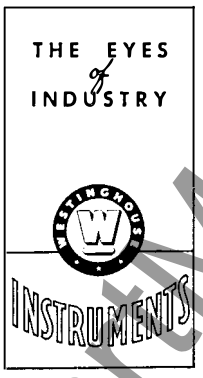
Westinghouse

K LINE
SWITCHBOARD INSTRUMENTS
FOUR AND ONE-HALF INCH CLASSIFICATION

INSTRUCTIONS

GENERAL



CASES

The first letter in type designates the form of case used.

K = Rectangular flush steel case 4-1/4" x 4".

MECHANISMS

The second letter in type designates the principle of operation.

A = Repulsion Moving Iron.
X = Permanent Magnet, Moving Coil.
Y = Air Core, Electrodynamic.
T = Thermocouple plus X.
C = Rectifier plus X.

INSULATION RATING

All instruments are insulated for 750 volt maximum service.

DIAL NOTES

References to type, style number, use of external shunts, calibration data, etc., are marked on the dial.

The full scale marking of an indicating instrument is not necessarily the same as the ratings of the current and voltage coils. The coil ratings are based upon temperature requirements. Full scale values of 1, 1.2,1.5, 2, 2.5, 3, 4, 5, 7.5, 8, or decimal multiples of these values are chosen to give clear, simple scale markings.

The coil ratings are given on the dial plate, and are not necessarily part of the calibration data of the instrument. The calibration data are marked on the dial and in the case of wattmeters and varmeters comprise the calibration Constant and the ratios of the current and potential transformers when these are used.

The constant for wattmeters is the product of the ratios of the current and potential transformers. It is equal to the number of Kilowatts (or Kilovars) indicated per Kilowatt (or Kilovar) applied to the coils, on a single phase test circuit.

INSTALLATION

Terminal and mounting hardware, and any external resistors or reactors may be in separate packages.

Drill panels and connect according to the diagrams in this leaflet, or according to switchboard drawings if instruments are supplied as part of a switchboard.

On any instruments which operate with spring control, such as ammeters, voltmeters or wattmeters, adjust the pointer to zero by means of the zero adjuster before energizing the windings. Power factor meters, position indicators, and frequency meters do not have zero adjusters. The zero adjuster is located under the front cover which may be snapped off.

CIRCUIT PRECAUTIONS

The secondary circuits of all instrument transformers should be grounded.

The external connecting diagrams for the a-c instruments show the proper locations for ground connections for the secondary circuits of the instrument transformers, and for the instrument cases.

The ground connection of the cases should be omitted when instruments are mounted on "live front" switchboard panels.

CALIBRATION

A-C INSTRUMENTS

Type KA ammeters and voltmeters operate on the repulsion iron vane principle. Calibration adjustments are made by shifting the outer end of the spring in its holder. After loosening the small clamping screw, the zero adjuster should be left in mid-position, the pointer being set to zero by shifting the small tail piece of the inner spring adjuster located beneath the spring, using a suitable tool. The outer spring clamping screw must be tightened before shifting the inner spring adjuster.

Type KY wattmeters are electrodynamic type. Polyphase wattmeters may be checked on single phase circuits by testing each element separately, or the current coils may be connected in series and the potential coils in parallel, both elements tested at the same time. Calibration adjustments are made by changing the resistance of the potential circuit.

Varmeters are exactly like the wattmeters, except that they indicate the reactive volt amperes by means of external phase shifting transformers. They are often made with zero center scales. When used on unidirectional circuits the scales are marked "lag" and "lead" as in power factor meters. When intended for tie lines or other duo-directional circuits, the

lag and lead notations are generally omitted and directional markings are substituted, to show direction of reactive power flow.

Type KY power factor meters are of the crossed coil, electrodynamic type. Rated accuracy is obtained when current in the current coils is from 40 to 125 per cent of coil rating and voltage on the potential circuit from 75 to 125 per cent of normal. Polyphase power factor meters are designed to indicate correctly only on balanced load.

In order to test external 3 phase connections first check in reference to phase sequence.

A trial connection may be checked by shunting part of the current from the stationary coil with a low resistance wire (about 0.1 ohm) across the current terminals. If the pointer movement is toward the lag side of the scale, connections are correct. If the pointer movement is toward the lead side of the scale the connections to the first and third potential terminals should be interchanged on the line side of external resistors if any are used.

Further incorrect action may be due to the current connection being in the wrong phase, or reversed, giving six possible vector directions on three phase, one of which is correct for the power factor meter.

