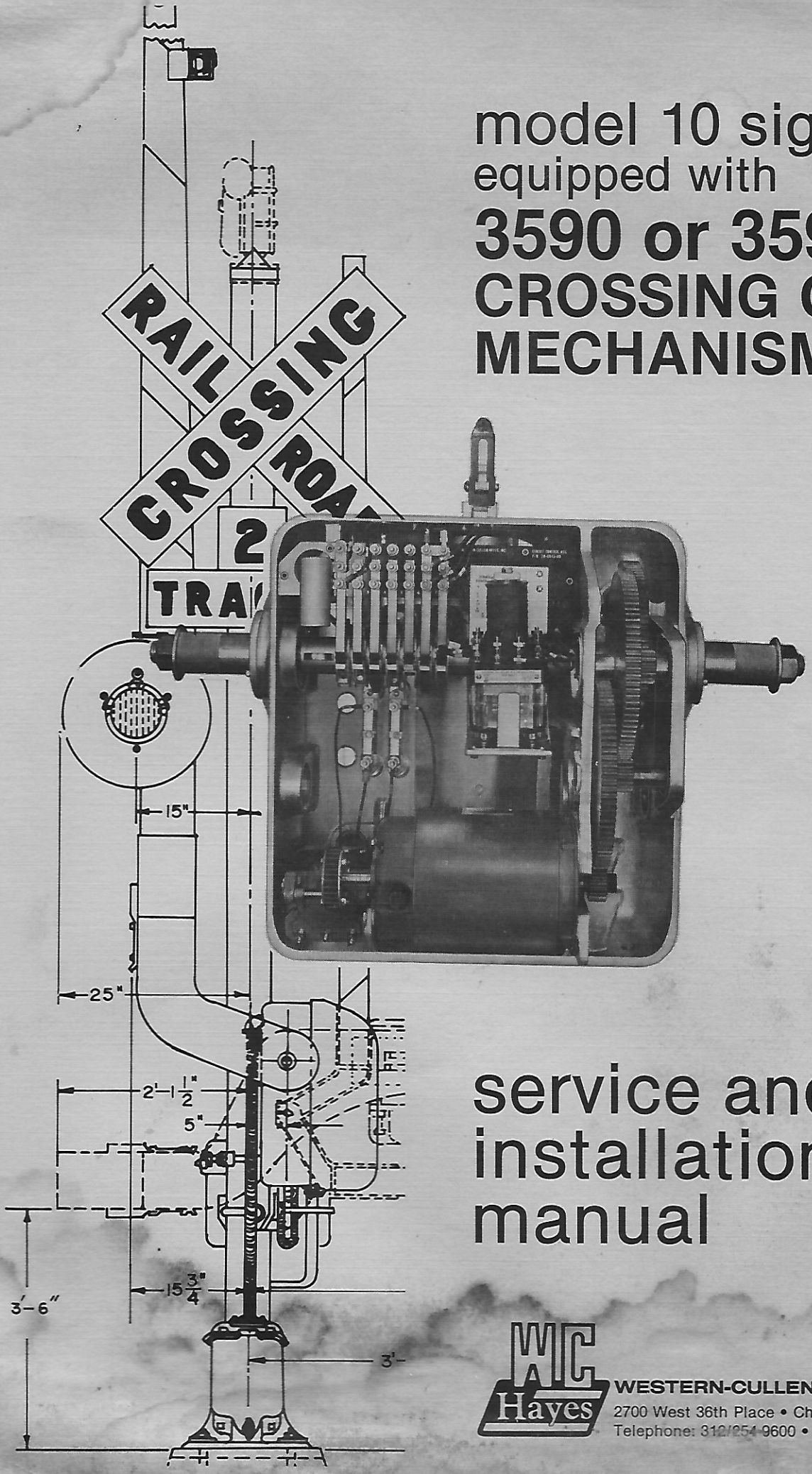
model 10 signals
equipped with
3590 or 3593
CROSSING GATE MECHANISMS



service and installation manual

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Mechanism
Hold-Clear Device
Fiberglass Gate Arm & Adapter

INTRODUCTION

Western-Cullen-Hayes, and it's 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.

Model 10 Crossing Gate Signals meet the specifications and requirements of the AAR, Communication & Signal Section, and all state specifications or regulations applying to grade crossing warning systems. Also, these devices fully comply with the requirements of the Canadian Board of Transport Commissioners.

Gate Mechanisms that will accommodate two types of control circuits are covered in this manual. The Type 3590 Mechanism is designed to work with a three power wire circuit, where power-up/power-down is switched by a relay with heavy duty contacts in the signal case. The Type 3593 Mechanism is designed to work with a two power wire circuit, where power-up/power-down is switched by a safety-grade relay with heavy duty contacts in the mechanism. They are designed for automatic control, but can be circuited for manual supervision imposed upon automatic control.

This booklet is designed to provide instructions on the installation and use of Model 10 Signals with 3590/3593 Gate Mechanisms with/without Sidewalk Shaft. This manual deals with the complete Model 10 Signal.

FIGURE 1

Model 10 Signal
With Type 3590 Mechanism

NOTES

1. ASSEMBLY WITH 18—24 FOOT ARMS = SOLID LINES
2. ASSEMBLY WITH 25—30 FOOT ARMS = BROKEN LINES
3. ASSEMBLY WITH 31—40 FOOT ARMS = DOTTED LINES
4. MECHANISM SUPPORT

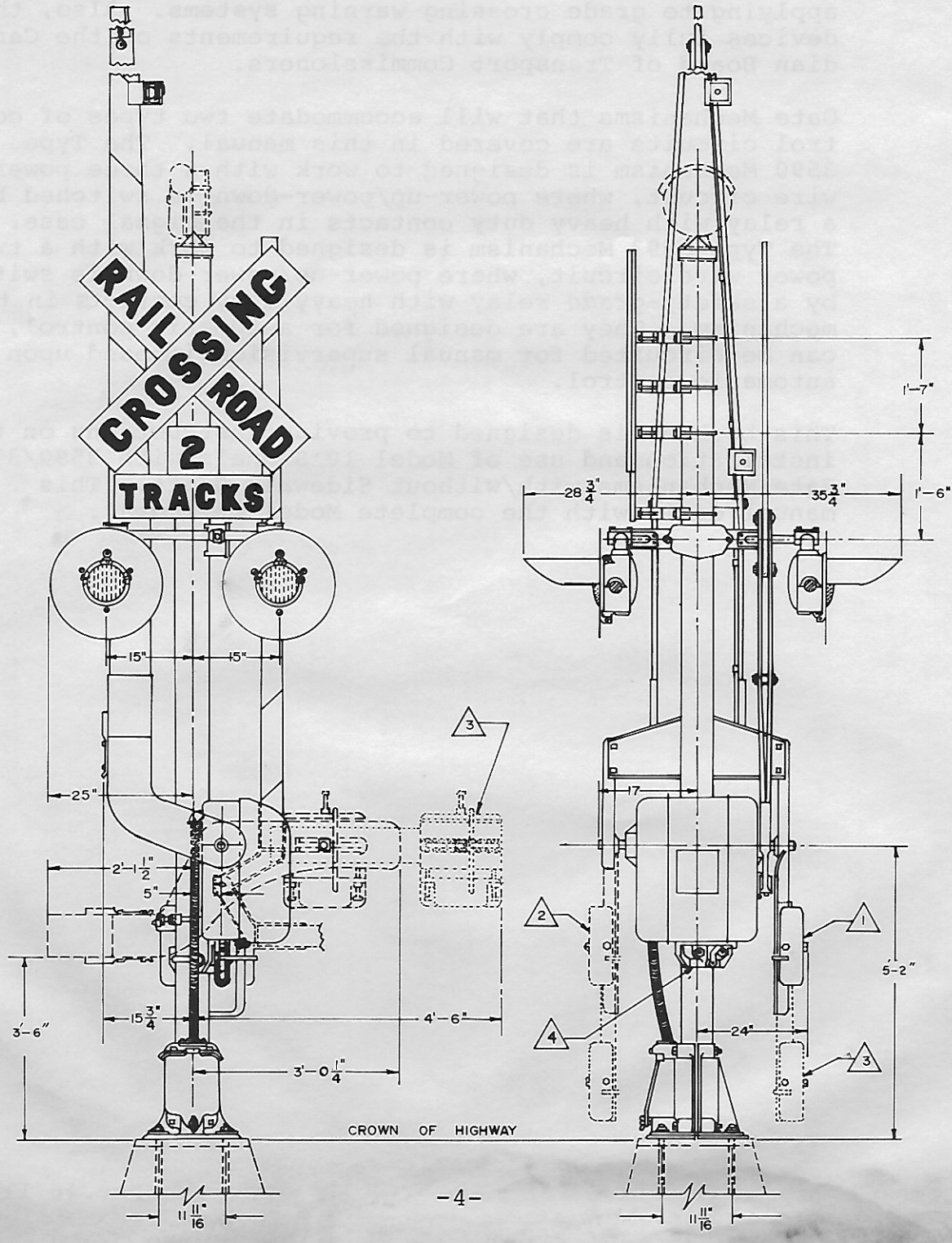
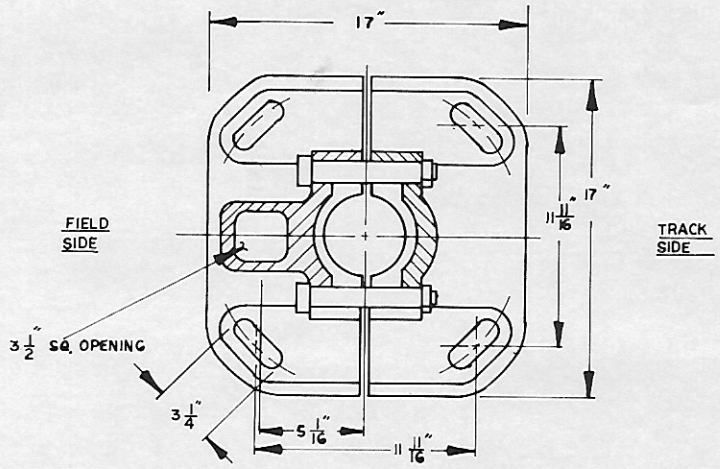
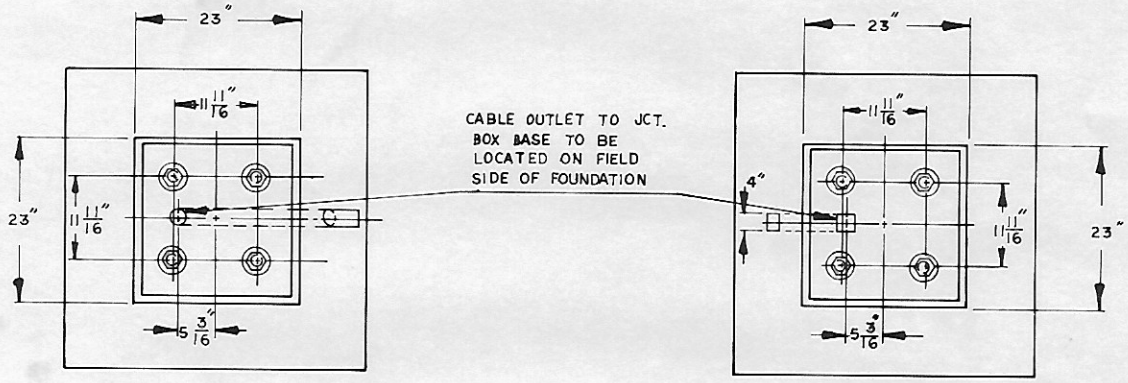
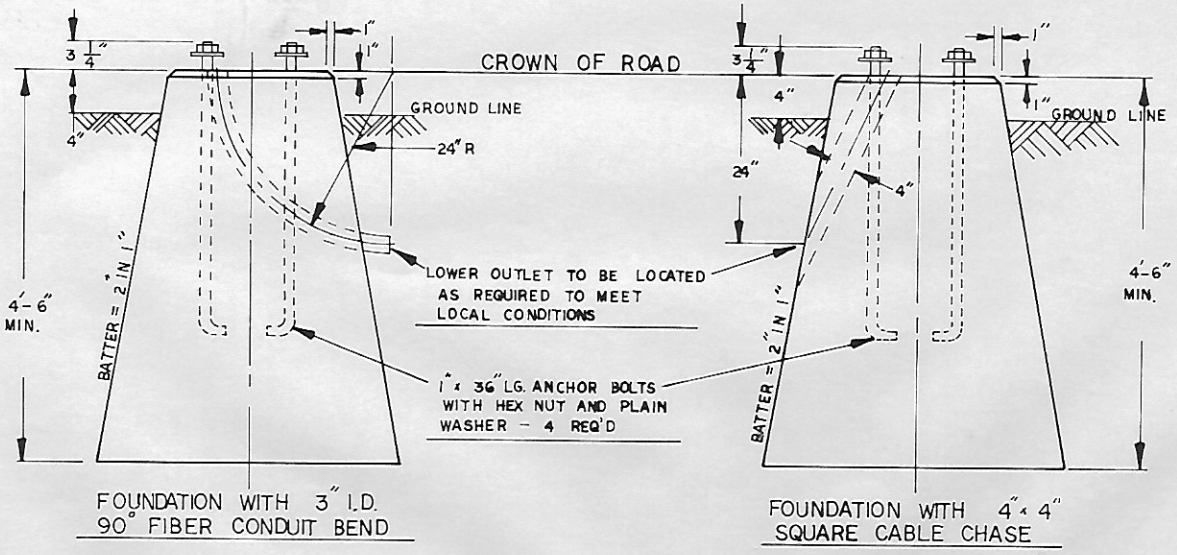


