collimating Cylinder
4	Screen H. V.



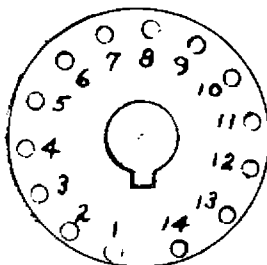
Side View

Bulb Terminal Connections:

Viewing bulb from panel end. Terminal 1 is at top of bulb, Terminal 3 is 60° clockwise, Terminal 4 is 120° clockwise, Terminal 3 is at bottom or 180° clockwise, Terminal 2 is 240° clockwise, and Terminal 3 is 300° clockwise. Note: All three Terminal 3 connections are internally connected.

Base Connections

Pin	Element
1	Writing gun Heater
2	Writing gun Grid #1
3	Writing gun Focus
4	Writing gun D1
5	Writing gun D3
6	Flood gun Anode
7	Flood gun Heater & Cathode
8	Flood gun Heater
9	Flood gun Grid #1
10	Writing gun Anode
11	Writing gun D4
12	Writing gun D2
13	Writing Gun Cathode
14	Writing gun Heater



Basing - Bottom View

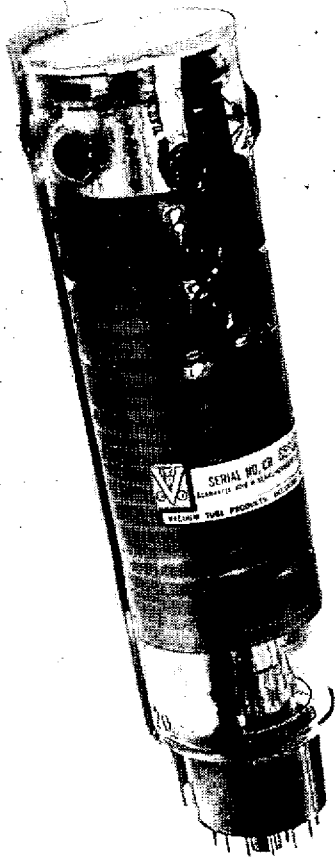
B14-38 Med. Shell Diheptal 14 pin

V T P 6991

- Note:
1. Heater connections (Base pins #1 and #14) align approximately with bulb terminal #4 and trace D1 D2 of the writing gun.
 2. With positive voltage on deflection plate D1, the beam is deflected approximately between base pins #7 and #8.
 3. With positive voltage on deflection plate D3, the beam is deflected approximately towards base pin #4.
 4. The base key (between pins #1 and #14) aligns approximately with bulb terminal #4.



PRODUCT DATA SHEET



TYPE VTP 6992

3" TONE DISPLAY STORAGE TUBE

The VTP 6992 is a storage type cathode ray tube designed to present bright visual displays of television, radar or other types of electronically written information. Special features of this tube are its ability to display tones and to write, hold and erase at the operator's option. Brightness is sufficiently high for easy viewing in bright daylight and writing and erasure speeds are fast enough to present excellent displays of high speed data with good contrast.

The VTP 6992 contains a storage structure mounted internally near the panel, and both a flood gun and an electrostatically deflected and focused writing gun supported in a single neck axially aligned at the rear of the tube. All gun connections are terminated in a diheptal base attached to the tube neck.

DATA

General	Writing Gun	Viewing Gun
Heater—Unipotential Cathode		
Voltage AC or DC	6.3	6.3 volts
Current	0.6	0.6 Amp
Focus Method	Electrostatic	Electrostatic
Deflection Method	Electrostatic	None
Phosphor — Aluminized — As specified.		Standard P20
Minimum useful screen diameter		2 inches
Maximum overall length		10 1/2 inches
Maximum tube radius		1-21/32 inches
Maximum bulb diameter		3-5/16 inches
Base	B14—38 Med Shell Diheptal 14 pin	
Bulb Terminals	Recessed small ball caps (6)	J1-22
Mounting Position		Any



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May 1957 Rev C

VTP 6992

MAXIMUM RATINGS—All voltages are referenced to Viewing gun cathode unless otherwise specified.

