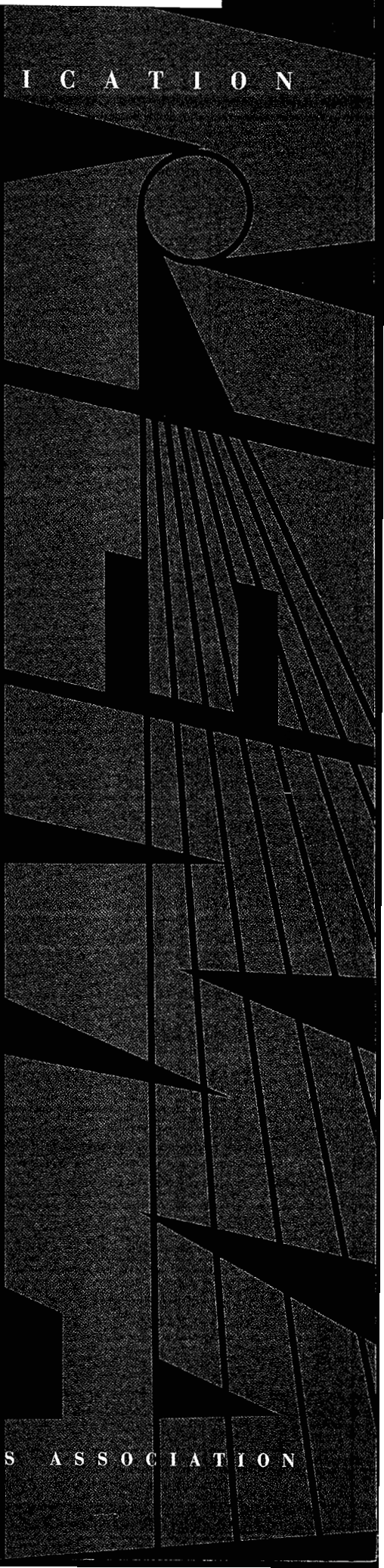
STD.NEMA BL 1-ENGL 1997 ■ 6470247 0513372 43T ■

NEMA STANDARDS PUBLICATION

NEMA BL 1

FLUORESCENT BALLAST CONNECTOR



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NEMA STANDARDS PUBLICATION BL 1-1997

FLUORESCENT BALLAST CONNECTOR

Published by

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FOREWORD

This standard was generated by the NEMA Ballast Section to satisfy the needs for connector compatibility and interchangeability by ballast manufacturers, lighting fixture manufacturers, and users. The standard is a voluntary standard and does not imply that fluorescent lamp ballast connectors must be used or that, if connectors are used, they must be per this standard; only that compatibility and interchangeability are maintained among connectors made per this standard.

Furthermore, the connector set forth in this standard is dimensionally compatible with traditional ballast can cross-sectional sizes. It is anticipated that, in the future, ballast cans will become smaller and that accordingly additional standards will be forthcoming for smaller connectors.

NOTE: The user's attention is called to the possibility that compliance with this Standard may require use of an invention covered by patent rights. By publication of this Standard, no position is taken with respect to the validity of this claim or of any patent rights in connection therewith. The patent holder has, however, filed a statement of willingness to grant a license under these rights on reasonable and non-discriminatory terms and conditions to applicants desiring to obtain such a license. Details may be obtained from the publisher.

In the preparation of this Standards Publication, input of users and other interested parties has been sought and evaluated. Inquiries, comments, and proposed or recommended revisions should be submitted to the concerned NEMA product Subdivision by contacting the:

Vice President, Engineering
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1847
Rosslyn, VA 22209

This Standards Publication was developed by the Ballast Section. Section approval of the standard does not imply that all section members voted for its approval or participated in its development. At the time it was approved, the Ballast Section was comprised of the following members:

Advance Transformer Company—Rosemont, IL
American Electric Lighting—Memphis, TN
Ballastronix, Inc.—Canada
Cooper Lighting HID—Vicksburg, MS
Deltona Lighting Products, Inc.—Memphis, TN
GE Lighting Systems—Hendersonville, NC
Holophane Corp.—Newark, OH
Lutron Electronics Co., Inc.—Coopersburg, PA
MagneTek, Inc.—Huntington, IN
Motorola Lighting, Inc.—Buffalo Grove, IL
O-Z Gedney—Tulsa, OK
OSRAM SYLVANIA, INC.—Danvers, MA
Power Lighting Products, Inc.—El Paso, TX
Robertson Transformer Co.—Blue Island, IL

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Section 1
GENERAL

1.1 SCOPE

This standard covers a connector system for external connections to fluorescent lamp ballasts rated up to 347 volts and 5 amps input. The receptacle with pin assembly of the connector system covered by this standard is permanently mounted. The inclusion in this standard of receptacle assemblies that are not permanently mounted, but are free-standing, is under consideration. It does not cover connectors intended to be connected or disconnected under loaded conditions.

1.2 REFERENCES

Underwriters Laboratories Inc.
333 Pfingsten Road
Northbrook, IL 60062

UL 94	*Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*
UL 486A	*Wire Connectors and Soldering Lugs for Use with Copper Conductors*
UL 840	*Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment*
UL 935	*Fluorescent-Lamp Ballasts*
UL 1977	*Connectors for Data, Signal, Control and Power*

1.3 DEFINITIONS

For the purposes of this standard, the following definitions apply:

contact: A conductive element in a component that mates with a corresponding element to provide an electrical path.

locking mechanism: A mechanical arrangement that holds a plug or connector in position when it is in proper engagement and prevents its unintentional withdrawal.

plug with socket assembly: A connector that is intended to provide power to the ballast and power from the ballast to the lamp and provide a means for attachments to the electrical conductors of the ballast. It consists of a plastic plug housing containing electrical socket contacts.

receptacle with pin assembly: a receptacle that is intended to receive power from the line and provide power to the lamps when coupled with a mating device and that establishes connection between its own conductors and those of the plug assembly. The receptacle with pin assembly is intended to be a permanent part of the ballast. It consists of a plastic receptacle housing containing electrical pin contacts.

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Section 2
GENERAL REQUIREMENTS

2.1 CONSTRUCTION

The ballast receptacle with pin assembly consists of a single row of 9 pins that are equally spaced from one another. The plug with socket shall conform to the basic dimensional and spacing requirements given in Figure 2-1, and the receptacle with pin assembly shall conform to the basic dimensional and spacing requirements given in Figure 2-2.

The plug with socket housing, as shown in Figure 2-1, provides two key ways on the sides of the connector in order to insure proper orientation of the plug as it is being inserted into the receptacle assembly. The plug with socket housing shall be made of a polymeric material and contain the contact terminals that mate with the current carrying pins and the insulated lead wires. The housing provides the through-air and over-surface spacings as required by UL 840 and UL 935.

The receptacle with pin assembly housing shall be made of a polymeric material that houses the current carrying pins and may have an integral locking mechanism that mates to the plug assembly. The housing provides the through-air and over-surface spacings as required by UL 840 and UL 935.

The current carrying parts or pins in the receptacle assembly shall be 0.040 ± 0.001 inches in diameter and shall be of copper or copper alloy and shall be tin plated.

The contact terminals in the plug assembly are designed to mate to the pins of the receptacle assembly and to the insulated lead wire conductors, which shall be 18 gauge minimum. Acceptable materials are tinned copper alloy. Terminal dimensions shall conform to the requirements shown in Figure 2-3.

The locking mechanism holds the plug into the receptacle. It may be integral to the polymeric material, as shown in Figure 2-2, or it may be incorporated into other components of the ballast provided that the configuration provides the minimum retention force required to prevent unintentional removal of the connector assembly and provided that it complies with all the dimensional requirements.

2.2 MARKING

The plug with socket shall have plain, legible marking and shall include (1) the manufacturer's name, trademark, or other identifying symbol, and (2) a designation including the designation of the NEMA wiring diagram. All lead location numbers need not be included, only enough to make all lead locations obvious.

The ballast label shall include markings to identify the correct plug with socket assembly to use, the wiring diagram, and the warning that the connector is not intended to be used for disconnect service.

Industry standard NEMA designations are assigned to plug with socket assemblies based on wiring configuration. These designations shall appear on the ballast label and the plug assembly. These designations are included in Tables 2-1 and 2-2.

2.3 TESTING

2.3.1 General Requirements

Plug with socket and receptacle with pin assemblies shall be designed to provide reliable and safe performance. They shall be tested in accordance with the requirements in UL 935.

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All tests and measurements shall be made at a temperature of 25°C ± 5°C.

Reference plug and receptacle gauges may be developed and specified so individual plugs and receptacles can be tested separately.

2.3.2 Insertion, Withdrawal and Disengagement Forces

2.3.2.1 Insertion Force

The insertion force of a plug into a receptacle shall be 18 lb. maximum.

Compliance shall be checked by measuring the force required to insert a test plug into a permanently mounted 9-lead reference receptacle and a reference plug into a ballast containing a test receptacle.

2.3.2.2 Withdrawal Force

The connector with the latch engaged shall withstand a 20 lb force applied in a direction that would tend to disconnect the plug and receptacle.

Compliance shall be checked by measuring the force required to remove a test plug from a permanently mounted receptacle and a reference plug from a ballast containing a test receptacle. The force gauge should be attached to the leads of the connector and at least 8 inches from the connector.

2.3.2.3 Disengagement Force

The force required to disengage the locking mechanism shall be greater than 3 lb. and less than 20 lb.

Compliance shall be measured by applying a force to the latch perpendicular to the ballast mounting surface with a 1/4 inch diameter rod, while simultaneously applying a withdrawal force of 10 lb.

2.3.2.4 Lead Pull-out Force

Each individual lead in the plug assembly shall withstand a 20 lb. pull without being dislocated or pulled out of the plug.

