

PHILIPS SPECTRAL LAMPS

- 8 all-quartz sources for work in the UV range
- All lamps require the same current

For Spectral Calibration Sources see page 65.

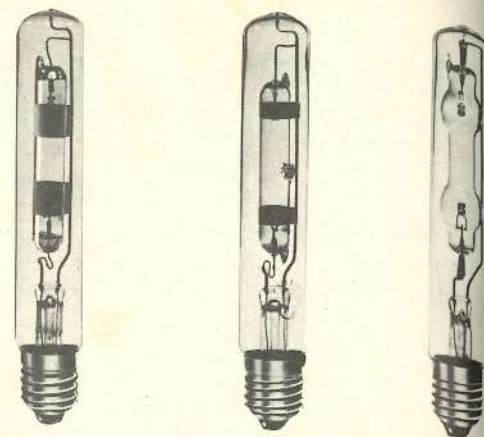
This series of Philips Spectral Lamps considerably extends the range of readily available monochromatic sources. All Philips lamps have the same electrical characteristics and are the same size so they provide ideal, immediately interchangeable sources.

The lamps consist of a small discharge tube surrounded by a cylindrical outer bulb. The discharge tube contains a gas, a metallic vapor, or a mixture of both; the electrodes provide for a high current density. This results in an intense source.

For use in the visible region of the spectrum from 400-700nm lamps with an outer bulb of glass are provided. For ultraviolet work in the region 210-400nm, the bulb and discharge tube are both of quartz.

Slight manufacturing variances preclude stating precise absolute energy output figures. Moreover, the spectral energy distribution changes during lamp life due to selective absorption rather than absolute failure of the discharge. Operating environment, frequency of turn-on, and applied current also affect useful life which is generally 100-200 hours.

All Philips Spectral Lamps must be operated base down. The lamps are 171.5mm high overall with an outside diameter of 30mm. They all emit their radiation from the same area, the optimum point being 111mm from the tip of the base cap. The lamps may be fitted into any Edison screw socket.



The 27-1254 Philips Lamp Housing (on pg. 64) is particularly recommended when using these lamps with Ealing Optical Benches.

The 26-2683 Universal Spectral Lamp Supply listed on the page is recommended for these lamps. The supply provides about 500 volts for striking and a steady .9 ampere current operation. These lamps must not be connected directly to the line as they require a ballast.

See Spectral Lamp Interference Filters on page 162.

Catalog Number	Type	Symbol	Burner	Material Envelope	Operating Current Amperes	Wattage	Arc Length mm
26-2709	Mercury (low pressure)	Hg	Quartz	Glass	0.9	15	40
26-2717	Mercury (high pressure)	Hg	Quartz	Glass	0.9	90	30
26-2725	Cadmium	Cd	Quartz	Glass	0.9	25	30
26-2733	Zinc	Zn	Quartz	Glass	0.9	25	30
26-2741	Mercury, Cadmium & Zinc	Hg, Cd, Zn	Quartz	Glass	0.9	90	30
26-2758	Helium	He	Glass	Glass	0.9	45	32
26-2766	Neon	Ne	Glass	Glass	0.9	25	40
26-2774	Argon	A	Glass	Glass	0.9	15	40
26-2782	Krypton	Kr	Glass	Glass	0.9	15	40
26-2790	Xenon	Xe	Glass	Glass	0.9	10	40
26-2808	Sodium	Na	Glass	Glass	0.9	15	40
26-2816	Rubidium	Rb	Glass	Glass	0.9	15	40
26-2824	Cesium	Cs	Glass	Glass	0.9	10	40
26-2832	Potassium	K	Glass	Glass	0.9	10	40
26-2857	Mercury (low pressure)	Hg	Quartz	Quartz	0.9	15	40
26-2865	Mercury (high pressure)	Hg	Quartz	Quartz	0.9	90	30
26-2873	Cadmium	Cd	Quartz	Quartz	0.9	25	30
26-2881	Zinc	Zn	Quartz	Quartz	0.9	25	30
26-2899	Mercury, Cadmium & Zinc	Hg, Cd, Zn	Quartz	Quartz	0.9	90	30
26-2907*	Indium*	In	Quartz	Quartz	0.9	25	25
26-2915	Thallium	Tl	Quartz	Quartz	0.9	20	30
26-2923	Gallium	Ga	Quartz	Quartz	0.9	20	30

*This lamp requires the use of a Tesla coil to initially cause it to strike. However, it strikes successfully with the 26-2683 Universal Spectral Lamp Supply listed on the next page.

