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 ± 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. $\mu\mu$f
Grid No. 1 to Filament	44 $\mu\mu$f
Plate to Filament**	0.08 Max. $\mu\mu$f
Grid No. 1 to Grid No. 2	60 $\mu\mu$f
Grid No. 2 to Plate	23 $\mu\mu$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 Each Class of Service	100	80	60	per cent
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.

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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	%

▶ 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
▶ 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 CCS① 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:

	Bandwidth②of 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	800④Watts
Pedestal Level	450 Watts
Power Output (Approx.):	
Synchronizing Level	12,000 Watts
Pedestal Level	6,800 Watts

Typical Operation in Cathode-Drive Circuit:

	Bandwidth②of 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	1,300⑥Watts
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 CCS① 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.

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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 (11) 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.

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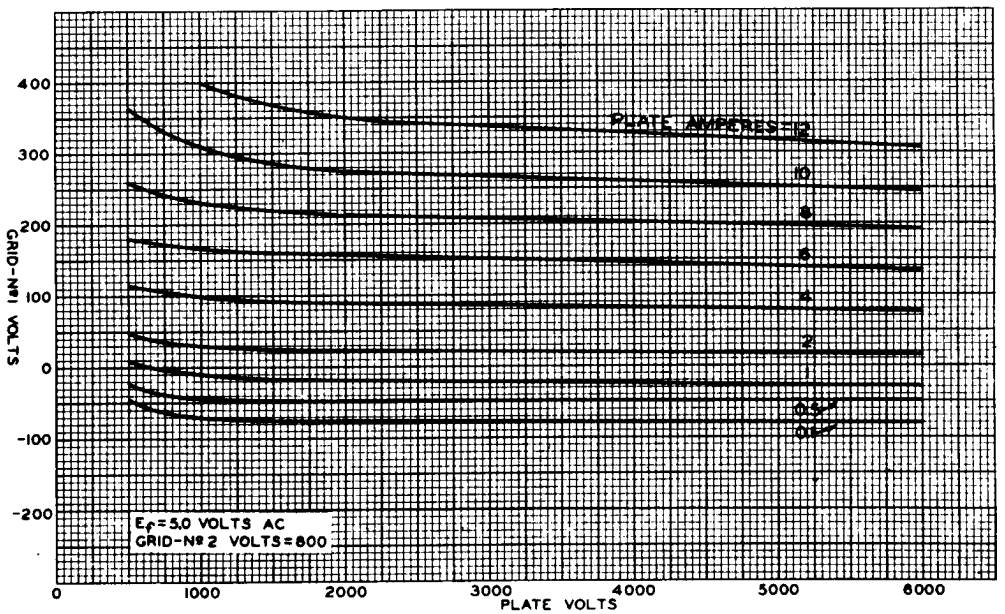
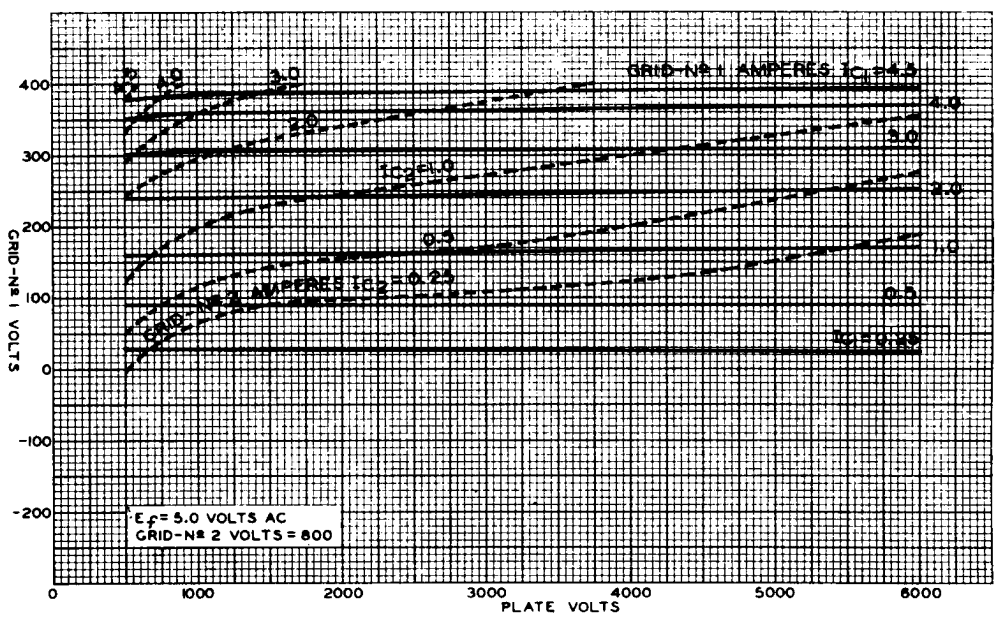
That Federal tubes virtually sell themselves by their performance, is a tribute to the product and the manufacturer.

