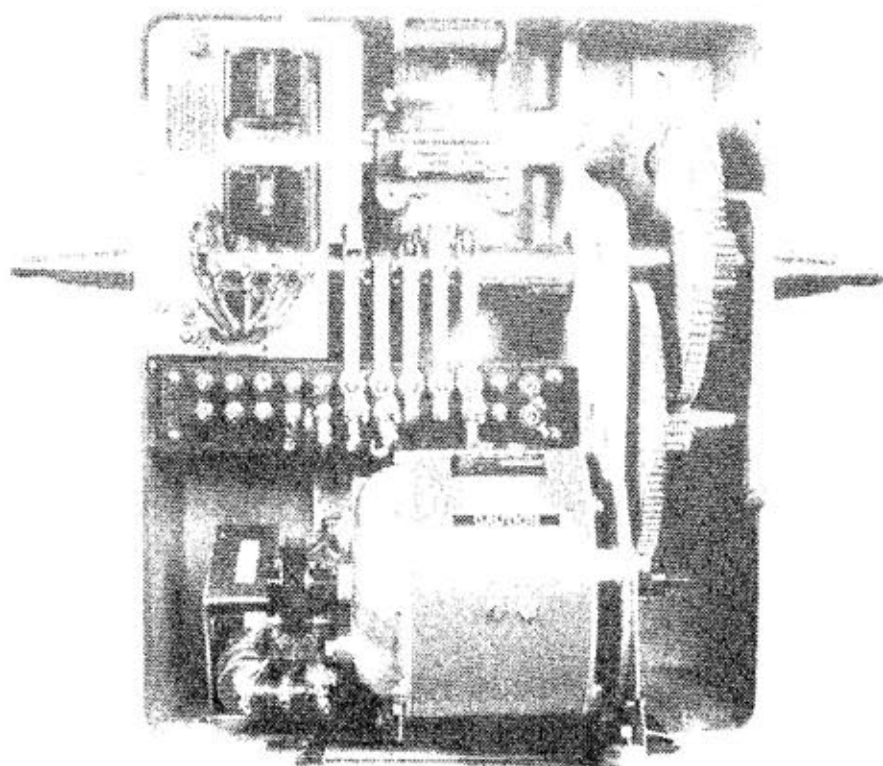


# Instruction and Maintenance Manual

## Railroad Highway Crossing Gate Model S40



## Circuit Controller Adjustment

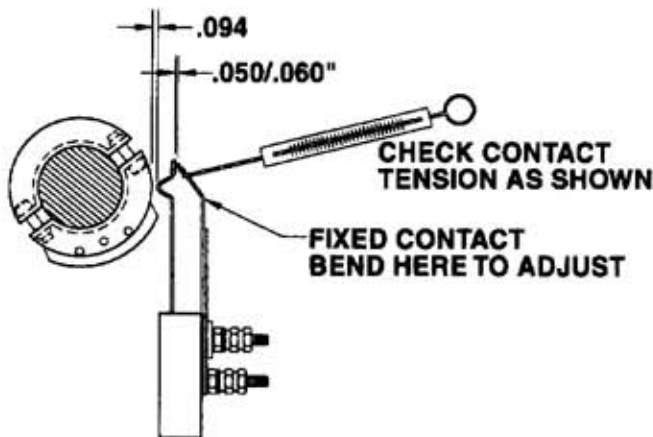
Five spring contacts are provided on a standard mechanism assembly. Additional contacts can be furnished if required. Three contacts are required for gate operation (position 6, 7 & 10) and two contacts (position 8 & 9) are factory adjusted and may be used as indicated in the table below.

Contacts are factory set as shown below. The rear or moveable contact rarely requires adjustment unless being replaced. The contact opening can increase with use and should be checked periodically and adjusted if required. The openings should not exceed 1/16". Contact adjustment can be made by adjusting the bend angle of the front or fixed contact with a contact forming tool. Set contact opening to where there is a light drag on a 1/16" gage. Always check contact operation after adjustment to be sure there is square contact and a good wiping action when the contact closes. Tension pressure of closed contact to be between 28 and 48 oz.

Contact tools and gages are available, see page 15 for ordering information.

**CAUTION: Repeated or overbending of a contact may cause damage and not allow proper tension when closed or gap when opened.**

Contact cams are factory set for contact function as shown in the table below, or as specified by customer. Adjustment may be required at installation. Use the allen wrench provided to loosen the cam locking screw, then using the allen wrench as a lever, shift the cam position and retighten the screw.