	Writing Gun	Viewing Gun
Screen Voltage	12,000	Max Volts
Storage Mesh (Peak)	25	Max Volts.
Collector Mesh	500	Max Volts
Collimating Cylinder	500	Max Volts
Anode	+100	500 Max Volts
Cathode	-2500	500 Max Volts
Grid #1 Voltage (Reference to Cathode)		
Negative bias value	200	200 Max Volts
Positive bias value	0	0 Max Volts
Positive Peak value.....	2	0 Max Volts
Peak voltage between reference and any deflecting electrode	500	Max Volts
Maximum resistance in deflecting electrode circuit	5.0 meg	Max Ohms
Peak Heater — Cathode Voltage		
Heater negative reference cathode.....	125	125 max volts
Heater positive reference cathode.....	125	125 max volts
Grid Control		
Cutoff (Reference to cathode)	-20 to -70	-30 to -100 volts

TYPICAL OPERATION ~ Suggested values

Screen Voltage	8,000	volts
Storage Mesh	0*	volts
Storage Mesh Series resistance	5 K	ohms
Collector Mesh.....	200	volts
Collector Mesh Series resistance	None	
Collimating Cylinder	120 (Adj)	volts
Collimating Cylinder Series Resistance	None	
Anode	0 to +20(Adj)	185 (Adj) volts
Cathode	-1400	0 volts
Grid #1 (Reference to Cathode)	-20 to -30(Adj)	-30 to -50 volts
Deflection D1 - D2	60 to 90	v/in
Deflection D3 - D4	45 to 70	v/in
Focus	-1100 (Adj)	volts

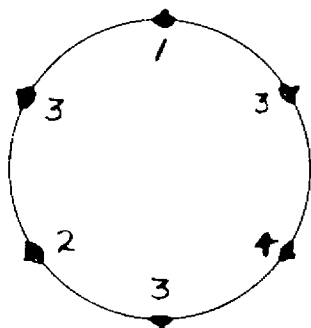
* **Note:** Zero volts is the black storage condition. Normal usage is to increase storage mesh positive approximately 20 volts to erase, then reduce to approximately zero volts, placing screen in the unwritten condition. Application of the writing gun beam will now present a display on the screen which will be stored. This display may be erased by repeating above procedure.

Pulse erasure: Pulse erasure may be accomplished by the application of pulses of +10 to +25 volts with a pulse width of 1 to 10 microseconds and a repetition rate of 400 to 3000pps. For this application the storage mesh receives the pulse through an .01 mfd capacitor. The storage mesh is tied to ground by means of a 5 K resistor.

Displays of variable or selectable persistence may be presented by varying the pulse erasure in either pulse width or repetition rate, and applying this erasure continuously during writing. Persistence may be varied from about 1 second to several minutes.

VTP 6992

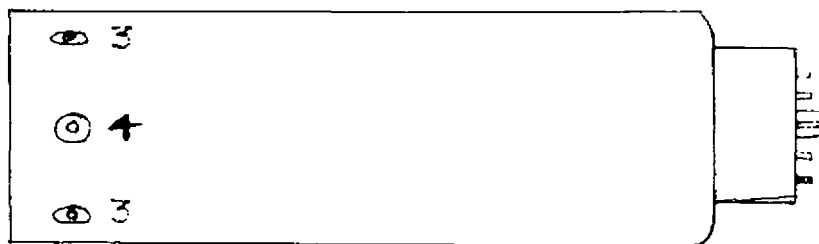
3" TONE DISPLAY STORAGE TUBE BASE PIN CONNECTIONS



Panel View

Panel and Bulb Terminals

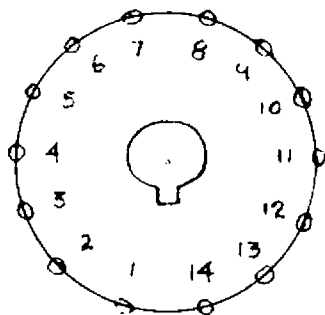
Terminal	Element
1	Storage Mesh
2	Collector Mesh
3	Collimating Cylinder
4	Screen H. V.



Side View

Bulb Terminal Connections:

Viewing bulb from panel end. Terminal 1 is at top of bulb, Terminal 3 is 60° clockwise, Terminal 4 is 120° clockwise, Terminal 3 is at bottom or 180° clockwise, Terminal 2 is 240° clockwise, and Terminal 3 is 300° clockwise. Note: All three Terminal 3 connections are internally connected.