Figure 2



PLAN VIEW OF 2149
JUNCTION BOX TYPE BASE





FOUNDATION WITH 3" I.D.
90° FIBER CONDUIT BEND

FOUNDATION WITH 4" x 4"
SQUARE CABLE CHASE

SUGGESTED FOUNDATION FOR
AUTOMATIC CROSSING GATE SIGNAL
USING 2149 JUNCTION BOX TYPE BASE

NOTES

SECTION 1

DETAIL INSTRUCTIONS

FOR

ERECTING A
MODEL 10 SIGNAL WITH
TYPE 3590 or 3593 MECHANISM

Operations should be performed in the following order:

1. INSTALL JUNCTION BOX TYPE CLAMP BASE AND MAST making sure that junction box half of base and opening in mast for flashing light signal junction box and cross arm are in the proper position with relation to the roadway, as shown in Figure 1. Knock out tin plug in wire outlet in top of junction box, remove conduit adapter from inside junction box and attach it to top of junction box with cap screws.

   Note: Place pipe shield -(shipped with junction box base) in lower end of mast before installing mast base.

2. CLAMP THE MECHANISM TO THE MAST on the side away from the roadway so that the shaft is 5'2" above the top of the foundation. Remove protective closure on conduit outlet on back of case and install 1-1/2" flexible conduit. (See Figure 1)

3. MAKE SURE THE MAIN SHAFT IS IN THE POSITION IT ASSUMES WHEN THE GATE ARM IS HORIZONTAL. This condition exists when gear segment A is in contact with stop screw B shown in Figure 8, Page 14.

4. REMOVE NUTS, WASHERS AND SPLINE PROTECTORS FROM ENDS OF MAIN SHAFT.

5. APPLY GATE AND COUNTERWEIGHT SUPPORT ARMS (Figure 1) keeping the gate end in the horizontal position. (shown-----) when applying to shaft. Replace washers, and nuts on ends of main shaft but DO NOT TIGHTEN THE NUTS.

6. APPLY GATE SUPPORT OR BREAKAWAY FIBERGLASS GATE ARM ADAPTER between arms. Insert bolts, apply lock washers and nuts, then tighten securely. With Breakway Adapter, make sure the steel channel that supports the Adapter between the gate and counterweight support arms is mounted so that the mounting holes closest to the edge of the channel are facing toward the mechanism.

7. Now TIGHTEN NUTS on end of main shaft.

8. Install ventilator in 1/2" threaded hole provided in back of mechanism housing with screen being positioned down.

9. DO NOT APPLY COUNTERWEIGHT before roadway gate arm is installed. See Paragraph 1.

10. WHEN WOODEN ARMS ARE USED, ATTACH ARM TO SUPPORT, insert bolts, apply washer plates on inner sides of side boards, install lock washers and nuts, tightening securely.

    WHEN FIBERGLASS ARMS ARE USED ASSEMBLE ARMS by sliding sections together to achieve desired length. Make sure that male ends of joints are those equipped with nuts imbedded in the fiberglass. Secure sections to one another with bolts and washers provided. Install aluminum rain plugs in exposed ends of arm sections. Bolt assembled arm to breakway adapter.

11. IF SIDEWALK ARM IS USED, THE MECHANISM is supplied with an additional shaft which has a square extension on one side only of the mechanism case. This shaft is factory installed to extend from the right (track) SIDE OF THE CASE. The sidewalk arm should be applied in a horizontal position corresponding with the position of the roadway arm. Proper alignment results because of indexing of gear sectors on shafts. Sidewalk arm support casting should be applied before gate arm support. However, do not apply sidewalk arm until torque has been adjusted. (See Paragraph 15 and 16)

    To have sidewalk shaft project from the left side, when clearance requires, remove both bearing caps, key, bearings and segment shaft. Turn shaft around and reinstall as before with bearing caps on opposite sides.

12. WHEN WOODEN GATE ARMS ARE USED, INSTALL GATE ARM LIGHT TERMINAL BLOCKS, which will be found in a carton secured to the inner side of the arm at one of the cross braces. Install terminal blocks on track side of arm using flat head wood screws furnished. Attach wires from cable on gate arm to binding posts of terminal blocks.

13. INSTALL GATE ARM LIGHTS using bolts furnished. Attach lead wires on arms so as to leave proper drip loop. On wood arms,apply cover of terminal block with slotted wire opening facing mechanism end of arm so block will drain with gate arm clear.

Remove plug from wire entrance opening in back of case, and insert cable, extending from gate arm, through cable grip.

Secure cable in connector and attach wires to binding posts inside mechanism case.

14. ATTACH COUNTERWEIGHTS, following the instructions below and diagrams referred to. The correct weights are furnished for each gate arm. For safety have a man hold gate arm in horizontal position while applying counterweights.

Where gate arms are not more than 24' long, only one counterweight support arm is used. The other gate support arm has no extension for mounting a counterweight. (See Figure 1) Where gate arms exceed 24' in length, two counterweights are required and there are extensions for mounting counterweights on both support arms. (See Figure 1)

(a) IF GATE ARM IS NOT OVER 24' LONG (26 feet with Fiber Glass Arm) assemble Counterweight Support Assembly (PN: 3565-604) as shown in Figure 3 for attaching to support arm Figure 4.

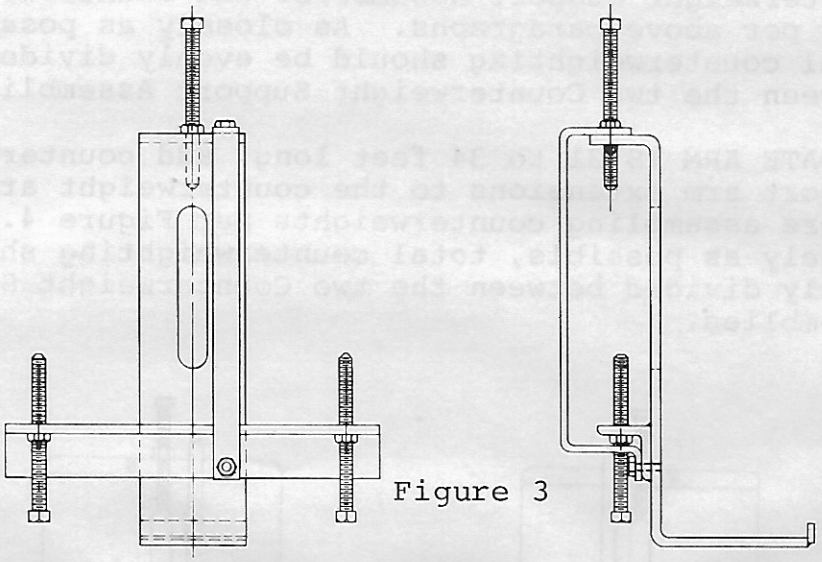


Figure 3

Place Support Assembly in position near the middle of the support arm slot, insert clamp washer and 1" bolt and mount counterweights per Figure 4.

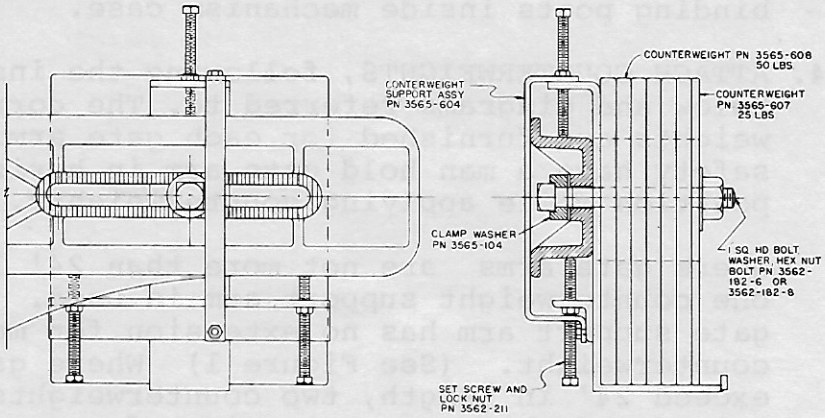


Figure 4

Apply washer and nut, but tighten just enough to keep counterweights under control on the support assembly.

