
DOOR OPERATOR CONVERSION PACKAGE:
Type M, PMSSC, HPM/SSC to Closed Loop with 105D Board
Repair Instruction

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TABLE OF CONTENTS

1	SAFETY	4
2	PRODUCT DESCRIPTION	5
3	CONVERSION OF TYPE M DOOR OPERATOR	6
4	WIRE MICROSWITCHES - TYPE M DOOR OPERATOR.....	7
5	CONVERSION OF PM/SSC, HPM/SSC TO CLOSED LOOP 105D BOARD	8
6	INSTALL MOTOR AND CONTROL - TYPE M, PM/SSC, HPM/SSC DOOR OPERATORS .	9
7	INSTALL BOTTOM COVER.....	10
8	INSTALL NEW COVER	11
9	VERIFY MICROSWITCH CAM SETTINGS	12
10	WIRE CLOSED LOOP DOOR OPERATOR	13
11	105D DOOR CONTROL BOARD.....	15
12	BOARD FEATURES.....	18
13	PARAMETERS AND FUNCTIONS	19
14	LCD DISPLAY MENU STRUCTURE	20
15	LEARN CYCLE.....	22
16	ADJUSTING 105D BOARD	23
17	DOOR CLOSING FORCE ADJUSTMENT.....	24
18	REPLACEMENT PARTS	25
19	APPROVALS AND VERSION HISTORY	27

1 SAFETY

Participate in the success of the installation of the closed loop door operator.

- Know the safety hazards related to any procedure.
- Know what equipment has been specified for each specific contract.
- 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 others around you. Always consider safety first.

- Wear safety glasses or goggles when using power tools.
- When working on the car canopy, always be aware of where the sides of the car are located.
- If step ladders are used, always support step ladder feet.
- 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.
- Always wear protective gloves when installing or removing access covers, conduits, wireway, or electrical devices.
- Before connecting wiring, cover sharp edges to keep hands and arms from being cut.
- Always disconnect power from all related circuits before proceeding with wiring. Treat all circuits as if they are still live.
- Use insulated and ground tools.
- Clear wiring sites of any unnecessary materials or equipment.
- Always know where other people are and how elevator wiring can affect their safety.

6-003663 (2012-01)

2 PRODUCT DESCRIPTION

Closed loop door control is a microprocessor-based fully digital elevator door control system. It continuously controls all aspects of door motion including direction, velocity, acceleration and force. Closed loop door control includes the following components and controls.

- Main PC board
- Motor control
- Current/torque control

Main PC board

The main board contains all user connections, power converter, power supplies, adjustment switches, display and an “Overseer” function that monitors door acceleration and control input.

Motor control

Closed loop door control utilizes a low voltage permanent magnet DC Motor powered by a fully controlled PWM (Pulse Width Modulated) converter operating at a very high frequency. High frequency is well out of audible range and provides for quiet motor operation.

The converter also includes full overcurrent sensing and electronic output short circuit protection circuitry.

PWM power delivered to motor is supplied in a series of voltage pulses. Each pulse has same amplitude, but varies in width. Motor responds to average pulse voltage, so by varying width of pulses, average motor voltage is either increased or decreased.

Current/Torque control

Closed looped door control incorporates a closed loop controller continuously measuring current/torque in the motor and adjusting it as necessary to provide for proper acceleration and force required to move doors. It also regulates door closing force, which is adjustable. Current control also provides full overcurrent sensing and proper system shutdown when faults occur.

6-003665 (2012-01)

