



Door Operator:

Solid State with Board 104[®]

Door Operator: Solid State with Board 1Ø4®
Product Instruction



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Issue	Date	Description of Change	Ref. CR	Approved by
R6	6/2000	Keynote added about door force. Revised crank arm information. Revised layout to KONE layout. Revised procedure on Installing Clutch.		Charlie Finnegan
R7	10/2000	Revised door assembly part numbers on pages 31, 33, 35, 36, & 37		John Matzen

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DOOR OPERATOR:

Solid State with Board 1Ø4®

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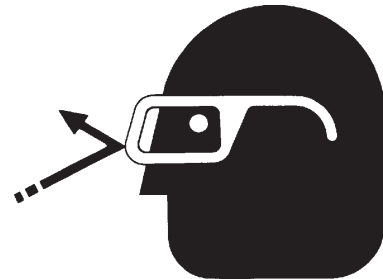
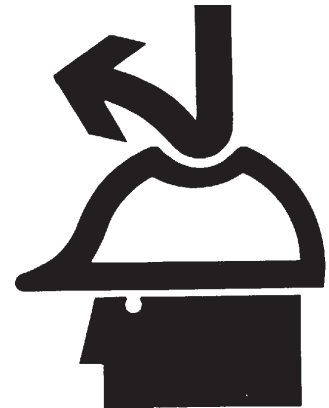
Safety

Know the safety hazards related to any procedure you are about to perform, know what equipment has been specified for each specific contract, and know what tools and materials you should plan to have available beforehand.

Before connecting electrical wiring, take precautions to prevent accidents from happening to yourself and other people around you. Always consider safety first.

- Wear a hard hat when working in hoistway.
- Wear safety glasses or goggles when using power tools.
- Always wear protective gloves when installing or removing access covers, conduits, wireway or electrical devices.
- When working on car canopy, always be aware of where the sides of the car are located.
- Use properly grounded cords and power equipment (ground fault circuit interrupters).
- Make sure hoistways and work areas are adequately lighted.
- Make sure there are proper clearances in hoistway between the car and other devices.
- Before connecting wiring, cover sharp edges to keep hands and arms from being cut.
- Always assume that a circuit is live — disconnect power from all related circuits before proceeding with wiring.
- Clear wiring sites of any unnecessary materials or equipment.
- Always know where other people are and how elevator wiring can affect their safety.
- Safety lock and tag out procedures are always required before performing any kind of service, repair, adjustment, lubrication, or inspection of power-driven equipment. These procedures help to prevent injury or death caused by power-driven equipment.
- To reduce the danger of electrical shock, always make sure electrical connections are secure. Also, make sure no bare wires are exposed after pulling electrical cable.
- Use a circuit tester to be certain the circuit is not active before touching it.

P201-103 (1/97)



Recommended tools & materials

Pre-arrange to have the following available.

- ✓ Small hand tools to fit assorted screws, bolts and nuts.
- ✓ Levels
- ✓ Drill with assorted bits
- ✓ Digital VOM meter
- ✓ Tape measure

P201-S11 (1/97)

Equipment description

Use the same installation and adjustment procedures for all solid state door operators with Board 1Ø4®.

Solid state door operators with Board 1Ø4® are described as follows.

- Summary of Solid State door operators
- Features of door operators with Board 1Ø4®

SUMMARY OF SOLID STATE DOOR OPERATORS

For more information refer to table:
Summary of Solid State door operators.

F615-011 (3/97)

Summary of Solid State Door Operators				
Feature	Model			
	PM	HPM	HPMS	WM/HPM
Permanent magnet D.C. motor	X	X	X	X
Integral solid state control	X	X	X	X
Ball bearing construction	X	X	X	X
Quiet V-belt drive	X	X	X	X
Full top cover (provides protection from potentially damaging elements)	X	X	X	X
Full bottom cover (isolates power supply)	X	X	X	X
Welded frame	X	X	X	
Dual output power supply		X	X	X
Dual drive belts (reduces belt slippage due to increased torque)		X	X	
Auxiliary reduction shaft (increases mechanical advantage)			X	
Welded structural channel and angle frame				X
Heavy duty cast iron sheaves				X
Timing belt drive				X

F615-T01 (3/97)

FEATURES OF DOOR OPERATORS WITH BOARD 1Ø4®

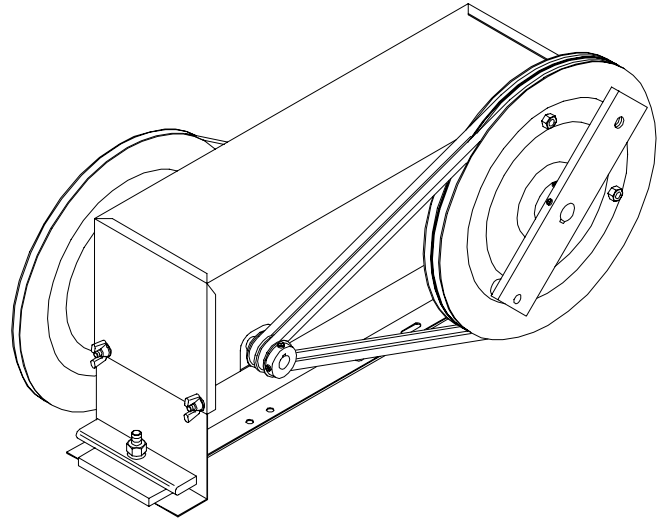
Door operators with Board 1Ø4® control have following operations and features:

- Door control power
- Current control
- Speed & travel limits
- Acceleration & deceleration
- Troubleshooting & switch adjusting
- Auxiliary piloting
- Other features

Door control power. Door operator control uses a low voltage permanent magnet DC motor. DC motor is powered by pulse width modulated power (high speed switching - 20,000 Hz). Motor responds to average voltage of high frequency pulses, and not individual pulses.

Current control. Door operator control has a current sensing circuit in both open and closed directions to supply feedback to speed control circuit. Current sensing circuit regulates door closing force, and open/stall current caused by a hooked interlock. Current sensing circuit also guarantees that door operator control relay contacts do not break or make when motor armature current is present—helping to prevent damage to relay contacts. Motor direction is controlled by reversing armature connection using a conventional relay system.

Speed & travel limits. Door operator control selects speed and travel limits with cam operated microswitches. These microswitches operate relays tied into speed direction circuits.



C202-H02(10/92)

Door operator

Installing door operator

Installing door operators in Canada

For additional door operator control information, use product instruction: *Door Operator Control Board w/ auxiliary locking board (Canadian supplement) 63113-043, PAA8-603.*

F615-SI2 (4/97)

Procedures show a PM door operator installation. Install WM door operators in a similar manner.

Install door operator as follows.

- Mount the door operator
- Install long lever and split link
- Align door operator
- Adjust split link
- Wire door operator
- Adjust door speed
- Adjust door closing force
- Adjust nudge speed (optional)
- Set microswitch cams (optional)

F615-003 (4/97)

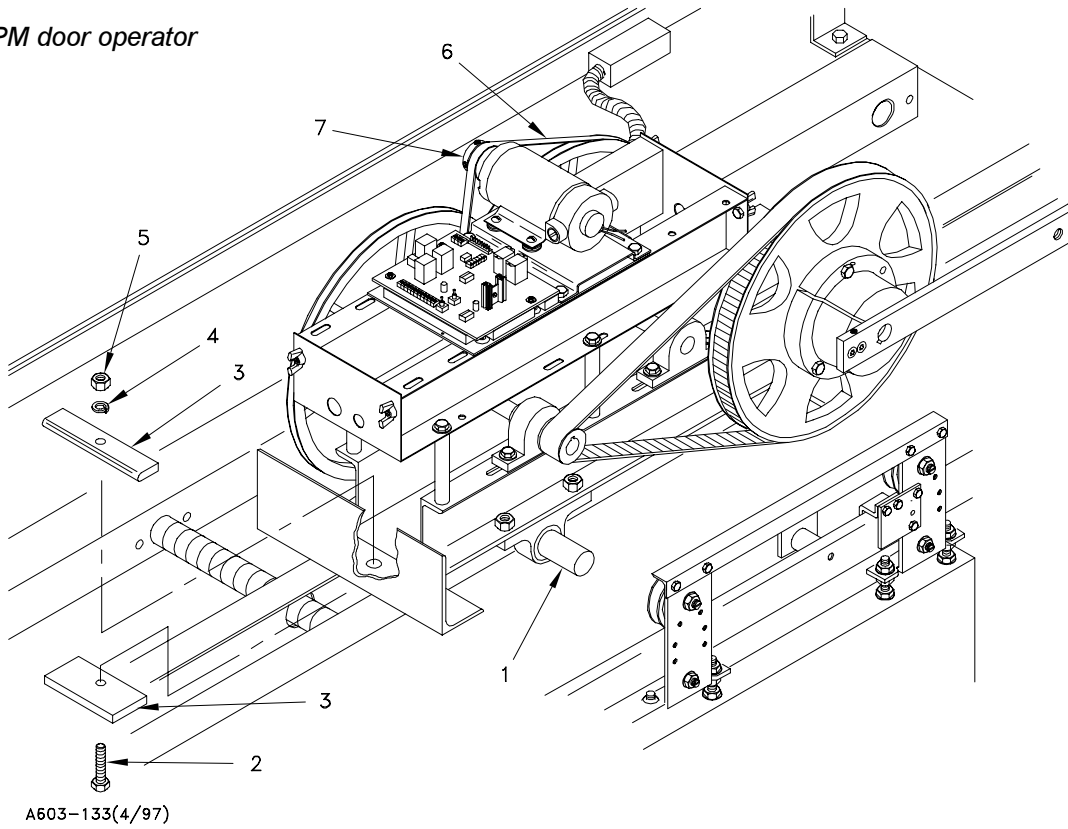
MOUNT DOOR OPERATOR

1. Open operator box, remove split link and door operator, being careful of car door clutch underneath.
2. Loosen wing nuts securing operator cover.
3. Remove nuts, washers, and clamp bars and set aside for future use.
4. Remove pallet from door operator.
5. Place operator on header plate. Pivot shaft (1) extends over door sill towards hoistway entrance. Shaft should be above return jamb.
6. Attach door operator to header using bolts (2), clamp bars (3), washers (4), and nuts (5) which held shipping pallet. Do not tighten mounting hardware.
7. Remove drive belt (6) from motor sheave (7).

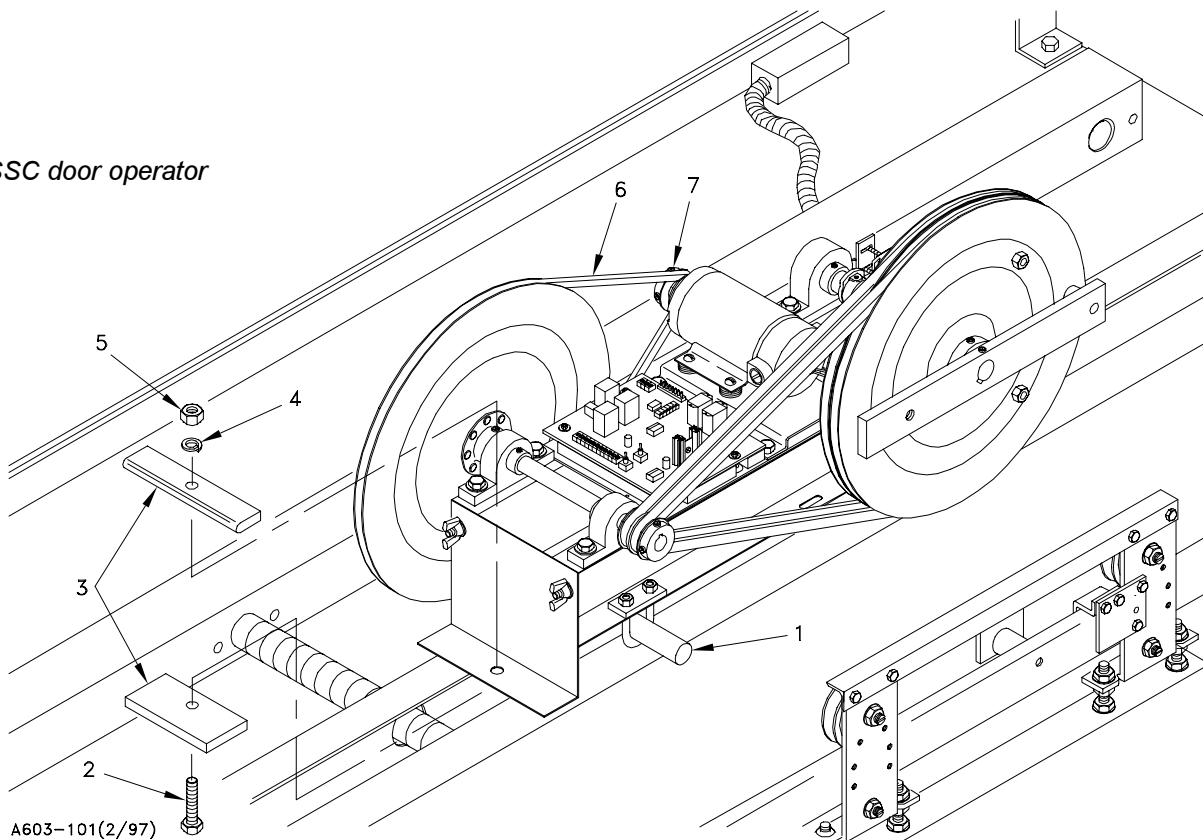
Removing drive belt allows door sheave to turn more freely, and makes it easier to install long lever and door clutch.