(b) IF GATE ARM IS 25 to 30 feet long assemble both Counterweight Support Assemblies and counterweight sets per above paragraphs. As closely as possible, total counterweighting should be evenly divided between the two Counterweight Support Assemblies.

(c) IF GATE ARM IS 31 to 34 feet long, add counterweight support arm extensions to the counterweight arms before assembling counterweights per Figure 4. As closely as possible, total counterweighting should be evenly divided between the two Counterweight Support Assemblies.

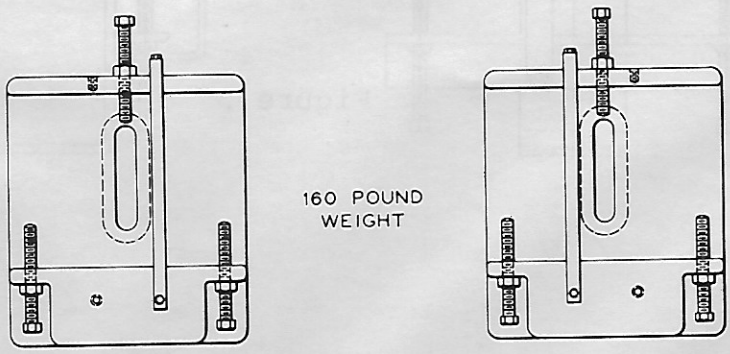


Figure 5A

(d) IF GATE ARM IS 35 to 44 feet long assemble retaining straps to 160 pound counterweights as shown in Figure 5A for attaching to support arm extensions as in Figure 5B. Note that the heavy side of the 160 counterweights is mounted up.

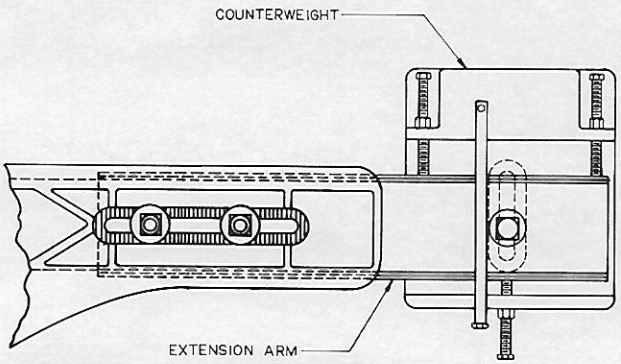


Figure 5B

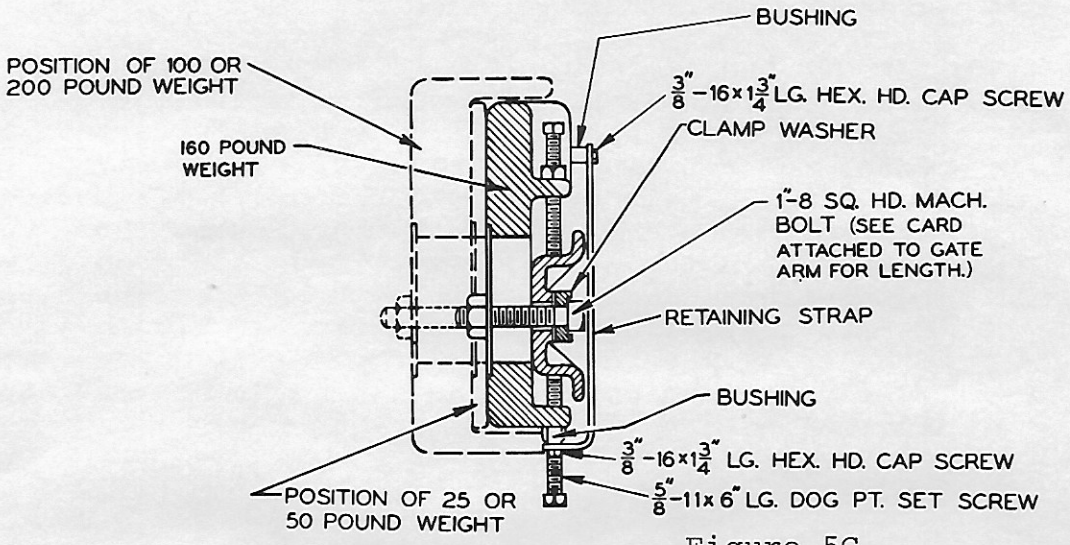


Figure 5C

Insert clamp washers and 1" bolts and assemble additional counterweights as shown by dotted lines in Figure 5C. Apply washers and nuts, but tighten just enough to prevent weights from sliding lengthwise in the slots.

NOTES

15. HORIZONTAL TORQUE ADJUSTMENT (Ref. Figure 6)

Adjust to 50 foot pounds by loosening the nut on bolt(s) "A" and sliding weights(s) "B" horizontally in or out until scale reads 10 pounds at a point on the arm five feet from the center of the main shaft, indicating a torque of 50 foot pounds.

Where sidewalk arm is used, torque adjustments should be made before sidewalk arm is applied. When proper torque adjustment has been obtained, tighten nut on bolt "A" just enough to prevent weight from sliding lengthwise in the slot.

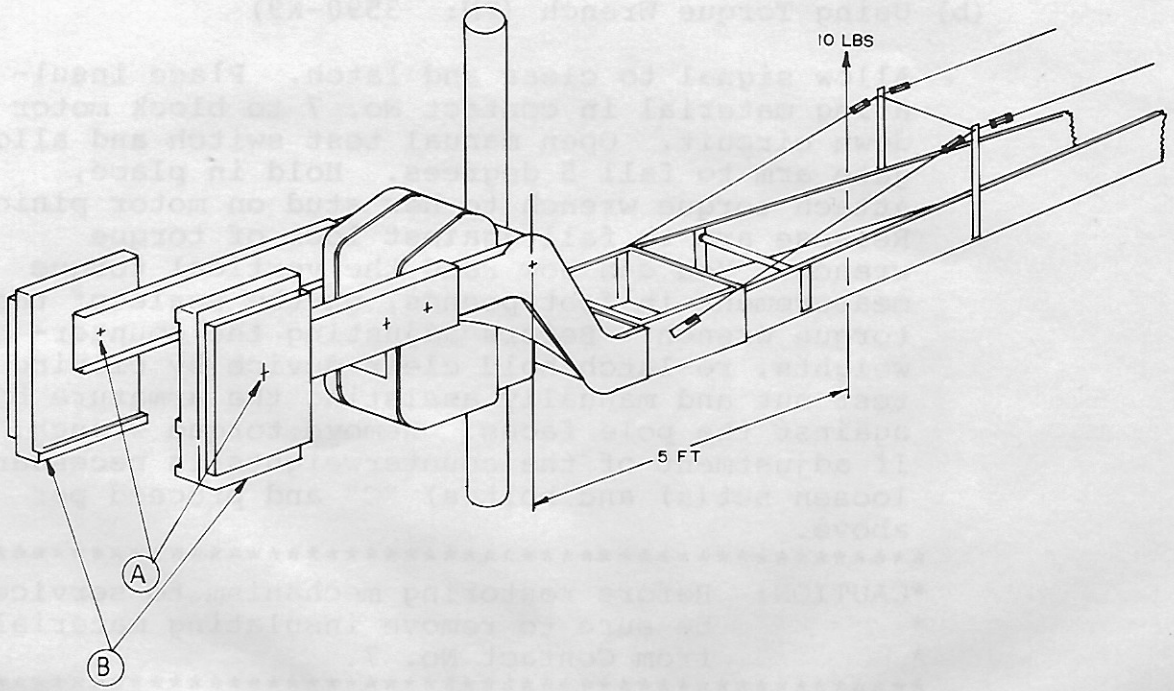


Figure 6

16. CLEAR POSITION TORQUE ADJUSTMENT

(a) Using spring scale (PN: 3562-210)

Allow signal to clear and latch. Attach spring scales as shown in Figure 7 (between point "A" and "B"). Place insulating material in Contact No. 7 to block Motor Down Circuit. Open manual test switch and allow gate arm to fall 5 degrees against scale chain, and read scale. Before adjusting the counterweights re-latch hold clear device by closing test nut and manually assisting the armature back against the pole faces. Loosen nut(s) on bolt(s) "C" enough to permit adjustment and shift counterweight(s) "D" horizontally in or out by means of bolts "E" and "F" until scale reading agrees with value in Tables I or II, Pages 18 and 19, for the corresponding length of the gate arm. Tighten all bolts.

****
*CAUTION: Before restoring mechanism to service *
* be sure to remove insulating material *
* from contact No. 7. *
****

(b) Using Torque Wrench (PN: 3590-K9)

Allow signal to clear and latch. Place insulating material in contact No. 7 to block motor down circuit. Open manual test switch and allow gate arm to fall 5 degrees. Hold in place, attach torque wrench to hex stud on motor pinion. Release arm to fall against lock of torque wrench. You can now read the vertical torque measurement in foot pounds, on the scale of the torque wrench. Before adjusting the counterweights, re-latch hold clear device by closing test nut and manually assisting the armature back against the pole faces. Remove torque wrench. If adjustment of the counterweights is necessary, loosen nut(s) and bolt(s) "C" and proceed per above.

****
*CAUTION: Before restoring mechanism to service, *
* be sure to remove insulating material *
* from Contact No. 7. *
****

