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# **Model 10 Signals Equipped With 3590 Series Gate Mechanism**

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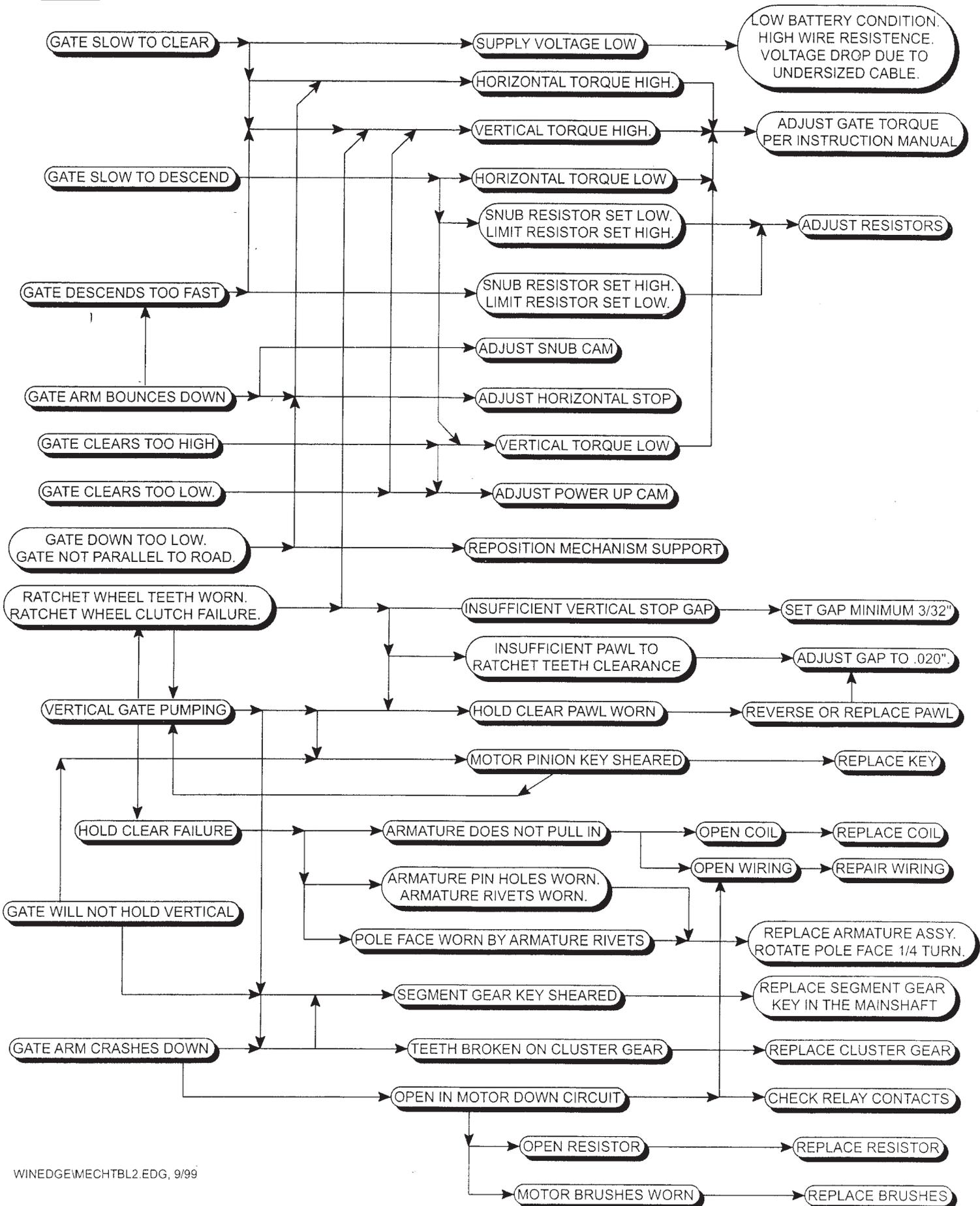
Service and installation  
manual



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# 3590 SERIES GATE MECHANISM TROUBLE SHOOTING GUIDE



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## **INTRODUCTION**

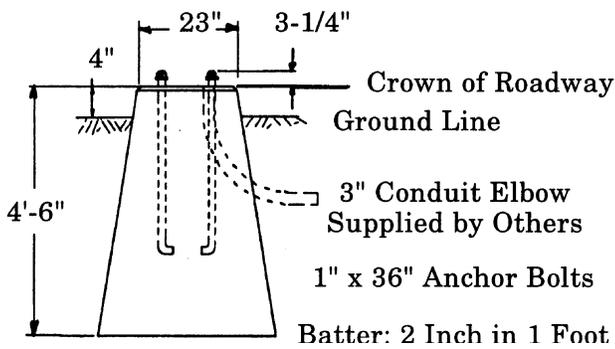
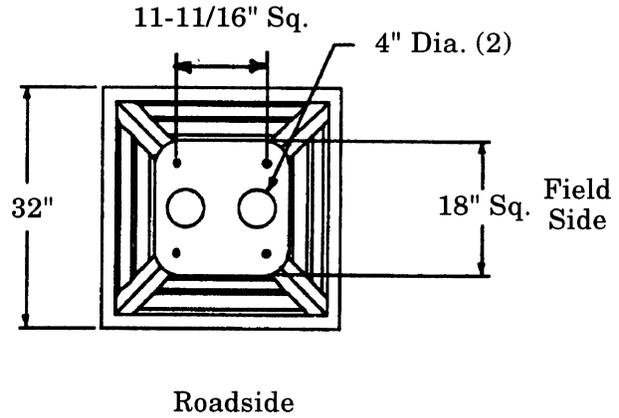
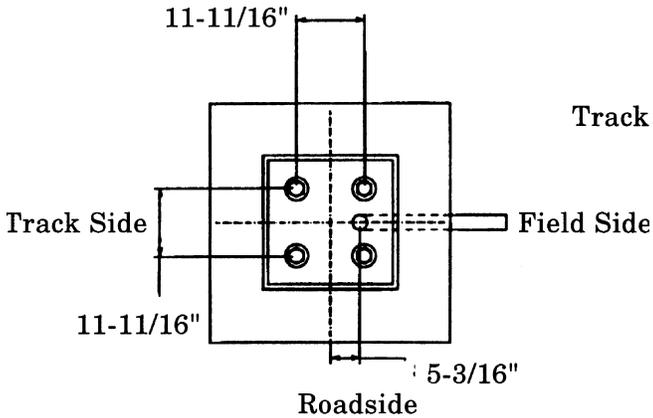
Western-Cullen-Hayes, Inc. and its predecessor companies, have been serving the railroad industry with crossing warning equipment for over 100 years. Among many “firsts”, we provided the first automatically actuated crossing gate signal installed in North America in 1936.

This manual is designed to provide instructions on the installation and use of all Model 10 Signals with 3590 Series Gate Mechanisms.

# SECTION 1

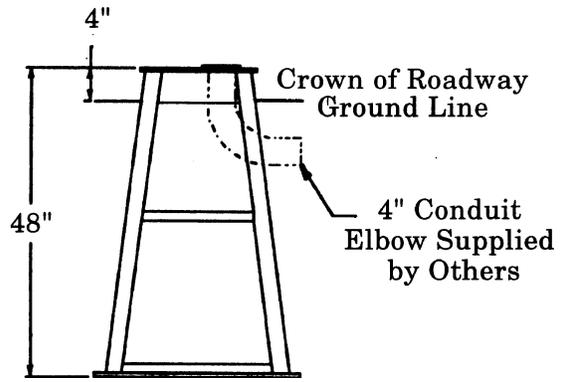
## INSTALLATION INSTRUCTIONS - MODEL 10 SIGNAL

1. Install foundation in proper location per the requirements of the installation. Refer to figures 1 and 2 for typical foundation details.



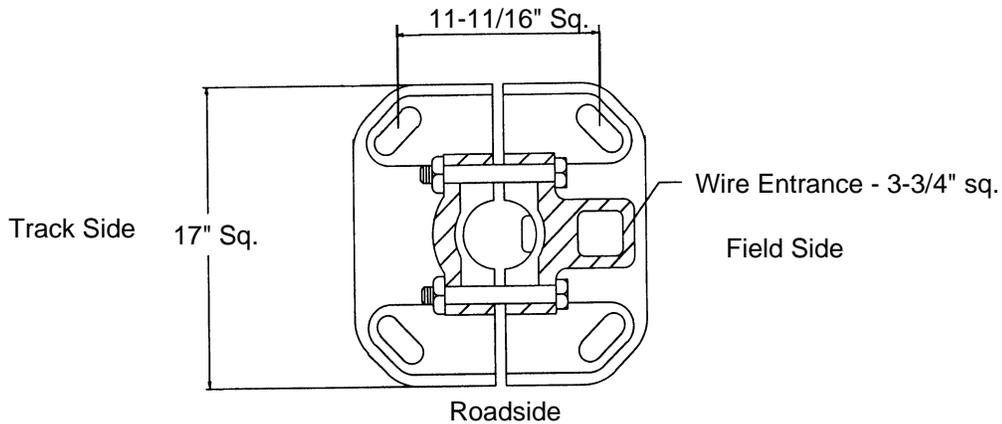
**Suggested Concrete Foundation  
for Model 10 Gate Signal Using  
2149 Junction Box Base**

**Figure 1**



**Galvanized Steel Foundation  
No. 1181-9**

**Figure 2**



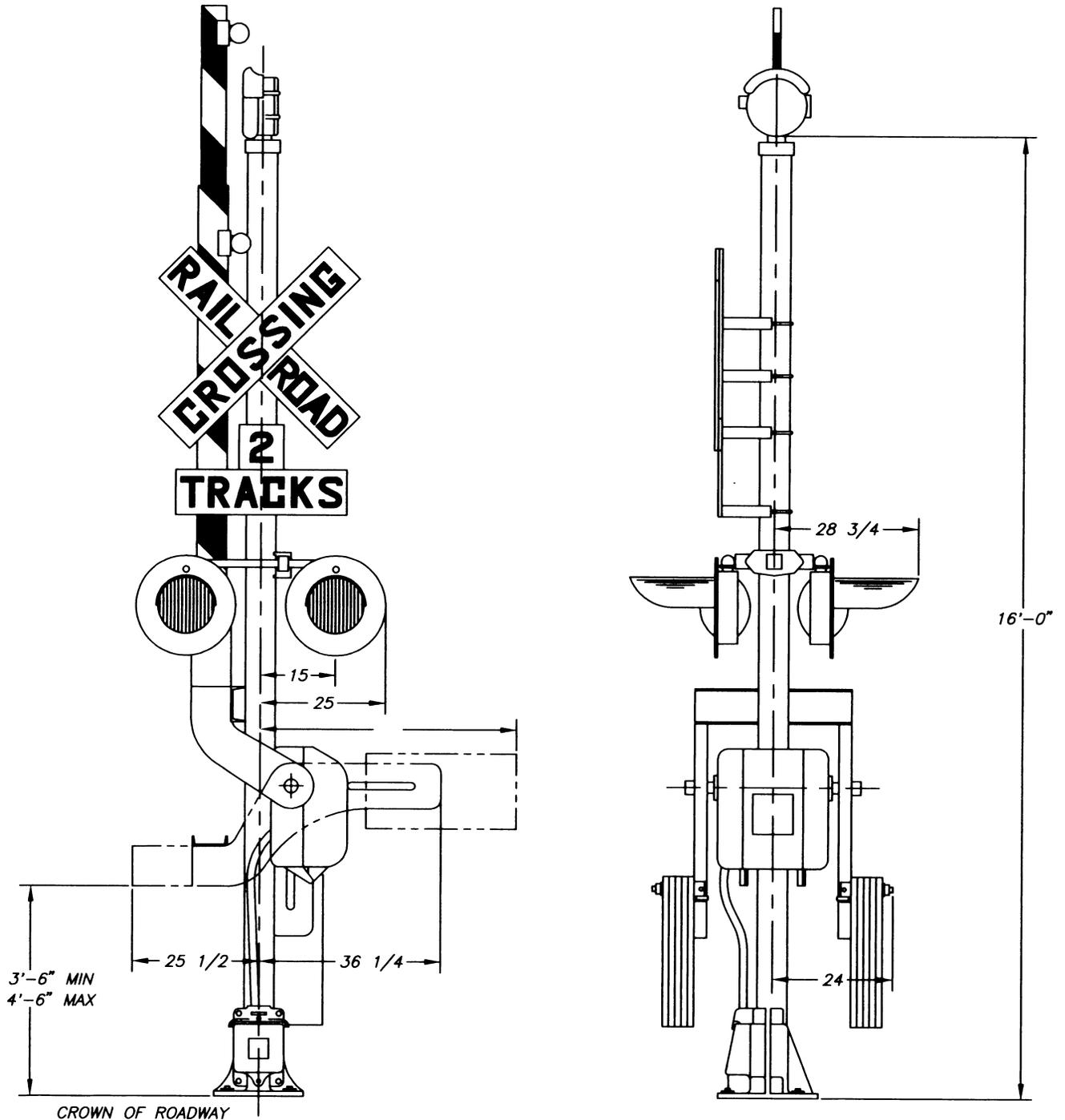
**Plan View of Type 2149  
Junction Box Base**

**Figure 2A**

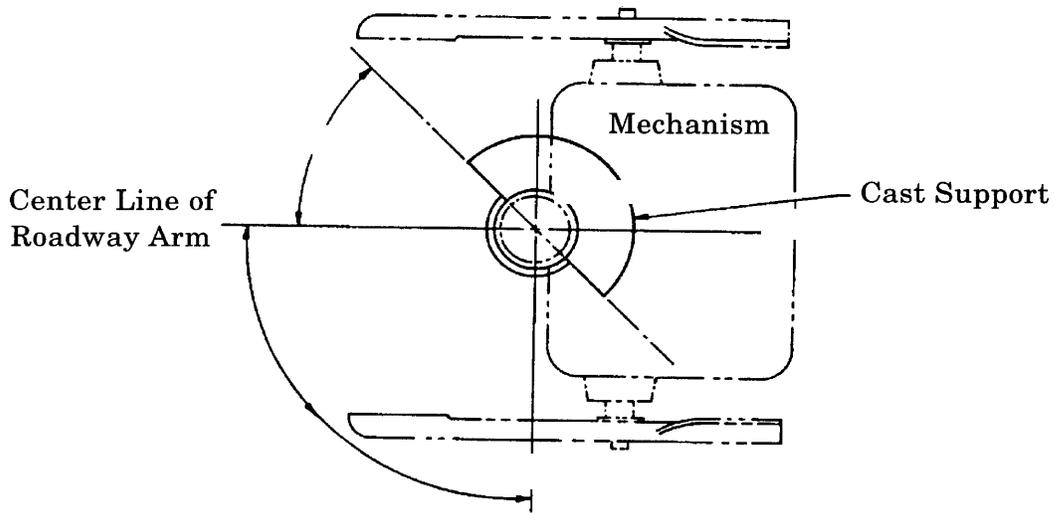
- Remove the junction box cover to access the conduit adapter and hardware kit. Attach the conduit adapter to the top of the base. Loosen the base clamp bolts and install the lower pipe shield in the bottom of the base. Insert the signal mast into the base and tighten the base clamp bolts. Place the base and mast assembly on the foundation with the junction box cover facing on-coming traffic as shown in figure 3. Secure the assembly to the foundation anchoring bolts.

Typical Model 10 Signal

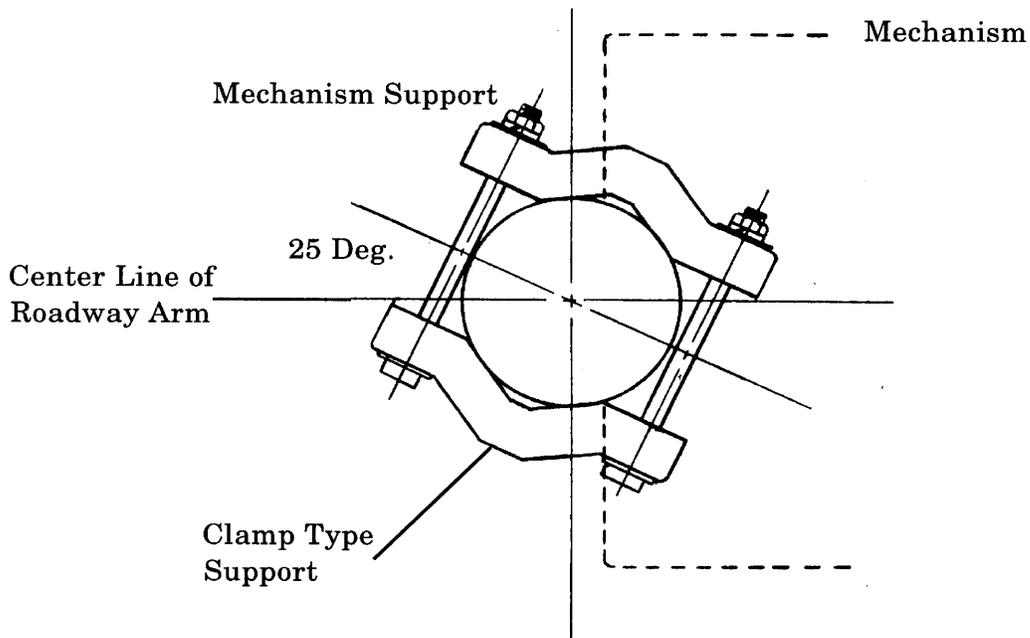
Figure 3



3. Secure the mechanism support assembly to the mast 48 inches above the top of the foundation in a position as shown in figure 4 or 4A, depending on the style of support ordered.
4. Install 4 square head bolts into the slots in the rear of the mechanism case. Set the mechanism onto the support assembly. Install saddle clamps and nuts.



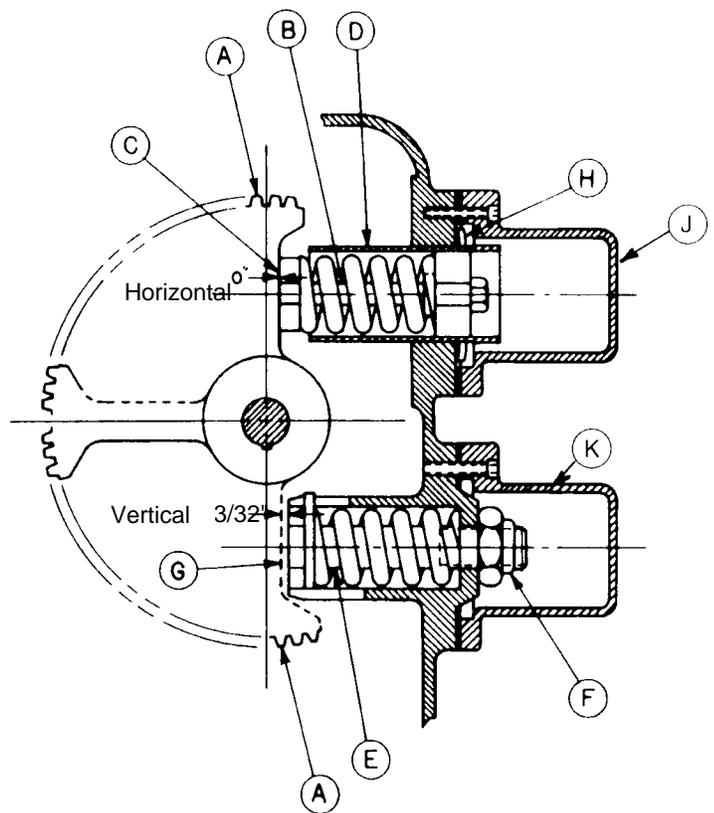
**Cast Mechanism Support Installation**  
**Figure 4**



**Clamp Type Mechanism Support Installation**  
**Figure 4A**

5. Remove hole plugs from mechanism case. Install conduit fittings, adapters, cable grip and ventilator. Install the 1-1/2" sealtite from the base to the mechanism. Be sure enough slack is available to allow rotation of the mechanism.
6. Remove nuts, washers and spline protectors from the ends of the mechanism main shaft.
7. Make sure the main shaft is in the position it assumes when the gate arm is down (horizontal). This condition exists when segment gear (A) is resting on the horizontal stop pin (B) at point (C) as shown in figure 5.

