

FEDERAL VHF POWER TETRODE

Type F-6166

10 Kilowatts Plate Dissipation



GENERAL DATA

DESCRIPTION:

The F-6166 by Federal is a power tetrode designed for VHF service in television and CW service. The anode is forced air cooled, capable of dissipating 10 kilowatts. The coaxial stem construction minimizes lead inductance and provides for easy insertion into coaxial cylinder type circuits.

Electrical:

- ▶ Filament, Thoriated Tungsten:
 - Voltage (AC or DC)* $5.0 \pm 5\%$ Volts
 - Current at 5 volts 175 Amperes
 - Minimum Heating Time 15 Seconds
 - Cold Resistance 0.0038 Ohm
- ▶ Mu-Factor, Grid No. 2 to Grid No. 1 for plate volts=2000, grid No. 2 volts=1000, and plate amps. =2 10
- ▶ Direct Interelectrode Capacitances:
 - Grid No. 1 to Plate** 0.6 Max. $\mu\mu\text{f}$
 - Grid No. 1 to Filament 44 $\mu\mu\text{f}$
 - Plate to Filament** 0.08 Max. $\mu\mu\text{f}$
 - Grid No. 1 to Grid No. 2 60 $\mu\mu\text{f}$
 - Grid No. 2 to Plate 23 $\mu\mu\text{f}$

Mechanical:

- ▶ Mounting Position—
 - Vertical, filament end up or down
- ▶ Maximum Overall Length 11-5/8"
- ▶ Maximum Diameter 6-13/32"
- ▶ Terminal Connections See Outline Drawing
- ▶ Radiator Integral part of tube
- ▶ Air Flow:

THROUGH RADIATOR—The specified flow of incoming air at a temperature of 45°C for various plate dissipations, as indicated in the tabulation below, should be delivered by a blower through the radiator before and during the application of any voltages. The air should enter the radiator at its plate-contact-surface end (see Outline Drawing). Filament power, plate power, and air flow may be removed simultaneously.

Percentage of Max. Rated

Plate Dissipation for	100	80	60	per cent
Each Class of Service				
Minimum Air Flow	350	270	200	cfm
Static Pressure	3	2.1	1.3	in. of water

TO GRID-NO. 2 TERMINAL:

Plate-Ring End	†
Grid-No. 1—Terminal End	50 min. cfm

† A sufficient quantity of the air flow to the radiator should be directed onto the plate end of the grid-No. 2 terminal so that its temperature does not exceed the specified value.

TO GRID-NO. 1 TERMINAL

AND FILAMENT SEALS 50 min. cfm

* Full rated filament voltage can be applied safely to the cold filament. It is not necessary to provide means for limiting the filament starting current.

** With external flat metal shield 12" square having center hole 4-5/16" diameter. Shield is located in plane of the grid-No. 2 terminal, perpendicular to the tube axis, and is connected to grid No. 2.



FEDERAL VHF POWER TETRODE

Type F-6166

10 Kilowatts Plate Dissipation



- ▶ Incoming—Air Temperature 45 Max. °C
- ▶ Radiator Temperature (Measured on the core at end away from incoming air) 180 Max. °C
- ▶ Glass Temperature (At hottest part) 180 Max. °C

Maximum Ratings vs. Operating Frequency

Frequency	30	220	Mc
Max. Permissible Percentage of Max. Rated Plate Voltage and Plate Input:			
Class B Television Service	Full Ratings—54 to 216 Mc		
Class C Television Service	Full Ratings—54 to 216 Mc		
Class C Telephony Service, Plate-Modulated	100	90	%
Class C Telegraphy and FM Telephony	100	90	%

- ▶ Seal Temperature: Filament, Grid No. 1, Grid No. 2, and Plate 180 Max. °C
- ▶ Weight (Approx.) 15 Pounds

Maximum Ratings and Typical Operating Conditions

RF POWER AMPLIFIER—CLASS B TELEVISION SERVICE

Synchronizing—level conditions per tube unless otherwise specified
(Voltages are referred to cathode unless otherwise specified)

Maximum CCS^① Ratings, Absolute Values:

