INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

—K-241 LINE—
SWITCHBOARD INSTRUMENTS
FOUR AND ONE-HALF INCH CLASSIFICATION
FULL-VIEW CIRCULAR SCALE TYPE

GENERAL

Type K-241 instruments are designed and built to meet or exceed the requirements of American Standard C39.1 for electrical indicating switchboard instruments. The rated accuracy class is one per cent.

CASES

The first letter in the Type designation indicates the form of case used. K = Rectangular Flush Case, Flange mounted.

MECHANISMS

The second letter in the type designation indicates the principle of operation.

X = Permanent magnet moving coil
A = Repulsion-Attraction, moving iron
P = Watt transducer plus X
I = Rotating iron vane
C = Rectifier plus X
F = Iron core electromagnetic

DESCRIPTION OF TAUT BAND SUSPENSION INSTRUMENTS

CAUTION: When the instrument mechanism is exposed, avoid contact with the tension springs. These springs are precisely made and positioned. and any pressures inadvertently applied to them may cause misalignment of the moving element.

The KX-241 is a pivotless, bearingless d.c. instrument of the permanent magnet moving coil type. A suspension system is employed which replaces the conventional pivots, jewels, and control spring. At each end of one side of the moving coil is attached a thin metallic band. At the top and bottom bridges these bands are connected to tension springs. The tension springs exert axial forces which keep the metallic bands taut and the moving element from sagging. The taut bands serve to carry current to the moving coil, and also provide the necessary deflection counter-torque.

This design eliminates pivot friction and allows the instrument to withstand severe conditions of shock and vibration. The suspension system assures longer life with reduced maintenance costs.

The KA-241 Ammeters and Voltmeters employ similar suspensions but operate on the repulsion — attraction, moving iron principle.

The KP-241 is a transducer type wattmeter consisting of a Hall Generator watt-transducer and an X-241 millivoltmeter mechanism tandem mounted in one self contained unit. The transducer portion converts the a-c watts represented by the current and voltage applied at the wattmeter terminals into a proportional d-c millivolt output. This transducer output operates the d-c millivoltmeter mechanism whose pointer indicates watts on a suitably marked scale.

DIAL NOTES

References to type style number, use of external components if required, coil ratings, calibration data etc., are made on the dial mask.

INSTALLATION

Unpack instruments carefully. Terminal and mounting hardware, and any external components may be in separate packages.

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

Before energizing the instrument, adjust the pointer to zero by means of the zero adjuster at the front of the instrument.

CIRCUIT PRECAUTIONS

HIGH VOLTAGE OPERATION

All instruments are insulated for 800 volt maximum service.

When voltmeters are used with external resistors on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be grounded.

Ammeters with external shunts must be used with leads having the resistance specified in the dial notes. If the circuit voltage exceeds the insulation rating of the instrument, the shunt should be in the grounded side of the line.

GROUNDING OF CASES

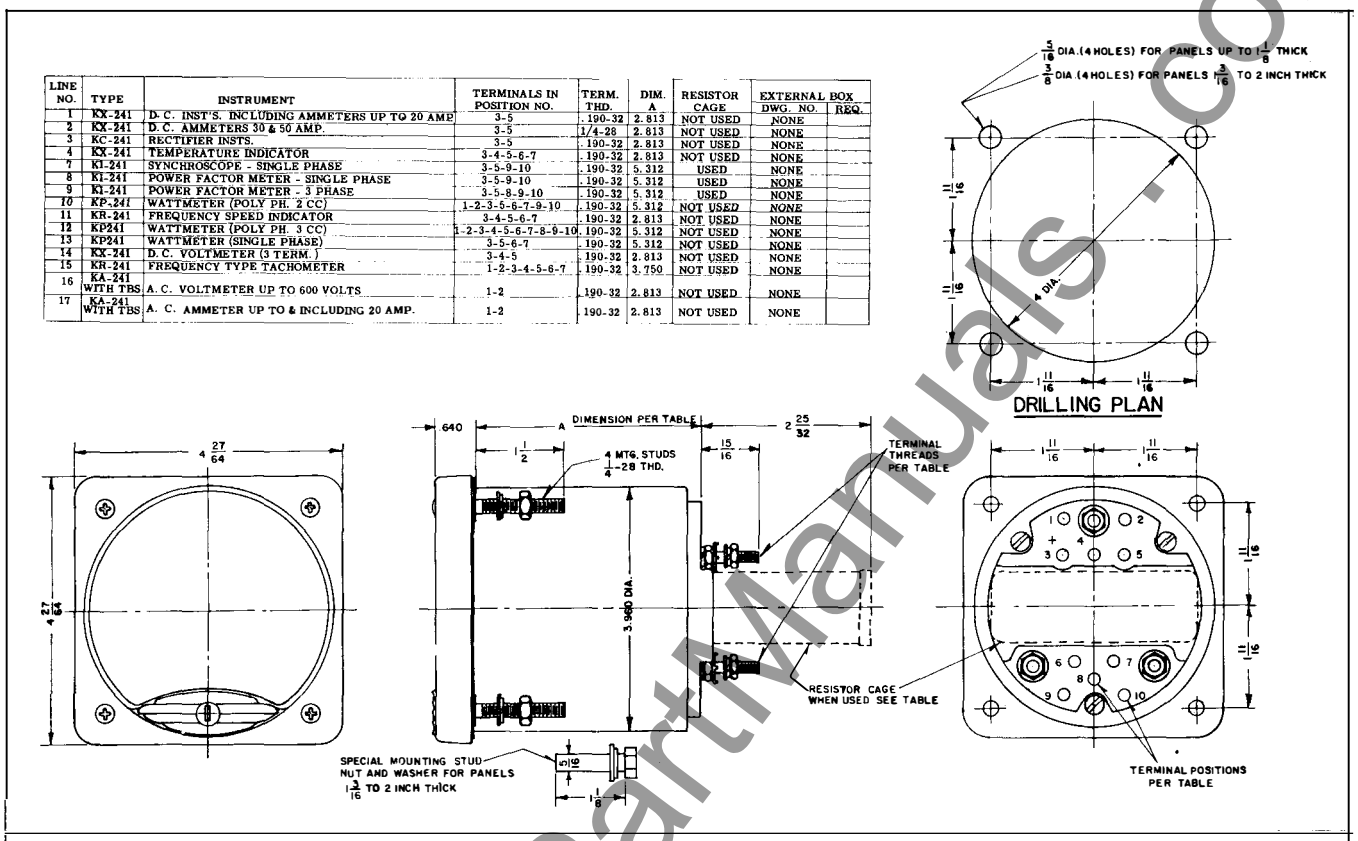
Instruments, when mounted on grounded metal structures, are considered adequately grounded when secured to the structures by metal hardware. For mounting on insulated structures any one of the three case to base mounting screws may be used as a grounding terminal.

REPAIRS AND RENEWAL PARTS

The usual procedures and practices employed for servicing mechanisms of pivot-jewel type instruments cannot be applied to suspension type instruments. For this reason we recommend that all instruments in need of mechanism servicing be returned to the factory.

Orders for renewal parts should include the name of the part and the style and serial number of the instrument, appearing on the dial mask.

LINE NO.	TYPE	INSTRUMENT	TERMINALS IN POSITION NO.	TERM. THD.	DIM. A	RESISTOR CAGE	EXTERNAL BOX DWG. NO.	EXTERNAL BOX REQ.
1	KX-241	D. C. INST'S. INCLUDING AMMETERS UP TO 20 AMP.	3-5	.190-32	2.813	NOT USED	NONE	
2	KX-241	D. C. AMMETERS 30 & 50 AMP.	3-5	1/4-28	2.813	NOT USED	NONE	
3	KC-241	RECTIFIER INSTS.	3-5	.190-32	2.813	NOT USED	NONE	
4	KX-241	TEMPERATURE INDICATOR	3-4-5-6-7	.190-32	2.813	NOT USED	NONE	
7	KI-241	SYNCHROSCOPE - SINGLE PHASE	3-5-9-10	.190-32	5.312	USED	NONE	
8	KI-241	POWER FACTOR METER - SINGLE PHASE	3-5-9-10	.190-32	5.312	USED	NONE	
9	KI-241	POWER FACTOR METER - 3 PHASE	3-5-8-9-10	.190-32	5.312	USED	NONE	
10	KP-241	WATTMETER (POLY PH. 2 CC)	1-2-3-5-6-7-9-10	.190-32	5.312	NOT USED	NONE	
11	KR-241	FREQUENCY SPEED INDICATOR	3-4-5-6-7	.190-32	2.813	NOT USED	NONE	
12	KP241	WATTMETER (POLY PH. 3 CC)	1-2-3-4-5-6-7-8-9-10	.190-32	5.312	NOT USED	NONE	
13	KP241	WATTMETER (SINGLE PHASE)	3-5-6-7	.190-32	5.312	NOT USED	NONE	
14	KX-241	D. C. VOLTMETER (3 TERM.)	3-4-5	.190-32	2.813	NOT USED	NONE	
15	KR-241	FREQUENCY TYPE TACHOMETER	1-2-3-4-5-6-7	.190-32	3.750	NOT USED	NONE	
16	KA-241 WITH TBS	A. C. VOLTMETER UP TO 600 VOLTS	1-2	.190-32	2.813	NOT USED	NONE	
17	KA-241 WITH TBS	A. C. AMMETER UP TO & INCLUDING 20 AMP.	1-2	.190-32	2.813	NOT USED	NONE	



ASSEM. NO.	TYPE	INSTRUMENT	TERMINALS IN POSITION NO.	TERM. THD.	DIM. A	DIM. B	RESISTOR CAGE	EXTERNAL BOX DWG. NO. REQ.
16	KF-241	SINGLE ELE. WATTMETER UP TO 150 V. & 20 A. INC.	1-3-8-10	.190-32	2-13/16	4-27/64	USED	NONE
17	KF-241	DOUBLE ELE. WATTMETER 3 C. C. UP TO 150V& 20A. INC.	1-3-4-5-6-7-8-10	.190-32	5-3/8	4-27/64	USED	NONE
18	KF-241	DOUBLE ELE. WATTMETER 3 C. C. UP TO 150V& 20A. INC.	1-2-3-4-5-6-7-8-9-10	.190-32	5-3/8	4-27/64	USED	NONE
19	KF-241	EXPANDED SCALE VOLTMETER	8-10	.190-32	3-13/16	4-27/64	USED	NONE

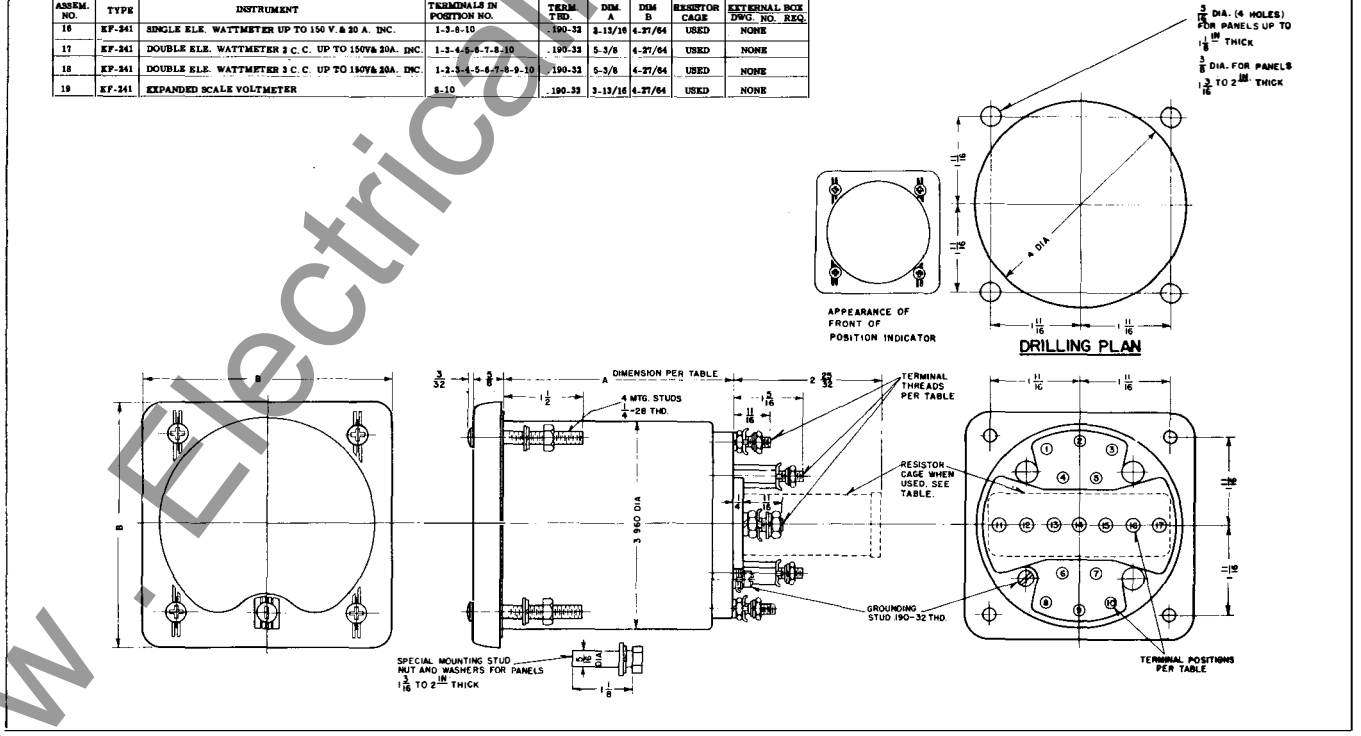


Fig. 1. Outline Dimensions and Drilling Plan for Type K-241 Instruments.

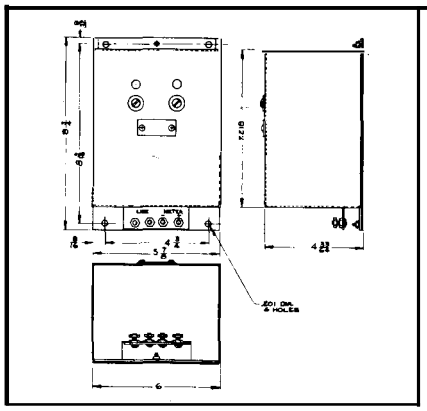


Fig. 2. Outline Dimensions and Drilling Plan for Transducer used with Frequency Meter.

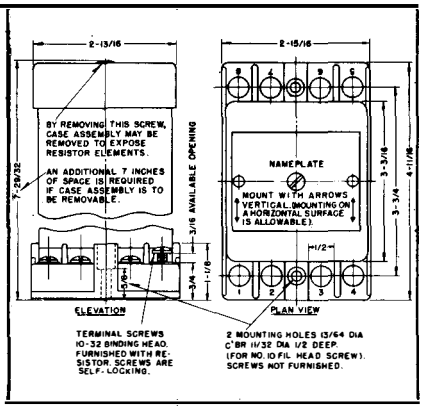


Fig. 3. Outline Dimensions and Drilling Plan for VR-825 External Resistor.

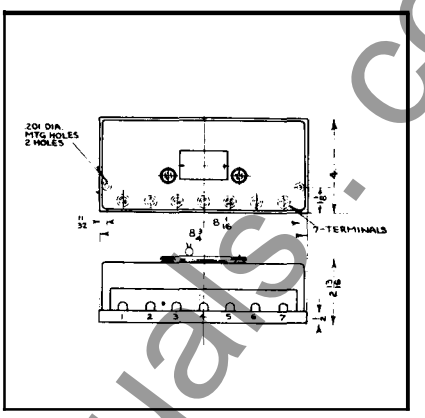


Fig. 4. Outline Dimensions and Drilling Plan for Phase Shifting Transformer used with 3-phase, 3-wire Varmeter.

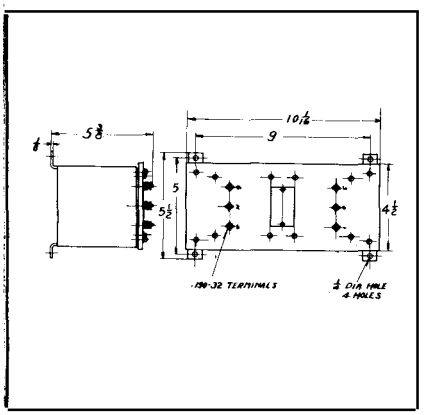


Fig. 5. Outline Dimensions and Drilling Plan for Phase Shifting Transformer used with 3-phase, 4-wire Varmeter.

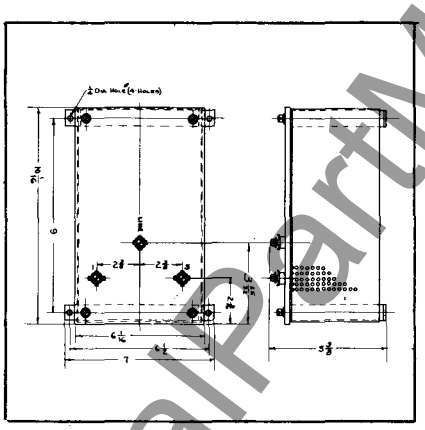


Fig. 6. Outline dimensions and Drilling. Plan for Reaction Compensation used with Single. Phase Varmeter.

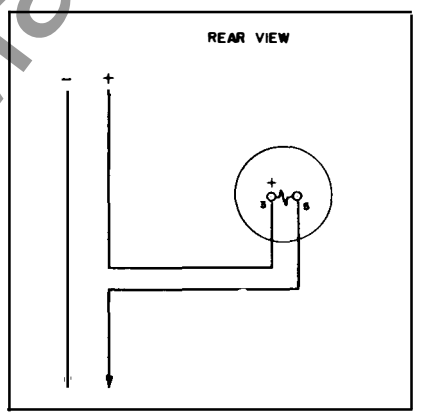


Fig. 7. Type X-241 Ammeter and Milliameter (self contained).

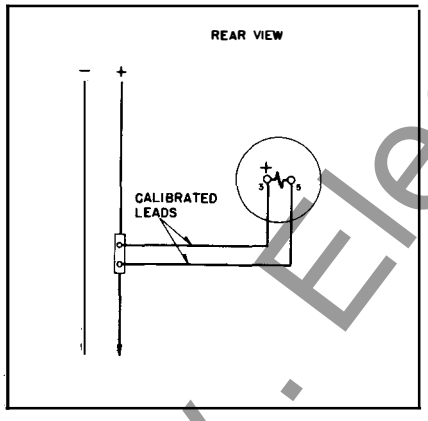


Fig. 8. Type X-241 Ammeter with External Shunt.

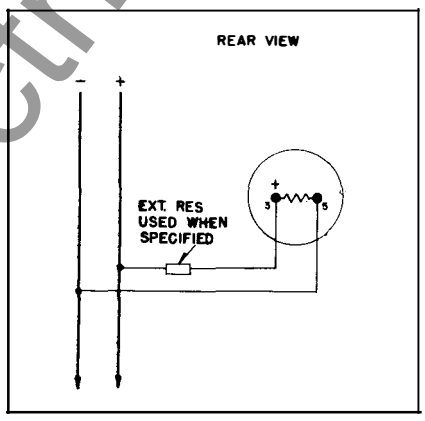


Fig. 9. Type X-241 Voltmeter.

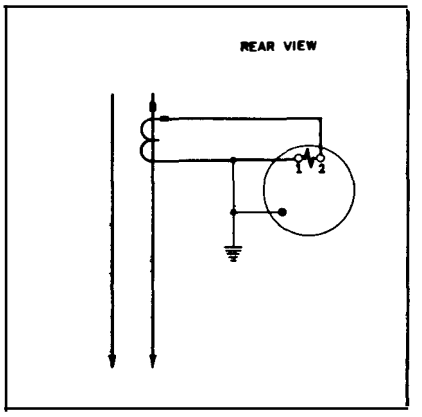


Fig. 10. Type A-241 Ammeter with Current Transformer.

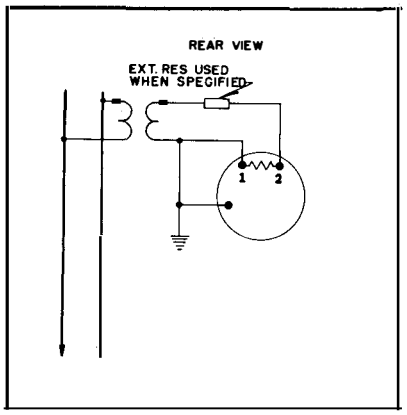


Fig. 11. Type A-241 Voltmeter with Potential Transformer.

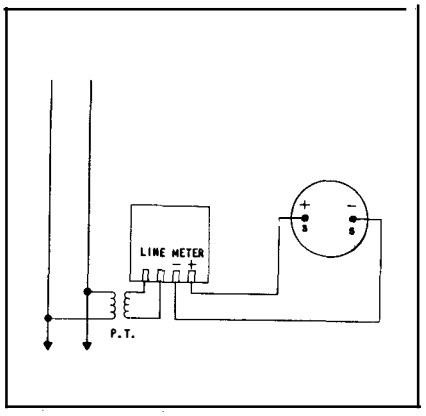


Fig. 12. Type X-241 Frequency Meter with External Transducer and Potential Transformer.

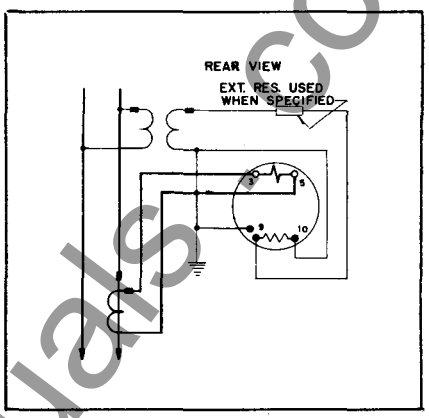


Fig. 13. Type F-241 and P-241 Single Phase Wattmeter with Current Transformer and Potential Transformer.

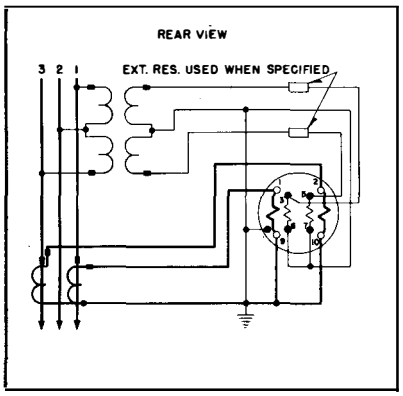


Fig. 14. Types F-241 and P-241 polyphase 2 current coil wattmeter with Current Transformer and Potential Transformer.

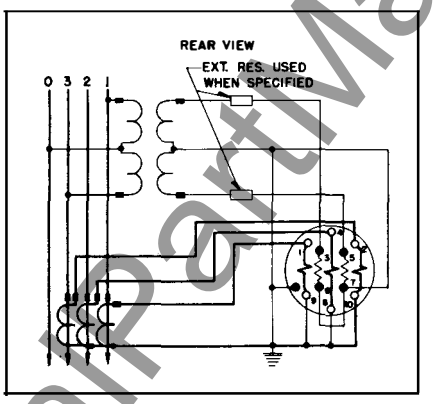


Fig. 15. Types F-241 and P-241 Polyphase 3 current coil wattmeter with Current Transformer and Potential Transformer.

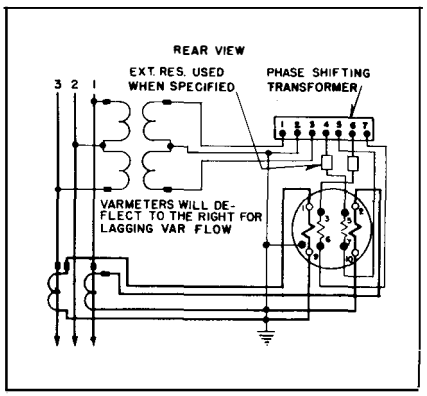


Fig. 16. Types F-241 and P-241 Polyphase 2 Current Coil Varmeter with Current Transformer and Potential Transformer.

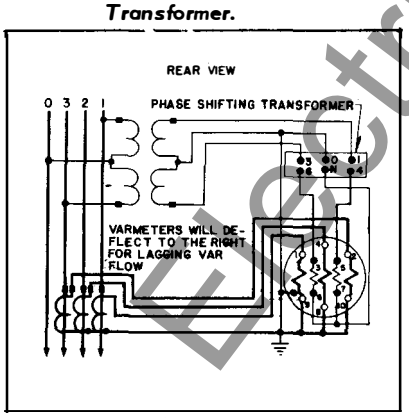


Fig. 17. Types F-241 and P-241 Polyphase 3 Current Coil Varmeter with Current Transformer and Potential Transformer.

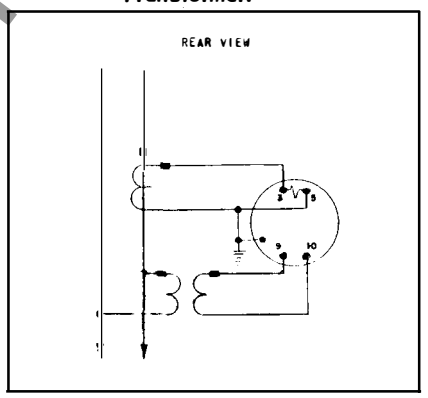


Fig. 18. Type I-241 Single Phase Power Factor Meter with Current Transformer and Potential Transformer.

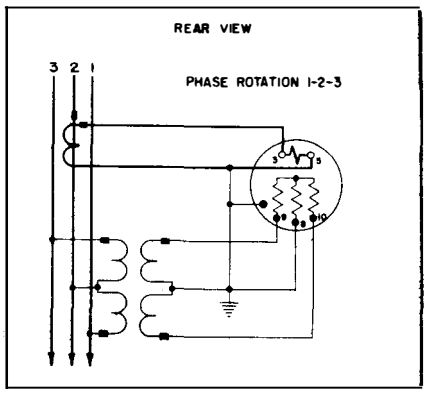


Fig. 19. Type I-241 Polyphase Power Factor Meter with Current Transformer and Potential Transformer.

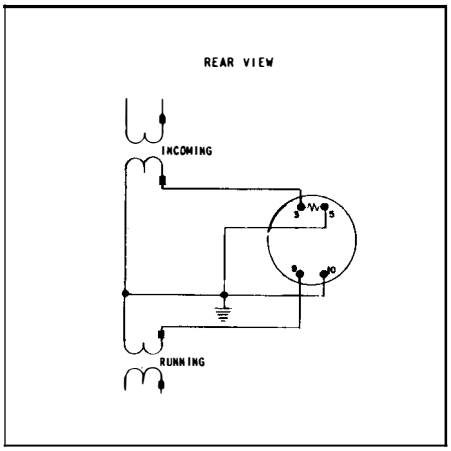


Fig. 20. Type 1-241 Synchroscope with Potential Transformer.

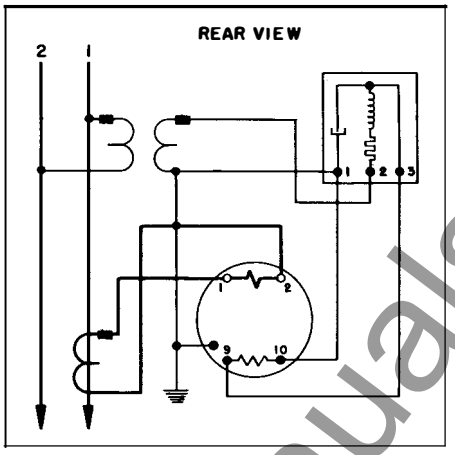


Fig. 21. Types F-241 and P-241 Single Phase Varmeter with C.T. and P.T.

WESTINGHOUSE ELECTRIC CORPORATION

INSTRUMENT DEPARTMENT **NEWARK, N. J.**

Printed in U. S. A.

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The first letter in the Type designation indicates the form of case used. K = Rectangular Flush Case, Flange mounted.

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A = Repulsion-Attraction, moving iron
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DESCRIPTION OF TAUT BAND SUSPENSION INSTRUMENTS

The KX-241 is a pivotless, bearingless d.c. instrument of the permanent magnet moving coil type. A suspension system is employed which replaces the conventional pivots, jewels, and control spring. At each end of one side of the moving coil is attached a thin metallic band. At the front and rear bridges these bands are connected to tension springs. The tension springs exert axial forces which keep the metallic bands taut and the moving element from sagging. The taut bands serve to carry current to the moving coil, and also provide the necessary deflection counter-torque.

allows the instrument to withstand severe conditions of shock and vibration. The suspension system assures longer life with reduced maintenance costs.

The KP-241 is a transducer type wattmeter consisting of a Hall Generator watt-transducer and an X-241 millivoltmeter mechanism tandem mounted in one self contained unit. The transducer portion converts the a-c watts represented by the current and voltage applied at the wattmeter terminals into a proportional d-c millivolt output. This transducer output operates the d-c millivoltmeter mechanism whose pointer indicates watts on a suitably marked scale.

DIAL NOTES

References to type style number, use of external components if required, coil ratings, calibration data etc., are made on the dial mask.

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Before energizing the instrument, adjust the pointer to zero by means of the zero adjuster at the front of the instrument.

CIRCUIT PRECAUTIONS

HIGH VOLTAGE OPERATION

All instruments are insulated for 800 volt maximum service.

When voltmeters are used with external resistors on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be grounded.

Ammeters with external shunts must be used with leads having the resistance specified in the dial notes. If the circuit voltage exceeds the insulation rating of the instrument, the shunt should be in the grounded side of the line.

GROUNDING OF CASES

Instruments, when mounted on grounded metal structures, are considered adequately grounded when secured to the structures by metal hard-

ware. For mounting on insulated structures any one of the three case to base mounting screws may be used as a grounding terminal.

CALIBRATION OF TAUT BAND SUSPENSION INSTRUMENTS

CAUTION: When the instrument mechanism is exposed, avoid contact with the tension springs. These springs are precisely made and positioned, and any pressures inadvertently applied to them may cause misalignment of the moving element.

Calibration changes or adjustments as large as plus or minus five per cent can be made without removing the instrument from the switchboard. Two magnetic shunts are provided for this purpose. These are hex-ended to facilitate adjustment into or out of the magnetic circuit. One shunt is located to the right, and one to the left of the vertical center line behind the dial at the top of the instrument. With the instrument cover removed the shunts can easily be adjusted using an insulated open end wrench*. The left hand shunt controls points at the upper end of the scale. The right hand shunt controls points about the center of the scale. These adjustments are interdependent and more than one adjustment of each calibrating shunt may be required to obtain a particular condition.

REPAIRS AND RENEWAL PARTS

The usual procedures and practices employed for servicing mechanisms of pivot-jewel type instruments cannot be applied to suspension type instruments. For this reason we recommend that all instruments in need of mechanism servicing be returned to the factory.

Orders for renewal parts should include the name of the part and the style and serial number of the instrument, appearing on the dial mask.

* Calibrating wrench, style no. 186A070G01. See special Data Sheet 43-805.