F615-004 (3/97)

WM/HPM door operator

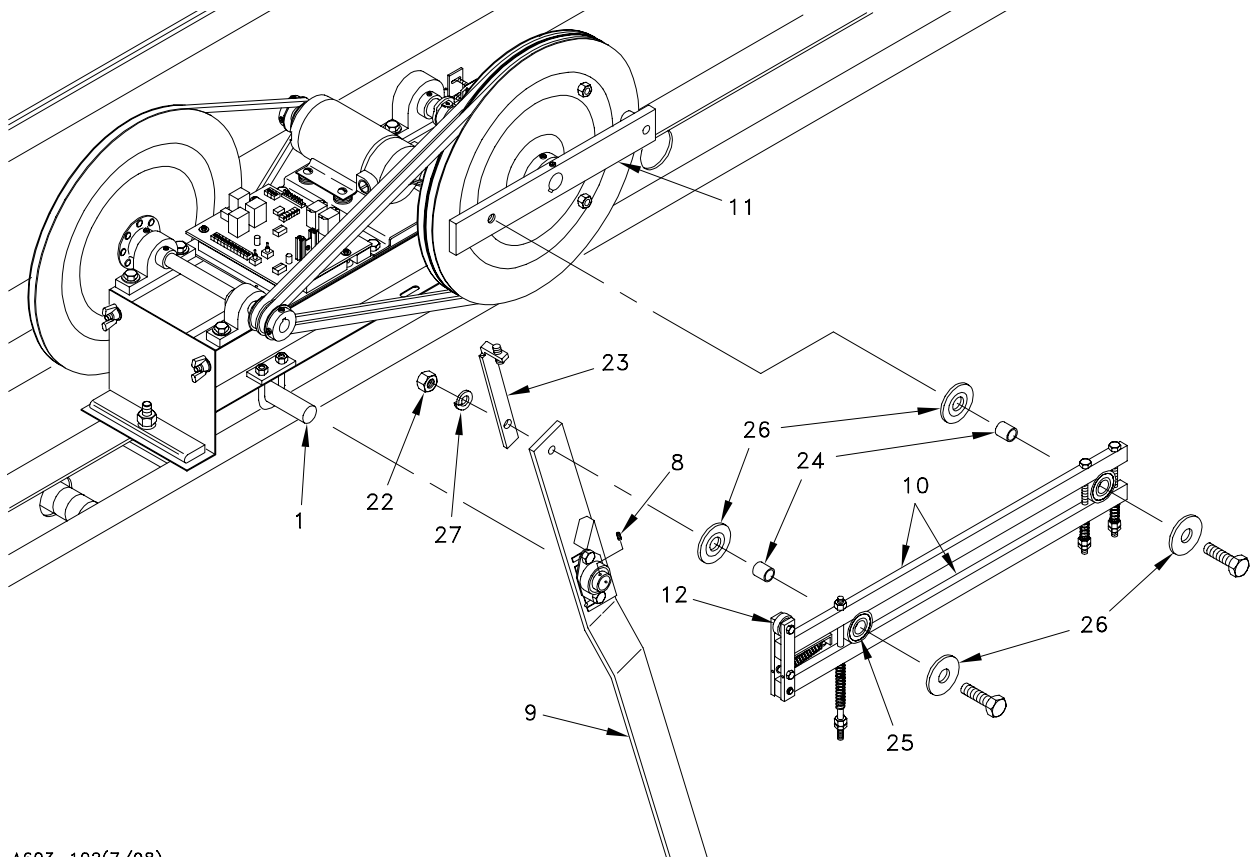


PM/SSC door operator



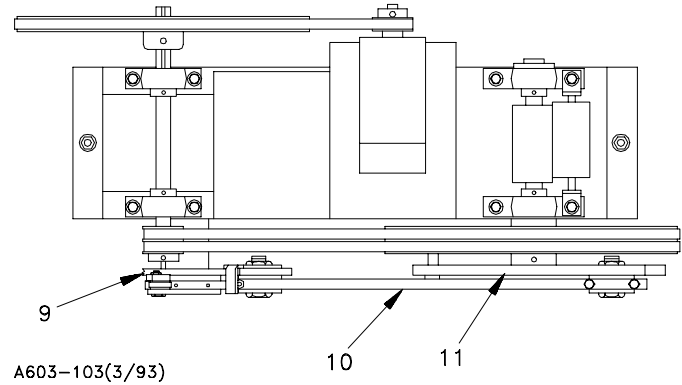
INSTALL LONG LEVER & SPLIT LINK

1. Remove long lever from shipping carton.
2. Loosen set screws (8) in long lever (9) and place lever on pivot shaft (1). DO NOT tighten set screws.
3. Install long lever (9) on pivot shaft (1) with bend facing away from hanger.
4. Remove split link from packaging.
5. Remove nut (22) and release arm (23) from split link.
6. Attach split link assembly (10) to long lever (9) and crank arm (11) with release bearing (12) facing up. Tighten bolt carefully to prevent binding between bushing (24), bearing (25), and washers (26).
7. Attach release arm (23), washer (27), and nut (22) to back of long lever (9).



A603-102(7/98)

8. Rotate crank arm (11) until long lever (9) is at door open position. Adjust position of long lever until split link is aligned parallel to crank arm (11).
9. Tighten long lever set screws (8).

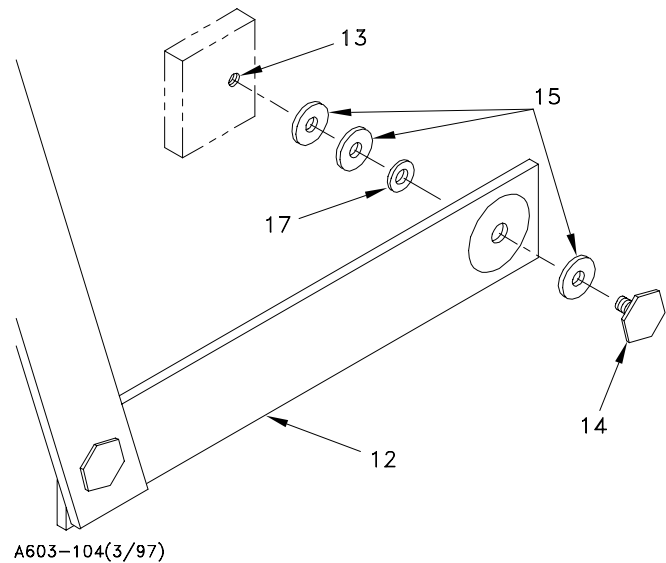


10. Remove tape and swing long lever link arm out. Remove shipping nut from bolt (14).

Make sure small washer (17) is between link (12) and washers (15).

11. Attach link (12) to hole in door block (13) with provided bolt (14) and washers (15 & 17).
12. Check clearances between long lever and door hanger hardware. Long lever should not rub against cables or brackets. Move operator to provide necessary clearances.

F615-005 (3/97)

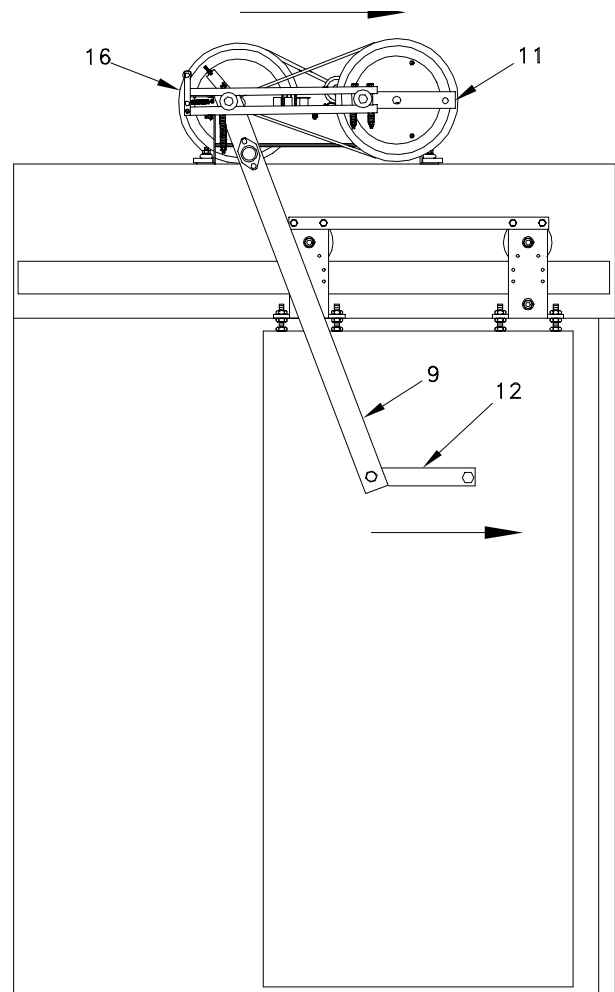


ALIGN DOOR OPERATOR

1. Rotate crank arm (11) until long lever (9) reaches fully extended position.

Link (12) is shown horizontal in drawing. Link does not have to be exactly horizontal when long lever reaches fully extended position.

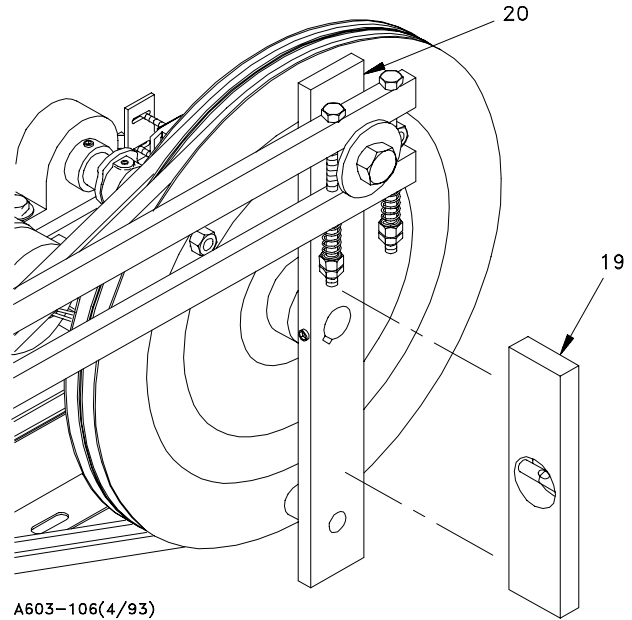
2. Slide door operator (16) until door reaches fully closed position.



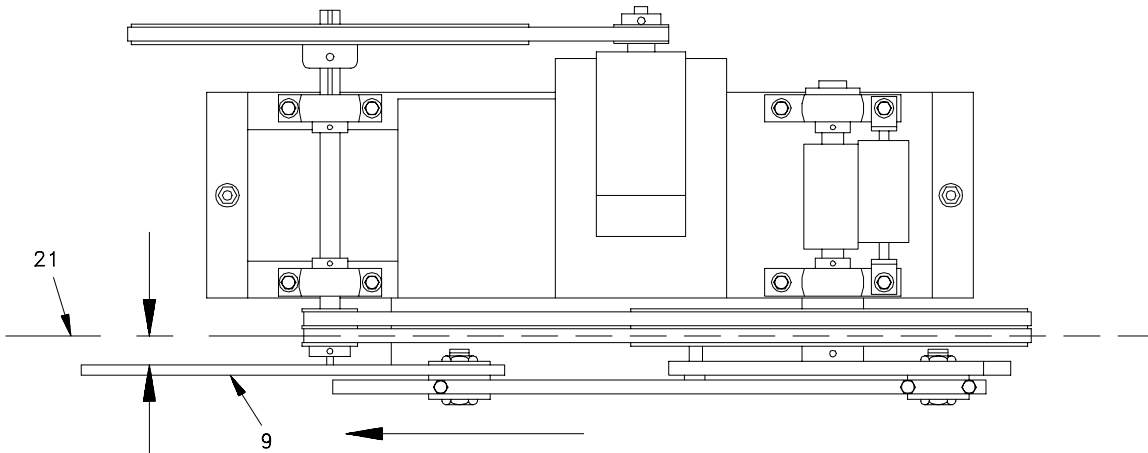
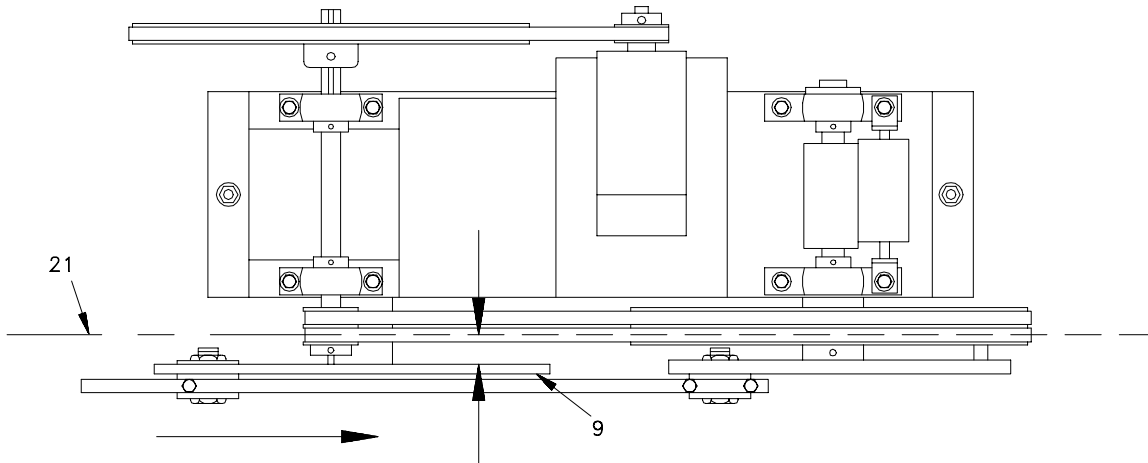
A603-105(3/97)

3. Rotate crank arm to vertical position and attach magnetic level (19) to crank arm (20). Place shims under front or rear edges as required.
4. Align door operator on top axis by measuring distance between long lever (9) and centerline of door hanger track (21). Adjust door operator position until distance is equal in door open and door closed position.
5. Tighten clamp bars securing door operator to header.

F615-006 (3/97)



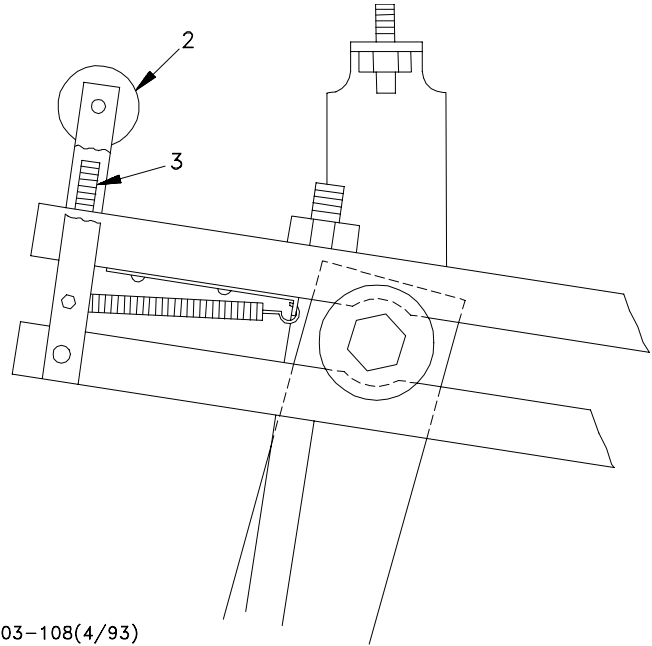
A603-106(4/93)



A603-107(4/93)

ADJUST SPLIT LINK

1. Place door in closed position.
2. Adjust detent screw (3) to clear release bearing (2) by 1/32 inch [0.8 mm].

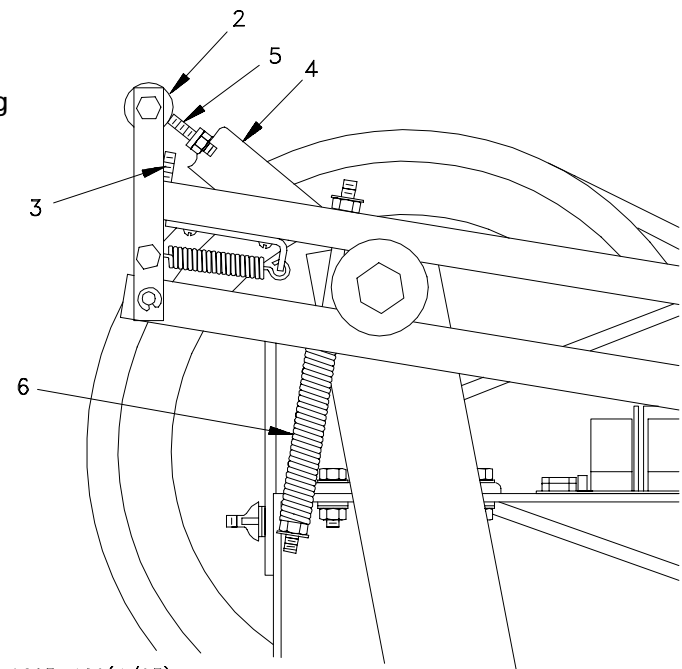


A603-108(4/93)

3. Position latch arm (4) so latch arm stud (5) is centered on release bearing (2).
4. Adjust latch arm stud (5) to push release bearing (2) 1/8 inch [3.2 mm] past detent screw (3).
5. Secure latch arm behind long lever.
6. Replace motor drive belt.
7. Adjust pressure on compression springs (6) to allow door to be opened manually.