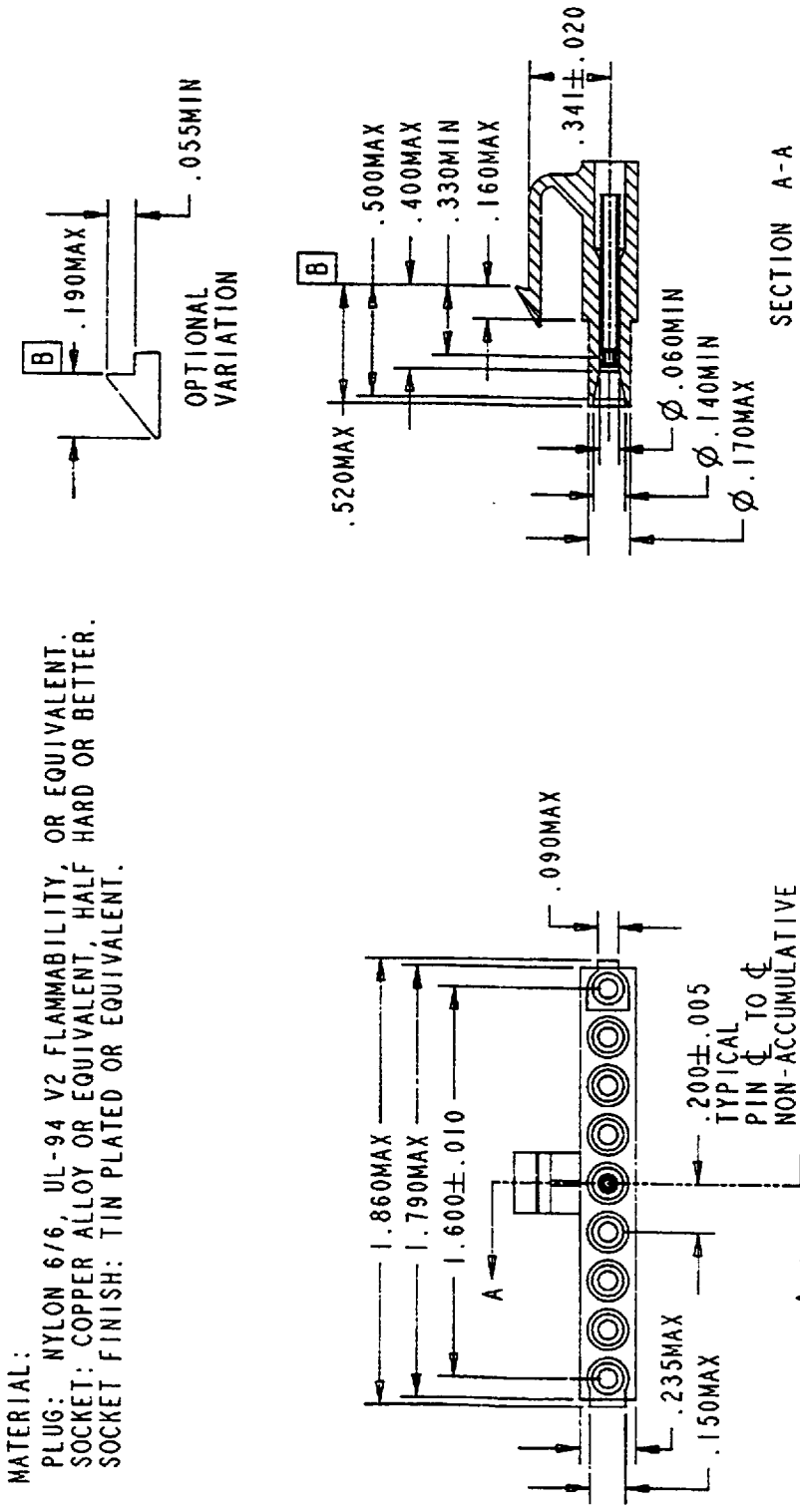
2.4 Application Requirements

Receptacles shall be installed in ballasts as shown in Figure 2-4, where there is one connector per ballast, and as shown in Figure 2-5, where there are two connectors per ballast.

Lead positioning shall be per Tables 2-1 and 2-2 and wiring diagrams 1 through 14 in Figures 2-6 through 2-19.

The connector assemblies are suitable for use in indoor or outdoor type I ballasts.

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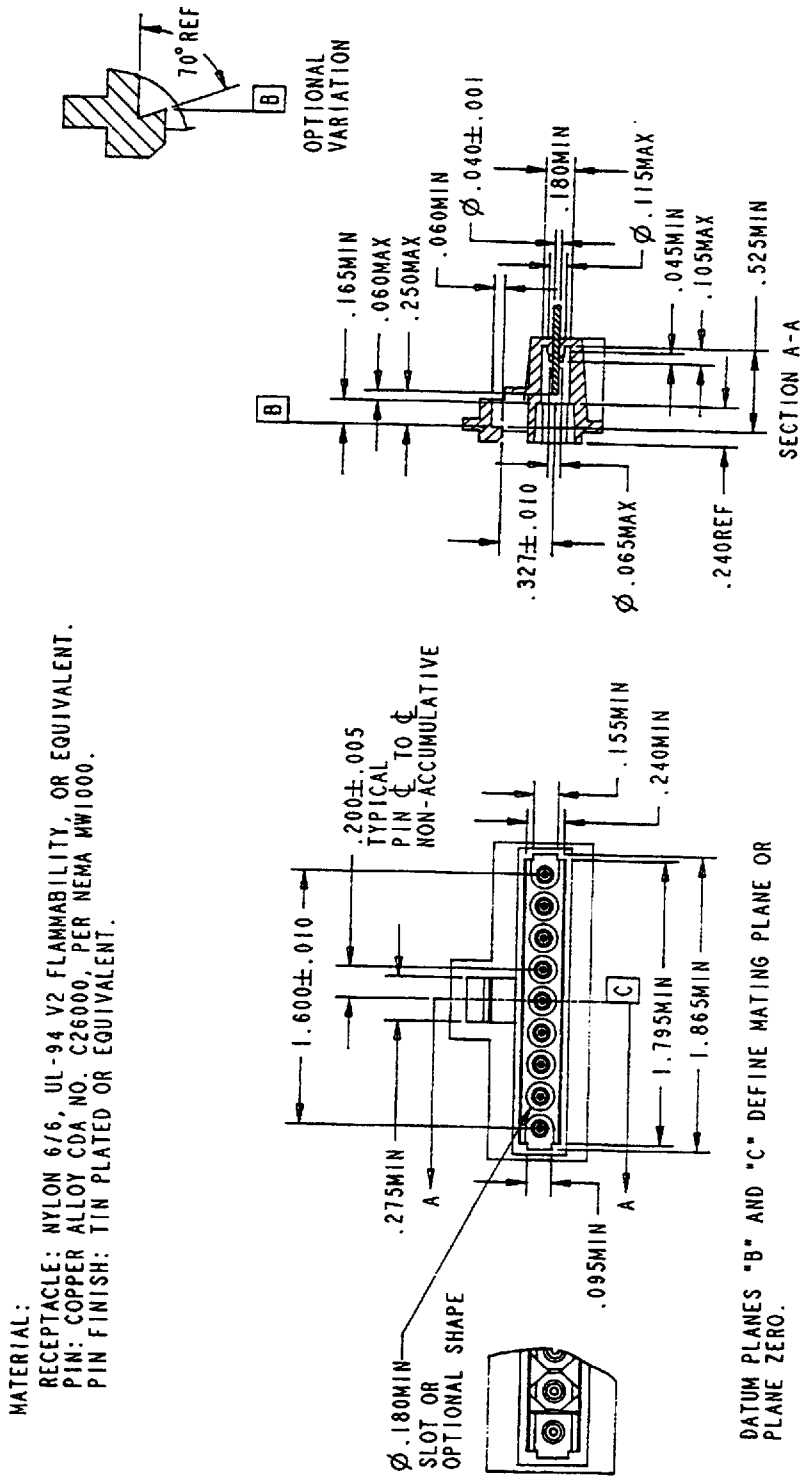
MATERIAL:
PLUG: NYLON 6/6, UL-94 V2 FLAMMABILITY, OR EQUIVALENT.
SOCKET: COPPER ALLOY OR EQUIVALENT, HALF HARD OR BETTER.
SOCKET FINISH: TIN PLATED OR EQUIVALENT.

DATUM PLANES "B" AND "C" DEFINE MATING PLANE OR PLANE ZERO.

Figure 2-1
PLUG WITH SOCKET

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MATERIAL:
RECEPTACLE: NYLON 6/6, UL-94 V2 FLAMMABILITY, OR EQUIVALENT.
PIN: COPPER ALLOY CDA NO. C26000, PER NEMA WW1000.
PIN FINISH: TIN PLATED OR EQUIVALENT.

Figure 2-2
RECEPTACLE WITH PIN ASSEMBLY

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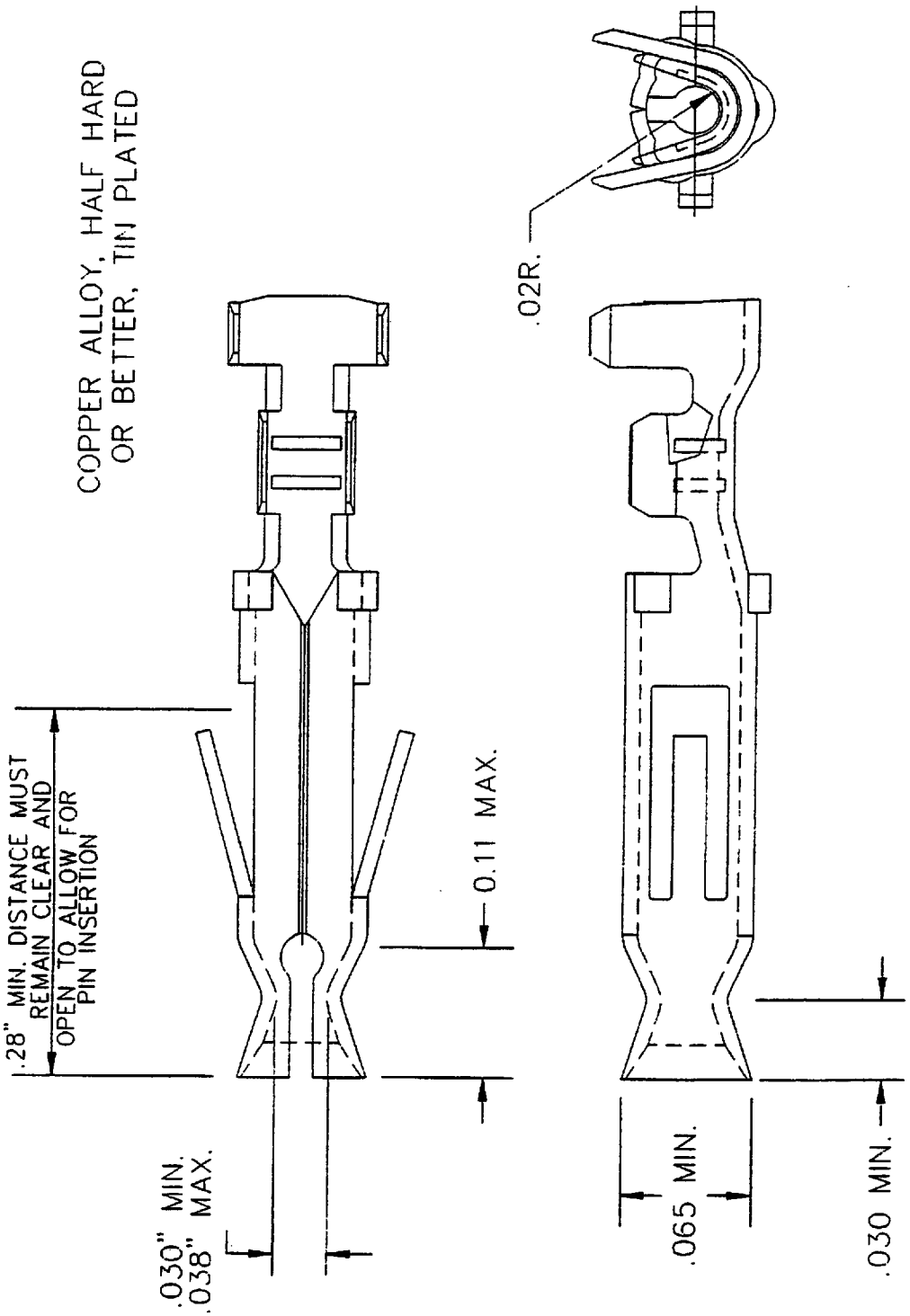