	54 to 216 Mc
DC Plate Voltage	6,000 Max. Volts
DC Grid—No. 2 (Screen) Voltage	2,000 Max. Volts
DC Plate Current	4 Max. Amps
Plate Input	22,000 Max. Watts
Grid—No. 2 Input	400 Max. Watts
Plate Dissipation	10,000 Max. Watts
Grid—No. 1 (Control—Grid) Dissipation	300 Max. Watts

Typical Operation in Grid-Drive Circuit:

	Bandwidth ^② of 8.5 Mc
DC Plate Voltage	5800 Volts
DC Grid—No. 2 Voltage	1200 Volts
DC Grid—No. 1 Voltage	—130 Volts
Peak RF Grid—No. 1 Voltage:	
Synchronizing Level	375 Volts
Pedestal Level	290 Volts
DC Plate Current:	
Synchronizing Level	3.45 Amps
Pedestal Level	2.60 Amps
DC Grid—No. 2 Current (Pedestal Level)	0.207 Amp
DC Grid—No. 1 Current (Approx.):	
Synchronizing Level	0.350 Amp
Pedestal Level	0.170 Amp
Driver Power Output (Approx.): ^③	
Synchronizing Level	800 ^④ Watts
Pedestal Level	450 Watts
Power Output (Approx.):	
Synchronizing Level	12,000 Watts
Pedestal Level	6,800 Watts

Typical Operation in Cathode-Drive Circuit:

	Bandwidth ^② of 8.5 Mc
DC Plate Voltage	5,885 Volts
DC Grid—No. 2 Voltage	885 Volts
DC Cathode-to-Grid—No. 1 Voltage	85 Volts
Peak RF Cathode-to-Grid—No. 1 Voltage:	
Synchronizing Level	330 Volts
Pedestal Level	260 Volts
DC Plate Current:	
Synchronizing Level	3.45 Amps
Pedestal Level	2.60 Amps
DC Grid—No. 2 Current (Pedestal Level)	0.152 Amp
DC Grid—No. 1 Current (Approx.):	
Synchronizing Level	0.405 Amp
Pedestal Level	0.220 Amp
Driver Power Output (Approx.): ^⑤	
Synchronizing Level	1,300 ^⑥ Watts
Pedestal Level	700 Watts
Power Output (Approx.):	
Synchronizing Level	12,000 Watts
Pedestal Level	6,800 Watts

BIAS-MODULATED RF POWER AMPLIFIER—CLASS C TELEVISION SERVICE

Synchronizing—level conditions per tube unless otherwise specified

Maximum CCS^① Ratings, Absolute Values:

	54 to 216 Mc
DC Plate Voltage	6,000 Max. Volts
DC Grid—No. 2 (Screen) Voltage	2,000 Max. Volts
DC Grid—No. 1 (Control—Grid) Voltage (White Level)	—1,000 Max. Volts
DC Plate Current	4 Max. Amps
Plate Input	22,000 Max. Watts
Grid—No. 2 Input	400 Max. Watts
Plate Dissipation	10,000 Max. Watts
Grid—No. 1 Dissipation	300 Max. Watts

Type F-6166 features high temperature gettering action that protects against momentary overloads.

FEDERAL VHF POWER TETRODE Type F-6166 10 Kilowatts Plate Dissipation



Typical Operation in Grid-Drive Circuit:

	Bandwidth ⁽²⁾ of 8.5 Mc
DC Plate Voltage	5,800 Volts
DC Grid—No. 2 Voltage	1,200 Volts
DC Grid—No. 1 Voltage:	
Synchronizing Level	—130 Volts
Pedestal Level	—195 Volts
White Level	—350 Volts
Peak RF Grid—No. 1 Voltage	375 Volts
DC Plate Current:	
Synchronizing Level	3.45 Amps
Pedestal Level	2.42 Amps
DC Grid—No. 2 Current	
(Pedestal Level)	0.148 Amp
DC Grid—No. 1 Current (Approx.):	
Synchronizing Level	0.350 Amp
Pedestal Level	0.190 Amp
Driver Power Output (Approx.) ⁽³⁾	
Synchronizing Level	800 ⁽⁴⁾ Watts
Power Output (Approx.):	
Synchronizing Level	12,000 Watts
Pedestal Level	6,800 Watts