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.

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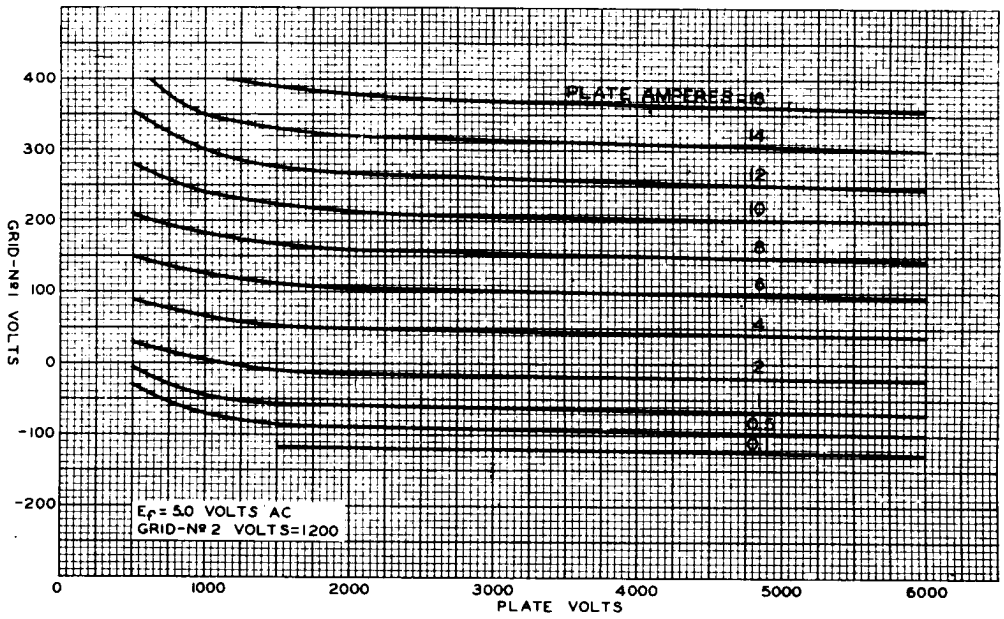