Figure 2-3
TYPICAL TERMINAL

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Table 2-1
LEAD NUMBERS, COLORS, AND POSITIONS FOR VARIOUS LAMP AND BALLAST CIRCUITS

Circuit	NEMA Wiring Diagram Designation	Position/Lead Number and Color								
		1	2	3	4	5	6	7	8	9
1 Lamp R.S.	BL1/WD1	Blk/Wht or Blk	White	...	Blue	Blue	Red	Red	...	...
1 Lamp Bi-pin I.S.	BL1/WD2	Blk/Wht or Blk	White	...	...	Blue	...	Red	...	...
1 Lamp S-pin I.S.	BL1/WD3	Black	...	...		White	...		...	Red
2 Lamp R.S.	BL1/WD4	Black	White	...	Blue	Blue	Red	Red	Yellow	Yellow
2 Lamp Bi-pin I.S.	BL1/WD5	Black	White	...	...	Blue	...	Blue	...	Red
2 Lamp S-pin I.S. (120 V Magnetic)	BL1/WD6	Black	...	...	...	White	...	Blue	...	Red
2 Lamp S-pin I.S. (277 V Magnetic)	BL1/WD7	Black	Brown	...	Brown	White	...	Blue	...	Red
2 Lamp S-pin I.S. (Electronic)	BL1/WD8	Black	White	...	...	Blue	...	Blue	...	Red
3 Lamp Bi-pin I.S.	BL1/WD9	Black	White	...	...	Blue	Blue	Blue	...	Red
4 Lamp Bi-pin I.S.	BL1/WD10	Black	White	...	Blue	Blue	Red	Red	Yellow	Yellow

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Table 2-2
LEAD NUMBERS, COLORS, AND POSITIONS FOR VARIOUS LAMP AND BALLAST CIRCUITS

	NEMA Wiring Diagram	Position/Lead Number and Color																	
Circuit	**Designation**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
3 Lamp (2 & 1) R.S.	BL1/WD11	Blk/ Wht	...	...	Yel	Yel	Wht /Blk	Blu/ Wht	Blu/ Wht	...	Blk	Blu	Blu	Red	Red	Wht	Brown	Brown	...
4 Lamp (2 & 2) R.S.	BL1/WD12	Blk/ Wht	Blu	Blu	Yel	Yel	Wht /Blk	Red	Red	...	Blk	Blu	Blu	Yel	Yel	Wht	Red	Red	...
3 Lamp Series R.S.	BL1/WD13	Blk	Wht	...	Blu/ Wht	Blu/ Wht	...	...	Red	Red	Yel	Yel	...	...	Blu	Blu	...	...	...
3 Lamp I.L.O. R.S.	BL1/WD14	Blk	Wht	...	...	...	...	...	Yel	Yel	Blu	Blu	...	Blu/ Wht	Blu/ Wht	...	Red	Red	...

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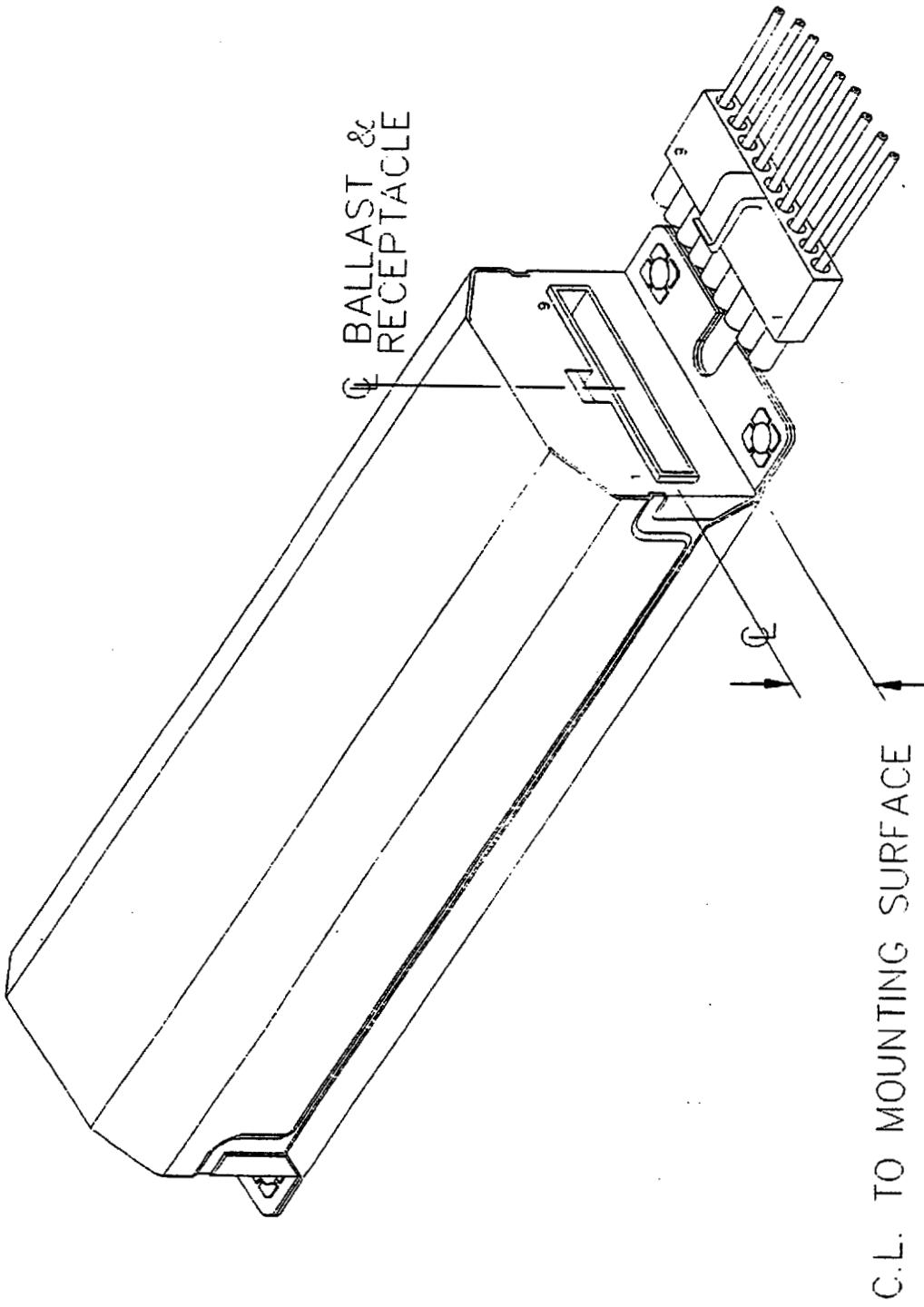


Figure 2-4
BALLAST WITH 1 CONNECTOR

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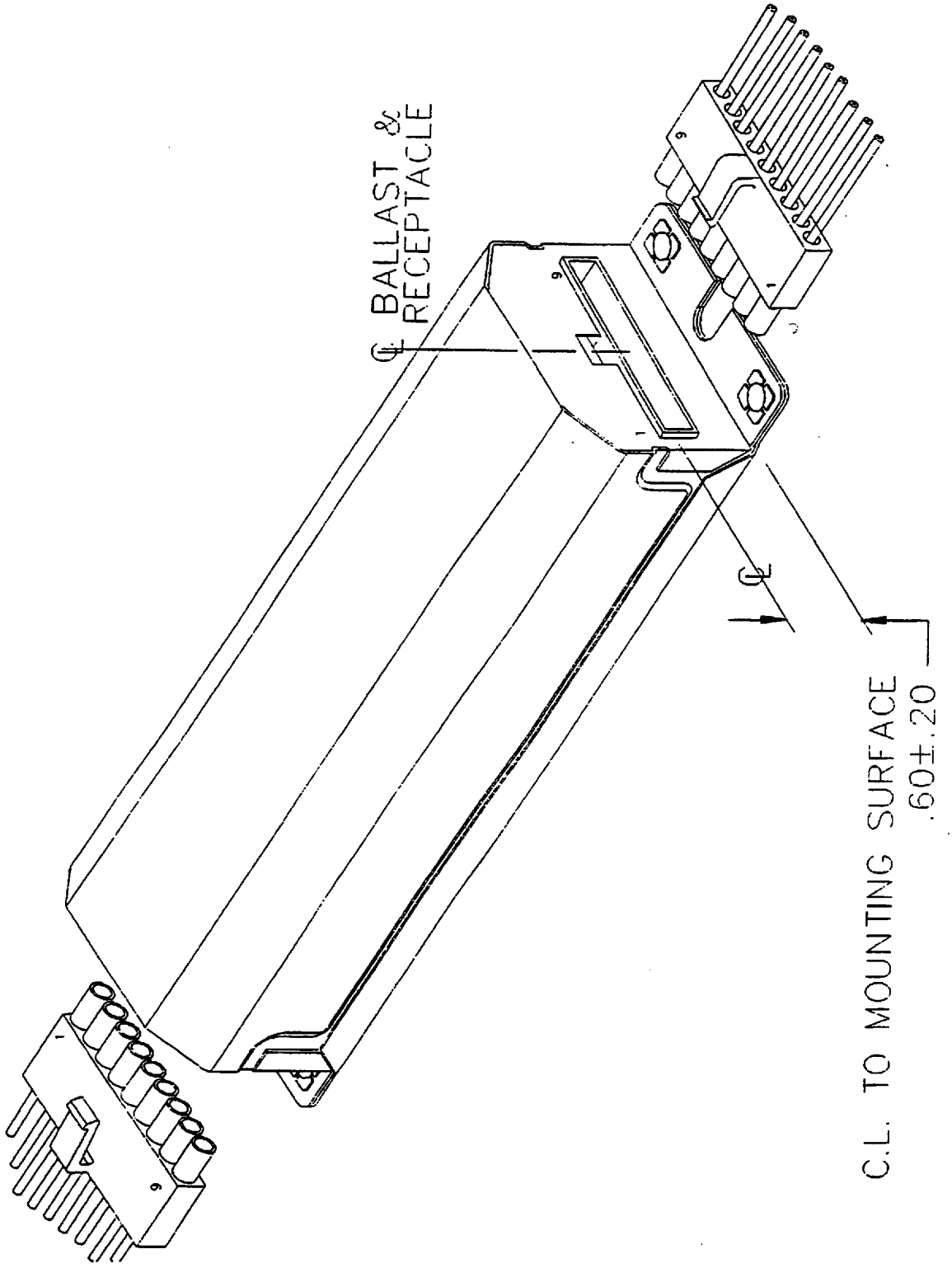


