INSTALLATION

198 4555K19-001C
Supersedes 4555K19-001B

TYPES AB-14, -15, -16, -18, -19, -30, AND -40 SINGLE-PHASE AND POLYPHASE WATTMETERS

(THIS PUBLICATION FORMERLY IDENTIFIED AS GEH-1456)

INTRODUCTION

These instructions cover the installation of the Types AB-14, -15*, -16, -18, -19*, -30, and -40 single- and polyphase wattmeters. These wattmeters are long-scale, rectangular-pattern, switchboard instruments designed for flush mounting. The instruments, as supplied, are intended for use on the circuit specified by the customer. Burden data of the wattmeters is given in Table I.

WARNING

REMOVE POWER FROM CIRCUIT MEASURED BY THIS INSTRUMENT BEFORE REMOVING COVER. SCALEPLATE, POINTER, AND ELEMENT ASSEMBLY MAY BE AT HAZARDOUS VOLTAGE LEVELS.

Two-element wattmeters are supplied for use on balanced or unbalanced two-phase, three- or four-wire circuits and on balanced or unbalanced three-phase, three-wire circuits. A modified two-element wattmeter is furnished for use on three-phase, four-wire circuits.

A rating plate, located on the back of each wattmeter, gives the instrument serial number, instrument rating, and other important data. If the instrument is to be used on a circuit of higher voltage or current value than that stamped on this rating plate, an instrument transformer (or transformers) of the ratio indicated must be used. When the circuit exceeds 625 volts, a current transformer as well as a potential transformer must be used for purposes of insulation. A current or potential transformer, if used, must have a frequency rating which corresponds to that stamped on the instrument rating plate.

Instruments of certain voltage ratings are designed to be used with external resistors. The appropriate resistor is supplied with the wattmeter and has a

*Discontinued type; no longer available

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

As a measurement, control or protection device or system, customer should note that a failure of this instrument or system for whatever reason, may leave the monitored process unprotected. It is suggested that the customer review the need for further redundant or other alternate means of protection.

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serial number which corresponds to that of the instrument. Only this resistor should be used with the instrument. The table of EXTERNAL RESISTORS (Table II) indicates the number of tubes in the resistors supplied for the various voltage ratings. The dimensions of these resistors are given in Fig. 4.

TABLE I

BURDEN DATA								
Type	Description	Impedance in Ohms	Effective Resistance in Ohms	Inductance in Henries	Volt-Amperes	Watts	Vars	Power Factor
120-volt, 60-cycle Potential Circuit								
AB-14, -15, -16, -18, -19, -40	Single-phase Wattmeters	6790	6790	0	2.12	2.12	0	1.0
	Polyphase Wattmeters	7340	7340	0	1.96	1.96	0	1.0
AB-30	Single-phase Wattmeters	9160	9160	0	1.57	1.57	0	1.0
	Polyphase Wattmeters	10160	10160	0	1.42	1.42	0	1.0
5-ampere, 60-cycle Current Circuit								
AB-14, -15, -16, -18, -19, -30, -40	Single- and Polyphase Wattmeters	0.063	0.019	0-00016	1.58	0.48	1.51	0.30

TABLE II

EXTERNAL RESISTORS		
Description	Volts	External Resistor
Single-phase	100-125	None
Single-phase	200-250	One 1-tube
Single-phase	400-500	One 2-tube
Single-phase	501-625	One 2-tube
Polyphase	100-125	None
Polyphase	200-250	One 2-tube
Polyphase	400-500	One 4-tube
Polyphase	501-625	One 4-tube

UNCALIBRATED SCALES

CAUTION

For instruments with unmarked scales, incoming inspection (or acceptance) tests must be performed for "on zero", calibration at full scale, stickiness, etc. Failure to do so will place warranty in jeopardy. As with any instrument, extreme caution should be taken not to touch the pointer while removing cover and scale because of the possibility of unbalancing the element. The same precaution should be exercised in handling any other parts of the moving system.

CALIBRATING WATTS

The value of calibrating watts (indicated CAL. WATTS on the rating plate) is the power required for full scale deflection of the instrument when connected in the calibrating circuit without current or potential transformers..

In the calibration of all wattmeters, it is customary to utilize a single-phase, unity-power-factor source. During calibration of a two-element wattmeter, the potential coils are connected in parallel across the single-phase circuit and the field coils are connected in series. The deflection of the polyphase instrument is then the sum of the torques produced by the two elements.

When a wattmeter is intended for high-power measurements, requiring the use of a transformer (or transformers), the scale is usually graduated in terms of primary power; and therefore, the transformer ratio must be considered.