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1	KX-241	D.C. INST'S. INCLUDING AMMETERS UP TO 20 AMP.	3-5	.190-32	2.813	NOT USED	NONE	
2	KX-241	D.C. AMMETERS 30 & 50 AMP.	3-5	1/4-28	2.813	NOT USED	NONE	
3	KC-241	RECTIFIER INSTS.	3-5	.190-32	2.813	NOT USED	NONE	
4	KX-241	TEMPERATURE INDICATOR	3-4-5-6-7	.190-32	2.813	NOT USED	NONE	
5	KA-241	A.C. VOLTMETER UP TO 600 V.	3-5	.190-32	3.750	USED	NONE	
6	KA-241	A.C. AMMETER UP TO 6 INCLUDING 40 AMP	3-5	.190-32	3.750	NOT USED	NONE	
7	KI-241	SYNCHROSCOPE - SINGLE PHASE	3-5-9-10	.190-32	5.312	USED	NONE	
8	KI-241	POWER FACTOR METER - SINGLE PHASE	3-5-9-10	.190-32	5.312	USED	NONE	
9	KI-241	POWER FACTOR METER - 3 PHASE	3-5-8-9-10	.190-32	5.312	USED	NONE	
10	KP-241	WATTMETER (POLY PH. 2 CC)	1-2-3-5-6-7-9-10	.190-32	5.312	NOT USED	NONE	
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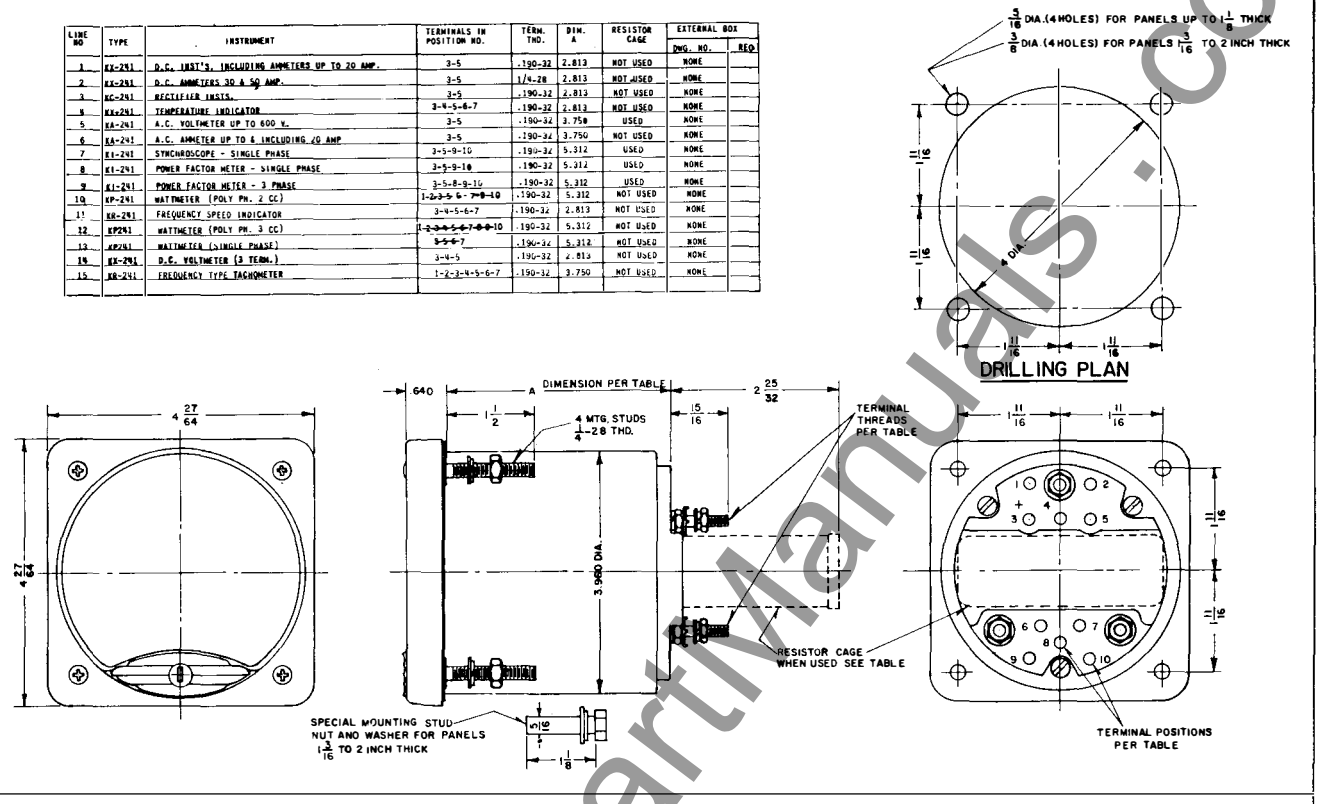

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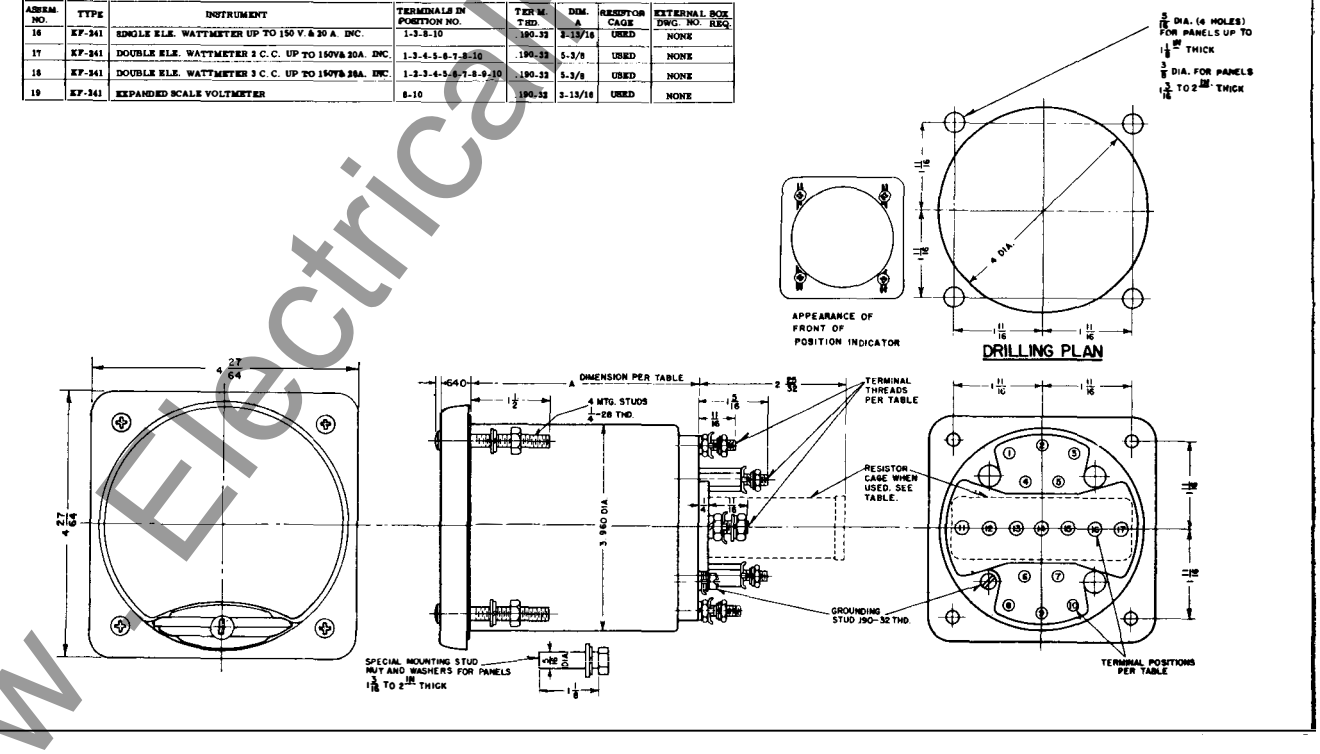
18	KF-241	DOUBLE ELE. WATTMETER 3 C.C. UP TO 150V& 20A. INC.	1-2-3-4-5-6-7-8-9-10	.190-32	5-3/8	USED	NONE	
19	KF-241	EXPANDED SCALE VOLTMETER	8-10	.190-32	3-13/16	USED	NONE	



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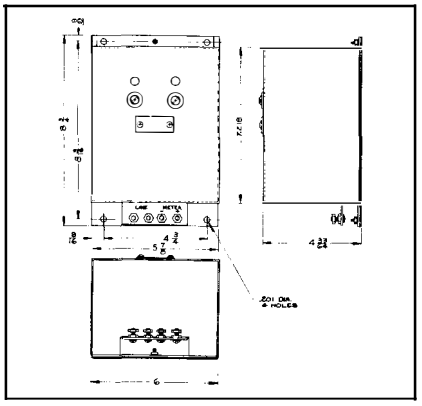


Fig. 2. Outline Dimensions and Drilling Plan for Transducer used with Frequency Meter.

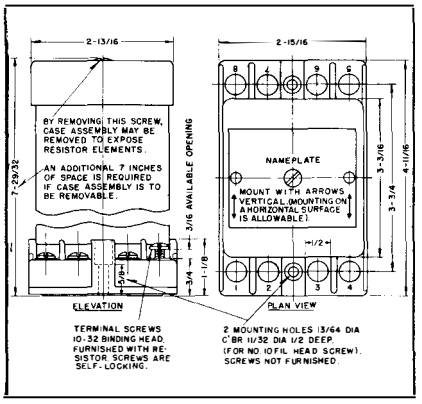


Fig. 3. Outline Dimensions and Drilling Plan for VR-825 External Resistor.

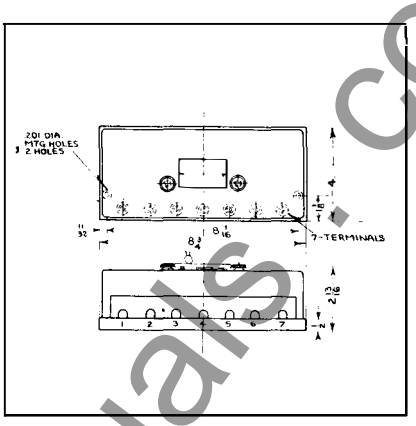


Fig. 4. Outline Dimensions and Drilling Plan for Phase Shifting Transformer used with 3-phase, 3-wire Varmeter.

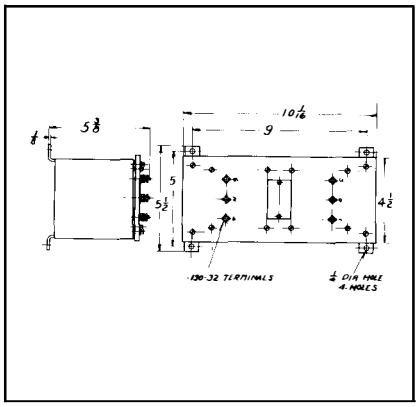


Fig. 5. Outline Dimensions and Drilling Plan for Phase Shifting Transformer used with 3-phase, 4-wire Varmeter.

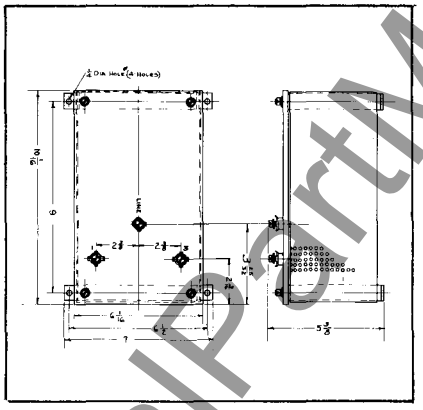


Fig. 6. Outline dimensions and Drilling Plan for Reaction Compensation used with Single Phase Varmeter.

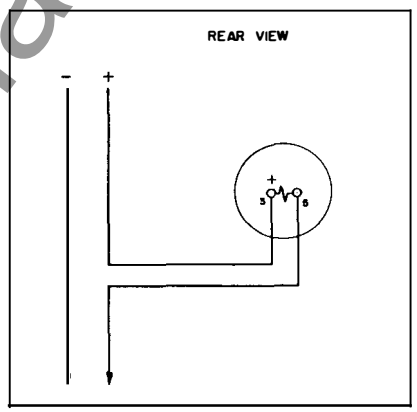


Fig. 7. Type X-241 Ammeter and Milliameter (self contained).

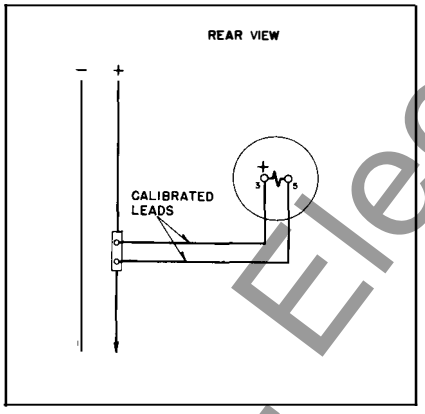


Fig. 8. Type X-241 Ammeter with External Shunt.

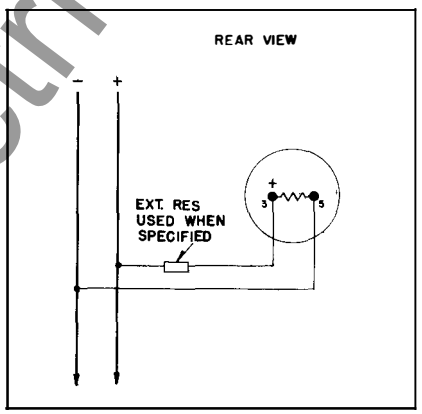


Fig. 9. Type X-241 Voltmeter.

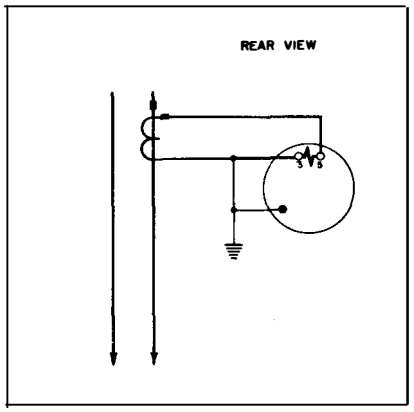


Fig. 10. Type A-241 Ammeter with Current Transformer.

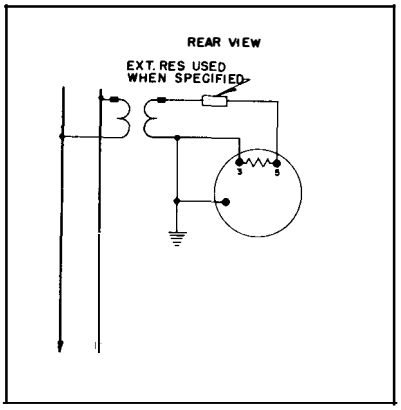


Fig. 11. Type A-241 Voltmeter with Potential Transformer.

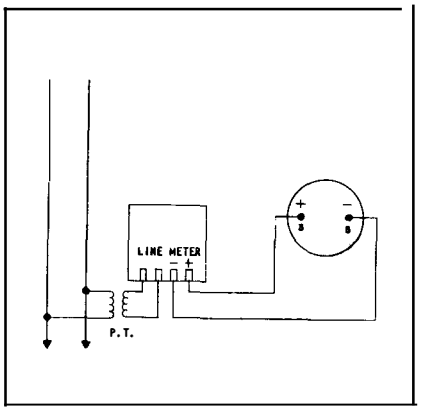


Fig. 12. Type X-241 Frequency Meter with External Transducer and Potential Transformer.

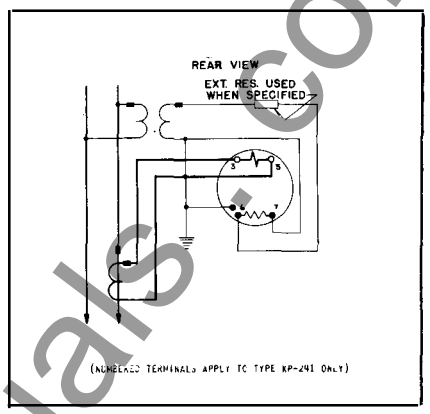


Fig. 13. Type F-241 and P-241 Single Phase Wattmeter with Current Transformer and Potential Tronsformer.

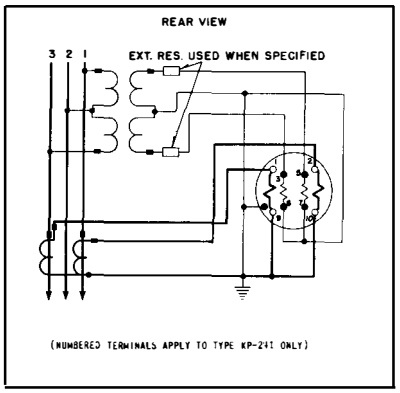


Fig. 14. Types F-241 and P-241 polyphase 2 current coil wattmeter with Current Transformer and Potential Transformer.

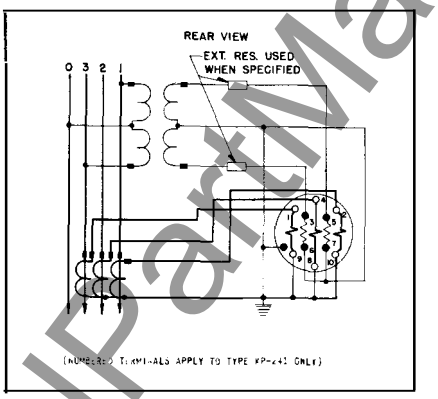


Fig. 15. Types F-241 and P-241 Polyphase 3 current coil wattmeter with Current Transformer and Potential Transformer,

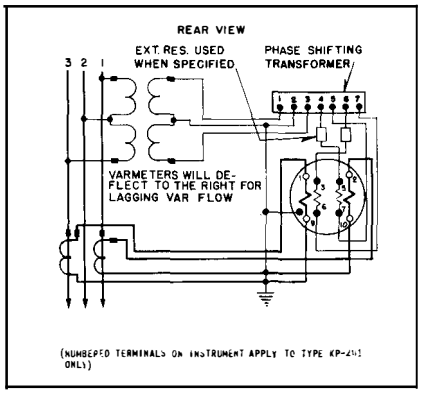


Fig. 16. Types F-241 and P-241 Polyphase 2 Current Coil Varmeter with Current Transformer and Potential Transformer.

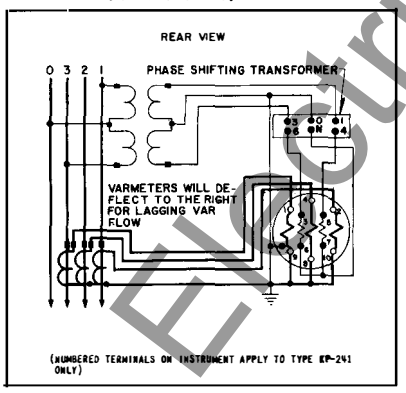


Fig. 17. Types F-241 and P-241 Polyphase 3 Current Coil Varmeter with Current Transformer and Potential Transformer.

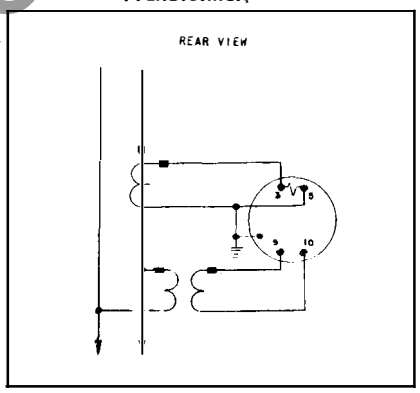


Fig. 18. Type I-241 Single Phase Power Factor Meter with Current Transformer and Potential Transformer.

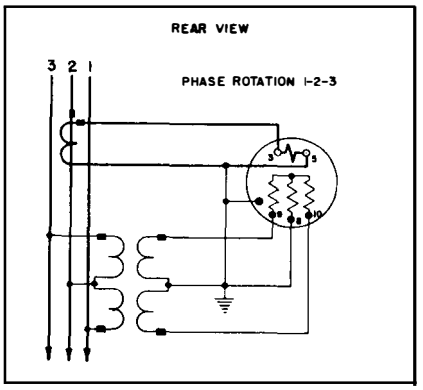


Fig. 19. Type I-241 Polyphase Power Factor Meter with Current Transformer and Potential Transformer.

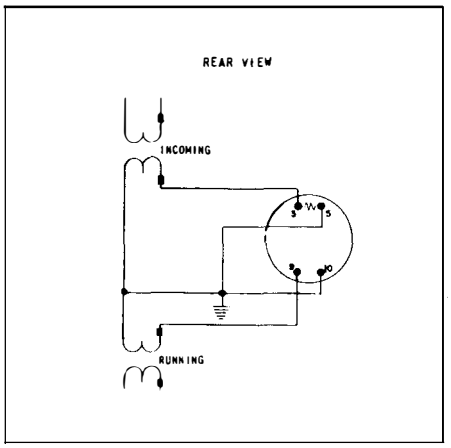


Fig. 20. Type 1-241 Synchroscope with Potential Transformer.

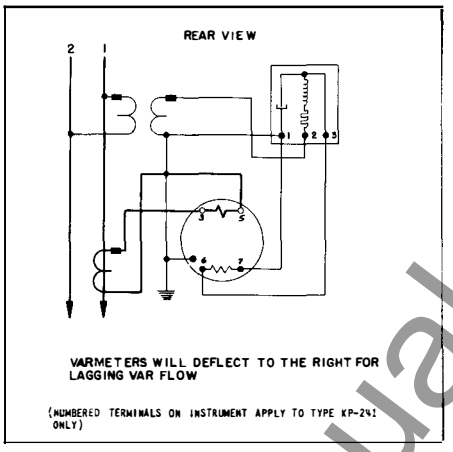


Fig. 21. Types F-241 and P-241 Single Phase Varmeter with C.T. and P.T.

WESTINGHOUSE ELECTRIC CORPORATION

INSTRUMENT DEPARTMENT

NEWARK, N. J.

Printed in U. S. A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

—K-241 LINE—
SWITCHBOARD INSTRUMENTS
FOUR AND ONE-HALF INCH CLASSIFICATION
FULL-VIEW CIRCULAR SCALE TYPE

GENERAL

Type K-241 instruments are designed and built to meet or exceed the requirements of American Standard C39.1 for electrical indicating switchboard instruments. The rated accuracy class is one per cent.

CASES

The first letter in the Type designation indicates the form of case used. K = Rectangular Flush Case, Flange mounted.

MECHANISMS

The second letter in the type designation indicates the principle of operation.

X = Permanent magnet moving coil
A = Repulsion-Attraction, moving iron
P = Watt transducer plus X
I = Rotating iron vane
C = Rectifier plus X
F = Iron core electromagnetic

All of the above mechanisms employ the taut band suspension bearing system except the I and F types.

CAUTION: When the instrument mechanism is exposed, avoid contact with the tension springs. These springs are precisely made and positioned. and any pressures inadvertently applied to them may cause misalignment of the moving element.

DIAL NOTES

References to type style number, use of external components if required, coil ratings, calibration data etc., are made on the dial mask.

INSTALLATION

Unpack instruments carefully. Terminal and mounting hardware, and any external components may be in separate packages.

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

Before energizing the instrument, adjust the pointer to zero by means of the zero adjuster at the front of the instrument.

CIRCUIT PRECAUTIONS

HIGH VOLTAGE OPERATION

All instruments are insulated for 800 volt maximum service.

When voltmeters are used with external resistors on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be grounded.

Ammeters with external shunts must be used with leads having the resistance specified in the dial notes. If the circuit voltage exceeds the insulation rating of the instrument, the shunt should be in the grounded side of the line.

GROUNDING OF CASES

Instruments, when mounted on grounded metal structures, are considered adequately grounded when secured to the structures by metal hardware. For mounting on insulated structures any one of the three case to base mounting screws may be used as a grounding terminal.

REPAIRS AND RENEWAL PARTS

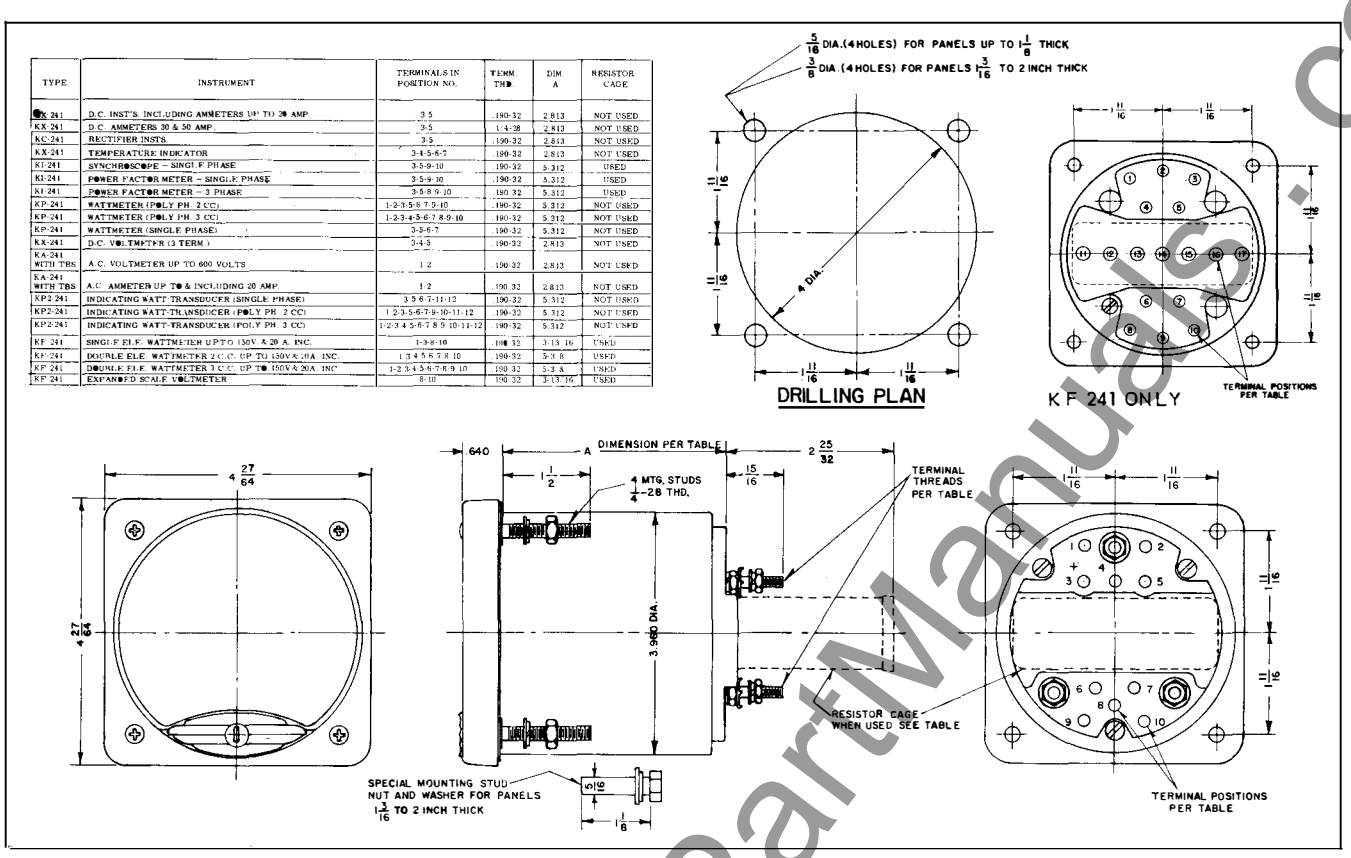
The usual procedures and practices employed for servicing mechanisms of pivot-jewel type instruments cannot be applied to suspension type instruments. For this reason we recommend that all instruments in need of mechanism servicing be returned to the factory.

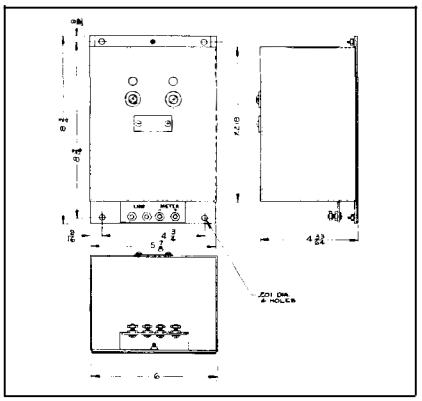
Orders for renewal parts should include the name of the part and the style and serial number of the instrument, appearing on the dial mask.

SUPERSEDES I.L. 43-241D
Complete Revision

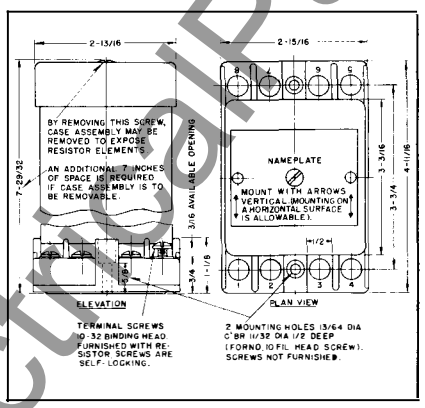
EFFECTIVE APRIL 1962

TYPE	INSTRUMENT	TERMINALS IN POSITION NO.	TERM. THD.	DIM. A	RESISTOR CAGE
KX-241	D.C. INST'S. INCLUDING AMMETERS UP TO 20 AMP.	3-5	10-32	2.813	NOT USED
KX-241	D.C. AMMETERS 30 & 50 AMP.	3-5	1/4-28	2.813	NOT USED
KC-241	RECTIFIER INSTS.	3-5	10-32	2.813	NOT USED
KX-241	TEMPERATURE INDICATOR	3-4-5-6-7	10-32	2.813	NOT USED
KI-241	SYNCHROSCOPE – SINGLE PHASE	3-5-9-10	10-32	5.312	USED
KI-241	POWER FACTOR METER – SINGLE PHASE	3-5-9-10	10-32	5.312	USED
XI-241	POWER FACTOR METER – 3 PHASE	3-5-8-9-10	10-32	5.312	USED
KP-241	WATTMETER (POLY PH. 2 CC)	1-2-3-5-6-7-9-10	10-32	5.312	NOT USED
KP-241	WATTMETER (POLY PH. 3 CC)	1-2-3-4-5-6-7-8-9-10	10-32	5.312	NOT USED
KP-241	WATTMETER (SINGLE PHASE)	3-5-6-7	10-32	5.312	NOT USED
KX-241	D.C. VOLTMETER (3 TERM.)	3-4-5	10-32	2.813	NOT USED
KA-241 WITH TBS	A.C. VOLTMETER UP TO 600 VOLTS	1-2	10-32	2.813	NOT USED
KA-241 WITH TBS	A.C. AMMETER UP TO & INCLUDING 20 AMP.	1-2	10-32	2.813	NOT USED
KP2-241	INDICATING WATT-TRANSDUCER (SINGLE PHASE)	3-5-6-7-11-12	10-32	5.312	NOT USED
KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 2 CC)	1-2-3-5-6-7-9-10-11-12	10-32	5.312	NOT USED
KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 3 CC)	1-2-3-4-5-6-7-8-9-10-11-12	10-32	5.312	NOT USED
KF-241	SINGLE ELE. WATTMETER UP TO 150V & 20 A. INC.	1-3-8-10	10-32	3-13/16	USED
KF-241	DOUBLE ELE. WATTMETER 2 C.C. UP TO 150V & 20A. INC.	1-3-4-5-6-7-8-10	10-32	5-3/8	USED
KF-241	DOUBLE ELE. WATTMETER 3 C.C. UP TO 150V & 20A. INC.	1-2-3-4-5-6-7-8-9-10	10-32	5-3/8	USED
KF-241	EXPANDED SCALE VOLTMETER	8-10	10-32	3-13/16	USED

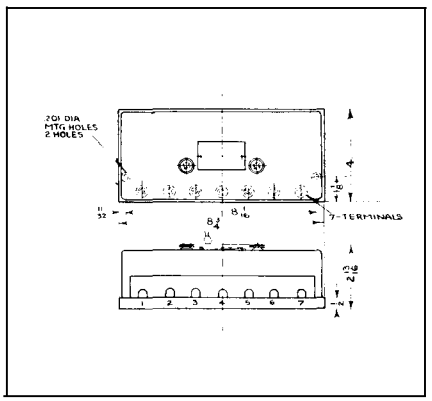




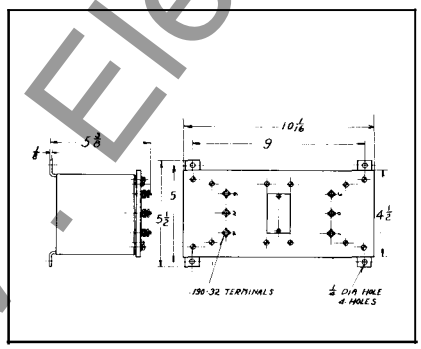
Transducer used with Frequency Meter.



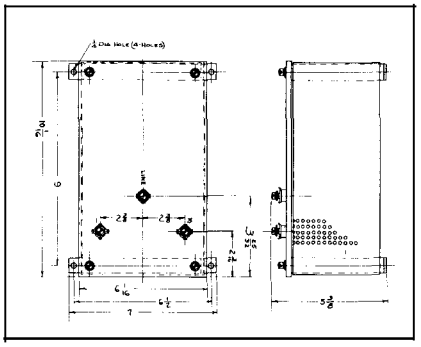
VR-825 External Resistor.



Phase Shifting Transformer used with 3-phase, 3-wire Varmeter.



Phase Shifting Transformer used with 3-phase, 4-wire Varmeter.



Reaction Compensation used with Single Phase Varmeter.

Fig. 1. Outline Dimensions and Drilling Plan for Type K-241 Instruments and Accessories.

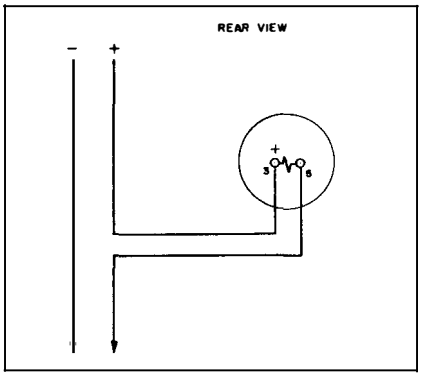


Fig. 2. Type X-241 Ammeter and Milliameter (self-contained).

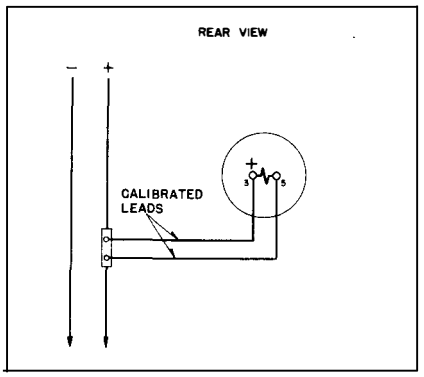


Fig. 3. Type X-241 Ammeter with External Shunt.

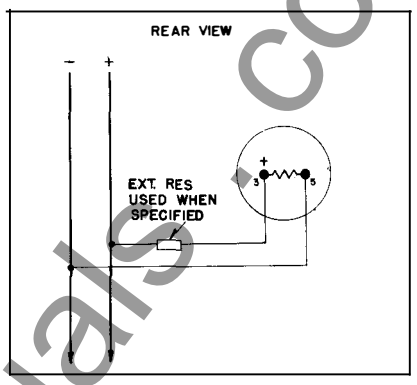


Fig. 4. Type X-241 Voltmeter.

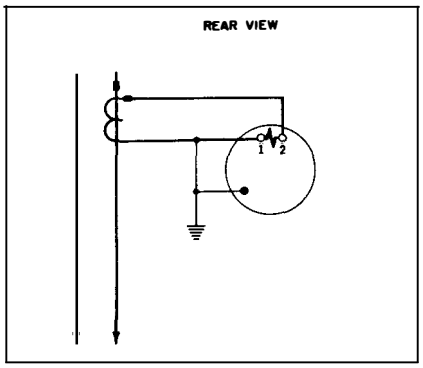


Fig. 5. Type A-241 and C-241 Ammeter.

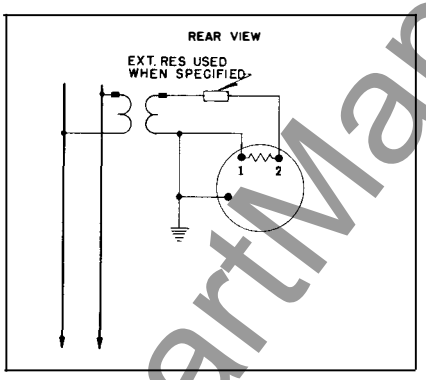


Fig. 6. Type A-241 and C-241 Voltmeter.

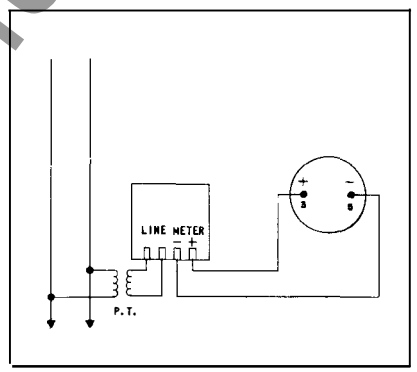


Fig. 7. Type X-241 Frequency Meter with External Transducer.

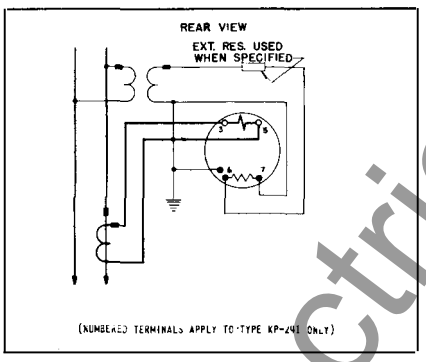


Fig. 8. Type F-241 and P-241 Single Phase Wattmeter.

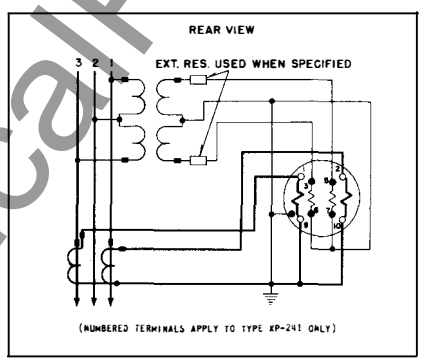


Fig. 9. Types F-241 and P-241 polyphase 2 current coil wattmeter.

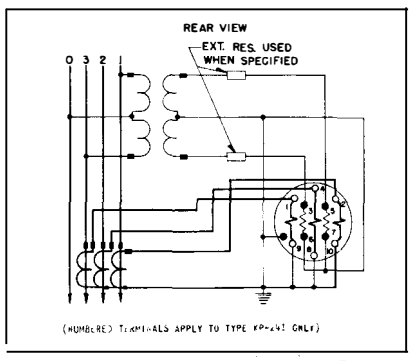


Fig. 10. Types F-241 and P-241 Polyphase 3 current coil wattmeter.

