



## **INSTRUCTION & MAINTENANCE**

# **S-20 RAILROAD HIGHWAY CROSSING GATE**

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VERSION B

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# Instruction & Maintenance

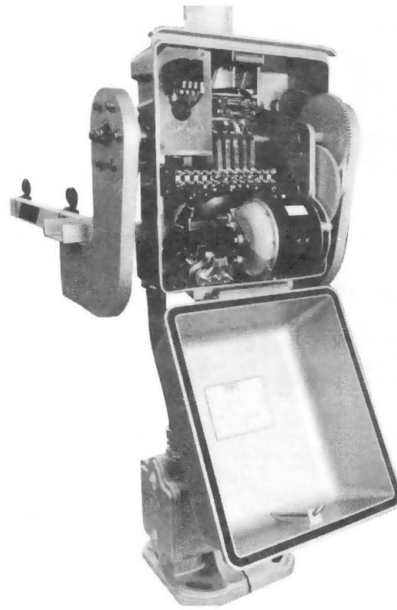
## Railroad Highway Crossing Gate

### Model S-20

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# Model S-20 Mast Mounted Gate



## Introduction

The Model S-20 Gate is an update of the Model S Gate that has served the railroad industry for over a half century. A newly designed Hold Clear with improved magnetics and mechanical latching is combined with the existing rugged 4 pole, series wound 12 volt motor. Steel gears mounted on ball bearing shafts provide a smooth running 240 to 1 reduction gear train. Maintenance free sealed bearings are used with the gear shafts and the main shaft. A new rugged one piece permanent mold housing and gear frame is precision machined using C.N.C. (Computer Numerical Control).

This mechanism will operate the longest, properly counterbalanced gate arms smoothly and rapidly even when arms are covered with sleet.

During motor-up cycle, current consumption is 6-15 amperes. During the motor-down cycle, current consumption is 6-15 amperes. Operating voltage is 11-16 volts dc.

The hold-clear device, mounted on the end of the motor utilizes an over-running clutch which will latch the gate in the vertical position when energized. The hold-clear drops by gravity when de-energized. No electromagnetic brake is used. Holding the gate arm in the vertical position requires 35 milliamps at 12 volts.

Adjustable circuit controller cams are mounted on the shaft. Contact springs are mounted on a terminal board, forward in the assembly for ease of adjustment, inspection and maintenance.

Cast aluminum gate arm supports are mounted on each end of the main shaft. They are adaptable for mounting of either wood or fiberglass gate arms.

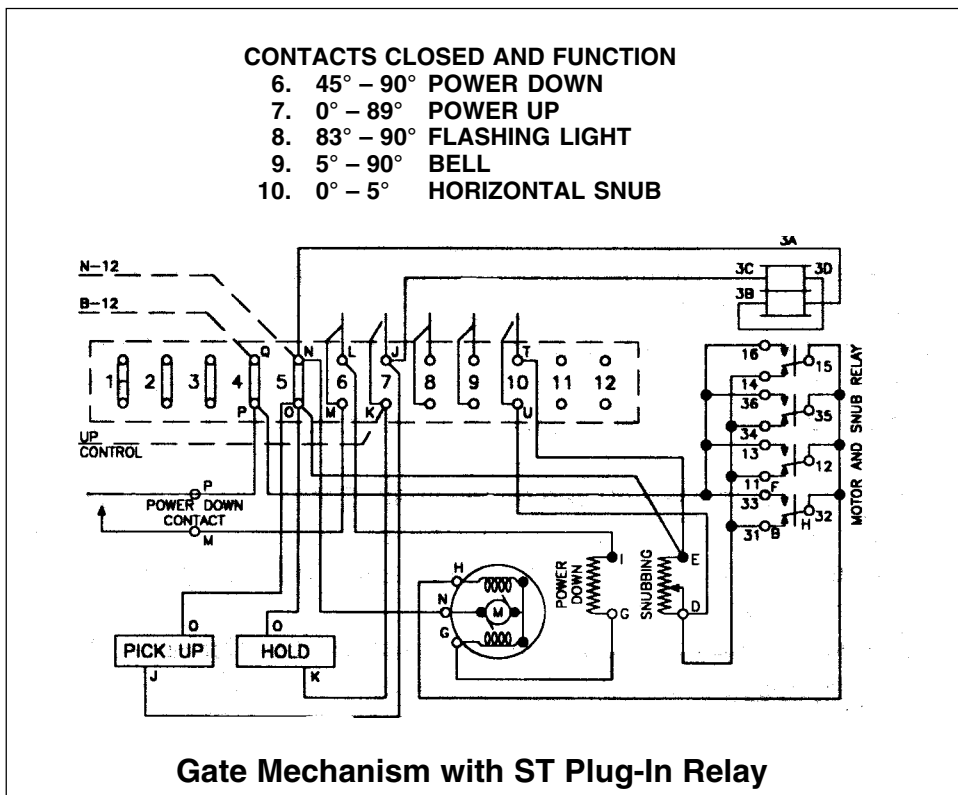
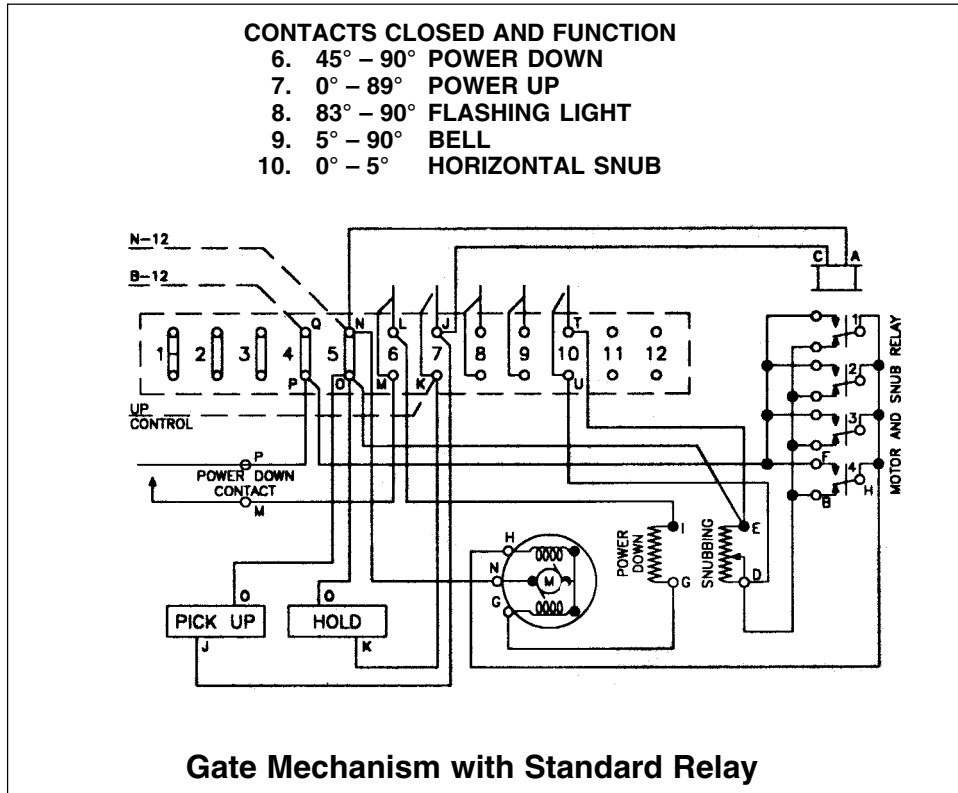
Gate mechanism may be ordered with factory installed auxiliary shaft for application of sidewalk arm where required.

The cast cabinet is designed to mount directly on a five-inch mast, however, adapters can also be furnished for mounting on four- or eight-inch masts.

Serial numbers are located on the motor identification tag and on the rear of the gate mechanism cabinet.

# Model S-20 Gate Wiring Diagram

(Shown with mechanism in vertical position)



# Recommended Battery and Wire Requirements

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

Wire sizes as follows are recommended:

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

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

Gate Arm Length in Feet	Number of Cells		
	Lead	Nickel Iron	Nickel Cadmium
Up to 24	6	9	9
25 to 42	7	11	11

## Defrosters

### Ordering Information

When planning installations in areas where frost accumulation on mechanism contacts might be expected, thought should be given to providing 2 wires in cable to permit operation of defroster.

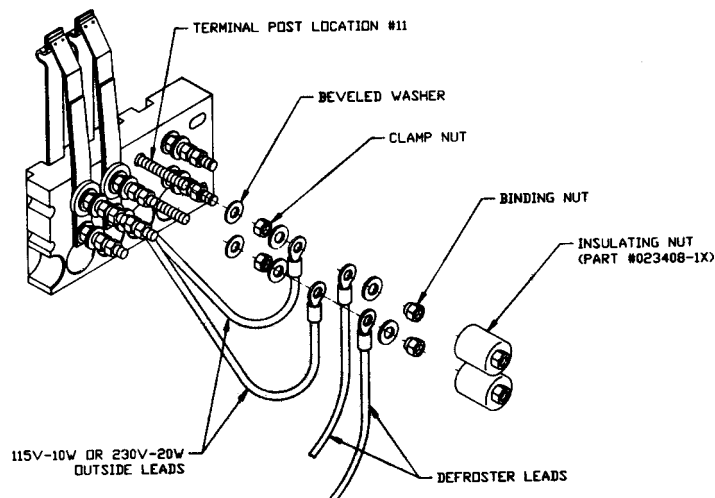
Defroster (115 VAC Operation) Part #070698-4X

Defroster (230 VAC Operation) Part #070698-5X

### Installation

Using contact terminal posts at position 11 on terminal board (see wiring diagram, page 2), connect the two terminal rings as shown in illustration below. Position the heating element directly under the commutator and brushes, located on the bottom side of the motor toward the operating end. Wrap the remaining wire around the outside circumference of the motor end. Attach the wire to the motor end cover with clips provided.