The following formulas give the relation for calibrating watts when the instrument is calibrated on a single-phase system as described above:

For a single-phase instrument, calibrating watts

$$= \frac{\text{full-scale watts}}{\text{CT ratio X PT ratio}}$$

For 3-wire, 3-phase and 2-phase instruments, calibrating watts

$$= \frac{\text{full-scale watts}}{\text{CT ratio X PT ratio X2}}$$

For a 4-wire, 3-phase instrument, calibrating watts

$$= \frac{\text{full-scale watts}}{\text{CT ratio X PT ratio X 4}}$$

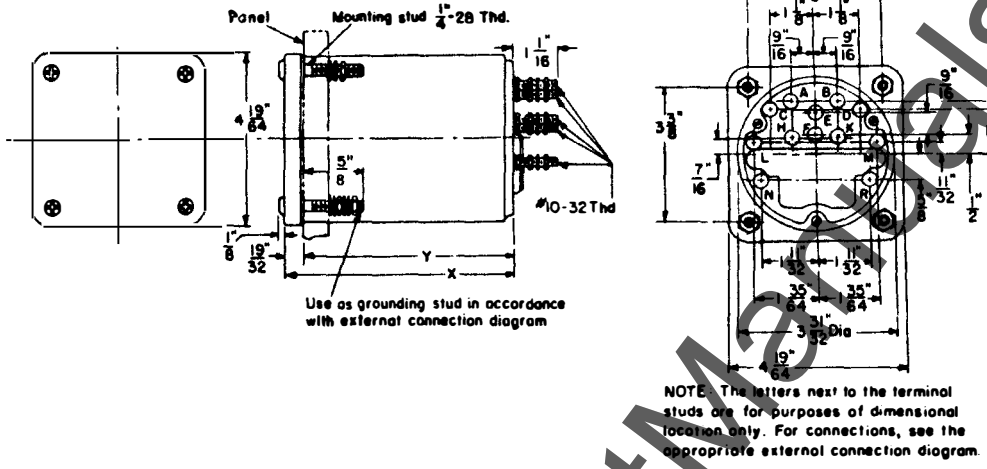
INSTALLATION

MOUNTING

Cut-out and panel-drilling dimensions are shown in Fig. 3. Complete all wiring on the switchboard before installing the instrument. Supporting studs are provided for mounting the wattmeters on the switchboard. Mount the instruments in a level position.

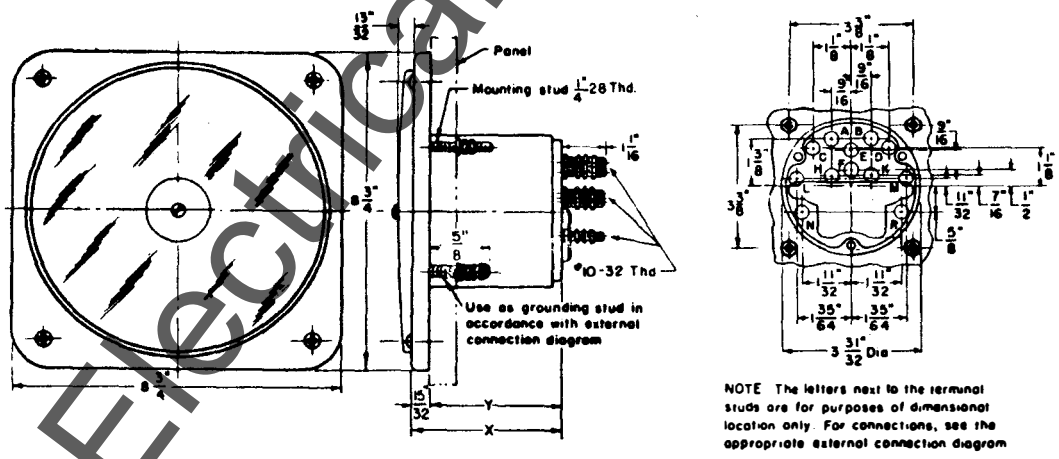
These instruments are practically unaffected by stray fields, but it is advisable to follow the general practice of keeping transformers and wires carrying heavy currents as far as possible from all indicating instruments.

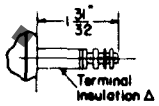
When no current is flowing through the instrument, the pointer should indicate zero. If the pointer does not indicate zero, correction should be made by insert-



DESCRIPTION	STUD LOCATION	DIMENSIONS	
		X	Y
Single-phase	CD NR	4-15/32"	3-7/8"
Polyphase 3-wire, 2- and 3-phase; and 4-wire, 2-phase	AB HKLMNR	5-29/32"	5-5/16"
Polyphase 4-wire, 3-phase	AB EFHKLMNR	5-29/32"	5-5/16"

Fig. 1. Dimensions of Types AB-14,-15, and -19 wattmeters.





