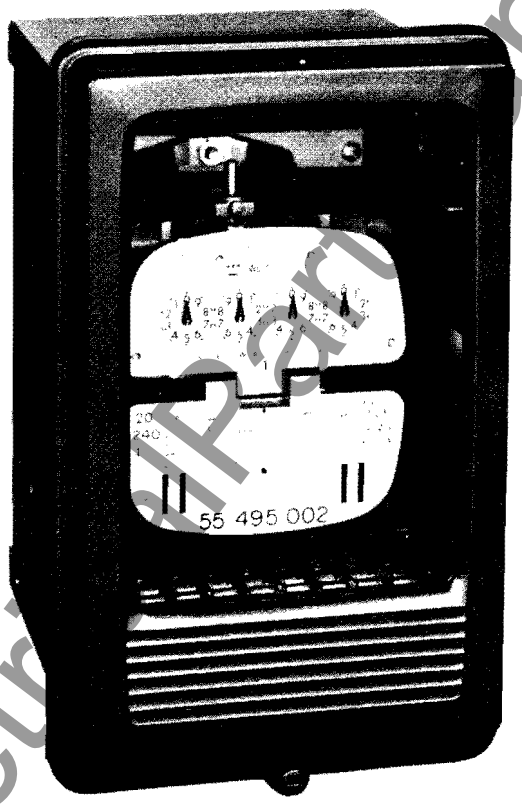
INSTALLATION - OPERATION - MAINTENANCE

INSTRUCTIONS

SWITCHBOARD WATTHOUR METERS IN FT-21 FLEXITEST CASE TYPES D4B-F, D4B-2F, D4B-3F, D4B-7F, D4B-8F



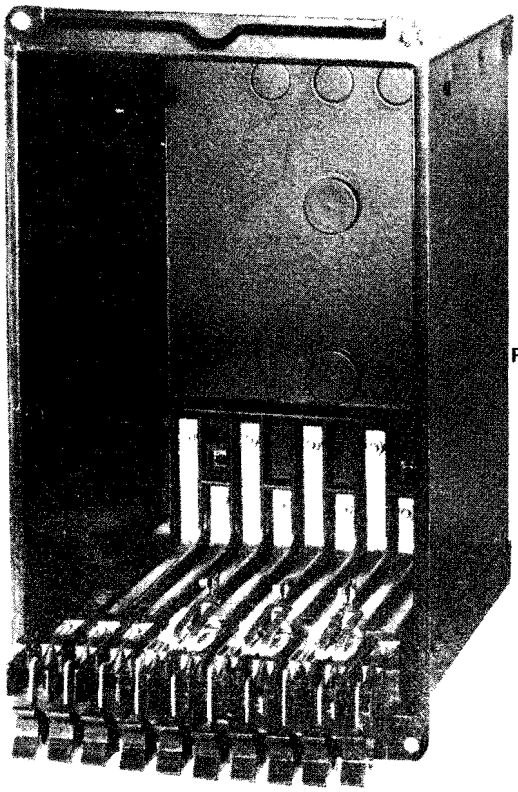
TYPE D4B-7F

APPLICATION CHART

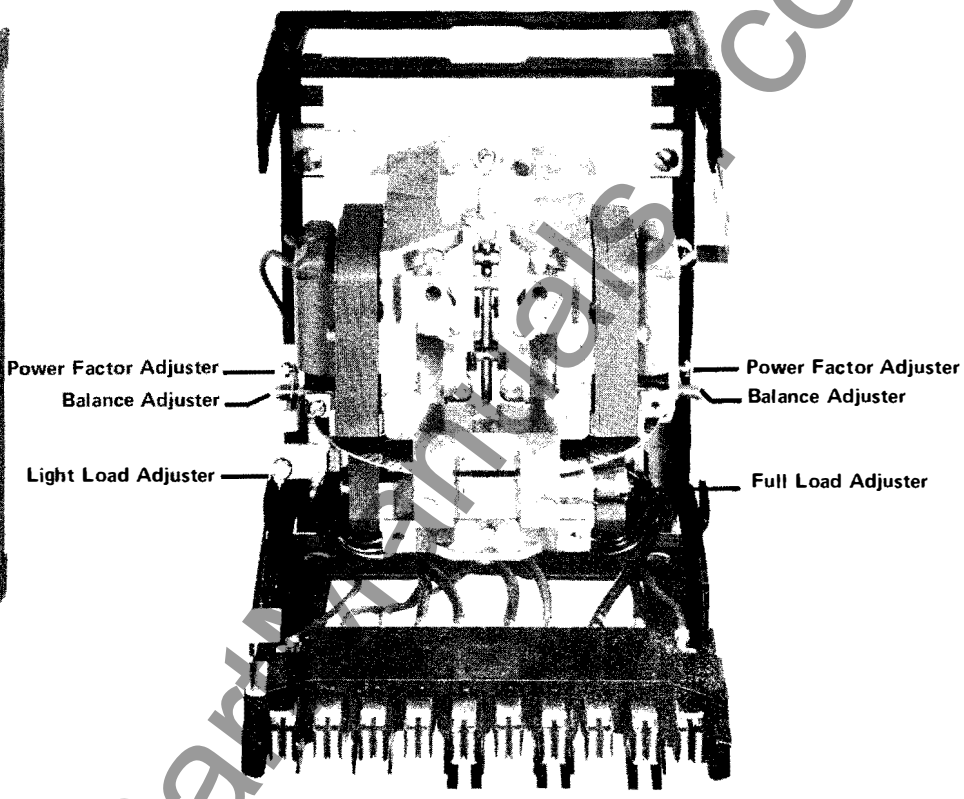
TYPE	NUMBER OF STATORS	CIRCUIT APPLICATION
D4B-F	1	1-Phase, 2 or 3-Wire
D4B-2F	2	1, 2, or 3-Phase 3-Wire
D4B-3F	3	3-Phase, 4-Wire Wye
D4B-7F	2	3-Phase, 4-Wire Delta
D4B-8F	2-Split Coil	3-Phase, 4-Wire Wye

NEW INFORMATION

EFFECTIVE JANUARY 1972



FT-21 Case



D4B-7F Chassis

GENERAL

The meter elements are mounted on a removable chassis, which is held in the case by two latches. All connections between the case and the chassis are made through the test switches. Automatic shorting switches are provided on all current circuits to prevent opening current transformers when testing or removing the chassis. For testing, leads can be clipped to the test lugs above the chassis jaws and on the switch blades.

Two test plugs are available to facilitate calibration of these meters. A 10-circuit plug is inserted into the chassis jaws and is provided with binding post terminals for connections to the test circuit. Current measurements are made by connecting ammeters to a current circuit test plug, which is then inserted into the current switch assembly, between the chassis and the case.

The hardware supplied with the meter permits semi-flush mounting on panels up to 3/16 inch thick. For projection mounting on panels thicker than 3/16 inch, special hardware is furnished upon request (specify panel thickness).

Provisions have been made on all FT-21 cases for convenient field installation of either 2- or 3-wire pulse initiators. Removal of three knockouts (located in the back of the case, near the top) will permit installation of an output terminal-block and pin assembly. A mating bracket and socket assembly is then attached to the meter frame and latch assembly. The output circuits will be closed by inserting the meter frame and latch assembly into the case. All necessary parts are available in kit form for each type of pulse initiator.

CALIBRATION

All meters have been factory tested before shipment. For single-stator meters, the full load test speed is 16 2/3 RPM, and the watthour constant is 0.6 per nominal 600-watt rating (constant of 7.2 for 30 amp., 240-volt meter). For two-stator meters, the full load test speed is 8 1/3 RPM, and the watthour constant is 1.2 per nominal 300-watt rating. For three-stator meters, the full load test speed is 8 1/3 RPM, and the watthour constant is 1.8 per nominal 300-watt rating.

Full Load

Single-stator sensitivity is approximately 1.3 percent per turn. Two- and three-stator sensitivity is approximately 1.2 percent per turn.

Light Load

Single-stator sensitivity is approximately 0.8 percent per turn. Two-stator sensitivity is approximately 0.35 percent per turn. Three-stator sensitivity is approximately 0.25 percent per turn.

Power Factor

Power factor calibration is fixed factory adjusted and permanent for single-stator meters. For two- and three-stator meters, sensitivity is 0.5 percent per turn.

Phase Balance

For two- and three-stator meters, sensitivity is approximately 2.0 percent per turn but will vary with the adjuster position.

CALIBRATION PROCEDURE

Single-phase test speed for single-phase meters is 16 2/3 RPM (polyphase meters, 8 1/3 RPM except for -8 meters which is 11 1/9 RPM). All meters are tested on a single-phase power source with voltage coils connected in parallel. The following calibration procedures should be used.

Combined Stator Operation

Connect all current coils in series and observe full load and light load registration. Calibrate light load to full load. For example, if full load registration is 101.0 percent, calibrate light load to 101.0 percent.

INDIVIDUAL STATOR OPERATION

Two-Stator Meter

Energize the left-stator current coil, calibrate full load, unity power factor to 100 percent registration by turning the Full Load adjuster screw at the front of the meter. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the left stator adjuster bracket.

Energize the right stator. Calibrate full load unity power factor to 100 percent registration by turning the Phase Balance adjuster screw on the right stator adjuster bracket. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the right stator adjuster bracket.

Three-Stator Meter

Energize the rear-stator current coil, calibrate full load, unity power factor to 100 percent registration by turning the Full Load adjuster screw at the front of the meter. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the rear stator adjuster bracket from the right side.

Energize the remaining two stators one at a time. Calibrate full load unity power factor to 100 percent registration by turning the Phase Balance adjuster screw on the respective stator adjuster bracket. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the respective stator adjuster bracket.

NOTE:

Figure 10 shows a D4B-3F meter connected for reactive measurement on 3-phase, 4-wire wye in a 10-point flexitest case and with a standard PS-3 phase-shifting transformer. Although the standard PS-3 has a TEST RUN SWITCH, **it cannot be thrown to test as this will result in a short circuit on line voltage.** If testing is required, the meter should be tested as a standard KWH meter with PS-3 removed from circuit.

BEARING ADJUSTMENTS

1. Place the meter in the normal operating position.
2. Insert the upper and lower bearing with the set screws loose.
3. Move the lower bearing until the disk is slightly below center in the meter gap.
4. Tighten the lower set screw, raise the upper bearing to obtain 0.005 to 0.010 inch end play, and tighten the upper set screws.

ACCESSORIES

To install a Mark series demand register or a CD series contact device on a D-line polyphase meter, see instruction leaflets:

1. Mark Ia	42-302-11
2. Mark II	42-302.2
3. Mark III	42-302.3
4. CD-2, -3, -5, -6	42-950.3
5. CD-12 and CD1-12	42-559
6. CD-22 and CDI-22	42-570

REPLACEMENT PARTS AND REPAIRS

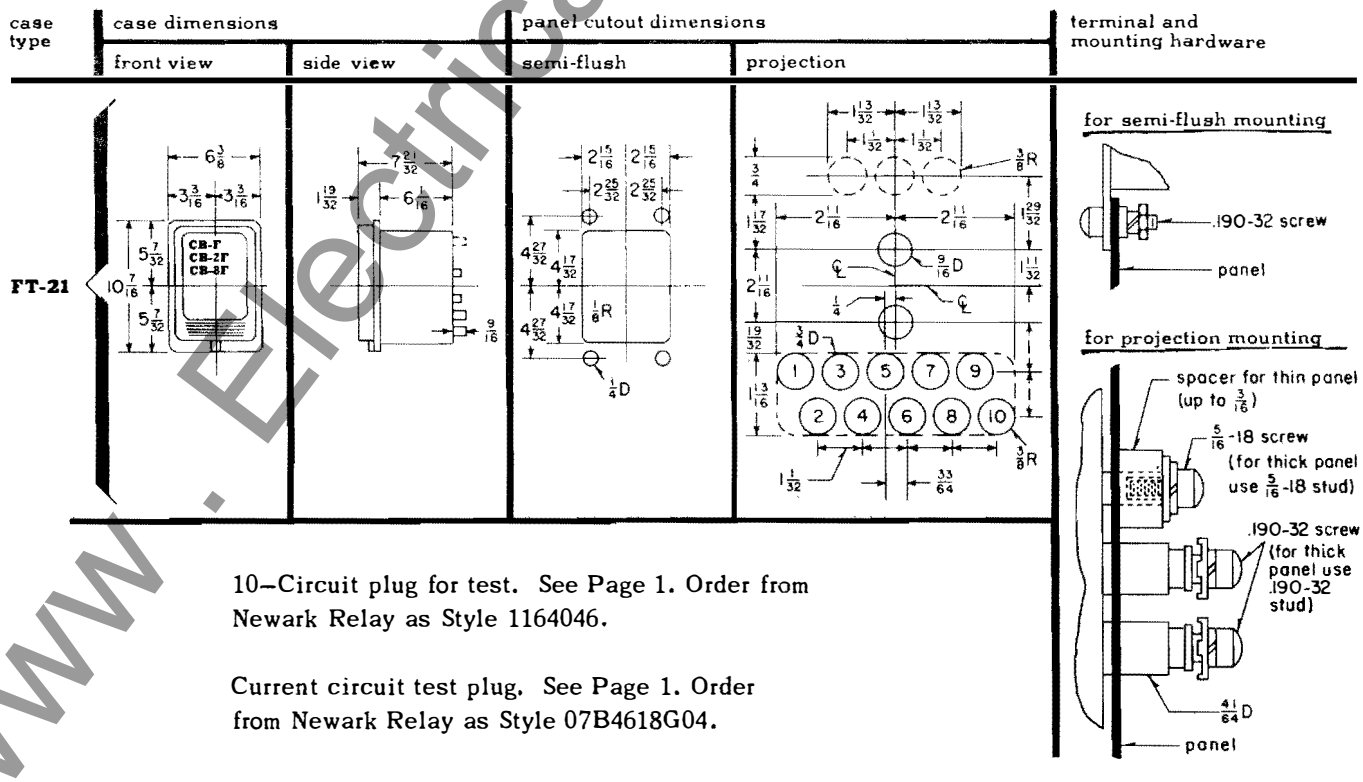
Where facilities are limited or where only a small number of meters are used, it is recommended that the meter be returned to the factory for repairs. When returning a meter for repairs, obtain a Returned Material Tag from the District Office so as to avoid delay in identifying the shipment.

When ordering renewal parts, give the entire nameplate reading. Always give the name of the part wanted. Check Renewal Parts Data 42-227 for aid in identifying parts.

GENERAL DATA

Description	D4B-F 2.5 Amps. 120 Volt 2-Wire	D4B-2F 2.5 Amps. 120 Volt	D4B-3F 2.5 Amps. 120 Volt	D4B-7F 2.5 Amps. 240 Volt	D4B-8F 2.5 Amps. 120 Volt
Starting Watts	1.50	3.00	4.50	6.00	3.00
Test RPM at Meter Rating	16 2/3	8 1/3	8 1/3	8 1/3	11 1/9
Watthour Constant (kh)	0.30	1.20	1.80	2.40	1.80
Voltage Coil Circuit					
Volt-Amps.	7.40	6.40	6.40	6.40	6.40
Watts Loss per Element	0.96	0.95	0.95	0.95	0.95
Power Factor	0.13	0.14	0.14	0.14	0.14
Current Coil Circuits at 5 Amps. 2-Wire Coil					
Watts Loss	0.30	0.30	0.30	0.30	0.30
Volt-Amps.	1.20	1.20	1.20	1.20	1.20
3-Wire Coil (Each Half)					
Watts Loss	.....	.....	.....	0.16	0.16
Volt-Amps	.....	.....	.....	0.65	0.65

Mounting of FT-21 Case



10–Circuit plug for test. See Page 1. Order from Newark Relay as Style 1164046.

Current circuit test plug. See Page 1. Order from Newark Relay as Style 07B4618G04.