PLATE-MODULATED RF POWER AMPLIFIER— CLASS C TELEPHONY

Carrier conditions per tube for use with a maximum modulation factor of 1.0

Maximum CCS⁽¹⁾ Ratings, Absolute Values:⁽⁷⁾

DC Plate Voltage	5,000 Max. Volts
DC Grid—No. 2 (Screen) Voltage	2,000 Max. Volts
DC Grid—No. 1 (Control—Grid) Voltage	—1,000 Max. Volts
DC Plate Current	2 Max. Amps
DC Grid—No. 1 Current	0.6 Max. Amp
Plate Input	10,000 Max. Watts
Grid—No. 2 Input	270 Max. Watts
Plate Dissipation	6,600 Max. Watts

Typical Operation in Grid-Drive Circuit:

	Up to 30 Mc
DC Plate Voltage	4,700 Volts
DC Grid—No. 2 Voltage	
(Modulated 100%) ⁽⁸⁾	800 Volts
DC Grid—No. 1 Voltage ⁽⁹⁾	—280 Volts
Peak RF Grid—No. 1 Voltage	485 Volts
DC Plate Current	1.56 Amps
DC Grid—No. 2 Current	0.217 Amp
DC Grid—No. 1 Current (Approx.)	0.300 Amp
Driver Power Output (Approx.)	180 ⁽¹⁰⁾ Watts
Power Output (Approx.)	5,500 Watts

RF POWER AMPLIFIER & OSCILLATOR—

CLASS C TELEGRAPHY⁽¹⁾ and

RF POWER AMPLIFIER—CLASS C FM TELEPHONY

Maximum CCS⁽¹⁾ Ratings, Absolute Values:⁽⁷⁾

DC Plate Voltage	6,600 Max. Volts
DC Grid—No. 2 (Screen) Voltage	2,000 Max. Volts
DC Grid—No. 1 (Control—Grid) Voltage	—1,000 Max. Volts
DC Plate Current	2.75 Max. Amps
DC Grid—No. 1 Current	0.6 Max. Amp
Plate Input	18,000 Max. Watts
Grid—No. 2 Input	400 Max. Watts
Plate Dissipation	10,000 Max. Watts

Typical Operation in Grid-Drive Circuit:

	At 216 Mc
DC Plate Voltage	5,800 5,800 Volts
DC Grid—No. 2 Voltage ⁽¹²⁾	1,200 1,200 Volts
DC Grid—No. 1 Voltage ⁽¹³⁾	—130 —175 Volts
Peak RF Grid—No. 1 Voltage	230 370 Volts
DC Plate Current	1.8 2.6 Amps
DC Grid—No. 2 Current	0.1 0.267 Amp
DC Grid—No. 1 Current	
(Approx.)	0.1 0.222 Amp
Driver Power Output (Approx.) ⁽³⁾	300 ⁽¹⁴⁾ 750 ⁽¹⁵⁾ Watts
Power Output (Approx.)	6,000 9,000 Watts

NOTES

- (1) Continuous Commercial Service.
- (2) Computed between half-power points and based on tube output capacitance only.
- (3) The driver stage is required to supply tube losses and rf circuit losses. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.
- (4) This value includes 700 watts of rf circuit loss at 216 Mc.
- (5) The driver stage is required to supply tube losses, rf circuit losses, and rf power added to plate circuit. The driver stage should be designed as indicated under (3).
- (6) This value includes 300 watts of rf circuit loss at 216 Mc, and 900 watts added to plate circuit.
- (7) These ratings hold for operation up to 30 Mc; for ratings at higher frequencies, see Maximum Ratings vs. Frequency Table.
- (8) Obtained preferably from a separate source.
- (9) Obtained preferably from a combination of 365-ohm grid-No. 1 resistor and —170-volt fixed bias.
- (10) This value includes 50 watts of rf circuit loss at 30 Mc.
- (11) Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.
- (12) Obtained preferably from a separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No. 2 resistor should not be used if the 6166 or a preceding stage is keyed. In this case, the regulation of the source should be sufficient to prevent the grid-No. 2 voltage from rising above 2000 volts under key-up conditions; and additional fixed grid-No. 1 bias must be provided to limit the plate current.
- (13) Obtained from fixed supply, by grid-No. 1 resistor, by cathode resistor, or by combination methods.
- (14) This value includes 270 watts of rf circuit loss.
- (15) This value includes 675 watts of rf circuit loss.