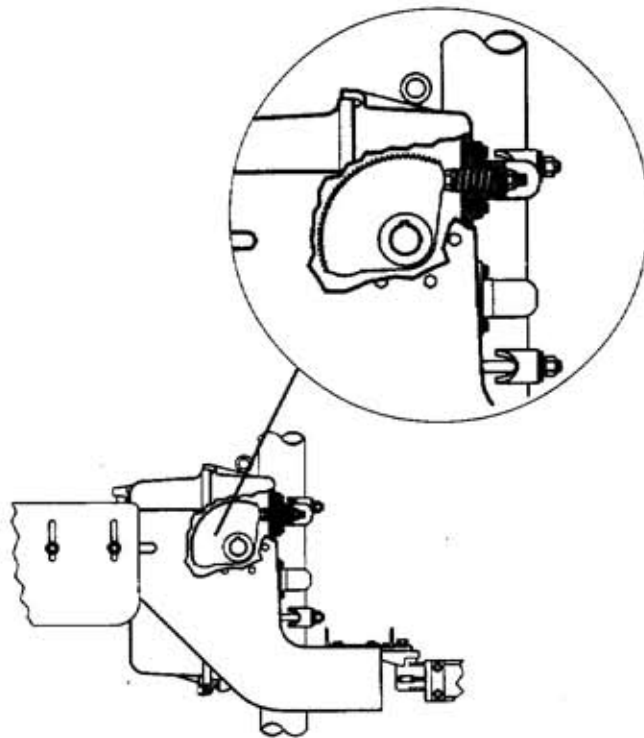


Term. Board Position Number	Wire Designation	Contact Closed with Gate Arm at	Function of Contact
6	L-M	45 degrees - 90 degrees	Power Down Control
7	J-K	0 degrees - 89 degrees	Power Up Control
8	R-S	83 degrees - 90 degrees	Spare (Suggest Flashing Light Control)
9	H-I	5 degrees - 90 degrees	Spare ( Bell Control)
10	T-U	0 degrees - 5 degrees	Horizontal Snub Control

# Spring Buffer Adjustment

The Model S-40 gate mechanism is equipped with an adjustable spring buffer for horizontal and vertical gate arm positioning. Field adjustment is necessary, follow instructions below.

**Note:** These adjustments should always be checked before placing gate in service.

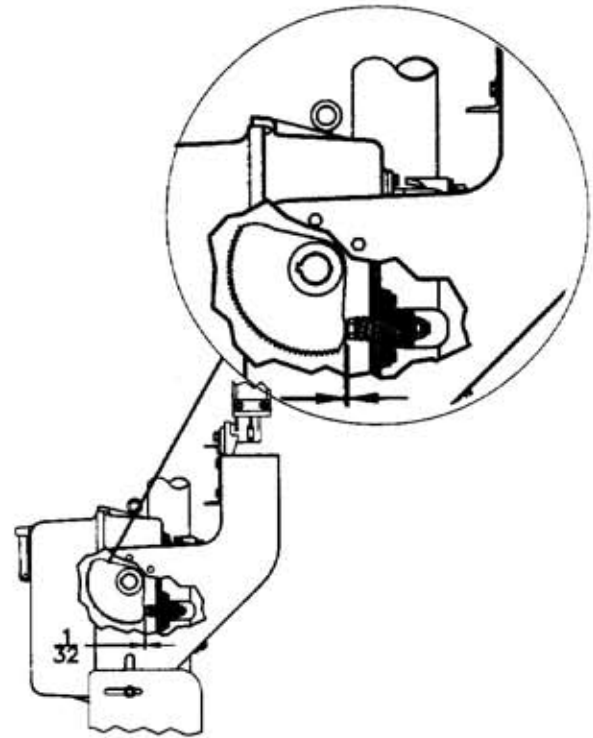


**Horizontal Position**

The horizontal buffer controls the height of the gate arm above the roadway.

**To adjust horizontal arm position** - With arm horizontal, remove cap from rear of the top buffer housing, remove the 3/16 x 1 1/2 cotter pin and turn the castle nut on the buffer stud as required to raise or lower the gate arm.

After adjusting, replace the cotter pin and cap.



**Vertical Position**

The vertical buffer supports the weight of counterweights at installation and if the gate arm is knocked off, however there should be no contact with the segment gear during normal operation.