3 CONVERSION OF TYPE M DOOR OPERATOR

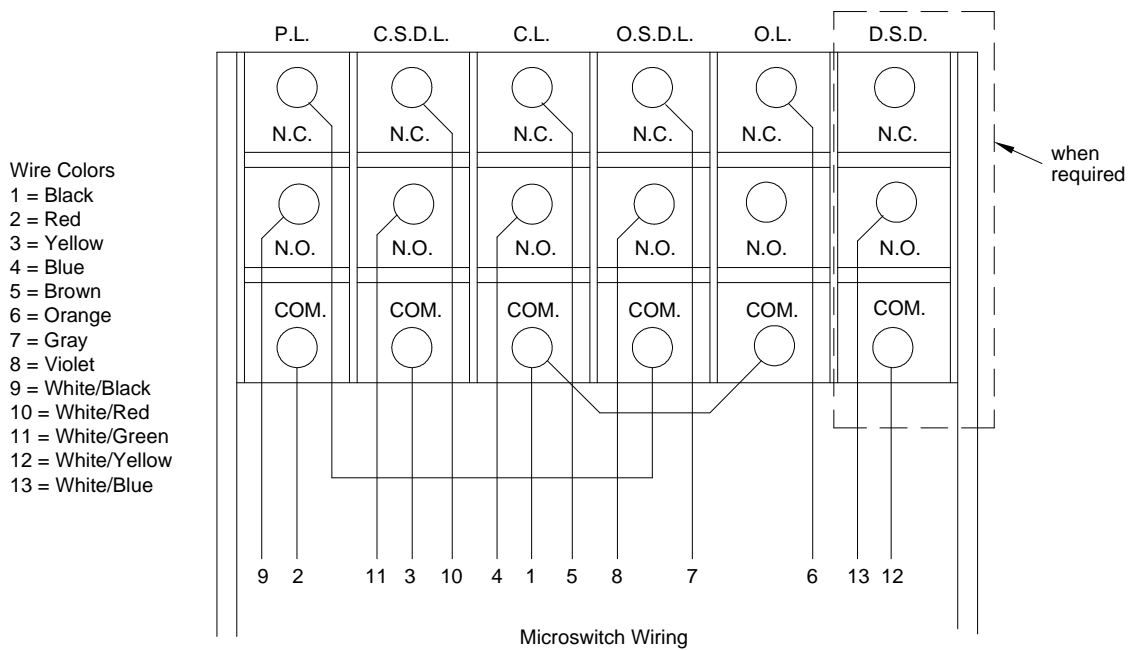
1. Turn OFF electrical power to door operator.
2. Remove existing microswitch cover.
3. Remove all wiring and jumpers from microswitch.
4. Remove and tag all controller wiring from terminal block.
5. Remove motor wires from terminal block, and remove terminal block and hardware.
6. Remove motor belt, and remove motor.
7. Install the flex conduit with controller wiring from the outside - in on the end of the base opposite the microswitches.

NOTE! For more information on installing cover, refer to the section in this document titled:
Install New Cover.

6-003679 (2012-02)

4 WIRE MICROSWITCHES - TYPE M DOOR OPERATOR

1. Using the cable supplied, wire the microswitches as shown below.
 - If the DSD microswitch is required, add the switch.
 - If the DSD microswitch is not required, tape up the number 12 and number 13 wire.
2. Route the connector of the cable under the cams.



2-003680 (2012-02)

5 CONVERSION OF PM/SSC, HPM/SSC TO CLOSED LOOP 105D BOARD

1. Turn OFF all power to the door operator.
2. Remove the covers(s) from the operator, or from the control and microswitch (if unit is an older style unit). Discard covers.
3. Remove and tag all wires at the main terminal strip.
4. If the control is the older style that has flex conduit connected directly to the control assembly, remove this from the control and reinstall in the end of the operator base.
 - The wires may need to be spliced to make them long enough to reach the new control board.
5. Disconnect the motor from the terminals A1 and A2 and the control board.
6. Remove the four motor bolts and remove the motor. Discard the belt.
7. Unplug the microswitch connector from the control board.
8. Push the connector of the microswitch cable through slot in the control. Lift the control and remove the microswitch cable.
9. Remove the control.
10. For older style controls with two small covers, install mounting hardware for the new cover.

NOTE! For more information on installing cover, refer to the section in this document titled:
Install New Cover.

6-003681 (2012-02)

6 INSTALL MOTOR AND CONTROL - TYPE M, PM/SSC, HPM/SSC DOOR OPERATORS

1. Set the control assembly in place on the operator, and route the microswitch cable through the slotted hole in the end of the control and up through the slot in the control base.
2. Install split bushings in the holes to guard the wires.
3. Plug microswitch cable into the 105D board.
4. Set the motor on the control and secure with four 3/8-24 x 1 in. screws (HHCS) supplied. Do not completely tighten the screws.
5. Install the motor belt, set belt to proper tension, and tighten the four screws that hold the motor and control to the base.
6. Replace drive belts with belts supplied with the kit.
 - The split link will have to be removed temporarily to replace the belts.
7. Install the encoder cable.
 - The end of the cable with the key in position number 2 connects to the motor encoder.
 - The other end of the cable connects to the encoder connector on the 105D board.