Figure 2-5
BALLAST WITH 2 CONNECTORS

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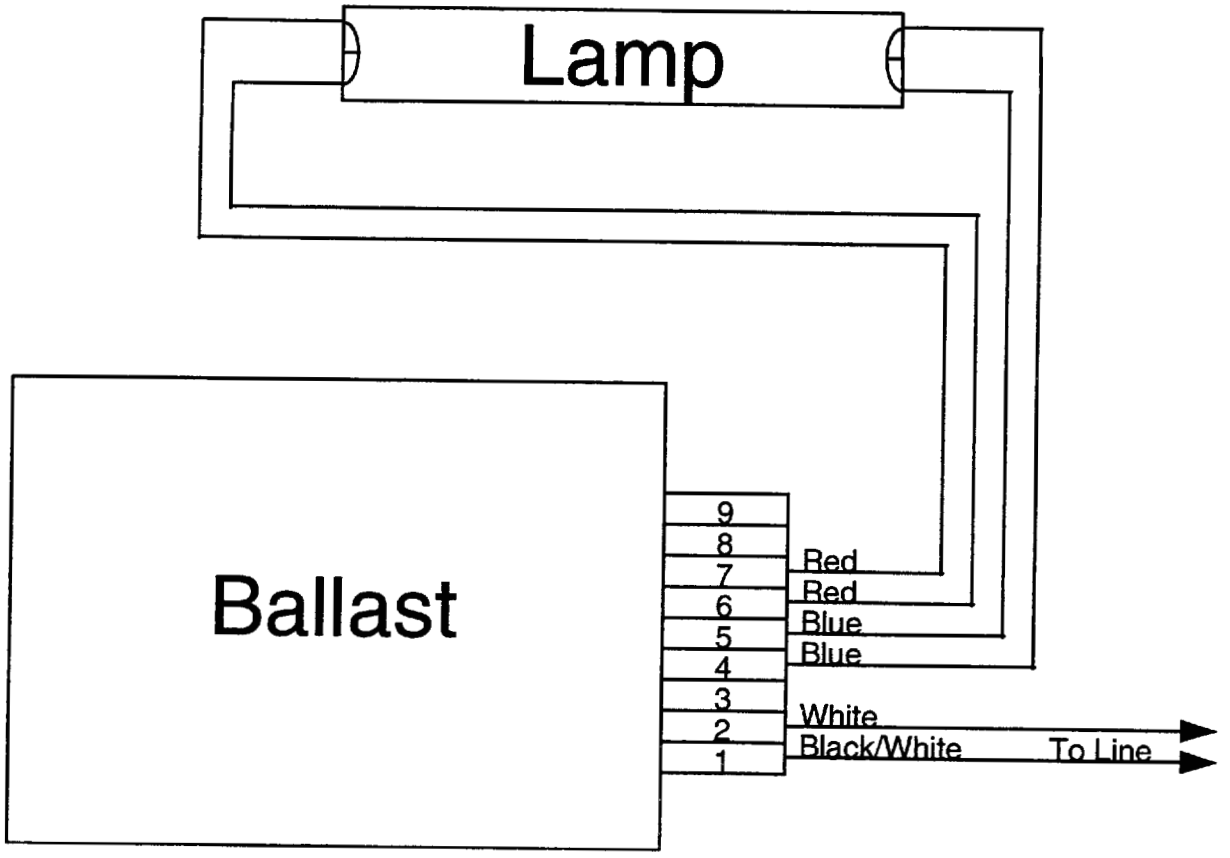


Figure 2-6
WIRING DIAGRAM 1

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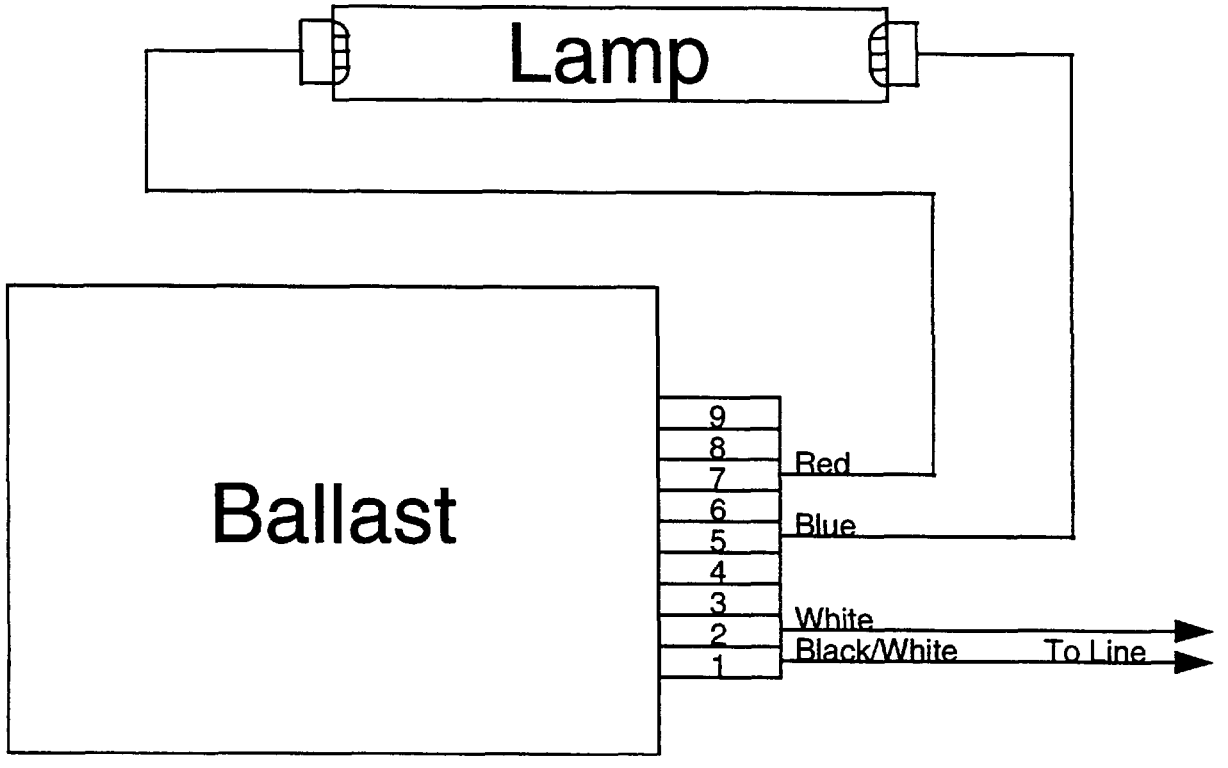


Figure 2-7
WIRING DIAGRAM 2

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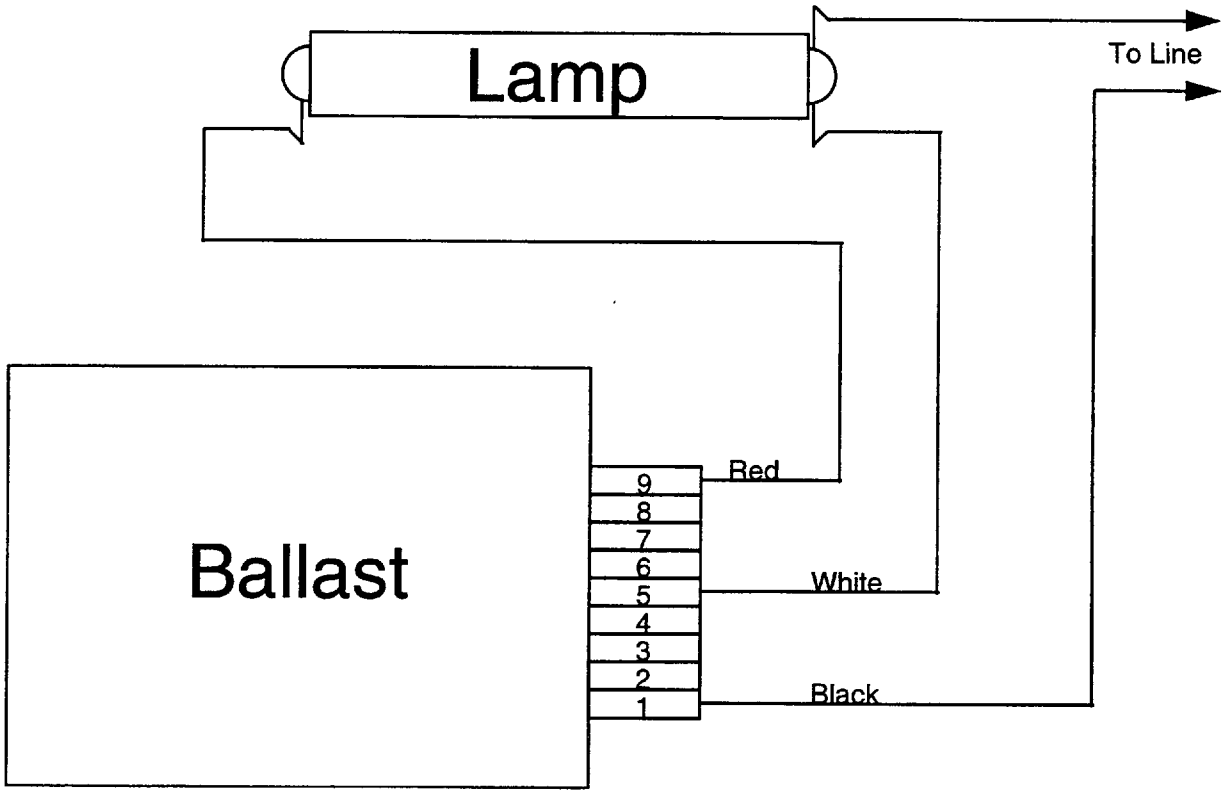


