GEH-1537A
Supersedes GEH-1537

INSTRUCTIONS

PHASE-SHIFTING TRANSFORMERS FOR VAR-HOUR METERING

TYPES MC-21, MC-22, MC-27, MC-28, MC-31, MC-32, MC-33, AND MC-34

GENERAL ELECTRIC

Fig. 1. Type MC-21 phase-shifting transformer

PHASE–SHIFTING TRANSFORMERS FOR VAR–HOUR METERING

INTRODUCTION

The General Electric Type MC-21, MC-22, MC-27, MC-28, MC-31, MC-32, MC-33 and MC-34 phase-shifting transformers are designed for use with watthour meters or watthour-demand meters for var-hour or var-hour demand metering. This method of metering var-hours is based on the principle of shifting the phase of voltages to the watthour meter by 90 degrees.

DESCRIPTION

All of the phase-shifting transformers covered by these instructions consist essentially of two core-and-coil assemblies mounted in a non-magnetic case. Terminals are provided on the side of the case for external connections. One or two sealing studs and thumb nuts are provided for seal wires. All transformers are designed to operate on a 1-2-3 phase sequence, however, provision is made for transposing leads inside the case if the phase sequence is found to be reversed 1-3-2.

Type MC-27, -28, -33, and -34 phase-shifting transformers have been made in two versions which are designated by the last figure ("1", "2", or "3") of the model number.

The phase-sequence of these transformers may be changed by interchanging the leads identified as red and black in each pair of wires.

In the "1" version the leads are interchanged at the back of the terminal block.

In the "2" and "3" versions the leads are interchanged at the switch terminals.

Each transformer is equipped with a two-position switch which makes it possible to disconnect it from the circuit for checking the calibration of the watthour meter without having to disconnect the leads to the transformer or the meter.

The characteristics of these transformers are given in Table I.

For installation and connections of these transformers, refer to the INSTALLATION section on pages 6 and 7, and to the diagrams on pages 4 and 5.

Only one watthour meter should be connected to each phase-shifting transformer as a greater burden is not recommended for accurate operation.

TABLE I

Type	Circuit	Watthour Meter	Number of Terminals	Sec. Voltages	KWH-KVARH Switch
MC-21	3-w, 3-ph	2-element	7	2	None
MC-22	4-w Y, 3-ph	3-element	9	3	None
MC-22	4-w Y, 3-ph	2-element*	7 used	2 used	None
MC-27	3-w, 3-ph	2-element	7	2	4-pole, 2-pos.
MC-28	4-w Y, 3-ph	3-element	10	3	6-pole, 2-pos.
MC-31	4-w △, 3-ph	2-element	7	2	None
MC-32	4-w △, 3-ph	3-element	9	3	None
MC-33	4-w △, 3-ph	2-element	8	2	4-pole, 2-pos.
MC-34	4-w △, 3-ph	3-element	10	3	6-pole, 2-pos.

* 4-w, 3-ph watthour meter

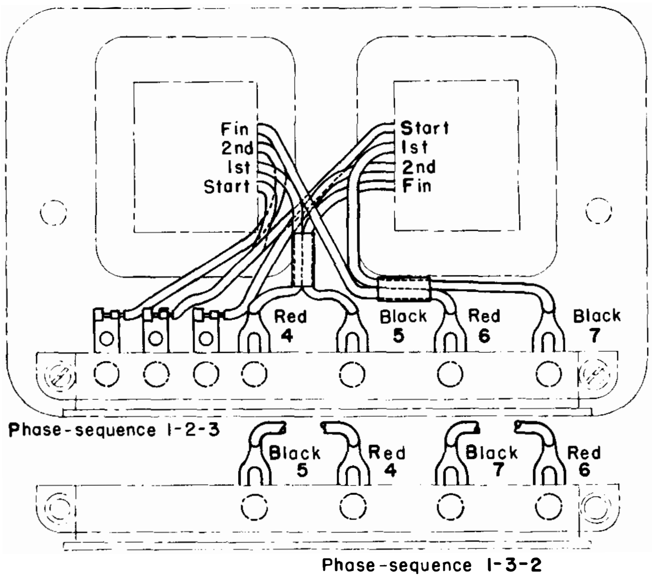


Fig. 2. Internal connections, Type MC-21 phase-shifting transformer.

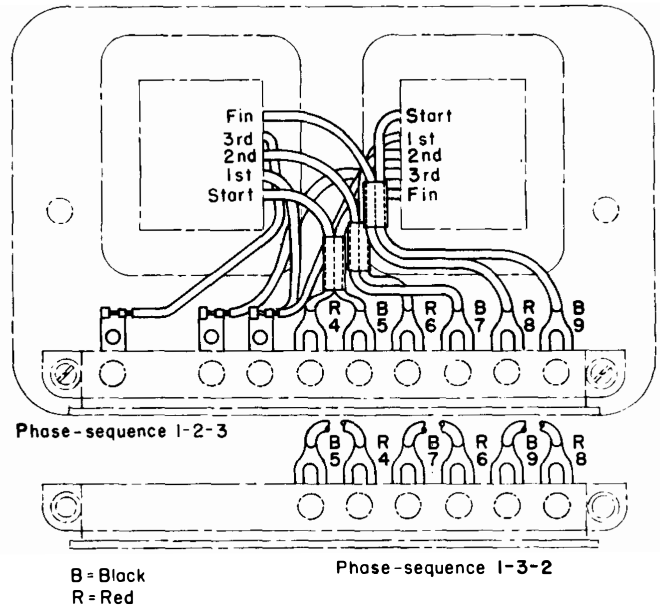


Fig. 3. Internal connections, Type MC-22, phase-shifting transformer.

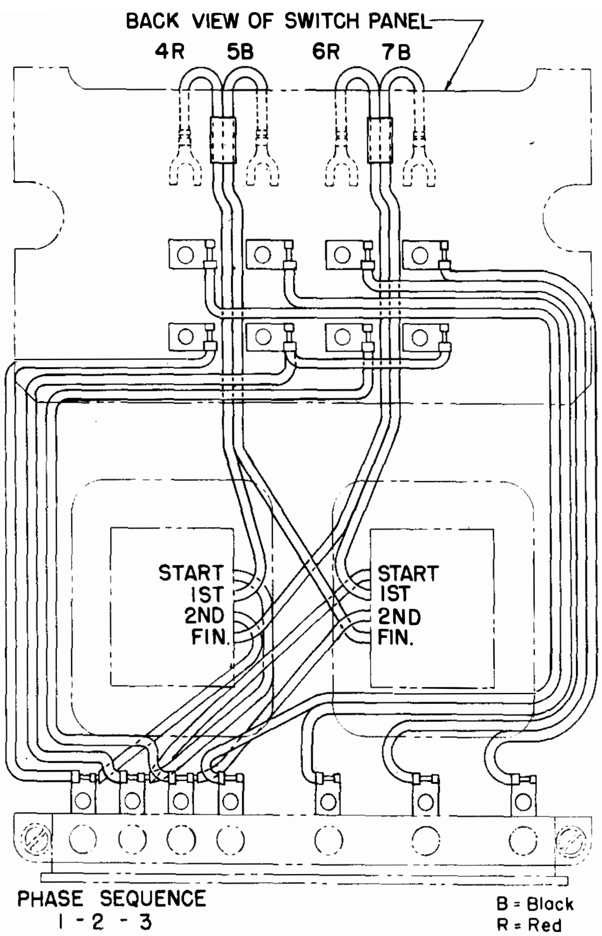


*Fig. 4. Internal connections, Type MC-27 phase-shifting transformer.**

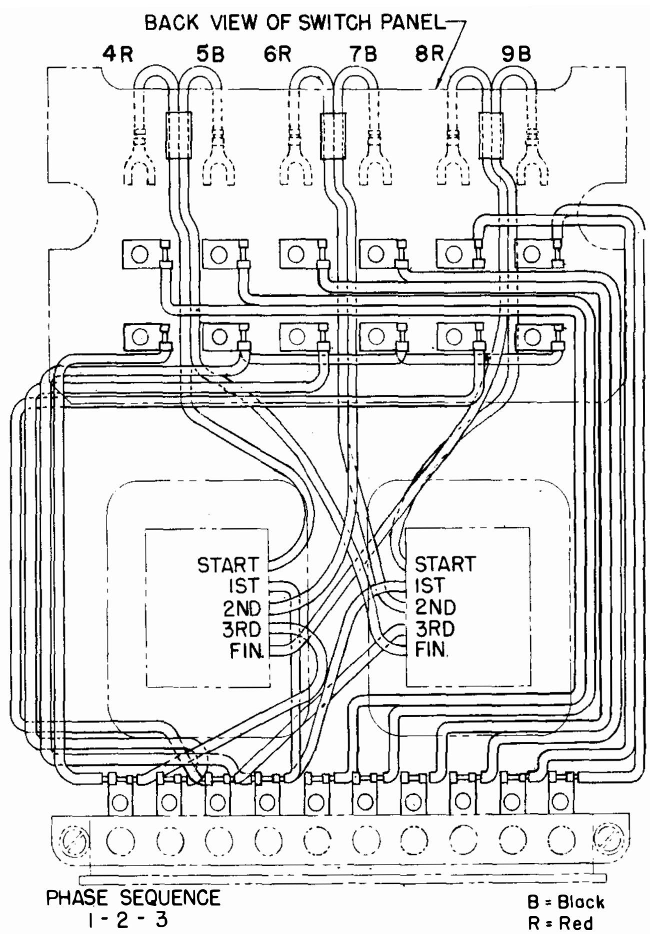


*Fig. 5. Internal connections, Type MC-28 phase-shifting transformer.**

* **See Internal Connections on page 7.**

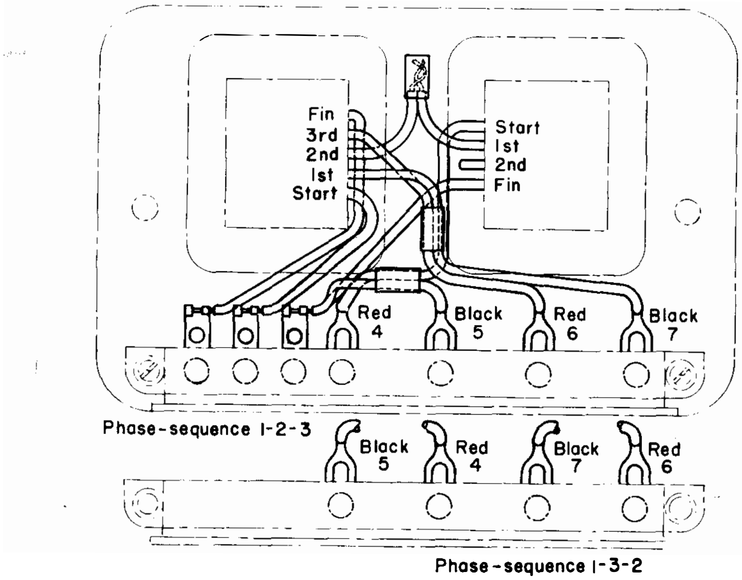


Fig. 6. Internal connections, Type MC-31 phase-shifting transformer.