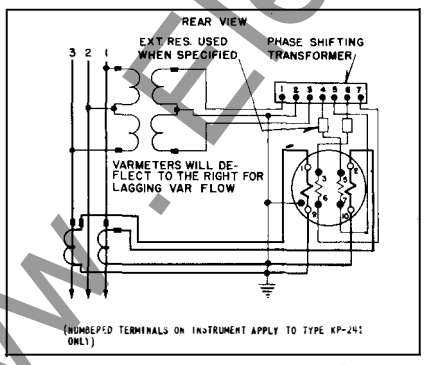


Fig. 11. Types F-241 and P-241 Polyphase 2 Current Coil Varmeter.

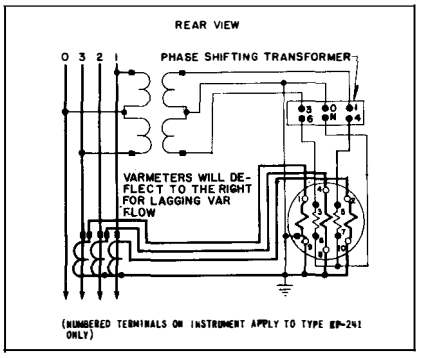


Fig. 12. Types F-241 and P-241 Polyphase 3 Current Coil Varmeter.

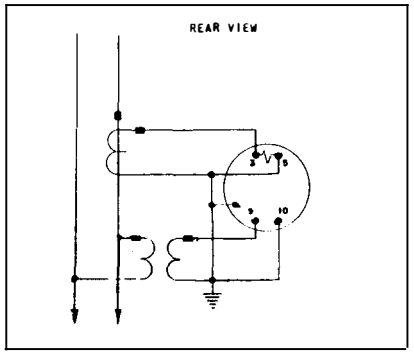


Fig. 13. Type I-241 Single Phase Power Factor Meter.

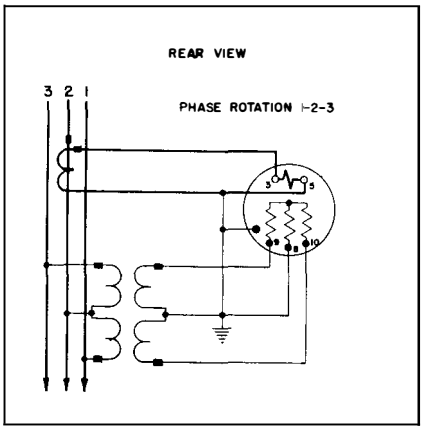


Fig. 14. Type I-241 Polyphase Power Factor Meter.

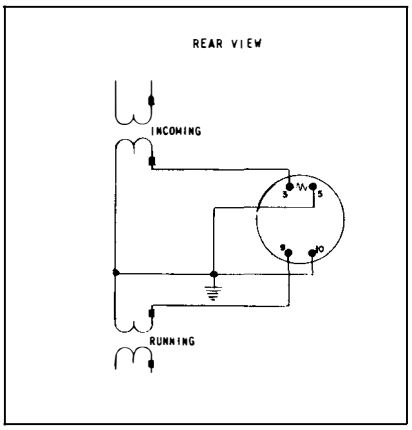


Fig. 15. Type I-241 Synchroscope.

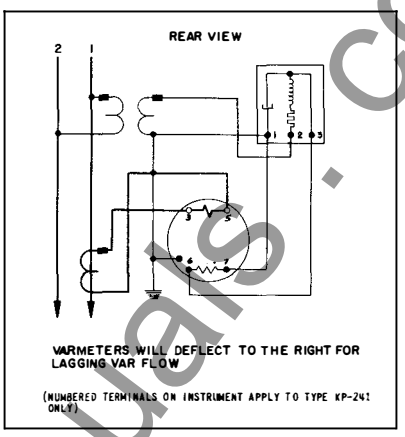


Fig. 16. Types F-241 and P-241 Single Phase Varmeter.

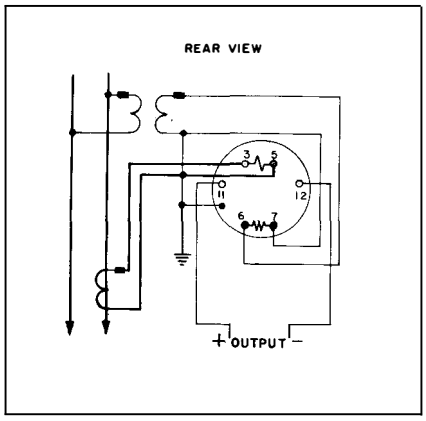


Fig. 17. Type KP2-241 Indicating Watt Transducer Single Phase.

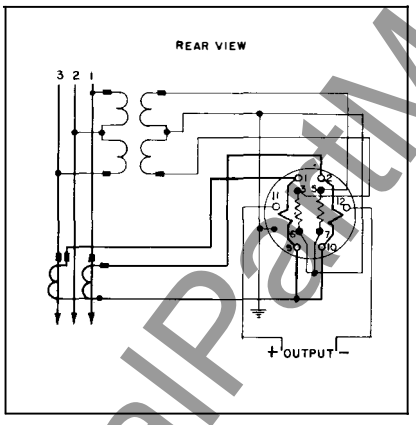


Fig. 18. Type KP2-241 Indicating Watt Transducer 2 Current Coil.

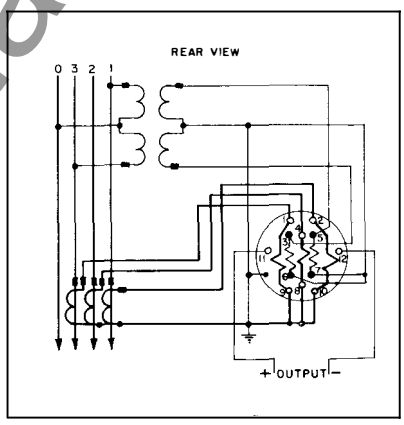


Fig. 19. Type KP2-241 Indicating Watt Transducer 3 Current Coil.

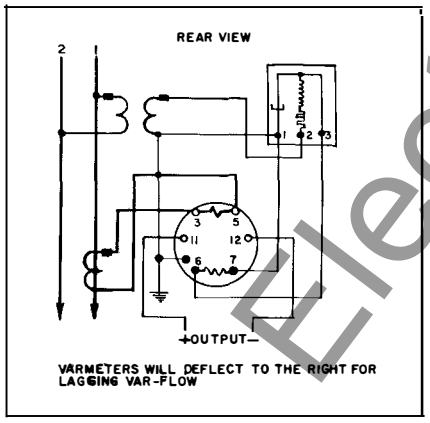


Fig. 20. Type KP2-241 Indicating VAR Transducer Single Phase.

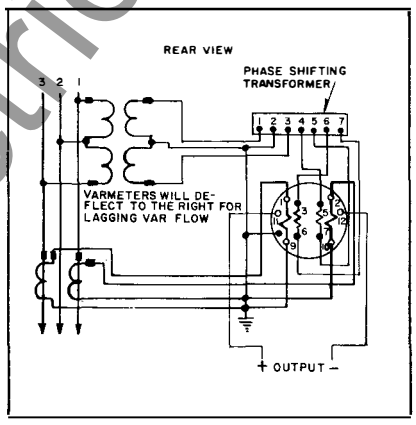


Fig. 21. Type KP2-241 Indicating VAR Transducer 2 Current Coil.

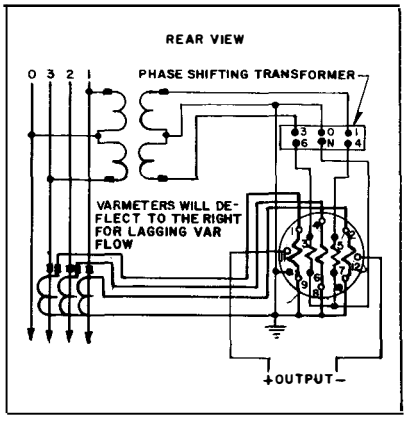


Fig. 22. Type KP2-241 Indicating VAR Transducer 3 Current Coil.

WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**
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INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

— K-241 LINE —
SWITCHBOARD INSTRUMENTS
FOUR AND ONE-HALF INCH CLASSIFICATION
FULL-VIEW CIRCULAR SCALE TYPE

GENERAL

Type K-241 instruments are designed and built to meet or exceed the requirements of American Standard C39.1 for electrical indicating switchboard instruments. The rated accuracy class is one per cent.

CASES

The first letter in the Type designation indicates the form of case used. K = Rectangular Flush Case, Flange mounted.

MECHANISMS

The second letter in the type designation indicates the principle of operation.

X = Permanent magnet moving coil
A = Repulsion-Attraction, moving iron
P = Watt transducer plus X
I = Rotating iron vane
C = Rectifier plus X
F = Iron core electromagnetic

All of the above mechanisms employ the taut band suspension bearing system except the I and F types.

CAUTION: When the instrument mechanism is exposed, avoid contact with the tension springs. These springs are precisely made and positioned. and any pressures inadvertently applied to them may cause misalignment of the moving element.

DIAL NOTES

References to type style number, use of external components if required, coil ratings, calibration data etc., are made on the dial mask.

INSTALLATION

Unpack instruments carefully. Terminal and mounting hardware, and any external components may be in separate packages.

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

Before energizing the instrument, adjust the pointer to zero by means of the zero adjuster at the front of the instrument.

CIRCUIT PRECAUTIONS

HIGH VOLTAGE OPERATION

All instruments are insulated for 800 volt maximum service.

When voltmeters are used with external resistors on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be grounded.

Ammeters with external shunts must be used with leads having the resistance specified in the dial notes. If the circuit voltage exceeds the insulation rating of the instrument, the shunt should be in the grounded side of the line.

GROUNDING OF CASES

Instruments, when mounted on grounded metal structures, are considered adequately grounded when secured to the structures by metal hardware. For mounting on insulated structures any one of the three case to base mounting screws may be used as a grounding terminal.

REPAIRS AND RENEWAL PARTS

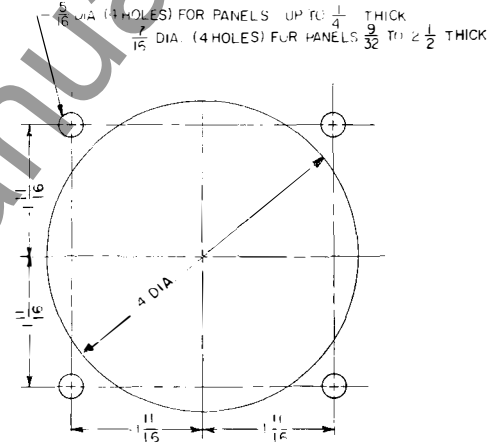
The usual procedures and practices employed for servicing mechanisms of pivot-jewel type instruments cannot be applied to suspension type instruments. For this reason we recommend that all instruments in need of mechanism servicing be returned to the factory.

Orders for renewal parts should include the name of the part and the style and serial number of the instrument, appearing on the dial mask.

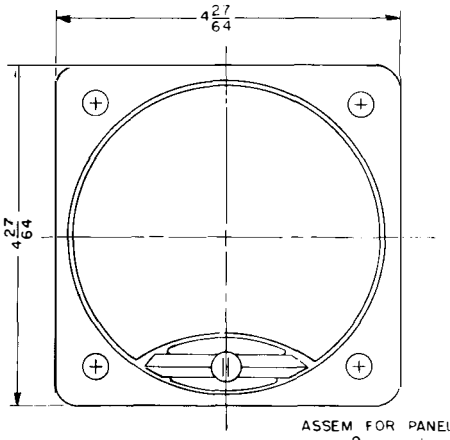
SUPERSEDES I.L. 43-241M
*Denotes change from superseded issue.

EFFECTIVE OCTOBER 1968

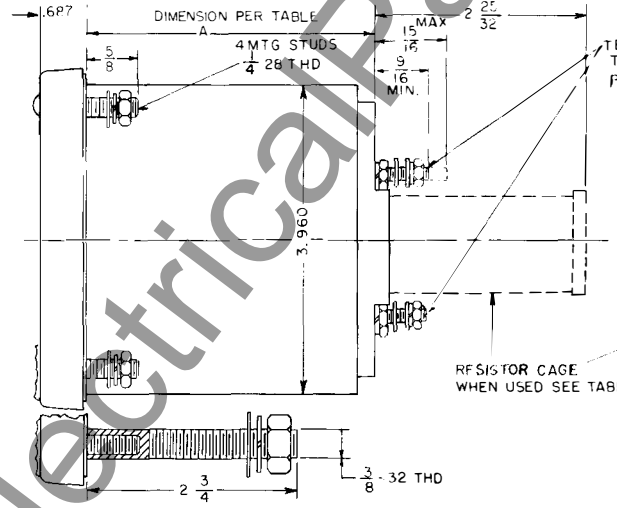
FIGURE NO.	TYPE	INSTRUMENT	TERMINALS IN POSITION NO.	TERM. THD.	DIM. A	RESISTOR CASE	USED WITH ILLUMINATION ONLY DIAL ILLUMINATION TERMINALS	EXTERNAL TRANSFORMER
1	KX-231 KX-241	D.C. INST'S INCLUDING AMMETERS UP TO 20 AMP	3-5	.190-32	2.813	NOT USED	6-7	REQ.
2	KX-231 KX-241	D.C. AMMETERS 30 & 50 AMP.	3-5	1/4-28	2.813	NOT USED	6-7	REQ.
3	K-231 KX-241	RECTIFIER INSTS. EXCEPT TRANSFORMER TYPE	3-5	.190-32	2.813	NOT USED	6-7	REQ.
4	KX-231 KX-241	TEMPERATURE INDICATOR	3-4-5-6-7	.190-32	2.813	NOT USED	9-10	REQ.
5	KA-241	A.C. VOLTMETER UP TO 600 V.	3-5	.190-32	3.750	USED	9-10	NOT REQ.
6	KA-241	A.C. AMMETER UP TO & INCLUDING 20 AMP	3-5	.190-32	3.750	NOT USED	9-10	NOT REQ.
7	K1-231 K1-241	SYNCHROSCOPE - SINGLE PHASE	1-2-9-10	.190-32	5.312	USED	NONE	NONE
8	K1-231 K1-241	POWER FACTOR METER - SINGLE PHASE	1-2-9-10	.190-32	5.312	USED	NONE	NONE
9	K1-231 K1-241	POWER FACTOR METER - 3 PHASE	1-2-8-9-10	.190-32	5.312	USED	NONE	NONE
10	KP-231 KP-241	WATTMETER (POLY PH. 2CC)	1-2-3-5-6-7-9-10	.190-32	5.312	NOT USED	5-7	NOT REQ.
11	KR3-231 KR3-241	FREQUENCY METER (SELF CONTAINED)	3-5	.190-32	3.750	NOT USED	6-7	REQ.
12	KP-231 KP-241	WATTMETER (POLY PH. 3 CC)	1 TO 10	.190-32	5.312	NOT USED	5-7	NOT REQ.
13	KP-231 KP-241	WATTMETER (SINGLE PHASE)	3-5-6-7	.190-32	5.312	NOT USED	6-7	NOT REQ.
14	KX-231 KX-241	D.C. VOLTMETER (3 TERM.)	3-4-5	.190-32	2.813	NOT USED	6-7	REQ.
15								
16	KA-231 KA-241 (TB5)	A.C. VOLTMETER UP TO 600 VOLTS	1-2	.190-32	2.813	NOT USED	6-7	NOT REQ.
17	KA-231 KA-241 (TB6)	A.C. AMMETER UP TO & INCLUDING 20 AMP	1-2	.190-32	2.813	NOT USED	6-7	NOT REQ.
18	KC-231 KC-241	ELECTRICALLY SUPPRESSED INST.	3-5	.190-32	3.750	NOT USED	6-7	REQ.
19	KA-231 KA-241 (TB8)	A.C. DOUBLE RANGE AMMETER	1-2-9-10	.190-32	2.813	NOT USED	NONE	NOT REQ.
20								
21	KR-231 KR-241	SPEED INDICATOR	1-2-9-10	.190-32	3.750	NOT USED	NONE	NOT REQ.
22	KP-2-231 KP2-241	INDICATING WATT-TRANSDUCER (SINGLE PHASE)	3-5-6-7-11-12	.190-32	5.312	NOT USED	6-7	NOT REQ.
23	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 2 CC)	1-2-3-5-6-7-9 TO 12	.190-32	5.312	NOT USED	5-7	NOT REQ.
24	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 3 CC)	1 TO 12	.190-32	5.312	NOT USED	5-7	NOT REQ.
25	KC-231 KC-241	TRANSFORMER TYPE RECTIFIER AMMETER	3-5	.190-32	3.750	NOT USED	6-7	REQ.
26	KX-241	ELECTRICAL RESISTANCE THERMOMETER	1-2-3-4-5-6-7	.190-32	3.750	NOT USED	NONE	NOT REQ.
27								
28	KR2-231 KR2-241	SPEED INDICATOR	1-2-3-5-9-10	.190-32	3.750	NOT USED	NONE	NOT REQ.
29	KC-241	EXPANDED SCALE VOLTMETER	3-5	.190-32	3.750	NOT USED	6-7	REQ.

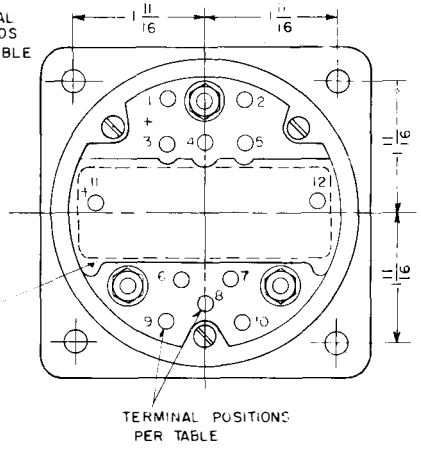


DRILLING PLAN



ASSEM FOR PANELS FROM 9/32 TO 2 1/2 TK





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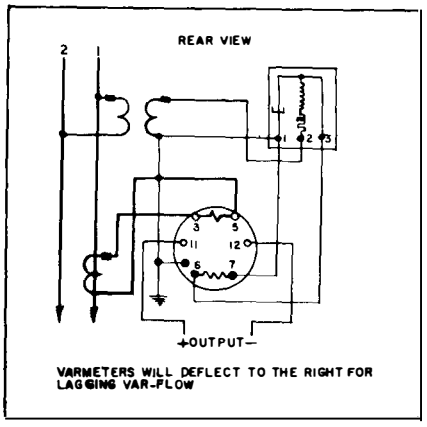


Fig. 21. Type KP2-241 Indicating VAR Transducer Single Phase.

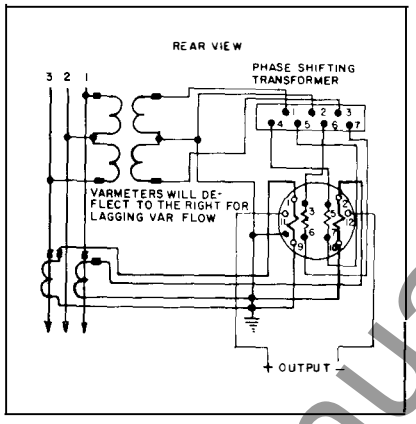


Fig. 22. Type KP2-241 Indicating VAR Transducer 2 Current Coil.

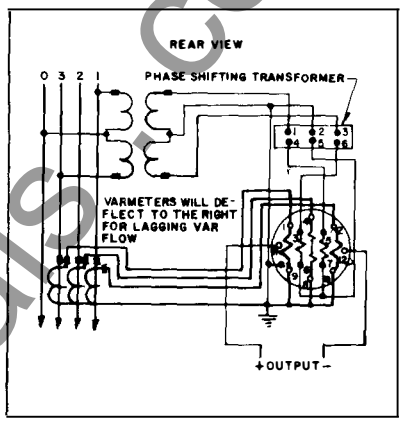
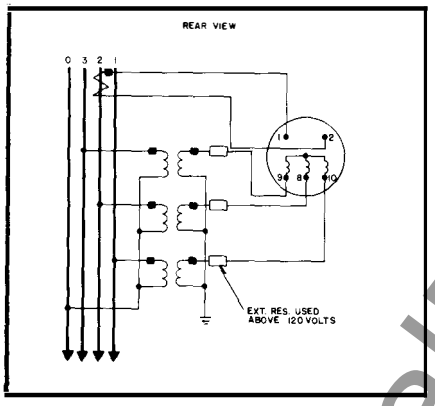
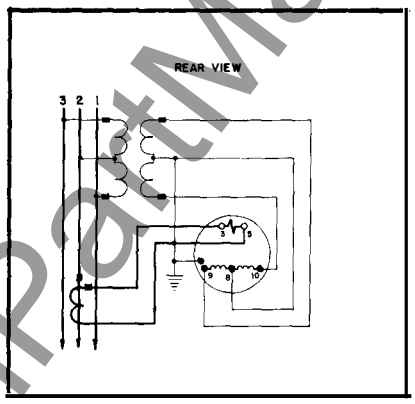


Fig. 23. Type KP2-241 Indicating VAR Transducer 3 Current Coil.



** Fig. 24. Type KI241-3 Phase 4 Wire Power Factor Meter*



** Fig. 25 Type KP241 Single Element Wattmeter for 3 Phase 3 Wire.*

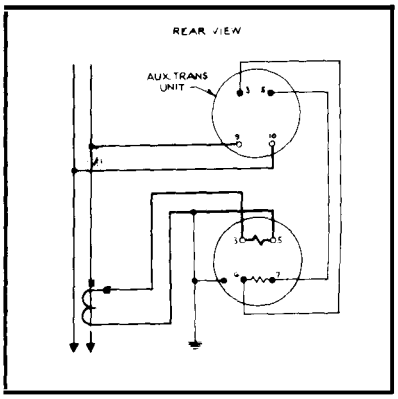


Fig. 26 KP241 Single Phase Wattmeter for use on 480 volts.

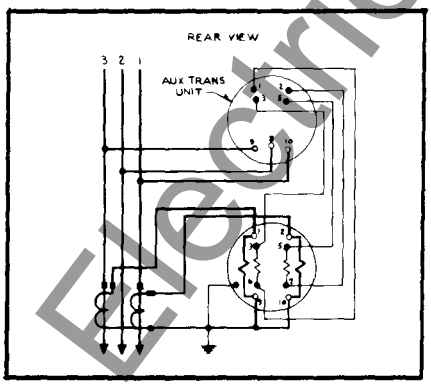


Fig. 27 KP241-2 Current Coil Wattmeter for use on 480 volts.

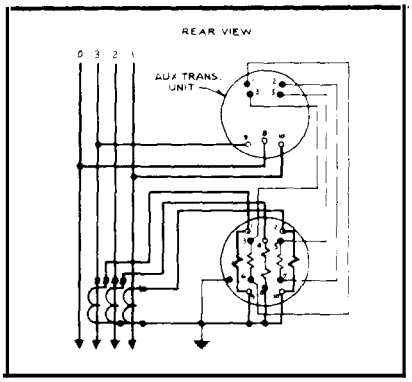
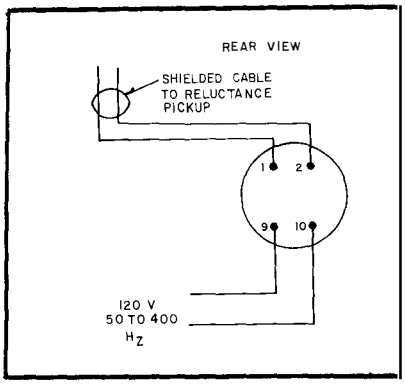
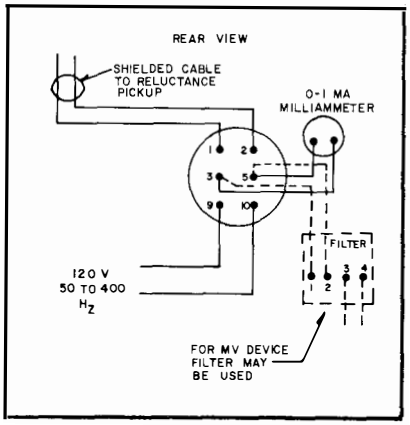


Fig. 28 KP241-3 Current Coil Wattmeter for use on 480 volts.



** Fig. 29 KR241 Speed Indicator 876A468.*



* *Fig. 30 KR-2-241 Speed Indicator 876A469.*

WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION
NEWARK, N. J.
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INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

—K-241 LINE—
SWITCHBOARD INSTRUMENTS
FOUR AND ONE-HALF INCH CLASSIFICATION
FULL-VIEW CIRCULAR SCALE TYPE

GENERAL

Type K-241 instruments are designed and built to meet or exceed the requirements of American Standard C39.1 for electrical indicating switchboard instruments. The rated accuracy class is one per cent.

CASES

The first letter in the Type designation indicates the form of case used. K = Rectangular Flush Case, Flange mounted.

MECHANISMS

The second letter in the type designation indicates the principle of operation.

- X = Permanent magnet moving coil
- A = Repulsion-Attraction, moving iron
- P = Watt transducer plus X
- I = Rotating iron vane
- C = Rectifier plus X
- F = Iron core electromagnetic

All of the above mechanisms employ the taut band suspension bearing system except the I and F types.

CAUTION: When the instrument mechanism is exposed, avoid contact with the tension springs. These springs are precisely made and positioned. and any pressures inadvertently applied to them may cause misalignment of the moving element.

DIAL NOTES

References to type style number, use of external components if required, coil ratings, calibration data etc., are made on the dial mask.

INSTALLATION

Unpack instruments carefully. Terminal and mounting hardware, and any external components may be in separate packages.

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

Before energizing the instrument, adjust the pointer to zero by means of the zero adjuster at the front of the instrument.

CIRCUIT PRECAUTIONS

HIGH VOLTAGE OPERATION

All instruments are insulated for 800 volt maximum service.

When voltmeters are used with external resistors on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be grounded.

Ammeters with external shunts must be used with leads having the resistance specified in the dial notes. If the circuit voltage exceeds the insulation rating of the instrument, the shunt should be in the grounded side of the line.

GROUNDING OF CASES

Instruments, when mounted on grounded metal structures, are considered adequately grounded when secured to the structures by metal hardware. For mounting on insulated structures any one of the three case to base mounting screws may be used as a grounding terminal.

REPAIRS AND RENEWAL PARTS

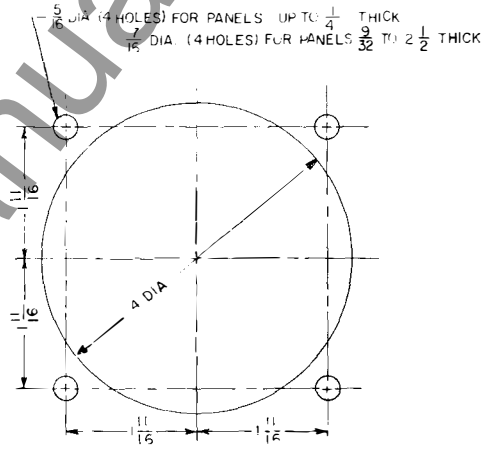
The usual procedures and practices employed for servicing mechanisms of pivot-jewel type instruments cannot be applied to suspension type instruments. For this reason we recommend that all instruments in need of mechanism servicing be returned to the factory.

Orders for renewal parts should include the name of the part and the style and serial number of the instrument, appearing on the dial mask.

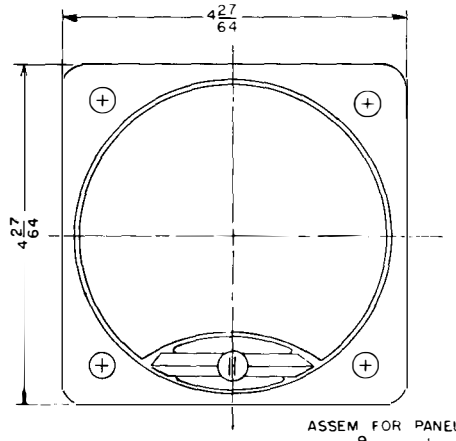
SUPERSEDES I.L. 43-241N
*Denotes change from superseded issue.

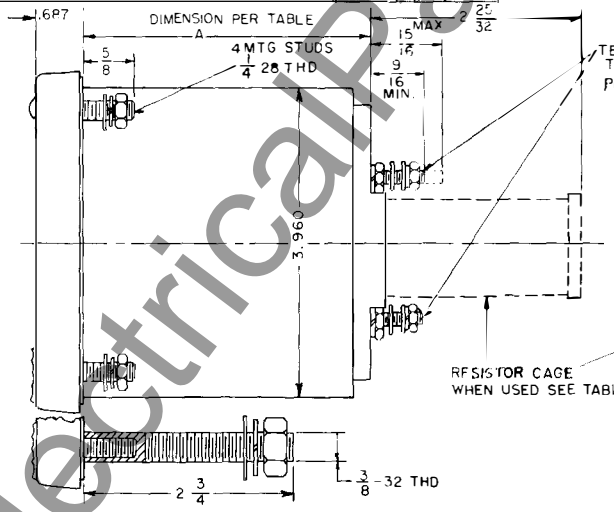
EFFECTIVE JUNE 1969

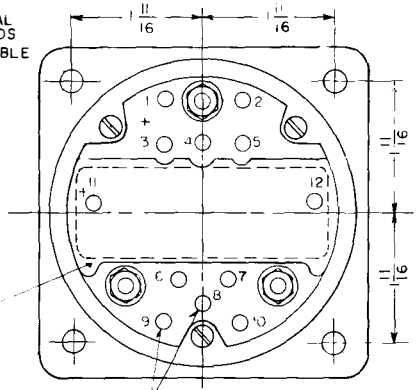
NUMBER	TYPE	INSTRUMENT	TERMINALS IN POSITION NO.	TERM. THD.	DIM. A	RESISTOR CASE	USED WITH ILLUMINATION ONLY: DIAL ILLUMINATION TERMINALS	USED WITH ILLUMINATION ONLY: EXTERNAL TRANSFORMER
1	KX-231 KX-241	D.C. INST'S INCLUDING AMMETERS UP TO 20 AMP	3-5	.190-32	2.813	NOT USED	6-7	REQ.
2	KX-231 KX-241	D.C. AMMETERS 30 & 50 AMP.	3-5	1/4-28	2.813	NOT USED	6-7	REQ.
3	K-231 KX-241	RECTIFIER INSTS. EXCEPT TRANSFORMER TYPE	3-5	.190-32	2.813	NOT USED	6-7	REQ.
4	KX-231 KX-241	TEMPERATURE INDICATOR	3-4-5-6-7	.190-32	2.813	NOT USED	9-10	REQ.
5	KA-241	A.C. VOLTMETER UP TO 600 V.	3-5	.190-32	3.750	USED	9-10	NOT REQ.
6	KA-241	A.C. AMMETER UP TO & INCLUDING 20 AMP	3-5	.190-32	3.750	NOT USED	9-10	NOT REQ.
7	KI-231 KI-241	SYNCHROSCOPE - SINGLE PHASE	1-2-9-10	.190-32	5.312	USED	NONE	NONE
8	KI-231 KI-241	POWER FACTOR METER - SINGLE PHASE	1-2-8-10	.190-32	5.312	USED	NONE	NONE
9	KI-231 KI-241	POWER FACTOR METER - 3 PHASE	1-2-8-9-10	.190-32	5.312	USED	NONE	NONE
10	KP-231 KP-241	WATTMETER (POLY PH. 2CC)	1-2-3-5-6-7-9-10	.190-32	5.312	NOT USED	5-7	NOT REQ.
11	KR2-231 KR2-241	FREQUENCY METER (SELF CONTAINED)	3-5	.190-32	3.750	NOT USED	6-7	REQ.
12	KP-231 KP-241	WATTMETER (POLY PH. 3 CC)	1 TO 10	.190-32	5.312	NOT USED	5-7	NOT REQ.
13	KP-231 KP-241	WATTMETER (SINGLE PHASE)	3-5-6-7	.190-32	5.312	NOT USED	6-7	NOT REQ.
14	KX-231 KX-241	D.C. VOLTMETER (3 TERM.)	3-4-5	.190-32	2.813	NOT USED	6-7	REQ.
15								
16	KA-231 KA-241(TB5)	A.C. VOLTMETER UP TO 600 VOLTS	1-2	.190-32	2.813	NOT USED	6-7	NOT REQ.
17	KA-231 KA-241(TB6)	A.C. AMMETER UP TO & INCLUDING 20 AMP	1-2	.190-32	2.813	NOT USED	6-7	NOT REQ.
18	KC-231 KC-241	ELECTRICALLY SUPPRESSED INST.	3-5	.190-32	3.750	NOT USED	6-7	REQ.
19	KA-231 KA-241(TB9)	A.C. DOUBLE RANGE AMMETER	1-2-9-10	.190-32	2.813	NOT USED	NONE	NOT REQ.
20								
21	KR-231 KR-241	SPEED INDICATOR	1-2-9-10	.190-32	3.750	NOT USED	NONE	NOT REQ.
22	KP-2-231 KP2-241	INDICATING WATT-TRANSDUCER (SINGLE PHASE)	3-5-6-7-11-12	.190-32	5.312	NOT USED	6-7	NOT REQ.
23	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 2 CC)	1-2-3-5-6-7-9 TO 12	.190-32	5.312	NOT USED	5-7	NOT REQ.
24	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 3 CC)	1 TO 12	.190-32	5.312	NOT USED	5-7	NOT REQ.
25	KC-231 KC-241	TRANSFORMER TYPE RECTIFIER AMMETER	3-5	.190-32	3.750	NOT USED	6-7	REQ.
26	KX-241	ELECTRICAL RESISTANCE THERMOMETER	1-2-3-4-5-6-7	.190-32	3.750	NOT USED	NONE	NOT REQ.
27								
28	KR2-231 KR2-241	SPEED INDICATOR	1-2-3-5-9-10	.190-32	3.750	NOT USED	NONE	NOT REQ.
29	KC-241	EXPANDED SCALE VOLTMETER	3-5	.190-32	3.750	NOT USED	6-7	REQ.



DRILLING PLAN







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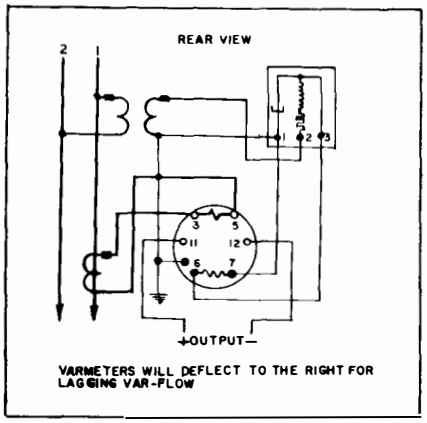

Fig. 21. Type KP2-241 Indicating VAR Transducer Single Phase.

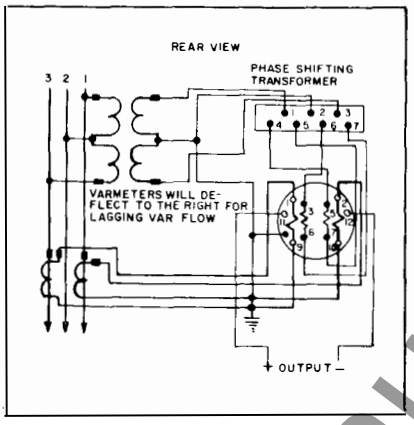

Fig. 22. Type KP2-241 Indicating VAR Transducer 2 Current Coil.