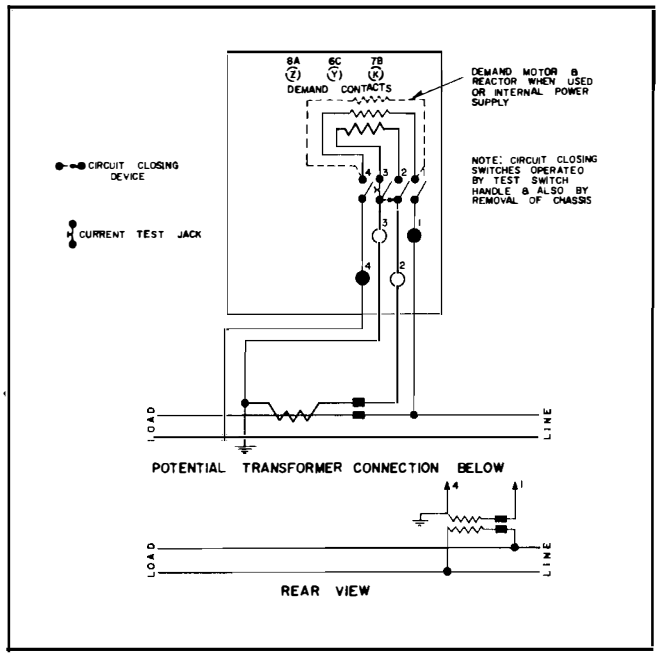


Fig. 1 - Type D4B-F, 1-Phase, 2-Wire

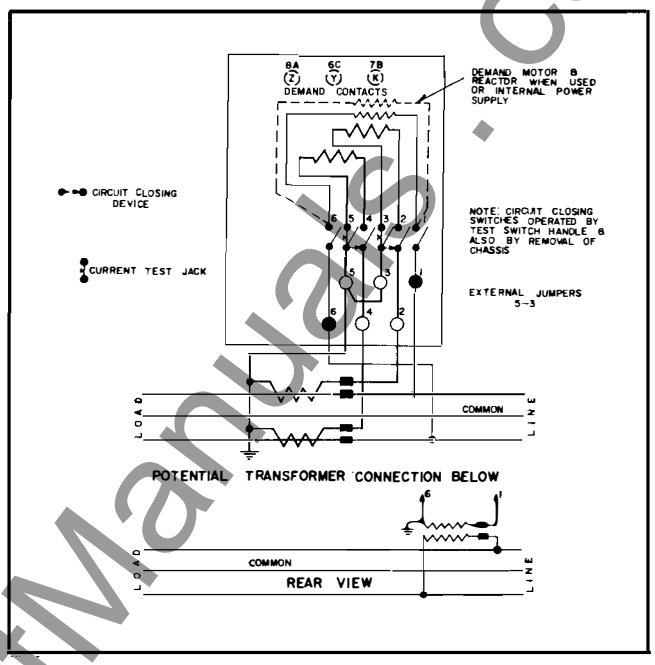


Fig. 2 - Type D4B-F, 1-Phase, 3-Wire

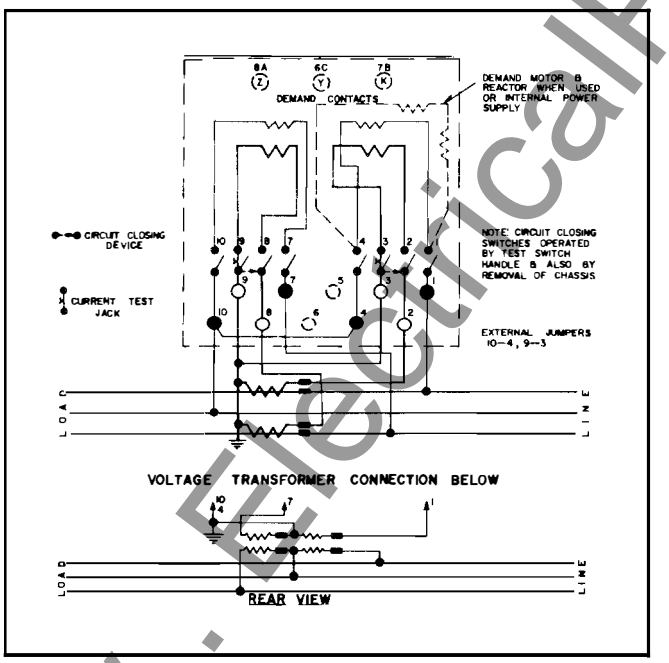


Fig. 3 - Type D4B-2F, 3-Phase, 3-Wire

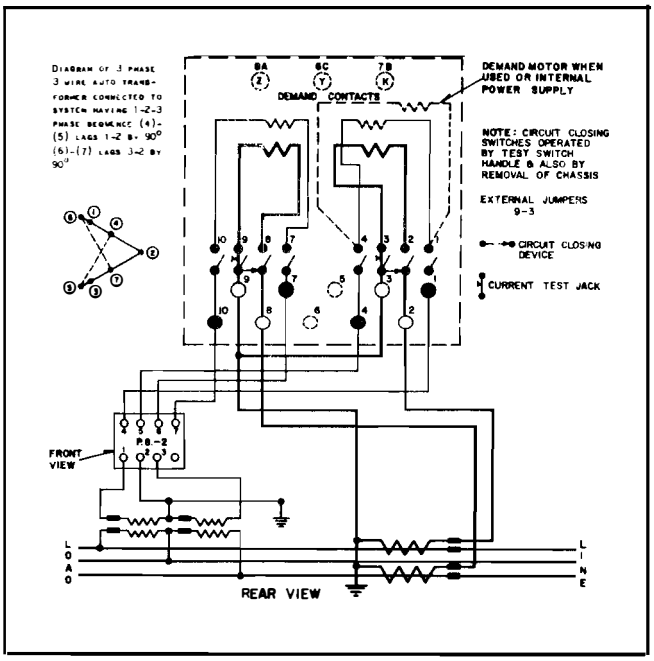


Fig. 4 - Type D4B-2F, 3-Phase, 3-Wire with Phase-Shifting Transformer

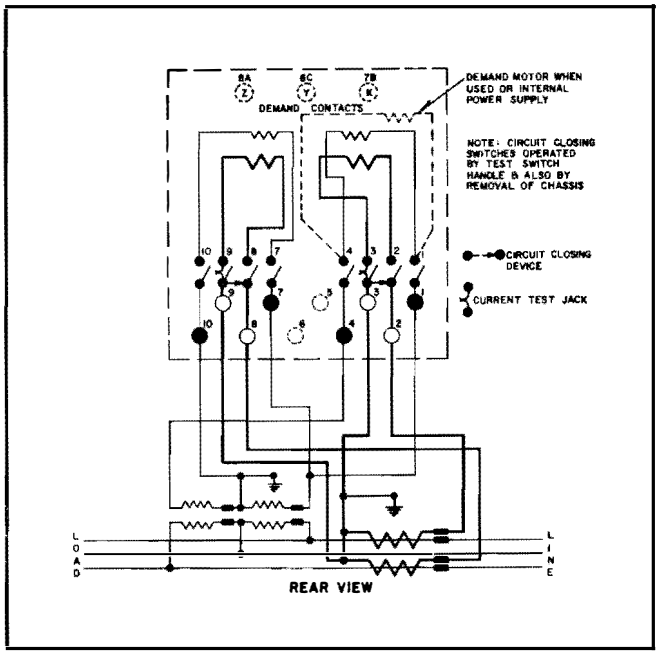


Fig. 5 - Type D4B-2F, 3-Phase, 3-Wire, Q Meter

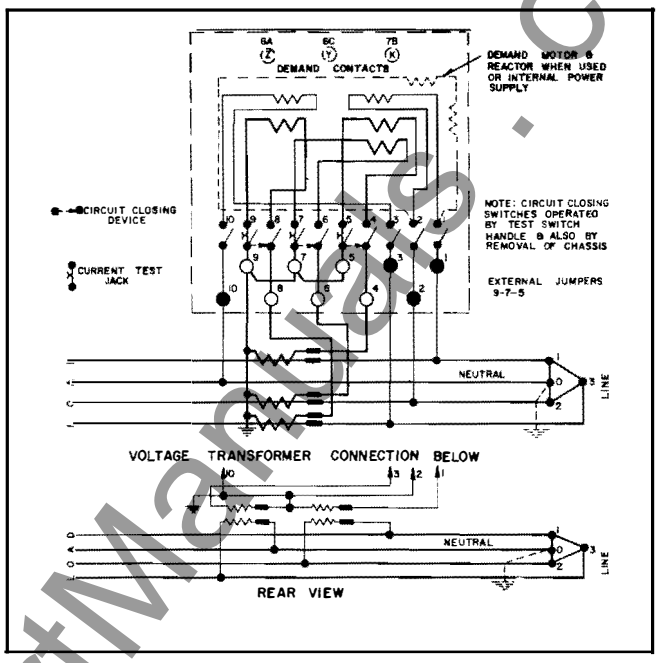


Fig. 6 - Type D4B-7F, 3-Phase, 4-Wire Delta

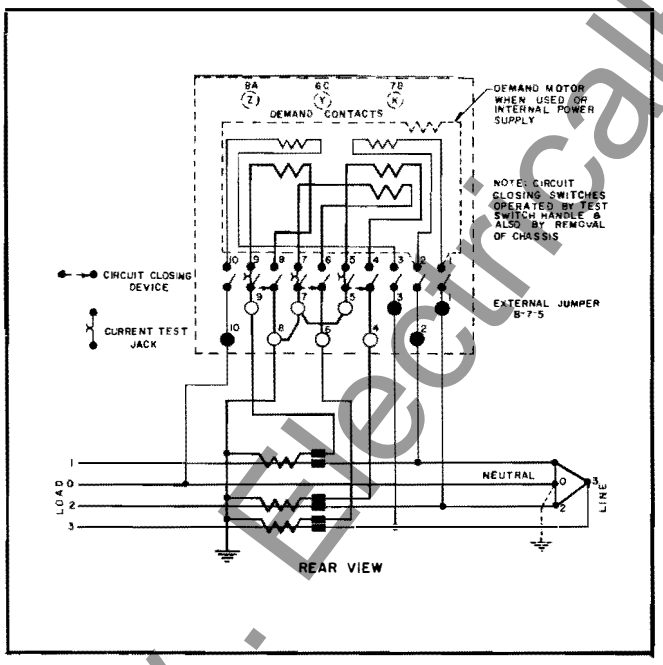


Fig. 7 - Type D4B-7F, 3-Phase, 4-Wire Delta, Q-Meter

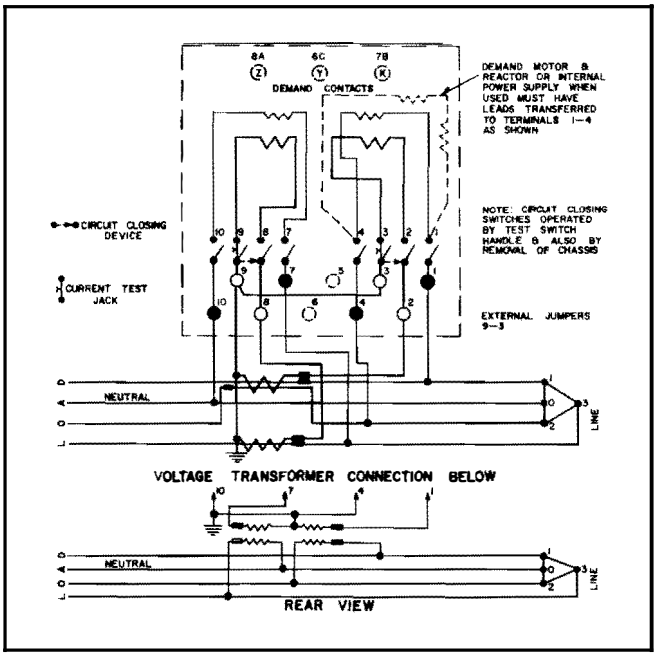


Fig. 8 - Type D4B-2F, 3-Phase, 4-Wire Delta with One 2-Wire and One 3-Wire CT

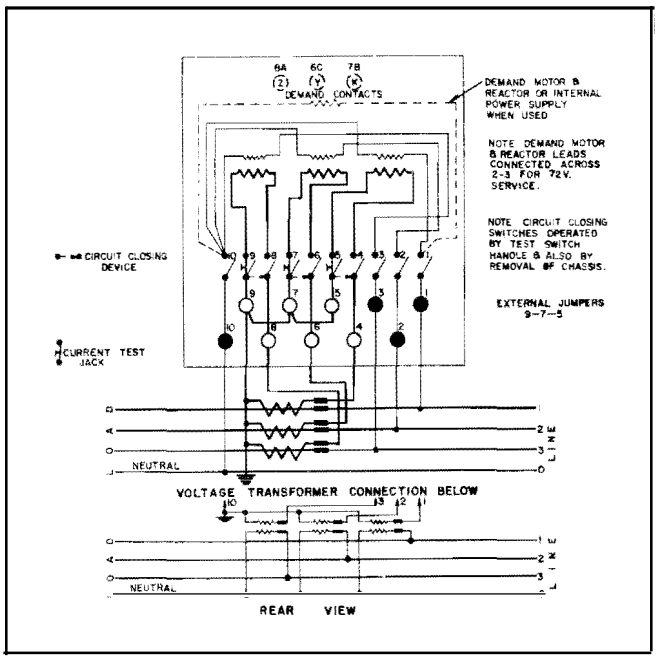


Fig. 9 - Type D4B-3F, 3-Phase, 4-Wire Wye

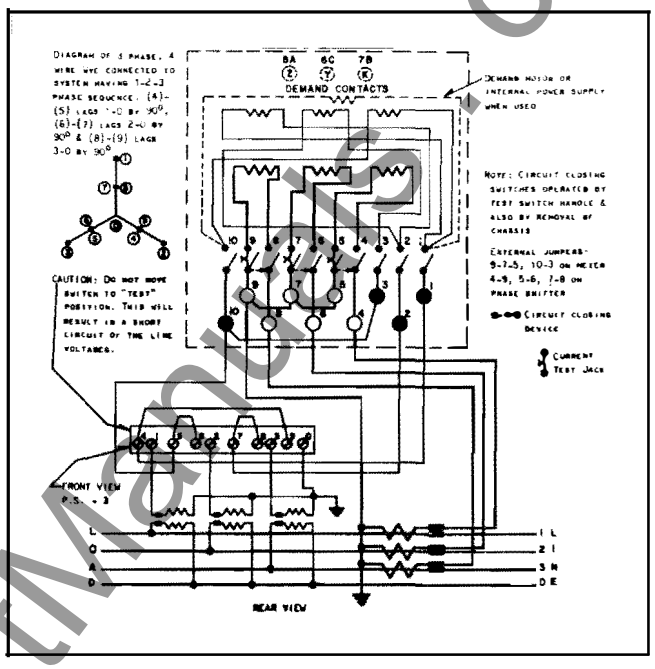


Fig. 10 - Type D4B-3F, 3-Phase, 4-Wire Wye with Phase-Shifting Transformer

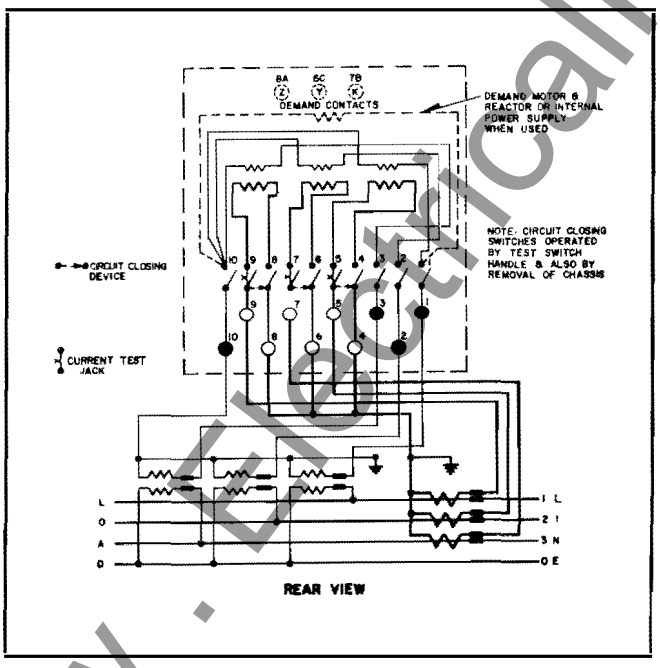


Fig. 11 - Type D4B-3F, 3-Phase, 4-Wire Wye, Q-Meter

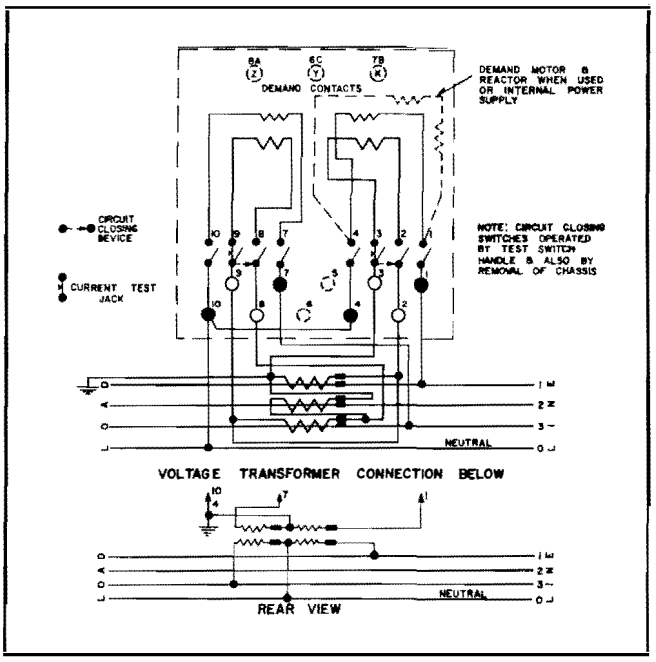


Fig. 12 - Type D4B-2F, 3-Phase, 4-Wire Wye with Current Transformers In Closed Delta