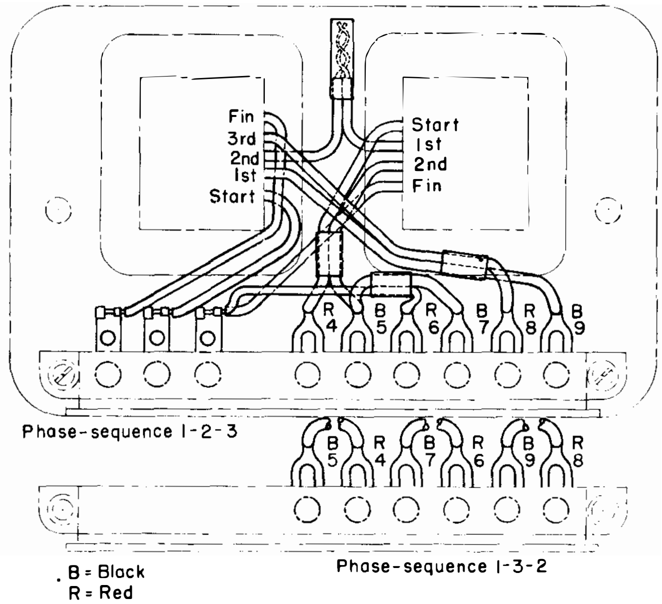


Fig. 7. Internal connections, Type MC-32 phase-shifting transformer.

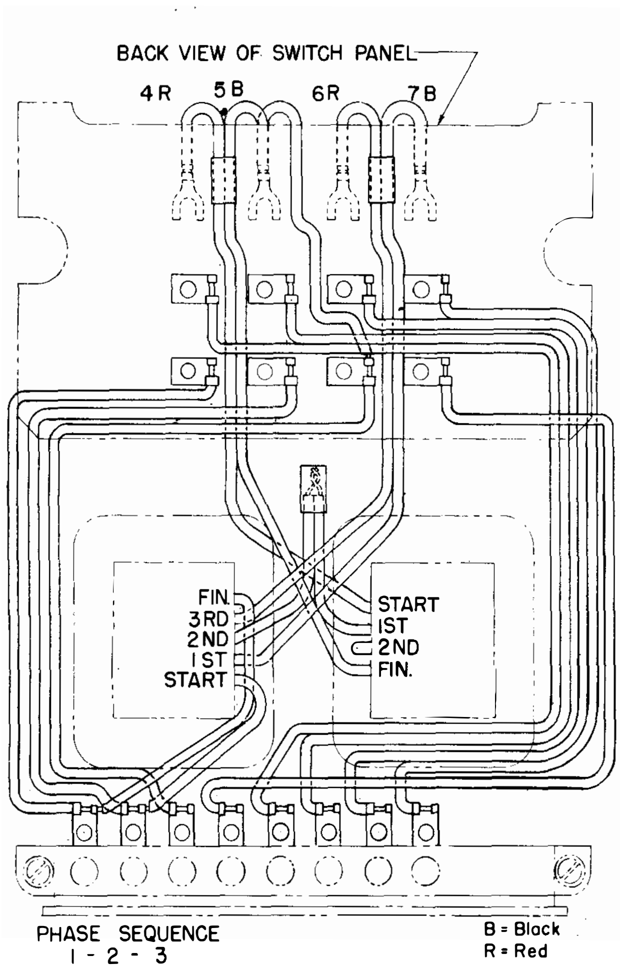


*Fig. 8. Internal connections, Type MC-33 phase-shifting transformer.**

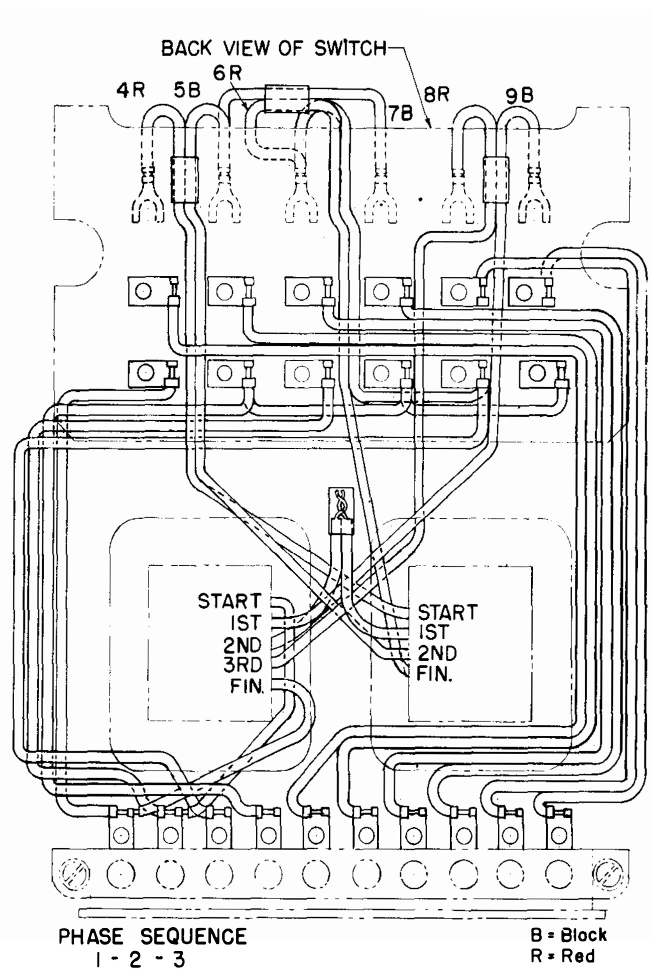
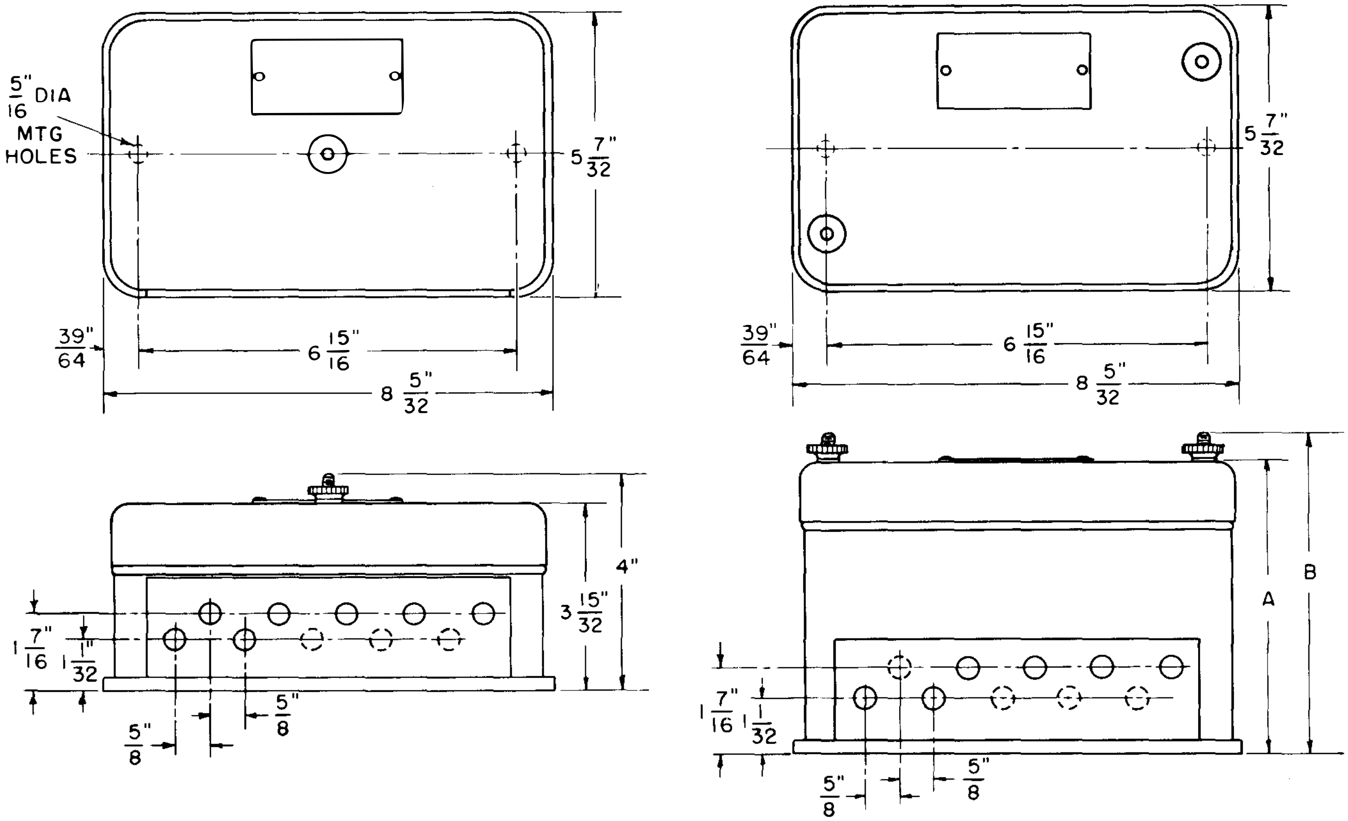


*Fig. 9. Internal connections, Type MC-34 phase-shifting transformer. **

*** See Internal Connections on page 7.**



TYPE	VOLTAGE RATING
MC-21	100 to 600
MC-22	100 to 240
MC-31	240
MC-32	240

TYPE	VOLTAGE RATING	A	B
MC-22	400 to 600	5-3/8"	5-29/32"
MC-27	100 to 600	5-3/8"	5-29/32"
MC-28	100 to 240	5-3/8"	5-29/32"
MC-28	400 to 600	6-7/8"	7-13/32"
MC-33	240	5-3/8"	5-29/32"
MC-34	240	5-3/8"	5-29/32"

Fig. 10. Dimensions of phase-shifting transformer.