Ref. No	Description
A	Segment Gear
B	Horizontal Stop Pin
C	Contact Point
D	Horizontal Stop Spring Housing
E	Vertical Stop Pin
F	Vertical Stop Pin Nut
G	Clearance Gap 3/32" Minimum
H	Horizontal Stop Pin Locknut
J	Horizontal Stop Pin Cover
K	Vertical Stop Pin Cover



Stop Detail

Figure 5

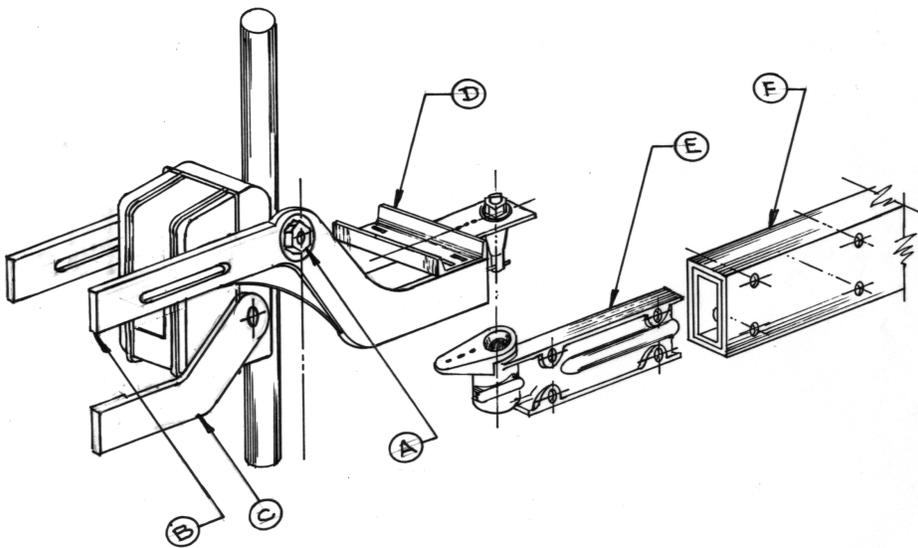
8. Refer to figure 6. Apply gate and counterweight support arms (B) to the mechanism main shaft (A). Keeping the gate end of the supports in the down (horizontal) position, install washers and hand tighten nuts on the main shaft. If the mechanism is supplied with a sidewalk arm shaft (C), install the sidewalk arm adapter to the shaft at this time. Do not install the sidewalk arm.

**CAUTION: Do not apply counterweight before the roadway gate arm is installed.**

9. Install conversion bracket or breakaway adapter channel (D) to the counterweight support arms (B). Secure with provided hardware. The square head bolts fit into the recess on the support arm with the threads facing up.
10. Tighten the main shaft nuts (A).

**Installation of fiberglass or aluminum/fiberglass gate arms**

11. Assemble the arm by sliding sections together to achieve desired length. In some cases, it may be necessary to drill holes in the inserted arm section. Secure sections with provided hardware.



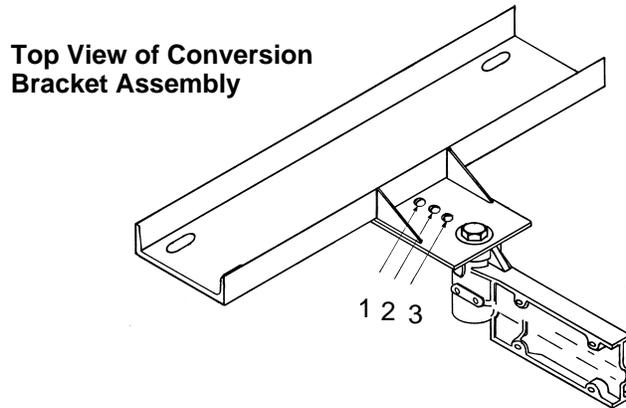
**Gate and Counterweight Support Installation**

**Figure 6**

Ref. No	Description
A	Main Shaft
B	Gate and Counterweight Support Arms
C	Sidewalk Arm Adapter
D	Conversion Bracket
E	Cast Breakaway Adapter
F	Gate Arm Section

## PIVOT TYPE BREAKAWAY ADAPTER

Referring to figure 6, page 6, insert the cast breakaway adapter (E) into the gate arm end section (F) and secure with provided hardware. Position the gate arm with adapter attached 90 degrees from the mechanism assembly. Slip adapter onto mounting pin. Rotate arm 90 degrees, arm will lock in place.



**Figure 7**

Install brass shear bolts in holes as instructed below. Gate arm length is measured from the centerline of the signal mast.

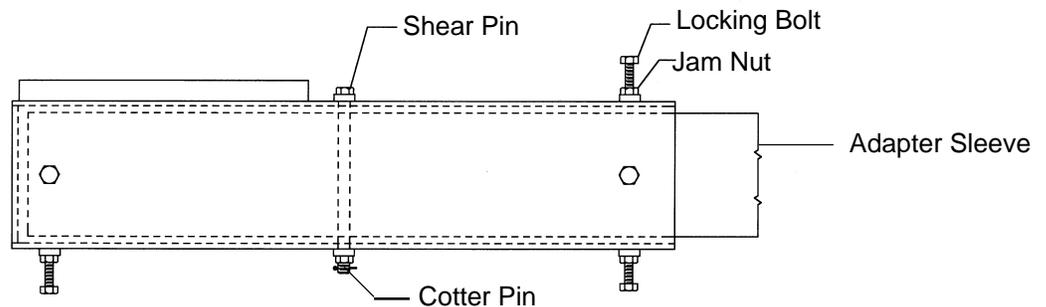
0-18' Gate Arms - Holes 2 and 3

19'-28' Gate Arms - Holes 1 and 2

Over 29' Gate Arms - Holes 1, 2 and 3

## CHANNEL TYPE BREAKAWAY ADAPTER

Install adapter to channel with provided hardware, then slide adapter sleeve into the mounting channel. Install shear pin and cotter pin per figure 7A. Insert gate arm onto adapter sleeve and secure with hardware provided.



**Figure 7A**

Insert shear pin; #3575-170-1 for 0-28' gate arms or #3575-201-1 for gate arms over 28'.

Adjust and loosely tighten 5 locking bolts to align and secure gate arm. Once aligned, securely tighten the 5 locking bolt jam nuts.

After securing gate arm to breakaway adapter, install gate lamps. See paragraph 14 and figure 11, page 12, for gate lamp installation.

## 12. **Installation of Wooden Gate Arms**

Attach the pre-assembled gate arm to the gate arm support. Insert bolts, apply washer plates on the inner side of the side boards. Secure with provided hardware. Remove tip section. Re-insert section at desired length. In some cases, it may be necessary to drill holes in this section. Secure the section with provided hardware. Install this gate arm and support assembly to the counterweight support arms and secure with hardware provided. See paragraph 14 and figure 11, page 12, for gate lamp installation.

## 13. **Installation of Counterweights**

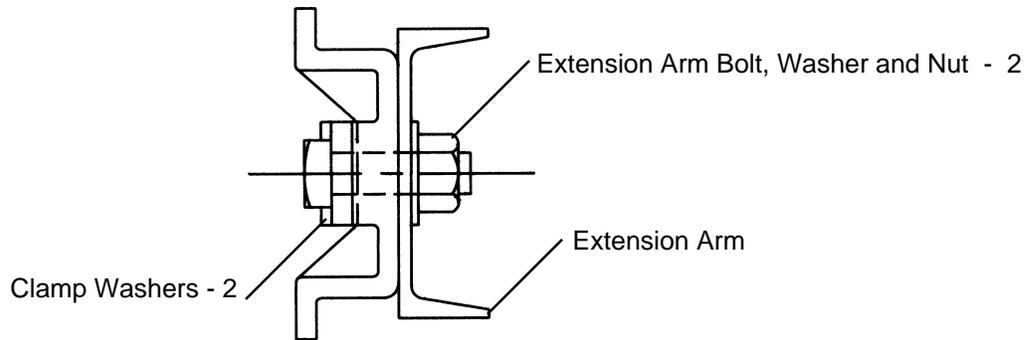
### A. **Square single slot counterweights on cast iron counterweight arms with counterweight support assembly**

Refer to figure 8, page 9.

Maintain and secure the gate in the horizontal position. For arms longer than 32 feet, install the counterweight extension arms to the counterweight arms. Install the clamp washers to the extension arm bolts and insert the bolts through the slot from the inside of the counterweight arm. Install the extension arms onto the bolts. Install flat washers and nuts, position the arms near the center of the slot and tighten the nuts. Be sure that the teeth in the clamp washers are seated into the teeth on the inside of the counterweight arm. Slide the counterweight support assembly onto the extension arm and loosely tighten the three support assembly set screws. Install the counterweight bolt from the inside of the extension arm. Install the counterweights by placing each weight onto the support and sliding the slot over the counterweight bolt. Distribute the weights evenly on the two arms. After all weights are installed, install the flat washer and nut onto the counterweight bolt and tighten.

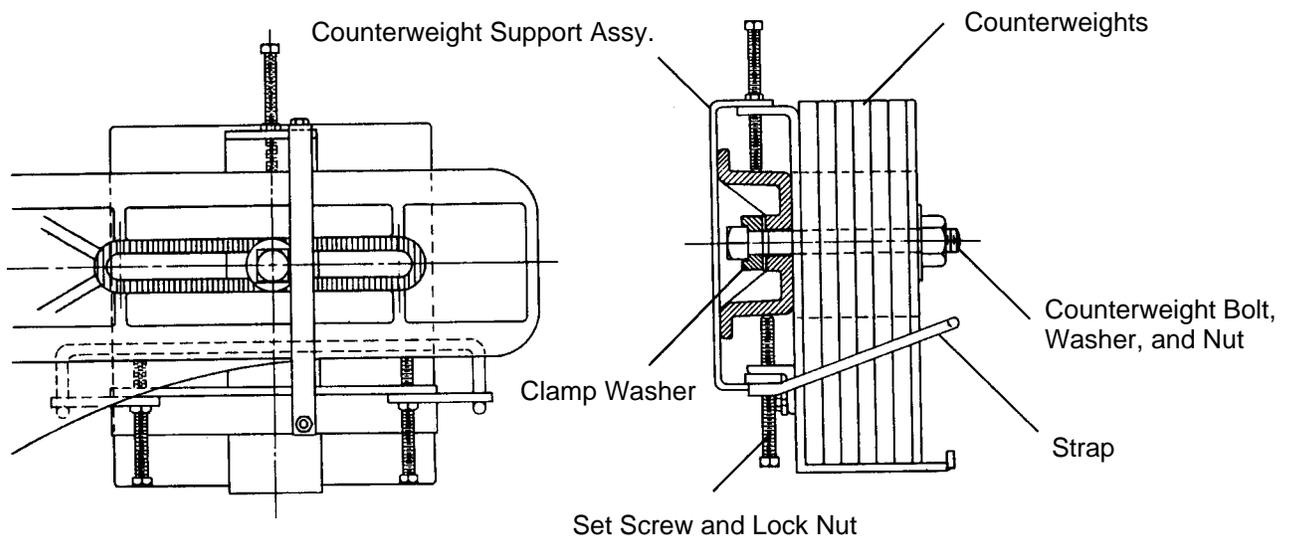
Refer to figure 8A, page 9.

Slide the counterweight support assembly onto the counterweight arm. Position the assembly near the center of the slot in the arm and loosely tighten the three support assembly set screws. Install the clamp washer onto the counterweight bolt and insert the bolt through the slot from the inside of the counterweight arm. Install the counterweights by placing each weight onto the support and sliding the slot over the counterweight bolt. If two counterweight arms are supplied, distribute the weights evenly on the two arms. After all weights are installed, install the flat washer and nut onto the counterweight bolt and tighten. Be sure that the teeth in the clamp washer are seated into the teeth on the inside of the counterweight arm.



**Single Slot Counterweight Assembly with Extension Arm**

**Figure 8**



**Single Slot Counterweight Assembly**

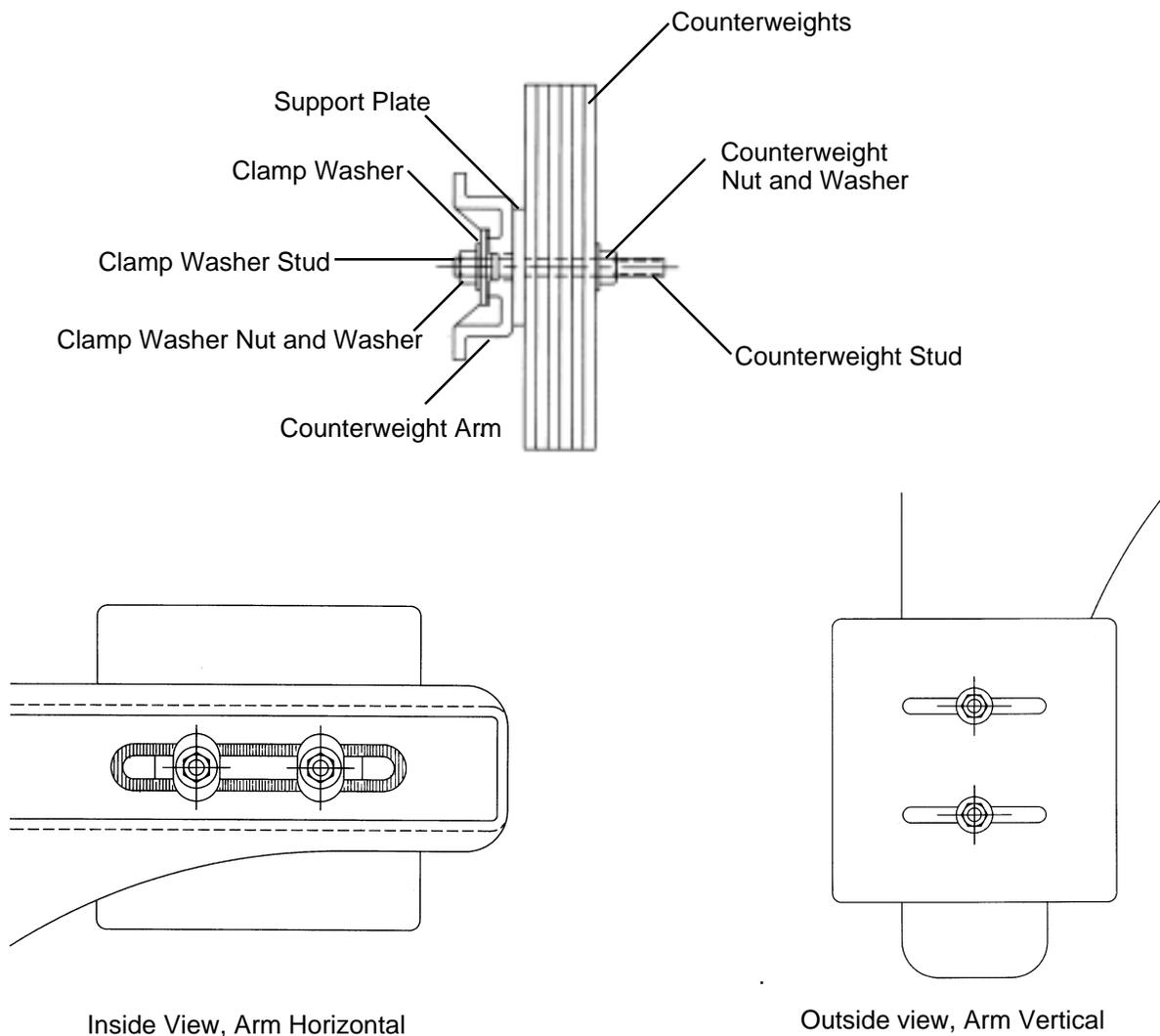
**Figure 8A**

## B. Square double slot counterweights on aluminum counterweight arms

Refer to figure 9.

Install the counterweight support plate to the counterweight arm by inserting the clamp washer (short) studs through the slot from the outside of the arm. Install the clamp washers, flat washers and nuts to the studs. Locate the support plate near the center of the slot and tighten the clamp washer nuts. Be sure that the teeth in the clamp washers are seated into the teeth on the inside of the counterweight arm.

Raise and secure the gate arm in the up (vertical) position. Install the counterweights to the counterweight (long) studs. Install the flat washers and nuts to these studs and hand tighten the nuts. If two counterweight arms are supplied, distribute the weights evenly on the two arms. Now position the weights near the middle of the slot in the weights and securely tighten the counterweight nuts. Lower the gate arm to the horizontal position.



**Double Slot Counterweight Assembly**

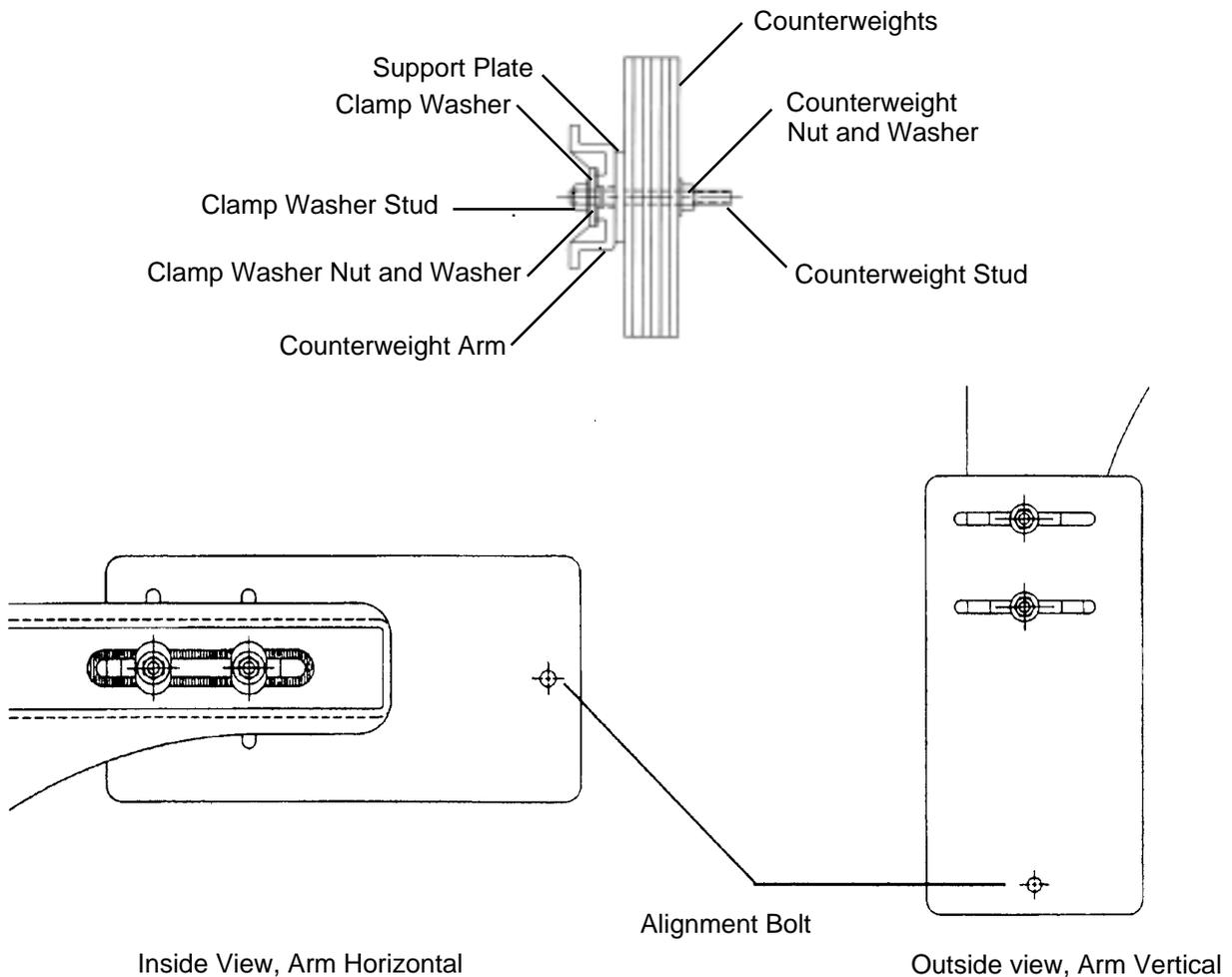
**Figure 9**

### C. Oblong counterweights on cast iron or aluminum counterweight arms

Refer to figure 10.