FEDERAL VHF POWER TETRODE

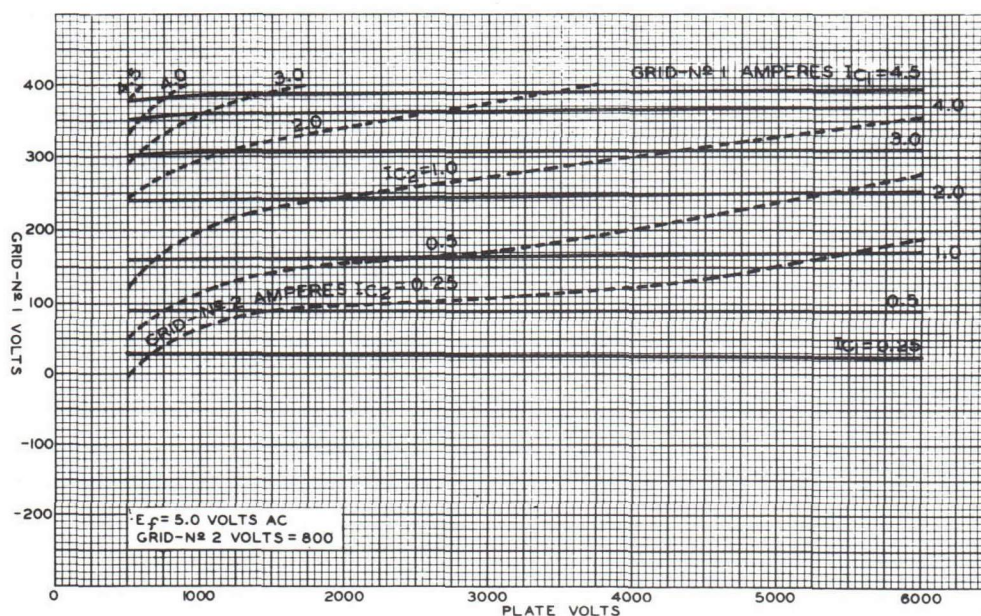
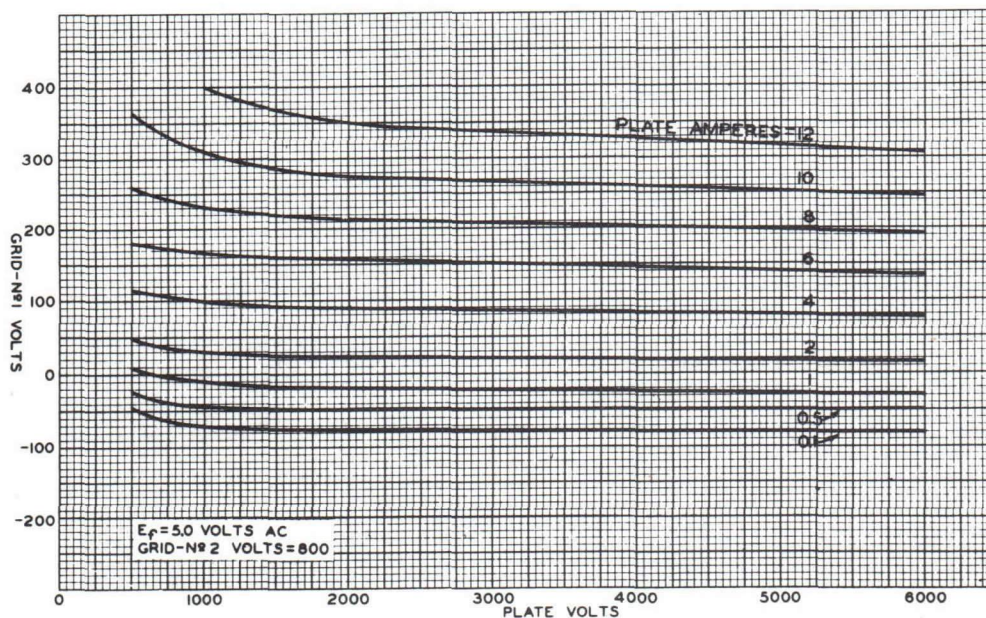
Type F-6166

10 Kilowatts Plate Dissipation



That Federal tubes virtually sell themselves by their performance, is a tribute to the product and the manufacturer.