**To adjust vertical buffer** - With arm vertical, remove cap and 3/16 cotter pin at lower buffer and turn castle nut clockwise until buffer pad is clear of segment gear. Cycle gate down and back to vertical, then adjust buffer pad to 1/32" clearance (use plastic card as gauge).

After adjusting, replace the cotter pin and cap.

## Additional Instructions and Adjustments Necessary When Auxillary Arms are Installed

**The adjustment is a two person operation and takes place as follows:**

1. Position roadway arm in the horizontal position.
2. Person No. 1 to loosen set screws (item 4, page 27) and slide the driven gear (item 2) from the train. Note person No. 2 may have to raise the arm slightly to relieve the gear tooth pressure from the driven gear.
3. Person No. 2 should raise the auxiliary arm (item 14, page 27) to the horizontal or near horizontal position to allow person No. 1 to reenter the driven gear to the gear train.
4. Retighten set screw and run test operation.

# Counterweight Guidelines

Counterweight requirements depend on the weight and length of the gate arm, and on the weight and position of the arm coupling or conversion bracket. The counterweights listed in the tables below are based on new Safetran arms and conversion brackets and may vary when other or repaired arms are used.

Counterweights can be mounted on a single counterweight support arm for fiberglass or combination aluminum/fiberglass arms up to 32' and wood arms up to 24'. Longer arms require counterweight supports on both sides of the mechanism.

**Horizontal torque.** Set horizontal torque to between 80 and 120 foot-pounds per instructions on page 11 for all arm lengths with standard applications. Use of a gate retraction device may require a higher setting, see note on page 11.

**Vertical torque.** Set vertical torque to torque range listed in tables below and instructions on page 11 for all applications.

**Table 1 – Fiberglass and Fiberglass/Aluminum Gate Arm  
Counterweights and Vertical Torque**

	Gate Arm Length in feet	Counterweights Required		Stud Plate 070757		Distance "X" in feet	Scale Reading Range (lbs)		Torque Range (ft - lbs)	
		Std	Short	Std	Short		Min	Max	Min	Max
Counterweights mounted on one Support Arm	12' – 15'	1	3	-26X	-30X	5'	30	35	175	205
	16' – 20'	2	5	-26X	-30X	5'	35	37	175	210
	21' – 22'	3	7	-26X	-30X	5'	35	38	175	210
	23' – 27'	4	10	-26X	-30X	5'	38	46	190	230
	28' – 32'	5	10	-26X	-30X	6'	39	44	235	260
Counterweights mounted on two Support Arms	33' – 36'	6	13	-26X (2)	-30X(2)	7'	41	48	260	300
	37' – 40'	7	17	-26X (2)	-30X(2)	10'	34	38	300	350

**Table 2 – Wood Gate Arm Counterweights and Vertical Torque**  
**Note: Wood arms 31 feet and longer are shipped with a truss assembly**

	Gate Arm Length in feet	Counterweights Required		Stud Plate 070757		Distance "X" in feet	Scale Reading Range (lbs)		Torque Range (ft - lbs)	
		Std	Short	Std	Short		Min	Max	Min	Max
Counterweights mounted on one Support Arm	13' – 18'	2	5	-26X	-30X	5'	35	37	175	185
	19' – 24'	4	9	-26X	-30X	5'	35	38	175	190
	25' – 28'	7	15	-26X(2)	-30X(2)	5'	38	46	190	230
Counterweights mounted on two Support Arms	29' – 30'	7	15	-26X(2)	-30X(2)	6'	39	44	235	260
	31' – 32'	10	22	-26X(2)	-30X(2)	7'	37	41	260	285
	33' – 36'	10	22	-26X(2)	-30X(2)	7'	41	48	285	335
	37' – 40'	16	34	-24X(2)	-31X(2)	10'	34	38	340	380
	41' – 42'	16	34	-24X(2)	-31X(2)	10'	38	40	380	400
	43' – 46'	20	42	-24X(2)	-31X(2)	10'	40	44	400	440

Standard Galvanized Counterweight #070755-4G 15" x 30" x 1/2" 58 pounds.

Short Galvanized Counterweight #070755-34G 15" x 15" x 5/8" 38 pounds. (Furnished only when specified)

## **Torque Adjustments (Using Safetran Torque Wrench Kit)**

Safetran's Torque Wrench Kit permits measurements to be taken from the 1/2 inch hexagon end of the motor shaft. It provides a simpler method than the conventional manner with a spring scale for both measurements.