**WARNING:** Observe caution in handling 115/230 VAC primary connections. Make initial primary connections with power off.



# Foundations

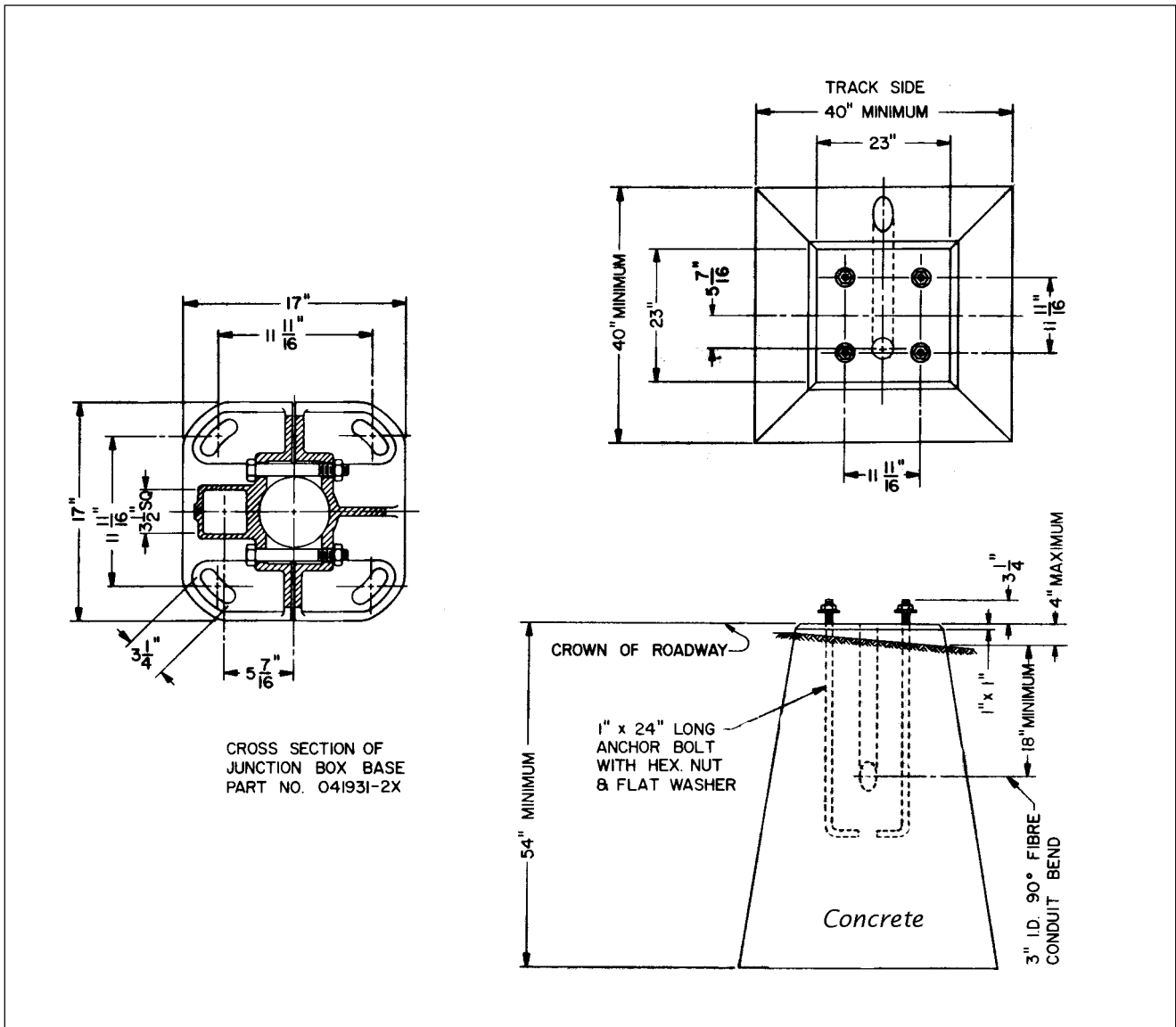
Prefabricated galvanized steel or poured concrete may be used for the foundation.

When using Safetran's galvanized steel foundation, part number 035903-911-1X, be sure bottom of excavation is flat and level to insure full support to the base plate. Backfill should be compacted, with height of exposure above ground as shown for concrete below.

Place foundation as dictated by local conditions, remembering that gate arm lengths are measured from center of foundation to end of arm.

For field poured concrete foundation, 4 anchor bolts, part number 131702-26X, are required.

The recommended size of concrete foundation is shown in drawing below.



# Installation

1. Erect five-inch mast, with junction box on base facing traffic. Mounting hole for normal front and/or back flashing lights will be on the field side of mast. Place a level on the mast and plumb to vertical using large shim washers or leveling nuts on the foundation bolts.
2. Thread flex conduit coupling into top of junction box base, and 90° coupling into back of gate cabinet.
3. Mount mechanism support clamp assembly 070786-5X on mast with castings facing 45° from field side toward track. Top of casting should be placed 52" above top of foundation. (See page 16, item 5).
4. Insert four (4) square head machine bolts, 3/4" x 7" long, in back of cabinet. (See page 18, item 14).
5. Set gate mechanism on top of support clamp assembly, fasten to mast with clamps, nuts and washers provided. (See page 18, items 13, 15, 16, and 44).
6. Install cast aluminum gate arm supports which have mounting hubs bolted in place. Locate on keyed main shaft loosely, **do not tighten nuts on main shaft securely until gate arm coupling has been bolted in place.**
7. Bolt bendable coupling (for wood gate arms) or conversion bracket (for Fiberglass or Fiberglass/Aluminum Gate Arms) in place securely.
8. Tighten nuts on ends of main shaft.
9. Install flex conduit from rear of gate housing to coupling on top of junction box base.
10. Mount flashing lights on main mast. The flashing light units have been factory wired into their junction box, control wires from the junction box to junction box base must be field installed. When crossing is placed in service align lamps to provide maximum indication for approaching vehicles.
11. Bell, when used, is mounted on top of mast with gong facing roadway. A spare contact is provided on the controller to cut-off bell when gate arm is down. (See wiring diagram, page 2).
12. Mount required signs with hardware furnished.
13. Swing gate mechanism parallel to roadway, mount gate arm with gate arm lamps installed and wired. For safety, the gate arm should be held in horizontal position while applying counterweights. Counterweights furnished in accordance with table listings on page 9 are based on fiberglass or wood arms as manufactured by Safetran. Weights for other gate arms may vary due to construction and/or materials used.
14. Adjust descending time to 10-15 seconds by adjustment of resistor ED. To cause gate arm to lower faster, increase resistance. (See wiring diagram, page 2).
15. Follow set-up adjustment card furnished with each gate mechanism. (Also printed on page 6).

<b>Recommended Clearing Time</b>	
<b>Gate Arm Length in feet</b>	<b>Clearing Time in seconds</b>
Up to 24	6
25 to 36	6 to 8
37 to 40	8 to 10

# Final Adjustments for Safetran Model "S-20" Gate

\_\_\_\_\_ Date placed in service                      Location \_\_\_\_\_

- |       |        |   |
|-------|--------|---|
| _____ | volts  | 1. Check voltage at terminal P & N, should be no less than 11 or more than 16 volts.  |
| _____ | chk    | 2. Check B-12 and N-12 for possible grounds.  |
| _____ | lbs    | 3. Set horizontal torque at 60 to 100 lbs., with no pressure on top buffer — top buffer controls horizontal position of gate arm.   |
| _____ | inches | 4. Set horizontal position of gate arm to desired height above roadway by adjusting top buffer.   |
| _____ | lbs    | 5. Block #6 power-down and #7 power-up contact - (plastic torque table card furnished should be used to block contacts), position gate arm at approximately 85° and set vertical torque according to the length of arm ____ ft. Check to see that the segment gear is not touching the bottom buffer during torque setting. |
| _____ | chk    | 6. Check #6 power-down contact which is adjusted to open at 45°.  |
| _____ | chk    | 7. Check #10 contact to insure that it is closed at 0 to 5°.  |
| _____ | volts  | 8. Operate gates and check voltage at motor terminals. Voltage should not drop below 11 volts during gate up cycle.   |
| _____ | chk    | 9. Disable power-down circuit by blocking #6 contact and check that gate arm descends by gravity to the horizontal position. The descend time should not be less than 8 or more than 15 seconds.  |
| _____ | amps   | 10. Check gate-up current per gate. Should be 6 to 15 amps. Longer arms require more current.   |
| _____ | amps   | 11. Check power-down current per gate. Should be 6 to 15 amps.  |
| _____ | time   | 12. Check descending time of gate arm, which is adjustable with snubbing resistor ED. Descend time to be from 10 to 15 seconds.   |
| _____ | chk    | 13. Adjust bottom buffer so there is 1/32" clearance between top segment gear and buffer with gate in vertical position.  |



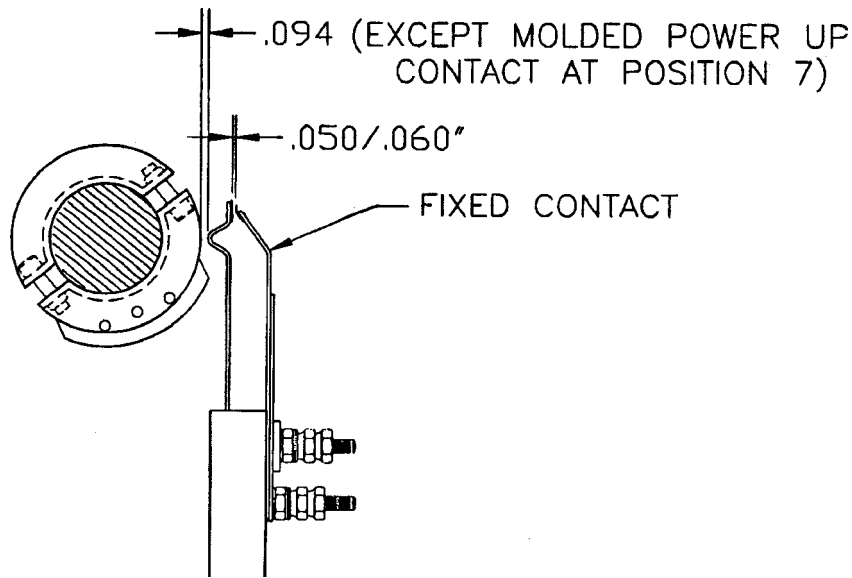
## Circuit Controller Adjustment

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.