6-003682 (2012-02)

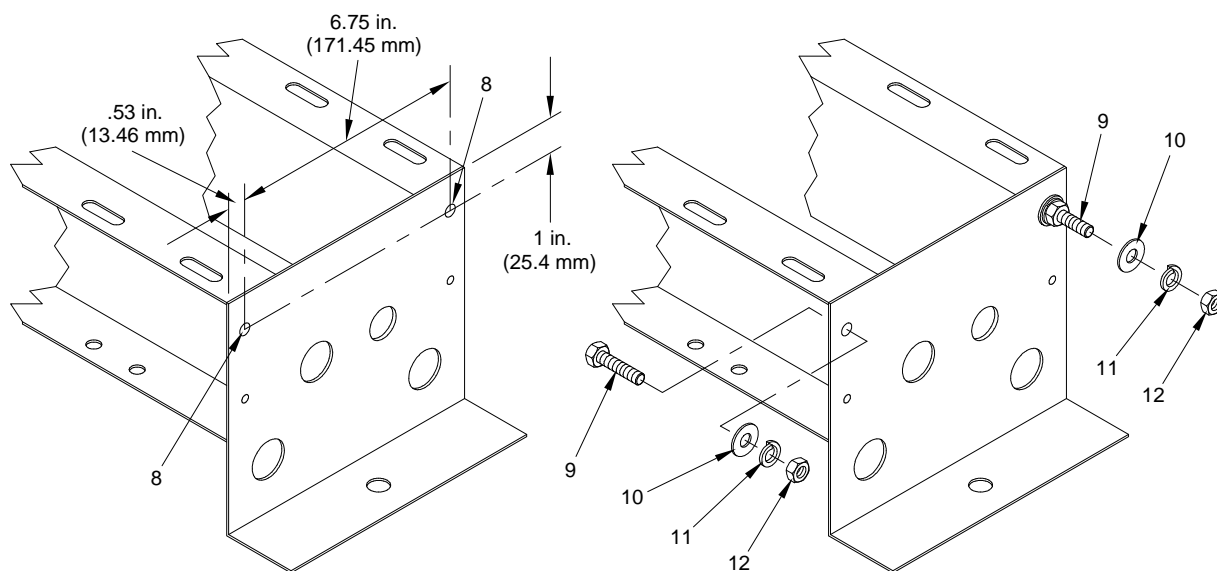
7 INSTALL BOTTOM COVER

1. To install bottom cover remove U-bolts holding the pivot shaft.
2. Slide the bottom cover in place and use the clips supplied to hold the cover in place.
3. Reinstall the pivot shaft to hold the bottom cover in place.

6-003683 (2012-02)

8 INSTALL NEW COVER (IF REQUIRED)

1. Drill two 21/64 inch [8.3 mm] diameter holds (8) in each end of the base assembly. (Two holes in each end of base assembly for a total of four holes.)
 - Centers of holes are located 1 inch [25.4 mm] down from top of end plate and .53 inch [13.5 mm] from side of end plate.
 - Center to center of holes is 6-3/4 inches [171.5 mm].
2. With the threaded end to the inside, install four 5/16-18 x 1-1/4 inch hex head cap screws (9) through the 21/64 inch [8.3 mm] diameter holes.
3. Secure screws with four 5/16 inch flat washers (10), four 5/16 inch lock washers (11), and 5/16 inch hex nuts (12).
4. Position new cover on 5/16-18 x 1-1/4 inch hex head cap screws (9) and secure cover with four 5/16 inch flat washers (10), four 5/16 inch lock washers (11) and 5/16 inch hex nuts (12).