The torque wrench is calibrated to allow for both inch-pound and foot-pound readings to be taken through the 240 to 1 gear reduction from the 1/2 inch hexagon end of the motor shaft.

**NOTE: Other torque wrenches should not be used.**

The Safetran Torque Wrench Kit, part number 070981-X, consists of:

- Torque Wrench (calibrated for both inch-pound and foot-pound readings through the 240 to 1 gear reduction)
- Ratchet Wrench (3/8 inch drive)
- Ratcheting Box End Wrench (1/2 and 9/16 inch openings)
- Socket (1/2 inch, 3/8 inch drive)
- Hex Key Wrench (3/16 inch)
- Tool Box
- I & M Sheet

### **Horizontal Torque**

1. To obtain horizontal torque, lower the arm to the horizontal position.
2. Block contact #10 (horizontal snub) with a plastic card and lift the gate arm approximately 5 degrees from the horizontal position.
3. Attach the torque wrench to the hexagon end of the motor shaft and allow wrench to rotate until blocked by the housing or edge of the open cover.
4. The value read should be between 80 and 120 foot-pounds. If reading does not fall in this range, counterweights should be moved in either direction, as shown on page 12 until proper reading is obtained. Remove torque wrench before adjusting counterweights.
5. When proper reading is obtained, remove torque wrench, remove card from contact #10 and reapply power.

Note: The use of a gate retraction device may require a higher horizontal torque setting to keep the arm at horizontal when it is rotated. If done, add final checks of:

Horizontal torque must not exceed 250 ft. lbs.

Gate up current must be 6-15 amps.

Horizontal snub contact #10 to be a full 5 degrees for all length arms.

Vertical torque must remain within specified limits.

Increased gear maintenance will be required. Clean gears and reapply grease when signs of gear wear evident.

### **Vertical Torque**

1. To obtain vertical torque, operate the gate mechanism to place the arm in the vertical position. Make certain that the segment gear is not touching the lower buffer pad.
2. Place the torque wrench over the 1/2 inch hexagon end of the motor shaft.
3. Disable the power down and power up contacts (position 6 & 7) by blocking with a plastic card. Holding the torque wrench firmly, disconnect power-up circuit. Slowly allow wrench to rotate until blocked by the housing or edge of the open cover.
4. The value read should be in accordance with the torque range specifications as listed in tables on page 10.
5. If reading does not fall within specifications, counterweights should be moved horizontally in either direction, as shown on page 12 until proper reading is obtained. Always reapply power-up, engage hold clear and remove torque wrench before adjusting counterweights. When proper reading is obtained, remove wrench, remove card from contacts 6 & 7 and reapply power.

## Hand Cranking of Gate Mechanism

**Warning:** Disconnect power to gate mechanism before inserting tools for hand cranking.

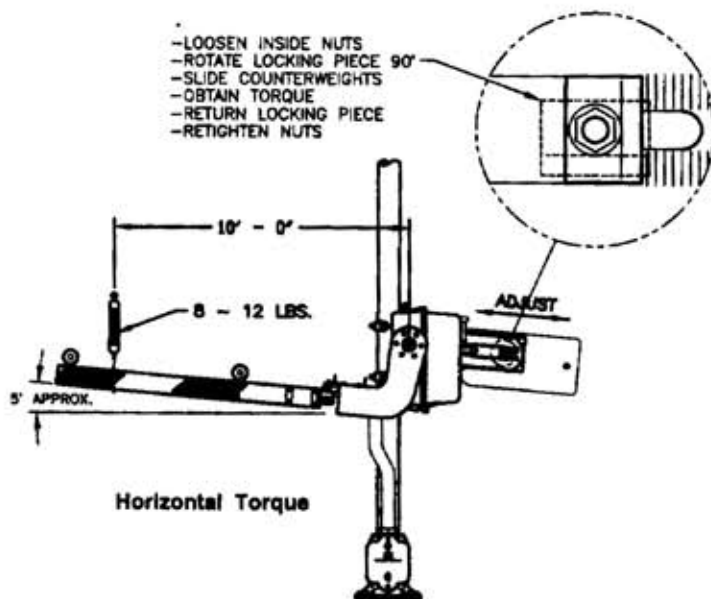
The gate mechanism hand crank feature may be used either to crank the gate arm up, or in the case where the arm has been sheared off, to crank the counterweights to the horizontal position. The tools required are a ratchet wrench with 3/8 inch square drive, a 1/2 inch socket for 3/8 inch drive, and a ratcheting box end wrench for 1/2 inch hex shaft; all of which are included in the Safetran Torque Wrench Kit.