Contact tools and gages are available, see page 25 for ordering information.

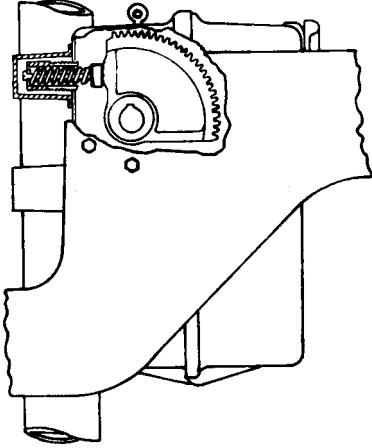
Contact cams are factory set for contact function as shown in the table below, or as specified by customer. Adjustment may be required at installation. Use the allen wrench provided to loosen the cam locking screw, then using the allen wrench as a lever, shift the cam position and retighten the screw.



Terminal 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

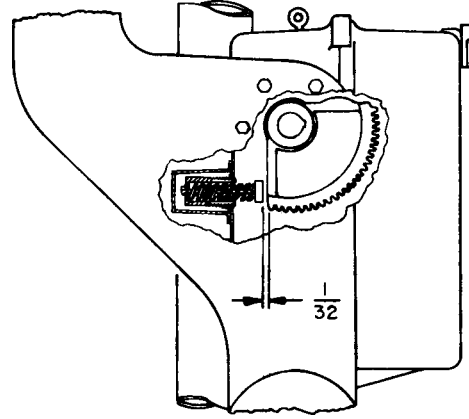
The Model S-20 gate mechanism is equipped with an adjustable spring buffer for horizontal and vertical gate arm positioning. They are factory adjusted; however, if field adjustment is necessary, follow instructions below.



**Horizontal Position**

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

To adjust horizontal position; remove cap from rear of housing, loosen lock nut, turn threaded sleeve to raise or lower arm as required. Re-tighten lock nut and replace cap.



**Vertical Position**

Factory adjustment provides 1/32" clearance between the buffer pad and segment gear, based on arm at full 90° position. If gate arm is to be positioned at less than 90°, the vertical buffer should be readjusted at time of installation.

To adjust, remove lower cover cap from the rear of the gate cabinet, loosen lock nut and adjust threaded sleeve until contact with the segment gear is obtained. Backing off sleeve approximately 1/3 turn will provide 1/32" clearance.

After adjusting, secure lock nut and replace cap.

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

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

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

1. Position roadway arm in the horizontal position.
2. One man to loosen set screws (item 4, page 24) and slide the driven gear from the train. Note the number two man may have to raise the arm slightly to relieve the gear tooth pressure from the driven gear.
3. The number two man should raise the auxiliary arm (item 14, page 24) to the horizontal or near horizontal position to allow the number one man 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 long counterweight supports on both sides of the mechanism.

**Horizontal torque.** Set horizontal torque to between 80 and 120 foot-pounds per instructions on page 10 for all arm lengths with standard applications. Use of a gate saver device may require a higher setting, see note on page 10.

**Vertical torque.** Set vertical torque to torque range listed in tables below and instructions on page 10 for all applications.

<b>Table 1 – Fiberglass and Fiberglass/Aluminum Gate Arm Counterweights and Vertical Torque</b>										
Counterweights mounted on one Support Arm	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
		12' – 16'	1	3	-26X	-30X	5'	30	35	175
	17' – 20'	2	5	-26X	-30X	5'	35	37	175	185
	21' – 24'	3	7	-26X	-30X	5'	35	38	175	190
	25' – 28'	4	10	-26X	-30X	5'	38	46	190	230
	29' – 30'	5	10	-26X	-30X	6'	39	44	235	260
	31' – 32'	5	10	-26X	-30X	7'	37	41	260	285
Counterweights mounted on two Support Arms	33' - 36'	6	13	-26X (2)	-30X(2)	7'	41	48	285	335
	37' - 40'	7	17	-26X (2)	-30X(2)	10'	34	38	340	380

<b>Table 2 – Wood Gate Arm Counterweights and Vertical Torque</b>										
<b>Note: Wood arms 31 feet and longer are shipped with a truss assembly</b>										
Counterweights mounted on one Support Arm	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
		13' – 18'	2	5	-26X	-30X	5'	35	37	175
	19' – 24'	4	9	-26X	-30X	5'	35	38	175	190
Counterweights mounted on two Support Arms	25' – 28'	7	15	-26X(2)	-30X(2)	5'	38	46	190	230
	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" 63 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. 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

**Note:** A torque adapter is required if using the Torque Wrench Kit on pre 1977 Model S gates. Torque Adapter, 070554-2X, must be ordered separately.

## 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 bearing and gear wear will result and increased gear maintenance will be required. Clean gears and reapply grease when signs of gear wear are 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.

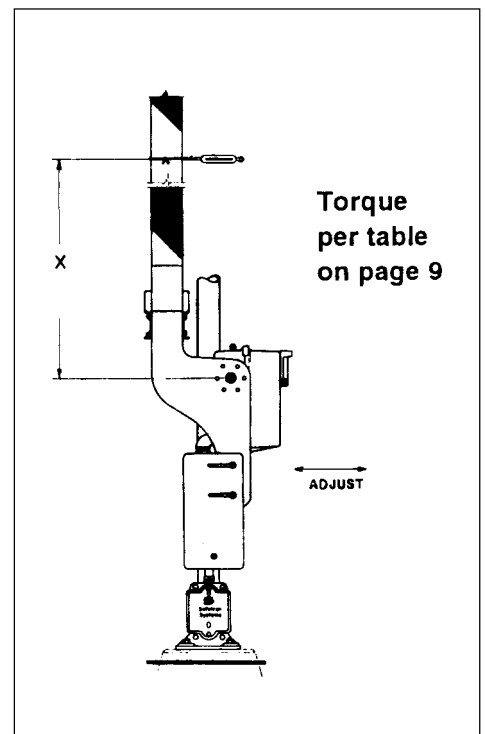
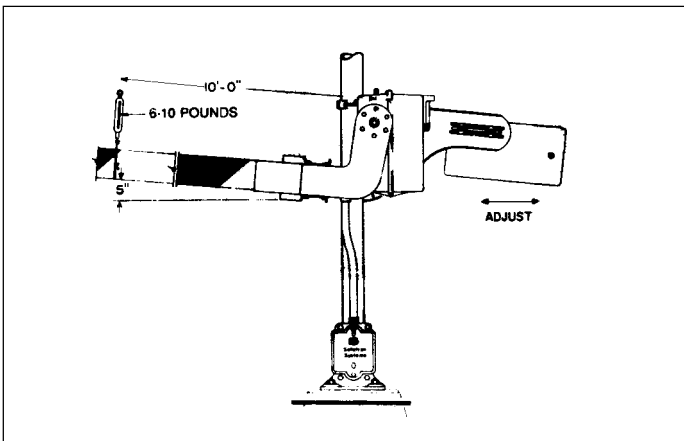
The gate mechanism hand crank feature may be used either to crank the gate arm up, or in the case where the arm has been sheared off, to crank the counterweights to the horizontal position. The tools required are a ratchet wrench with 3/8 inch square drive, a 1/2 inch socket for 3/8 inch drive, and a 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

With counterweights properly mounted on Gate Arm Support(s), adjust counterweights for proper horizontal torque as shown below. Horizontal torque should be at least 60 foot-pounds and not more than 100 foot-pounds.



### Vertical Torque

Allow gate to clear and latch. Attach spring scale as shown at right. Open power down and power up circuits by disconnecting battery to mechanism or by blocking controller contacts, allowing gate to fall (about 5°) against scale. Adjust counterweights for proper vertical torque. Torque values will vary with length of arm. Use tables 1 or 2 on page 9 to determine proper torque value and measuring point on gate arm. Adjust counterweights for proper scale reading.

**Note:** Voltage on gate motor during up cycle should not be less than 11.0 volts nor more than 16.0 volts measured at motor terminals. If voltage exceeds 16.0 volts, it is possible gate will over drive and not latch at the clear position.

# General Maintenance

Model S-20 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.