Force required to open door should not exceed 75 pounds.

F615-007 (9/99)

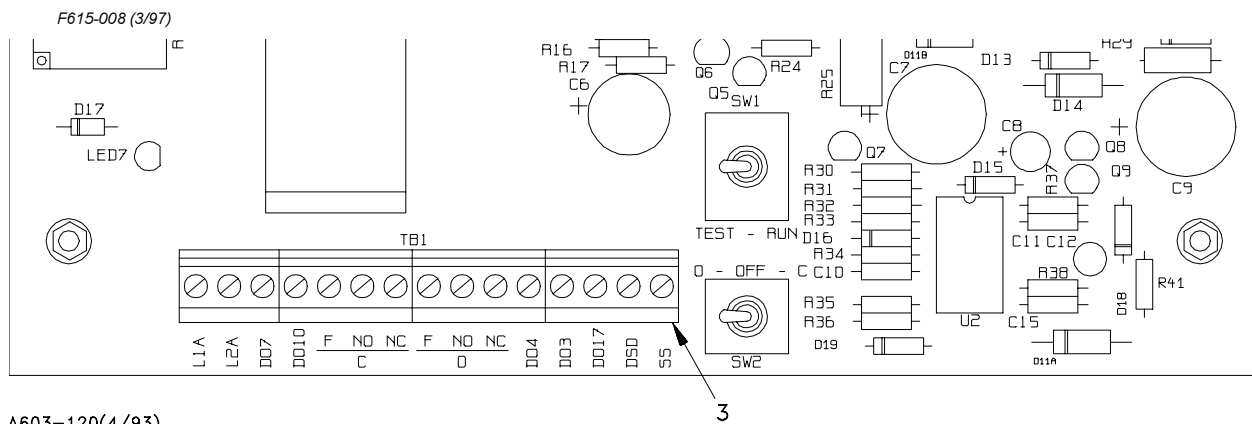
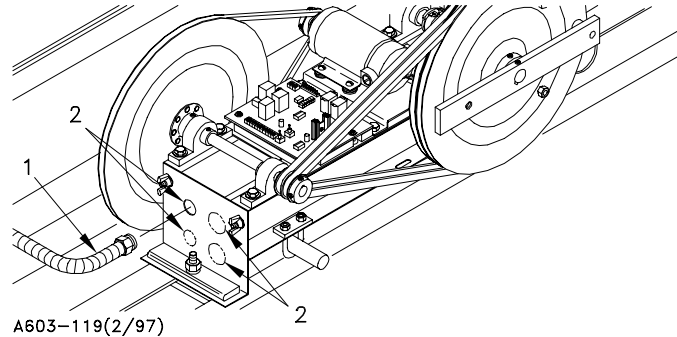


A603-109(4/93)

WIRE DOOR OPERATOR

1. Install and secure field wiring conduit (1) to appropriate knockout (2) in operator base.
2. Pull wires from elevator controller and connect to input & output terminals of terminal block TB-1 (3).

If you are unable to direct-wire, temporarily connect one end of a line cord to L1A and L2A, and plug other end into any 115 VAC outlet.



Input & Output Terminals

Required for door to operate

- L1A to L2A** **120VAC @ 500VA input.** If one of input lines is grounded, it should be connected to L1A.
- DO3 to L1A** **Open limit signal.** A relay across these terminals de-energizes when open limit microswitch is actuated. Relay is energized at all other times.
- DO7 to L1A** **Signal to close.** When a relay contact across these terminals makes up, doors should close.
- DO10 to L1A** **Signal to open.** When a relay contact across these terminals makes up, the doors should open.
- DO17 to L1A** **Close limit signal.** A relay across these terminals de-energizes when close limit microswitch is actuated. Relay is energized at all other times.

Optional

- DO3 to DO10** **Auxiliary to "O" relay.** A relay across these terminals should be energized only when doors are opening.
- DO7 to DO17** **Auxiliary to "C" relay.** A relay across these terminals should be energized only when doors are closing.
- DO4 to DO7** **Reduced speed closing signal.** When doors have a signal to close, and a relay contact across these terminals makes up, door speed is controlled by "N" potentiometer.
- F NC NO C** **Auxiliary C relay switching contact.** Designates a Form "C" contact on a 1-C relay.
- F NC NO O** **Auxiliary O relay switching contact.** Designates a Form "C" contact on 1-O relay.
- DSD to SS** **Optional -** Used on some projects for load balancing or other customer requirement.

F615-S11 (3/97)

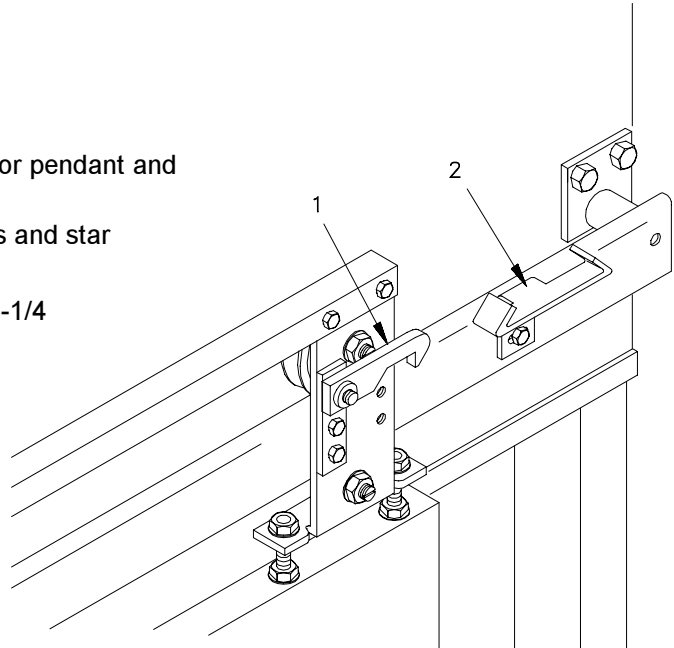
Installing clutch

Install clutch as follows.

- Install clutch
- Adjust clutch

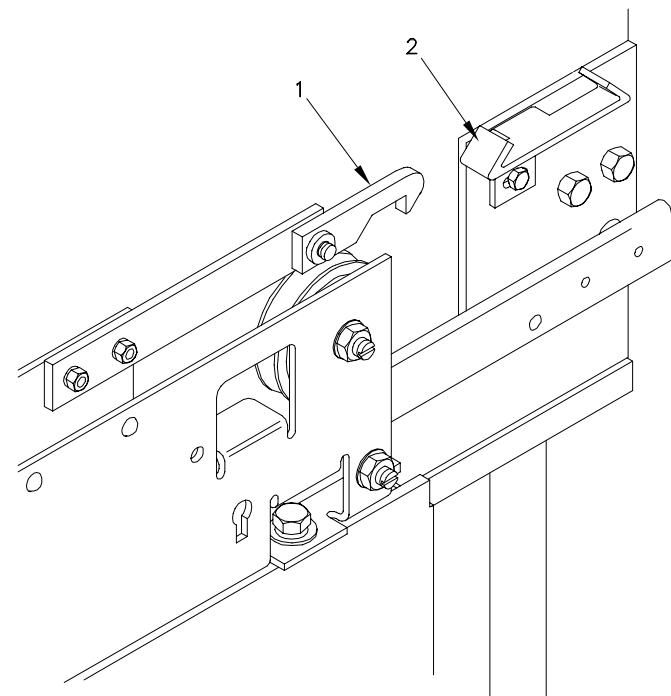
INSTALL CLUTCH

1. Attach restrictive hook (1) to mounting bar on door pendant and hook keeper (2) on door hanger.
 - Use special socket head screws, flat washers and star lock washers on hook keeper.
2. Mount door clutch (3) to key slot holes located 6-1/4 inches [158.8 mm] from leading edge of door panel.
3. Mount retracting lever (4) to lower end of long lever (5) with 1/4 inch hardware.
4. Close doors fully.
5. Install adjustment screw (6) to retracting lever (4).
6. Attach retracting chain (7) to retracting bar (8) with S-hook (9), and crimp S-hook to secure retracting chain to retracting bar.
7. Attach a link of retracting chain (7) to adjustment screw (6) and hook keeper on PE-1 side-opening system crimp hook.
8. Rotate eccentric (13) into retracting cam (10). Adjust eccentric to obtain minimum movement of the retracting cam, while not applying pressure to the retracting cam.
9. Install adjustment screw (11) through spring on restrictive clutch, and temporarily adjust spring length to 1/4 inch extension.
10. Set jack screws (18) to obtain 5/16 inch running clearance between long cam (12) and hoistway sill.
 - Shimming between the car door face and clutch may be required to achieve vertical plumb of long cam.
11. Slide bottom end of rod (14) through clevis (15) on lift link (16) of sensing bar (17). Connect other end of rod to restrictive hook (1).
 - Initially set the restrictive hook (1) high enough to prevent engagement with the hook keeper (2) while completing installation and adjustments.
12. Measure rod (14) and cut off excess.



A604-101(3/93)

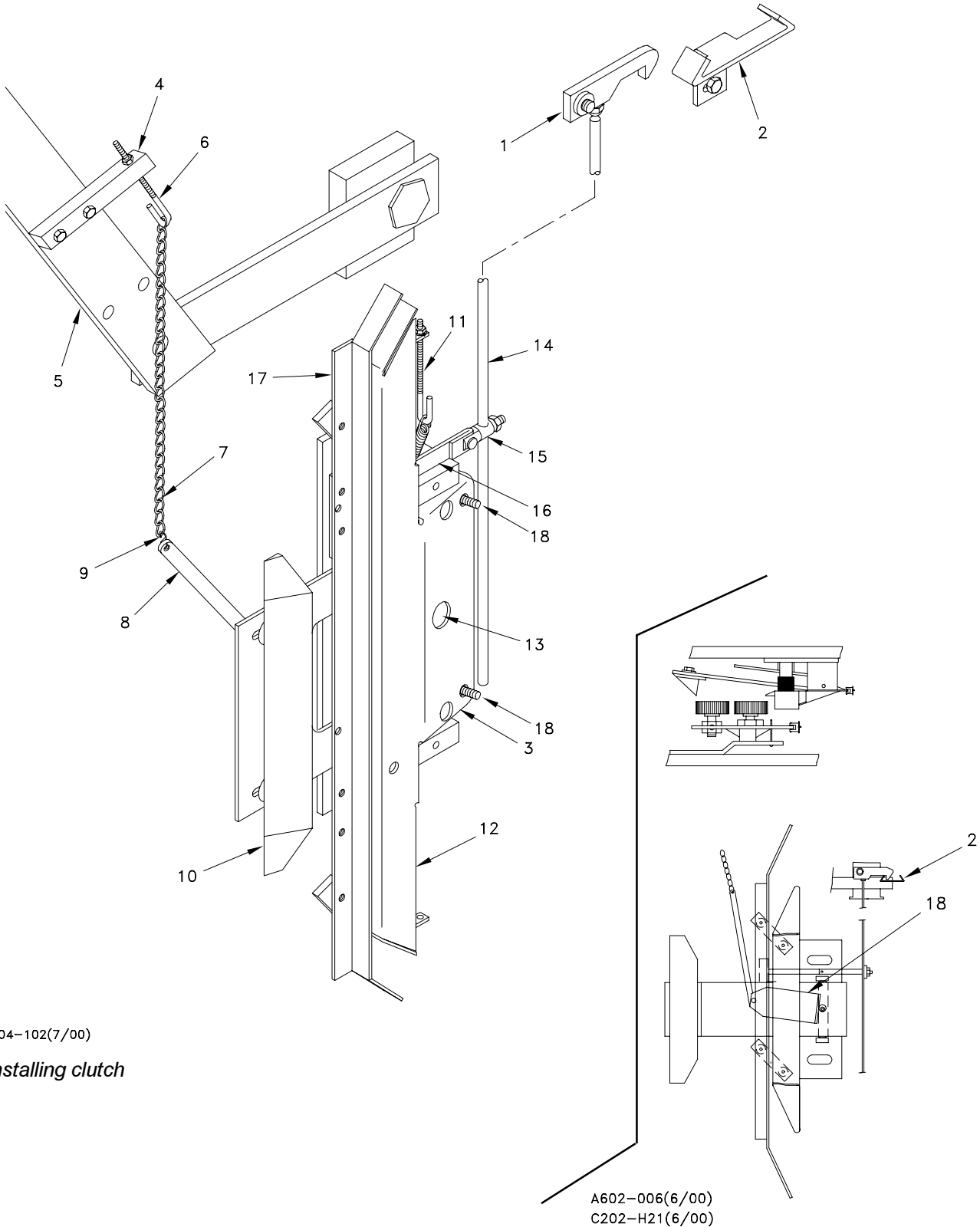
Hook & hook keeper on PE-1 side-opening system



C203-H14(5/98)

Hook & hook keeper on Side-opening PE-3 system

A602-008 (7/2000)



A604-102(7/00)

Installing clutch

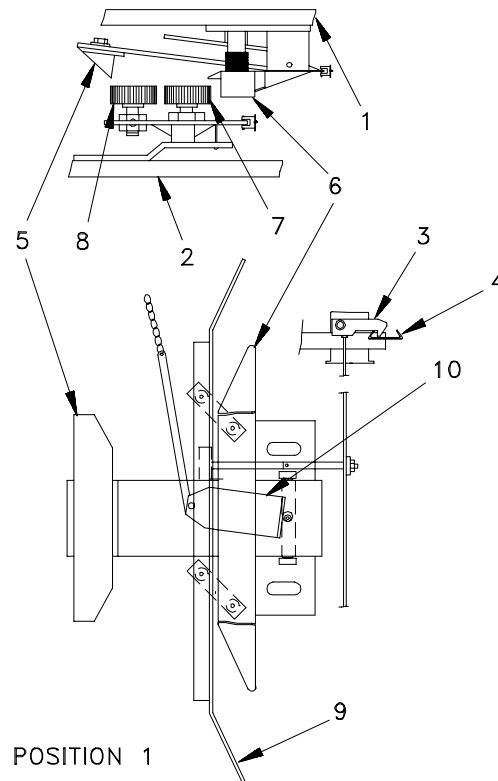
A602-006(6/00)
 C202-H21(6/00)

ADJUST CLUTCH

1. Adjust adjustment screw for retraction and clearances shown in position 2. Recheck 5/16 inch running clearance to hoistway sill.
2. Adjust eccentric roller and chain length to retract short cam, leaving 1/8 inch clearance from back of short cam bracket to door face.
3. Manually open and close doors several times to check clutch operations at positions 1, 2, 3, and 4.
4. Close doors and set restrictive hook (3) and hook keeper (4) so they will not engage.

