INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPES RW AND RW-2 DEMAND REGISTERS BLOCK INTERVAL TYPE

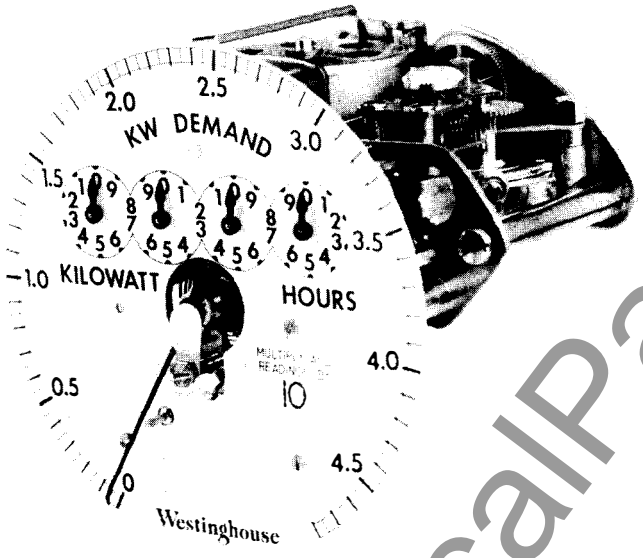

Fig. 1 – Type RW – Demand Register.

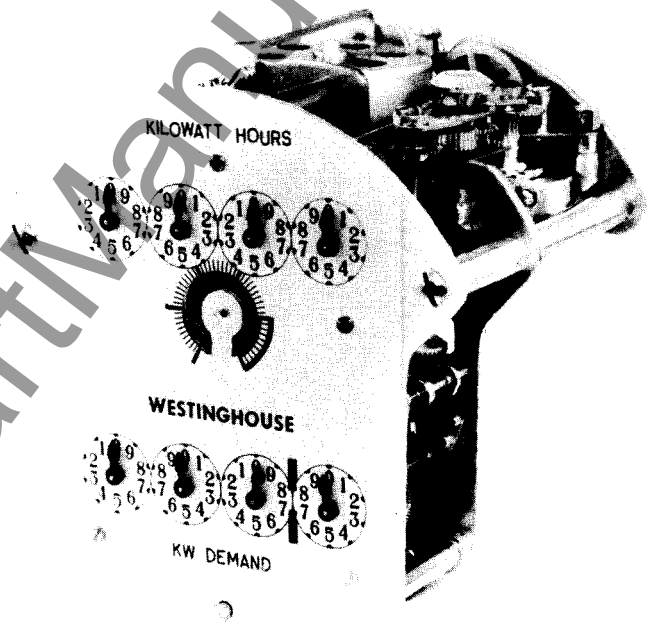

Fig. 2 – Type RW-2 – Demand Register.

INTRODUCTION

General

Types RW and RW-2 registers convert watt-hour meters to block interval demand meters. The RW register has an indicating maximum demand pointer which is returned to zero by means of a manually operated reset device in the special glass cover. The lower dials on the RW-2 register give accumulated value of previous maximum demands. The motor operated cumulative mechanism is started by operating a manual reset in the cover and the maximum demand for the preceding period is added to the previous demands. These registers will fit Westinghouse types OB, OC, CA, CS, and CB singlephase and corresponding polyphase meters.

This instruction leaflet is intended to supplement the usual watthour instructions in order to cover the installation and operating maintenance of the demand mechanism.

Rating and Dial Marking

The kw rating in demand (as marked on the small register name plate) is the same as that of the watt-

hour meter and its usual integrating register. This rating is based on 120 volts or multiples thereof, in conformance with MS-4.* Full load on the meter, continued for the demand period, will cause the maximum indicator to reach a reading equal to the rating. For singlephase self-contained meters, full scale equal to 333-1/3% of full load is normally provided.* For transformer type singlephase and all polyphase meters, full scale equal to 166-2/3% of full load is normally provided.* All registers are made in 15 or 30 min. interval types.

Universal Registers

In order to provide flexibility in application of registers to meters of any kw capacity, the "Universal" demand registers are recommended. These have the following ratings.*

0.6 kw – (Register Ratio – 3600)
1.2 kw – (Register Ratio – 1800)

When using universal registers, it must be kept in mind that a multiplier must be used in most cases. With self-contained meters just a register multiplier is used. When used with transformer type meters, the register multiplier must be multiplied by the transformer ratio to arrive at the final multiplier.

In all cases, the multiplier will apply to both kilowatthour readings as well as the KW demand readings.

The easiest way to determine the correct multiplier is to use the K_h of the meter that the register is to be applied to.

Find the meter K_h in the table below. The proper multiplier will be in the second or third column according to which RR is being used.

For example, if the K_h of the meter is 2 as in the case of a self-contained, 15 amp, 3 wire, single phase meter, the multiplier would be 3 of the universal register used had a RR of 1800.

If the K_h of a meter were 1 as in the case of a 3 element, 5 amp, 120 volt meter used with current transformer, the multiplier would be 1-1/2 for a register with RR 1800. This 1-1/2 would be multiplied by the transformer ratios used to determine the final multiplier.

The full scale capacity of the .6 kw Universal is 333-1/3% and that of the 1.2 kw Universal is 166-2/3%.

Multiplier When Used On
C Line Meters 30 rpm.

Meter K_h	Register with RR of 1800	Register with RR of 3600
1/3	1/2	1
1/2	3/4	1-1/2
2/3	1	2
1	1-1/2	3
1- 1/3	2	4
2	3	6
3	4-1/2	9
3- 1/3	5	10
4	6	12
6	9	18
6 - 2/3	10	20
10	15	30
13-1/3	20	40
20	30	60

Multiplier When Used On
D Line Single Phase Meters

Meter Kh *	Register with RR of 1800	Register with RR of 3600
1/3	1/2	1
2/3	1	2
2	3	6
4	6	12
8	12	24

* Based on 15 rpm.