## Motor

The armature shaft is equipped with ball bearings packed at the factory with a special all weather grease. The bearings are sealed and lubrication of the motor is not required. The brush pressure should be between 10 to 16 ounces. Excessive pressure may result in brushes wearing too rapidly, while lack of pressure will result in arcing of the brushes, together with loss of power and excessive carbon deposits on the motor commutator. Lack of sufficient brush pressure may also result in failure of the gate to raise if weather conditions have caused frost to accumulate on the commutator surface. 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. 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 gate 2-3 times to clear brushes and wipe commutator with a lint free cloth. Brushes worn to less than 3/4" length should be replaced.

When gate arm is broken or fouled, motor commutator must be cleaned as described in preceding paragraph.

## Motor and Snub Relay – Standard

The motor and snub relay has four front and back contacts, connected in parallel. Removable plastic cover allows for contact inspection. During clearing of the gate the relay is energized with front contacts closed to complete the motor up circuit. Relay is de-energized when contact number two at terminal board position #7 on the controller opens. With back contacts closed, it controls the snubbing on descent of the gate.

Field adjustments of this relay are not recommended. Relays failing to pick-up at nine volts should be replaced. The replacement number for the new relay is 070941-X.

## Motor and Snub Relay – Type ST

A plugboard type relay with clear cover for contact inspection. Field adjustments of this relay are not recommended. Relays failing to pick-up at nine volts can be returned to Safetran for repair and recalibration or replacement. Relay part number is 400020.

# Model S-20 Hold Clear Assembly

## 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 by an overrunning clutch with an outer ratchet tooth ring, which is latched by an electro-magnetically operated lever and pawl.

## Installation

The Hold Clear is factory installed and adjusted on all new S-20 Gate Mechanisms.

To reinstall or to install this S-20 Hold Clear into an older Model S Mechanism, follow the installation and adjustment steps on pages 14 and 15.

## Maintenance

Periodically inspect to the maintenance check points listed. Readjust and/or replace any worn parts and apply Loctite when specified per note. No lubrication is required. When gate arm is broken or fouled, maintenance check points must be followed.

### Maintenance Check Points

- a. Ratchet Wheel
  - Spins freely on hub clockwise.
  - Locks to hub counter clockwise.
  - Aligned with pawl. Set screws are tight.
- b. Pawl
  - Latched and clear clearances per installation steps 5 & 8 on page 14.
  - Wear of pawl latching edge. Pawl can be removed and turned 180° to obtain a new sharp edge. Apply Loctite per note.
- c. Armature
  - Free movement on pivot pin. Pivot free of dirt. If pivot is fouled with grit, remove and clean the pin, clean the holes and replace using a new cotter pin.
  - Actuator intact.
  - Condition of stop pins.
  - Spring length in de-energized position.
  - Armature parallel to pole faces and clearance per installation step 3 on page 14.
  - Drop away voltage (see installation step 13 on page 14).
- d. Power Down Contact
  - Condition of contacts
  - Clearance to actuator (de-energized) and contact clearance (energized) per installation step 9 on page 14.
  - Check contact for arcing marks. Clean if necessary.

**NOTE: Adjustment or reassembly of pawl, actuator or adjustment screws (A, B, & C) requires application of Loctite Removable Threadlocker 242 or equal into joint threads before tightening.**

# Hold Clear Installation and Adjustment

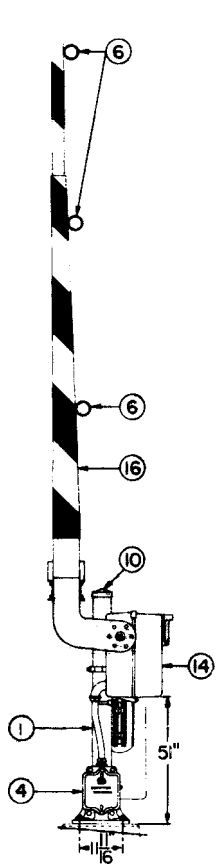
1. Install Ratchet Wheel Assembly (with key and set screws) to the motor shaft. Long end of hub out. **Do Not** tighten set screws.
- \*2. Preset the two armature stud springs to 17/32" exposed length by turning the castle nuts. Insert cotter pins and bend ends around stud.
- \*3. Preset the armature stop pin faces parallel to the magnet pole faces using **Adjustment Screw A** while holding the armature bracket up (energized position). Gap should be between .050" and .075". Apply Loctite per note and tighten adjustment screw lock nut.
4. Install the Hold Clear Assembly to the motor with the two shoulder type mounting bolts and flat washers. **Do not** fully tighten bolts.
5. Holding the armature bracket up (energized position-against stop from Adjustment Screw A), set the clearance between the pawl and root space of the ratchet wheel using **Adjustment Screw B**. Clearance should be .015 Max. (Back off **Screw B** 1/2 turn from touching).
6. **Tighten** the two mounting bolts and check clearance from step 5. Repeat step 5 if needed. Apply Loctite per note and tighten the adjustment screw locknut.
7. Center the ratchet wheel to the pawl and **tighten** the two ratchet wheel hub set screws.
- \*8. Check clearance between pawl and ratchet with armature in released position. Min. of .050.
- \*9. Power Down Contact. Set the upper contact spring to 1/64 (.015) max. clearance over the actuator with armature bracket released (de-energized position-against stop). With the armature bracket up (energized position-against screw A stop), set the lower contact spring to .050 contact opening.
10. Check installation per the maintenance check points on page 13.
11. Install contact guard cover.
12. Connect wires per Gate Wiring Diagram page 2.
13. Voltage Check. The Hold Clear Armature as factory adjusted will release with full load (gate vertical) at approximately 4.5 volts on the hold coils. Allowable tolerance is 2.5 volts minimum. The release can be adjusted by means of the armature stud springs. Shorten springs to increase the release voltage. Maximum pick up is 7.0 volts on the pick-up coils.
- \* Steps 2, 3, 8 & 9 are factory preset on complete Hold Clear Assemblies but should be checked after installation.

**NOTE: Adjustment or reassembly of pawl, actuator or adjustment screws (A, B, & C) requires application of Loctite Removable Threadlocker 242 or equal into joint threads before tightening.**

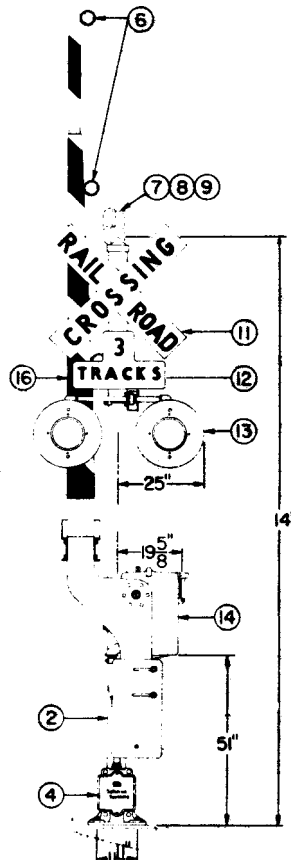




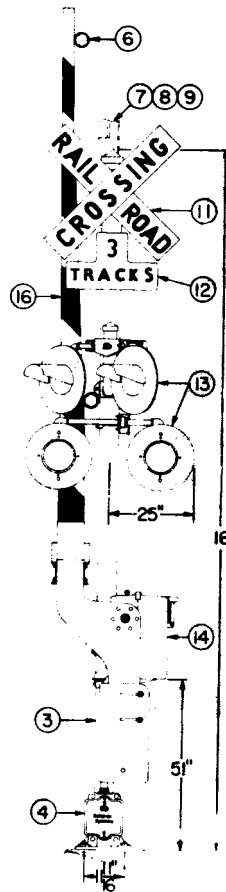
# Model S-20 Gate Types 50, 51, and 52 Replacement Parts



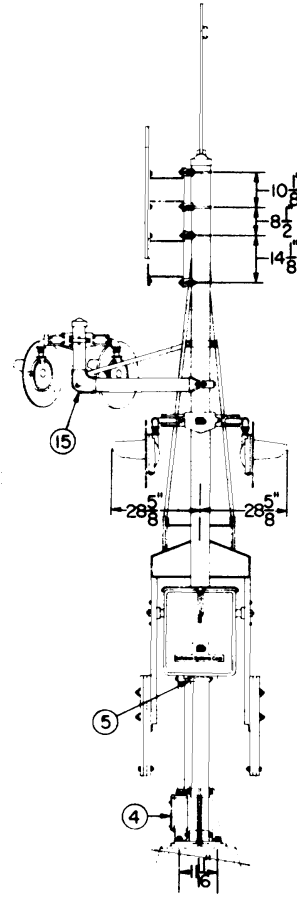
**Type 50**  
S-20 Gate mounted  
on stub mast