1. Place ratcheting box end wrench over the hexagon shaft and slide towards motor. The ratchet should be set in the direction to prevent its rotation backward (**-ON-** to raise arm, **-OFF-** to raise counterweights).
2. Place the socket ratchet wrench over the end of the hexagon shaft and crank in the desired direction.
3. At the desired height, align the hole in the lower gear with the hole in the gear frame and insert a 3/8" pin or bolt. The gear train should be locked in this manner whenever working with the unbalanced condition of removing or replacing an arm or counterweights.

## Torque Adjustments (Using Spring Scale)

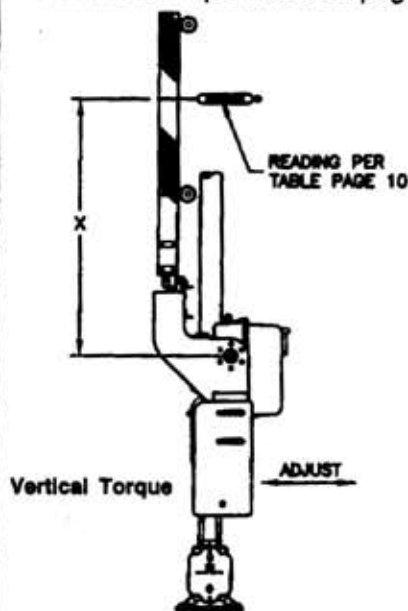
### Horizontal Torque

Follow steps listed on page 13 using a spring scale in place of the torque wrench.



### Vertical Torque

Follow steps listed on page 13 using a spring scale in place of the torque wrench. Spring scale readings and locations are listed in the torque tables on page 12.





# Maintenance Switch Operation

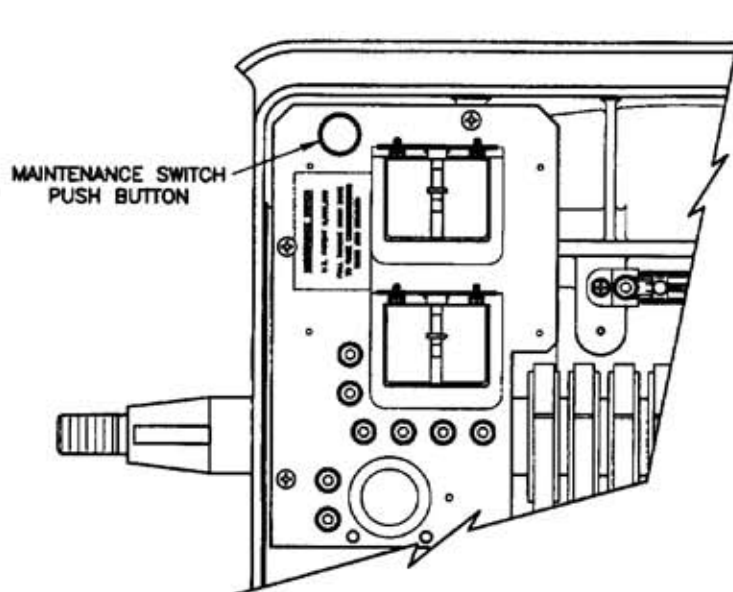
**Note: The Maintenance Switch (patent no. 5, 852, 350) is an optional feature and must be specified when ordering an S-40 Gate Mechanism.**

The Maintenance Switch option consists of a push button switch and operating relay as part of the relay panel located in the upper left area of the gate cabinet, and a stop bar assembly located at the motor end of the gear train. See diagram below and on next page.

The Maintenance Switch is applicable to fiberglass/aluminum gate arms up to 40 feet long. Activating the normally open, momentary contact, push button switch will raise up to seven standard size counterweight plates\* to a horizontal position when the gate arm is removed. Once raised the stop bar is used to hold the counterweights at horizontal until the arm is in place.

