



## **INSTALLATION & MAINTENANCE**

# **S-60 HIGHWAY GRADE CROSSING GATE**

FEBRUARY 2021

DOCUMENT NO. 074050  
VERSION G

Siemens Rail Automation Corporation  
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## NOTES, CAUTIONS, AND WARNINGS

Throughout this manual, notes, cautions, and warnings are frequently used to direct the reader's attention to specific information. Use of the three terms is defined as follows:

### **WARNING**

**WARNING**  
INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY. WARNINGS ALWAYS TAKE PRECEDENCE OVER NOTES, CAUTIONS, AND ALL OTHER INFORMATION.

### **CAUTION**

**CAUTION**  
REFERS TO PROPER PROCEDURES OR PRACTICES WHICH IF NOT STRICTLY OBSERVED, COULD RESULT IN A POTENTIALLY HAZARDOUS SITUATION AND/OR POSSIBLE DAMAGE TO EQUIPMENT. CAUTIONS TAKE PRECEDENCE OVER NOTES AND ALL OTHER INFORMATION, EXCEPT WARNINGS.

### **NOTE**

**NOTE**  
Generally used to highlight certain information relating to the topic under discussion.

If there are any questions, contact Siemens Rail Automation Corporation Application Engineering.

## **ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS**

Static electricity can damage electronic circuitry, particularly low voltage components such as the integrated circuits commonly used throughout the electronics industry. Therefore, procedures have been adopted industry-wide which make it possible to avoid the sometimes invisible damage caused by electrostatic discharge (ESD) during the handling, shipping, and storage of electronic modules and components. Siemens Rail Automation has instituted these practices at its manufacturing facility and encourages its customers to adopt them as well to lessen the likelihood of equipment damage in the field due to ESD. Some of the basic protective practices include the following:

- Ground yourself before touching card cages, assemblies, modules, or components.
- Remove power from card cages and assemblies before removing or installing modules.
- Remove circuit boards (modules) from card cages by the ejector lever only. If an ejector lever is not provided, grasp the edge of the circuit board but avoid touching circuit traces or components.
- Handle circuit boards by the edges only.
- Never physically touch circuit board or connector contact fingers or allow these fingers to come in contact with an insulator (e.g., plastic, rubber, etc.).
- When not in use, place circuit boards in approved static-shielding bags, contact fingers first. Remove circuit boards from static-shielding bags by grasping the ejector lever or the edge of the board only. Each bag should include a caution label on the outside indicating static-sensitive contents.
- Cover workbench surfaces used for repair of electronic equipment with static dissipative workbench matting.
- Use integrated circuit extractor/inserters tools designed to remove and install electrostatic-sensitive integrated circuit devices such as PROM's (OK Industries, Inc., Model EX-2 Extractor and Model MOS-40 Inserter (or equivalent) are highly recommended).
- Utilize only anti-static cushioning material in equipment shipping and storage containers.

For information concerning ESD material applications, please contact the Technical Support Staff at 1-800-793-7233. ESD Awareness Classes and additional ESD product information are also available through the Technical Support Staff.

## DEFINITIONS

**AREMA** - American Railway Engineering and Maintenance of Way Association

**Ascent Time (Entrance/Exit Gate)** - the amount of time elapsed from when energy is first applied to the mechanism GC terminals to the point when the gate arm is in the full vertical position (0 to 90 degrees)

**Back EMF (Back Electromotive Force) (Entrance/Exit Gate)** - energy generated by the entrance gate motor when the gate is descending via gravity and the exit gate motor when ascending via gravity

**Descent Time (Entrance/Exit Gate)** - the amount of time elapsed from when energy is first removed from the mechanism GC terminals to the point when the gate arm is in the full horizontal position (90 to 0 degrees)

**Double Break**- a method of design in which the positive and negative wires to the controlled device are both opened as a means of controlling the unit. This includes solid-state inputs and outputs, whose wires are electrically isolated from other circuits

**Entrance Gate**- a gate mechanism designed to release and lower via gravity from the full vertical position to the horizontal position under a loss of power condition or when control energy is intentionally removed

**Exit Gate**- a gate mechanism intended for four quadrant gate applications that is designed to release and raise via gravity from the horizontal position to a vertical position great enough to allow vehicle clearing of the crossing under a loss of power condition or when control energy is intentionally removed

**GC**- abbreviation for Gate Control (also referred to as Gate Control) - External power applied to the PCB that keeps the gate in the vertical position and brake energized. If GC power is applied or removed from the PCB, the gate will lower to the horizontal position

**MUTCD**- Manual on Uniform Traffic Control Devices

**PCB**- abbreviation for Printed Circuit Board

**Snubbing**- a method of braking in which the motor is used as a generator and the kinetic energy of the apparatus is employed as an actuating means of exciting a retarding force (also known as dynamic braking)



# Part One

## *GENERAL INFORMATION*

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## SECTION 1 INTRODUCTION

### 1.0 INTRODUCTION

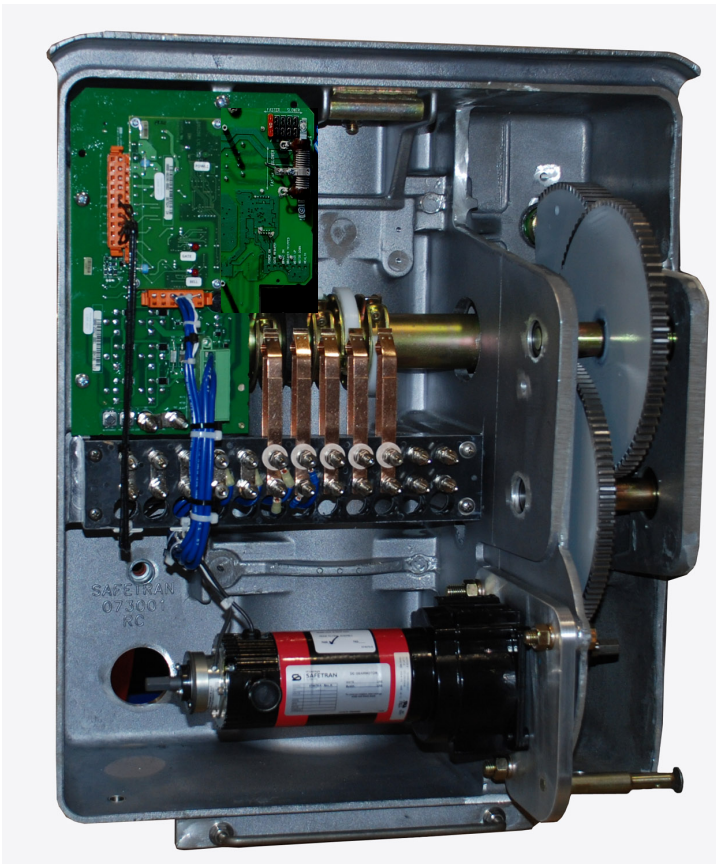


Figure 1-1 S-60 Entrance Gate Mechanism

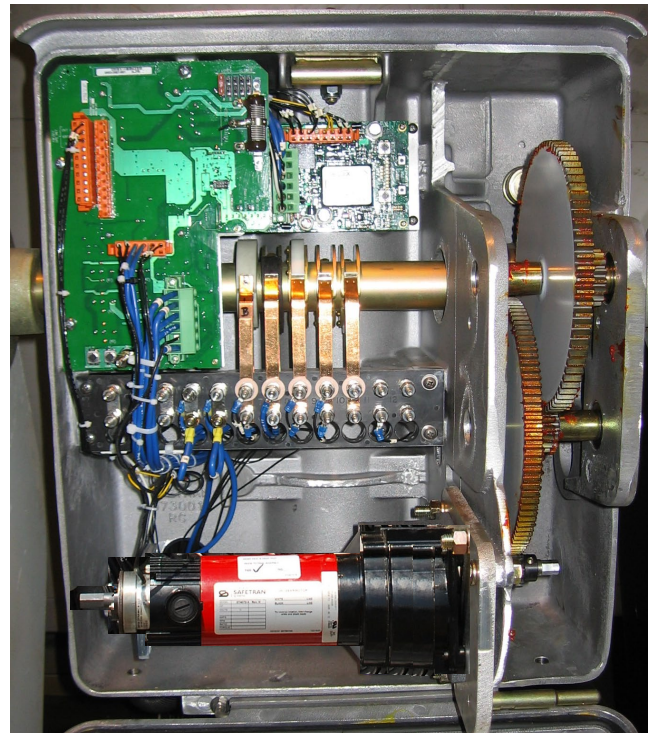


Figure 1-2 S-60 Exit Gate Mechanism

**WARNING**

**WARNING**

THE S-60 IS CAPABLE OF BEING EQUIPPED AND CONFIGURED AS EITHER AN ENTRANCE OR EXIT MECHANISM. SIEMENS ASSUMES NO LIABILITY FOR IMPROPER INSTALLATION, MAINTENANCE OR OPERATION OF THIS DEVICE.

**NOTE**

**NOTE**

The S-60 Control Electronics are designed to meet Siemens standards for safety related equipment.

## 1.1 PRODUCT OVERVIEW

The S-60 Gate Mechanism provides improved efficiency and versatility with Entrance or Exit gate configuration options. The S-60 is an integral part of Siemens complete Wayside Information System (WIS) and Wayside Alarm Management System (WAMS). The optional Mini Trackage Sensor (MTSS) monitors the operation of the electronic bell and gate tip sensor, as well as gate position, and reports the data back to the SEAR II event recorder on the wayside.

The S-60 gate mechanism utilizes many of the same field-proven components used in previous S-20 and S-40 units including the cast cover/housing, main shaft, bearings, gearing, contacts & cams. An inline gearmotor & electric brake combination replaces the previous motor and electromechanical hold clear device. A Bi-directional Lock Bar (US Patent #20070075193) locks the gate arm in any position to perform maintenance and adjustment functions.

The plug-coupled PC Board and wiring harness eliminates the possibility of wiring errors when replacing components. The PC Board can be changed and functionally tested in less than five (5) minutes.

A series of diagnostic LED's on the PC Board monitor the condition of the mechanism, minimizing the need for a multi-meter when troubleshooting.

The major components of the S-60 were designed to provide full backward compatibility for Siemens S-20 & S-40 mechanisms. A retrofit kit is available that contains the gearmotor & electric brake combination, plug-coupled PC Board, plug-coupled wiring harness, as well as other accessories and hardware required to upgrade older mechanisms to S-60 performance levels, at a competitive cost.

## 1.2 STANDARDS AND FEATURES (ENTRANCE GATE)

- Tested & Certified to be fully AREMA compliant
- Integrated PC Board with LED diagnostics and over-speed control
- Adjustable snub resistor to set descent time
- Electronic Auto-Restore Breaker for motor protection
- Four (4) contact cam arrangements
- Maintenance Switch to raise the counterweights when gate arm is broken
- Bi-directional Lock Bar to secure mechanism in any position, in either direction
- Vertical & horizontal buffers that are adjusted from the outside of the mechanism
- Single-break and Double-break gate control capability
- Lifting eyebolt for ease of installation
- Serial Number stamped on top of housing

## 1.3 ENTRANCE GATE OPTIONS

- Mini Trackage Sensor daughter board
- 12 & 24 VDC, 115 VAC Defrosters
- Three (3) additional spare contact/cam arrangements are available for gate position indication, traffic preemption interface, etc.
- Mechanism bolts & saddles for 5" mast mounting.
- Mechanism support clamp for 5" mounting.
- 2" x 42" long liquid tight conduit with one straight and one 90° connector.
- Fused Light Board.
- Wireless Gate Tip Sensor

## 1.4 ENTRANCE GATE SPECIFICATIONS

<b>Housing and Cover:</b>	Permanent mold alloy 356 aluminum castings. Precision CNC machining of all gear, shaft and motor surfaces
<b>Gear Train:</b>	240:1 Reduction (Gear motor output to main shaft)
<b>Bearings:</b>	Maintenance-Free Sealed – both main and gear shaft
<b>Gearmotor:</b>	12 VDC, Permanent Magnet
<b>Brake:</b>	165 mA @ 12VDC
<b>Operating Voltage:</b>	11 to 16 VDC (At the mechanism)
<b>Operating Current:</b>	6 to 15 A @ 12 VDC (current varies with gate arm length)
<b>Hold (Vertical) Current:</b>	350 mA without MTSS, 450 mA with MTSS @ 12 VDC
<b>Circuit Breaker:</b>	50 A, Electronic Auto Restore (timed reset), software programmed 24 A Normal operation, 41.5 A with Maintenance Button pushed.
<b>Weight:</b>	209 pounds (mechanism only)

## 1.5 EXIT GATE STANDARDS AND FEATURES

- Tested & Certified to be fully AREMA compliant
- Panel assembly complete with down rate resistors and over-speed control.
- Electronic Auto-reset circuit breaker motor protection.
- Adjustable snap action contact actuating cam for power up and power down (positions 6 & 7).
- Adjustable contact and cam for flashing light control (position 8).
- Adjustable contact and cam for bell control (position 9).
- Internal Printed Circuit Board with LED Operating Status
- Maintenance Jumper Terminals
- Lifting eyebolt.
- Adjustable Electronic Snub Settings
- Mounting bolts and saddles for 5" pipe mounting.
- Mechanism support clamp for 5" pipe mounting.
- 2" x 42" long liquid tight conduit with one straight and one 90° connector.
- Mechanism serial number stamped on top outside of cabinet.

## 1.6 EXIT GATE SPECIFICATIONS

<b>Housing and Cover:</b>	Permanent mold alloy 356 aluminum castings. Precision CNC machining of all gear, shaft and motor surfaces
<b>Gear Train:</b>	240 to 1 Reduction (Gear motor output to main shaft)
<b>Bearings:</b>	Maintenance free sealed – both main and gear shaft
<b>Gearmotor:</b>	12 VDC, Permanent magnet
<b>Brake:</b>	165 mA @ 12VDC
<b>Operating Voltage:</b>	11 to 16 VDC (At the mechanism)
<b>Operating Current:</b>	Up = 6 – 15 A @ 12 VDC, Down = 6 – 15 A @ 12 VDC.
<b>Circuit Breaker:</b>	50 A, Electronic Auto Restore (timed reset), software programmed 18 A Normal operation, 41.5 A with Maintenance Jumper Installed.
<b>Weight:</b>	211 pounds (mechanism only)

## 1.7 EXIT GATE OPTIONS

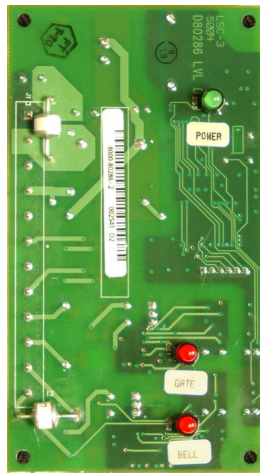
- Mini Trackside Sensor daughter board
- 12 & 24 VDC, 115 VAC Defrosters
- Three (3) additional spare contact/cam arrangements are available for gate position indication, traffic preemption interface, etc.
- Mechanism bolts & saddles for 5" mast mounting.
- Mechanism support clamp for 5" mounting.
- 2" x 42" long liquid tight conduit with one straight and one 90° connector.
- Fused Light Board.
- Wireless Gate Tip Sensor

## 1.8 S-60 OPTIONS

The following are optional accessories available for the S-60 Highway Grade Crossing:

### 1.8.1 Mini Trackside Sensor (MTSS)

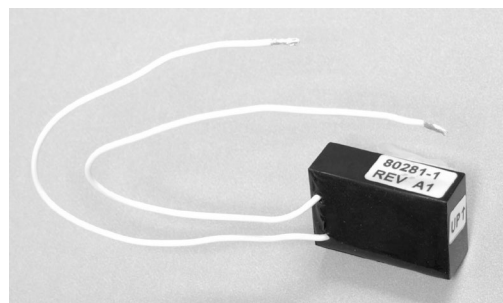
The MTSS (8000-80286-0002) is a part of Siemens remote monitoring system for highway-rail grade crossings. The MTSS monitors local gate position and electronic bell inputs and sends the acquired data to a SEAR II unit on the wayside. Data is received from the sensor inputs and assembled into a serial bit stream that only requires a single-wire connection to a spare Digital Input on the SEAR II. A typical field wiring diagram, incorporating the MTSS and sensor system into an S-60 application, is shown Figure 1-3. A standard MTSS wiring harness (075014-X4) is required for installation in the mechanism.



**Figure 1-3 Mini Trackside Sensor PCB (8000-80286-0002)**

### 1.8.2 Gate Tip Sensor

A Gate-Tip Sensor (GTS) is mounted on the end of the gate arm. It is wired via two connections to the existing tip light wires and reports back to the MTSS when the gate is within 5 degrees of horizontal.



**Figure 1-4 Gate Tip Sensor**

### 1.8.3 RF Sensor System (Wireless Gate Tip Sensor)

Siemens RF Sensor System consists of a Gate Tip Transmitter (8000-80319-000X), a RF Sensor Base (8000-80320-0001), and Antenna (Z835-00003-0000), which provides gate tip orientation information to the MTSS via radio instead of using lamp wires to convey information. Further information on the RF Sensor System is available in Siemens Document Number: COM-00-08-17.

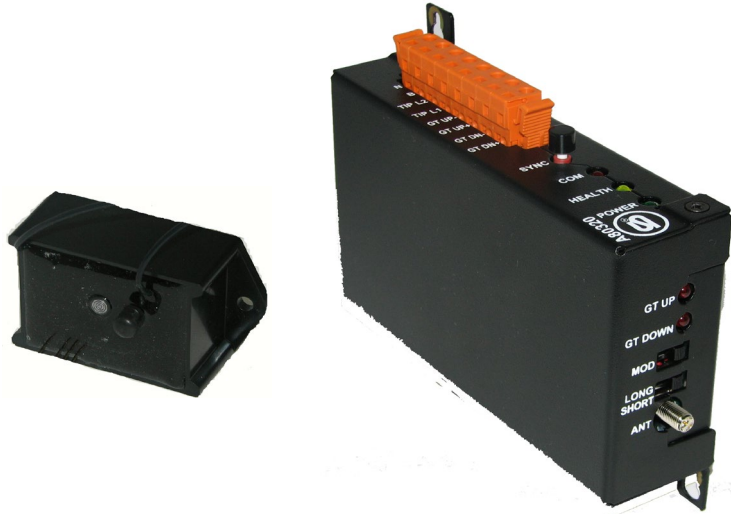


Figure 1-5 RF Sensor System (Wireless Gate Tip Sensor)

### 1.8.4 Electronic Bell (E-Bell™)

Siemens Electronic Bell (E-bell™) is equipped with a bell sensing circuit that monitors both electrical and audio bell characteristics and continuously reports the status back to the MTSS.



Figure 1-6 Electronic Bell (E-Bell™)

### 1.8.5 Fused Light Board (9000-25528-0001 and 9000-25528-0002 (5 Amp Version))

The fused light board (P/N 9000-22528-0001 and 9000-25528-0002 (5 Amp version)) is used in place of the terminal straps for gate arm lights. This can be used on the S-20, S-40, and S-60 Entrance Gates. Both L1 and L2 wires are fused via a mini ATO 10 amp fuse. One spare fuse is provided on the board.

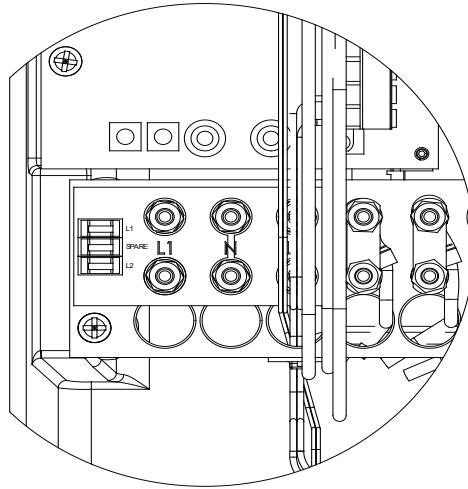
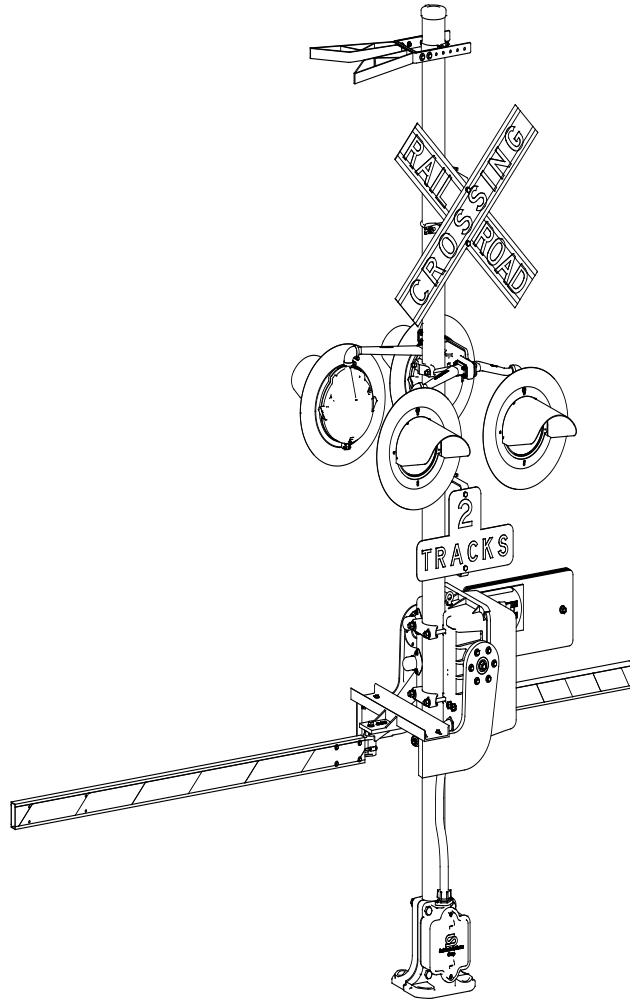


Figure 1-7 Fused Light Board (9000-25528-0001 or 9000-25528-0002 (5 Amp version))

### 1.8.6 Sidewalk Gate (P/N: 074007-X012) Mechanism Only

An optional Sidewalk Gate is available for the S-60 Entrance Gates. The kit includes an arm bracket and gears that are attached to the gate mechanism. The arm lowers to the right side of the gate to protect the pedestrian walkway as shown in the figure below.



**Figure 1-8 Sidewalk Gate**



A faded, grayscale background image of a railway crossing. It features a signpost with a 'RAILROAD CROSSING' sign and a 'RAILROAD ROAD' sign. Below the signs is a gate mechanism with two large circular wheels and a central pivot point. The text 'Part Two' is in a large, bold, black sans-serif font, and 'ENTRANCE GATE' is in a smaller, bold, black sans-serif font below it.

# Part Two

## *ENTRANCE GATE*

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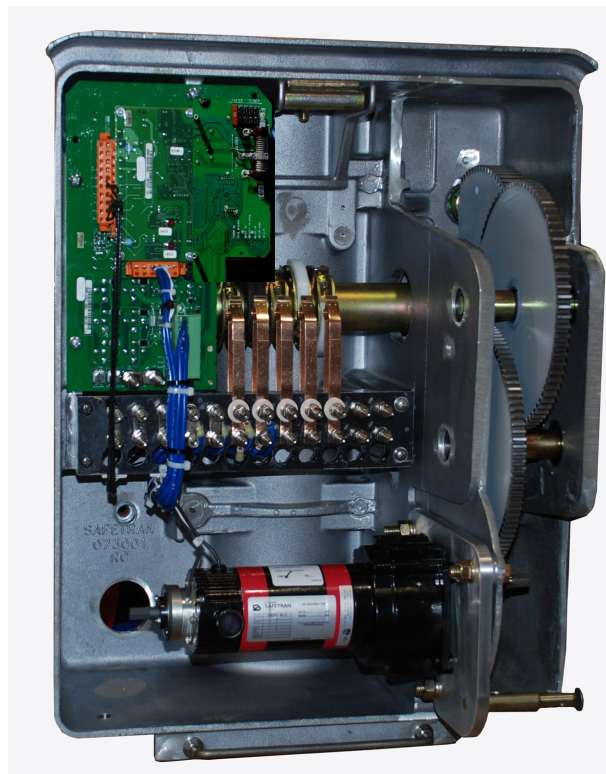
## SECTION 2

### ENTRANCE GATE OPERATION

#### 2.0 ENTRANCE GATE INTRODUCTION

#### 2.1 GENERAL

The S-60 entrance gate mechanism has a DC motor, gear train to transfer power from motor to gate arm, a buffer to prevent the gate from slamming into the housing at its end of rotational operation, a snubbing circuit to slow the gate down during descent/ascent before it hits bottom or top, an over-speed circuit to prevent the gate from moving too fast, and an electric brake to lock the gate's drive train at the vertical position (Entrance and Exit) and horizontal (Exit only). The Entrance gate is counter weighted so that the gate arm side is heavy. When the gate is to be brought down the brake is de-energized and the motor is powered down from vertical (90 degrees) to about 70 degrees. At 70 degrees, the motor power is cut and the moving mass will coast to the horizontal position or 0 degrees. At all times when the brake is de-energized and there is downward motion, the snubbing circuit is engaged which slows the moving arm down prior to reaching horizontal. Gravity holds the gate in the horizontal position.



**Figure 2-1 Entrance Gate Mechanism**

2.2 ENTRANCE GATE COMPONENTS

Figure 2-2 displays the various components of the Entrance Gate mechanism.

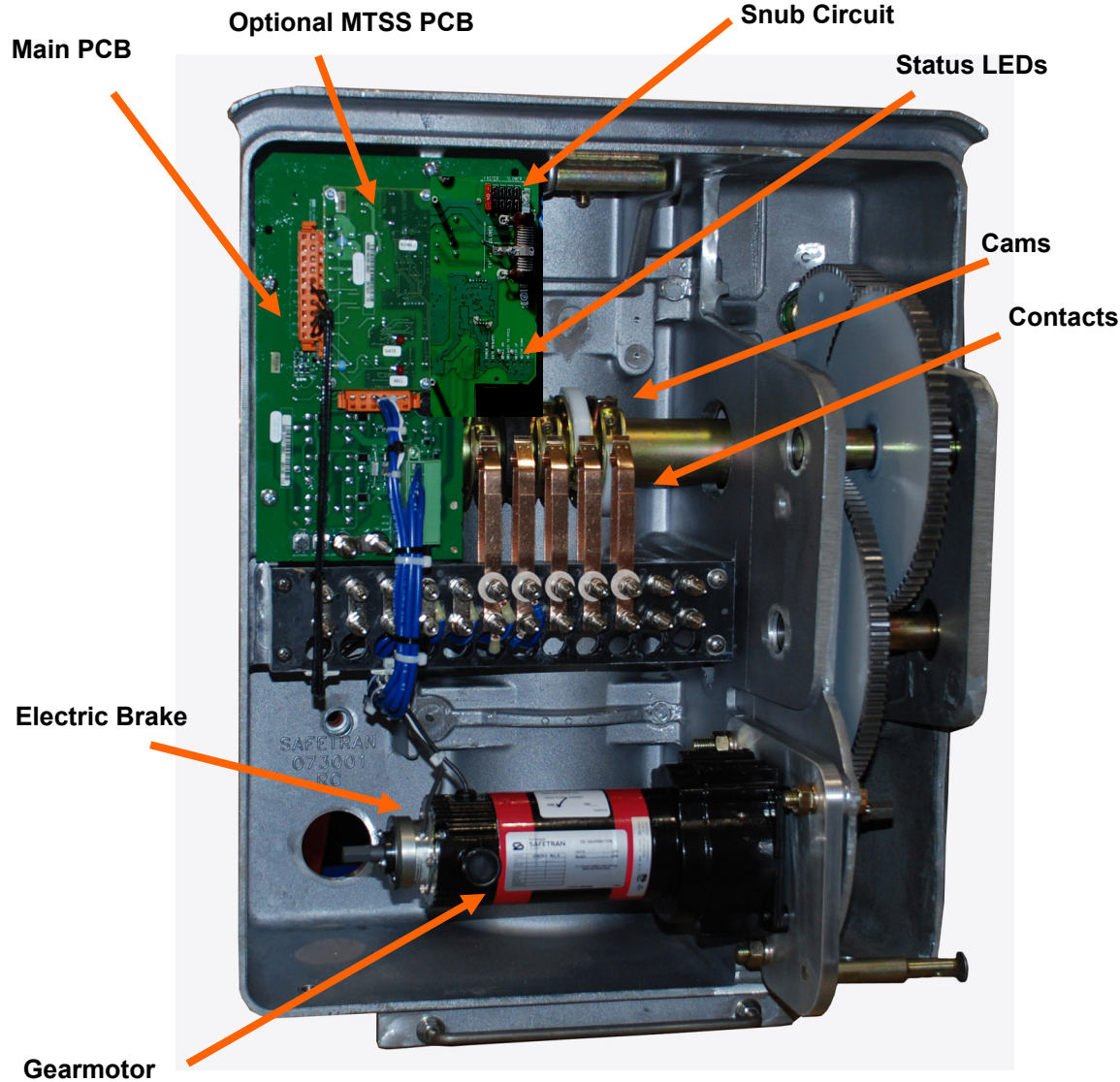


Figure 2-2 S-60 Entrance Gate Components

**2.3 BASIC OPERATION**

Using standard wiring as shown in Figure 3-1, Battery Power (B & N) is continuously applied to terminal locations 4 & 5 and supplies power to the motor and PC board. Two-wire "Gate Control" (or GC) positive and negative connections serve to energize the relays on the PCB and the electric brake (when the gate is in the vertical position). External switching of the Gate Control is required by the user. Application of 12 VDC nominal to the Gate Control input will raise the gate. Absence of Gate Control voltage will result in the gate driving down to 70 degrees and descending by gravity from 70 to 0 degrees. A test link connection is provided to use in conjunction with the maintenance switch, for powering up counterweights when the gate arm is broken. Test links are also provided to isolate/remove battery power on terminals 4 & 5.

The PC Board uses six (6) automotive-style, sealed, 50 Amp SPDT relays. These are designed to operate for years under high vibration, temperature extremes and voltage transients.

In normal operation, the S-60 works as follows. The gate is up, held in place by the brake, powered from the Gate Control (GC) voltage. When the GC voltage is removed, the gate is driven down from 90 to 70 degrees. At 70 degrees, Power Down cam 6 opens, and the gate arm descends via gravity in a controlled (snubbed) manner.

The snubbing circuitry in the S-60 consists of an adjustable resistor bank (jumper/fuse selector, positions A through E) in series with a fine adjustment 1 Ohm adjustable slide resistor (R29) and a diode directly across the motor. The motor is driven down from 90 degrees to 70 degrees and the snub resistance has little effect on the gate movement while the motor is being driven. Below 70 degrees, the snub resistance controls the gate arm movement as it approaches the horizontal position. This accomplishes both a smooth gate movement, and puts minimal stress on the housing by allowing the mechanism to gently rest up against the mechanical buffer, which provides longer brush life. The snubbing circuit can be used to synchronize multiple gate movements. The S-60 gate mechanism is equipped with backup over-speed (O/S) snubbing protection, in the event of an arm knockdown during power up, in which case the regular snub circuit is open. The O/S circuit, however, will function in either direction to protect the mechanism.

The positive and negative Battery and GC inputs on the PCB are reverse polarity protected. Improper application of polarity will not damage the unit.

**NOTE**

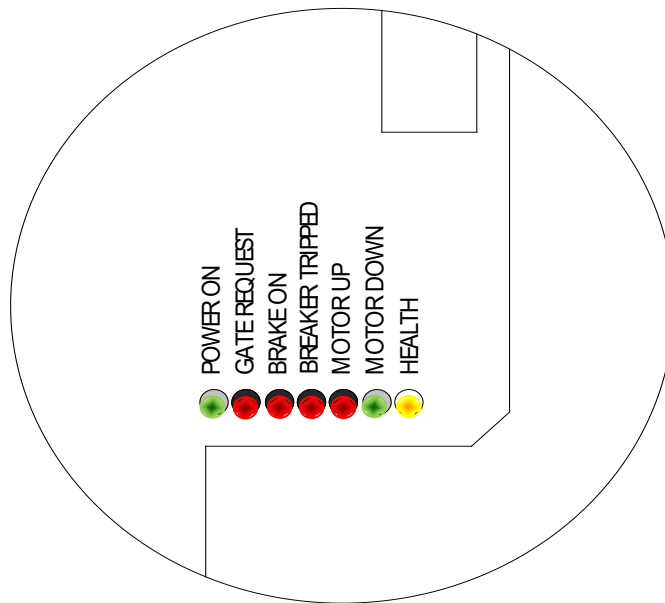
**NOTE**  
Unlike previous Siemens S-20 & S-40 model gates, there is no longer a 0 to 5 degree snub adjustment cam (previously cam #10). With the S-60, the snub resistance is in the motor circuit at all times when the gate is descending.

2.4 LED INDICATIONS

<b>NOTE</b>	<b>NOTE</b> Some LED indications are shut off after 10 minutes to conserve power. Actuate the S2 "View LEDs" switch on the lower left hand corner of the PCB to illuminate all active LED's
-------------	--

The PCB has a series of LED indicators that monitor key gate functions. This minimizes the need for a multi-meter when troubleshooting the status of the mechanism. The LED indications are listed below (in left to right order on the PCB):

- **Power ON (Green)** - indicates Battery Power is present on terminals 4 & 5 and the PCB is receiving power. If the power level is outside the normal limits, the Health LED flashes at a rate of 4 Hz.
- **Gate Request (Red)** - also known as Gate Control (GC). Indicates Gate Control input is present.
- **Brake On (Red)** - indicates power is being sent from the PCB to energize the electric brake.
- **Breaker Tripped (Red)** - indicates that the Electronic Auto Restore Overload is activated.
- **Motor Up (Red)** - indicates power is being sent from the PCB to energize the motor to raise the gate.
- **Motor Down (Green)** - indicates power is being sent from the PCB to energize the motor to lower the gate.
- **Health (Yellow)** - Indicates that the microprocessor is operating properly. The LED flashes at a one (1) cycle per second rate (½ second on, ½ second off) when board is healthy. If the CPU detects a failed condition, the LED will flash at a rate of 4 Hz. Any mode other than 1 Hz indicates a failed condition. Refer to the Troubleshooting Section for further information.



LED DETAIL

Figure 2-3 LED Detail

## 2.5 GEARMOTOR

The gearmotor in the S-60 mechanism is a factory sealed, line replaceable unit. No lubrication of the internal gear mechanism is required.

The black and white wires of the gearmotor are terminated in Plug Connector P4, which plugs into Connector J4 on the PCB.

Periodic inspection and replacement of the motor brushes is necessary annually for light traffic crossing or every six months for heavy traffic crossings. Refer to Section 5 for Motor Brush Cleaning, Wear & Replacement Instructions.



### WARNING

**DO NOT UNPLUG CONNECTOR P4/J4 FROM THE PCB OR THE MOTOR WIRES FROM THE PLUG CONNECTOR WITH THE GATE IN THE VERTICAL POSITION UNLESS THE LOCK BAR IS IN PLACE TO RESTRICT DOWNWARD MOVEMENT. WITHOUT THE LOCK BAR IN PLACE, THE GATE ARM WILL FALL IN AN UNCONTROLLED MANNER IF GC IS REMOVED.**

## 2.6 ELECTRIC BRAKE

The electric brake is a two-piece unit consisting of an Armature Plate Assembly and a Brake Housing. The Brake Housing is mounted directly to the motor end bell and the Armature Plate Assembly is fastened to the motor shaft via setscrews in the assembly collar. An air gap of 0.015" minimum, 0.020" maximum must be maintained, between the Armature Plate Assembly and the Brake Housing, to ensure proper operation of the brake. The air gap is factory set to 0.015" and will very gradually increase as the brake wears. The brake should be inspected periodically to ensure the air gap is maintained. If air gap adjustment is necessary, set the air gap to between 0.015" and 0.020", using Siemens brake adjustment shims (part # 074070-C & 074070-D) or two automotive feeler gauges (one on either side of the motor shaft). Once the gap is set, remove each setscrew, one at a time, and reapply Loctite® 243. Refer to the detailed illustration on the next page.

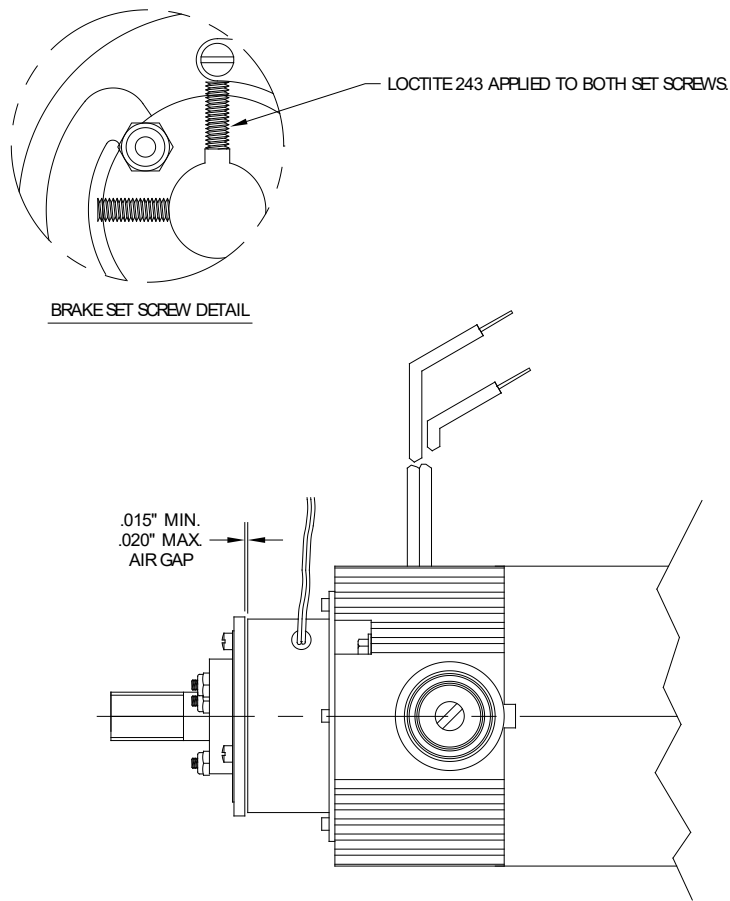


Figure 2-4 Electric Brake Detail

**⚠ WARNING**

**WARNING**

**ALWAYS ENSURE A MINIMUM BRAKE AIR GAP OF 0.015". IF ADJUSTMENT OF THE BRAKE AIR GAP IS REQUIRED, ENSURE THAT LOCTITE® 243 IS REAPPLIED TO THE BRAKE COLLAR SET SCREWS. REMOVE THE SET SCREWS INDEPENDENTLY AND ONLY APPLY A SINGLE DROP OF LOCTITE 243 DIRECTLY ONTO EACH SET SCREW. DO NOT POUR LOCTITE IN THE SETSCREW THREADED HOLES. DO NOT ALLOW ANY LOCTITE® TO COME IN CONTACT WITH THE FRICTION SURFACES OF THE BRAKE.**



**2.7 ELECTRONIC AUTO-RESTORE BREAKER FOR MOTOR PROTECTION**

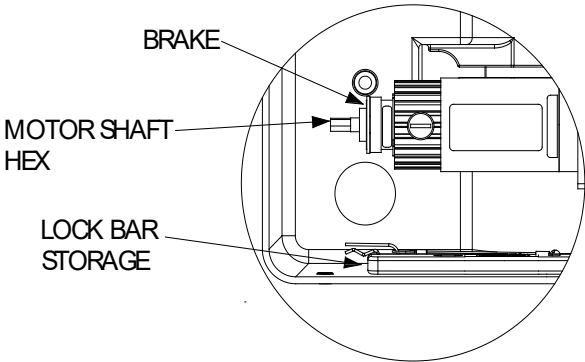
The circuit breaker function in the S-60 is designed to protect both the motor and the PC Board in a stalled motor condition. Typically during normal circuit breaker operation, when the motor current exceeds 24 amperes for one second, the breaker trips and will automatically restore in 10 seconds. If the breaker sequentially trips a second and third time, it will restore again in 10 seconds. If the breaker sequentially trips a fourth time, the restoration time is increased to one (1) minute to conserve battery capacity and will continue to restore in one minute intervals until the obstruction has been cleared. The circuit breaker will trip at 41.5 Amps when the Maintenance Switch is being used to raise counterweights when the gate arm has been damaged. There are many factors that influence circuit breaker behavior. Refer to Table 8.2 for detailed information.

**2.8 BI-DIRECTIONAL LOCK BAR (PATENT PENDING)**

The S-60 is equipped with a Bi-Directional Lock Bar used to lock the mechanism at any angle, in either direction, for maintenance purposes. The bar is placed over the Reaction Pin on the Motor Adapter Plate and the Hex portion of the Motor Pinion Gear Shaft. Proper orientation of the bar is required to restrict upward or downward movement of the mechanism. The cover cannot be closed with the lock bar in place due to the length of the handle. Under certain conditions, it may be difficult to remove the lock bar if it is under pressure. It may be necessary to use an open end wrench on the brake end of the motor hex to relieve the pressure of the lock bar against the reaction pin.

**CAUTION**

APPLY MINIMAL FORCE IN THE PROPER DIRECTION TO AVOID DAMAGE TO GEAR TEETH.



**Figure 2-5 Bi-Directional Lock Bar**

Refer to the illustration on the next page.

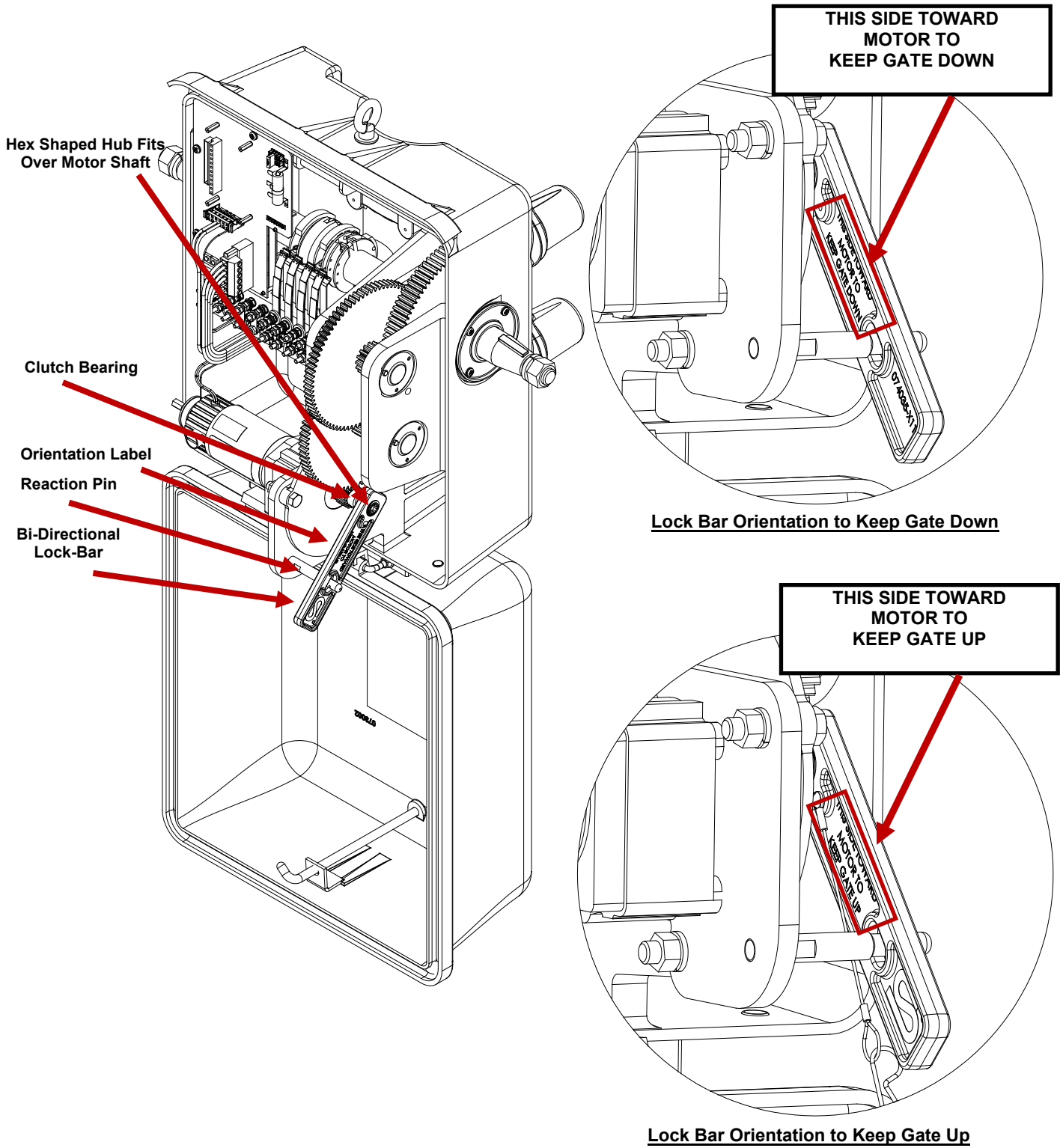


Figure 2-6 Bi-Directional Lock Bar Illustration

### 2.9 MAINTENANCE SWITCH

The Maintenance Switch on the lower left hand corner of the S-60 PC Board is used to drive the gate mechanism from the vertical position to the horizontal position so that a damaged gate arm can be repaired. By opening the Gold Nut link on the PC Board, Gate Control (GC) power is removed and the Maintenance Switch can be activated to power down the mechanism. The S-60 is designed to drive a mechanism with seven (7) 58 pound counterweights, fully extended, to the horizontal position. The Bi-Directional Lock Bar is needed to hold the mechanism in the horizontal position once it has been powered down using the Maintenance Switch.