Average Constant-Current Characteristics of Federal Type F-6166 Power Tetrode



Federal's name on a tube signifies the best in design, engineering, materials, components and craftsmanship.

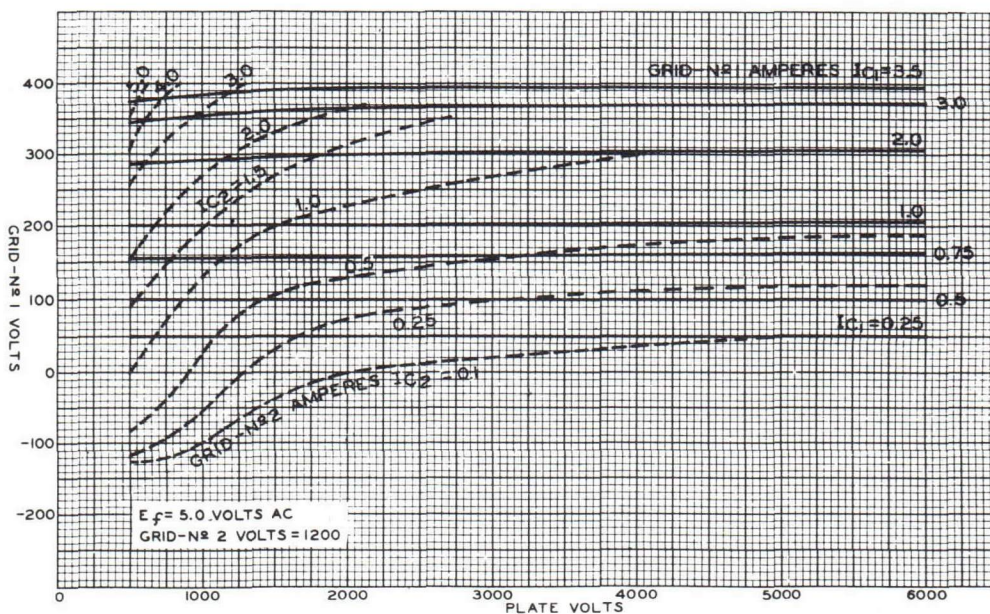
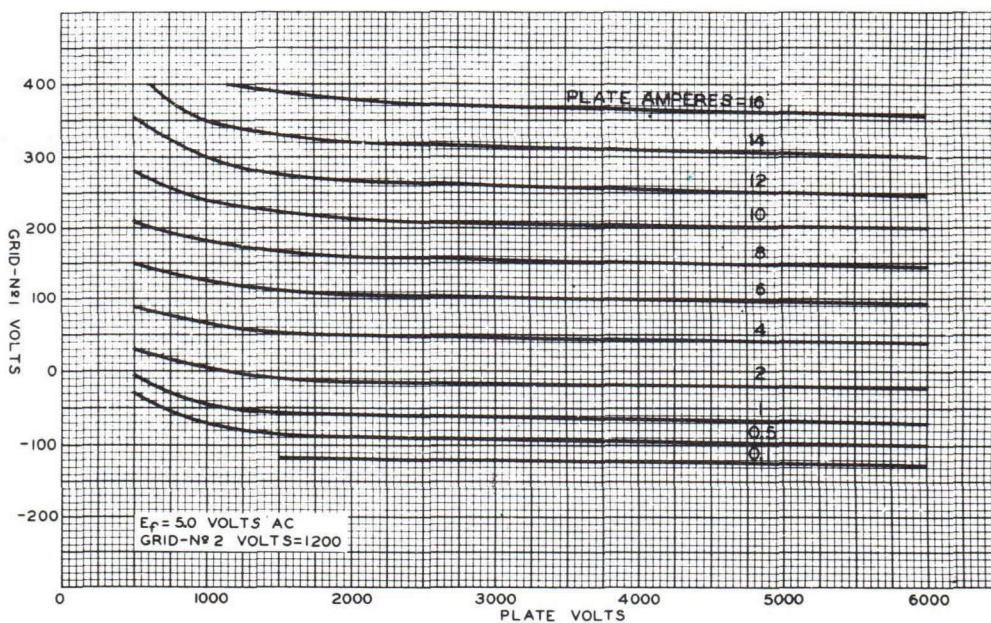
FEDERAL VHF POWER TETRODE