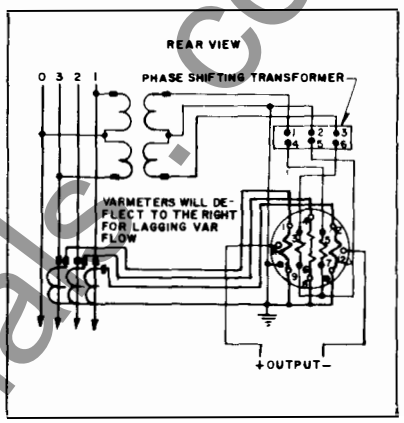

Fig. 23. Type KP2-241 Indicating VAR Transducer 3 Current Coil.

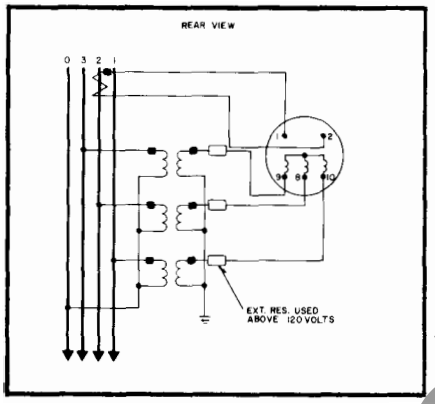

Fig. 24. TypeKI241-3 Phase 4 Wire Power Factor Meter

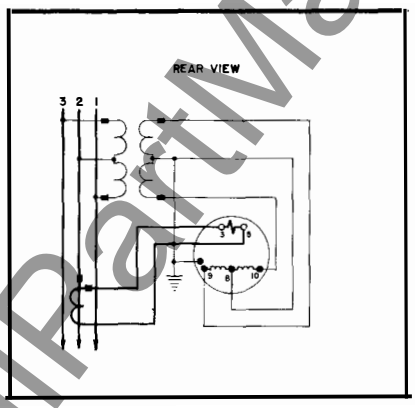

Fig. 25 Type KP241 Single Element Wattmeter for 3 Phase 3 Wire.

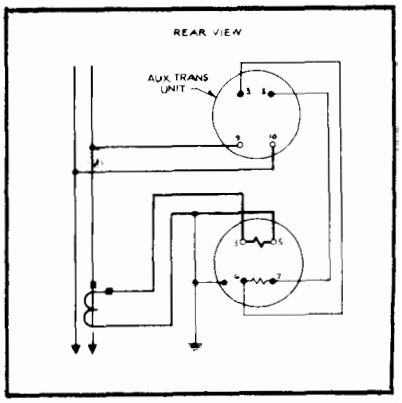

Fig. 26 KP241 Single Phase Wattmeter for use on 480 volts.

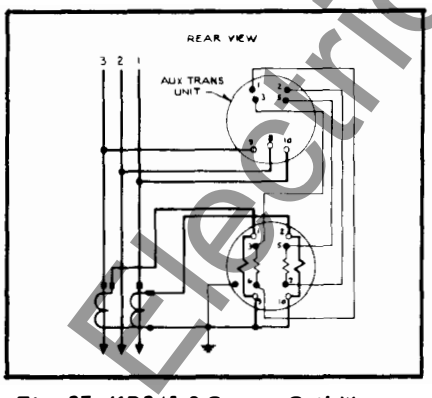

Fig. 27 KP241-2 Current Coil Wattmeter for use on 480 volts.

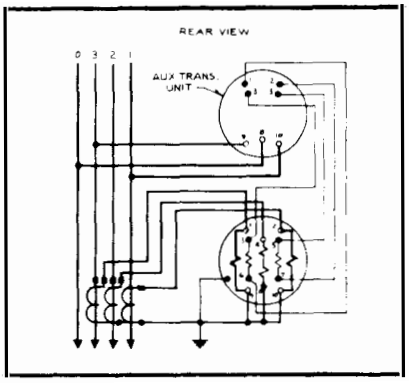

Fig. 28 KP241-3 Current Coil Wattmeter for use on 480 volts.

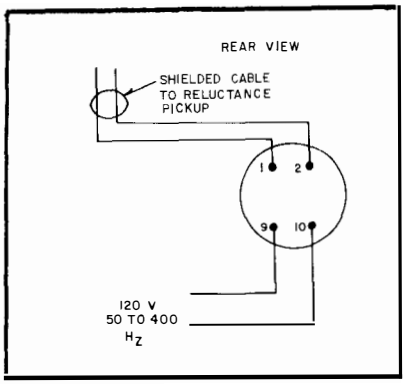

Fig. 29 KR241 Speed Indicator 876A468.

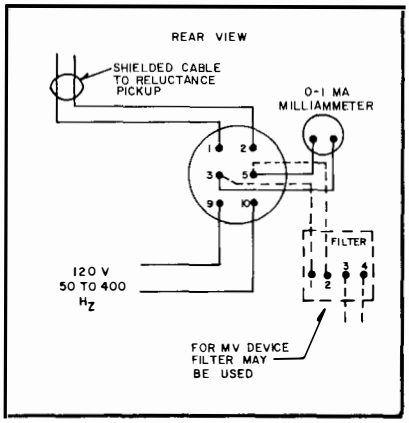

Fig. 30 KR-2-241 Speed Indicator 876A469.

WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION
NEWARK, N. J.
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INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

— K-241 LINE —
SWITCHBOARD INSTRUMENTS
FOUR AND ONE-HALF INCH CLASSIFICATION
FULL-VIEW CIRCULAR SCALE TYPE

GENERAL

Type K-241 instruments are designed and built to meet or exceed the requirements of American Standard C39.1 for electrical indicating switchboard instruments. The rated accuracy class is one per cent.

CASES

The first letter in the Type designation indicates the form of case used. K = Rectangular Flush Case, Flange mounted.

MECHANISMS

The second letter in the type designation indicates the principle of operation.

X = Permanent magnet moving coil
A = Repulsion-Attraction, moving iron
P = Watt transducer plus X
I = Rotating iron vane
C = Rectifier plus X
F = Iron core electromagnetic

All of the above mechanisms employ the taut band suspension bearing system except the I and F types.

CAUTION: When the instrument mechanism is exposed, avoid contact with the tension springs. These springs are precisely made and positioned. and any pressures inadvertently applied to them may cause misalignment of the moving element.

DIAL NOTES

References to type style number, use of external components if required, coil ratings, calibration data etc., are made on the dial mask.

INSTALLATION

Unpack instruments carefully. Terminal and mounting hardware, and any external components may be in separate packages.

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

Before energizing the instrument, adjust the pointer to zero by means of the zero adjuster at the front of the instrument.

CIRCUIT PRECAUTIONS

HIGH VOLTAGE OPERATION

All instruments are insulated for 800 volt maximum service.

When voltmeters are used with external resistors on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be grounded.

Ammeters with external shunts must be used with leads having the resistance specified in the dial notes. If the circuit voltage exceeds the insulation rating of the instrument, the shunt should be in the grounded side of the line.

GROUNDING OF CASES

Instruments, when mounted on grounded metal structures, are considered adequately grounded when secured to the structures by metal hardware. For mounting on insulated structures any one of the three case to base mounting screws may be used as a grounding terminal.

REPAIRS AND RENEWAL PARTS

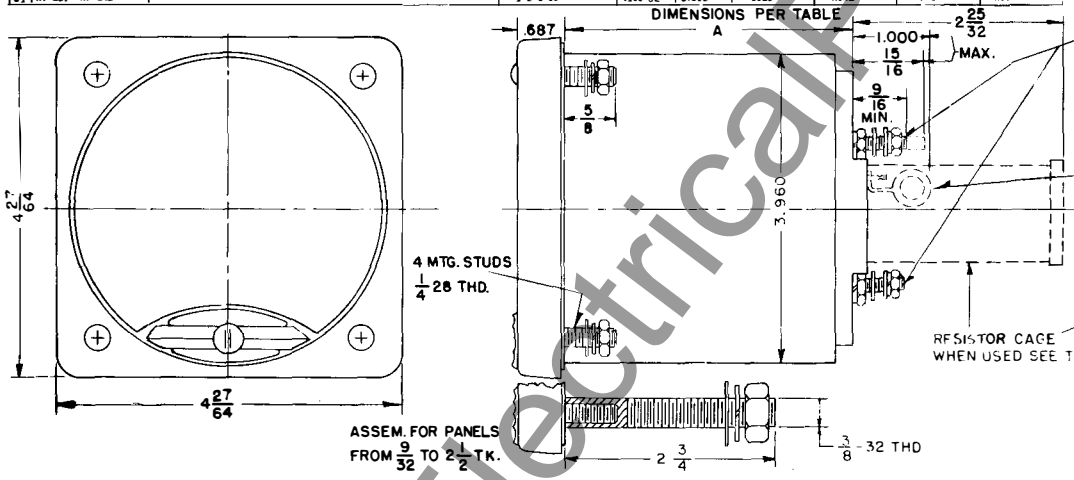
The usual procedures and practices employed for servicing mechanisms of pivot-jewel type instruments cannot be applied to suspension type instruments. For this reason we recommend that all instruments in need of mechanism servicing be returned to the factory.

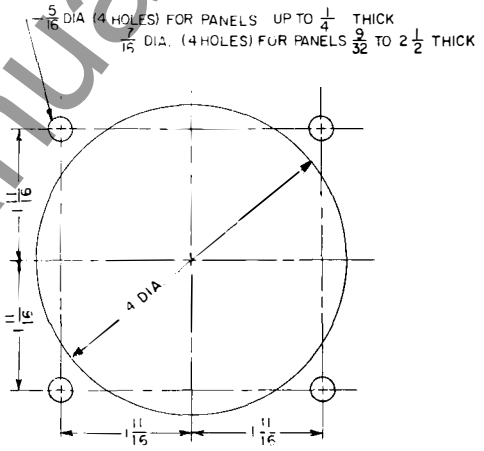
Orders for renewal parts should include the name of the part and the style and serial number of the instrument, appearing on the dial mask.

SUPERSEDES I.L. 43-241P
*Denotes change from superseded issue.

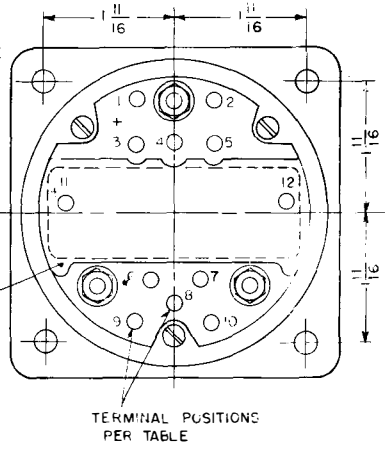
EFFECTIVE FEBRUARY 1970

LINE	TYPE	INSTRUMENT	TERMINALS IN POSITION NO.	TERM. THD.	DIM. A	RESISTOR CASE	USED WITH ILL DIAL ILLUMINATION TERMINALS	MINATION ONLY EXTERNAL TRANSFORMER	TUBULAR TYPE RESISTOR
1	KX-231 KX-241	D.C. INST'S INCLUDING AMMETERS UP TO 20 AMP	3-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED
2	KX-231 KX-241	D.C. AMMETERS 30 & 50 AMP.	3-5	1/4-28	2.813	NOT USED	6-7	REQ.	NOT USED
3	K-231 KX-241	RECTIFIER INSTS. EXCEPT TRANSFORMER TYPE	3-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED
4	KX-231 KX-241	TEMPERATURE INDICATOR	3-4-5-6-7	.190-32	2.813	NOT USED	9-10	REQ.	NOT USED
5	KA-241	A.C. VOLTMETER UP TO 600 V.	3-5	.190-32	3.750	USED	9-10	NOT REQ.	NOT USED
6	KA-241	A.C. AMMETER UP TO & INCLUDING 20 AMP	3-5	.190-32	3.750	NOT USED	9-10	NOT REQ.	NOT USED
7	KI-231 KI-241	SYNCHROSCOPE - SINGLE PHASE COMM 50 & 60 HZ	1-2-9-10	.190-32	5.312	NOT USED	NONE	NONE	REQ
8	KI-231 KI-241	POWER FACTOR METER - SINGLE PHASE - COMM 50 & 60 HZ	1-2-9-10	.190-32	5.312	NOT USED	NONE	NONE	REQ
9	KI-231 KI-241	POWER FACTOR METER - 3 PHASE	1-2-8-9-10	.190-32	5.312	USED	NONE	NONE	NOT USED
10	KP-231 KP-241	WATTMETER (POLY PH. 2CC)	1-2-3-5-6-7-9-10	.190-32	5.312	NOT USED	5-7	NOT REQ.	NOT USED
11	KR2-231 KR2-241	FREQUENCY METER (SELF CONTAINED)	3-5	.190-32	3.750	NOT USED	6-7	REQ.	NOT USED
12	KP-231 KP-241	WATTMETER (POLY PH. 3 CC)	1 TO 10	.190-32	5.312	NOT USED	5-7	NOT REQ.	NOT USED
13	KP-231 KP-241	WATTMETER (SINGLE PHASE)	3-5-6-7	.190-32	5.312	NOT USED	6-7	NOT REQ.	NOT USED
14	KX-231 KX-241	D.C. VOLTMETER (3 TERM.)	3-4-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED
15									
16	KA-231 KA-241(TB6)	A.C. VOLTMETER UP TO 600 VOLTS	1-2	.190-32	2.813	NOT USED	6-7	NOT REQ.	NOT USED
17	KA-231 KA-241(TB6)	A.C. AMMETER UP TO & INCLUDING 20 AMP	1-2	.190-32	2.813	NOT USED	6-7	NOT REQ.	NOT USED
18	KC-231 KC-241	ELECTRICALLY SUPPRESSED INST.	3-5	.190-32	3.750	NOT USED	6-7	REQ.	NOT USED
19	KA-231 KA-241(TB6)	A.C. DOUBLE RANGE AMMETER	1-2-9-10	.190-32	2.813	NOT USED	NONE	NOT REQ.	NOT USED
20									
21	KR-231 KR-241	SPEED INDICATOR	1-2-9-10	.190-32	3.750	NOT USED	NONE	NOT REQ.	NOT USED
22	KP-2-231 KP2-241	INDICATING WATT-TRANSDUCER (SINGLE PHASE)	3-5-6-7-11-12	.190-32	5.312	NOT USED	6-7	NOT REQ.	NOT USED
23	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 2 CC)	1-2-3-5-6-7-9 TO 12	.190-32	5.312	NOT USED	5-7	NOT REQ.	NOT USED
24	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 3 CC)	1 TO 12	.190-32	5.312	NOT USED	5-7	NOT REQ.	NOT USED
25	KC-231 KC-241	TRANSFORMER TYPE RECTIFIER AMMETER	3-5	.190-32	3.750	NOT USED	6-7	REQ.	NOT USED
26	KX-241	ELECTRICAL RESISTANCE THERMOMETER	1-2-3-4-5-6-7	.190-32	3.750	NOT USED	NONE	NOT REQ.	NOT USED
27									
28	KR2-231 KR2-241	SPEED INDICATOR	1-2-3-5-9-10	.190-32	3.750	NOT USED	NONE	NOT REQ.	NOT USED
29	KC-241	EXPANDED SCALE VOLTMETER	3-5	.190-32	3.750	NOT USED	6-7	REQ.	NOT USED
30	KI-231 KI-241	SYNSCP. - ALL SINGLE PH. HI SHOCK & 400 HZ COMM	1-2-9-10	.190-32	5.312	USED	NONE	NONE	NOT USED
31	KI-231 KI-241	P.F. METER - ALL SINGLE PH. HI SHOCK & 400 HZ COMM	1-2-9-10	.190-32	5.312	USED	NONE	NONE	NOT USED





DRILLING PLAN



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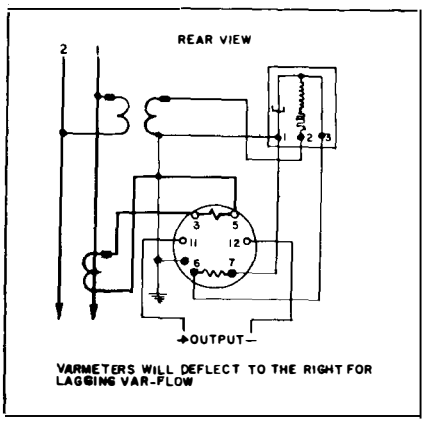


Fig. 21. Type KP2-241 Indicating VAR Transducer Single Phase.

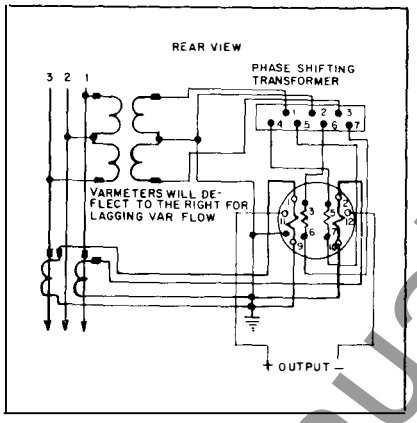


Fig. 22. Type KP2-241 Indicating VAR Transducer 2 Current Coil.

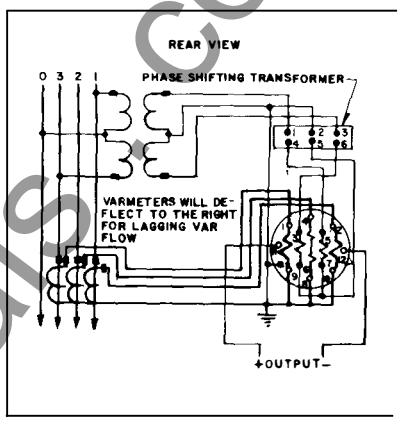


Fig. 23. Type KP2-241 Indicating VAR Transducer 3 Current Coil.

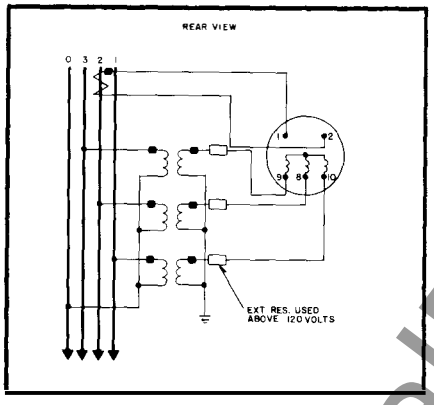


Fig. 24. Type KI241-3 Phase 4 Wire Power Factor Meter

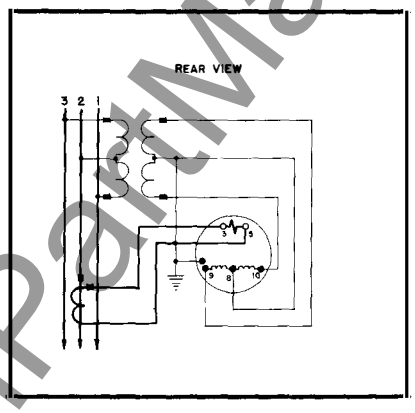


Fig. 25 Type KP241 Single Element Wattmeter for 3 Phase 3 Wire.

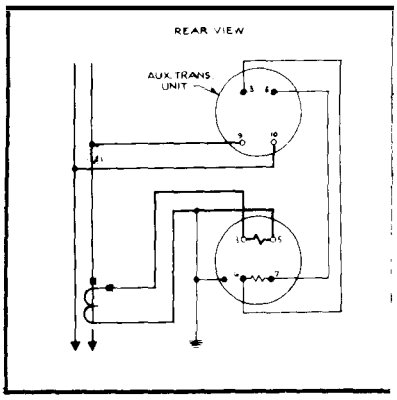


Fig. 26 KP241 Single Phase Wattmeter for use on 480 volts.

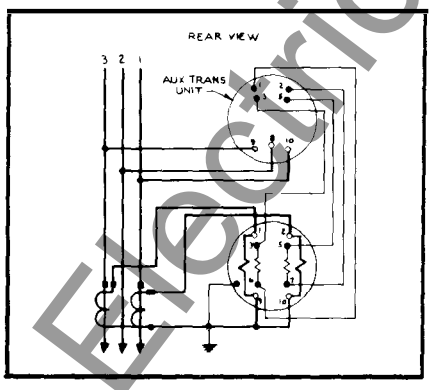


Fig. 27 KP241-2 Current Coil Wattmeter for use on 480 volts.

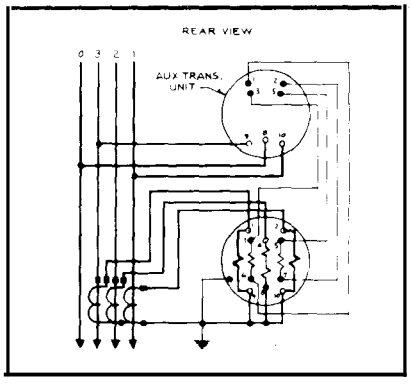


Fig. 28 KP241-3 Current Coil Wattmeter for use on 480 volts.

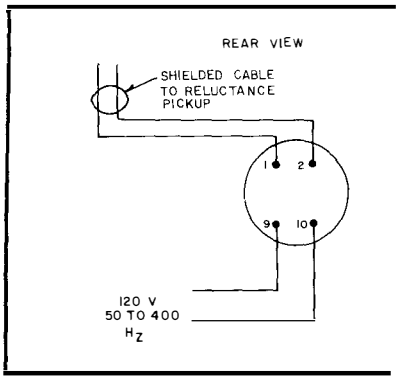


Fig. 29 KR241 Speed Indicator 876A468.

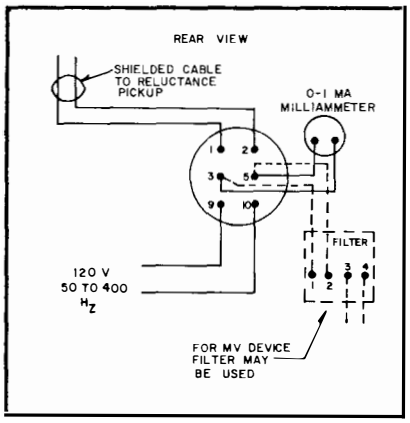


Fig. 30 KR-2-241 Speed Indicator 876A469.

WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION
NEWARK, N. J.
Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

— K-241 LINE —
SWITCHBOARD INSTRUMENTS
FOUR AND ONE-HALF INCH CLASSIFICATION
FULL-VIEW CIRCULAR SCALE TYPE

GENERAL

Type K-241 instruments are designed and built to meet or exceed the requirements of American Standard C39.1 for electrical indicating switchboard instruments. The rated accuracy class is one per cent.

CASES

The first letter in the Type designation indicates the form of case used. K = Rectangular Flush Case, Flange mounted.

MECHANISMS

The second letter in the type designation indicates the principle of operation.

X = Permanent magnet moving coil
A = Repulsion-Attraction, moving iron
P = Watt transducer plus X
I = Rotating iron vane
C = Rectifier plus X
F = Iron core electromagnetic

All of the above mechanisms employ the taut band suspension bearing system except the I and F types.

CAUTION: When the instrument mechanism is exposed, avoid contact with the tension springs. These springs are precisely made and positioned. and any pressures inadvertently applied to them may cause misalignment of the moving element.

DIAL NOTES

References to type style number, use of external components if required, coil ratings, calibration data etc., are made on the dial mask.

INSTALLATION

Unpack instruments carefully. Terminal and mounting hardware, and any external components may be in separate packages.

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

Before energizing the instrument, adjust the pointer to zero by means of the zero adjuster at the front of the instrument.

CIRCUIT PRECAUTIONS

CAUTION: Dial and pointer may be at dangerous voltage levels when instrument is energized.

HIGH VOLTAGE OPERATION

All instruments are insulated for 800 volt maximum service.

When voltmeters are used with external resistors on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be grounded.

Ammeters with external shunts must be used with leads having the resistance specified in the dial notes. If the circuit voltage exceeds the insulation rating of the instrument, the shunt should be in the grounded side of the line.

GROUNDING OF CASES

Instruments, when mounted on grounded metal structures, are considered adequately grounded when secured to the structures by metal hardware. For mounting on insulated structures any one of the three case to base mounting screws may be used as a grounding terminal.

REPAIRS AND RENEWAL PARTS

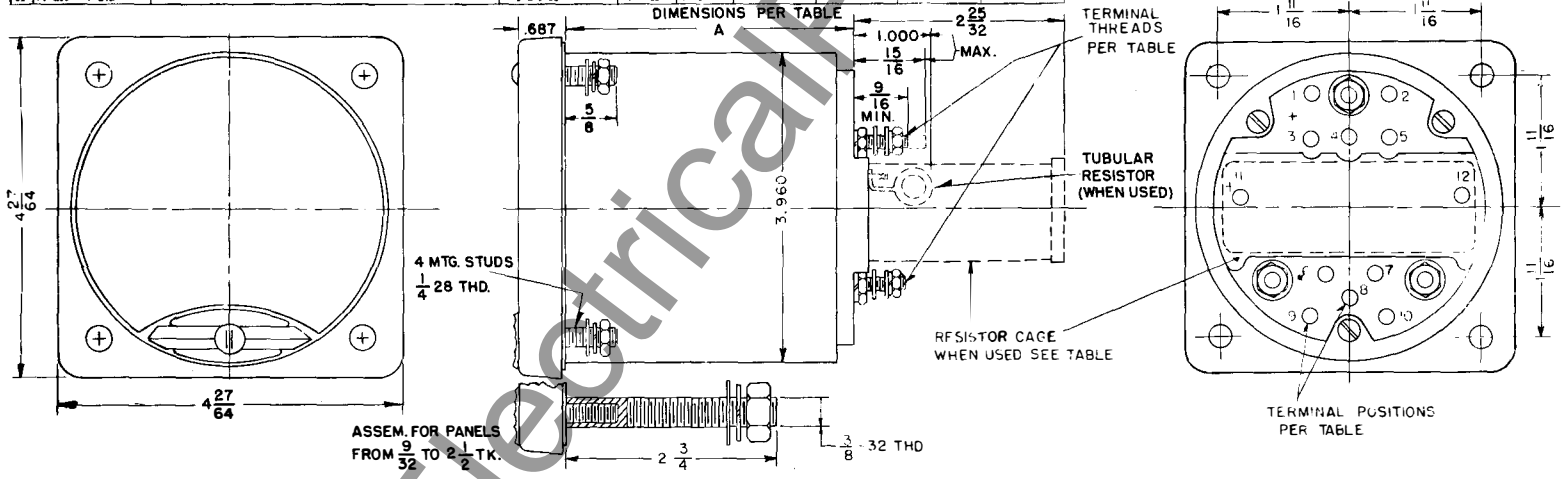
The usual procedures and practices employed for servicing mechanisms of pivot-jewel type instruments cannot be applied to suspension type instruments. For this reason we recommend that all instruments in need of mechanism servicing be returned to the factory.

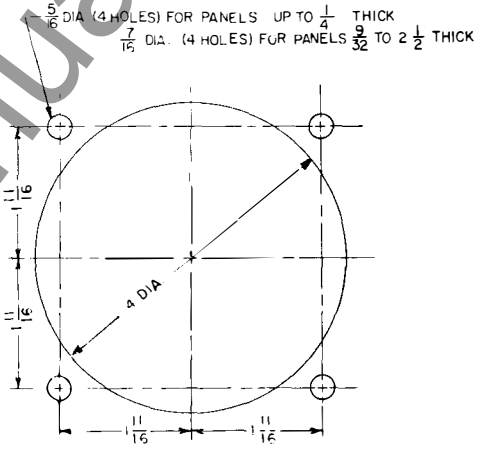
Orders for renewal parts should include the name of the part and the style and serial number of the instrument, appearing on the dial mask.

SUPERSEDES I.L. 43-241Q
*Denotes change from superseded issue.

EFFECTIVE FEBRUARY 1971

LINE NO.	TYPE	INSTRUMENT	TERMINALS IN POSITION NO.	TERM. THD.	DIM. A	RESISTOR CAGE	USED WITH ILLUMINATION ONLY: DIAL ILLUMINATION TERMINALS	USED WITH ILLUMINATION ONLY: EXTERNAL TRANSFORMER	TUBULAR TYPE RESISTOR
1	KX-231 KX-241	D.C. INST'S INCLUDING AMMETERS UP TO 20 AMP	3-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED
2	KX-231 KX-241	D.C. AMMETERS 30 & 50 AMP.	3-5	1/4-28	2.813	NOT USED	6-7	REQ.	NOT USED
3	K-231 KX-241	RECTIFIER INSTS. EXCEPT TRANSFORMER TYPE	3-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED
4	KX-231 KX-241	TEMPERATURE INDICATOR	3-4-5-6-7	.190-32	2.813	NOT USED	9-10	REQ.	NOT USED
5	KA-241	A.C. VOLTMETER UP TO 600 V.	3-5	.190-32	3.750	USED	9-10	NOT REQ.	NOT USED
6	KA-241	A.C. AMMETER UP TO & INCLUDING 20 AMP	3-5	.190-32	3.750	NOT USED	9-10	NOT REQ.	NOT USED
7	KI-231 KI-241	SYNCHROSCOPE - SINGLE PHASE COMM 50 & 60 HZ	1-2-9-10	.190-32	5.312	NOT USED	NONE	NONE	REQ
8	KI-231 KI-241	POWER FACTOR METER - SINGLE PHASE - COMM 50 & 60 HZ	1-2-9-10	.190-32	5.312	NOT USED	NONE	NONE	REQ
9	KI-231 KI-241	POWER FACTOR METER - 3 PHASE	1-2-8-9_10	.190-32	5.312	USED	NONE	NONE	NOT USED
10	KP-231 KP-241	WATTMETER (POLY PH. 2CC)	1-2-3-5-6-7-9-10	.190-32	5.312	NOT USED	5-7	NOT REQ.	NOT USED
11	KR3-231 KR3-241	FREQUENCY METER (SELF CONTAINED)	3-5	.190-32	3.750	NOT USED	6-7	REQ.	NOT USED
12	KP-231 KP-241	WATTMETER (POLY PH. 3 CC)	1 TO 10	.190-32	5.312	NOT USED	5-7	NOT REQ.	NOT USED
13	KP-231 KP-241	WATTMETER (SINGLE PHASE)	3-5-6-7	.190-32	5.312	NOT USED	6-7	NOT REQ.	NOT USED
14	KX-231 KX-241	D.C. VOLTMETER (3 TERM.)	3-4-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED
15									
16	KA-231 KA-241(TB5)	A.C. VOLTMETER UP TO 600 VOLTS	1-2	.190-32	2.813	NOT USED	6-7	NOT REQ.	NOT USED
17	KA-231 KA-241(TB6)	A.C. AMMETER UP TO & INCLUDING 20 AMP	1-2	.190-32	2.813	NOT USED	6-7	NOT REQ.	NOT USED
18	KC-231 KC-241	ELECTRICALLY SUPPRESSED INST.	3-5	.190-32	3.750	NOT USED	6-7	REQ.	NOT USED
19	KA-231 KA-241(TB8)	A.C. DOUBLE RANGE AMMETER	1-2-9-10	.190-32	2.813	NOT USED	NONE	NOT REQ.	NOT USED
20									
21	KR-231 KR-241	SPEED INDICATOR	1-2-9-10	.190-32	3.750	NOT USED	NONE	NOT REQ.	NOT USED
22	KP-2-231 KP2-241	INDICATING WATT-TRANSDUCER (SINGLE PHASE)	3-5-6-7-11-12	.190-32	5.312	NOT USED	6-7	NOT REQ.	NOT USED
23	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 2 CC)	1-2-3-5-6-7-9 TO 12	.190-32	5.312	NOT USED	5-7	NOT REQ.	NOT USED
24	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 3 CC)	1 TO 12	.190-32	5.312	NOT USED	5-7	NOT REQ.	NOT USED
25	KC-231 KC-241	TRANSFORMER TYPE RECTIFIER AMMETER	3-5	.190-32	3.750	NOT USED	6-7	REQ.	NOT USED
26	KX-241	ELECTRICAL RESISTANCE THERMOMETER	1-2-3-4-5-6-7	.190-32	3.750	NOT USED	NONE	NOT REQ.	NOT USED
27									
28	KR2-231 KR2-241	SPEED INDICATOR	1-2-3-5-9-10	.190-32	3.750	NOT USED	NONE	NOT REQ.	NOT USED
29	KC-241	EXPANDED SCALE VOLTMETER	3-5	.190-32	3.750	NOT USED	6-7	REQ.	NOT USED
30	KI-231 KI-241	SYNSCP. - ALL SINGLE PH. HI SHOCK & 400 HZ COMM	1-2-9-10	.190-32	5.312	USED	NONE	NONE	NOT USED
31	KI-231 KI-241	P.F. METER - ALL SINGLE PH. HI SHOCK & 400 HZ COMM	1-2-9-10	.190-32	5.312	USED	NONE	NONE	NOT USED





DRILLING PLAN

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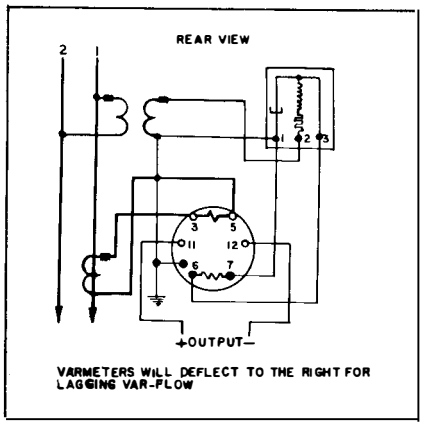


Fig. 21. Type KP2-241 Indicating VAR Transducer Single Phase.

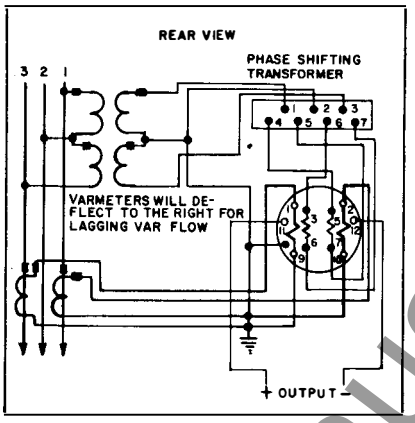


Fig. 22. Type KP2-241 Indicating VAR Transducer 2 Current Coil.

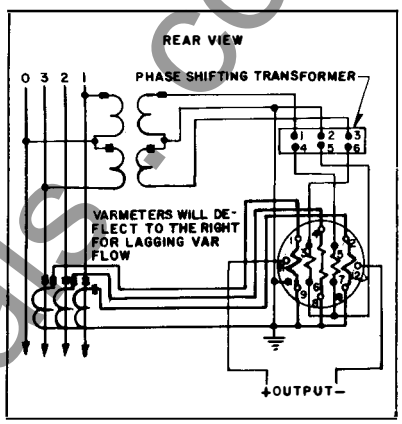


Fig. 23. Type KP2-241 Indicating VAR Transducer 3 Current Coil.