DESCRIPTION	STUD LOCATION	DIMENSIONS	
		X	Y
Single-phase	CD NR	4-7/32"	3-3/4"
Polyphase 3-wire, 2- and 3-phase; and 4-wire, 2-phase	AB HKLMNR (Δ)	5-21/32"	5-3/16"
Polyphase 4-wire, 3-phase	AB E FHKLMNR (Δ)	5-21/32"	5-3/16"

Fig. 2. Dimensions of Type AB-16 wattmeters.

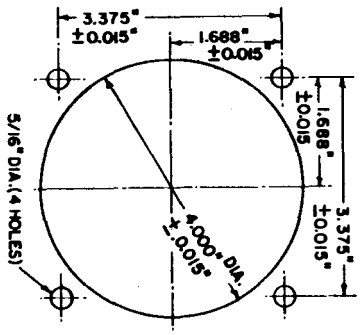


Fig. 3. Cut-out and panel-drilling dimensions for wattmeters

ing a small screwdriver in the zero set screw, located at the front of the instrument, and turning until a zero indication is obtained.

TERMINAL CONNECTIONS

The connections for single-phase wattmeters are shown in Fig. 7 and 8. Connections for polyphase wattmeters are shown in Fig. 9-15.

On instruments manufactured prior to 1951, the terminal studs are stamped with letters instead of numbers. For such instruments, the connection diagrams in this book may be followed by observing the pictorial positioning of the terminals, rather than the stud markings.

WARNING

CARE MUST BE EXERCISED IN HANDLING HIGH TENSION WIRES WHEN INSTALLING INSTRUMENTS ON SUCH CIRCUITS.

The numbers in the appropriate connection diagrams correspond to the numbers stamped on the instrument terminals.

POLARITY MARKINGS OF TRANSFORMERS

Polarity markings are indicated in the connection diagrams and should be followed irrespective of their physical location on the transformers.

GROUNDING INSTRUMENT CASES

The cases of wattmeters which are used with instrument transformers should be connected to the grounded side of the secondary circuits of such transformers. No. 12 Awg copper wire is suitable for this purpose. Grounding connections from the grounded side of the secondary circuits to earth should be made in accordance with the provisions of the National Electric Code.

CAPACITOR BANKS

In applications where compensating capacitor banks are put on and taken off the line, protective devices, such as Thyrite* resistors across the current trans-

*Reg. Trade-mark of the General Electric Co.

formers, should be used to protect the instrument from high voltage surges between the charged and uncharged capacitor banks.