## Operating Steps

1. Position the Stop Bar with key-slot over the pivot lug in a ready position as shown on page 16.
2. Apply gate control of Down by removing up control (back off gold nut at test link assembly).
3. Depress and hold the Push Button until counterweights are fully raised with the segment gear stopped against the horizontal buffer.
4. Rotate the Stop Bar end against the motor pinion teeth and release the Push Button.
5. Install gate arm.
6. Return the Stop Bar to the storage position as shown on page 16.



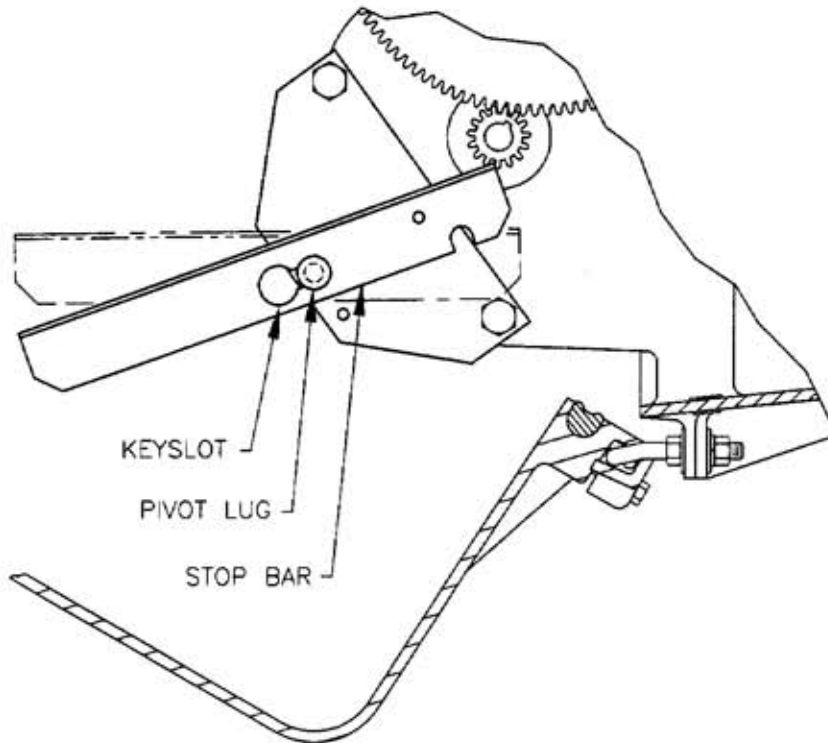
\* Tests show that 7 of the standard size 63# counterweights in a centered position with 13 VDC at gate terminals can be raised to a full horizontal position. Six counterweights in a maximum extended position can be raised to full horizontal with the minimum 11 VDC at gate terminals.

Gates with 8 or more counterweights will require hand cranking per page 14 or the use of a come-along to move the counterweights to the horizontal position.

# Maintenance Stop Bar Application

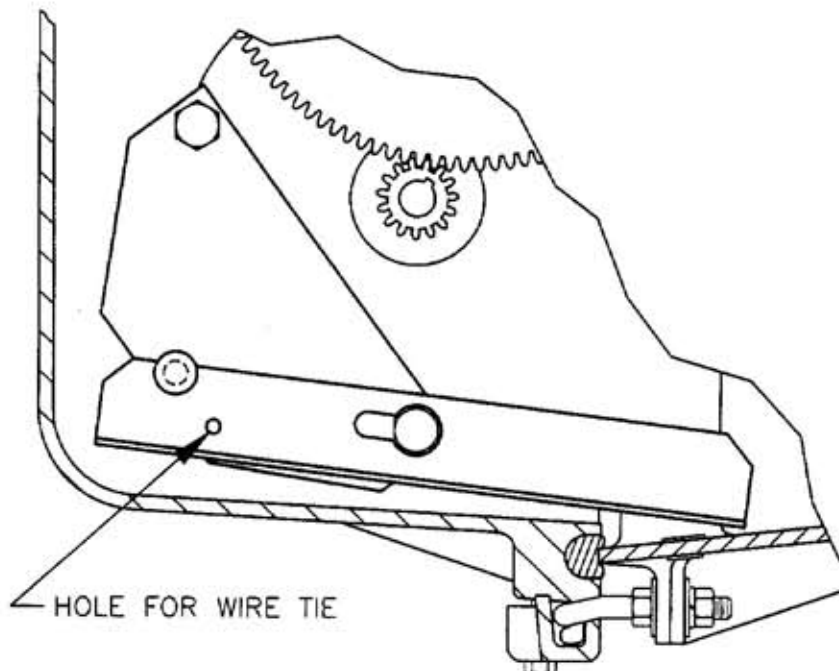
## Maintenance Hold Position (Door Open)

Position Stop Bar with key-slot over pivot lug. When counterweights are fully raised, rotate Stop Bar up against motor pinion teeth as shown and release the maintenance switch push button.