**CAUTION**

**WHEN USING MAINTENANCE SWITCH, DO NOT DRIVE SEGMENT GEAR INTO BUFFER ASSEMBLY.**

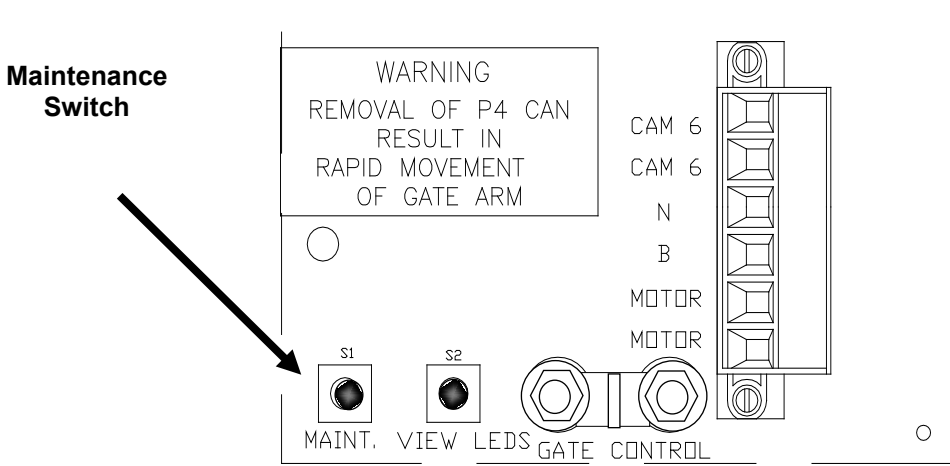


Figure 2-7 Maintenance Switch

### 2.10 OVER SPEED CIRCUIT

The over-speed snubbing circuit is always in place directly across the motor. It provides robust dynamic braking if the motor RPM goes too high, driven by a gate arm with no counter weights, or a broken gate arm. It provides snubbing protection in both motor directions.

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## SECTION 3 INSTALLATION AND CONFIGURATION

### 3.0 APPLICATION DESIGN

#### 3.1 INTERNAL WIRING

The following illustrations detail the S-60 Entrance Gate interior wiring.

#### **NOTE**

#### **NOTE**

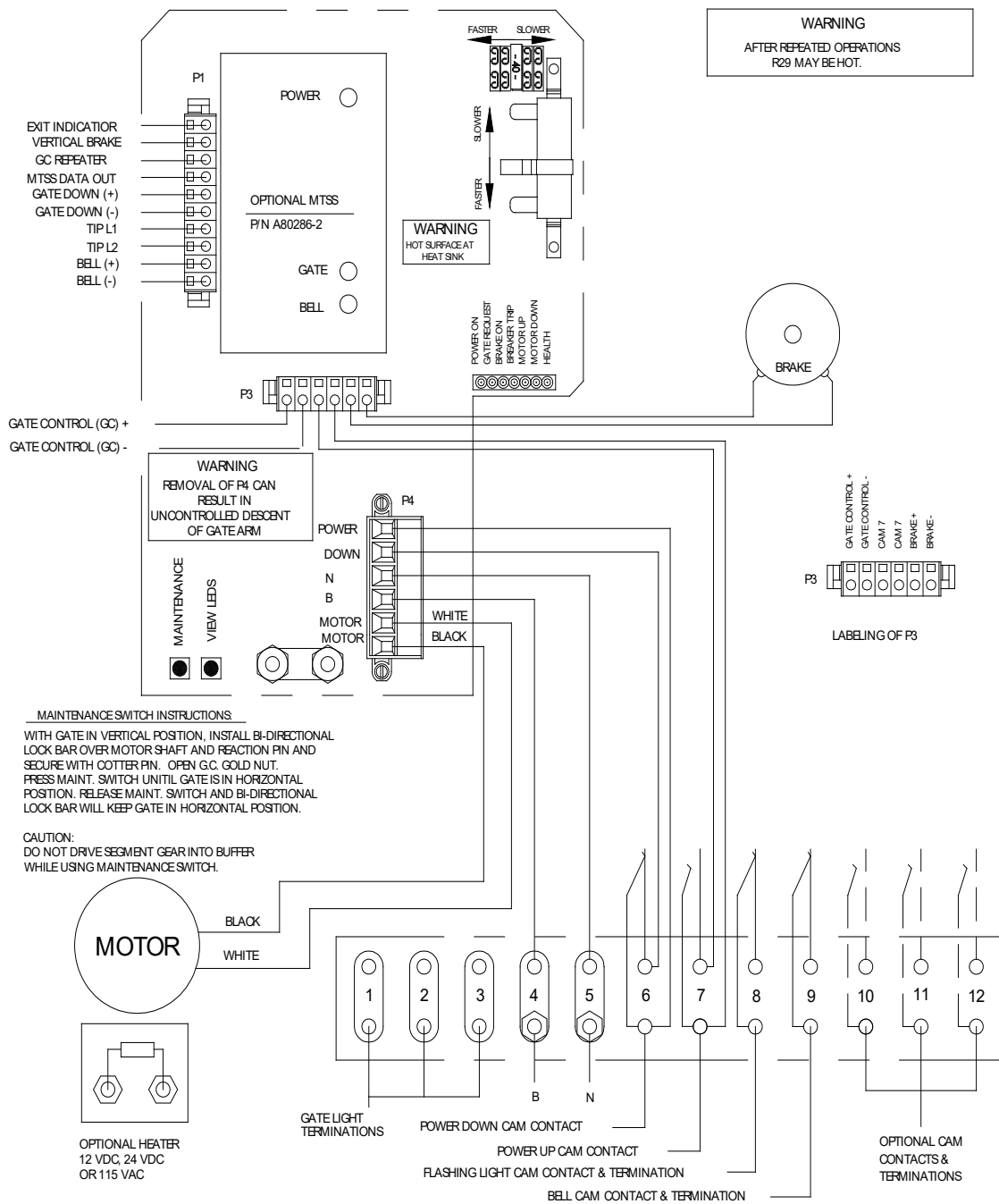
Siemens recommends the use of a double-break (+) Positive & (-) Negative GC or Gate Control circuit. If single-wire GC or Gate Control is desired, connect positive GC to Gate CONTROL (+) **positive** position on Connector P-3 and **run an additional field wire** from N-12 AREMA terminal 5 to GATE CONTROL - position on Connector P3/J3. The maximum wire size for the P3/J3 WAGO connector is #12 AWG, solid or stranded wire.

#### **NOTE**

#### **NOTE**

Gate application design (mechanical & electrical) for Entrance Gates & Four Quadrant Gates should be done in accordance with Part 8 (Traffic Controls for Highway Rail Grade Crossings) of the MUTCD Manual, latest revision. This includes installation of gate mechanism foundations to achieve the required gate arm horizontal height above the roadway and horizontal clearance to the edge of the roadway.

# INSTALLATION AND CONFIGURATION



**Figure 3-1 S-60 Entrance Gate Internal Wiring Schematic**

3.2 MAIN PCB

Figure 3-2 details the Main PCB connectors and components.

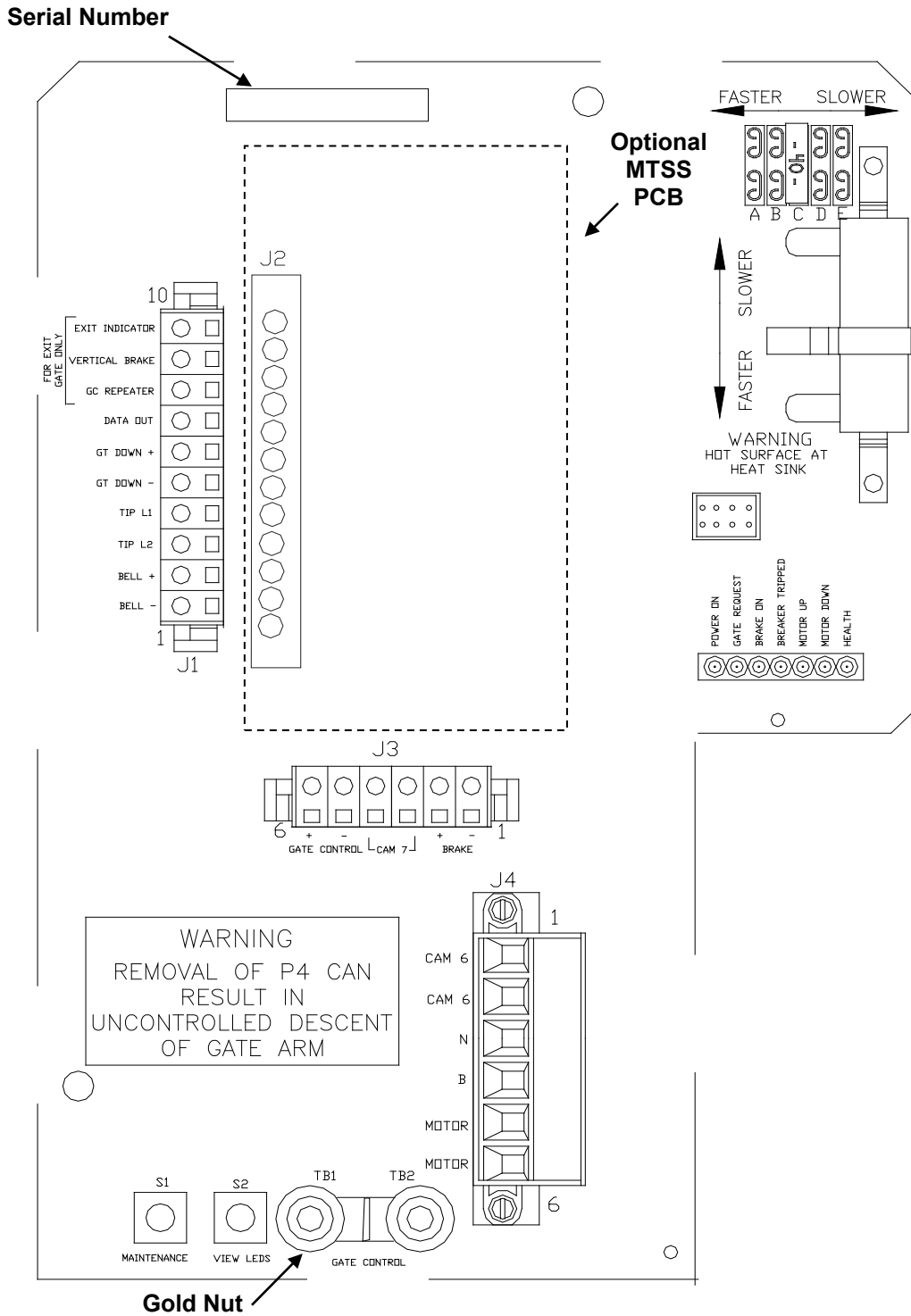


Figure 3-2 Main PCB Detail

# INSTALLATION AND CONFIGURATION

## 3.3 TYPICAL S-60 FIELD WIRING (ENTRANCE GATE)

The following is a typical field wiring of an S-60 Crossing with a MTSS, SEAR II application and a P1/J1 connector termination.

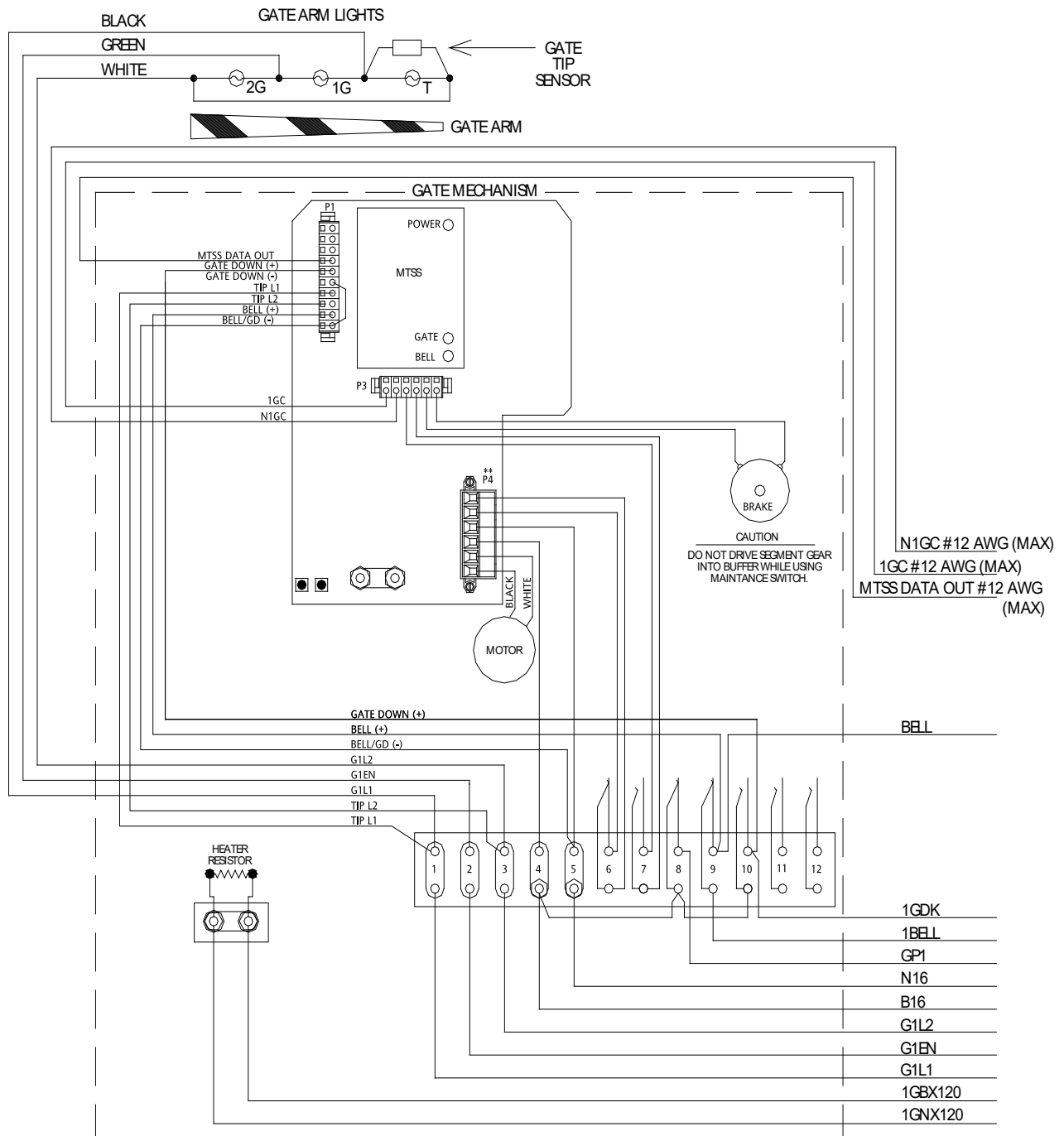


Figure 3-3 Gate with Additional Gate Down Cam (#10) and MTSS Option (1 of 2)



(Continued from Previous Page)

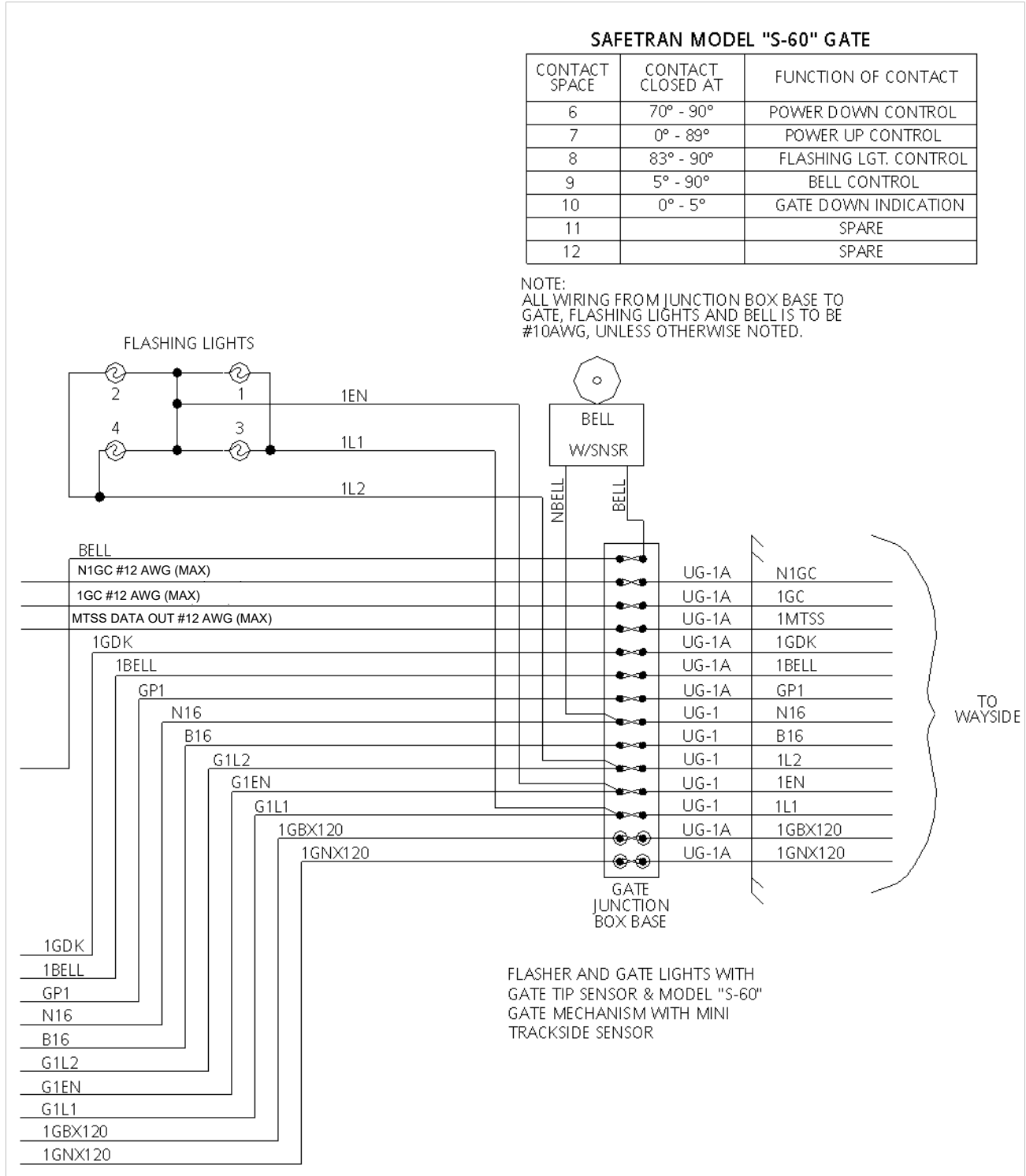


Figure 3-4 Gate with Additional Gate Down Cam (#10) and MTSS Option (2 of 2)

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## SECTION 4 ENTRANCE GATE INSTALLATION AND SET UP

### 4.0 ENTRANCE GATE INSTALLATION AND SET UP

#### 4.1 GENERAL

The following section will detail the installation and setup of the S-60 Entrance Gate Crossing.

#### 4.2 RECOMMENDED BATTERY AND WIRE SIZE 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 are recommended as follows:

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

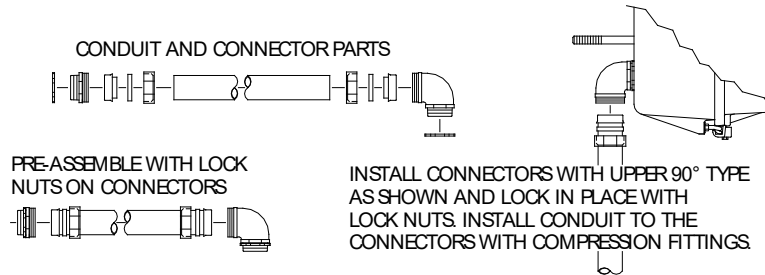
The following batteries are recommended with the above wire sizes for gates of various lengths:

Gate Arm Length in Feet	Number of Cells		
	Lead	Nickel Iron	Nickel Cadmium
Up to 24	6	9	9
25 to 40	7	11	11

#### 4.3 INSTALLATION PROCEDURE

1. **Erect mast and base.** Erect five-inch mast, with junction box base facing traffic. Mounting hole for front and 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. **Mount support clamp on mast.** Support clamp 070786-5X mounts on the mast with casting facing 45 degrees from the field side toward track. The top of casting should be 51" above the top of foundation (Section 6.1.4).
3. **Prepare mechanism.** Thread 90 degree flex conduit coupling into the back of the gate cabinet and insert the 4 square head machine bolts into the slots on the back of cabinet.
4. **Clamp mechanism in place.** Lift mechanism (Figure 4-1) and set on top of the support clamp. Clamp to mast with clamps, nuts and washers (Section 6.1.4).
5. **Install arm supports.** Mount gate arm supports (Section 4.3.3) with bolted on hubs over the keys on the main shaft ends. Install main shaft nuts and washers (Figure 6-1, items 37 & 38) but **do not fully tighten** until after installing the conversion bracket.

6. **Install arm coupling or conversion bracket.** Bolt to the arm support castings and **fully tighten** main shaft nuts.
7. **Install flexible conduit.** Thread coupling into base and install conduit to base and rear of cabinet.
8. **Mount flashing lights, bell and signs.** The flashing light units have been factory wired but control wires



from the light's junction box to the junction box base must be field installed. Contact set #8 is provided for flashing light control. **Align the flashing light units before placing the crossing in service.** Bell, when used, is mounted on top of the mast with the horn (if directional) or gong facing the roadway. Contact #9 is provided to turn off bell when the gate arm is down (see wiring diagram Figure 3-3 and Figure 3-4). Mount the required signs.

9. **Connect power to mechanism.** See Section 4.2 for recommended battery and wire size requirements and connect per wiring diagram, Figure 3-3 and Figure 3-4. Connect two-wire GC or GATE Control to GATE CONTROL + & - positions on Connector P-3. Seal conduit opening per AREMA Signal Manual Part 2.4.25. See Figure 3-3 for wiring of defroster (if applicable) and defroster installation.

**NOTE**

**NOTE**

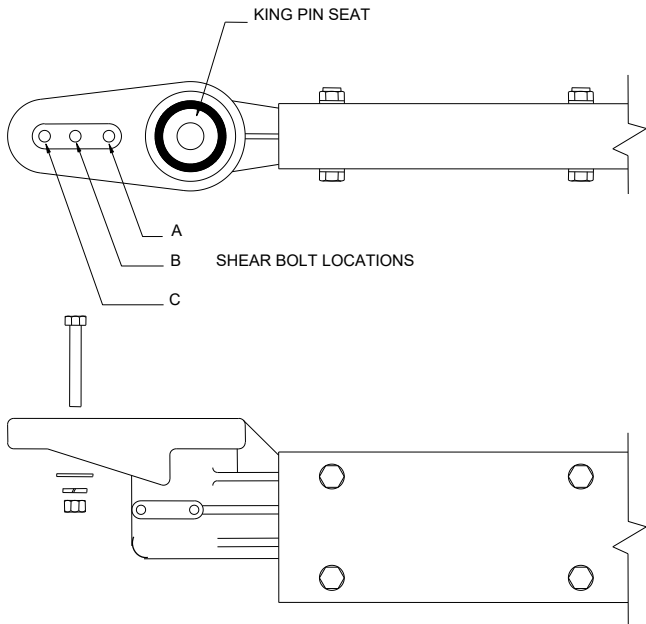
Siemens recommends the use of a double-break (B & N) GATE Control circuit. If single-wire GATE Control is desired, connect positive GC to GATE CONTROL (+) positive position on Connector P-3 **and run an additional field wire** from N-12 AREMA terminal 5 to GATE CONTROL (-) negative position on Connector P-3.

**NOTE**

**NOTE**

Strip Gate control wires back before inserting into P3/J3 connector. Maximum wire size for this connector is 12 AWG. It may be necessary during change out from older style gate mechanisms to change the existing 10 AWG wire that terminated in the junction box base and replacing with 12 AWG.

10. **Install counterweight stud plates.** Be sure the roller spacers are over the studs and in the arm support slot before mounting clamp bar and locking piece. See Figure 4-2, items 4, 8, 11, 12 & 13.
11. **Install counterweights and gate arm as follows:** If required, the back clamps can be loosened and the mechanism rotated parallel to the roadway for arm installation.
  - a. **Install counterweights** (see Figure 4-2). Install with the gate arm supports and counterweights with the gate arm in the up position. Number of counterweights required is shown in Table 4-1 . Weights are based on the use of Siemens arms and may vary slightly when other manufacturer's arms are used. Use of gate retractions device may change the number of cuts required.
  - b. **Raise counterweights** to horizontal position using the Maintenance Switch per Section 2.9. Manual ratcheting of the mechanism can also be accomplished using the Bi-directional Lock Bar on the motor pinion shaft. The Lock Bar needs to be installed to maintain horizontal position (refer to Section 2.8).
  - c. **Install gate arm and Siemens shear bolts as follows:**



- Arm lengths up to and including 18 feet- use 2 shear bolts in positions A & B
- Arms 19 to 23 feet- use 2 shear bolts in B & C positions
- Arms 24 feet & longer- use 3 shear bolts in A, B & C positions

**DO NOT OVERTIGHTEN**

Grease King Pin and mating surfaces lightly

12. **Set horizontal torque and arm height.** Per instructions in Section 4.3.7 set horizontal torque to  $200 \pm 20$  foot-pounds, then set arm height with horizontal buffer (upper position).

**NOTE**

**NOTE**

When using a gate arm protection device, it may be necessary to set the horizontal torque higher (250 ft. lbs. Max.) to ensure proper operation (restoration) of the device. Vertical torque should be set based on gate arm length recommendations in Section 4.3.6.

13. **Raise and check vertical position of arm.** Adjust the vertical position by rotating contact cam # 7 on the main shaft.
14. **Adjust the vertical buffer (lower position).** Set to 1/32 clearance from segment gear per instructions in Section 4.3.5.
15. **Set vertical torque.** Determine vertical torque limits per and set per instructions in Section 4.3.6.

**NOTE**

**NOTE**

In some applications with long gate arms and high wind conditions, Siemens recommends the use of an extended mast with multiple wind guards spaced no more than 10' apart.

16. **Adjust descending time.** Recommended descend time is between 10 and 15 seconds. Start with Coarse Snub Adjustment Fuse in the "C" position and the R-29 Fine Snub Adjustment band in the lower (Faster) position of the resistor. Check descent time. Move the Fuse to the left to increase decent time or to the right to decrease descent time. If necessary, use the Fine Snub Adjustment resistor to fine-tune the desired descent time.

**⚠ WARNING**

**WARNING**

**AFTER REPEATED OPERATIONS, THE R-29 RESISTOR MAY BE HOT. IT IS NOT RECOMMENDED TO LEAVE THE R-29 RESISTOR ADJUSTED TOWARD THE UPPER (SLOWER) POSITION. ADJUST SNUB FUSE ACCORDINGLY TO ALLOW THE R-29 BAND TO BE POSITIONED IN THE CENTER OR LOWER PORTION OF THE RESISTOR.**

**⚠ CAUTION**

**CAUTION**

**IN EXTREME COLD TEMPERATURES, IT MAY BE NECESSARY TO CHANGE THE SNUB FUSE SETTING AND RE-ADJUST THE SNUB VALUE ON R29 TO ACHIEVE A 15 SECOND MAXIMUM DESCEND TIME**

4.3.1 Lifting Recommendations

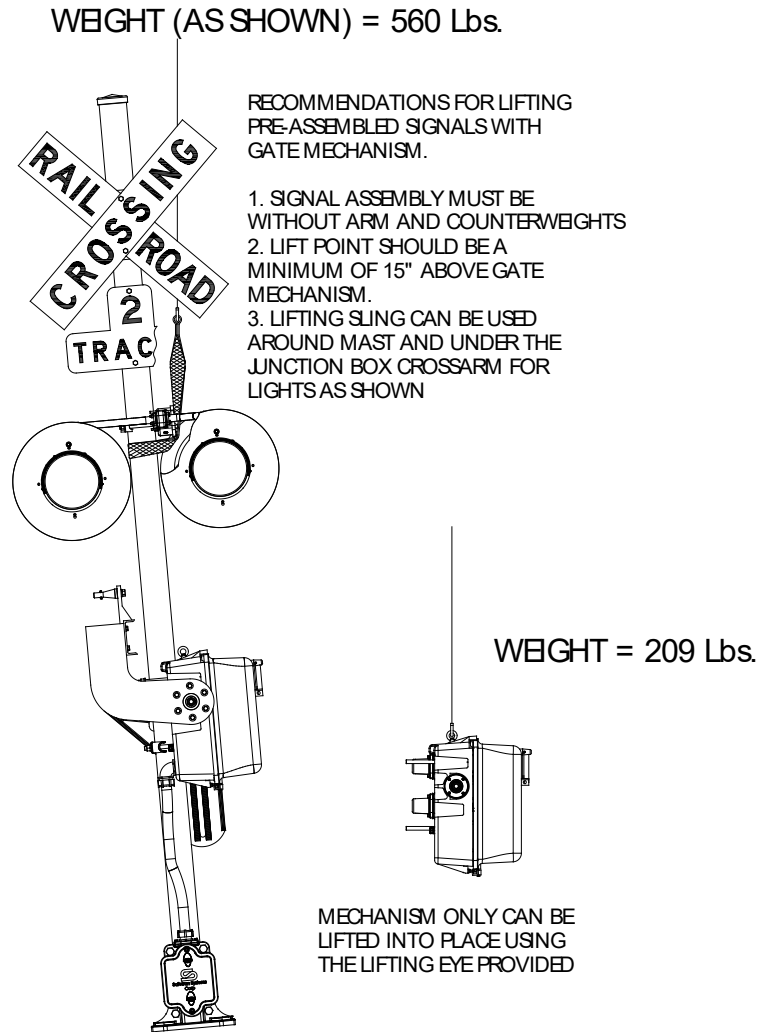


Figure 4-1 Lifting Gate Assembly

**CAUTION**

**CAUTION**  
DO NOT LIFT COMPLETE GATE ASSEMBLY WITH LIFTING EYE IN TOP OF MECHANISM HOUSING.

### 4.3.2 Gate Assembly Physical Data

Description	Part Number	Dimensions	Weight
Adapter Cast	076203-510X		28 lbs.
Adapter Fab	076203-501X		20 lbs.
Conversion Bracket (Cast Adapter)	076227-X		75 lbs.
Conversion Bracket (Fabricated Adapter)	076227-22X		55 lbs.
J B. Base Assy.	041931-X		85 lbs.
Mast & J B. Base (5" Alum.)	070519-27AX	14 feet - 0 inches	140 lbs.
Mast & J B. Base (5" Alum.)	070519-40AX	16 feet - 0 inches	160 lbs.
Mast & J B. Bast Stub (5" Alum.)	070519-3AX	7 feet - 0 inches	100 lbs.
Sidelight Cantilever	041442-26X		38 lbs.
Counterweight Std.	070755-4	15 x 30 x 1/2 inches	63 lbs.
Counterweight Short	070755-34	15 x 15 x 5/8 inches	38 lbs.
Counterweight Stud Plate	070757-26X		15 lbs.
Arm Supports (1 each)	070920-LX -or- 070920-RX		72 lbs. ea.
Arm Supports (1 each)	070921-LX -or- 070921-RX		30 lbs. ea.
R R Crossing Sgn w/mtg. Hardware	035200-17X		40 lbs.
#2 Track Sgn w/mt. Hardware	035236-2X		25 lbs.
J B. Crossarm 2-Way w/FLX-12 Heads Complete	042003-000616		110 lbs.
S-60 Gate Mechanism	As specified		209 lbs
Galvanized Steel Foundation	035903-911-1X		200 lbs.



4.3.3 Gate Arm Supports and Counterweights

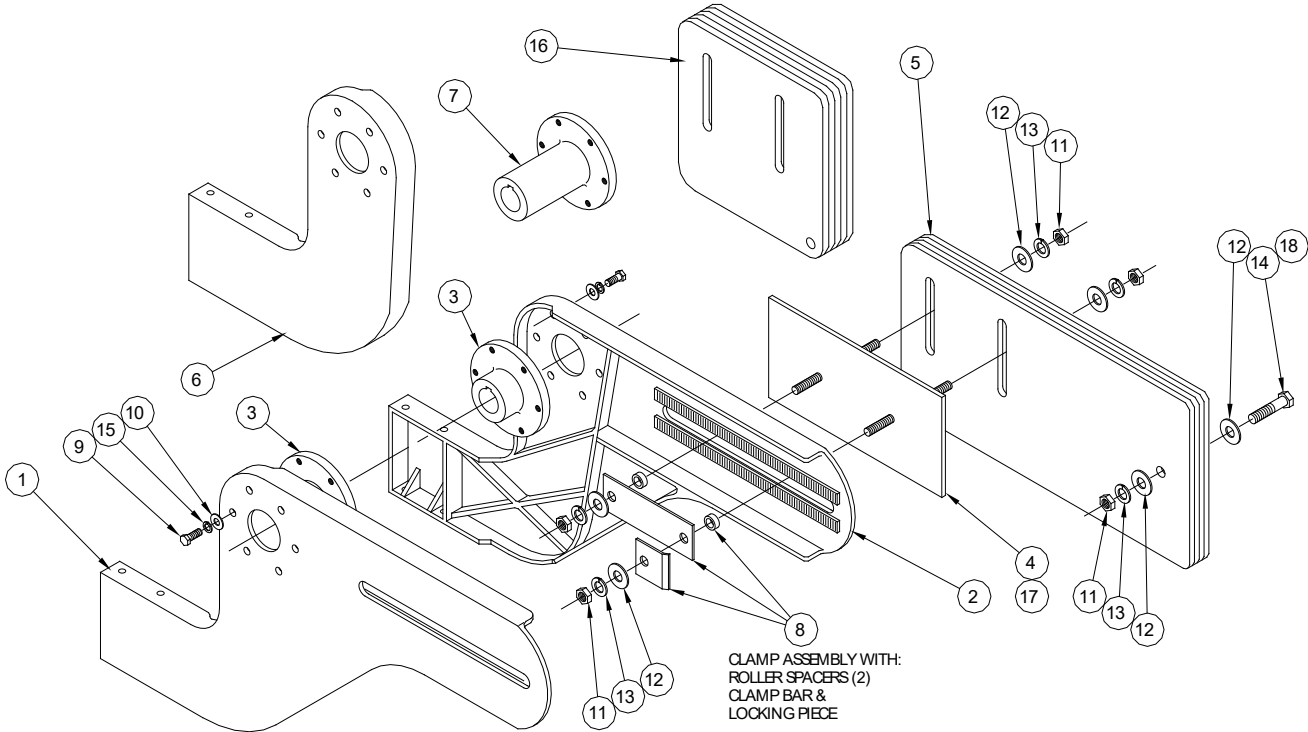


Figure 4-2 Gate Arm Supports and Counterweights

**4.3.3.1 Bill of Materials Gate Arm Supports and Counterweights**

Item No.	Description	Part Number
1	Support, Left Hand	070920-L
	Support, Left Hand with Hub and Mounting Bolts	070920-LX
2	Support, Right Hand	070920-R
	Support, Right Hand with Hub and Mounting Bolts	070920-RX
3	Hub, Gate Arm Support	070923-3
4	Plate, Stud for wood arms 13' – 36' and all fiberglass arms (standard) w/hardware	070757-26X
	Plate, Stud for wood arms 37' – 42' (standard) w/hardware	070757-24X
5	Counterweight, Galvanized Steel, 1/2" x 15" x 30", 58 lbs (standard)	070755-4G
6	Support, Left Hand for use without counterweights	070921-L
	Support, LH w/o counterweights with Hub and Mounting Bolts	070921-LX
6A	Support, Right Hand (not shown) w/o counterweights	070921-R
	Support, RH w/o counterweights with Hub and Mounting Bolts	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"	004167-HSC
10	Washer, Wrought, 1/2"	001755-C
11	Nut, Hex, 3/4" – 10	002114-SC
12	Washer, Wrought, 3/4"	001737-SC
13	Washer, Spring Lock, M, 3/4"	001815-MSC
14	Cap Screw, Hex Head, 3/4" – 10 x 2" for 1 – 2 standard counterweights	004274-HSC
	Cap Screw, Hex Head, 3/4" – 10 x 3" for 3 – 4 standard counterweights	004278-HSC
	Cap Screw, Hex Head, 3/4" – 10 x 4" for 5 – 6 standard counterweights	004282-HSC
	Machine Bolt, Hex Head, 3/4" – 10 x 6.5" for 7 – 10 standard counterweights	003177-SC
15	Washer, Spring Lock, M, 1/2"	001812-MSC
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	070757-30X
	Plate, Stud for wood arms 37' – 46' (short) w/hardware	070757-31X
18	Cap Screw, Hex Head, 3/4" – 10 x 2.5" for 1 – 3 short counterweights	004276-HSC
	Cap Screw, Hex Head, 3/4" – 10 x 5" for 4 – 6 short counterweights	004284-HSC
	Machine Bolt, Hex Head, 3/4" – 10 x 8" for 7 – 11 short counterweights	003180-SC
	Machine Bolt, Hex Head, 3/4" – 10 x 14" for 12 – 21 short counterweights	003190-SC

#### 4.3.4 Hand Cranking of Gate Mechanism



#### WARNING

DISCONNECT POWER BY OPENING THE TEST LINKS (AREMA TERMINALS 4 & 5) TO GATE MECHANISM AND THE GOLD NUT ON THE MAIN PCB BEFORE INSERTING TOOLS FOR HAND CRANKING

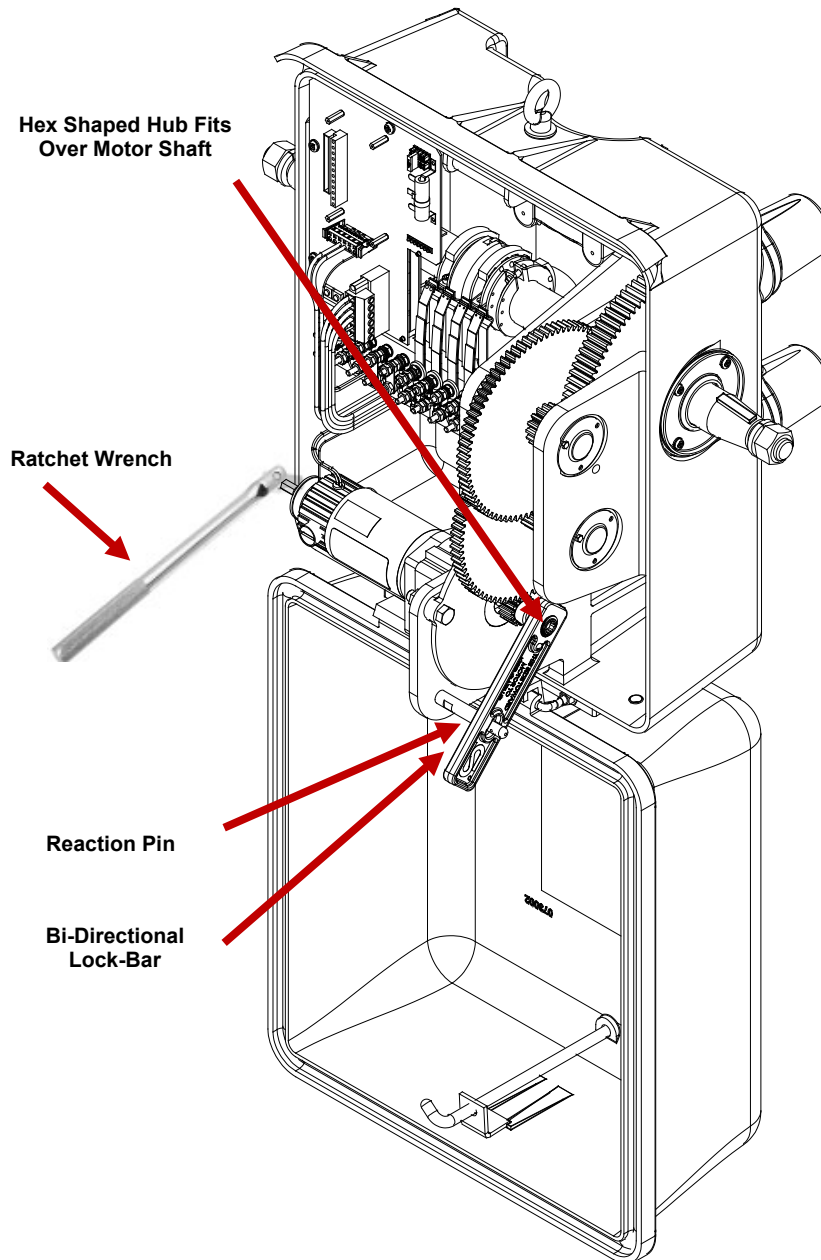


Figure 4-3 Hand Cranking Gate Mechanism

The gate mechanism hand crank feature may be used either to crank the gate arm up, or in the cases where the arm has been sheared off, to crank the counterweights to the horizontal position. The tools required are a ratchet wrench, 7/16-inch socket, and the Bi-directional Lock Bar.

1. Place ratchet wrench with 7/16-inch socket over the hexagon shaft (brake side). The ratchet should be set in the direction to prevent its rotation backwards (direction depends on whether you are raising or lowering the mechanism; the motor shaft rotates in the opposite direction as the main shaft of the gate).
2. Place the Lock Bar on the motor output shaft in the proper orientation (“Keeps Gate Up” or “Keeps Gate Down” position). Do not engage the Lock Bar with the Reaction Pin. Rotate the Lock Bar to raise or lower the gate. Once the gate is in the desired position, slide the Lock Bar over the Reaction Pin and secure in place using the Cotter Pin.

### 4.3.5 Spring Buffer Adjustment

The Model S-60 Entrance gate mechanism is equipped with external, adjustable spring buffers for horizontal gate arm positioning and vertical protection of the assembly.