INSTALLATION

The phase-shifting transformer should be mounted close to the meter to which it will be connected. When used with switchboard meters the transformer should be mounted on the back of the board. Reference should be made to the dimension sketch given in Fig. 10 for the size and location of mounting holes.

External Connections

Usually when a watthour meter is used with a phase-shifting transformer to meter var-hours, another watthour meter is installed to meter watthours. The current coils of the two meters are connected in series. If current transformers are used, the current coils of the two meters are fed from a single set of current transformers. Fig. 20 through 33 show recommended methods of connecting two watthour meters and one phase-shifting transformer for metering watthours and lagging var-hours.

Connections for Types MC-28, -33, and -34 phase-shifting transformers are similar to those shown for Types MC-22, -31, and -32 respectively, the only difference being that all line wires are brought to the Types MC-28, -33,- and -34. This is so the internal switch in these types may connect the meter as a watthour meter for testing purposes. Typical connections for Types MC-28, -33, and -34 are shown in Fig. 28, 32, and 33 respectively.

Meters which are connected to measure lagging var-hours will rotate backwards on leading var-hours. To prevent registration on leading var-hours, a meter with a detent, or having a register with a ratchet device, should be used.

Var-hour demand may be metered either by adding a contact device to the var-hour meter and operating a demand meter from it, or by using a watthour-demand meter with a phase-shifting transformer. If a watthour-demand meter is used, the timing motor should preferably be connected to the line ahead of the phase-shifting transformer, to avoid placing an unbalanced load on the transformer.

Internal Connections

Proper operation of the watthour meter and phase-shifting transformer combination depends on the phase-sequence of the circuit.

For phase-sequence 1-3-2 on "1" models, interchange the leads in each pair identified as red and black at the back of the terminal block.

For phase sequence 1-3-2 on "2" and "3" models, interchange the leads in each pair identified as red and black at the switch as shown in Fig. 4, 5, 8, and 9.

PRINCIPLES OF OPERATION

A-c watthour meters have a highly inductive potential coil and operate on the principle that the effective potential flux must lag the applied potential by 90 degrees. The speed of rotation of the disk is proportional to the product of the current in the current coil and the voltage across the potential coil, multiplied by the cosine of the phase angle between them. That is:

$$\text{Watts} = EI \cos \theta$$

$$\text{Watthours} = EI \cos \theta \times t \text{ (time)}$$

If a watthour meter is to be used to meter var-hours, the speed of rotation of the disk must be proportional to the product of the current in the current coil and the voltage across the potential coil, multiplied by the *sine* of the phase angle between them. That is:

$$\text{Vars} = EI \sin \theta$$

$$\text{Varhours} = EI \sin \theta \times t \text{ (time)}$$

This is shown in the elementary diagram in Fig. 11. The projection of the line current **I** on the voltage **E** is proportional to the active power in kilowatts. Likewise, the projection of the same current **I** on a reference axis which leads or lags the circuit voltage **E** by 90 degrees is proportional to the reactive power in kilovars. Since

$$\cos \theta = \sin (\theta + 90^\circ)$$

a watthour meter can be used to meter var-hours if the potential circuit is excited by a voltage which is 90 degrees out of phase with the voltage ordinarily used in watthour metering. The way the required 90-degree voltage relationships are obtained in polyphase circuits is shown in the following paragraphs.

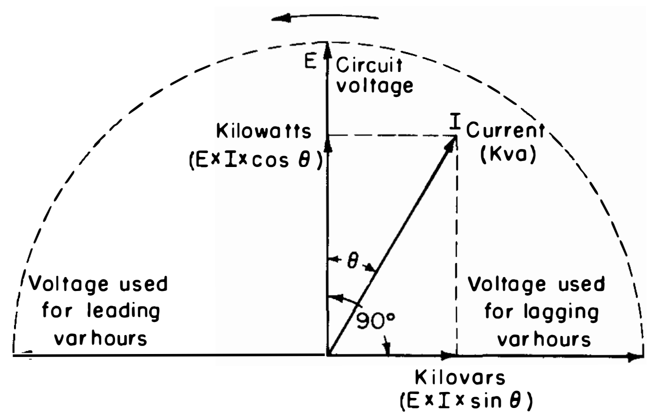


Fig. 11. Fundamental relation between kilowatts, kilovars, and kilovolt-amperes.

2-phase Circuits

In balanced two-phase circuits, the 90-degree voltage relations required for var-hour metering are easily obtained by coupling the current of one phase with the voltage of the other phase, thus eliminating the need for a phase-shifting transformer.

3-wire, 3-phase Circuits

In 3-wire, 3-phase circuits, the 90-degree voltage relations required for var-hour metering are obtained by the use of a phase-shifting transformer as shown in Fig. 12. One winding of the transformer (terminals 1 and 2) is connected across phase 1-2 of the line and the other winding (terminals 3 and 2) is connected across phase 3-2 of the line. The two windings have a common point at terminal 2 and are extended to terminals 6 and 5 respectively. The diagram shows that the voltage appearing across terminals 4 and 5 of the transformer is equal in magnitude but lags line voltage 1-2 by 90 degrees; likewise, the voltage across transformer terminals 6 and 7 is equal in magnitude but lags line voltage 3-2 by 90 degrees. If these phase-shifted voltages are applied to the potential coils of a two-element watthour meter, it will meter var-hours.

4-wire Y, 3-phase Circuits

In 4-wire Y, 3-phase circuits, where three voltages are available for metering, the voltage between any two lines is 90 degrees out of phase with the

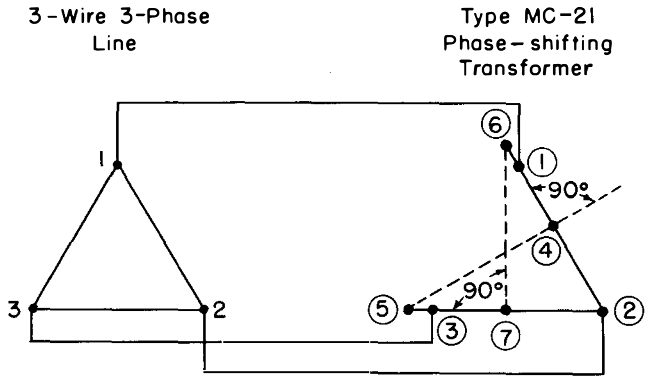


Fig. 12. Elementary diagram of Type MC-21 phase-shifting transformer for 3-wire, 3-phase circuits.

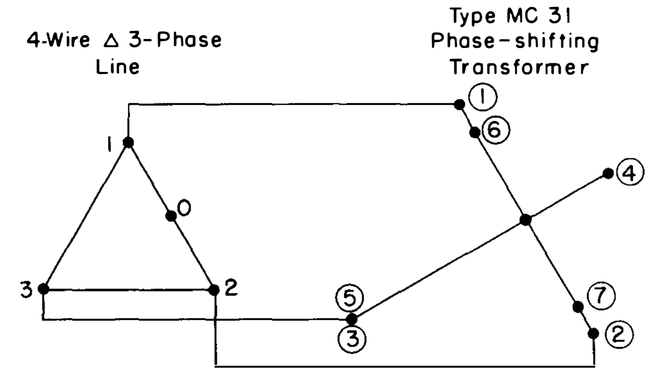


Fig. 14. Elementary diagram of Type MC-31 phase-shifting transformers for 4-wire△, 3-phase circuits.

voltage between the third line and neutral. These voltages have the phase relationship required for var-hour metering, but their magnitude is not a value commonly used in watthour metering, thus requiring a specially rated meter. For this reason it is desirable to obtain the required 90-degree voltage relations from a phase-shifting transformer as shown in Fig. 13. One winding of the transformer is connected across phase 1-0 of the line and the other winding is connected across phase 3-0. The two windings have a common point at terminal 0 and both ends of each winding are extended.

The voltages appearing across transformer terminals 4 and 5, 6 and 7, and 8 and 9, are equal in magnitude but lag by 90 degrees line voltages 1-0, 2-0, and 3-0, respectively. If these phase-shifted voltages are applied to the potential coils of a three-element watthour meter, it will meter var-hours.

4-wire △ , 3-phase Circuits

The two diagrams, shown in Figs. 14 and 15 show methods of using watthour meters with phase-shifting transformers to meter var-hours in 4-wire△, 3-phase circuits. The circuit shown in Fig. 14 is used when line voltages 1-2 and 3-0 are used with a two-element meter for watthour metering. The phase-displaced voltages required for var-hour metering appear across terminals 4 and 5, and 6 and 7, respectively. The circuit shown in Fig. 15 is used when line voltages 1-0, 2-0, and 3-0 are used with a three-element meter for watthour metering. The phase-displaced voltages required for var-hour metering appear across terminals, 4 and 5, 6 and 7, and 8 and 9, respectively.

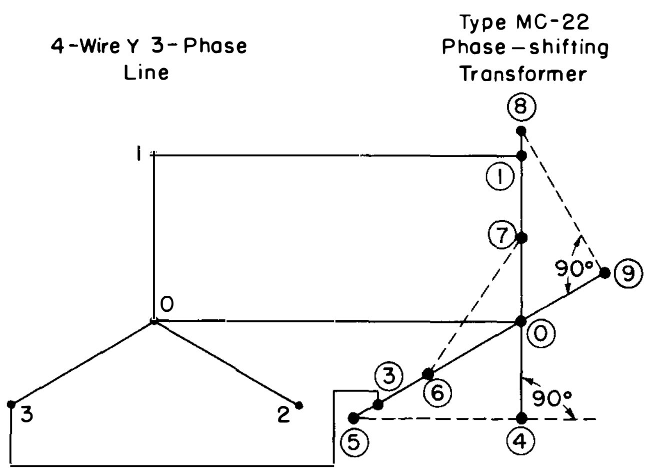


Fig. 13. Elementary diagram of Type MC-22 phase-shifting transformer for 4-wire Y, 3-phase circuits.