Keep restrictive hook disengaged during installation, to prevent car doors from accidentally being locked.

5. Check final operation with hoistway doors engaged.
 - Final adjustment of spring tension for sensing bar should be set so it takes less pressure to retract the sensing bar (9) than the pressure needed to lift front interlock pickup roller (7).
6. Readjust as necessary.

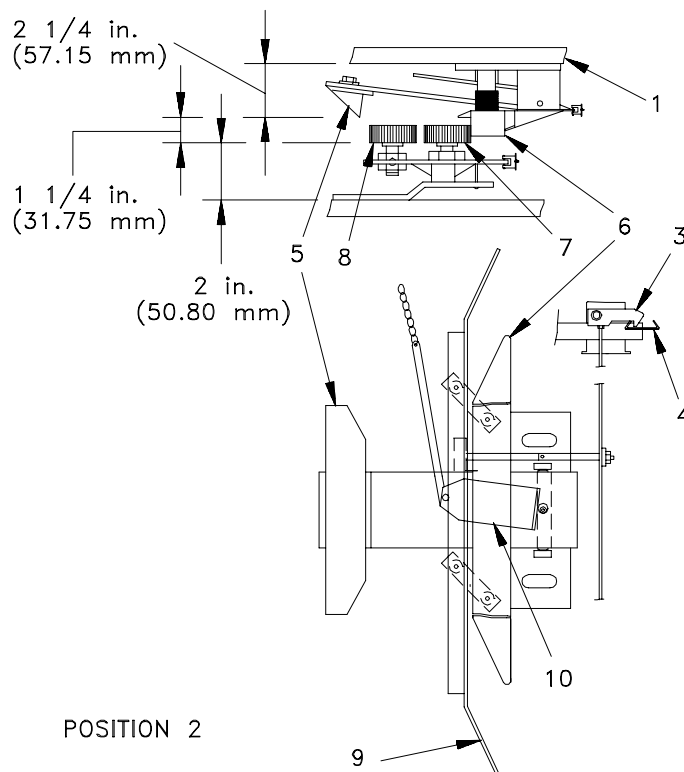


POSITION 1

C202-H21(9/92)

Position 1

- ✓ Car (1) and hoistway (2) doors are fully closed.
- ✓ Restrictive hook (3) is engaged without touching hook keeper (4).
- ✓ Short cam (5), long cam (6), front pick-up roller (7), and back pick-up roller (8) are disengaged and have correct running clearances.
- ✓ Sensing bar (9) and retracting cam (10) are in an extended position.

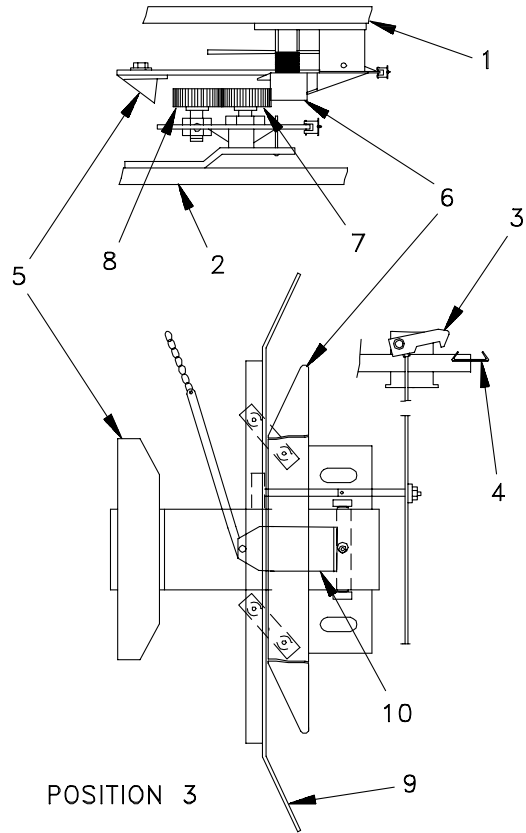


POSITION 2

C202-H23(9/92)

Position 3

- ✓ Long cam (6) is engaged with front pick-up roller (7), and short cam (5) is still disengaged with back pick-up roller (8).
- ✓ Front (7) and back (8) pick-up rollers are engaged, and retracting cam (10) and sensing bar (9) have retracted.
- ✓ Hook (3) has disengaged from hook keeper (4), and allows hoistway door (2) to move with car door (1).

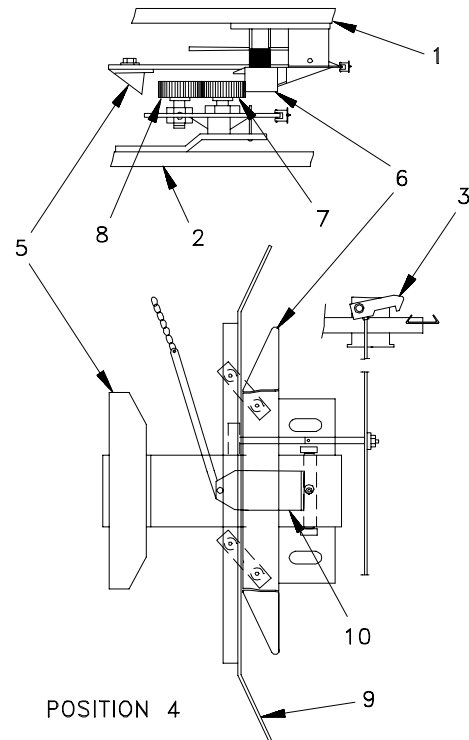


C202-H22(9/92)

Position 4

- ✓ Long cam (6), short cam (5), and both front (7) and back (8) pick-up rollers are engaged.
- ✓ Retracting cam (10) and sensing bar (9) are retracted and the hook (3) is disengaged.
- ✓ Car (1) and hoistway (2) doors are fully open.

A602-009 (6/2000)



C202-H24(9/92)

Adjusting door operator control Board 1Ø4®

Adjust door operator control Board 1Ø4® as follows.

- Measure current (optional)
- Set potentiometers
- Adjust door speeds
- Adjust door closing force
- Adjust nudge speed
- Set microswitch cams

Board 1Ø4® could be damaged if adjustment instructions are not followed carefully. If you cannot complete any of procedures as described, stop and request assistance.

A604-017 (2/97)

Toggle switches

To adjust and service door control, use two toggle switches on door operator control Board 1Ø4® — TEST-RUN switch and O-OFF-C switch.

- **TEST-RUN.** TEST-RUN switch is normally in RUN position. When TEST-RUN switch is in TEST position, it disconnects normal open and close input signals from door control, and switches the O-OFF-C toggle switch into the circuit.
- **O-OFF-C.** O-OFF-C switch is normally in OFF (center) position. OFF position does not indicate input power has been removed. It only indicates no signal to open or close when TEST-RUN switch is in TEST position.

A604-SI5 (2/97)

MEASURE CURRENT (OPTIONAL)

CAUTION: Do not install an ammeter in power supply line.

Current measurements are not required to adjust door operator control Board 1Ø4®. If necessary, measure current as follows.

1. Connect a voltmeter to resistor R2 (.1 Ohm 5 watt resistor) located between heat sinks Q2 and D2.

Viewing from TB1 side of control board, right side of resistor R2 is (-) and left side of resistor R2 is (+).

2. Set voltmeter to a low range — 1 volt or 2.5 volt.
3. Read measurement with following in mind.
 - 1 volt on meter indicates 10 amps of current.
 - .5 volt on meter indicates 5 amps of current.

A604-018 (2/97)

SET POTENTIOMETERS

Make sure all potentiometers are set to ZERO, except P8. *Do not set potentiometer P8.* It is factory-set and sealed.

These multi-turn potentiometers require 25 turns to traverse their complete range.

A604-019 (3/97)

ADJUST DOOR SPEEDS

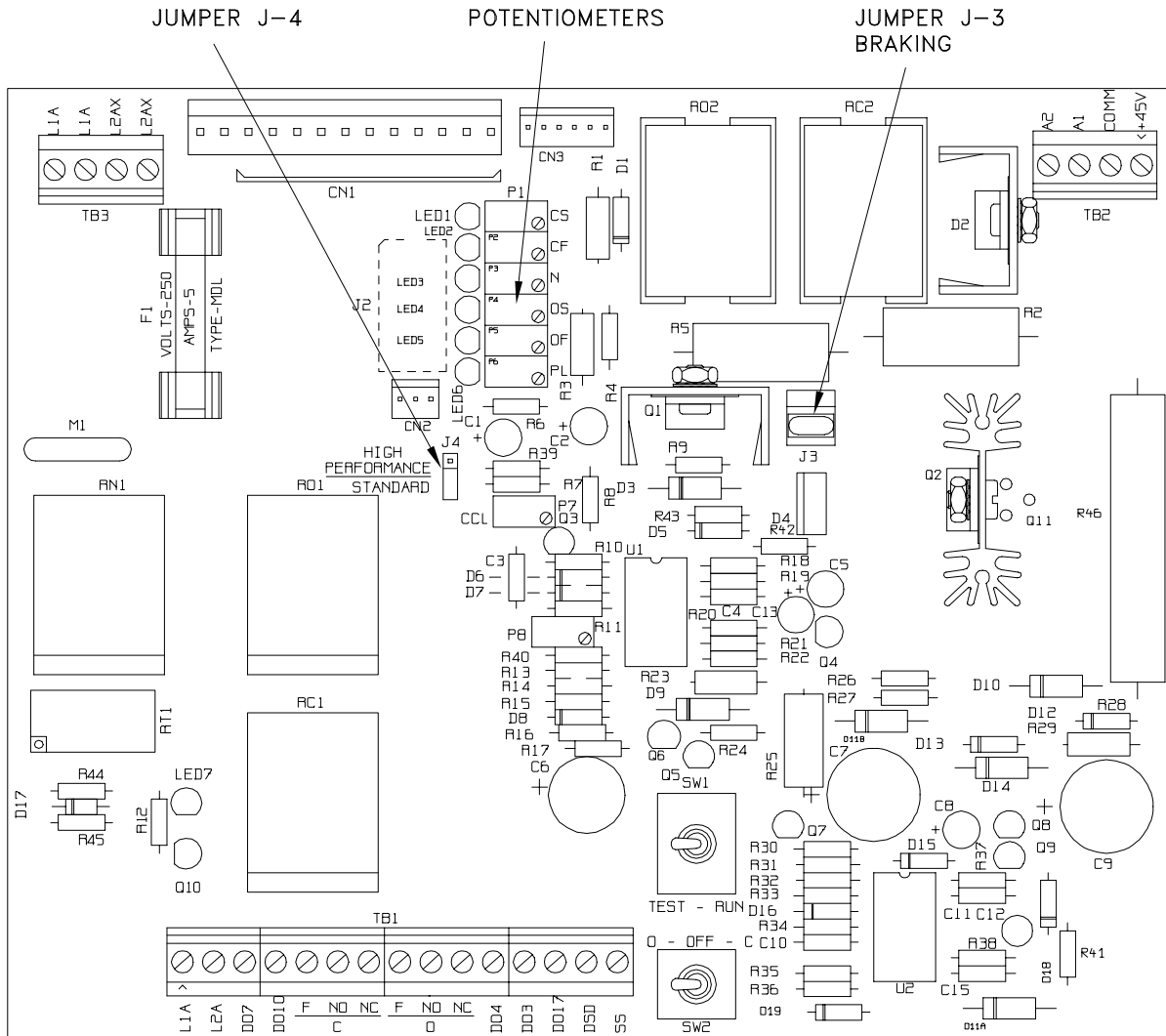
1. Disconnect and tag-out power.
2. Remove door operator cover and close doors.
3. Set switches and potentiometer in following positions.
 - All speed control potentiometers - fully counter-clockwise.
 - C.C.L. potentiometer - Fully clockwise.
 - TEST-RUN switch - TEST position.
 - O-OFF-C switch - OFF (center) position.
 - Two position jumper J4 - just to right, and slightly above, R01 relay.
(*Standard* position if one pair of wires is present at TB3. *High Performance* if two pairs of wires are present at TB3.)
4. Apply power. Toggle O-OFF-C switch to “O” position. LED6 next to “PL” potentiometer illuminates, indicating doors are in PL zone.
5. Turn “PL” potentiometer clockwise until doors begin to open. When “PL” microswitch drops, LED next to “PL” potentiometer goes out, and LED next to “OF” potentiometer illuminates.
6. Turn “OF” potentiometer clockwise, just enough to move doors through “OF” speed zone. When “OSDL” microswitch drops, LED next to “OF” potentiometer goes out, and LED next to “OS” potentiometer illuminates.
7. Turn “OS” potentiometer, just enough to move door through “OS” speed zone. When “OL” cam activates “OL” microswitch, LED next to “OS” potentiometer goes out. Doors should be fully open.
8. Toggle O-OFF-C switch to C position. LED next to “CF” potentiometer comes on.
9. Turn “CF” potentiometer clockwise until doors begin to move. When “CSDL” microswitch is dropped by its cam, LED next to “CF” potentiometer goes out and LED next to “CS” potentiometer illuminates.
10. Turn “CS” potentiometer clockwise until “CL” microswitch is actuated by its CAM. LED next to “CS” potentiometer goes out. Doors should open and close at slow speed.
 - If doors do not fully open or close within 20 to 30 seconds, internal timer removes motor power and LED 7 is lit.
 - If board senses over 5 amps, power shuts down and LED 7 is lit.
11. Using speed zone potentiometer and CAM settings, adjust door speeds for desired performance. Green LED’s indicate which speed control potentiometer is controlling door speed.
 - **Increase door speed** — turn potentiometer *clockwise*
 - **Decrease door speed** — turn potentiometer *counterclockwise*

Do not set potentiometer P8. It is factory-set and sealed.