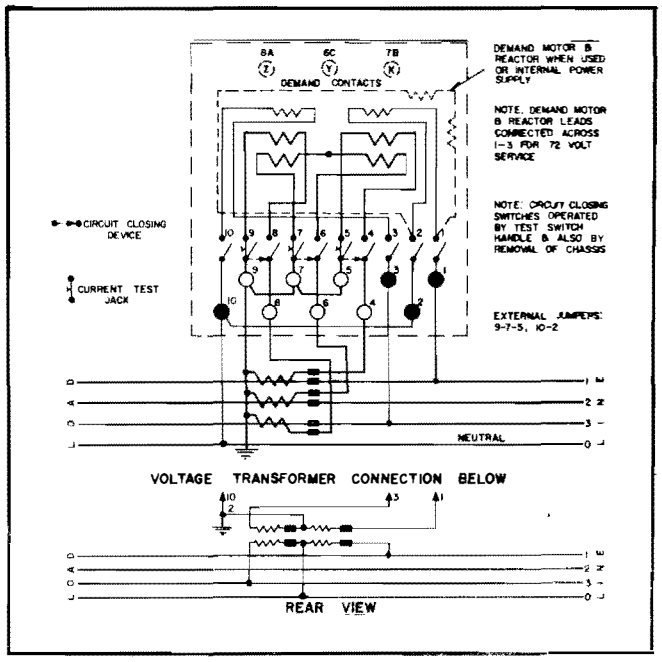


Fig. 13 - Type D4B-8F, 3- Phase, 4-Wire Wye

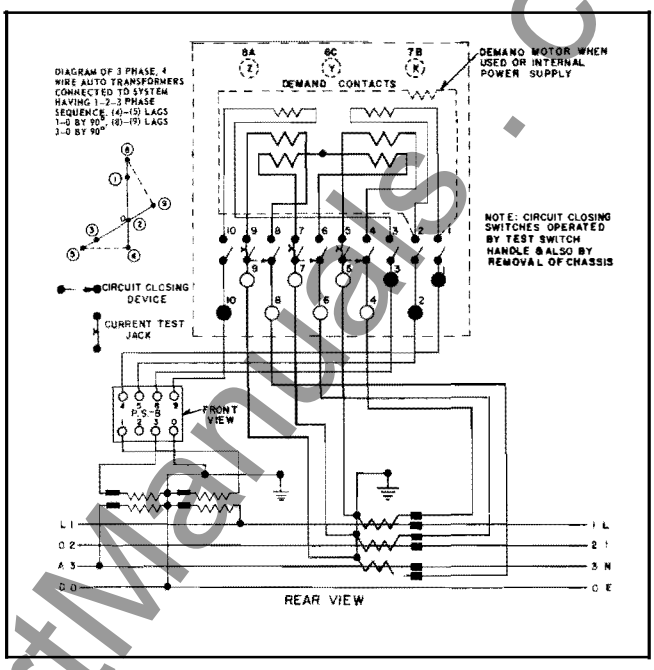


Fig. 14 - Type D4B-8F, 3-Phase, 4-Wire Wye with Phase-Shifting Transformer

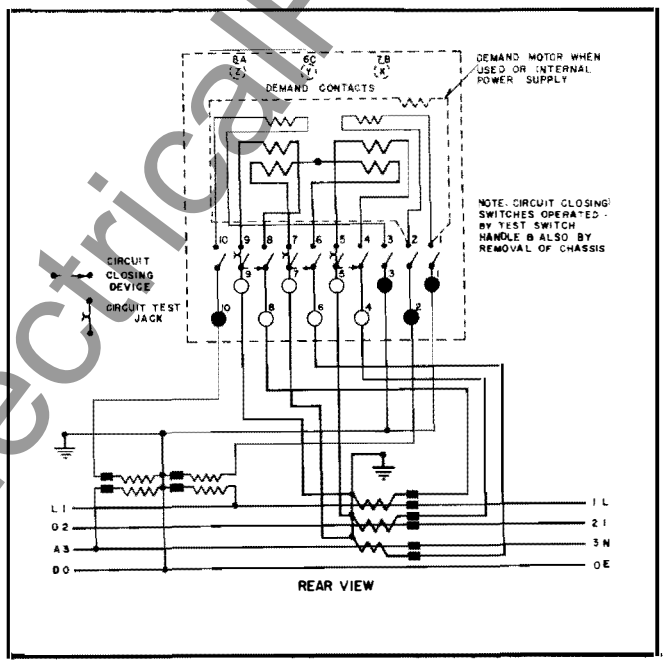


Fig. 15 - Type D4B-8F, 3-Phase, 4-Wire Wye, Q-Meter

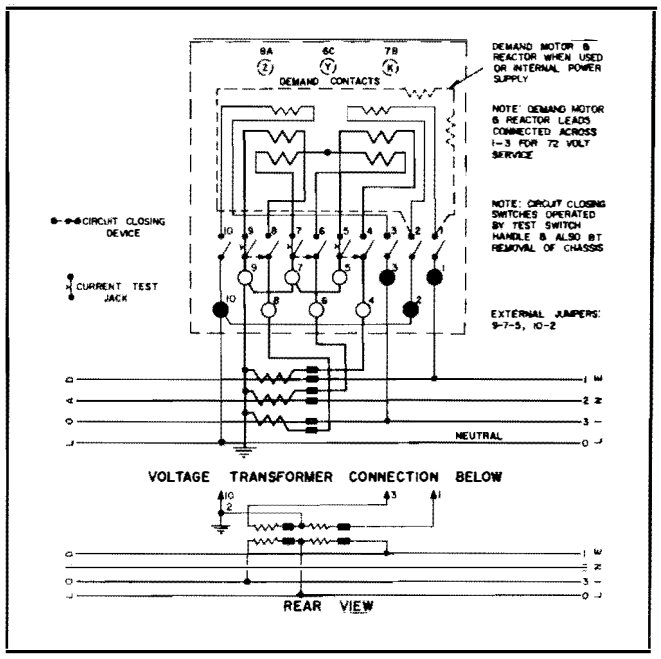


Fig. 13 - Type D4B-8F, 3- Phase, 4-Wire Wye

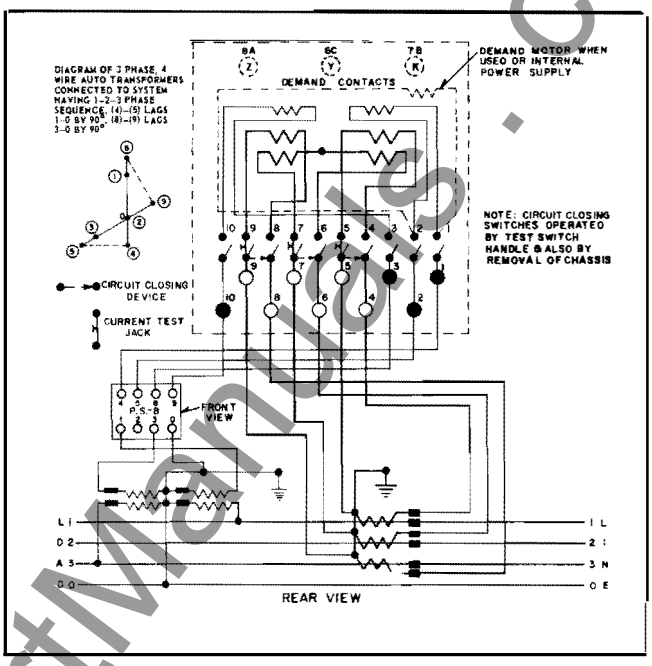


Fig. 14 - Type D4B-8F, 3-Phase, 4-Wire Wye with Phase-Shifting Transformer

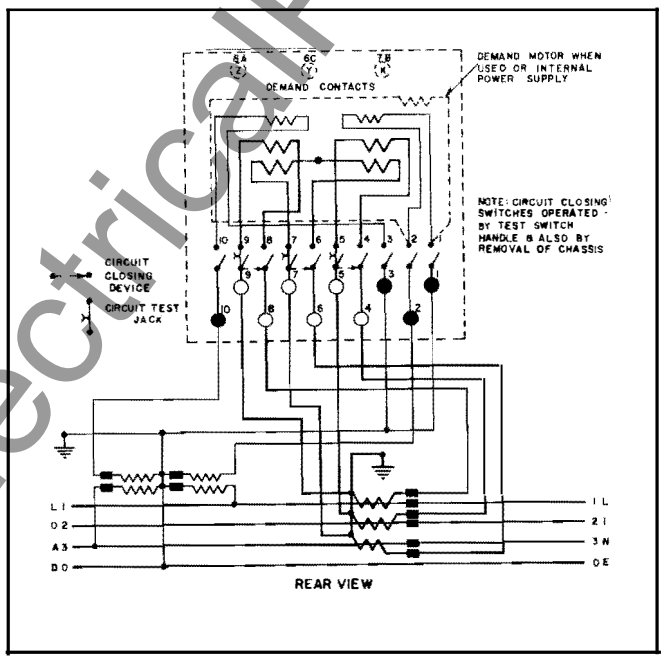


Fig. 15 - Type D4B-8F, 3-Phase, 4-Wire Wye, Q-Meter

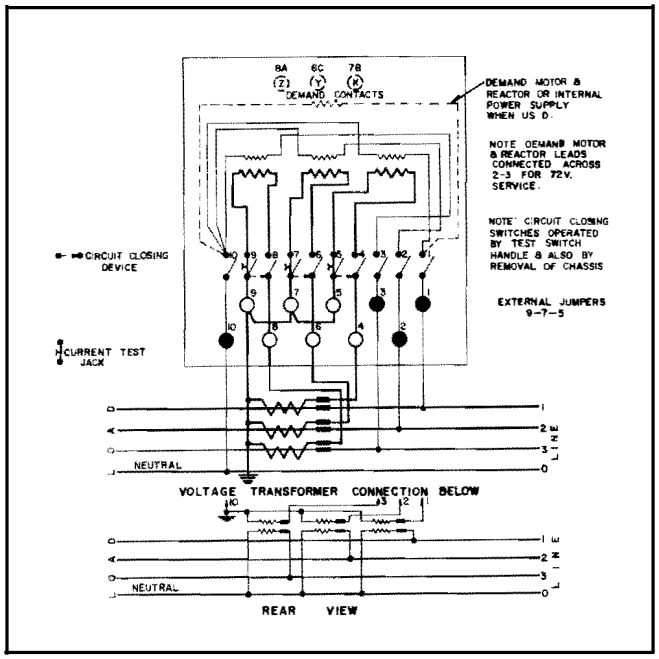


Fig. 9 - Type D4B-3F, 3-Phase, 4-Wire Wye

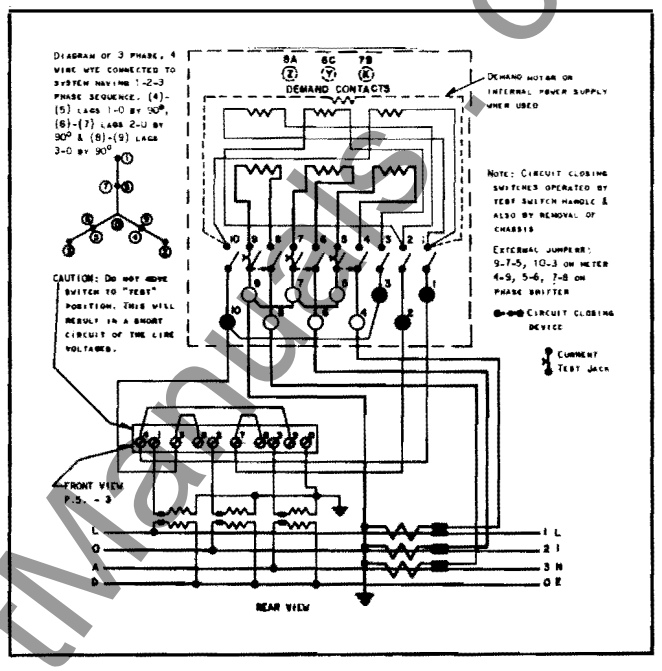


Fig. 10 - Type D4B-3F, 3-Phase, 4-Wire Wye with Phase-Shifting Transformer

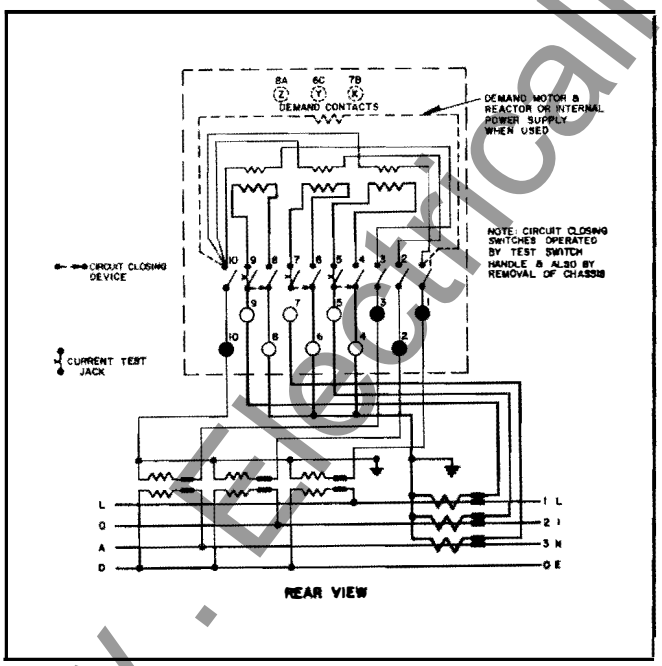


Fig. 11 - Type D4B-3F, 3-Phase, 4-Wire Wye, Q-Meter

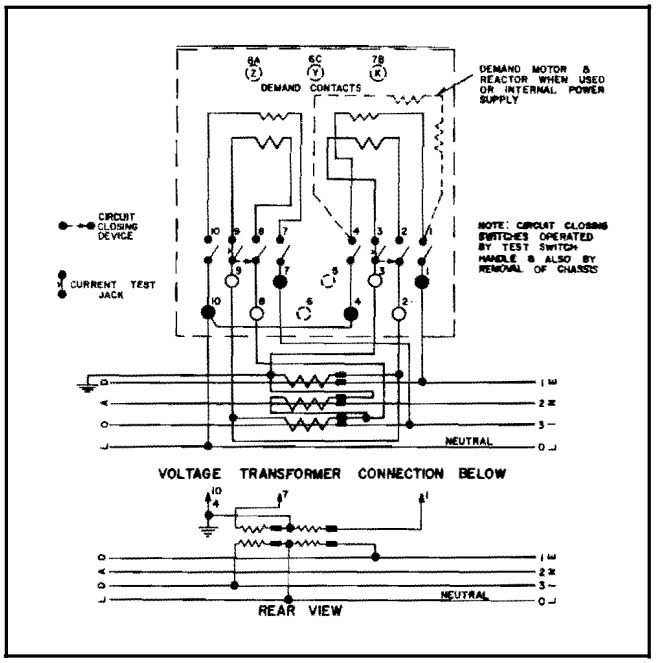


Fig. 12 - Type D4B-2F, 3-Phase, 4-Wire Wye with Current Transformers In Closed Delta

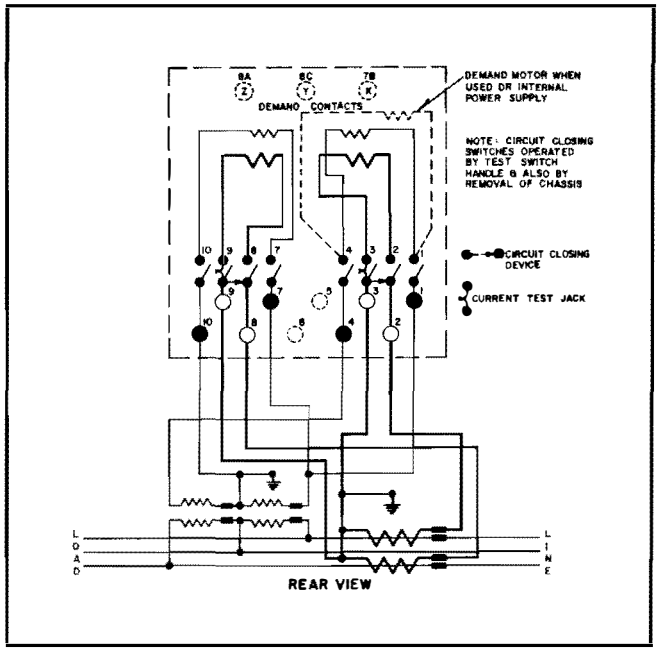


Fig. 5 - Type D4B-2F, 3-Phase, 3-Wire, Q Meter

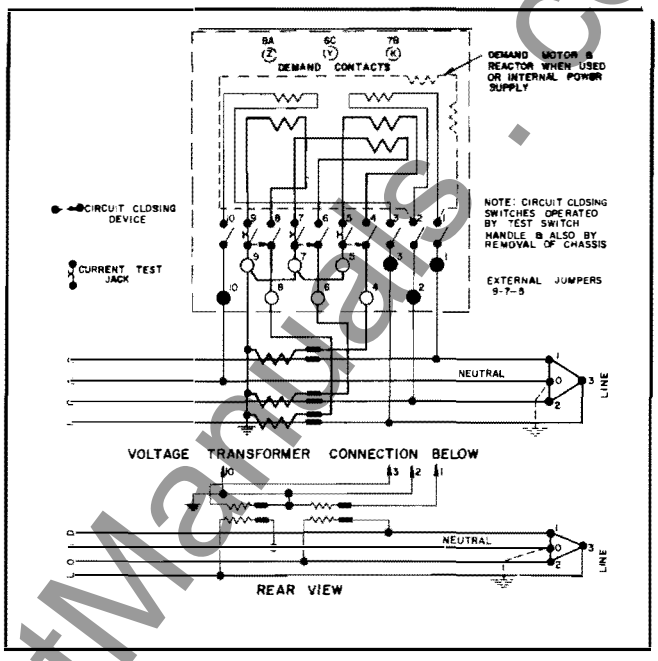


Fig. 6 - Type D4B-7F, 3-Phase, 4-Wire Delta

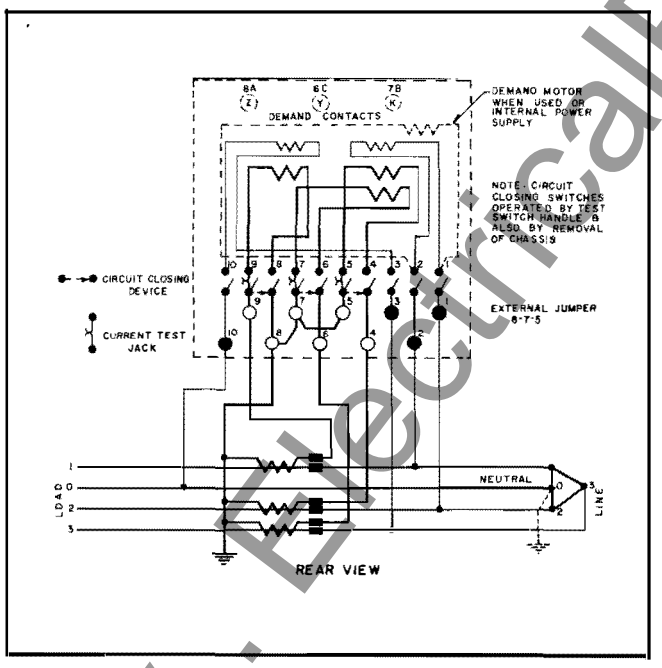


Fig. 7 - Type D4B-7F, 3-Phase, 4-Wire Delta, Q-Meter

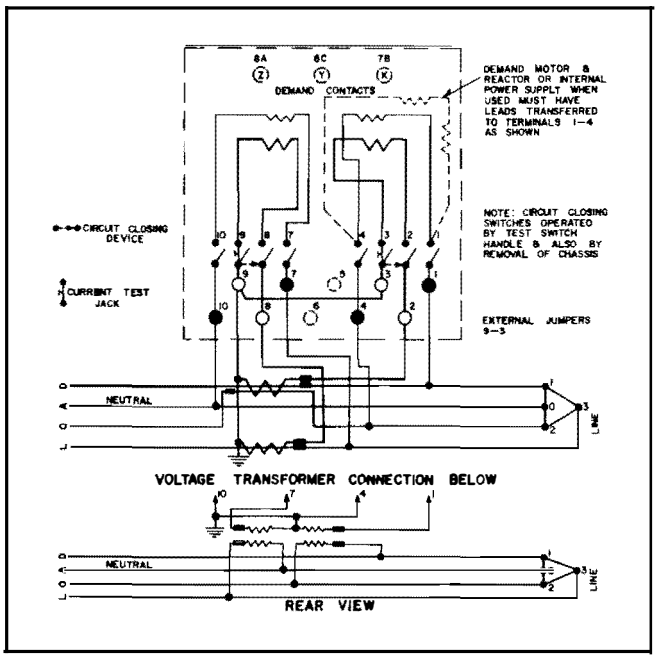


Fig. 8 - Type D4B-2F, 3-Phase, 4-Wire Delta with One 2-Wire and One 3-Wire CT

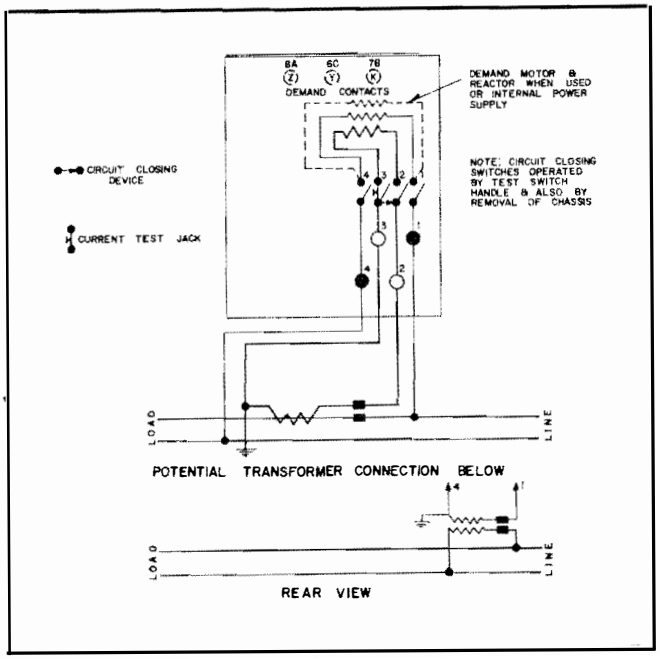


Fig. 1 - Type D4B-F, 1-Phase, 2-Wire

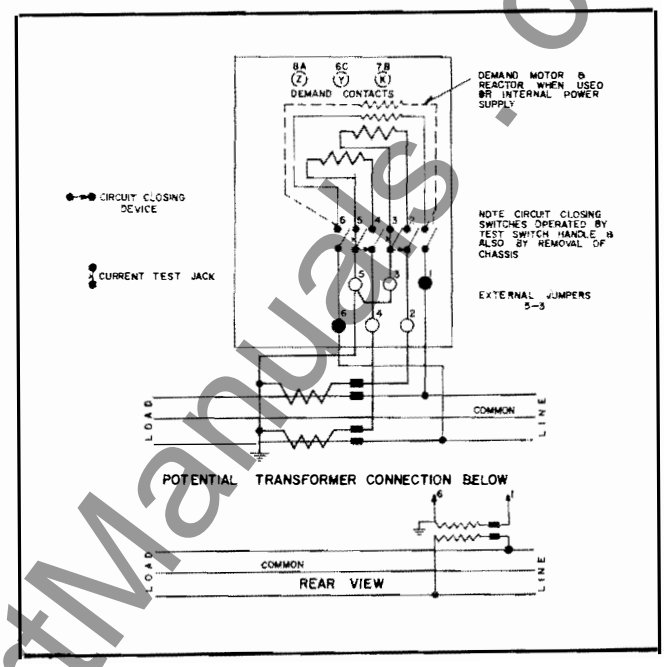


Fig. 2 - Type D4B-F, 1-Phase, 3-Wire

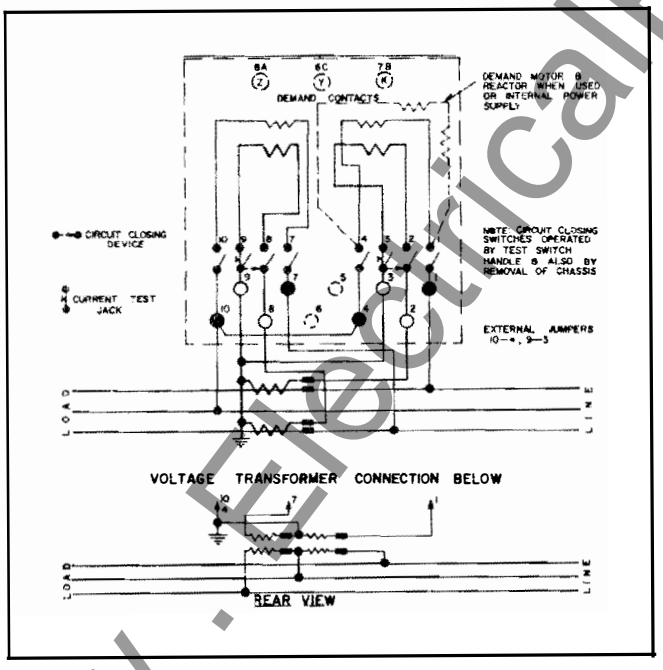


Fig. 3 - Type D4B-2F, 3-Phase, 3-Wire

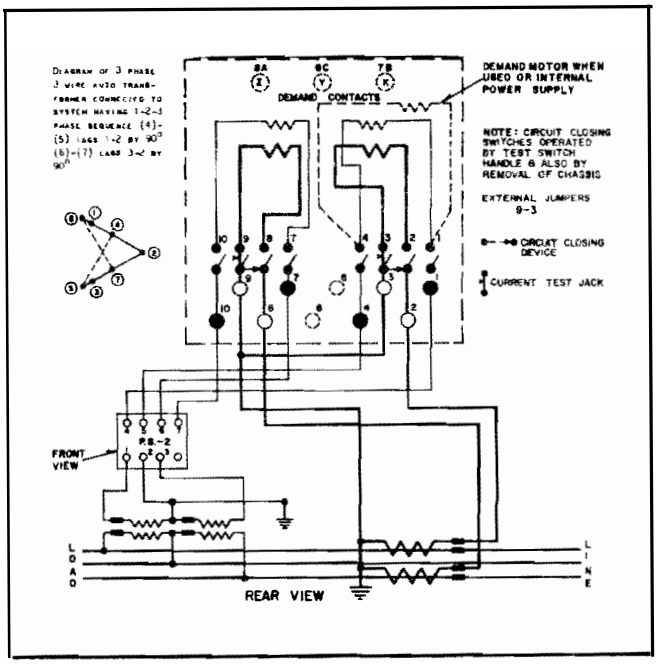
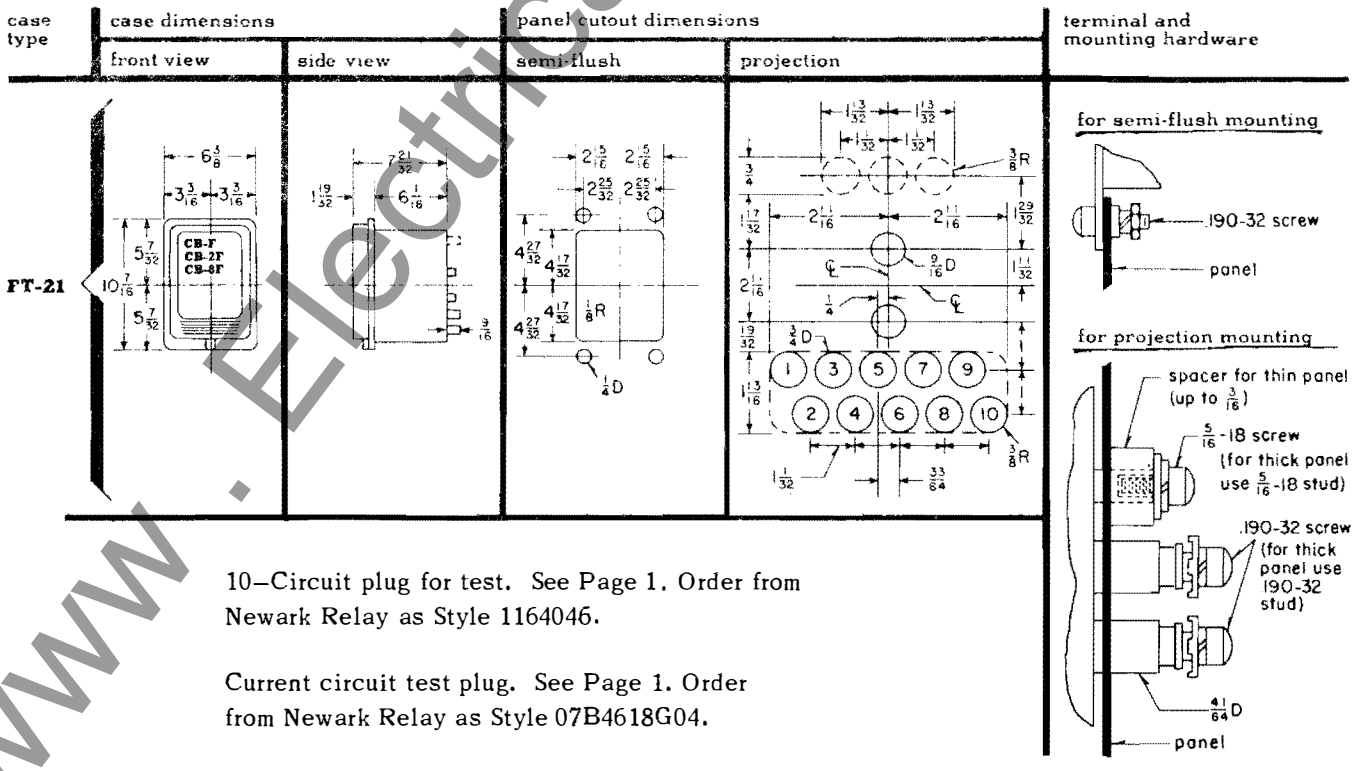


Fig. 4 - Type D4B-2F, 3-Phase, 3-Wire with Phase-Shifting Transformer

GENERAL DATA

Description	D4B-F 2.5 Amps. 120 Volt 2-Wire	D4B-2F 2.5 Amps. 120 Volt	D4B-3F 2.5 Amps. 120 Volt	D4B-7F 2.5 Amps. 240 Volt	D4B-8F 2.5 Amps. 120 Volt
Starting Watts	1.50	3.00	4.50	6.00	3.00
Test RPM at Meter Rating	16 2/3	8 1/3	8 1/3	8 1/3	11 1/9
Watthour Constant (kh)	0.30	1.20	1.80	2.40	1.80
Voltage Coil Circuit					
Volt-Amps.	7.40	6.40	6.40	6.40	6.40
Watts Loss per Element	0.96	0.95	0.95	0.95	0.95
Power Factor	0.13	0.14	0.14	0.14	0.14
Current Coil Circuits at 5 Amps. 2-Wire Coil					
Watts Loss	0.30	0.30	0.30	0.30	0.30
Volt-Amps.	1.20	1.20	1.20	1.20	1.20
3-Wire Coil (Each Half)					
Watts Loss	.....	.....	.....	0.16	0.16
Volt-Amps	.....	.....	.....	0.65	0.65

Mounting of FT-21 Case



10–Circuit plug for test. See Page 1. Order from Newark Relay as Style 1164046.

Current circuit test plug. See Page 1. Order from Newark Relay as Style 07B4618G04.

Light Load

Single-stator sensitivity is approximately 0.8 percent per turn. Two-stator sensitivity is approximately 0.35 percent per turn. Three-stator sensitivity is approximately 0.25 percent per turn.

Power Factor

Power factor calibration is fixed factory adjusted and permanent for single-stator meters. For two- and three-stator meters, sensitivity is 0.5 percent per turn.

Phase Balance

For two- and three-stator meters, sensitivity is approximately 2.0 percent per turn but will vary with the adjuster position.

CALIBRATION PROCEDURE

Single-phase test speed for single-phase meters is 16 2/3 RPM (polyphase meters, 8 1/3 RPM except for -8 meters which is 11 1/9 RPM). All meters are tested on a single-phase power source with voltage coils connected in parallel. The following calibration procedures should be used.