Footnote
* Demand registers were formerly rated on a 100 volt basis. On this basis the full scale equals 200% or 400% of the full load rating.

Multiplier When Used On

D Line Polyphase Meters 16 2/3 rpm

Meter Kh	Register with RR of 1800*	Register with RR of 3600*
.6	1	2
.9	1½	3
1.2	2	4
1.8	3	6
2.4	4	8
3.6	6	12
5.4	9	18
7.2	12	24
10.8	18	36
14.4	24	48
28.8	48	96

*Multipliers listed are for the 15 rpm adapter

INSTALLATION

The installation of meters complete with registers is no different from existing practice on watthour meters. Care should be taken to have the meters approximately level.

Installing Registers in Meters

Suggested order of Procedure.

1. Unpack the register with care.
2. Inspect the register as follows:

a. Check the small nameplate on the top of register to insure that the register is correct for the meter.

b. Check all shaft assemblies for proper end play and gear mesh.

c. If it is desired to check the calibration, proceed as outlined in the "Maintenance and Adjustments" section below.

3. Remove integrating register and attach leads to meter potential terminals. (120 volt meters only)

4. Registers are supplied with 120 or 240 volt motors depending on the meter rating. For 240 volt meters a 240 volt reactance coil is connected in series with a 240 volt motor.

Wiring drawings for the installation of reactance coils for all types of Westinghouse meters are given in I.L. 42-300.

5. Install in place of previous register. The register is exactly interchangeable with the ordinary integrating register and no changes are necessary in the meter proper. For RW-2 registers mount supporting bracket as shown in the appropriate diagram of Fig. 5 to Fig. 12.

6. Complete connections to the terminal block. As the motor is inherently shielded, reverse connections have no effect on the meter calibration.

7. Apply rated voltage and see that motor functions correctly.

8. Recheck complete meter on full load and light load. A slight light load adjustment will be necessary to compensate for the extra friction load of the mechanism. While this adjustment is being made the maximum demand pointer (RW) or the test dial indicator (RW-2) should be up scale so that it is not being driven when calibrating the meter. This corresponds to actual operating conditions as it is very unlikely that maximum demand will occur when the meter is operating at very low loads.

9. Give meter standard ground test.

10. Apply demand type cover. For RW registers cut off the reset wire to the proper length. Make sure that when reset is in the locked position the pointer can move freely from zero to full scale.

11. Install complete meter in service as usual for watthour meters, being careful to have it approximately level.

ADJUSTMENTS AND MAINTENANCE

General

All RW and RW-2 demand registers should be given a periodic cleaning and lubrication. The frequency of the servicing varies according to the con-

ditions to which the device is subjected.

It is not possible to specify in a general instruction leaflet any rigid rules to govern time intervals between servicing or inspection. The conditions in applications are so variable that dependence must be placed upon the experience and judgment of the local operators. Some operating companies consider that the registers should be serviced every five years, or more frequently if installed where subject to high temperatures or unusual environments.

The register mechanism should be removed from the meter, and the motor and interval assembly disassembled from the register. Each component should be cleaned with a good grade of clock cleaning fluid. On older style registers where the billiard cloth type of clutch was used, care must be taken not to get it wet. The complete clutch shaft should be removed. All parts should be dried thoroughly after cleaning.

In replacing interval gearing assembly pay particular attention to the assembly of the interval shaft and make sure the zero mark on the gear is opposite the arrow point in the top plate when the point of the cam is in contact with the pawl. See small views in Fig. 3 and Fig. 4 .

Lubrication

With the exception of the motor, all of the moving parts on these registers operate at very low speeds and with practically no mechanical load. They therefore, require very little lubrication.

The motor bearings are lubricated at the factory. Experience has shown that under normal indoor temperate conditions there is sufficient oil to last at least five years. Under normal average outdoor conditions* it is recommended that the motors be checked and reoiled approximately every five years or at the time as the register is serviced. In dismantling and reoiling motor the following procedure is recommended.

1. Remove cover from motor assembly. Use a sharp gas flame or a soldering iron to soften yellow lacquer on screw heads. Remove screws while hot.

2. Remove motor gear train.

Footnote

*Local conditions may vary so that this period may be either longer or shorter. No rigid rules can be given and local experience must govern.

3. Clean shellac and oil from frame. Do not get cleaning fluid in rotor shaft and bearing assembly.

4. Dismantle motor gear train.

5. Clean shaft assemblies and plates with a good clock cleaning fluid.

6. In reassembling gearing be certain to replace the washer on the #21 (Fig. 3 or 4) shafts which do not have gear hubs. A hub is used in early design motors. If shaft has neither hub nor washer add new washer S#1009316.

7. Apply thin coat of shellac P.D. #1154-5 around the matching surfaces of both motor frame and cover. Be sure to apply the shellac on all surfaces around the holes. Allow shellac to dry a few minutes before assembly.

8. Put cover on frame and tighten all screws. Seal screw heads and the joint between cover and case with lacquer P.D. #7241 using artist brush.

9. After allowing shellac to dry from 12 to 15 hours add 1-1/3 c.c. of oil S#1723639 through breather hole. A combination oil gauge and filler S#1340461 is recommended for adding oil to the gear case.

10. After adding oil, remove any excess that may adhere to inside of breather hole by cleaning same with a good grade of pipe cleaner. Cut cleaner in short pieces and remove fuzz by rubbing with hand. Change cleaners often to do satisfactory job.

11. Apply anti-creep fluid P.D. #9289-1 around the top of the #24 shaft, to the inside of the breather hole, and on the casting adjacent to the hole.