**Type 51**  
S-20 Gate with front  
and/or back flashing  
lights



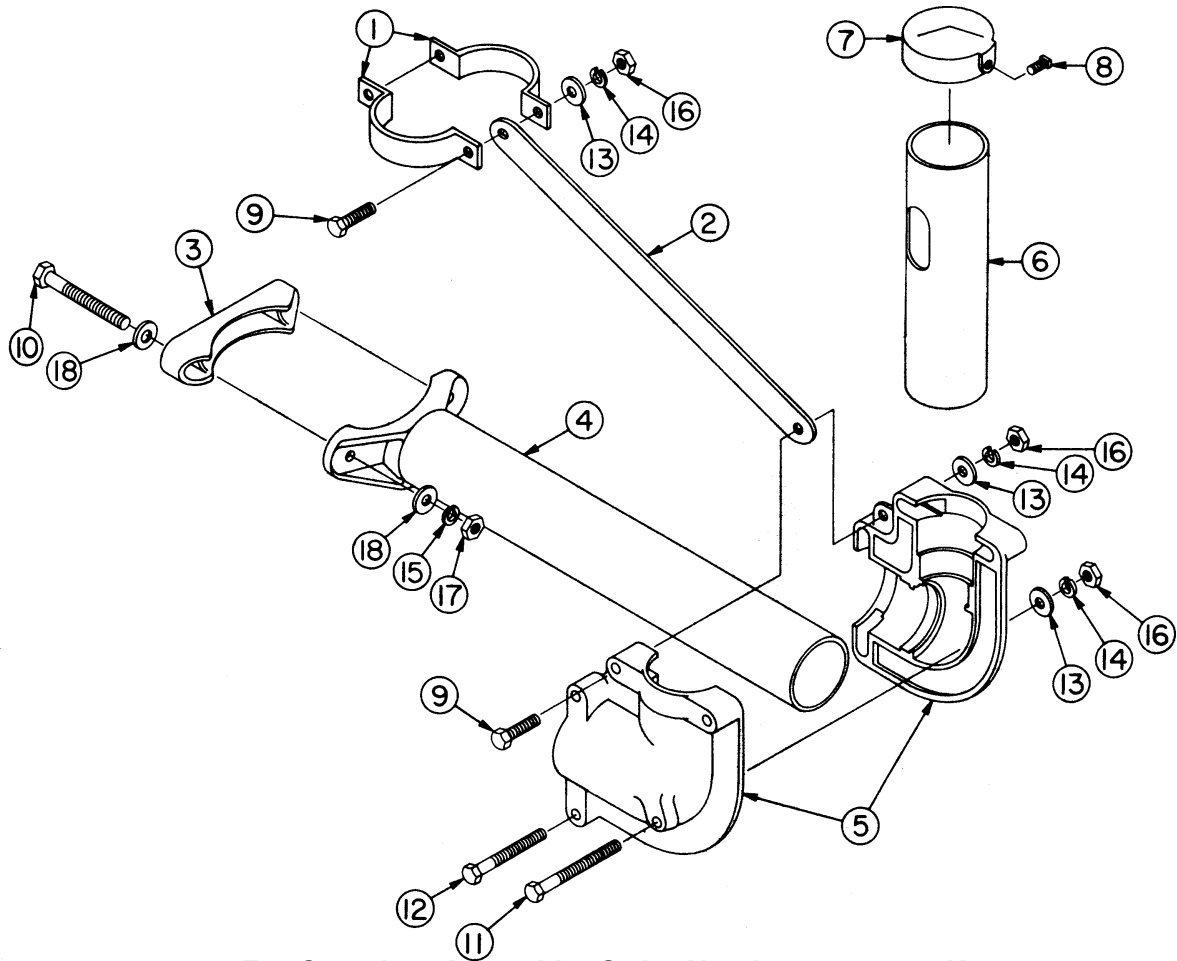
**Type 52**  
S-20 Gate with front and/or back flashing  
lights and cantilever mounted sidelights



To Order: Specify Description and Part Number

Item Number	Description	Part Number
1	Mast, 5" Stub	070519-3A
2	Mast, 5" Standard	070519-27A
3	Mast, 5", for Front, Back, and 45° Left Lights	070519-43A
4	Base, Junction Box, 11-11/16" Bolt Spacing for 5" Pipe	041931-2X
5	Clamp, Mechanism Support	070786-5X
6	Lamp, Gate Arm	075970-AX
7	Bell, 8-12 VDC Operation, for 5" Mounting	040200-4X
8	Bell, 120 VAC Operation, for 5" Mounting	040200-8X
9	Bell, 12-16 VAC/10-12 VDC Operation, for 5" Mounting	040200-10X
10	Pinnacle, 5"	035045-503X
11	Sign, Railroad Crossing, for 5" Mounting	035200-17X
12	Sign, Track, for 5" Mounting, (specify # of tracks)	035236-(#)X
13	Lamp, Flashing — See flashing lamp section of catalog	Specified
14	Mechanism, S-20 Gate	073000-X
15	Cantilever, Sidelight (required for left hand sidelights)	041442-26X
16	Arm, Gate — See gate arm section of catalog	Specified

# Sidelight Cantilever Assembly and Replacement Parts

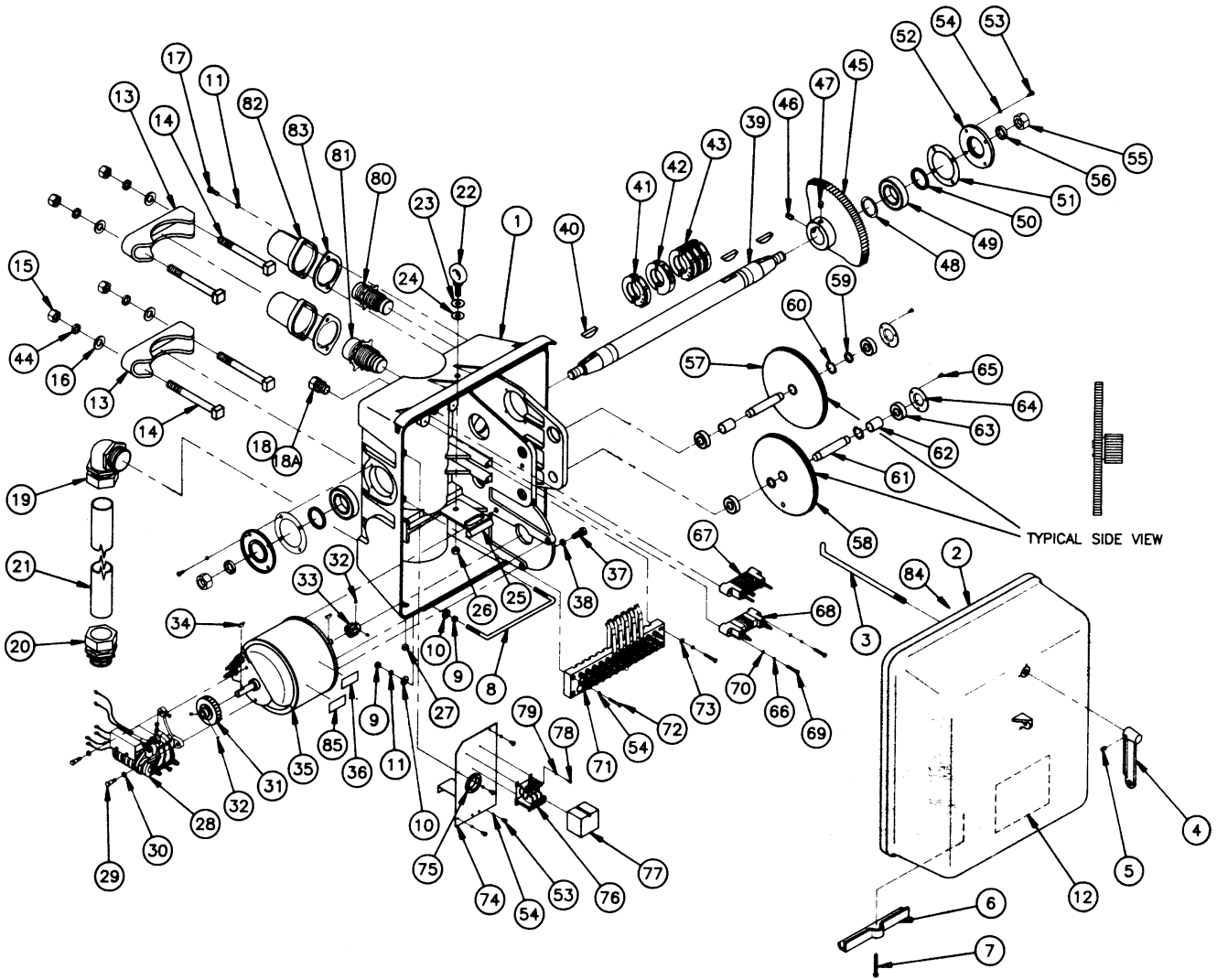


**For Complete Assembly, Order Number 041442-26X**

To Order: Specify Description and Part Number

Item Number	Description	Quantity Required	Part Number
1	Clamp, Pipe, 5"	2	035015-A
2	Bar, Support	1	041442-30
3	Casting, Aluminum Clamp	1	070950
4	Pipe, Lower	1	041442-25X
5	Casting, Aluminum Elbow	2	041442-515
6	Pipe, Upper	1	041442-29
7	Pinnacle, 4" – 5"	1	035045-502
8	Set Screw, Square Head, 3/8" – 16 x 1"	1	4932-SC
9	Cap Screw, Hex Head, 1/2" – 13 x 2"	3	4170-HSC
10	Cap Screw, Hex Head, 3/4" – 10 x 6"	2	4286-HSC
11	Cap Screw, Hex Head, 1/2" – 13 x 6"	1	4182-HSC
12	Cap Screw, Hex Head, 1/2" – 13 x 5"	4	4180-HSC
13	Washer, Wrought, 1/2"	8	1755-C
14	Washer, Spring Lock, M, 1/2"	8	1812-MSC
15	Washer, Spring Lock, M, 3/4"	8	1815-MSC
16	Nut, Hex, 1/2" – 13	8	2108-SC
17	Nut, Hex, 3/4" – 10	2	2114-SC
18	Washer, Flat, 3/4"	4	1737-SC