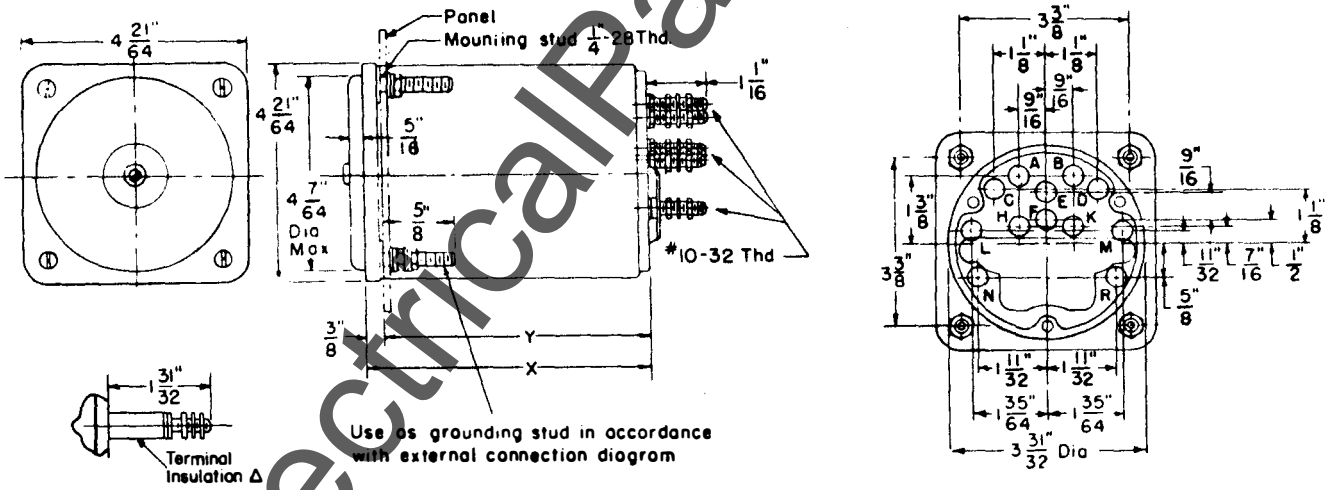
PRINCIPLES OF OPERATION

Single-phase wattmeters utilize a mechanism of the electrodynamic type. The field coil of the mechanism is connected in series with the line, and the moving coil is connected across the line. Therefore, the field flux is proportional to the line current, the moving-coil flux is proportional to the line voltage, and the instantaneous torque of the instrument is proportional to the instantaneous product of the current and voltage. The instrument reads the average of the power pulses.

Polyphase wattmeters utilize two single-phase mechanisms with the moving coils mounted on a common shaft. Polyphase wattmeters supplied for three-phase, four-wire measurements are designed with four current (field) coils and two potential (moving) coils. In this modification two current coils interact with each potential coil.

REPAIR PARTS

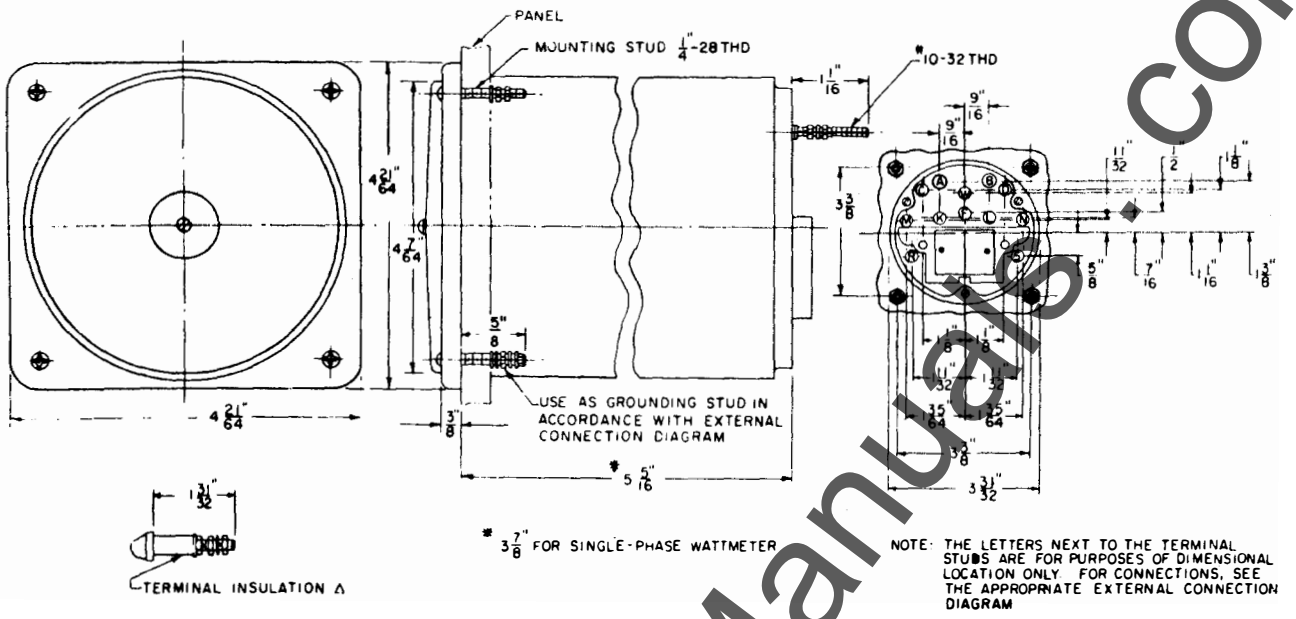
Repair parts for these instruments and additional copies of this publication must be ordered through the nearest General Electric sales office or distributor.