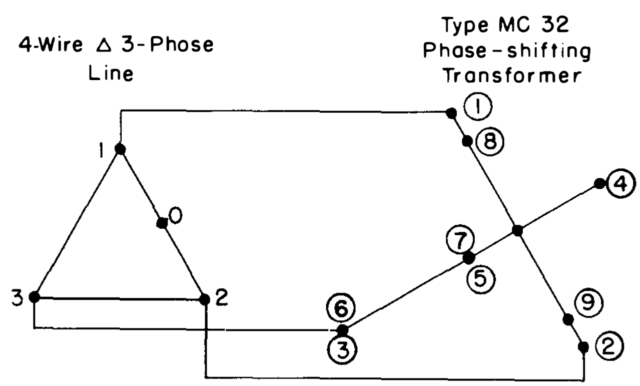


Fig. 15. Elementary diagram of Type MC-32 phase-shifting transformers for 4-wire△, 3-phase circuits.

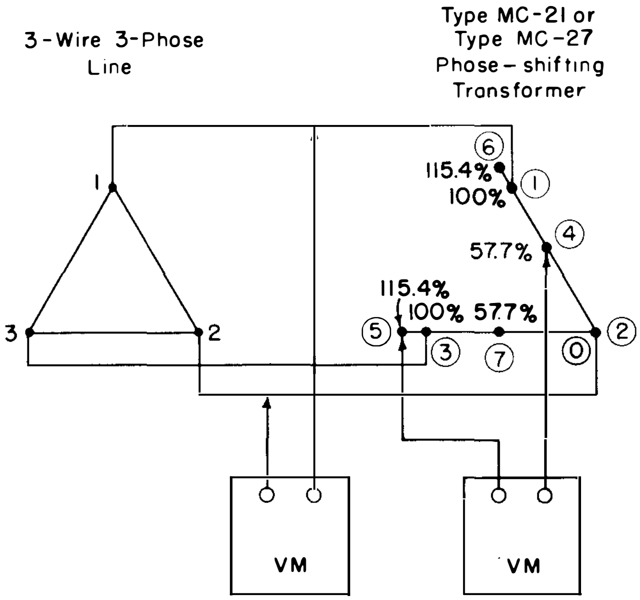


Fig. 16. Test circuit for Type MC-21 and MC-27 phase-shifting transformer.

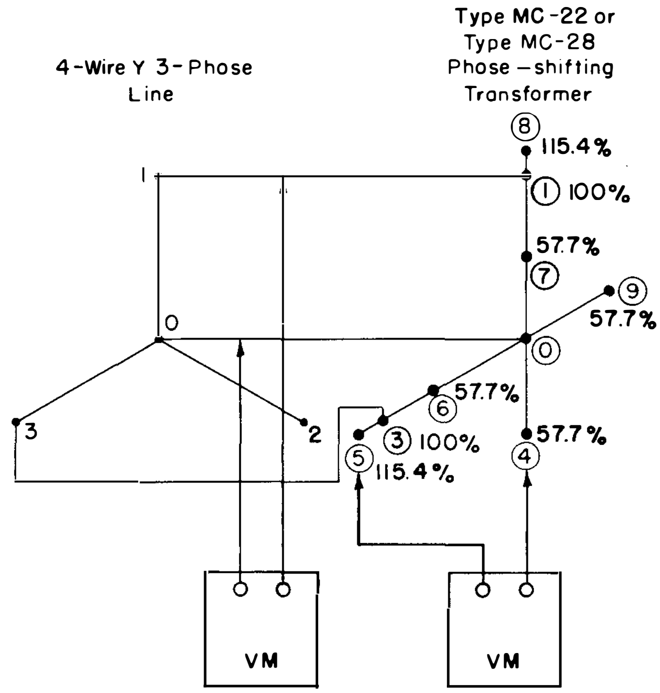


Fig. 17. Test circuit for Type MC-22 and MC-28 phase-shifting transformers.

TESTING

To test the phase-shifting transformer for correct location of taps, or open or shorted windings, connect it in the appropriate test circuit, shown in Figs. 16 through 19 and with two voltmeters compare the secondary voltages with the primary voltages. The correct relationships of secondary voltages to primary voltages are given in Table II. These figures assume that the primary of the transformer is connected to a balanced polyphase line.

If further testing is required, the individual taps may be checked by exciting each primary winding with single-phase A. C. of the proper voltage and frequency and measuring voltage between the various terminals. The percentage of line voltage appearing across the terminals should agree with the values given in Table III within 1/2 of one percent.

TABLE II

Type	Test Circuit Fig. No.	Percentage of Line Voltage across indicated terminals 4-5	6-7	8-9
MC-21	16	100±½%	100±½%	
MC-22	17	100±½%	100±½%	100±½%
MC-27*	16	100±½%	100±½%	
MC-28*	17	100±½%	100±½%	100±½%
MC-31	18	100±½%	86.6±½%	
MC-32	19	50±½%	50±½%	86.6±½%
MC-33*	18	100±½%	86.6±½%	
MC-34*	19	50±½%	50±½%	86.6±½%

* "Kilowatthours-Kilovarhours" switch must be in "Kilovarhours" position.

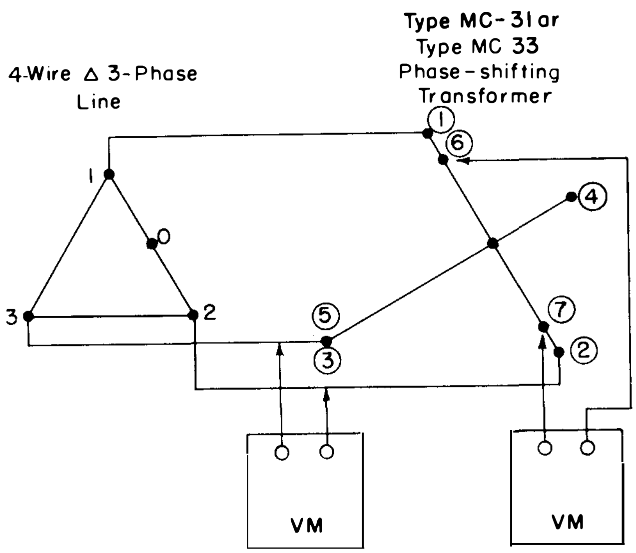


Fig. 18. Test circuit for Type MC-31 and MC-33 phase-shifting transformers.

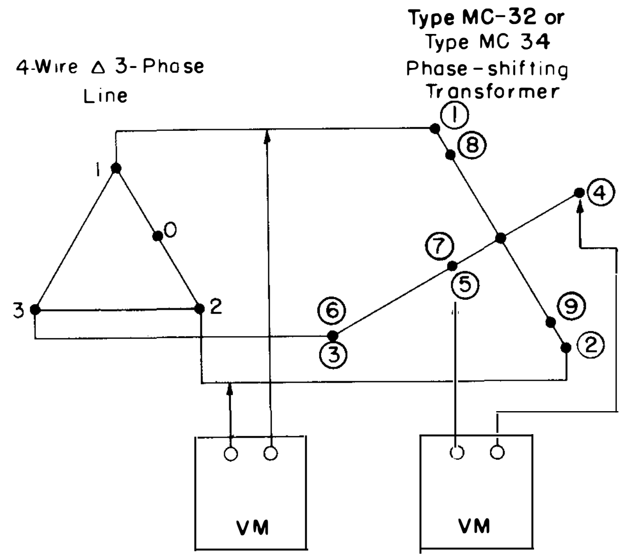
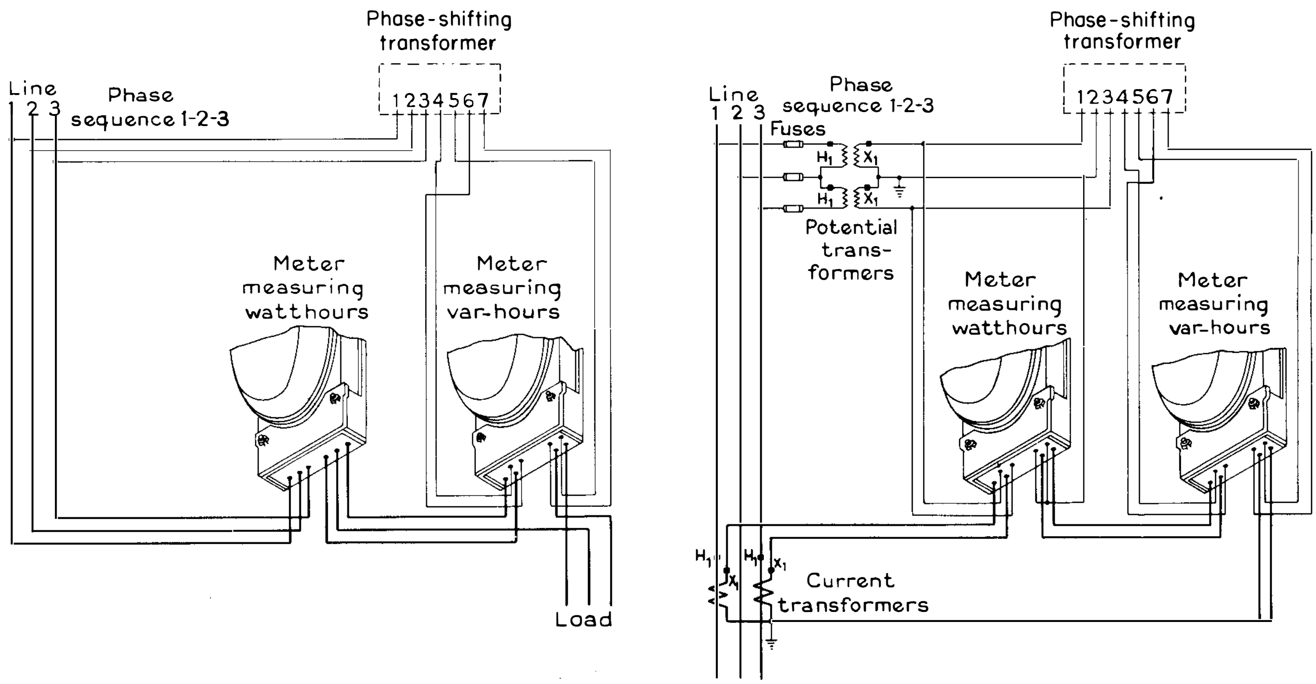


Fig. 19. Test circuit for Type MC-32 and MC-34 phase-shifting transformers.