# S-20 Gate Complete Assembly

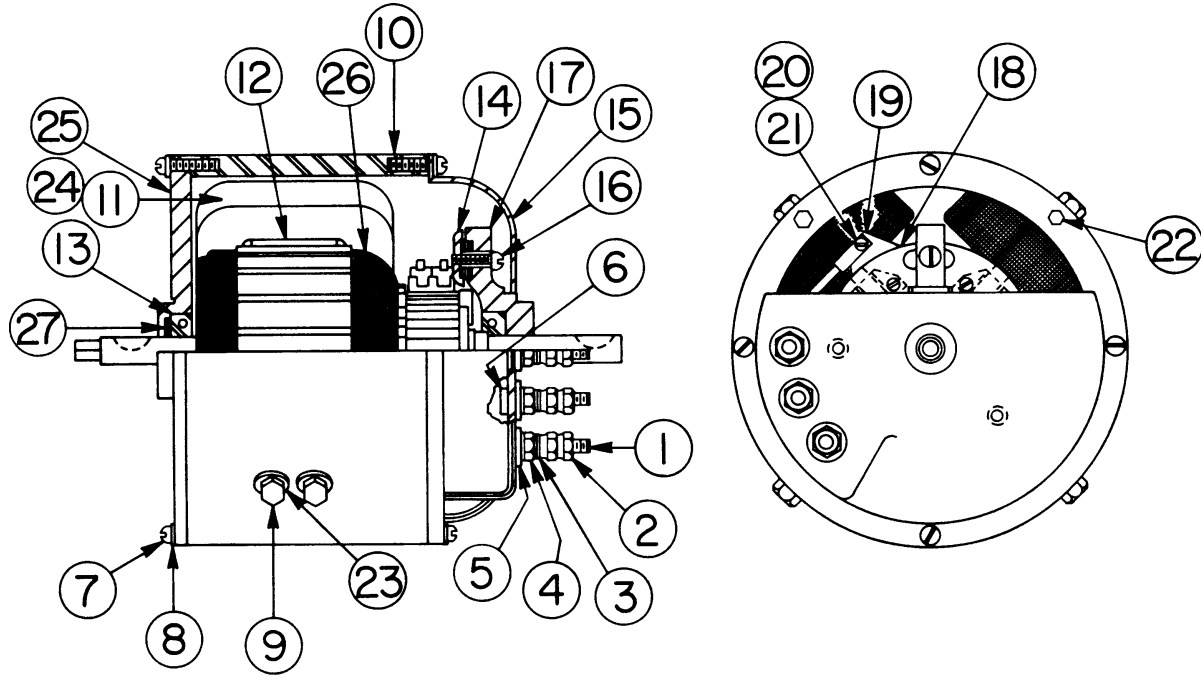


# S-20 Gate Replacement Parts

To Order: Specify Description and Part Number

Item No	Description	Qty Req'd	Part No.	Item No	Description	Qty Req'd	Part No.
1	Cabinet, Gate	1	073001-1	44	Washer Lock 3/4"	4	1815-MSC
2	Cover, Gate	1	073002-X	45	Gear Segment	1	073003
3	Latch Rod	1	070919-2	46	Set Screw, Socket	1	4708-SC
4	Handle, Latch	1	070909-4		1/2" – 13 x 3/4"		
5	Screw Set Socket Head 3/8" – 16 x 1/2"	1	7860-SC	47	Set Screw, Socket 1/2" – 13 x 1/2" (Over Key)	1	4706-SC
6	Hinge Retainer	1	070968-4	48	Retaining Ring	1	070584
7	Screw, Hex 5/16" – 18 x 2-1/2"	1	2692-HSC	49	Bearing	2	075284
8	Hinge Bolt	1	070968-2	50	O-Ring 2"	2	070585
9	Nut, Hex 3/8" – 16	4	2104-SC	51	Gasket, Seal Plate	2	070747-3
10	Washer, Flat 3/8" x 1 O.D.	2	1753-C	52	Seal Plate, Bearing	2	073008
11	Washer, Lock 3/8"	6	1810-MSC	53	Machine Screw Phil Pan	12	2659-PSCX
12	Decal, Wiring	1	073000		Head 1/4" – 20 x 5/8"		
13	Casting, Aluminum Saddle	2	070950	54	Washer, Lock 1/4"	16	1808-MSC
14	Machine Bolt, Square 3/4" – 10 x 7.00"	4	8085-SC	55	Nut, Hex 1-1/4"	2	2119-SC
				56	Washer, Lock 1"	2	1817-MSC
15	Nut, Hex 3/4" – 10	4	2114-SC	57	Gear & Pinion Upper	1	073004
16	Washer, Flat 3/4"	4	1737-SC	58	Gear & Pinion Lower	1	073005
17	Screw, Hex Cap 3/8" – 16 x 1-1/4"	4	4089-HSC	59	Spacer 1/4"	2	073009-3
				60	Washer, Spring	2	070695-500
18	3/4" Connector 3/8" – 1/2" wire	1	7304-2	61	Shaft, Gear	2	073007-1
18A	3/4" Connector 5/8" – 3/4" wire	1	7354	62	Spacer 1-1/2"	2	073009-2
19	Connector, Elbow	1	070232	63	Ball Bearing	4	070588
20	Connector, Straight	1	070233	64	Cover, Bearing	2	073007-2
21	Conduit, Flexible	1	070692	65	Machine Screw Phil Truss	6	2614-TEX
22	Eye Bolt 1/2" – 13 x 1.50"	1	7099		Head #10 – 32 x 3/8"		
23	Washer, Flat 1/2"	1	1755-C	66	Washer, Lock #10	4	1806-MSC
24	Washer, Neoprene	1	070980-4	67	Resistor Adjustable 1.3 Ohm	1	029602-4BX
25	Latch Plate	1	070919-3X	68	Resistor Fixed .4 Ohm	1	029604-11X
26	Nut, Flexlock 1/2" – 13	1	2327-FLSC	69	Machine Screw Phil Pan	4	2624-PSCX
27	Vent Bushing	2	041913-X		Head #10 – 32 x 1.50"		
28	Hold Clear Assembly	1	073100-X	70	Washer, Flat #10	4	1712-SC
29	Mounting Bolt	2	075084	71	Terminal Board Assembly	1	073010-X
30	Washer, Flat 5/16"	2	1752-C	72	Machine Screw Phil Pan	4	2665-PEX
31	Ratchet Wheel Assembly	1	073111-X		Head 1/4" – 20 x 1-1/2"		
32	Set Screw, Socket 1/4" – 28 x 1/4"	4	4615-SC	73	Washer, Flat 1/4" x 5/8" O.D.	2	1717-SC
				74	Panel, Relay	1	073016
33	Pinion	1	070554-A	75	Grommet 2-1/8" O.D. x 1-1/2" I.D.	1	020616-23A
34	Woodruff Key #10	2	7101	76	Relay	1	070941-X
35	Motor Assembly 12 VDC	1	070640-3DX	77	Cover, Relay	1	070941-1
36	Tag, Warning (hand cranking)	1	070980-2	78	Machine Screw Phil Pan	3	2572-PSCX
37	Cap Screw, Hex 1/2" – 13 x 1-1/4"	3	4167-HSC		Head #8 – 32 x 3/8"		
38	Washer, Lock 1/2"	3	1812-MSC	79	Washer, Lock #8	3	1805-MSC
39	Shaft, Main	1	073006	80	Buffer Assembly Upper	1	070903-X
40	Woodruff Key #UX	3	7149	81	Buffer Assembly Lower	1	070903-2X
41	Cam, Contact Assembly	1	070633-502X	82	Cap, Buffer	2	070902-1
42	Contact, Snap Switch Assembly	1	073014-1X	83	Gasket, Buffer Cap	2	070926-1
43	Cam, Contact Assembly	3	070633-AX	84	Gasket, Cover	1	070559-A
				85	Label, Caution (hold clear)	1	070980-8