Basing — Bottom View

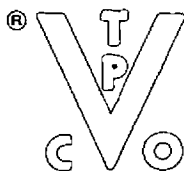
814-38 Med. Shell Diheptal 14 pin

Base Connections

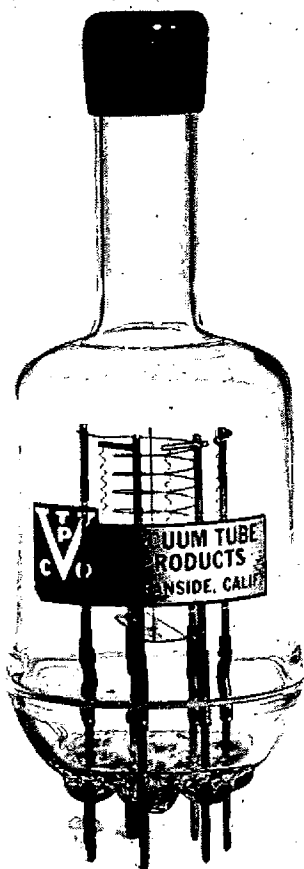
Pin	Element
1	Writing gun Heater
2	Writing gun Grid #1
3	Writing gun Focus
4	Writing gun D1
5	Writing gun D3
6	Flood gun Anode
7	Flood gun Heater & Cathode
8	Flood gun Heater
9	Flood gun Grid #1
10	Writing gun Anode
11	Writing gun D4
12	Writing gun D2
13	Writing gun Cathode
14	Writing gun Heater

VTP 6992

- Note:
1. Heater connections (Base pins #1 and #14) align approximately with bulb terminal #4 and trace D1 D2 of the writing gun.
 2. With positive voltage on deflection plate D1, the beam is deflected approximately between base pins #7 and #8.
 3. With positive voltage on deflection plate D3, the beam is deflected approximately towards base pin #4.
 4. The base key (between pins #1 and #14) aligns approximately with bulb terminal #4.



PRODUCT DATA SHEET



VTP-7169 — VTP Ionization Gauge Tube

The VTP-7169 Ionization Gauge Tube is an all glass gauge tube designed for the maximum of reliability and reproduction of accurate readings. This tube type utilizes the recognized superior design of the metal version—VTP Type 6578—but is now available in this type suitable for attachment to all glass vacuum systems. Attachment may also be made to tubular connectors on metal systems by means of VTP portcouples.

The VTP-7169 employs a grid surrounding the collector with dual grid connections allowing for easy outgassing of the grid and other elements of the gauge by merely passing heater current directly through the grid structure. The VTP-7169 is provided with three separately connected filaments providing the maximum in gauge reliability when used on large systems and where a shutdown for gauge tube replacement is costly.

GENERAL CHARACTERISTICS

Filaments (use filaments individually for maximum life) Three.
 Filament Voltage 5.0 Max. Volts
 Filament Current 6.0 Max. Amps
 Grid Voltage (Referenced to Filament) 500 Max. Volts
 Grid Current (Emission Current) 15 Max Ma
 Grid Voltage (Pin #3 to Pin #5).....5 Max. Volts
 Grid Current (Pin #3 through pin #5 circuit).....4 1/4 Max.Amps
 Collector Voltage (Referenced to Filament)..... 500 Max. Volts
 Collector Current—Varies directly with gas pressure and directly with grid current.

When Filament is hot do not exceed following pressures:

Pressure Maximum (Corrosive gases or Nitrogen) 5 Microns
 Pressure Maximum (Noble gases or Hydrogen).....1.2 Atmospheres

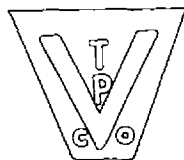
Base Medium Moulded flare Septar 7 pin—RETMA E7-2
 Basing: Pin No. 1 2 3 4 5 6 7
 Element F1F2 F1 G C G F3 F2F3
 Mounting (Mechanical) Portcouple or glass seal
 Mounting Position Any
 Bulb Glass (Type) Nonex 7720

TYPICAL OPERATION

Filament Voltage—Single Filament.
 (Adjust to provide 5 ma Emission to grid).....Approx. 3.0 Volts
 Filament Current (When obtaining Emission from one Filament) Approx. 4.0 Amps
 Grid Voltage (use regulated supply)+ 150 Volts
 Grid Current (adjust filament voltage to obtain this value) 5 Ma
 Collector Voltage—30 Volts
 Collector Current (Depends on gas and gas pressure).....60 Microamps/micron for dry air.

Grid Outgassing Operation—Apply 5 volts at approx. 4 amps between pins #3 and #5 until gas pressure measured is stable.

Note: Neither the bulb or the collector of the VTP-7169 require separate outgassing due to the efficient radiation heating from the grid outgas operation.