12. Re-date motor whenever it is reoiled.

In addition to the motor only those points marked (x) in Fig. 3 or Fig. 4 are to be lubricated. A trace of oils #1723 639 should be applied to these points whenever the registers are given a periodic cleaning or overhauling.

CAUTION – Only a trace of lubricant should be applied to these parts and care should be taken to prevent getting any lubricant on the clutch drum surface.

ADJUSTMENTS AND CALIBRATION
TYPE RW

1. Clutch Adjustment. The clutch trip arm should be adjusted to engage with the cam arm so that the

clutch is disengaged from 2-1/2 to 3-1/2 seconds time. The position of the screw on the trip arm is changed to regulate this. The adjustment should be made so that from 2-1/2 to 3-1/2 seconds pass between the time the pusher pointer drops back to zero and the clutch disc on the #11 shaft moves forward.

The clutch is adjusted to have a tension of 8 to 17 cmg., and should require no further attention. However, it may be checked by the use of torque tester S#1001442 as illustrated in I.L. 42-315.1.

2. Demand Pointer Adjustment — To set the demand pointer on zero loosen the set screw and turn the adjusting screw so that the pusher pointer allows the demand pointer to come to zero when reset by hand.

The demand pointer friction should be from 2-1/2 to 3 1/2 cmg. It is changed by adjusting the spring tension screw on the front of the register. The use of torque testers S#930660 or S#1001442 as illustrated in I.L. 42-315.1 is recommended in checking this friction.

The tension of the spring which returns the pusher pointer to zero is not critical and requires no adjustment.

3. Calibration — The first step in the calibration should be to check the synchronism of the motor. Observe the rotor in the light of a neon glow lamp or equivalent operated from the same cirucit as the motor. When in synchronism the rotor will appear to stand still.

The best way to check the calibration is by means of some constant speed device such as S#1098422 as shown in I.L. 42-315.1. On this device the register can be driven at a rate equivalent to motor speeds of 25, 50, and 100 rpm. If a constant speed device is not available mount the register on a meter and carefully control the meter load.

Before beginning the calibration check, adjust zero as per above. Then set the demand pointer just below the constant load applied. It is best to check the register at both the half scale and full scale points. Disc shaft speeds of 25 and 50 rpm will give, half and full scale deflections for the class 1 registers. Disc shaft speeds of 50 and 100 rpm will give the corresponding deflection for the class 2 registers.

If it is not possible to carefully control the meter speed a check may be made by counting the disc revolutions and noting the advancement of the pointer during the time the revolutions were counted.

The integrating train is checked in the usual way for standard watthour registers.

ADJUSTMENTS AND CALIBRATION TYPE RW-2

1. Clutch Adjustments — The clutch trip arm should be adjusted to engage with the cam arm so that the clutch is disengaged from 2-1/2 to 3-1/2 seconds time. The position of the screw on the trip arm is changed to regulate this. Adjustment should be made so that from 2-1/2 to 3-1/2 seconds pass between the time the pusher pointer drops back to zero and the clutch disc on the #11 shaft moves forward.

The clutch is adjusted to have a tension of 8 to 17 cmg., and should require no further attention. However, it may be checked by the use of torque tester S#1001442 as illustrated in I.L. 42-315.1

2. Zero Adjustment — The zero adjuster for the pusher finger on the #11 shaft (See Fig. 4) is the pin and locking screw on the post to which the #11 shaft spring is attached. To make this adjustment loosen the locking screw and push the pin upwards. Run the pusher finger up scale by rotating the #3 shaft and then accumulate the demand. Voltage must be applied to the motor to do this. After the latch mechanism has tripped out tighten the locking screw.

In older type registers the zero adjuster is a set screw with locking nut. Care must be taken in making this adjustment so that the arm on the #11A shaft can trip out the latch.

3. Friction Adjustment — The friction brake on the #30 shaft which holds the #11A, #35, #30 and #32A shafts in position while not being advanced should be adjusted to a tension of 3 to 4 cmg. This adjustment is made from the rear of the register by turning the screw to increase the spring tension. Torque tester S#1001442 as illustrated in I.L. 42-315.1 is recommended for measuring this friction.

4. Miscellaneous Adjustments — The adjusting screw mounted on the lower post back of the dial controls the mesh of the long pinion and the matched gears on the #32 shaft. The adjusting screw in the

arm on the #39 shaft regulates the mesh of the pinion and the crown gear. These adjustments should require no attention in the field.

The retaining latch on the #39 shaft that engages with the gear on the #31 shaft for holding the #31, #32, #33 and #34 shafts in position while not being driven needs no adjustment. The demand pointers on the KW demand gear train should not be set on zero or moved without first releasing the latch holding the #31 shaft gear.

Some older registers have a holding latch on the #38 shaft engaging with a gear on the #32 shaft. This latch needs no adjustment. Other older registers have a holding spring on the #31 shaft which should be adjusted from 1/2 to 1-1/2 cmg's.

5. Calibration — The first step in the calibration should be to check the synchronism of the motor. Observe the rotor in the light of a neon glow lamp or equivalent operated from the same circuit as the motor. When in synchronism the rotor will appear to stand still.

The best way to check the calibration is by means of some constant speed device such as S#1098422 as shown in I.L. 42-315.1. On this device the register can be driven at a rate equivalent to meter speeds of 25, 50 and 100 rpm. If a constant speed device is not available mount the register on a meter and carefully control the meter load.

Push test dial indicator up scale by hand and then operate the cumulative mechanism. Note the reading of the demand dials and then allow register to operate at half scale speed. This will be 25 rpm or 50 rpm for the class 1 and class 2 registers respectively. Operate the cumulative mechanism again and note the demand dial readings. Repeat at full scale which will require disc speeds of 50 rpm and 100 rpm for the class 1 and class 2 registers respectively.