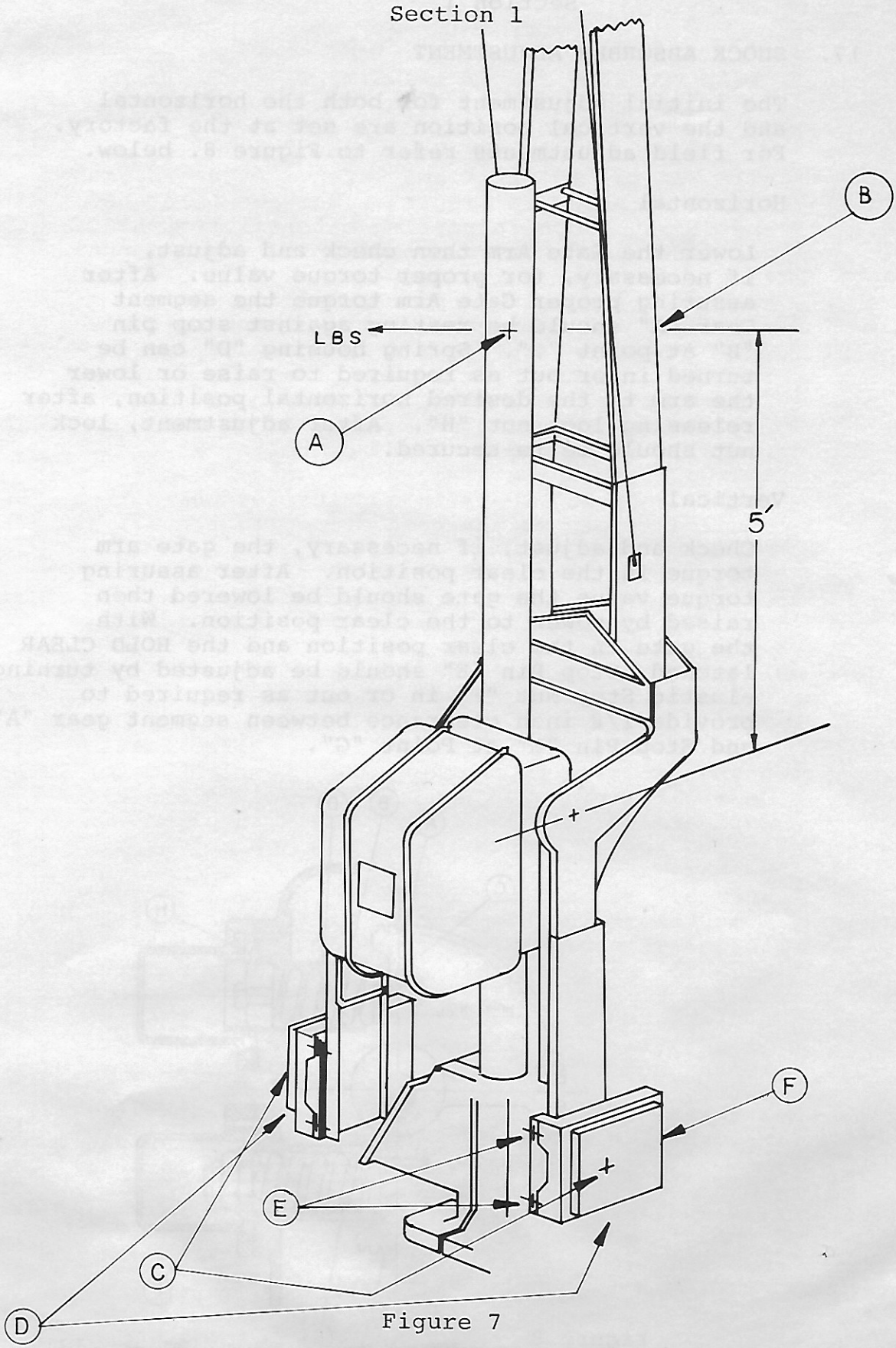


Figure 7

17. SHOCK ABSORBER ADJUSTMENT

The initial adjustment for both the horizontal and the vertical position are set at the factory. For field adjustments refer to Figure 8. below.

Horizontal

Lower the Gate Arm then check and adjust, if necessary, for proper torque value. After assuring proper Gate Arm torque the segment Gear "A" should be resting against stop pin "B" at point "C". Spring housing "D" can be turned in or out as required to raise or lower the arm to the desired horizontal position, after releasing lock nut "H". After adjustment, lock nut should be re-secured.

Vertical

Check and adjust, if necessary, the gate arm torque in the clear position. After assuring torque value the gate should be lowered then raised by power to the clear position. With the gate in the clear position and the HOLD CLEAR latched, Stop Pin "E" should be adjusted by turning elastic Stop Nut "F" in or out as required to provide 1/8 inch clearance between segment gear "A" and Stop Pin "E" at Point "G".

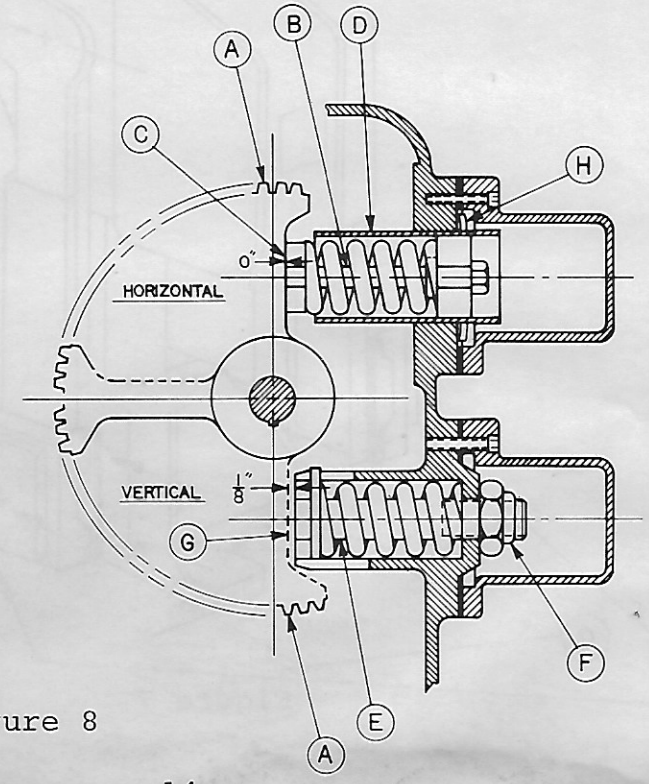


Figure 8

18. CIRCUIT CONTROLLER ADJUSTMENT

Initial adjustment for both the cams and the contacts are set at the factory. For field adjustment refer to Figures 9A and 9B, and the following.

Cams

The cams may be adjusted to open or close the contacts at any position of the gate arm by loosening either of the cap screws "A" (Figure 9A) and rotating the cam in the proper direction. Be certain to tighten cap screws securely after adjustment. When adjusting Cams 2 thru 7 a gap of 1/16 inch must be maintained at "K" between cap screw "A" and cam insert "E" after the cap screws are tightened. Cam No. 1 (Figure 9B) has a slotted insert "H" which allows for approximately 3/16 inch radial motion when No. 1 Contact opens. Slots at "G" are to be kept free of foreign material. When insert "H" is rotated to the closest point toward cap screw "L" after the cap screw has been tightened, a gap of 1/16" must be maintained at "J".

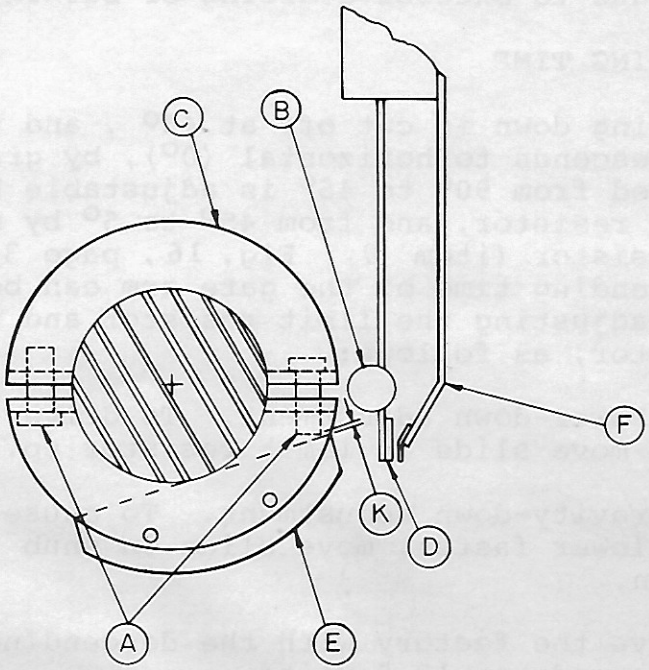


Figure 9A

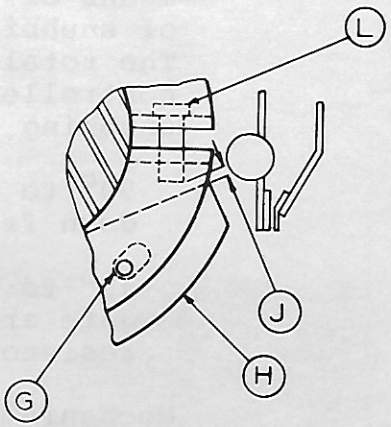


Figure 9B

Contacts(Ref. Figures 9A and 9B)

If contacts require adjustment it is necessary to bend the contact spring to obtain the following settings. With the contact in the open position, there must be a clearance of 1/16 inch between cam follower "B" and Cam "C". With the contact in the open position, the contact gap at point "D" must be 1/16 inch. With the contact closed (the cam follower "B" on cam insert "E") the contact to contact pressure should be 12 to 24 oz., when measured with a scale by slightly lifting the near contact spring at point "F". Order Tension Testing Scale:PN:3565-211.

19. MOTOR CONTROL RELAY

The Motor Control Relay (MCR) is a key element in the motor control circuit. No field adjustments are recommended. Field tests suggested are:

1. Verify pick and release values as follows:

Type Mechanism	Relay Part No.	Pick - VDC	Drop - VDC
3590	38-0050-200	5.96 (Max.)	2.14 (Min.)
3590B	38-0045-188-1	6.54 (Nom.)	.72 (Nom.)
3593	38-0050-200	5.96 (Max.)	2.14 (Min.)

2. Visual inspections of contact condition observing for damage due to excessive arcing or burning.

20. ADJUST DESCENDING TIME

Power for driving down is cut off at 45° , and then the gate arm descends to horizontal (0°), by gravity. Descending speed from 90° to 45° is adjustable by means of limit resistor, and from 45° to 5° by means of snubbing resistor (item 9, Fig. 16, page 34). The total descending time of the gate arm can be controlled by adjusting the limit resistor and the snubbing resistor, as follows:

90° to 45°, Power-down adjustment. To drive down faster, move slide on limit resistor up.

45° to 5°, Gravity-down adjustment. To cause gate arm to lower faster, move slide on snub resistor down.

Mechanisms leave the factory with the descending time set for 9-11 seconds at 13.5 volts.

The normal descending time should be between 10 and 15 seconds, depending on gate arm length and local requirements. Long gate arms should usually

operate somewhat slower than short arms. However, arms of unequal length at the same crossing can be adjusted to descend at equal rates.

Care should be taken to see that the slide contact on the resistance unit is bearing on the winding with firm pressure, and that the lock nut is tightened to hold the slide securely in place.

21. CHECK THE RELEASE OF THE HOLD-CLEAR DEVICE before placing in service and periodically thereafter. The drop-away voltage of the hold-clear device should be taken with a voltmeter and resistance slide. The drop-away voltage should not be less than 2.5 volts.

22. CHECK THE CLEARING TIME. The gate should clear from horizontal to vertical position in 6 to 10 seconds. This time should be verified with a stop watch before the gate is placed in service, to ensure that the battery and all electrical connections are in satisfactory working condition.

23. MAKE FINAL INSPECTION. The gears should all be inspected before placing the mechanism in service to see that they are clean and sufficiently lubricated. The hold-clear device armature and pole faces should be wiped with a clean dry cloth to ensure that they are free of all dirt, oil or grease.

24. INSTALL FLASHING LIGHT JUNCTION BOX crossarm and flashing light units.

25. INSTALL SIGNS. Attach the extension brackets to the adaptor clamps on the back of the signs, by means of the 1/2"x4" hex. hd. bolts and nuts supplied with the extension brackets, and attach the extension brackets to the mast with the "U" bolts furnished with the signs.

26. PLACE BELL OR PINNACLE ON MAST. A bell, if used, should be placed with the gong parallel with the roadway; the sound thrown out by the edge of the gong is thus strongest parallel with the roadway. Bells are shown correctly mounted in Figure 1, Page 4 .