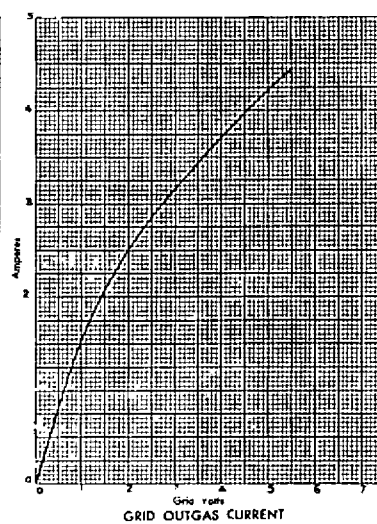
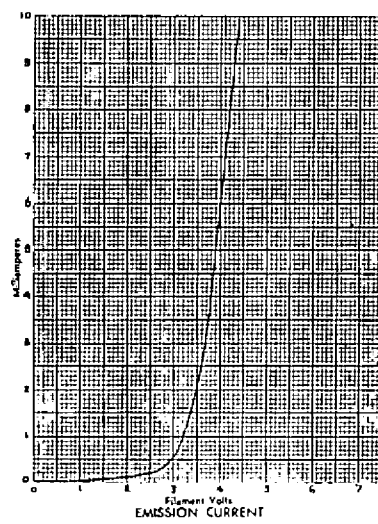
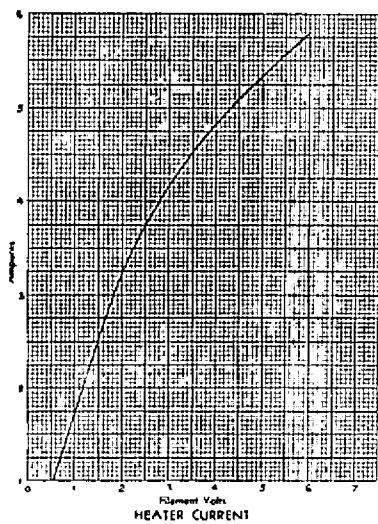
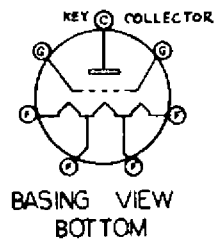
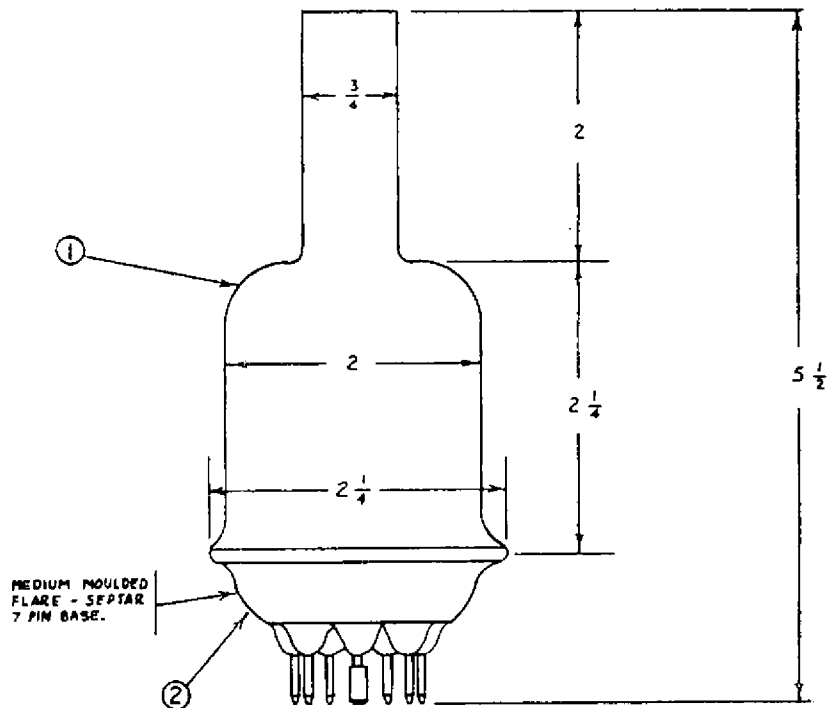


VACUUM TUBE PRODUCTS CO. INC.