A604-020 (4/97)

TIP: If doors do not operate smoothly, particularly on slower moving doors, it may help to remove jumper J3. This eliminates dynamic braking, and allows a smoother transition between speeds.

A604-SI6 (2/97)



A603-121(2/97)

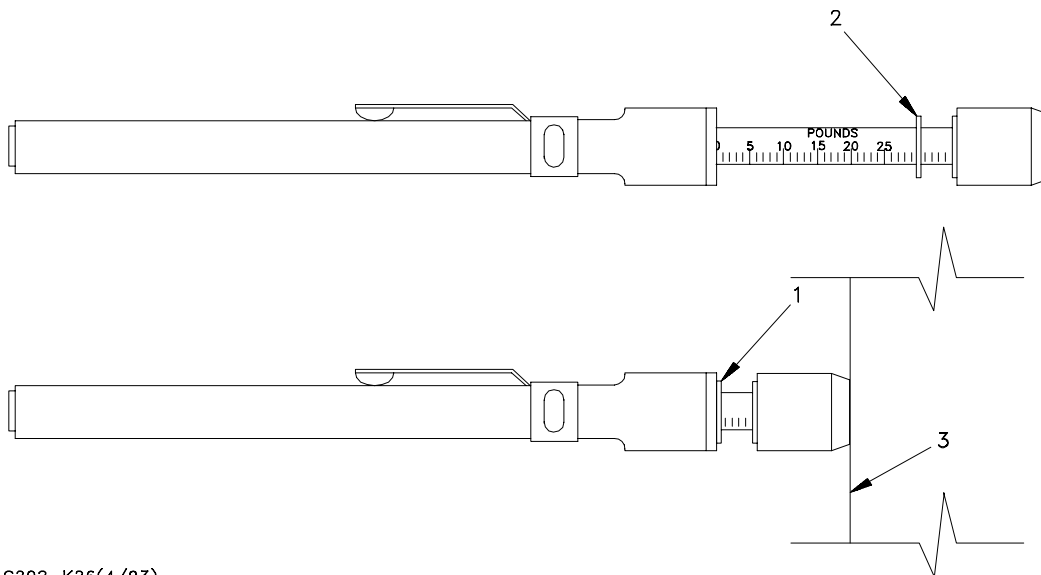
Board 104®

ADJUST DOOR CLOSING FORCE

1. Toggle TEST-RUN switch to TEST position.
2. Stop doors at mid-point in closing direction by toggling O-OFF-C switch to OFF position.
3. Turn CCL (close current limit) potentiometer fully counter-clockwise until doors stall.
4. Turn CCL potentiometer clockwise until desired door close operation is achieved. Door closing force should be less than 30 pound maximum allowed by Code.
5. To check door pressure, physically stall door at midpoint in closing direction.
6. Place rubber end of a pressure gauge (1) on edge of power-driven car door (3). Read pounds of force (2) on gauge and record results.
7. Open and close doors with O-OFF-C switch several times.
8. Physically stall doors again in closing direction and re-check door closing force with pressure gauge.

If door closing force CANNOT be kept under 30 pounds, contact Moline Accessories Company.

A604-021 (2/97)



C202-K26(4/93)

ADJUST NUDGE SPEED

1. Simulate a nudge signal by placing a jumper on terminal strip TB-1 between L1A and DO4.
2. Set the TEST-RUN switch to TEST position.
3. Set O-OFF-C switch to C position. Doors should close at nudge speed.
4. Turn the N potentiometer clockwise to desired nudging speed.
5. Remove jumper between L1A and DO4 before returning the TEST-RUN switch to RUN.

F615-010 (2/97)

**When all adjustments are complete,
place O-OFF-C switch in OFF position,
and TEST-RUN switch in RUN
position. *Replace door operator cover.***

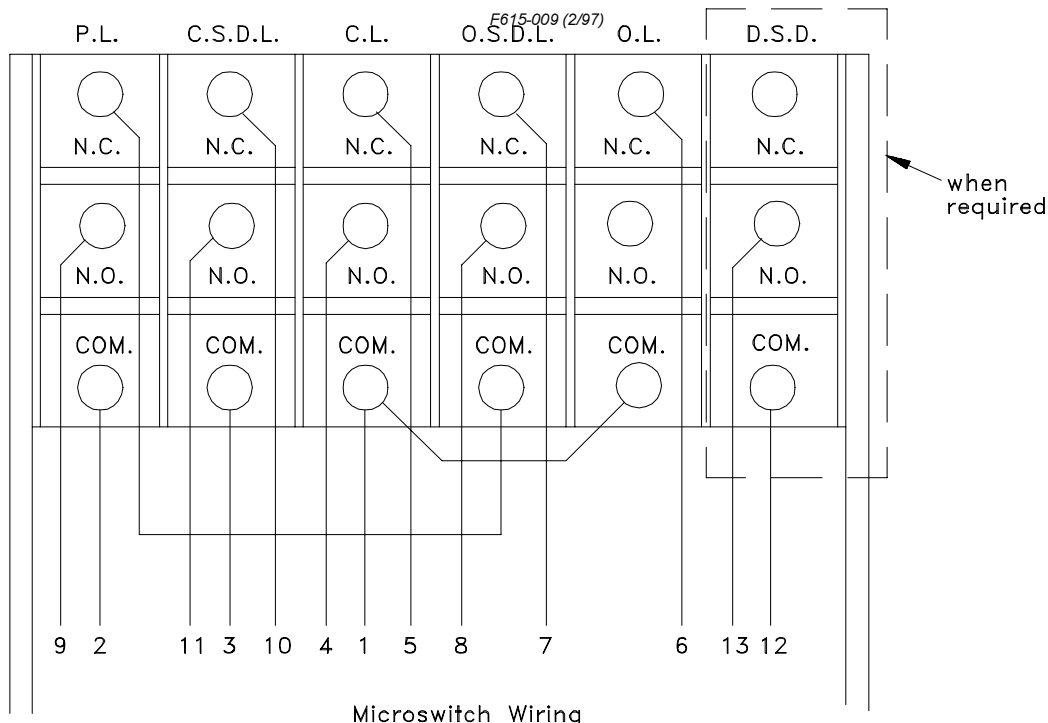
A604-S17 (2/97)

SET MICROSWITCH CAMS

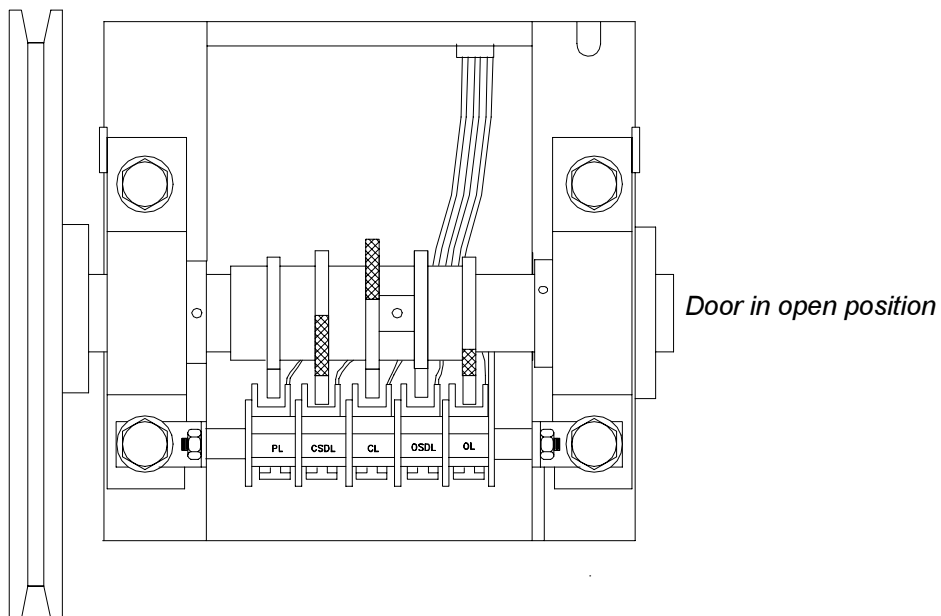
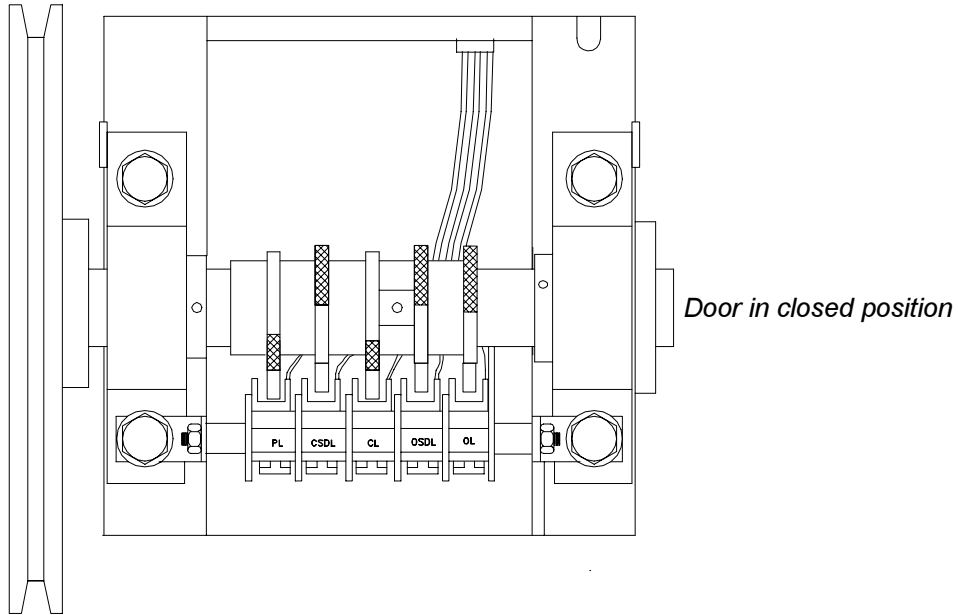
PM/SSC door operator microswitch cams determine where changes in door speed occur. Factory settings are approximate. Set microswitch cams, if necessary, per individual job requirements.

- | | | | |
|-----------|---|-------------|---|
| CL | CAM actuates CL microswitch when doors are in their desired fully closed position. | OSDL | CAM drops OSDL microswitch when doors are approximately half open. |
| PL | Initial opening CAM drops microswitch when car door clutch has just engaged both hoistway door rollers, but should not drop microswitch if door interlock hangs up. | CSDL | CAM drops CSDL microswitch when doors are approximately 4 inches [10.2 mm] from their fully closed position. |
| | | OL | CAM actuates OL microswitch when doors are in fully open position. |
| | | DSD | (optional) CAM actuates DSD microswitch when doors are approximately 4 to 6 inches [10.2 to 15.2 mm] from fully closed position when used with load balancing. CAM can also be set for other customer requirements. |

- Wire Colors
- 1 = Black
 - 2 = Red
 - 3 = Yellow
 - 4 = Blue
 - 5 = Brown
 - 6 = Orange
 - 7 = Gray
 - 8 = Violet
 - 9 = White/Black
 - 10 = White/Red
 - 11 = White/Green
 - 12 = White/Yellow
 - 13 = White/Blue



A603-124(4/93)



A603-122(4/93)

Adjusting door closure switch

The door closure switch is a normally open switch that is closed when the door is closed.

For more information on wiring, refer to contract-specific wiring diagrams.

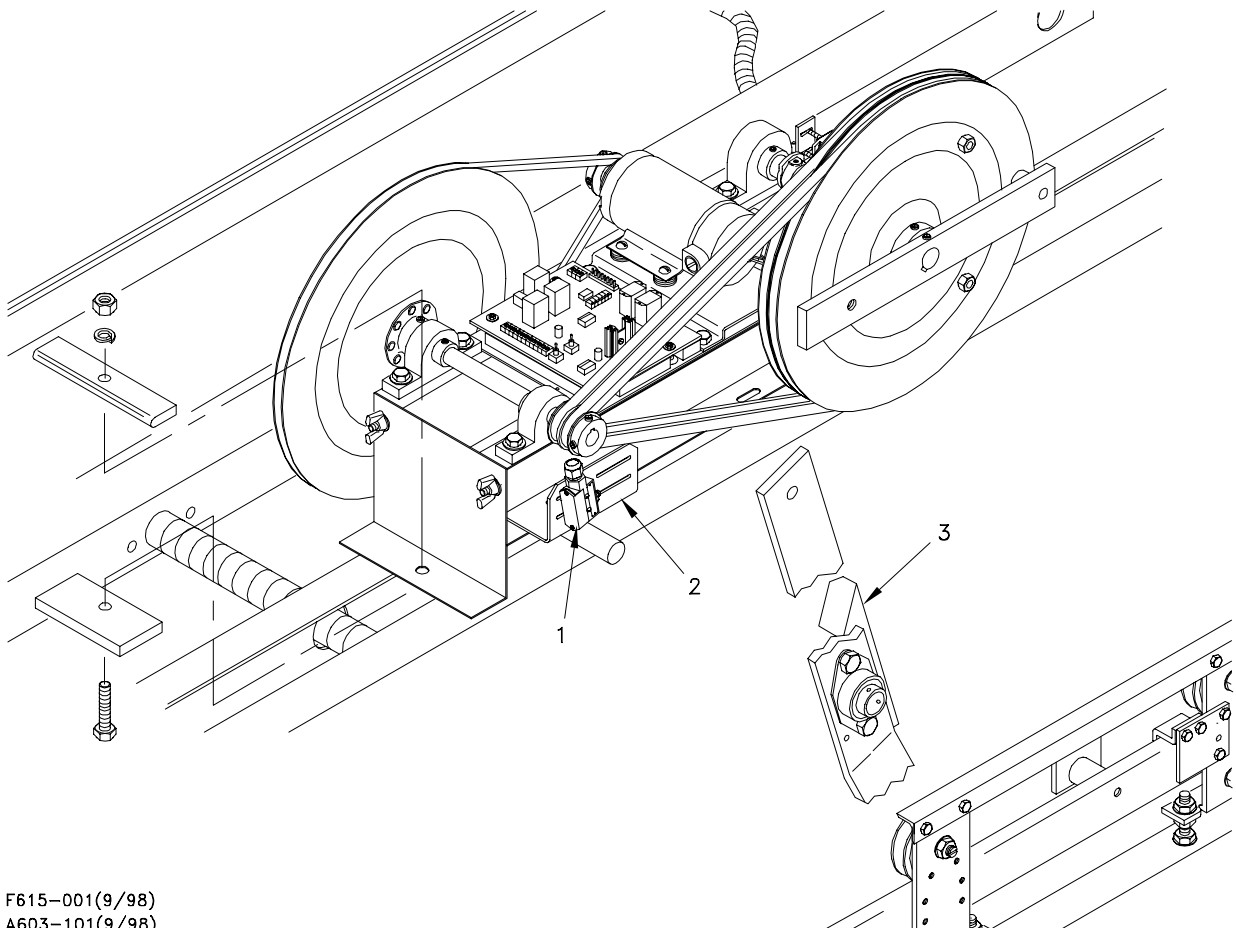
PM, HPM, & HPMS door operators: The door closure switch (1) is mounted to a bracket (2) on the door operator. The switch is actuated by an actuator (3) mounted to the long lever. To adjust:

1. With door closed, loosen mounting screws on switch (1).
2. Adjust switch so actuator trips switch when door is closed. Tighten switch mounting screws.
3. Open and close doors to observe that switch is tripped when door is closed.