27. MECHANISM SUPPORT. Attach support (4 , Figure 1, Page 4) to the mast and against the underside of the mechanism as shown in Figure 10. When necessary to replace a gate arm or work on the mechanism with the gate arm in the horizontal position, loosen mechanism clamp bolts and remove 3/8" cap screws holding conduit flange to the top of the junction box base. When traffic permits, lower gate arm to horizontal position by use of the manual test switch and swing mechanism and gate arm assembly away from track until arm is parallel to curb or highway edge.

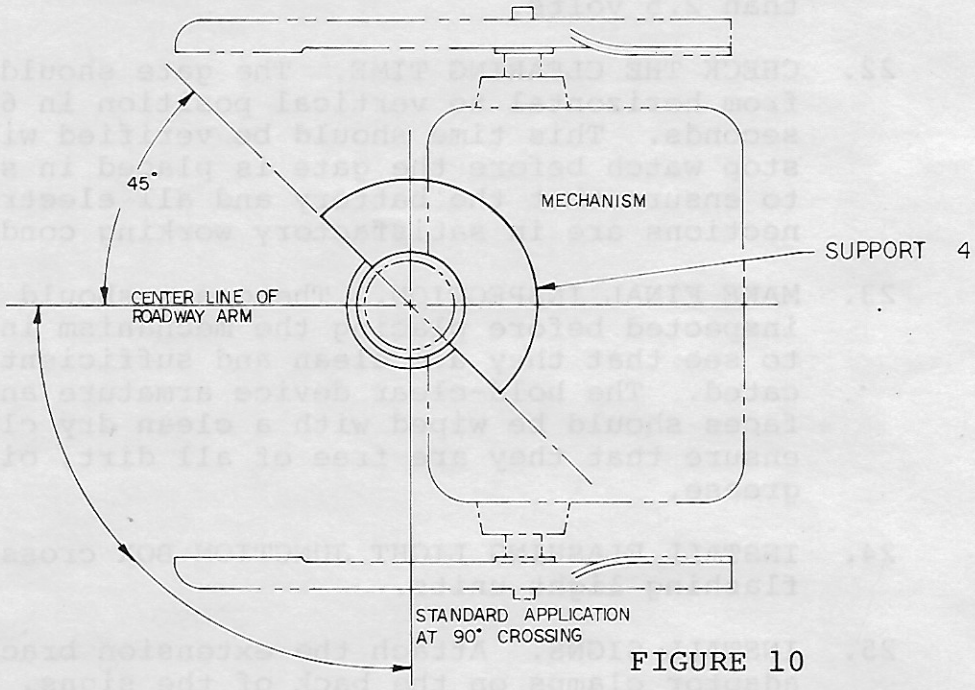


FIGURE 10

TABLE I
COMPLETE TABLE OF TORQUE VALUES
FOR FIBERGLASS GATE ARMS

Position of Weights	Arm Type	Arm Length	Torque *(1) (Ft. Lbs.)	Scale Reading (Lbs.)	Distance "X" * (2)	Total Ctwt. *(3)
One Ctwt Arm	FG	13-19 ft.	200	40	5	185
One Ctwt Arm	FG	20-26 ft.	200-260 (10 lb.per ft.)	40-52	5	310
Two Ctwt Arms	AL/FG	16-19 ft.	200	40	5	320
Two Ctwt Arms	AL/FG	20-26 ft.	200-260 (10 lb.per ft.)	40-52	5	320
Two Ctwt Arms	AL/FG	27-33 ft.	270-330 (10 lb.per ft.)	54-66	5	420

See footnotes on Page 19.

TABLE II
COMPLETE TABLE OF CLEAR POSITION TORQUE VALUES FOR WOOD GATE ARMS

Position of Weights	Wood Gate Arm Length (Feet)	Gravity Torque In Clear Pos.*(1) (Ft. Lbs.)	Scale Reading (Lbs.)	Distance X Feet *(2)	Approx. Lbs. of Counter-weight Total Lbs. * (3)
Mount weights on one arm only	14	175	35	5	160
	15	175	35	5	160
	16	175	35	5	185
	17	175	35	5	210
	18	180	36	5	235
	19	190	38	5	260
	20	200	40	5	260
	21	210	42	5	285
	22	220	44	5	285
	23	230	46	5	310
	24	240	48	5	360
Mount weights on both arms	25	250	50	5	370
	26	260	52	5	395
	27	270	54	5	420
	28	280	56	5	470
	29	290	58	5	520
	30	300	60	5	620
Mount weights on both arms, add extension arms	31	310	62	5	395
	32	320	64	5	420
	33	330	66	5	445
	34	340	68	5	470
Mount weights on both arms, add extension arms, invert counterweights *(4)	35	350	70	5	495
	36	360	72	5	520
	37	370	74	5	545
	38	380	76	5	570
	39	390	78	5	595
	40	400	80	5	620
	41	410	82	5	645
	42	420	84	5	675
	43	430	86	5	700
	44	440	88	5	725

*(1) Where sidewalk arm is used, do not apply gate arm until torque adjustments have been made, as torque would be low if arm should be broken off.

*(2) Distance of 5'-0" is the span in feet measured parallel to the gate arm from the mechanism shaft to the point at which the spring scales are attached. See Figure 5.

*(3) Will vary somewhat with weight of gate arm and lights. Extensions on counterweight arms of gates 31' to 44' long reduce the weight required.

*(4) All counterweights 35' to 44' gate arms must be inverted. See Figure 5.

SECTION 2

GENERAL INSTRUCTIONS

MECHANISM OPERATION AND MAINTENANCE

A. GATE ARM TORQUE

Counterweights are supplied to suit the particular length and weight of gate arm furnished. They will provide suitable torque for both horizontal and clear position, as given in Torque Adjustment Instructions in Section 1 of this manual.

B. TESTS FOR OPERATION

Mechanisms are given a final inspection and are properly lubricated before shipment from the factory.

Before placing any mechanism in service, inspection should be made to ensure that there is no oil, grease or dirt on the armature or pole faces of the hold-clear magnet. These parts should be kept clean at all times.

Electrical tests - should be made before placing in service, and at regular intervals. Please note that a test switch has been built into the mechanism to facilitate testing. Look for the gold test nut on the circuit controller (Terminal 1B of the 3590 and 3590B Mechanisms, and Terminal 7A of the 3593 Mechanism). Suggested tests are as follows:

1) Gravity Down Test - Place a piece of insulating material (business card, credit card, etc.) between the contacts of No.7 on the Circuit Controller. Open the test switch. The gate should descend freely to the horizontal position.

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

2) Operating Voltage - Operating voltage for the mechanism should be maintained at between 11 and 16 VDC. Observing polarity, check voltage on Terminals 1A(+) and 7A (-) for power-up and Terminals 7B(+) and 7A(-) for power-down in the Type 3590 Mechanisms and Terminals 2H(+) and 6A(-) for both power-up and down in the Type 3593 Mechanism.

3) Grounds - Check for grounds on battery circuit.

4) Power Loss/Gain - Operate the mechanism through a power-up/power-down/power-up cycle. In the Motor-Up mode, voltage should not drop below 11 VDC. Current flow should be in the 6-20 AMP range, depending on length of gate arm. In the Motor-Down mode, current flow should be in the 6-15 AMP range, depending on length of gate arm.

5) Hold-Clear Release - The drop-away voltage of the hold-clear device should not be less than 2.5 VDC.

6) Also, see following section on the Motor Control Relay.

Mechanisms located in dense traffic zones should be tested more frequently than those operating under average traffic conditions.

Wire size and Battery - sizes of wire used for the motor circuit should be calculated so that there will not be more than 0.1 ohm resistance between the battery and mechanism terminals.

Wire sizes as follows are recommended:

Distance From Battery Terminals to Mechanism	Size of Soft Drawn Copper Wire to Use
Up to 60' (120' of wire)	No. 9 AWG
From 60-120' (240' of wire)	No. 6 AWG

When planning installations in territory where frost accumulation on mechanism contacts might be expected, thought should be given to providing two wires in the cable to permit operation of optional heaters (PN: 38-0045-287 or 38-0045-318).

The following battery is recommended with above wire sizes for gates of various lengths:

Gate Arm Length In Feet	Clear Position Torque In Foot-Pounds	No. of Cells Lead	No. of Cells Nickel-Cadium
Up to 24	240	6	9
25 to 36	360	6	9
37 to 44	440	7	11

Clearing Time (Recommended) -

Clearing time is a function of voltage applied to the motor. See above battery recommendations to achieve below clearing times.

Gate Arm Length In Feet	Time In Seconds
Up to 24	6
25 to 36	6 - 8
37 to 44	8 - 10

THE MOTOR CONTROL RELAY varies with the type of mechanism purchased. Performance characteristics are as follows:

Type Mechanism	Relay Part No.	Coil Resistance	Pick-VDC	Drop-VDC
3590	38-0050-200	1000 ohm	5.96 (MAX.)	2.14 (MIN.)
3590B	38-0045-188-1	32.3 ohm	6.54 (NOM.)	.72 (NOM.)
3593	38-0050-200	1000 ohm	5.96 (MAX.)	2.14 (MIN.)

Adjustment should not be attempted in the field. Drawings and specifications for the signal shop use are available on request.

THE TIME FOR THE GATE TO DESCEND from the clear position to the horizontal position should not be more than 15 seconds, not less than 10 seconds. Descending time may be requlated by means of the adjustable snubbing resistance. Please note that the snub resistor is to the right, the limit resistor is to the left, in the mechanism housing.

C. GENERAL

Care should be exercised to protect all parts of the mechanism against exposure, and also to prevent foreign substances from getting into parts where there is a possibility of interfering with proper action of the mechanism.

GATE ARM TORQUE ADJUSTMENT should be checked each time that any change is made in gate arm, location of gate light, or other alteration affecting the total weight of the assembly. See Section 1.

GATE ARM POSITION ADJUSTMENTS should be properly maintained to avoid ill-appearance of a dropping gate arm when down, and to avoid the possibility of travel beyond the desired clear position where gate arm or arm light may strike the mast or other part of the assembly.

D. LUBRICATION

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 No. 3590-1650 All-Temperature Lubricating Grease. A light coat of multi-purpose oil should be maintained between the Ratchet Wheel (Item 6, Figure 16) and its attendant Ring Clip (Item 7 , Figure 16).

Moving parts in the hold-clear magnet assembly should have no more lubrication than is obtained by wiping with a cloth moistened with AAR Sig. Spec. 103 Oil. This should be done periodically.

Time interval for periodic lubrication will be governed by usage. This interval, therefore, should be determined by the railroad.