Should the pointer remain at one end of the scale regardless of change in power factor the current connections should be interchanged. Polyphase power factor meters are adjusted by changing the value of resistance in the potential circuits. Single-phase instruments are adjusted by changing the air gap of the iron in the reactor or changing the value of resistance in the voltage circuit.

Type KY frequency meters are of the crossed-coil electrodynamic type, the coils being connected into a network consisting of a reactor and a capacitor forming a resonant circuit.

If errors are found, the calibration may be corrected by adjusting the magnetic shunt in the air gap of the reactor. Changing the internal resistor which shunts one of the moving coils varies the over-all width of the scale range.

PERMANENT MAGNET MOVING COIL TYPES

Type KX voltmeter calibration adjustments are made by changing the value of resistance in series with the element. When used with an external resistor on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be kept at ground potential.

Type KX ammeter calibration adjustments are made by changing the resistance of the wire lead in series with the element. When connected to an external shunt, leads listed for use with the instrument, or leads of specified resistance should be used.

Type KX milliammeter calibration adjustments are made by changing the resistance of the internal shunt. Some ranges not provided with element shunts are adjusted by changing the strength of the magnet.

Type KT radio frequency instrument calibration adjustments are made by changing the value of the resistance in series with the thermocouple. To avoid burning out the thermocouple, the instrument should not be loaded above full scale.

Radio frequency instruments have the left terminal, as viewed from the rear, bonded to the metal chassis and dial of the instrument. This prevents electrostatic effects between pointer and dial and provides points of zero potential inside the instrument.

Radio frequency instruments, particularly when operated from external thermocouples, should be arranged with effective R.F. by-pass and ground connections to minimize the effect of capacity currents.

Type KC Rectifier type voltmeter calibration adjustments are made by changing the value of series resistance. Rectifier type milliammeters are calibrated by changing the strength of the magnet. Rectifier type instruments indicate correctly at 25°C. with 60 cycle pure sine wave.

ILLUMINATION

In the illuminated dial KA, KX or KY instruments an intensity of approximately 5 foot candles is provided when the internal miniature lamps are energized at 6.3 volts. For higher voltage lighting circuits, a 140, 130, 120, 110/6.3 volt special transformer S#1246552 or other similar step down transformers may be used.

Two #40 miniature lamps connected in parallel are used, each requiring .15 amperes. These lamps are carried in stock as a renewal part as per Style 717,744.

TO REMOVE COVER

To Remove Cover - The front cover may be removed for adjusting the zero, by inserting a screw driver under one of the upper corners.

To replace the internal lamps or to service the mechanism, the rear cover plate must also be removed.

SERVICING MECHANISMS

The mechanism mounted on the instrument base with all internal connections intact may be removed from the case, leaving the case mounted in place on the panel by removing the three base holding screws at the back of the instrument and disconnecting the external wiring to the terminals at the rear of the panel.

RENEWAL PARTS

When ordering renewal parts, give the name of the part wanted and the style number and serial number of the instrument which appear on the dial. Failure to give this information may result in delay.

S#717, 744 - Illuminating lamp #40 Mazda. Miniature screw base lamp, 6.3 volts.

S#1,246,552 - Transformer, 140, 130, 120 or 110 Volts Primary 6.3 volt secondary for 60 cycle lighting circuit.

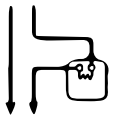


Fig. 1 - A-C Self-Contained Ammeter

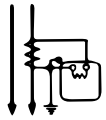


Fig. 2 - A-C Ammeter with Current Trans.

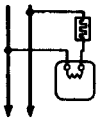


Fig. 3 - A-C Voltmeter

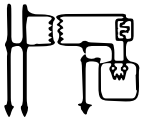


Fig. 4 - A-C Voltmeter with Potential Trans.

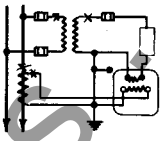


Fig.5 Single Phase Wattmeter on Single Phase Line

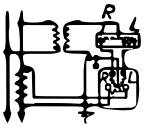


Fig. 6 Single Phase Power Factor Motor

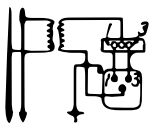


Fig.7 Resonant Type Freq. Motor (Complete conn.1 &3 before connecting to line)