WOTAN SPECTRAL LAMPS

- 12 lamps cover most laboratory application
- Glass or quartz arc tube is sealed inside glass outer envelope to give insulation and protection.

Note that these Lamps have recently been physically redesigned. They are a different height and have a new 9 pin instead of a bayonet base. Pay particular attention to the Housing required. These are listed on page 64

For Spectral Calibration Sources see page 65

This justly famous series of gas discharge lamps can be used in a wide variety of applications requiring monochromatic radiation since light intensity remains very constant.

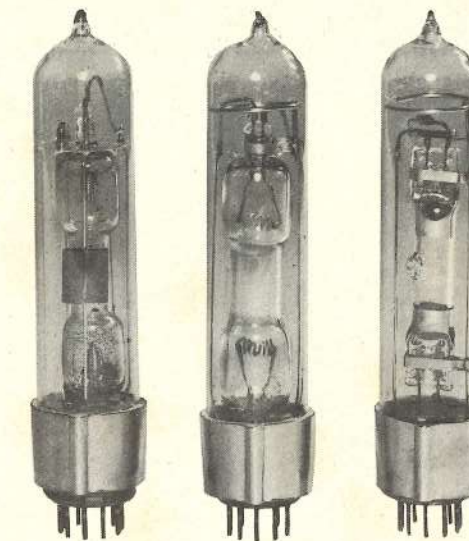
The glass or quartz tube containing the gas or metal vapor whose spectrum is desired is sealed in an envelope that provides thermal insulation and mechanical protection. The material of the envelope is stated in the table below and depends on the particular spectral region; it is either ordinary glass or a special glass which transmits down to a wavelength of 280nm.

Lamp 27-1155 has an opening in the outer envelope which allows transmission of radiation down to 230nm.

These lamps are 107mm high overall with an outside diameter of 21mm. They all emit radiation from the same space within the tube, with the optimum portion of the arc being 43mm above the bottom of the tube. See the Wotan Lamp Housings listed on Page 64

The base of these lamps is a standard 9 pin radio tube type. (Pico 9, DIN 41 539 BL2.)

Two types of housing are available. One accepts the lamps directly while the other requires a special adapter to convert to the old style Wotan bayonet fitting. If the latter system is used the lamps will be interchangeable with old style Wotan lamps.



All of these lamps operate at a current of 1 ampere which allows for complete interchangeability when operating from a common power supply.

These Lamps are for AC operation, they require a starting potential of 220 volts and must be used with a series resistance or choke coil to protect the filament. The 26-2931 Wotan Spectral Lamp Supply and the 26-2683 Universal Spectral Lamp Supply, both listed on Page 64 are recommended. The Wotan Spectral Lamps must not be connected directly to 230 volt AC lines.

These lamps, with the exception of the neon and helium lamps, take several minutes to warm up before reaching full intensity.

See the Wotan Lamp Holders on Page 64.

See Lamp supplies on Page 64.

See Spectral Lamp Interference Filters on Page 162.

WOTAN SPECTRAL LAMPS SPECIFICATION

Catalog Number	Type	Burner	Material Envelope	Operating Potential Volts	Operating Current Amperes	Power Dissipated in Lamp Watts	Light Intensity Candela	Emitting Height mm	Surface Width mm	Surface Brightness Stilb	Old Ealing Cat. No. for reference only (Nearest equivalent)
27-1106	Cadmium	Quartz	Glass*	15	1.0	15	1.2	15	6	2	26-2204
27-1114	Cesium	Glass	Glass	10	1.0	10	0.3	15	6	0.2	26-2220
27-1122	Helium	Glass	Glass	60	1.0	55	2.0	15	8	1.5	26-2246
27-1130	Mercury	Quartz	Glass*	50	1.0	40	90	20	8	110	26-2261
27-1148	Mercury & Cadmium	Quartz	Glass*	30	1.0	25	10	20	8	15	26-2287
27-1155	Mercury (Hg3)	Quartz	Glass†	50	1.0	40	40	25	6	40	26-2295
27-1163	Potassium	Glass	Glass	10	1.0	10	0.04	15	6.5	0.02	26-2303
27-1171	Sodium	Glass	Glass	15	1.0	15	40	15	6.5	15	26-2329
27-1189	Neon	Glass	Glass	30	1.0	30	3.5	15	8	1.5	26-2360
27-1197	Rubidium	Glass	Glass	10	1.0	10	0.2	15	6	0.1	26-2386
27-1205	Thallium	Quartz	Glass*	15	1.0	15	1.5	8	3	3.5	26-2402
27-1213	Zinc	Quartz	Glass*	15	1.0	15	0.5	15	6	0.7	26-2428