E. CIRCUIT CONTROLLER

1. All contact openings are factory adjusted, have 1/16" minimum opening.

2. The contact pressures are factory adjusted between 16 and 24 ounces.

3. Contacts should have at least 1/64" wipe.

   Motor Control Contact, Space 1 (Items 12,13 Figure 16, Page 34) is a snap contact which cuts off motor energy when gate reaches 90 degree position. The adjustment allows about 6 degree downward movement from vertical before reclosing the contact. The cam on the main shaft is adjustable to permit gate to be driven to correct clear position.

4. The Arc Suppressor (Item 14, Figure 16, Page 34) consists of 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 ohm meter. 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.

5. Circuit Controllers should be inspected at regular intervals to check for proper action of their parts, including contact opening.

6. Motor care - the motor has a totally closed, non-ventilated housing and has pre-lubricated, sealed bearings so no maintenance is required. The motor brushes should be periodically inspected for wear. Replace brushes when carbon portion has worn to 5/8" in length or less.

****
*CAUTION: Always remove motor brushes when gate arm *
* is in the horizontal position. No dynamic *
* braking is provided with a brush removed. *
* Also, note that brushes are spring-loaded *
* in holders. *
****

F. HOLD-CLEAR DEVICE (Figure 17, Page 35). The armature support bracket should have appreciable end play on it's pivot and should not be restricted in any manner by friction or any tendency to bind.

Engagement between the Ratchet Wheel (#6, Figure 16) and the Pawl (#17, Figure 17) is controlled by the position of the Hold-Clear Device (Figure 17) on the Motor Face. With the Hold-Clear Coils energized and the Armature (#23, Figure 17) 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.

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 should be replaced.

In the de-energized position, the Pawl should clear the Ratchet Wheel teeth by a minimum of .010 inch. This clearance is controlled by Stop Screw and Attendant Lock Nut (#'s 20, 21, Figure 17). This adjustment should be maintained in service and the Lock Nut kept tight to prevent movement of the Stop Screw.

The armature support bracket springs (#22, Figure 17) are adjusted as follows: with 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 (#23, Figure 17) and its pole pieces (#24, Figure 17) at time of latching is controlled by stop screw and attendant lock nut (#'s 25, 26, Figure 17). The lock nut should be kept tight to prevent movement of the stop screw. If field adjustment is required, this measure should be undertaken when hold-clear device is de-energized.

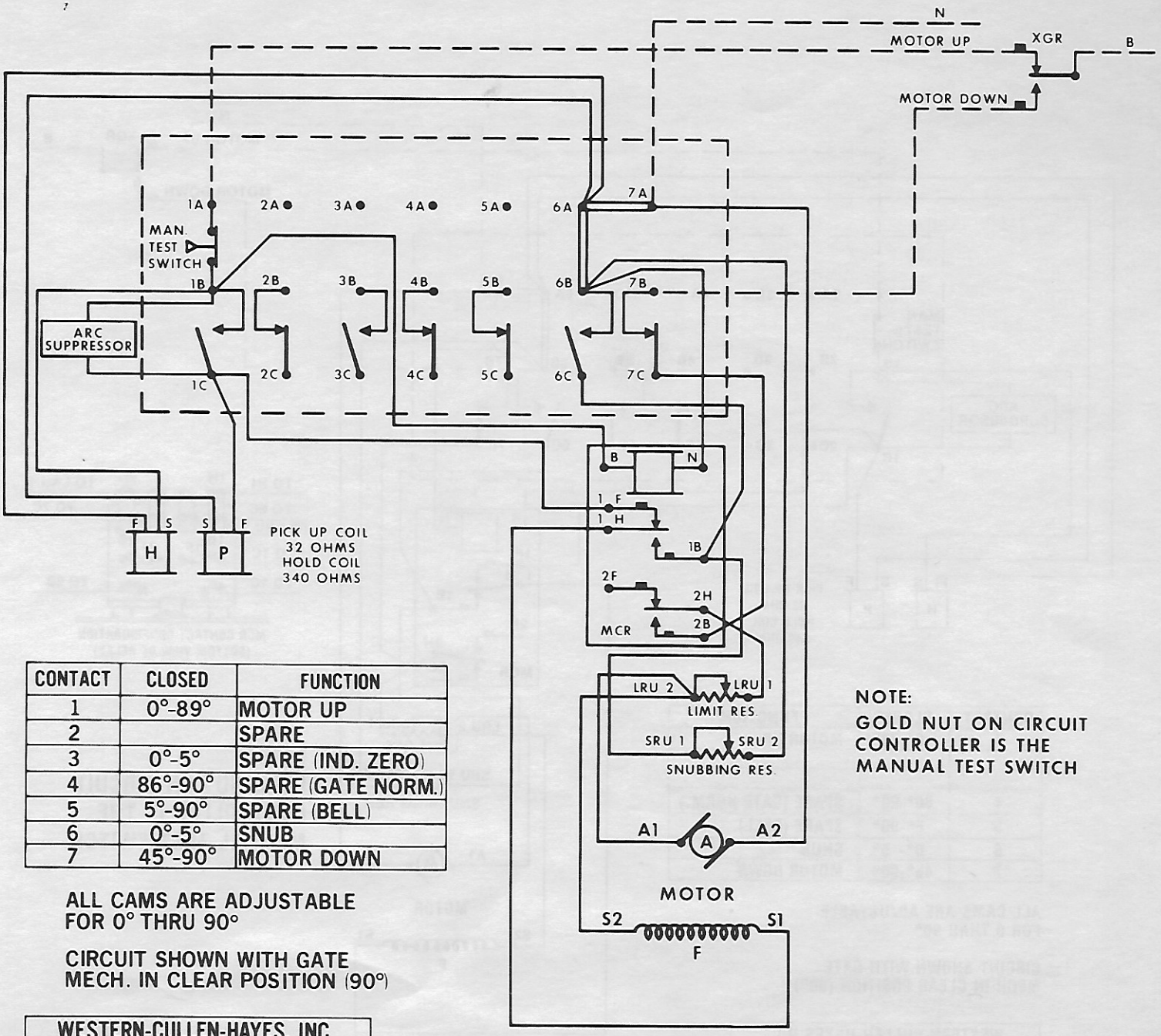
If this adjustment is changed, it will be necessary to readjust stop springs per above paragraph.

The Ratchet Wheel includes a press-fit, prelubricated 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 Ring Clip and Key hold the Ratchet Wheel in place on the motor shaft. If the Ratchet Wheel is removed for any reason the ring clip should be replaced. When remounting the ring clip, care should be taken to insure that the rounded edges of the clip face into the Ratchet Wheel, thereby reducing wear of the Ratchet Wheel cover plate. When positioned properly, the ring clip should be no closer to the Ratchet Wheel cover plate than 0.010". A light coat of multipurpose oil should be maintained between the two parts to reduce wear.

G. WIRING DIAGRAM (Figures 11, 11A and 12, Pages 27, 28 and 29)

Figures 11, 11A and 12 illustrate the arrangement of mechanism wiring for the operating circuits for the 3590 series crossing gate mechanisms. They indicate the uses to which each of the contacts of the circuit controller are put in properly controlling the other components of a standard Model 10 Crossing Signal. The same figures show the standard adjustment of all circuit controller contacts as set at the factory.



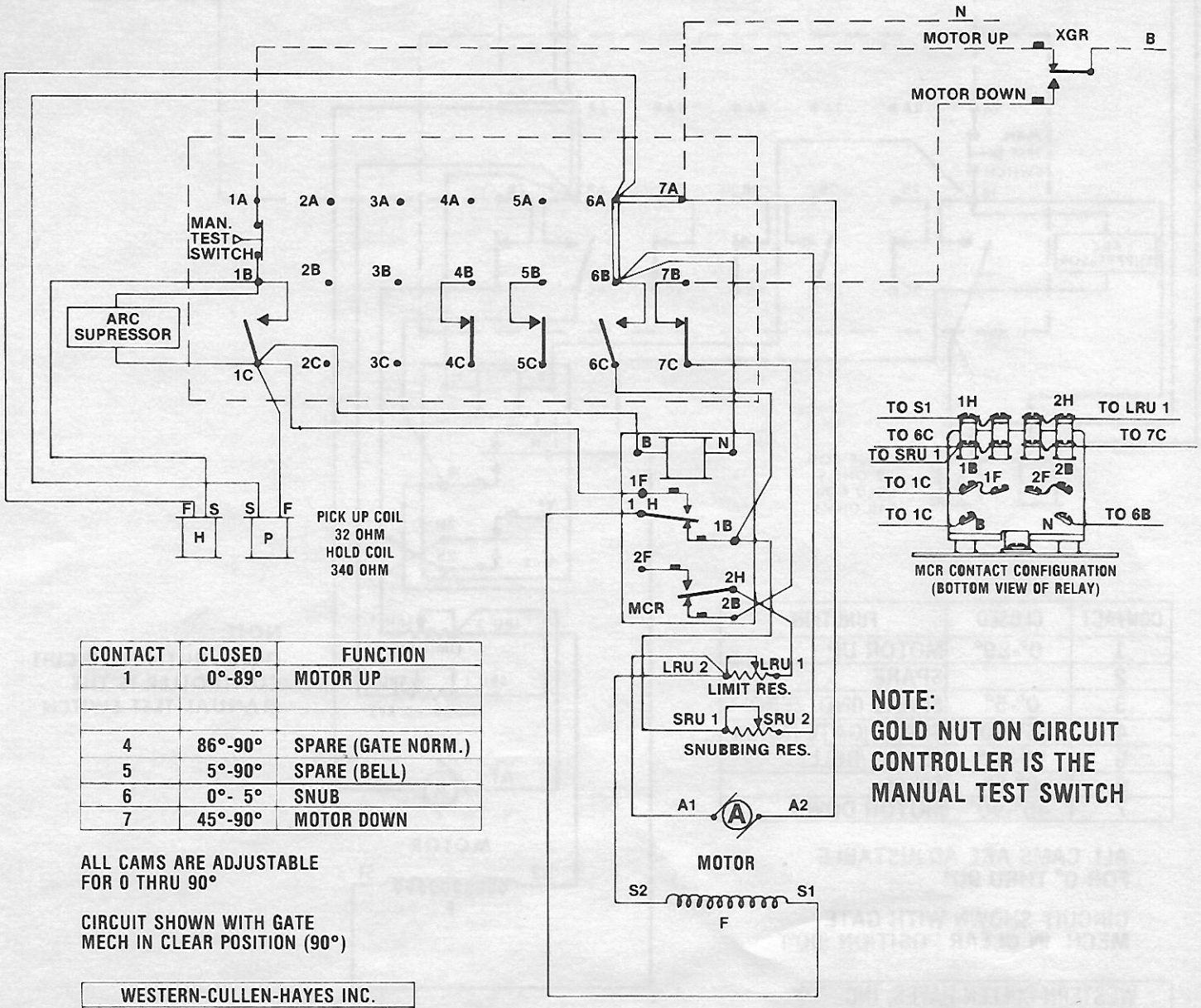
CONTACT	CLOSED	FUNCTION
1	0°-89°	MOTOR UP
2		SPARE
3	0°-5°	SPARE (IND. ZERO)
4	86°-90°	SPARE (GATE NORM.)
5	5°-90°	SPARE (BELL)
6	0°-5°	SNUB
7	45°-90°	MOTOR DOWN