Install the counterweight support plate to the counterweight arm by inserting the clamp washer (short) studs through the slot from the outside of the arm. Install the clamp washers, flat washers and nuts to the studs. Locate the support plate near the center of the slot and tighten the clamp washer nuts. Be sure that the teeth in the clamp washers are seated into the teeth on the inside of the counterweight arm.

Raise and secure the gate arm in the up (vertical) position. Install the counterweights to the counterweight (long) studs. Install the flat washers and nuts to these studs and hand tighten the nuts. If two counterweight arms are supplied, distribute the weights evenly on the two arms. Align the weights and insert the alignment bolt into the holes at the bottom of the weights. Install washers and nut onto the alignment bolt and securely tighten. Now position the weights near the middle of the slot in the weights and securely tighten the counterweight nuts. Lower the gate arm to the horizontal position.



**Oblong Counterweight Assembly**

**Figure 10**

14. Install gate arm lights using provided hardware. Attach cable to the arm using eyelets provided. Leave slack in the cable between eyelets to provide drip points. Route cable through cable grip installed in the mechanism and terminate wires at required binding posts. Refer to figure 11 for proper lamp spacing.
15. Install signal light units, signs and bell or pinnacle as required.

**Minimum recommended battery and wire requirements**

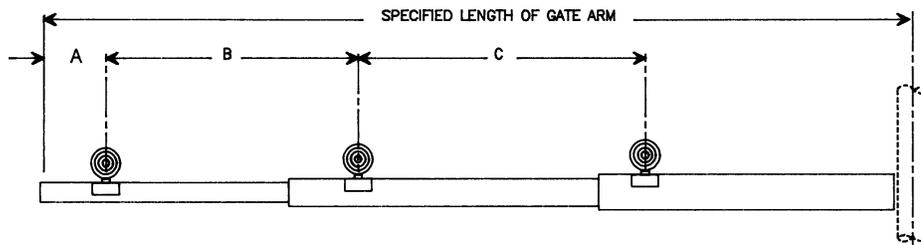
16. Wire size for the motor circuit should be calculated so that the wire selected has no more than 0.1 ohm resistance between the battery and the mechanism terminals. Wire should be soft drawn copper.

Minimum Wire Recommendation:  
(Battery to mechanism terminals)

Battery Recommendation:

<u>2-Way Length of Run</u>	<u>Wire Size</u>
0 - 60 ft.	#6AWG
60 - 120 ft.	2-#6AWG or 1-#4AWG
Over 120 ft	3-#6AWG or 1-#2AWG

Refer to AAR and FRA specifications for battery stand-by power as determined by the calculated mechanism and lamp load per the crossing application.



Specified length of gate arm	Dimension "A"	Dimension "B"	Dimension "C"
16-17 Ft.	24"	48"	48"
18-19 Ft.	28"	46"	46"
20-23 Ft.	28"	46"	46"
24-28 Ft.	28"	60"	60"
29-31 Ft.	36"	72"	72"
32-34 Ft.	36"	84"	84"
35-37 Ft.	36"	108"	108"
38 Ft. & Over	36"	120"	120"

**Suggested Roadway Gate Arm Light Spacing**

**Figure 11**

17. Complete field electrical wiring of mechanism, signal lights, and bell as required.

## 18. **Horizontal Torque Adjustment**

### A. **Square single slot counterweights on cast iron counterweight arms with counterweight support assembly**

**NOTE: If sidewalk arm is being used, all torque adjustments must be made with the sidewalk arm support installed and the sidewalk gate arm not installed.**

Refer to figure 12, page 14.

#### 1. **Using torque wrench PN: 3590-K9**

Open mechanism cover and place gate in horizontal position. Gently push down on the counterweights to raise the gate arm about 2 feet from horizontal.

Attach the 7/8" socket attached to the torque wrench onto the hex surface on the motor pinion gear.

Slowly release the counterweight arm and allow the wrench to rotate and rest against the housing. Note the scale reading.

The reading should be between 50 and 100 pounds regardless of the length of the gate arm.

If adjustment is required, loosen the counterweight bolt nut and the lower two counterweight support assembly set screws to allow the weights to be moved.

If the reading is more than specified, move the counterweights away from the mechanism.

If the reading is less than specified, move the counterweights toward the mechanism.

When weights are installed on two counterweight arms, move the weights on each arm proportionally.

After the proper scale reading is achieved, tighten the counterweight nut just enough so that the weights do not move and the clamp washer teeth are securely seated into the teeth in the counterweight arm.

#### 2. **Using spring scale PN: 3562-210**

Attach the 50 pound spring scale to the gate arm at a point located 10 feet from the center of the mechanism main shaft.

Lift the gate by the scale and note the scale reading. The scale reading should be 5 to 10 pounds regardless of the length of the gate arm. See figure 12, page 14.

If adjustment is required, loosen the counterweight bolt nut and the lower two counterweight support assembly set screws to allow the weights to be moved.

If the reading is more than specified, move the counterweights away from the mechanism.

If the reading is less than specified, move the counterweights toward the mechanism.

When weights are installed on two counterweight arms, move the weights on each arm proportionally.

After the proper scale reading is achieved, tighten the counterweight nut just enough so that the weights do not move and the clamp washer teeth are securely seated into the teeth in the counterweight arm.

For gate arms longer than 32 feet using counterweight extension arms, adjust the horizontal torque by moving the extension arms within the slot in the counterweight arm per the procedure outlined above.

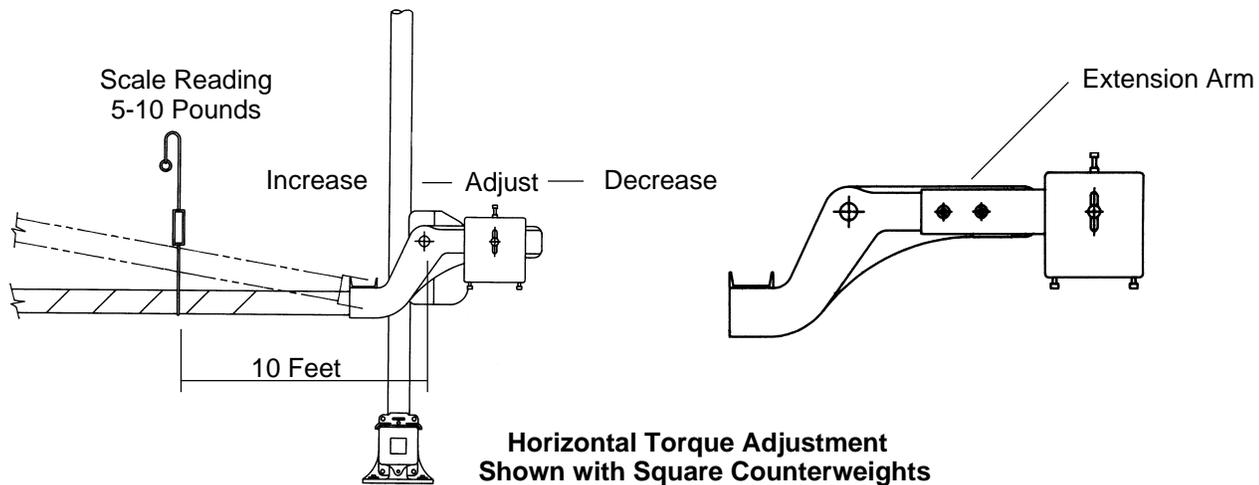


Figure 12

**B. Square double slot counterweights on aluminum counterweight arms or oblong counterweights on cast iron or aluminum counterweight arms**

**NOTE: If sidewalk arm is being used, all torque adjustments must be made with the sidewalk arm support installed and the sidewalk gate arm not installed.**

Refer to figure 13, page 16.

**1. Using torque wrench PN: 3590-K9**

Open mechanism cover and place gate in horizontal position.

Gently push down on the counterweights to raise the gate arm about 2 feet from horizontal.

Attach the 7/8" socket attached to the torque wrench onto the hex surface on the motor pinion gear.

Slowly release the counterweight arm and allow the wrench to rotate and rest against the housing. Note the scale reading.

The reading should be between 50 and 100 pounds regardless of the length of the gate arm.

If adjustment is required, loosen the clamp washer nuts to allow the weights to be moved.

If the reading is more than specified, move the counterweights away from the mechanism.

If the reading is less than specified, move the counterweights toward the mechanism.

When weights are installed on two counterweight arms, move the weights on each arm proportionally.

After the proper scale reading is achieved, tighten the clamp washer nuts securely. Be sure the teeth on the clamp washers are securely seated into the teeth in the counterweight arm.

## 2. **Using spring scale PN: 3562-210**

Attach the 50 pound spring scale to the gate arm at a point located 10 feet from the center of the mechanism main shaft.

Lift the gate by the scale and note the scale reading. The scale reading should be 5 to 10 pounds regardless of the length of the gate arm. See figure 13, page 16.

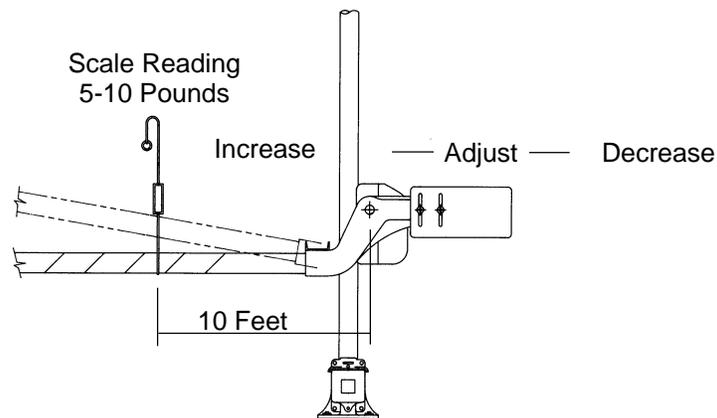
If adjustment is required, loosen the clamp washer nuts to allow the weights to be moved.

If the reading is more than specified, move the counterweights away from the mechanism.

If the reading is less than specified, move the counterweights toward the mechanism.

When weights are installed on two counterweight arms, move the weights on each arm proportionally.

After the proper scale reading is achieved, tighten the clamp washer nuts securely. Be sure the teeth on the clamp washers are securely seated into the teeth in the counterweight arm.



**Horizontal Torque Adjustment  
Shown with Oblong Counterweights**

**Figure 13**

## 19. Vertical Torque Adjustment

### A. Square single slot counterweights on cast iron counterweight arms with counterweight support assembly

Refer to figure 14, page 18

#### 1. Using torque wrench PN: 3590-K9

Place the gate in the vertical position.

Place insulating material in the motor down contact. Refer to table 1, page 20, to determine location of the motor down contact.

Attach the 7/8" socket attached to the torque wrench onto the hex surface on the motor pinion gear.

With the wrench held securely, open the manual test switch (gold nut).

The arm will begin to descend. Slowly allow the wrench to rotate until the wrench rests against the housing. Note the scale reading. Compare the scale reading with the torque specification for the applied length of gate arm as listed in tables 2 and 3, pages 21-25, per your \*counterweight configuration. Manually assist the gate back to the vertical position. Remove the torque wrench and close the test switch.

**NOTE: Do not attempt to obtain readings with a foot pound torque wrench.**

If adjustment is required, loosen the counterweight bolt nut just enough to allow the weights to be moved when the counterweight support assembly set screws are turned. To adjust, move the set screws with a wrench as follows.

**CAUTION: Do not loosen the counterweight bolt nut too much as the counterweights may slip in the counterweight slot and may cause injury or the necessity to re-set the horizontal torque.**

If the reading is more than specified, move the counterweights away from the roadway.

If the reading is less than specified, move the counterweights toward the roadway.

Repeat procedure as required until the scale reading is within the listed specification.

When complete, securely tighten the counterweight bolt nut, the three set screws and the set screw jam nuts. Remove the insulating material from the motor down contact.

## 2. Using spring scale PN: 3562-210

Place the gate in the vertical position.

Place insulating material in the motor down contact. Refer to table 1, page 20, to determine location of the motor down contact.

Attach the 50 pound spring scale between the gate arm and the mast, on a horizontal plane, at "X" distance from the center of the mechanism main shaft. Refer to tables 2 or 3, pages 21-25, to determine "X" distance for the length of applied gate arm per your \*counterweight configuration. See figure 14, page 18.

Open the manual test switch (gold nut) to allow the gate arm to descend approximately 5 degrees. Note the scale reading and compare with the specification in tables 2 or 3, pages 21-25.

If adjustment is required, loosen the counterweight bolt nut just enough to allow the weights to be moved when the counterweight support assembly set screws are turned. To adjust, move the set screws with a wrench as follows.

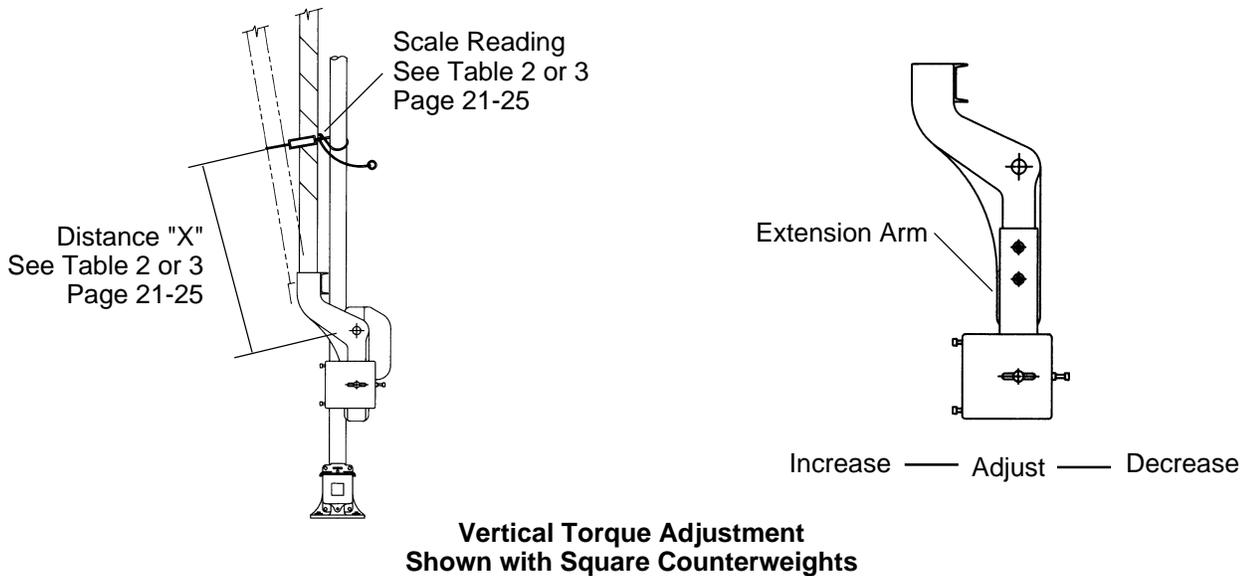
**CAUTION: Do not loosen the counterweight bolt nut too much as the counterweights may slip in the counterweight slot and may cause injury or the necessity to re-set the horizontal torque.**

If the reading is more than specified, move the counterweights away from the roadway.

If the reading is less than specified, move the counterweights toward the roadway.

Manually assist the gate back to the vertical position, close the test switch, remove the insulating material from the motor down contact and remove the spring scale.

When complete, securely tighten the counterweight bolt nut, the three set screws and the set screw jam nuts.



**Figure 14**

**B. Square double slot counterweights on aluminum counterweight arms or oblong counterweights on cast iron or aluminum counterweight arms**

**1. Using torque wrench PN: 3590-K9**

Place the gate in the vertical position.

Place insulating material in the motor down contact. Refer to table 1, page 20, to determine location of the motor down contact.

Attach the 7/8" socket attached to the torque wrench onto the hex surface on the motor pinion gear.

With the wrench held securely, open the manual test switch (gold nut). The arm will begin to descend, slowly allow the wrench to rotate until the wrench rests against the housing. Note the scale reading. Compare the scale reading with the torque specification for the applied length of gate arm as listed in tables 2 and 3, pages 21-25, per your \*counterweight configuration. Manually assist the gate back to the vertical position, remove the torque wrench and close the test switch.

**NOTE: Do not attempt to obtain readings with a foot pound torque wrench.**

If adjustment is required, loosen the counterweight stud nuts just enough to allow the weights to slide in the weight slots.

If the reading is more than specified, move the counterweights away from the roadway.

If the reading is less than specified, move the counterweights toward the roadway.

Repeat procedure as required until the scale reading is within the listed specification.

When complete, securely tighten the counterweight stud nuts and remove the insulating material from the motor down contact.

## **2. Using spring scale PN: 3562-210**

Place the gate in the vertical position.

Place insulating material in the motor down contact. Refer to table 1, page 20, to determine location of the motor down contact.

Attach the 50 lb spring scale between the gate arm and the mast, on a horizontal plane, at "X" distance from the center of the mechanism main shaft. Refer to tables 2 or 3, pages 21-25, to determine "X" distance for the length of applied gate arm per your \*counterweight configuration.

Open the manual test switch (gold nut) to allow the gate arm to descend approximately 5 degrees. Note the scale reading and compare with the specification in tables 2 or 3, pages 21-25.

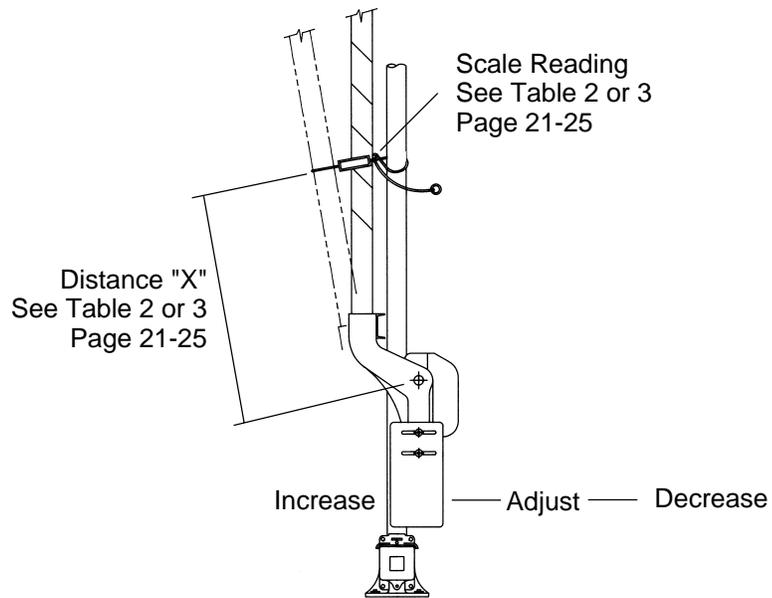
If adjustment is required, loosen the counterweight stud nuts just enough to allow the weights to slide in the weight slot.

If the reading is more than specified, move the counterweights away from the roadway.