Combined Stator Operation

Connect all current coils in series and observe full load and light load registration. Calibrate light load to full load. For example, if full load registration is 101.0 percent, calibrate light load to 101.0 percent.

INDIVIDUAL STATOR OPERATION

Two-Stator Meter

Energize the left-stator current coil, calibrate full load, unity power factor to 100 percent registration by turning the Full Load adjuster screw at the front of the meter. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the left stator adjuster bracket.

Energize the right stator. Calibrate full load unity power factor to 100 percent registration by turning the Phase Balance adjuster screw on the right stator adjuster bracket. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the right stator adjuster bracket.

Three-Stator Meter

Energize the rear-stator current coil, calibrate full load, unity power factor to 100 percent registration by turning the Full Load adjuster screw at the front of the meter. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the rear stator adjuster bracket from the right side.

Energize the remaining two stators one at a time. Calibrate full load unity power factor to 100 percent registration by turning the Phase Balance adjuster screw on the respective stator adjuster bracket. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the respective stator adjuster bracket.

NOTE:

Figure 10 shows a D4B-3F meter connected for reactive measurement on 3-phase, 4-wire wye in a 10-point flexitest case and with a standard PS-3 phase-shifting transformer. Although the standard PS-3 has a TEST RUN SWITCH, it **cannot be thrown to test as this will result in a short circuit on line voltage.** If testing is required, the meter should be tested as a standard KWH meter with PS-3 removed from circuit.

BEARING ADJUSTMENTS

1. Place the meter in the normal operating position.
2. Insert the upper and lower bearing with the set screws loose.
3. Move the lower bearing until the disk is slightly below center in the meter gap.
4. Tighten the lower set screw, raise the upper bearing to obtain 0.005 to 0.010 inch end play, and tighten the upper set screws.

ACCESSORIES

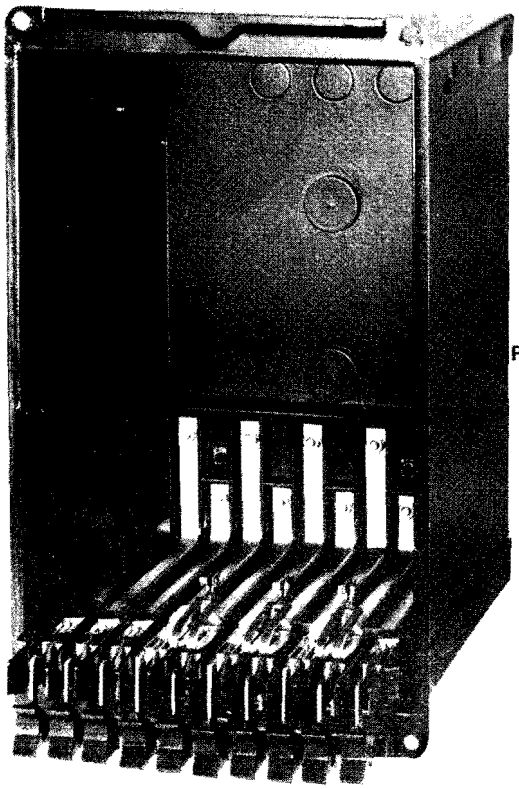
To install a Mark series demand register or a CD series contact device on a D-line polyphase meter, see instruction leaflets:

1. Mark Ia	42-302-11
2. Mark II	42-302.2
3. Mark III	42-302.3
4. CD-2, -3, -5, -6	42-950.3
5. CD-12 and CD1-12	42-559
6. CD-22 and CDI-22	42-570

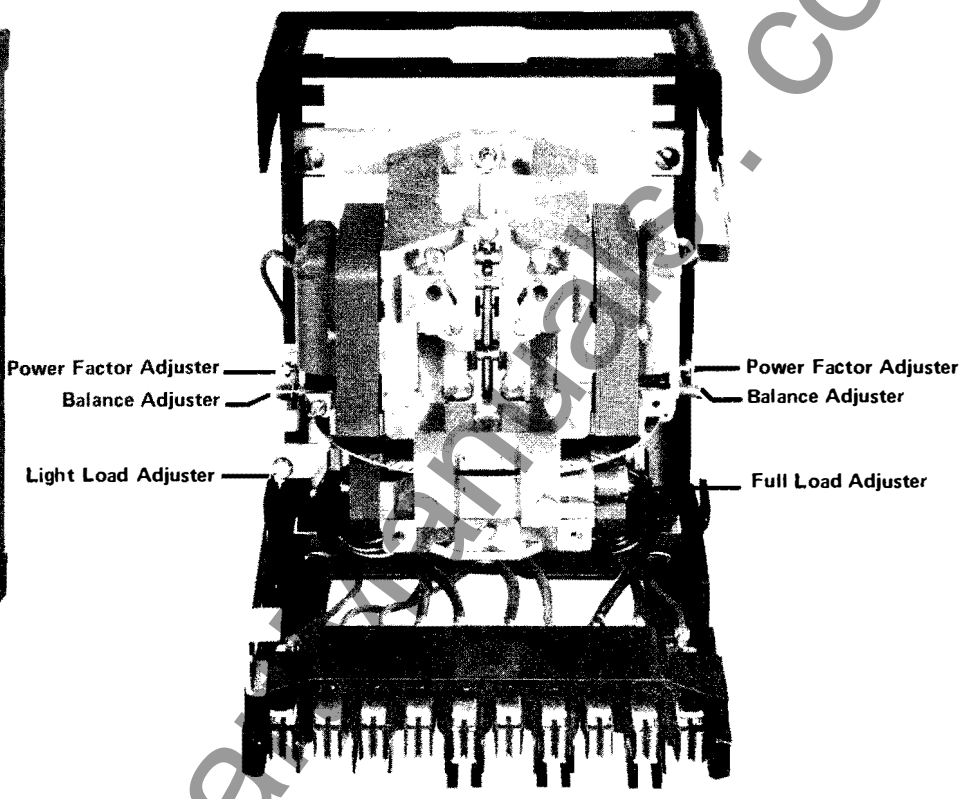
REPLACEMENT PARTS AND REPAIRS

Where facilities are limited or where only a small number of meters are used, it is recommended that the meter be returned to the factory for repairs. When returning a meter for repairs, obtain a Returned Material Tag from the District Office so as to avoid delay in identifying the shipment.

When ordering renewal parts, give the entire nameplate reading. Always give the name of the part wanted. Check Renewal Parts Data 42-227 for aid in identifying parts.



FT-21 Case



D4B-7F Chassis

GENERAL

The meter elements are mounted on a removable chassis, which is held in the case by two latches. All connections between the case and the chassis are made through the test switches. Automatic shorting switches are provided on all current circuits to prevent opening current transformers when testing or removing the chassis. For testing, leads can be clipped to the test lugs above the chassis jaws and on the switch blades.

Two test plugs are available to facilitate calibration of these meters. A 10-circuit plug is inserted into the chassis jaws and is provided with binding post terminals for connections to the test circuit. Current measurements are made by connecting ammeters to a current circuit test plug, which is then inserted into the current switch assembly, between the chassis and the case.

The hardware supplied with the meter permits semi-flush mounting on panels up to 3/16 inch thick. For projection mounting on panels thicker than 3/16 inch, special hardware is furnished upon request (specify panel thickness).

Provisions have been made on all FT-21 cases for convenient field installation of either 2- or 3-wire pulse initiators. Removal of three knockouts (located in the back of the case, near the top) will permit installation of an output terminal-block and pin assembly. A mating bracket and socket assembly is then attached to the meter frame and latch assembly. The output circuits will be closed by inserting the meter frame and latch assembly into the case. All necessary parts are available in kit form for each type of pulse initiator.

CALIBRATION

All meters have been factory tested before shipment. For single-stator meters, the full load test speed is 16 2/3 RPM, and the watthour constant is 0.6 per nominal 600-watt rating (constant of 7.2 for 30 amp., 240-volt meter). For two-stator meters, the full load test speed is 8 1/3 RPM, and the watthour constant is 1.2 per nominal 300-watt rating. For three-stator meters, the full load test speed is 8 1/3 RPM, and the watthour constant is 1.8 per nominal 300-watt rating.

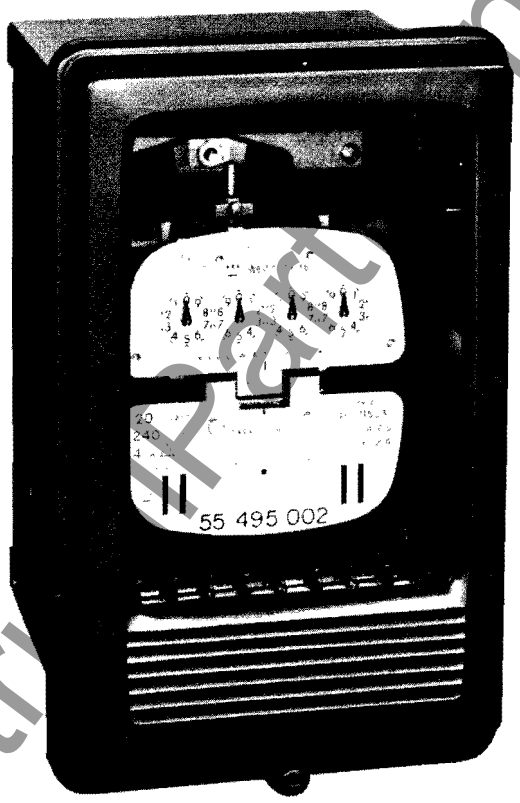
Full Load

Single-stator sensitivity is approximately 1.3 percent per turn. Two- and three-stator sensitivity is approximately 1.2 percent per turn.

INSTALLATION - OPERATION - MAINTENANCE

INSTRUCTIONS

SWITCHBOARD WATTHOUR METERS IN FT-21 FLEXITEST CASE TYPES D4B-F, D4B-2F, D4B-3F, D4B-7F, D4B-8F



TYPE D4B-7F

APPLICATION CHART

TYPE	NUMBER OF STATORS	CIRCUIT APPLICATION
D4B-F	1	1-Phase, 2 or 3-Wire
D4B-2F	2	1, 2, or 3-Phase 3-Wire
D4B-3F	3	3-Phase, 4-Wire Wye
D4B-7F	2	3-Phase, 4-Wire Delta
D4B-8F	2-Split Coil	3-Phase, 4-Wire Wye

NEW INFORMATION

EFFECTIVE JANUARY 1972

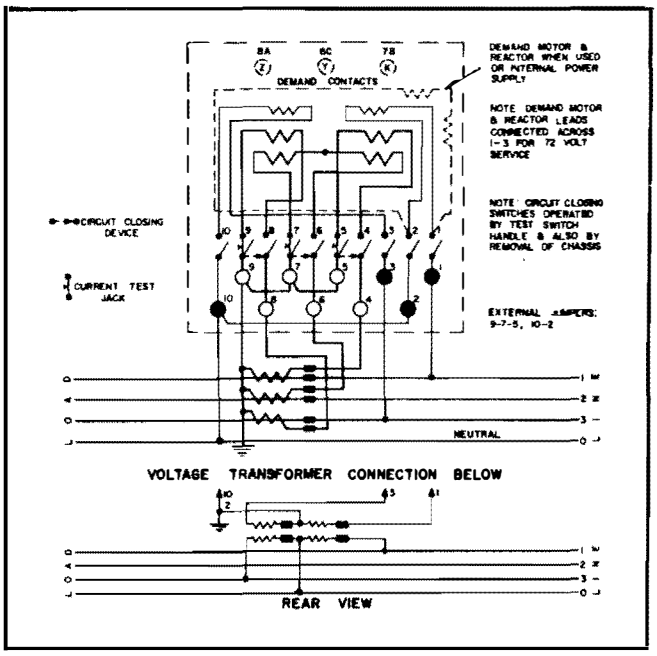


Fig. 13 - Type D4B-8F, 3- Phase, 4-Wire Wye

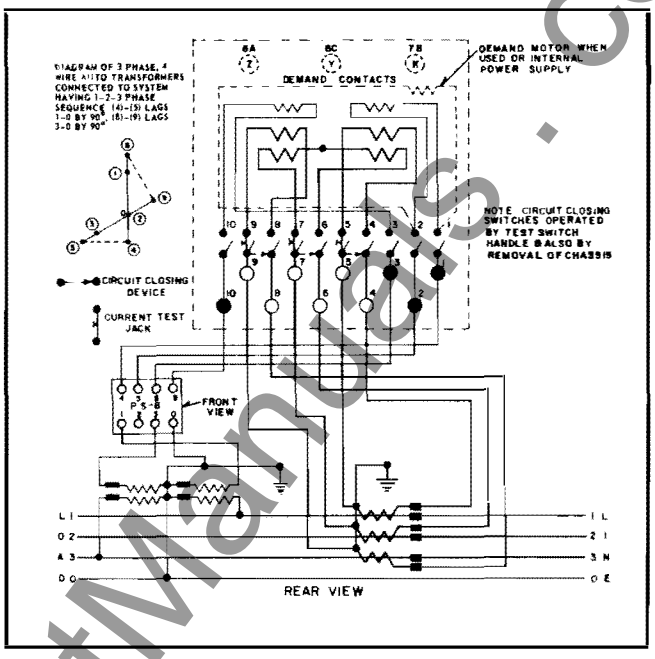


Fig. 14 - Type D4B-8F, 3-Phase, 4-Wire Wye with Phase-Shifting Transformer

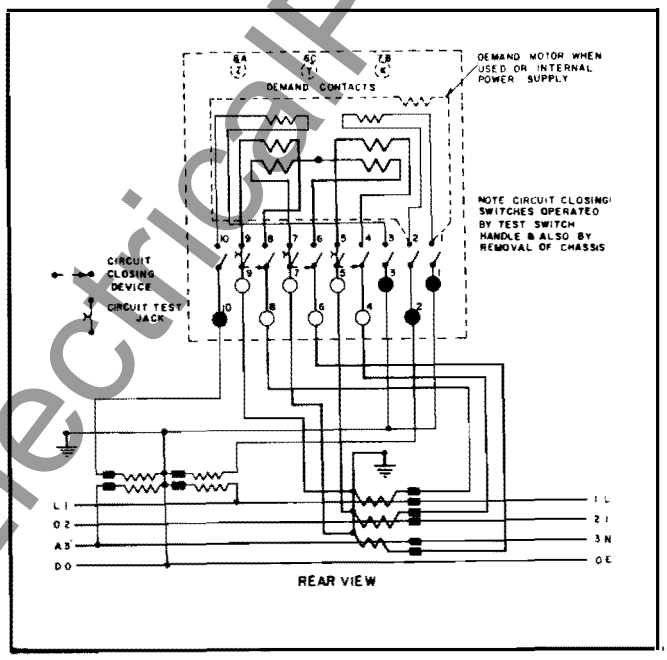


Fig. 15 - Type D4B-8F, 3-Phase, 4-Wire Wye, Q-Meter

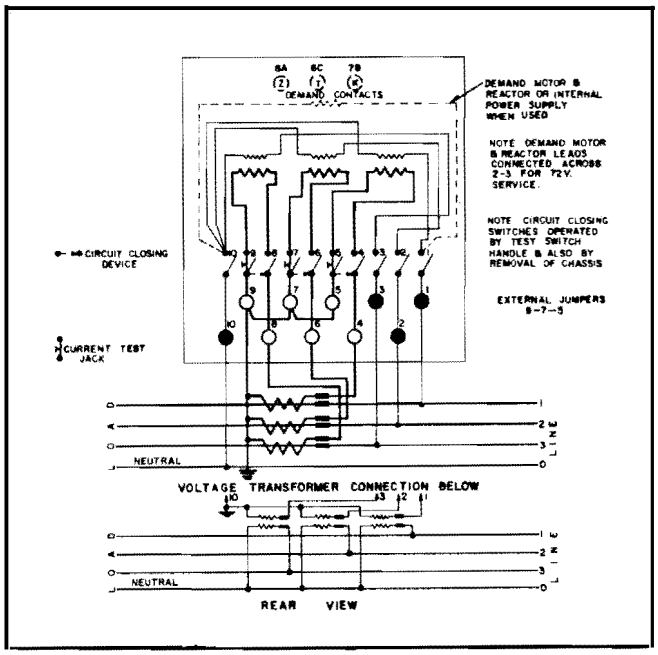


Fig. 9 - Type D4B-3F, 3-Phase, 4-Wire Wye

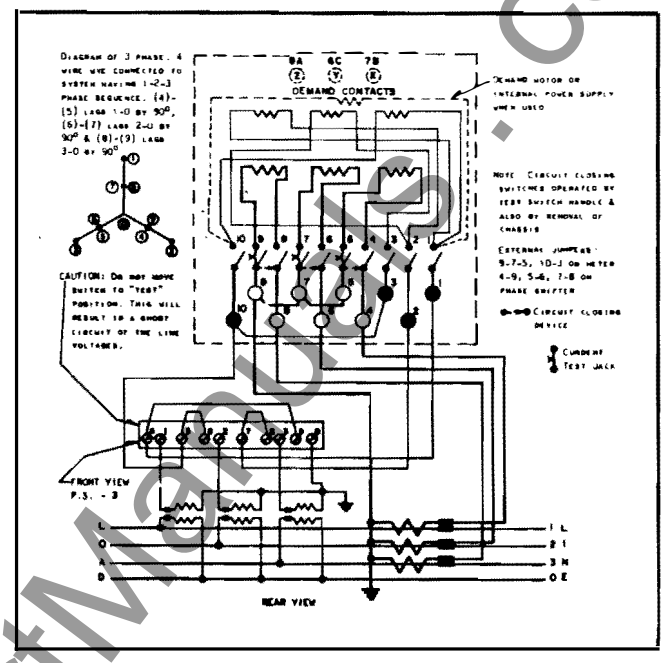


Fig. 10 - Type D4B-3F, 3-Phase, 4-Wire Wye with Phase-Shifting Transformer

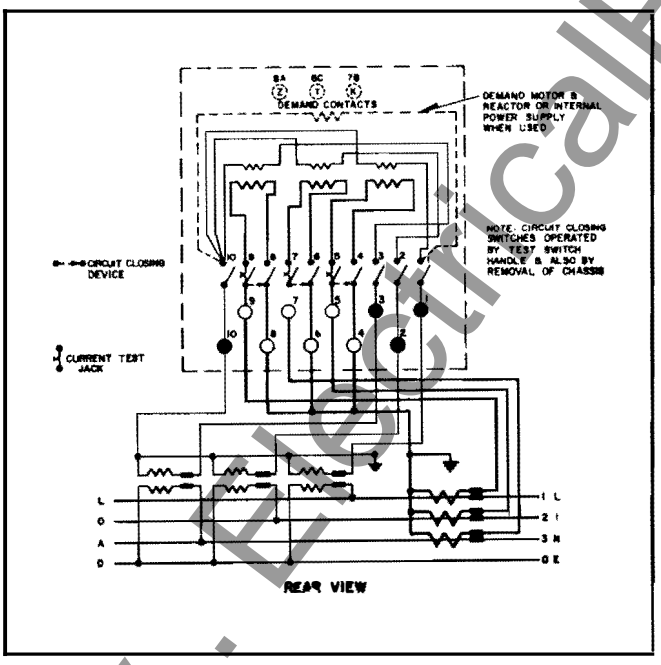


Fig. 11 - Type D4B-3F, 3-Phase, 4-Wire Wye, Q-Meter

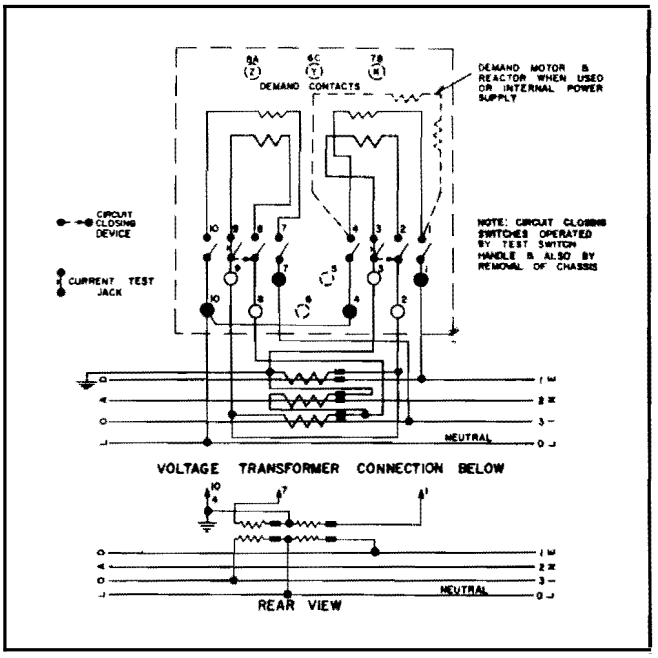


Fig. 12 - Type D4B-2F, 3-Phase, 4-Wire Wye with Current Transformers In Closed Delta