*Transmits to 280nm

†Constant light emission plus an outer envelope opening extending the UV range to 230nm

26-2683 UNIVERSAL SPECTRAL LAMP SUPPLY

Operates all Wotan and Philips Spectral Lamps. This power supply provides precise .9 to 1.5 ampere current adjustment to give optimal performance with all Spectral Lamps. A high voltage push-to-start button is used with the Philips Lamps.

The ammeter front panel permits current adjustment corresponding to the specified value of each lamp. A coarse adjustment selector-switch marks the current ranges applicable to Philips and Wotan lamps. A fine adjustment knob then sets the current exactly. Weight 9 kg. Operates from 115V, 60Hz or 230V, 50Hz supply.



26-2683

27-1247 WOTAN LAMP HOUSING, BAYONET BASE

This housing accepts the old style bayonet base lamps and the 27-1221 Adapter below. Optical centerline is the same regardless of which lamp fitting is used. The lamphouse may be mounted on Ealing Optical Bench Carriers by using the 22-5128 Assortment of Screws listed on page 224

The lamp must always be operated base down. Provided with a 1.8M cord with a plug to fit the 26-2683 Universal Spectral Lamp Supply above.



27-1221

27-1221 WOTAN ADAPTER SOCKET

Adapts from old style bayonet sockets to new type lamps with 9 pin bases maintaining a common center height. For use with old lamp housing 27-1239.

27-1239 WOTAN LAMP HOUSING, 9 PIN BASE

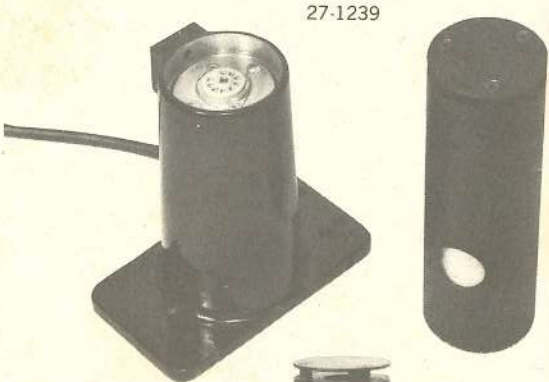
Accepts only the new Wotan Lamps with the 9 pin base.

The socket is mounted in a heavy aluminum base. The removable aluminum shield has a 19mm diameter hole which is centered on the brightest portion of the arc.

This housing may be set directly on a table when the aperture will be 158mm above the table.

This housing may also be mounted directly on an Ealing Optical Bench Carrier by using the 22-5128 Assortment of Screws listed on page 224 The brightest portion of the arc and the hole in the shield are set at the standard optical bench center line height.

The lamp must always be operated base down. Provided with a 1.8m cord with a plug for attaching to the 26-2683 Universal Spectral Lamp Supply above.



27-1239

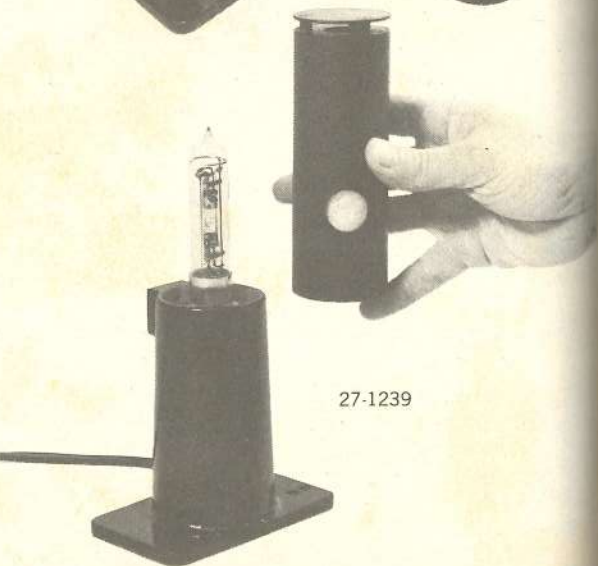
27-1254 PHILIPS LAMP HOUSING

Identical to the 27-1239 Wotan Lamp Housing except that the appropriate screw socket for Philips Spectral Lamps has been substituted for the Wotan socket.