If the reading is less than specified, move the counterweights toward the roadway.

Manually assist the gate back to the vertical position, close the test switch, remove the insulating material from the motor down contact and remove the spring scale.

When complete, securely tighten the counterweight stud nuts.



**Vertical Torque Adjustment  
Shown with Oblong Counterweights**

**Figure 15**

<b>Motor Down Contact Location</b>	
<b>Mechanism</b>	<b>Contact Location</b>
3590, 3590B, 3593, 3593I, 3593NJ, 3595, 3596, 3596NJ.	7
3593B, 3593C, 3593E, 3593F, 3596B.	3

**Table 1**

**Table 2A**

TABLE OF WEIGHT AND VERTICAL TORQUE VALUES FOR  
FIBERGLASS AND ALUMINUM/FIBERGLASS GATE ARMS.

**\*SQUARE SINGLE SLOT COUNTERWEIGHTS WITH CAST IRON COUNTERWEIGHT ARMS**

Gate Arm Length in Feet	Counterweight Arms	Counterweight Supplied in Pounds	Counterweights .....Supplied		Torque Wrench Reading (ft.lbs)	Spring Scale Reading (lbs)	Distance "X" in Feet
			25lb	50lb			
18	1	175	1	3	200	36	5
19-20	1	300	2	5	200	38-40	5
21	1	300	2	5	210	42	5
22	1	300	2	5	220	42	5
23	1	300	2	5	230	42	5
24	1	300	2	5	240	48	5
25	2	350	2	6	250	50	5
26	2	350	2	6	260	26	10
27	2	350	2	6	270	27	10
28	2	350	2	6	280	28	10
29	2	400	4	6	290	29	10
30	2	400	4	6	300	30	10
31	2	400	4	6	310	31	10
32	2	400	4	6	320	32	10
33	2+ Extension	400	4	6	330	33	10
34	2+ Extension	400	4	6	340	34	10
35	2+ Extension	400	4	6	350	35	10
36	2+ Extension	400	4	6	360	36	10
37	2+ Extension	400	4	6	370	37	10
38	2+ Extension	400	4	6	380	38	10
39	2+ Extension	400	4	6	390	39	10
40	2+ Extension	400	4	6	400	40	10

**Table 2B**

TABLE OF WEIGHT AND VERTICAL TORQUE VALUES FOR  
FIBERGLASS AND ALUMINUM/FIBERGLASS GATE ARMS.

**\*OBLONG COUNTERWEIGHTS WITH CAST IRON COUNTERWEIGHT ARMS.**

Gate Arm Length in Feet	Counterweight Arms	Counterweight Supplied in Pounds	Counterweights Supplied 47lb.	Torque Wrench Reading (ft.lbs)	Spring Scale Reading (lbs)	Distance "X" in Feet
18	2	188	4	200	36	5
19	2	235	5	200	38	5
20	2	235	5	200	40	5
21	2	235	5	210	42	5
22	2	235	5	220	44	5
23	2	235	5	230	46	5
24	2	235	5	240	48	5
25	2	329	7	250	50	5
26	2	329	7	260	26	10
27	2	329	7	270	27	10
28	2	329	7	280	28	10
29	2	376	8	290	29	10
30	2	376	8	300	30	10
31	2	376	8	310	31	10
32	2	376	8	320	32	10
33	2	564	12	330	33	10
34	2	564	12	340	34	10
35	2	564	12	350	35	10
36	2	564	12	360	36	10
37	2	564	12	370	37	10
38	2	564	12	380	38	10
39	2	564	12	390	39	10
40	2	564	12	400	40	10

**Table 2C**

TABLE OF WEIGHT AND VERTICAL TORQUE VALUES FOR  
FIBERGLASS AND ALUMINUM/FIBERGLASS GATE ARMS.

**\*OBLONG COUNTERWEIGHTS WITH ALUMINUM COUNTERWEIGHT ARMS.**

Gate Arm Length in Feet	Counterweight Arms	Counterweight Supplied in Pounds	Counterweights Supplied 47lb.	Torque Wrench Reading (ft.lbs)	Spring Scale Reading (lbs)	Distance "X" in Feet
18	2	188	4	200	36	5
19	2	235	5	200	38	5
20	2	235	5	200	40	5
21	2	235	5	210	42	5
22	2	235	5	220	44	5
23	2	235	5	230	46	5
24	2	235	5	240	48	5
25	2	329	7	250	50	5
26	2	329	7	260	26	10
27	2	329	7	270	27	10
28	2	329	7	280	28	10
29	2	376	8	290	29	10
30	2	376	8	300	30	10
31	2	376	8	310	31	10
32	2	376	8	320	32	10
33	2	470	10	330	33	10
34	2	470	10	340	34	10
35	2	470	10	350	35	10
36	2	470	10	360	36	10
37	2	470	10	370	37	10
38	2	470	10	380	38	10
39	2	470	10	390	39	10
40	2	470	10	400	40	10

**Table 2D**

TABLE OF WEIGHT AND VERTICAL TORQUE VALUES FOR  
FIBERGLASS AND ALUMINUM/FIBERGLASS GATE ARMS.

**\*SQUARE DOUBLE SLOT COUNTERWEIGHTS WITH ALUMINUM COUNTERWEIGHT ARMS.  
32 FOOT GATE MAXIMUM ALLOWED WITH THIS COUNTERWEIGHT SETUP.**

Gate Arm Length in Feet	Counterweight Arms	Counterweight Supplied in Pounds	Counterweight Supplied 25 lb	Counterweight Supplied 50 lb.	Torque Wrench Reading (ft.lbs)	Spring Scale Reading (lbs)	Distance "X" In Feet
18	2	350	2	6	200	36	5
19	2	525	3	9	200	38	5
20	2	525	3	9	200	40	5
21	2	525	3	9	210	42	5
22	2	525	3	9	220	44	5
23	2	525	3	9	230	46	5
24	2	525	3	9	240	48	5
25	2	600	4	10	250	50	5
26	2	600	4	10	260	26	10
27	2	600	4	10	270	27	10
28	2	600	4	10	280	28	10
29	2	650	6	10	290	29	10
30	2	650	6	10	300	30	10
31	2	650	6	10	310	31	10
32	2	650	6	10	320	32	10

**Table 3**

TABLE OF WEIGHT AND VERTICAL TORQUE VALUES FOR  
WOODEN GATE ARMS.

**\*SQUARE SINGLE SLOT COUNTERWEIGHTS WITH CAST IRON COUNTERWEIGHT ARMS**

Gate Arm Length in Feet	Counterweight Arms	Counterweights Supplied in Pounds	Torque Wrench Reading (ft.lbs)	Spring Scale Reading (lbs)	Distance ..... "X" in Feet
14	1	175	175	35	5
15	1	175	175	35	5
16	1	175	175	35	5
17	1	225	175	35	5
18	1	225	180	36	5
19	1	275	190	38	5
20	1	275	200	40	5
21	1	275	210	42	5
22	1	275	220	44	5
23	1	300	230	46	5
24	1	350	240	48	5
25	2	375	250	50	5
26	2	400	260	26	10
27	2	425	270	27	10
28	2	475	280	28	10
29	2	525	290	29	10
30	2	600	300	30	10
31	2+ Extension	400	310	31	10
32	2+ Extension	425	320	32	10
33	2+ Extension	450	330	33	10
34	2+ Extension	475	340	34	10
35	2+ Extension (1)	500	350	35	10
36	2+ Extension (1)	525	360	36	10
37	2+ Extension (1)	550	370	37	10
38	2+ Extension (1)	575	380	38	10
39	2+ Extension (1)	600	390	39	10
40	2+ Extension (1)	625	400	40	10
41	2+ Extension (1)	650	410	41	10
42	2+ Extension (1)	675	420	42	10
43	2+ Extension (1)	700	430	43	10
44	2+ Extension (1)	725	440	44	10

(1) Counterweights Inverted

## SECTION 2

### INTERNAL ADJUSTMENT

#### 1. Horizontal Gate Position and Stop Adjustment

The horizontal and vertical stops are set at the factory. If it is necessary to adjust the stops in the field, follow these directions and refer to figure 5, page 5.

- a. Lower the gate to horizontal position. The segment gear (A) should be resting on the horizontal stop pin (B) at point (C). The clearance between the segment gear and the stop pin is 0.0 inch.
- b. Remove the horizontal stop cover (J).
- c. Attach the angle finder, PN: 3590-1014 to the main shaft and position the angle finder so that a reading of 0 degrees is shown.
- d. To adjust the horizontal gate position, loosen the stop pin lock nut then turn the spring housing in or out until the arm is parallel with the roadway.
- e. Note the reading on the angle finder. If the arm has been adjusted more than 5 degrees either side of 0 degrees, it will be necessary to adjust some of the contact cams, especially the snub contact cam. Refer to section 2.3, page 27, for contact cam adjustment instructions.
- f. Tighten the stop pin locknut and re-install the cover.

#### 2. Vertical Gate Position. Motor up Cam and Vertical Stop Adjustment

If your requirements are such that the gate must rest at more or less than the 86 degrees vertical factory setting, the motor up contact cam will have to be adjusted to stop the gate arm at the desired vertical position.

- a. Place the gate in the horizontal position by loosening the gold test nut. Attach the angle finder, PN: 3590-1014 to the main shaft and position the angle finder so that a reading of 0 degrees is shown.
- b. Loosen the motor up contact cam and rotate the cam downward until the contact is open and the cam has cleared the contact.
- c. Tighten the gold test nut.
- d. Apply finger pressure on the motor up contact to close the contact, the gate will begin to rise. Remove finger pressure when the gate is near the desired vertical position. Apply pressure again if necessary to jog the gate to the final desired position.
- e. Note and record the angle finder reading.

- f. Holding the metal frame of the cam, rotate the cam upward until the cam surface is approximately 1/16-1/8 inch above the contact cam follower. Be certain that the sliding portion of the cam is fully downward within the cam frame. Tighten the contact cam. Refer to section 2.3 below for specifications on the contact and cam clearances.
- g. When complete, cycle the gate. Note the reading on the angle finder. If the reading is between 84 and 90 degrees, adjust the vertical stop pin. Refer to instruction below. If the reading is less than 86 degrees, it will be necessary to adjust the gate clear cam. A minimum differential of 4 degrees between the closing of the gate clear contact and the opening of the power up contact must be maintained. Refer to section 2.3 below for contact cam adjustments.

**If the reading is less than 84 degrees, do not adjust the vertical stop pin.**

Refer to figure 5, page 5.

- h. To adjust the vertical stop pin (E), remove the stop pin cover (K). Turn the stop pin nut (F) counterclockwise until the stop pin just contacts the segment gear (A) at (G). Then turn the nut clockwise until a minimum clearance of 3/32 inch is achieved between the stop pin (E) and the segment gear (A) at point (G). Check this with a 3/32 inch wire gauge, PN:3590-1013. Re-install and tighten the cover. NOTE: After cycling of a pedestrian mechanism, (3595, 3596), this clearance is no longer required. The segment gear will rest against the vertical stop pin in normal operation.

**WARNING: Do not place hands into the gear area when checking this clearance.**

### 3. Contact Cam Adjustments

Refer to figures 16A and 16B, page 29.

Cams and contacts are factory set at the positions shown on the wiring diagram.

Be sure that the slots in the power up cam (G) are kept free of foreign material at all times, and cam and cam follower surfaces are clean

**CAUTION: Do not use any type of lubricant on the cam surface.**

- a. Beginning with the gate in the horizontal position, attach the angle finder, PN: 3590-1013 to the main shaft and position it so that a reading of 0 degrees is shown.
- b. Move the gate to the position required. Refer to the mechanism wiring diagram for the normal operational positions.

- c. Loosen one allen head cap screw (A) or (L), rotate the cam to a position where the contact cam follower (B) just touches the end of the cam surface (E) or (H).

**EXAMPLE:** If adjusting the motor down cam, position and hold the gate at 45 degrees, position the cam so that the motor down contact is open and the cam follower (B) is touching the end of the cam surface (E).

- d. After adjustment, be certain to tighten the allen head cap screw securely. **Caution needs to be taken when tightening the cap screws referred to below.**

Referring to figure 16B, the motor up cam has a slotted insert (G) which allows for 3/16 inch radial travel. Refer to table 4, page 30, for motor up cam and contact position. When cam insert (H) is rotated to the closest point toward cap screw (L), a gap of 1/16 inch must be maintained between the cap screw and the cam insert at location (J).

Referring to figure 16A, for all other cams, a gap of 1/16 inch must be maintained between cam insert (E) and cap screw (A) at position (K).

### **Circuit Controller Contact Adjustment**

**Bending adjustment of contacts is not normally required unless the contact has been replaced.**

To adjust a contact, it will be necessary to bend the contact spring to achieve the following specifications by using the contact adjusting tool, PN: ES-6104-2.

When adjusting contacts, gently bend the contact spring by applying several gentle upward or downward forces against the contact spring. Recheck the gap or pressure after each operation. Repeat this procedure until specification is achieved.

Overbending may damage the contact and make it impossible to achieve proper contact spring pressure. Always apply the adjusting tool at the top of the contact directly beneath the circuit controller board. Never bend the contact body or at the bend near the contacting surface. Do not twist the contact while bending. Minimum contacting area must be 1/4 inch.

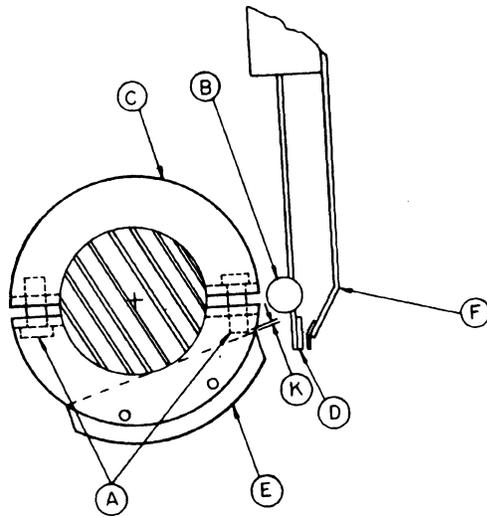
Using an insulated 1/16 inch gauge, PN: 3590-1010, adjust contacts in the following order. Refer to figure 16A.

- a. With the contact in the fully open position, the clearance between the cam follower (B) and the metal frame of the cam (C) must be a minimum of 1/16 inch. To adjust, bend the back contact until specification is achieved.
- b. With the contact in the fully open position, the clearance between the contacting surfaces (D and F) must be a minimum of 1/16 inch. To adjust, bend the front contact until specification is achieved.

Using an ounce spring scale, PN: 3565-211, and contact adjusting tool, PN: ES-6104-2, adjust contact spring pressure as follows. Refer to figure 16A.

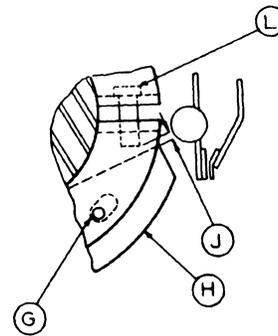
Position the gate so that the contact cam follower (B), is well upon the cam surface (E) or (H) and the contact is fully closed. Hook the end of the scale to the front contact at the bend (F), near the contacting surface and lift gently until the contact opens. The reading should fall between 18 to 28 ounces on the motor up contact and between 16 to 24 ounces for all other contacts. To adjust, bend the front contact while the contact is closed. To reduce pressure, bend the contact away from the cam. To increase pressure, bend the contact toward the cam.

**CAUTION: Do not overbend the contact. Overbending may damage the contact and make it impossible to achieve the correct gap or contact spring pressure.**



**Cam and Contact Detail**

**Figure 16 A**



**Sliding Cam Detail**

**Figure 16 B**

Ref. No	Description
A	Cap Screws
B	Cam Follower
C	Cam Frame
D	Minimum Gap 1/16"
E	Cam Insert Surface

Ref. No	Description
F	Attach Spring Scale 18-28 oz. Motor Up Contact 16-24 oz. All other Contacts
G	Cam Slot
H	Cam Insert Surface
J	Minimum Gap 1/16"
K	Minimum Gap 1/16"
L	Cap Screw

<b>Motor up Contact Cam Location</b>	
Mechanism	Contact/Cam Location
3590, 3590B, 3593, 3593I, 3593NJ, 3595, 3596, 3596NJ	1
3593B, 3593C, 3593E, 3593F, 3596B	4

**Table 4**

## 5. Hold Clear Device

The armature support assembly should have appreciable end play on its pivot and should not be restricted in any manner by friction or any tendency to bind.

Refer to figures 18, 19 and 20, pages 43, 44 and 46.

Engagement between the ratchet wheel, (1, figure 18, page 43), and the pawl, (2, figure 19, page 44), is controlled by the position of the hold-clear device on the motor face. With the hold clear coils energized and the armature, (10, figure 19, page 44), against the pole faces, the tip of the pawl should **just touch** the bottom or root of the space between the ratchet wheel teeth. This adjustment is set at the factory. If field adjustment becomes necessary, loosen the three hex head cap screws holding the hold-clear to the motor and move the entire hold-clear assembly to the proper position. Retighten mounting screws.

In the de-energized position, the pawl should clear the ratchet wheel teeth by a minimum of .020 inch. This clearance is controlled by stop screw and attendant lock nut. This adjustment should be maintained in service and the lock nut kept tight to prevent movement of the stop screw.

The pawl is double-sided. When the tip becomes worn to the point where it will not properly engage the ratchet wheel, it may be taken off the hold-clear device, turned around and re-attached. When both tips are worn, the pawl and pawl screw should be replaced.

The armature support bracket springs, (6, figure 19, page 44), are adjusted as follows; with the hold-clear coil energized and the armature held against the pole faces, the nuts are tightened until the coils of the springs are compressed together lightly, then each nut is backed off one-half turn and locked in place with the cotter pin.

The parallelism between the hold-clear armature, (10, figure 19, page 44), and its pole pieces, (15, figure 19, page 44), at time of latching is controlled by set screw and attendant lock nut. The lock nut should be kept tight to prevent movement of the set screw. If field adjustment is required, this measure should be under taken when hold-clear device is de-energized. If the parallelism adjustment is changed, it will be necessary to re-adjust the pawl to ratchet clearance and the stop springs per the above instructions.

## 6. Motor Down Contact Adjustment on Hold Clear 38-0045-340

Refer to figure 20, page 46.

Disconnect one wire from the terminal block (10). Apply hand pressure to the armature plate, (10, figure 19, page 44), to hold the armature in the closed, (energized) position. Check the gap between the contacts (8 and 9). The gap should be set at 0.032 inch. Check with gauge, PN: 3590-1011. To adjust the gap, insert contact adjusting tool, PN: ES-6104-2 onto the lower contact (9), near the mounting block spacer (4). To increase the gap, apply several forward forces on the tool to bend the contact. To decrease the gap, apply several rearward forces to bend the contact.

Release the armature. Check the contact spring pressure. Place the straight end of the ounce spring scale, PN: 3565-211, on the upper side of the lower contact (9) near the bend in the contact. Press downward on the contact until the contact just opens. The reading should be no less than 4 ounces. If it is necessary to adjust the contact spring pressure, insert contact adjusting tool, PN: ES-6104-2 onto the lower contact (9), near the mounting block (4). With a finger on the top of the upper contact (8), securely hold the contacts against the contact operating cam, (8, figure 19, page 44). To increase the pressure, apply several rearward forces on the tool to bend the contact.

**CAUTION: Do not overbend the contact. Overbending may damage the contact and make it impossible to achieve the correct gap or contact spring pressure.**

## 7. Ratchet Wheel

Refer to figure 18, page 43.

The ratchet wheel includes a press-fit, pre-lubricated and shielded one-way clutch. No maintenance of this unit is required. When the ratchet wheel becomes worn so as to interfere with proper latching or if the internal clutch becomes inoperative, it should be replaced.