ALL CAMS ARE ADJUSTABLE FOR 0° THRU 90°

CIRCUIT SHOWN WITH GATE MECH. IN CLEAR POSITION (90°)

NOTE:
GOLD NUT ON CIRCUIT CONTROLLER IS THE MANUAL TEST SWITCH

WESTERN-CULLEN-HAYES, INC.
WIRING DIAGRAM FOR 3590 GATE MECHANISM (3 POWER WIRE)
NO. 38-0045-321



CONTACT	CLOSED	FUNCTION
1	0°-89°	MOTOR UP
4	86°-90°	SPARE (GATE NORM.)
5	5°-90°	SPARE (BELL)
6	0°- 5°	SNUB
7	45°-90°	MOTOR DOWN

ALL CAMS ARE ADJUSTABLE FOR 0 THRU 90°

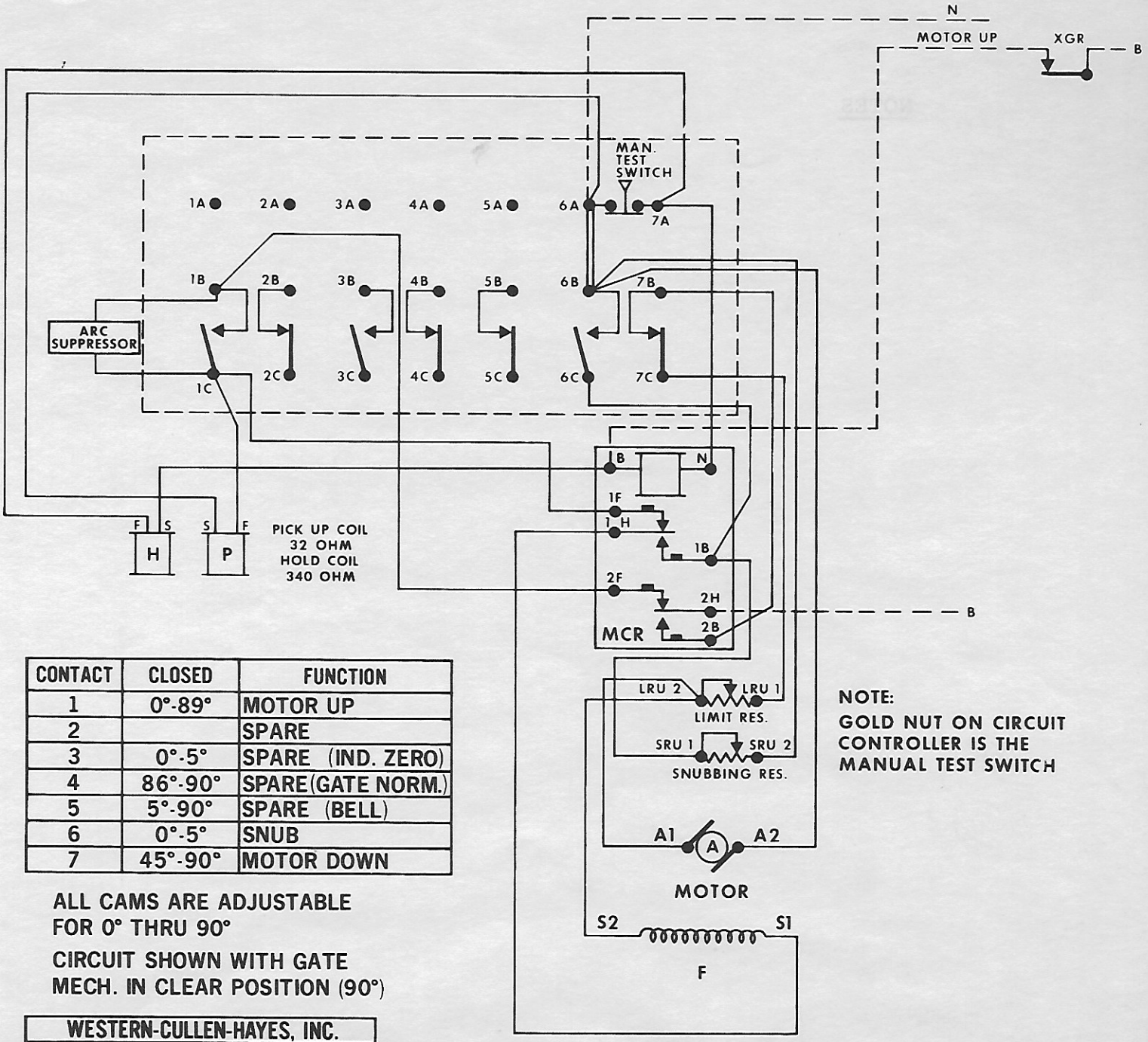
CIRCUIT SHOWN WITH GATE MECH IN CLEAR POSITION (90°)

NOTE:
GOLD NUT ON CIRCUIT CONTROLLER IS THE MANUAL TEST SWITCH

WESTERN-CULLEN-HAYES INC.
WIRING DIAGRAM FOR 3590 B GATE MECHANISM (3 POWER WIRE) NO. 38-0045-320

REVISION H, MARCH 22, 1982

FIGURE 11A



CONTACT	CLOSED	FUNCTION
1	0°-89°	MOTOR UP
2		SPARE
3	0°-5°	SPARE (IND. ZERO)
4	86°-90°	SPARE(GATE NORM.)
5	5°-90°	SPARE (BELL)
6	0°-5°	SNUB
7	45°-90°	MOTOR DOWN

ALL CAMS ARE ADJUSTABLE FOR 0° THRU 90°

CIRCUIT SHOWN WITH GATE MECH. IN CLEAR POSITION (90°)

NOTE:
GOLD NUT ON CIRCUIT CONTROLLER IS THE MANUAL TEST SWITCH

WESTERN-CULLEN-HAYES, INC.
WIRING DIAGRAM FOR 3593 GATE MECHANISM (2 POWER WIRE) NO. 38-0045-330

NOTES

Section 3

OPTIONAL EQUIPMENT

Heater

A heater may be attached to the mechanism for prevention of frost formation on controller contacts. Ordering References: 115V 25W Heater Kit, 38-0045-287 or 24 VDC, Heater Kit 38-0045-318.

Shroud

Permits concealment of electrical cable from junction box base to gate mechanism.
Ordering Reference: 38-0045-171.

Sidewalk Arm Kit

Permits addition of sidewalk arm to mechanism in service as operator of roadway arm. Includes necessary bearings, gears, keys, shaft, instructions. Does not include Sidewalk Arm Bracket (PN:3565-111) or Sidewalk Arm.
Ordering Reference: 3590-295.

4" Mast Adapters

Bolt Sleeve, PN: 3580-300 is available to permit use of the mechanism on 4" ID Masts. Six Bolt Sleeves are required to adapt the mechanism mounting hardware.

Section 4

MAINTENANCE AIDS

Appropriate spring scales complete with chain and hook, for measuring torque, are available.
Ordering Reference: Torque Adjusting Scale Assy. 3562-210.

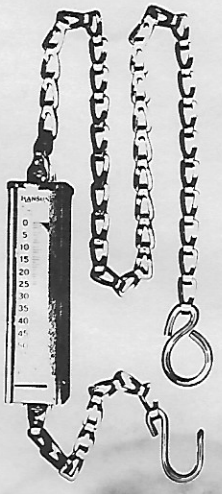


Figure 13

Vertical Torque measurements can be obtained by utilizing hex stub furnished as integral part of Motor Pinion (Order Kit No. 3590-K8 if motor pinion does not have hex stub).

Ordering reference: Torque Wrench Kit No. 3590-K9

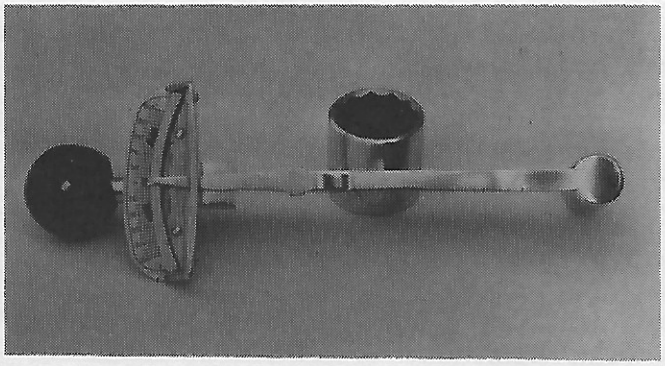


Figure 14

The No. 3565-211 Tension Testing Scale meets the requirement for determining contact pressure. It can be used to measure tension by pushing the movable contact away from the fixed contact or by pulling it away. Full scale two pounds by 1/4 ounces. May be obtained by specifying:

Ordering reference: Tension Testing Scale No. 3565-211



Figure 15

No. 3590-1650 Gear Grease is recommended for use with crossing gate mechanisms. Its unique characteristics include:

1. Ability to remain viscous in cold temperatures.

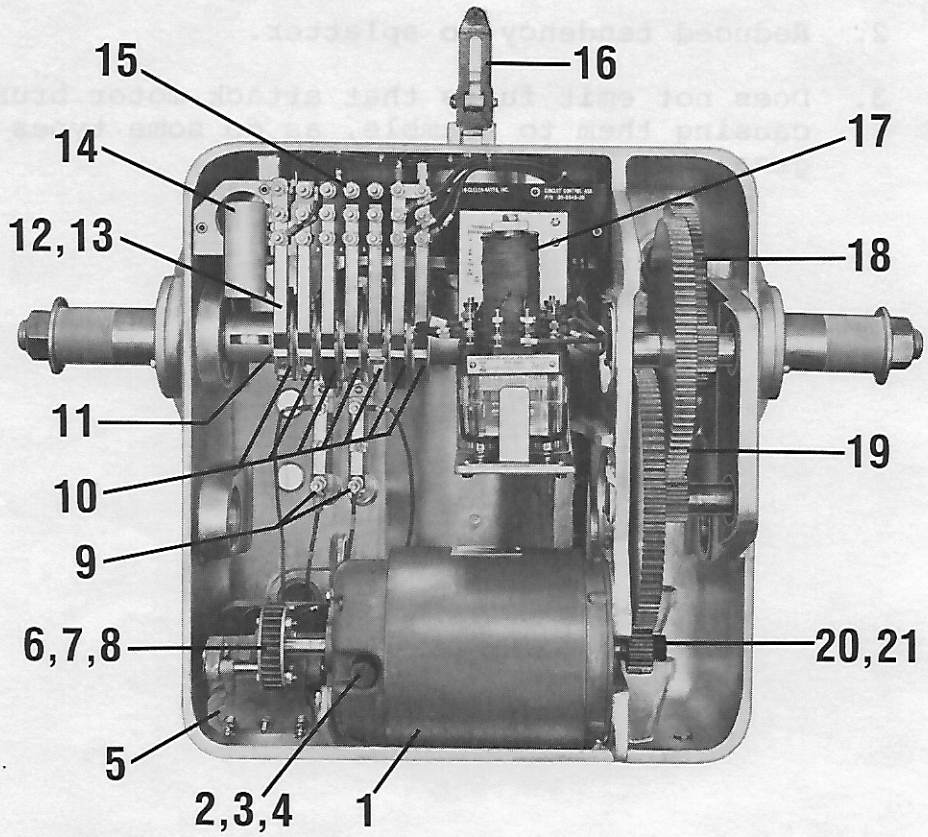
2. Reduced tendency to splatter.