27-1270 HOLDER FOR FILTERS AND IRIS DIAPHRAGM

This sturdy mounting baffle will accept common 25 and 50mm diameter and 50mm square filters, frosted glass windows, etc., with the clips supplied. The 22-3917 Utility Iris Diaphragm on page 169 may also be fitted. Includes screws to attach to all lamp-houses above.

For filters see pages 146 through 166.



27-1239

EALING SPECTRAL CALIBRATION SOURCES

See Color Filters on pages 148 to 157
See Interference Filters on pages 158 to 162

This is a series of five highly stable gas discharge sources for use as reference standards and in the calibration of optical instruments. They are listed on the following two pages, each with its recommended power supply.

Radiation is emitted in characteristic spectral lines which may be isolated with suitable filters. See the Color Filters on pages 148 to 157 and also the Ealing-TFP Interference Filters on pages 158 to 162.

Read the Technical Notes on the 26-4812 Mercury Spectral Calibration Source on the next page.

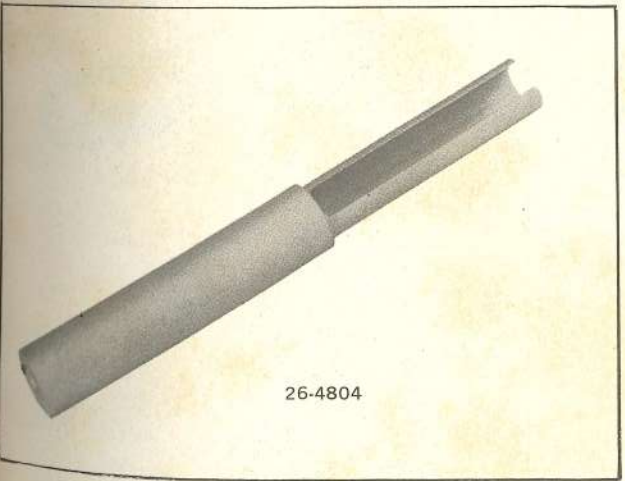
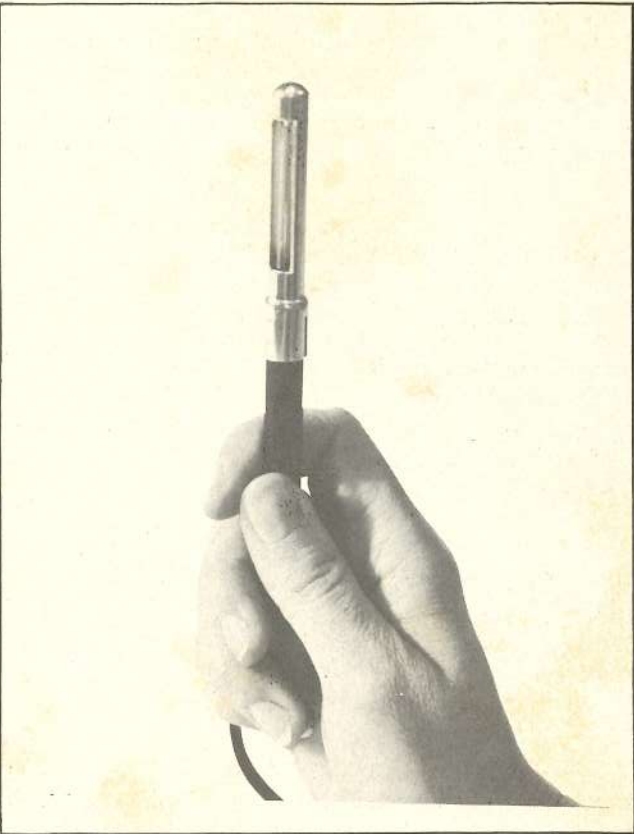
The 26-4804 Pin Holder for Spectral Calibration Sources, listed below, is used to mount these lamps on any Ealing Optical Bench Carrier for Pin Mounted Accessories. Thus, these lamps may be used with all Ealing Optical Tables and Benches.

All sources require 800 volts to start and 270 volts for operation. The power supplies listed with each lamp are recommended. Source power consumption is about 5 watts.