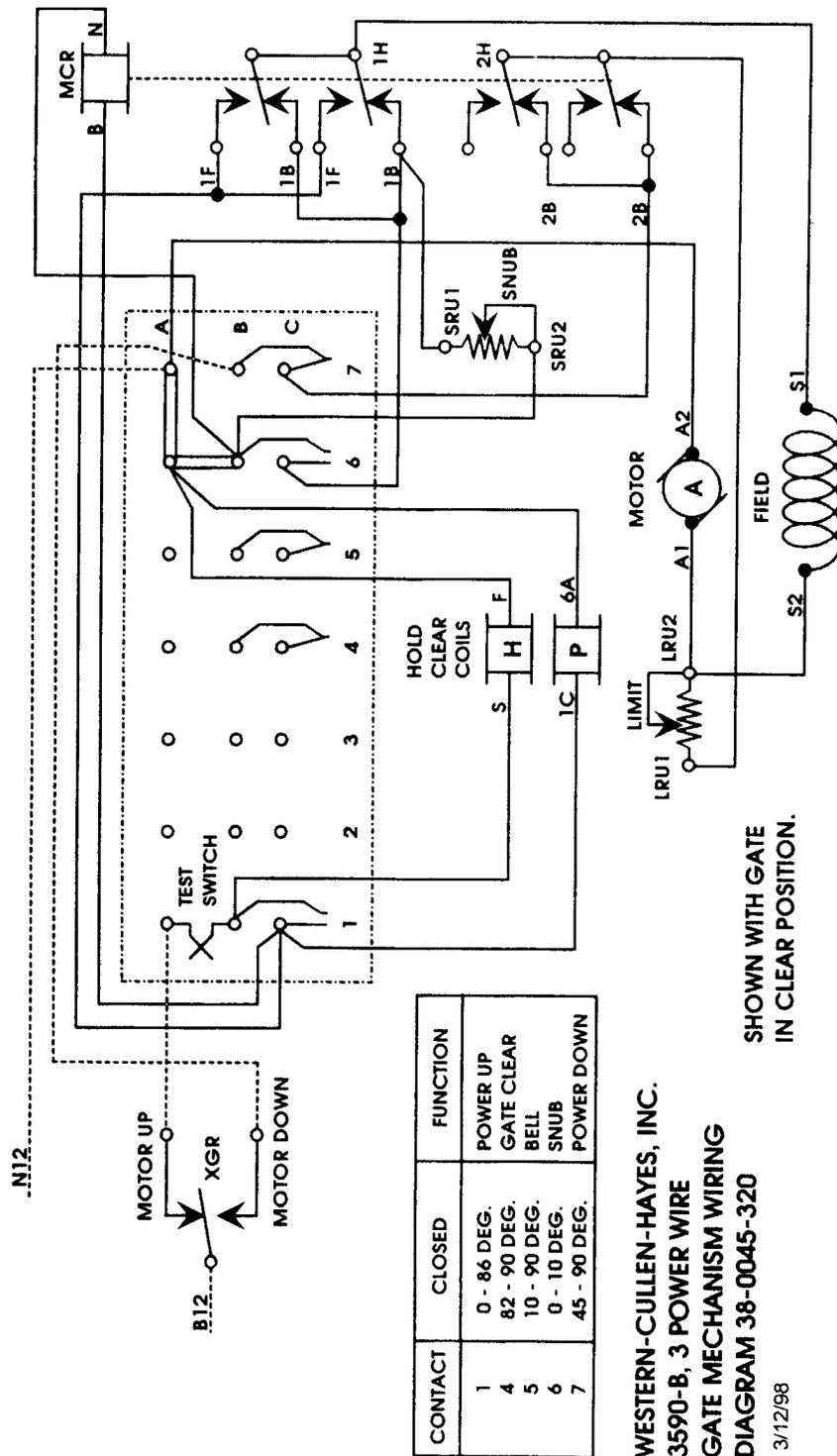
A snap ring, (5) and the key hold the ratchet wheel in place on the motor shaft. If the ratchet wheel is removed for any reason, the snap ring should be replaced. When remounting the snap ring, care should be taken to insure that the rounded edges of the snap ring face into the ratchet wheel, thereby reducing the wear of the ratchet wheel cover plate. When positioned properly, the snap ring should be no closer to the ratchet wheel cover plate than 0.010 inch. A light coat of multipurpose oil should be maintained between the two parts to reduce wear.

## 8. Wiring Diagram

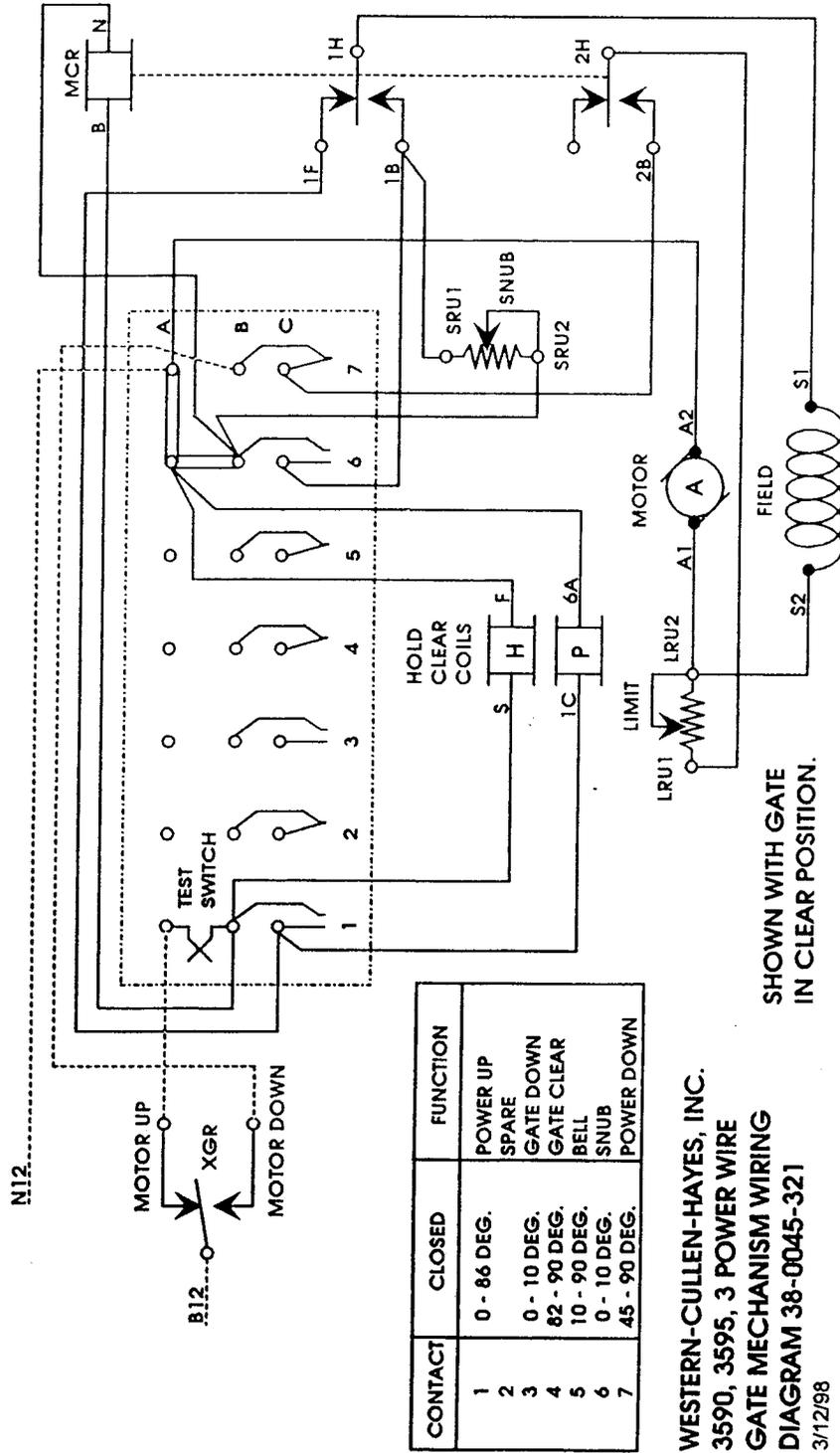
The following wiring diagrams illustrate the arrangement of mechanism wiring and operating circuits for all 3590 series crossing gate mechanisms. The same diagrams show the standard adjustment of all circuit controller contacts as set at the factory.

<b>Wiring Diagram Reference</b>		
<b>Mechanism Model</b>	<b>Wiring Diagram</b>	<b>Page</b>
3590, 3595	38-0045-321	32A
3590B	38-0045-320	32B
3593, 3593NJ, 3596, 3596NJ	38-0045-330	32C
3593B	38-0045-400	32D
3593C	38-0045-470	32E
3593E, 3593-J	38-0045-461	32F
3593F	38-0045-463	32G
3593I	38-0045-330-1	32H
3596B	38-0045-450	32I
3596-C	38-0045-469	32J

**Table 5**



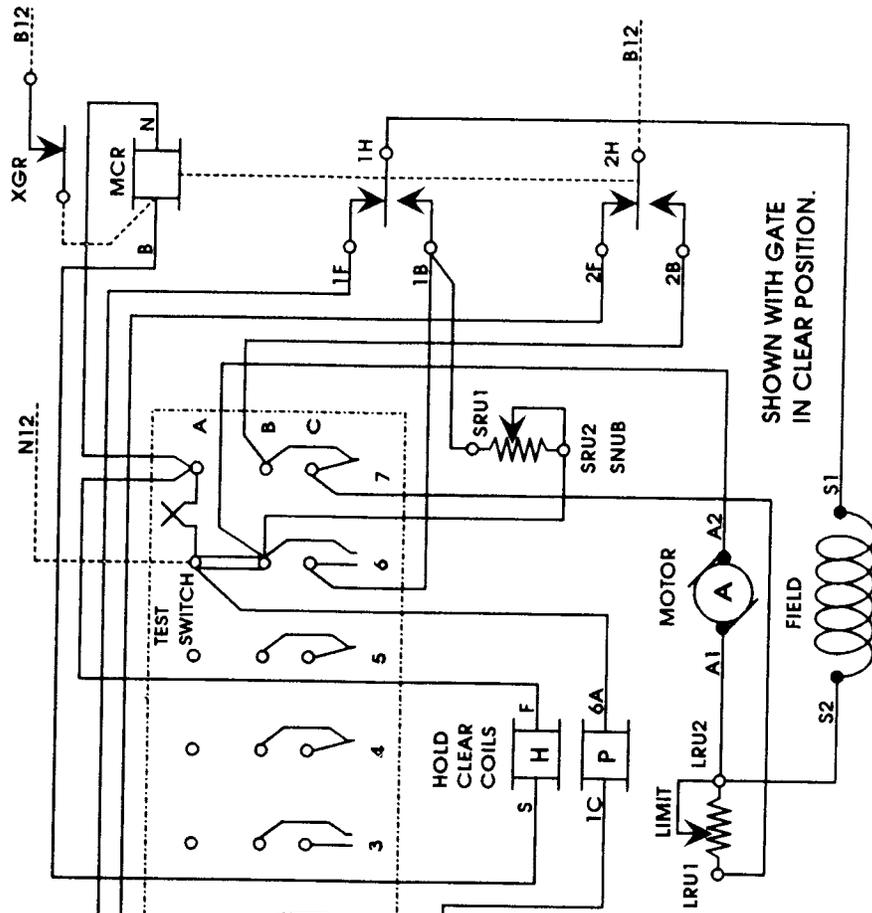
Rev. 3/98



CONTACT	CLOSED	FUNCTION
1	0 - 86 DEG.	POWER UP
2		SPARE
3	0 - 10 DEG.	GATE DOWN
4	82 - 90 DEG.	GATE CLEAR
5	10 - 90 DEG.	BELL
6	0 - 10 DEG.	SNUB
7	45 - 90 DEG.	POWER DOWN

WESTERN-CULLEN-HAYES, INC.  
 3590, 3595, 3 POWER WIRE  
 GATE MECHANISM WIRING  
 DIAGRAM 38-0045-321  
 3/12/98

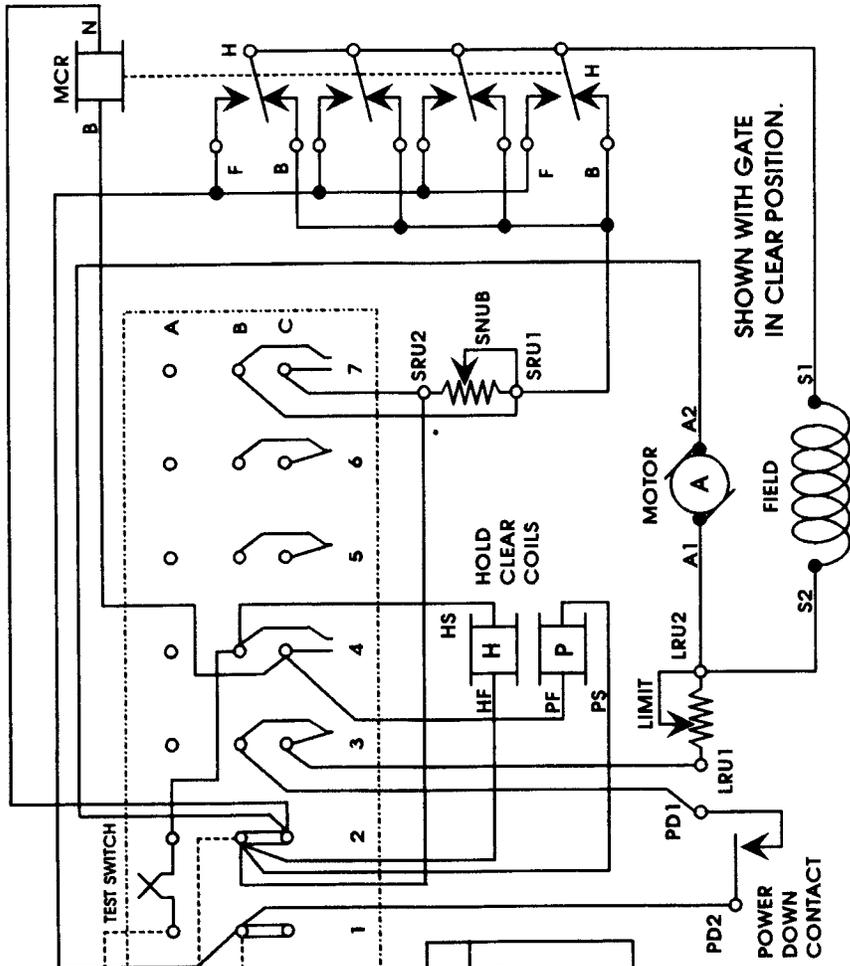
SHOWN WITH GATE  
 IN CLEAR POSITION.



CONTACT	CLOSED	FUNCTION
1	0 - 86 DEG.	POWER UP
2	0 - 10 DEG.	SPARE
3	82 - 90 DEG.	GATE DOWN
4	10 - 90 DEG.	GATE CLEAR
5	0 - 10 DEG.	BELL
6	0 - 10 DEG.	SNUB
7	45 - 90 DEG.	POWER DOWN

WESTERN-CULLEN-HAYES, INC.  
 3593, 3593NJ, 3596, 3596NJ,  
 2 POWER WIRE GATE MECHANISM  
 WIRING DIAGRAM 38-0045-330  
 3/12/98

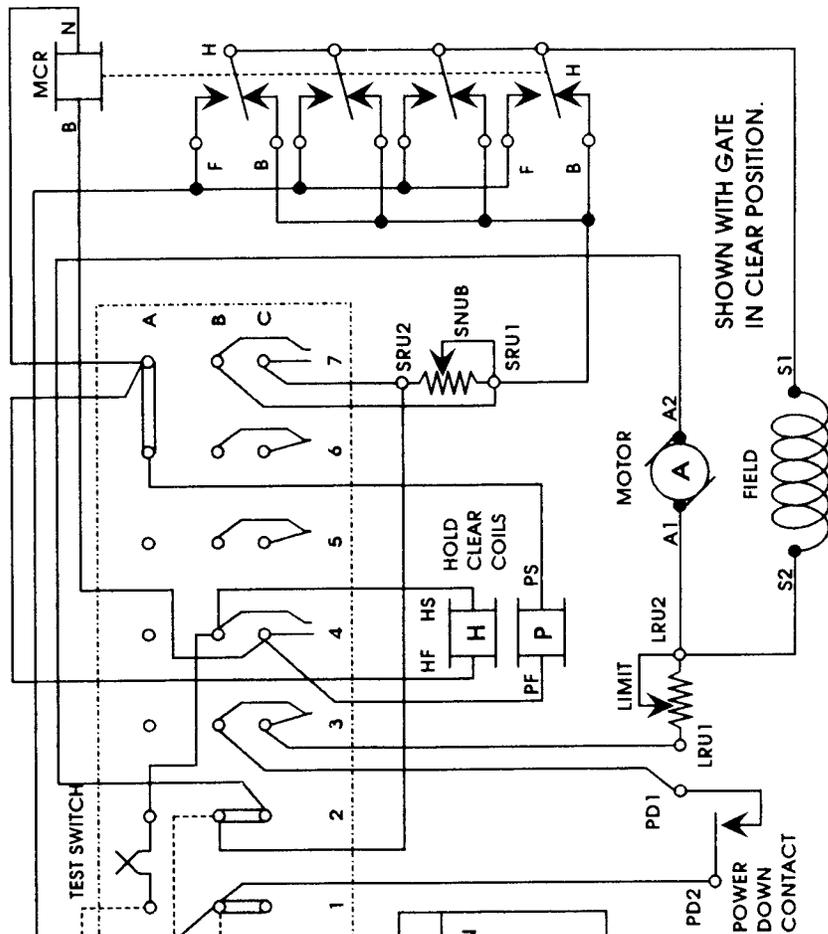
Rev. 3/98



CONTACT	CLOSED	FUNCTION
3	45 - 90 DEG.	POWER DOWN
4	0 - 86 DEG.	POWER UP
5	82 - 90 DEG.	GATE CLEAR
6	10 - 90 DEG.	BELL
7	0 - 10 DEG.	SNUB