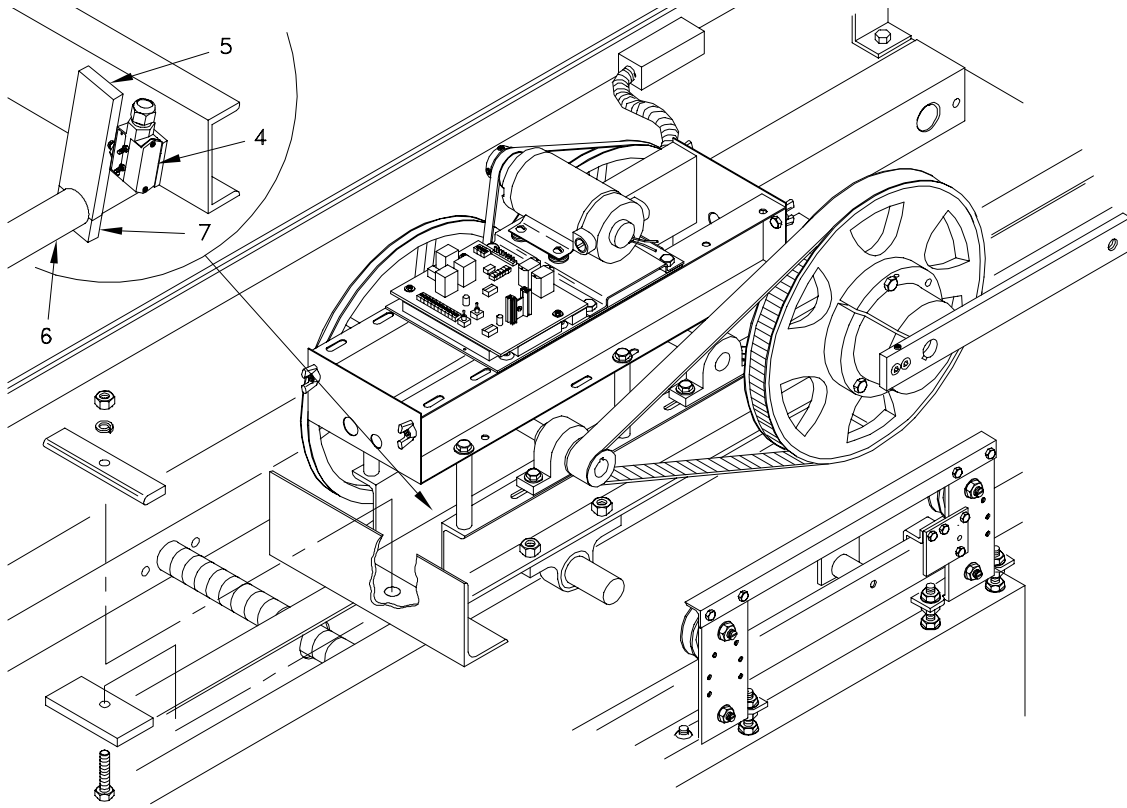
WM/HPM door operator: The door closure switch (4) is actuated by a lever body (5) mounted on door operator shaft (6). To adjust:

1. With door closed, loosen lever clamp (7) hardware.
2. Turn lever clamp (7) and lever body (5) assembly so switch (4) is actuated when door is closed. Tighten lever clamp hardware.
3. Open and close doors to observe that switch is tripped when door is closed.

F615-012 (9/98)



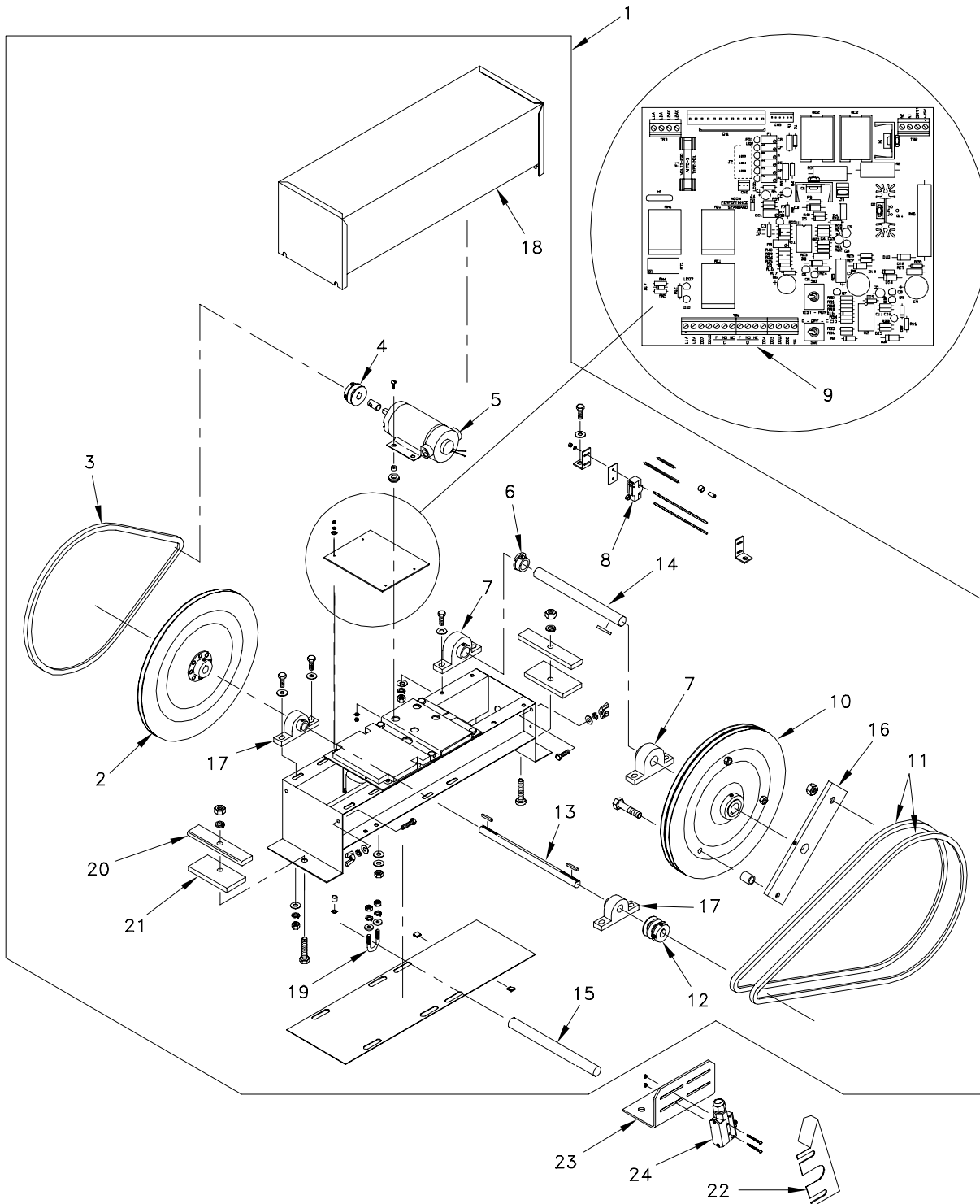
F615-001(9/98)
A603-101(9/98)



F615-002(9/98)
A603-133(9/98)

Replacement parts

SOLID STATE DOOR OPERATOR: PM



A603-001(9/98)

Right hand shown

Replacement parts

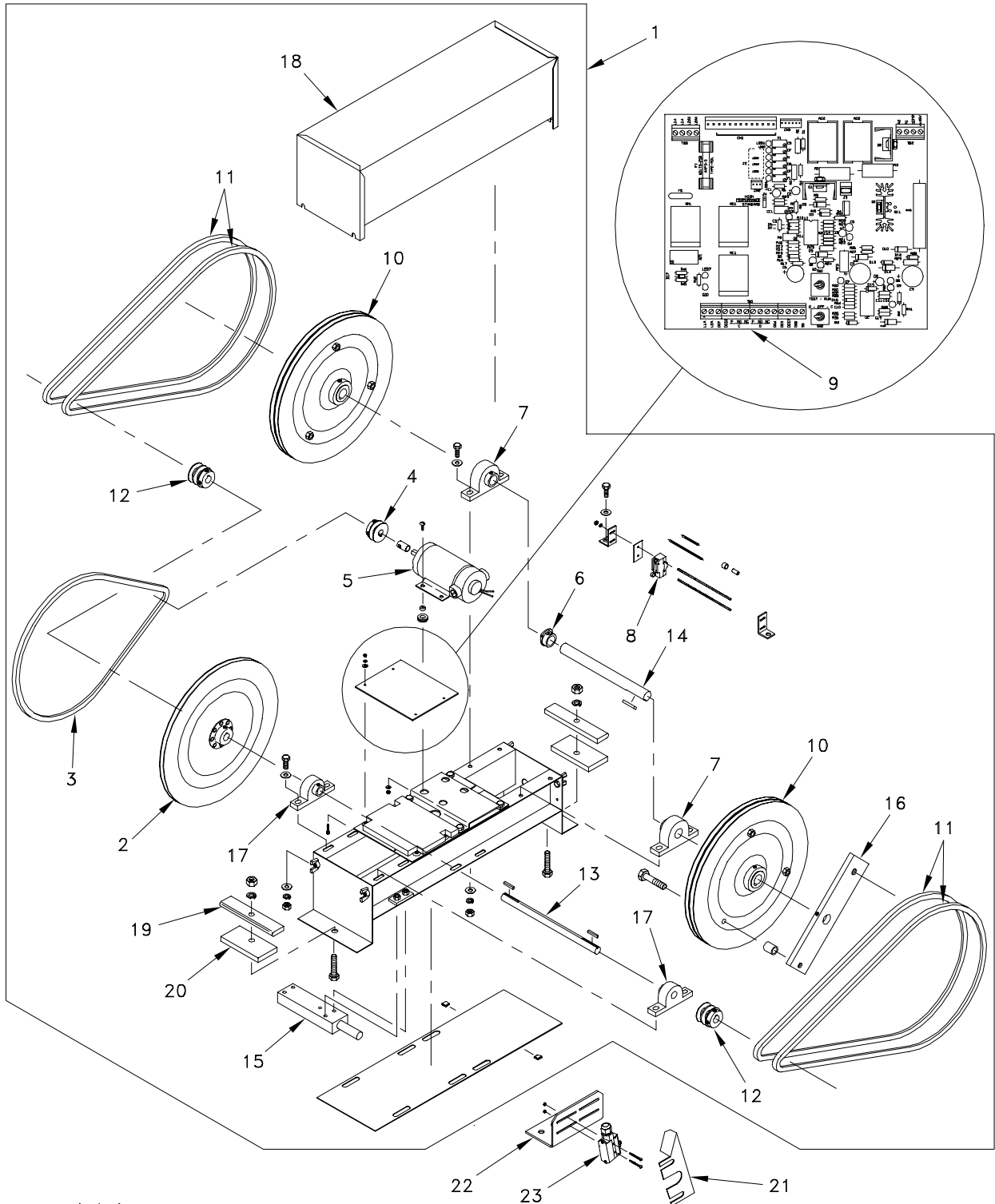
SOLID STATE DOOR OPERATOR: PM

KEY	PART NO.	PARTNAME	REMARK
1	P35011-001	Door operator, PM/SSC	Complete assembly; RH; with Board 104
	P35011-002	Door operator, PM/SSC	Complete assembly; LH; with Board 104
2	19502-029	Sheave, single	15-1/4 in. diameter
3	19501-021	Belt	4L 550 Frac hp V-type (A53)
4	19502-031	Sheave, single	1.7 in. pitch for reduction stage
5	101849	Motor, permanent magnet	1140 RPM, 24 VDC
6	25078	Cam, door operator	5 or 6 required
7	38351	Pillow block	1 in. bore
8	100165	Switch, micro	For PMSSC door operators
9	P-24783-001	PC board, 104	Board 104 with relays, fuse, & instructions
10	19502-028	Sheave, double	15-1/4 in. diameter
11	19501-022	Belt	4L 680 Frac hp V-type (A66)
12	19502-030	Sheave, double	1.7 in.
13	25076	Shaft	3/4 in. x 12 in. for reduction
14	25077	Shaft	Door operator camshaft
15	25075	Shaft, pivot	Door operator
16	25082-001	Crank arm, door operator	Without drilling for crank bolt
16	25082-002	Crank arm, door operator	For 42 in. center-opening doors (1 or 2 speed)
16	25082-003	Crank arm, door operator	For 36 in. side-opening doors (1 or 2 speed)
16	25082-004	Crank arm, door operator	For 42 in. side-opening doors (1 or 2 speed)
16	25082-005	Crank arm, door operator	For 48 in. side-opening doors (1 or 2 speed)
17	19500-032	Pillow block	3/4 in. dia. bore
18	P-24186	Cover, door operator	
19	P-35008-001	U-bolt hardware bag	Includes U-bolt(101871), hex nuts (47401-003) and lockwashers (48731-003)
20	25089	Bar	
21	25090	Bar	
NS	46208	Transformer	32V 250VA; 2 required for high performance option
NS	46217-020	Rectifier, bridge	25A 200V
NS	46218	Capacitor, electrolytic	4500 uF, 50 WV
NS	P-31364	Switch & cam assembly	Used for adding a switch
22	102023-001	Actuator, closure switch	RH
	102023-002	Actuator, closure switch	LH
23	102022-001	Fitting, mounting, closure switch	
24	P-35015-001	Microswitch assembly	Door closure switch