# Motor Assembly and Replacement Parts

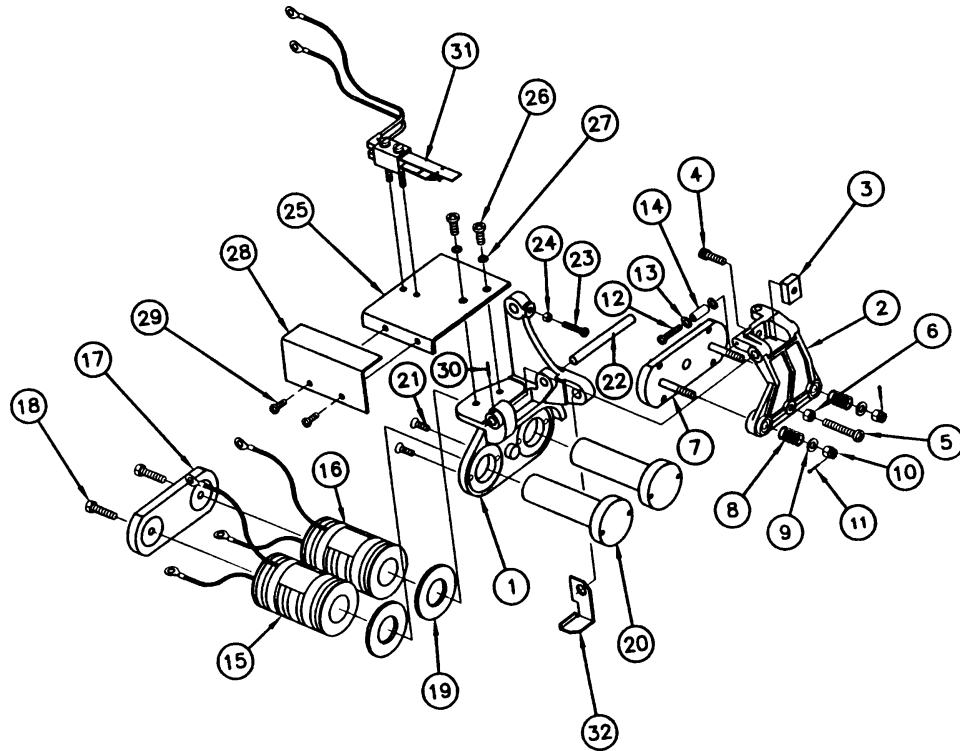


**For Complete Assembly, Order Number 070640-3DX.**

To Order: Specify Description and Part Number

Item No	Description	Qty Req'd	Part Number	Item No	Description	Qty Req'd	Part Number
1	Post, Binding	3	023833	15	Cover, End Motor	1	075119
2	Nut, Binding	6	023831	16	Machine Screw, Fillister Head, 1/4" – 20 x .1"	8	2662-LSN
3	Washer, Beveled	15	023834	17	End, Motor (Rear)	1	075118-2
4	Nut, Clamp	3	023832	18	Bracket, Assembly	1	075111-X
5	Insulator, Lower	6	075123-1	19	Brush, Motor Assembly	4	075116-
6	Insulator, Upper	3	075124-1	20	Machine Screw, Round Head, #6 – 32 x .500"	6	2559-RBN
7	Machine Screw, Fillister Head, 1/4" – 20 x 3/4"	8	2660-LBN	21	Washer, Cut, #6S	2	1704-B
8	Washer, Kant Link Lock, 1/4"	1	1808-QSC	22	Machine Screw, Hex Head, #10 – 24 x .25"	2	2589-HSC
9	Cap Screw, Hex Head, 3/8" – 16 x 1"	8	4088-HSC	23	Washer, Shakeproof Lock, 1, 3/8"	8	1860-ISC
10	Housing, Motor	1	075120	24	Tape, Insulator	8	075133-1
11	Coil, Field Assembly	1	075107-X	25	End, Motor	1	070689-7
12	Pole, Field Assembly	1	075108-500X	26	Armature, Assembly	1	070682-BX
13	Bearing, Ball	2	075142	27	Spacer	1	070695-500
14	Clamp, Bracket	1	075117				

# Hold Clear Assembly and Replacement Parts



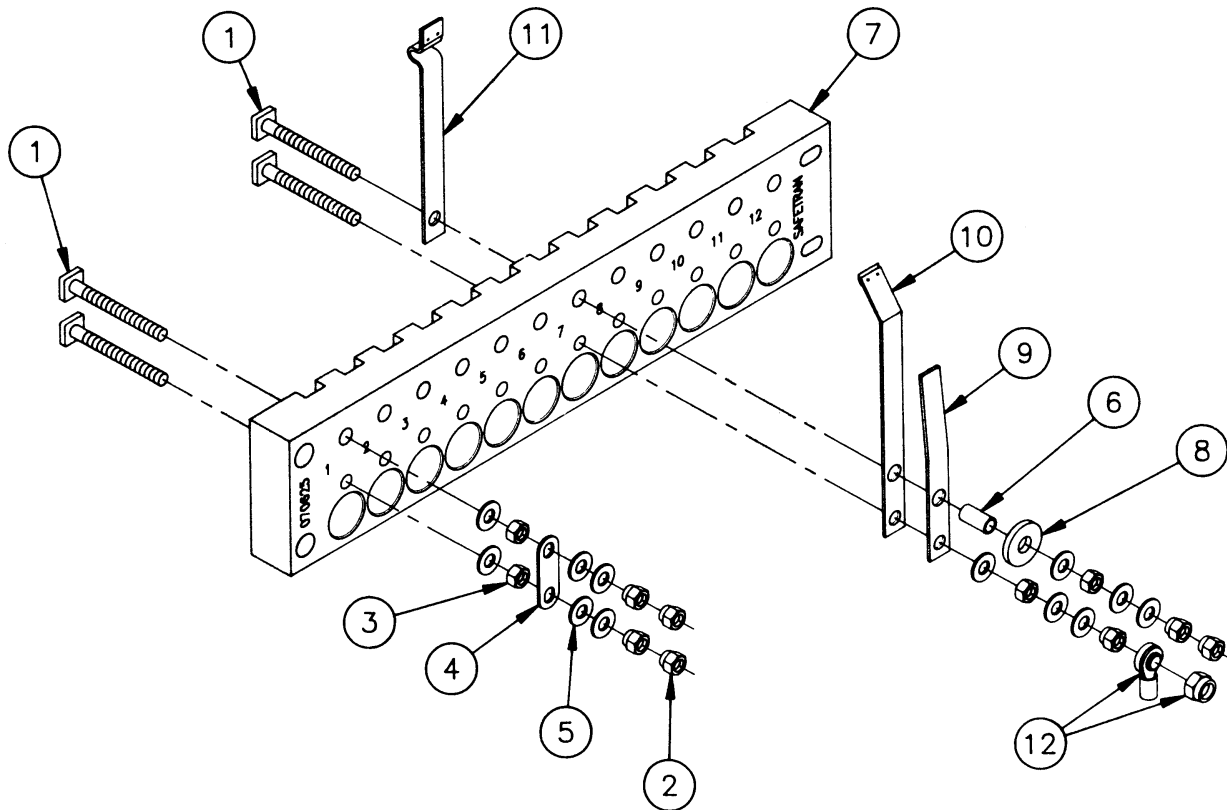
To Order: Specify Description and Part Number

Item No.	Description	Qty Req'd	Part Number	Item No.	Description	Qty Req'd	Part Number
1	Hold Clear Frame	1	073100-1	18	Cap Screw, Hex Head, 1/4" - 20 x 3/4"	2	4002-HE
2	Armature Bracket	1	073102	19	Cushion Spacer	2	073100-2
3	Pawl, Hold Clear	1	073102-2	20	Core	2	073103-1
4	Cap Screw, Socket Head, 1/4" - 28 x 3/4"	1	4023-SSJ	21	Cap Screw, Flat Socket Head 10-32 x 5/8"	4	7747-YE
5	Machine Screw, Phil Pan Head, 1/4" - 20 x 1-1/2"	1	2665-PEX	22	Pivot Pin	1	073100-3
6	Nut 1/4" - 20" Hex	1	2100-E	23	Machine Screw, Phil Pan Head, 10-32 x 3/4"	1	2619-PEX
7	Armature, Assembly	1	073105-X	24	Nut Hex, 10 - 32	1	2015-E
8	Spring, Compression	2	070651	25	Contact Shelf	1	073106
9	Washer, Shoulder	2	1978-F	26	Machine Screw, Phil Pan Head, 1/4 - 20 x 5/8"	2	2659-PSCX
10	Nut Hex Castle, 1/4" - 28	2	2494-SN	27	Lock Washer, 1/4"	2	1808-ME
11	Cotter Pin, 1/16" x 1/2"	2	1000-SC	28	Contact Guard	1	073107
12	Machine Screw, Phil Pan Head, 10-32" x 1-1/4"	1	2623-PSCX	29	Machine Screw, Phil Pan Head, 10 - 32 x 1/2"	2	2616-PSCX
13	Washer, Nylon	2	1712-1	30	Roll Pin	1	1537-E
14	Actuator, Hold Clear	1	073102-3	31	Power Down Cont. Assy.	1	070777-2AYX
15	Coil Assy, Pick Up	1	073108-1X	32	Stop	1	074025-2
16	Coil Assy, Hold	1	073108-X	33	Loctite, Smal Tube	1	104798
17	Yoke	1	073104-1				

For Complete Assembly, Order Number 073100-X.

For Complete Assembly with Ratchet Wheel and Mounting Hardware, Order Number 073100-1X.