WESTERN-CULLEN-HAYES, INC.  
 3593-B, 2 POWER WIRE  
 GATE MECHANISM WIRING  
 DIAGRAM 38-0045-400  
 3/12/98

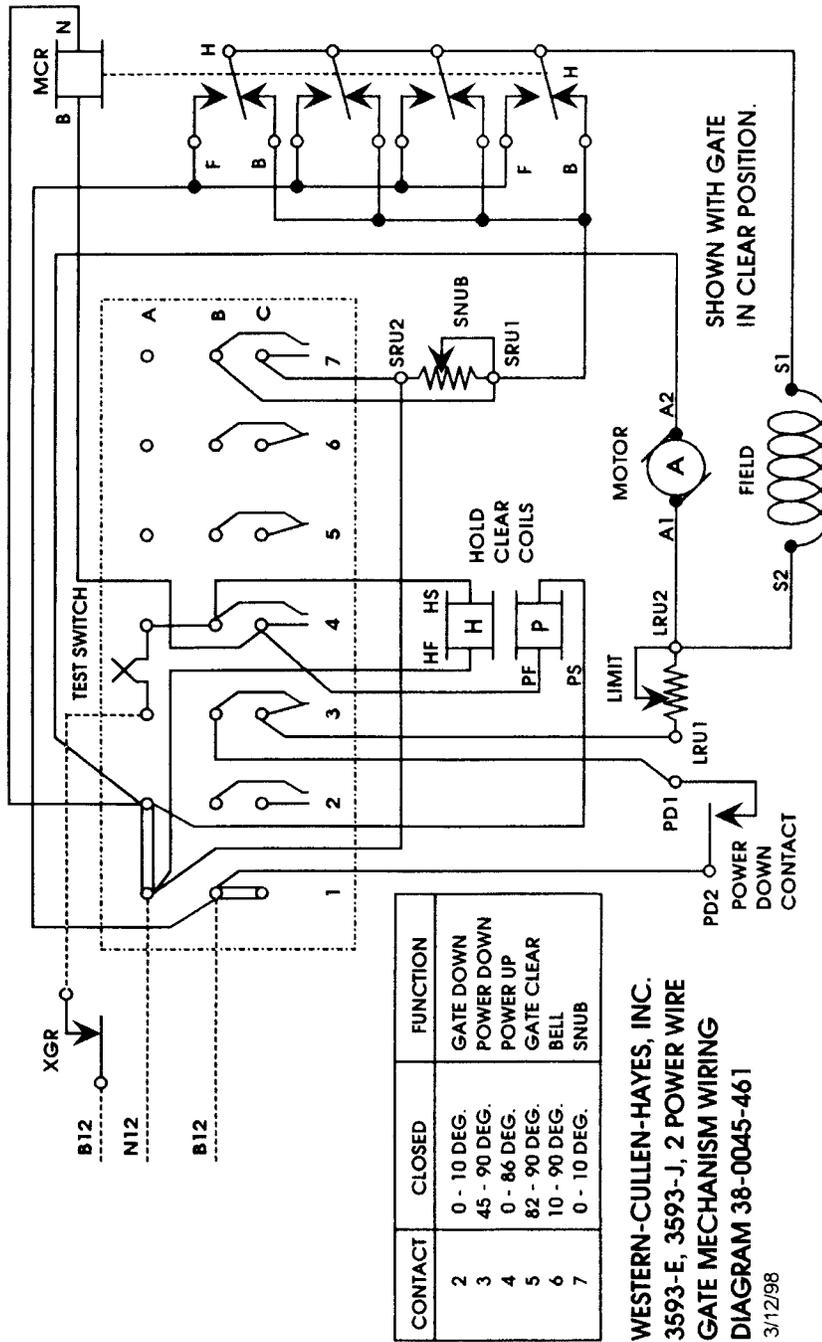
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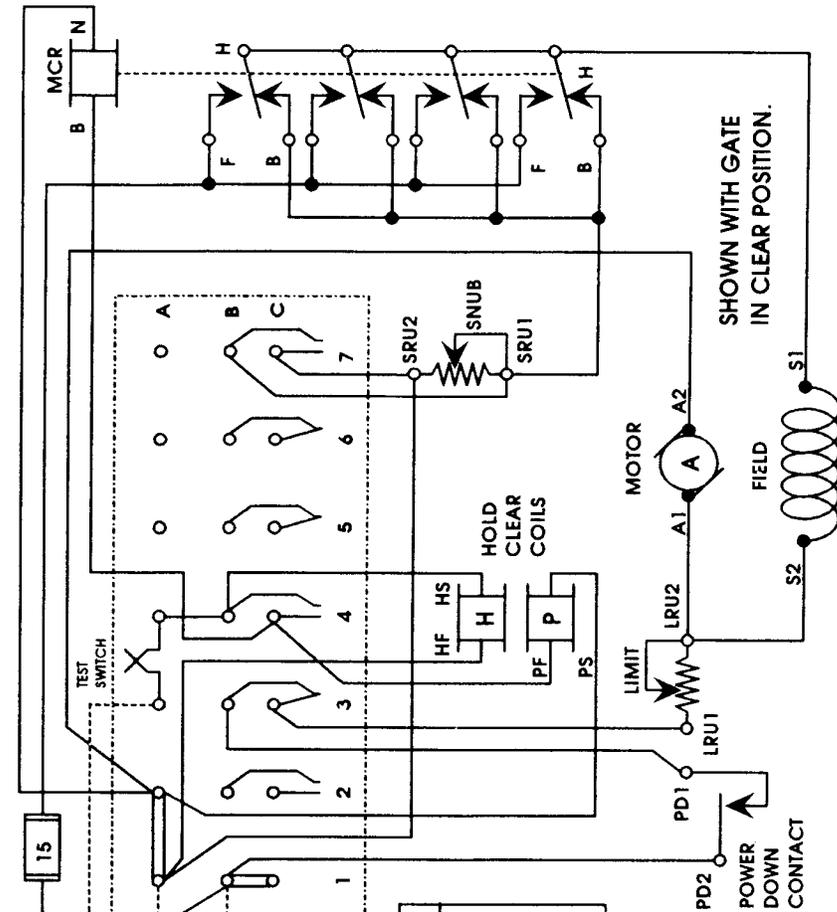
CONTACT	CLOSED	FUNCTION
3	45 - 90 DEG.	POWER DOWN
4	0 - 86 DEG.	POWER UP
5	82 - 90 DEG.	GATE CLEAR
6	10 - 90 DEG.	BELL
7	0 - 10 DEG.	SNUB

WESTERN-CULLEN-HAYES, INC.  
 3593-C, 2 POWER WIRE  
 GATE MECHANISM WIRING  
 DIAGRAM 38-0045-470  
 3/12/98

SHOWN WITH GATE  
 IN CLEAR POSITION.



Rev. 3/98

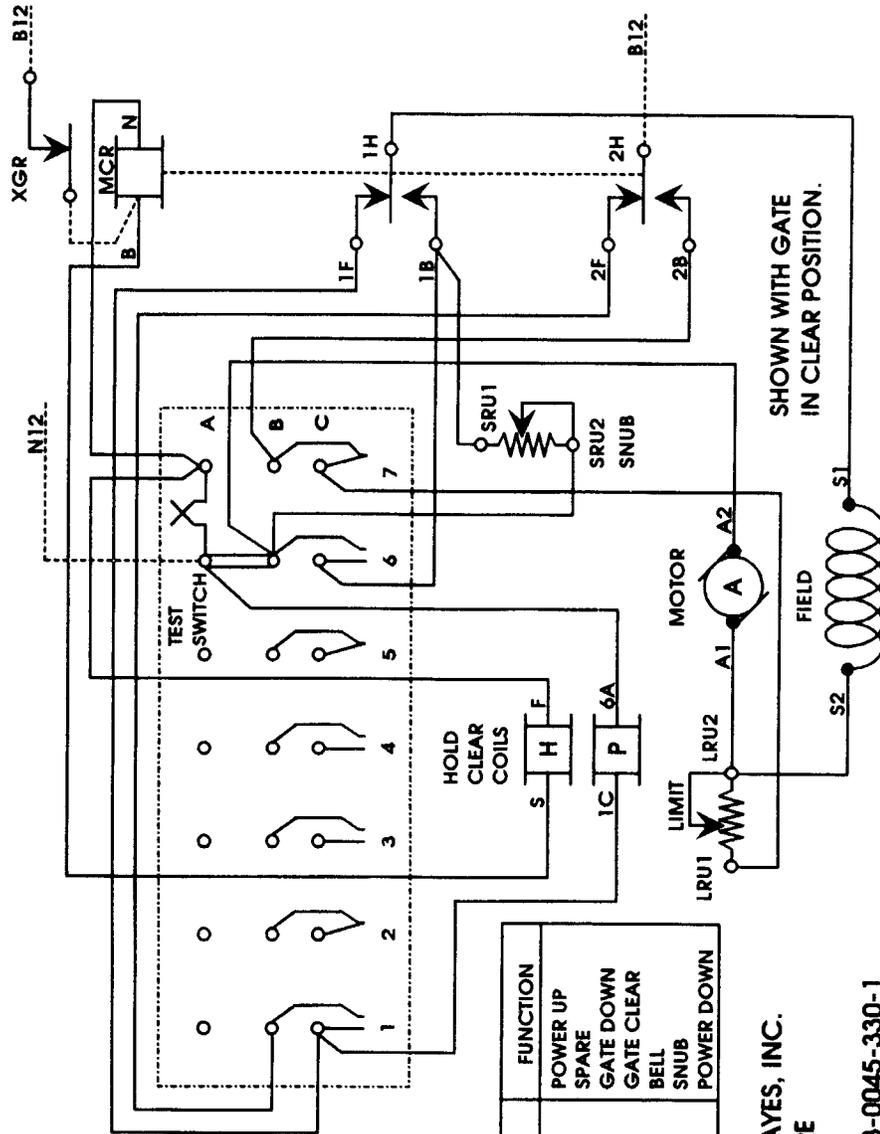


CONTACT	CLOSED	FUNCTION
2	0 - 10 DEG.	GATE DOWN
3	45 - 90 DEG.	POWER DOWN
4	0 - 86 DEG.	POWER UP
5	82 - 90 DEG.	GATE CLEAR
6	10 - 90 DEG.	BELL
7	0 - 10 DEG.	SNUB

WESTERN-CULLEN-HAYES, INC.  
 3593-F, 2 POWER WIRE  
 GATE MECHANISM WIRING  
 DIAGRAM 38-0045-463  
 3/12/98

SHOWN WITH GATE  
 IN CLEAR POSITION.

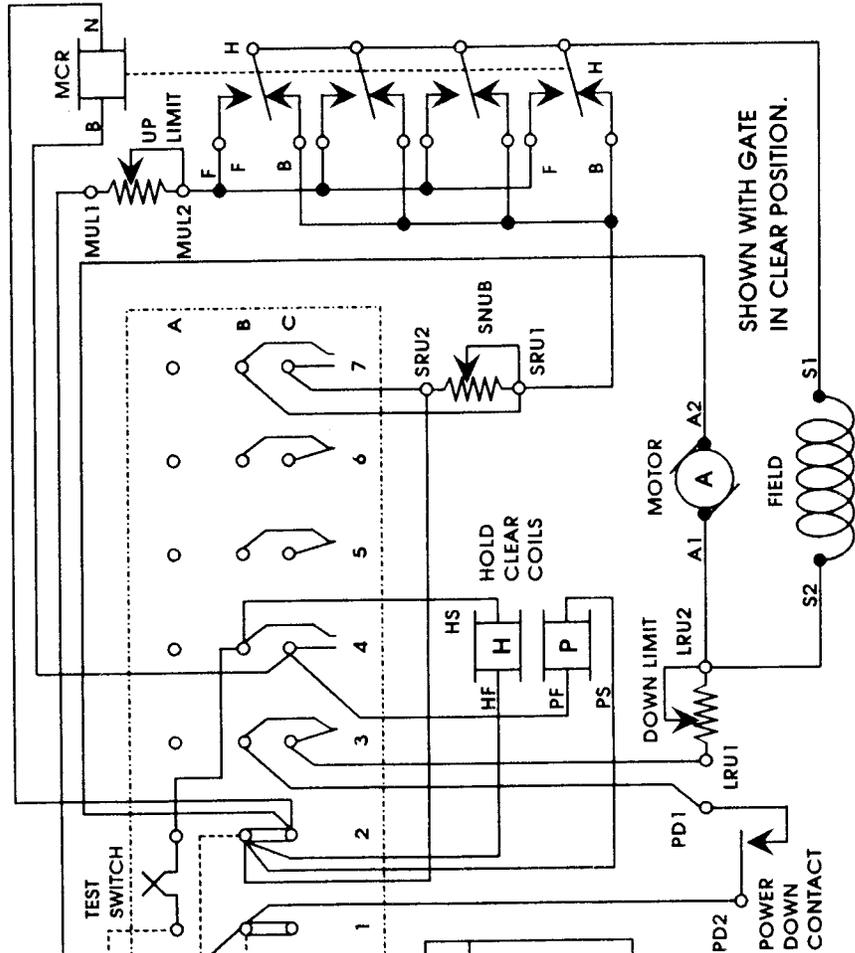
Rev. 3/98



CONTACT	CLOSED	FUNCTION
1	0 - 86 DEG.	POWER UP
2	0 - 10 DEG.	SPARE
3	0 - 10 DEG.	GATE DOWN
4	0 - 82 DEG.	GATE CLEAR
5	10 - 90 DEG.	BELL
6	0 - 10 DEG.	SNUB
7	45 - 90 DEG.	POWER DOWN

WESTERN-CULLEN-HAYES, INC.  
 3593-I, 2 POWER WIRE  
 GATE MECHANISM  
 WIRING DIAGRAM 38-0045-330-1  
 3/12/98

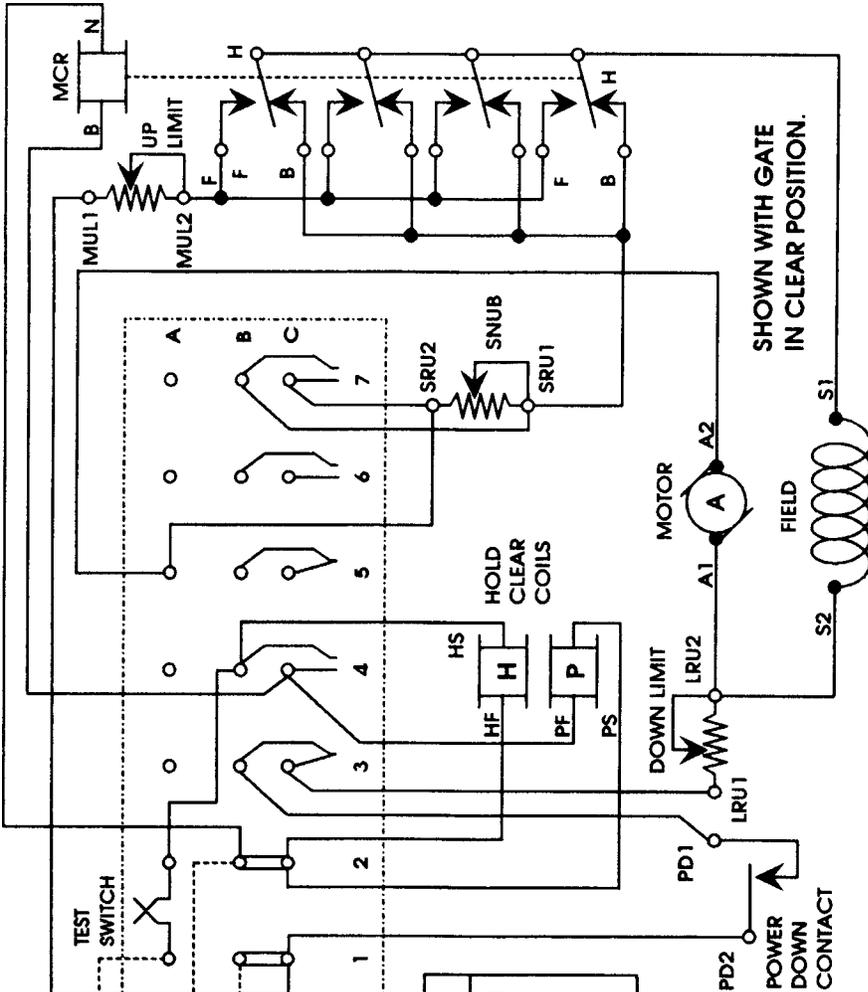
Rev. 3/98



CONTACT	CLOSED	FUNCTION
3	45 - 90 DEG.	POWER DOWN
4	0 - 86 DEG.	POWER UP
5	82 - 90 DEG.	GATE CLEAR
6	10 - 90 DEG.	BELL
7	0 - 10 DEG.	SNUB

WESTERN-CULLEN-HAYES, INC.  
 3596-B, 2 POWER WIRE  
 GATE MECHANISM WIRING  
 DIAGRAM 38-0045-450  
 3/12/98

Rev. 3/98

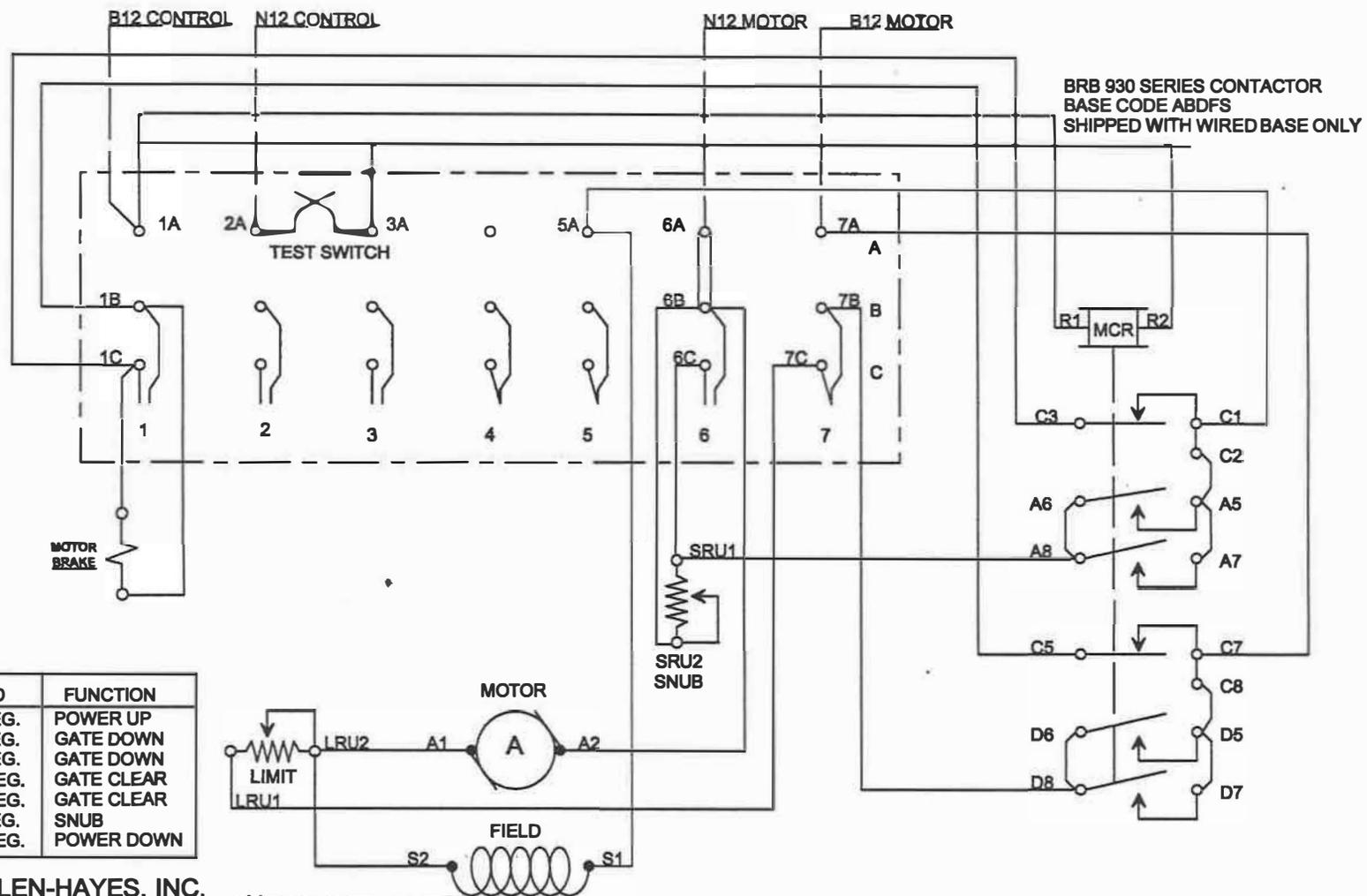


SHOWN WITH GATE  
IN CLEAR POSITION.

CONTACT	CLOSED	FUNCTION
3	45 - 90 DEG.	POWER DOWN
4	0 - 86 DEG.	POWER UP
5	82 - 90 DEG.	GATE CLEAR
6	0 - 10 DEG.	GATE REVERSE
7	0 - 10 DEG.	SNUB

WESTERN-CULLEN-HAYES, INC.  
3596-C, 2 POWER WIRE  
GATE MECHANISM WIRING  
DIAGRAM 38-0045-469  
6/16/98

Rev. 3/98



CONTACT	CLOSED	FUNCTION
1	0 - 86 DEG.	POWER UP
2	0 - 10 DEG.	GATE DOWN
3	0 - 10 DEG.	GATE DOWN
4	82 - 90 DEG.	GATE CLEAR
5	82 - 90 DEG.	GATE CLEAR
6	0 - 10 DEG.	SNUB
7	45 - 90 DEG.	POWER DOWN

SHOWN WITH GATE  
IN CLEAR POSITION.