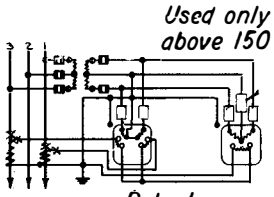


Fig. 8 Std. Polyphase Wattmeter

Polyphase power factor meter when used with 2 current trans. as shown

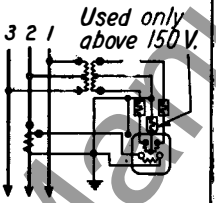


Fig. 9 Polyphase Power Factor Meter

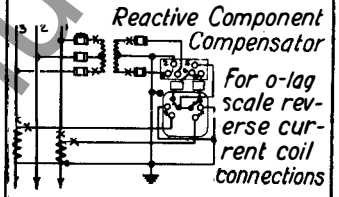


Fig.10 Polyphase R.V.A. Meter with Reactive Component Compensator (Std. Wattmeter Calibration)

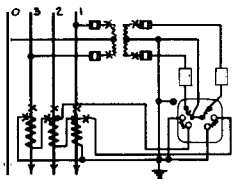


Fig.11 Polyphase Wattmeter (Delta Conn. C.T.)

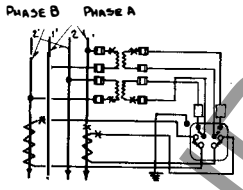


Fig. 12 2 Ph. 4 Wire Polyphase Wattmeter

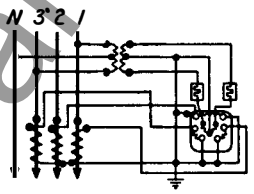


Fig. 13 3 C.C. Wattmeter

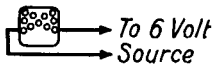


Fig.14 For all Insts. with Illumination

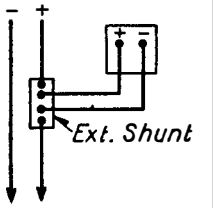


Fig.15 D-C. Ammeter Ext. Shunt

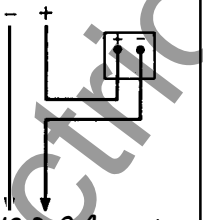


Fig.16 D-C. Ammeter & Milliammeter Self Contained

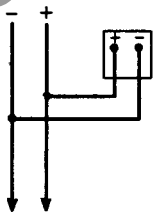


Fig. 17 D-C. Voltmeter Self Contained

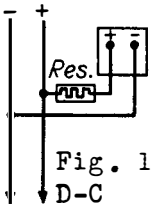


Fig. 18 - D-C Voltmeter with Ext. Res. Above 750 V.

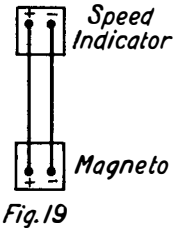


Fig.19

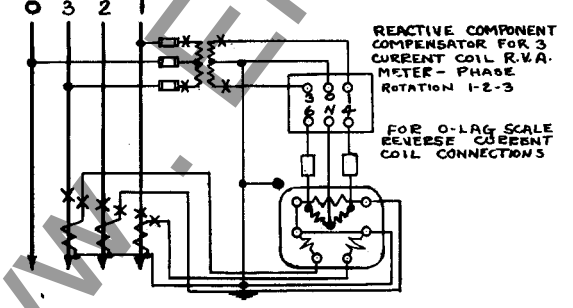


Fig. 20 - 3-Cur. Coil Polyphase Varmeter With C. T. and P. T.