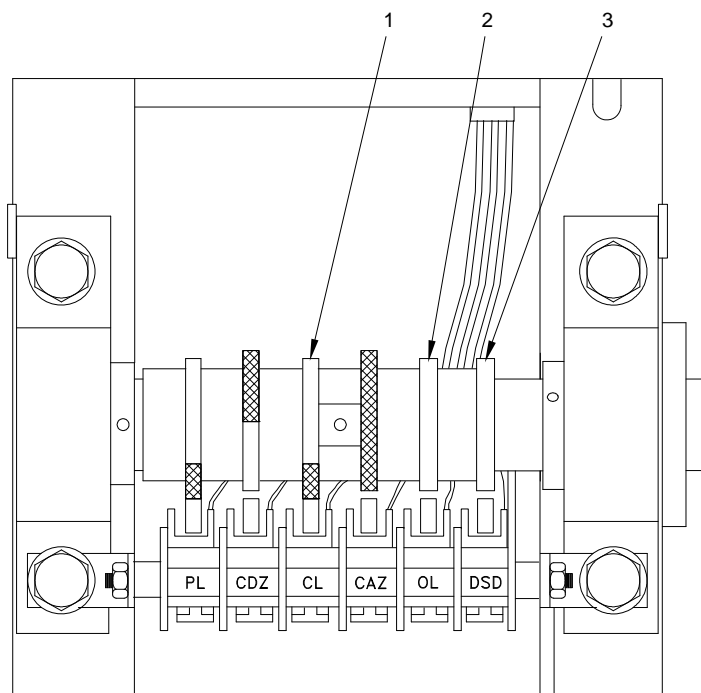
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9 VERIFY MICROSWITCH CAM SETTINGS

Closed loop door control requires only two switches on the door operator microswitch CAM. Verify the microswitch cams are set as follows

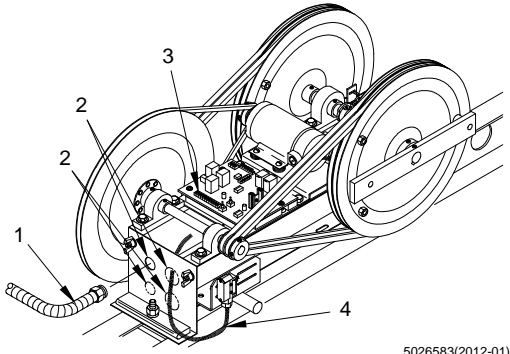
CL	CAM actuates CL (1) (Close Limit) microswitch when the doors are in the desired fully closed position.
OL	CAM actuates OL (2) (Open Limit) microswitch when the doors are in the desired fully open position.
OPTIONAL CAM DSD	CAM actuates DSD (3) microswitch when doors are approximately 4 to 6 inches from fully closed position when used with load balancing. CAM can also be set for other customer requirements.

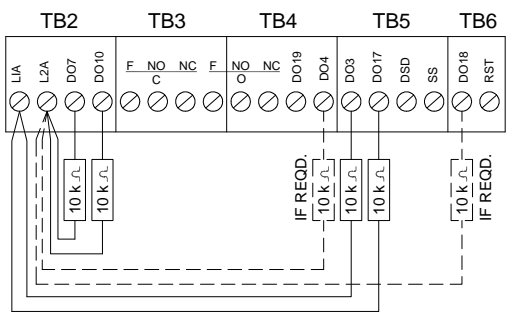


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10 WIRE CLOSED LOOP DOOR OPERATOR

Closed loop door control requires an input of 115 VAC. When this power is supplied from a transformer, transformer must have a rating of at least 500 VA.

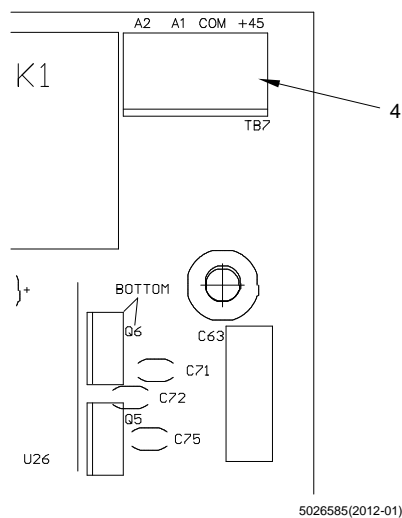
Step	Action	Note
1	Install and secure field wiring conduit (1) to appropriate knockout (2) in operator base.	 <p style="text-align: right;">5026583(2012-01)</p>
2	Pull wires from elevator controller and connect to input and output terminals of terminal blocks TB2-TB6 (3). NOTE! Because of the high input impedance of the 105D board false inputs and outputs may occur. This is more likely if the controller has solid state inputs and outputs. To alleviate this a 10,000 ohm resistor, at least 5 watts or greater, should be connected to the affected output or input as shown on the bottom left. As 120vac is present, the resistor leads should be insulated. Insulation stripped from 18ga wire works well.	
3	Route switch cable (4) through one of top two knockouts (2) in door operator.	