WESTERN-CULLEN-HAYES, INC.  
3593-NZ2 GATE MECHANISM  
WIRING DIAGRAM 38-0045-468

6/23/21

## SECTION 3

### GENERAL MAINTENANCE

#### 1. Operational Tests.

All mechanisms are given a final inspection and are properly lubricated and adjusted before shipment from the factory.

##### **Before placing any mechanism in service:**

- a. Inspection should be made to insure that there is no oil, grease or dirt on the armature or pole faces of the hold-clear magnet. These surfaces should be kept clean at all times.
- b. Supply voltage should be maintained between 11 and 16 volts DC. Observing polarity, check supply voltage at the motor supply terminal points. Refer to proper wiring diagram for terminal points.
- c. Operate the mechanism through an up-down cycle and note operating voltage readings. As the gate goes up, voltage should not drop below 11 volts and current should range from 6 to 20 amps. As the gate descends, voltage should not drop below 11 volts and current should range from 6 to 15 amps. Readings will vary depending on the length of gate arm. If voltage drops below 10 volts, check motor supply wiring between the battery and the mechanism terminal points for proper wire sizing and voltage drop. Correct wiring where necessary.
- d. Perform a gravity down test. Place a piece of insulating material, (business card, credit card, etc.), between the motor up contacts. ( Refer to table 4, page 30). Open the test switch. The gate should descend freely to the horizontal position. When complete, remove the insulating material from the contacts and close the test switch.

**CAUTION: Before returning mechanism to service, be sure to remove insulating material.**

- e. Normal field descending time should be between 10 and 15 seconds depending on gate arm length and local requirements. Long gate arms should usually operate slower than shorter arms. Arms of unequal length at the crossing should be adjusted to descend at equal times.

Powered descending speed, 90 to 45 degrees, is adjusted at the limit resistor. Gravity descending speed from 45 to 5 degrees, is adjusted at the snubbing resistor.

##### **Powered Descending Adjustment**

To increase speed, move slide on the limit resistor upward; to reduce move downward. The limit resistor is mounted to the left of the snub resistor.

## Gravity Descending Adjustment

To increase speed, move slide on the snubbing resistor downward; to reduce move upward. The snub resistor is mounted to the right of the limit resistor.

Care should be taken to be sure that the resistor slide contact is bearing on the windings with firm pressure and that the slide screw and locknut are securely tightened.

f. Check the clearing time:

Depending on gate arm length and voltage supplied, the arm should raise to the clear position between 6 to 10 seconds.

g. Check for grounds in the battery and control circuit wiring.

h. Check hold-clear release voltage. Hold-clear should release at not less than 2.5 volts DC, and hold-clear should energize between 7.5 and 10 volts DC.

Replace any hold-clear that does not energize by 10 volts.

i. No field adjustments are recommended to the motor control relay. Field tests suggested are:

1. Verify pick and drop values as listed in table 6.
2. Visually inspect contacts for arcing or burning.

<b>Relay Specifications</b>				
Mechanism	Relay	Coil Resistance	Maximum Required Voltage To Pick	Minimum Drop Voltage
3590, 3593, 3593I, 3595, 3596	38-0050-200	1000 ohm	5.96	2.14
3593NJ, 3596NJ	38-0050-300	160 ohm	5.32	2.89
Mechanism	Relay	Coil Resistance	Nominal Pick	Nominal Drop
3590B	91254-10	32.3 ohm	6.54	.72
3593B, 3593C, 3593E, 3593F, 3596B	91254-11	32.3 ohm	6.54	.72
<b>NOTE: Replace any 91254 relay that fails to pick by 9 VDC.</b>				

## SETUP CHECKLIST

Location: \_\_\_\_\_ In Service Date: \_\_\_\_\_

1. Hold clear armature and pole faces clean. \_\_\_\_\_
2. Supply voltage between 11 and 16 volts DC. \_\_\_\_\_ volts
3. Voltage during gate up cycle. \_\_\_\_\_ volts
4. Amperage during gate up cycle. \_\_\_\_\_ amps
5. Gravity down test. \_\_\_\_\_
6. Check and adjust descending time. Resistor screws tight. \_\_\_\_\_ seconds
7. Check clearing time. \_\_\_\_\_ seconds
8. Check for grounds in wiring. \_\_\_\_\_
9. Check hold clear release voltage. \_\_\_\_\_ volts
10. Check relay pick voltage. \_\_\_\_\_ volts
11. Check relay drop voltage. \_\_\_\_\_ volts
12. Set horizontal gate arm torque. \_\_\_\_\_ ft. lbs.
13. Set vertical gate arm torque. \_\_\_\_\_ ft. lbs.
14. Gate parallel to roadway surface. \_\_\_\_\_
15. 3/32" clearance between segment gear and vertical stop. \_\_\_\_\_
16. Contact cams adjusted if gate stop positions have been altered. \_\_\_\_\_  
Motor up cam. \_\_\_\_\_  
Snub cam closed at 10 degrees. \_\_\_\_\_

Installed by: \_\_\_\_\_

Checked by: \_\_\_\_\_

## 2 **Lubrication.**

Time interval for periodic lubrication will be governed by usage.

This interval, therefore, should be determined by the user.

The mechanism gear train, main shaft and motor bearings are pre-lubricated and sealed. No periodic lubrication is required for these bearings.

The gear teeth are to be lubricated periodically with, PN: 3590-1733 Areoshell 33 all-temperature lubricating grease.

## 3 **Motor Service.**

Refer to figure 18, page 43.

The motor has a totally enclosed, non-ventilated housing and has pre-lubricated sealed bearings.

The motor brushes should be periodically inspected for wear. Replace brushes and springs, (11 and 12) when carbon portion has worn to 5/8 inch length or less.

**NOTE: Motor brush caps (13) screw on. Remove caps by turning**

2

0

## 4. **Optional Arc Suppressor Testing**

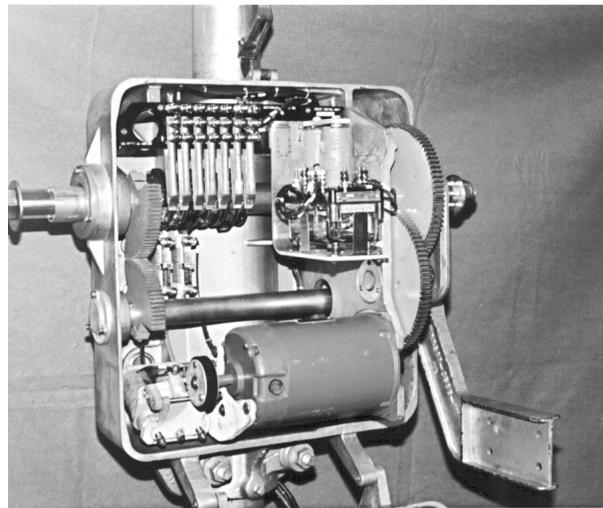
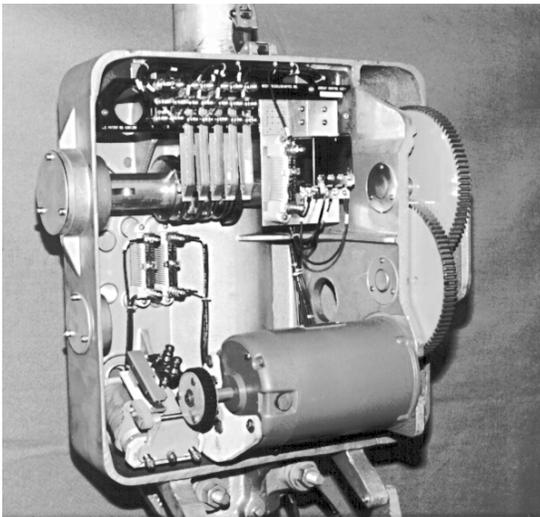
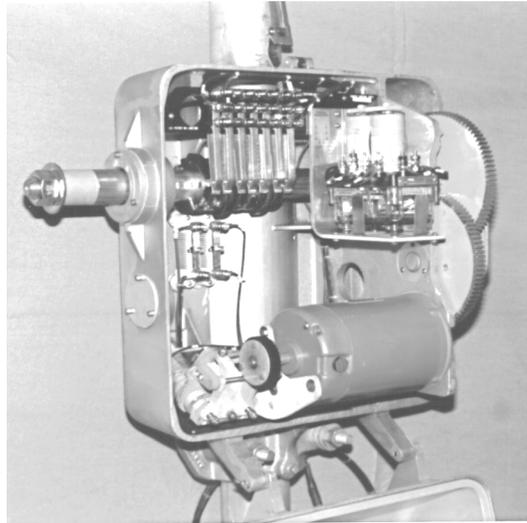
The optional arc suppressor, (Item 9, figure 21, page 47) is a fused, passive electronic network encapsulated in a throw-away cartridge. A defective arc suppressor can be detected by removing the unit from the circuit controller and testing it with an analog ohmmeter. After shorting the two arc suppressor mounting lugs together to discharge any stored energy, set the meter on the highest resistance scale and touch each probe to one of the arc suppressor mounting lugs. If the unit is functioning properly, a noticeable kick will be observed on the meter, followed by a gradual return to full scale as the capacitor charges. If the unit is bad, the meter will show an open circuit.

## SECTION 4

### OPTIONAL EQUIPMENT

1. Sidewalk Arm Kit, (figure 22, page 50), permits the addition of a sidewalk arm to the mechanism in service as operator of roadway arm. The kit includes necessary bearings, gears, keys, shafts and instructions. Does not include sidewalk arm bracket or sidewalk arm.
2. Heater, (figure 23, page 51), may be attached to the mechanism for prevention of frost formation on controller contacts.
3. Counter kit, PN: 38-0045-192, consists of an electro-mechanical counter and mounting bracket. (Not shown).
4. Set-up and adjustment tools are listed on the last page of the mechanism parts section.

**3590 SERIES  
CROSSING GATE MECHANISMS  
Internal View**



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Circuit Controller Assembly	47
Mechanism Relays	49
Sidewalk Kit	50
Contact Heater Assembly	51
Maintenance Aids	52

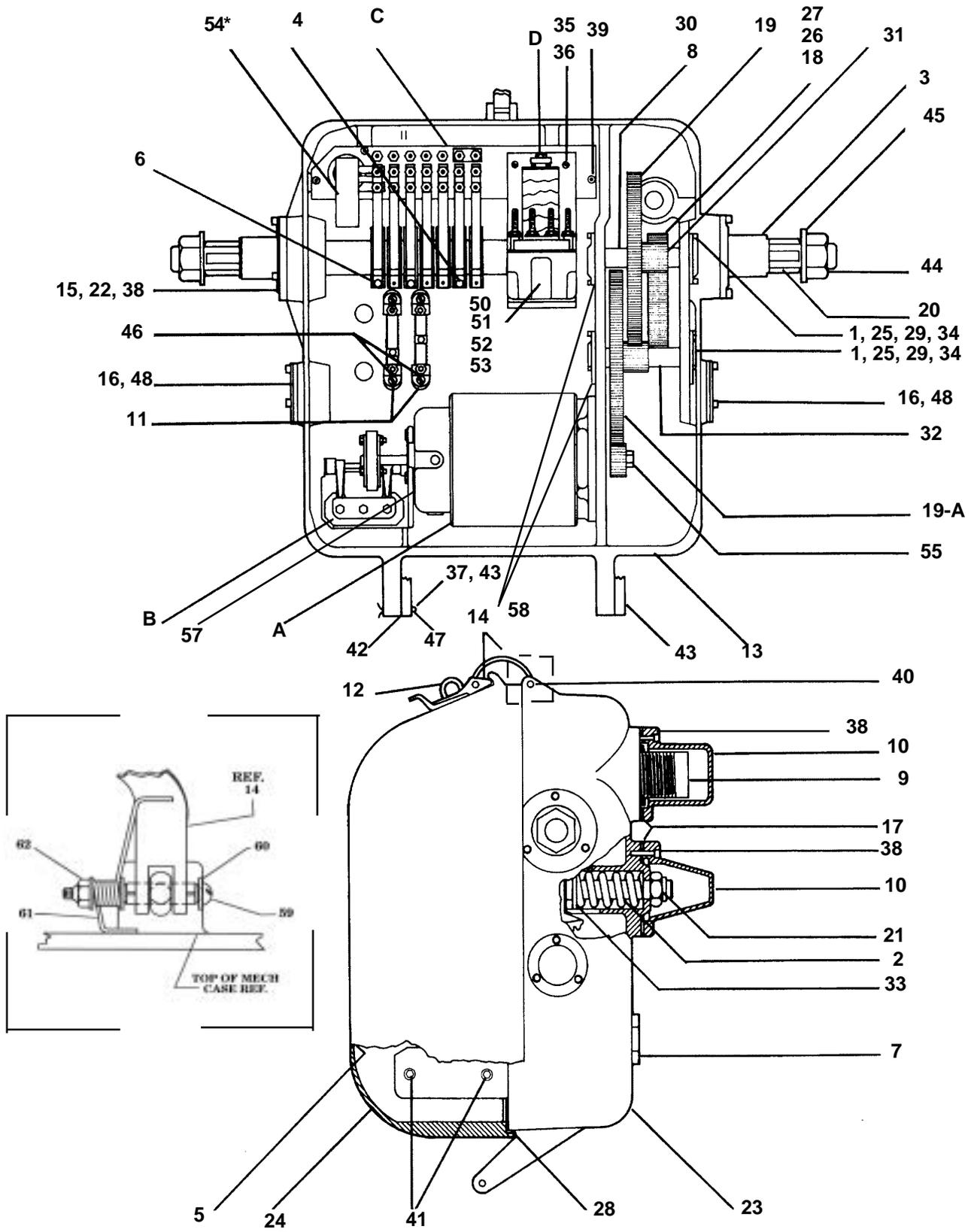
Basic Gate Mechanism							
Features	2 Wire Control	3 Wire Control	Vital Relay	Non-Vital Relay	Contacts	Standard Mainshaft	Single End Mainshaft (RH)
3590		X	X		7	X	
3590B		X		X	5	X	
3593	X		X		7	X	
3593B	X			X	5	X	
3593C	X			X	5	X	
3593E	X			X	6	X	
3593F	X			X	6	X	
3593I	X		X		7	X	
3593NJ	X		X		7	X	
3595		X	X		7		X
3596	X		X		7		X
3596B	X			X	5		X
3596NJ	X		X		7		X

**Note:**

Add Suffix - 132 for sidewalk kit. Specify field or track side sidewalk arm.

# CROSSING GATE ASSEMBLY

Figure 17



**3590 SERIES  
CROSSING GATE ASSEMBLY  
REPLACEMENT PARTS**

Refer to Figure 17, Page 40

<b>Ref. No.</b>	<b>Description</b>	<b>Part No.</b>
1	Bearing Cover	38-0045-30
2	Spring, Vertical Stop	38-0045-38
3	Spacer Tube	38-0045-42
4	Cam Assembly	38-0045-55
5	Wiring Diagram (Consult W-C-H)	
6	Slide Cam Assembly	38-0045-92
7	3/8"-16 Square Nut	JJ-11-JJ-3
8	Gear Shaft for Intermediate Gears	38-0045-267
9	Horizontal Stop Pin Assembly	38-0045-305
10	Stop Pin Cover	38-0045-329-M
11	Adjustable Resistance Unit	1110-1
12	Staple	1265-4
13	Ventilator Screen	1265-6-B
14	Hasp Assembly*	1265-40-1*
15	Main Shaft Bearing	3580-166
16	End Cap	3580-291
17	Neoprene Gasket	3580-281
18	Gear Segment	3590-219-F
19	Gear Cluster	3590-220-F
19-A	Gear Cluster With Hole	3590-220-G
20	Main Shaft	3590-222
20-A	Single End (Right) Main Shaft (Not Shown)	3590-226
21	Nut, Nylon Insert, for Vertical Stop Assembly	3590-231
22	Main Shaft Cap	3590-232
22-A	Main Shaft Cap Without Hole (Not Shown)	3590-232-1
23	Case	3590-234-2-M
24	Cover*	3590-240-2-M*
25	Bearing	3590-249
26	Set Screw	3590-251
27	Woodruff Key	3590-254
28	Cover Gasket*	3590-258-2*
29	3/8" Lockwasher	RR-00-AM-3

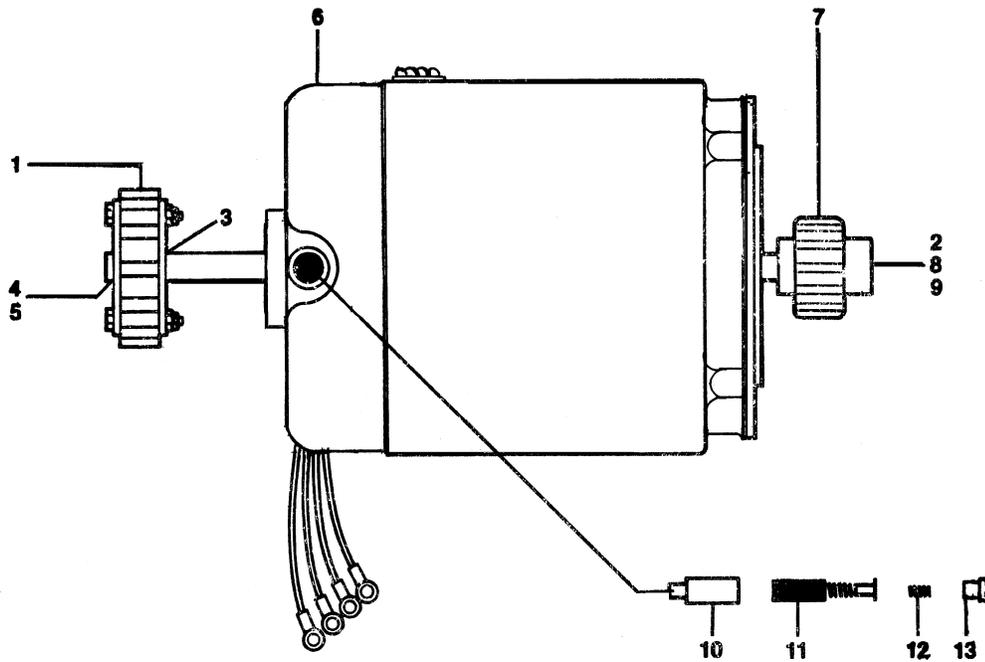
## REPLACEMENT PARTS

Refer to Figure 17, Page 40

Ref. No.	Description	Part No.
30	Spacer	3590-277
31	Spacer	3590-278
32	Spacer	3590-279
33	Vertical Stop Pin Assembly	3590-293
34	#8-32 x 3/8" Button Head Socket Cap Screw	BB-32-BB-3-0037
35	#10-24 x 1-1/4 Round Head Machine Screw	AA-10-CC-3-0125
36	#10 Split Lock Washer	RR-00-AH-3
37	3/8" Hex Nylok Nut	AL-12-JJ-3
38	1/4"-20 x 3/4" Hex Head Socket Cap Screw	BB-23-EE-3-0075
39	1/4"-20 x 1-1/4" Hex Head Socket Cap Screw	BB-23-EE-3-0125
40	Eyebolt	3590-381
41	3/8"-16 x 3/4" Socket Cap Screw	BB-59-JJ-3-0075
42	5/26"-18 x 2 1/4" Hex Head Bolt	CC-12-GG-3-0225
43	3/8"-16 Hex Nut	HH-12-JJ-3
44	1-1/4"-7 Hex Nut	JJ-12-AD-3
45	1-1/4" ID Flat Washer	3570-114
46	10-24 x 1-3/4" Round Head Machine Screw	AA-10-CC-3-0175
47	1/4" Plain Washer	PP-00-AJ-3
48	1/4"-20 x 3/8" Hex Socket Cap Screw	BB-23-EE-3-0037
50	Mtg. Brkt. for Non-Vital Relay	38-0045-190-1
50-A	Mtg. Brkt. & Spring Base Assembly for Vital Relay (Not Shown)	38-0045-225
51	5/16"-18 Hex Nylok	AL-12-GG-3
52	Installation Manual	
54	Arc Suppressor (Optional) Not Shown	38-0045-293
55	Pinion Gear	3590-218
56	Mounting Kit for 5" Mast (Not Shown)	3590-294
57	Cap Screw	38-0045-282
58	Spacer for Bearing Cap	3590-275
59	10-32 x 2 Round Head Machine Screw Steel	AA-10-DD-3-02
60	#10 Plain Steel Washer	PP-00-AH-3
61	Torsion Spring-Formed	3590-382
62	10-32 Nylon -Lok Hex Nut	AL-12-DD-3