Figure 2-8
WIRING DIAGRAM 3

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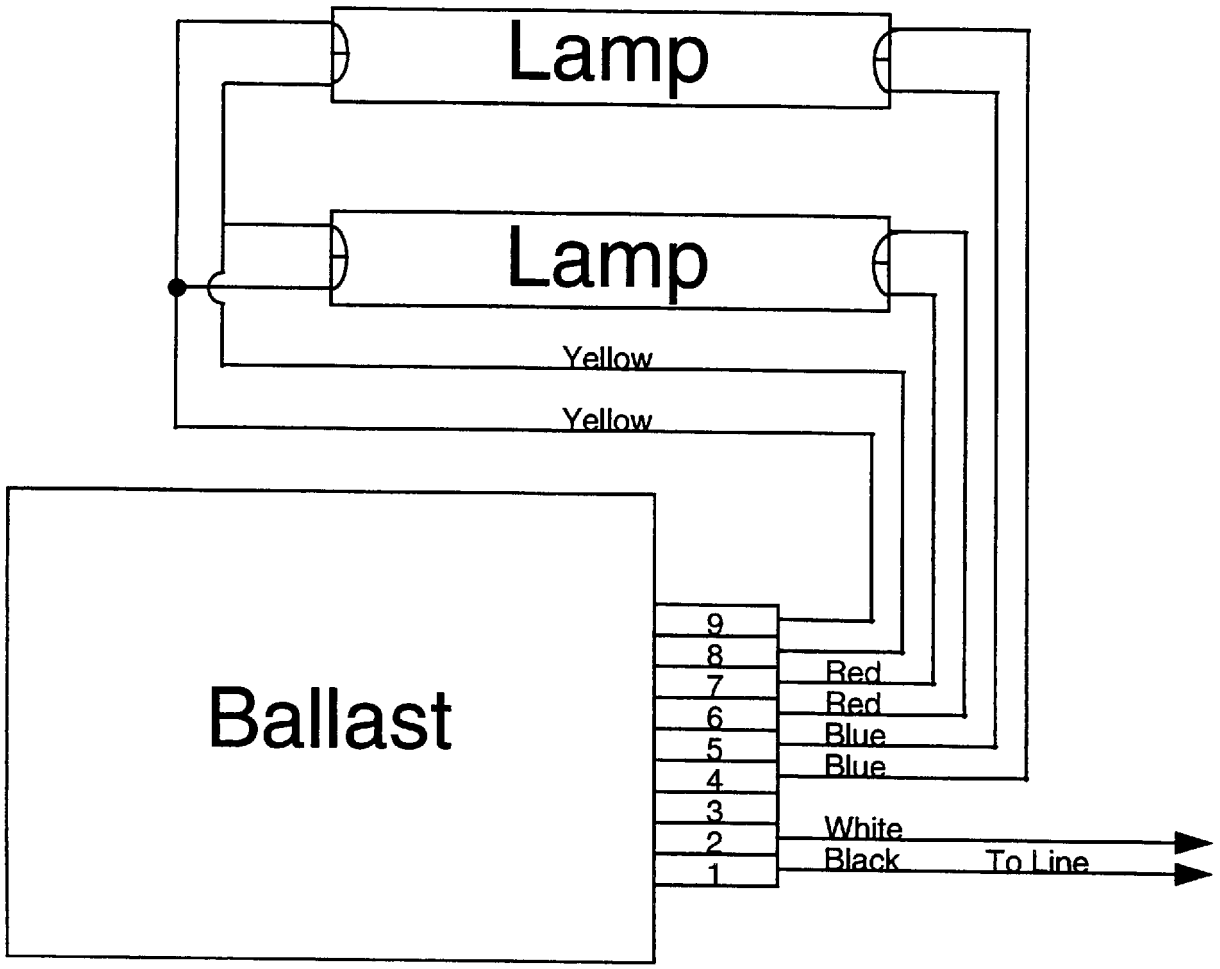


Figure 2-9
WIRING DIAGRAM 4

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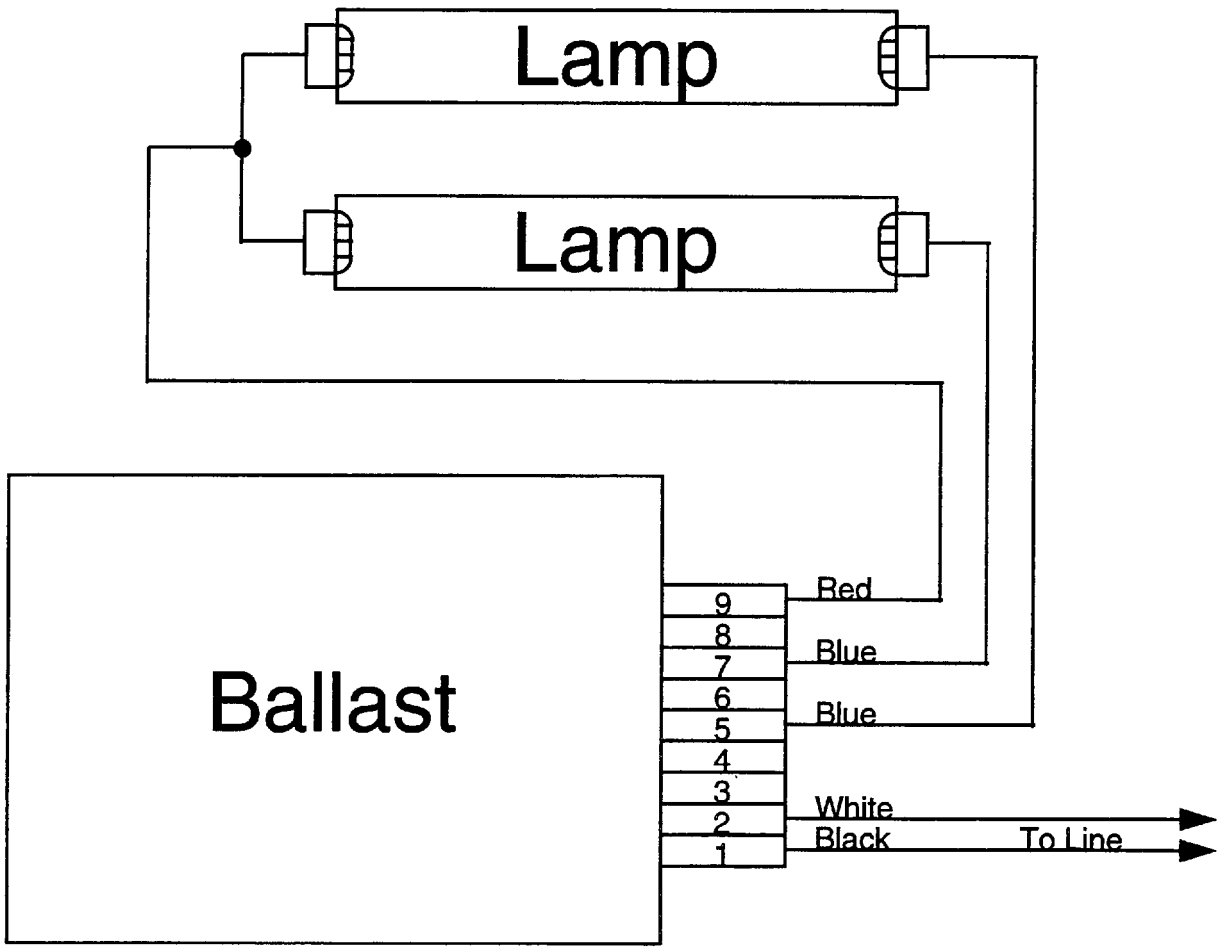