TABLE III

Type	Connect 1-ph voltage to terminals	Percentage of primary voltage across indicated terminals					
MC-21 or MC-27*		2-4	2-5	2-6	2-7		
	1-2	57.7 ±½%	-	115.4±½%	-		
	2-3	-	115.4±½%	-	57.7±½%		
MC-22 or MC-28*		0-4	0-5	0-6	0-7	0-8	0-9
	1-2	57.7 ±½%	-	-	57.7±½%	115.4±½%	-
	3-0	-	115.4±½%	57.7 ±½%	-	-	57.7±½%
MC-31 or MC-33*		1-7	2-6	4-5	6-7		
	1-2	93.3±½%	93.3 ±½%	-	86.6±½%		
	3-4	-	-	100±½%	-		
MC-32 or MC-34*		1-9	2-8	4-5	6-7	8-9	
	1-2	93.3 ±½%	93.3 ±½%	-	-	86.6±½%	
	3-4	-	-	50±½%	50±½%	-	

* "Kilowatthours-Kilovarhours" switch must be in "Kilovarhours" position.



without instrument transformers

with instrument transformers

Fig. 20. Type MC-21 or MC-27 phase-shifting transformer with Type V-3-A or D-14 meters in a 3-wire, 3-phase circuit (front views).

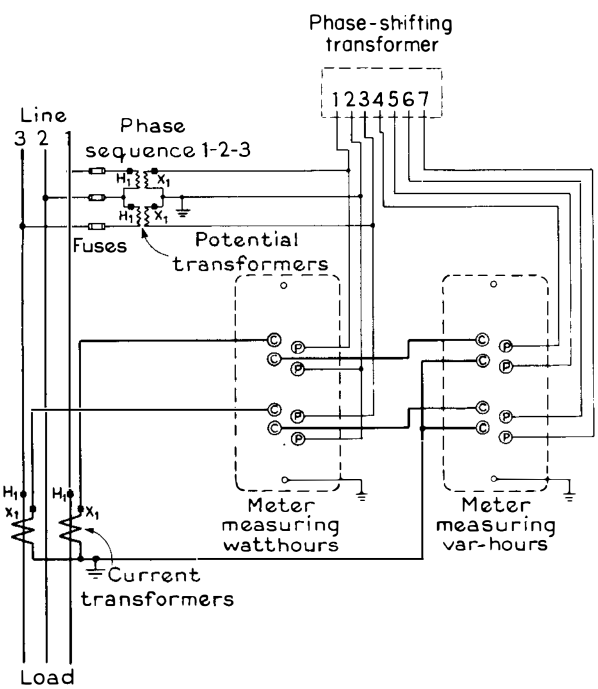


Fig. 21. Type MC-21 or MC-27 phase-shifting transformer with Type DS-19 or DS-34 meters in a 3-wire, 3-phase circuit, with instrument transformers (back view).

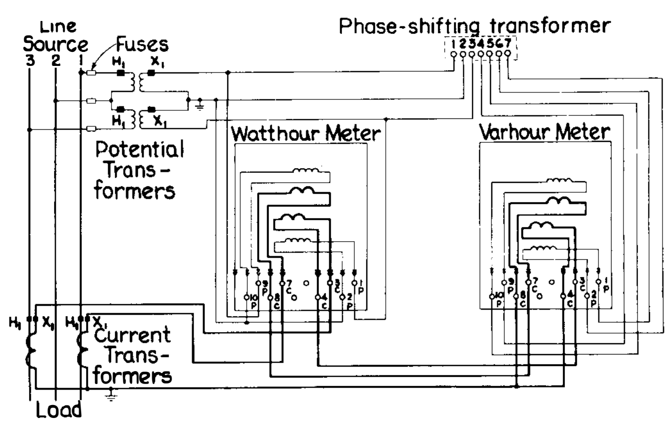
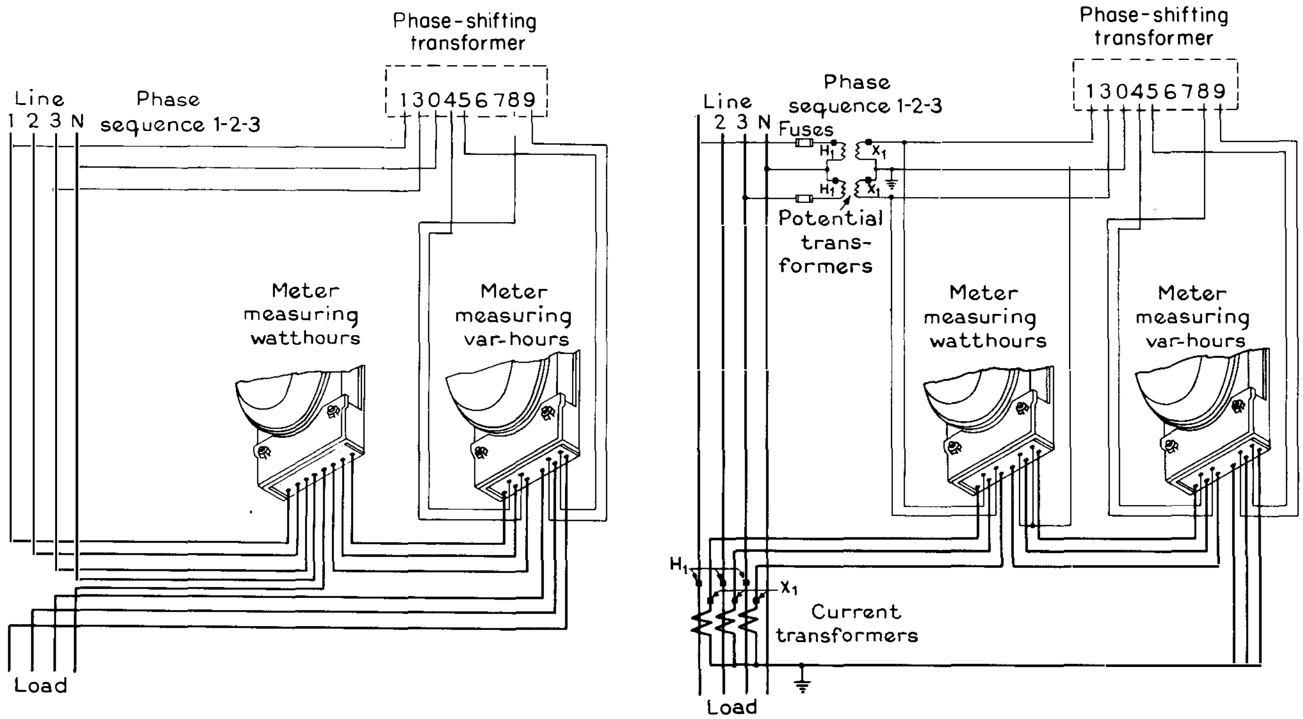
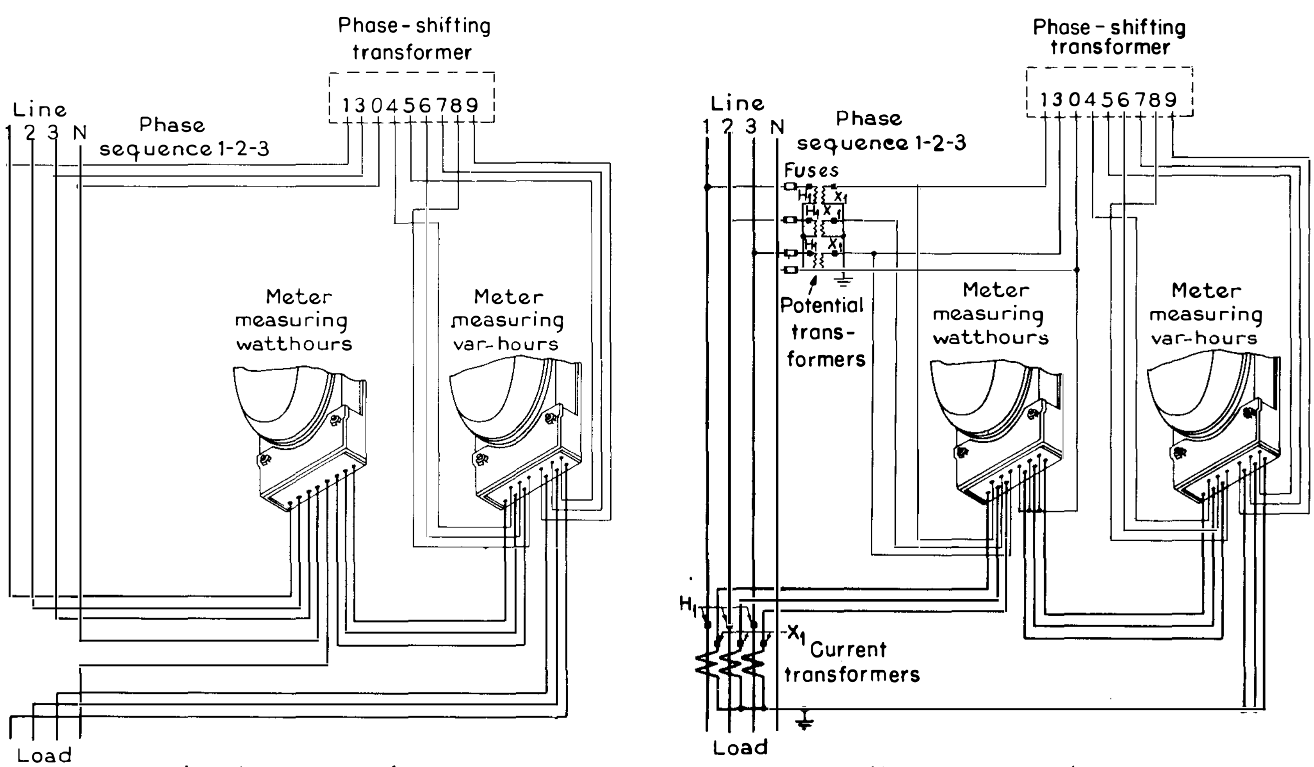


Fig. 22. Type MC-21 or MC-27 phase-shifting transformer with Type DS-38, DS-40 or DS-43 meters in a 3-wire, 3-phase circuit, with instrument transformers (back view).



without instrument transformers   with instrument transformers

Fig. 23. MC-22 phase-shifting transformer with Type V-5-A or D-14 meters in a 4-wire Y, 3-phase circuit (front views).



without instrument transformers   with instrument transformers

Fig. 24. Type MC-22 phase-shifting transformer with Type V-4-A or D-15 meters in a 4-wire Y, 3-phase circuit (front views).