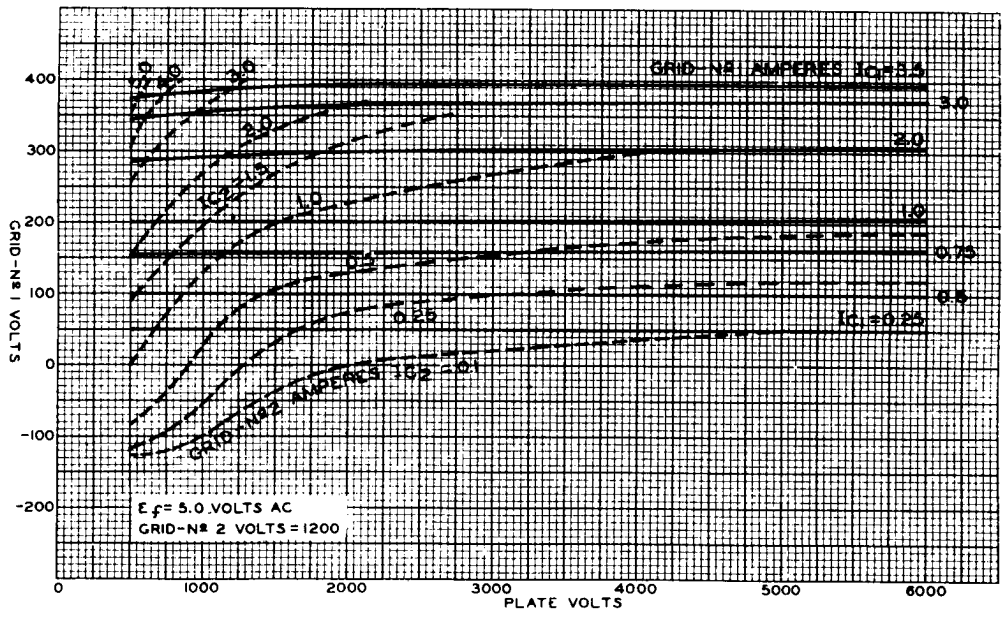

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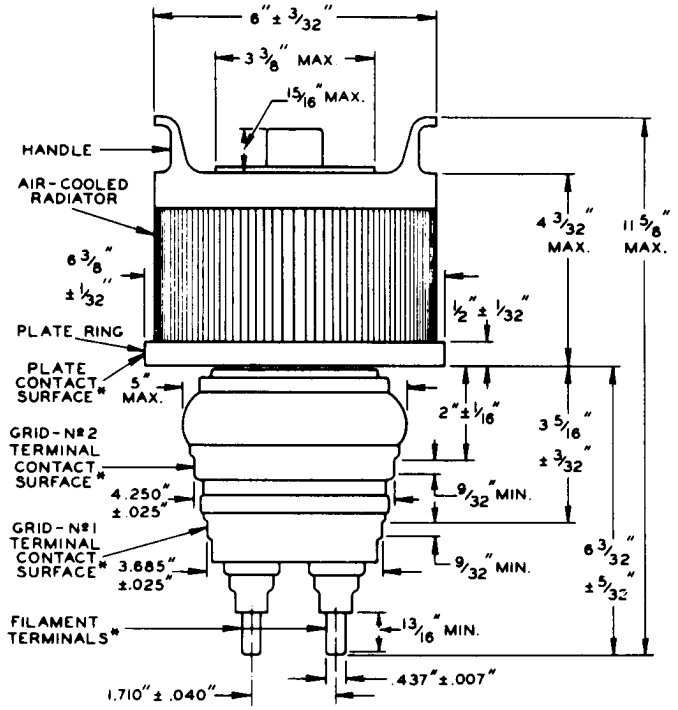
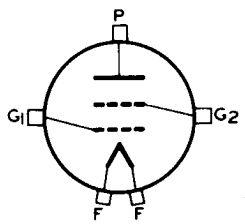
One of the first to manufacture power tubes, Federal experience goes back to the earliest days of the industry.

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 G_1. Proper entry of the tube in the gauge is obtained when the Plate Ring is entirely engaged by hole H_1.



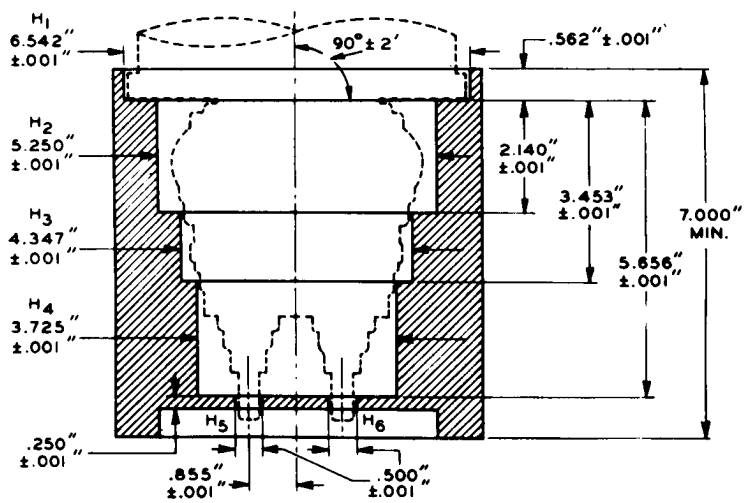
TERMINAL CONNECTIONS

F: FILAMENT POST

G_1: GRID-No. 1 TERMINAL (Adjacent to Filament Posts)

G_2: GRID-No. 2 TERMINAL (Between Grid-No. 1 Terminal and Grid-No. 2 Terminal)

P: PLATE TERMINAL (Ring of Radiator)



The four cylindrical holes H_1, H_2, H_3, and H_4 have axes coincident within 0.001". The holes H_5 and H_6 have axes parallel to the axes of H_1, H_2, H_3, and H_4 within 0° ± 2".

Form F-694 Printed in U.S.A.

Federal Telephone and Radio Company
A Division of INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION
100 Kingsland Road — COMPONENTS DIVISION • VACUUM TUBE DEPARTMENT — Clifton, New Jersey