NS = Not Shown

Replacement parts

SOLID STATE DOOR OPERATOR: HPM



A603-002(9/98)

Replacement parts

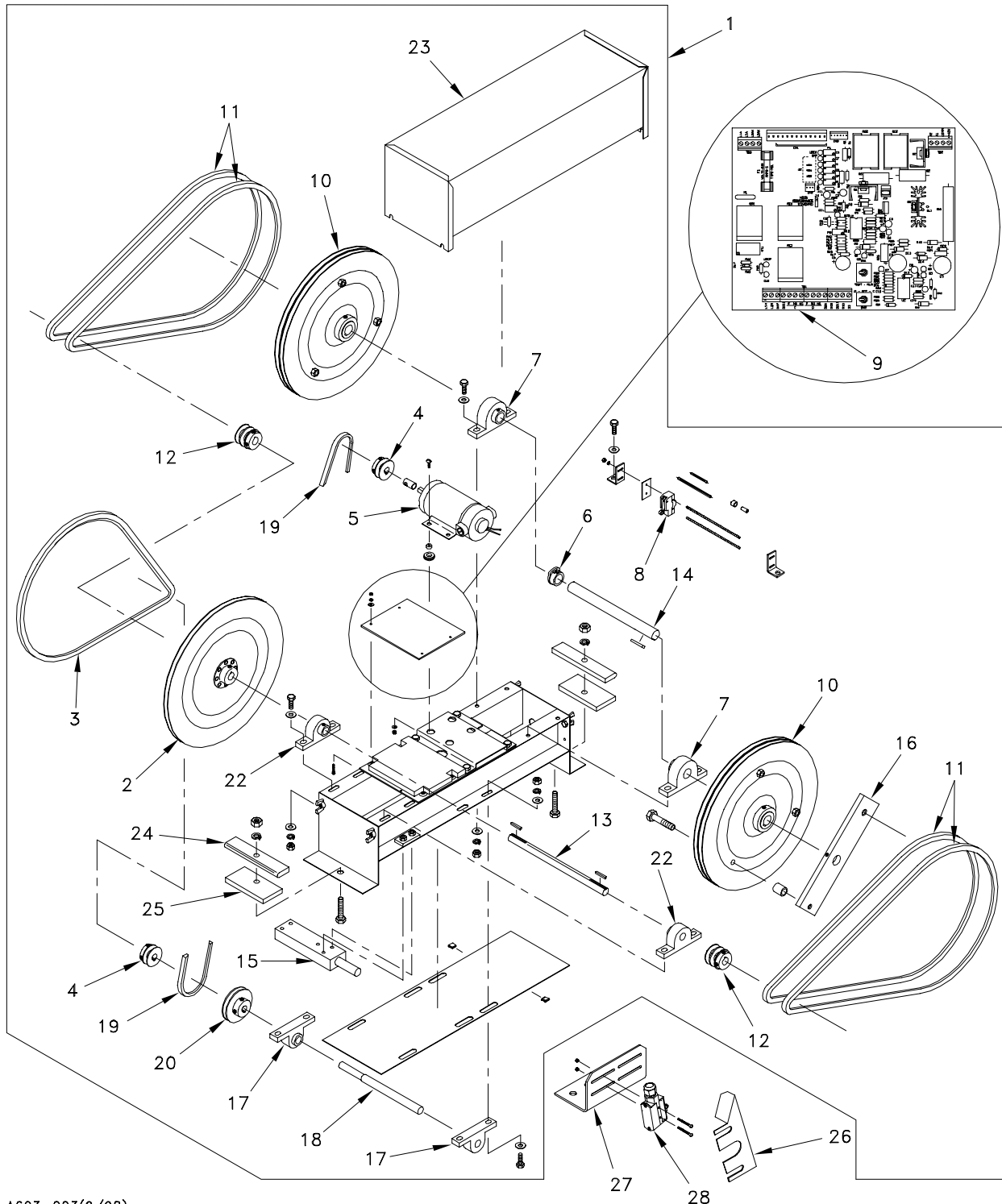
SOLID STATE DOOR OPERATOR: HPM

KEY	PART NO.	PARTNAME	REMARK
1	P35013-001	Door operator, HPM	Complete assembly; RH
	P35013-002	Door operator, HPM	Complete assembly; LH
2	19502-029	Sheave, single	15-1/4 in. diameter
3	19501-021	Belt	4L 550 Frac hp V-type
4	19502-031	Sheave, single	1.7 in. pitch for reduction stage
5	101849	Motor, permanent magnet	1140 RPM, 24 VDC
6	25078	Cam, door operator	5 or 6 required
7	38351	Pillow block	1 in. bore
8	100165	Switch, micro	For PMSSC door operators
9	P-24783-001	PC board, 104	Board 104 with relays, fuse, & instructions
10	19502-028	Sheave, double	15-1/4 in. diameter
11	19501-022	Belt	4L 680 Frac hp V-type
12	19502-030	Sheave, double	1.7 in.
13	58819	Shaft	3/4 in. for reduction
14	58820	Shaft	Door operator camshaft
15	P-24187	Shaft, pivot ass'y	
16	25082-001	Crank arm, door operator	Without drilling for crank bolt
	25082-002	Crank arm, door operator	For 42 in. center-opening doors (1 or 2 speed)
	25082-003	Crank arm, door operator	For 36 in. side-opening doors (1 or 2 speed)
	25082-004	Crank arm, door operator	For 42 in. side-opening doors (1 or 2 speed)
	25082-005	Crank arm, door operator	For 48 in. side-opening doors (1 or 2 speed)
17	19500-032	Pillow block	3/4 in. dia. bore
18	P-24186	Cover, door operator	
19	25089	Bar	
20	25090	Bar	
21	102023-001	Actuator, closure switch	RH
	102023-002	Actuator, closure switch	LH
22	102022-001	Fitting, mounting, closure switch	
23	P-35015-001	Microswitch assembly	Door closure switch
NS	46208	Transformer	32V 250VA; 2 required for high performance option
NS	46217-020	Rectifier, bridge	25A 200V
NS	49732	Capacitor, electrolytic	41000 uF, 50 WV for high performance power supply
NS	P-31364	Switch & cam assembly	Used for adding a switch

NS = Not Shown

Replacement parts

SOLID STATE DOOR OPERATOR: HPMS



A603-003(9/98)

Right hand shown

Replacement parts

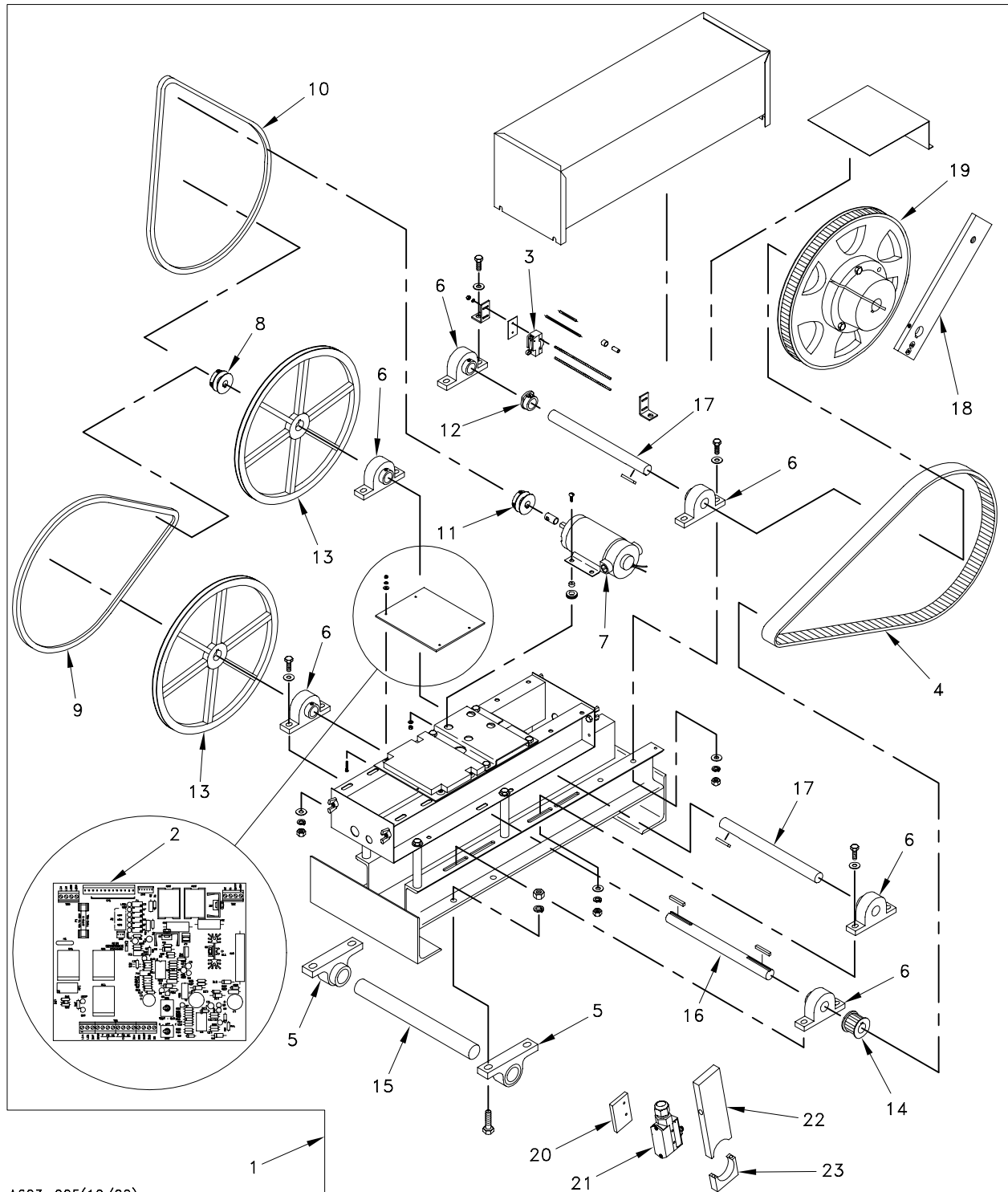
SOLID STATE DOOR OPERATOR: HPMS

KEY	PART NO.	PARTNAME	REMARK
1	P35016-001	Door operator, HPMS	Complete assembly; RH
	P35016-002	Door operator, HPMS	Complete assembly; LH
2	19502-029	Sheave, single	15-1/4 in. diameter
3	19501-021	Belt	4L 550 Frac hp V-type
4	19502-031	Sheave, single	1.7 in. pitch for reduction stage
5	101849	Motor, permanent magnet	1140 RPM, 24 VDC
6	25078	Cam, door operator	5 or 6 required
7	38351	Pillow block	1 in. bore
8	100165	Switch, micro	For PMSSC door operators
9	P-24783-001	PC board, 104	Board 104 with relays, fuse, & instructions
10	19502-028	Sheave, double	15-1/4 in. diameter
11	19501-022	Belt	4L 680 Frac hp V-type
12	19502-030	Sheave, double	1.7 in.
13	58819	Shaft	3/4 in. for reduction
14	58820	Shaft	Door operator camshaft
15	P-24187	Shaft, pivot ass'y	
16	25082-001	Crank arm, door operator	Without drilling for crank bolt
	25082-002	Crank arm, door operator	For 42 in. center-opening doors (1 or 2 speed)
	25082-003	Crank arm, door operator	For 36 in. side-opening doors (1 or 2 speed)
	25082-004	Crank arm, door operator	For 42 in. side-opening doors (1 or 2 speed)
	25082-005	Crank arm, door operator	For 48 in. side-opening doors (1 or 2 speed)
17	58793	Pillow block	3/4 in. bore for reduction shaft
18	P-22369	Shaft	5/8 in. diameter for reduction & pulleys
19	19501-092	Belt, V-type	2250 Tru-Flex, for reduction stage
20	19502-026	Sheave	3.0 in. pitch for reduction stage
22	19500-032	Pillow block	3/4 in. dia. bore
23	P-24186	Cover, door operator	
24	25089	Bar	
25	25090	Bar	
26	102023-001	Actuator, closure switch	RH
	102023-002	Actuator, closure switch	LH
27	102022-001	Fitting, mounting, closure switch	
28	P-35015-001	Microswitch assembly	Door closure switch
NS	46208	Transformer	32V 250VA; 2 required for high performance option
NS	46217-020	Rectifier, bridge	25A 200V
NS	49732	Capacitor, electrolytic	41000 uF, 50 WV for high performance power supply
NS	P-31364	Switch & cam assembly	Used for adding a switch

NS = Not Shown

Replacement parts

SOLID STATE DOOR OPERATOR: WM/HPM



A603-005(10/00)