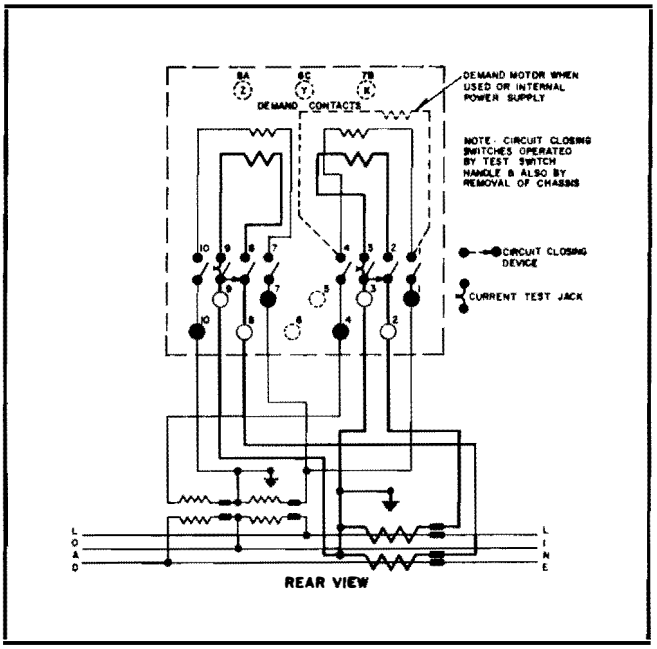


Fig. 5 - Type D4B-2F, 3-Phase, 3-Wire, Q Meter

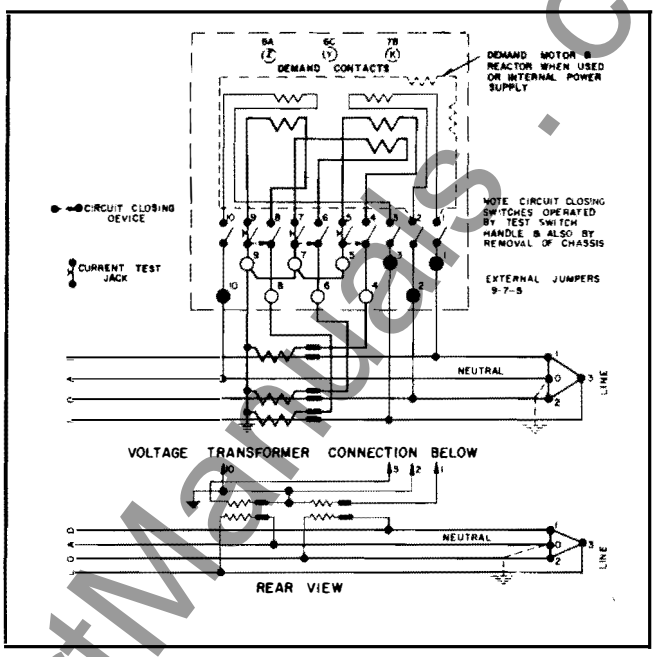


Fig. 6 - Type D4B-7F, 3-Phase, 4-Wire Delta

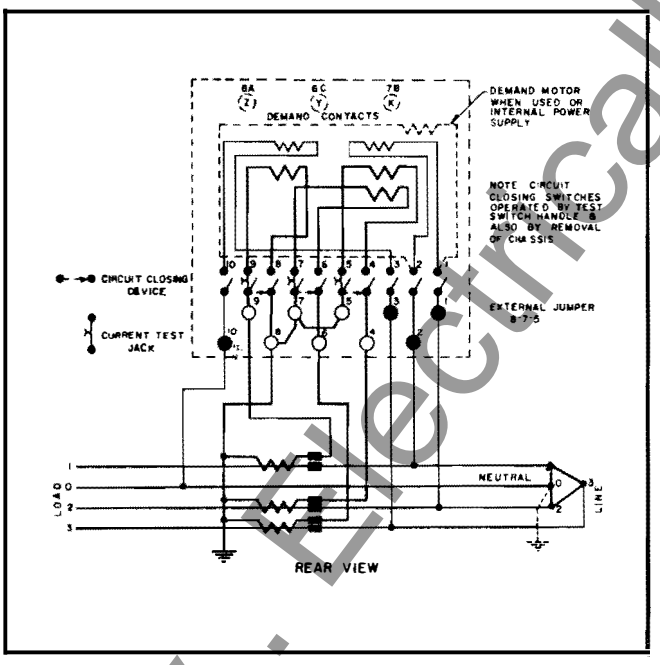


Fig. 7 - Type D4B-7F, 3-Phase, 4-Wire Delta, Q-Meter

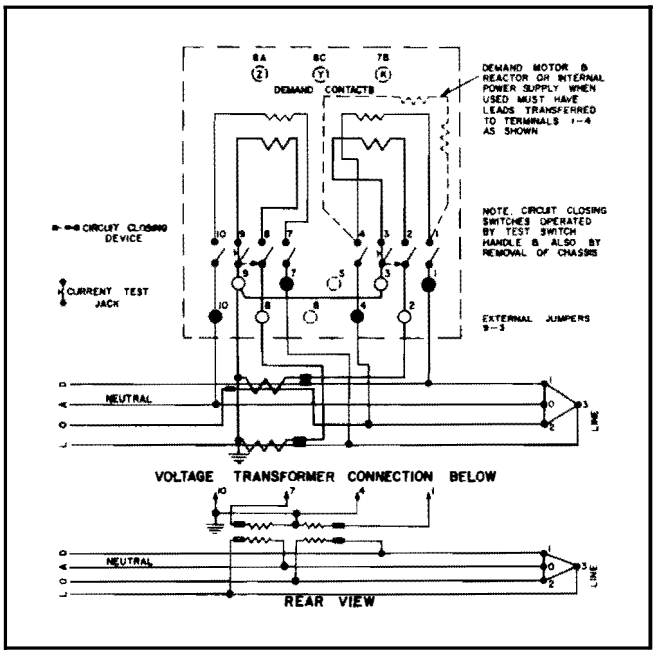


Fig. 8 - Type D4B-2F, 3-Phase, 4-Wire Delta with One 2-Wire and One 3-Wire CT

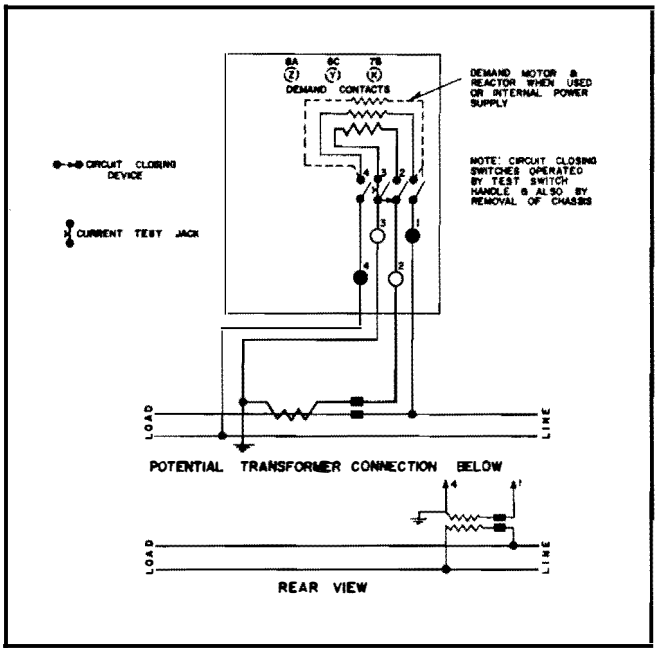


Fig. 1 - Type D4B-F, 1-Phase, 2-Wire

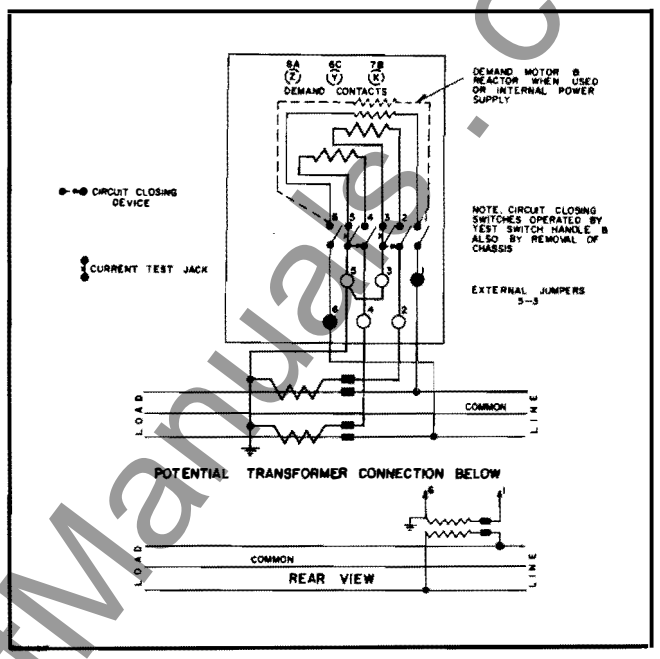


Fig. 2 - Type D4B-F, 1-Phase, 3-Wire

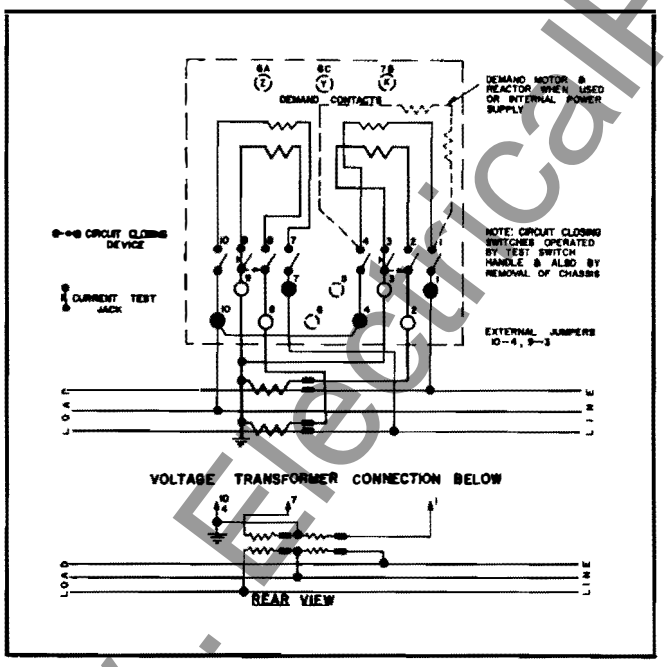


Fig. 3 - Type D4B-2F, 3-Phase, 3-Wire

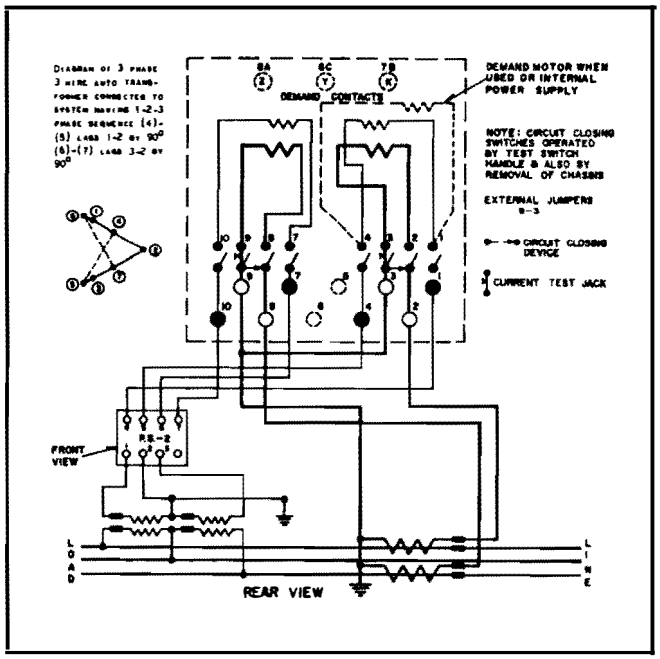
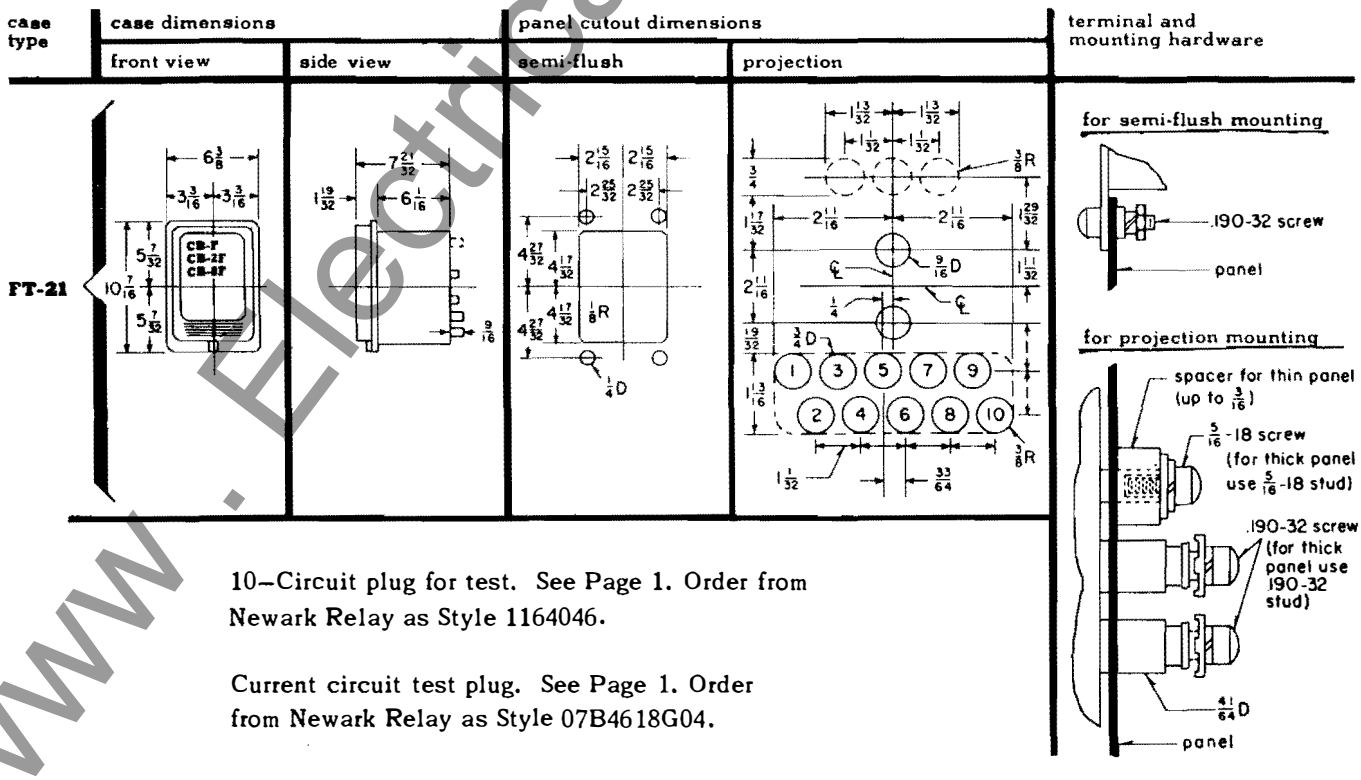


Fig. 4 - Type D4B-2F, 3-Phase, 3-Wire with Phase-Shifting Transformer

GENERAL DATA

Description	D48-F 2.5 Amps. 120 Volt 2-Wire	D4B-2F 2.5 Amps. 120 Volt	D4B-3F 2.5 Amps. 120 Volt	D4B-7F 2.5 Amps. 240 Volt	D4B-8F 2.5 Amps. 120 Volt
Starting Watts	1.50	3.00	4.50	6.00	3.00
Test RPM at Meter Rating	16 2/3	8 1/3	8 1/3	8 1/3	11 1/9
Watthour Constant (kh)	0.30	1.20	1.80	2.40	1.80
Voltage Coil Circuit					
Volt-Amps.	7.40	6.40	6.40	6.40	6.40
Watts Loss per Element	0.96	0.95	0.95	0.95	0.95
Power Factor	0.13	0.14	0.14	0.14	0.14
Current Coil Circuits at 5 Amps. 2-Wire Coil					
Watts Loss	0.30	0.30	0.30	0.30	0.30
Volt-Amps.	1.20	1.20	1.20	1.20	1.20
3-Wire Coil (Each Half)					
Watts Loss	.....	.....	.....	0.16	0.16
Volt-Amps	.....	.....	.....	0.65	0.65

Mounting of FT-21 Case



10–Circuit plug for test. See Page 1. Order from Newark Relay as Style 1164046.

Current circuit test plug. See Page 1. Order from Newark Relay as Style 07B4618G04.

Light Load

Single-stator sensitivity is approximately 0.8 percent per turn. Two-stator sensitivity is approximately 0.35 percent per turn. Three-stator sensitivity is approximately 0.25 percent per turn.

Power Factor

Power factor calibration is fixed factory adjusted and permanent for single-stator meters. For two- and three-stator meters, sensitivity is 0.5 percent per turn.

Phase Balance

For two- and three-stator meters, sensitivity is approximately 2.0 percent per turn but will vary with the adjuster position.

CALIBRATION PROCEDURE

Single-phase test speed for single-phase meters is 16 2/3 RPM (polyphase meters, 8 1/3 RPM except for -8 meters which is 11 1/9 RPM). All meters are tested on a single-phase power source with voltage coils connected in parallel. The following calibration procedures should be used.

Combined Stator Operation

Connect all current coils in series and observe full load and light load registration. Calibrate light load to full load. For example, if full load registration is 101.0 percent, calibrate light load to 101.0 percent.

INDIVIDUAL STATOR OPERATION

Two-Stator Meter

Energize the left-stator current coil, calibrate full load, unity power factor to 100 percent registration by turning the Full Load adjuster screw at the front of the meter. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the left stator adjuster bracket.

Energize the right stator. Calibrate full load unity power factor to 100 percent registration by turning the Phase Balance adjuster screw on the right stator adjuster bracket. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the right stator adjuster bracket.

Three-Stator Meter

Energize the rear-stator current coil, calibrate full load, unity power factor to 100 percent registration by turning the Full Load adjuster screw at the front of the meter. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the rear stator adjuster bracket from the right side.

Energize the remaining two stators one at a time. Calibrate full load unity power factor to 100 percent registration by turning the Phase Balance adjuster screw on the respective stator adjuster bracket. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the respective stator adjuster bracket.

NOTE:

Figure 10 shows a D4B-3F meter connected for reactive measurement on 3-phase, 4-wire wye in a 10-point flexitest case and with a standard PS-3 phase-shifting transformer. Although the standard PS-3 has a TEST RUN SWITCH, **it cannot be thrown to test as this will result in a short circuit on line voltage.** If testing is required, the meter should be tested as a standard KWH meter with PS-3 removed from circuit.

BEARING ADJUSTMENTS

1. Place the meter in the normal operating position.
2. Insert the upper and lower bearing with the set screws loose.
3. Move the lower bearing until the disk is slightly below center in the meter gap.
4. Tighten the lower set screw, raise the upper bearing to obtain 0.005 to 0.010 inch end play, and tighten the upper set screws.

ACCESSORIES

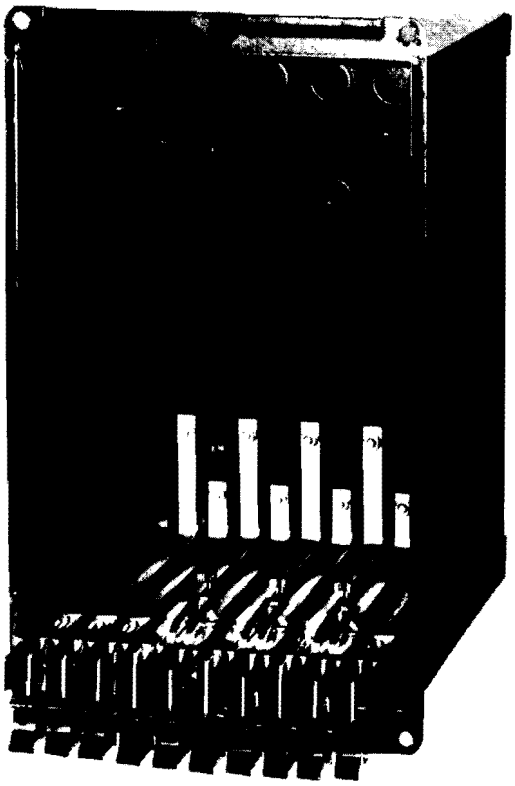
To install a Mark series demand register or a CD series contact device on a D-line polyphase meter, see instruction leaflets:

1. Mark Ia	42-302-11
2. Mark II	42-302.2
3. Mark III	42-302.3
4. CD-2, -3, -5, -6	42-950.3
5. CD-12 and CD1-12	42-559
6. CD-22 and CDI-22	42-570

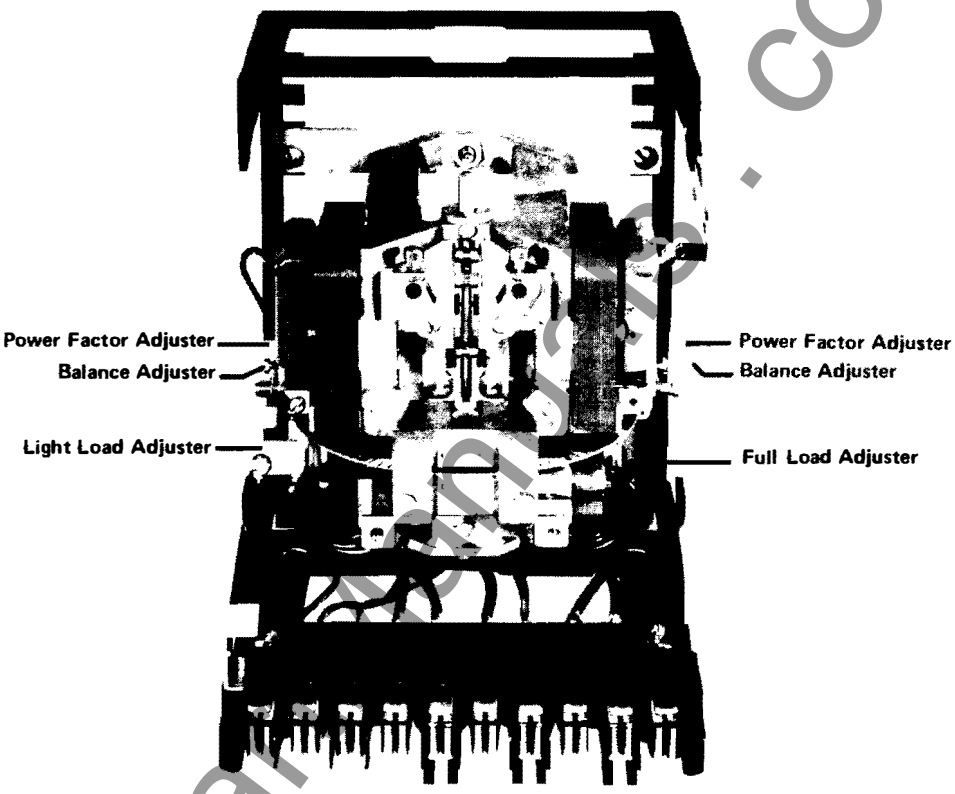
REPLACEMENT PARTS AND REPAIRS

Where facilities are limited or where only a small number of meters are used, it is recommended that the meter be returned to the factory for repairs. When returning a meter for repairs, obtain a Returned Material Tag from the District Office so as to avoid delay in identifying the shipment.