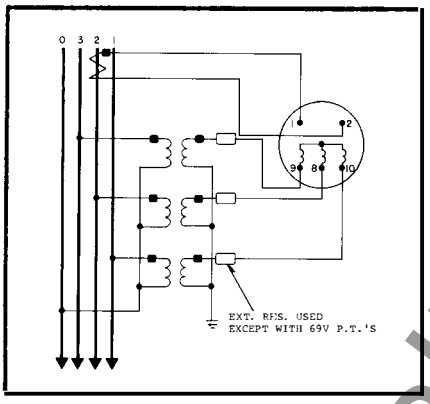


Fig. 24. Type KI241-3 Phase 4 Wire Power Factor Meter

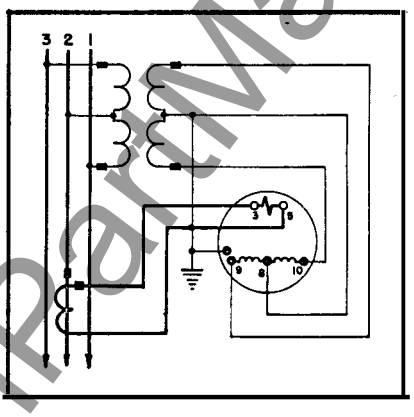


Fig. 25 Type KP241 Single Element Wattmeter for 3 Phase 3 Wire.

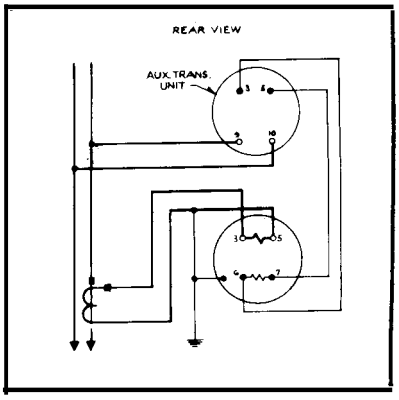


Fig. 26 KP241 Single Phase Wattmeter for use on 480 volts.

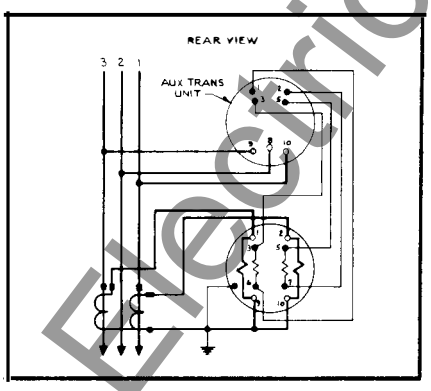


Fig. 27 KP241-2 Current Coil Wattmeter for use on 480 volts.

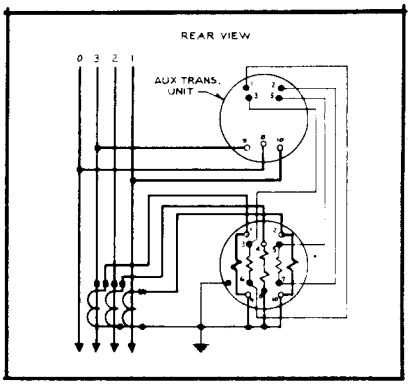


Fig. 28 KP241-3 Current Coil Wattmeter for use on 480 volts.

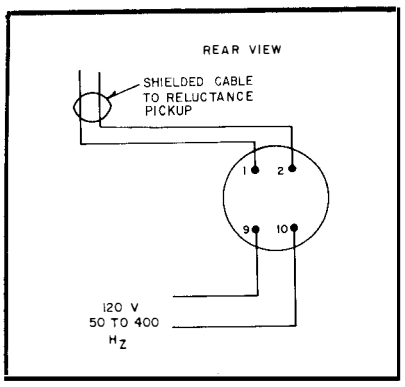


Fig. 29 KR241 Speed Indicator 876A468.

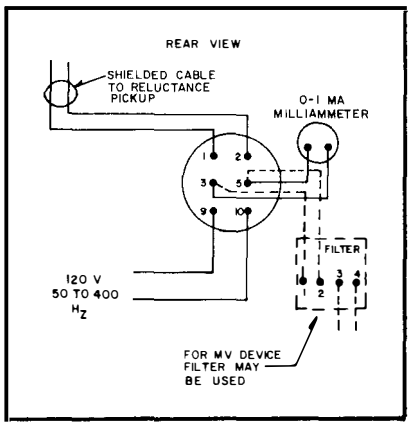


Fig. 30 KR-2-241 Speed Indicator 876A469.

WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION
NEWARK, N. J.
Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

— K-241 LINE —
SWITCHBOARD INSTRUMENTS
FOUR AND ONE-HALF INCH CLASSIFICATION
FULL-VIEW CIRCULAR SCALE TYPE

GENERAL

Type K-241 instruments are designed and built to meet or exceed the requirements of American Standard C39.1 for electrical indicating switchboard instruments. The rated accuracy class is one per cent.

CASES

The first letter in the Type designation indicates the form of case used. K = Rectangular Flush Case, Flange mounted.

MECHANISMS

The second letter in the type designation indicates the principle of operation.

X = Permanent magnet moving coil
A = Repulsion-Attraction, moving iron
P = Watt transducer plus X
I = Rotating iron vane
C = Rectifier plus X
F = Iron core electromagnetic

All of the above mechanisms employ the taut band suspension bearing system except the I and F types.

CAUTION: When the instrument mechanism is exposed, avoid contact with the tension springs. These springs are precisely made and positioned. and any pressures inadvertently applied to them may cause misalignment of the moving element.

DIAL NOTES

References to type style number, use of external components if required, coil ratings, calibration data etc., are made on the dial mask.

INSTALLATION

Unpack instruments carefully. Terminal and mounting hardware, and any external components may be in separate packages.

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

Before energizing the instrument, adjust the pointer to zero by means of the zero adjuster at the front of the instrument.

CIRCUIT PRECAUTIONS

CAUTION: Dial and pointer may be at dangerous voltage levels when instrument is energized.

HIGH VOLTAGE OPERATION

All instruments are insulated for 800 volt maximum service.

When voltmeters are used with external resistors on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be grounded.

Ammeters with external shunts must be used with leads having the resistance specified in the dial notes. If the circuit voltage exceeds the insulation rating of the instrument, the shunt should be in the grounded side of the line.

GROUNDING OF CASES

Instruments, when mounted on grounded metal structures, are considered adequately grounded when secured to the structures by metal hardware. For mounting on insulated structures any one of the three case to base mounting screws may be used as a grounding terminal.

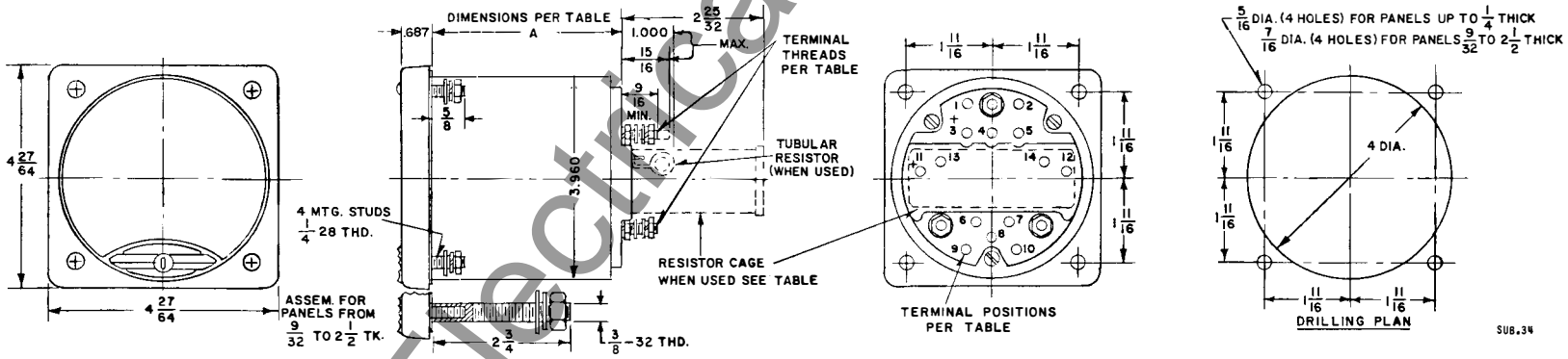
* REPAIRS AND RENEWAL PARTS

Repair work can be done most satisfactorily at the factory, or at any authorized Instrument Repair Facility (see Service Directory 43-000). However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts always give complete nameplate data.

SUPERSEDES I.L. 43-241S
EFFECTIVE NOVEMBER 1972
*Denotes change from supersedes issue.

LINE NO.	TYPE	INSTRUMENT	TERMINALS IN POSITION NO.	TERM. THD.	DIM. A	RESISTOR CAGE	USED WITH ILLUMINATION ONLY		TUBULAR TYPE RESISTOR	EXT. RESIS. TYPE VR-825
							DIAL ILLUMINATION TERMINALS	EXTERNAL TRANSFORMER		
1	KX-231 KX-241	D.C. INST'S INCLUDING AMMETERS UP TO 20 AMP	3-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED	NOT USED
2	KX-231 KX-241	D.C. AMMETERS 30 & 50 AMP.	3-5	1/4-28	2.813	NOT USED	6-7	REQ.	NOT USED	
3	KX-231 KX-241	RECTIFIER INSTS. EXCEPT TRANSFORMER TYPE	3-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED	
4	KX-231 KX-241	TEMPERATURE INDICATOR	3-4-5-6-7		2.813	NOT USED	9-10	REQ.	NOT USED	
5	KC-241	EXPANDED SCALE VOLTMETER MIL-V-231518	3-5		3.750	NOT USED	NONE	NOT REQ.	NOT USED	
6	KR4-241	FREQUENCY METER MIL-M-23167	3-5		3.750	NOT USED	NONE	NOT REQ.	NOT USED	
7	KI-231 KI-241	SYNCHROSCOPE-SINGLE PHASE COMM. 50 & 60HZ	1-2-9-10		5.312	NOT USED	NONE	NONE	REQ.	
8	KI-231 KI-241	POWER FACTOR METER - SINGLE PHASE - COMM 50 & 60HZ	1-2-9-10		5.312	NOT USED	NONE	NONE	REQ.	
9	KI-231 KI-241	POWER FACTOR METER - 3 PHASE	1-2-8-9-10		5.312	USED	NONE	NONE	NOT USED	
10	KP-231 KP-241	WATTMETER (POLY PH.2 CC) & KV-231 KV-241 VAR S.C.(3 PH. 3W)	1-2-3-5-6-7-9-10		5.312	NOT USED	5-7	NOT REQ.	NOT USED	
11	KR3-231 KR3-241	FREQUENCY METER (SELF CONTAINED)	3-5		3.750	NOT USED	6-7	REQ.	NOT USED	
12	KP-231 KP-241	WATTMETER (POLY PH. 3 CC)	1 TO 10		5.312	NOT USED	5-7	NOT REQ	NOT USED	
13	KP-231 KP-241	WATTMETER (SINGLE PHASE)	3-5-6-7		5.312	NOT USED	6-7	NOT REQ.	NOT USED	
14	KX-231 KX-241	D.C. VOLTMETER (3 TERM.)	3-4-5		2.813	NOT USED	6-7	REQ.	NOT USED	
15	KV-231 KV-241	VARMETER SELF CONT. (3PH 4W)	1 TO 12		5.312	NOT USED	NONE	NOT REQ.	NOT USED	
16	KA-231 KA-241	A.C. VOLTMETER UP TO 600 VOLTS	1-2		2.813	NOT USED	6-7	NOT REQ.	NOT USED	
17	KA-231 KA-241	A.C. AMMETER UP TO & INCLUDING 20 AMP	1-2		2.813	NOT USED	6-7	NOT REQ.	NOT USED	
18	KC-231 KC-241	ELECTRICALLY SUPPRESSED INST.	3-5		3.750	NOT USED	6-7	REQ.	NOT USED	
19	KA-231 KA-241	A.C. DOUBLE RANGE AMMETER	1-2-9-10		2.813	NOT USED	NONE	NOT REQ.	NOT USED	
20	KV-231 KV2-241	INDICATING VAR TRANSDUCER S.C (3 PH. 3W)	1 TO 12		5.312	NOT USED	NONE	NOT REQ.	NOT USED	
21	KR-231 KR-241	SPEED INDICATOR	1-2-9-10		3.750	NOT USED	NONE	NOT REQ.	NOT USED	
22	KP-2-231 KP2-241	INDICATING WATT-TRANSDUCER (SINGLE PHASE)	3-5-6-7-11-12		5.312	NOT USED	6-7	NOT REQ.	NOT USED	
23	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 2 CC)	1-2-3-5-6-7-9 TO 12		5.312	NOT USED	5-7	NOT REQ.	NOT USED	
24	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 3CC)	1 TO 12		5.312	NOT USED	5-7	NOT REQ.	NOT USED	
25	KC-231 KC-241	TRANSFORMER TYPE RECTIFIER AMMETER	3-5		3.750	NOT USED	6-7	REQ.	NOT USED	
26	KX-241	ELECTRICAL RESISTANCE THERMOMETER	1-2-3-4-5-6-7		3.750	NOT USED	NONE	NOT REQ.	NOT USED	
27	KV2-231 KV2-241	INDICATING VAR TRANSDUCER S.C (3PH. 4W)	1 TO 14		5.312	NOT USED	NONE	NOT REQ.	NOT USED	
28	KR2-231 KR2-241	SPEED INDICATOR	1-2-3-5-9-10		3.750	NOT USED	NONE	NOT REQ.	NOT USED	
29	KC-241	EXPANDED SCALE VOLTMETER	3-5		3.750	NOT USED	6-7	REQ.	NOT USED	
30	KI-231 KI-241	SYNSCP.-ALL SINGLE PH. HI SHOCK & 400 HZ COMM	1-2-9-10		5.312	USED	NONE	NONE	NOT USED	
31	KI-231 KI-241	P-F. METER-ALL SINGLE PH. HI SHOCK & 400HZ COMM	1-2-9-10		5.312	USED	NONE	NONE	NOT USED	
32	KI-231 KI-241	P.F. METER 3 PHASE 4 WIRE	1-2-8-9-10		5.312	USED	NONE	NONE	NOT USED	REQ.

FIRST MADE FOR ASSEM. DWG. 409C486



SUB. 34
*409C619

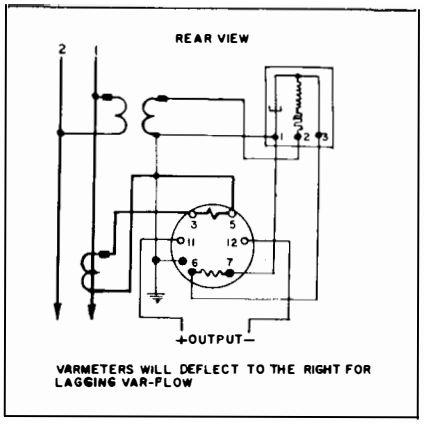


Fig. 21. Type KP2-241 Indicating VAR Transducer Single Phase.

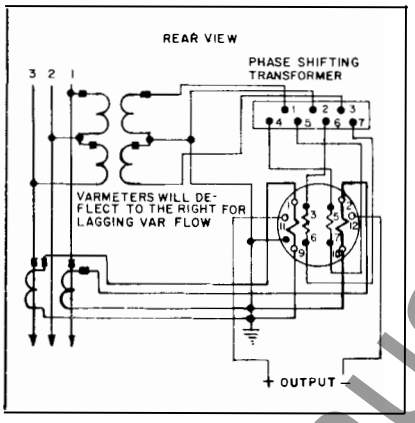


Fig. 22. Type KP2-241 Indicating VAR Transducer 2 Current Coil with phase shifter

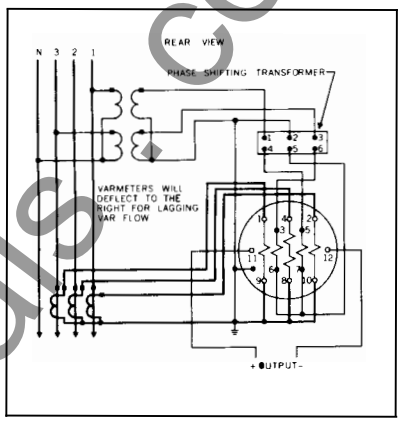


Fig. 23. Type KP2-241 Indicating VAR Transducer 3 Current Coil with phase shifter

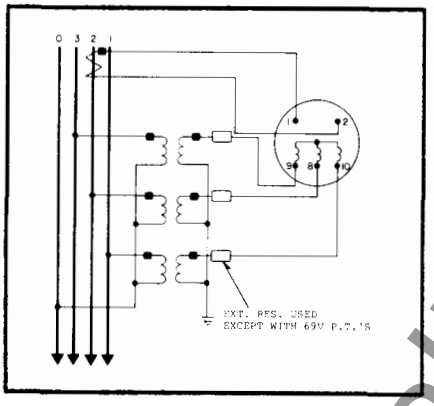


Fig. 24. Type KI241-3 Phase 4 Wire Power Factor Meter

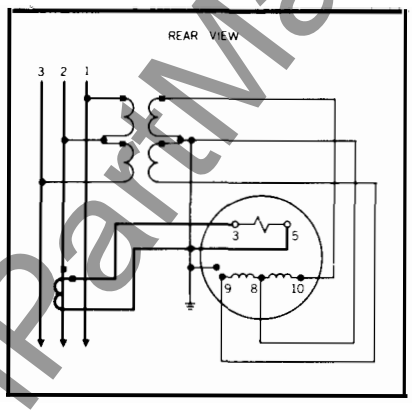


Fig. 25 Type KP241 Single Element Wattmeter for 3 Phase 3 Wire.

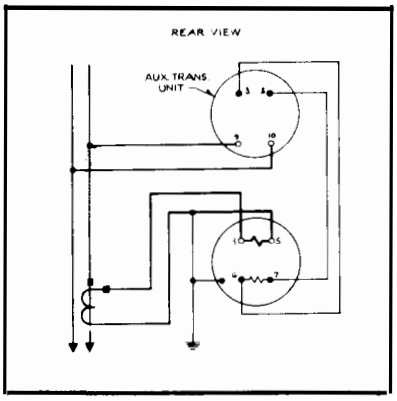


Fig. 26 KP241 Single Phase Wattmeter for use on 480 volts.

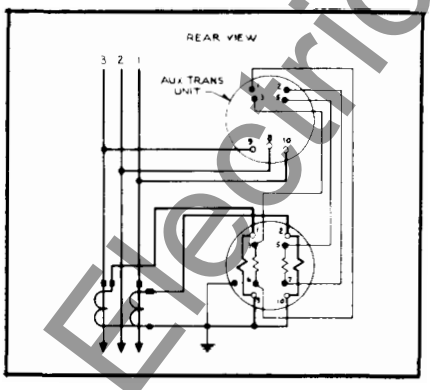


Fig. 27 KP241-2 Current Coil Wattmeter for use on 480 volts.

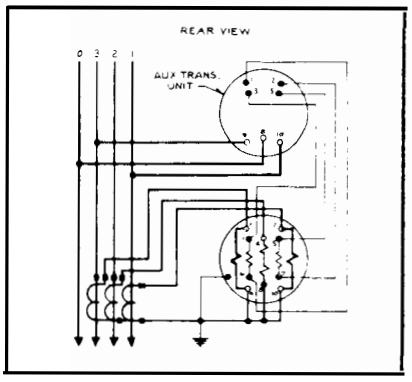


Fig. 28 KP241-3 Current Coil Wattmeter for use on 480 volts.

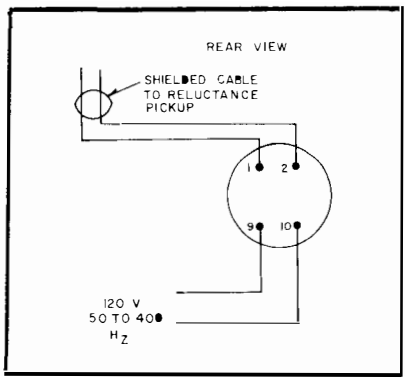


Fig. 29 KR241 Speed Indicator 876A468.

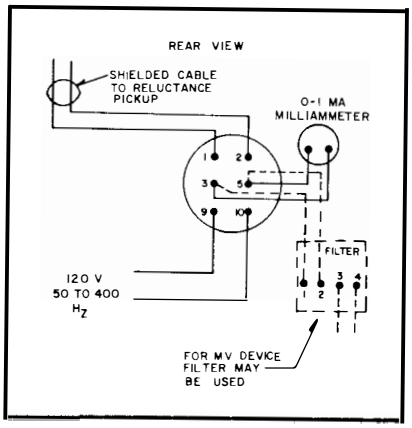


Fig. 30 KR-2-241 Speed Indicator 876A469.

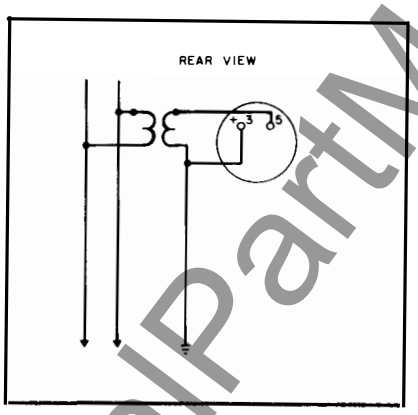


Fig. 31. KR4-241 Frequency Meter

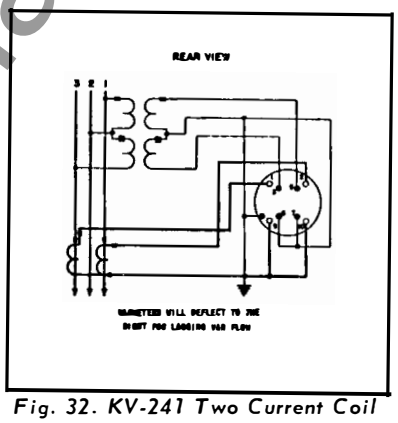


Fig. 32. KV-241 Two Current Coil Self Contained Varmeter. For single phase test connection see Drawing 880A086.

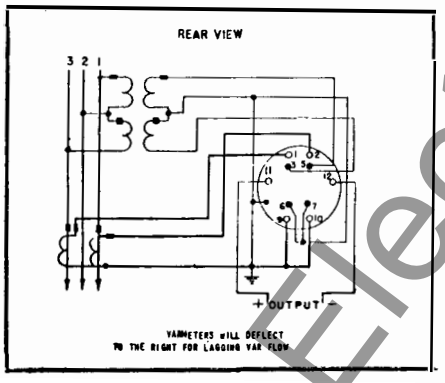


Fig. 33. KV2-241 Two Current Coil self contained indicating Var-transducer. For single phase test connection, see drawing 880A128.

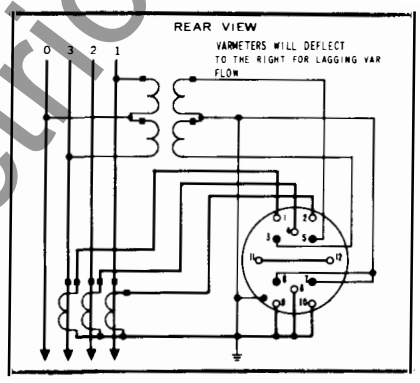


Fig. 34. KV-241 Three Current Coil Self Contained Varmeter. For single phase test connection see Drawing 880A085.

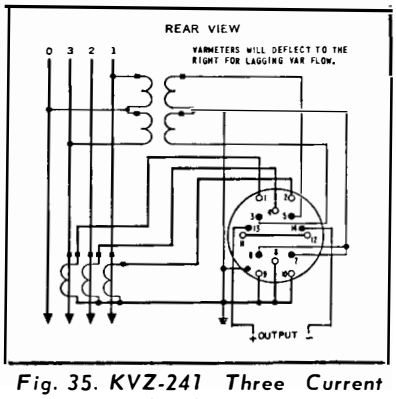


Fig. 35. KVZ-241 Three Current Coil Self Contained Indicating Var-Transducer. For single phase test connection see Drawing 880A085.

WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION
NEWARK, N. J.
Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

— K-241 LINE —
SWITCHBOARD INSTRUMENTS
FOUR AND ONE-HALF INCH CLASSIFICATION
FULL-VIEW CIRCULAR SCALE TYPE

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Type K-241 instruments are designed and built to meet or exceed the requirements of American Standard C39.1 for electrical indicating switchboard instruments. The rated accuracy class is one per cent.

CASES

The first letter in the Type designation indicates the form of case used. K = Rectangular Flush Case, Flange mounted.

MECHANISMS

The second letter in the type designation indicates the principle of operation.

X = Permanent magnet moving coil
A = Repulsion-Attraction, moving iron
P = Watt transducer plus X
I = Rotating iron vane
C = Rectifier plus X
F = Iron core electromagnetic

All of the above mechanisms employ the taut band suspension bearing system except the I and F types.

CAUTION: When the instrument mechanism is exposed, avoid contact with the tension springs. These springs are precisely made and positioned. and any pressures inadvertently applied to them may cause misalignment of the moving element.

DIAL NOTES

References to type style number, use of external components if required, coil ratings, calibration data etc., are made on the dial mask.

INSTALLATION

Unpack instruments carefully. Terminal and mounting hardware, and any external components may be in separate packages.

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

Before energizing the instrument, adjust the pointer to zero by means of the zero adjuster at the front of the instrument.

CIRCUIT PRECAUTIONS

CAUTION: Dial and pointer may be at dangerous voltage levels when instrument is energized.

HIGH VOLTAGE OPERATION

All instruments are insulated for 800 volt maximum service.

When voltmeters are used with external resistors on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be grounded.

Ammeters with external shunts must be used with leads having the resistance specified in the dial notes. If the circuit voltage exceeds the insulation rating of the instrument, the shunt should be in the grounded side of the line.

GROUNDING OF CASES

Instruments, when mounted on grounded metal structures, are considered adequately grounded when secured to the structures by metal hardware. For mounting on insulated structures any one of the three case to base mounting screws may be used as a grounding terminal.

REPAIRS AND RENEWAL PARTS

Repair work can be done most satisfactorily at the factory, or at any authorized Instrument Repair Facility (see Service Directory 43-000). However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts always give complete nameplate data.

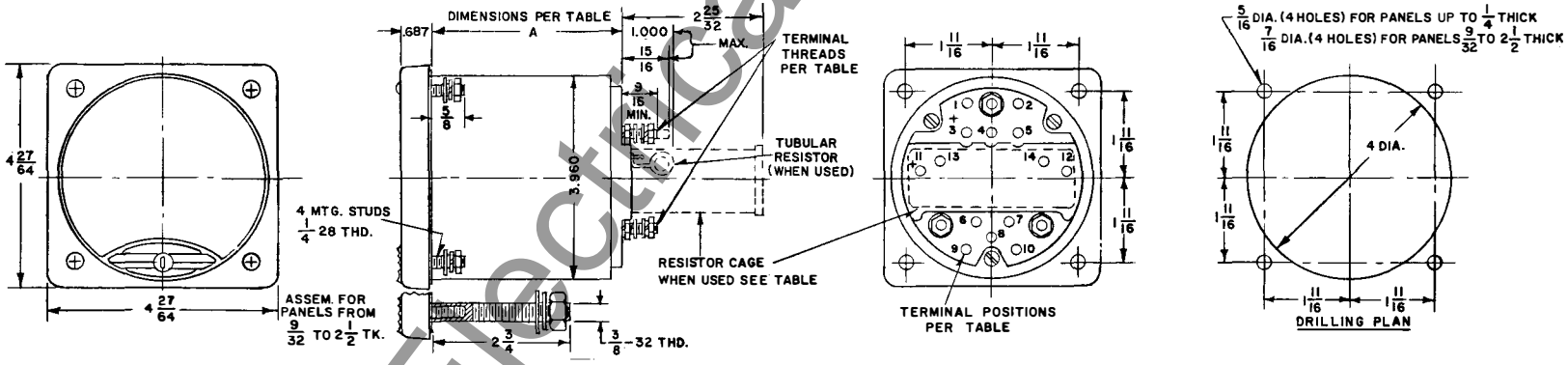
These instructions neither cover all details or variations in equipment nor provide for all contingencies with regard to installation, operation or maintenance. On request, Westinghouse will be glad to supply further information as to particular problems or questions which are not covered sufficiently for the purchaser's needs.

SUPERSEDES I.L. 43-241T
*Denotes change from superseded issue.

EFFECTIVE APRIL 1974

LINE NO.	TYPE	INSTRUMENT	TERMINALS IN POSITION NO.	TERM. THD.	DIM. A	RESISTOR CAGE	USED WITH ILLUMINATION ONLY: DIAL ILLUMINATION TERMINALS	USED WITH ILLUMINATION ONLY: EXTERNAL TRANSFORMER	TUBULAR TYPE RESISTOR	EXTERNAL BOX
1	KX-231 KX-241	D.C. INST'S INCLUDING AMMETERS UP TO 20 AMP	3-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED	NOT USED
2	KX-231 KX-241	D.C. AMMETERS 30 & 50 AMP.	3-5	1/4-28	2.813	NOT USED	6-7	REQ.	NOT USED	
3	KX-231 KX-241	RECTIFIER INSTS. EXCEPT TRANSFORMER TYPE	3-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED	
4	KX-231 KX-241	TEMPERATURE INDICATOR	3-4-5-6-7		2.813	NOT USED	9-10	REQ.	NOT USED	
5	KC-241	EXPANDED SCALE VOLTMETER MIL-V-23151B	3-5		3.750	NOT USED	NONE	NOT REQ.	NOT USED	
6	KR4-241	FREQUENCY METER MIL-M-23167	3-5		3.750	NOT USED	NONE	NOT REQ.	NOT USED	
7	KI-231 KI-241	SYNCHROSCOPE-SINGLE PHASE COMM. 50 & 60HZ	1-2-9-10		5.312	NOT USED	NONE	NONE	REQ.	
8	KI-231 KI-241	POWER FACTOR METER - SINGLE PHASE - COMM 50 & 60HZ	1-2-9-10		5.312	NOT USED	NONE	NONE	REQ.	
9	KI-231 KI-241	POWER FACTOR METER - 3 PHASE	1-2-8-9-10		5.312	USED	NONE	NONE	NOT USED	
10	KP-231 KP-241-	WATTMETER (POLY PH.2CC)& KV-231 KV-241 VAR S.C.(3 PH. 3W)	1-2-3-5-6-7-9-10		5.312	NOT USED	5-7	NOT REQ.	NOT USED	
11	KR3-231 KR3-241	FREQUENCY METER (SELF CONTAINED)	3-5		3.750	NOT USED	6-7	REQ.	NOT USED	
12	KP-231 KP-241	WATTMETER (POLY PH. 3 CC)	1 TO 10		5.312	NOT USED	5-7	NOT REQ.	NOT USED	
13	KP-231 KP-241	WATTMETER (SINGLE PHASE)	3-5-6-7		5.312	NOT USED	6-7	NOT REQ.	NOT USED	
14	KX-231 KX-241	D.C. VOLTMETER (3 TERM.)	3-4-5		2.813	NOT USED	6-7	REQ.	NOT USED	
15	KV-231 KV-241	VARMETER SELF CONT. (3PH 4W)	1 TO 12		5.312	NOT USED	NONE	NOT REQ.	NOT USED	
16	KA-231 KA-241	A.C. VOLTMETER UP TO 600 VOLTS	1-2		2.813	NOT USED	6-7	NOT REQ.	NOT USED	
17	KA-231 KA-241	A.C. AMMETER UP TO & INCLUDING 20 AMP	1-2		2.813	NOT USED	6-7	NOT REQ.	NOT USED	
18	KC-231 KC-241	ELECTRICALLY SUPPRESSED INST.	3-5		3.750	NOT USED	6-7	REQ.	NOT USED	
19	KA-231 KA-241	A.C. DOUBLE RANGE AMMETER	1-2-9-10		2.813	NOT USED	NONE	NOT REQ.	NOT USED	
20	KV2-231 KV2-241	INDICATING VAR-TRANSDUCER S.C (3 PH. 3W)	1 TO 12		5.312	NOT USED	NONE	NOT REQ.	NOT USED	
21	KR-231 KR-241	SPEED INDICATOR	1-2-9-10		3.750	NOT USED	NONE	NOT REQ.	NOT USED	
22	KP-2-231 KP2-241	INDICATING WATT-TRANSDUCER (SINGLE PHASE)	3-5-6-7-11-12		5.312	NOT USED	6-7	NOT REQ.	NOT USED	
23	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 2 CC)	1-2-3-5-6-7-9 TO 12		5.312	NOT USED	5-7	NOT REQ.	NOT USED	
24	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 3CC)	1 TO 12		5.312	NOT USED	5-7	NOT REQ.	NOT USED	
25	KC-231 KC-241	TRANSFORMER TYPE RECTIFIER AMMETER	3-5		3.750	NOT USED	6-7	REQ.	NOT USED	
26	KX-241	ELECTRICAL RESISTANCE THERMOMETER	1-2-3-4-5-6-7		3.750	NOT USED	NONE	NOT REQ.	NOT USED	
27	KV2-231 KV2-241	INDICATING VAR TRANSDUCER S.C (3PH. 4W)	1 TO 14		5.312	NOT USED	NONE	NOT REQ.	NOT USED	
28	KR2-231 KR2-241	SPEED INDICATOR	1-2-3-5-9-10		3.750	NOT USED	NONE	NOT REQ.	NOT USED	
29	KC-241	EXPANDED SCALE VOLTMETER	3-5		3.750	NOT USED	6-7	REQ.	NOT USED	
30	KI-231 KI-241	SYNSCP.-ALL SINGLE PH. HI SHOCK & 400 HZ COMM	1-2-9-10		5.312	USED	NONE	NONE	NOT USED	
31	KI-231 KI-241	P-F. METER-ALL SINGLE PH. HI SHOCK & 400HZ COMM	1-2-9-10		5.312	USED	NONE	NONE	NOT USED	
32	KI-231 KI-241	P.F. METER 3 PHASE 4 WIRE	1-2-8-9-10		5.312	USED	NONE	NONE	NOT USED	VR-825
33	KP-231 KP-241	VARMETER SINGLE PHASE	3-5-6-7		5.312	NOT USED	6-7	NONE	NOT USED	VV2-876
34	KP2-231 KP2-241	INDICATING VAR-TRANSDUCER SINGLE PHASE	3-5-6-7-11-12		5.312	NOT USED	6-7	NONE	NOT USED	VV2-876
35	KJ-231 KJ-241	TRANSDUCER TYPE P.F. METER 1 PH. & 3 PH.	1-2-9-10		5.312	NOT USED	9-10	NONE	NOT USED	NOT USED

FIRST MADE FOR ASSEM. DWG. 409C486



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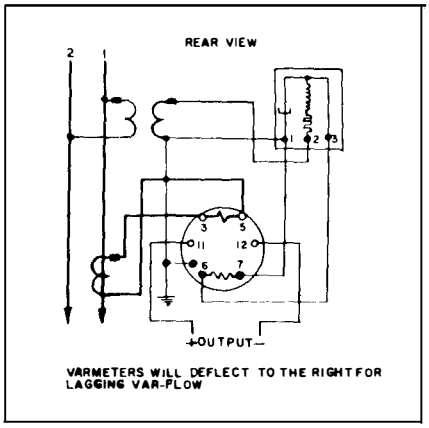


Fig. 21. Type KP2-241 Indicating VAR Transducer Single Phase.