## Storage Position

Remove Stop Bar, rotate it and place the key-slot over the lower motor mount bolt head, then rotate up with the notch under the pivot lug as shown.





## General Maintenance

Model S-40 gate mechanisms have self-lubricating bearings on the main shaft, gear shafts and on the auxiliary sidewalk arm shaft when so equipped. No lubrication is required.

Gears should be coated with a thin film of all temperature grease, such as Aeroshell 7, at 3 to 6 month intervals depending on number of gate operations. Clean thoroughly and reapply grease every two years or when signs of gear wear are evident.

Ensure that air vents are kept unobstructed and flexible conduit between the gate mechanism and the junction box base is kept sealed.

## Motor

Motor Shaft bearings are sealed with all temperature grease and no lubrication is required. The brush pressure should be between 10 and 16 ounces. Normally the brush pressure, as adjusted at the factory, will be retained within proper limits throughout the long life of the brushes.

Required maintenance is to inspect the brushes and commutator annually and following a broken or fouled gate arm condition that may have held the motor in stall. Clean a darkened commutator by holding a commutator cleaning stone or non-metallic abrasive cloth to it while rotating the motor shaft. After cleaning, cycle the gate 2-3 times to clear brushes, then wipe commutator with a lint free cloth. Brushes worn to less than 3/4" length should be replaced.

## Maintenance Tools

Torque Wrench Kit (contents listed on page 11) - 070981-X

Maintenance Kit Complete-073112-3X (includes following items which can be ordered separately)

Contact Forming Tool-073112

Contact Setting Gage-073112-1

Commutator Cleaning Tool-073112-2

Contact Cleaning Strips (box of 12)-073000-15

Tension Gage for Motor Brush Springs and Controller Contacts-073000-16

**Torque Card - 070982-2**

## Motor and Snub Relay

The motor and snub relay has four front back and heel contacts as shown on the wiring diagram page 3. A removable plastic cover allows for contact inspection. The relay is energized by up control closing the front contacts to complete the motor up circuit. The relay is de-energized closing the back contacts when controller contact #7 on the terminal board opens at 90 degrees. This completes the snub circuit and is positioned for power down when up control is removed.

Field adjustments of the relay are not recommended.

Relay Specifications			
Relay	Coil Resistance	Pick Up	Drop Away
12VDC Std	33 Ohm	9.0V max.	2.5V min.
24VDC Std	132 Ohm	18.0 V max.	1.0V nominal
12 VDC Type ST	250 Ohm	7.0V max.	2.0V min.

# Hold Clear Maintenance & Installation

## Introduction

The hold clear function is to hold the arm in a vertical position with power applied, but allowing the arm to descend when power is removed. This is achieved with an overrunning clutch type ratchet wheel which is latched by an electromagnetically operated lever and pawl.

## Adjustment

The hold clear itself as factory installed and adjusted normally needs no readjusting, however if any parts are changed or if disassembled for cleaning, all adjustments should be carefully checked and readjustments made if necessary. Adjustment details are found under the installation instructions and the diagrams on pages 19 and 20.

The power down contact assembly mounted on the hold clear top plate should be inspected periodically and may at some point need to be readjusted. See diagrams and instructions on page 19 for adjustment specifications.

## Maintenance

Periodically inspect to the maintenance check points listed below. No lubrication is required.

### 1. Power Down Contact Assembly.

- Condition of contacts, is cleaning required?
- Contact clearance and wiping action when closed.

### 2. Ratchet Wheel.

- Spins freely on hub clockwise.
- Locks to hub counter-clockwise.
- Aligned with pawl. Set screws are tight.

### 3. Pawl

- Latched and clear clearances.
- Wear of pawl. Pawl can be removed and turned 180 degrees to obtain a new sharp edge. Apply Loctite.

### 4. Armature

- Free movement on pivot pin. Pivot free of dirt.
- The contact actuator is intact and holding screw tight.
- Condition of stop pins.