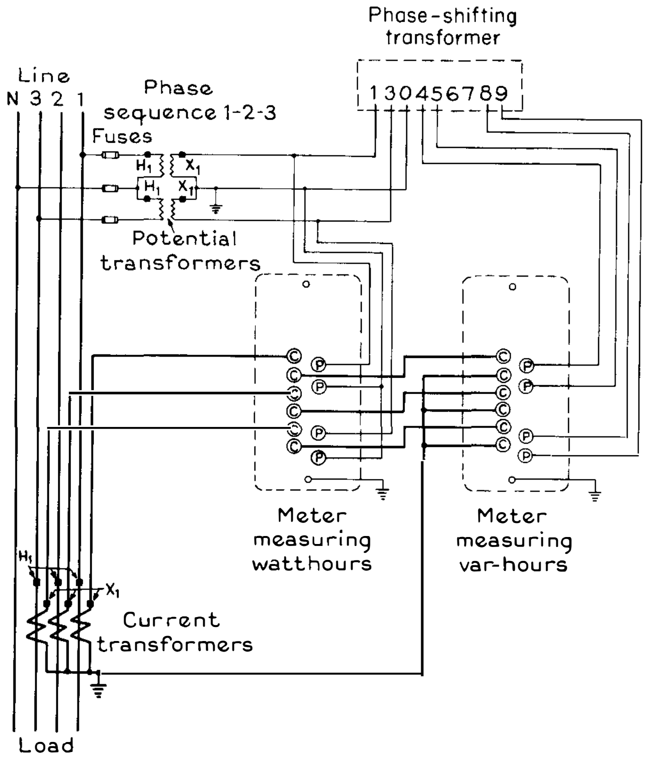


Fig. 25. Type MC-22 phase-shifting transformer with Type DS-19 or DS-34 meters in a 4-wire, 3-phase circuit with instrument transformers (back view).

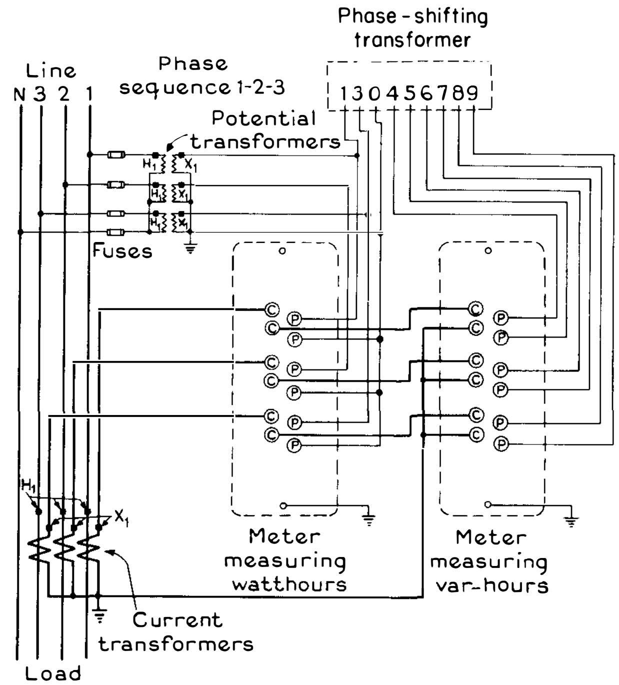


Fig. 26. Type MC-22 phase-shifting transformer with Type DS-20 or DS-35 meters in a 4-wire Y, 3-phase circuit with instrument transformers (back views).

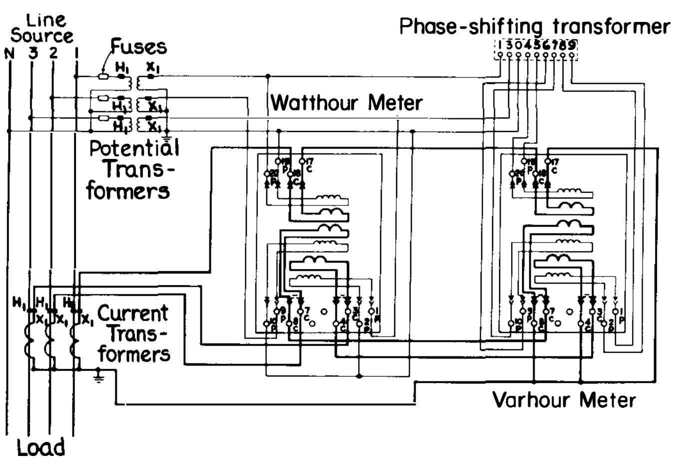


Fig. 27. Type MC-22 phase-shifting transformer with Type DS-39, DS-41 or DS-44 meters in a 4-wire Y, 3-phase circuit, with instrument transformers (back views).

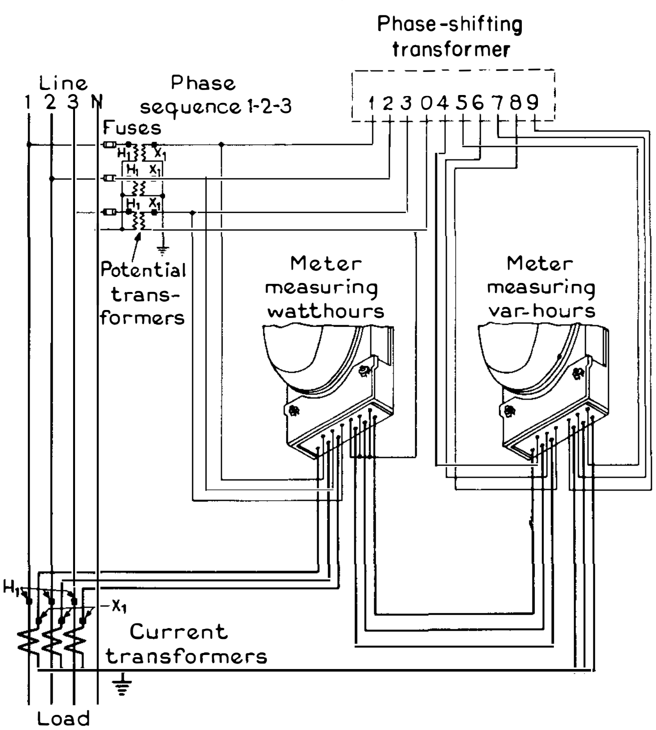
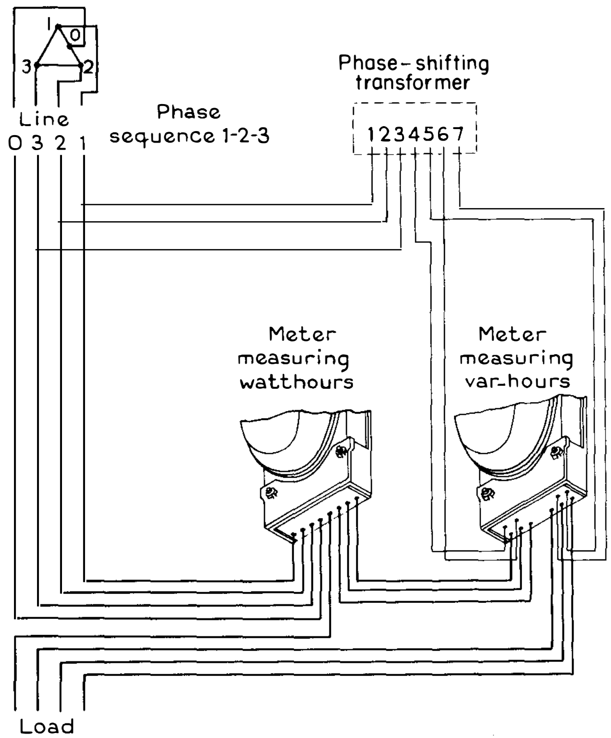
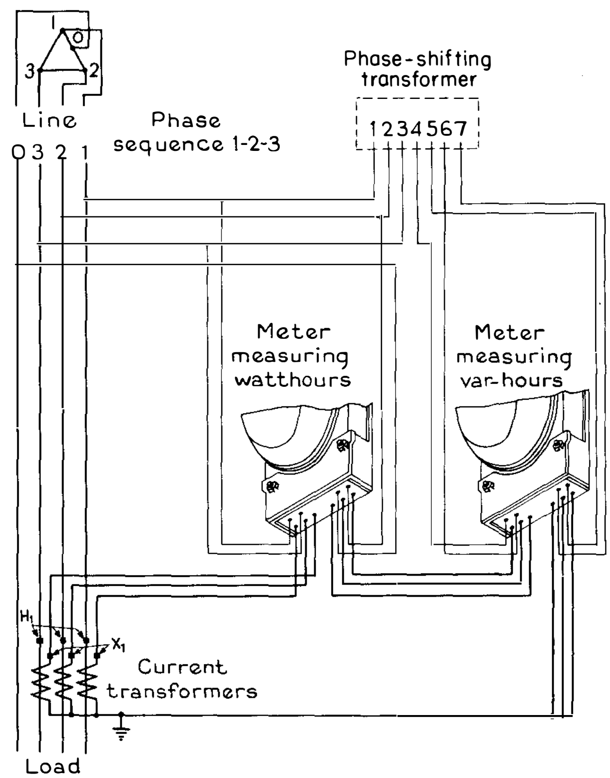


Fig. 28. Type MC-28 phase-shifting transformer with Type V-4-A or D-15 meters in a 4-wire Y, 3-phase circuit. Note that this figure is similar to Fig. 24 (right) except for connection of line 2 to transformer.