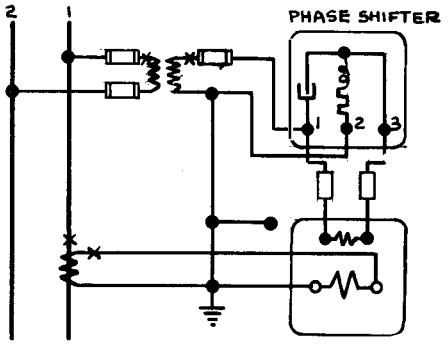
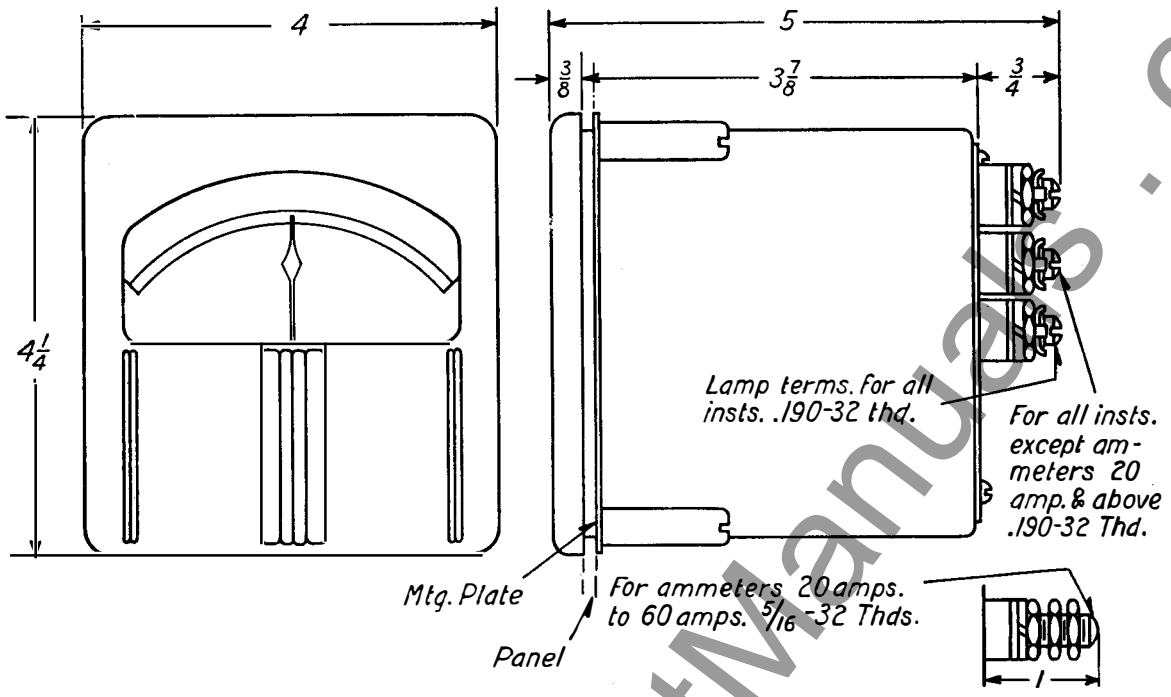
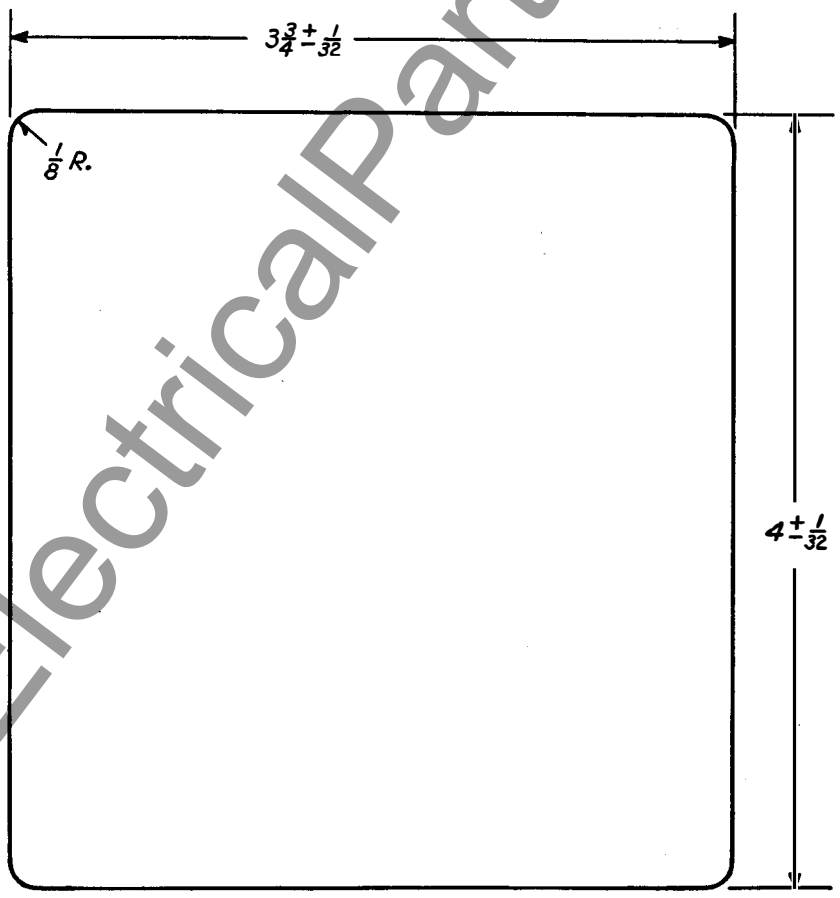


Fig. 21 - 2-Wire Single Phase Varmeter

NOTE: ALL CONNECTIONS OF INSTRUMENTS PROPER ARE REAR VIEWS WITH DIAL UPRIGHT.





Note:—This drilling plan is actual size and may be used as a drilling template.