When ordering renewal parts, give the entire nameplate reading. Always give the name of the part wanted. Check Renewal Parts Data 42-227 for aid in identifying parts.



FT-21 Case



D4B-7F Chassis

GENERAL

The meter elements are mounted on a removable chassis, which is held in the case by two latches. All connections between the case and the chassis are made through the test switches. Automatic shorting switches are provided on all current circuits to prevent opening current transformers when testing or removing the chassis. For testing, leads can be clipped to the test lugs above the chassis jaws and on the switch blades.

Two test plugs are available to facilitate calibration of these meters. A 10-circuit plug is inserted into the chassis jaws and is provided with binding post terminals for connections to the test circuit. Current measurements are made by connecting ammeters to a current circuit test plug, which is then inserted into the current switch assembly, between the chassis and the case.

The hardware supplied with the meter permits semi-flush mounting on panels up to 3/16 inch thick. For projection mounting on panels thicker than 3/16 inch, special hardware is furnished upon request (specify panel thickness).

Provisions have been made on all FT-21 cases for convenient field installation of either 2- or 3-wire pulse initiators. Removal of three knockouts (located in the back of the case, near the top) will permit installation of an output terminal-block and pin assembly. A mating bracket and socket assembly is then attached to the meter frame and latch assembly. The output circuits will be closed by inserting the meter frame and latch assembly into the case. All necessary parts are available in kit form for each type of pulse initiator.

CALIBRATION

All meters have been factory tested before shipment. For single-stator meters, the full load test speed is 16 2/3 RPM, and the watthour constant is 0.6 per nominal 600-watt rating (constant of 7.2 for 30 amp., 240-volt meter). For two-stator meters, the full load test speed is 8 1/3 RPM, and the watthour constant is 1.2 per nominal 300-watt rating. For three-stator meters, the full load test speed is 8 1/3 RPM, and the watthour constant is 1.8 per nominal 300-watt rating.

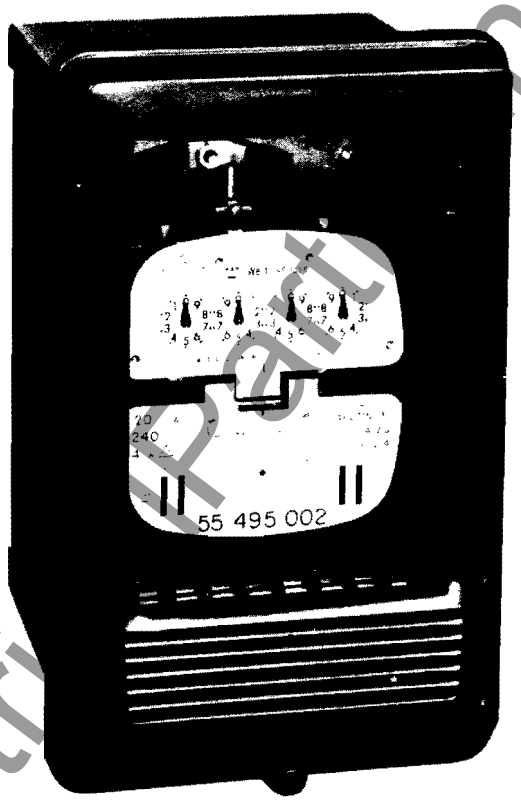
Full Load

Single-stator sensitivity is approximately 1.3 percent per turn. Two- and three-stator sensitivity is approximately 1.2 percent per turn.

INSTALLATION - OPERATION - MAINTENANCE

INSTRUCTIONS

SWITCHBOARD WATTHOUR METERS IN FT-21 FLEXITEST CASE TYPES D4B-F, D4B-2F, D4B-3F, D4B-7F, D4B-8F



TYPE D4B-7F

APPLICATION CHART

TYPE	NUMBER OF STATORS	CIRCUIT APPLICATION
D4B-F	1	1-Phase, 2 or 3-Wire
D4B-2F	2	1, 2, or 3-Phase 3-Wire
D4B-3F	3	3-Phase, 4-Wire Wye
D4B-7F	2	3-Phase, 4-Wire Delta
D4B-8F	2-Split Coil	3-Phase, 4-Wire Wye

NEW INFORMATION

EFFECTIVE JANUARY 1972

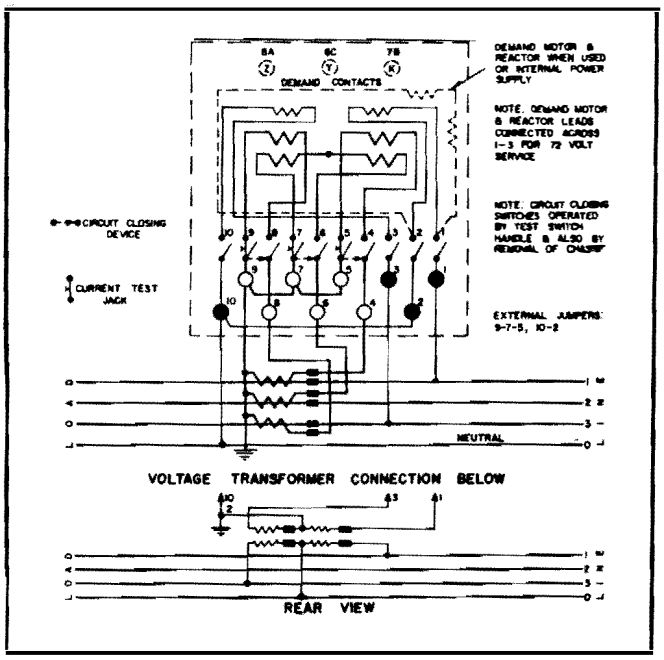


Fig. 13 - Type D4B-8F, 3- Phase, 4-Wire Wye

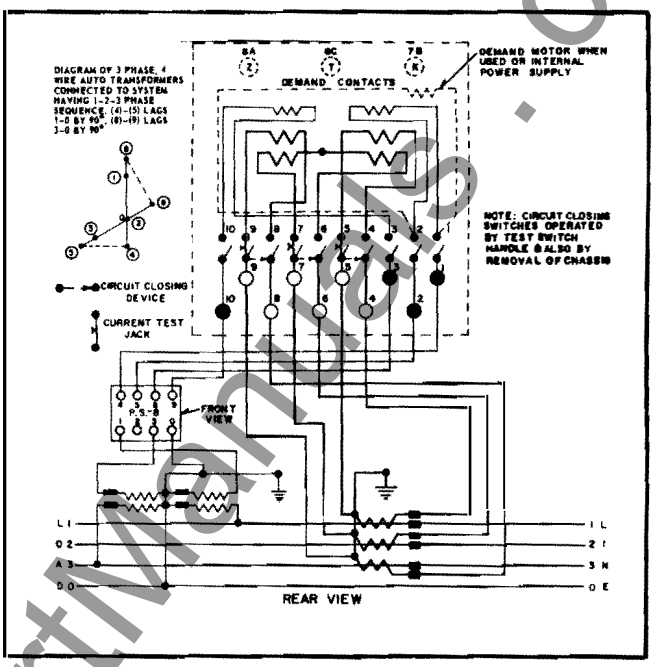


Fig. 14 - Type D4B-8F, 3-Phase, 4-Wire Wye with Phase-Shifting Transformer

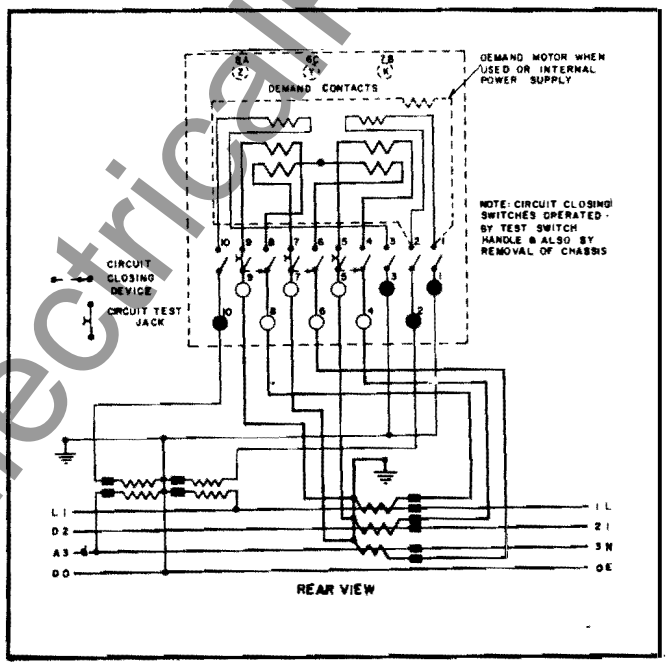


Fig. 15 - Type D4B-8F, 3-Phase, 4-Wire Wye, Q-Meter

TYPE D4B FLEXITEST SWITCHBOARD METERS I. L. 42-227

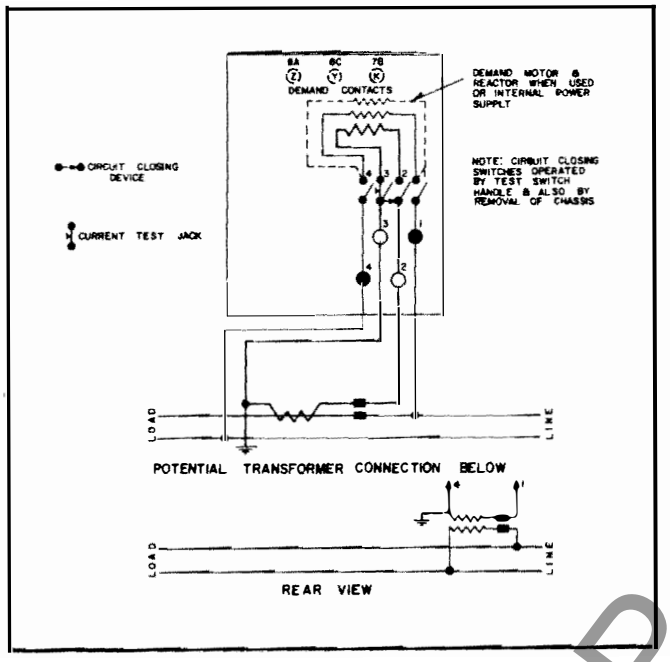


Fig. 1 - Type D4B-F, 1-Phase, 2-Wire

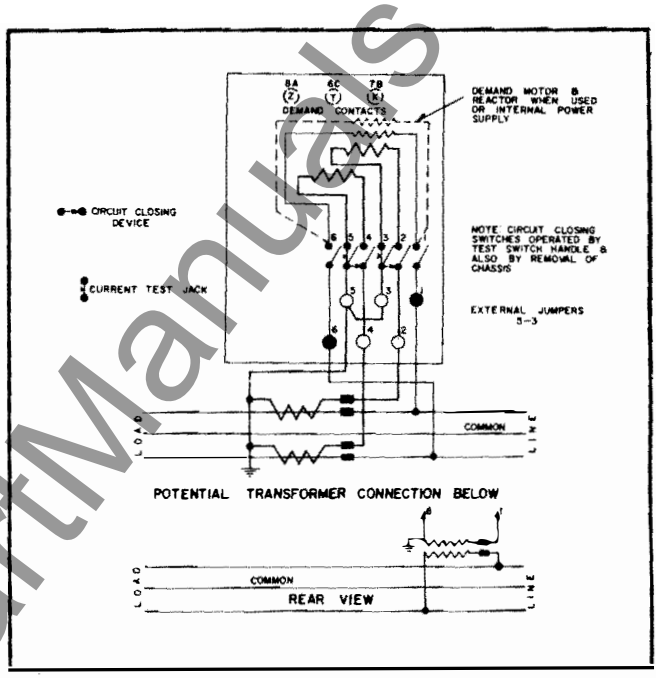


Fig. 2 - Type D4B-F, 1-Phase, 3-Wire

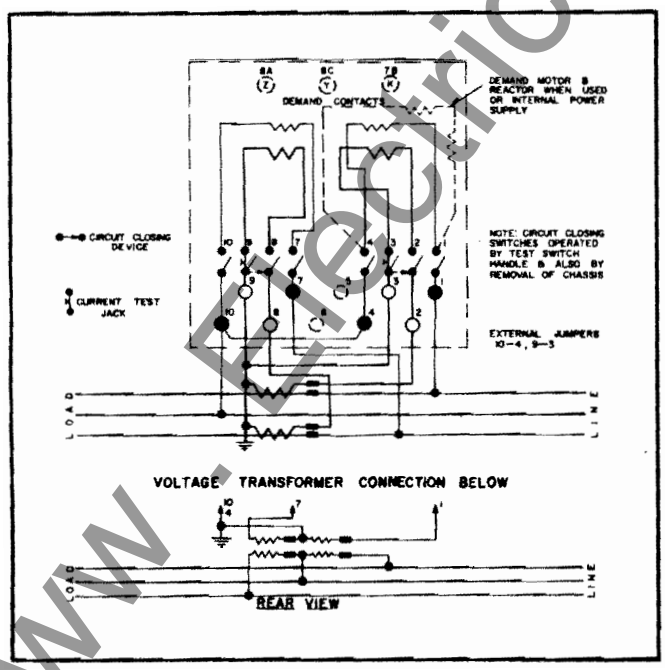


Fig. 3 - Type D4B-2F, 3-Phase, 3-Wire

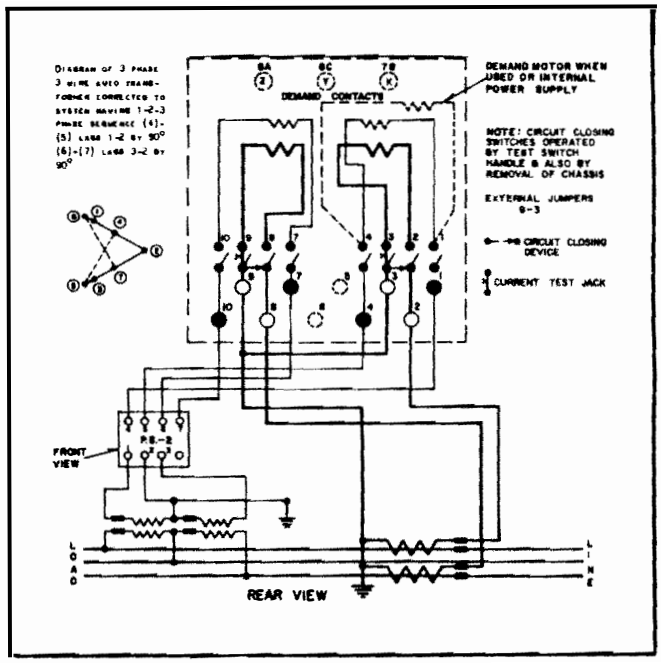


Fig. 4 - Type D4B-2F, 3-Phase, 3-Wire with Phase-Shifting Transformer

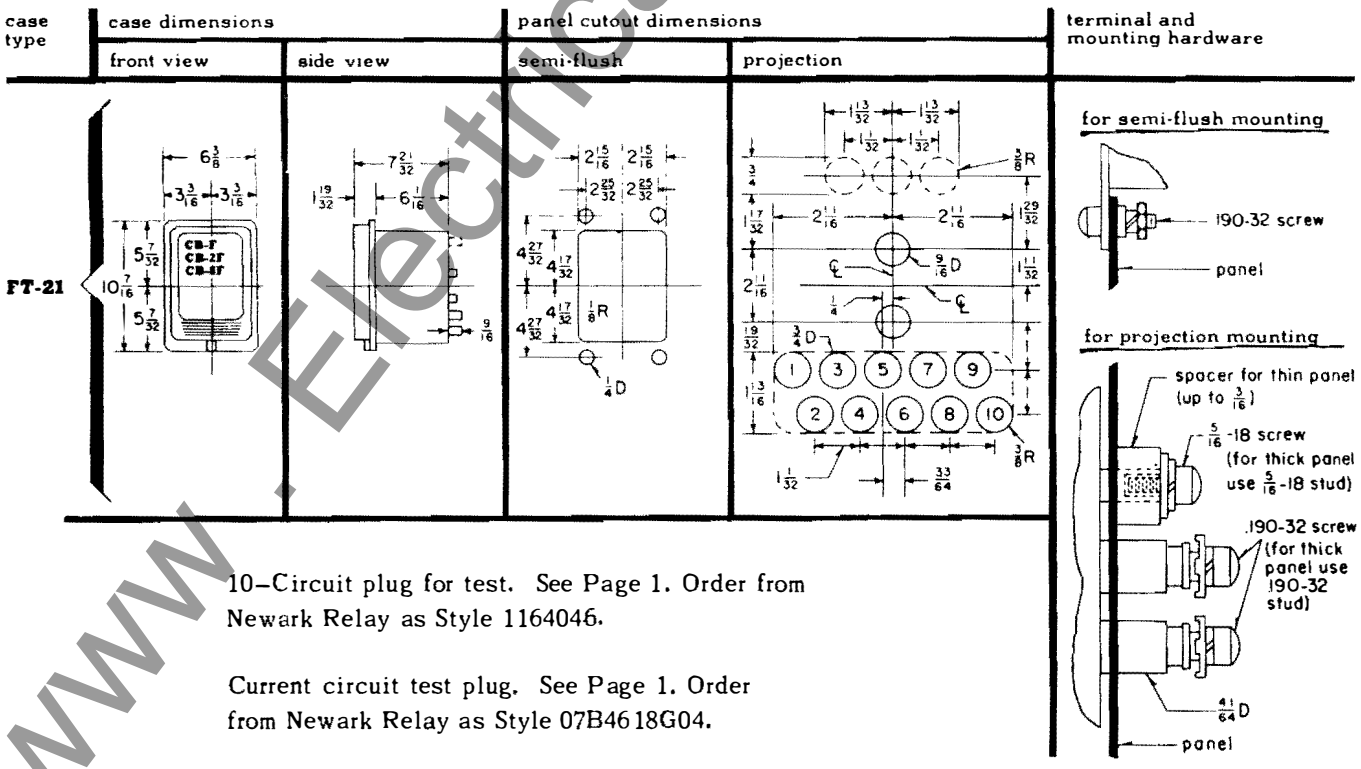
District office so as to avoid delay in identifying the shipment.

When ordering renewal parts, give the entire nameplate reading. Always give the name of the part wanted. Check Renewal Parts Data 42-227 for aid in identifying parts.

GENERAL DATA

Description	D4B-F 2.5 Amps. 120 Volt 2-Wire	D4B-2F 2.5 Amps. 120 Volt	D4B-3F 2.5 Amps. 120 Volt	D4B-7F 2.5 Amps. 240 Volt	D4B-8F 2.5 Amps. 120 Volt
Starting Watts	1.50	3.00	4.50	6.00	3.00
Test RPM at Meter Rating	16 2/3	8 1/3	8 1/3	8 1/3	11 1/9
Watthour Constant (kh)	0.30	1.20	1.80	2.40	1.80
Voltage Coil Circuit					
Volt-Amps.	7.40	6.40	6.40	6.40	6.40
Watts Loss per Element	0.96	0.95	0.95	0.95	0.95
Power Factor	0.13	0.14	0.14	0.14	0.14
Current Coil Circuits at 5 Amps. 2-Wire Coil					
Watts Loss	0.30	0.30	0.30	0.30	0.30
Volt-Amps.	1.20	1.20	1.20	1.20	1.20
3-Wire Coil (Each Half)					
Watts Loss	.....	.....	.....	0.16	0.16
Volt-Amps	.....	.....	.....	0.65	0.65

Mounting of FT-21 Case



10–Circuit plug for test. See Page 1. Order from Newark Relay as Style 1164046.

Current circuit test plug. See Page 1. Order from Newark Relay as Style 07B4618G04.

Light Load

Single-stator sensitivity is approximately 0.8 percent per turn. Two-stator sensitivity is approximately 0.35 percent per turn. Three-stator sensitivity is approximately 0.25 percent per turn.

Power Factor

Power factor calibration is fixed factory adjusted and permanent for single-stator meters. For two- and three-stator meters, sensitivity is 0.5 percent per turn.

Phase Balance

For two- and three-stator meters, sensitivity is approximately 2.0 percent per turn but will vary with the adjuster position.

CALIBRATION PROCEDURE

Single phase test speed for single phase meters is 16-2/3 rpm (polyphase meters, 8-1/3 rpm except for -8 meters which is 11-1/9 rpm). All meters are tested on a single phase power source with voltage coils connected in parallel. The following calibration procedures should be used.

Combined Stator Operation

Connect all current coils in series and observe full load and light load registration. Calibrate light load to full load. For example, if full load registration is 101.0 percent, calibrate light load to 101.0 percent.

INDIVIDUAL STATOR OPERATION

Two-Stator Meter

Energize the left stator current coil, calibrate full load, unity power factor to 100 percent registration by turning the Full Load adjuster screw at the front of the meter. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the left stator adjuster bracket.

Energize the right stator. Calibrate full load unity power factor to 100 percent registration by turning the Phase Balance adjuster screw on the right stator adjuster bracket. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the right stator adjuster bracket.

Three-Stator Meter

Energize the rear stator current coil, calibrate full load, unity power factor to 100 percent registration by turning the Full Load adjuster screw at the front of the meter. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the rear stator adjuster bracket from the right side.

Energize the remaining two stators one at a time. Calibrate full load unity power factor to 100 percent registration by turning the Phase Balance adjuster screw on the respective stator adjuster bracket. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the respective stator adjuster bracket.

NOTE

Figure 10 shows a D4B-3F meter connected for reactive measurements on 3-phase, 4-wire wye in a 10 point flexitest case and with a standard PS-3 phase-shifting transformer. Although the standard PS-3 has a TEST RUN SWITCH, it cannot be thrown to test as this will result in a short circuit on line voltage. If testing is required, the meter should be tested as a standard KWH meter with PS-3 removed from circuit.

BEARING ADJUSTMENTS

1. Place the meter in the normal operating position.
2. Insert the upper and lower bearing with the setscrews loose.
3. Move the lower bearing until the disk is slightly below center in the meter gap.
4. Tighten the lower setscrew, raise the upper bearing to obtain 0.005 to 0.010 inch end play, and tighten the upper setscrews.