Right hand shown

Replacement parts

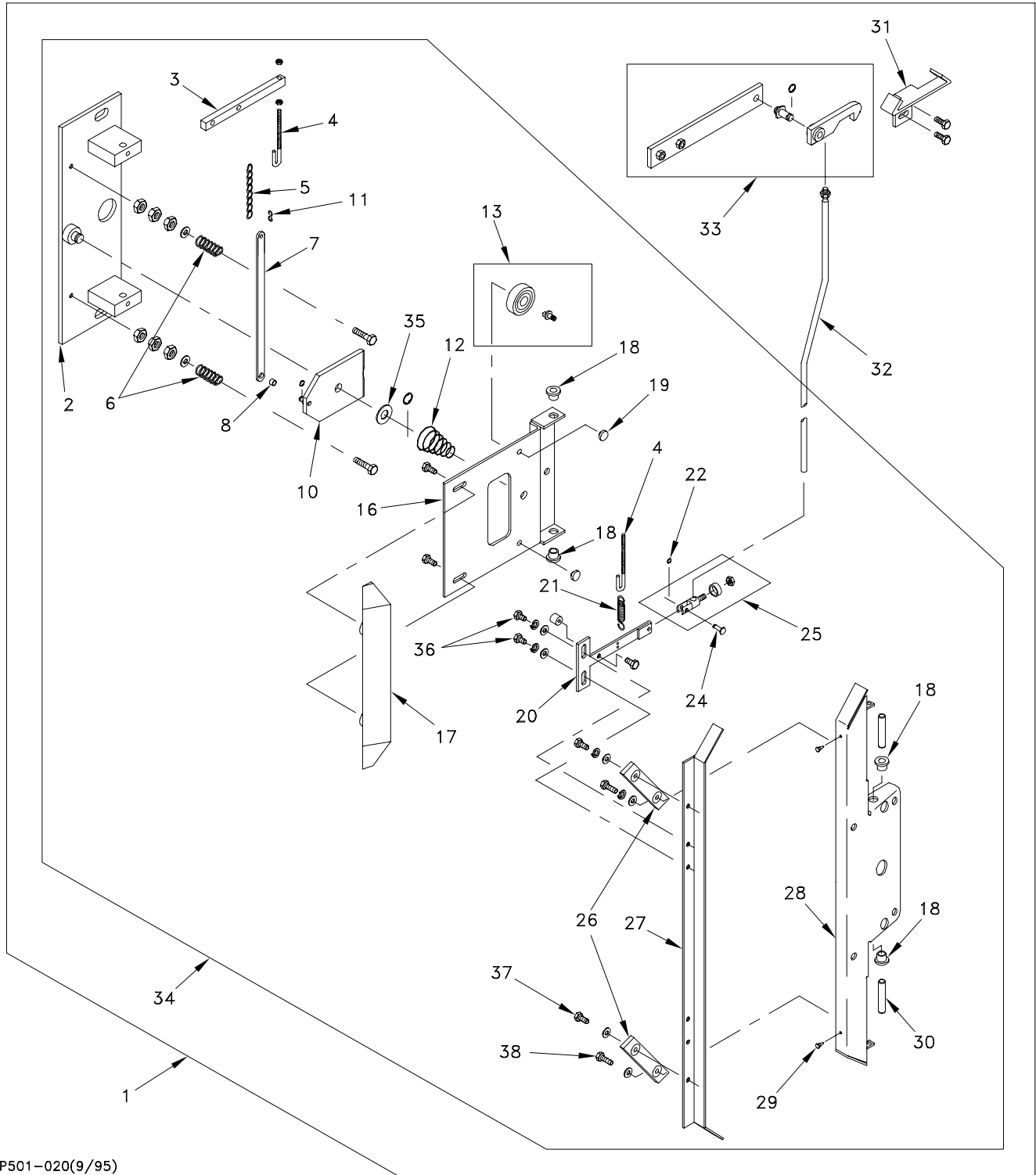
SOLID STATE DOOR OPERATOR: WM/HPM

KEY	PART NO.	PARTNAME	REMARK
1	P35019-001	Door operator, WM/HPM	Complete assembly, RH
	P35019-002	Door operator, WM/HPM	Complete assembly, LH
2	P-24783-001	PC board, 104	Board 104 with relays, fuse, & instructions
3	100165	Switch, micro	For PMSSC door operators
4	20267	Belt, 600H-150	Toothed type
5	19500-019	Pillow block	1-7/16 inch bore
6	38351	Pillow block	1.0 inch bore
7	101849	Motor, permanent magnet	1140 RPM, 24 VDC
8	19502-007	Sheave	3 inch pitch, cast iron
9	19501-013	Belt	A-48, V-type
10	19501-109	Belt	4L 510, Fractional hp V-type
11	19502-031	Sheave, single	1.7 in. pitch
12	25078	Cam, door operator	5 or 6 required
13	19502-009	Sheave	13.7 pitch, grey iron
14	20268	Gear pulley	For toothed belt
15	20185	Shaft, pivot	For WM-series door operators
16	20183	Shaft	1 in. for 2nd reduction
17	20182	Shaft	1 in. for reduction & cam
18	20249-***	Crank arm	Drilled per listing. -001 = Not drilled
19	20266	Gear pulley	For toothed belt
NS	46208	Transformer	32V 250VA; 2 required for high performance option
NS	46217-020	Rectifier, bridge	25A 200V
NS	49732	Capacitor, electrolytic	41000 uF, 50 WV for high performance power supply
NS	P-31364	Switch & cam assembly	Used for adding a switch
20	102029-001	Plate, shim, closure switch	
21	P-35015-001	Microswitch assembly	Door closure switch
22	102030-001	Lever body, closure switch	
23	102031-001	Lever clamp, closure switch	

NS = Not Shown

Replacement parts

DOOR CLUTCH, RESTRICTIVE - 1-3/4 INCH SILLS



F501-020(9/95)
A604-005(8/97)

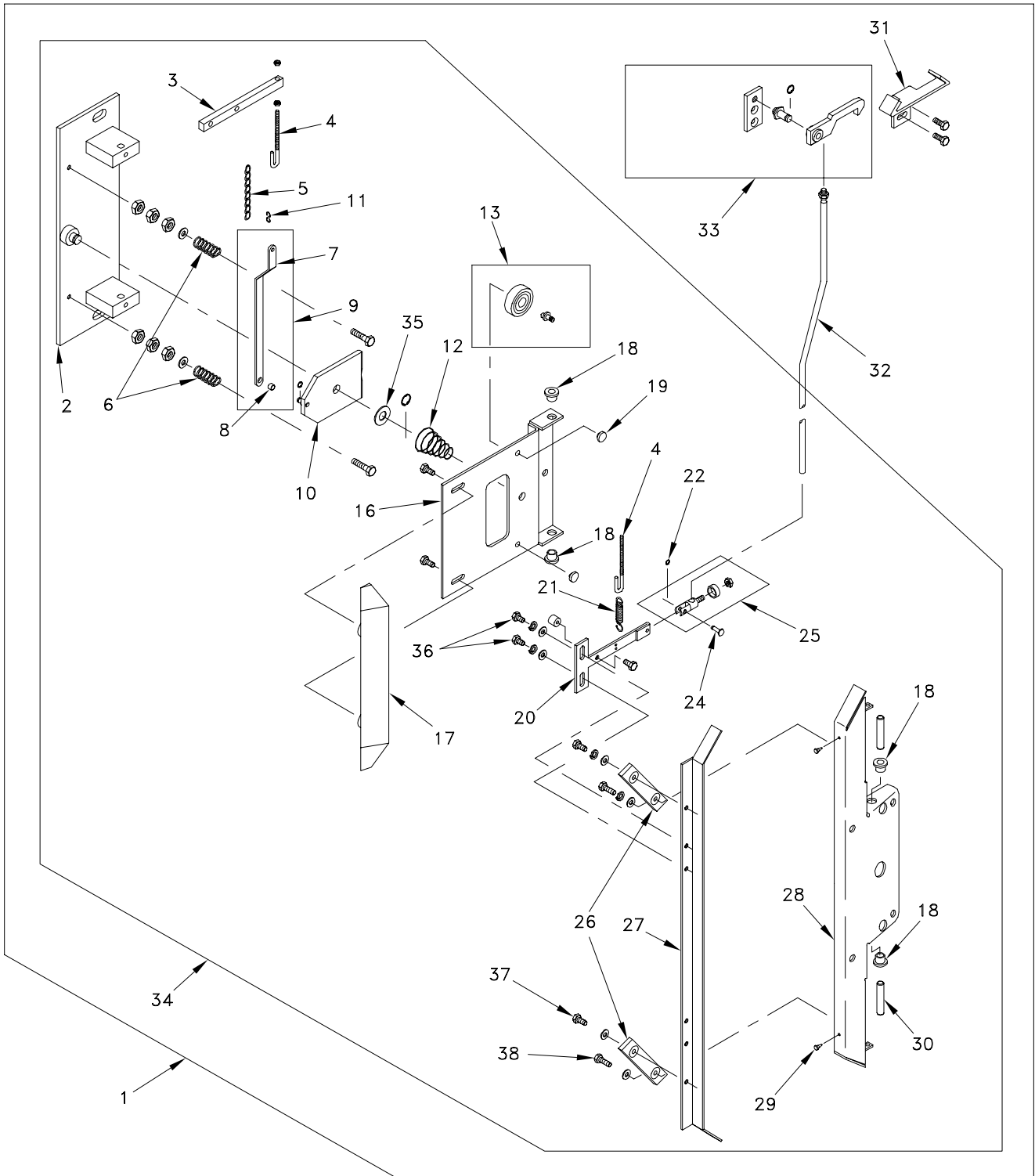
Replacement parts

DOOR CLUTCH, RESTRICTIVE - 1-3/4 INCH SILLS

KEY	MKOPART	PARTNAME	REMARK
1	P-31436-001	Clutch, restrictive	RH, 1-3/4 in. sill applications, single-speed
	P-31436-002	Clutch, restrictive	LH, 1-3/4 in. sill applications, single-speed
	P-31437-001	Clutch, restrictive	CALIFORNIA. RH, 1-3/4 in. sill applications, single-speed
	P-31437-002	Clutch, restrictive	CALIFORNIA. LH, 1-3/4 in. sill applications, single-speed
	P-31440-001	Clutch, restrictive	RH, 1-3/4 in. sill applications, two-speed
	P-31440-002	Clutch, restrictive	LH, 1-3/4 in. sill applications, two-speed
	P-31441-001	Clutch, restrictive	CALIFORNIA. RH, 1-3/4 in. sill applications, two-speed
	P-31441-002	Clutch, restrictive	CALIFORNIA. LH, 1-3/4 in. sill applications, two-speed
2	P-22031	Base, clutch	For shallow restrictive clutch; 1-3/4 in. applications
3	101150	Bar	
4	101154	Screw, adjustment	#10-24, 3.5 inches long, for retraction chain adjustment
5	101152	Chain, retracting	Welded, 23 inches long
6	2881-156	Spring, compression	6.9 lbs.
7	58982	Arm, retracting	1/8 in. L=10 in., with bushing; 1-3/4 in. sill applications
8	101161	Bushing	1/4 inch Nyliner
10	P-22120	Cam, retract, door, recessed	Cam: 1/4 x 3 in., L=4.375 in.; Stud: .25 in ID x .375 in. OD, L= .654 in.
11	101630	S-hook, closer	5/16 in. ID, L=1 in.
12	101260	Spring, conical	5/8 inch ID, 1.3 in. OD
14	101192	Bearing, ball, single	1.181 in. OD used for shallow clutch; for 1-3/4 inch sill applications
15	101236	Stud, eccentric	For mounting bearing on shallow clutch; 1-3/4 in. applications
16	101743	Plate	
17	101021	Cam, short	
18	17046	Bushing	Oilite bronze 0.376 inch ID
19	101146	Bumper	Rubber, 9/16 inch OD, 3/8 inch wide
20	58655	Link, lift lever	
21	00057	Spring, extension	1/2 in. OD, L=2-1/4 in.
22	101163	E-ring	3/16 inch, .029 in. wide
24	101156	Pin	3/16 inch D, L= 11/16 in.
25	101155	Clevis, lock	1/4-28, L=1.875 in.
26	P-22089	Arm, pivot, with bearing	1 x 3.25 in.
27	58651	Cam, locking	
28	P-22282	Cam, long car door clutch	Replaces 58654
29	100887	Bumper	Grommet, 1/4 inch OD, .44 inch length
30	101143	Pin	3/8 in. diam. x 2 in. long
31	58947	Hook keeper	
32	58976	Rod, lift	1-3/4 in. sill applications
33	P-31434-001	Hook/bracket assembly	RH
	P-31434-002	Hook/bracket assembly	LH
	P-31435-001	Hook/bracket assembly	CALIFORNIA. RH
	P-31435-002	Hook/bracket assembly	CALIFORNIA. LH
34	P-22284-001	Clutch, restrictive, subassembly	RH, 1-3/4 in. sill applications, does not include restrictive lock
	P-22284-002	Clutch, restrictive, subassembly	LH, 1-3/4 in. sill applications; does not include restrictive lock
35	100136	Washer	17/32 ID x 1-1/8 OD, 16 GA
36	61112-001	Screw	HHC/G5, 1/4-28, 3/8 in.
37	49388-002	Screw	HHC/G2, 1/4-28, 1/2 in.
38	49388-003	Screw	HHC/G2, 1/4-28, 5/8 in.

Replacement parts

DOOR CLUTCH, RESTRICTIVE - 2-1/4 INCH SILLS



A604-005(8/97)

Replacement parts

DOOR CLUTCH, RESTRICTIVE - 2-1/4 INCH SILLS

KEY	MKOPART	PARTNAME	REMARK
1	P-22076-001	Clutch, restrictive	RH, 2-1/4 in. sill applications
	P-22076-002	Clutch, restrictive	LH, 2-1/4 in. sill applications
2	P-31203	Base, clutch	For deep restrictive clutch; 2-1/4 in. applications
3	101150	Bar	For 2-1/4 in. sill applications - not threaded
4	101154	Screw, adjustment	#10-24, 3.5 inches long, for retraction chain adjustment
5	101152	Chain, retracting	Welded, 23 inches long
6	2881-156	Spring, compression	6.9 lbs.
7	101153	Arm, retracting	With bend; 1/8 in.; L=10 in.; 2-1/4 in. sill applications
8	101161	Bushing	1/4 inch Nylon
9	P-22121	Arm, retracting	Includes retracting arm 101153 & bushing 101161; 2-1/4 in. sill applications
10	P-22120	Cam, retract, door, recessed	Cam: 1/4 x 3 in., L=4.375 in.; Stud: .25 in ID x .375 in. OD, L= .654 in.
11	101630	S-hook, closer	5/16 in. ID, L=1 in.
12	101260	Spring, conical	5/8 inch ID, 1.3 in. OD
13	P-31131	Uprthrust roller assembly	For deep clutch; 2-1/4 inch sill applications; Includes single ball bearing and eccentric stud
16	101743	Plate	
17	101021	Cam, short	Aluminum
18	17046	Bushing	Oilite bronze 0.376 inch ID
19	101146	Bumper	Rubber, 9/16 inch OD, 3/8 inch wide
20	58655	Link, lift lever	
21	00057	Spring, extension	1/2 in. OD, L=2-1/4 in.
22	101163	E-ring	3/16 inch, .029 in. wide
24	101156	Pin	3/16 inch D, L= 11/16 in.
25	101155	Clevis, lock	1/4-28, L=1.875 in.
26	P-22089	Arm, pivot, with bearing	1 x 3.25 in.
27	58651	Cam, locking	
28	P-22282	Cam, long car door clutch	Replaces 58654
29	100887	Bumper	Grommet, 1/4 inch OD, .44 inch length
30	101143	Pin	3/8 in. diam. x 2 in. long
31	58947	Hook keeper	
32	58656	Rod, lift	2-1/4 in. sill applications; L=44 inches
33	P-22077-001	Hook/bracket assembly	RH - Shorter hook
	P-22077-002	Hook/bracket assembly	LH - Shorter hook
	P-22097-001	Hook/bracket assembly	CALIFORNIA. RH - Longer hook
	P-22097-002	Hook/bracket assembly	CALIFORNIA. LH - Longer hook
34	P-22226-001	Clutch, restrictive, subassembly	RH, 2-1/4 in. sill applications
	P-22226-002	Clutch, restrictive, subassembly	LH, 2-1/4 in. sill applications
35	100136	Washer	17/32 ID x 1-1/8 OD, 16 GA
36	61112-001	Screw	HHC/G5, 1/4-28, 3/8 in.
37	49388-002	Screw	HHC/G2, 1/4-28, 1/2 in.
38	49388-003	Screw	HHC/G2, 1/4-28, 5/8 in.

NOTES

NOTES