3. Does not emit fumes that attack motor brushes, causing them to crumble, as do some types of greases.

Section 5
Parts Callout
(See Catalog Section 3 For
Complete Listing Of Parts)

Mechanism Replacement Parts

Figure 16



Ref. #	Description	Ordering Reference
1	Motor (only)	3590-217X
2	Brush Cap	38-0045-312
3	Brush	38-0045-118
4	Brush Holder	38-0045-117
5	Hold-Clear Device	38-0045-254
6	Ratchet Wheel	38-0045-262
7	Ring Clip	3580-271
8	Ratchet Wheel Key	3580-270
9	Limit, Snub Resistors	1110-1
10	Cams No. 2 thru No. 7	38-0045-55
11	No. 1 Cam	38-0045-92

Ref. #	Description	Ordering Reference
12	Front Contact	38-0045-28
13	Back Contact	38-0045-27
14	Arc Suppressor	38-0045-293
15	Circuit Controller Assy. (3590)	38-0045-20
	(3593)	38-0045-235
16	Hasp	1265-40
17	Motor Control Relay (3590,3593) w/o bkt.	38-0050-200
18	Segment Gear	3590-219
19	Intermediate Gears	3590-220
20	Pinion Gear	3590-218
21	Pinion Gear Key	38-0045-86

Section 5
Parts Callout
(See Catalog Section 3 for
complete listing of parts)

Hold-Clear Device Replacement Parts

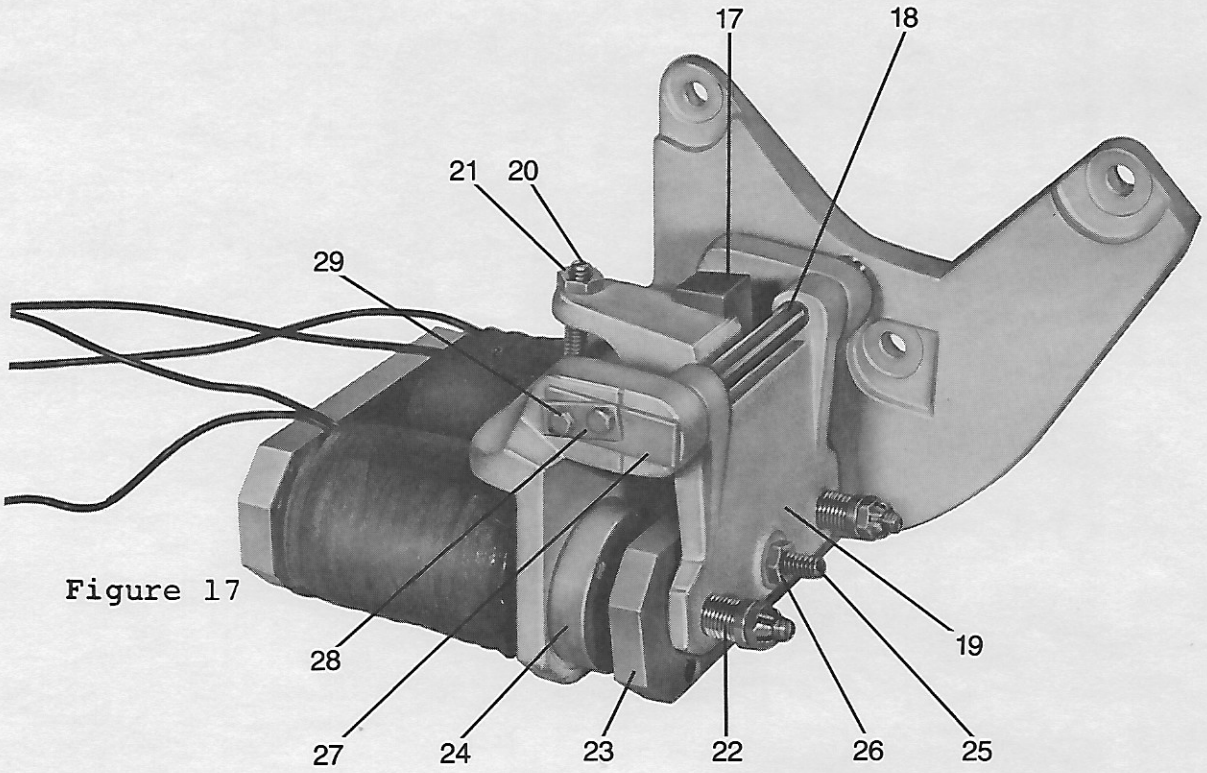


Figure 17

Ref. #	Description	Ordering Reference
17	Pawl	38-0045-7
18	Pin	38-0045-160
19	Armature Support Assembly	38-0045-159
20	Adjusting Screw	38-0045-256
21	Jam Nut	
22	Spring	38-0045-223
23	Armature Assy.	38-0045-265
24	Pole Piece	38-0045-151
25	Adjusting Screw	38-0045-151
26	Jam Nut	
27	Pin Stop	38-0045-256
28	Keeper	38-0045-153
29	Hex Bolt	38-0045-279

NOTES

ORDERING REFERENCES
FIBERGLASS - ONLY GATE ARMS AND PARTS

ARMS WITH LIGHTS, WIRING

	Piece No.
13′—19′ Arm, Type 1591 (4″ dia.) Gate Lights, Engr. Grade Striping	38-0026-80
As above but Hi-intensity Striping	38-0026-137
20′—26′ Arm, Type 1591 (4″ dia.) Gate Lights, Engr. Grade Striping	38-0026-81
As above but Hi-intensity Striping	38-0026-138
13′—19′ Arm, Type 1592 (7″ dia.) Gate Lights, Engr. Grade Striping	38-0026-84
As above but Hi-intensity Striping	38-0026-114
20′—26′ Arm, Type 1592 (7″ dia.) Gate Lights, Engr. Grade	38-0026-85
As above but Hi-intensity	38-0026-115

ARMS ONLY

13′—19′ Arm, Engr. Grade	38-0026-47
As above but Hi-intensity	38-0026-112
20′—26′ Arm, Engr. Grade	38-0026-57
As above but Hi-intensity	38-0026-113

ARM MAINTENANCE PARTS

13′—19′ Butt Section, Engr. Grade	38-0026-48
13′—19′ Mid Section, Engr. Grade	38-0026-49
13′—19′ Tip Section, Engr. Grade	38-0026-50
13′—19′ Butt Section, Hi-intensity	38-0026-106
13′—19′ Mid Section, Hi-intensity	38-0026-107
13′—19′ Tip Section, Hi-intensity	38-0026-108

ARM MAINTENANCE PARTS
CONTINUED

	Piece No.
20′—26′ Butt Section, Engr. Grade	38-0026-58
20′—26′ Mid Section, Engr. Grade	38-0026-59
20′—26′ Tip Section, Engr. Grade	38-0026-60
20′—26′ Butt Section, Hi-intensity Striping	38-0026-109
20′—26′ Mid Section, Hi-intensity	38-0026-110
20′—26′ Tip Section, Hi-intensity	38-0026-111
End Plug, Butt Section	38-0026-51
End Plug, Mid Section	38-0026-52
End Plug, Tip Section	38-0026-53
13′—19′ Wiring Kit	38-0011-46
20′—26′ Wiring Kit	38-0011-47
4″ dia. Gate Lights, Set of Three	1591-50
7″ dia. Gate Lights, Set of Three	1592-50

ORDERING REFERENCES
BREAKAWAY ADAPTERS
AND PARTS FOR FIBERGLASS-ONLY GATE ARMS

BREAKAWAY ADAPTER	Piece No.
For Model 10, Type S, Model 75 mast mounted gate signals, and 4″ dia. Gate Lights	3575-177
As above, but for 7″ dia. Gate Lights	3575-179
For Pedestal-type Gate Signals	3575-178

ADAPTER MAINTENANCE PARTS	
Shear Bolt Assembly, Arms 13′—26′	3575-170-1
Shear Bolt Assembly, High Wind or Arms over 26′	3575-201-1
Arm Mount Sleeve	38-0026-44-2

ORDERING REFERENCES
ALUMINUM/FIBERGLASS GATE ARMS AND PARTS

ARMS WITH LIGHTS, WIRING

	Piece No.
16′—33′ Arm, Type 1591 (4″ dia.) Gate Lights, Engr. Grade Striping	38-0060-05
As above but Hi-intensity Striping	38-0060-06
16′—33′ Arm, Type 1592 (7″ dia.) Gate Lights, Engr. Grade Striping	38-0060-07
As above but Hi-intensity Striping	38-0060-10

ARMS ONLY

16′—33′ Arm, Engr. Grade Striping	38-0060-13
16′—33′ Arm, Hi-intensity Striping	38-0060-14

ARM MAINTENANCE PARTS

AL Butt Section, Engr. Grade Striping	38-0026-125-3
AL Butt Section, Hi-intensity Striping	38-0026-125-4
FG Intermediate Section, Engr. Grade Striping	38-0026-58
Above, but Hi-intensity Striping	38-0026-109
FG Mid Section, Engr. Grade Striping	38-0026-59
Above, but Hi-intensity Striping	38-0026-110
FG Tip Section, Engr. Grade Striping	38-0026-60
Above, but Hi-intensity Striping	38-0026-111
End Plug, Intermediate Section	38-0026-51
End Plug, Mid Section	38-0026-52
End Plug, Tip Section	38-0026-53
End Plug, Special, Full Intermediate Section	38-0026-194
End Plug, Special, Full Mid Section	38-0026-205
Wiring Kit, 16′—33′	38-0011-122
Gate Lights, Set of Three Type 1591 (4″ dia.)	1591-50
Gate Lights, Set of Three Type 1592 (7″ dia.)	1592-50

ORDERING REFERENCES
BREAKAWAY ADAPTERS AND PARTS
FOR ALUMINUM/FIBERGLASS GATE ARMS

BREAKAWAY ADAPTER	Piece No.
For Model 10, Type S, Model 75 mast mounted gate signals, and 4″ dia. Gate Lights	3575-250
As above, but for 7″ dia. Lights	3575-252
For Pedestal-type Gate Signals	3575-251

ADAPTER MAINTENANCE PARTS	
Shear Bolt Assembly, Arms 13′—26′	3575-170-1
Shear Bolt Assembly, High Wind or Arms over 26′	3575-201-1