#### CAUTION

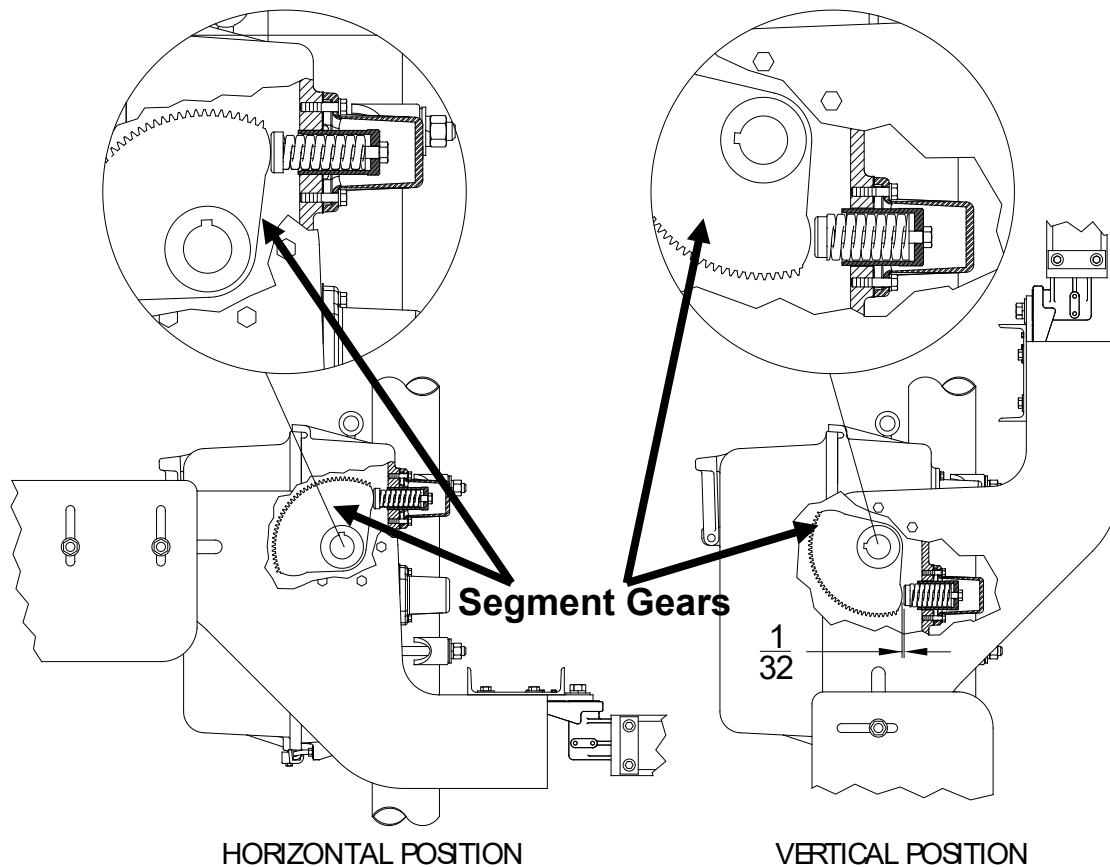
FIELD ADJUSTMENT OF THE SPRING BUFFERS IS NECESSARY. VERTICAL BUFFER SHOULD CLEAR SEGMENT GEAR BY 1/32". THESE ADJUSTMENTS SHOULD ALWAYS BE CHECKED BEFORE PLACING THE GATE IN SERVICE.

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

**To adjust horizontal position** – with arm horizontal, remove the buffer cap from the top buffer, loosen the locking ring and thread buffer into gate housing to raise the gate arm.

The vertical buffer supports the weight of the counterweights during installation and if the gate arm is knocked off, however there should be no contact with the segment gear during normal operation (1/32" gap per the illustration).

**To adjust the vertical buffer** – with arm vertical, remove the lower buffer cap, loosen the locking ring and adjust the buffer so that there is a  $\frac{1}{32}$ " clearance (use plastic card as a gauge). Tighten locking ring and install buffer cover.



**Figure 4-4 Spring Buffer Adjustment – Horizontal and Vertical Positions**

**4.3.6 Counterweight Guidelines**

The charts below provide Counterweight and Torque guidelines for Fiberglass/Aluminum Gate Arms.

**Table 4-1 Fiberglass/Aluminum Gate Arm Counterweights and Vertical Torque**

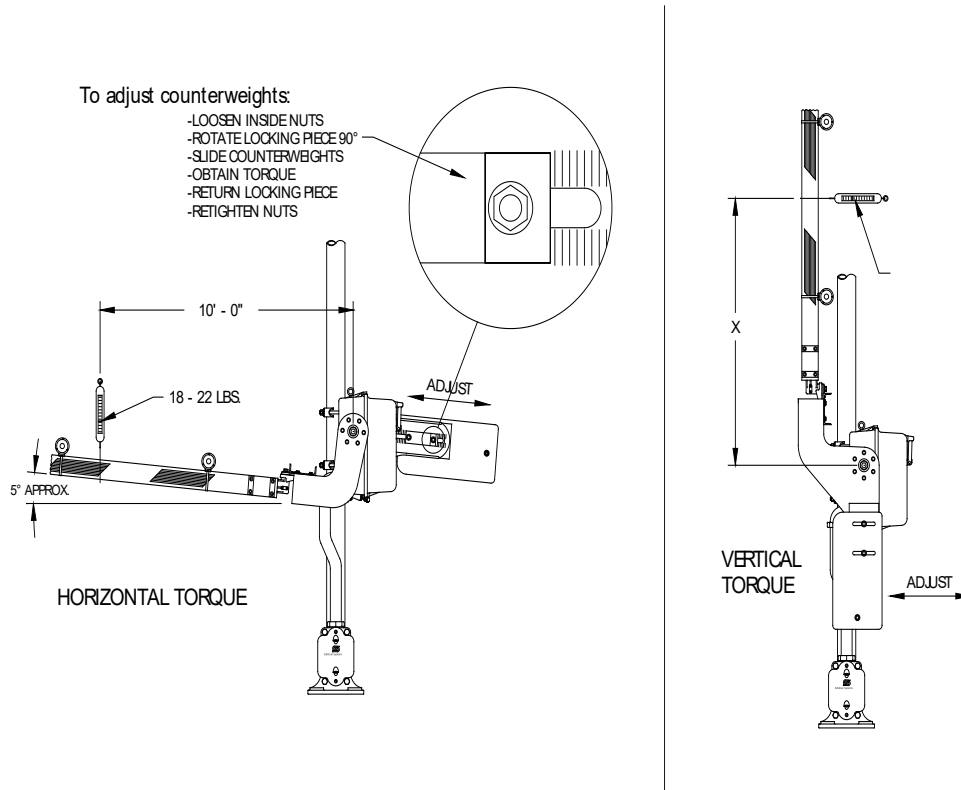
Table 1 – Fiberglass and Fiberglass/ Aluminum Gate Arm Counterweights and Vertical Torque										
Counter-weights mounted on one Support Arm	Gate Arm Length in feet	Counterweights Required		Stud Plate 070757		Distance "X" in feet	Scale Reading		Torque Range	
		Std.	Short	Std.	Short		Min.	Max.	Min.	Max.
		12' – 15'	1	3	-26X		-30X	5'	30	35
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	
Counter-weights 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

**NOTE**  
 The values listed in Table 4-1 are approximate as there are differences between various Gate Arm Manufacturers.

**NOTE**  
 Due to variations in gate arm cross sections, arm material, gate arm lights, and gate arm adapters, torque must be checked. Table 1 is a rough approximation when using a conversion bracket.

### 4.3.7 Torque Adjustments (Using Spring Scale)

The diagram below details the adjustment for Horizontal and Vertical torque.



**Figure 4-5 Torque Adjustments (Using Spring Scale)**

#### Horizontal Torque

Follow steps listed in Section 4.3.8.1 using a spring scale in place of the torque wrench.

#### Vertical Torque

Follow the steps listed in 4.3.8.2 using a spring scale in place of the torque wrench. Spring scale readings and locations are listed in the torque tables on.

### 4.3.8 Torque Adjustments (Using Siemens Torque Wrench)

Siemens Torque Wrench Kit permits measurements to be taken from the  $\frac{1}{2}$  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  $\frac{1}{2}$  inch hexagon of the motor shaft.



**CAUTION**

COMMERCIALY AVAILABLE TORQUE WRENCHES SHOULD NOT BE USED TO ADJUST HORIZONTAL AND VERTICAL TORQUES, AS THEY ARE NOT DESIGNED TO ACCOUNT FOR THE 240:1 GEAR RATIO OF THE DRIVE TRAIN.

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

- Torque Wrench (calibrated for both inch-pound and foot-pound readings through the 240:1 gear reduction)
- Ratchet Wrench (3/8 in 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
- Instruction Sheet

#### 4.3.8.1 Horizontal Torque

Open the gate housing cover. Lower the gate to the full horizontal position by opening the gate control gold nut TB-1 on the PCB. Once the gate arm reaches the horizontal position, the gold test nuts on terminals 4 and 5 can be opened to remove all power leading to the PCB. With the gate arm in the horizontal position, install the S-60 lock bar orientated to keep the gate up and manually lift the gate arm to about 5 degrees from horizontal. The lock bar will hold the gate in this position.

Place a 7/16" open-ended wrench on the extended motor shaft on the brake end of the motor. Rotating the wrench slightly will remove pressure of the lock bar against the reaction pin and the lock bar can be removed. Install the Siemens Torque wrench to the pinion end of the motor shaft and slowly lower the torque wrench to rest against the cover. Note that moving the torque wrench in this particular direction is lowering the gate arm. Do not move or wiggle the cover from this point forward. Record the torque value.

Continue to take 5 more horizontal torque readings as follows. Rotate the brake end of the motor shaft slightly so the torque wrench can be removed. Rotate the torque wrench 60 degrees (one flat) and reinstall. Lower the torque wrench to the cover edge and record the torque value. Repeat until 1 full revolution of the output shaft has been checked. The lowest reading recorded is the horizontal torque.



**WARNING**

**DO NOT CHANGE THE POSITION OF THE COUNTERWEIGHTS WITH THE TORQUE WRENCH IN PLACE.**



**NOTE**

Please note that the horizontal torque has been increased from 80 - 120 ft. lbs. to 180 - 220 ft. lbs.



If adjustment of counterweights is required, recheck torque to verify proper torque range as described above.

When proper reading is obtained, remove torque wrench and reapply power.

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

- A) Horizontal torque does not exceed 250 foot-pounds.
- B) Gate up current does not exceed 15 amps.
- C) Snub adjustments provide acceptable descent time.
- D) Vertical torque is within specified limits.
- E) Increased gear and brush maintenance may be required. Clean gears and reapply Aeroshel #7 or equivalent grease when signs of wear are evident.

#### **4.3.8.2 Vertical Torque**

Make sure the torque wrench has been removed from the output shaft and the lock bar has been installed to keep the gate up before proceeding. Close the test links on terminals 4 and 5 allowing the PCB to power up. Close the Gold Nut on the PCB TB-1 and the gate should go to the vertical position. Once the gate is in the vertical position, remove power to the gate by first opening the test links on terminals 4 and 5 and then opening TB-1. The lock bar will hold the gate in the vertical position.

Place a 7/16" open-ended wrench on the extended motor shaft on the brake end of the motor. Rotating the wrench slightly will remove pressure of the lock bar against the reaction pin and the lock bar can be removed. Install the Siemens Torque wrench to the pinion end of the motor shaft and slowly lower the torque wrench to rest against the cover. Note that moving the torque wrench in this particular direction is lowering the gate arm. Do not move or wiggle the cover from this point forward. Record the torque value.

Take 5 more vertical torque readings by rotating the brake end of the motor shaft slightly until the torque wrench can be removed, then rotate the torque wrench 60 degrees and reinstall. Lower the torque wrench to the cover edge and record the torque value. Repeat this until 1 full revolution of the output shaft has been checked. The lowest reading recorded is the vertical torque.

Segment gear should not be touching bumper on the main shaft.

To make a vertical torque adjustment with the gate in the vertical position, reinstall the lock bar to keep the gate up, move the counterweights in or out to increase or decrease the torque and tighten the nuts. Recheck the torque if needed but note that you just rotated the motor output shaft one turn and lowered the gate arm about 2 degrees.

Remove the 7/16" wrench, torque wrench and lock bar and allow the gate to drop to horizontal by gravity. Close the test links on the terminal board 4 and 5 and then close TB-1 and the gate should go to the vertical position.

4.3.9 S-60 Installation Overview

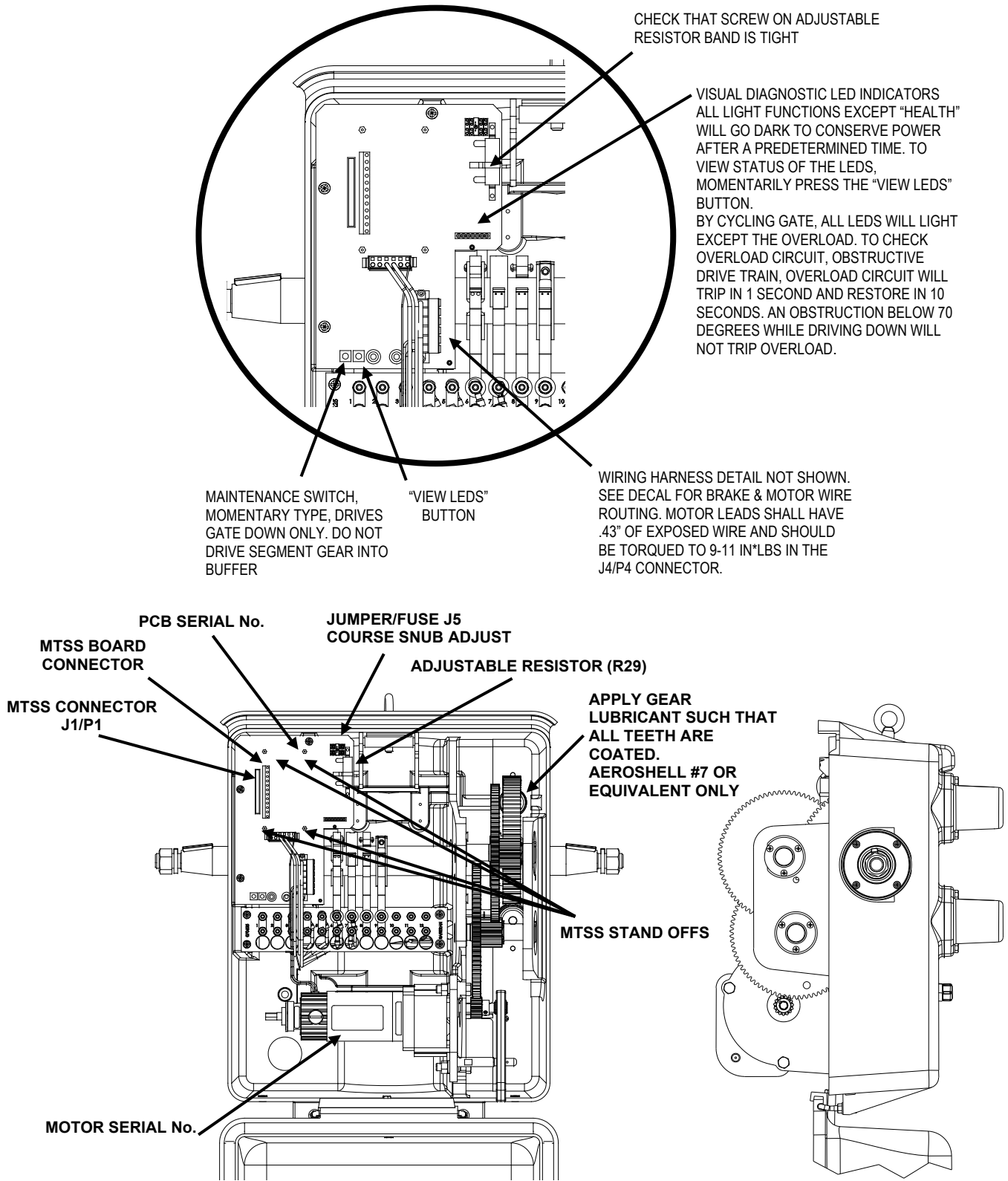


Figure 4-6 S-60 Installation Overview

### 4.3.10 Contact Adjustments

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

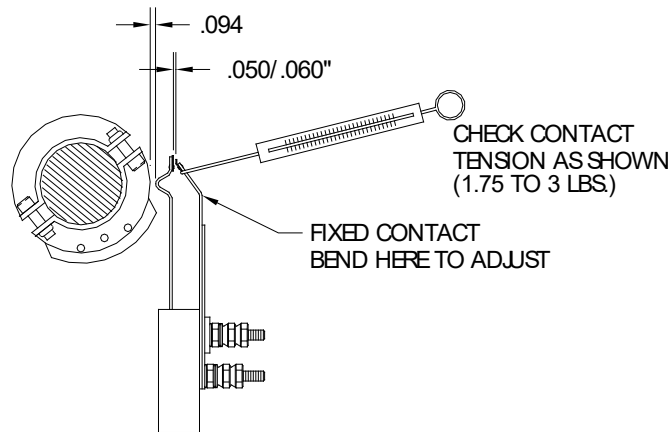
Contacts are set as shown below. The rear or movable contact rarely requires adjustment unless being replaced. The contact opening can increase with use and should be checked periodically and adjusted if required. The openings should not exceed 1/16". Contact adjustments can be made by adjusting the bend angle of the front or fixed contact with a contact forming tool. Set the 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 should be between 28 and 48 oz. (1-3/4 to 3 lbs.).

Contact tools and gages are available, see Section 5.2 for ordering information.



**CAUTION**

REPEATED OR OVER BENDING OF A CONTACT MAY CAUSE DAMAGE AND NOT ALLOW PROPER TENSION WHEN CLOSED.

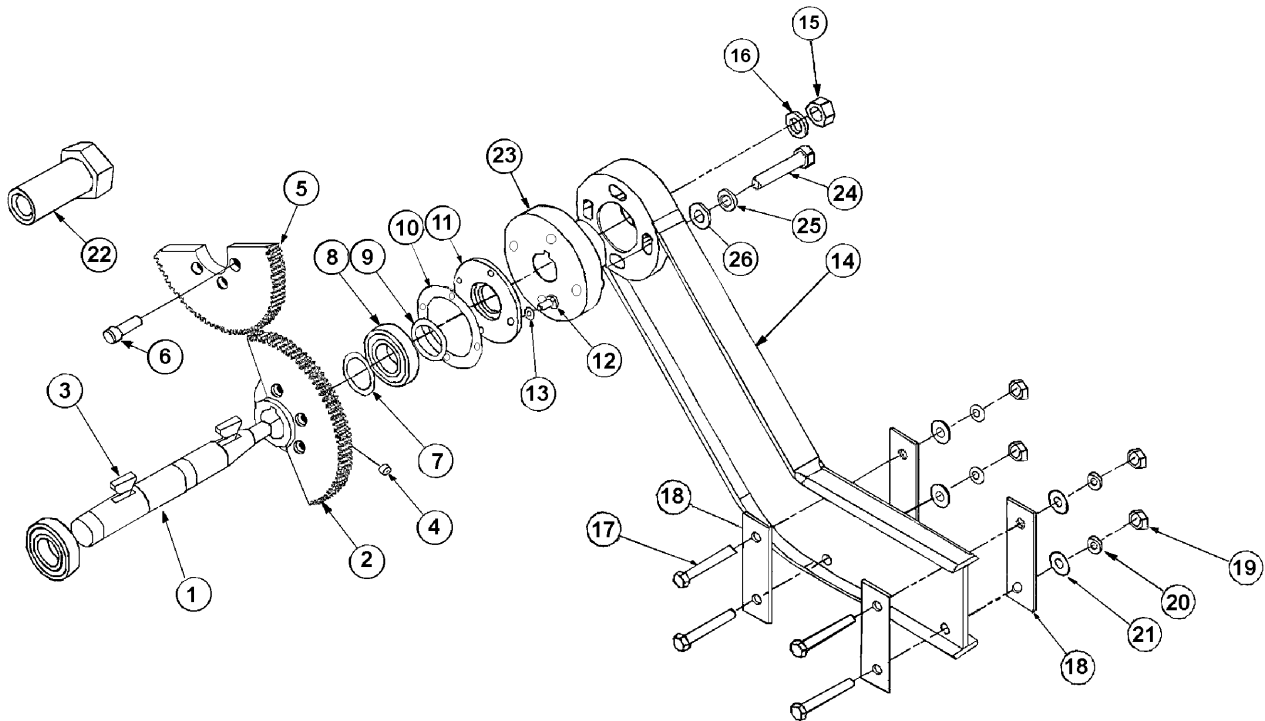


Terminal Board Position Number	Contact Closed with Gate Arm at	Function of Contact
6	70 degrees - 90 degrees	Power Down Control
7	0 degrees - 89 degrees	Power Up Control
8	83 degrees - 90 degrees	Spare (Flashing Light Control)
9	5 degrees - 90 degrees	Spare (Bell Control)

### 4.3.11 Auxiliary (Sidewalk) Arms – Additional Instructions and Adjustments

The Auxiliary Arm adjustment is a one person operation performed as follows:

- 1) Lower the main gate arm to horizontal position.
- 2) Loosen the four setscrews (item 24) from the sidewalk arm gear (item 2).
- 3) Raise or lower the sidewalk Auxiliary Arm to the level horizontal position.
- 4) Tighten the four cap screws (item 24).
- 5) Test the gate operation.



**Figure 4-7 Auxiliary (Sidewalk) Arm Assembly**

**NOTE**

**NOTE**

An auxiliary arm cannot be retrofitted to a normal entrance gate in the field, the housing has different machined features

**4.3.11.1 Auxiliary (Sidewalk) Arm Assembly Bill of Materials 073001-2**

<b>Item No</b>	<b>Description</b>	<b>Qty Req'd</b>	<b>Part Number</b>
1	Shaft, Sidewalk Arm	1	073020
2	Gear Assembly, Sidewalk Arm	1	070569-AX
3	Woodruff Key #D	2	007102
4	Set Screw, 3/8" – 16 x .31"	2	004655-SC
5	Gear, Bottom	1	070569-1A
6	Cap Screw, Socket Head 3/8" – 16 x 1.25" Locking	3	004089-2
7	Retaining Ring	1	073021
8	Bearing	2	073022
9	O-Ring 1-3/16" I.D.	1	073023
10	Gasket, Seal Plate	1	073025
11	Seal Plate	1	073024
12	Machine Screw, Phil Pan Head 1/4" – 20 x 5/8"	4	002659-PEX
13	Washer, Lock 1/4"	4	001808-ME
14	Sidewalk support arm, adjustable	1	070759-54
15	Nut, Hex 5/8" – 18	1	002113-E
16	Washer, Lock 5/8"	1	001814-ME
17	Cap Screw, Hex Head 3/8" – 16 x 2.75"	4	004095-HSC
18	Plate, Washer	4	070763-1
19	Nut, Hex 3/8" – 16"	4	002104-SC
20	Washer, Lock	4	001810-MSC
21	Washer, Flat 3/8"	4	001753-C
22	Nut, Extended 1" - 8	1	074038
23	Hub, Shaft, Sidewalk Support arm	1	070759-51
24	Cap Screw, Hex Head, 1/2" - 13 x 2.5"	4	004172-HSC
25	Washer, Lock, 1/2"	4	001812-MSC
26	Washer, Flat, 1/2"	4	001730-SC

### 4.3.12 Final Inspection

**NOTE**

**NOTE**

When using Gold Nut to operate gate mechanism, take care to make quick, positive contact.

- A. **Voltage at terminal posts 4 & 5-** Should be no less than 11 or more than 16 volts DC.
- B. **Check for possible grounds.**
- C. **Check voltage and current during operation.**
  - Voltage should **not drop below 11 volts** during gate up cycle.
  - Gate up current should be 6-15 amps (longer arms require more current).
  - Power down current should be 6-15 amps.
- D. **Check clearing and descending times.**
  - Clearing time varies with length of arm but should be between 6 and 10 seconds.
  - Descending time with power down is between 10 and 15 seconds.
  - Descending time without power down - Disable the power down circuit by blocking contact #6 with a plastic card and open Gold Test Link on PC Board. The descent time should not be more than 20 seconds.
- E. **Check terminal board contacts.** Check clearance, square contact and wiping action per Section 4.3.10.
- F. **Brake air gap** - using Air Gap Tools (part numbers 074070-C & 074070-D) verify air gap is no less than 0.015" and no more than 0.020".

**⚠ WARNING**

**WARNING**

**WHEN PLACING THE GATE IN SERVICE, OBSERVE PROPER OPERATION WITH TRAIN ACTIVATION OF THE CROSSING AND PERFORM ANY ADDITIONAL TESTS IN ACCORDANCE WITH RAILROAD PROCEDURES.**

## SECTION 5 MAINTENANCE

### 5.0 MAINTENANCE

#### 5.1 GENERAL

This section will provide a maintenance requirements and procedures.

#### 5.2 TOOLS

The following is a list of tools included with every gate mechanism.

- S-60 Maintenance & Installation Kit part # 074050-X (included with every gate mechanism) includes:
  - a. S-60 I&M Manual (Siemens part #074050)
  - b. 1/8" Allen wrench for motor pinion gear (Siemens part # 007650)
  - c. 3/16" Allen wrench for cams & motor adapter plate (Siemens part # 070554-1)
  - d. 5/64" Allen wrench for brake armature adjustment (Siemens part # 007655)
  - e. 9/64" Allen wrench for brake housing (Siemens part # 007656)
  - f. 3/32" Allen wrench for PCB & MTSS fasteners (Siemens part # 007657)
  - g. 0.015" Brake Adjusting Shim (Siemens part # 074070-C)
  - h. 0.020" Brake Adjusting Shim (Siemens part # 074070-D)
  - i. Retainer (Siemens part # 070983-3)
  - j. 5/8" x 3/4" Bushing (Siemens part # 070983-2)
  - k. 1/4" x 3/8" Busing (Siemens part # 070983-1)
  - l. Torque Card (Siemens part # 070982-2)

The following are a list of tools recommended but not provided with the gate mechanism:

- 1-1/2" open-end wrench (main shaft to hub nuts)
- 1-1/8" open-end wrench (counterweight support studs/nuts)
- 3/4" wrench (motor adaptor plate to housing bolts / nuts, conversion bracket)
- #3 Phillips head screw driver (PCB to housing, terminal board assy. to housing)
- #2 Phillips head screw driver (adjustable resistor)
- #2 Standard screw driver (P4/J4 connector, fixed resistor connection)
- Cage Clamp tool for P3/J3 connector (Siemens part #Z919-00009-0000)
- AREMA terminal wrench (Siemens part # 032619-9X)
- 9/16" & 1/2" wrenches (gate arm)
- Loctite® 243 Threadlocker
- Contact Forming Tool (Siemens part # 073112)
- Contact Setting (Feeler) Gauge (Siemens part # 073112-1)
- Contact Spring Scale (Siemens part # 073000-16)

### 5.3 PERIODIC LUBRICATION

Model S-60 Gate Mechanisms have sealed bearings on the main shaft, idler gear shafts and on the auxiliary sidewalk arm shaft when so equipped. No bearing lubrication is required. Gearmotor bearings are sealed with all temperature grease and 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 the number of gate operations. Clean thoroughly and reapply grease every two years or when signs of gear wear are evident.



**CAUTION**

USING THE IMPROPER LUBRICANT ON THE GEARS MAY CAUSE THE GATE OPERATION SPEED TO DECREASE.

### 5.4 PERIODIC INSPECTION

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

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 a stalled condition. It is NOT recommended that a darkened commutator be cleaned. Visually inspect the commutator bars by first removing the brush from the holder and looking through the brush holder while rotating the extended motor shaft near the brake. The brush can be extracted by removing the plastic, threaded cover and using a small screwdriver to dislodge the brush spring clip. The commutator is made up of segments of copper and will appear rectangular when looking through the brush holder. If the commutator bar is worn through, evident by oblong spots forming in the center of each rectangular segment, the motor will have to be replaced.

Ensure that when brushes are removed, that they are installed in the same holder and the same orientation in the holder. Otherwise, the brushes may not seat correctly against the commutator. The brushes have numbers on one side.

The brushes have a wear line scribed into the side of the brush to indicate the usable length of the brush. Typical applications will need the brushes changed in the 250,000 to 400,000-cycle operation range.

The first sign of brush or commutator wear will be inconsistent snubbing in the downward direction. A commutator should last for 2 to 3 brush sets depending on length of gate arm and accuracy of horizontal and vertical torque settings.



**⚠ CAUTION****CAUTION**

REMOVE THE BRUSH DUST OFF OF THE BRUSH SURFACE AND FROM INSIDE THE BRUSH HOLDER. THE BRUSH CAN BE WIPED OFF WITH A CLEAN, LINT-FREE RAG. **DO NOT WIPE OFF THE COMMUTATOR SURFACE.**

**5.5 MOTOR BRUSH WEAR AND REPLACEMENT**

Figure 5-1 displays the gearmotor brushes wear information.

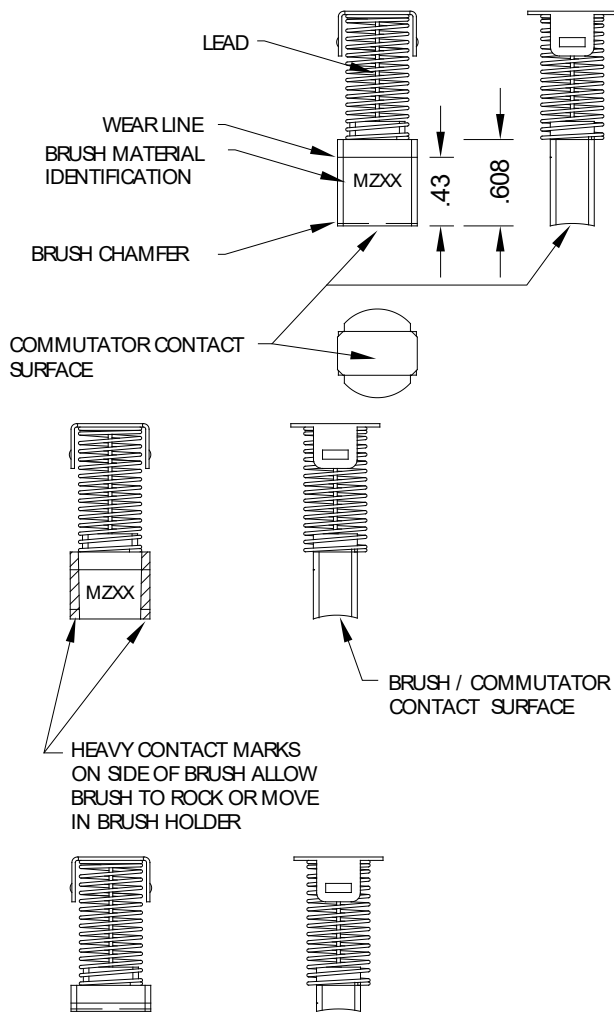
**⚠ WARNING****WARNING**

**IF GATE SHOWS SIGNS OF ERRATIC DOWNWARD OPERATION, THE BRUSHES SHOULD BE CHANGED. IF PROBLEM REPEATS AFTER NEW BRUSHES ARE INSTALLED, THE COMMUTATOR HAS BEEN DAMAGED AND THE MOTOR WILL HAVE TO BE REPLACED.**

**NOTE****NOTE**

Each brush has markings on one side. Do not change brushes from side to side. Brushes should be reinstalled in the same orientation.

S-60 GEAR MOTOR BRUSH DETAILS



THE S-60 GATE ONLY DYNAMICALLY BRAKES (SNUBS) IN ONE DIRECTION AND WILL CAUSE BRUSH SIDE WEAR MARKS. REPLACE BRUSH WHEN SIMILAR MARKINGS START TO APPEAR. BRUSHES SHOULD LAST 250,000 CYCLES ON FIRST SET DEPENDING ON GATE SET UP.

THIS TYPE OF WEAR IS TYPICAL OF LONG GATES WITH HEAVY SNUBBING OF MOTOR AND MEDIUM LENGTH GATES WITH THE INCREASED HORIZONTAL TORQUE WHEN USING A GATE ARM RETURN DEVICE

WORN BRUSH EXAMPLE

SIEMENS RECOMMENDS CHANGING THE BRUSH AFTER THE BRUSH MATERIAL MARKINGS ARE NO LONGER VISIBLE. AT THIS POINT THERE WILL BE .080" OF USABLE BRUSH LENGTH.

Figure 5-1 Gearmotor Brush Details



**WARNING**

**WARNING**

WHEN PLACING THE GATE IN SERVICE, OBSERVE PROPER OPERATION WITH TRAIN ACTIVATION OF THE CROSSING AND PERFORM ANY ADDITIONAL TESTS IN ACCORDANCE WITH RAILROAD PROCEDURES.

## 5.6 PERIODIC MOTOR TESTING AND MAINTENANCE

### 5.6.1 Motor Insulation Resistance Testing

Gates that operate frequently (30 trains or more per day) should be periodically tested for insulation resistance to ensure that the motor has not become grounded due to excess brush dust build-up inside the motor housing. Siemens recommends that gates that operate frequently (30 trains or more per day) be checked every six months. Gates in lower density areas should be tested annually.

**WARNING****WARNING**

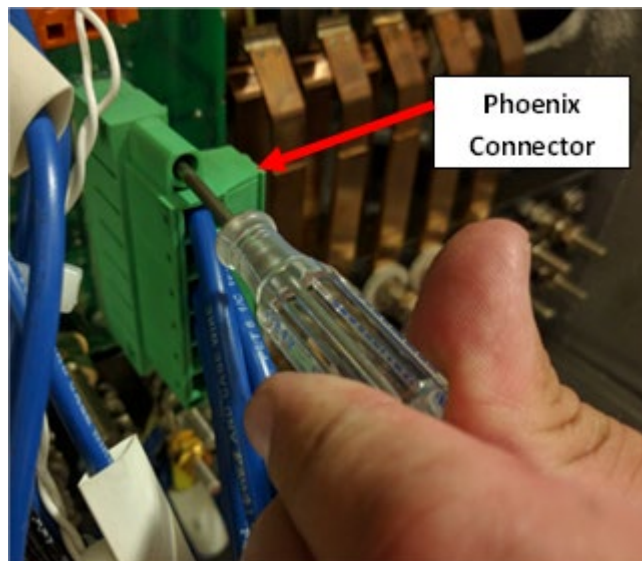
THE RAILROAD PROCEDURES GOVERNING HOW TO TAKE A CROSSING OUT OF SERVICE AND RESTORED TO SERVICE SHALL BE FOLLOWED. THE INSTRUCTIONS IN THIS MANUAL MAY BE FOLLOWED ONLY IF ALLOWED BY THE RAILROAD AND/OR AUTHORIZING AGENCY.

- Lower the mechanism to the horizontal position taking all necessary precautions to protect the crossing and personnel.

**WARNING****WARNING**

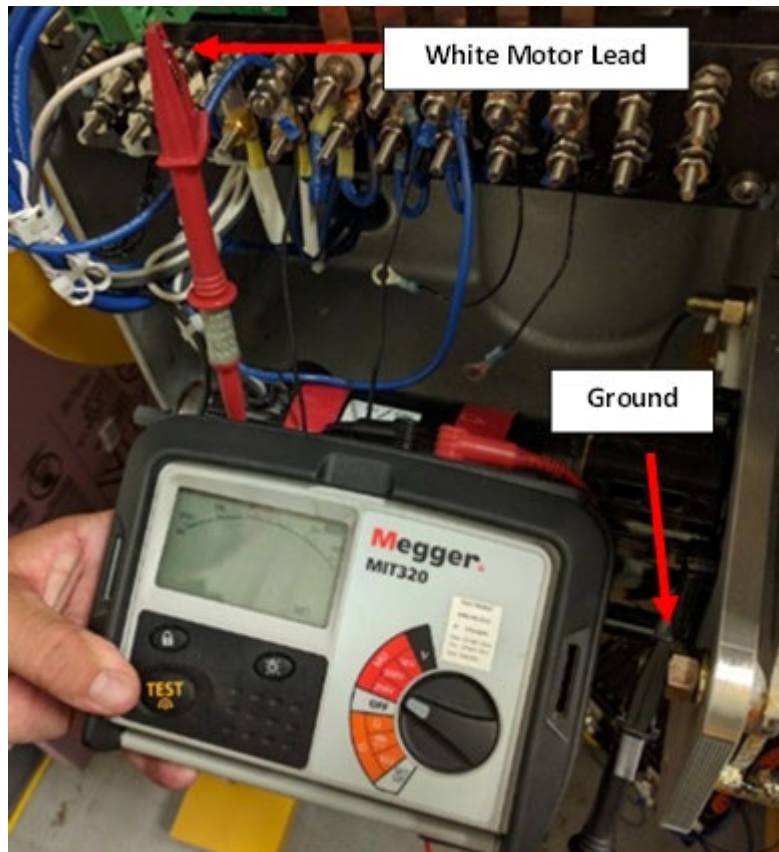
THE GATE SHOULD BE IN THE HORIZONTAL POSITION PRIOR TO REMOVING THE PHOENIX® CONNECTOR. FAILURE TO DO SO WILL RESULT IN AN UNCONTROLLED DROP OF THE GATE ARM.

- Remove the green Phoenix® connector from the control board by loosening the two connector retaining screws (top & bottom) with a small flat blade screwdriver as shown in Figure 5-2.



**Figure 5-2 Remove Phoenix® Connector from Control Board**

- Using a small, flat blade screwdriver, remove the WHITE motor lead from the Phoenix® connector.
- Using a Megger (Insulation Resistance Tester), measure the insulation resistance between the disconnected WHITE motor wire and the motor mounting hardware (ground) as shown in Figure 5-3.



**Figure 5-3 Using Megger to Check Insulation Resistance**

- If there is any indication of resistance breakdown (100 Mega-ohms or less on a 250 Volt scale) it is recommended that the motor be cleaned at your earliest convenience. The motor can be exchanged and returned to Siemens for cleaning or you can perform the Motor Field Cleaning Procedure outlined in Manual Section 5.6.2.
- If no breakdown is detected, re-install the WHITE motor wire back into the Phoenix® connector and repeat the same test on the BLACK motor wire.
- After all tests have been completed, ensure wires are secured into the Phoenix® connector and reinstall the connector to the S-60 control board. Secure connector with retaining screws and test the gate for proper operation.

## 5.6.2 Motor Field Cleaning Procedure

**⚠ WARNING**

**WARNING**

THE RAILROAD PROCEDURES GOVERNING HOW TO TAKE A CROSSING OUT OF SERVICE AND RESTORED TO SERVICE SHALL BE FOLLOWED. THE INSTRUCTIONS IN THIS MANUAL MAY BE FOLLOWED ONLY IF ALLOWED BY THE RAILROAD AND/OR AUTHORIZING AGENCY.

- Lower the mechanism to the horizontal position taking all necessary precautions to protect the crossing and personnel.
- Remove outside brush from motor as shown in Figure 5-4. **Note: Remember to reinstall brush the same way it was removed.**



Figure 5-4 Removing Outside Brush from Motor

- Siemens recommends using the following equipment for extracting the brake dust from the motor housing. See Figure 5-5.
  - DeWalt DCV581H AC and portable 20 volt DC vacuum\*
  - Wet Dry Vacuum Micro Cleaning Kit #648846000954)\*
  - Universal Rubber Bushing (Hillman Group # 884621)\*

\*Note- All of these products are available at your major home improvement centers or from your online retailer.



**Figure 5-5 Recommended Wet/Dry Vacuum**

- Attach the vacuum as shown in Figure 5-6. Rotate the motor armature during the vacuuming process by turning the shaft by hand at the brake end. It may be necessary to repeat the vacuuming procedure more than once to fully clear the grounds.



**CAUTION**

MAKE SURE THE VACUUM HOSE IS CONNECTED TO THE VACUUM PORT AND NOT THE BLOWER PORT ON THE UNIT. DO NOT BLOW FORCED AIR INTO THE MOTOR AS THAT WILL BLOW THE BRUSH DUST DEEPER INTO THE ARMATURE HOUSING OF THE MOTOR.



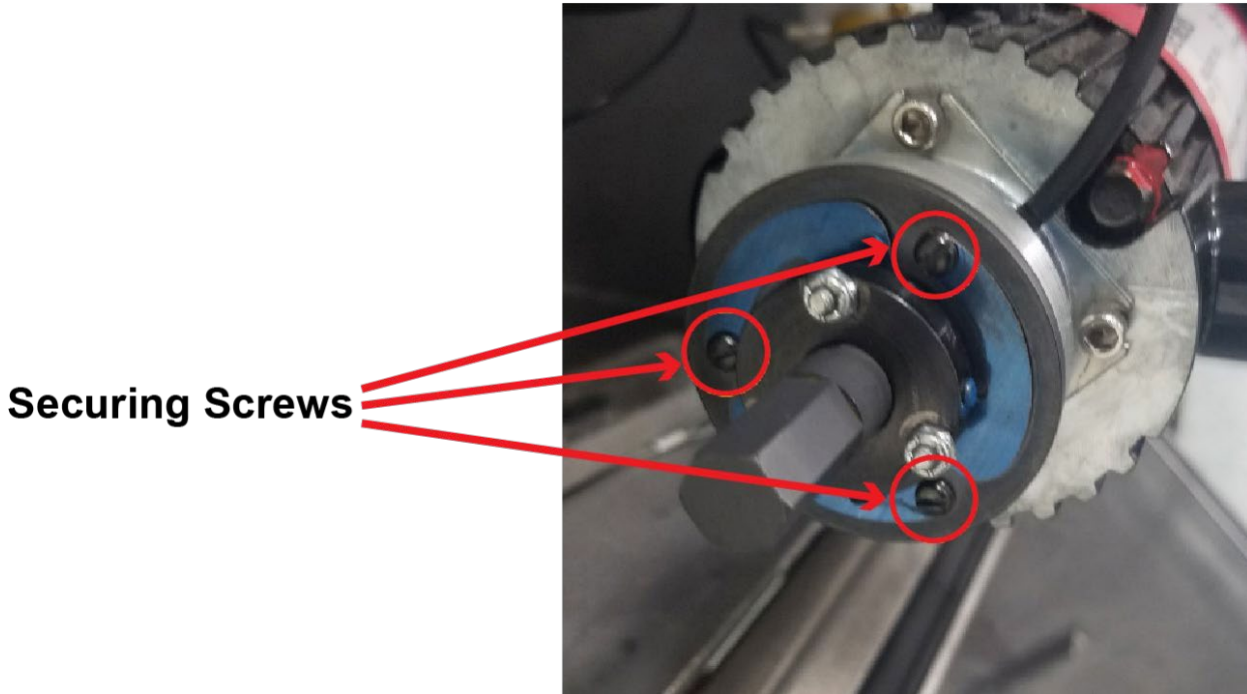
**Figure 5-6 Attaching Vacuum to Motor**

- Re-check the motor for grounding per Section 5.6.1. If all grounds are clear then reinstall the motor brush (in the same position it was removed; alphanumeric characters facing upwards), ensure the security of all motor wires and test the gate for proper operation.

### 5.7 VISUAL BRAKE INSPECTION

Inspect for the presence of the three (3) screws securing the brake armature leaf springs to the brake armature housing as shown in the following figure.

If the brake screws are present and visually appear to be properly fastened, then no further action is required. DO NOT ATTEMPT TO TIGHTEN BRAKE SCREWS.



**Figure 5-7 Location of Brake Screws**

**⚠ CAUTION**

**CAUTION**

THE BRAKE SCREWS ARE NOT USER SERVICEABLE PARTS AND CAN BE EASILY DAMAGED OR BROKEN IF HANDLED IMPROPERLY. DURING MANUFACTURING THREAD COMPOUND IS APPLIED TO THE BRAKE SCREWS TO KEEP THEM SECURE. TWISTING THE BRAKE SCREW HEAD COULD RESULT IN REDUCING THE EFFECTIVENESS OF THE THREAD COMPOUND.

**⚠ WARNING**

**WARNING**

IF ANY OF THE BRAKE SCREWS BECOME DISLODGED, THE BRAKE MAY NOT FUNCTION AS INTENDED. DO NOT ATTEMPT TO REPLACE OR TIGHTEN THE BRAKE SCREWS. IMMEDIATELY REPLACE THE MOTOR/BRAKE ASSEMBLY.