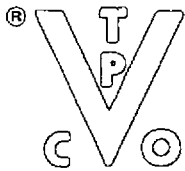
2020 SHORT STREET - OCEANSIDE, CALIFORNIA

Phone: SARatoga 2-7648

Post Office Box 810



VACUUM TUBE PRODUCTS CO. INC. — 2020 Short Street, Oceanside, California



PRODUCT DATA SHEET

VTP-7170 — VTP Ionization Gauge Tube

The VTP-7170 Ionization Gauge Tube is an all glass gauge tube designed for the maximum of reliability and reproduction of accurate readings. This tube type is externally similar to the VTP Type 7169 and differs only in the grid structure installed. The VTP-7170 is of all glass construction and may be attached to all glass vacuum systems by direct glass sealing or to either glass or metal vacuum systems by means of a port couple.

The VTP-7170 employs a grid surrounding the collector. The design of this grid structure is such that it can be easily outgassed by means of D.C. bombardment when connected to gauge controls designed for this method of element outgassing. The VTP-7170 is provided with three separately connected filaments providing the maximum in gauge reliability when used on large systems and where a shut-down for gauge tube replacement is costly.

GENERAL CHARACTERISTICS

Filaments (use filaments individually for maximum life) Three.
Filament Voltage (single filament) 5.0 Max. Volts
Filament Current 5.0 Max. Amps
Grid Voltage (Referenced to Filament) 500 Max. Volts
Grid Current (Emission Current) 40 Max. Ma.
Grid Power (Dissipation for outgassing) 20 Max. Watts
Collector Voltage (referenced to filament) 500 Max. Volts
Collector Current Varies with gas pressure
and directly with grid current.

When Filament is hot do not exceed following pressures.
Pressure Maximum (Corrosive gases or Nitrogen) 5 microns
Pressure Maximum (Noble gases or Hydrogen) 1.2 Atmospheres

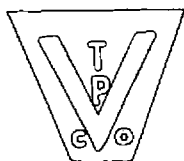
Base Medium Moulded flare Septar 7 pin—RETMA E7-2
Basing: Pin No. 1 2 3 4 5 6 7
 Element F1F2 F1 G C G F3 F2F3
Mounting (Mechanical) Portcouple or glass seal
Mounting Position Any
Bulb and Tubulation Glass Nonex—Corning #7720

TYPICAL OPERATION

Filament Voltage — Single Filament.
(Adjust to provide 5 Ma Emission to Grid) Approx. 3.0 Volts
Filament Current (When obtaining Emission from one Filament) Approx. 4.0 Amps
Grid Voltage (Use Voltage Regulated supply) +150 Volts
Grid Current (Adjust filament voltage to obtain this value) 5 Ma
Collector Voltage -30 Volts
Collector Current* (Depends on gas and gas pressure) 50 Microamps/micron
for Dry Air @ 5 Ma Grid Current.

GRID OUTGASSING OPERATION: Apply positive 400 Volts to Grid, with negative to filament. Adjust Filament Voltage to approx. 4.25 Volts or to allow 35 Ma of Grid Current to flow. Continue bombardment until the pressure reading measured is stable.

*NOTE: The sensitivity of the VTP-7170 may be increased to 100 μ a/micron of dry air by using a grid current of 10 milliamp. This may be done in either of two ways—(1) Use two filaments at one time to obtain 5 ma emission from either one—or (2) Increase the filament temperature of one filament to provide 10 ma emission.