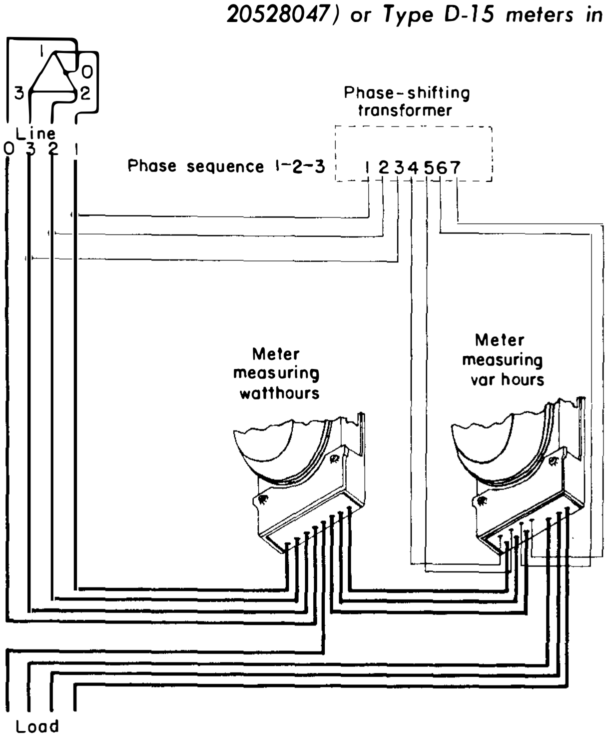


without current transformers



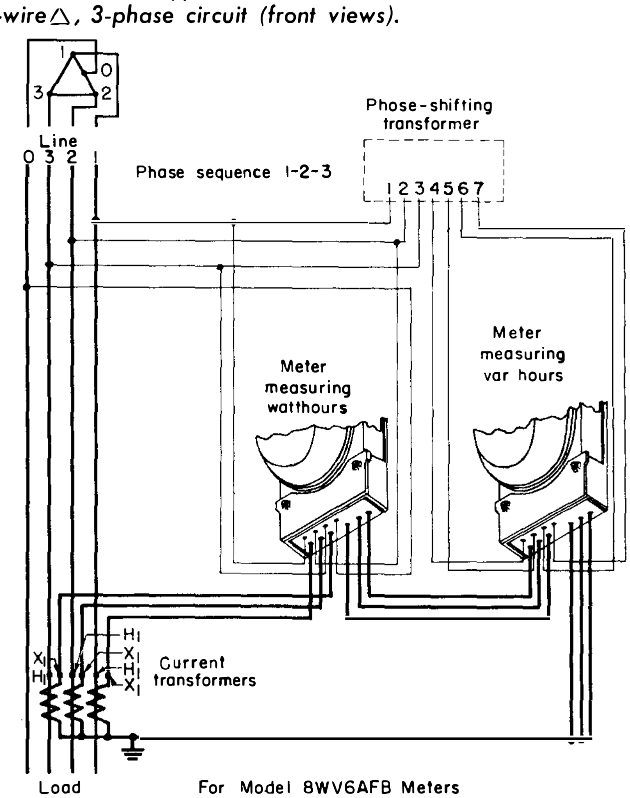
with current transformers

Fig. 29. Type MC-31 phase-shifting transformer with Type V-6-A (serial below 20528047) or Type D-15 meters in a 4-wire△, 3-phase circuit (front views).



For Model 8WV6AFB Meters

without current transformers



For Model 8WV6AFB Meters

with current transformers

Fig. 30. Type MC-31 phase-shifting transformer with Type V-6-A (serial above 20528047) meters in a 4-wire△, 3-phase circuit (front views).

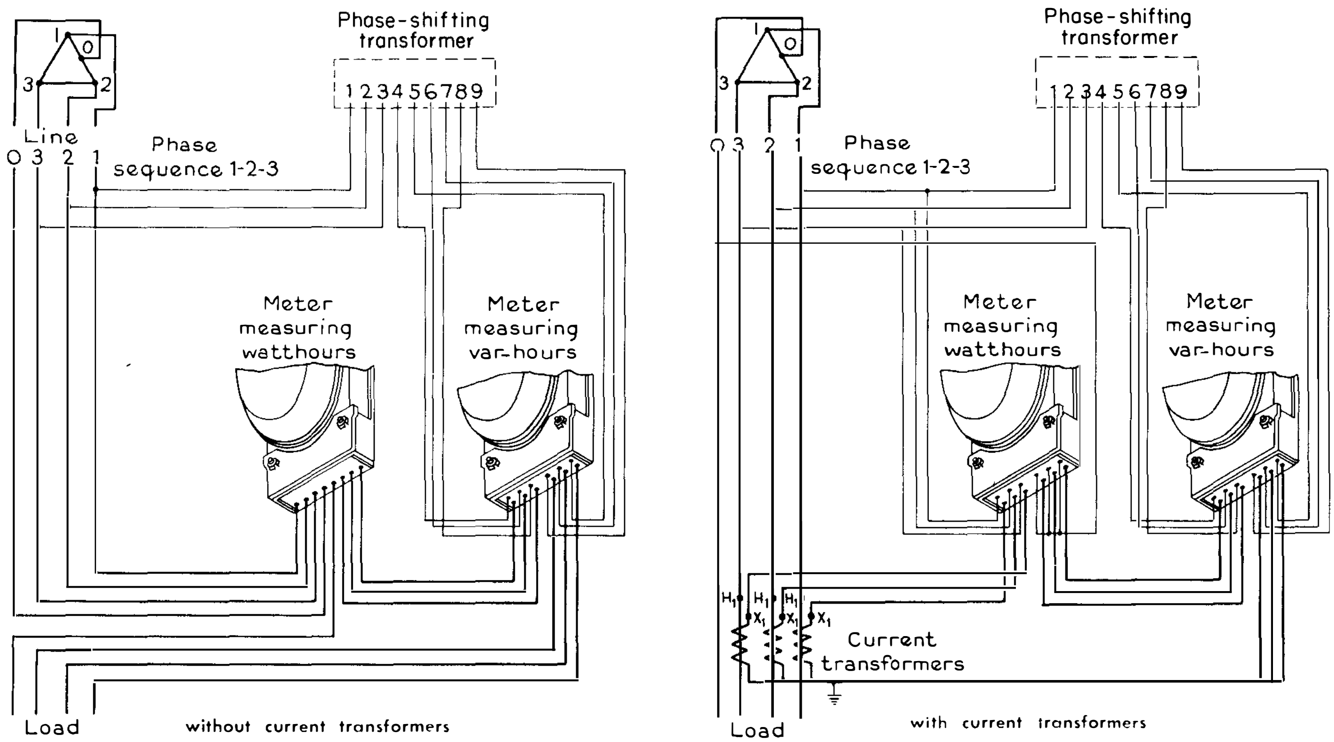


Fig. 31. Types MC-32 phase-shifting transformer with Type V-7-A or D-15 meter in a 4-wire △, 3-phase circuit (front views).

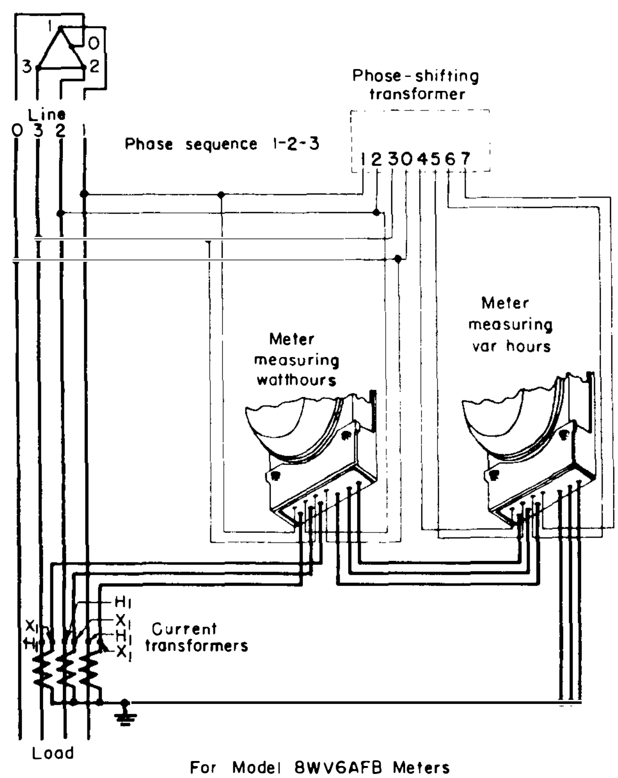


Fig. 32. Type MC-33 phase-shifting transformer with Type V-6-A (serial above 20528047) meter in a 4-wire △, 3-phase circuit. Note that this figure is similar to Fig. 30 (right) except for the connection to line O.

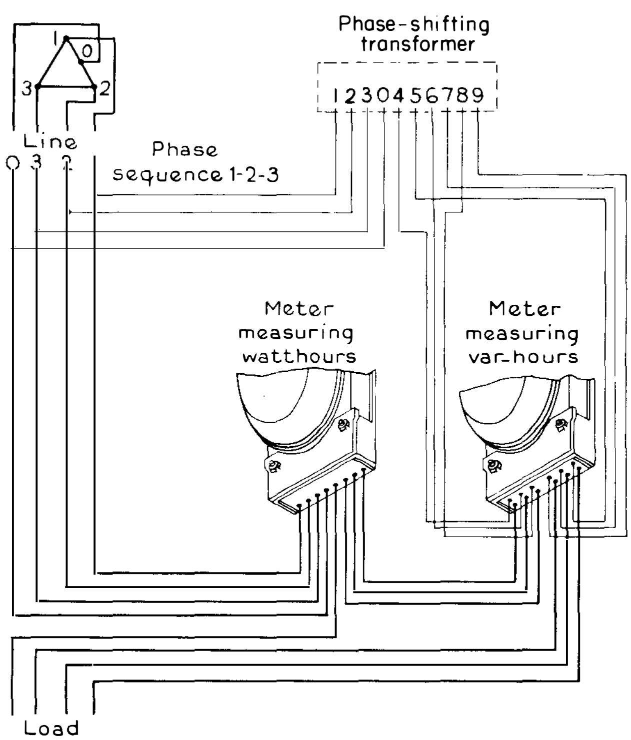


Fig. 33. Type MC-34 phase-shifting transformer with a Type V-7-A or D-15 meter in a 4-wire △, 3-phase circuit. Note that this figure is similar to Fig. 31 (left) except for the connections to line O.