IF THE BRAKE DOES NOT FUNCTION AS INTENDED, THE GATE ARM MAY NOT REACH FULL HORIZONTAL POSITION FOR AN ENTRANCE GATE, OR FULL VERTICAL POSITION FOR AN EXIT GATE.



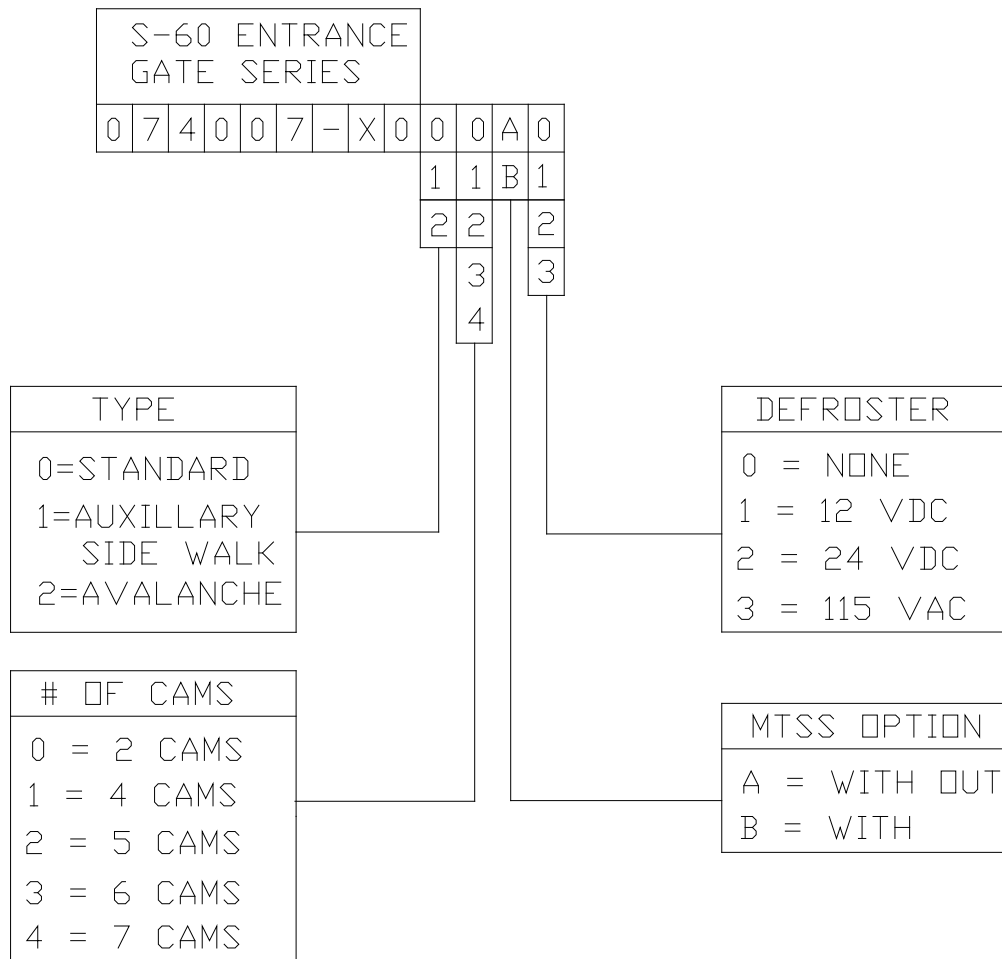
## SECTION 6 ENTRANCE GATE ORDERING INFORMATION

### 6.0 ENTRANCE GATE ORDERING INFORMATION

### 6.1 S-60 ENTRANCE GATE MECHANISM ORDERING INFORMATION

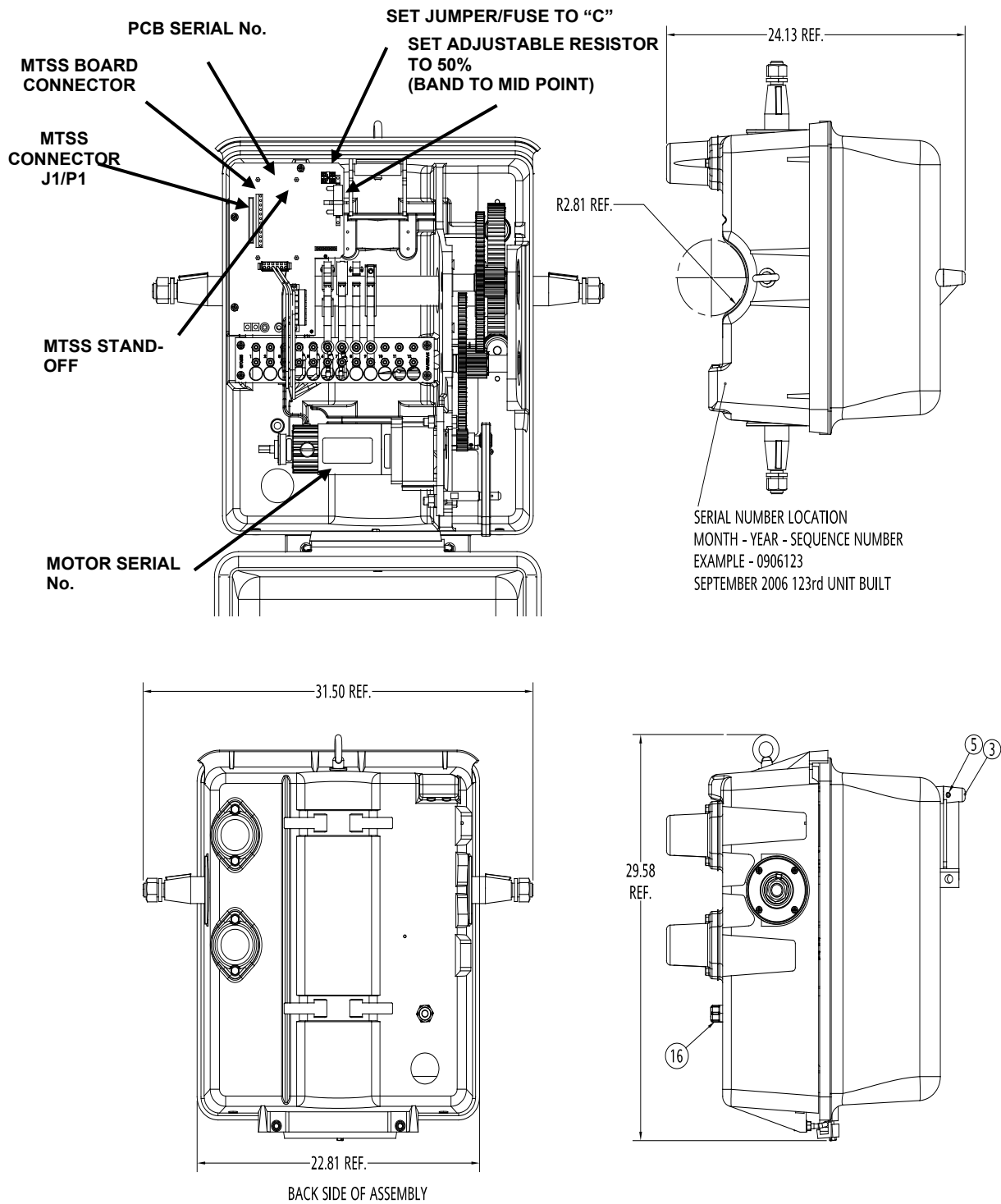
The following is the S-60 Entrance Gate ordering information:

#### S-60 STANDARD ORDERING INFORMATION



**Table 6-1 S-60 Entrance Gate Ordering Information**

# ENTRANCE GATE ORDERING INFORMATION



**Figure 6-1 S-60 Assembled View**

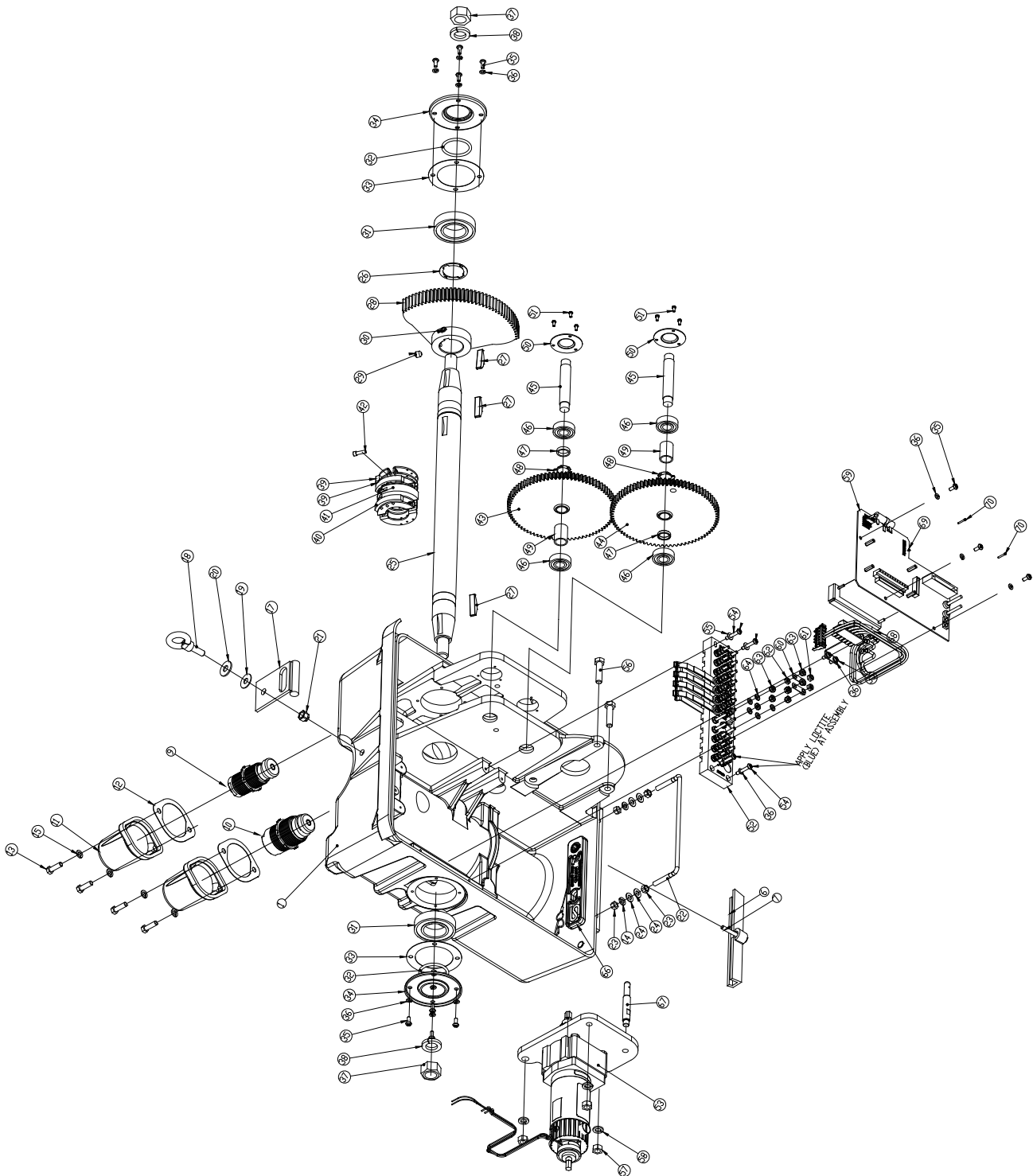


Figure 6-2 S-60 Exploded View

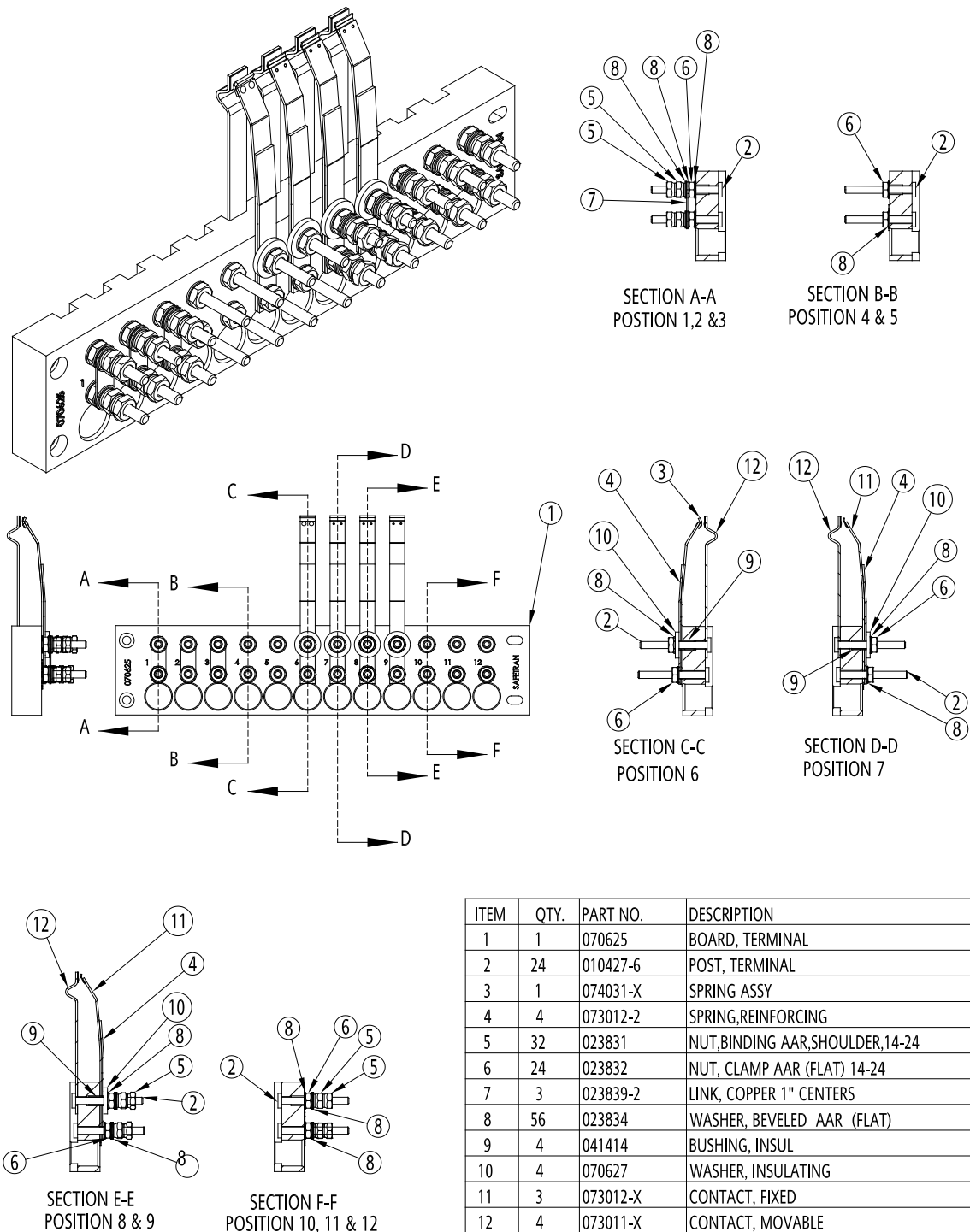
ENTRANCE GATE ORDERING INFORMATION

6.1.1 S-60 Entrance Gate Bill of Materials / Replacement Parts

Table 6-2 Bill of Materials – 074007-X001 4 Contact, without Defroster & MTSS Option

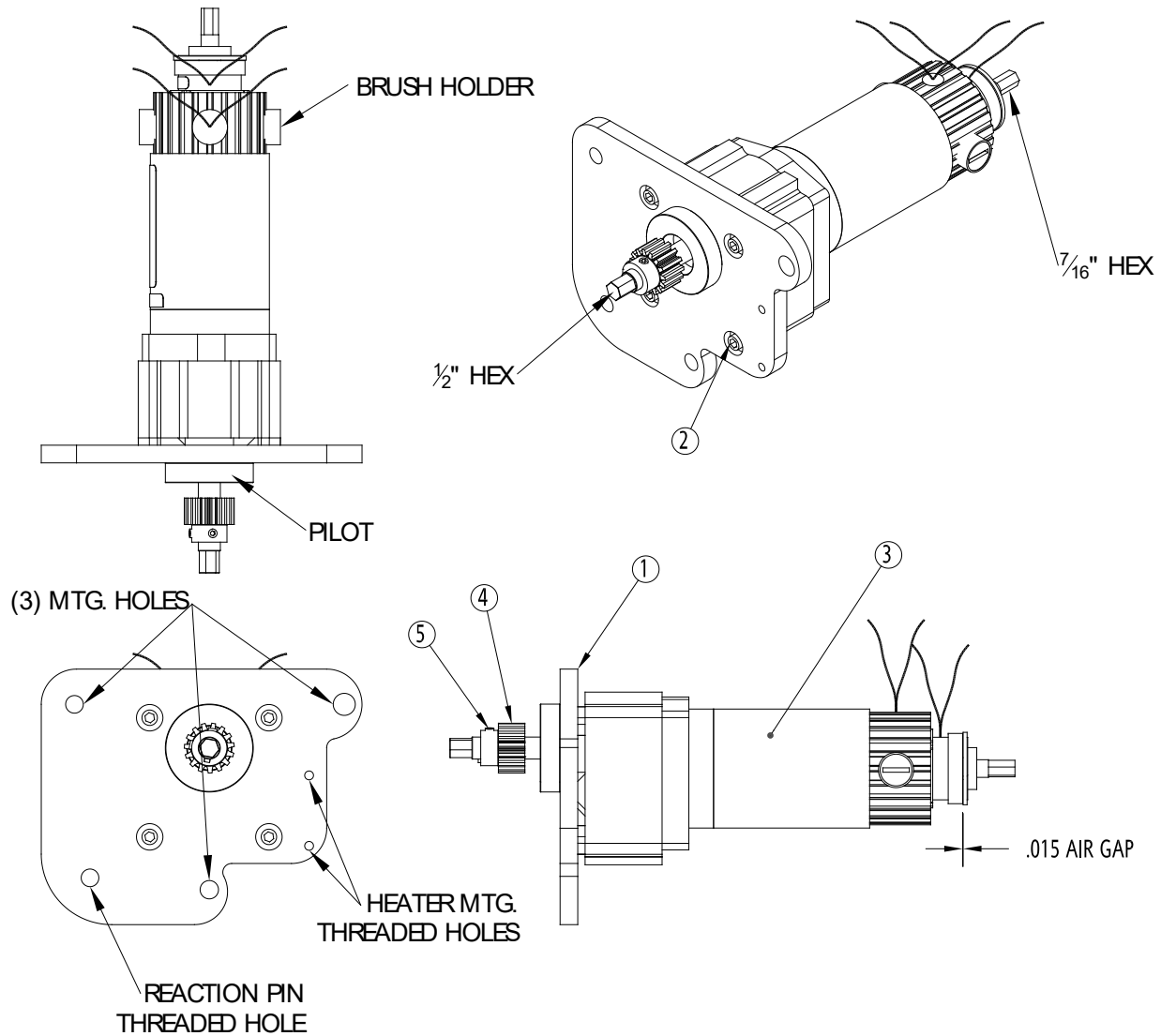
Item No	Description	Component	Qty	Item No	Description	Component	Qty
1	CABINET, GATE	073001-1	1	41	SWITCH ASSY, SNAP	073014-AX	1
2	WELDMENT, COVER	073002-X	1	42	CS SH 1/4-20 X.875	004003-SSC	4
3	HANDLE, LATCH	070909-4	1	43	GEAR & PINION UP	073004	1
4	ROD, LATCH	070919-2	1	44	GEAR & PINION,LOWER	073005	1
5	SS SH 3/8-16 X .50	004658-E	1	45	SHAFT, GEAR	073007-1	2
6	RETAINER, HINGE	070968-4	1	46	BEARING 3/4	070588	4
7	MS HH 5/16-18 X2.5	002692-HE	1	47	SPACER 1/4	073009-3	2
8	GASKET, COVER	070559-A	1	48	WASHER, SPRING	070695-500	2
9	BUFFER ASSY, UPPER	070903-X	1	49	SPACER 1-1/2	073009-2	2
10	BUFFER ASSY, LOWER	070903-2X	1	50	COVER, BEARING	073007-2	2
11	CAP, BUFFER	070902-1	2	51	MS TR 10-32 X .375	002614-TEX	6
12	GASKET, BUFFER CAP	070926-1	2	52	TERMINAL BD ASSY, S-60 4 CAM	074030-X001	1
13	CS HH 3/8-16 X1.25	004089-HSC	4	53	MS PH 1/4-20 X 1.5	002665-PEX	4
14	W LKS M 3/8	001810-ME	2	54	W FA 1/4 STNLS	001717-E	2
15	W LKS M 3/8	001810-MSC	4	55	ASSY, S-60 MTR & ADAPTOR PLATE	074070-X5	1
16	CONNECTOR, RELIEF	007304-2	1	56	CS HH 1/2-13 X 2	004170-HSC	3
17	DOOR STAPLE	070919-3X	1	57	N HX 1/2-13	002108-SC	3
18	EB 1/2-13 X 1.50	007099	1	58	W LKS M 1/2	001812-MSC	3
19	WASHER, NEOPRENE	070980-4	1	59	ASSY, S-60 ENTRANCE PCB, 12VDC	9000-25527-0001	1
20	W FA 1/2	001755-E	1	60	TEST LINK ASSY, W/ 1" CENTERS	024620-3X	2
21	N FL F-L 1/2-13	002327-FLSC	1	61	NUT, GOLD TEST	024620-13	2
22	BOLT, HINGE	070968-2	1	62	NUT, CLAMP AREMA(FLAT) 14-24	023832	2
23	N HX 3/8-16	002104-E	4	63	NUT,BINDING AAR,SHOULDER,14-24	023831	14
24	W WR 3/8	001726-E	4	64	WASHER, BEVELED AREMA (FLAT)	023834	16
25	MAIN SHAFT, GATE	074028	1	65	TIE, CABLE	104824	5
26	RING, RETAINING	070584	1	66	STOP BAR ASSEMBLY, S-60	074035-X11	1
27	KEY UX WOODRUFF	007149	3	67	PIN, REACTION, S-60	074035-14	1
28	GEAR, SEGMENT	073003	1	68	BRACKET S-60 PCB STANDOFF	Z610-39557-0001	1
29	SS SH 1/2-13 X .50	004706-SC	1	69	W LKS M #4	001802-MSC	2
30	SS SH 1/2-13 X .75	004708-SC	1	70	SCREW CAP SOC 4-40 X 3/4 STL	007754-SSC	2
31	BEARING, 2"	075284	2	71	KIT, S-60 MAINT. & INST.	074050-X	1
32	O-RING 2"	070585	2	72	DECAL, S-60 WIRING	074007-10	1
33	GASKET, SEAL PLATE	070747-3	2	73	ASSY, S-60 WIRING HARNESS	075014-X1	1
34	PLATE,BEARING SEAL	073008	2	74	PANDUIT TIE BASE #ABM2S-A-C	098222-T01708	1
35	MS PH 1/4-20 X.625	002659-PEX	13				
36	W LKS M 1/4	001808-ME	16				
37	N HX 1-8	002118-SC	2				
38	W LKS M 1"	001817-MSC	2				
39	CAM ASSY, PLASTIC	070633-2AX	2				
40	CAM ASSY, PHENOLIC	070633-500AX	1				

**Entrance Gate Terminal Board Assembly & Replacement Parts  
4-Contact (P/N 074030-X001)**



**Figure 6-3 Entrance Gate Terminal Board Assembly & Replacement Parts**

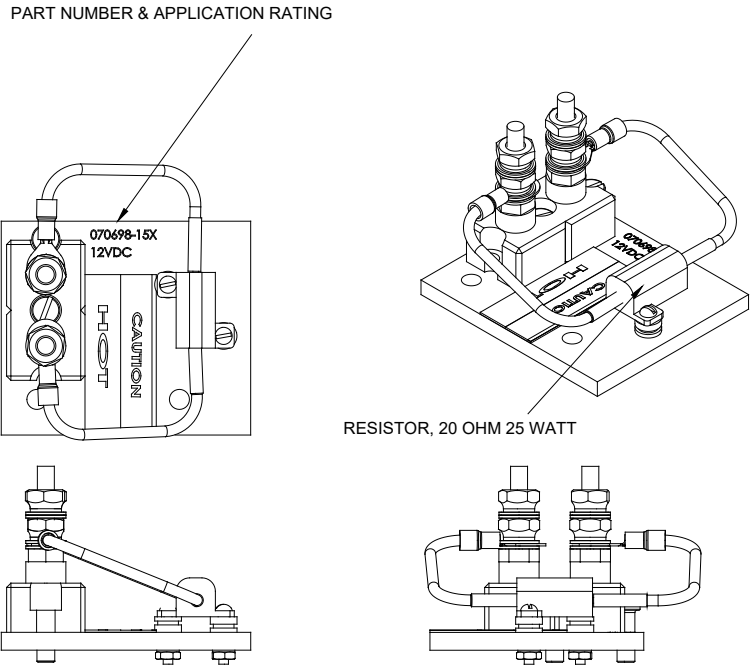
# ENTRANCE GATE ORDERING INFORMATION



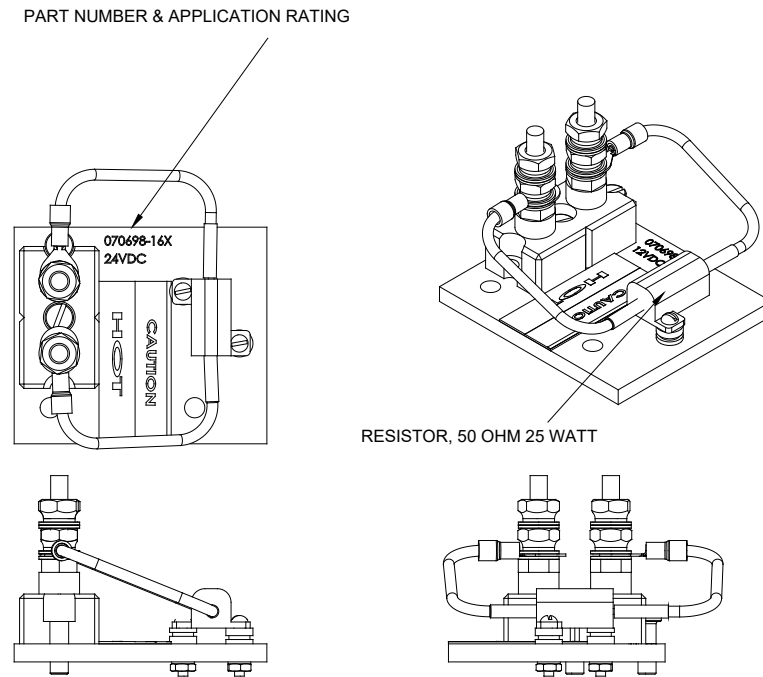
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	074070-X3	ASSY, S-60 ADAPTOR PLATE
2	4	004023-SSJ	SCREW, 1/4-28 x 3/4" S.H. CAP
3	1	074070-X	MOTOR ASSY, S-60 12 VDC GEAR
4	1	070554-A	GEAR, MOTOR PINION
5	2	004615-SC	SET SCREW, SOCKET 1/4-28 x 1/4"

**Figure 6-4 Motor, Brake, & Adaptor Plate Assembly (P/N 074070-X5)**

### 6.1.2 Optional Defrosters

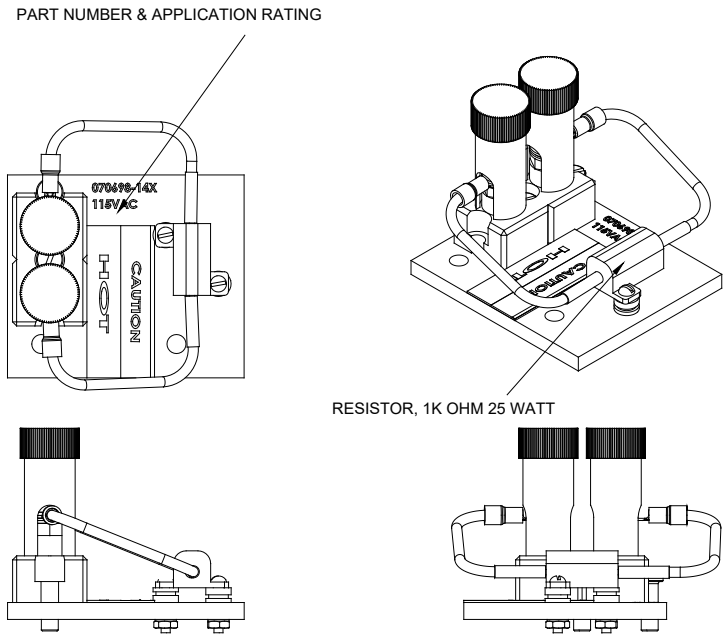


**Figure 6-5 12 VDC Defroster (P/N 070698-15X)**



**Figure 6-6 24 VDC Defroster (P/N 070698-16X)**

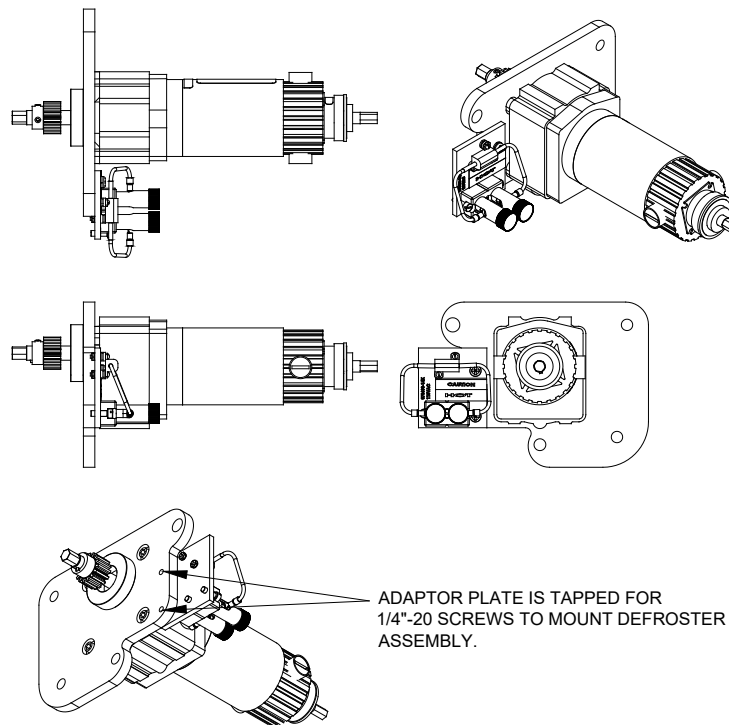
# ENTRANCE GATE ORDERING INFORMATION



**Figure 6-7 115 VAC Defroster (P/N 070698-14X)**

## 6.1.2.1 Defroster Mounting

The diagram below details the mounting location for the optional defroster assembly.

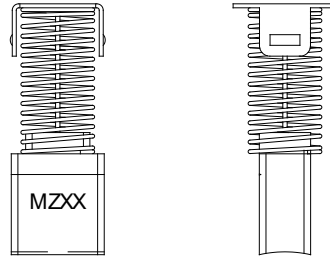


**Figure 6-8 Defroster Mounting Location**

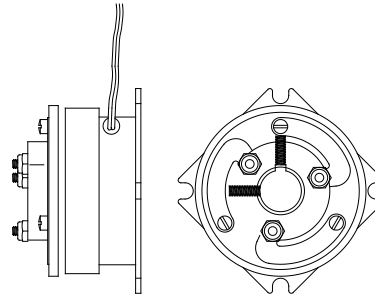


6.1.3 Spare Parts and Brake Air Gap Adjustment Tool

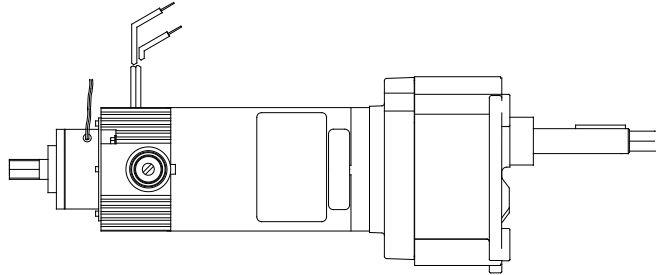
P/N 074070-B  
REPLACEMENT BRUSHES  
(2 PER PACKAGE)



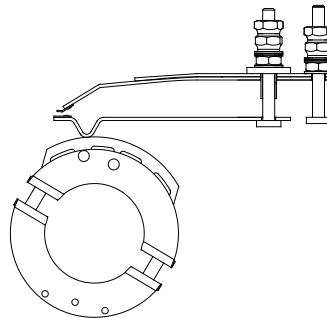
P/N 074070-A  
S-60 REPLACEMENT BRAKE



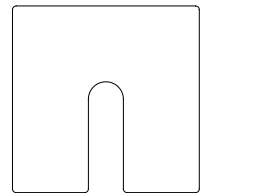
P/N 074070-X  
S-60 REPLACEMENT MOTOR  
WITH BRAKE 12 VDC



P/N 070633-10X  
CAM & CONTACT KIT FOR  
POSITIONS 8 THRU 12

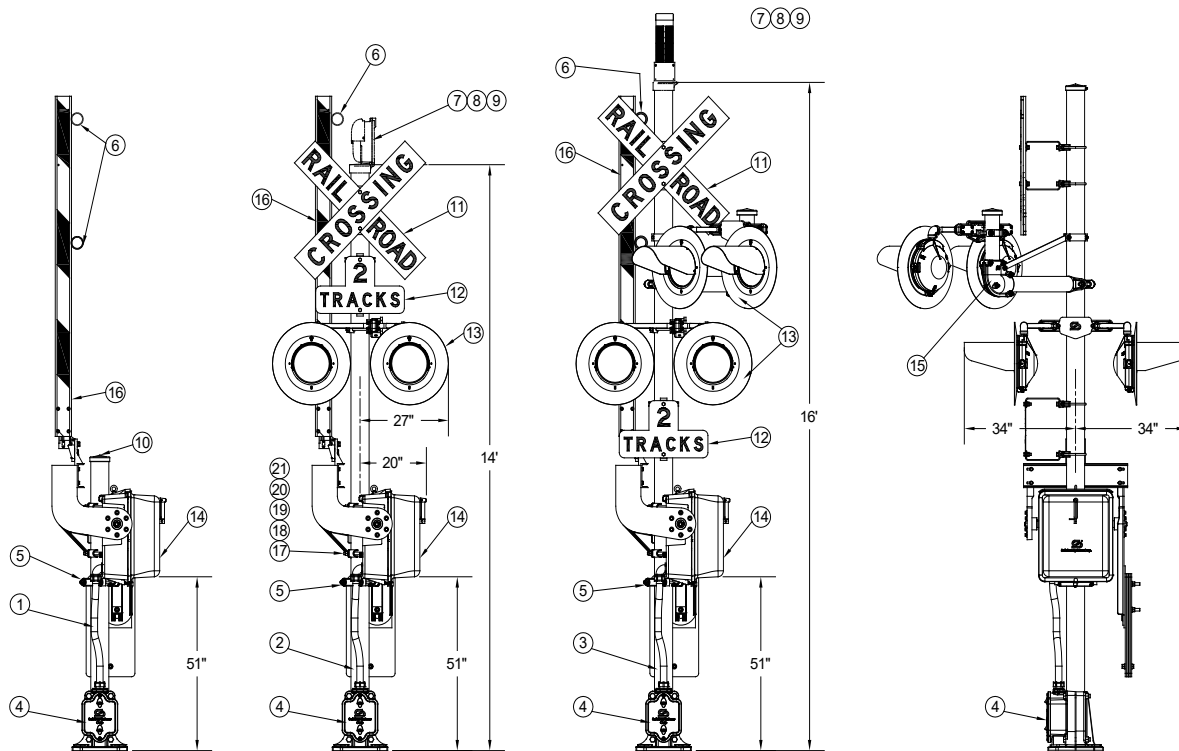


P/N 074070-C & 074070-D  
BRAKE ADJUSTMENT SHIM  
.015 & .020" THICK



# ENTRANCE GATE ORDERING INFORMATION

## 6.1.4 Model S-60 Gate Types 50, 51, and 52 Replacement Parts



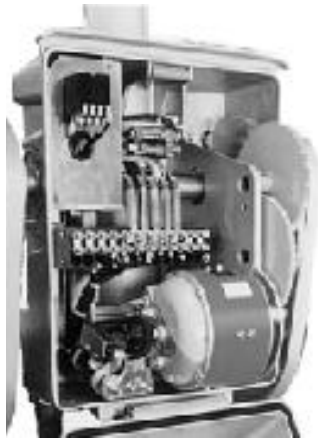
Item No.	Description	Part number
1	Mast, 5" Stub	070519-3A
2	Mast, 5" Standard	070519-27A
3	Mast, 5" for Front, Back , and 45 Deg. Left Lights	070519-43A
4	Base, Junction Box, 11-11/16" Bolt Spacing for 5" Pipe	041931-2X
5	Clamp, Mechanism Support	070786-5X
6	Lamp, Gate Arm	075970-AX
7	Bell, 5" Mounting	8-12 VDC 040200-4X 24 VDC 040200-110X
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-60 Gate	074007-X001
15	Cantilever, Sidelight (required for left-hand sidelights)	041442-26X
16	Gate Arm & Conversion Bracket --See gate arm section of catalog	Specified
17	Machine Bolt, Square 3/4" – 10 x 7.00"	008085-SC
18	Casting, Aluminum Saddle	070950
19	Washer, Flat 3/4"	001737-SC
20	Washer Lock 3/4"	001815-MSC
21	Nut, Hex 3/4" – 10	002114-SC

## SECTION 7 UPGRADING KITS ORDERING AND INSTALLATION

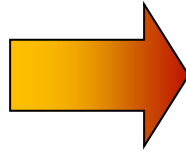
### 7.0 UPGRADING KITS ORDERING AND INSTALLATION

#### 7.1 GENERAL INFORMATION

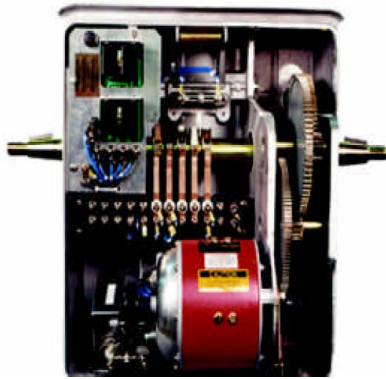
Siemens offers S-60 upgrade kits for the S-20 and S-40 mechanisms.



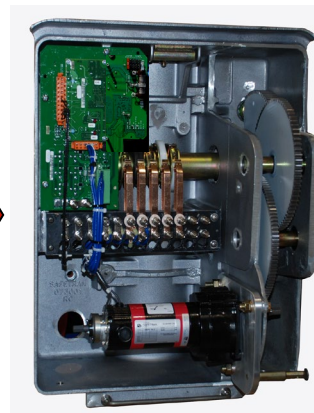
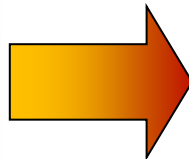
**S-20**



**S-60**



**S-40**



**S-60**

#### 7.1.1 S-60 Retrofit Type 1 Kit (P/N 074007-X500)

The S-60 Type 1 Kit (Part Number: 074007-X500) includes buffers, caps, and hardware.

#### 7.1.2 S-60 Retrofit Type 2 Kit (P/N 074007-X501)

The S-60 Type 2 Kit (Part Number: 074007-X501) does not include new buffers or related parts.

7.1.3 Upgrading S-20 and S-40 Units (Retrofit Kits)



**WARNING**

**ENSURE THAT THE GATE MECHANISM IS IN THE HORIZONTAL POSITION AND ALL POWER IS REMOVED FROM THE UNIT PRIOR TO IMPLEMENTING UPGRADE PROCEDURE.**

PARTS TO BE REMOVED

ITEM	PART NUMBER	DESCRIPTION	QTY
1	074018-X	ASSY, MOTOR AND HOLD CLEAR	1
2	004168-HSC	CS HH 1/2-13 X 1 1/2	3
3	001812-MSC	W LKSM 1/2	3
4	070926-1	GASKET, BUFFER CAP	2
5	074045-X	BUFFER ASSEMBLY (UPPER AND LOWER)	2
6	001810-ME	W LKSM 3/8	4
7	004089-HE	SCREW, HEX CAP 3/8-16 x 1 1/4"	4
8	070698-X	DEFROSTER, 110 VAC	1
9	074034-X	MOUNTING PLATE	1
10	074035	STOP BAR	1
11	029602-3BX	RESISTOR, ADJUSTABLE	1
12	001806-ME	WASHER, LOCK #10	2
13	002625-PEX	MACHINE SCREW #10-32 x 1.75	2
14	001712-E	WASHER, FLAT #10	2
15	002659-PEX	MACHINE SCREW, 1/2-20 x 5/8"	4
16	001808-ME	WASHER, LOCK 1/4	4
17	074010-XXX	RELAY PANEL	1
18	024620-13	NUT, GOLD TEST	1
19	024620-3X	TEST LINK ASSY, W 1" CENTERS	2
20	023834	WASHER, BEVELED AAR (FLAT)	30
21	023831	NUT, BINDING AAR SHOULDER 14-24	15
22	074007-6	DECAL, S-40 WIRING	1

ITEMS 4, 5, 6 & 7 ARE OPTIONAL

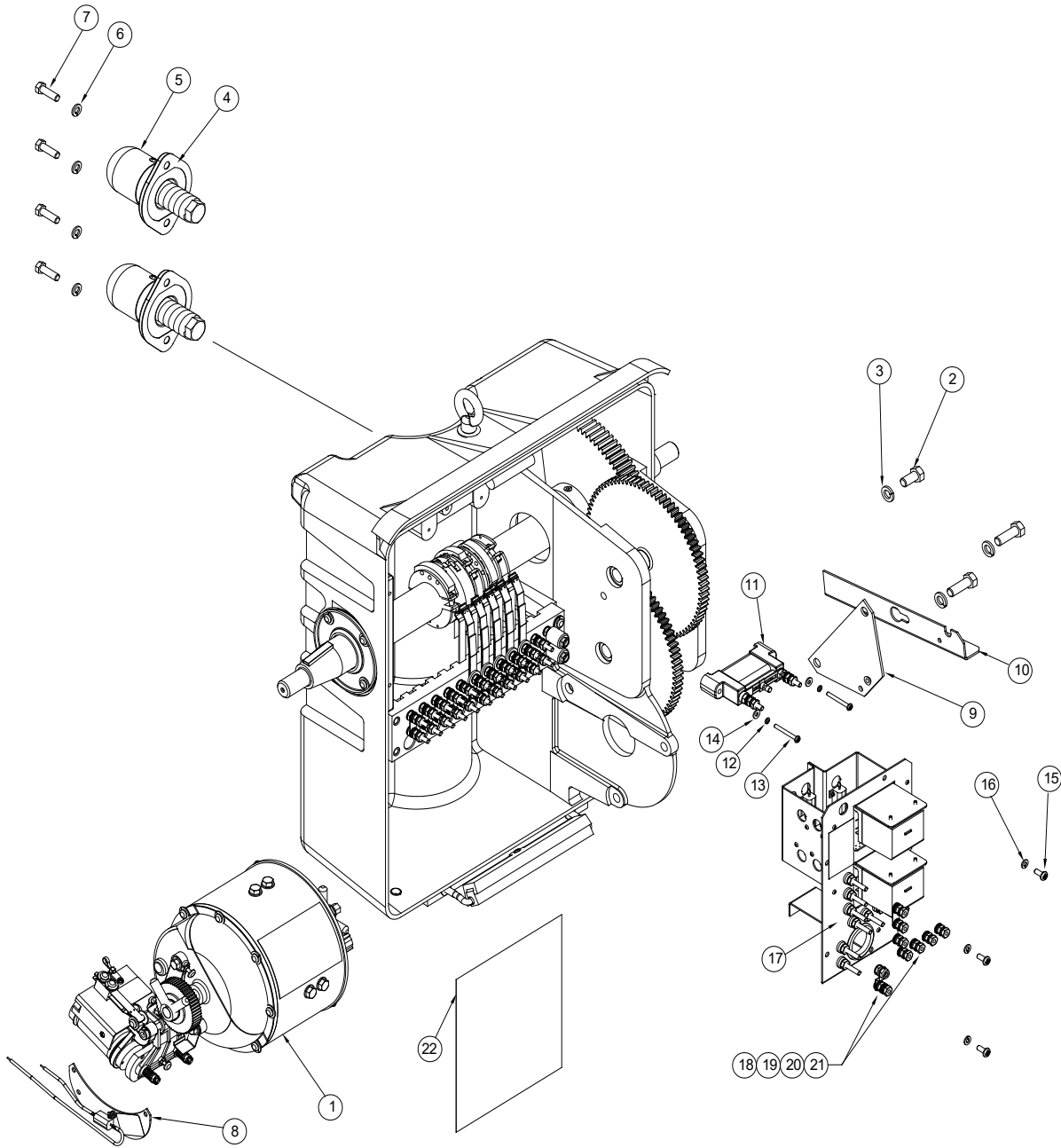


Figure 7-1 Component Removal Detail (Wiring not shown)

### 7.1.3.1 Upgrade Procedure

The following procedure details the upgrade to an S-60 Gate Mechanism.