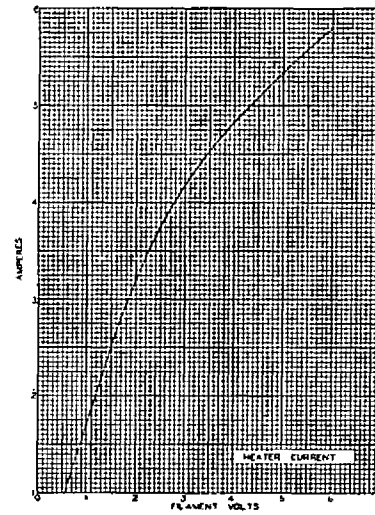
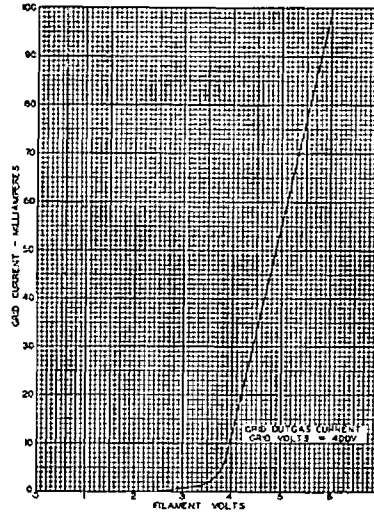
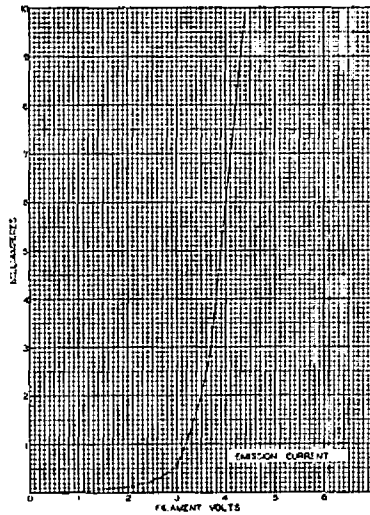
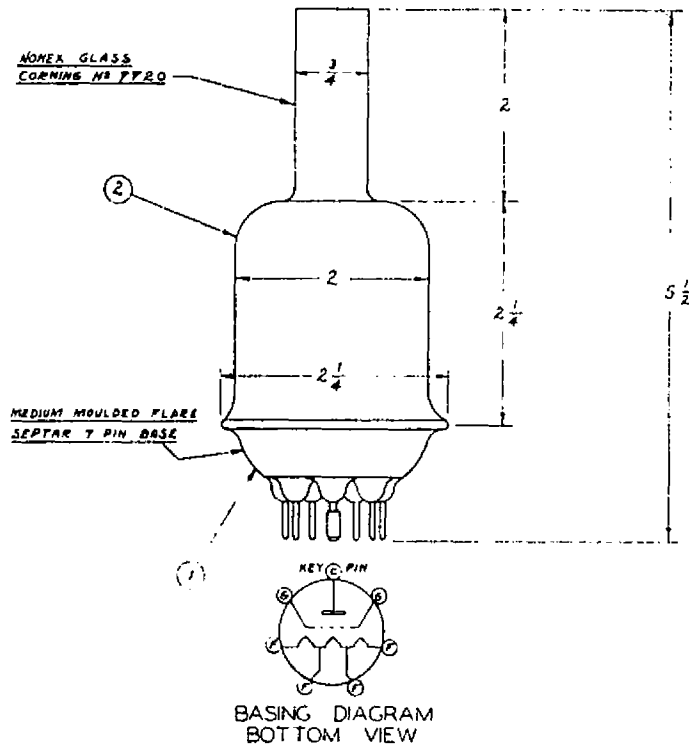


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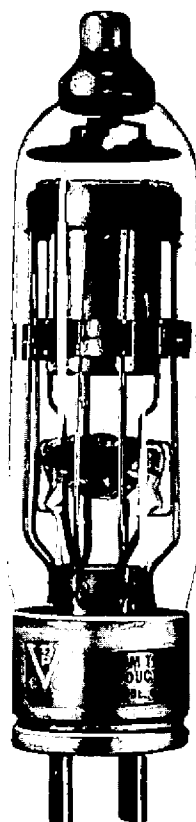
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VACUUM TUBE PRODUCTS

a division of Hughes Aircraft Co.

PRODUCT DATA SHEET

VTP 7386 THYRATRON



Type VTP 7386

THYRATRON

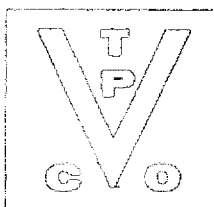
The VTP 7386 is a rugged and reliable xenon thyratron designed for grid controlled rectifier service where high efficiency is of primary concern. A typical application is for use in controlling current pulses to welding transformers for spot and seam welding machines. Another wide usage is the control of power to D.C. motors supplied from A.C. lines allowing wide ranges of motor speed control. Xenon thyratrons of this type are also used for converting A.C. power sources to adjustable current or voltage D.C. supplies, not only for general industrial uses, but also where the tubes are subjected to wide extremes of ambient temperature conditions.

The VTP 7386 has been thoroughly engineered and incorporates such features as hard glass construction, zirconium coated graphite anode, precious metal non-emitting grid construction, close and uniform grid control, low grid current, low deionization time, high frequency operation, low arc drop, high peak currents, black body heat dissipation, and automatic gettering action. It is also electrically superior to the C6JF and is interchangeable except for the base.

The VTP 7386, manufactured under tight controls at Vacuum Tube Products, is so designed as to replace any tubes designated as 5685, C6J, C6JA, or 5C21.