POWER-FACTOR CHART

To determine the average power-factor divide the registration of the reactive volt-ampere-hour meter by that of the watthour meter. Select from the table below a figure which agrees with this result as closely as possible and in the column at the left, opposite this figure, read the power-factor. This is computed to the nearest second decimal place. The third decimal figure (if this is required) will be found at the top of the column in which the figure appears.

p f	0	1	2	3	4	5	6	7	8	9
1.00	0									
0.99	0.1425	0.1351	0.1272	0.1190	0.1100	0.1004	0.0897	0.0777	0.0634	0.0448
0.98	0.2031	0.1978	0.1923	0.1868	0.1811	0.1752	0.1691	0.1629	0.1563	0.1496
0.97	0.2506	0.2462	0.2418	0.2372	0.2326	0.2279	0.2231	0.2183	0.2133	0.2083
0.96	0.2917	0.2878	0.2838	0.2799	0.2758	0.2718	0.2676	0.2635	0.2592	0.2550
0.95	0.3288	0.3252	0.3214	0.3179	0.3143	0.3105	0.3067	0.3032	0.2994	0.2956
0.94	0.3630	0.3597	0.3564	0.3528	0.3495	0.3460	0.3427	0.3391	0.3356	0.3323
0.93	0.3953	0.3921	0.3889	0.3859	0.3825	0.3792	0.3762	0.3729	0.3696	0.3663
0.92	0.4261	0.4231	0.4200	0.4169	0.4139	0.4108	0.4078	0.4047	0.4015	0.3983
0.91	0.4557	0.4526	0.4498	0.4470	0.4438	0.4411	0.4379	0.4350	0.4320	0.4289
0.90	0.4843	0.4816	0.4788	0.4759	0.4731	0.4702	0.4672	0.4642	0.4614	0.4585
0.89	0.5123	0.5095	0.5068	0.5040	0.5011	0.4984	0.4957	0.4928	0.4899	0.4870
0.88	0.5398	0.5369	0.5343	0.5315	0.5287	0.5261	0.5233	0.5206	0.5178	0.5150
0.87	0.5667	0.5641	0.5614	0.5587	0.5560	0.5532	0.5505	0.5479	0.5452	0.5426
0.86	0.5934	0.5906	0.5881	0.5855	0.5828	0.5801	0.5774	0.5746	0.5721	0.5694
0.85	0.6196	0.6172	0.6144	0.6118	0.6092	0.6066	0.6040	0.6013	0.5987	0.5961
0.84	0.6459	0.6432	0.6408	0.6381	0.6354	0.6330	0.6301	0.6277	0.6249	0.6224
0.83	0.6720	0.6694	0.6669	0.6642	0.6615	0.6590	0.6565	0.6538	0.6511	0.6486
0.82	0.6980	0.6954	0.6929	0.6902	0.6877	0.6849	0.6824	0.6798	0.6773	0.6745
0.81	0.7239	0.7214	0.7188	0.7163	0.7135	0.7111	0.7085	0.7059	0.7032	0.7006
0.80	0.7499	0.7474	0.7447	0.7422	0.7395	0.7371	0.7344	0.7319	0.7292	0.7265
0.79	0.7761	0.7734	0.7708	0.7683	0.7657	0.7632	0.7604	0.7579	0.7552	0.7526
0.78	0.8023	0.7997	0.7971	0.7945	0.7919	0.7893	0.7865	0.7839	0.7813	0.7787
0.77	0.8287	0.8261	0.8234	0.8206	0.8180	0.8154	0.8127	0.8103	0.8077	0.8050
0.76	0.8551	0.8526	0.8498	0.8471	0.8446	0.8418	0.8391	0.8366	0.8339	0.8312
0.75	0.8819	0.8793	0.8765	0.8739	0.8711	0.8685	0.8657	0.8632	0.8603	0.8578
0.74	0.9089	0.9062	0.9036	0.9009	0.8980	0.8955	0.8928	0.8899	0.8873	0.8847
0.73	0.9363	0.9336	0.9306	0.9279	0.9252	0.9225	0.9198	0.9172	0.9145	0.9115
0.72	0.9637	0.9612	0.9584	0.9556	0.9528	0.9501	0.9473	0.9446	0.9418	0.9391
0.71	0.9919	0.9890	0.9861	0.9833	0.9807	0.9779	0.9750	0.9722	0.9694	0.9666
0.70	1.0203	1.0173	1.0144	1.0117	1.0088	1.0058	1.0032	1.0003	0.9974	0.9948
0.69	1.0489	1.0461	1.0431	1.0404	1.0373	1.0346	1.0316	1.0289	1.0259	1.0230
0.68	1.0783	1.0752	1.0724	1.0694	1.0664	1.0637	1.0606	1.0578	1.0547	1.0519
0.67	1.1080	1.1051	1.1020	1.0990	1.0961	1.0930	1.0900	1.0872	1.0840	1.0812
0.66	1.1383	1.1352	1.1323	1.1293	1.1260	1.1230	1.1200	1.1171	1.1139	1.1111
0.65	1.1692	1.1660	1.1629	1.1599	1.1568	1.1538	1.1506	1.1474	1.1443	1.1413
0.64	1.2005	1.1974	1.1943	1.1910	1.1878	1.1848	1.1816	1.1785	1.1754	1.1722
0.63	1.2327	1.2294	1.2261	1.2229	1.2198	1.2167	1.2135	1.2102	1.2070	1.2038
0.62	1.2655	1.2621	1.2589	1.2557	1.2524	1.2489	1.2456	1.2426	1.2393	1.2360
0.61	1.2989	1.2957	1.2923	1.2888	1.2857	1.2822	1.2788	1.2753	1.2723	1.2689
0.60	1.3335	1.3299	1.3262	1.3230	1.3194	1.3162	1.3127	1.3091	1.3059	1.3024
0.59	1.3684	1.3650	1.3613	1.3580	1.3543	1.3511	1.3473	1.3438	1.3404	1.3367
0.58	1.4045	1.4008	1.3972	1.3937	1.3899	1.3865	1.3827	1.3792	1.3755	1.3722
0.57	1.4415	1.4379	1.4340	1.4304	1.4266	1.4229	1.4193	1.4154	1.4120	1.4080
0.56	1.4792	1.4756	1.4718	1.4678	1.4641	1.4605	1.4565	1.4527	1.4490	1.4451
0.55	1.5185	1.5147	1.5105	1.5066	1.5027	1.4988	1.4951	1.4910	1.4872	1.4835
0.54	1.5587	1.5547	1.5507	1.5465	1.5425	1.5384	1.5345	1.5304	1.5262	1.5224
0.53	1.6000	1.5958	1.5916	1.5875	1.5834	1.5792	1.5751	1.5711	1.5667	1.5627
0.52	1.6426	1.6383	1.6340	1.6297	1.6255	1.6212	1.6170	1.6128	1.6083	1.6042
0.51	1.6864	1.6820	1.6775	1.6731	1.6687	1.6643	1.6599	1.6555	1.6512	1.6469
0.50	1.7321	1.7274	1.7228	1.7182	1.7136	1.7090	1.7045	1.6999	1.6954	1.6909
0.49	1.7790	1.7742	1.7965	1.7648	1.7600	1.7554	1.7506	1.7460	1.7413	1.7367
0.48	1.8276	1.8227	1.8178	1.8128	1.8080	1.8031	1.7983	1.7934	1.7886	1.7838
0.47	1.8780	1.8728	1.8678	1.8627	1.8576	1.8526	1.8476	1.8426	1.8376	1.8327
0.46	1.9303	1.9250	1.9197	1.9144	1.9091	1.9039	1.8986	1.8935	1.8883	1.8832
0.45	1.9846	1.9791	1.9736	1.9680	1.9626	1.9572	1.9518	1.9463	1.9408	1.9356
0.44	2.0410	2.0352	2.0295	2.0238	2.0181	2.0125	2.0069	2.0012	1.9957	1.9901
0.43	2.0997	2.0937	2.0877	2.0817	2.0758	2.0700	2.0641	2.0583	2.0525	2.0467
0.42	2.1608	2.1546	2.1484	2.1422	2.1361	2.1299	2.1238	2.1177	2.1116	2.1056
0.41	2.2248	2.2181	2.2116	2.2053	2.1988	2.1924	2.1861	2.1797	2.1733	2.1670
0.40	2.2912	2.2845	2.2778	2.2710	2.2642	2.2576	2.2510	2.2443	2.2377	2.2311
0.39	2.3611	2.3539	2.3469	2.3398	2.3328	2.3258	2.3189	2.3119	2.3050	2.2982
0.38	2.4342	2.4268	2.4194	2.4119	2.4046	2.3972	2.3900	2.3827	2.3754	2.3683
0.37	2.5110	2.5031	2.4953	2.4876	2.4799	2.4721	2.4645	2.4569	2.4493	2.4417
0.36	2.5916	2.5833	2.5751	2.5670	2.5588	2.5508	2.5427	2.5347	2.5267	2.5189
0.35	2.6764	2.6678	2.6591	2.6506	2.6420	2.6335	2.6250	2.6166	2.6082	2.5999
0.34	2.7660	2.7569	2.7477	2.7386	2.7295	2.7207	2.7117	2.7029	2.6940	2.6852
0.33	2.8606	2.8508	2.8413	2.8317	2.8221	2.8126	2.8032	2.7939	2.7845	2.7752
0.32	2.9608	2.9504	2.9403	2.9300	2.9200	2.9099	2.8999	2.8900	2.8800	2.8702
0.31	3.0669	3.0560	3.0452	3.0344	3.0236	3.0130	3.0025	2.9920	2.9810	2.9710
0.30	3.1798	3.1682	3.1567	3.1452	3.1338	3.1225	3.1112	3.1000	3.1000	3.0778
0.29	3.3002	3.2877	3.2756	3.2633	3.2511	3.2390	3.2271	3.2151	3.2151	3.1915
0.28	3.4287	3.4154	3.4022	3.3892	3.3764	3.3633	3.3506	3.3377	3.3377	3.3126
0.27	3.5662	3.5520	3.5379	3.5239	3.5[illegible]00	3.4962	3.4826	3.4688	3.4553	3.4419
0.26	3.7139	3.6996	3.6835	3.6685	3.6535	3.6387	3.6240	3.6095	3.5959	3.5805
0.25	3.8730	3.8566	3.8403	3.8241	3.8079	3.7919	3.7759	3.7604	3.7448	3.7292
0.24	4.0450	4.0272	4.0094	3.9919	3.8747	3.9573	3.9401	3.9232	3.9066	3.8898
0.23	4.2313	4.2120	4.1928	4.1737	4.1549	4.1362	4.1177	4.0993	4.0811	4.0630
0.22	4.4342	4.4130	4.3921	4.3715	4.3509	4.3305	4.3103	4.2903	4.2705	4.2505
0.21	4.6558	4.6327	4.6098	4.5871	4.5647	4.5425	4.5204	4.4983	4.4768	4.4556
0.20	4.8980	4.8736	4.8484	4.8236	4.7990	4.7746	4.7503	4.7253	4.7026	4.6791

METER DEPARTMENT, GENERAL ELECTRIC COMPANY, SOMERSWORTH, N. H.

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