5026726(2012-02)

See input and output terminals on page 16.

Verify TB7(4) connections- Motor and DC supply

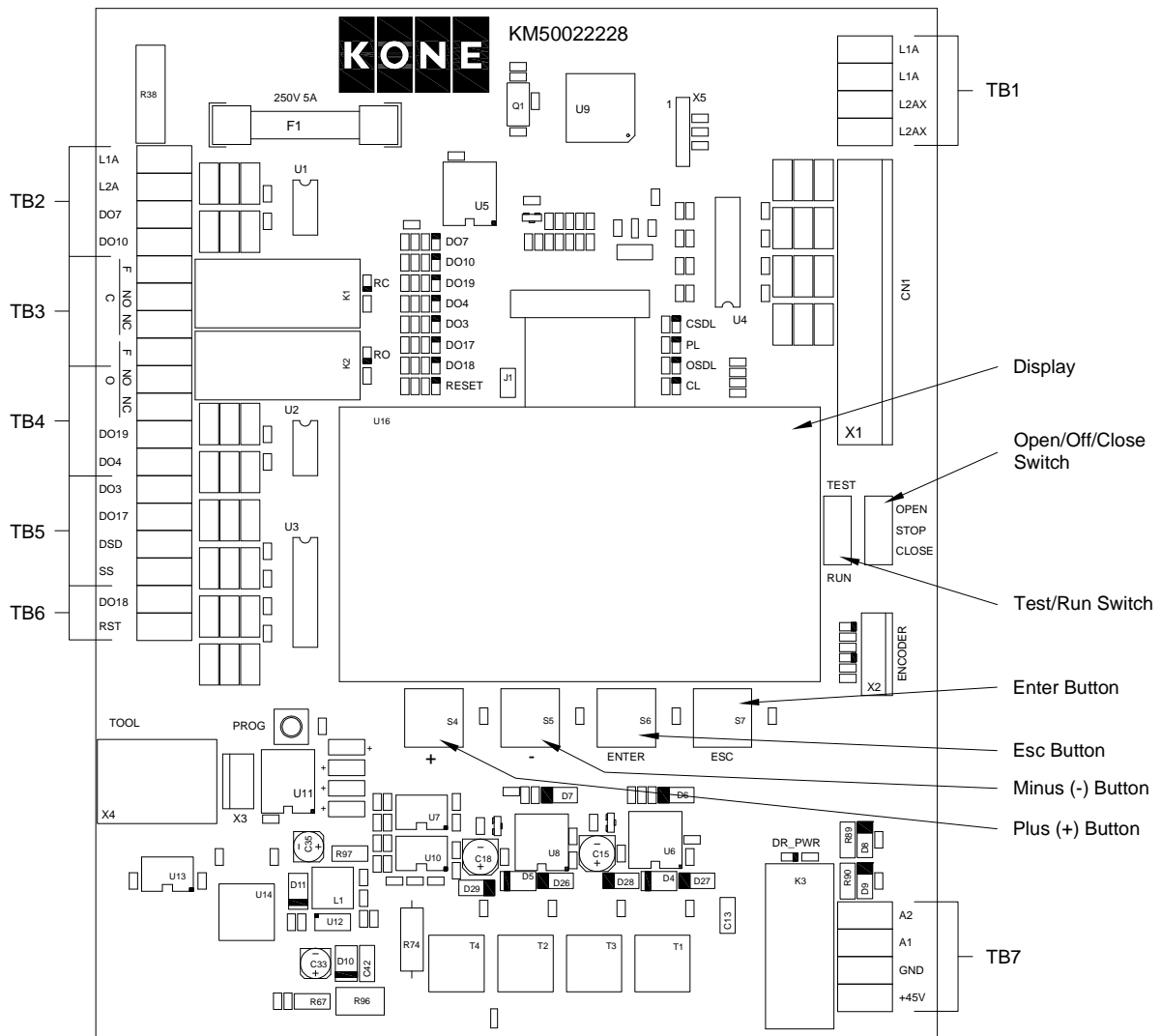


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A2	Motor connection	Black wire
A1	Motor connection	Red wire
COM	DC power supply connection	Black wire
+45	DC power supply connection	Red wire

6-003686 (2012-01)

11 105D DOOR CONTROL BOARD



5026593(2012-02)