SPECIFICATIONS

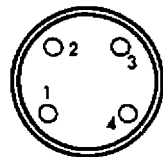
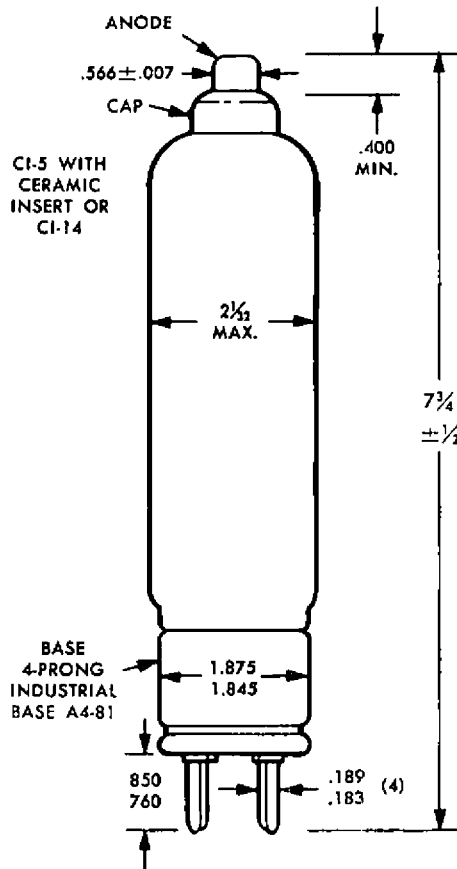
Cathode:	Directly heated filament type	Tube Voltage Drop:	With 6.4 amp. D.C. flowing through the tube, the maximum voltage drop across the tube will be 14 volts.
Heater Voltage:	2.5 volts (A.C.)	Peak Emission:	With 100 amp. D.C. flowing through the tube, the maximum voltage drop across the tube will be 45 volts.
Heater Current:	17.0 to 23.0 amperes (A.C.)	Critical Grid Voltage: *	When the anode has 1000 volts D.C. applied, the tube will start to pass current when the grid bias is made less negative and falls between -3.0 and -7.5 volts D.C.
Heating Time:	60 seconds	Critical Anode Voltage: *	When the grid has plus 3.0 volts applied, the tube will start to pass current when the anode voltage is raised and conduction will start at less than +75 volts D.C. anode voltage.
Rated Anode Current: (Continuous)	6.4 amps. (DC meter reading)	A.C. Anode Voltage for Conduction: *	With zero grid volts bias, the tube will pass current at less than 80 volts A.C. applied.
Rated Anode Current: (Average max.)	6.4 amps. (DC meter reading)		
Rated Anode Current: (15 seconds max. ON and 15 seconds min. OFF)	12.8 amps. (D.C. meter reading)		
Rated Anode Current Peak: (Continuously oscillographically recorded)	100 amps.		
Peak Forward Voltage:	1000 volts		
Peak Inverse Voltage:	1250 volts		
Operating Temperature:	-55° to +75°C		
Operating Altitude:	0 to 60,000 ft.		
Operating Frequency: (Max. recommended)	400 cycles +10%		