The integrating train is checked in the usual way for standard watthour registers.

PRINCIPLE OF OPERATION – TYPE RW

The type RW demand register operates on the integrated demand or block interval principle, in which the energy used is integrated over definite intervals of time, such as 15 minutes, 30 minutes, etc., as desired.

Fig. 3 is representation of the principle parts of the mechanism.

The register consists of three distinct units.

1. The motor unit consisting of a 600 rpm (60 cycle) synchronous motor operating on the hysteresis principle and a gear train. The motor drives through an oil immersed speed reduction gear train with a one rpm output shaft.

2. The interval gear train. This train includes the tripping cam which releases the clutch at the end of the interval. It also includes a disengaging knob which makes it possible to manually advance the interval to the tripping time. This is accomplished by pushing down and forward on the knob, so as to rotate it in a counter clockwise direction, until the interval shaft cam and pawl point are in contact. From this point the knob must be released and the actual tripping power be supplied by the motor.

3. The register mechanism proper, including the framework and gear train operated from the meter disc.

Referring to diagram Fig. 3 it is seen that the watthour meter advances the kilowatt hour dials through shafts #3, #4, #5 and #13. The pusher finger (shaft #11) is advanced by the motion of the meter disc through shafts #3, #4, #5A, #13A, #10 and the clutch on the #11 shaft. At the end of the time interval the clutch is released and the spiral spring returns the pusher finger to zero. The indicating pointer is held at the maximum demand point by the felt brake on the front of the register.

The time interval is determined as follows:

The one rpm shaft (#24) meshes with the interval gear train (shafts 25 and 26) which drives the interval shaft. The latter is designed so that the cam makes 12 revolutions to each revolution of the disc on which the pawls (cam arms) are mounted. As the point of the cam arm coincides with the point of the cam it rises and operates the clutch tripping arm allowing the pusher pointer to return to zero. The top gear on the interval shaft is marked to indicate the time remaining in the interval.

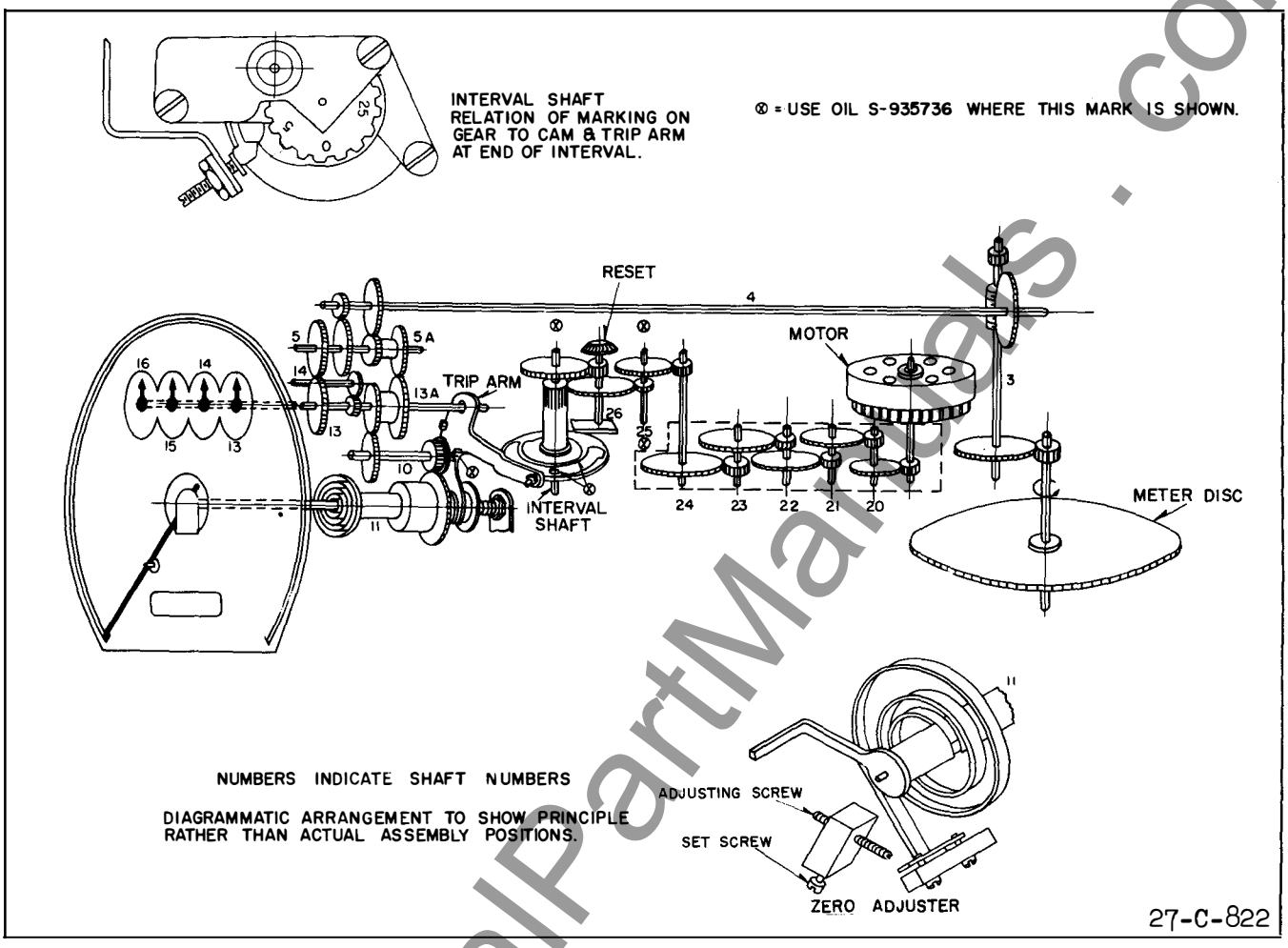

Fig. 3 – Type RW Register – Perspective View of Mechanism.