**MOTOR AND RATCHET WHEEL  
REF. A**

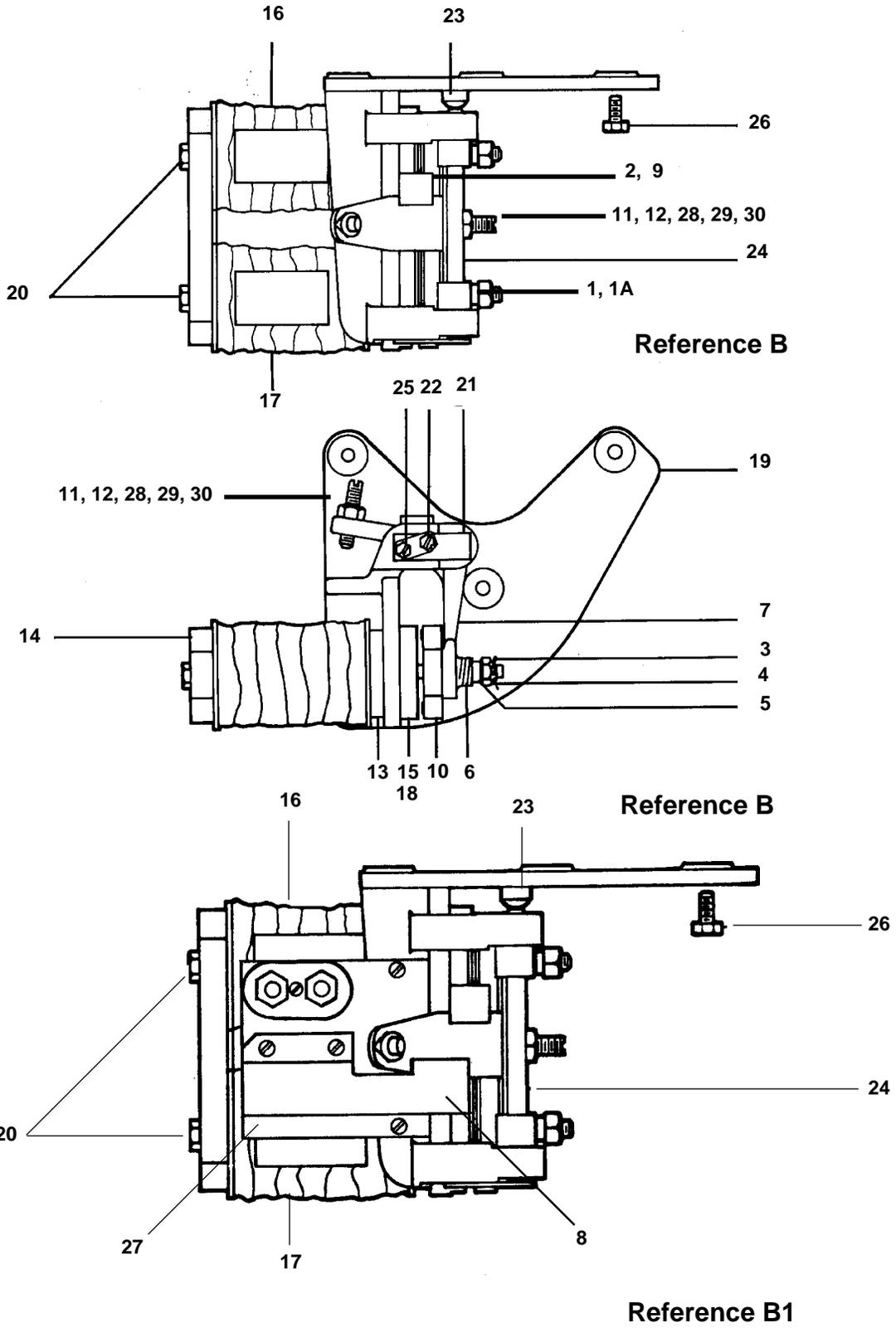
**Figure 18**



Ref. No	Description	Part No.
A	Motor Assembly Complete	38-0045-82X
<b>REPLACEMENT PARTS</b>		
1	RatchetWheel Assembly	38-0045-262
2	Motor Pinion Woodruff Key	38-0045-86
3	Washer	38-0045-182
4	Ratchet Wheel Key	3580-270
5	Snap Ring	3580-271
6	Motor	3590-217X
7	Motor Pinion Gear	3590-218
8	Round Head Nylok Machine Screw 8/32 x 1/2	BJ-10-BB-3-005
9	Washer	38-0045-241
10	Brush Holder	38-0045-117
11	Motor Brush	38--0045-118
12	Cap Spring	38-0045-137
13	Brush Cap	38-0045-268

**HOLD CLEAR ASSEMBLY  
REF. B, B1**

**Figure 19**



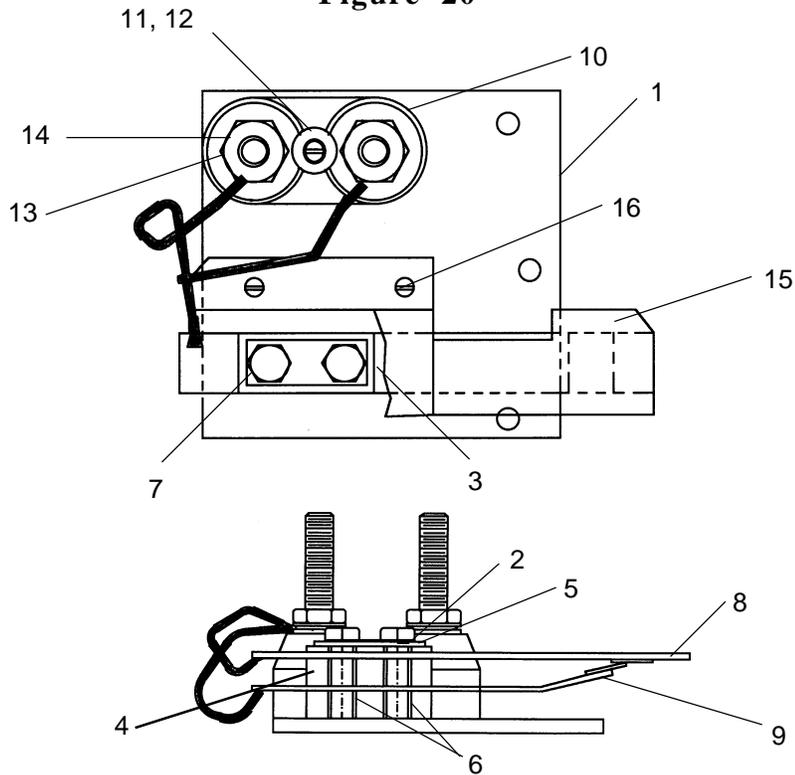
## HOLD CLEAR ASSEMBLY

Refer to figure 19, Page 44

Ref. No.	Description	Part No.
B	Hold-Clear Assembly	38-0045-254
B1	Hold-Clear Assembly with Motor Down Contact	38-0045-340
1	Armature and Support Bracket Assembly, Consists of Ref: 2,3,4,5,6,7,9,10,11,12,28,29 and 30	38-0045-159
1A	Armature & Support Bracket Assembly for Hold Clear With Motor Down Contact, Consists of Ref: 2,3,4,5,6,7,8,9,10,11,12,28,29 and 30	38-0045-159-1
2	Pawl	38-0045-7
3	Cotter Pin	38-0045-139
4	Castle Nut	38-0045-140
5	Cup Washer	38-0045-220
6	Compression Spring	38-0045-223
7	Armature Support Bracket	38-0045-246
8	Cam	38-0045-390
9	Pawl Mounting Screw	38-0045-261
10	Armature Sub-Assembly	38-0045-265
11	1/4-20 Hex Jam Nut	KK-12-EE-8
12	Set Screw	38-0045-266
13	Coil Spacer	38-0045-147
14	Magnet Yoke	38-0045-148
15	Magnet Pole and Core Sub-Assembly	38-0045-151
16	Hold Coil, 340 Ohms	38-0045-158
17	Pick Coil, 32 Ohms	38-0045-162
18	Mounting Screw, Pole/Core Sub Assy to Hold -Clear Base	38-0045-260
19	Hold-Clear Base	38-0045-248
19A	Hold-Clear Base For Contact Plate	38-0045-322
20	Mounting Screw, Magnet Yoke to Pole/Core Sub-Assembly	38-0045-264
21	Hinge Pin Stop	38-0045-152
22	Bolt/Screw Keeper	38-0045-153
23	Set Screw, Nickel Plated Brass	38-0045-157
24	Hinge Pin	38-0045-160
25	Hex Bolt, Nickel Plated Brass	38-0045-279
26	Hex Head Cap Screw, Grade 8	38-0045-282
27	Motor Down Contact Block (Ref. Page 46 )	38-0045-410
28	Plain Washer 1/4 ID-7/16 OD x 1/32	AH-00-AJ-8
29	Nylok Nut 1/4 x 20	AL-00-EE-3
30	External Lock Washer	TT-00-AJ-3

**MOTOR DOWN CONTACT BLOCK**  
**38-0045-410**

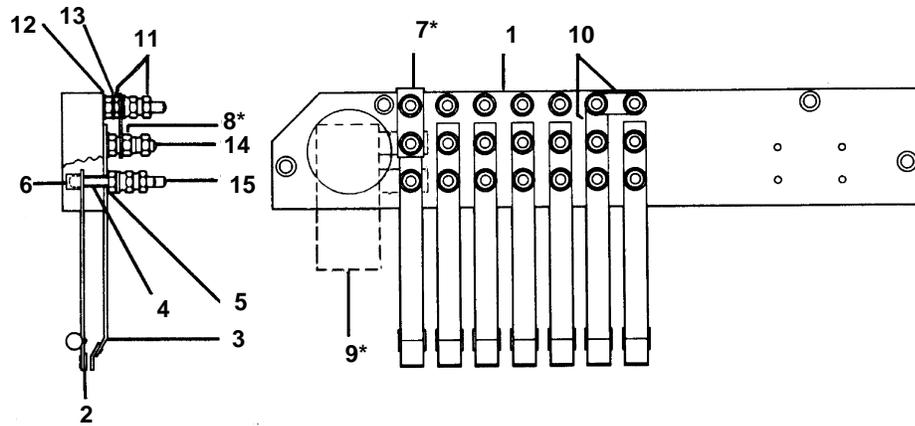
**Figure 20**



Ref. No	Description	Part No.
1	Mounting Bracket	38-0045-375
2	Washer Plate	38-0045-376
3	Keeper	38-0045-380
4	Mounting Block Spacer	38-0045-381
5	Spacer	38-0045-382
6	Insulator	38-0045-383
7	Screw	38-0045-384
8	Upper Contact Spring Assembly	38-0045-387
9	Lower Contact Spring Assembly	38-0045-388
10	Terminal Block	2506-2
11	#10-32 x 1/2 Round Head Machine Screw	AA-10-DD-8-005
12	#10 Lockwasher External	TT-00-AH-3
13	Clamp Nut	10707
14	Washer	10708
15	Guard	38-0045-386
16	#8-32 x 1/4 Round Head Machine Screw	AA-10-BB-8-0025

**CIRCUIT CONTROLLER ASSEMBLY  
REF. C**

**Figure 21**



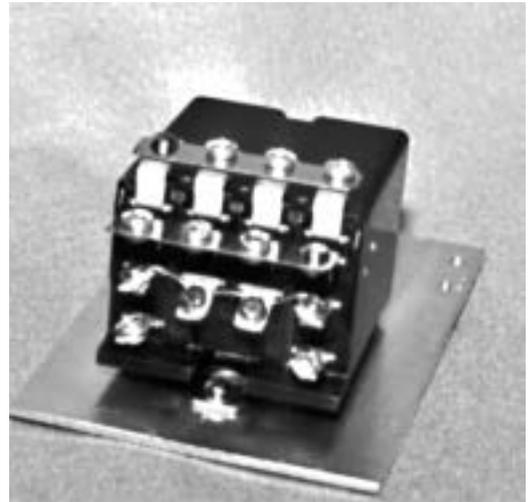
Ref. No.	Description	Part No.
C	Circuit Controller Assembly Complete Listed on Page 48	
1	Terminal Board	38-0045-21
2	Back Contact Spring Assembly	38-0045-27
3	Front Contact Spring Assembly	38-0045-28
4	Insulator Sleeve	38-0045-29-A
5	Insulator Washer	38-0045-29-B
6	Binding Post Seat	38-0045-77
7*	Test Terminal (Location will vary)	38-0045-89-R
8*	Gold Nut (Location will vary)	38-0045-290
9*	Arc Suppressor (Optional)	38-0045-293
10	Connector	1705-4
11	Binding Nut	10706
12	Clamp Nut	10707
13	Washer	10708
14	Binding Post 1-7/8 Lg.	10709-2
15	Binding Post 2-1/4 Lg.	10709-3

<b>Circuit Controller</b>						
Mechanism	38-0045-20	38-0045-20-1	38-0045-235	38-0045-235-1	38-0045-235-2	38-0045-423
3590	X					
3590B		X				
3593			X			
3593B				X		
3593C					X	
3593E						X
3593F						X
3593I			X			
3593NJ			X			
3595	X					
3596			X			
3596B				X		
3596NJ			X			
Contact s	7	5	7	5	5	6

## MECHANISM RELAYS



**REF. D**

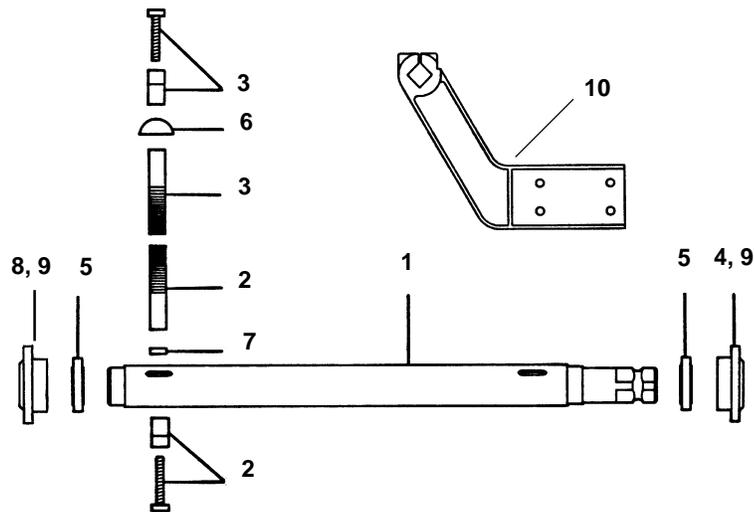


**REF. D1**

Ref. No.	Description	Part No.
D	1000 OHM Vital Relay (Shown)	38-0050-200
	160 OHM Vital Relay (Not Shown)	38-0050-300
D1	Non-Vital Relay for 3590B mechanism with mounting plate (Not shown)	38-0045-188-1
	Non-Vital Relay for all other mechanisms with mounting plate (Shown)	38-0045-188-2
	Non-Vital Relay only for 3590B mechanism	91254-10
	Non-Vital Relay only for all other mechanisms	91254-11
	Cover for Non-Vital Relay (Not Shown)	91254-1

## SIDEWALK KIT

Figure 22



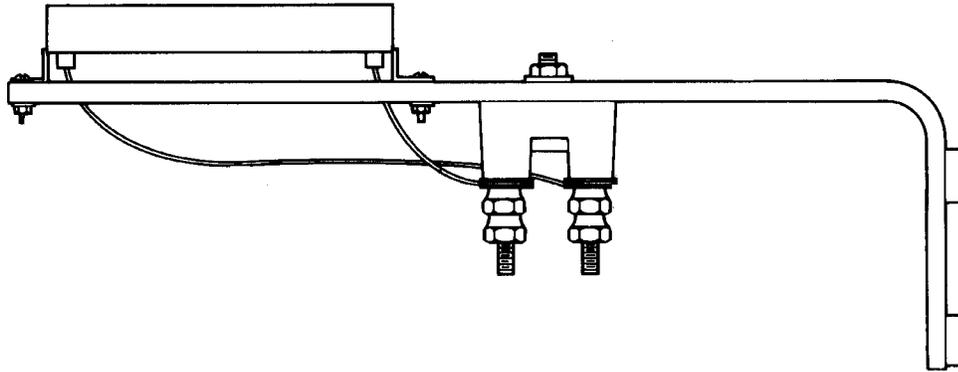
Ref. No.	Description	Part No.
E	Sidewalk Arm Shaft Kit (for Right or Left Hand use)	3590-295

### REPLACEMENT PARTS

1	Sidewalk Arm Shaft	3590-223
2	Gear Segment w/clamp and Assembly Bolts, for Sidewalk Shaft.	3590-224
3	Gear Segment w/clamp and Assembly Bolts, for Main Shaft.	3590-225
4	Collar	3590-227
5	Bearing	3590-248
6	Woodruff Key, for Main Shaft	3590-254
7	Key, for Sidewalk Shaft	3590-255
8	Cap	3580-226-M
9	1/4-20 x 3/4 Machine Socket Screw	AA-15-EE-3-0075
10	Sidewalk Arm Adaptor (not included in kit)	3565-111

# CONTACT HEATER ASSEMBLY

Figure 23



Ref. No.	Description	Part No.
F	Contact Heater Assembly Complete, 115VAC, 50 Watt	38-0045-287
F1	Contact Heater Assembly Complete, 230VAC, 50 Watt	38-0045-318

## SET-UP AND ADJUSTMENT TOOLS

**Spring Scale**, PN: 3562-210

Used for measuring gate arm torque.

**Torque wrench with socket**, PN: 3590-K-9.

Used for measuring gate arm torque.

**Snap ring pliers**, PN: 3590-1007

Used for ratchet wheel removal.

**.020 gauge**, PN: 3590-1012

Used to adjust ratchet wheel to hold clear pawl clearance.

**.032 gauge**, PN: 3590-1011

Used to adjust gap on hold clear mounted power down contact.

**Ounce spring scale**, PN: 3565-211

Used to measure contact spring pressure.

**1/16" insulated gauge** , PN: 3590-1010

**Contact bending tool for contacts without stiffeners**, PN: ES-6104-2

**Contact bending tool for contacts with stiffeners**, PN: ES-6104-1

Used to adjust circuit board contact.

**Angle finder**, PN: 3590-1014

Used to set contact cam operating position.

**3/32" wire gauge**, PN: 3590-1013

Used to check vertical stop to segment gear clearance.

**Tool kit**, PN: 3590-K-11

Includes snap ring pliers, 3/32", 3/16" and 7/32" T handle allen wrenches, 7/16" combination wrench and canvas pouch.

**Aeroshell 33 lubricating grease**, PN: 3590-1733

For lubrication of gears and contact cams, 1 quart can.

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