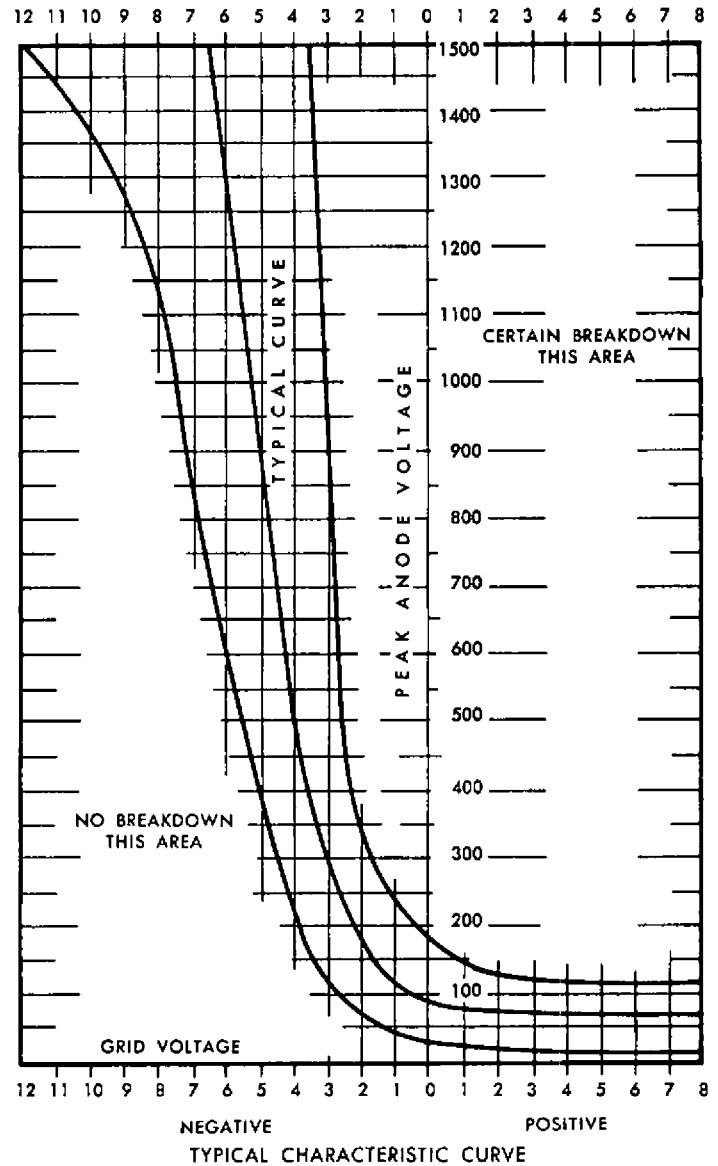
®

*NOTE: The filament pin adjacent to the grid pin shall be negative with respect to the other filament pin on the half cycle that the plate is positive.

VTP 7386



BOTTOM VIEW OF BASE



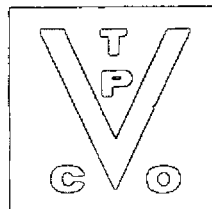
- PIN #1 GRID
- PIN #2 FILAMENT
- PIN #3 FILAMENT
- PIN #4 NO CONNECTION

NOTE: FOR CIRCUIT APPLICATION MAKE CATHODE CONNECTION TO PIN #2

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VACUUM TUBE PRODUCTS



VTP 7L

The VTP 7L cathode ray tube is an electro magnetic deflection and electrostatic focus tube of the zero focus voltage type providing high definition and intensity. A metal backed screen is used to provide the ultimate conditions when viewing is required at high ambient light levels. The metallic coating also provides freedom from ion burns. A high quality optical glass face plate is used to allow full benefit of the excellent signal presentation. Assurance of long life is had through the exclusive Vacuum Tube Products method of long and careful exhaust.

The VTP 7L cathode ray tube is available with the following phosphors:
P 1, 2, 3, 4, 5, 7, 11, 12, 15, 16, 17; 18; 19; 20.

GENERAL CHARACTERISTICS

Heater Voltage	6.3 Volts
Heater Current	0.6 Amperes
Anode Voltage (conductive inner wall coating and G#3)	18,000 Max. Volts D.C.
Grid #2 Voltage (accelerating electrode)	410 Max. Volts D.C.
Grid #1 Voltage (control electrode)	
Negative Bias Value	125 Max. Volts D.C.
Positive Bias Value	0 Max. Volts D.C.
Positive Peak Value	2 Max. Volts D.C.
Peak Heater to Cathode Voltage	
Heater Negative with respect to Cathode	125 Max. Volts D.C.
Heater Positive with respect to Cathode	125 Max. Volts D.C.
Focus	Electrostatic
Focus Voltage Range (Max.)	plus or minus 500 Volts
Deflection	Magnetic
Deflection Angle (approximate)	53 Degrees
Basing (RTMA 8EQ)	Medium Shell Octal 8 Pin
Anode contact is small recessed ball cap in bulb wall.	

TYPICAL OPERATION

Pin No.	1	2	3	4	5	6	7	8
Element	NC	H	G#2	NC	G#1	Focus	K	H
Heater Voltage	6.3 Volts							
Anode Voltage	12,000 Volts D.C.							
Grid #2 Voltage	250 Volts D.C.							
Grid #1 Voltage	-27 to -63 Volts							
Focus Voltage	Zero							
Grid #1 Circuit Resistance								
Maximum	1.5 Megohms							
Minimum	150 Ohms							
Grid #2 Circuit Resistance	470 Min. Ohms							
Anode Circuit Resistance	15,000 Min. Ohms							

Note: Type VTP 7L tube operates from power supplies that are dangerous.
The above circuit values are recommended as a safety measure.

VACUUM TUBE PRODUCTS, 506 SOUTH CLEVELAND STREET, OCEANSIDE, CALIFORNIA
PHONE: OCEANSIDE 6567