Figure 2-10
WIRING DIAGRAM 5

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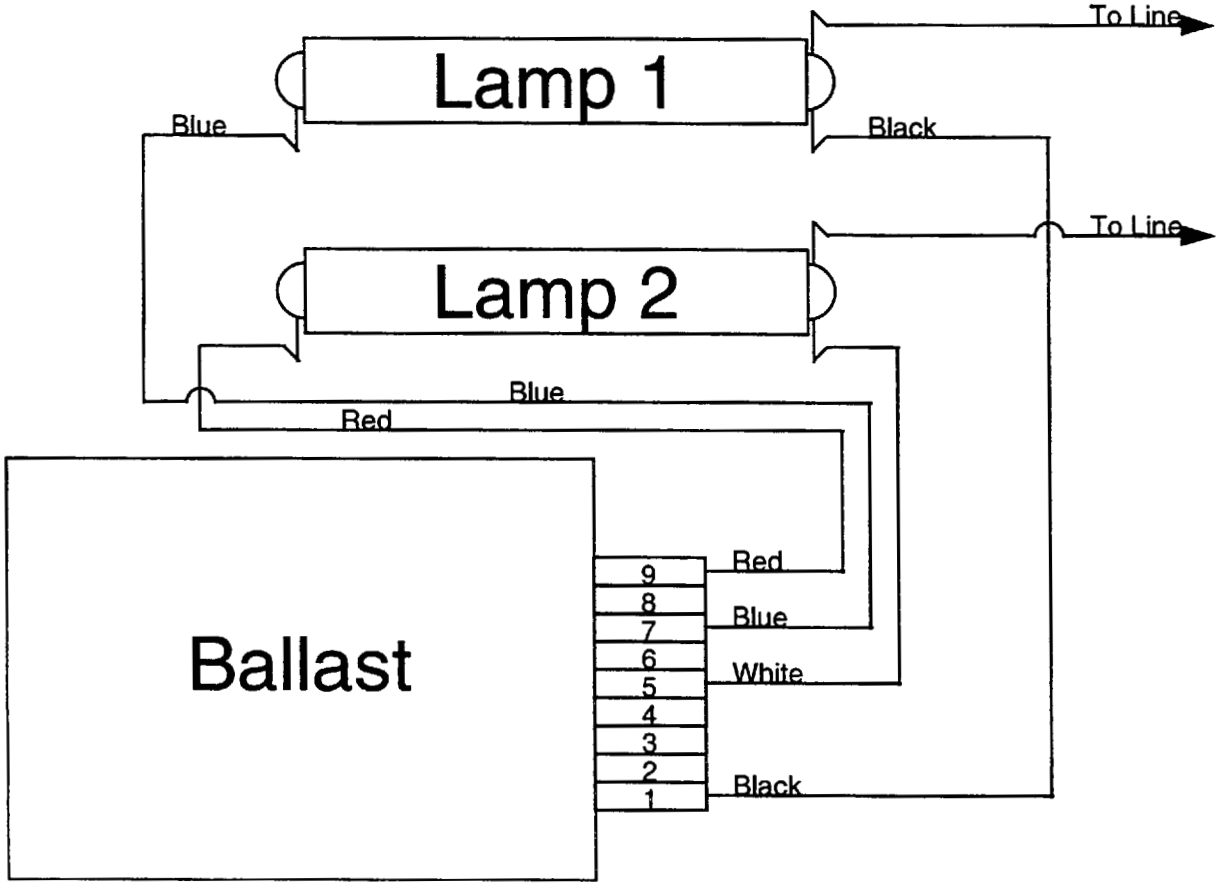


Figure 2-11
WIRING DIAGRAM 6

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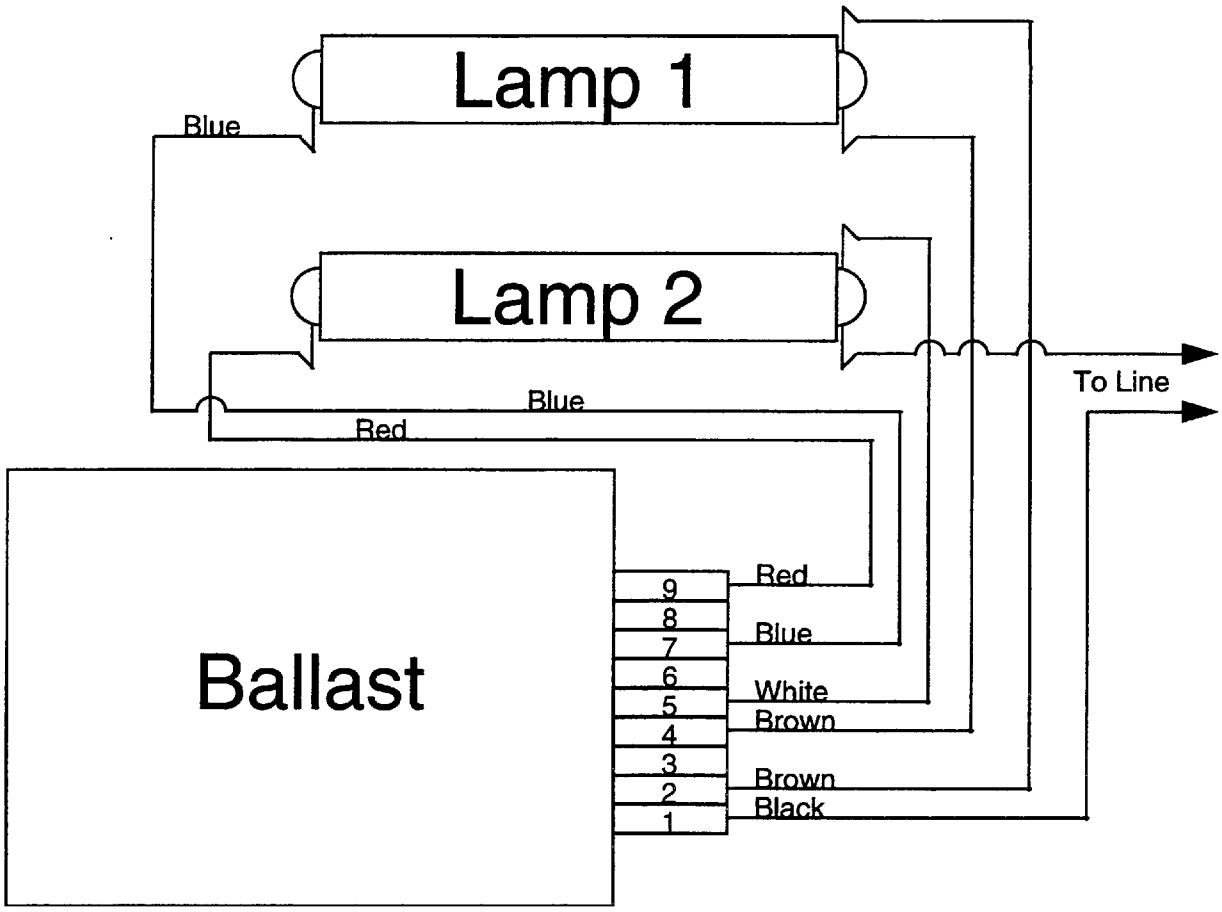


Figure 2-12
WIRING DIAGRAM 7

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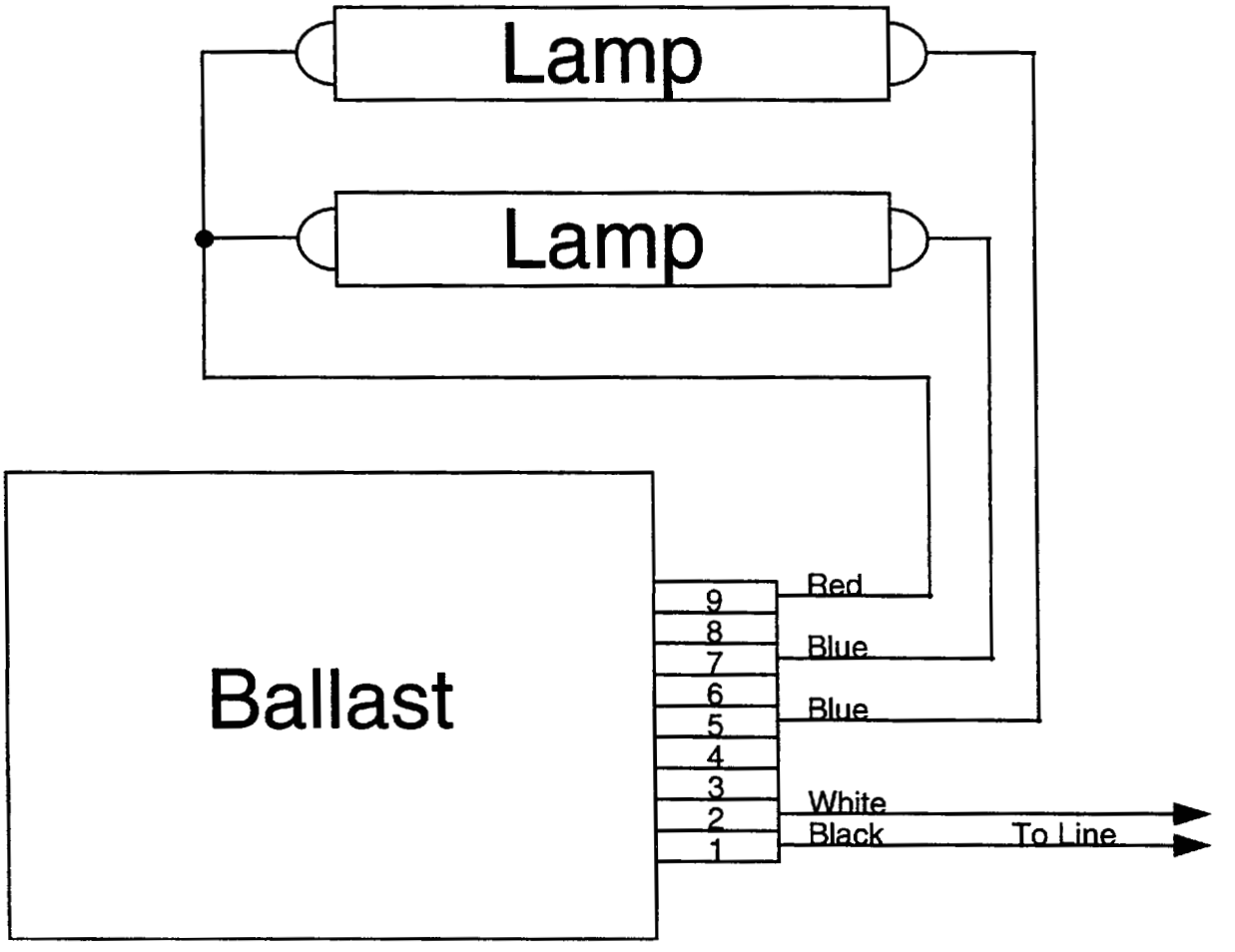