DESCRIPTION	STUD LOCATION	DIMENSIONS	
		X	Y
Single-phase	CD NR	4-1/4"	3-7/8"
Polyphase 3-wire, 2- and 3-phase; and 4-wire, 2-phase	AB HKLMNR (Δ)	5-11/16"	5-5/16"
Polyphase 4-wire, 3-phase	AB E FHKLMNR (Δ)	5-11/16"	5-5/16"

NOTE The letters next to the terminal studs are for purposes of dimensional location only. For connections, see the appropriate external connection diagram

Fig. 4. Dimensions of Type AB-18 and -40 wattmeters



DESCRIPTION	STUD LOCATION
Single-phase	CD RS
Polyphase 3-wire, 3-phase	AB KLMNRS
Polyphase 4-wire, 3-phase	AB FKLMNRS W

Fig. 5. Dimensions of Type AB-30 wattmeters

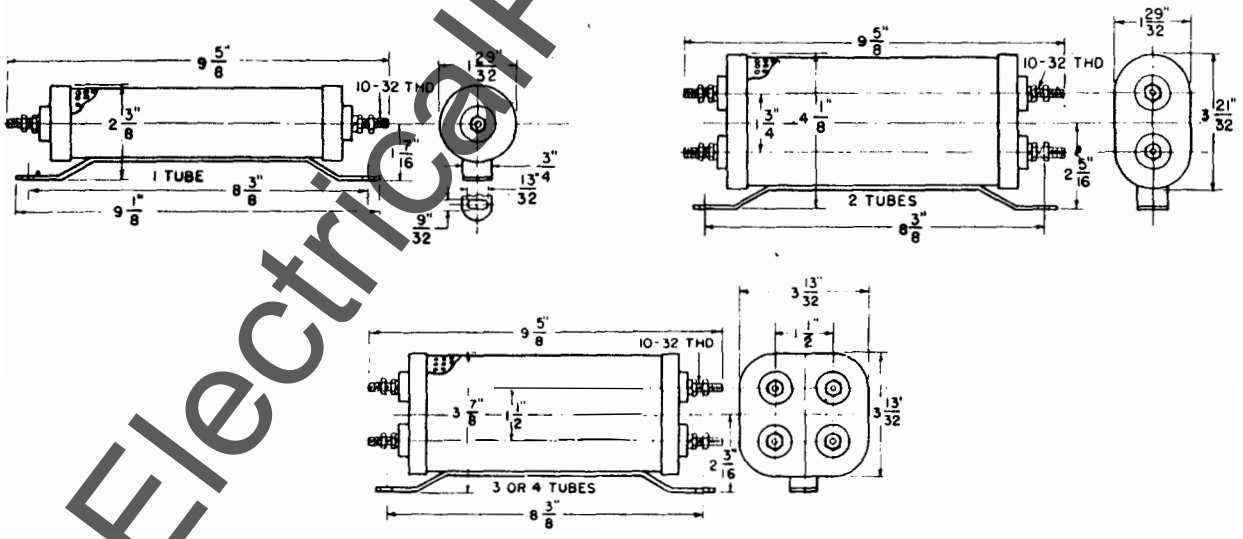


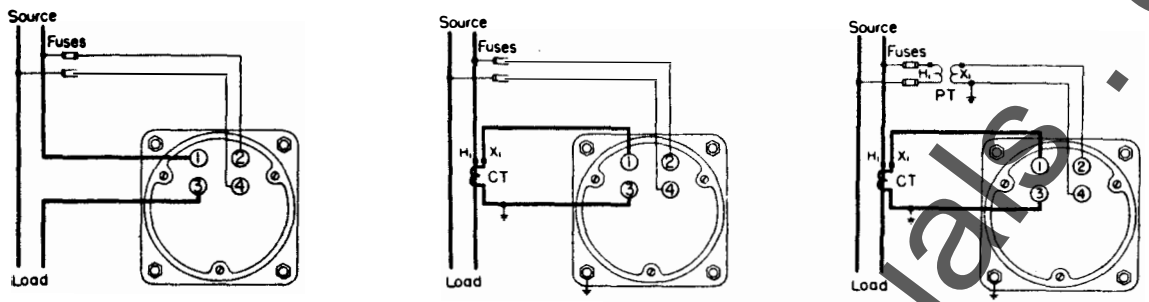
Fig. 6. Dimensions of Form-3 resistor cages

WARNING

DANGEROUS VOLTAGES MAY DEVELOP IN THE OPEN-CIRCUIT SECONDARY WINDINGS OF ENERGIZED CURRENT TRANSFORMERS. DE-ENERGIZE THE TRANSFORMERS BY SHORT-CIRCUITING THE SECONDARY WINDINGS BEFORE DISCONNECTING OR CONNECTING INSTRUMENTS TO TRANSFORMERS.