**WARNING**

**ENSURE THAT THE GATE MECHANISM IS IN THE HORIZONTAL POSITION AND ALL POWER IS REMOVED FROM THE UNIT PRIOR TO IMPLEMENTING UPGRADE PROCEDURE.**

#### Tools Required

10" long Phillips screwdriver, 3/4" socket wrench, 3/4" opened end wrench, AREMA terminal wrench and wire cutters (for cutting cable ties only).

#### Motor and Hold Clear Removal

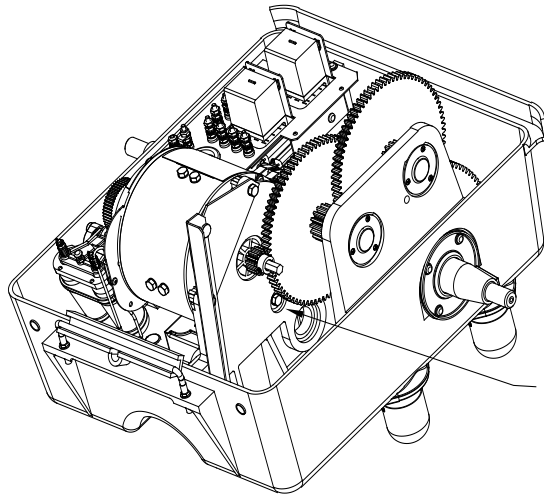
- 1) Lower gate, remove power from gate mechanism.
- 2) Cut cable tie around wires near hold clear.
- 3) Remove motor wires (23, 21, 18 & 17) from AREMA terminals on front of electrical panel. Pull wires through grommet.
- 4) Remove remaining AREMA hardware and wires from the upper and lower rows of terminals at positions 4, 5, 6, 7 & 10.
- 5) Remove (3) lower bearing cover attaching screws, slide lower gear combo shaft to the right while supporting gear and remove gear/shaft assembly. There will be 2 spacers, 1 bearing, 1 shaft, 1 spring thrust washer and 1 gear that will be removed during this step. These parts will be reinstalled.
- 6) Remove (3) 1/2" motor attaching bolts (item 2) with 3/4" wrench / socket. Remove the back bolt first (partially covered by lower combo gear) and the bottom bolt second. Support the motor while removing the third top bolt.
- 7) Reinstall idler gear w/ spacers, spring, shaft bearings, cover and (3) screws. The idler gear shaft is symmetrical. Place bearing on right end of shaft, slide long spacer along shaft next to bearing, install spring washer so it is up against long spacer. Support combo gear and move gear into original position. Slide shaft, bearing, long spacer and thrust washer through bearing bore and into gear combo bore. Push shaft through combo gear until 1/4" of shaft protrudes. Install small spacer on end of shaft and push shaft into bearing in the center wall. Install bearing cover and (3) screws.



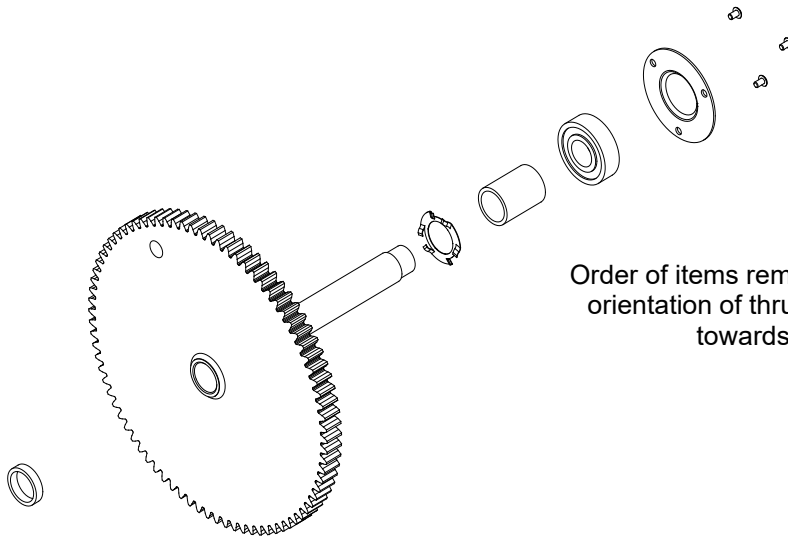
**WARNING**

**WARNING**

**GATE MOTOR AND HOLD CLEAR ASSEMBLY WEIGHS APPROXIMATELY 50 POUNDS. TWO PEOPLE ARE RECOMMENDED FOR THIS REMOVAL OPERATION. ENSURE MOTOR ASSEMBLY IS PROPERLY SUPPORTED BEFORE REMOVING LAST BOLT.**



MOTOR ATTACHING BOLT  
IS PARTIALLY OBSTRUCTED BY GEAR



Order of items removed in step 5 above. Note orientation of thrust washer, the 3 tabs face towards the combo gear.

**Figure 7-2 Motor and Hold Clear Removal**

## UPGRADING KITS ORDERING AND INSTALLATION

### Snub Resistor Removal

- 1) Remove (4) wires (E & D) from adjustable snub resistor, item 11, mounted on back wall of housing.
- 2) Remove (2) screws (item 13) and (4) washers (items 12 and 14) holding the resistor to the back wall of the housing.

### Relay Panel Removal

- 1) Remove wire (N) from upper post of terminal #5. Remove wires (J & K) from cam #7 terminals. Remove wire "L" from terminal #7. Remove wire (P) from bottom post of terminal #4. Remove snub wires (T & U) from cam #10 terminal post.
- 2) Remove screws (item 16) & washers (item 15) from back of housing holding support leg of electrical panel. Remove upper screw on the cast boss first, using a Medium Phillips screwdriver that is 10" long to enable reaching across the terminal board to the back of the housing. A second screw on the cast is used to seal the housing and can be removed at this time and will be used to mount the S-60 standoff bracket. Remove (3) Phillips screws (items 15) from upper and left hand edge of panel. Remove panel.

### Parts to save from above removal steps

None

### Parts to discard

- 1) S-40 motor / hold clear assembly and (3) attaching bolts & washers.
- 2) Relay Panel and attaching hardware.
- 3) Snub resistor and attaching hardware.
- 4) Loose wiring.



Table 7-1 lists the materials included in the S-60 Retrofit Type 1 Kit. The kit includes Buffers, Caps, and Hardware.

**Table 7-1 S-60 Retrofit Type 1 Kit (P/N 074007-X500) Bill of Materials (W/O MTSS)**

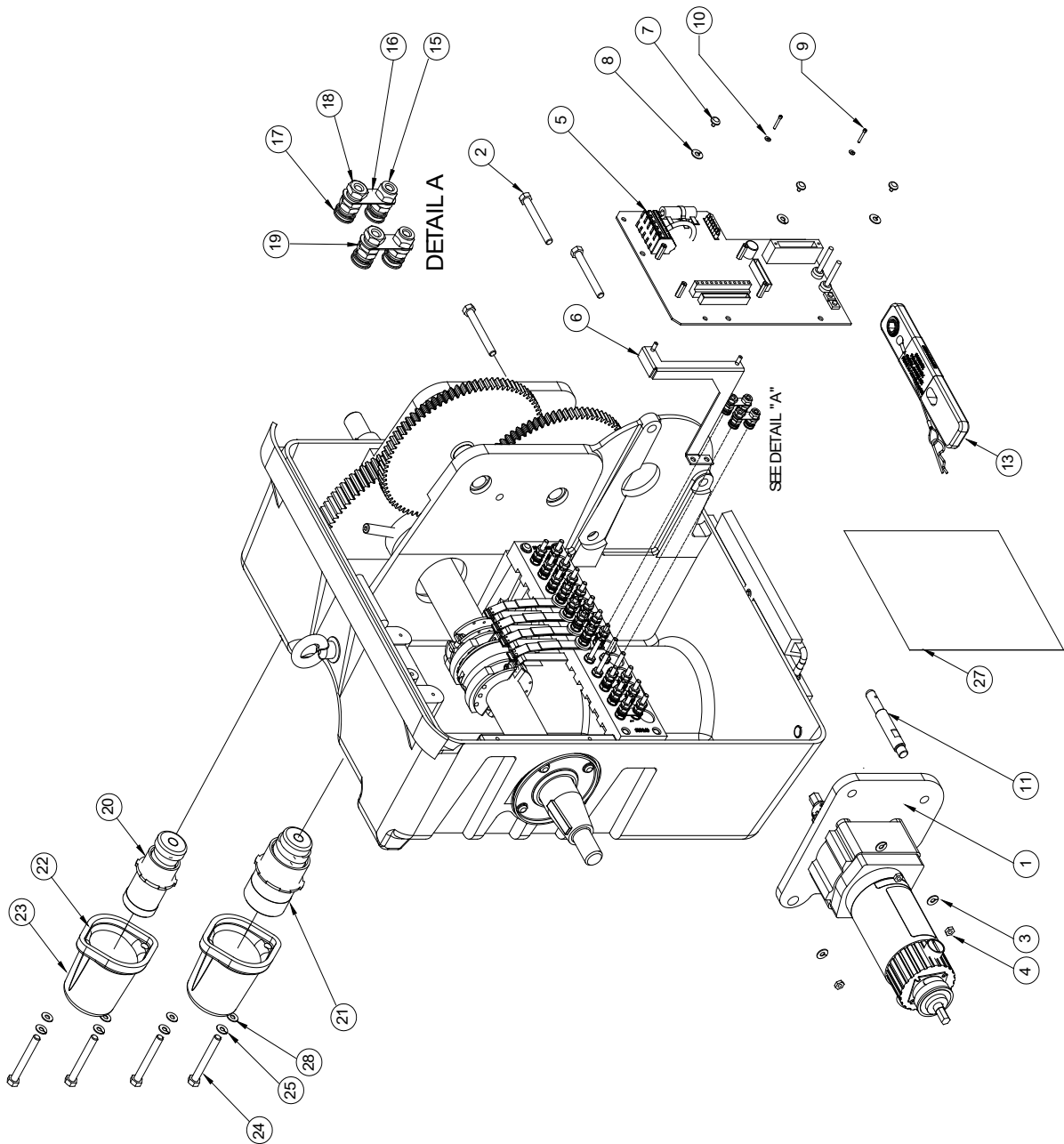
**S-60 RETROFIT TYPE 1 KIT P/N 074007-X500  
WITH BUFFERS, CAPS AND HARDWARE (W/O MTSS)**

ITEM	PART NUMBER	DESCRIPTION	QTY
1	074070-X5	ASSY, S-60 MTR & ADAPTOR PLATE	1
2	004170-HSC	CSHH 1/2-13 X 2	3
3	001812-MSC	W LKS M 1/2	3
4	002108-SC	N HX 1/2-13	3
5	9000-25527-0001	PCB, S-60 12 VDC ENTRANCE GATE	1
6	Z610-39557-0001	BRACKET S-60 PCB STANDOFF	1
7	002659-PEX	MS PH 1/4-20 X .625	5
8	001808-ME	W LKS M 1/4	5
9	007754-SSC	SCREW CAP SOC 4-4 X 3/4 STL	2
10	001802-MSC	W LKS M #4	2
11	074035-14	PIN, REACTION S-60	1
12	075014-X1	ASSY, S-60 WIRING HARNESS DOUBLE BREAK	1 *
13	074035-X11	STOP, BAR ASSEMBLY S-60	1
14	074050-X	KIT, S-60 MAINT. & INST.	1 *
15	024620-13	NUT, GOLD TEST	2
16	024620-3X	TEST LINK ASSY, W 1" CENTERS	2
17	023834	WASHER, BEVELED AAR (FLAT)	4
18	023831	NUT, BINDING AAR SHOULDER 14-24	4
19	023832	NUT, CLAMP AAR (FLAT) 14-24	2
20	070903-X	BUFFER ASSY, UPPER	1
21	070903-2X	BUFFER ASSY, LOWER	1
22	070923-1	GASKET, BUFFER CAP	2
23	070902-1	CAP, BUFFER	2
24	004090-HE	CSHH 3/8-16 X 1.5	4
25	001810-ME	W LKS M 3/8	4
26	070904	TUBE, 1OZ ANTISEZE LUBRICANT	1 *
27	074007-11	LABEL, S-60 RETROFIT WIRING	1
28	001726-E	FLAT WASHER	4

\* = NOT SHOWN

# UPGRADING KITS ORDERING AND INSTALLATION

Figure 7-3 details the components and their locations for the S-60 Retrofit Type 1 Kit.



**Figure 7-3 S-60 Retrofit Type 1 Kit Component Detail**

Table 7-2 lists the Bill of Materials included in the S-60 Retrofit Type 2 Kit.

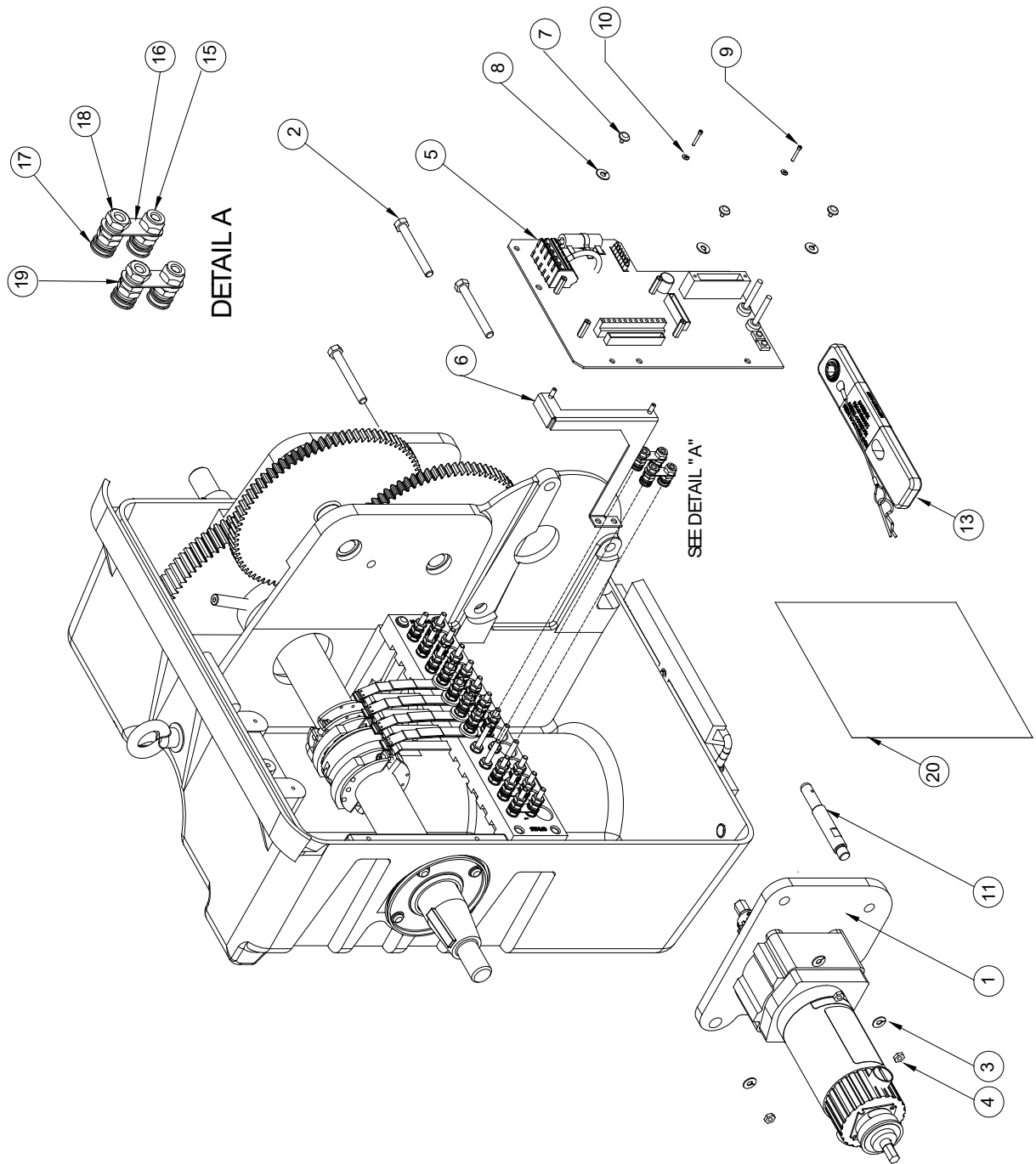
**Table 7-2 S-60 Retrofit Type 2 Kit (P/N 074007-X501) Bill of Materials (W/O MTSS)**

**S-60 RETROFIT TYPE 2 KIT P/N 074007-X501  
WITHOUT NEW BUFFERS AND RELATED PARTS (W/O MTSS)**

ITEM	PART NUMBER	DESCRIPTION	QTY
1	074070-X5	ASSY, S-60 MTR & ADAPTOR PLATE	1
2	004170-HSC	CSHH 1/2-13 X 2	3
3	001812-MSC	W LKSM 1/2	3
4	002108-SC	N HX 1/2-13	3
5	9000-25527-0001	PCB, S-60 12 VDC ENTRANCE GATE	1
6	Z610-39557-0001	BRACKET S-60 PCB STANDOFF	1
7	002659-PEX	MSPH 1/4-20 X .625	5
8	001808-ME	W LKSM 1/4	5
9	007754-SSC	SCREW CAP SOC 4-4 X 3/4 STL	2
10	001802-MSC	W LKSM #4	2
11	074035-14	PIN, REACTION S-60	1
12	075014-X1	ASSY, S-60 WIRING HARNESS DOUBLE BREAK	1 *
13	074035-X11	STOP, BAR ASSEMBLY S-60	1
14	074050-X	KIT, S-60 MAINT. & INST.	1 *
15	024620-13	NUT, GOLD TEST	2
16	024620-3X	TEST LINK ASSY, W 1" CENTERS	2
17	023834	WASHER, BEVELED AAR (FLAT)	4
18	023831	NUT, BINDING AAR SHOULDER 14-24	4
19	023832	NUT, CLAMP AAR (FLAT) 14-24	2
20	074007-11	LABEL, S-60 RETROFIT WIRING	1

\* = NOT SHOWN

# UPGRADING KITS ORDERING AND INSTALLATION



**Figure 7-4 S-60 Retrofit Type 2 Kit Component Detail**

### **S-60 Motor Assembly Installation**

- 1) Install motor / brake / adaptor plate and pinion gear assembly (item 1) with the supplied (3) ½” bolts (item 2), lock washers (item 3) and nuts (item 4). Adaptor plate should sit flush to machined mounting pads. Tighten nuts.
- 2) Check alignment of pinion gear to large idler gear. Move gear on motor shaft if necessary by loosening (2) set screws in pinion gear, sliding gear to correct location and tightening setscrews.

### **PCB Panel Installation**

- 1) Install PCB standoff bracket assembly (item 6) to back wall of housing with (2) screws (item 7) and washers (item 8) in the original relay panel bracket location. Install S-60 PCB (item 5) with (3) screws (item 7) and (3) washers (item 8) to the original relay panel mounting holes near the outer edge of the housing.
- 2) Install (2) PCB standoff bracket screws (item 9) and washers (item 10) through S-60 PCB near lower right hand corner.

### **Wiring Harness Installation**

Install wiring harness (item 12) plug connectors to PCB. Terminate wires eyelets to AREMA studs per wiring diagram label (item 27 or item 20 if type 2 kit).

### **Motor and Brake Wire Connections**

- 1) Install black motor wire to bottom connection point of connector J4/P4.
- 2) Install white motor wire to second from the bottom connection point of connector J4/P4 (see wiring diagram label for motor wire connections).
- 3) Prior to terminating brake wires, twist both conductors approximately 4 turns per foot.
- 4) Install brake wire leads in lower (2) connection points in connector J3/P3. Brake wire polarity does not matter in this connection (see wiring diagram label for brake wire connections).
- 5) Wire tie motor and brake wires as necessary to main wiring harness. Wire slack can be tucked behind PCB.

### **Test Link Installation**

- 1) Install field wires B-12 and N-12 to the lower terminals 4 & 5. Install (+ & -) leads from connector J4/P4 to upper terminals on posts 4 and 5. Install remaining test links and hardware to terminals #4 and #5 to cut battery power inside of mechanism (Items 15, 16, 17, 18 & 19).

### **Remaining Field Wire Connections**

- 1) Terminate G.C. (+) positive wire to connector J3/P3 terminal #1 and G.C. (-) negative wire to connector J3/P3 terminal #2. Siemens recommends using two-wire (double break) Gate Control. In a single-break application, terminal #2 of the J3/P3 connector will be terminated onto AREMA N-12 upper terminal #5 (see wiring diagram label for G.C. terminations).
- 2) Re-install light wires to terminals 1, 2 & 3 if they have been removed.

**Buffer Replacement (In Retrofit Kit #074007-X500 only)**

- 1) Lower gate arm to horizontal position, raise gate slightly and block position using Lock Bar (item 15) to remove pressure on upper buffer.
- 2) Remove bolts and washers (item 7 & 6) and remove old style buffers (item5) and gasket (item 4).
- 3) Spread a small amount of anti-seize lubricant around leading edge of threaded buffer housings (items 20 & 21). Thread new buffers into large threaded holes in back of housing. Adjust upper buffer (item 20) until gate arm is horizontal. Tighten lock ring on buffer. Install gasket (item 22), buffer cap (item 23) with bolts (item 24) and lock washer (item 25).
- 4) Raise gate to vertical position. Adjust lower buffer towards segment gear and maintain 1/32" clearance. Tighten lock ring on buffer. Install gasket (item 22), buffer cap (item 23) with bolts (item 24) and lock washer (item 25).

**Final checks and adjustments**

- 1) Double check brake air gap of .015" minimum, recheck setscrew tightness on brake hub. If brake air gap adjustment is needed, follow warning below.
- 2) Clean and grease gearing.
- 3) Install new wiring diagram decal.



**WARNING**

**ALWAYS ENSURE A MINIMUM BRAKE AIR GAP OF 0.015". IF ADJUSTMENT OF THE BRAKE AIR GAP IS REQUIRED, ENSURE THAT LOCTITE® 243 IS REAPPLIED TO THE BRAKE COLLAR SET SCREWS. REMOVE THE SET SCREWS INDEPENDENTLY AND ONLY APPLY A SINGLE DROP OF LOCTITE® 243 DIRECTLY ONTO EACH SET SCREW. DO NOT POUR LOCTITE® IN THE SETSCREW THREADED HOLES. DO NOT ALLOW ANY LOCTITE® TO COME IN CONTACT WITH THE FRICTION SURFACES OF THE BRAKE.**

**Placing Crossing in Service**

Prior to placing the Crossing in service, test must be performed to verify proper operation. Verify all jumpers have been removed and the Gold Nut restored. Perform all tests as specified by Railroad procedures.



**WARNING**

**WHEN PLACING THE GATE IN SERVICE, OBSERVE PROPER OPERATION WITH TRAIN ACTIVATION OF THE CROSSING AND PERFORM ANY ADDITIONAL TESTS IN ACCORDANCE WITH RAILROAD PROCEDURES.**

**7.1.3.2 Recommended Hardware Torque Values**

<b>Thread Size</b>	<b>Hex Nut Size</b>	<b>Torque</b>
<b>4-40</b>	<b>3/32" Allen</b>	<b>6 in lbs.</b>
<b>10-32</b>	<b>-</b>	<b>32 in lbs.</b>
<b>14-24</b>	<b>7/16</b>	<b>6 ft. lbs.</b>
<b>1/4-20</b>	<b>7/16</b>	<b>6 ft. lbs.</b>
<b>5/16- 18</b>	<b>1/2</b>	<b>15 ft. lbs.</b>
<b>3/8 – 16</b>	<b>9/16</b>	<b>25 ft. lbs.</b>
<b>1/2 - 13</b>	<b>3/4</b>	<b>55 ft. lbs.</b>
<b>5/8- 11</b>	<b>15/16</b>	<b>90 ft. lbs.</b>
<b>3/4 -10</b>	<b>1-1/8</b>	<b>105 ft. lbs.</b>
<b>1" -8</b>	<b>1-1/2</b>	<b>140 ft. lbs.</b>

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## SECTION 8 ENTRANCE GATE TROUBLESHOOTING

### 8.0 ENTRANCE GATE TROUBLESHOOTING

#### 8.1 GENERAL

Table 8-1 below provides service assistance information. Contact Siemens Customer Service if assistance is required.

**Table 8-1 Entrance Gate Troubleshooting**

Trouble	Cause	Action	Correction
Gate does not ascend	No power available	Push the “View LED’s” pushbutton on the PCB and ensure green Power LED is illuminated.	Ensure 11 to 16 volts DC is applied to AREMA terminals 4 and 5.  Polarity on Battery & Common is reversed.
	No gate control (GC) power	For two-wire gate control: Push the “View LED’s” pushbutton and ensure red Up Request LED is lit.  For single-wire gate control: Push the “View LED’s” pushbutton and ensure red Gate Request LED is lit.	Ensure Gate Control positive (12 VDC nominal) is applied to Pin 6 on Connector P3 and Gate Control negative is applied to Pin 5 on Connector P3.  Ensure Gate Control positive (12 VDC nominal) is applied to Pin 6 on Connector P3 and ensure a field wire has be run from AREMA terminal 5 to Pin 5 on Connector P3.  Ensure the Gold test link is closed on the PCB.
	No motor power	Push the “View LED’s” pushbutton and ensure red Motor Up LED is lit.	Ensure motor leads are properly installed in Connector P4, Pins 5 (white wire) & 6 (black wire).  Inspect motor brushes to make sure they are intact and the brush wear line is clearly visible on the side of the brush. Ensure the brushes are properly seated in the brush holders. The brushes should be inserted into the brush holders so that the brush identification number is facing upwards for both brushes.  Clear gate arm of any exterior obstructions.

ENTRANCE GATE TROUBLESHOOTING

Trouble	Cause	Action	Correction
Gate does not ascend (Continued)	No Motor Power (Continued)		Clear gate drive train of any obstructions and ensure drive train rotates freely.  Replace gear motor.
		Ensure electric brake air gap is a minimum of 0.015" and the motor shaft rotates freely.	Adjust brake air gap.
		Verify Health LED is flashing at 1 Hz.	If the Health LED is on Steady or Dark, cycle power to the PC Board.  Replace the PCB control board.
		Verify correct counterweighing.	Adjust horizontal torque.
	No motor power and no motor up indication	Ensure adequate contact pressure (1 to 3 lbs.) and proper contact wipe.	Adjust or replace contacts.
		Ensure power up Cam #7 is properly adjusted to close from 0 to 89°.	Adjust or replace cam.
		Ensure contact tips are not burned.	Replace contacts.
		Verify Health LED is flashing at 1 Hz.	If the Health LED is on Steady or Dark, cycle power to the PC Board.  Replace the PCB control board.
	Overload breaker is tripped	Verify that the red Breaker Tripped LED is lit.	Clear gate arm of any exterior obstructions.  Clear gate drive train of any obstructions and ensure drive train rotates freely.  Replace gear motor.  Replace the PCB control board.
	Gate does not descend	Brake not releasing	Check the brake air gap.



**CAUTION**

WHEN CHANGING BRAKE WITH THE GATE IN THE VERTICAL POSITION, DO NOT REMOVE LOCK BAR.

ENTRANCE GATE TROUBLESHOOTING

Trouble	Cause	Action	Correction
Gate does not descend (Continued)	External obstruction	Verify that the gate is free of any obstructions.	Remove gate obstruction. Note: Gate is factory set to power down to 70 degrees and gravity fall to 0 degrees.  Check that wind guard is parallel to gate arm and not binding. Check that Power Down Cam is set so that the gate will power down through the wind guard.
	Internal obstruction	Ensure drive train rotates freely.	Internal reduction gearing shall be free to rotate without binding or drag.  Motor assembly damaged. Internal gearbox parts will not rotate. Replace motor sub-assembly. Do not remove motor wires and or motor with the gate arm in vertical position or gate arm will drop uncontrollably. If motor replacement or external idler or pinion gear must be done in the vertical position, lock the gear train by placing a 3/8" pin or bolt through the housing and into the first reduction gear.
	Incorrect horizontal torque	Verify correct counterweighing.	Ensure positive horizontal and vertical torque adjustment procedures have been followed.
Gate ascends or descends erratically	Motor brushes not in full contact with commutator	Check brushes.	Remove brushes with gate in the horizontal position; inspect brush length and side profile of the brush. Inspect commutator. Replace brushes if commutator looks OK. While descending, the Motor Down LED will be intermittent between 70 and 0 degrees, indicating intermittent brush contact. If problems repeat with new brushes, replace the motor assembly.
Gate drops uncontrollably	Intermittent connection of motor wires	Check both motor wires in the green P4/J4 connector.	Ensure wires are stripped to 0.43in and the connector fully clamps on the stripped portion of the wire.
		Check connector seating.	Ensure connector is fully seated and connector-retaining screws are secure.
	Motor brushes not in full contact with commutator during snubbing operation	Check brushes.	Remove brushes with gate in the horizontal position; inspect brush length and side profile of the brush. Inspect commutator. Replace brushes if commutator looks ok. If problems repeat with new brushes, replace the motor assembly.

ENTRANCE GATE TROUBLESHOOTING

<b>Trouble</b>	<b>Cause</b>	<b>Action</b>	<b>Correction</b>
Gate rises too slowly	Low system voltage	Measure the voltage at terminals 4 and 5.	Verify voltage of 11-16 VDC is available between AREMA terminals 4 and 5.
	Incorrect counterbalance weight	Verify correct counterweighing.	Ensure positive horizontal and vertical torque adjustment procedures have been followed.
Gate drops too slowly	Incorrect snub resistance	Check snub setting.	Move Fuse Jumper J5 one or more jumper locations to the LEFT and/or adjust the band on resistor R29 toward the faster position.
	Incorrect counterbalance weight	Verify correct counterweighing.	Ensure positive horizontal and vertical torque adjustment procedures have been followed.
	Incorrect power down cam setting	Check cam 6 setting	Power down cam is factory set to 70 degrees. Note: extreme cold weather conditions may require a different cam setting.
Gate drops too quickly	Incorrect snub resistance	Check snub setting.	Move Fuse Jumper J5 one or more jumper locations to the RIGHT and/or adjust the band on resistor R29 toward the faster position.
	Incorrect counterbalance weight	Verify correct counterweighing.	Ensure positive horizontal and vertical torque adjustment procedures have been followed.
	Incorrect power down cam setting	Check cam 6 setting.	Power down cam is factory set to 70 degrees. Note: extreme cold weather conditions may require a different cam setting.
Gate "pumps" at top	Brake not engaging	Brake LED is on @ 90 degrees.	Repair broken or loose leads from the brake to control board.  Adjust air gap to 0.015" minimum/0.020" maximum.  Clean brake parts with a lint-free cloth or replace brake assembly.
		Brake LED is not on.	Press "View LEDS" button.  Ensure that cam #7 is opening @ vertical position. Replace the PCB control board.

ENTRANCE GATE TROUBLESHOOTING

Trouble	Cause	Action	Correction
Gate rises part way, then falls	Breaker tripping	Observe control board and see if "breaker tripped" LED is coming on when gate falls.	Check for and correct any binding of the gear train or obstruction.  Check that counterbalance weight is correct for length of gate arm.
		Measure the voltage at AREMA terminals 4 and 5.	Verify voltage of 11-16 VDC is available between AREMA terminals 4 and 5.
			Replace the PCB control board.
Gate goes up and then falls	Breaker tripping	Observe control board and see if "breaker tripped" LED is coming on when gate falls.	Verify clearance between segment gear and buffer when gate is up. Adjust clearance to 1/32 inch, if necessary
Motor drives gate down when it should go up	Reversed motor wire	Check If "motor up" LED is on when gate is driven down.	Wire motor leads per the wiring diagram.
Gate does not shut off in vertical position	Incorrect cam adjustment	Check cam 7.	Readjust cam such that the contact opens when there is 1/32" buffer clearance in vertical position.  Adjust power up Cam #7 to close properly from 0 to 89°.  Adjust or replace cam.
		Contacts	Adjust or replace contacts.
		Ensure adequate contact pressure (1 to 3 lbs.) and proper contact wipe. Ensure contact tips are not burned.	Replace contacts.
		Verify Health LED is flashing at 1 Hz.	If the Health LED is on steady or dark, cycle power to the PCB control board.  Replace the PCB control board.
Gate powers below horizontal, compresses buffer and breaker trips	Incorrect power down cam or contact adjustment	Observe control board and see if "breaker tripped" LED is lit.	Readjust power down cam to 70 degrees. Note: cold weather conditions may require a different power down setting. This cam should never be adjusted below 0 degrees.
		Ensure contact tips are not burned.	Replace contacts.
		Verify Health LED is flashing at 1 Hz.	If the Health LED is on steady or dark, cycle power to the PCB control board.  Replace the PCB control board.

ENTRANCE GATE TROUBLESHOOTING

<b>Trouble</b>	<b>Cause</b>	<b>Action</b>	<b>Correction</b>
Gate arm above horizontal position.	Incorrect buffer adjustment	Check horizontal buffer.	Remove buffer cover and loosen jam nut. Raise arm slightly and unthread upper buffer from mechanism until desired height is reached. Reinstall buffer cover.
MTSS does not function properly	No power indication	Power LED not lit.	Press "View LEDS" button. Ensure PCB control board has power and MTSS card is secure to PCB.  Replace MTSS card.  Replace PCB control board.
	No gate indication	Gate LED not lit.	Ensure gate is horizontal within 5 degrees.  Ensure gate tip sensor wiring is secure to gate tip light.  Check function of gate tip sensor and replace if necessary.  Replace MTSS board.  Replace the PCB control board.
	No bell indication	Bell LED not lit.	Check that bell is ringing when requested.  Check wiring to terminals.  Replace bell.  Replace MTSS card.
	No data at SEARII	No Data Out signal to SEAR II.	Ensure SEAR II is properly set up for MTSS application.  Check single wire Data Out connection from the gate to the wayside.  Check Data In – has connection to the same ground as the MTSS.  Replace MTSS card.

## 8.2 CIRCUIT BREAKER TROUBLESHOOTING

In the normal operation of the gate mechanism the circuit breaker may trip and reset. If the motor is stalled or restricted from rotation, over-currents can exist. An overcurrent condition causes overheating and may result in failure of the motor. The S-60 is designed to detect a stalled motor and open the circuit breaker relay. The circuit allows for initial startup or inrush currents to not open the circuit breaker relay. Inrush current may be as high as 30 amperes or higher at 12 VDC. The current rapidly decays to 15 amperes or less, depending on the length of the gate arm and the direction of motion.

Common circuit breaker activation conditions:

1. **Current Overload** – The supply current is over the specified limit.
2. **Under Voltage** – The average supply voltage is below the specified limit.
3. **Over Voltage** – The average supply voltage is over the specified limit.
4. **Extended Operation** – The supply current exceeds the specified limit for 1 minute.

Table 8-2 displays a Circuit Breaker Troubleshooting Chart.

**Table 8-2 Circuit Breaker Troubleshooting Table**

<b>CB Trip Condition</b>	<b>Determination</b>	<b>Action</b>	<b>10-10-10-60 Sequence</b>	<b>Observation</b>
Current Overload	Entrance gate motor current exceeds 24A for 75% of 1 second	Circuit breaker tripped while current is over 24A, when current drops below 24A, the circuit breaker will remain tripped for 10 seconds or 1 minute	Yes	Circuit Breaker LED and Power LED solid while breaker is tripped Health LED is unchanged
Current Overload	Exit gate motor current exceeds 18A for 75% of 1 second	Circuit breaker tripped while current is over 18A, when current drops below 18A, the circuit breaker will remain tripped for 10 seconds or 1 minute	Yes	Circuit Breaker LED and Power LED solid while breaker is tripped Health LED is unchanged
Current Overload	While in maintenance mode, gate motor current exceeds 41.5A for 75% of 1 second	Circuit breaker tripped while current is over 41.5A, when current drops below 41.5A, the circuit breaker will remain tripped for 10 seconds or 1 minute	Yes	Circuit Breaker LED and Power LED solid while breaker is tripped Health LED is unchanged
Low Voltage	Supply voltage (averaged over 100 ms) drops below 6.0V	Circuit breaker tripped when voltage drops below 6.0V, when voltage rises above 8.0V, the circuit breaker will remain tripped for 10 seconds or 1 minute	Yes	Circuit Breaker LED and Power LED flashing at 4Hz while breaker is tripped Note that if the voltage does not rise above 8.0V the circuit breaker will remain tripped indefinitely Health LED is unchanged
	Over 5 Supply voltage samples under 6.0V in ½ second period			
High Voltage	Supply voltage (averaged over 1 Sec) rises above 18.5V	Circuit breaker tripped when voltage rises above 18.5V, when voltage drops below 18.5V, the circuit breaker will remain tripped for 10 seconds or 1 minute	Yes	Circuit Breaker LED and Power LED flashing at 4Hz while breaker is tripped Note that if the voltage does not drop below 18.5V the circuit breaker will remain tripped indefinitely Health LED is unchanged
Extended Operation	Continuous current is above 4A for 1 minute	Circuit breaker tripped while current is over 4A, when current drops below 4A, the circuit breaker will remain tripped for 1 or 3 minutes	No – Tripped for 1 or 3 minutes, does not affect sequence	1 minute CB trip – For 1 minute, the current samples were continuously over 4A
				3 minute CB trip – For 1 minute, the current samples were continuously over 4A and half the samples were over 20A
				Circuit Breaker LED and Power LED solid while breaker is tripped This condition will cause an Unhealthy LED indication





# Part Three

## *EXIT GATE*

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# SECTION 9 EXIT GATE INTRODUCTION

## 9.0 EXIT GATE INTRODUCTION

### 9.1 INTRODUCTION

Siemens Model S-60EXIT Railroad Highway Crossing Gate is a "default up" mechanism for use in four-quadrant gate applications. A typical four-quadrant installation will include two standard S-60 mechanisms and two S-60EXIT mechanisms. The Exit gate is designed to raise the arm in a loss of power condition clearing the exit portion of the crossing. This differs from the standard gate which is designed to lower the arm in a loss-of-power condition blocking access to the crossing.

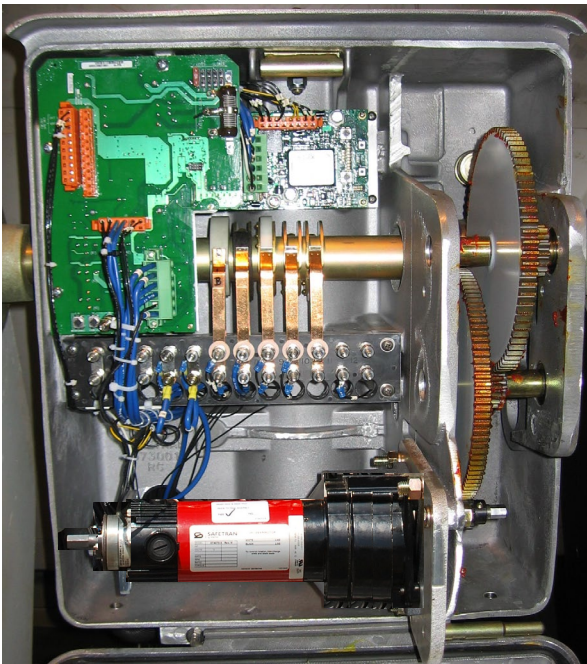


Figure 9-1 S-60EXIT Exit Gate Mechanism



**WARNING**

**THE S-60 IS CAPABLE OF BEING EQUIPPED AND CONFIGURED AS EITHER AN ENTRANCE OR EXIT MECHANISM. SIEMENS ASSUMES NO LIABILITY FOR IMPROPER INSTALLATION, MAINTENANCE OR OPERATION OF THIS DEVICE.**

## 9.2 EXIT GATE COMPONENTS

Figure 9-2 displays the various components that make up the Exit Gate mechanism. The J5 Jumper/Fuse is **always** set to the “A” position. The Exit PCB controls the snub setting for the gate descent speed. Standoffs are provided for the optional MTSS PCB.