Figure 2-13
WIRING DIAGRAM 8

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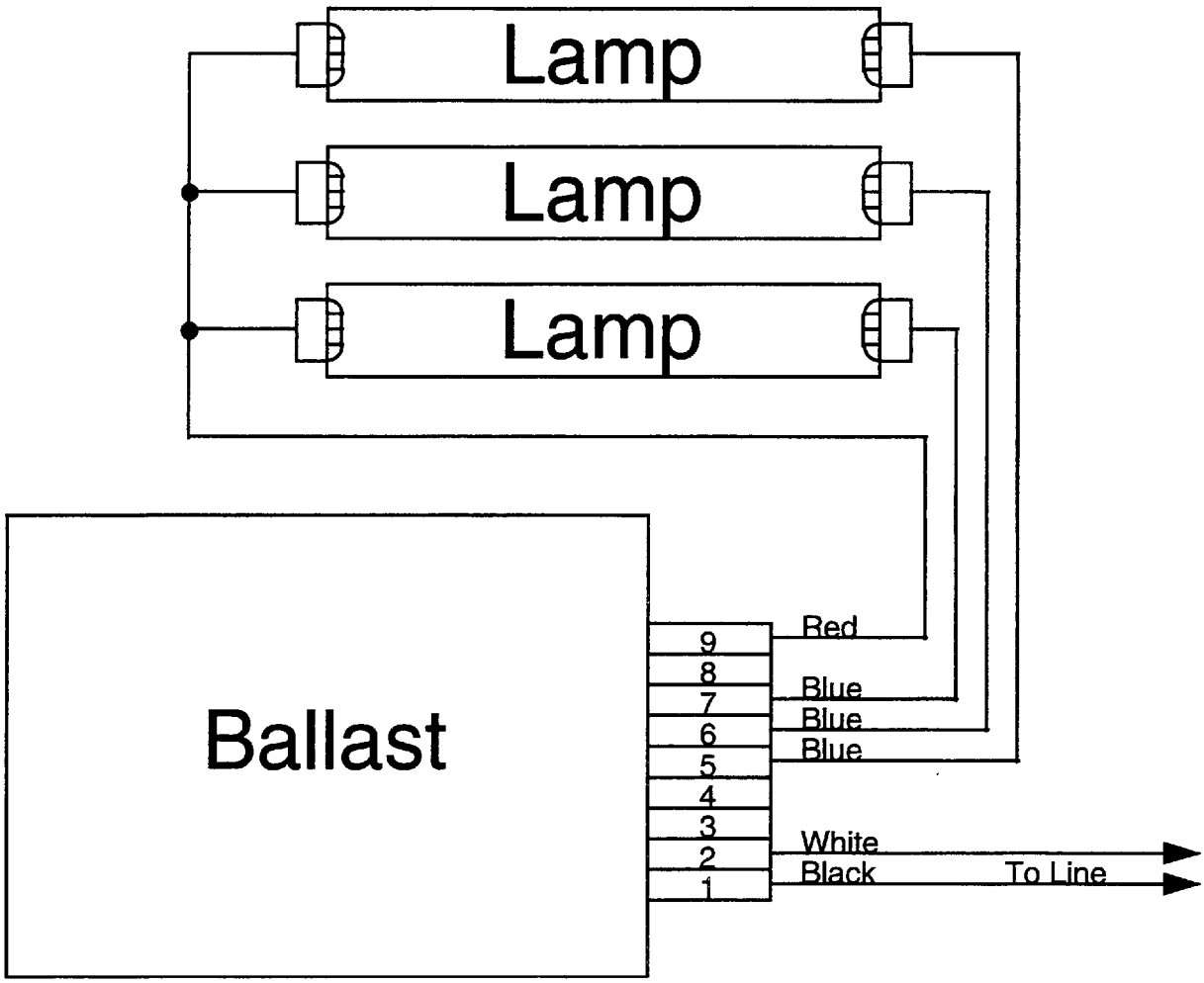


Figure 2-14
WIRING DIAGRAM 9

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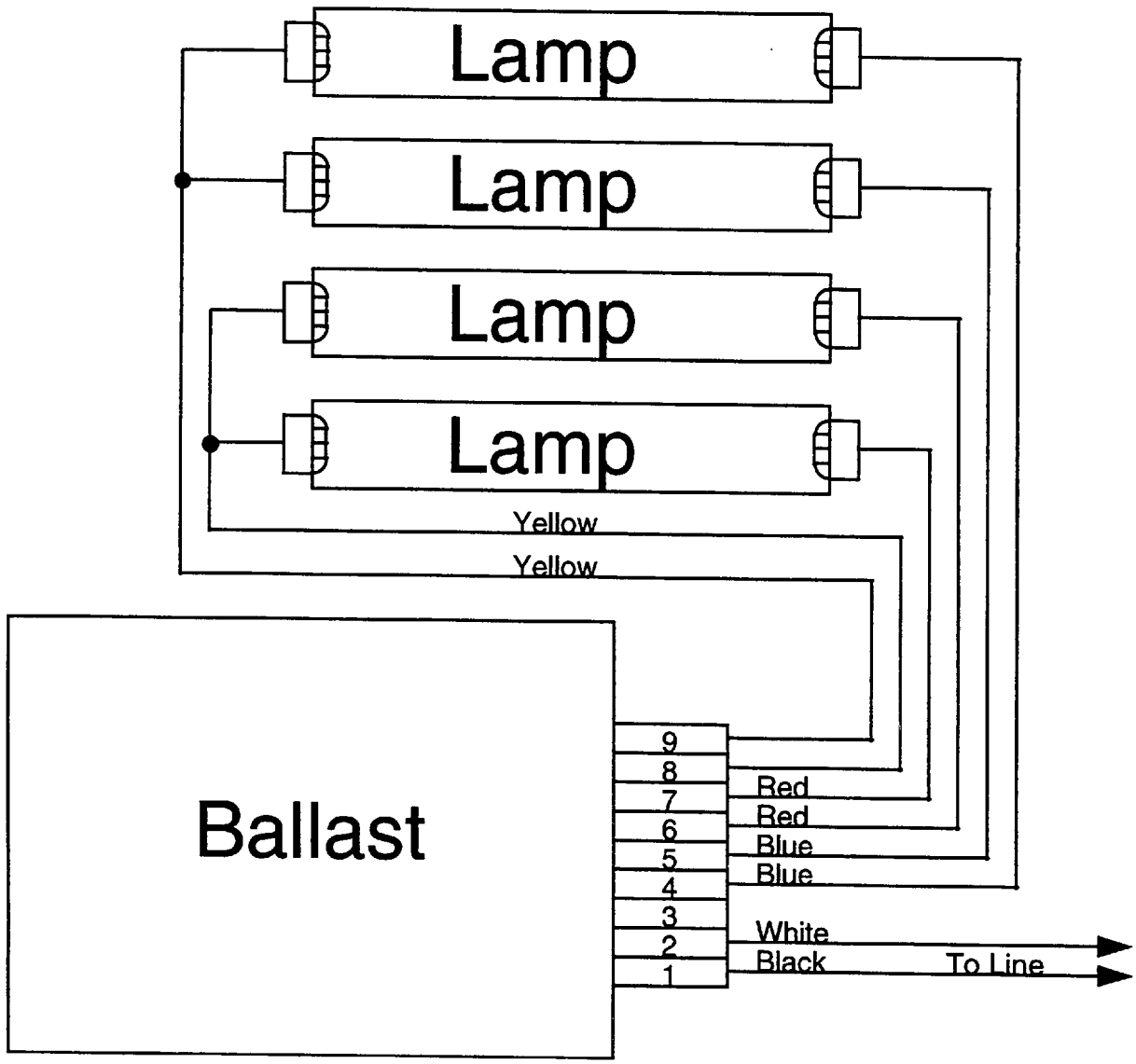


Figure 2-15
WIRING DIAGRAM 10

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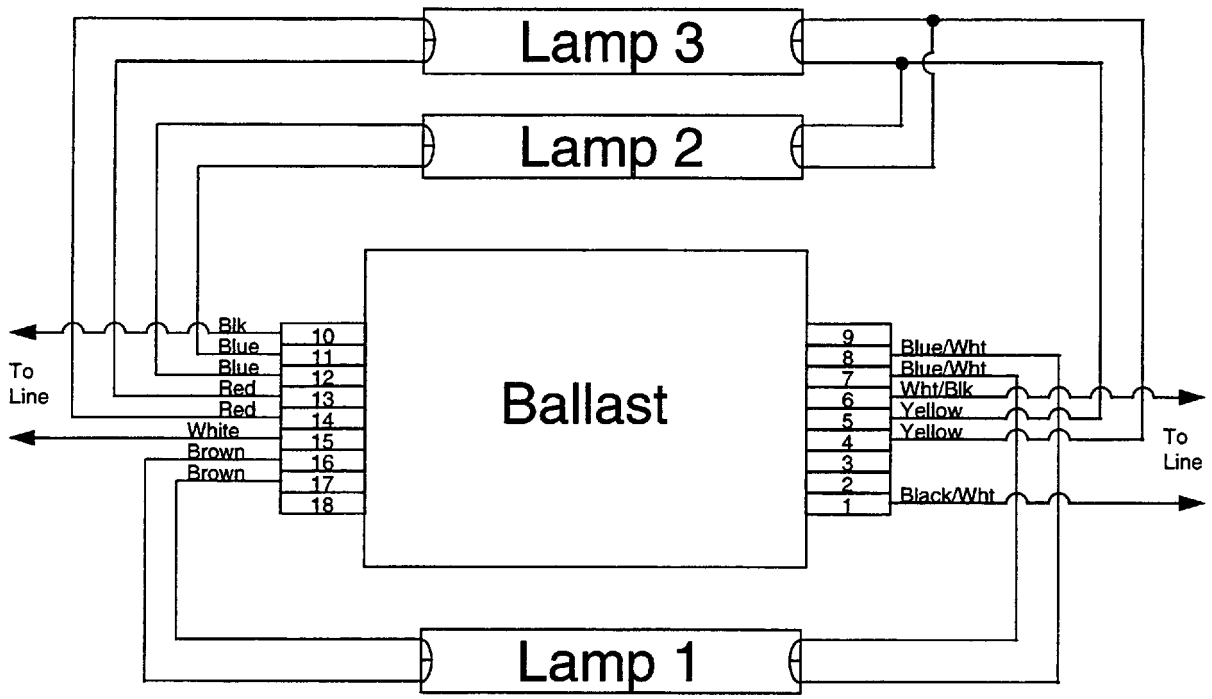