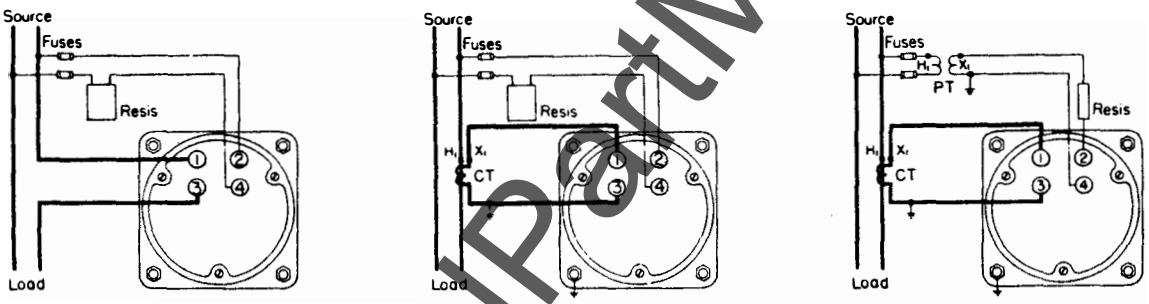
CONNECTION DIAGRAMS

(Back Views)



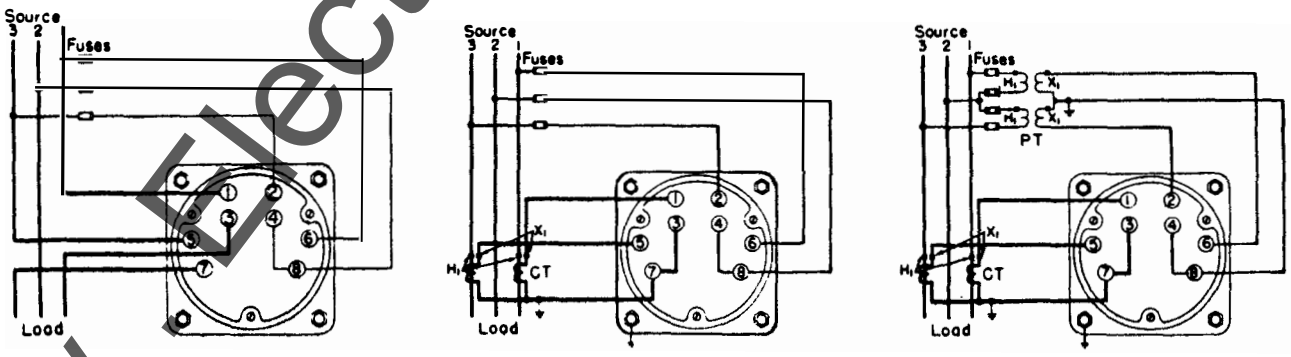
Without transformers | With current transformer | With current and potential transformers

Fig. 7. Connections for single-phase wattmeters rated 0-125 volts (with internal resistor).



Without transformers | With current transformer | With current and potential transformers

Fig. 8. Connections for single-phase wattmeters rated 130-625 volts (with external resistor).



Without transformers | With current transformers | With current and potential transformers

Fig. 9. Connections for polyphase wattmeters rated 0-125 volts (with internal resistor) for 3-wire, 3-phase and 3-wire, 2-phase circuits. On 3-wire, 2-phase circuits, line 2 in common.

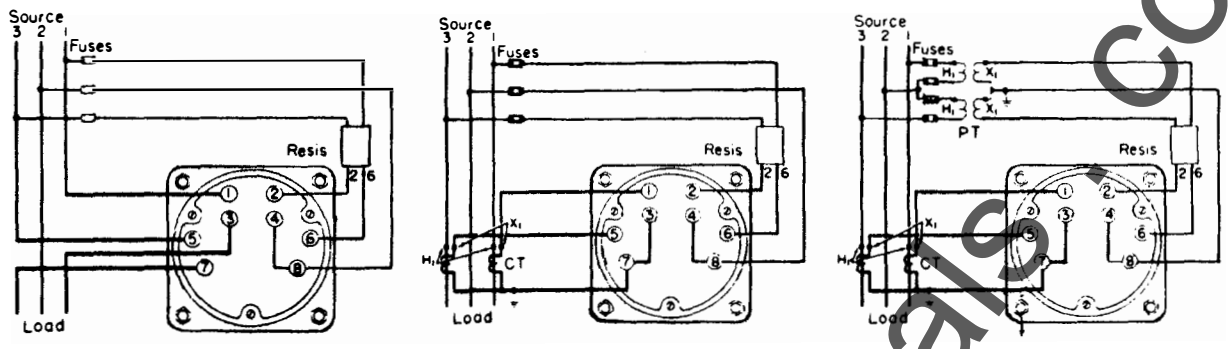


Fig. 10. Connections for polyphase wattmeters rated 130-625 volts (with external resistor) for 3-wire, 3-phase and 3-wire, 2-phase circuits. On 3-wire, 2-phase circuits, line 2 in common.