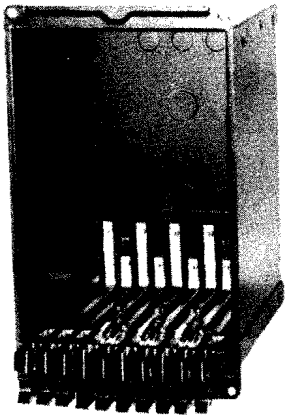
ACCESSORIES

To install a Mark series demand register or a CD series contact device on a D-line polyphase meter, see instruction leaflets:

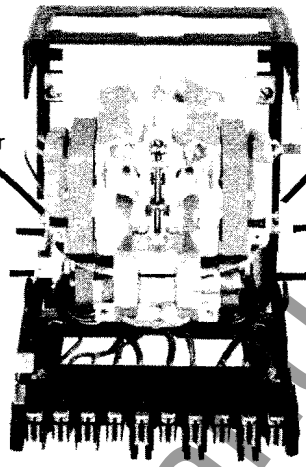
1. Mark Ia	42-302.11B
2. Mark II	42-302.2D
3. Mark III	42-302.3B
4. CD-2, -3, -5, -6	42-950.3
5. CD-12 and CDI-12A/12B	42-559, 42-572, 42-573
6. CD-22 and CDI-22A/12B	42-570, 42-572, 42-573

REPLACEMENT PARTS AND REPAIRS

Where facilities are limited or where only a small number of meters are used, it is recommended that the meter be returned to the factory for repairs. When returning a meter for repairs, obtain a Returned Material Tag from the



FT-21 Case



D4B-7F Chassis

WARNING

To avoid bodily injury and/or property damage, it is recommended that installation, testing, and servicing be done only by authorized personnel using appropriate installation procedures.

GENERAL

The meter elements are mounted on a removable chassis, which is held in the case by two latches. All connections between the case and the chassis are made through the test switches.

CAUTION

Automatic shorting switches are provided on all current circuits to prevent opening current transformers when testing or removing the chassis to avoid electrical shock or bodily injury.

For testing, leads can be clipped to the test lugs above the chassis jaws and on the switch blades.

All rotors are supported by a maintenance-free Magnethrust bearing system and include a pinion for operating gear-driven pulse initiators.

Two test plugs are available to facilitate calibration of these meters. A 10-circuit plug is inserted into the chassis jaws and is provided with binding post terminals for connections to the test circuit. Current measurements are made by connecting ammeters to a current circuit test plug, which is then inserted into the current switch assembly, between the chassis and the case.

The hardware supplied with the meter permits semi-flush mounting on panels up to 3/16 inch thick. For projection mounting on panels thicker than 3/16 inch, special hardware is furnished upon request (specify panel thickness).

Provisions have been made on all FT-21 cases for convenient field installation of either 2- or 3-wire pulse initiators. Removal of three knockouts (located in the back of the case near the top) will permit installation of an output terminal block and pin assembly. A mating bracket and socket assembly is then attached to the meter frame and latch assembly. The output circuits will be closed by inserting the meter frame and latch assembly into the case. All necessary parts are available in kit form for each type of pulse initiator.

CALIBRATION

All meters have been factory tested before shipment. For single stator meters, the full load test speed is 16-2/3 rpm, and the watthour constant is 0.6 per nominal 600-watt rating (constant of 7.2 for 30 amp, 240 volt meter). For two-stator meters, the full load test speed is 8-1/3 rpm, and the watthour constant is 1.2 per nominal 300-watt rating. For three-stator meters, the full load test speed is 8-1/3 rpm, and the watthour constant is 1.8 per nominal 300-watt rating.

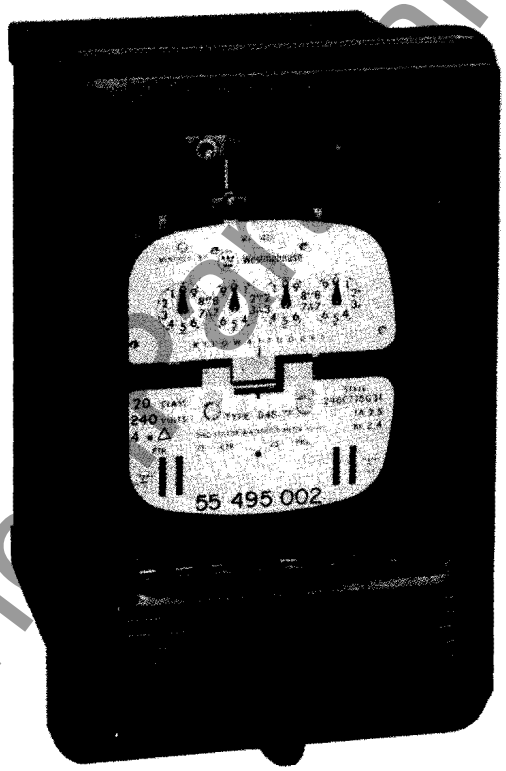
Full Load

Single stator sensitivity is approximately 1.3 percent per turn. Two- and three-stator sensitivity is approximately 1.2 percent per turn.

INSTALLATION - OPERATION - MAINTENANCE

INSTRUCTIONS

SWITCHBOARD WATTHOUR METERS IN FT-21 FLEXITEST CASE TYPES D4B-F, D4B-2F, D4B-3F, D4B-7F, D4B-8F



TYPE D4B-7F

Application Chart

Type	No. Stators	Circuit Application
D4B-F	1	1 Phase, 2 or 3 Wire
D4B-2F	2	1, 2 or 3 Phase, 3 Wire
D4B-3F	3	3 Phase, 4 Wire Wye
D4B-7F	2	3 Phase, 4 Wire Delta
D4B-8F	2 Split Coil	3 Phase, 4 Wire Wye

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.

NOVEMBER 1977
Supersedes I. L. 42-227 dtd August 1977

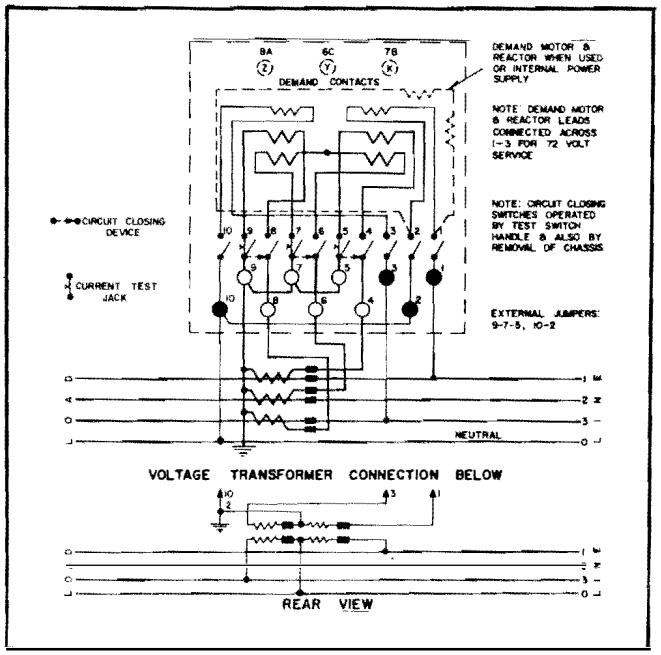


Fig. 13 - Type D4B-8F, 3- Phase, 4-Wire Wye

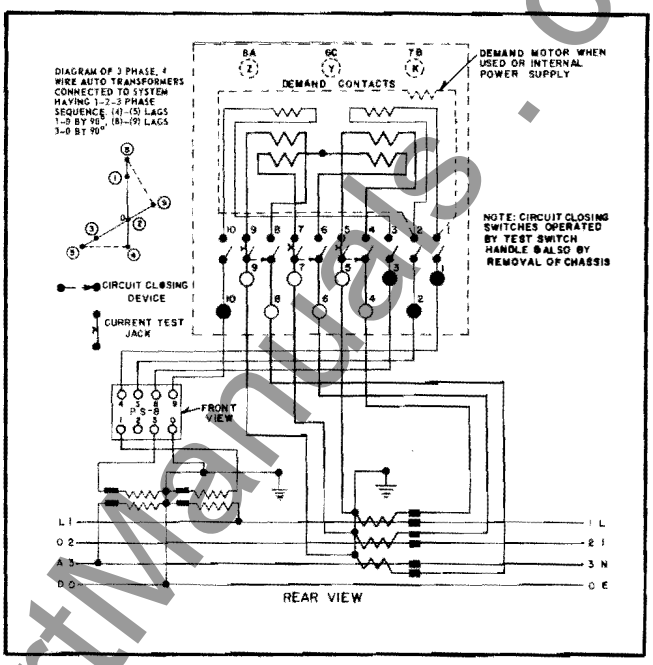


Fig. 14 - Type D4B-8F, 3-Phase, 4-Wire Wye with Phase-Shifting Transformer

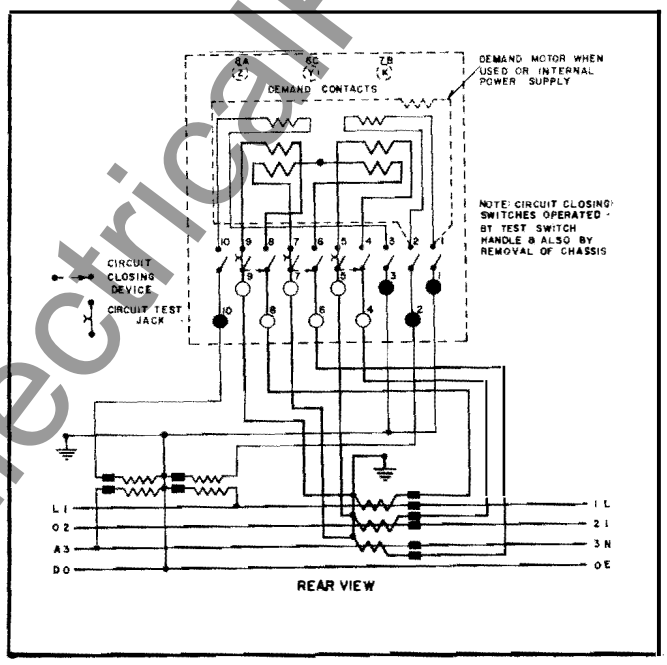


Fig. 15 - Type D4B-8F, 3-Phase, 4-Wire Wye, Q-Meter

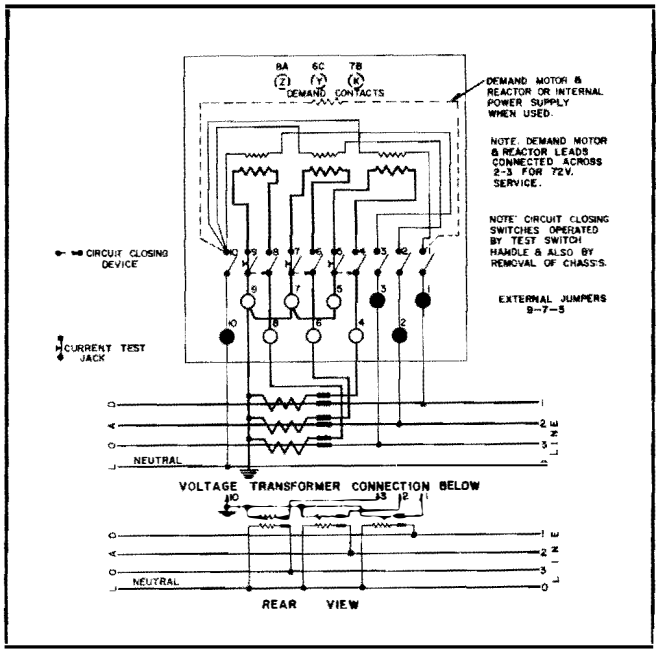


Fig. 9 - Type D4B-3F, 3-Phase, 4-Wire Wye

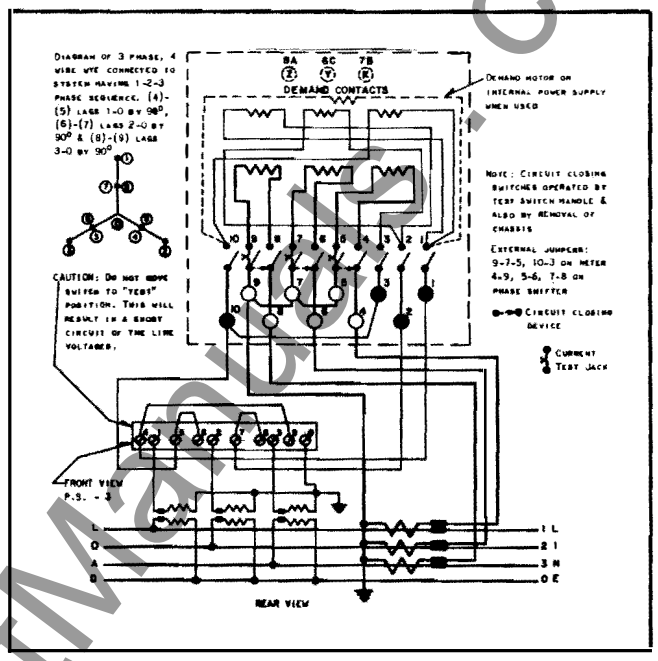


Fig. 10 - Type D4B-3F, 3-Phase, 4-Wire Wye with Phase-Shifting Transformer

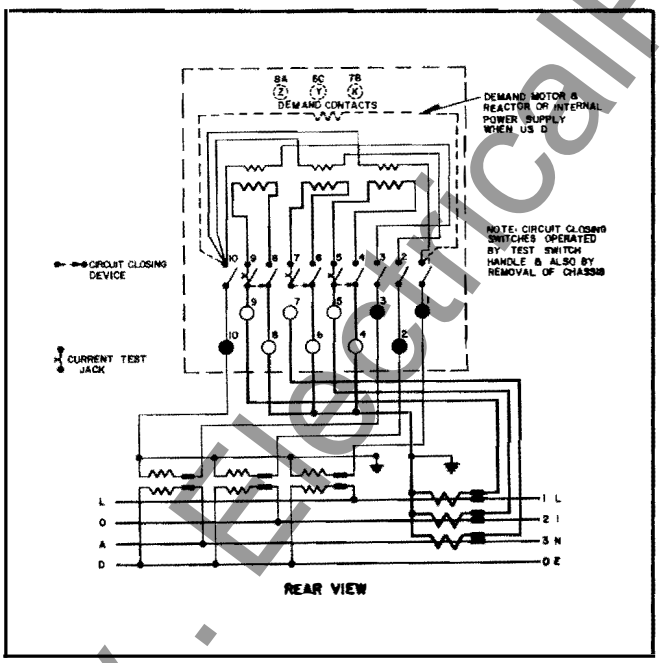


Fig. 11 - Type D4B-3F, 3-Phase, 4-Wire Wye, Q-Meter

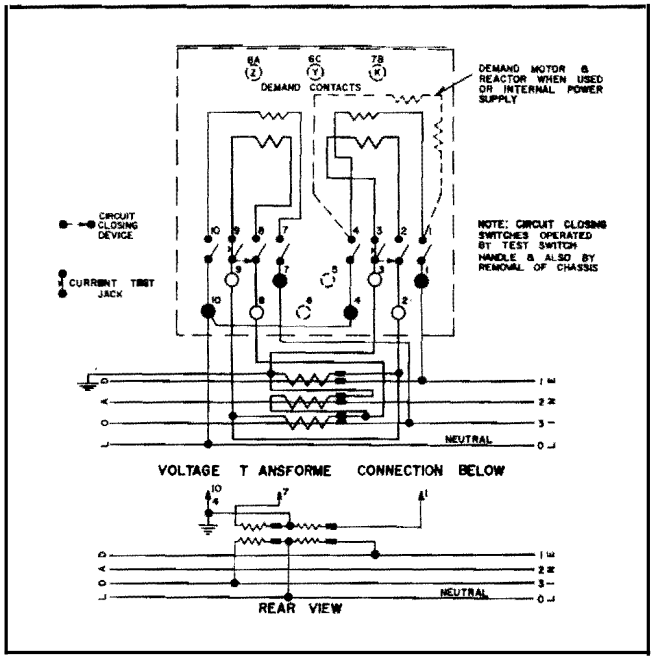


Fig. 12 - Type D4B-2F, 3-Phase, 4-Wire Wye with Current Transformers In Closed Delta