These sources are made from a double bore quartz tube, mounted in a 9.5mm diameter phenolic sleeve with a special insulating resin which prevents rotation of the tube within the sleeve. A two wire, ozone resistant plastic cord is attached for connection to the power supply.

A metal shield with a 5W x 38L mm slot is supplied with all but the 26-4887 Helium Source and fits over the source for protection against accidental damage and reduction of scattered radiation. The Helium Source is fitted with a 9mm diameter glass envelope to prolong source life. The shield, therefore, will not fit the 26-4887 Helium Source and is not supplied with it.

The overall length of all sources is 111mm. The unshielded tube diameter is 6.5mm and length is 54mm.



26-4804

26-4804 PIN HOLDER FOR SPECTRAL CALIBRATION SOURCES

The spring action of this holder is mounted on a standard 13.7mm pin and fits the Carriers for Pin Mounted Accessories listed with each Ealing Optical Bench or Table. The spring action firmly grips the source sleeve and permits the source to be centered on the optical axis of the Ealing Optical Benches and Tables.

Table of Wavelengths

(Air or N ₂)	Lamp	(Air or N ₂)	Lamp	(Air or N ₂)	Lamp
184.91	Hg	430.01	A	696.54	A
194.17	Hg	431.96	Kr	702.41	Ne
226.22	Hg	433.86	A	703.24	Ne
237.83	Hg	435.84	Hg	705.91	Ne
248.20	Hg	436.26	Kr	706.72	A
253.65	Hg	437.61	Kr	717.39	Ne
265.20	Hg	445.39	K	724.52	Ne
280.35	Hg	446.37	K	727.29	A
289.36	Hg	450.24	K	738.40	A
294.51	He	533.08	Ne	743.89	Ne
296.73	Hg	534.11	Ne	748.89	Ne
302.15	Hg	540.06	Ne	750.39	A
312.57	Hg	546.07	Hg	751.46	A
313.17	Hg	556.22	K	753.58	Ne
334.15	Hg	557.03	K	754.41	Ne
336.99	Ne	576.96	Hg	758.74	K
341.79	Ne	579.07	Hg	760.15	K
344.77	Ne	585.25	Ne	763.51	K
346.66	Ne	587.09	K	768.52	K
347.26	Ne	588.19	Ne	769.45	K
352.05	Ne	594.48	Ne	772.38	A
359.35	Ne	597.55	Ne	785.48	K
365.02	Hg	603.00	Ne	794.82	A
365.44	Hg	607.43	Ne	800.62	A
366.33	Hg	609.62	Ne	801.48	A
394.90	A	614.31	Ne	805.95	K
404.44	A	616.36	Ne	810.37	A
404.66	Hg	621.73	Ne	810.44	K
407.78	Hg	626.65	Ne	811.29	K
412.08	He	630.48	Ne	811.53	A
415.86	A	633.44	Ne	819.01	K
416.42	A	638.30	Ne	823.16	Xe
418.19	A	640.23	Ne	826.32	K
419.10	A	650.65	Ne	826.45	A
419.83	A	653.29	Ne	828.01	Xe
420.07	A	659.90	Ne	829.81	K
425.94	A	667.83	Ne	837.76	Ne
427.22	A	671.70	Ne	840.82	A
427.40	Kr	692.95	Ne	842.46	A

TECHNICAL NOTES ON THE 26-4812 MERCURY SPECTRAL CALIBRATION SOURCE

Intensity of Spectral Lines

Independent measurements of the 26-4812 Mercury Source have confirmed that the principal radiation is at the 253nm line where the absolute intensity is 3.9×10^{-2} watts \cdot cm $^{-2}$ \cdot ster $^{-1}$. With reference to this line, the relative intensity of other significant Hg. lines is as follows:

296.5nm	6.0×10^{-3}
302.2nm	1.1×10^{-2}
312.6nm	7.1×10^{-3}
313.2nm	1.1×10^{-2}
365.0nm	8.9×10^{-3}
365.5nm	2.1×10^{-3}
366.3nm	1.4×10^{-3}
404.7nm	8.9×10^{-3}
435.8nm	1.7×10^{-2}
546.1nm	1.2×10^{-2}
577.0nm	1.7×10^{-3}
579.0nm	1.8×10^{-3}

Stability

These lamps are low pressure, low temperature gas discharge lamps and therefore stable in wavelength when operated at a specific current. As is characteristic of the emission from a low pressure gas discharge, the spectral lines are extremely narrow and are excellent for calibration purposes.