Input and Output Terminals

The 105D control board requires an input of single phase 115 VAC. When this power is supplied by a transformer, the transformer must have a rating of at least 500 VA. Input and output terminal signals are shown below:

L1A to L2A	120 VAC @ 500 VA	If one of the input lines is grounded, it should be connected to L1A
D03 to L1A	Open limit signal	A relay across these terminals will be de-energized when the open limit micro switch is actuated. Relay will be energized at all other times.
D07 to L1A	Signal to close	When a relay contact across these terminals is made up, the doors will close.
D010 to L1A	Signal is open	When a relay contact across these terminals is made up, the doors will open
D017 to L1A	Close limit signal	A relay across these terminals will be de-energized when the close limit micro switch is actuated. Relay will be energized at all other times.
D03 to D010	Auxiliary to "O" relay	A relay across these terminals will be energized only when the doors are opening
D07 to D017	Auxiliary to "C" relay	A relay across these terminals will be energized only when the doors are closing
D04 to D07	Reduced speed closing signal	When the doors have a signal to close, and a relay contact across these terminals are made up, the door speed is controlled by N parameter
<u>F NC NO</u> C	Auxiliary C relay switching contact	Designates a form C contact on 1-C relay
<u>F NC NO</u> O	Auxiliary O relay switching contact	Designates a form C contact on 1-O relay
Option DSD to SS		Used on some projects for load balancing or other customer requirement

D018 TO L1A	Door locking signal	When a contact across these terminals is made up, the doors will lock
RST		Future use

6-003670 (2011-01)

12 BOARD FEATURES

- **Enter Button:** This button has three (3) uses.
 1. Pressing the enter Button moves the user into the highlighted menu field.
 2. When in the parameter adjustment field pressing the Enter Button while on the highlighted parameter to be adjusted will cause the highlight to be removed. Now adjustments (+ or -) can be made.
 3. When finished adjusting a parameter pressing the Enter Button will highlight that parameter again allowing the user to move to a different parameter using + or - or escape (ESC) back to the previous menu.
- **Plus (+) Button:** This button has two (2) uses.
 1. Pressing the + button when on a highlighted menu causes the highlight to move in the up direction on the menu.
 2. Pressing the + button when adjusting parameters will cause an increase in that parameter. For increasing the parameter values and moving the cursor in the up direction in the display menu.
- **ESC Button:** Pressing the ESC button returns the display to the previous menu.
- **TEST/RUN Toggle Switch:** This allows normal operation or manual mode for programming and adjusting.
- **OPEN/CLOSE Toggle Switch:** This allows open or close operation when in the test position.
- **COM PORT:** For initial programming of the board.
- Microprocessor with a flash program and data ram allows field programming if it is required.
- Nudging.
- Programmable CPU for adjustments.
- Built in fuse on the voltage for board protection (5 amp)
- LCD screen for field adjustments and display operating status.

6-003671 (2011-01)

13 PARAMETERS AND FUNCTIONS

Close Min Speed	Minimum allowable speed in the closing direction
Close Max Speed	Maximum allowable speed in the closing direction
Close Slow Down	Position where the door starts to slow down
Close Fault SP	Closing speed if there is an encoder failure
CL Torque Limit	Torque setting for the closing direction
CL Holding Force	Force exerted when D018 is enabled
Open Min Speed	Minimum allowable speed in the opening direction
Open Max Speed	Maximum allowable speed in the opening direction
Open Slow Down	Position where the door starts to slow down
Open Fault SP	Opening speed if there is an encoder failure
Open PL Speed	Speed in the PL Zone
Open PL POS	Initial opening position
Acceleration	How fast the operator moves once it is off in the open or close switch
Deceleration	How fast the operator slows down once it hits the slow down position
Nudging	Nudging speed

6-003672 (2012-01)

14 LCD DISPLAY MENU STRUCTURE

Edit Parameters

Displays the parameters that can be adjusted:

- Close Min Speed
- Close Max Speed
- Close Slow Down
- Close Fault SP
- CL Torque Limit
- CL Holding Force
- Open Min Speed
- Open Max Speed
- Open Slow Down POS
- Open Fault SP
- Open PL POS
- Acceleration
- Deceleration
- Nudging

Load Defaults

Loads default parameters

Diagnostics

Displays information about the output section of the board

Learning Cycle

Allows the operator to learn the limit switches

Remote Display

Flips the display to be viewed from the other side of the operator.