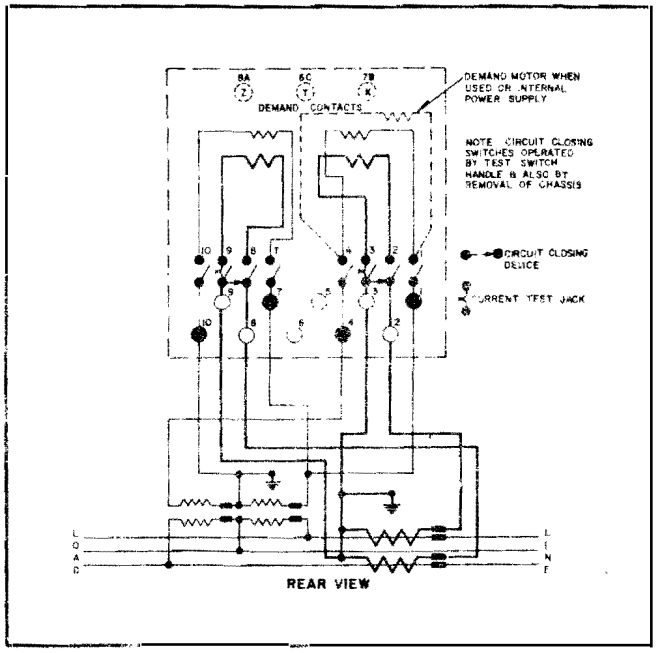


Fig. 5 - Type D4B-2F, 3-Phase, 3-Wire, Q Meter

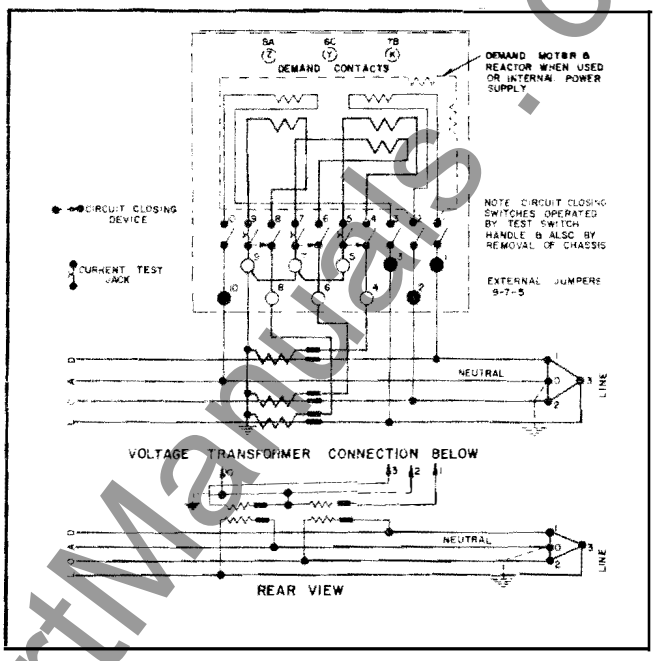


Fig. 6 - Type D4B-7F, 3-Phase, 4-Wire Delta

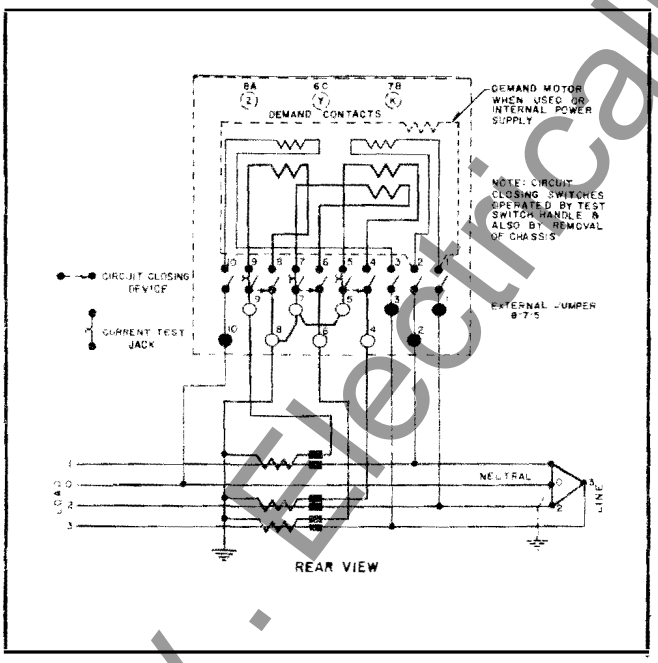


Fig. 7 - Type D4B-7F, 3-Phase, 4-Wire Delta, Q-Meter

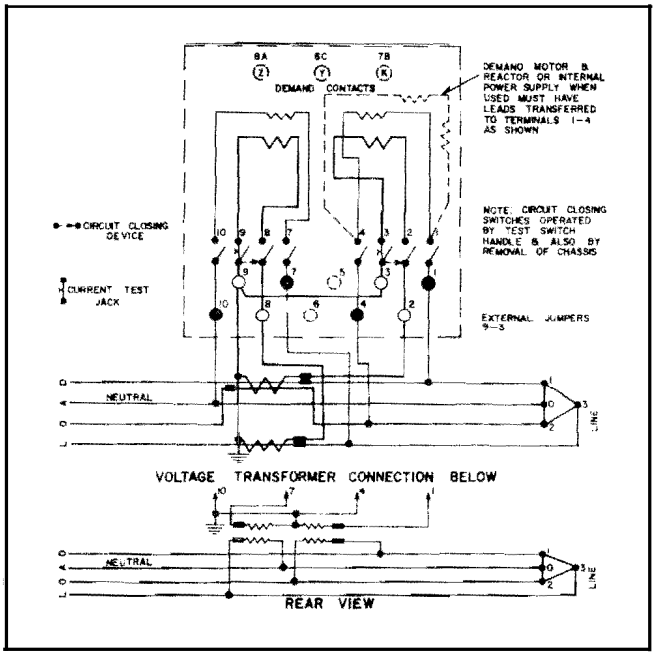


Fig. 8 - Type D4B-2F, 3-Phase, 4-Wire Delta with One 2-Wire and One 3-Wire CT

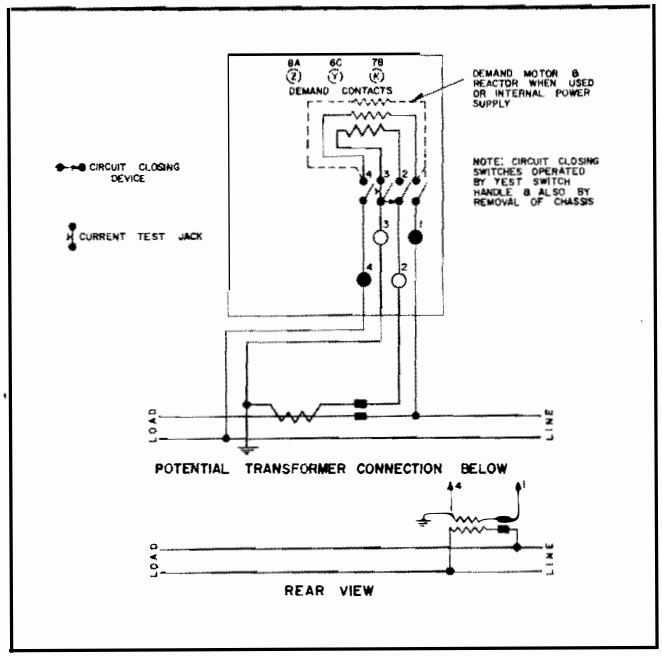


Fig. 1 - Type D4B-F, 1-Phase, 2-Wire

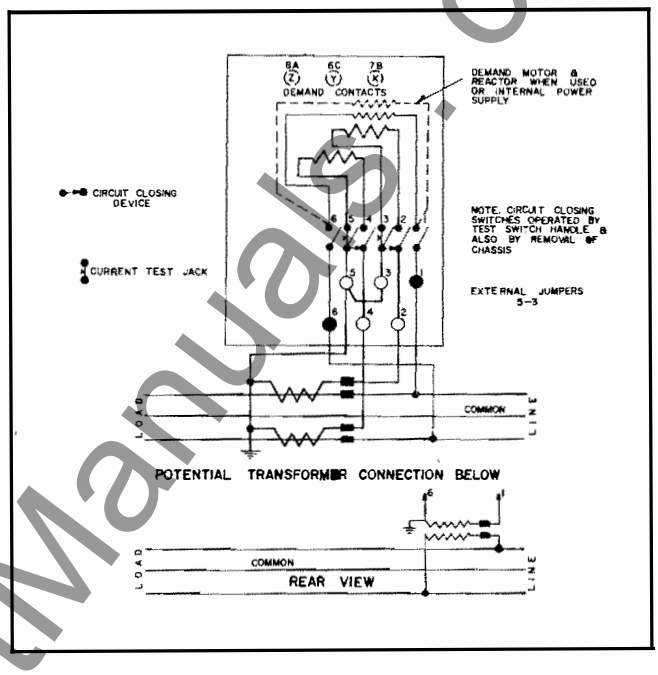


Fig. 2 - Type D4B-F, 1-Phase, 3-Wire

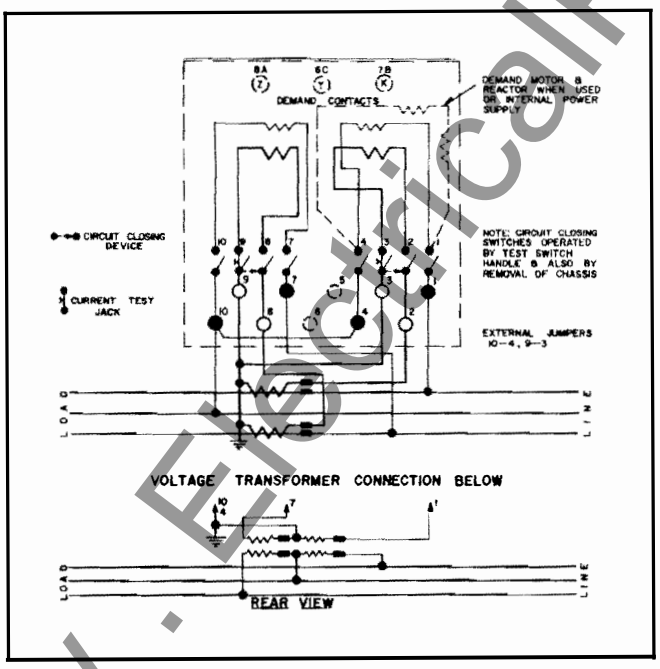


Fig. 3 - Type D4B-2F, 3-Phase, 3-Wire

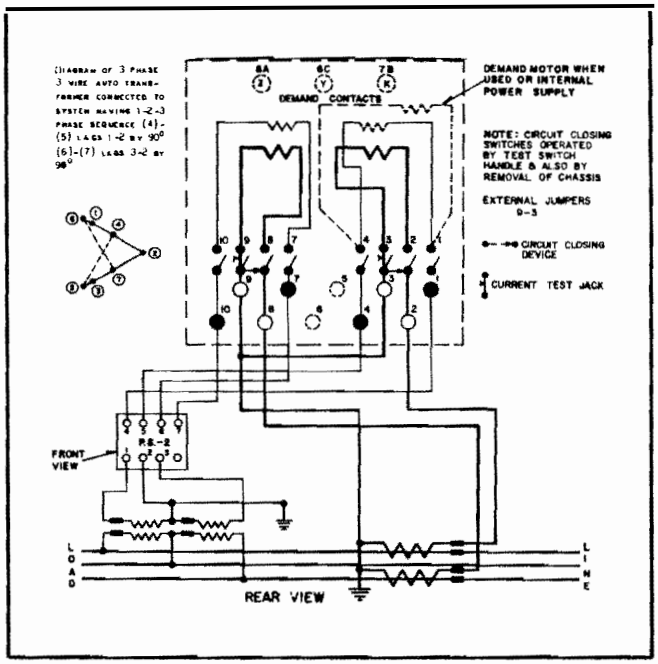
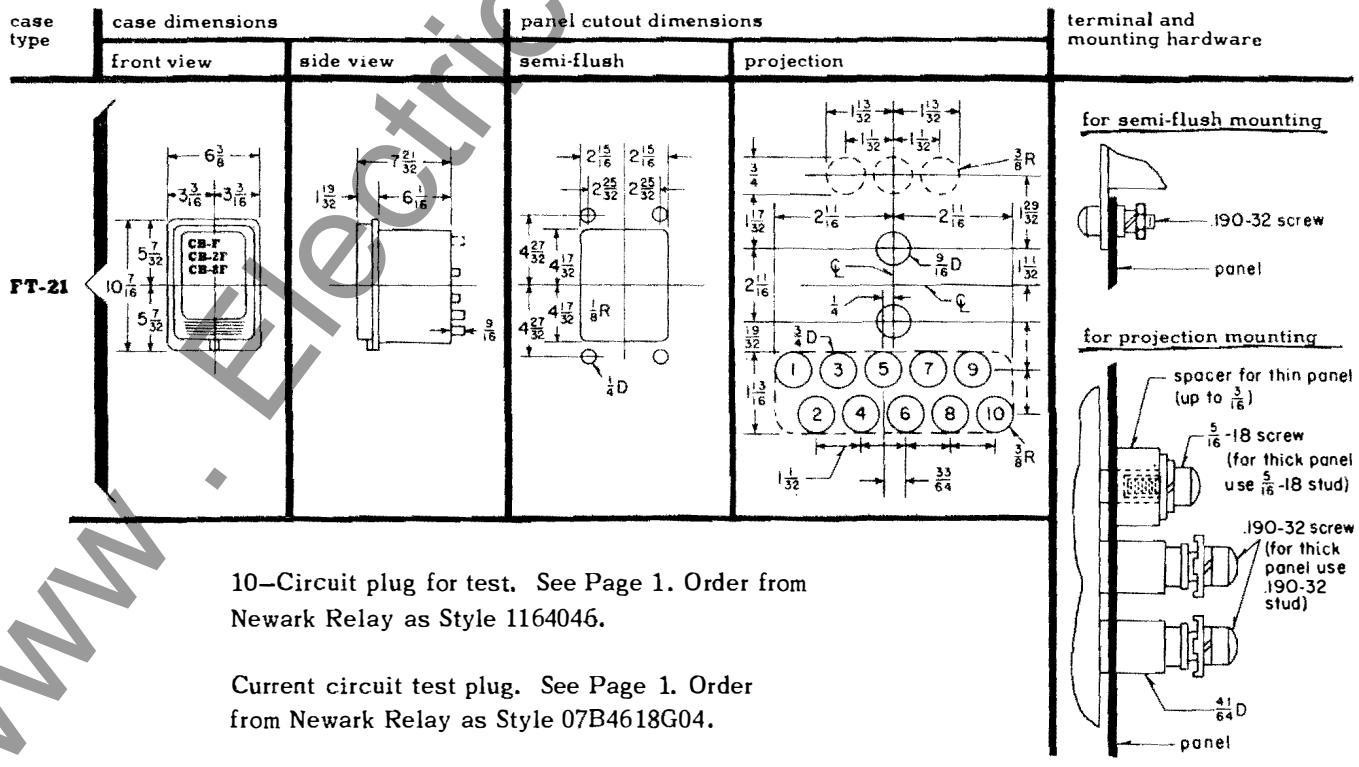


Fig. 4 - Type D4B-2F, 3-Phase, 3-Wire with Phase-Shifting Transformer

GENERAL DATA

Description	D4B-F 2.5 Amps. 120 Volt 2-Wire	D4B-2F 2.5 Amps. 120 Volt	D4B-3F 2.5 Amps. 120 Volt	D4B-7F 2.5 Amps. 240 Volt	D4B-8F 2.5 Amps. 120 Volt
Starting Watts	1.50	3.00	4.50	6.00	3.00
Test RPM at Meter Rating	16 2/3	8 1/3	8 1/3	8 1/3	11 1/9
Watthour Constant (kh)	0.30	1.20	1.80	2.40	1.80
Voltage Coil Circuit					
Volt-Amps.	7.40	6.40	6.40	6.40	6.40
Watts Loss per Element	0.96	0.95	0.95	0.95	0.95
Power Factor	0.13	0.14	0.14	0.14	0.14
Current Coil Circuits at 5 Amps.					
2-Wire Coil					
Watts Loss	0.30	0.30	0.30	0.30	0.30
Volt-Amps.	1.20	1.20	1.20	1.20	1.20
3-Wire Coil (Each Half)					
Watts Loss	.....	.....	.....	0.16	0.16
Volt-Amps	.....	.....	.....	0.65	0.65

Mounting of FT-21 Case



10–Circuit plug for test. See Page 1. Order from Newark Relay as Style 1164046.

Current circuit test plug. See Page 1. Order from Newark Relay as Style 07B4618G04.

Light Load

Single-stator sensitivity is approximately 0.8 percent per turn. Two-stator sensitivity is approximately 0.35 percent per turn. Three-stator sensitivity is approximately 0.25 percent per turn.

Power Factor

Power factor calibration is fixed factory adjusted and permanent for single-stator meters. For two- and three-stator meters, sensitivity is 0.5 percent per turn.

Phase Balance

For two- and three-stator meters, sensitivity is approximately 2.0 percent per turn but will vary with the adjuster position.

CALIBRATION PROCEDURE

Single-phase test speed for single-phase meters is 16 2/3 RPM (polyphase meters, 8 1/3 RPM except for -8 meters which is 11 1/9 RPM). All meters are tested on a single-phase power source with voltage coils connected in parallel. The following calibration procedures should be used.

Combined Stator Operation

Connect all current coils in series and observe full load and light load registration. Calibrate light load to full load. For example, if full load registration is 101.0 percent, calibrate light load to 101.0 percent.

INDIVIDUAL STATOR OPERATION

Two-Stator Meter

Energize the left-stator current coil, calibrate full load, unity power factor to 100 percent registration by turning the Full Load adjuster screw at the front of the meter. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the left stator adjuster bracket.

Energize the right stator. Calibrate full load unity power factor to 100 percent registration by turning the Phase Balance adjuster screw on the right stator adjuster bracket. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the right stator adjuster bracket.

Three-Stator Meter

Energize the rear-stator current coil, calibrate full load, unity power factor to 100 percent registration by turning the Full Load adjuster screw at the front of the meter. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the rear stator adjuster bracket from the right side.

Energize the remaining two stators one at a time. Calibrate full load unity power factor to 100 percent registration by turning the Phase Balance adjuster screw on the respective stator adjuster bracket. Calibrate full load, 50 percent lagging power factor to 100 percent registration by turning the Power Factor adjuster screw on the respective stator adjuster bracket.

NOTE:

Figure 10 shows a D4B-3F meter connected for reactive measurement on 3-phase, 4-wire wye in a 10-point flexitest case and with a standard PS-3 phase-shifting transformer. Although the standard PS-3 has a TEST RUN SWITCH, **it cannot be thrown to test as this will result in a short circuit on line voltage.** If testing is required, the meter should be tested as a standard KWH meter with PS-3 removed from circuit.

BEARING ADJUSTMENTS

1. Place the meter in the normal operating position.
2. Insert the upper and lower bearing with the set screws loose.
3. Move the lower bearing until the disk is slightly below center in the meter gap.
4. Tighten the lower set screw, raise the upper bearing to obtain 0.005 to 0.010 inch end play, and tighten the upper set screws.

ACCESSORIES

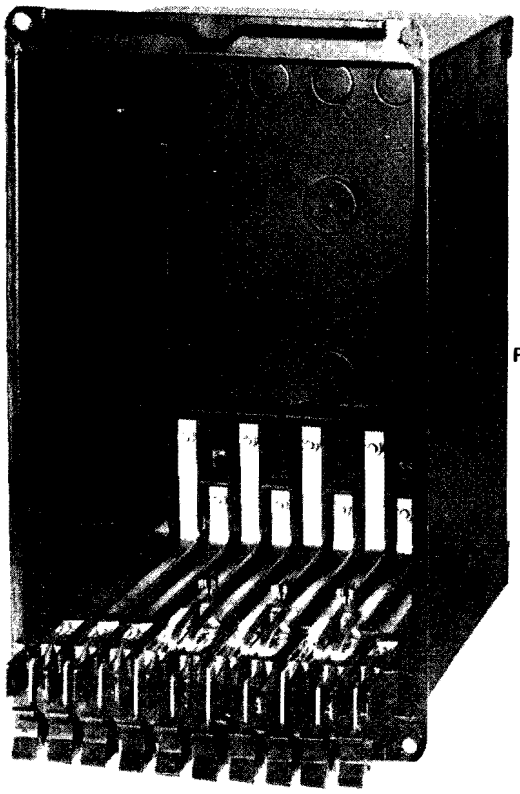
To install a Mark series demand register or a CD series contact device on a D-line polyphase meter, see instruction leaflets:

1. Mark Ia	42-302-11
2. Mark II	42-302.2
3. Mark III	42-302.3
4. CD-2, -3, -5, -6	42-950.3
5. CD-12 and CD1-12	42-559
6. CD-22 and CDI-22	42-570

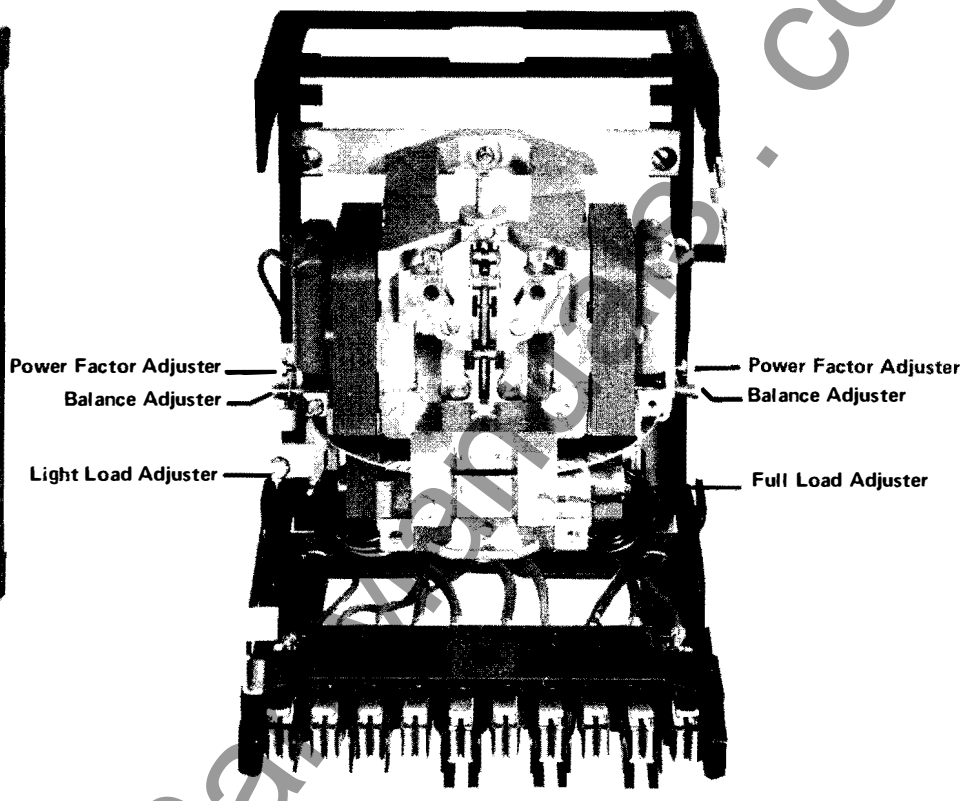
REPLACEMENT PARTS AND REPAIRS

Where facilities are limited or where only a small number of meters are used, it is recommended that the meter be returned to the factory for repairs. When returning a meter for repairs, obtain a Returned Material Tag from the District Office so as to avoid delay in identifying the shipment.

When ordering renewal parts, give the entire nameplate reading. Always give the name of the part wanted. Check Renewal Parts Data 42-227 for aid in identifying parts.



FT-21 Case



D4B-7F Chassis

GENERAL

The meter elements are mounted on a removable chassis, which is held in the case by two latches. All connections between the case and the chassis are made through the test switches. Automatic shorting switches are provided on all current circuits to prevent opening current transformers when testing or removing the chassis. For testing, leads can be clipped to the test lugs above the chassis jaws and on the switch blades.

Two test plugs are available to facilitate calibration of these meters. A 10-circuit plug is inserted into the chassis jaws and is provided with binding post terminals for connections to the test circuit. Current measurements are made by connecting ammeters to a current circuit test plug, which is then inserted into the current switch assembly, between the chassis and the case.

The hardware supplied with the meter permits semi-flush mounting on panels up to 3/16 inch thick. For projection mounting on panels thicker than 3/16 inch, special hardware is furnished upon request (specify panel thickness).

Provisions have been made on all FT-21 cases for convenient field installation of either 2- or 3-wire pulse initiators. Removal of three knockouts (located in the back of the case, near the top) will permit installation of an output terminal-block and pin assembly. A mating bracket and socket assembly is then attached to the meter frame and latch assembly. The output circuits will be closed by inserting the meter frame and latch assembly into the case. All necessary parts are available in kit form for each type of pulse initiator.

CALIBRATION

All meters have been factory tested before shipment. For single-stator meters, the full load test speed is 16 2/3 RPM, and the watthour constant is 0.6 per nominal 600-watt rating (constant of 7.2 for 30 amp., 240-volt meter). For two-stator meters, the full load test speed is 8 1/3 RPM, and the watthour constant is 1.2 per nominal 300-watt rating. For three-stator meters, the full load test speed is 8 1/3 RPM, and the watthour constant is 1.8 per nominal 300-watt rating.

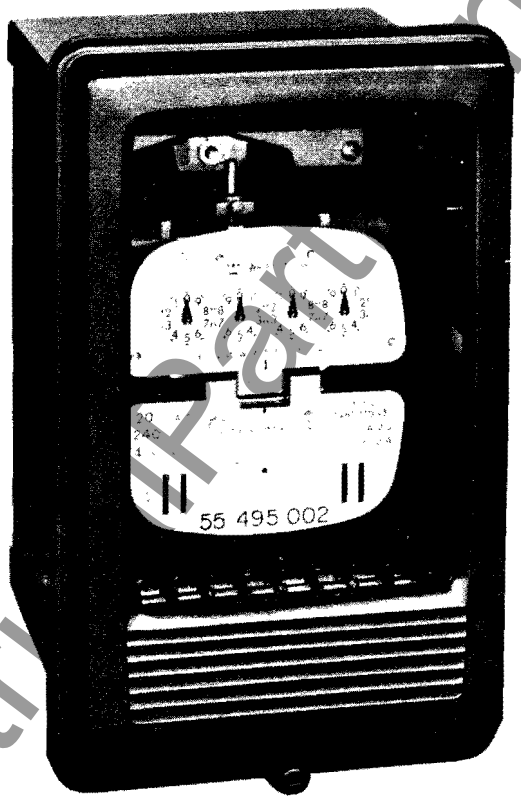
Full Load

Single-stator sensitivity is approximately 1.3 percent per turn. Two- and three-stator sensitivity is approximately 1.2 percent per turn.

INSTALLATION - OPERATION - MAINTENANCE

INSTRUCTIONS

SWITCHBOARD WATTHOUR METERS IN FT-21 FLEXITEST CASE TYPES D4B-F, D4B-2F, D4B-3F, D4B-7F, D4B-8F



TYPE D4B-7F

APPLICATION CHART

TYPE	NUMBER OF STATORS	CIRCUIT APPLICATION
D4B-F	1	1-Phase, 2 or 3-Wire
D4B-2F	2	1, 2, or 3-Phase 3-Wire
D4B-3F	3	3-Phase, 4-Wire Wye
D4B-7F	2	3-Phase, 4-Wire Delta
D4B-8F	2-Split Coil	3-Phase, 4-Wire Wye

NEW INFORMATION

EFFECTIVE JANUARY 1972