The indicating pointer is returned to zero by means of a manually operated reset in the glass cover.

PRINCIPLE OF OPERATION TYPE RW-2

The RW-2 demand register is basically the same as the RW register, differing only in the method of registering the maximum demand. The motor and interval unit are identical with those of a type RW.

Instead of a pusher finger advancing an indicating pointer the RW-2 mechanism advances a gear train a definite number of revolutions. Upon operation of the reset button these gears are returned to their starting point at the same time actuating a separate train of dials registering the demand.

Fig. 4 is a representation of the principle parts of the mechanism. It is seen that the watthour meter advances the kilowatt hour dials through shafts #3, #4, #5 and #13. The meter also drives the pusher finger on the #11 shaft through shafts #3, #4, #5A, #13A, #10 and the clutch on #11 shaft. The pusher finger on the #11 shaft engages with the arm on the #11A shaft which advances the gears on shaft assemblies #11A, #30, #35, and #32A equivalent to the maximum demand for that interval. At the end of the time interval the motor operates the trip arm which opens the clutch and the spring on the #11 shaft returns the pusher arm to zero while the #11A, #30, #35 and #32A shafts are retained at their advanced positions by the holding spring against the #30 shaft. These shafts are advanced further during succeeding intervals only if the kilowatt demand exceeds that of previous interval.

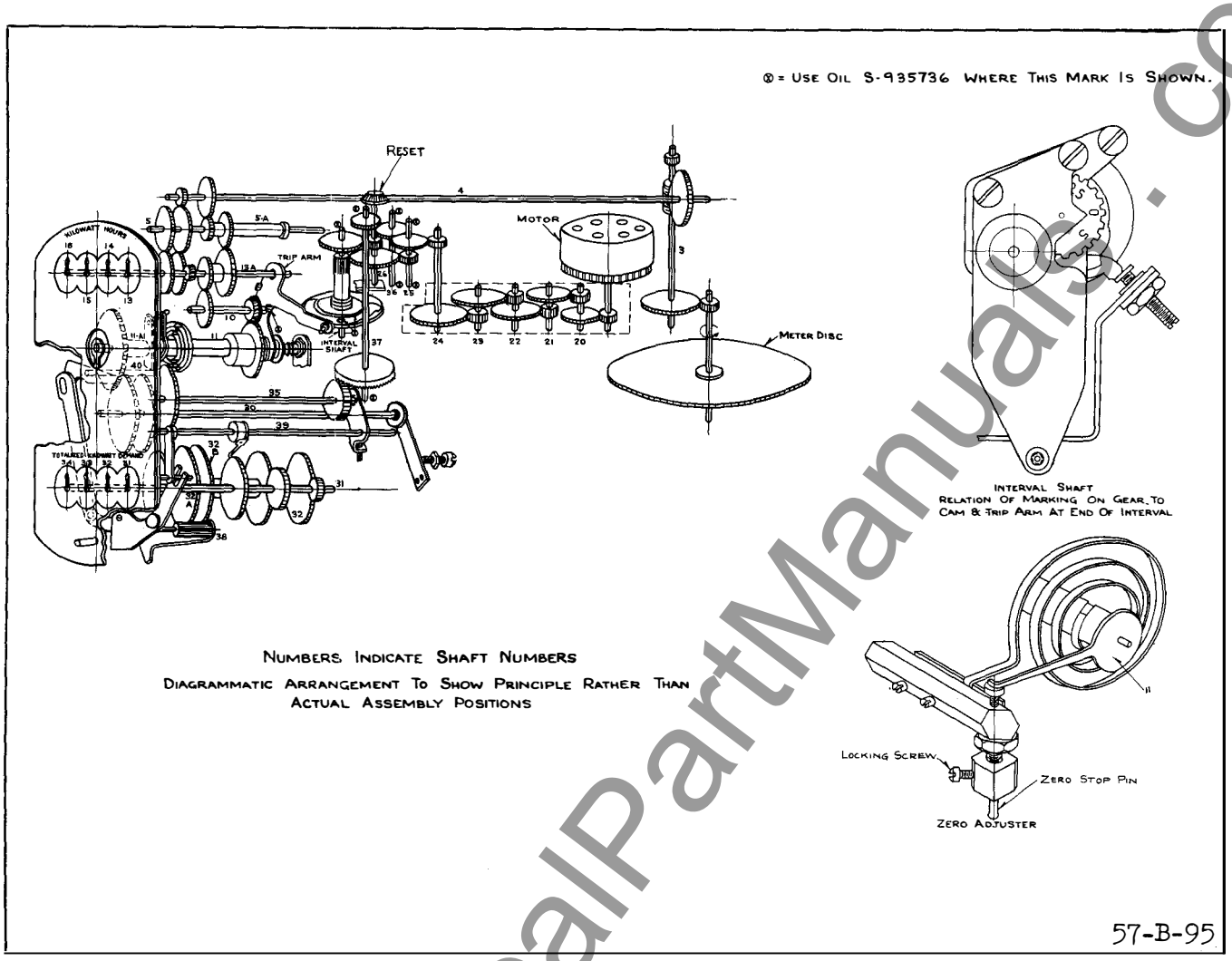

Fig. 4 – Type RW-2 Register – Perspective View of Mechanism.

To obtain the maximum kilowatt demand reading for a demand period, the button extending through the front plate of the register is pushed inward and then released. This causes the following sequence of actions.