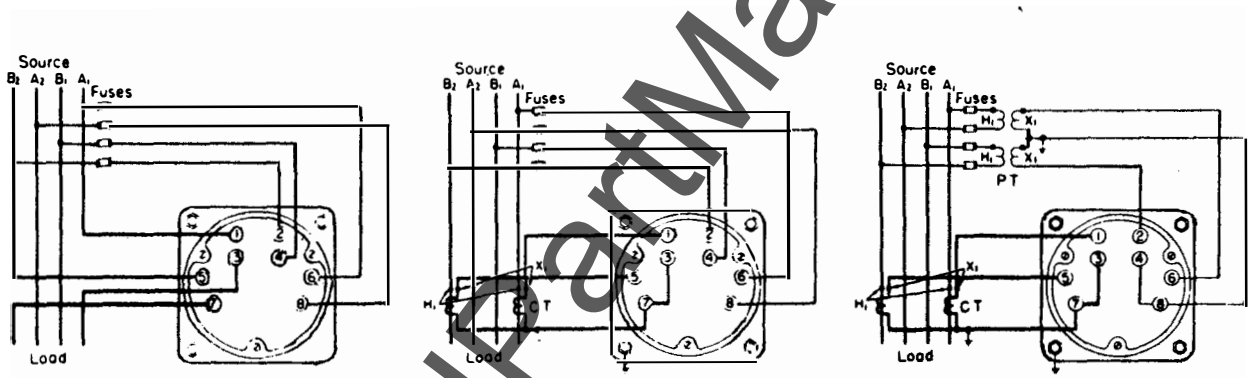


Fig. 11. Connections for polyphase wattmeters rated 0-125 volts (with internal resistor) for 4-wire, 2-phase circuits.

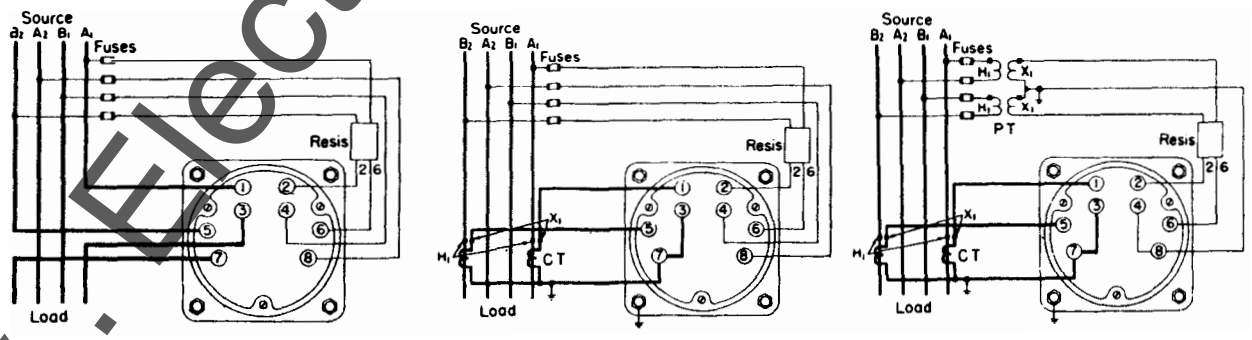
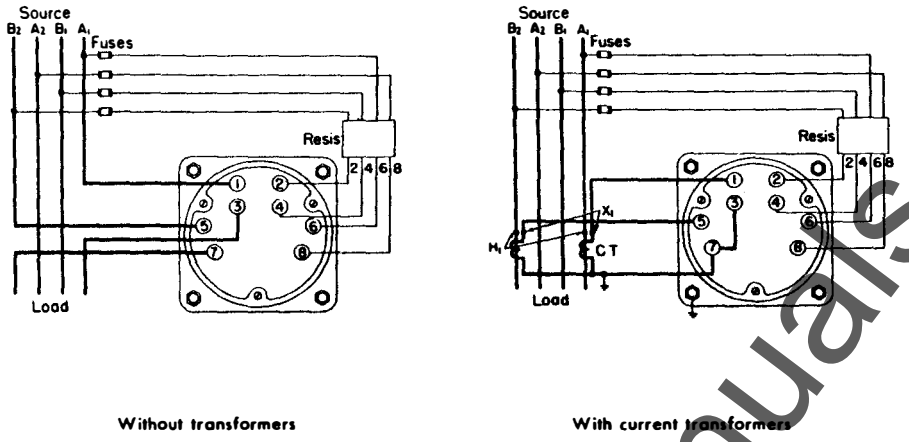