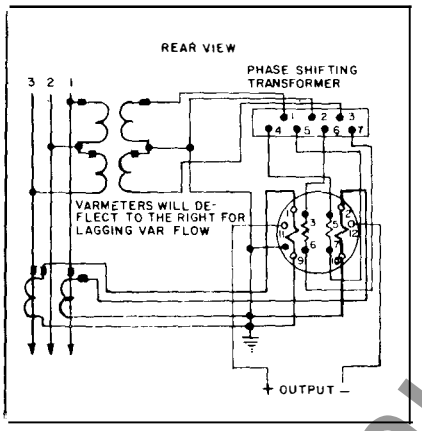


Fig. 22. Type KP2-241 Indicating VAR Transducer 2 Current Coil with phase shifter

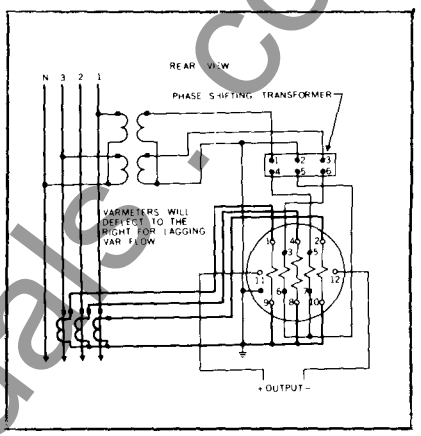
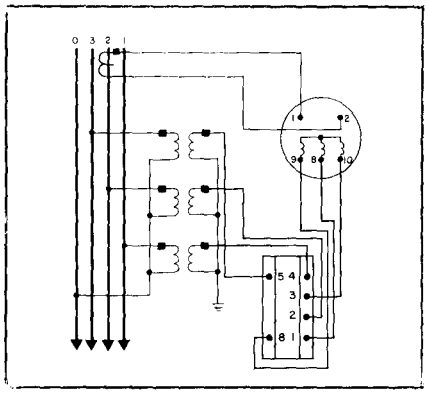


Fig. 23. Type KP2-241 Indicating VAR Transducer 3 Current Coil with phase shifter



** Fig. 24. Type KI241-3 Phase 4 Wire Power Factor Meter*

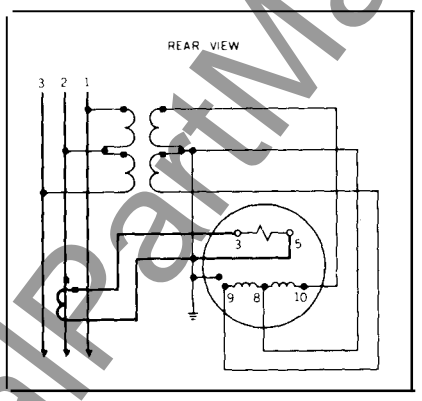


Fig. 25 Type KP241 Single Element Wattmeter for 3 Phase 3 Wire.

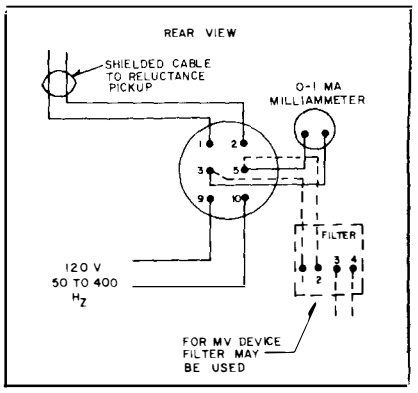


Fig. 26 KR-2-241 Speed Indicator

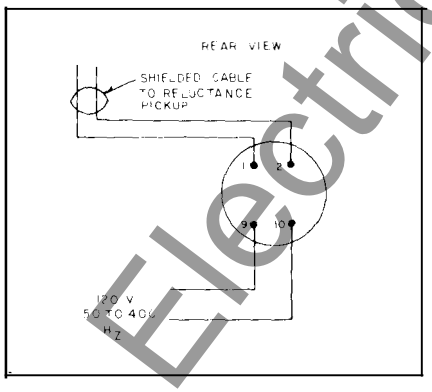


Fig. 27 KR241 Speed Indicator

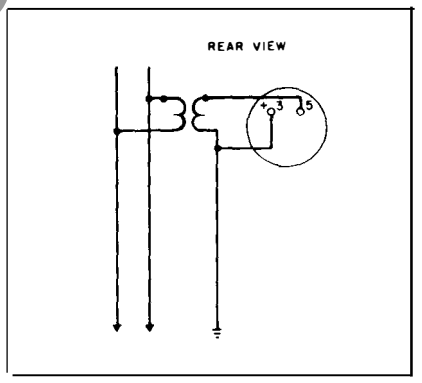


Fig. 28 KR4-241 Frequency Meter

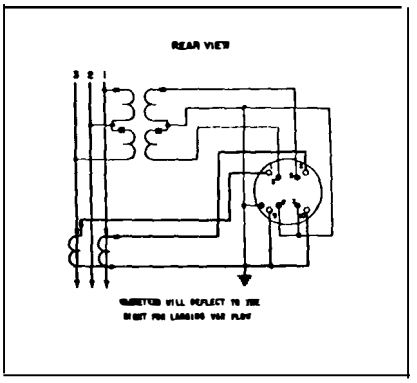


Fig. 29 KV-241 Two Current Coil Self Contained Varmeter. For single phase test connection see Fig. 33 and I.L. 43-241.1

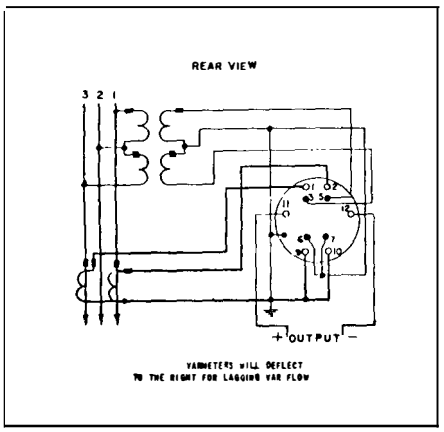
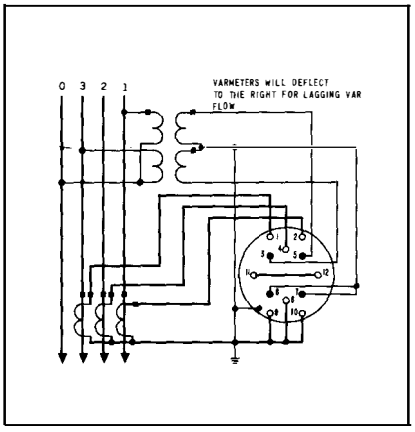
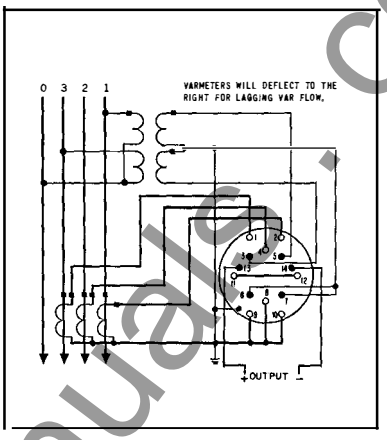


Fig. 30 KV2-241 Two Current Coil self contained indicating Var-transducer. For single phase test connection, see I.L. 43-241.1.



** Fig. 31 KV-241 Three Current Coil Self Contained Varmeter. For single phase test connection, see I.L. 43-241.1*



** Fig. 32 KV2-241 Three Current Coil Self Contained Indicating Vari-Transducer. For single phase test connection, see I.L. 43-241.1.*

WESTINGHOUSE ELECTRIC CORPORATION
RELAY-INSTRUMENT DIVISION
NEWARK, N. J.
Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

— K-241 LINE —
SWITCHBOARD INSTRUMENTS
FOUR AND ONE-HALF INCH CLASSIFICATION
FULL-VIEW CIRCULAR SCALE TYPE

GENERAL

Type K-241 instruments are designed and built to meet or exceed the requirements of American Standard C39.1 for electrical indicating switchboard instruments. The rated accuracy class is one per cent.

CASES

The first letter in the Type designation indicates the form of case used. K = Rectangular Flush Case, Flange mounted.

MECHANISMS

The second letter in the type designation indicates the principle of operation.

X = Permanent magnet moving coil
A = Repulsion-Attraction, moving iron
P = Watt transducer plus X
I = Rotating iron vane
C = Rectifier plus X
F = Iron core electromagnetic
J = Power Factor Transducer Plus X
V = Var Transducer Plus X

All of the above mechanisms employ the taut band suspension bearing system except the I and F types.

CAUTION: When the instrument mechanism is exposed, avoid contact with the tension springs. These springs are precisely made and positioned, and any pressures inadvertently applied to them may cause misalignment of the moving element.

DIAL NOTES

References to type, style number, use of external components if required, coil ratings, calibration data etc., are made on the dial mask.

INSTALLATION

Unpack instruments carefully. Terminal and mounting hardware, and any external components may be in separate packages.

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

Before energizing the instrument, adjust the pointer to zero by means of the zero adjuster at the front of the instrument.

CIRCUIT PRECAUTIONS

CAUTION: DO NOT REMOVE COVER WHILE THE INSTRUMENT IS ENERGIZED, DIAL AND POINTER MAY BE AT HAZARDOUS VOLTAGE LEVELS.

HIGH VOLTAGE OPERATION

All instruments are insulated for 800 volt maximum service.

When voltmeters are used with external resistors on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be grounded.

Ammeters with external shunts must be used with leads having the resistance specified in the dial notes. If the circuit voltage exceeds the insulation rating of the instrument, the shunt should be in the grounded side of the line.

GROUNDING OF CASES

Ground instrument cases with No. 12 AWG Copper Wire to any one of the three instrument case to base screws.

REPAIRS AND RENEWAL PARTS

Repair work can be done most satisfactorily at the factory, or at any authorized Instrument Repair Facility (see Service Directory 43-000). However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts always give complete nameplate data.

All possible contingencies which may arise during installation, operation, or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding his particular installation, operation or maintenance of his equipment, the local Westinghouse Electric Corporation representative should be contacted.

SUPERSEDES I.L. 43-241V, dated August 1975
✪ Changed since previous issue
EFFECTIVE OCTOBER 1976

LINE NO.	TYPE	INSTRUMENT	TERMINALS IN POSITION NO.	TERM. THD. (USS)	DIM. A INCHES	DIM. A (MM)	RESISTOR CAGE	ELECTROLUMINESCENT DIALS: DIAL ILLUMINATION TERMINALS	ELECTROLUMINESCENT DIALS: EXTERNAL TRANSFORMER	TUBULAR TYPE RESISTOR	EXTERNAL BOX: TYPE	EXTERNAL BOX: REQ
1	KX-231 KX-241	D.C. INST'S INCLUDING AMMETERS UP TO 20 AMP	3-5	10-32	2.813	71.5	NOT USED	6-7	USED	NOT USED	NOT USED	
2	KX-231 KX-241	D.C. AMMETERS 30 & 50 AMP.	3-5	1/4-28	2.813	71.5		6-7	USED	NOT USED		
3	KX-231 KX-241	RECTIFIER INSTS. EXCEPT [illegible] TYPE	3-5	10-32	2.813	71.5		6-7	USED	NOT USED		
4	KX-231 KX-241	TEMPERATURE INDICATOR, 20 VDC POWER SUPPLY	3-4-5-6-7		2.813	71.5		9-10	USED	NOT USED		
5	KC-241	EXPANDED SCALE VOLTMETER MIL-V-23151B	3-5		3.750	95.3		NOT USED	NOT USED	NOT USED		
6	KR3-241	FREQUENCY METER MIL-M-23167	3-5		3.750	95.3				NOT USED		
7	KI-231 KI-241	SYNCHROSCOPE-SINGLE PHASE COM. 50 & 60HZ	1-2-9-10		5.312	134.9				USED		
8	KI-231 KI-241	POWER FACTOR METER - SINGLE PHASE - COM 50 & 60HZ	1-2-9-10		5.312	134.9				USED		
9	KI-231 KI-241	POWER FACTOR METER - 3 PHASE	1-2-8-9-10		5.312	134.9	USED			NOT USED		
10	KP-231 KP-241	WATTMETER (3 PH 3W) & KV-231 KV-241 VAR S.C. (3PH 3 W)	1-2-3-5-6-7-9-10		5.312	134.9	NOT USED	5-7				
11	KR3-231 KR3-241	FREQUENCY METER (SELF CONTAINED)	3-5		3.750	95.3		6-7	USED			
12	KP-231 KP-241	WATTMETER (3 PH 4 W)	1 TO 10		5.312	134.9		5-7	NOT USED			
13	KP-231 KP-241	WATTMETER (SINGLE PHASE)	3-5-6-7		5.312	134.9		6-7	NOT USED			
14	KX-231 KX-241	D.C. VOLTMETER (3 TERM.)	3-4-5		2.813	71.5		6-7	USED			
15	KV-231 KV-241	VARMETER SELF CONT. (3PH 4W)	1 TO 12		5.312	134.9		NOT USED	NOT USED			
16	KA-231 KA-241	A.C. VOLTMETER	1-2		2.813	71.5	*	6-7	NOT USED			
17	KA-231 KA-241	A.C. AMMETER UP TO & INCLUDING 20 AMP	1-2		2.813	71.5	NOT USED	6-7	NOT USED			
18	KC-231 KC-241	ELECTRICALLY SUPPRESSED INST.	3-5		3.750	95.3		6-7	USED			
19	KA-231 KA-241	A.C. DOUBLE RANGE AMMETER	1-2-9-10		2.813	71.5		NOT USED	NOT USED			
20	KVP-231 KV2-241	INDICATING VAR TRANSDUCER S.C. (3 PH, 3W)	1 TO 12		5.312	134.9		NOT USED				
21	KR-231 KR-241	SPEED INDICATOR	1-2-9-10		[illegible]	95.3		NOT USED				
22	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (SINGLE PHASE)	3-5-6-7-11-12		[illegible]	134.9		6-7				
23	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (3 PH 3 W)	1-2-3-5-6-7-9 TO 12		5.312	134.9		5-7				
24	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (3 PH 4 W)	1 TO 12		[illegible]	134.9		5-7				
25	KC-231 KC-241	[illegible] AMMETER	3-5		[illegible]	95.3		6-7	USED			
26	KX-241	[illegible] 120V AC POWER SUP	1-2-3-4-5-6-7		[illegible]	95.3		NOT USED	NOT USED			
27	KV2-231 KV2-241	INDICATING VAR TRANSDUCER S.C. (3PH, 4W)	1 TO 14		[illegible]	134.9		NOT USED	NOT USED			
28	[illegible]	SPEED INDICATOR	1-2-3-5-9-10		[illegible]	95.3		NOT USED	NOT USED			
29	KC-241	EXPANDED SCALE VOLTMETER	3-5		[illegible]	95.3		5-7	USED			
30	KI-231 KI-241	SYNCHRO [illegible] SINGLE PH. [illegible] & 400 HZ COM	1-2-9-10		[illegible]	134.9	USED	NOT USED	NOT USED			
31	KI-231 KI-241	P.F. METER-ALL SINGLE PH. [illegible] & 400HZ COM	1-2-9-10		[illegible]	134.9	USED	NOT USED				
32	KI-231 KI-241	P.F. METER 3 PHASE 4 WIRE	1-2-8-9-10		[illegible]	134.9	USED	NOT USED			[illegible]	
33	KP-231 KP-241	[illegible] PHASE	3-5-6-7		[illegible]	134.9	NOT USED	6-7			[illegible]	
34	KP2-231 KP2-241	[illegible] PHASE	3-5-6-7-11-12		[illegible]	134.9	NOT USED	6-7			[illegible]	
35	KJ-231 KJ-241	[illegible] TYPE P.F. METER 1PH & 3 PH	1-2-9-10		[illegible]	134.9	NOT USED	NOT USED			NOT USED	
36	KX-241	FREQUENCY METER MIL-M-[illegible]	3-5		[illegible]	95.3	NOT USED	6-7	USED		[illegible]	

* = USED ABOVE 600 VOLTS

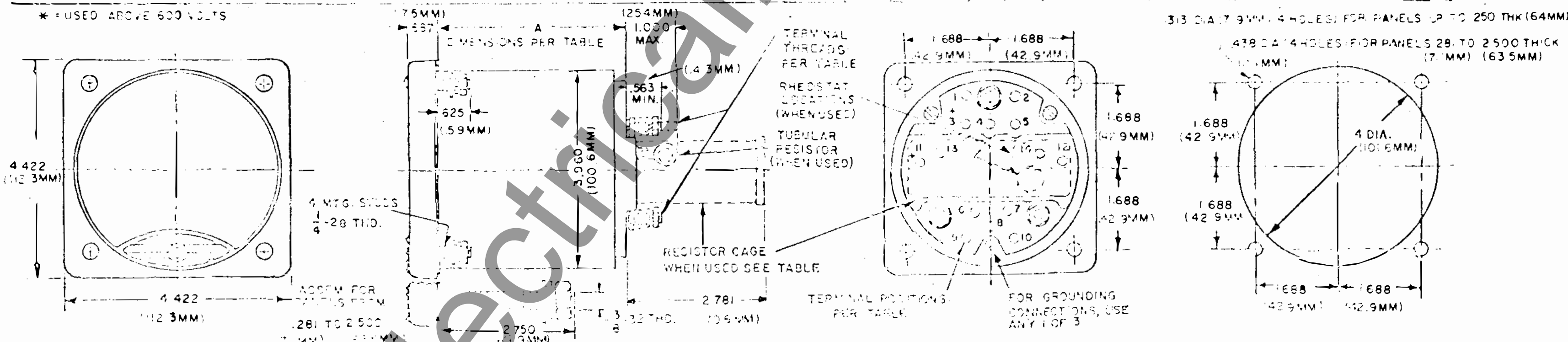


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Fig. 1.

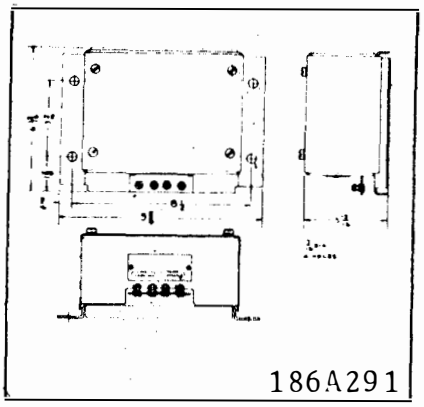


Fig. 2. Transducer used with Hi Shock Frequency Meter.

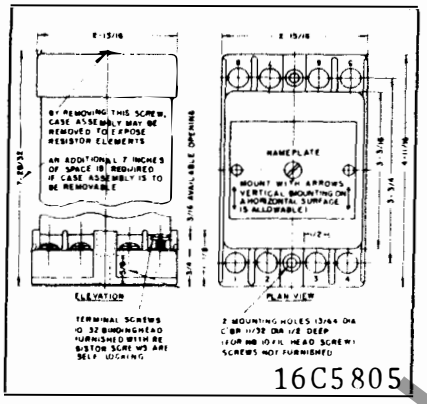


Fig. 3. VR-825 External Resistor.

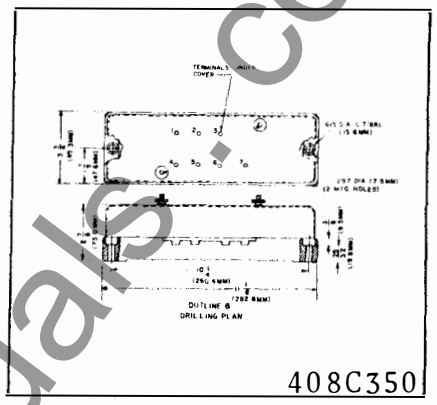


Fig. 4. Phase Shifting Transformer used with 3-phase, 3-wire and 3-phase 4-wire Varmeter.

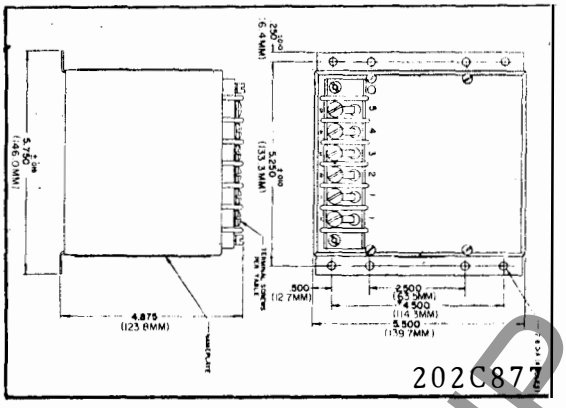


Fig. 5. VAR Compensator used with Single Phase Varmeter.

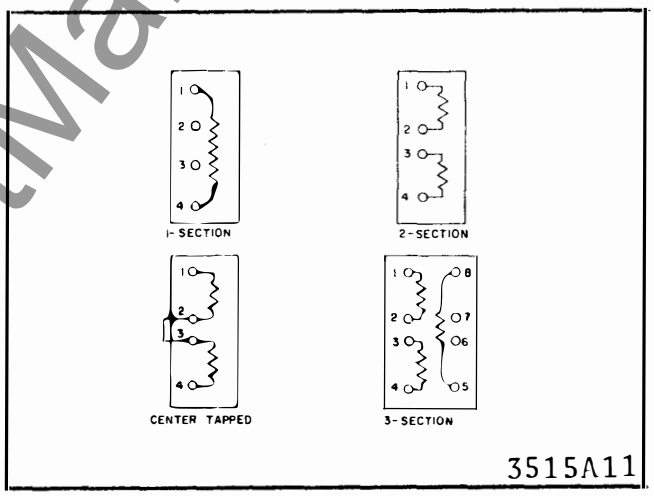


Fig. 6. Type VR825 Resistor Connections.

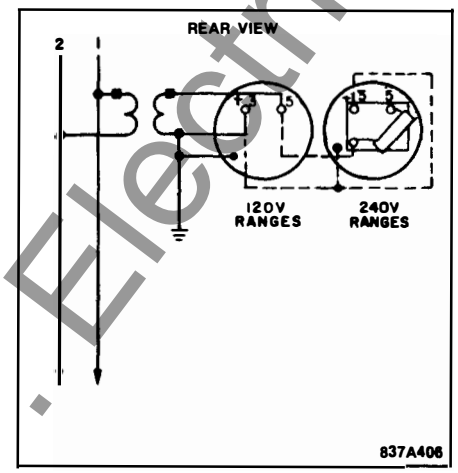


Fig. 7. Type KR3-241 Self Cont. Frequency Meter.

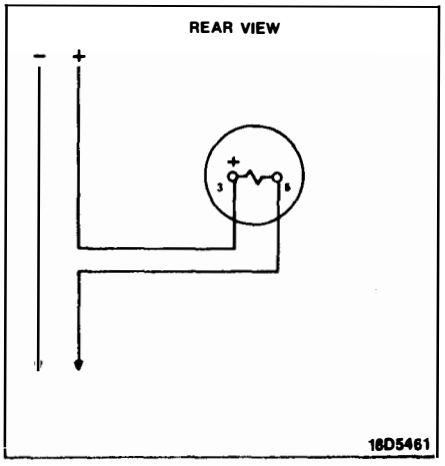


Fig. 8. Type KX-241 Ammeter and Milliameter (self-contained).

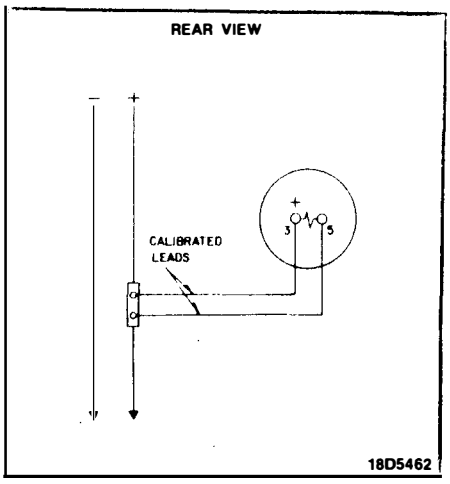


Fig. 9. Type KX-241 Ammeter with External Shunt.

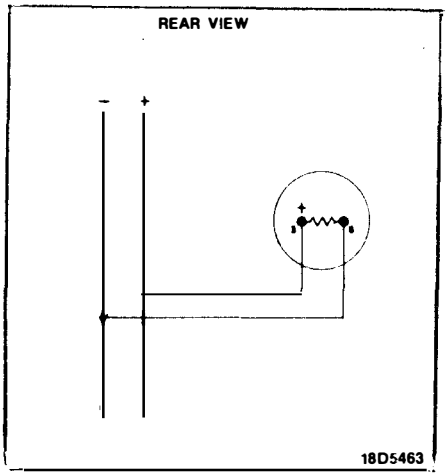


Fig. 10. Type KX-241 Voltmeter.

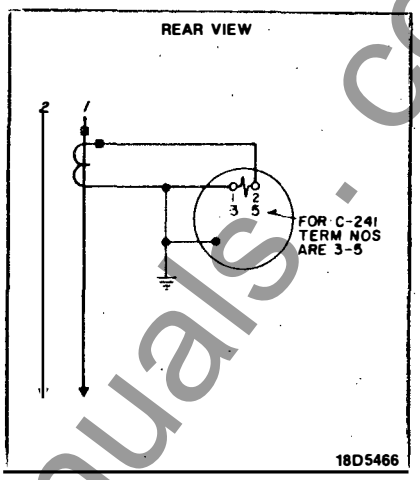


Fig. 11. Type KA-241 and KC-241 Ammeter.

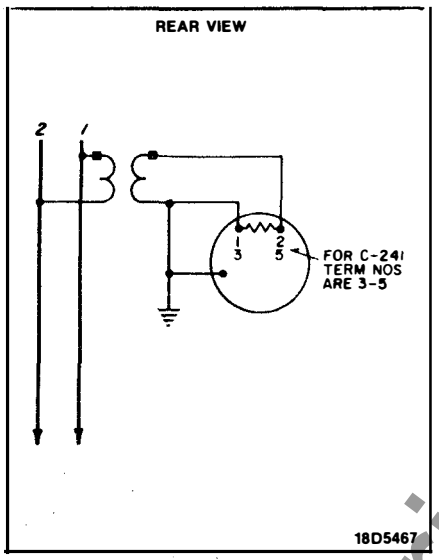


Fig. 12. Type KA-241 and KC-241 Voltmeter.

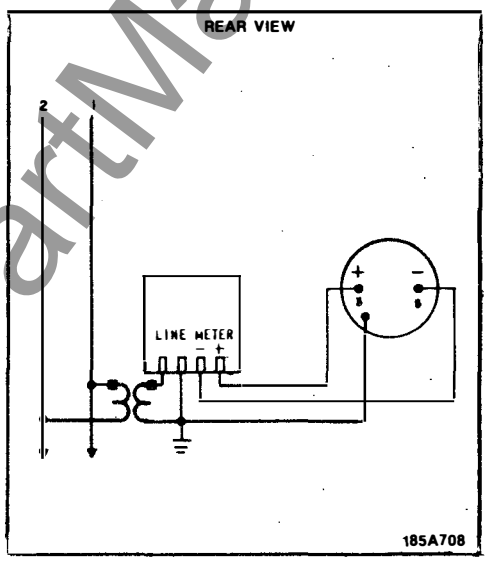


Fig. 13. Type KX-241 Frequency Meter, Hi-Shock, with External Transducer.

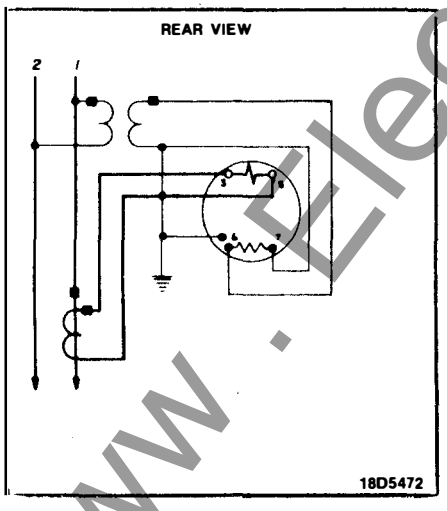


Fig. 14. Type KP-241 Single Phase Wattmeter.

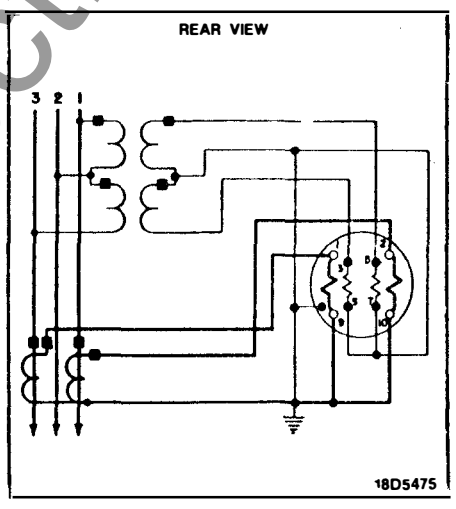


Fig. 15. Type KP-241 2 Current Coil Wattmeter.

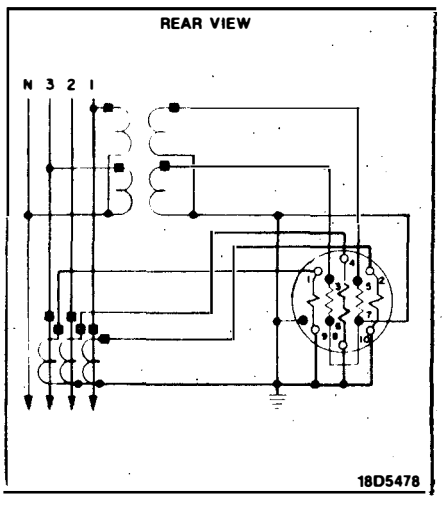


Fig. 16. Type KP-241 3 Current Coil Wattmeter.

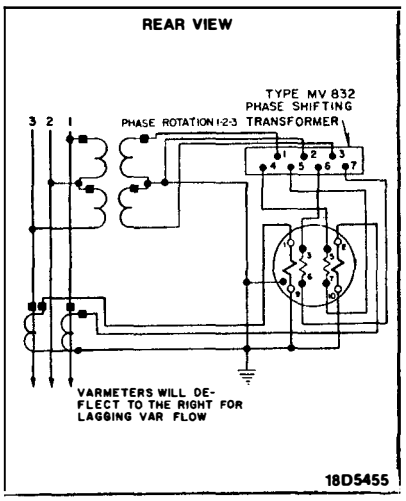


Fig. 17. Type KP-241 2 Current Coil Varmeter with phase shifter.

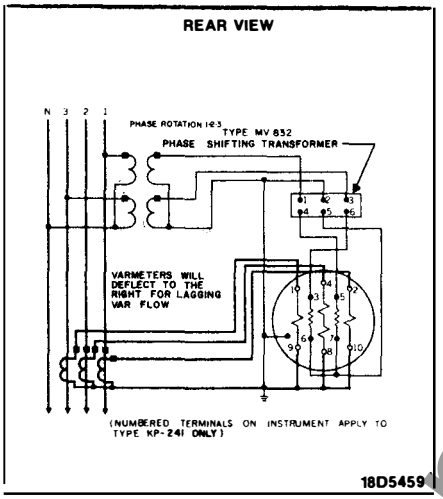


Fig. 18. Type KP-241 3 Current Coil Varmeter with phase shifter.

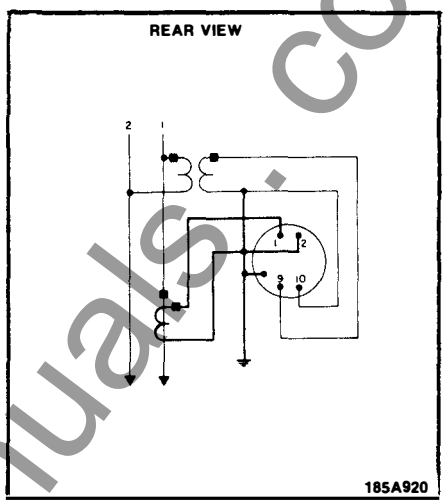


Fig. 19. Type KI-241 and KJ-241 Single Phase Power Factor Meter.

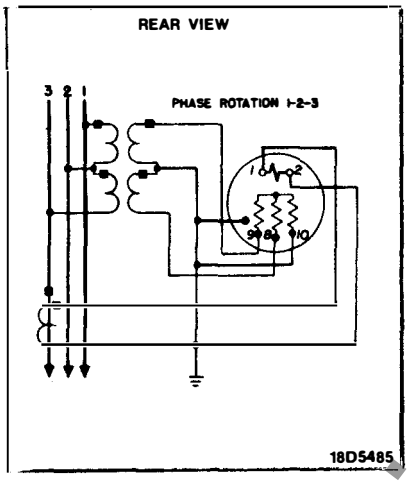


Fig. 20. Type KI-241 3 Phase-3 Wire Power Factor Meter.

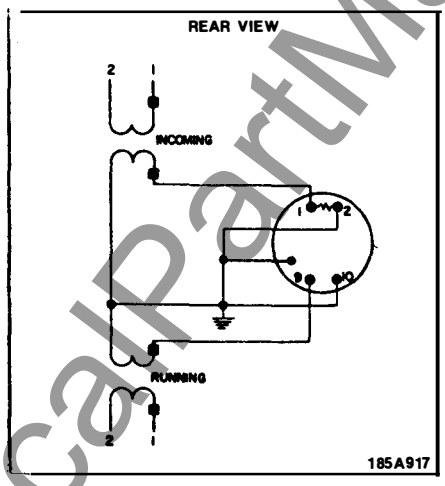


Fig. 21. Type KI-241 Synchroscope.

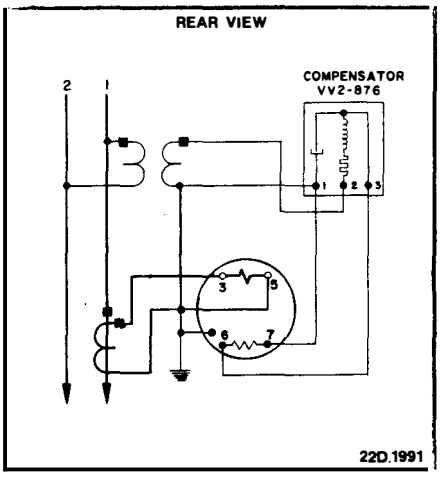


Fig. 22. Type KP-241 Single Phase Varmeter.