1. The long pinion attached to the #38 shaft engages the #32A and #32B shafts as the button is pressed in.

2. The retaining arm extending to the left side of the register is secured under the latch on the #40 shaft.

3. When the button is released, the arm on the #39 shaft causes the pinion on the #35 shaft to engage with the crown gear on the #37 shaft which is being driven constantly by the timing motor. The retaining latch on the #39 shaft is also disengaged from the gear on the #31 shaft.

4. The motor now being geared to the maximum demand gear train (shafts #11A, #30, #35 and #32A) and to demand dials (shafts #32b, #31, #33 and #34) returns the maximum demand train to zero and advances the indicating pointers a like amount.

5. As the arm on the #11A shaft returns to zero it strikes the back end of the latch on the #40 shaft and releases the retaining arm.

6. The spring then disengages the #35 shaft from the #37 shaft, the pinion on the #38 shaft is disengaged from the #32A and #32B shafts, and the retaining latch is again engaged on the #31 shaft gear.

The difference in readings on the demand dials before and after the resetting operation gives the maximum kilowatt demand for the demand period.

REPLACEMENT PARTS AND REPAIRS

Where facilities are limited or where only a small number of meters are used, it is recommended that the meters 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 42-315 for aid in identifying parts.

OUTLINE DIMENSIONS

The outline dimensions of meters when equipped with RW or RW-2 demand registers are the same as those of corresponding non-demand meters except as to depth dimensions as follows:

TYPE	ELEMENT	CAPACITY IN AMPERES	RW-2 Depth over cover * in Inches	RW-2 Depth Overall in Inches	RW Depth over Cover* in Inches	RW Depth Overall in Inches
CS **	1	All	6 23/32	8 1/16	6 5/8	7 11/16
CS-2, -5 **	2	All	6 3/4	8 3/32	7 1/8	8 5/32
CS-7, -8, -10 **	2	2 1/2 to 15	6 3/4	8 3/32	7 1/8	8 5/32
CS-7, -8, -10 **	2	25 to 50	7 1/8	8 13/32	7 1/8	8 5/32
CS-3, etc. **	3	All	7 3/16	8 17/32	7 3/16	7 15/16
CA	1	All	7 9/32	8 1/2	7 5/32	7 29/32
CA-2, etc.	2	All	8 1/2	9 23/32	8 15/32	9 5/32
CA-5	Network	All	7 31/32	9 3/16	7 29/32	8 5/8
CA-3 etc.	3	All	7 3/8	8 19/32	7 5/8	8 3/8
CB (Projection)	1	All	9 5/16	9 5/16	9	9
CB-2, etc. (Projection)	2	All	9 5/16	9 5/16	9	9
CB-3, etc. (Projection)	3	All	9 5/16	9 5/16	9	9
CB-32 etc. (Projection)	4	All	9 5/16	9 5/16	9	9
OC	1	All	6 23/32	7 23/32	6 13/32	7 5/32
C-2, etc.	2	All	7 7/16	8 7/16	7 5/16	8 1/16
C-3, etc.	3	All	7 17/32	8 17/32	7 3/8	8 1/8
OB House	1	5 to 15	6 13/32	7 13/32	6 5/16	7 1/16
OB House	1	25 to 75	6 7/8	7 7/8	6 13/16	7 9/16
OB House	2	All	6 15/16	7 15/16	6 27/32	7 19/32
OB House	Network	All	6 21/32	7 21/32	6 9/16	7 5/16
OB House	3	All	6 7/8	7 7/8	6 29/32	7 21/32
OB Switchboard	1	All	6 15/32	7 15/32	6 1/4	7
OB Switchboard	2	All	6 21/32	7 21/32	6 3/4	7 1/2
OB Switchboard	3	All	6 3/4	7 3/4	5 13/16	6 9/16

* Depth from face of socket or back of meter base to front surface of cover exclusive of reset.

** Depth dimensions given from face of socket.

RW-2 REGISTER SUPPORT DETAILS

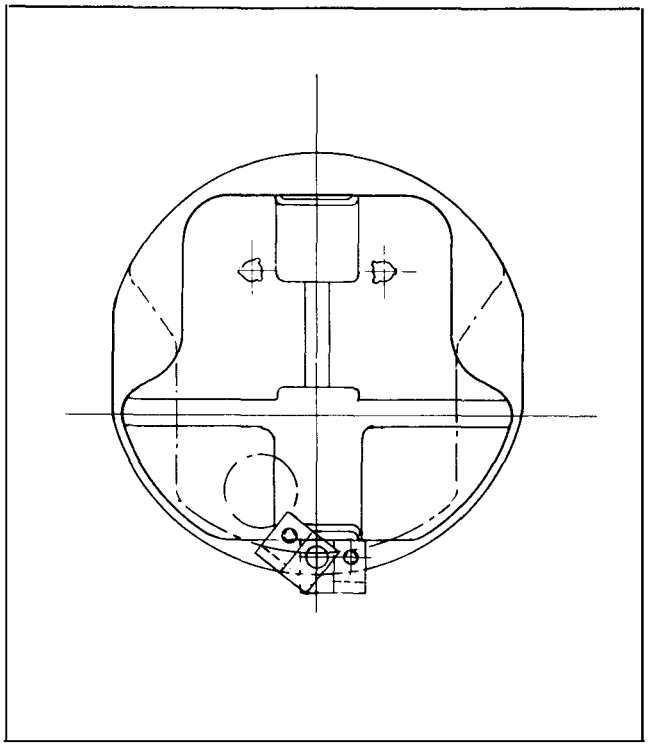

Fig. 5 – Position of Support for CA, CS and CB Singlephase Meters.