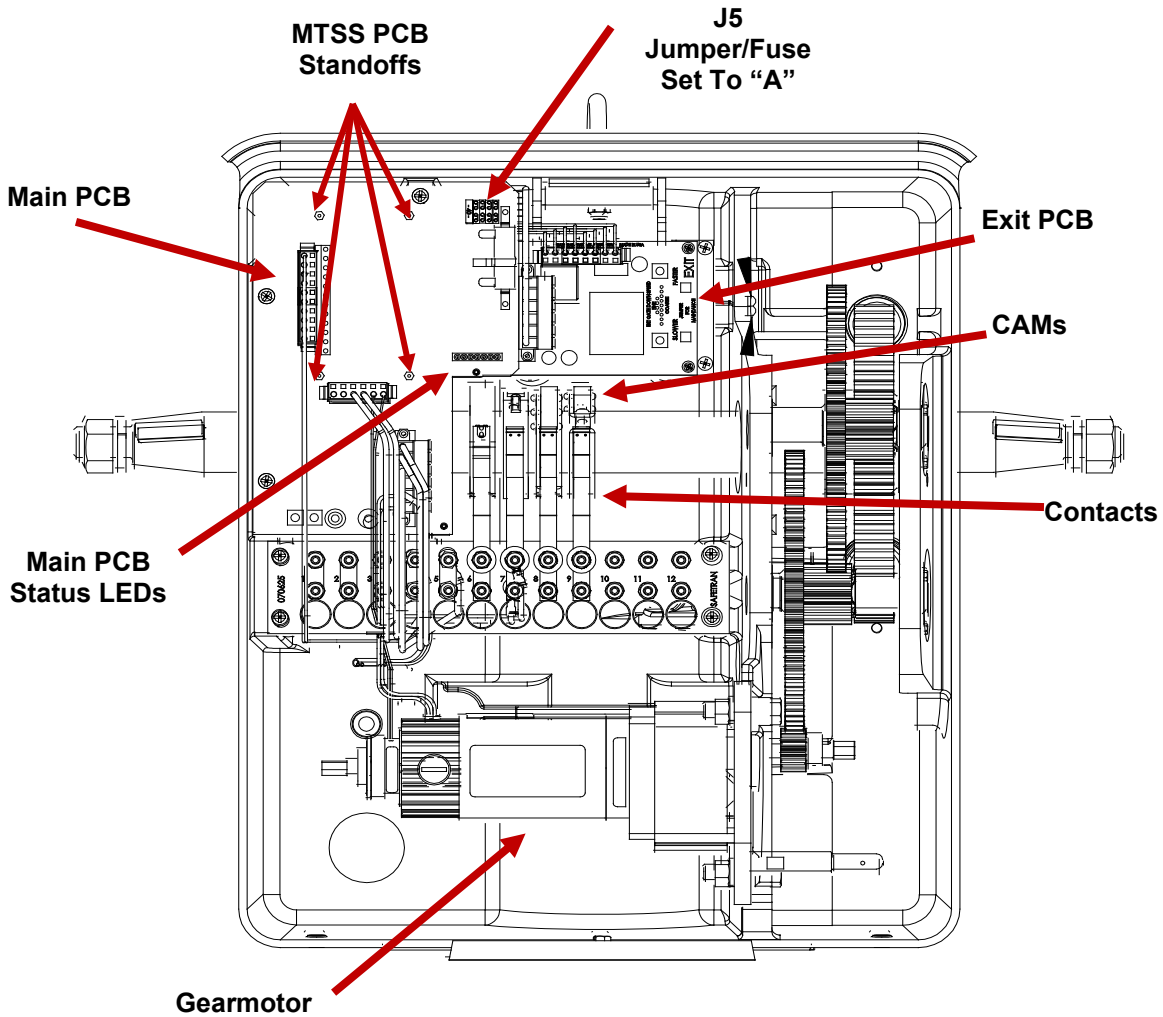


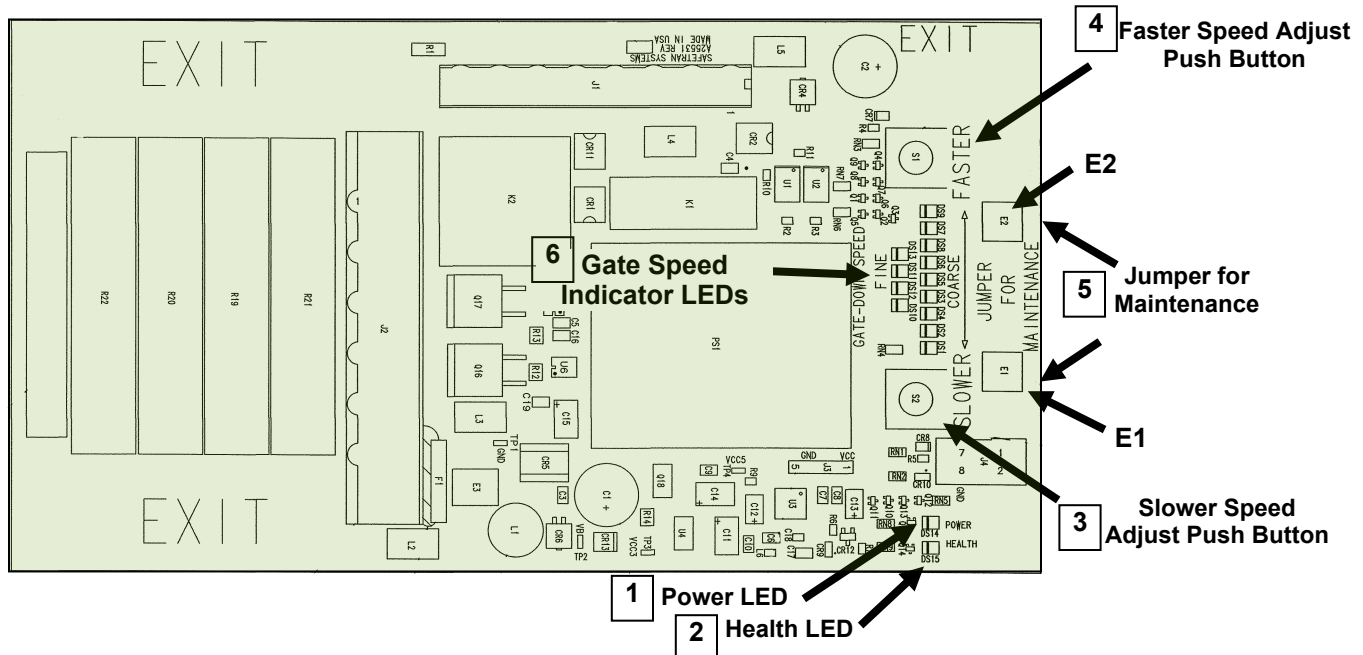
Figure 9-2 Exit Gate Components

### 9.2.1 Exit PCB

The Exit Gate PCB provides the additional functionality required for Exit Gate operation. The Exit Gate PCB controls the brake and the gate speed. Two push buttons control the 36 step gate speed selection process. The Maintenance Switch on the Main PCB is disabled on the Exit Gate. Terminals E1 and E2 on the Exit Board are jumpered to place the gate in the maintenance mode.

### 9.2.2 Exit PCB Controls and Indicators

Figure 9-3 displays the controls and indicators on the Exit PCB.



- 1 **Power LED** – Illuminates when power is present. Flashes with Under voltage/Over voltage condition.
- 2 **Health LED** – Indicates health of the Exit PCB. LED flashes at 1 Hz indicating good health, any other condition (4 Hz flash or extinguished) indicates unhealthy condition.
- 3 **Slower Speed Push Button** – Push button through 36 steps to decrease the gate speed.
- 4 **Faster Speed Push Button** – Push button through 36 steps to increase the gate speed.
- 5 **Maintenance Mode Jumper** – Install a jumper between E1 and E2 to place Exit Gate in the Maintenance Mode.
- 6 **Gate Speed LEDs** – 4 Fine Adjust LEDs and 9 Coarse Adjust LEDs sequence through 36 gate speed selections as the slower or faster speed selection buttons are pushed to set the rate of speed the gate ascends or descends. LEDs dim after 6-10 seconds of inactivity.

**Figure 9-3 Exit PCB Controls and Indicators**

### 9.2.3 Main PCB

The Main PCB is the same board used in the Entrance Gate. All functions are the same as the Entrance Gate except for the Snub Adjustment, which is set to the “A” position on all Exit Gates and the disabling of the Maintenance Switch. The Exit Gate is placed in the Maintenance Mode by installing a jumper between E1 and E2 on the Exit PCB. Snub Adjustment is also set on the Exit PCB.

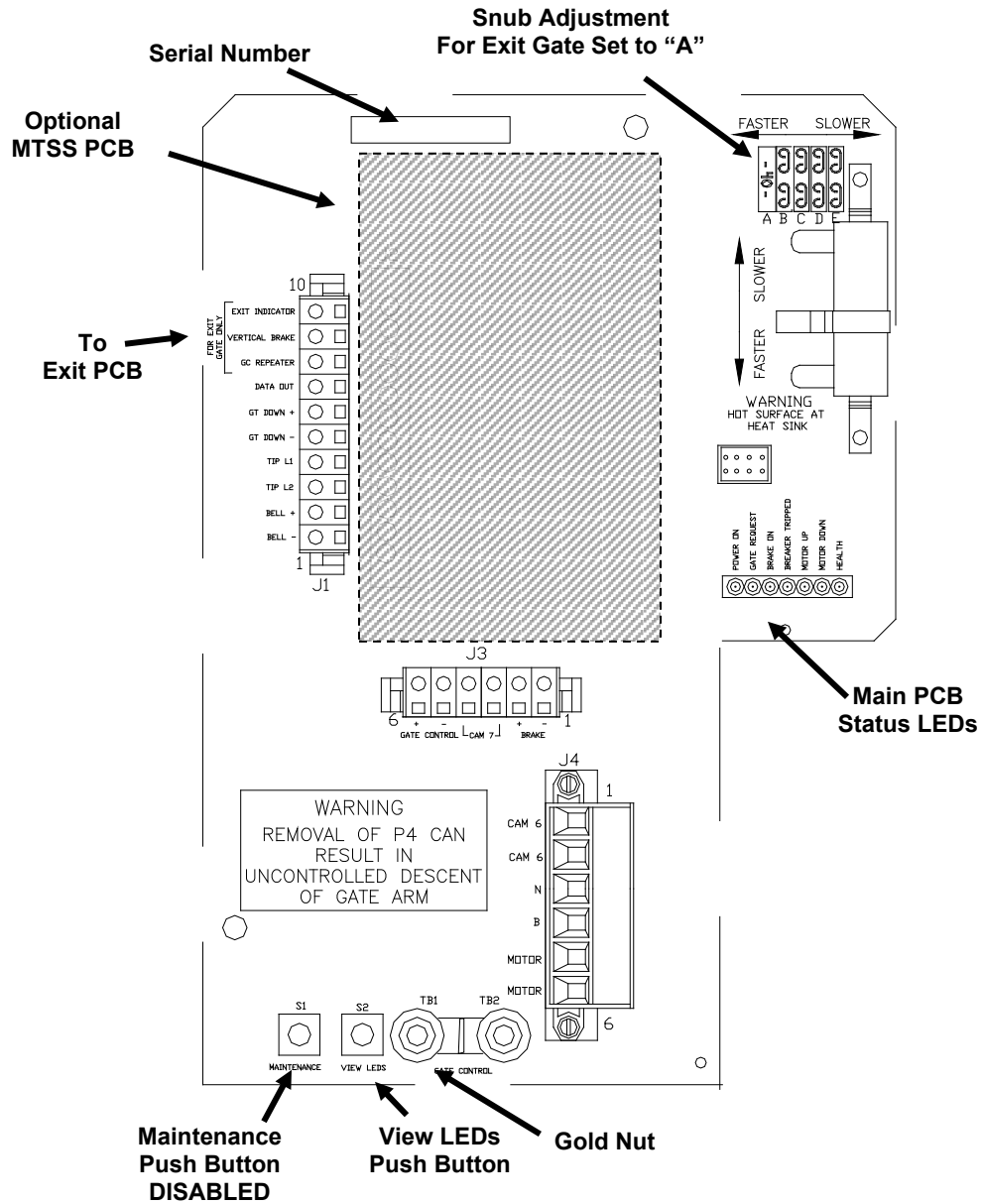


Figure 9-4 Main PCB

## SECTION 10 EXIT GATE OPERATION

### 10.0 EXIT GATE OPERATION

#### 10.1 OPERATION

The exit gate operates in reverse of the entrance gate. The gate arm is to fall up to a minimum of 70 degrees without power.

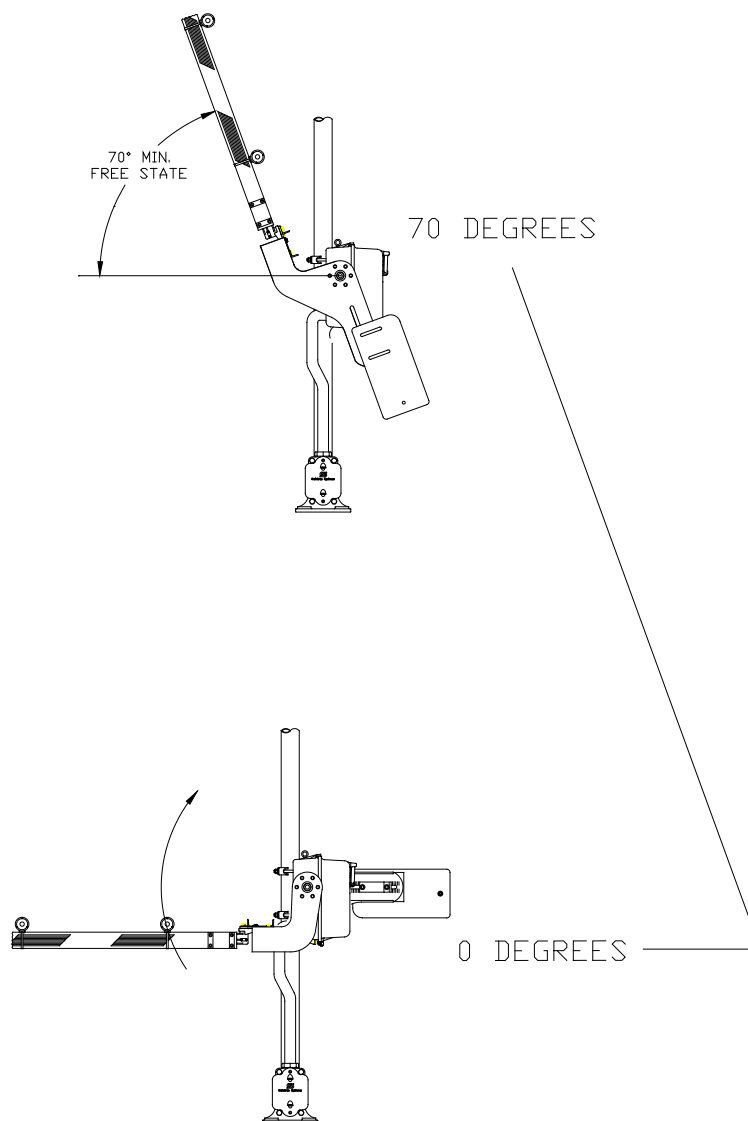
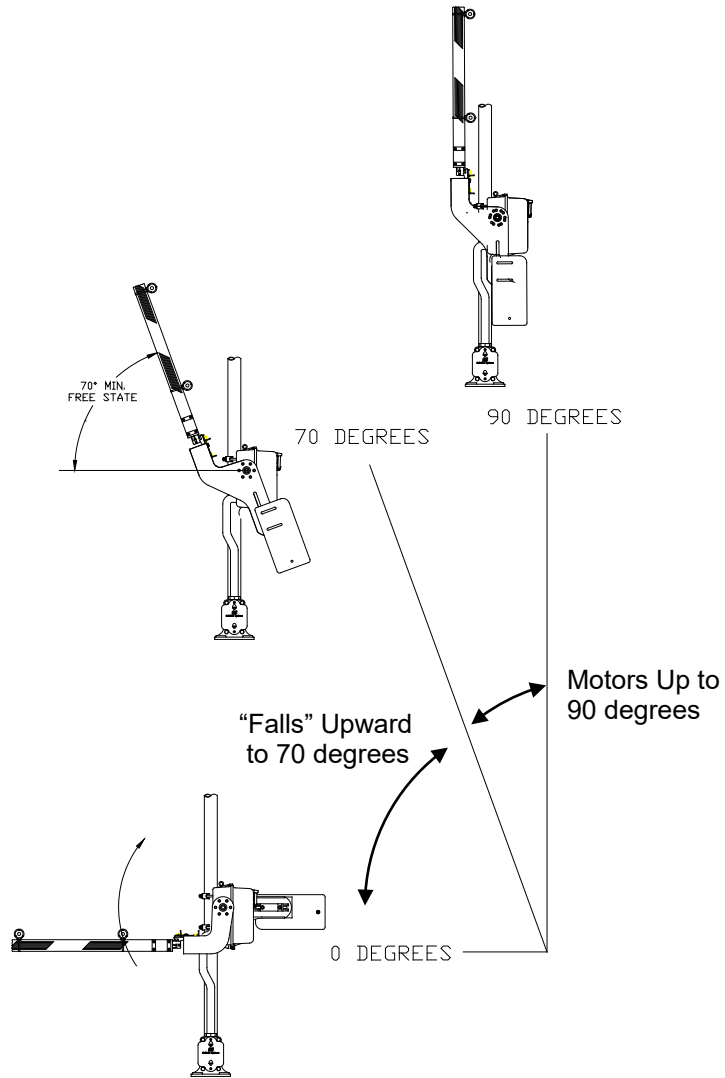


Figure 10-1 Exit Gate Free State

## EXIT GATE OPERATION

When GC is then removed, voltage will be applied to the motor and the gate will motor and “fall” upward until it passes the balance point and motor until vertical. At that point the brake is set and will remove motor power. An “Exit Module” provides the additional exit gate connections for maintenance functions along with the circuitry to apply the vertical brake.



**Figure 10-2 Exit Gate Motor Up to Vertical**



The diagram Figure 10-3 shows a simplified representation of the functionality of the S-60 Plus operating as an Exit gate.

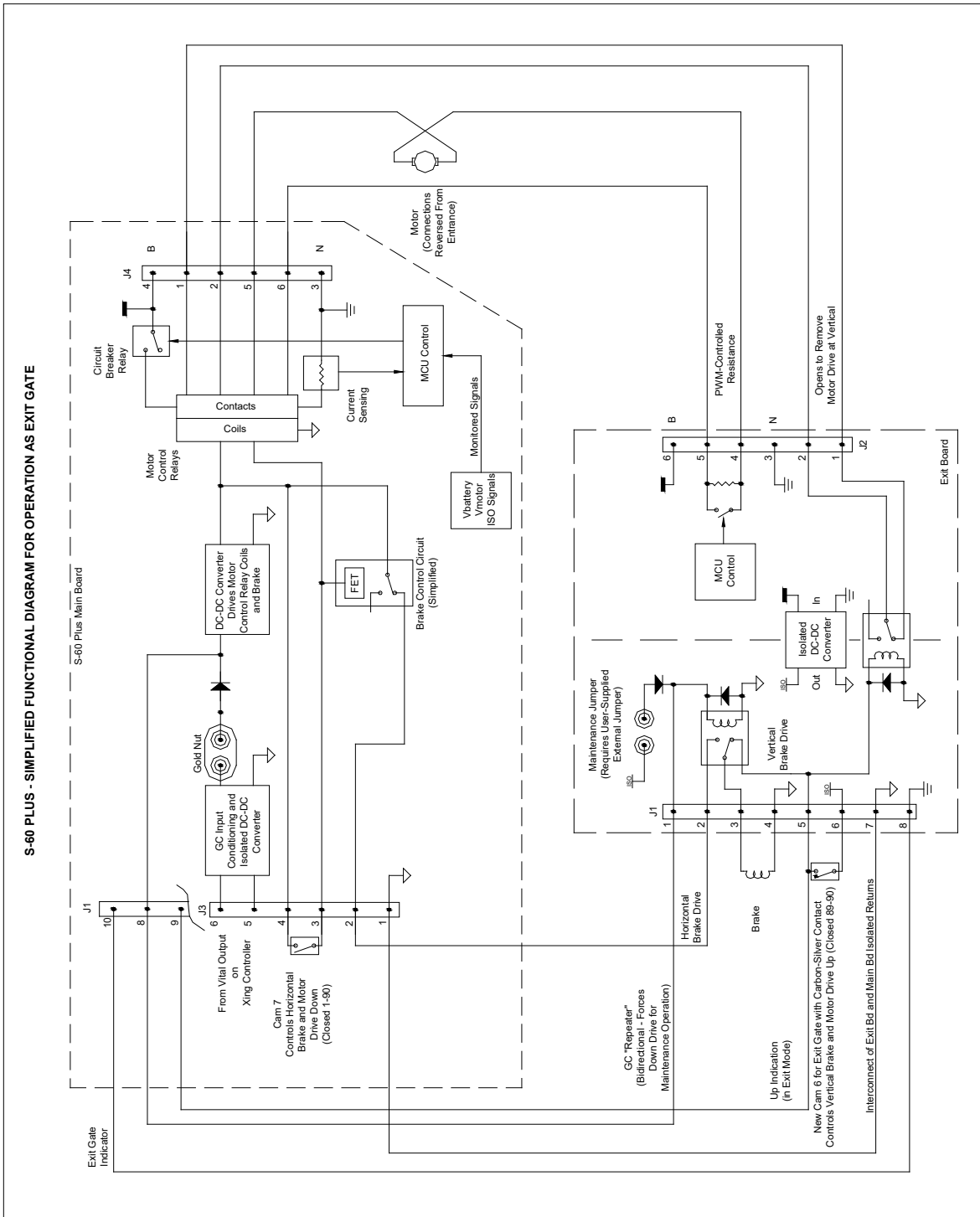


Figure 10-3 Simplified S-60EXIT Gate Block Diagram

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## SECTION 11 EXIT GATE INSTALLATION

### 11.0 EXIT GATE INSTALLATION

#### 11.1 GENERAL

The following section will detail the installation and setup of the S-60 Exit Gate Crossing.

#### 11.2 BATTERY AND WIRE SIZE 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 are as follows:

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 batteries are suggested with the 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 40	7	11	11

#### 11.3 TYPICAL EXIT GATE INSTALLATION

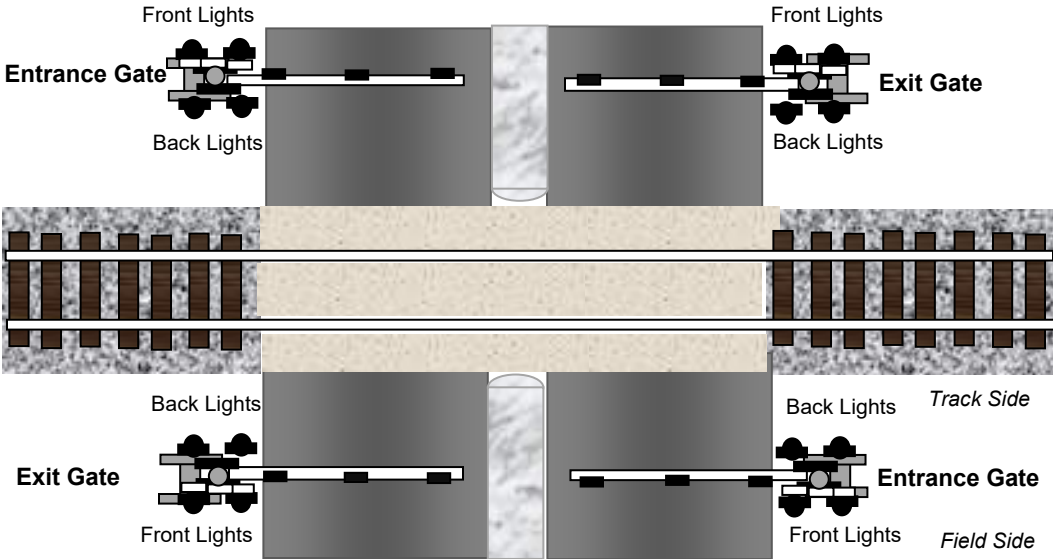
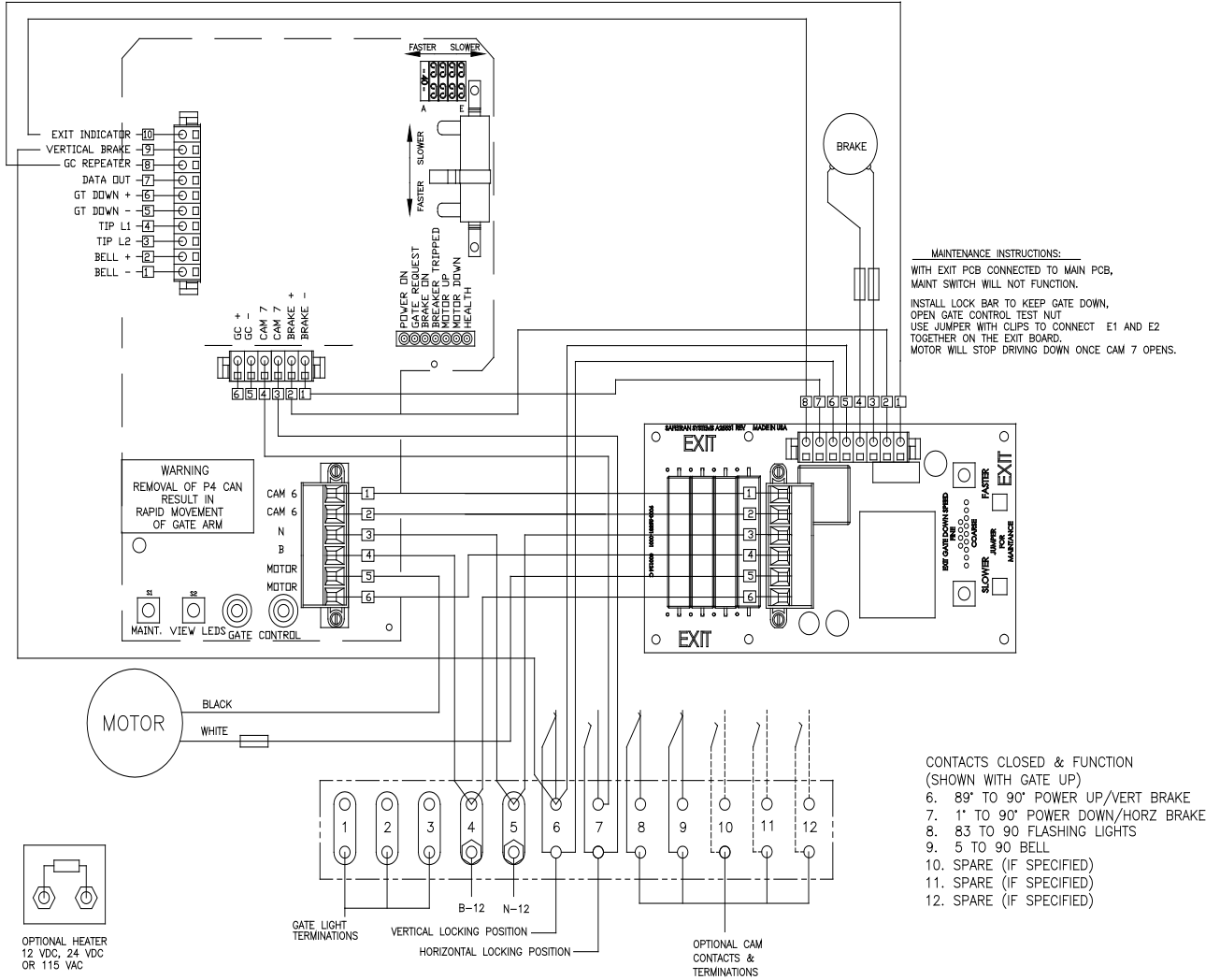


Figure 11-1 Typical Four-Quadrant Gate Installation

# EXIT GATE INSTALLATION

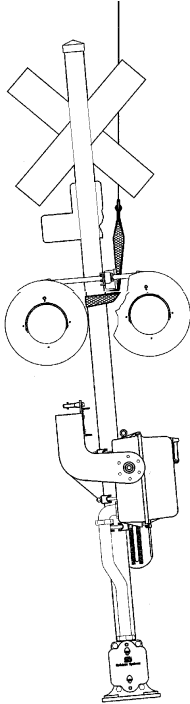
## 11.4 TYPICAL EXIT GATE WIRING

Figure 11-2 displays wiring of a typical Exit Gate.

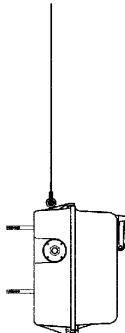


**Figure 11-2 Exit Gate Wiring**

**11.5 LIFTING RECOMMENDATIONS**



Weight (as shown), 560 lbs.



Weight (as shown), 211 lbs.

Mechanism only can be lifted into place using the lifting eye provided

Description	Part Number	Dimensions	Weight
Adapter Cast	076203-510X		28 lbs.
Adapter Fab	076203-501X		20 lbs.
Conversion Bracket (Cast Adapter)	076227-X		75 lbs.
Conversion Bracket (Fabricated Adapter)	076227-22X		55 lbs.
J B. Base Assy.	041931-X		85 lbs.
Mast & J B. Base (5" Alum.)	070519-27AX	14 feet - 0 inches	140 lbs.
Mast & J B. Base (5" Alum.)	070519-40AX	16 feet - 0 inches	160 lbs.
Mast & J B. Bast Stub (5" Alum.)	070519-3AX	7 feet - 0 inches	100 lbs.
Sidelight Cantilever	041442-26X		38 lbs.
Counterweight Std.	070755-4	15 x 30 x 1/2 inches	63 lbs.
Counterweight Short	070755-34	15 x 15 x 5/8 inches	38 lbs.
Counterweight Stud Plate	070757-26X		15 lbs.
Arm Supports (1 each)	070920-LX -or- 070920-RX		72 lbs. ea.
Arm Supports (1 each)	070921-LX -or- 070921-RX		30 lbs. ea.
R R Crossing Sgn w/mtg. Hardware	035200-17X		40 lbs.
#2 Track Sgn w/mt. Hardware	035236-2X		25 lbs.
J B. Crossarm 2-Way w/FLX-12 Heads Complete	042003-000616		110 lbs.
S-60EXIT Gate Mechanism	As specified		211 lbs.
Galvanized Steel Foundation	035903-911-1X		200 lbs.

# EXIT GATE INSTALLATION

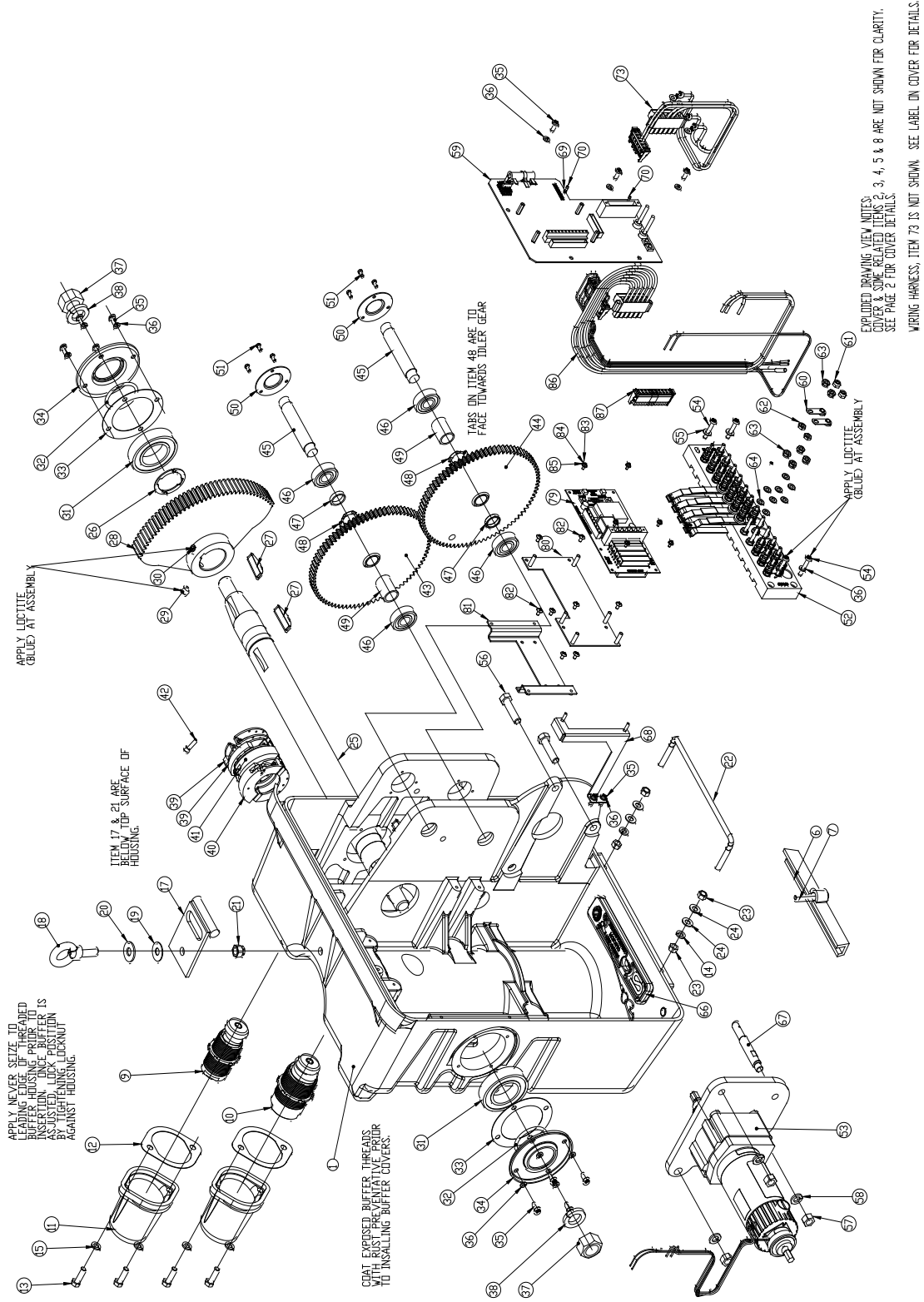


Figure 11-3 Exit Gate Exploded View

EXIT GATE BILL OF MATERIALS

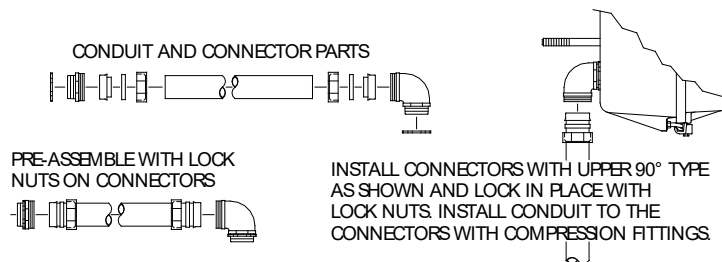
ITEM NO.	QTY. REQ'D.	UOM	PART NUMBER	DESCRIPTION	* NOT SHOWN	ITEM NO.	QTY. REQ'D.	UOM	PART NUMBER	DESCRIPTION	* NOT SHOWN
1	1	EA	073001-1	CABINET, GATE		46	4	EA	070588	BEARING 3/4	
2	1	EA	073002-X	WELDMENT, COVER		47	2	EA	073009-3	SPACER 1/4	
3	1	EA	070909-4	HANDLE, LATCH		48	2	EA	070695-500	WASHER, SPRING	
4	1	EA	070919-2	ROD, LATCH		49	2	EA	073009-2	SPACER 1-1/2	
5	1	EA	004658-E	SS SH 3/8-16 X .50		50	2	EA	073007-2	COVER, BEARING	
6	1	EA	070968-4	RETAINER, HINGE		51	6	EA	002614-HHE	MS HH 10-32 X .375	
7	1	EA	002692-HE	MS HH 5/16-18 X2.5		52	1	EA	074030-X101	TERM BD ASSY S60 EXIT 4 CAM	
8	1	EA	070559-A	GASKET, COVER		53	1	EA	074070-X5	ASSY, S-60 MOTOR & ADAPTOR	
9	1	EA	070903-X	BUFFER ASSY, UPPER		54	4	EA	002665-PEX	MS PH 1/4-20 X 1.5	
10	1	EA	070903-2X	BUFFER ASSY, LOWER		55	2	EA	001717-E	W FA 1/4 STLNS	
11	2	EA	070902-1	CAP, BUFFER		56	3	EA	004170-HSC	CS HH 1/2-13 X 2	
12	2	EA	070926-1	GASKET, BUFFER CAP		57	3	EA	002108-SC	N HX 1/2-13	
13	4	EA	004089-HSC	CS HH 3/8-16 X1.25		58	3	EA	001812-MSC	W LKS M 1/2	
14	2	EA	001810-ME	W LKS M 3/8		59	1	EA	9000-25527-0001	ASSY, S-60 ENTRANCE PCB	
15	4	EA	001810-MSC	W LKS M 3/8		60	2	EA	024620-3X	TEST LINK ASSY, 1' CENTERS	
16	1	EA	001304-2	CONNECTOR, RELIEF		61	2	EA	024620-13	NUT, GOLD TEST	
17	1	EA	070919-3X	WELDMENT, PLATE		62	2	EA	023832	NUT, CLAMP AHR (FLAT) 14-24	
18	1	EA	007099	EB 1/2-13 X 1.50		63	14	EA	023831	NUT, BINDING AHR, SHOULDER, 14-24	
19	1	EA	070980-4	WASHER, NEOPRENE		64	16	EA	023834	WASHER, BEVELED AHR (FLAT)	
20	1	EA	001755-E	W FA 1/2		65	5	EA	104824	TIE, CABLE	*
21	1	EA	002327-FLSC	N FL F-L 1/2-13		66	1	EA	074035-X11	BAR, STOP, ASSEMBLY, S-60	
22	1	EA	070968-2	BOLT, HINGE		67	1	EA	074035-14	PIN, REACTION, S-60	
23	4	EA	002104-E	N HX 3/8-16		68	1	EA	Z610-39557-0001	BRACKET, S-60 PCB STANDOFF	
24	4	EA	001726-E	W WR 3/8		69	2	EA	001802-MSC	W LKS M #4	
25	1	EA	074028	MAIN SHAFT, GATE		70	2	EA	007754-S3C	SCREW CAP SDC 4-40 X 3/4 STL	
26	1	EA	070584	RING, RETAINING		71	1	EA	074050-X	KIT, S-60 MAINT. & INST.	*
27	3	EA	007149	KEY UX WOODRUFF		72	1	EA	074007-10	LABEL, S-60 ENTRANCE 4 CAM WIRING	
28	1	EA	073003	GEAR, SEGMENT		73	1	EA	075016-X1	ASSY, S-60 WIRING HARNESS	
29	1	EA	004706-SC	SS SH 1/2-13 X .50		74	1	EA	098222-101708	PANDUIT TIE BASE	
30	1	EA	004708-SC	SS SH 1/2-13 X .75		75	1	EA	012-00-000	ADHESIVE	*
31	2	EA	075284	BEARING, 2"		76	1	EA	017-00-000	LUBRICANT, GEAR	*
32	2	EA	070585	O-RING 2"		77	1	EA	017-00-004	SPRAY, TEFLON	*
33	2	EA	070747-3	GASKET, SEAL PLATE		78	1	EA	019-02-000	TP 2" MASKING	*
34	2	EA	073008	PLATE, BEARING SEAL		79	1	EA	9000-25531-0001	PCB, S-60 EXIT GATE	
35	13	EA	002659-PEX	MS PH 1/4-20 X.625		80	1	EA	Z610-39551-0001	PLATE, EXIT PCB MOUNTING	
36	16	EA	001808-ME	W LKS M 1/4		81	1	EA	Z610-39552-0001	PLATE, EXIT PCB RISER	
37	2	EA	002118-SC	N HX 1-8		82	8	EA	002614-TEX	MS TR 10-32 X .375	
38	2	EA	001817-MSC	W LKS M 1"		83	6	EA	002557-PEX	MS PH 6-32 X .375	
39	2	EA	070633-2AX	CAM ASSY, PLASTIC		84	6	EA	001804-MSC	W LKS M #6	
40	1	EA	073014-BX	SWITCH ASSY, SNAP (S-60 Exit)		85	6	EA	001706-SC	W FA #6	
41	1	EA	073014-AX	SWITCH ASSY, SNAP		86	1	EA	075016-X2	ASSY, S-60 EXIT HARNESS	
42	4	EA	004003-S3C	CS SH 1/4-20 X.875		87	1	EA	Z715-09027-0010	CONNECTOR, 10 PIN WAGO	
43	1	EA	073004	GEAR & PINION UP							
44	1	EA	073005	GEAR & PINION, LOWER, S-20/S-40							
45	2	EA	073007-1	SHAFT, GEAR							

\* = Not Shown

Figure 11-4 Exit Gate Bill of Materials

## 11.6 EXIT GATE INSTALLATION PROCEDURE

1. **Erect mast and base.** Erect five inch mast, with junction box base on the track side. Mounting hole for front and 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. **Mount support clamp on mast.** Support clamp 070786-5X mounts on the mast with casting facing 45° from the field side toward track. The top of casting should be approximately 51" above the top of foundation (Figure 11-3, item 5). (Actual height may vary depending on local conditions.)
3. **Prepare mechanism.** Thread 90° flex conduit coupling into the back of the gate cabinet and insert the 4 square head machine bolts into the slots on the back of cabinet (Figure 11-3, items 72 & 76).
4. **Clamp mechanism in place.** Lift mechanism and set on top of the support clamp. Clamp to mast with clamps, nuts and washers provided (Figure 11-3, items 75, 77, 78 & 79).
5. **Install arm supports.** Apply a small amount of Siemens No-oxide Grease PN 032401-X on the main shaft threads. Mount gate arm supports with bolted on hubs over the keys on the main shaft ends. Install main shaft nuts and washers (Figure 11-3, items 36 & 37) but **do not fully tighten** until after installing the conversion bracket.
6. **Install arm coupling or conversion bracket.** Bolt to the arm support castings and then **fully tighten** the main shaft nuts.
7. **Install flexible conduit.** Thread coupling into base and install conduit to base and rear of cabinet.
8. **Mount flashing lights, bell and signs.** The flashing light units have been factory wired but control



wires from the lights junction box to the junction box base must be field installed. **Align the flashing light units before placing the crossing in service.** Bell, when used, is mounted on top of the mast with the gong facing the roadway. A spare contact is provided on the gate controller to cut off bell when the gate arm is down (see wiring Figure 11-2). Mount the required signs.

9. **Connect power to mechanism.** See Section 11.2 for recommended battery and wire requirements and connect per wiring diagram Figure 11-2. Seal conduit opening per AREMA Signal Manual Part 2.4.25.
10. **Install counterweight stud plates.** Ensure the roller spacers are over the studs and in the arm support slot before mounting clamp bar and locking piece. Figure 11-6 and Figure 11-7, items 8,4,11,12, and 13.



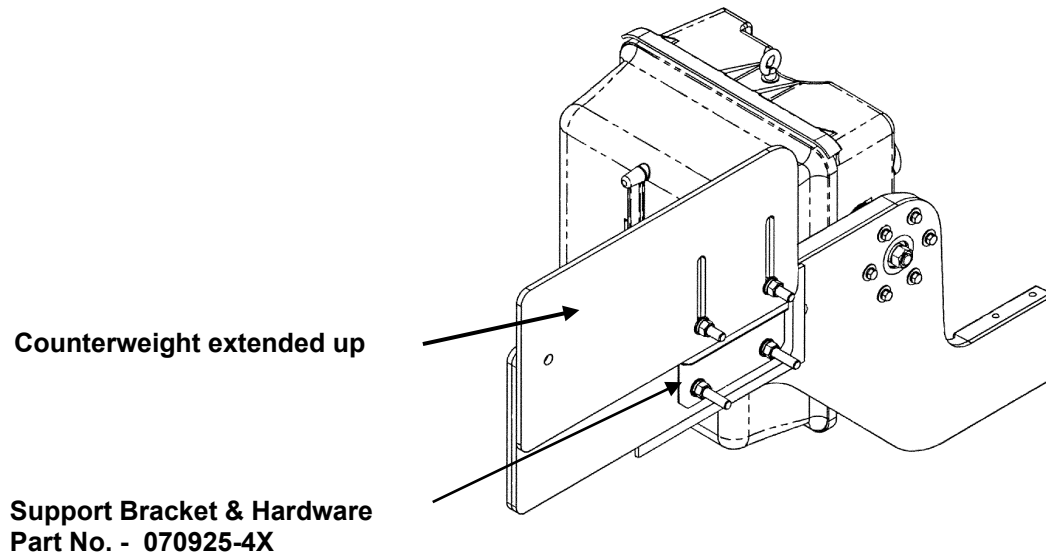
**11. Install counterweights and gate arm as follows:** If required, the back clamps can be loosened and the mechanism rotated parallel to the roadway for arm installation.

a. **Install counterweights.** With the arm supports in “arm up position”, install up to 6 counterweights (12 short type) at this time. Total number required per Table 11-2 Counterweights and Vertical Torque. Position the counterweights with the large corner radius to the field or up position and locate maximum to the field or up position (see Figure 11-6). Short arm installations may require extending counterweights as shown in Figure 11-5.

b. **Raise counterweights.** Place gate arm in the horizontal position using the Maintenance Jumper described in Section 12.2.