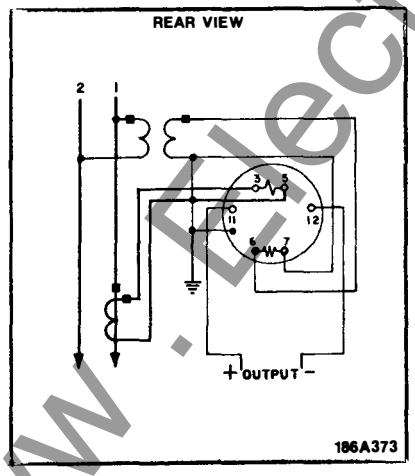


Fig. 23. Type KP2-241 Indicating Watt Transducer Single Phase.

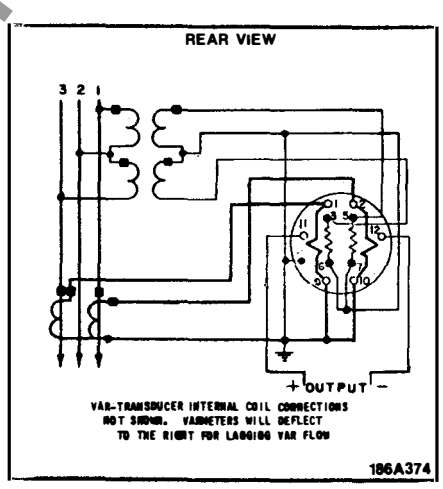


Fig. 24. Type KP2-241 Indicating Watt Transducer 2 Current Coil.

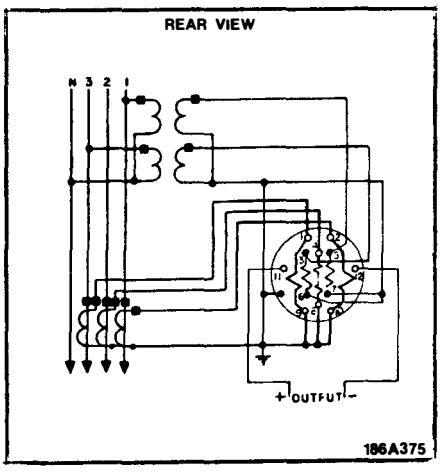


Fig. 25. Type KP2-241 Indicating Watt Transducer 3 Current Coil.

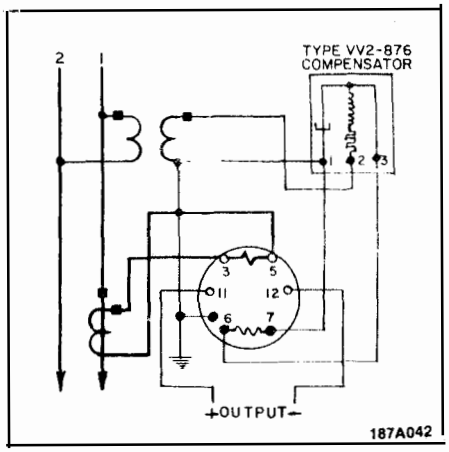


Fig. 26. Type KP2-241 Indicating VAR Transducer Single Phase.

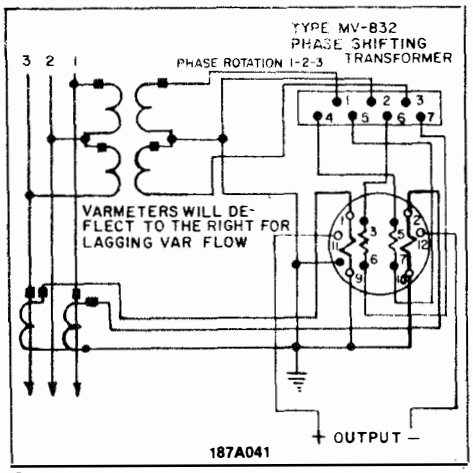


Fig. 27. Type KP2-241 Indicating VAR Transducer 2 Current Coil with phase shifter.

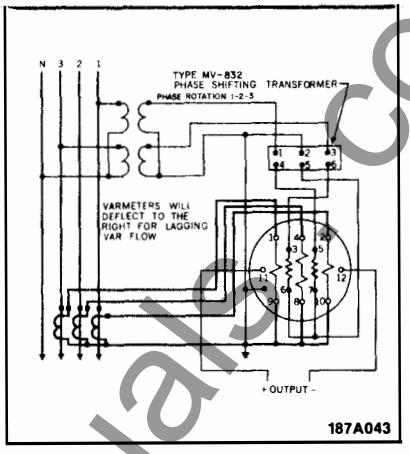


Fig. 28. Type KP2-241 Indicating VAR Transducer 3 Current Coil with phase shifter.

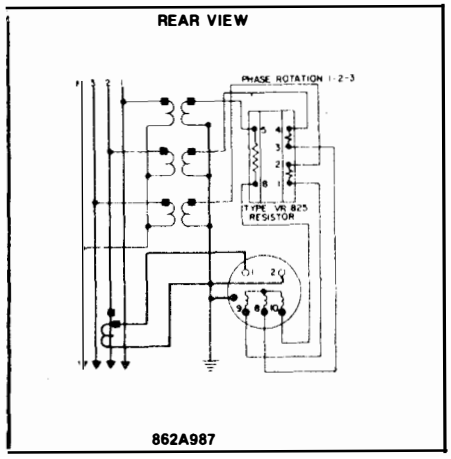


Fig. 29. Type KI241 3 Phase 4 Wire Power Factor Meter.

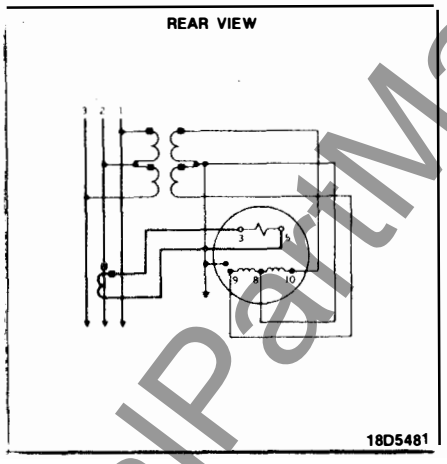


Fig. 30. Type KP241 Single Element Wattmeter for 3 Phase 3 Wire.

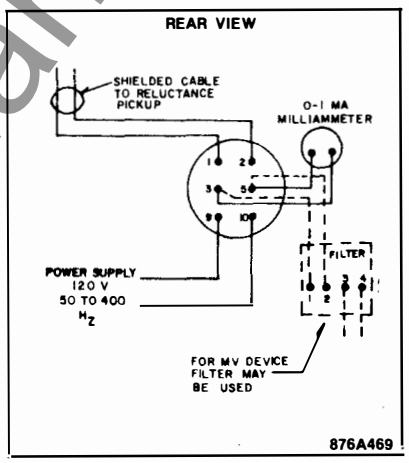


Fig. 31. Type KR2-241 Speed Indicator.

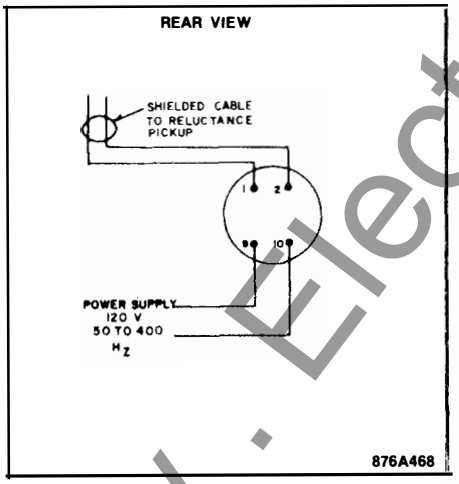


Fig. 32. Type KR241 Speed Indicator.

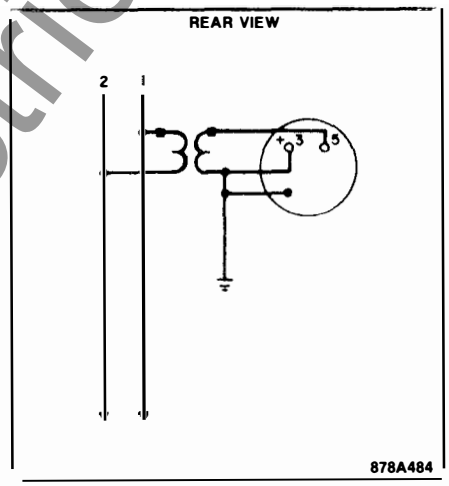


Fig. 33. Type KR4-241 Frequency Meter.

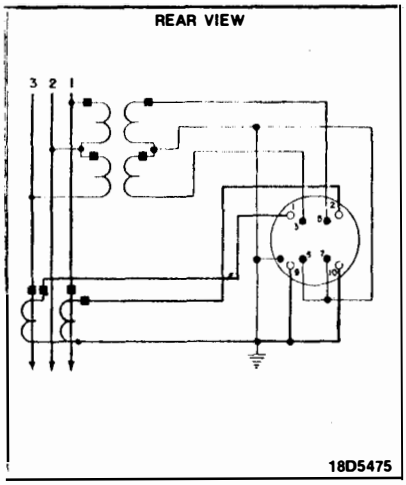


Fig. 34. Type KV-241 Two Current Coil Self Contained Varmeter. For single phase test connection see I.L. 43-241.1.

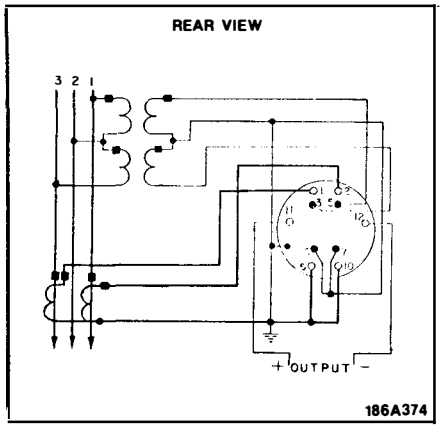


Fig. 35. Type KV2-241 Two Current Coil Self contained indicating Var-Transducer. For single phase test connection, see I.L. 43-241.1.

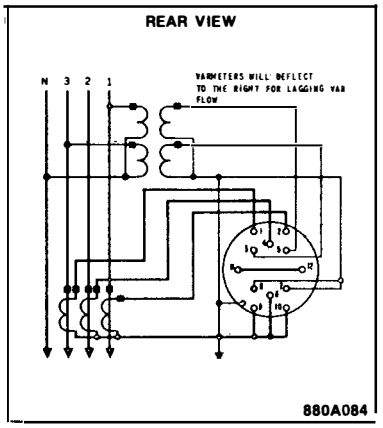


Fig. 36. Type KV-241 Three Current Coil Self Contained Varmeter. For single phase test connection, see I.L. 43 241.1.

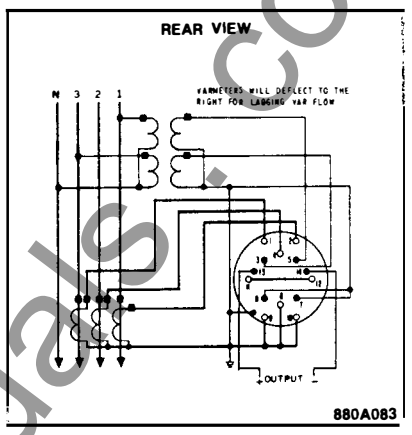
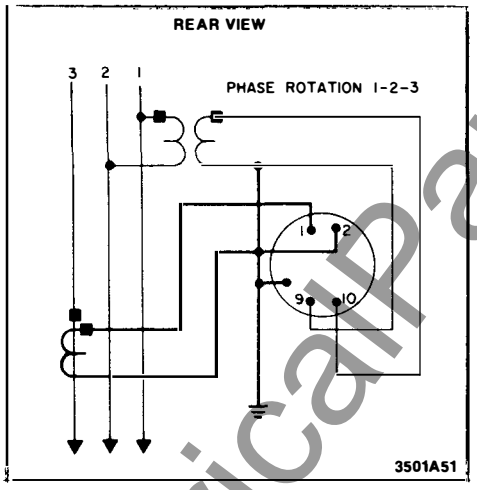
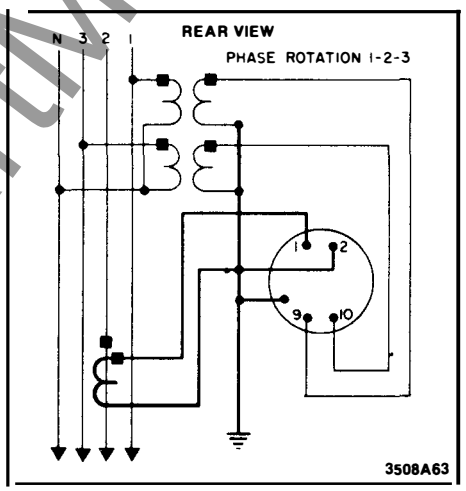


Fig. 37. Type KV2-241 Three Current Coil Self Contained Indicating VAR Transducer. For single phase test connection, see I.L. 43-241.1.



✪ Fig. 38. Type KJ-241 3 phase, 3 wire Power Factor Meter.



✪ Fig. 39. Type KJ-241 3 phase, 4 wire Power Factor Meter.

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **CORAL SPRINGS, FL.**

Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

— K-241 LINE —
SWITCHBOARD INSTRUMENTS
FOUR AND ONE-HALF INCH CLASSIFICATION
FULL-VIEW CIRCULAR SCALE TYPE

GENERAL

Type K-241 instruments are designed and built to meet or exceed the requirements of American Standard C39.1 for electrical indicating switchboard instruments. The rated accuracy class is one per cent.

CASES

The first letter in the Type designation indicates the form of case used. K = Rectangular Flush Case, Flange mounted.

MECHANISMS

The second letter in the type designation indicates the principle of operation.

X = Permanent magnet moving coil
A = Repulsion-Attraction, moving iron
P = Watt transducer plus X
I = Rotating iron vane
C = Rectifier plus X
F = Iron core electromagnetic
J = Power Factor Transducer Plus X
V = Var Transducer Plus X

All of the above mechanisms employ the taut band suspension bearing system except the I and F types.

CAUTION: When the instrument mechanism is exposed, avoid contact with the tension springs. These springs are precisely made and positioned, and any pressures inadvertently applied to them may cause misalignment of the moving element.

DIAL NOTES

References to type, style number, use of external components if required, coil ratings, calibration data etc., are made on the dial mask.

INSTALLATION

Unpack instruments carefully. Terminal and mounting hardware, and any external components may be in separate packages.

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

Before energizing the instrument, adjust the pointer to zero by means of the zero adjuster at the front of the instrument.

CIRCUIT PRECAUTIONS

CAUTION: DO NOT REMOVE COVER WHILE THE INSTRUMENT IS ENERGIZED. DIAL AND POINTER MAY BE AT HAZARDOUS VOLTAGE LEVELS.

HIGH VOLTAGE OPERATION

All instruments are insulated for 800 volt maximum service.

When voltmeters are used with external resistors on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be grounded.

Ammeters with external shunts must be used with leads having the resistance specified in the dial notes. If the circuit voltage exceeds the insulation rating of the instrument, the shunt should be in the grounded side of the line.

GROUNDING OF CASES

Ground instrument cases with No. 12 AWG Copper Wire to any one of the three instrument case to base screws.

REPAIRS AND RENEWAL PARTS

Repair work can be done most satisfactorily at the factory, or at any authorized Instrument Repair Facility (see Service Directory 43-000). However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts always give complete nameplate data.

All possible contingencies which may arise during installation, operation, or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding his particular installation, operation or maintenance of his equipment, the local Westinghouse Electric Corporation representative should be contacted.

SUPERSEDES I.L. 43-241V, dated August 1975
✪ **Changed since previous issue**
EFFECTIVE OCTOBER 1976

LINE NO.	TYPE	INSTRUMENT	TERMINALS IN POSITION NO.	TERM. THD. (USS)	DIM. A INCHES	DIM. A (MM)	RESISTOR CAGE	ELECTROLUMINESCENT DIALS: DIAL ILLUMINATION TERMINALS	ELECTROLUMINESCENT DIALS: EXTERNAL TRANSFORMER	TUBULAR TYPE RESISTOR	EXTERNAL BOX: TYPE	EXTERNAL BOX: REQ
1	KX-231 KX-241	D.C. INST'S. INCLUDING AMMETERS UP TO 20 AMP	3-5	10-32	2.813	71.5	NOT USED	6-7	USED	NOT USED	NOT USED	
2	KX-231 KX-241	D.C. AMMETERS 30 & 50 AMP.	3-5	1/4-28	2.813	71.5		6-7	USED	NOT USED		
3	KX-231 KX-241	RECTIFIER INSTS. EXCEPT TRANSFORMER TYPE	3-5	10-32	2.813	71.5		6-7	USED	NOT USED		
4	KX-231 KX-241	TEMPERATURE INDICATOR, 20 VDC POWER SUPPLY	3-4-5-6-7		2.813	71.5		9-10	USED	NOT USED		
5	KC-241	EXPANDED SCALE VOLTMETER MIL-V-23151B	3-5		3.750	95.3		NOT USED	NOT USED	NOT USED		
6	KR4-241	FREQUENCY METER MIL-M-23167	3-5		3.750	95.3				NOT USED		
7	KI-231 KI-241	SYNCHROSCOPE-SINGLE PHASE COMM. 50 & 60HZ	1-2-9-10		5.312	134.9				USED		
8	KI-231 KI-241	POWER FACTOR METER - SINGLE PHASE - COMM 50 & 60HZ	1-2-9-10		5.312	134.9				USED		
9	KI-231 KI-241	POWER FACTOR METER - 3 PHASE	1-2-8-9-10		5.312	134.9	USED			NOT USED		
10	KP-231 KP-241	WATTMETER (3 PH 3W) & KV-231-KV-241 VAR S.C. (3PH 3W)	1-2-3-5-6-7-9-10		5.312	134.9	NOT USED	5-7				
11	KR3-231 KR3-241	FREQUENCY METER (SELF CONTAINED)	3-5		3.750	95.3		6-7	USED			
12	KP-231 KP-241	WATTMETER (3 PH 4W)	1 TO 10		5.312	134.9		5-7	NOT USED			
13	KP-231 KP-241	WATTMETER (SINGLE PHASE)	3-5-6-7		5.312	134.9		6-7	NOT USED			
14	KX-231 KX-241	D.C. VOLTMETER (3 TERM.)	3-4-5		2.813	71.5		6-7	USED			
15	KV-231 KV-241	VARMETER SELF CONT. (3PH 4W)	1 TO 12		5.312	134.9	*	NOT USED	NOT USED			
16	KA-231 KA-241	A.C. VOLTMETER	1-2		2.813	71.5		6-7	NOT USED			
17	KA-231 KA-241	A.C. AMMETER UP TO & INCLUDING 20 AMP	1-2		2.813	71.5	NOT USED	6-7	NOT USED			
18	KC-231 KC-241	ELECTRICALLY SUPPRESSED INST.	3-5		3.750	95.3		6-7	USED			
19	KA-231 KA-241	A.C. DOUBLE RANGE AMMETER	1-2-9-10		2.813	71.5		NOT USED	NOT USED			
20	KV2-231 KV2-241	INDICATING VAR-TRANSDUCER S.C (3 PH. 3W)	1 TO 12		5.312	134.9		NOT USED				
21	KR-231 KR-241	SPEED INDICATOR	1-2-9-10		3.750	95.3		NOT USED				
22	KP-2-231 KP2-241	INDICATING WATT-TRANSDUCER (SINGLE PHASE)	3-5-6-7-11-12		5.312	134.9		6-7				
23	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (3 PH 3W)	1-2-3-5-6-7-9 TO 12		5.312	134.9		5-7				
24	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (3 PH 4W)	1 TO 12		5.312	134.9		5-7				
25	KC-231 KC-241	TRANSFORMER TYPE RECTIFIER AMMETER	3-5		3.750	95.3		6-7	USED			
26	KX-241	ELECTRICAL RESISTANCE THERMOMETER 120V AC POWER SUP	1-2-3-4-5-6-7		3.750	95.3		NOT USED	NOT USED			
27	KV2-231 KV2-241	INDICATING VAR TRANSDUCER S.C (3PH. 4W)	1 TO 14		5.312	134.9		NOT USED	NOT USED			
28	KR2-231 KR2-241	SPEED INDICATOR	1-2-3-5-9-10		3.750	95.3		NOT USED	NOT USED			
29	KC-241	EXPANDED SCALE VOLTMETER	3-5		3.750	95.3		6-7	USED			
30	KI-231 KI-241	SYNSCP.-ALL SINGLE PH. HI SHOCK & 400 HZ COMM	1-2-9-10		5.312	134.9	USED	NOT USED	NOT USED			
31	KI-231 KI-241	P-F. METER-ALL SINGLE PH. HI SHOCK & 400HZ COMM	1-2-9-10		5.312	134.9	USED	NOT USED				
32	KI-231 KI-241	P.F. METER 3 PHASE 4 WIRE	1-2-8-9-10		5.312	134.9	USED	NOT USED				
33	KP-231 KP-241	VARMETER SINGLE PHASE	3-5-6-7								VR-825	1
34	KP2-231 KP2-241	INDICATING VAR-TRANSDUCER SINGLE PHASE	3-5-6-7-11-12		5.312	134.9	NOT USED	6-7			VV2-876	1
35	KJ-231 KJ-241	TRANSDUCER TYPE P.F. METER 1 PH. & 3 PH.	1-2-9-10		5.312	134.9	NOT USED	6-7			VV2-876	1
36	KX-241	FREQUENCY METER MIL-M-16125	3-5		3.750	95.3	NOT USED	NOT USED			NOT USED	
								6-7	USED		VC 841	1

* = USED ABOVE 600 VOLTS

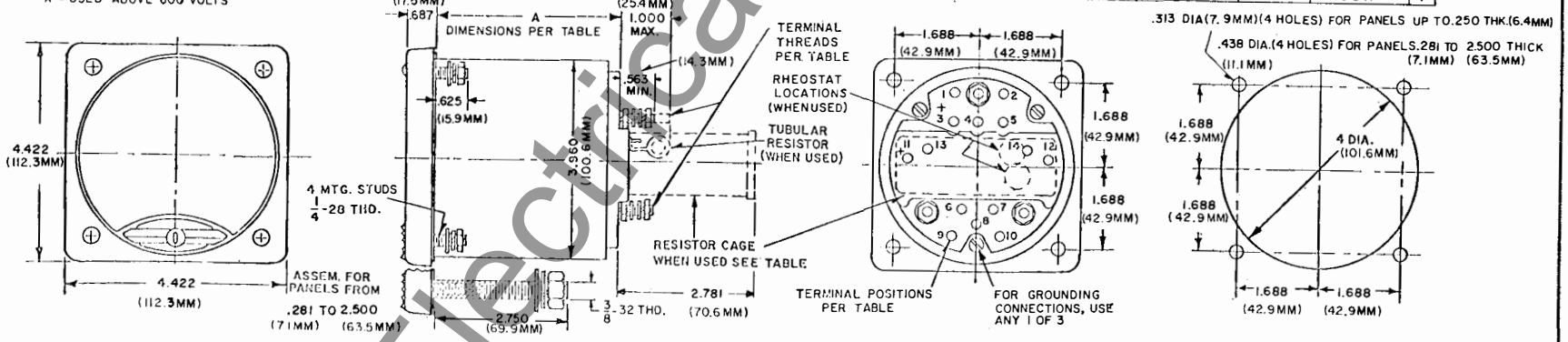


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Fig. 1.

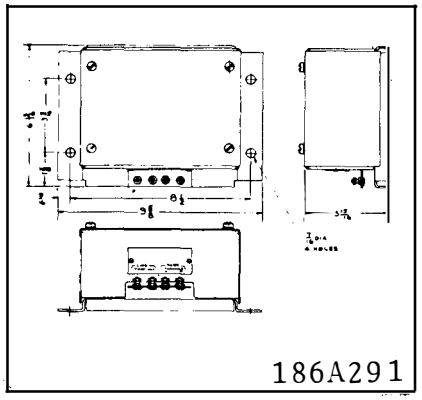


Fig. 2. Transducer used with Hi Shock Frequency Meter.

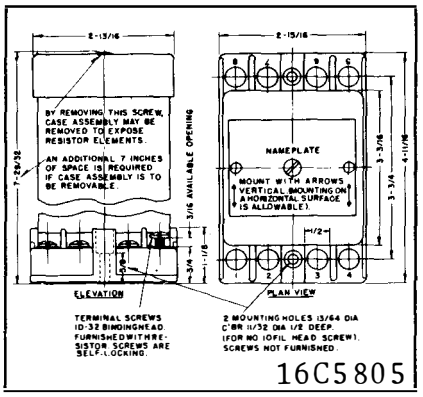


Fig. 3. VR-825 External Resistor.

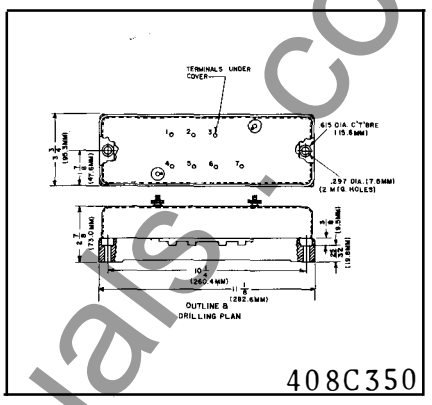


Fig. 4. Phase Shifting Transformer used with 3-phase, 3-wire and 3-phase 4-wire Varmeter.

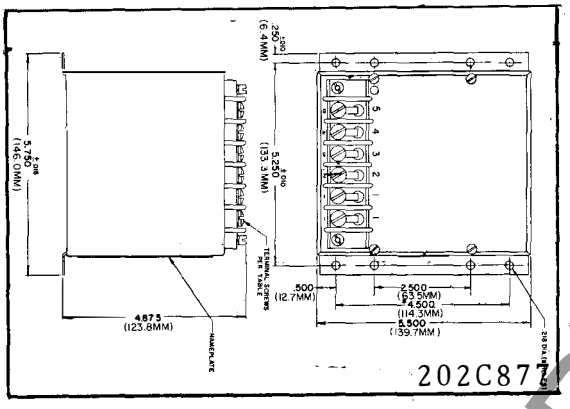


Fig. 5. VAR Compensator used with Single Phase Varmeter.

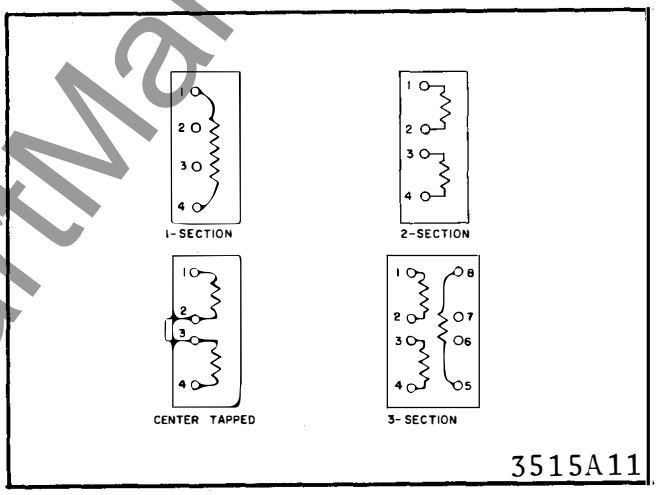


Fig. 6. Type VR825 Resistor Connections.

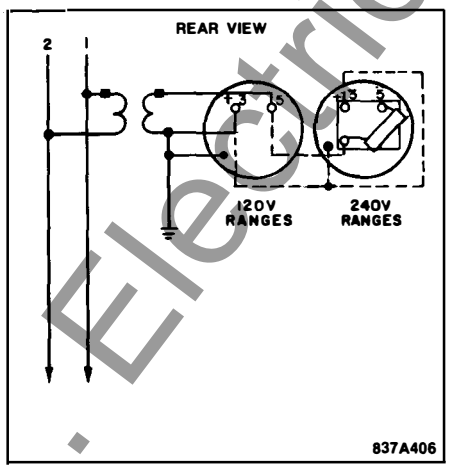


Fig. 7. Type KR3-241 Self Cont. Frequency Meter.

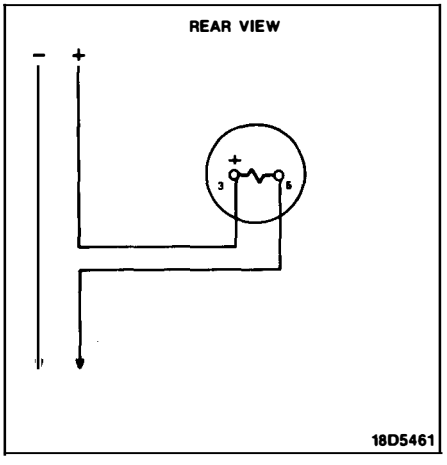


Fig. 8. Type KX-241 Ammeter and Milliameter (self-contained).

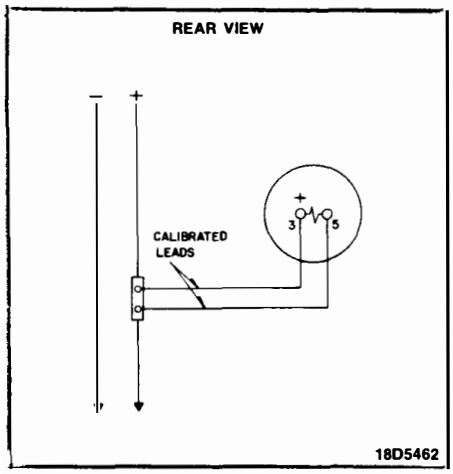


Fig. 9. Type KX-241 Ammeter with External Shunt.

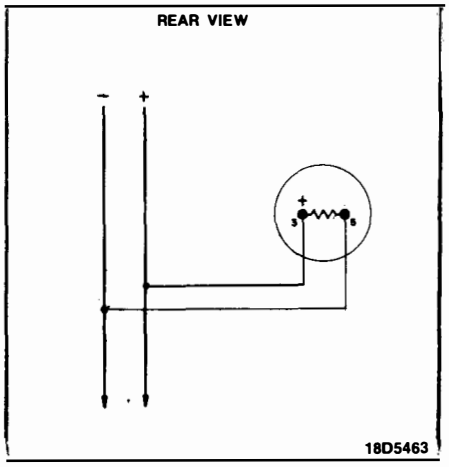


Fig. 10. Type KX-241 Voltmeter.

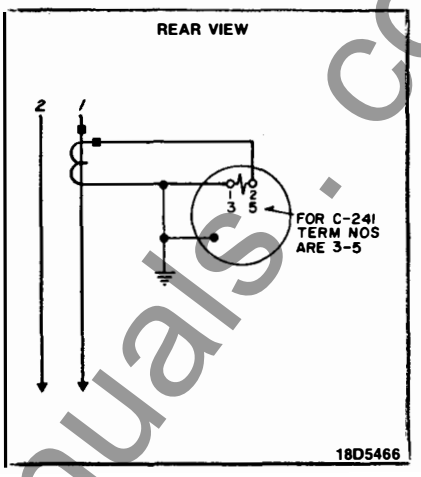


Fig. 11. Type KA-241 and KC-241 Ammeter.

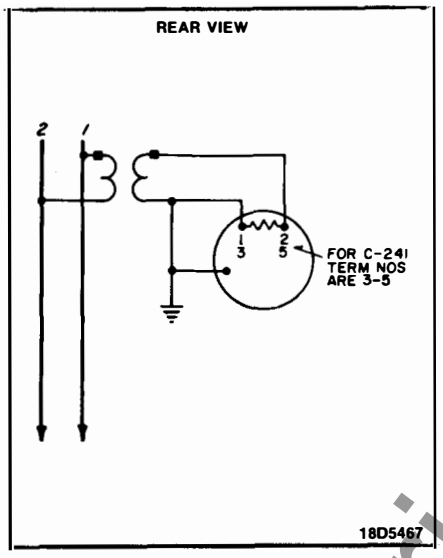


Fig. 12. Type KA-241 and KC-241 Voltmeter.

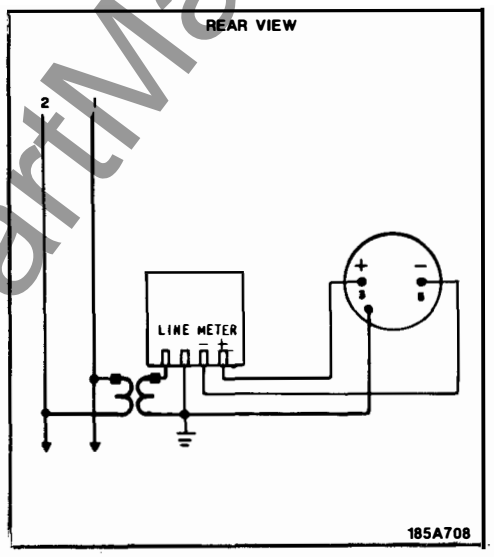


Fig. 13. Type KX-241 Frequency Meter, Hi-Shock, with External Transducer.

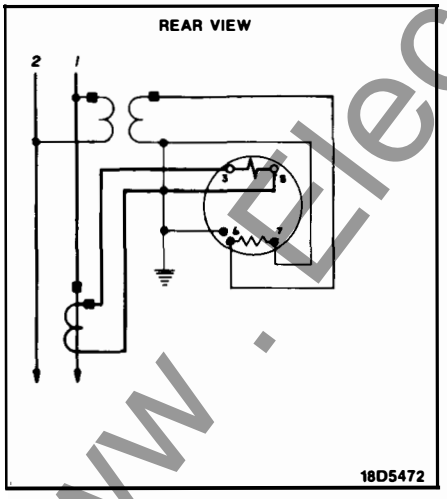


Fig. 14. Type KP-241 Single Phase Wattmeter.

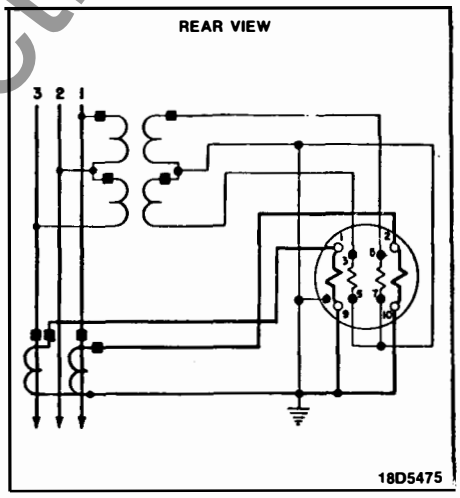


Fig. 15. Type KP-241 2 Current Coil Wattmeter.

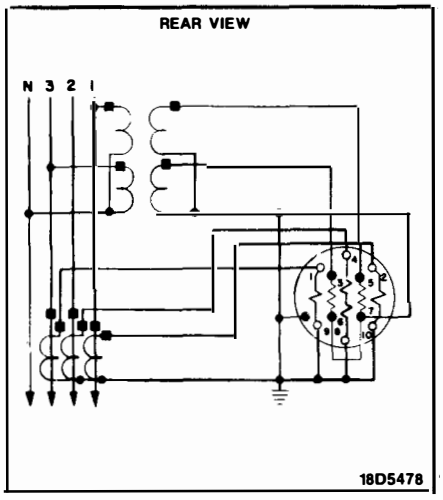


Fig. 16. Type KP-241 3 Current Coil Wattmeter.