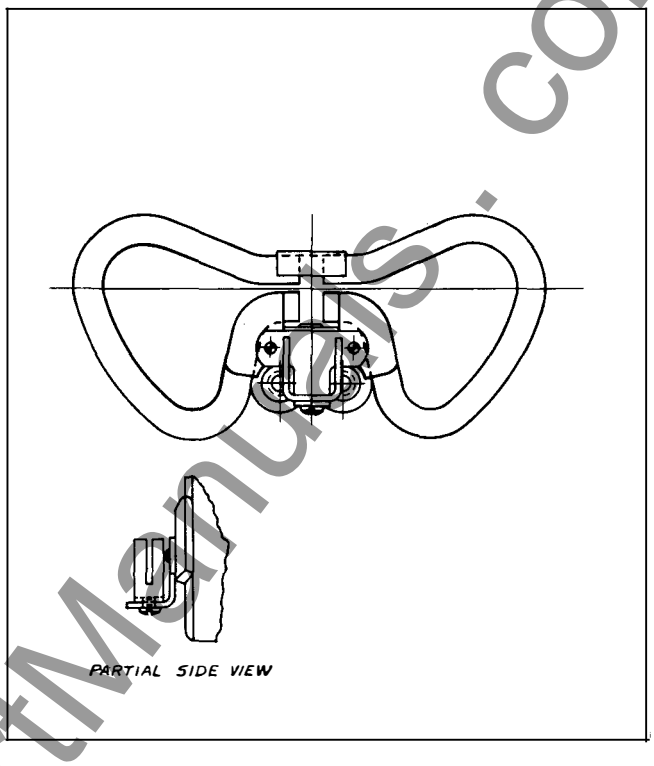

Fig. 6 – Position of Support for CA, CS and CB Polyphase, 2-3-4 Element Meters.

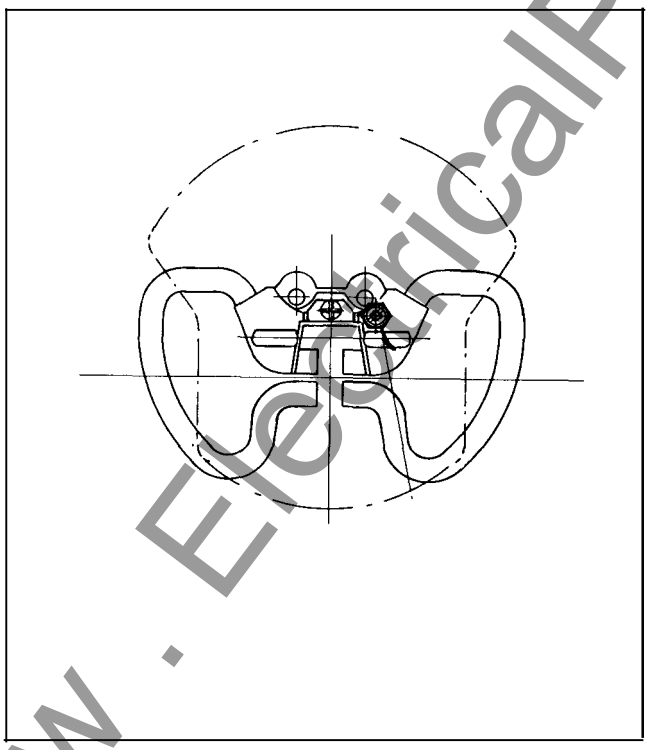

Fig. 7 – Position of Support for OC and OB Singlephase Meters.

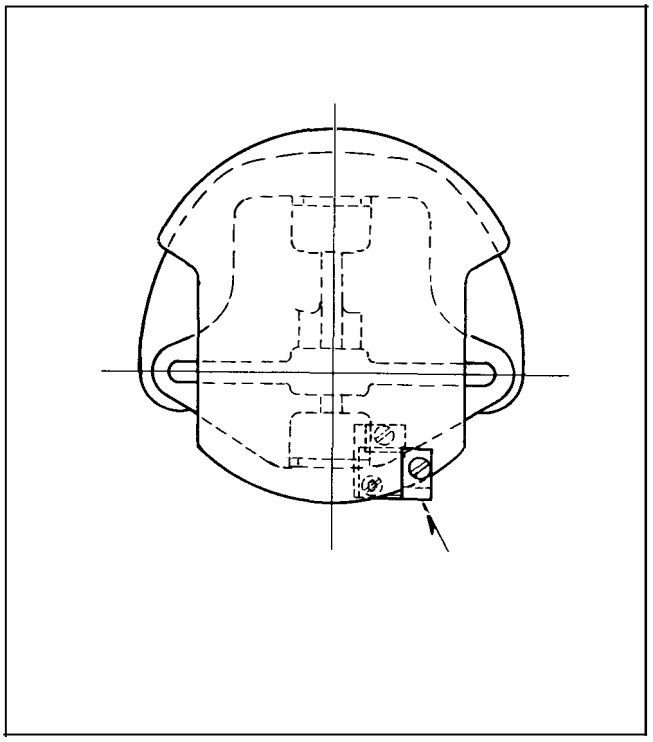

Fig. 8 – Position of Support for C-2 to C-10 and OB Polyphase, 2-3 Element Meters.