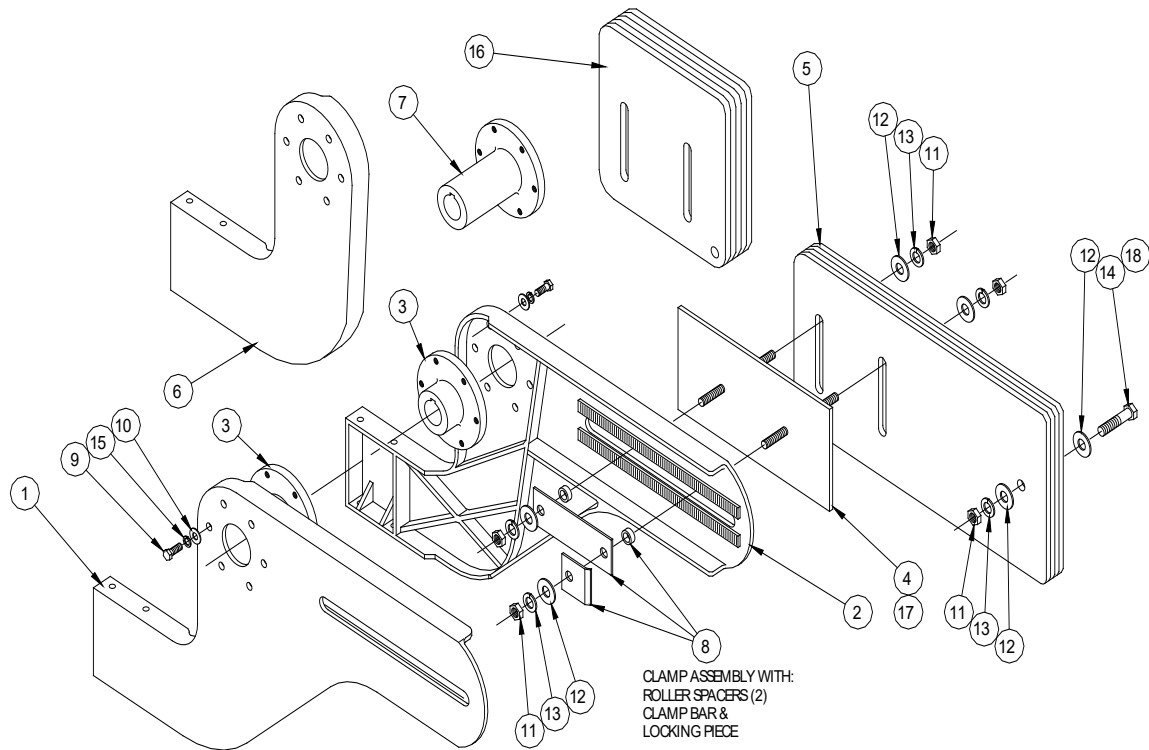
c. **Install gate arm.** On breakaway pivot type assemblies, install number and type of shear bolts per arm manufacturer’s instructions.

d. **Raise arm to vertical.** Install additional counterweights if required and preset them maximum to field (vertical torque adjustment).



**Figure 11-5 Extending Counterweights**

# EXIT GATE INSTALLATION



**Figure 11-6 Installing Counterweights**

Item No.	Description	Part Number
1	Support, Left Hand	070920-L
	Support, Left Hand with Hub and Mounting Bolts	070920-LX
2	Support, Right Hand	070920-R
	Support, Right Hand with Hub and Mounting Bolts	070920-RX
3	Hub, Gate Arm Support	070923-3
4	Plate, Stud for wood arms 13' – 36' and all fiberglass arms (standard) w/hardware	070757-26X
	Plate, Stud for wood arms 37' – 42' (standard) w/hardware	070757-24X
5	Counterweight, Galvanized Steel, 1/2" x 15" x 30", 58 lbs (standard)	070755-4G
6	Support, Left Hand for use without counterweights	070921-L
	Support, LH w/o counterweights with Hub and Mounting Bolts	070921-LX
6A	Support, Right Hand (not shown) w/o counterweights	070921-R
	Support, RH w/o counterweights with Hub and Mounting Bolts	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"	004167-HSC
10	Washer, Wrought, 1/2"	001755-C
11	Nut, Hex, 3/4" – 10	002114-SC
12	Washer, Wrought, 3/4"	001737-SC
13	Washer, Spring Lock, M, 3/4"	001815-MSC
14	Cap Screw, Hex Head, 3/4" – 10 x 2" for 1 – 2 standard counterweights	004274-HSC
	Cap Screw, Hex Head, 3/4" – 10 x 3" for 3 – 4 standard counterweights	004278-HSC
	Cap Screw, Hex Head, 3/4" – 10 x 4" for 5 – 6 standard counterweights	004282-HSC
	Machine Bolt, Hex Head, 3/4" – 10 x 6.5" for 7 – 10 standard counterweights	003177-SC
15	Washer, Spring Lock, M, 1/2"	001812-MSC
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	070757-30X
	Plate, Stud for wood arms 37' – 46' (short) w/hardware	070757-31X
18	Cap Screw, Hex Head, 3/4" – 10 x 2.5" for 1 – 3 short counterweights	004276-HSC
	Cap Screw, Hex Head, 3/4" – 10 x 5" for 4 – 6 short counterweights	004284-HSC
	Machine Bolt, Hex Head, 3/4" – 10 x 8" for 7 – 11 short counterweights	003180-SC
	Machine Bolt, Hex Head, 3/4" – 10 x 14" for 12 – 21 short counterweights	003190-SC

**Figure 11-7 Counterweight Bill of Materials**

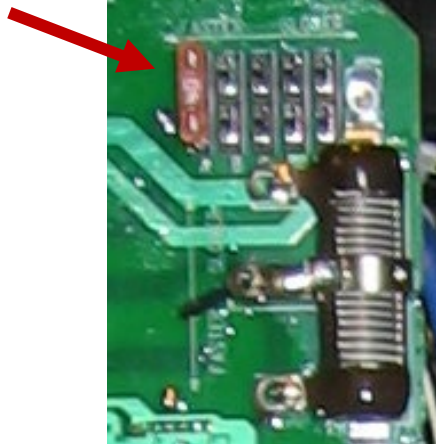
**NOTE**

**NOTE**

The default-up requirement of the model S-60 Exit gate requires counterweight heavy installation.

12. **Set horizontal torque and arm height.** Set horizontal torque to  $200 \pm 20$  foot-pounds at counterweight side per instructions. Set arm height by rotating contact cam #7 and operating gate with down control. Be sure that horizontal buffer (upper position) is clear of segment gear.
- 12A. The gate arm should move via gravity to 70 to 83 degrees from the horizontal position.
13. **Raise and check vertical position of arm.** Set the vertical position by rotating contact cam #7 and operating gate with up control.
14. **Adjust buffers.** Set both buffers to 1/32 clearance from segment gear per instructions.
15. **Set vertical torque.** With the arm horizontal, open the Gold Nut on the Main PCB. The counterweight heavy arm will move to a near vertical default position.
16. **Clearing time.** Clearing time is determined by voltage available and varies with length of arm but should be between 6 and 10 seconds.
17. **Adjust descending time.** Total descent time is determined by setting the coarse and fine speed adjustments located on the Exit PCB. Jumper/Fuse (J5) on Main PCB must be set to "A" position.

Set to "A" Position



Main PCB Snub Setting

**HINT**

**HINT**

Some combinations require use of the bracket as shown in Figure 11-5. BY shifting the weights up allows the gate arm to rise higher without adding more counter weights as this works against the horizontal torque. If the breaker is tripping, the counter weight adjustment is incorrect.

Set the descent time using the Slower or Faster push buttons on the Exit Module to sequence through the 36 snub settings. The example below displays a sequence through one coarse level. Each push of the button selects the next step. There are four fine level steps between each coarse level. LEDs will dim after six to ten seconds of inactivity.

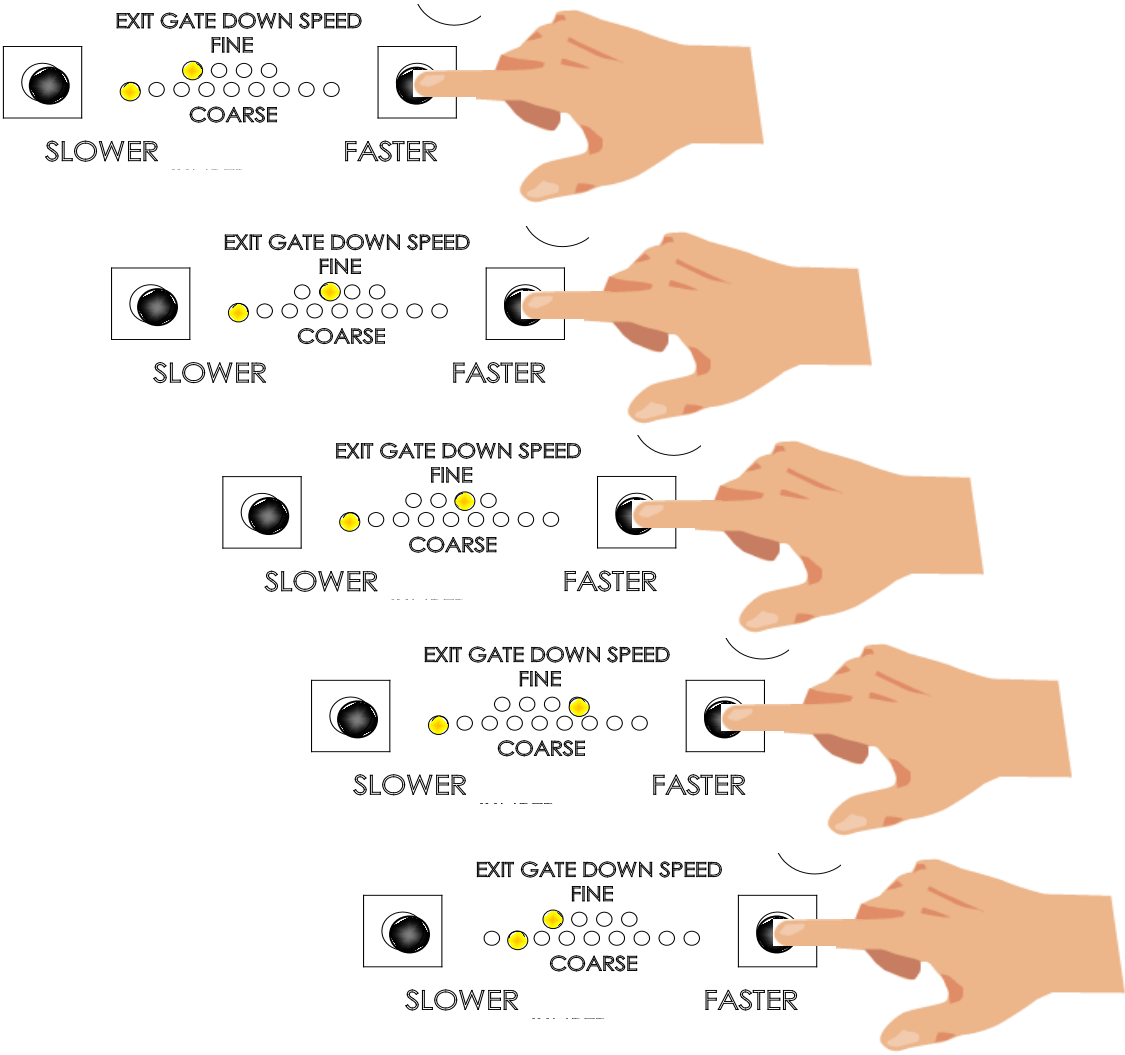


Figure 11-8 Snub Level Adjustment Example

### 11.7 CIRCUIT CONTROLLER ADJUSTMENT

Four spring contacts are provided on a standard mechanism assembly. An additional contact can be furnished if required. Two contacts are required for gate operation (position 6 and 7) and two contacts (position 8 & 9) are factory adjusted and may be used as indicated in the table below.

Contacts are adjustable. 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.



**CAUTION**

REPEATED OR OVER BENDING OF A CONTACT MAY CAUSE DAMAGE AND NOT ALLOW PROPER TENSION WHEN CLOSED OR GAP WHEN OPEN.



**NOTE**

Contact tools and gages are available, see ordering information.

Contact cams are factory set for contact function as shown in Table 11-1, 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.

**Table 11-1 Contact Function and Settings**

Term. Board Position Number	Contact Closed at Gate Arm at:	Function of Contact
6	89 Degrees – 90 Degrees	Power Up/Vertical Brake
7	1 Degrees – 90 Degrees	Power Down/Horizontal Brake
8	83 Degrees – 90 Degrees	Spare Flashing Light Control
9	5 Degrees – 90 Degrees	Spare (Bell Control)

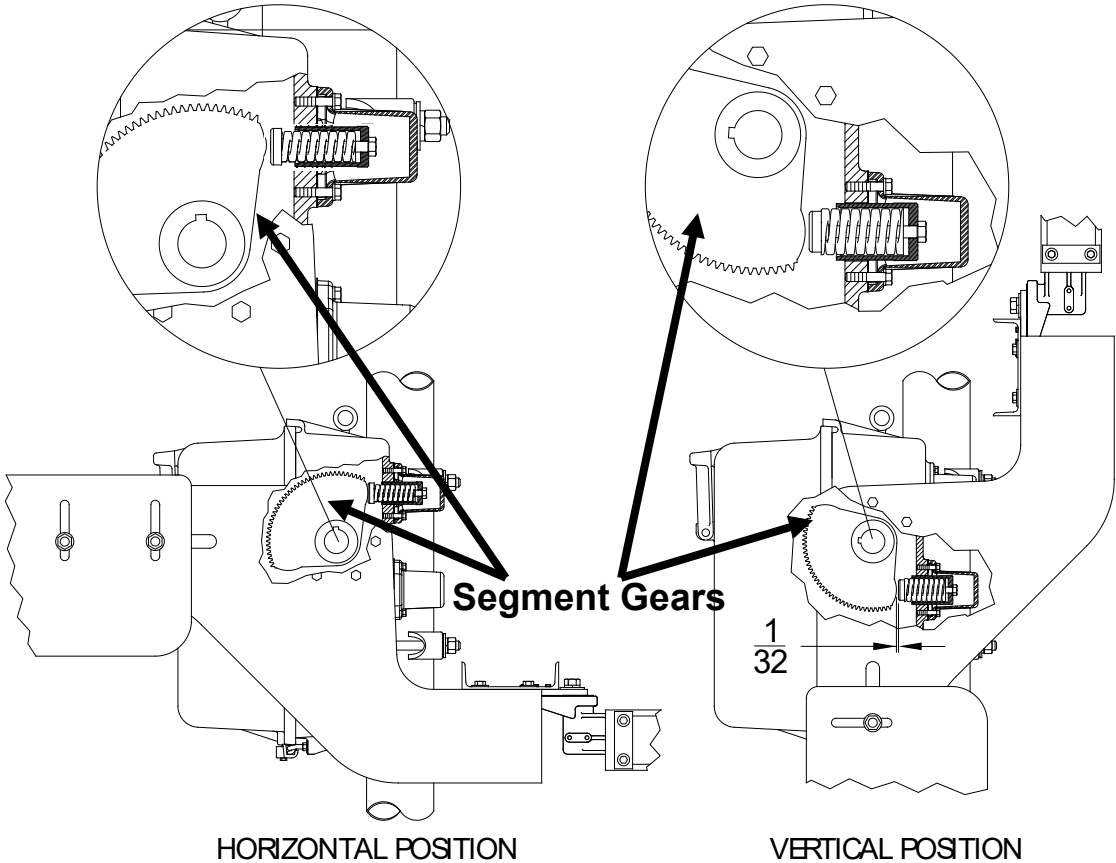
**11.8 SPRING BUFFER ADJUSTMENT**

The Model S-60 gate mechanism is equipped with external, adjustable spring buffers. In an Exit gate, the buffers do not contact the segment gear and are only used for added protection of the assembly.

**CAUTION**

**CAUTION**  
FIELD ADJUSTMENT OF THE SPRING BUFFERS IS NECESSARY. VERTICAL BUFFER SHOULD CLEAR SEGMENT GEAR BY 1/32". THESE ADJUSTMENTS SHOULD ALWAYS BE CHECKED BEFORE PLACING THE GATE IN SERVICE.

Cam #7 controls the height of the gate arm above the roadway and is held in place with the brake.



**Figure 11-9 Segment Gears**

## EXIT GATE INSTALLATION

**To adjust horizontal position** – rotate cam #7 as needed to raise or lower the arm position.

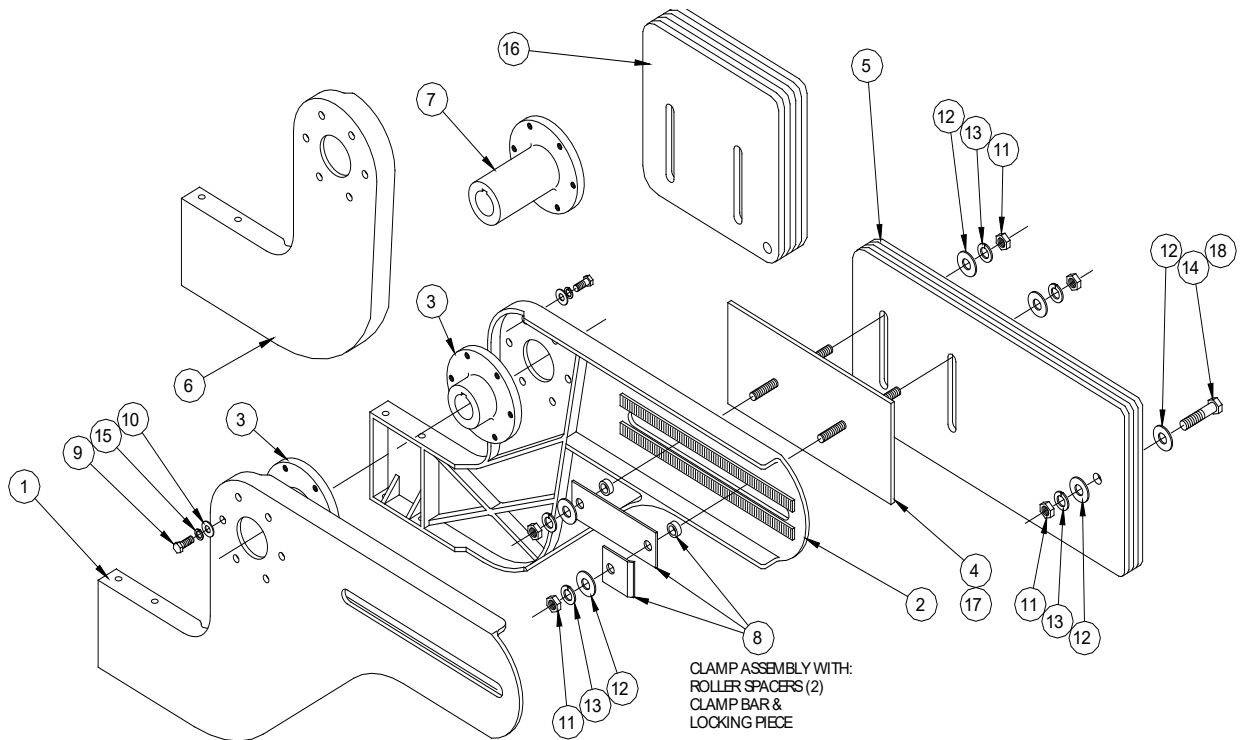
The vertical buffer supports the weight of the counterweights during installation and if the gate arm is knocked off, however there should be no contact with the segment gear during normal operation (1/32" gap per the illustration).

**To adjust the vertical buffer** – rotate cam #6 as needed to raise or lower the gate position.

### 11.9 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 Siemens arms, conversion bracket and adapter.

Counterweights can be mounted on a single counterweight support arm for arms up to 22'. Longer arms require counterweight supports on both sides of the mechanism.



**Figure 11-10 Counterweight Assembly**



**Table 11-2 Counterweights and Vertical Torque**

	Gate Arm Length in feet	Counterweights Required		Stud Plate 070757	
		Std.	Short	Std.	Short
Counter-weights mounted on one Support Arm	12' – 14'	3	6	-26X	-30X
	15' – 18'	4	8	-26X	-30X
	19' – 22'	5	10	-26X	-30X
	23' – 28'	6	14	-26X	-30X
	29' – 32'	7	14	-26X	-30X
Counter-weights mounted on two Support Arms	33' – 36'	8	16	-26X(2)	-30X(2)
	37' – 40'	9	18	-26X(2)	-30X(2)

**11.10 TORQUE ADJUSTMENTS**

**11.10.1 Horizontal Torque**

Open the gate housing cover. Lower the gate to the full horizontal position from the crossing controller equipment. Once the gate arm reaches the horizontal position, the brake will energize and hold the arm in this position. Install the lock bar to the gate to keep the arm down. Insure that the horizontal buffer is not compressed and that there is a 1/32" clearance. Open the gold nuts on terminals 4 and 5 to remove all power to the gate. The lock bar will hold the gate in this position.

Place a 7/16" open-ended wrench on the extended motor shaft on the brake end of the motor. Rotate the wrench slightly to remove pressure on the lock bar and remove. Install the Siemens torque wrench to the pinion end of the motor shaft and hold. The exit gate is counter weighted to go up so the torque wrench will try to pull away from the housing (opposite torque reaction as an entrance gate). Take your 6 torque readings. The lowest reading recorded is the horizontal torque.

Continue to take 5 more horizontal torque readings as follows. Rotate the brake end of the motor shaft slightly so the torque wrench can be removed. Rotate the torque wrench 60 degrees (one flat) and reinstall. Lower the torque wrench to the cover edge and record the torque value. Repeat until 1 full revolution of the output shaft has been checked. The lowest reading recorded is the horizontal torque.



**CAUTION**

DO NOT CHANGE THE POSITION OF THE COUNTERWEIGHTS WITH THE TORQUE WRENCH IN PLACE.



**NOTE**

Generally used to highlight certain information relating to the topic under discussion.

## EXIT GATE INSTALLATION

If adjustment of counter weights is required, recheck torque to verify proper torque range 180 - 220 ft. lbs.

When proper reading is obtained, remove torque wrench and reapply power.

If done, add final checks of:

- A) Horizontal torque does not exceed 250 ft. lbs. (up direction).
- B) Gate down current does not exceed 15 amps.
- C) Snub adjustments provide acceptable descent times.
- D) Gate arm falls up to 70 to 83 degrees under a loss of power condition.
- E) Increased gear and brush maintenance may be required. Clean gears and reapply grease when signs of wear are evident.

### **11.10.2 Free State Torque Adjustment**

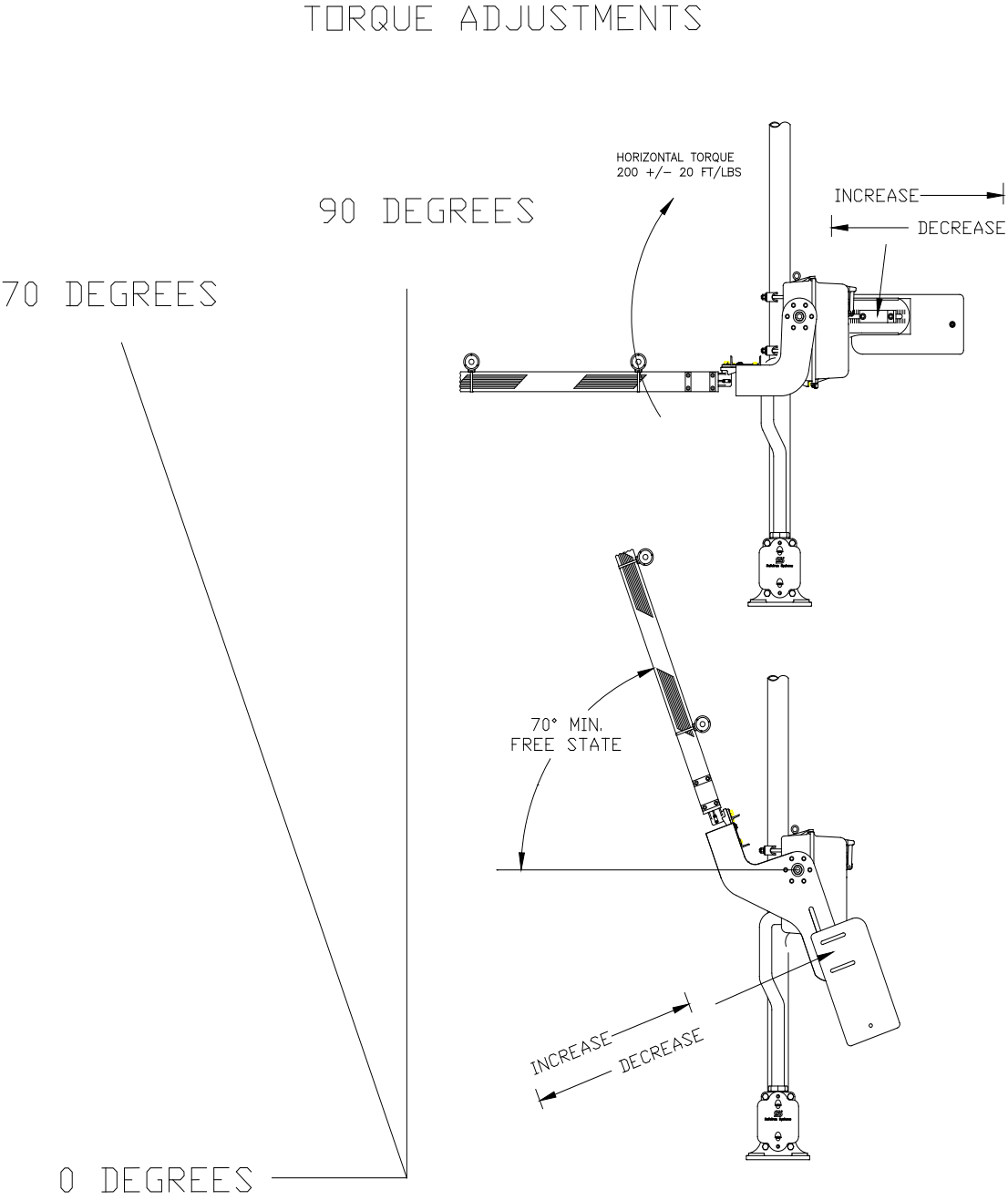
Set vertical torque to obtain a free position of 70 degree minimum as follows:

Make sure the torque wrench has been removed from the output shaft and the lock bar has been installed to keep the gate down before proceeding. With the gate in the horizontal position, open the test links on terminals 4 and 5 and open the Gold Nut TB-1 to remove all power from the gate and releasing the power on brake. The lock bar will hold the gate in the horizontal position.

Place a 7/16" open-ended wrench on the extended motor shaft on the brake end of the motor. Rotating the wrench slightly will remove pressure from the lock bar against the reaction pin and the lock bar can be easily removed. Remove wrench. Due to the negative horizontal torque, the gate arm will rise. Check the angle of the gate arm per Figure 11-11. Note angle. To adjust the free state position, close the test links on 4 and 5 and the gate arm should go to the vertical position. Install the lock bar to keep the arm up and adjust the counter weights on the stud plate away from the arm to increase the angle of the free state position and closer to the gate arm to lower the angle. Do not add more weights to increase the free state angle or it will affect you horizontal torque from the previous step. If more angle is needed, install support bracket 070925-4X to further extend the counter weights.

After each free state torque adjustment is made, check from the horizontal position. Remove the lock bar and reinstall to keep the gate down. Close the test links on terminals 4 and 5 to power the gate to the horizontal position. Open test links to remove power and remove the lock bar and let the arm move to the free state position via the counter weights. Repeat until a minimum of 70 degrees has been reached.

The diagram below details the torque adjustments.



**Figure 11-11 Torque Adjustments**

### 11.10.3 Torque Wrench Kit

Siemens Torque Wrench Kit permits measurements to be taken from the ½ 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 ½ inch hexagon of the motor shaft.



**CAUTION**

COMMERCIALLY AVAILABLE TORQUE WRENCHES SHOULD NOT BE USED TO ADJUST HORIZONTAL AND VERTICAL TORQUES, AS THEY ARE NOT DESIGNED TO ACCOUNT FOR THE 240:1 GEAR RATIO OF THE DRIVE TRAIN.

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

- Torque Wrench (calibrated for both inch-pound and foot-pound readings through the 240:1 gear reduction)
- Ratchet Wrench (3/8 in 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
- Instruction Sheet

**Figure 11-12 Torque Wrench Kit**



### 11.11 HARDWARE TORQUE GUIDELINES

The following chart details recommended hardware torque.

**Table 11-3 Torque Guidelines**

Thread Size	Hex Nut Size	Torque
4-40	3/32" Allen	6 in lbs.
10-32	-	32 in lbs.
14-24	7/16	6 ft. lbs.
1/4-20	7/16	6 ft. lbs.
5/16- 18	1/2	15 ft. lbs.
3/8 – 16	9/16	25 ft. lbs.
1/2 - 13	3/4	55 ft. lbs.
5/8- 11	15/16	90 ft. lbs.
3/4 -10	1-1/8	105 ft. lbs.
1" -8	1-1/2	140 ft. lbs.

### 11.12 FINAL CHECKS

- A. Voltage at terminals 4 and 5 should be no less than 11 or more than 16 volts.
- B. Check for possible grounds.
- C. Check voltage and current during operation.  
Voltage should not drop below 11 volts during gate up or gate down cycle.  
Power up current should be 2 - 8 amps. Power down current should be 6-15 amps.
- D. Check clearing and descending times.  
Check Clearing time as set per step 16 of 6-10 seconds.  
Check Descending time as set per step 17 of 10-15 seconds.  
Clear position with power removed (arm between 70° and 83°).
- E. Check terminal board contacts. Check clearance, square contact and wiping action.



**WARNING**

**WHEN PLACING THE GATE IN SERVICE, OBSERVE PROPER OPERATION WITH TRAIN ACTIVATION OF THE CROSSING AND PERFORM ANY ADDITIONAL TESTS IN ACCORDANCE WITH RAILROAD PROCEDURES.**

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## SECTION 12 EXIT GATE MAINTENANCE

### 12.0 EXIT GATE MAINTENANCE

#### 12.1 GENERAL

Maintenance of the Exit Gate is similar to the Entrance Gate however some of the operations and parameters are different.

#### 12.2 MAINTENANCE JUMPER OPERATION

The S-60EXIT Gate utilizes a jumper to place the gate mechanism in the maintenance mode. The jumper is located on the Exit PCB and is activated by installing a jumper on terminals E1 and E2 as shown in Figure 12-1. The Maintenance Button on the Gate Control Board is disabled and not used in the Exit Gate application. Placing a jumper across E1 and E2 will cause the gate to lower. Open the Gold-Nut on the Gate Control Board to disable the GC from activating the mechanism.

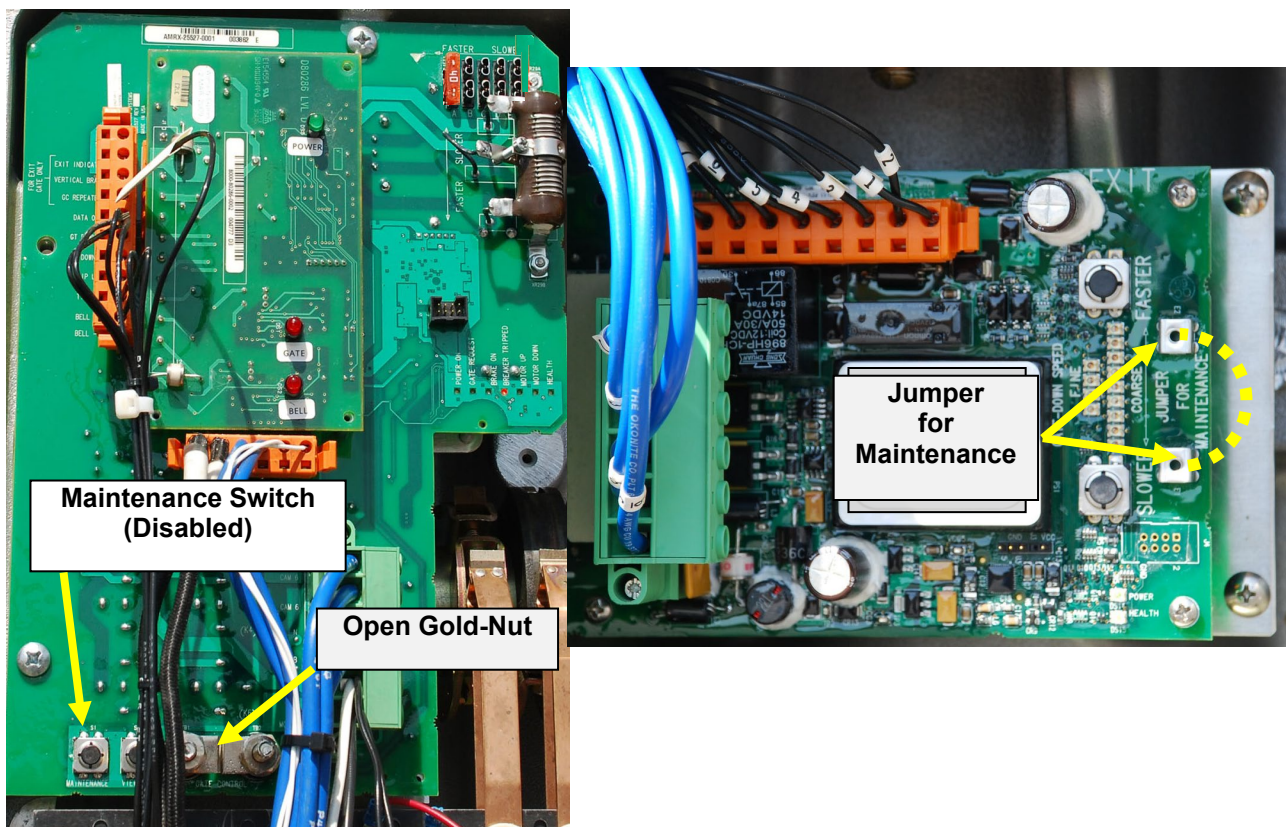


Figure 12-1 Maintenance Jumper

## 12.3 GENERAL MAINTENANCE

### 12.3.1 Lubrication

Model S-60 Gate Mechanisms have sealed bearings on the main shaft, idler gear shafts and on the auxiliary sidewalk arm shaft when so equipped. No bearing lubrication is required. Gearmotor bearings are sealed with all temperature grease and 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 the number of gate operations. Clean thoroughly and reapply grease every two years or when signs of gear wear are evident.



#### CAUTION

USING THE IMPROPER LUBRICANT ON THE GEARS MAY CAUSE THE GATE OPERATION SPEED TO DECREASE.

### 12.3.2 Maintenance Tools

The following is a list of tools included with every gate mechanism.

- S-60 Maintenance & Installation Kit part # 074050-X (with every gate mechanism) includes:
  - a. S-60 I&M Manual (Siemens part #074050)
  - b. 1/8" Allen wrench for motor pinion gear (Siemens part # 007650)
  - c. 3/16" Allen wrench for cams & motor adapter plate (Siemens part # 070554-1)
  - d. 5/64" Allen wrench for brake armature adjustment (Siemens part # 007655)
  - e. 9/64" Allen wrench for brake housing (Siemens part # 007656)
  - f. 3/32" Allen wrench for PCB & MTSS fasteners (Siemens part # 007657)
  - g. 0.015" Brake Adjusting Shim (Siemens part # 074070-C)
  - h. 0.020" Brake Adjusting Shim (Siemens part # 074070-D)
  - i. Retainer (Siemens part # 070983-3)
  - j. 5/8" x 3/4" Bushing (Siemens part # 070983-2)
  - k. 1/4" x 3/8" Busing (Siemens part # 070983-1)
  - l. Torque Card (Siemens part # 070982-2)
- 1-1/2" open-end wrench (main shaft to hub nuts)
- 1-1/8" open-end wrench (counterweight support studs/nuts)
- 3/4" wrench (motor adaptor plate to housing bolts / nuts, conversion bracket)
- #3 Phillips head screw driver (PCB to housing, terminal board assy. to housing)
- #2 Phillips head screw driver (adjustable resistor)
- #2 Standard screw driver (P4/J4 connector, fixed resistor connection)
- Cage Clamp tool for P3/J3 connector (Siemens part #Z919-00009-0000)
- AREMA terminal wrench (Siemens part # 032619-9X)
- 9/16" & 1/2" wrenches (gate arm)
- Loctite® 243 Threadlocker
- Contact Forming Tool (Siemens part # 073112)
- Contact Setting (Feeler) Gauge (Siemens part # 073112-1)
- Contact Spring Scale (Siemens part # 073000-16)



## 12.4 PERIODIC INSPECTION

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

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 a stalled condition. It is NOT recommended that a darkened commutator be cleaned. Visually inspect the commutator bars by first removing the brush from the holder and looking through the brush holder while rotating the extended motor shaft near the brake. The brush can be extracted by removing the plastic, threaded cover and using a small screwdriver to dislodge the brush spring clip. The commutator is made up of segments of copper and will appear rectangular when looking through the brush holder. If the commutator bar is worn through, evident by oblong spots forming in the center of each rectangular segment, the motor will have to be replaced.

Ensure that when brushes are removed, that they are installed in the same holder and the same orientation in the holder. Otherwise, the brushes may not seat correctly against the commutator.

The brushes have a wear line scribed into the side of the brush to indicate the usable length of the brush. Typical applications will need the brushes changed in the 250,000 to 400,000-cycle operation range.

The first sign of brush or commutator wear will be inconsistent snubbing in the downward direction. A commutator should last for 2 to 3 brush sets depending on length of gate arm and accuracy of horizontal and vertical torque settings.

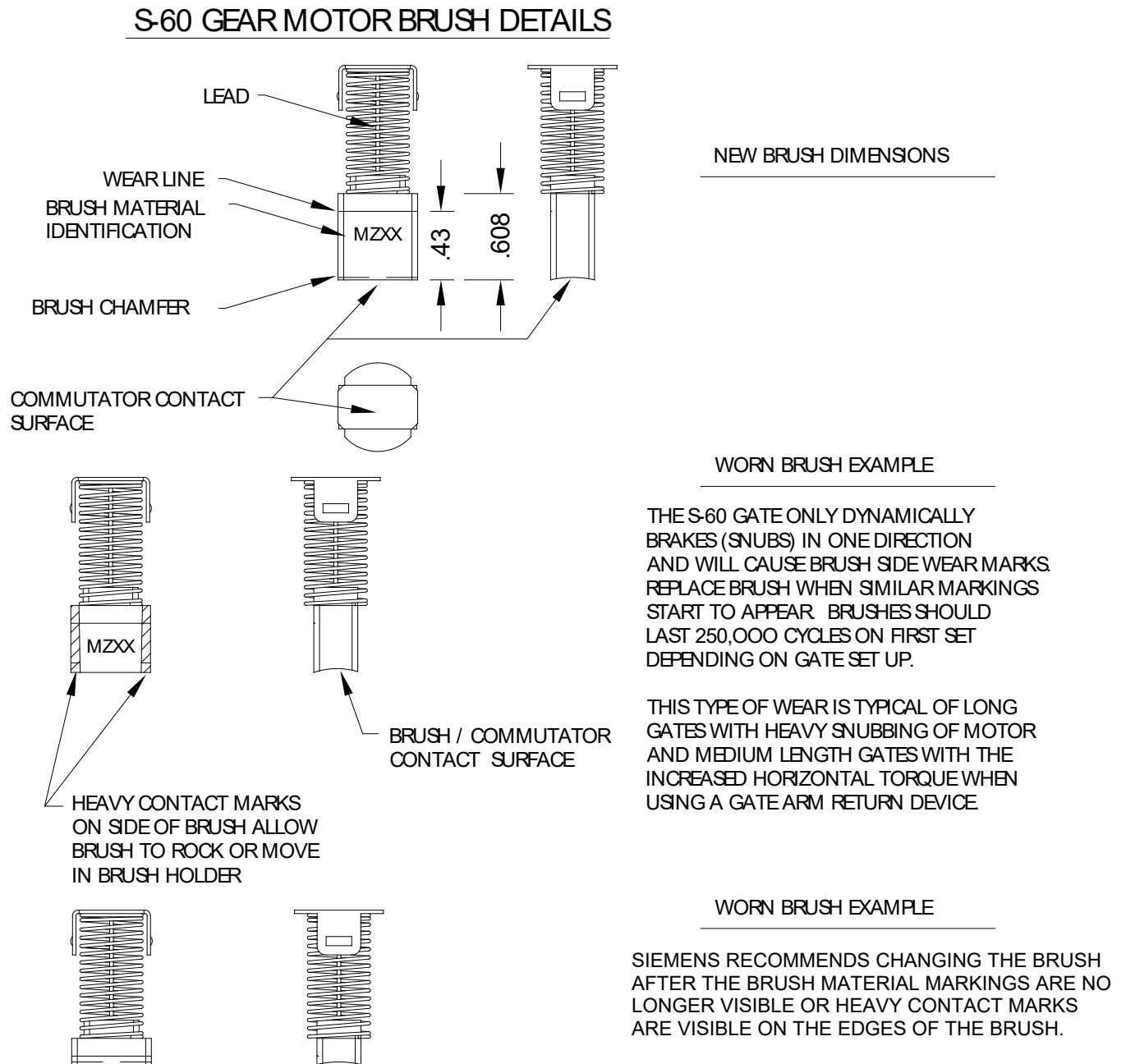


### CAUTION

REMOVE THE BRUSH DUST OFF OF THE BRUSH SURFACE AND FROM INSIDE THE BRUSH HOLDER. THE BRUSH CAN BE WIPED OFF WITH A CLEAN, LINT-FREE RAG. **DO NOT WIPE OFF THE COMMUTATOR SURFACE.**

## 12.5 MOTOR BRUSH WEAR AND REPLACEMENT

Figure 12-2 displays the gearmotor brushes wear information.



**Figure 12-2 Exit Gate Gearmotor Brush Details**

**⚠ WARNING****WARNING**

IF GATE SHOWS SIGNS OF ERRATIC DOWNWARD OPERATION, THE BRUSHES SHOULD BE CHANGED. IF PROBLEM REPEATS AFTER NEW BRUSHES ARE INSTALLED, THE COMMUTATOR HAS BEEN DAMAGED AND THE MOTOR WILL HAVE TO BE REPLACED.

**NOTE****NOTE**

Each brush has markings on one side. Do not exchange brushes from side to side.

**12.6 PLACING CROSSING IN SERVICE**

Prior to placing the Crossing in service, test must be performed to verify proper operation. Verify all jumpers have been removed and the Gold Nut restored. Perform all tests as specified by Railroad procedures.

**⚠ WARNING****WARNING**

WHEN PLACING THE GATE IN SERVICE, OBSERVE PROPER OPERATION WITH TRAIN ACTIVATION OF THE CROSSING AND PERFORM ANY ADDITIONAL TESTS IN ACCORDANCE WITH RAILROAD PROCEDURES.

## 12.7 HAND CRANKING OF GATE MECHANISM

The gate mechanism hand crank feature may be used either to crank the gate arm up, or in the cases where the arm has been sheared off, to crank the counterweights to the horizontal position. The tools required are a ratchet wrench, 7/16-inch socket, and the Bi-directional Lock Bar.



**WARNING**  
**DISCONNECT POWER TO GATE MECHANISM BEFORE INSERTING TOOLS FOR HAND CRANKING.**

1. Place ratchet wrench with 7/16-inch socket over the hexagon shaft (brake side). The ratchet should be set in the direction to prevent its rotation backwards (direction depends on whether you are raising or lowering the mechanism; the motor shaft rotates in the opposite direction as the main shaft of the gate).
2. Place the Lock Bar on the motor output shaft in the proper orientation (“Keeps Gate Up” or “Keeps Gate Down” position). Do not engage the Lock Bar with the Reaction Pin. Rotate the Lock Bar to raise or lower the gate. Once the gate is in the desired position, slide the Lock Bar over the Reaction Pin and secure in place using the Cotter Pin.