When using the 26-4812 Mercury Lamp—

Mercury fill must be evaporated to achieve proper operation. During warm-up the spectrum of the carrier gas, argon, will be stronger than the mercury spectrum. Calibration should not be performed until the lamp has been warmed up for a full two minutes.

26-4812 MERCURY SPECTRAL CALIBRATION SOURCE

For a detailed discussion of this source see above. Complete with shield and power cord for connection to 26-4820 or 26-4937 Supply. Nominal current, 18 milliamps. Rated life, 5000 hours.



An Ealing Spectral Calibration Source held in a 26-4804 Pin Holder mounted on an Ealing Triangular Optical Bench with its Power Supply.

When the intensity of a spectral line is being measured or when the lamp itself is used as a standard, it is preferable to allow the lamp to warm up for 30 minutes.

Rated Life

During testing several 26-4812 Mercury Lamps have been operated continuously for 28,000 hours. A conservative life expectancy for this lamp is 5000 hours.

Lamp Temperature

After 30 minutes, there is no detectable temperature rise.

Intensity Change as a Function of Current

Where a greater intensity of the visible spectral lines is desired, the lamps may be operated at a higher current. The table indicates percentage increases of intensity for the 26-4812 Mercury Lamp spectrum at various operating currents, as compared to a lamp operated at 18ma.

WAVELENGTH	30ma	CURRENT 35ma	40ma
253.7	34%	35%	35%
313.2	100%	83%	150%
365.0	130%	130%	160%
404.7	130%	130%	155%
435.8	125%	130%	150%
546.1	150%	160%	220%

26-4820 POWER SUPPLY FOR 26-4812 MERCURY SPECTRAL CALIBRATION SOURCE, 115V

Open core transformer in metal case with rubber feet, on/off switch, approx. 2.5m line cord, approx. 1m cord to interconnect with source cord. 14 watts. 89H x 64D x 140L mm. For 115V, 60Hz AC.

26-4937 POWER SUPPLY FOR 26-4812 MERCURY SPECTRAL CALIBRATION SOURCE, 230V

As 26-4820 above but for 230V, 50Hz AC.

See Color Filters on pages 148 to 157.
See Interference Filters on pages 158 to 162.
For Pin Holder see 26-4804 on preceding page.

26-4838 KRYPTON SPECTRAL CALIBRATION SOURCE

Complete with shield and power cord for connection to 26-4853 or 26-4945 Supply. Nominal current, 10 milliamps. Rated life, 1000 hours.

26-4846 ARGON SPECTRAL CALIBRATION SOURCE

Complete with shield and power cord for connection to 26-4853 or 26-4945 Supply. Nominal current, 10 milliamps. Rated life, 500 hours.

26-4853 POWER SUPPLY FOR 26-4838 KRYPTON AND 26-4846 ARGON SPECTRAL CALIBRATION SOURCE, 115V

As 26-4820 Mercury Supply on preceding page but with proper current limiting for the 26-4838 Krypton and the 26-4846 Argon Spectral Calibration Source. For 115V, 60Hz AC.

26-4945 POWER SUPPLY FOR 26-4838 KRYPTON AND 26-4846 ARGON SPECTRAL CALIBRATION SOURCE, 230V

As 26-4853 above but for 230V, 50Hz AC.



26-4861 NEON SPECTRAL CALIBRATION SOURCE

Complete with shield and power cord for connection to 26-4895 or 26-4978 Supply. Nominal current, 6 milliamps. Rated life, 500 hours.

26-4879 XENON SPECTRAL CALIBRATION SOURCE

Complete with shield and power cord for connection to 26-4895 or 26-4978 Supply. Nominal current, 6 milliamps. Rated life, 500 hours.

26-4895 POWER SUPPLY FOR 26-4861 NEON AND 26-4879 XENON SPECTRAL CALIBRATION SOURCE 115V

As 26-4820 Mercury Supply on preceding page but with proper current limiting for the 26-4861 Neon, the 26-4879 Xenon, and the 26-4887 Helium Spectral Calibration Sources. For 115V, 60Hz, AC.

26-4978 POWER SUPPLY FOR 26-4861 NEON AND 26-4879 XENON SPECTRAL CALIBRATION SOURCE 230V

As 26-4895 above but for 230V, 50Hz AC.

See Interference Filters on pages 158 to 162.

See Color Filters on pages 148 to 157.

For Pin Holder see 26-4804 on page 65.