**NOTE:** Adjustment or reassembly of pawl, contact actuator or adjustment screws requires application of Loctite Removable Threadlocker 242 or equal into joint threads before tightening.

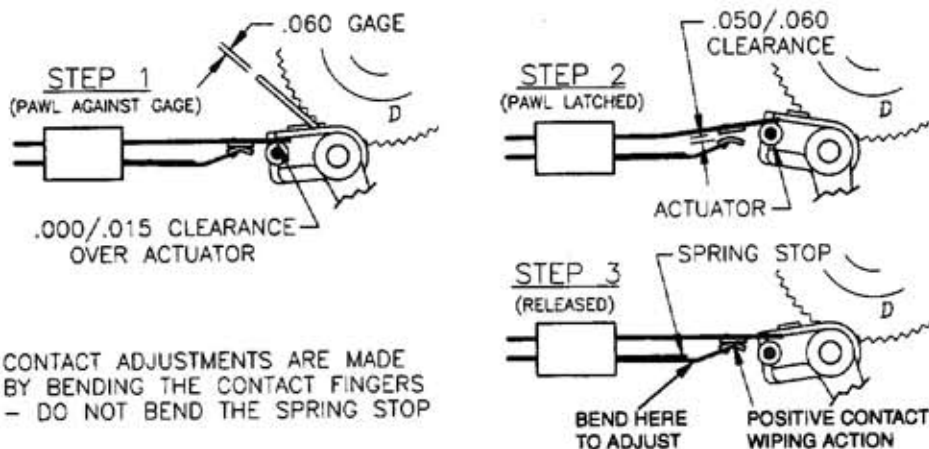
# Installation Instructions

Instructions for installing a complete new hold clear assembly #074025-X (w/o ratchet wheel) or #074025-2X (complete with ratchet wheel and mounting hardware). The Model S-40 Hold Clear can be used directly on the Model S-20 and on the older Model S Gates. The complete assembly with ratchet wheel is required when replacing a Model S Hold Clear.

1. Install the Ratchet Wheel Assembly first to the motor shaft with key and set screws. The long end of hub should be facing out and be even with the end of the motor shaft.
2. Install the complete Hold Clear assembly and the Stop to the motor end with the two shoulder type mounting bolts and washers, but do not fully tighten. The stop is located under the lower bolt head and washer as shown on the next page. **The following adjustments are pre-set on new Hold Clear assemblies.**
  - The armature plate stud springs are set to 17/32 dim. and locked with cotter pins as shown on next page.
  - The armature plate stop pins are set to parallel with the pole faces using adjustment screw "A" and lock nut as shown on the next page.
3. Set the Pawl to Ratchet tooth clearance to .015" max. but without binding or dragging on tooth root.
  - With the mounting bolts slightly loosened, hold the armature bracket up against adjustment screw "A" engaging the pawl to the ratchet wheel. Turn adjustment screw "B" until the pawl is tight into a ratchet tooth root and then back off 3/4 turn.
  - Tighten the mounting bolts and check the clearance as it can change slightly when tightening. When properly set, apply Loctite and tighten the lock nut.
4. Release the armature plate and check the .050" minimum clearance between the pawl and ratchet wheel.
  - The .060" contact setting gage #073112-1 can be used to check clearance.
  - Loosen the lower mounting bolt and reposition the stop if needed.
5. Power Down Contact must be checked for proper clearance and a positive wiping action when the contact points close. Contacts can be set using contact forming tool #073112 as follows:  
Step 1. Holding the armature up with the pawl against a .060" gage, the upper contact finger is set for .015" maximum clearance over the actuator.  
Step 2. Remove the gage and hold armature up with pawl fully engaged. Set contact gap to .050/.060".  
Step 3. Check for a positive wiping action of contacts when armature is released.
6. Connect wires, install cover guard and check pick up and drop away voltages.
  - Maximum pick-up is 7.0 volts.
  - Minimum drop away is 2.5 volts with load from raised gate arm (approx. 1.0 volts without load).

**NOTE:** Adjustment or re-assembly of pawl, contact actuator or adjustment screws requires application of Loctite Removable Threadlocker 242 or equal into joint threads before tightening.

## POWER DOWN CONTACT ASSEMBLY



**CAUTION:** Repeated or overbending of a contact may cause damage and not allow proper tension when closed or gap when opened.

# Model S-40 Hold Clear Assembly