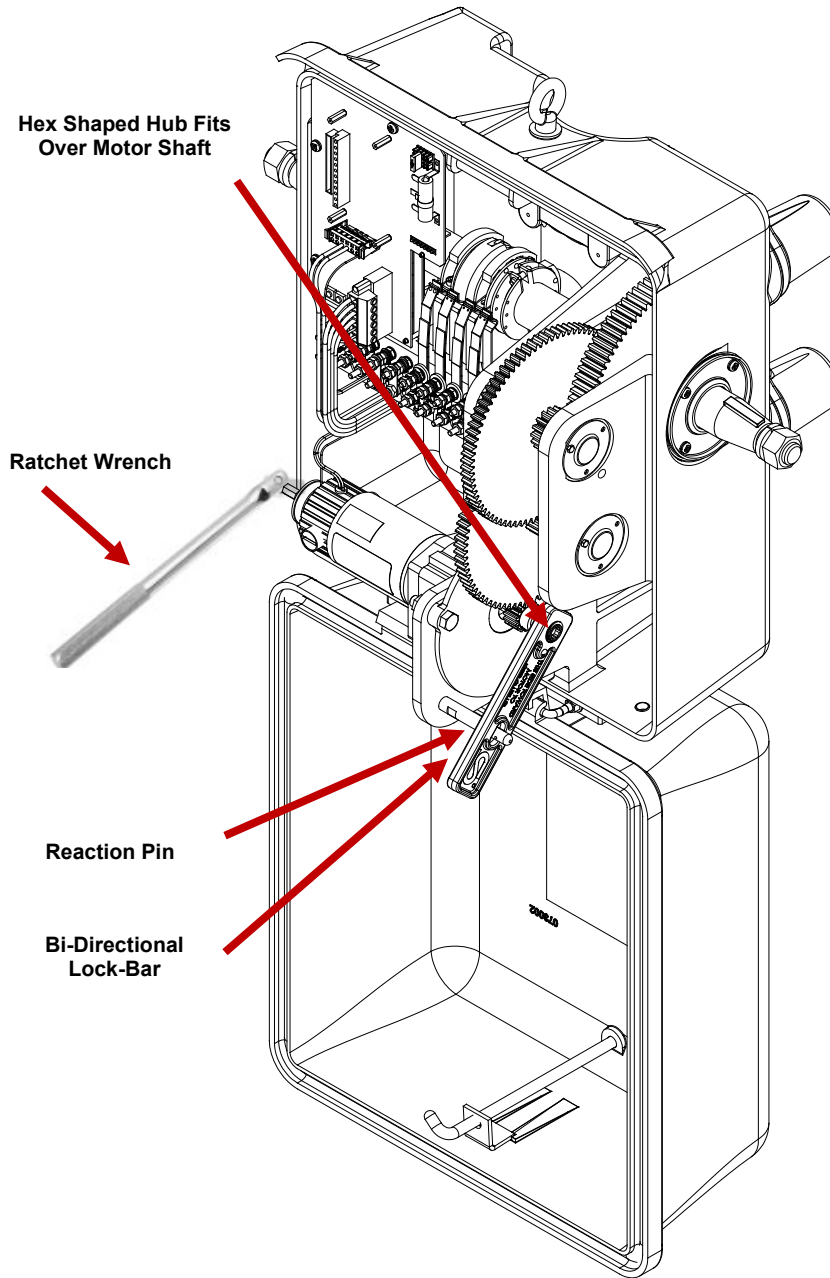


Figure 12-3 Hand Cranking Of Gate Mechanism

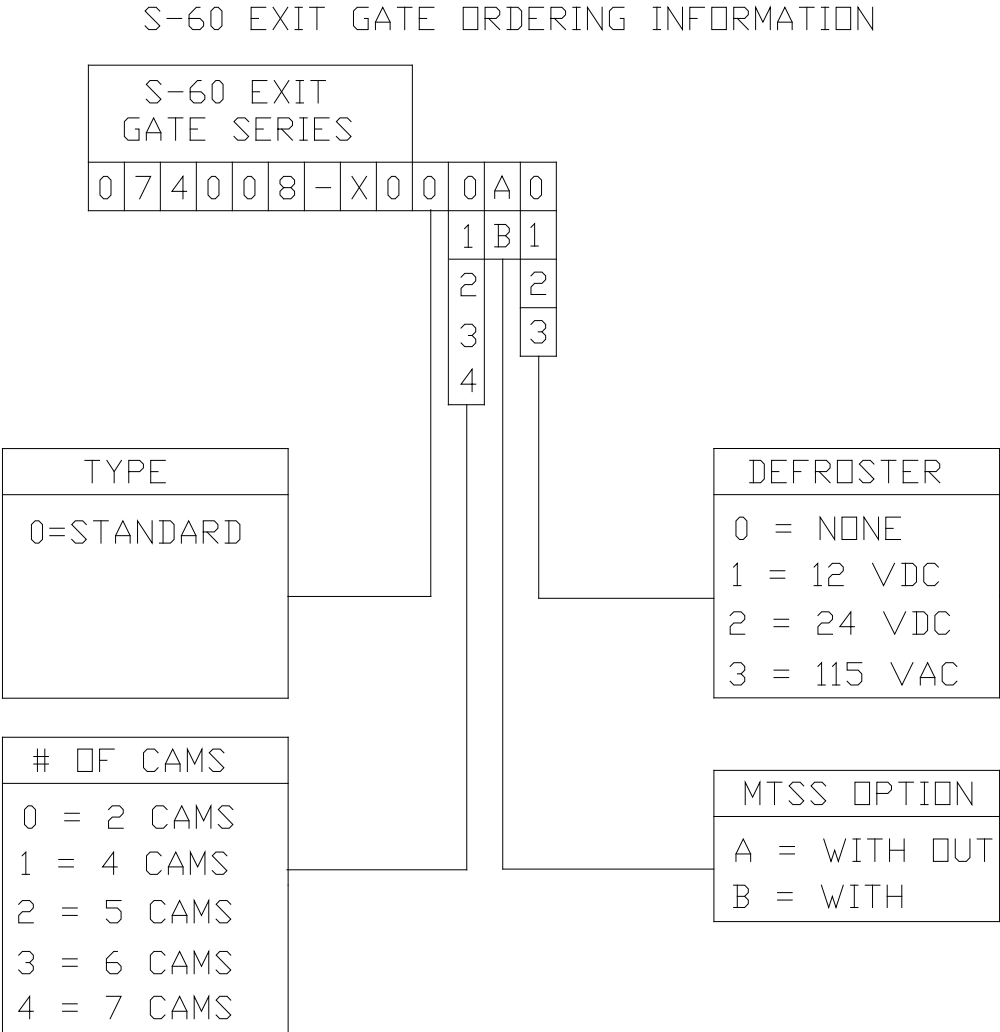
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## SECTION 13 EXIT GATE ORDERING INFORMATION

**13.0 EXIT GATE ORDERING INFORMATION**

**13.1 S-60 EXIT GATE MECHANISM ORDERING INFORMATION**

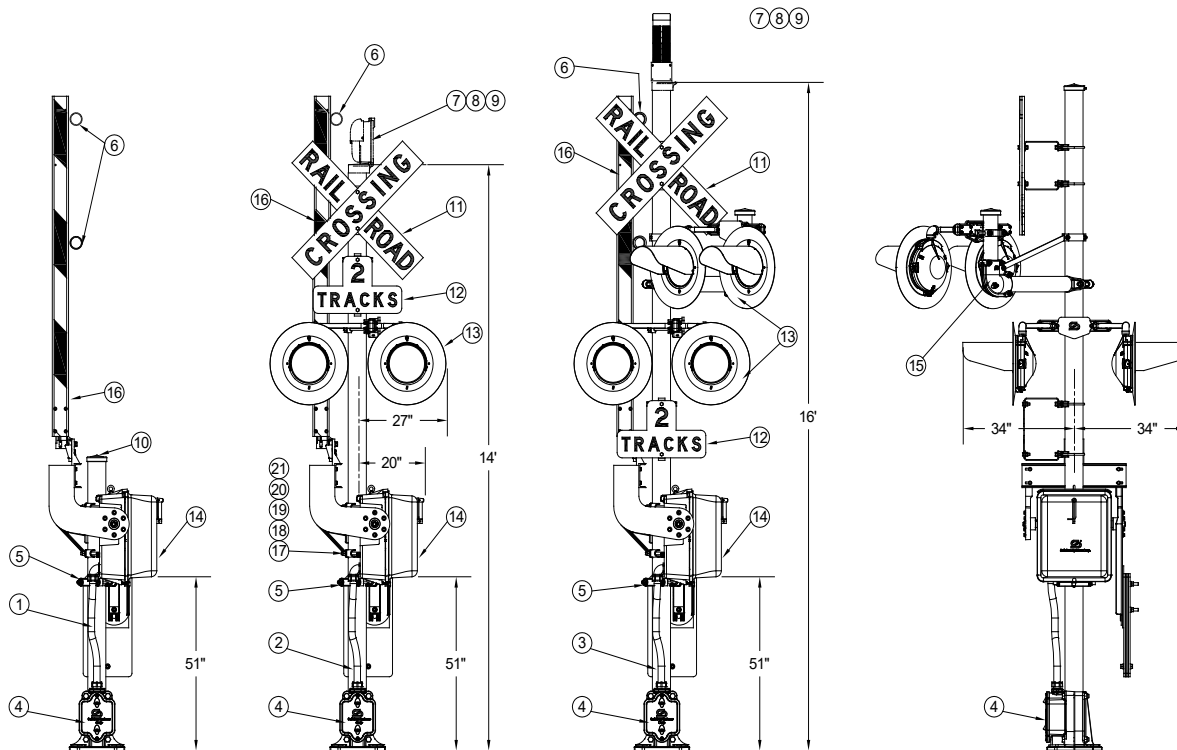
The following is the S-60 Exit Gate ordering information:



**Figure 13-1 S-60 Exit Gate Ordering Information**

# EXIT GATE ORDERING INFORMATION

## Model S-60EXIT Gate Types 50, 51, and 52 Replacement Parts



Item No.	Description	Part number	
1	Mast, 5" Stub	070519-3A	
2	Mast, 5" Standard	070519-27A	
3	Mast, 5" for Front, Back , and 45 Deg. 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, 5" Mounting	8-12 VDC 24 VDC	040200-4X 040200-110X
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-40 Gate	074007-X001	
15	Cantilever, Sidelight (required for left-hand sidelights)	041442-26X	
16	Gate Arm & Conversion Bracket --See gate arm section of catalog	Specified	
17	Machine Bolt, Square 3/4" – 10 x 7.00"	008085-SC	
18	Casting, Aluminum Saddle	070950	
19	Washer, Flat 3/4"	001737-SC	
20	Washer Lock 3/4"	001815-MSX	
21	Nut, Hex 3/4" – 10	002114-SC	



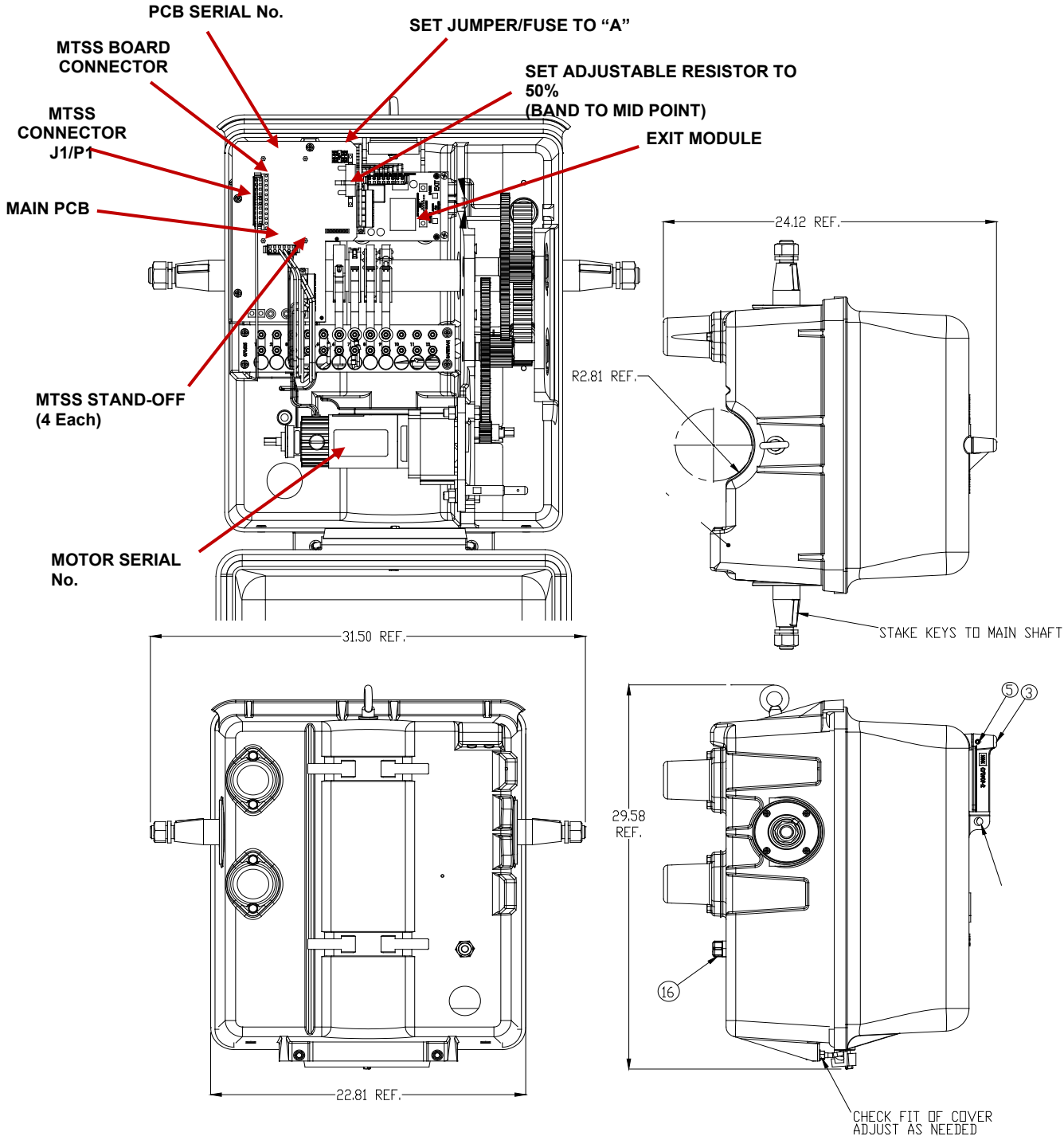
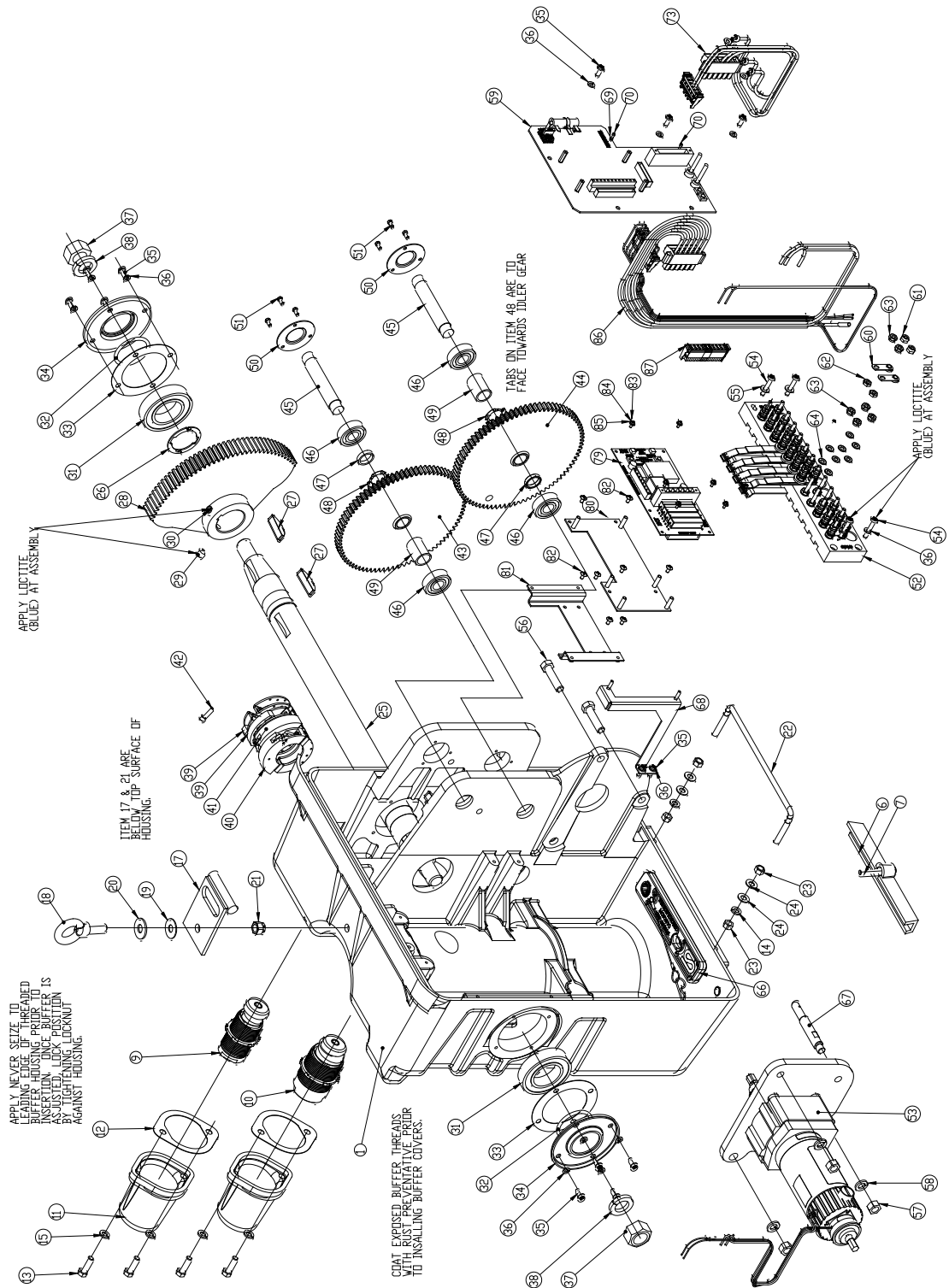


Figure 13-2 S-60 Exit Mechanism (Assembled View)

# EXIT GATE ORDERING INFORMATION

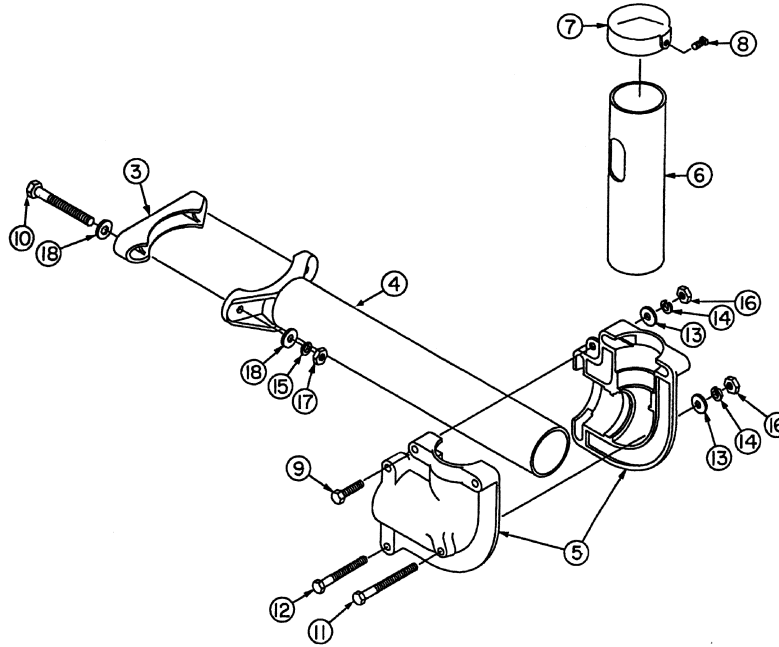


**Figure 13-3 S-60 EXIT Gate Exploded View**

ITEM NO.	QTY. REQ'D.	UOM	PART NUMBER	DESCRIPTION	* NOT SHOWN	ITEM NO.	QTY. REQ'D.	UOM	PART NUMBER	DESCRIPTION	* NOT SHOWN
1	1	EA	073001-1	CABINET, GATE		46	4	EA	070588	BEARING 3/4	
2	1	EA	073002-X	WELDMENT, COVER		47	2	EA	073009-3	SPACER 1/4	
3	1	EA	070909-4	HANDLE, LATCH		48	2	EA	070695-S00	WASHER, SPRING	
4	1	EA	070919-2	ROD, LATCH		49	2	EA	073009-2	SPACER 1-1/2	
5	1	EA	004658-E	SS SH 3/8-16 X .50		50	2	EA	073007-2	COVER, BEARING	
6	1	EA	070968-4	RETAINER, HINGE		51	6	EA	002614-HHE	MS HH 10-32 X .375	
7	1	EA	002692-HE	MS HH 5/16-18 X2.5		52	1	EA	074030-X101	TERM BD ASSY S60 EXIT 4 CAM	
8	1	EA	070559-A	GASKET, COVER		53	1	EA	074070-X5	ASSY, S-60 MOTOR & ADAPTOR	
9	1	EA	070903-X	BUFFER ASSY, UPPER		54	4	EA	002665-PEX	MS PH 1/4-20 X 15	
10	1	EA	070903-2X	BUFFER ASSY, LOWER		55	2	EA	001717-E	W FA 1/4 STNLS	
11	2	EA	070902-1	CAP, BUFFER		56	3	EA	004170-HSC	CS HH 1/2-13 X 2	
12	2	EA	070926-1	GASKET, BUFFER CAP		57	3	EA	002108-SC	N HK 1/2-13	
13	4	EA	004089-HSC	CS HH 3/8-16 X1.25		58	3	EA	001812-MSC	W LKS M 1/2	
14	2	EA	001810-ME	W LKS M 3/8		59	1	EA	9000-25527-0001	ASSY, S-60 ENTRANCE PCB	
15	4	EA	001810-MSC	W LKS M 3/8		60	2	EA	024620-3X	TEST LINK ASSY, 1' CENTERS	
16	1	EA	007304-2	CONNECTOR, RELIEF		61	2	EA	024620-13	NUT, GOLD TEST	
17	1	EA	070919-3X	WELDMENT, PLATE		62	2	EA	023832	NUT, CLAMP AAR (FLAT) 14-24	
18	1	EA	007059	EB 1/2-13 X .150		63	14	EA	023831	NUT, BINDING AAR, SHOULDER, 14-24	
19	1	EA	070980-4	WASHER, NEOPRENE		64	16	EA	023834	WASHER, BEVELED AAR (FLAT)	
20	1	EA	001755-E	W FA 1/2		65	5	EA	104824	TIE, CABLE	*
21	1	EA	002327-FLSC	N FL F-L 1/2-13		66	1	EA	074035-X11	BAR, STOP, ASSEMBLY, S-60	
22	1	EA	070968-2	BOLT, HINGE		67	1	EA	074035-14	PIN, REACTION, S-60	
23	4	EA	002104-E	N HK 3/8-16		68	1	EA	Z610-39557-0001	BRACKET, S-60 PCB STANDOFF	
24	4	EA	001726-E	W WR 3/8		69	2	EA	001802-MSC	W LKS M #4	
25	1	EA	074028	MAIN SHAFT, GATE		70	2	EA	007754-S5C	SCREW CAP SDC 4-40 X 3/4 STL	*
26	1	EA	070584	RING, RETAINING		71	1	EA	074050-X	KIT, S-60 MAINT. & INST.	*
27	3	EA	007149	KEY UX WOODRUFF		72	1	EA	074007-10	LABEL, S-60 ENTRANCE 4 CAM WIRING	
28	1	EA	073003	GEAR, SEGMENT		73	1	EA	075016-X1	ASSY, S-60 WIRING HARNESS	
29	1	EA	004706-SC	SS SH 1/2-13 X .50		74	1	EA	098222-101708	PANDUIT TIE BASE	*
30	1	EA	004708-SC	SS SH 1/2-13 X .75		75	1	EA	012-00-000	ADHESIVE	*
31	2	EA	075284	BEARING, 2"		76	1	EA	017-00-000	LUBRICANT, GEAR	*
32	2	EA	070585	O-RING 2"		77	1	EA	017-00-004	SPRAY, TEFLON	*
33	2	EA	070747-3	GASKET, SEAL PLATE		78	1	EA	019-02-000	TP 2" MASKING	*
34	2	EA	073008	PLATE, BEARING SEAL		79	1	EA	9000-25531-0001	PCB, S-60 EXIT GATE	
35	13	EA	002659-PEX	MS PH 1/4-20 X.625		80	1	EA	Z610-39651-0001	PLATE, EXIT PCB MOUNTING	
36	16	EA	001808-ME	W LKS M 1/4		81	1	EA	Z610-39652-0001	PLATE, EXIT PCB RISER	
37	2	EA	002118-SC	N HK 1-8		82	8	EA	002614-TEX	MS TR 10-32 X .375	
38	2	EA	001817-MSC	W LKS M 1"		83	6	EA	002557-PEX	MS PH 6-32 X .375	
39	2	EA	070633-2AX	CAM ASSY, PLASTIC		84	6	EA	001804-MSC	W LKS M #6	
40	1	EA	073014-BX	SWITCH ASSY, SNAP (S-60 Exit)		85	6	EA	001706-SC	W FA #6	
41	1	EA	073014-AX	SWITCH ASSY, SNAP		86	1	EA	075016-x2	ASSY, S-60 EXIT HARNESS	
42	4	EA	004003-S5C	CS SH 1/4-20 X.875		87	1	EA	Z715-09027-0010	CONNECTOR, 10 PIN WAGO	
43	1	EA	073004	GEAR & PINION UP							
44	1	EA	073005	GEAR & PINION, LOWER, S-20/S-40							
45	2	EA	073007-1	SHAFT, GEAR							

Figure 13-4 S-60 Exit Gate Bill of Materials

EXIT GATE ORDERING INFORMATION



**Figure 13-5  
Cantilever**

**Sidelight  
Assembly**

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

Item No.	Description	Qty	Part No.
1			
2			
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	004932-SC
9	Cap Screw, Hex Head, 1/2" – 13 x 2"	2	004170-HSC
10	Cap Screw, Hex Head, 3/4" – 10 x 6"	2	004286-HSC
11	Cap Screw, Hex Head, 1/2" – 13 x 6"	1	004182-HSC
12	Cap Screw, Hex Head, 1/2" – 13 x 5"	4	004180-HSC
13	Washer, Wrought, 1/2"	7	001755-C
14	Washer, Spring Lock, M, 1/2"	7	001812-MSC
15	Washer, Spring Lock, M, 3/4"	7	001815-MSC
16	Nut, Hex, 1/2 " – 13	7	002108-SC
17	Nut, Hex, 3/4" – 10	2	002114-SC
18	Washer, Flat, 3/4"	4	001737-SC

**Figure 13-6 Sidelight Cantilever Bill of Materials**

13.2 TERMINAL ASSEMBLY AND REPLACEMENT PARTS

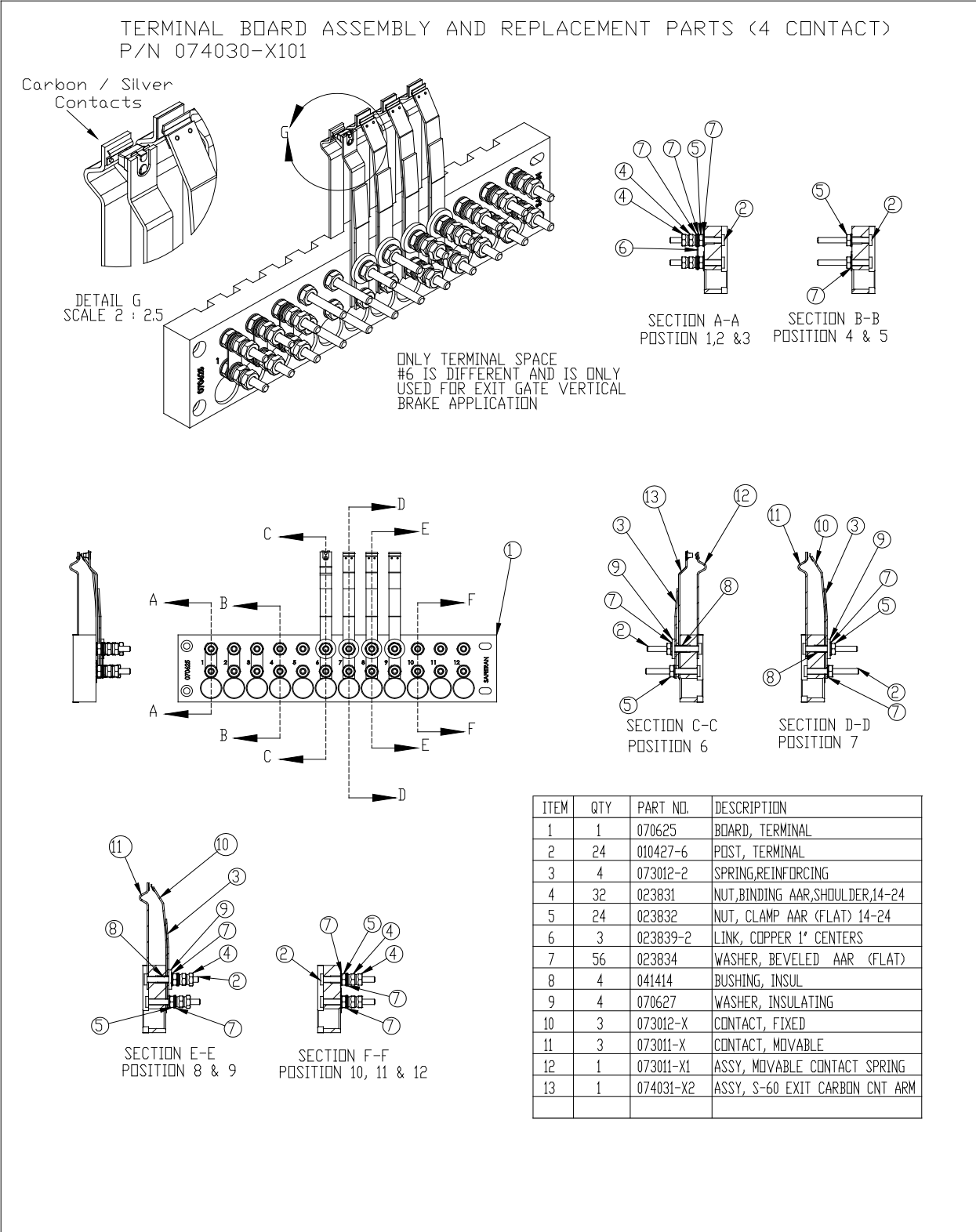
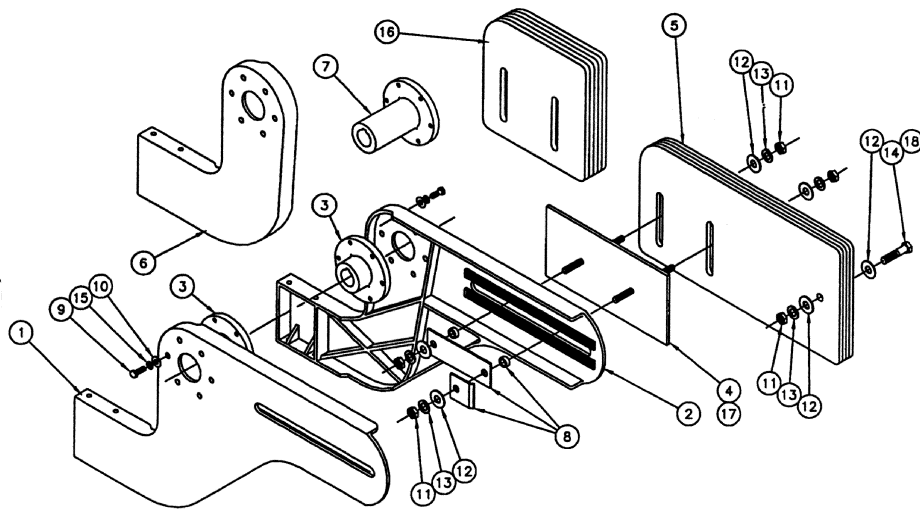


Figure 13-7 Terminal Board Assembly

**13.2.1 Gate Arm Supports/Counterweights Replacement Parts**



Description	Part No.
1 Support, Left Hand	070920-L
Support, Left Hand with Hub and Mounting Bolts	070920-LX
2 Support, Right Hand	070920-R
Support, Right Hand with Hub and Mounting Bolts	070920-RX
3 Hub, Gate Arm Support	070923-3
4 Plate, Stud for standard counterweight w/hardware	070757-26X
5 Counterweight, Galvanized Steel, 1/2" x 15" x 30", 58 lbs. (standard)	070755-4G
6 Support, Left Hand for use without counterweights	070921-L
Support, LH w/o counterweights with Hub and Mounting Bolts	070921-LX
6A Support, Right Hand (not shown) w/o counterweights	070921-R
Support, RH w/o counterweights with Hub and Mounting Bolts	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"	04167-HSC
10 Washer, Wrought, 1/2"	001755-C
11 Nut, Hex, 3/4" – 10	002114-SC
12 Washer, Wrought, 3/4"	001737-SC
13 Washer, Spring Lock, M, 3/4"	001815-MS
14 Cap Screw, Hex Head, 3/4" – 10 x 3" for 3 – 4 standard counterweights	004278-HSC
Cap Screw, Hex Head, 3/4" – 10 x 4" for 5 – 6 standard counterweights	004282-HSC
Machine Bolt, Hex Head, 3/4" – 10 x 6.5" for 7 – 10 standard counterweights	003177-SC
15 Washer, Spring Lock, M, 1/2"	001812-MS
16 Counterweight, Galvanized Steel, 5/8" x 15" x 15", 38 lbs. (short)	070755-34G
17 Plate, Stud for short counterweight w/hardware	070757-30X
18 Cap Screw, Hex Head, 3/4" – 10 x 5" for 4 – 6 short counterweights	004284-HSC
Machine Bolt, Hex Head, 3/4" – 10 x 8" for 7 – 11 short counterweights	003180-SC
Machine Bolt, Hex Head, 3/4" – 10 x 14" for 12 – 21 short counterweights	003190-SC
19 Bracket, Support w/hardware --Use for extending counterweight vertically	070925-4X

## SECTION 14 EXIT GATE TROUBLESHOOTING

### 14.0 EXIT GATE TROUBLESHOOTING

#### 14.1 TROUBLESHOOTING TABLES

The following table provides troubleshooting guidelines. Contact Siemens Customer Service with questions.

**Table 14-1 Exit Gate Troubleshooting Table**

Trouble	Cause	Action	Correction
Gate does not descend	No power available	Push the "View LED's" pushbutton on the PCB and ensure the green Power LED is illuminated.	<p>Ensure 11 to 16 volts DC is applied to connector P4 pins 3 (N12) and 4 (B12) on the Main PCB and P2 pins 3 (N12) and 6 (B12) on the Exit Module.</p> <p>Polarity on Battery &amp; Common is reversed.</p> <p>Ensure connector is fully seated and connector-retaining screws are secure.</p> <p>Replace the PCB control board.</p> <p>Replace the Exit module.</p>
	No gate control (GC) power	<p>For two-wire gate control: Push the "View LED's" pushbutton and ensure the red Gate Request LED is lit.</p> <p>For single-wire gate control: Push the "View LED's" pushbutton and ensure the red Gate Request LED is lit.</p>	<p>Ensure Gate Control positive (12 VDC nominal) is applied to Pin 6 on connector P3 and Gate Control negative is applied to Pin 5 on connector P3.</p> <p>Ensure Gate Control positive (12 VDC nominal) is applied to Pin 6 on connector P3 and ensure a field wire has been run from AREMA terminal 5 to Pin 5 on connector P3.</p> <p>Ensure the Gold test link is closed on the PCB.</p> <p>Replace the PCB control board.</p>

**Table 14-1 Exit Gate Troubleshooting Table (Continued)**

<b>Trouble</b>	<b>Cause</b>	<b>Action</b>	<b>Correction</b>
Gate does not descend (Continued)	No motor power	Push the "View LED's" pushbutton and ensure the green Motor Down LED is lit.	Ensure motor leads are properly installed in connector P4, Pins 5 (black wire) & 6 (white wire).  Inspect motor brushes to make sure they are intact and the brush wear line is clearly visible on the side of the brush. Ensure the brushes are properly seated in the brush holders. The brushes should be inserted into the brush holders so that the brush identification number is facing upwards for both brushes.  Clear gate arm of any exterior obstructions.  Clear gate drive train of any obstructions and ensure drive train rotates freely.  Replace gear motor.  Replace the Exit module.
		Ensure electric brake air gap is a minimum of 0.015" and the motor shaft rotates freely.	Adjust brake air gap.
		Verify correct counterweighing.	Adjust horizontal torque.
		Verify Health LED is flashing at 1 Hz.	If the Health LED is on Steady or Dark, cycle power to the PC Board.  Replace the PCB control board.
	No motor power and no motor down indication	Ensure adequate contact pressure (1 to 3 lbs.) and proper contact wipe.	Adjust or replace contacts.
		Ensure power down Cam #7 is properly adjusted to close from 90 to 1°.	Adjust or replace cam.
		Ensure contact tips are not burned.	Replace contacts.
		Verify Health LED is flashing at 1 Hz.	If the Health LED is on Steady or Dark, cycle power to the PCB control board.  Replace the PCB control board.



**Table 14-1 Exit Gate Troubleshooting Table (Continued)**

<b>Trouble</b>	<b>Cause</b>	<b>Action</b>	<b>Correction</b>
	Overload breaker is tripped	Verify that the red Breaker Tripped LED is lit.	Clear gate arm of any exterior obstructions.  Clear gate drive train of any obstructions and ensure drive train rotates freely.  Replace gear motor.  Replace the PCB control board.
Gate does not ascend	Brake not releasing	Check the brake air gap.	Reset air gap. Ensure Electric Brake air gap is a minimum of 0.015" and the motor shaft rotates freely.  Check brake function independently of PCB by installing lock bar and opening terminal #5 gold nut (N12). If brake does not release, adjust or replace the brake. Note: when changing brake with the gate in the vertical position, do not remove lock bar.
	External obstruction	Verify that the gate is free of any obstructions.	Remove gate obstruction.
	Internal obstruction	Ensure drive train rotates freely.	Internal reduction gearing shall be free to rotate without binding or drag.  Grease gears.
Ensure motor Internal gearbox can rotate.		Motor assembly damaged. Replace motor sub-assembly.	

**⚠ CAUTION****CAUTION**

DO NOT REMOVE MOTOR WIRES AND/OR THE MOTOR WITHOUT SECURING THE GATE ARM OR THE GATE ARM WILL MOVE UNCONTROLLABLY. IF THE MOTOR, EXTERNAL IDLER OR PINION GEAR REPLACEMENT MUST BE DONE IN THE VERTICAL OR HORIZONTAL POSITION, LOCK THE GEAR TRAIN BY PLACING A 3/8" PIN OR BOLT THROUGH THE HOUSING AND INTO THE FIRST REDUCTION GEAR.

**Table 14-1 Exit Gate Troubleshooting Table (Continued)**

<b>Trouble</b>	<b>Cause</b>	<b>Action</b>	<b>Correction</b>
	Incorrect horizontal torque	Verify correct counterweighing.	Ensure negative horizontal and vertical torque adjustment procedures have been followed.
Gate ascends or descends erratically	Motor brushes not in full contact with commutator	Check brushes.	Remove brushes with gate in the free position; inspect brush length and side profile of the brush. Inspect commutator. Replace brushes if commutator looks OK.  Replace the motor assembly.
		Verify Health LED is flashing at 1 Hz.	If the Health LED is on steady or dark, cycle power to the PCB control board.  Replace the PCB control board.
Gate rises too slowly	Low system voltage	Measure the voltage at terminals 4 and 5.	Verify voltage of 11-16 VDC is available between AREMA terminals 4 and 5 during gate operation.
	Incorrect counterbalance weight	Verify correct counterweighing.	Ensure negative horizontal and vertical torque adjustment procedures have been followed.  Replace the Exit module.
Gate lowers too slowly	Incorrect speed setting	Check speed setting on the Exit module.	Adjust speed control setting to faster.  Replace the Exit module.
	Incorrect counterbalance weight	Verify correct counterweighing.	Ensure negative horizontal and vertical torque adjustment procedures have been followed.

Table 14-1 Exit Gate Troubleshooting Table (Continued)

<b>Trouble</b>	<b>Cause</b>	<b>Action</b>	<b>Correction</b>
Gate lowers too quickly	Incorrect speed setting	Check speed setting on the Exit module.	Adjust speed control setting to slower. Replace the Exit module.
	High system voltage	Measure the voltage at terminals 4 and 5.	Verify voltage of 11-16 VDC is available between AREMA terminals 4 and 5 during gate operation.
	Incorrect counterbalance weight	Verify correct counterweighing.	Ensure positive horizontal and vertical torque adjustment procedures have been followed.
Gate "pumps" at the bottom	Brake not engaging	Brake LED is on when gate is down.	Repair broken or loose leads from the brake to control board. Adjust air gap to 0.015" minimum/0.020" maximum. Clean brake parts with a lint-free cloth. Replace brake assembly. Replace the Exit module.
		Brake LED is not on.	Press "View LEDS" button. Ensure that cam #7 is opening at the horizontal position. Replace the PCB control board. Replace the Exit module.
Gate drives down part way, then rises	Breaker tripping	Observe control board and see if "breaker tripped" LED is coming on when gate falls.	Check for and correct any binding of the gear train or obstruction. Grease gears.
		Verify correct counterweighing.	Ensure positive horizontal and vertical torque adjustment procedures have been followed.
		Measure the voltage at AREMA terminals 4 and 5.	Verify voltage of 11-16 VDC is available between AREMA terminals 4 and 5 during gate operation.
			Replace the PCB control board. Replace the Exit module.

**Table 14-1 Exit Gate Troubleshooting Table (Continued)**

<b>Trouble</b>	<b>Cause</b>	<b>Action</b>	<b>Correction</b>	
Gate goes all the way up or down and then moves to the free state	Breaker tripping	Observe control board and see if "breaker tripped" LED is coming on when gate falls.	Verify clearance between segment gear and buffer. Adjust clearance to 1/32 inch, if necessary.	
Motor drives gate down when it should go up	Reversed motor wire	Check If "motor up" LED is on when gate is driven down.	Ensure motor leads are properly installed in connector P4, pins 5 (black wire) & 6 (white wire).	
Gate does not shut off in horizontal position	Incorrect cam adjustment	Check cam #6.	Readjust cam such that the contact opens when there is 1/32" buffer clearance in vertical position.  Adjust power up Cam #6 to open properly at 0°.  Adjust or replace cam.	
		Contacts	Ensure adequate contact pressure (1 to 3 lbs.) and proper contact wipe.	Adjust or replace contacts.
			Ensure contact tips are not burned.	Replace contacts.
	Verify Health LED is flashing at 1 Hz.	If the Health LED is on steady or dark, cycle power to the PCB control board.  Replace the PCB control board.		
Gate powers below horizontal, compresses buffer and breaker trips	Incorrect cam or contact adjustment	Observe control board and see if "breaker tripped" LED is lit.	Readjust power down cam#6 to 0 °.  Readjust cam such that the contact opens when there is 1/32" buffer clearance in vertical position.	
		Verify Health LED is flashing at 1 Hz.	If the Health LED is on steady or dark, cycle power to the PCB control board.  Replace the PCB control board.	
Gate arm above or below horizontal position.	Incorrect cam adjustment	Check cam #6.	Readjust power down cam#6 to 0 °.  Readjust cam such that the contact opens when there is 1/32" buffer clearance in vertical position.	

**Table 14-1 Exit Gate Troubleshooting Table (Continued)**

<b>Trouble</b>	<b>Cause</b>	<b>Action</b>	<b>Correction</b>
MTSS does not function properly	No power indication	Power LED not lit.	<p>Press "View LEDS" button. Ensure PCB control board has power and MTSS card is secure to PCB.</p> <p>Replace MTSS card.</p> <p>Replace PCB control board.</p>
	No gate indication	Gate LED not lit.	<p>Ensure gate is horizontal within 5 degrees.</p> <p>Ensure gate tip sensor wiring is secure to gate tip light.</p> <p>Check function of gate tip sensor and replace if necessary.</p> <p>Replace MTSS board.</p> <p>Replace the PCB control board.</p>
	No bell indication	Bell LED not lit.	<p>Check that bell is ringing when requested.</p> <p>Check wiring to terminals.</p> <p>Replace bell.</p> <p>Replace MTSS card.</p>
	No data at SEARII	No Data Out signal to SEAR II.	<p>Ensure SEAR II is properly set up for MTSS application.</p> <p>Check single wire Data Out connection from the gate to the wayside.</p> <p>Ensure Data In has connection to the same ground as the MTSS.</p> <p>Replace MTSS card.</p>

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