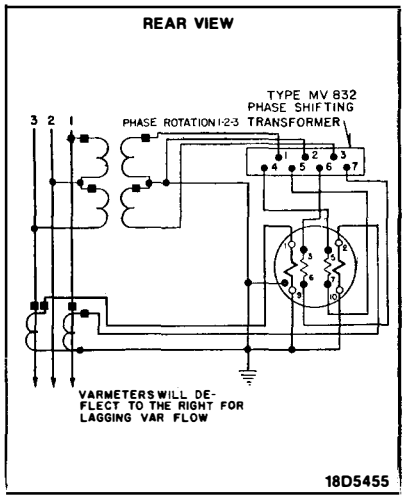


Fig. 17. Type KP-241 2 Current Coil Varmeter with phase shifter.

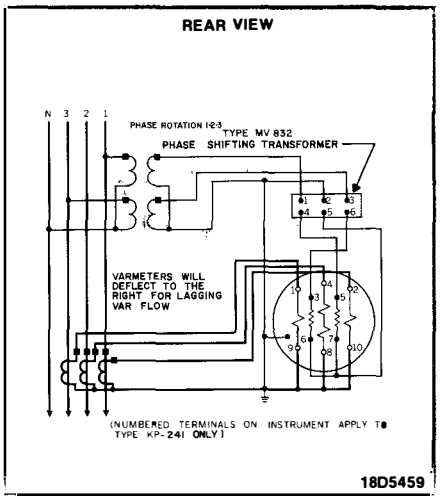


Fig. 18. Type KP-241 3 Current Coil Varmeter with phase shifter.

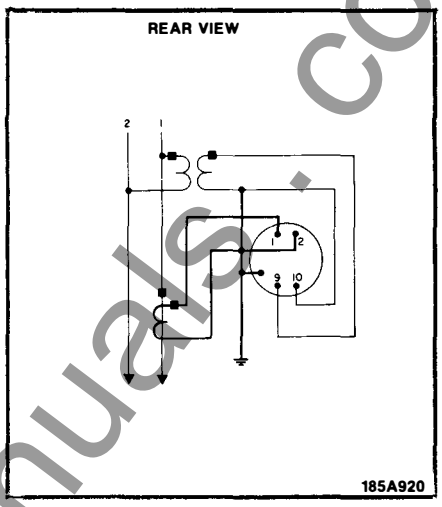


Fig. 19. Type KI-241 and KJ-241 Single Phase Power Factor Meter.

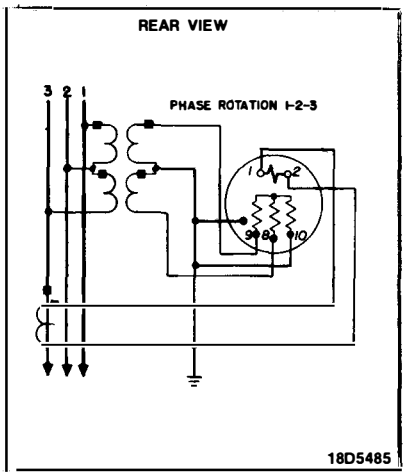


Fig. 20. Type KI-241 3 Phase-3 Wire Power Factor Meter.

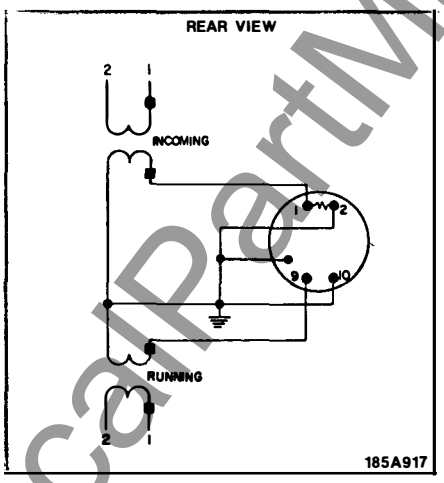


Fig. 21. Type KI-241 Synchroscope.

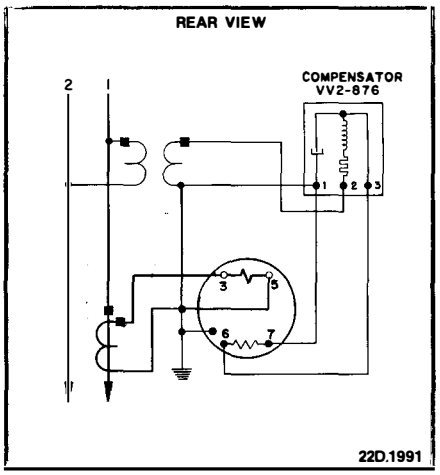


Fig. 22. Type KP-241 Single Phase Varmeter.

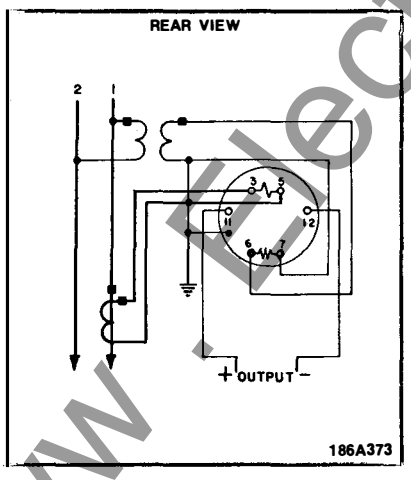


Fig. 23. Type KP2-241 Indicating Watt Transducer Single Phase.

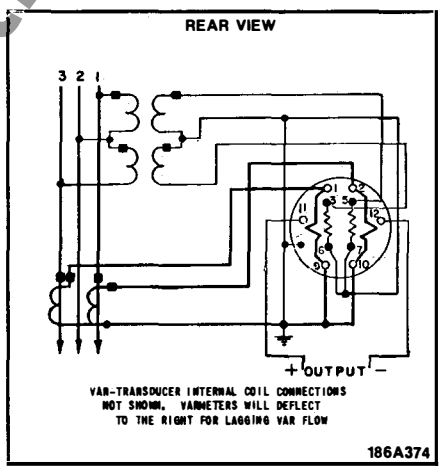


Fig. 24. Type KP2-241 Indicating Watt Transducer 2 Current Coil.

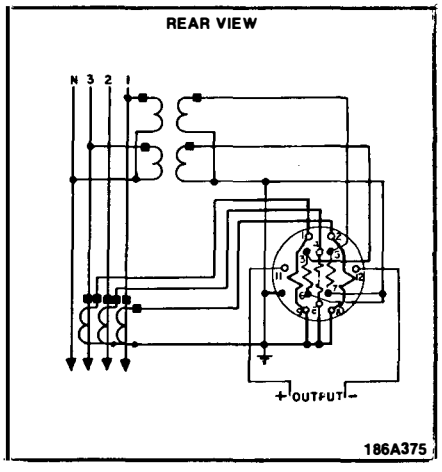


Fig. 25. Type KP2-241 Indicating Watt Transducer 3 Current Coil.

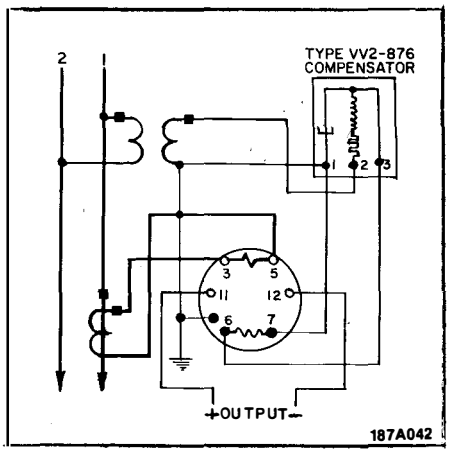


Fig. 26. Type KP2-241 Indicating VAR Transducer Single Phase.

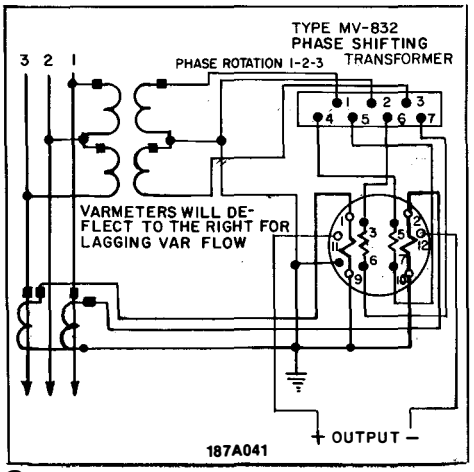


Fig. 27. Type KP2-241 Indicating VAR Transducer 2 Current Coil with phase shifter.

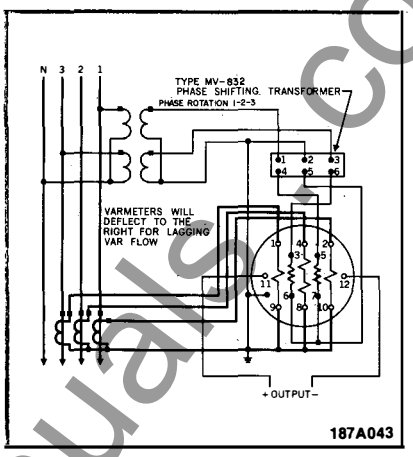


Fig. 28. Type KP2-241 Indicating VAR Transducer 3 Current Coil with phase shifter.

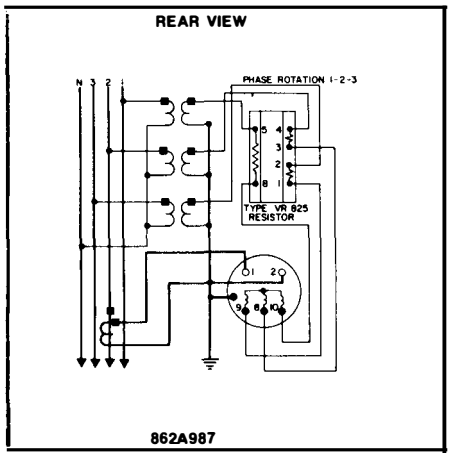


Fig. 29. Type KI241 3 Phase 4 Wire Power Factor Meter.

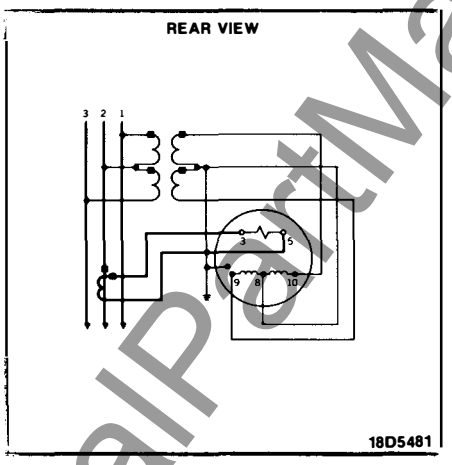


Fig. 30. Type KP241 Single Element Wattmeter for 3 Phase 3 Wire.

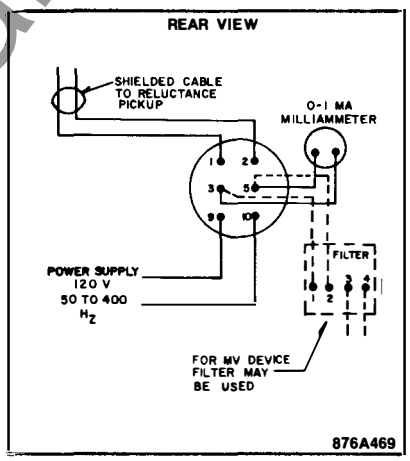


Fig. 31. Type KR2-241 Speed Indicator.

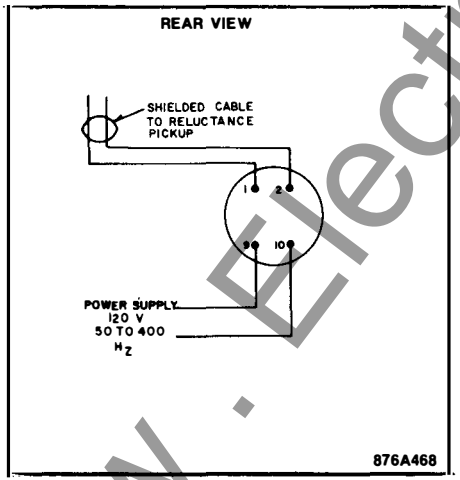


Fig. 32. Type KR241 Speed Indicator.

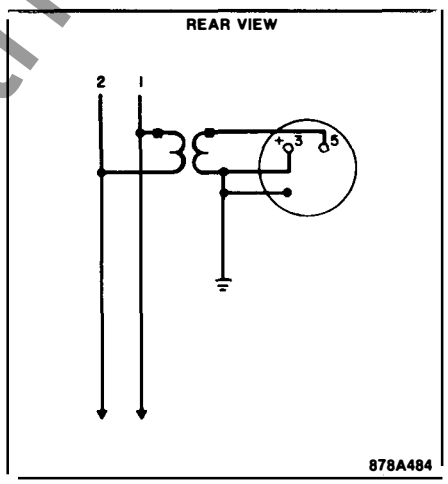


Fig. 33. Type KR4-241 Frequency Meter.

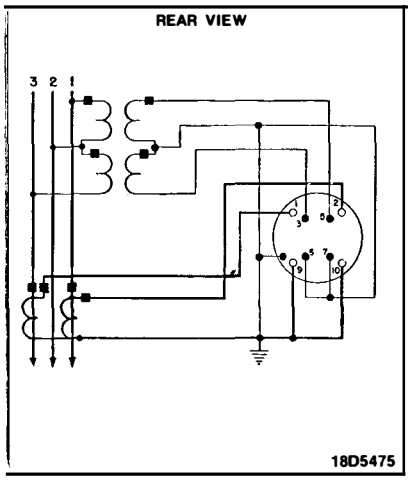


Fig. 34. Type KV-241 Two Current Coil Self Contained Varmeter. For single phase test connection see I.L. 43-241.1.

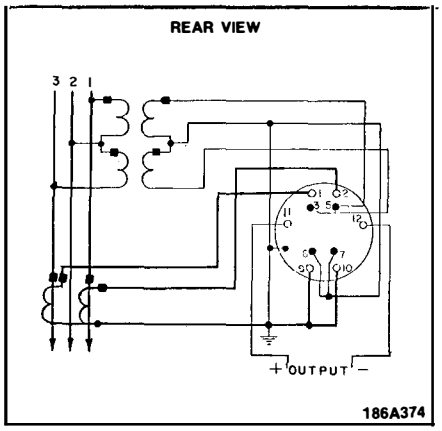


Fig. 35. Type KV2-241 Two Current Coil Self contained indicating Var-Transducer. For single phase test connection, see I.L. 43-241.1.

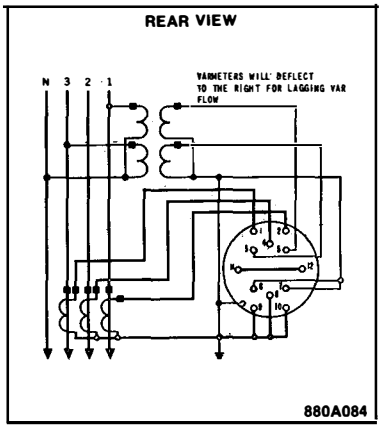


Fig. 36. Type KV-241 Three Current Coil Self Contained Varmeter. For single phase test connection, see I.L. 43 241.1.

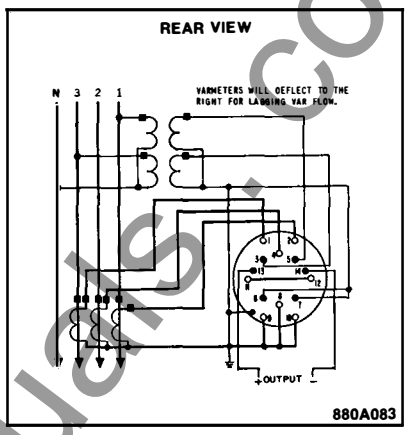
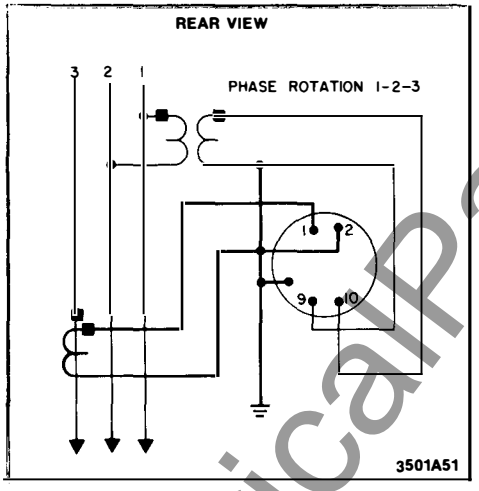
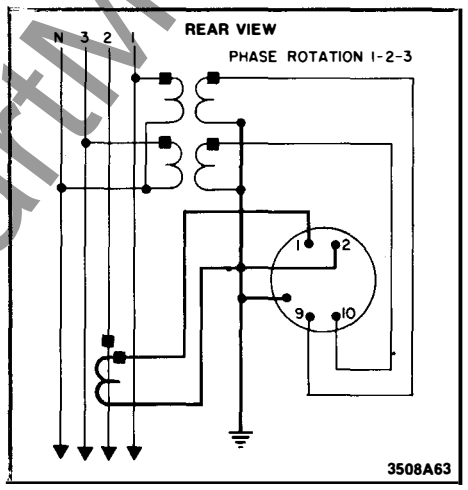


Fig. 37. Type KV2-241 Three Current Coil Self Contained Indicating VAR Transducer. For single phase test connection, see I.L. 43-241.1.



✪ *Fig. 38. Type KJ-241 3 phase, 3 wire Power Factor Meter.*



✪ *Fig. 39. Type KJ-241 3 phase, 4 wire Power Factor Meter.*

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **CORAL SPRINGS, FL.**

Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

— K-241 LINE —
SWITCHBOARD INSTRUMENTS
FOUR AND ONE-HALF INCH CLASSIFICATION
FULL-VIEW CIRCULAR SCALE TYPE

GENERAL

Type K-241 instruments are designed and built to meet or exceed the requirements of American Standard C39.1 for electrical indicating switchboard instruments. The rated accuracy class is one per cent.

CASES

The first letter in the Type designation indicates the form of case used. K = Rectangular Flush Case, Flange mounted.

MECHANISMS

The second letter in the type designation indicates the principle of operation.

X = Permanent magnet moving coil
A = Repulsion-Attraction, moving iron
P = Watt transducer plus X
I = Rotating iron vane
C = Rectifier plus X
F = Iron core electromagnetic

All of the above mechanisms employ the taut band suspension bearing system except the I and F types.

CAUTION: When the instrument mechanism is exposed, avoid contact with the tension springs. These springs are precisely made and positioned. and any pressures inadvertently applied to them may cause misalignment of the moving element.

DIAL NOTES

References to type style number, use of external components if required, coil ratings, calibration data etc., are made on the dial mask.

INSTALLATION

Unpack instruments carefully. Terminal and mounting hardware, and any external components may be in separate packages.

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

Before energizing the instrument, adjust the pointer to zero by means of the zero adjuster at the front of the instrument.

CIRCUIT PRECAUTIONS

HIGH VOLTAGE OPERATION

All instruments are insulated for 800 volt maximum service.

When voltmeters are used with external resistors on voltages higher than the insulation rating of the instrument, one terminal of the instrument should be grounded.

Ammeters with external shunts must be used with leads having the resistance specified in the dial notes. If the circuit voltage exceeds the insulation rating of the instrument, the shunt should be in the grounded side of the line.

GROUNDING OF CASES

Instruments, when mounted on grounded metal structures, are considered adequately grounded when secured to the structures by metal hardware. For mounting on insulated structures any one of the three case to base mounting screws may be used as a grounding terminal.

REPAIRS AND RENEWAL PARTS

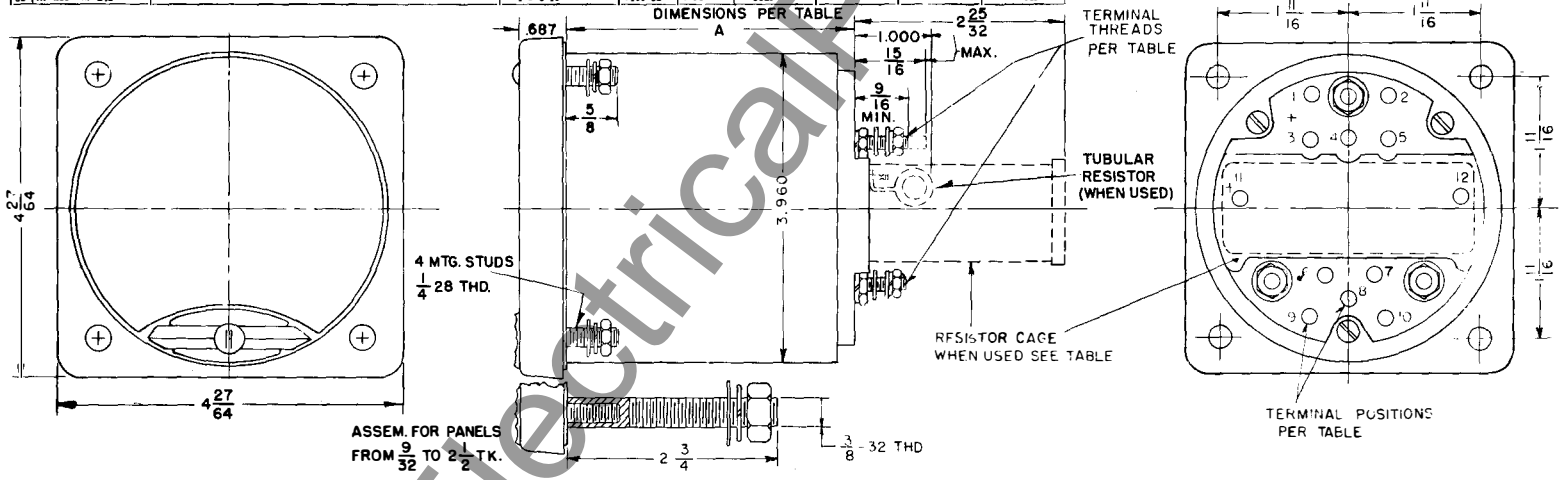
The usual procedures and practices employed for servicing mechanisms of pivot-jewel type instruments cannot be applied to suspension type instruments. For this reason we recommend that all instruments in need of mechanism servicing be returned to the factory.

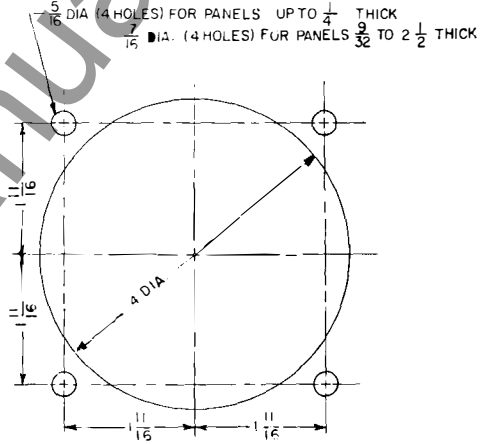
Orders for renewal parts should include the name of the part and the style and serial number of the instrument, appearing on the dial mask.

SUPERSEDES I.L. 43-241P
*Denotes change from superseded issue.

EFFECTIVE FEBRUARY 1970

LINE NO.	TYPE	INSTRUMENT	TERMINALS IN POSITION NO.	TERM. THD.	DIM. A	RESISTOR CASE	USED WITH ILL. DIAL ILLUMINATION TERMINALS	ILLUMINATION ONLY EXTERNAL TRANSFORMER	TUBULAR TYPE RESISTOR
1	KX-231 KX-241	D.C. INST'S INCLUDING AMMETERS UP TO 20 AMP	3-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED
2	KX-231 KX-241	D.C. AMMETERS 30 & 50 AMP.	3-5	1/4-28	2.813	NOT USED	6-7	REQ.	NOT USED
3	K-231 KX-241	RECTIFIER INSTS. EXCEPT TRANSFORMER TYPE	3-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED
4	KX-231 KX-241	TEMPERATURE INDICATOR	3-4-5-6-7	.190-32	2.813	NOT USED	9-10	REQ.	NOT USED
5	KA-241	A.C. VOLTMETER UP TO 600 V.	3-5	.190-32	3.750	USED	9-10	NOT REQ.	NOT USED
6	KA-241	A.C. AMMETER UP TO & INCLUDING 20 AMP	3-5	.190-32	3.750	NOT USED	9-10	NOT REQ.	NOT USED
7	KI-231 KI-241	SYNCHROSCOPE - SINGLE PHASE - COMM 50 & 60 HZ	1-2-9-10	.190-32	5.312	NOT USED	NONE	NONE	REQ
8	KI-231 KI-241	POWER FACTOR METER - SINGLE PHASE - COMM 50 & 60 HZ	1-2-9-10	.190-32	5.312	NOT USED	NONE	NONE	REQ
9	KI-231 KI-241	POWER FACTOR METER - 3 PHASE	1-2-8-9-10	.190-32	5.312	USED	NONE	NONE	NOT USED
10	KP-231 KP-241	WATTMETER (POLY PH. 2CC)	1-2-3-5-6-7-9-10	.190-32	5.312	NOT USED	5-7	NOT REQ.	NOT USED
11	KR2-231 KR2-241	FREQUENCY METER (SELF CONTAINED)	3-5	.190-32	3.750	NOT USED	6-7	REQ.	NOT USED
12	KP-231 KP-241	WATTMETER (POLY PH. 3 CC)	1 TO 10	.190-32	5.312	NOT USED	5-7	NOT REQ.	NOT USED
13	KP-231 KP-241	WATTMETER (SINGLE PHASE)	3-5-6-7	.190-32	5.312	NOT USED	6-7	NOT REQ.	NOT USED
14	KX-231 KX-241	D.C. VOLTMETER (3 TERM.)	3-4-5	.190-32	2.813	NOT USED	6-7	REQ.	NOT USED
15									
16	KA-231 KA-241 (TD5)	A.C. VOLTMETER UP TO 600 VOLTS	1-2	.190-32	2.813	NOT USED	6-7	NOT REQ.	NOT USED
17	KA-231 KA-241 (TD6)	A.C. AMMETER UP TO & INCLUDING 20 AMP	1-2	.190-32	2.813	NOT USED	6-7	NOT REQ.	NOT USED
18	KC-231 KC-241	ELECTRICALLY SUPPRESSED INST.	3-5	.190-32	3.750	NOT USED	6-7	REQ.	NOT USED
19	KA-231 KA-241 (TD8)	A.C. DOUBLE RANGE AMMETER	1-2-9-10	.190-32	2.813	NOT USED	NONE	NOT REQ.	NOT USED
20									
21	KR-231 KR-241	SPEED INDICATOR	1-2-9-10	.190-32	3.750	NOT USED	NONE	NOT REQ.	NOT USED
22	KP-2-231 KP2-241	INDICATING WATT-TRANSDUCER (SINGLE PHASE)	3-5-6-7-11-12	.190-32	5.312	NOT USED	6-7	NOT REQ.	NOT USED
23	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 2 CC)	1-2-3-5-6-7-9 TO 12	.190-32	5.312	NOT USED	5-7	NOT REQ.	NOT USED
24	KP2-231 KP2-241	INDICATING WATT-TRANSDUCER (POLY PH. 3 CC)	1 TO 12	.190-32	5.312	NOT USED	5-7	NOT REQ.	NOT USED
25	KC-231 KC-241	TRANSFORMER TYPE RECTIFIER AMMETER	3-5	.190-32	3.750	NOT USED	6-7	REQ.	NOT USED
26	KX-241	ELECTRICAL RESISTANCE THERMOMETER	1-2-3-4-5-6-7	.190-32	3.750	NOT USED	NONE	NOT REQ.	NOT USED
27									
28	KR2-231 KR2-241	SPEED INDICATOR	1-2-3-5-9-10	.190-32	3.750	NOT USED	NONE	NOT REQ.	NOT USED
29	KC-241	EXPANDED SCALE VOLTMETER	3-5	.190-32	3.750	NOT USED	6-7	REQ.	NOT USED
30	KI-231 KI-241	SYNSCP. - ALL SINGLE PH. HI SHOCK & 400 HZ COMM	1-2-9-10	.190-32	5.312	USED	NONE	NONE	NOT USED
31	KI-231 KI-241	P.F. METER - ALL SINGLE PH. HI SHOCK & 400 HZ COMM	1-2-9-10	.190-32	5.312	USED	NONE	NONE	NOT USED





DRILLING PLAN

* 409C619

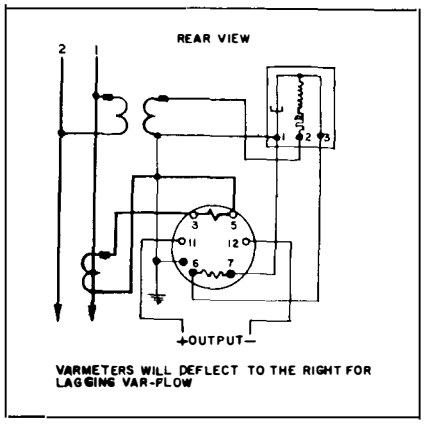


Fig. 21. Type KP2-241 Indicating VAR Transducer Single Phase.

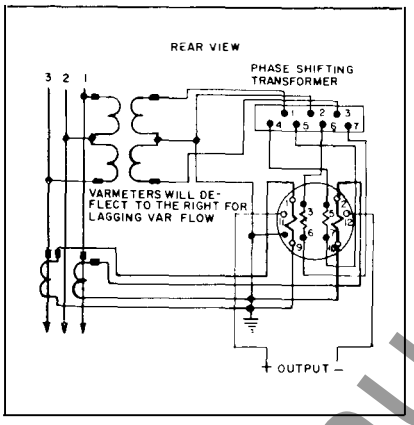


Fig. 22. Type KP2-241 Indicating VAR Transducer 2 Current Coil.

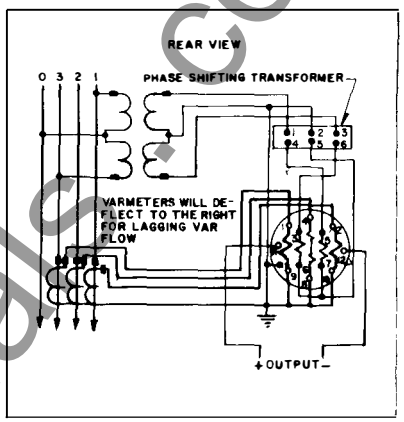


Fig. 23. Type KP2-241 Indicating VAR Transducer 3 Current Coil.

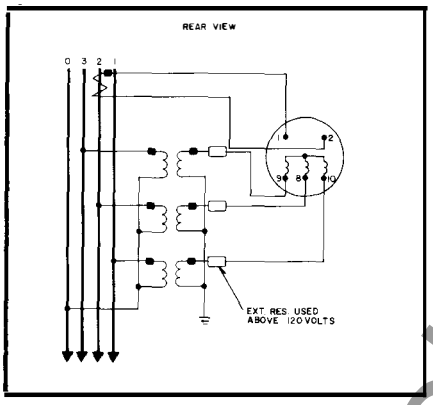


Fig. 24. Type KI241-3 Phase 4 Wire Power Factor Meter

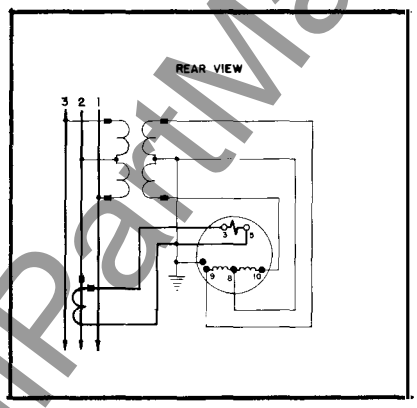


Fig. 25 Type KP241 Single Element Wattmeter for 3 Phase 3 Wire.

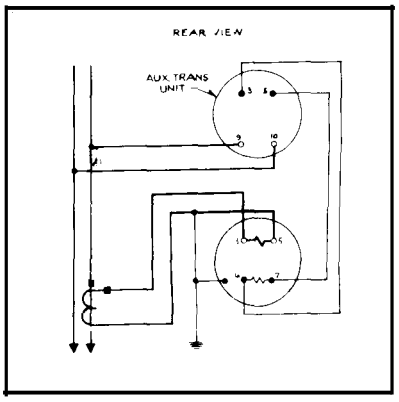


Fig. 26 KP241 Single Phase Wattmeter for use on 480 volts.

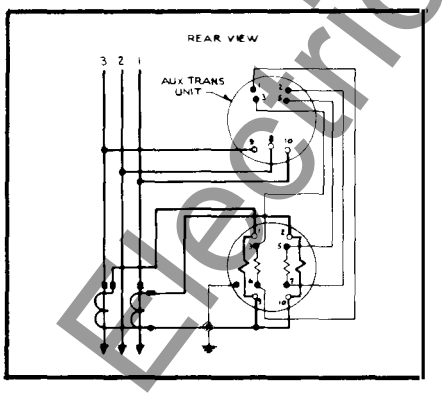


Fig. 27 KP241-2 Current Coil Wattmeter for use on 480 volts.

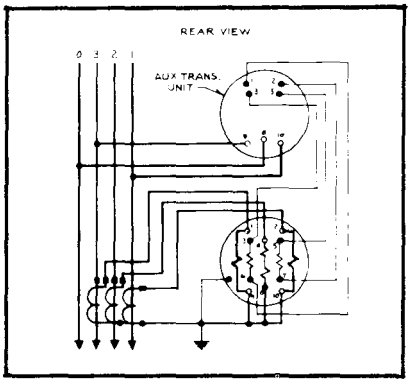


Fig. 28 KP241-3 Current Coil Wattmeter for use on 480 volts.

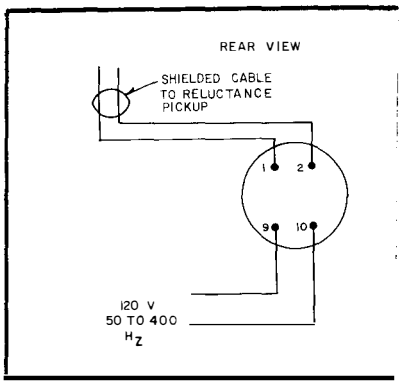


Fig. 29 KR241 Speed Indicator 876A468.

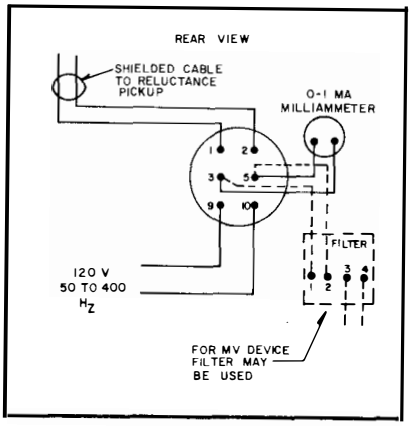


Fig. 30 KR-2-241 Speed Indicator 876A469.

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