Type F-6166

10 Kilowatts Plate Dissipation



Average Constant-Current Characteristics of Federal Type F-6166 Power Tetrode

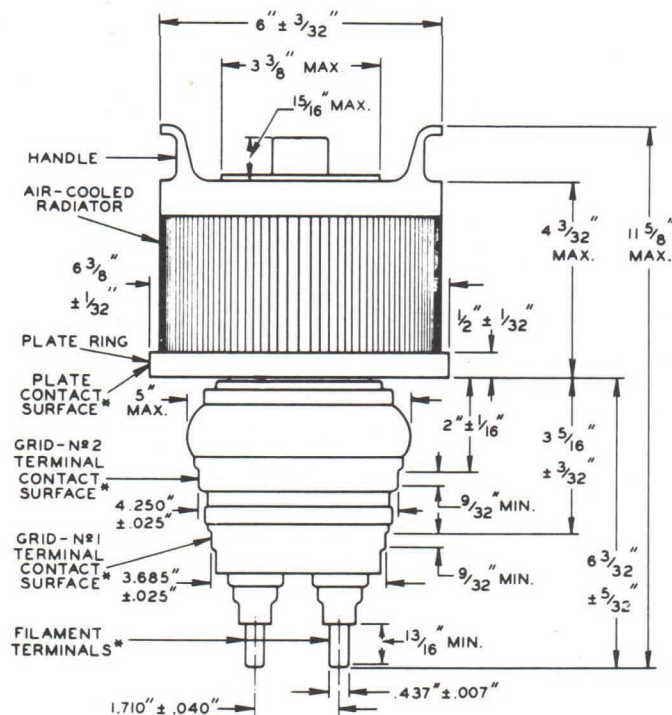


FEDERAL VHF POWER TETRODE Type F-6166 10 Kilowatts Plate Dissipation

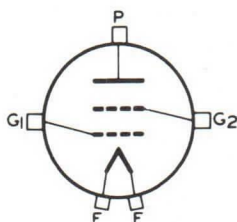


One of the first to manufacture power tubes, Federal experience goes back to the earliest days of the industry.

OUTLINE
F-6166

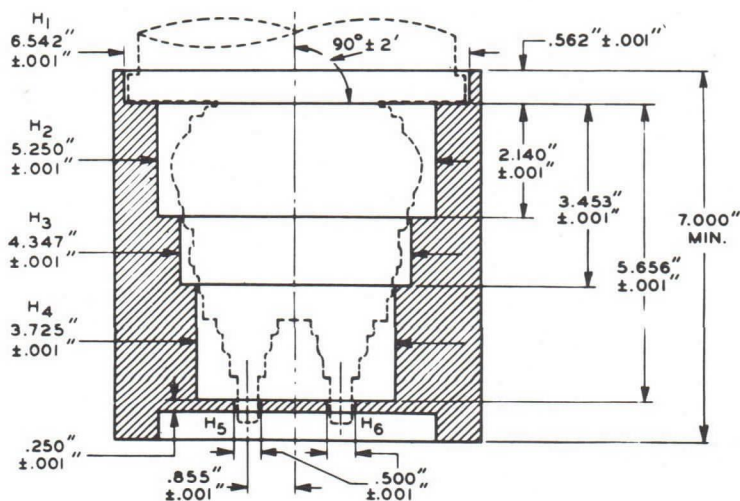


*With the cylindrical surfaces of the Plate Ring, Grid-No. 2 Terminal, Grid-No. 1 Terminal, and Filament Terminals clean, smooth, and free of burrs, the tube will enter a gauge as shown in Sketch G₁. Proper entry of the tube in the gauge is obtained when the Plate Ring is entirely engaged by hole H₁.



TERMINAL CONNECTIONS

- F: FILAMENT POST
- G₁: GRID-No. 1 TERMINAL (Adjacent to Filament Posts)
- G₂: GRID-No. 2 TERMINAL (Between Grid-No. 1 Terminal and Grid-No. 2 Terminal)
- P: PLATE TERMINAL (Ring of Radiator)



The four cylindrical holes H₁, H₂, H₃, and H₄ have axes coincident within 0.001". The holes H₅ and H₆ have axes parallel to the axes of H₁, H₂, H₃, and H₄ within 0° $\pm 2'$.