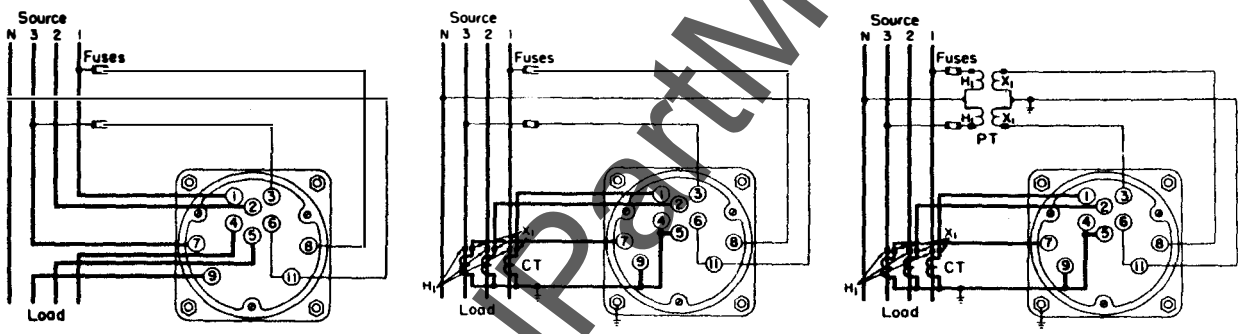
Fig. 12. Connections for polyphase wattmeters rated 130-250 volts (with external resistor) for 4-wire 2-phase circuits.



Without transformers

With current transformers

Fig. 13. Connections for polyphase wattmeters rated 260-625 volts (with external resistor) for 4-wire, 2-phase circuits.

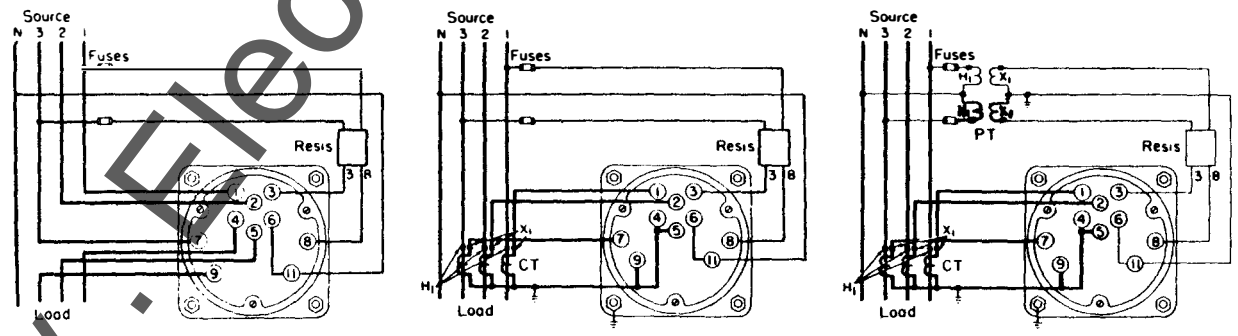


Without transformers

With current transformer

With current and potential transformers

Fig. 14. Connections for polyphase wattmeters rated 0-125 volts (with internal resistor) for 4-wire, 3-phase circuits.

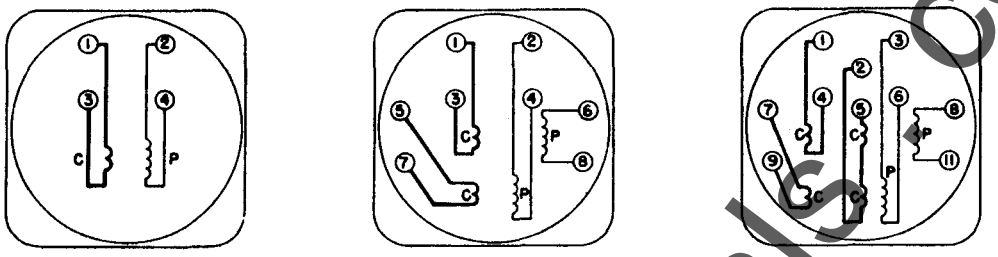


Without transformers

With current transformers

With current and potential transformers

Fig. 15. Connections for polyphase wattmeters rated 130-625 volts (with external resistor) for 4-wire, 3-phase circuits.



single-phase *3-wire 3-phase* *4-wire 3-phase*

Fig. 16. Schematic diagram of current and potential circuits for wattmeters (Back Views)

INSTRUMENT DEPARTMENT

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