Figure 2-16
WIRING DIAGRAM 11

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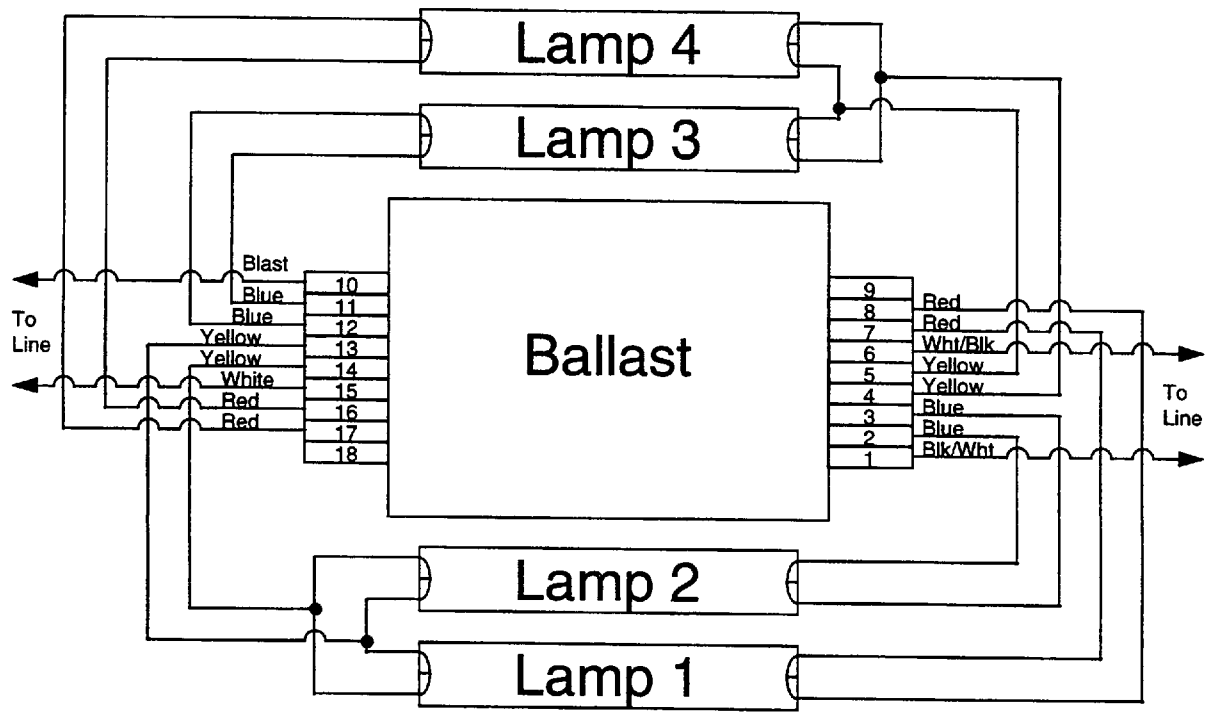


Figure 2-17
WIRING DIAGRAM 12

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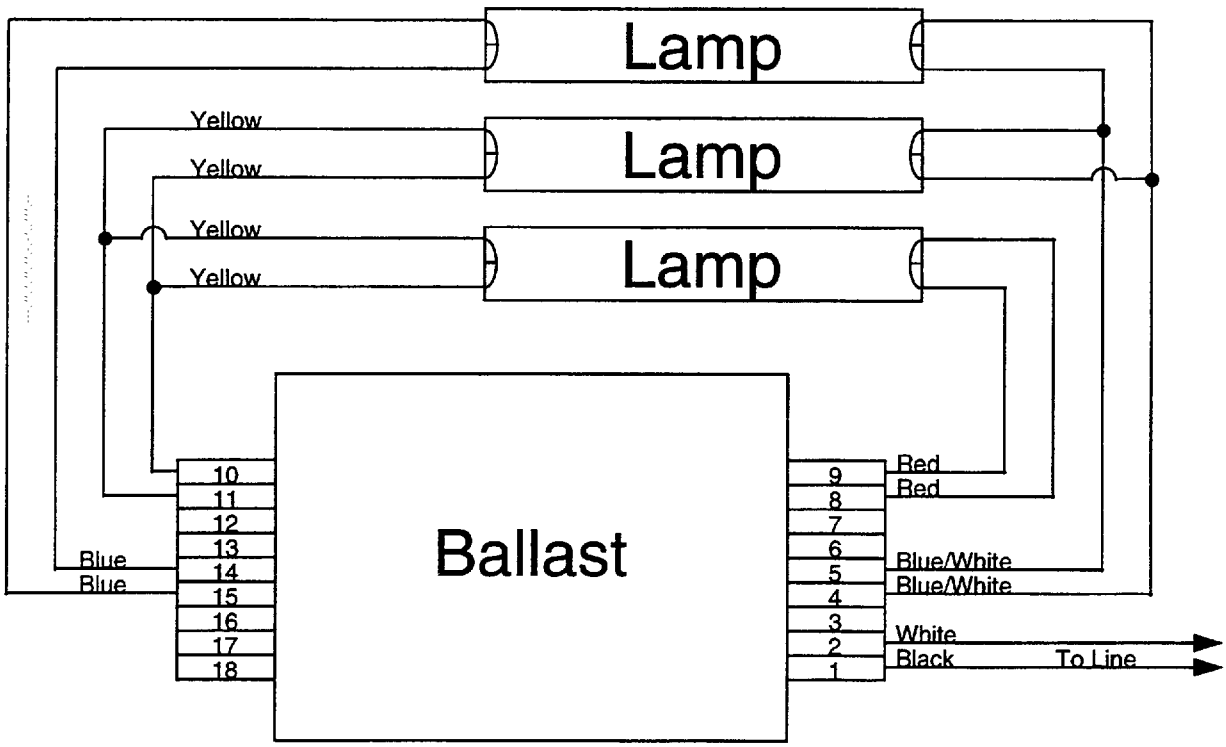


Figure 2-18
WIRING DIAGRAM 13

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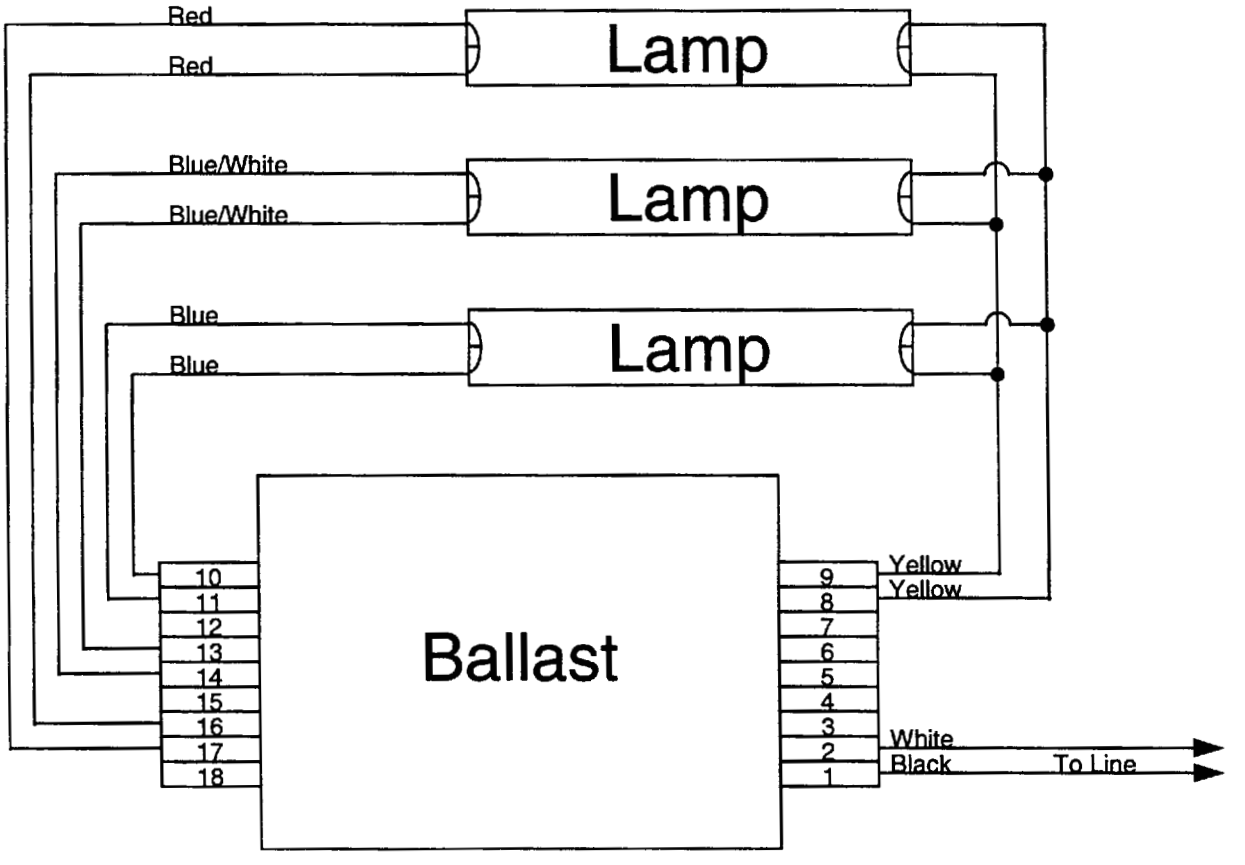


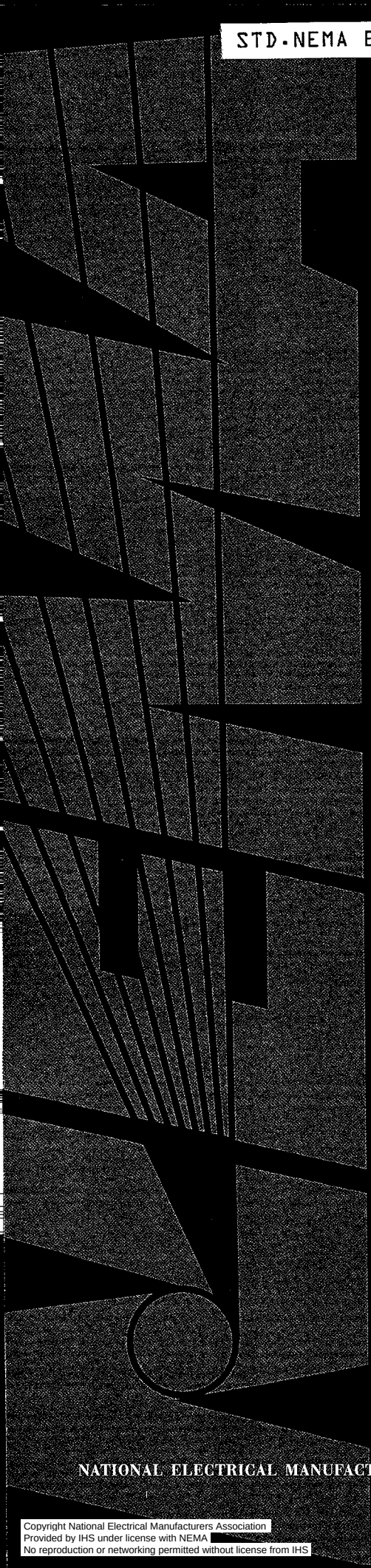
Figure 2-19
WIRING DIAGRAM 14

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