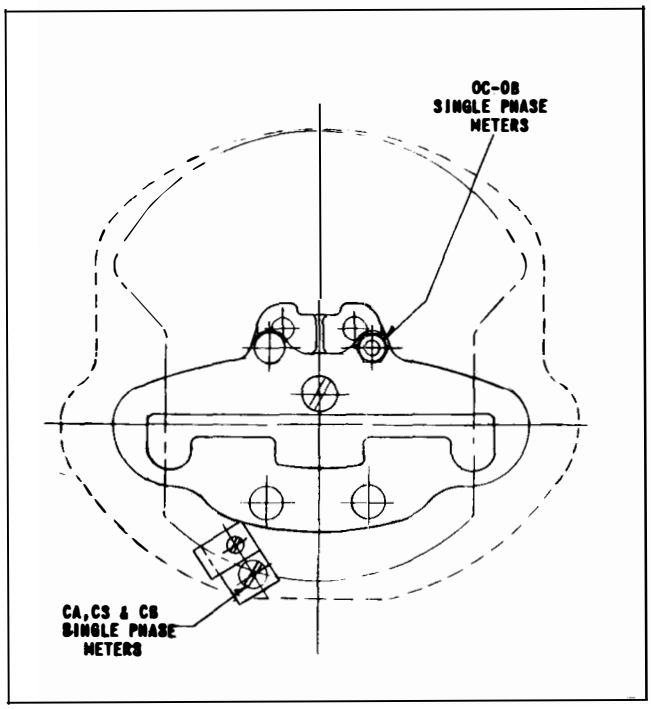

Fig. 9 – Position of Support for CA, CS, CB, OB and OC Singlephase Meters with ALNICO Permanent Magnets.

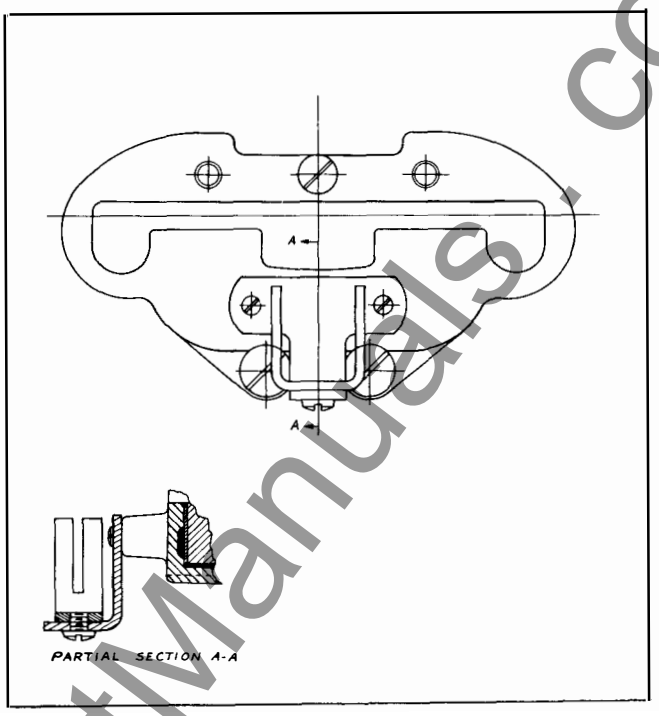

Fig. 10 – Position of Support for CA, CS, and CB Polyphase 2-3-4 elements meters with ALNICO Permanent Magnets.

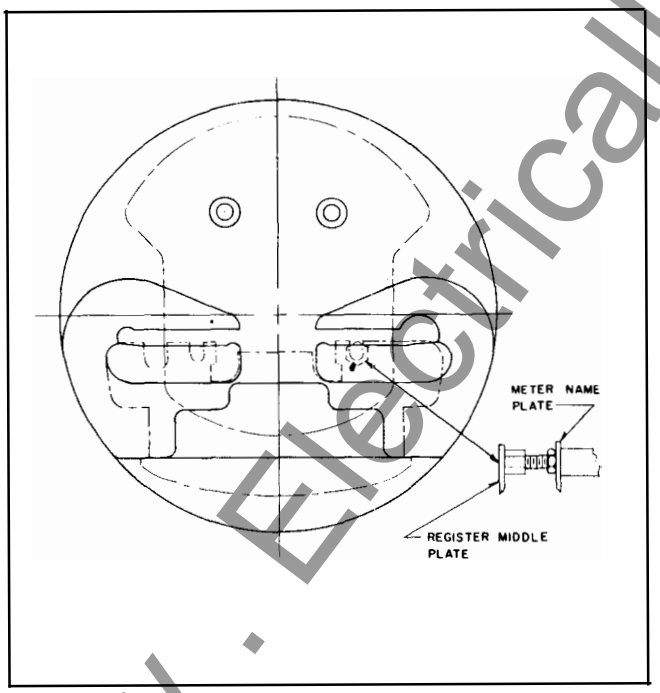

Fig. 11 – Position of Support for DS and DA Line of Meters.

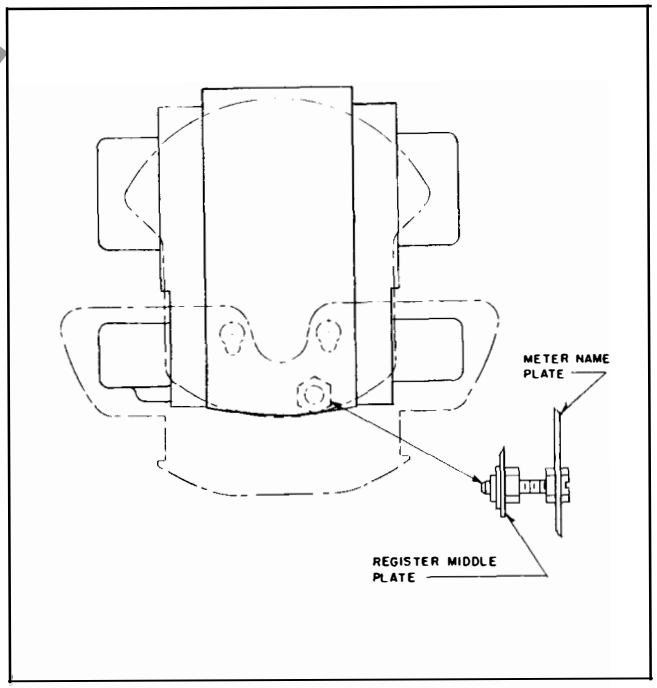

Fig. 12 – Position of Support for DSP and DAP Line of Meters.