# Terminal Board Assembly and Replacement Parts

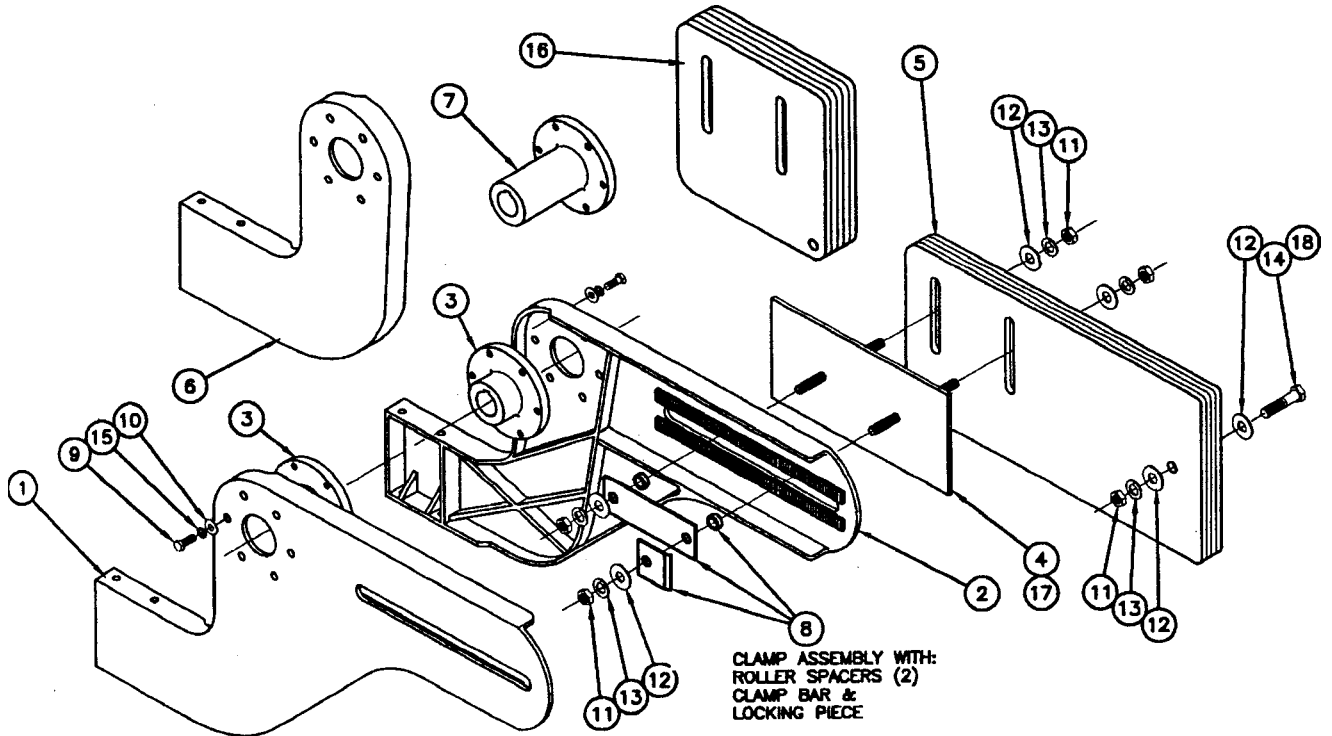


To Order: Specify Description and Part Number

Item Number	Description	Qty Req'd	Part Number
1	Terminal Post	24	010427-6
2	Nut, Binding	47	023831
3	Nut, Clamp	24	023832
4	Connector	5	023839-2
5	Washer, Beveled	72	023834
6	Bushing, Insulating	5	041414
7	Terminal Board	1	070625
8	Washer, Insulating	5	070627
9	Spring, Reinforcing	5	073012-2
10	Contact, Fixed	5	073012-X
11	Contact, Movable	5	073011-X
12	Eyelet, Test Assembly	1	024628-1X



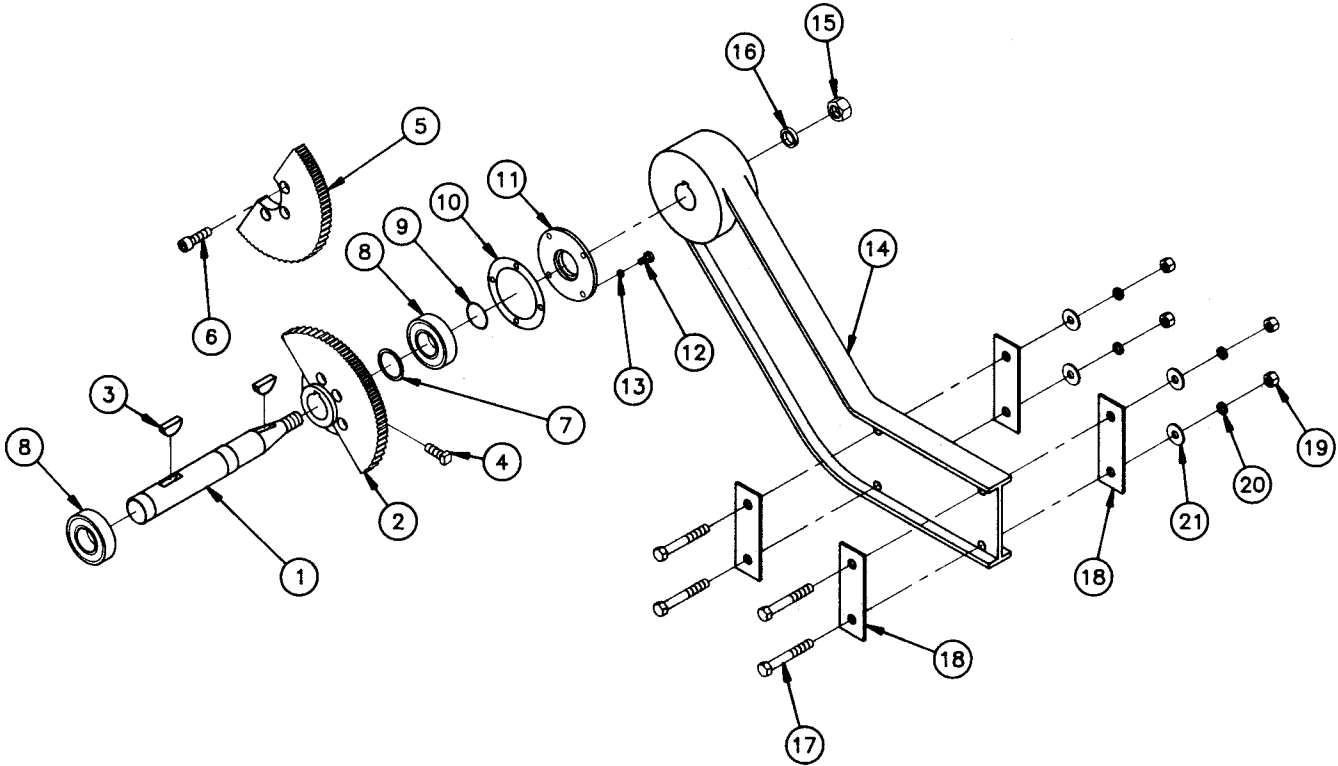
# Gate Arm Supports/Counterweights Replacement Parts



To Order: Specify Description and Part Number

Item No	Description	Part Number
1	Support, Left Hand Support, Left Hand with Hub and Mounting Bolts	070920-L 070920-LX
2	Support, Right Hand Support, Right Hand with Hub and Mounting Bolts	070920-R 070920-RX
3	Hub, Gate Arm Support	070923-3
4	Plate, Stud for wood arms 13' – 36' and all fiberglass arms (standard) w/hardware Plate, Stud for wood arms 37' – 42' (standard) w/hardware	070757-26X 070757-24X
5	Counterweight, Galvanized Steel, 1/2" x 15" x 30", 63 lbs (standard)	070755-4G
6	Support, Left Hand for use without counterweights Support, LH w/o counterweights with Hub and Mounting Bolts	070921-L 070921-LX
6A	Support, Right Hand (not shown) w/o counterweights Support, RH w/o counterweights with Hub and Mounting Bolts	070921-R 070921-RX
7	Hub, Extended (for sidewalk arms)	070575-1X
8	Clamp Assembly for Stud Plate	070925-X
9	Cap Screw, Hex Head, 1/2" – 13 x 1.25"	4167-HSC
10	Washer, Wrought, 1/2"	1755-C
11	Nut, Hex, 3/4" – 10	2114-SC
12	Washer, Wrought, 3/4"	1737-SC
13	Washer, Spring Lock, M, 3/4"	1815-MS
14	Cap Screw, Hex Head, 3/4" – 10 x 2" for 1 – 2 standard counterweights Cap Screw, Hex Head, 3/4" – 10 x 3" for 3 – 4 standard counterweights Cap Screw, Hex Head, 3/4" – 10 x 4" for 5 – 6 standard counterweights Machine Bolt, Hex Head, 3/4" – 10 x 6.5" for 7 – 10 standard counterweights	4274-HSC 4278-HSC 4282-HSC 3177-SC
15	Washer, Spring Lock, M, 1/2"	1812-MS
16	Counterweight, Galvanized Steel, 5/8" x 15" x 15", 38 lbs (short)	070755-34G
17	Plate, Stud for wood arms to 36' and all fiberglass arms (short) w/hardware Plate, Stud for wood arms 37' – 46' (short) w/hardware	070757-30X 070757-31X
18	Cap Screw, Hex Head, 3/4" – 10 x 2.5" for 1 – 3 short counterweights Cap Screw, Hex Head, 3/4" – 10 x 5" for 4 – 6 short counterweights Machine Bolt, Hex Head, 3/4" – 10 x 8" for 7 – 11 short counterweights Machine Bolt, Hex Head, 3/4" – 10 x 14" for 12 – 21 short counterweights	4276-HSC 4284-HSC 3180-SC 3190-SC

# Auxiliary Shaft and Support for Sidewalk Arms Replacement Parts



To Order: Specify Description and Part Number

Item No	Description	Qty Req'd	Part Number	Item No	Description	Qty Req'd	Part Number
1	Shaft, Sidewalk Arm	1	073020	11	Seal Plate	1	073024
2	Gear Assembly, Sidewalk Arm	1	070569-AX	12	Machine Screw, Phil Pan Head 1/4" – 20 x 5/8"	4	2659-PSCX
3	Woodruff Key #D	2	7102	13	Washer, Lock 1/4"	4	1808-MSC
4	Set Screw, Square Head 3/8" – 16 x 1.25"	2	4933-SC	14	Support, Sidewalk Arm	1	070759-1X
5	Gear, Bottom	1	070569-1A	15	Nut, Hex 5/8" – 18	1	2113-SC
6	Cap Screw, Socket Head 3/8" – 16 x 1.25" Locking	3	4089-2	16	Washer, Lock 5/8"	1	1814-MSC
7	Retaining Ring	1	073021	17	Cap Screw, Hex Head 3/8" – 16 x 2.75"	4	4095-HSC
8	Bearing	2	073022	18	Plate, Washer	4	070763-1
9	O-Ring 1-3/16" I.D.	1	073023	19	Nut, Hex 3/8" – 16"	4	2104-SC
10	Gasket, Seal Plate	1	073025	20	Washer, Lock	4	1810-MSC
				21	Washer, Flat 3/8"	4	1753-C

# Maintenance Tools

Torque Wrench Kit.....	070981-X
Torque Adapter - Required if using wrench	
Kit on pre 1977 Model S Gates.....	070554-2X
Maintenance Kit (Includes the following items which can be ordered separately).....	073112-3X
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 Spring.....	073000-16

# SIEMENS

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