Board Fuses

Board Location	Fuse Type
F1	AGC5

Diagnostic Screen

The diagnostic screen displays the following information:

- VBUS = 45V input voltage
- DRIVE = % of total power being used and the Stall Timer
- TEMP = Temperature of the output FETs
- MOTOR = Current the motor is using
- SPEED; POSITION = Overall speed in that direction and the encoder position
- CYCLE = Total of fully cycles of the door operation since being programmed
- DOOR STALL TIMER = 17 seconds in either direction once the door is stalled.

Door Stall Timers

If movement of the door is stopped in either direction, for 17 seconds, the operator will quit running. The door stall timer can be reset in one of the following ways:

1. A change of direction command from the direction it stalled in from the main controller
2. Removal of the 45V
3. Placing the TEST/RUN switch into the TEST position and give the board a direction change with the OPEN/OFF/CLOSE switch, then return the OPEN/OFF/CLOSE switch to the OFF position and the TEST/RUN switch to the RUN position.

6-003673 (2012-01)

15 LEARN CYCLE

NOTE! *The Run-Test switch of the 105D board has MIDDLE or OFF position.*

1. Prior to applying power, place the doors approximately in the middle of their travel. The OPEN-STOP-CLOSE switch and the RUN-TEST switch should both be in the MIDDLE or OFF position.
2. Apply power. The display will indicate: "Please run Learn Cycle first." (If it does not, go to Learn Cycle on the Display and hit ENTER.) Hit ENTER to start.
NOTE! *The display may be rotated 180 degrees by scrolling down to "ROTATE DISPLAY" and hitting "ENTER."*
3. Hit ENTER.
4. The display will show "HIT ENTER TO START."
5. Check to make sure the doors are clear of all obstacles and personnel. Hit the ENTER button. The doors will open, close, open and close.
6. With the learn cycle completed, hit the ESC button.
7. Scroll down to "LOAD DEFAULTS" and hit the "ENTER" button. The default operating parameter will be loaded.
8. Place the RUN-TEST switch to the TEST position and use the "OPEN-STOP-CLOSE" switch to open and close the doors a few times to insure the doors are running the correct direction.

Default Settings

Close Min Speed	30
Close Max Speed	50
Close Slow Down	900
Close Fault Speed	20
Close Torque Limit	10
Close Holding Force	10
Open Min Speed	30
Open Max Speed	50
Open Slow Down	900
Open Fault Speed	20
Open PL Speed	20
Open PL POS	400
Acceleration	10
Deceleration	30
Nudge Speed	30

6-003674 (2011-01)

16 ADJUSTING 105D BOARD

Parameter Ranges

Close Min Speed	1-100
Close Max Speed	1-100
Close Slow Down	1-1500
Close Fault Speed	1-100
CL Torque Limit	1-100
CL Holding Force	1-20
Open Min Speed	1-100
Open Max Speed	1-100
Open Slow Down	1-1500
Open Fault Speed	1-100
Open PL Speed	1-100
Open PL POS	1-1500
Acceleration	1-100
Deceleration	1-100
Nudging	1-100
(+)	Button will scroll up
(-)	Button will scroll down
(+)	Button will raise the number
(-)	Button will lower the number

1. Place the RUN-TEST switch in the test position.
2. Use the OPEN-STOP-CLOSE switch to cycle the doors and check their motion.
3. To change any setting, scroll to EDIT PARAMETERS and push enter.
4. Scroll to the parameter you wish to change and push enter.
5. Use the (+) or (-) buttons to change the parameter and push ENTER to save the setting.
6. Use the OPEN-STOP-CLOSE switch to check your setting.

6-003675 (2012-02)

17 DOOR CLOSING FORCE ADJUSTMENT

1. Place the RUN-TEST switch in the TEST position. Using the OPEN-STOP-CLOSE switch move the doors to mid travel.
2. Scroll to the parameter CL TORQUE LIMIT.
3. Adjust it to "0."
4. Using the OPEN-STOP-CLOSE switch to cycle the doors, slowly increase the CL TORQUE LIMIT until you have the desired closing operation.
5. Stall the doors while closing and using an approved scale measure the closing force to insure it is below the 30 lbs. allowed by code.
6. Cycle the doors a few times to insure that it is in the desired operation.
7. Place the OPEN-STOP-CLOSE switch in the OFF position and the RUN-TEST switch in the RUN position.

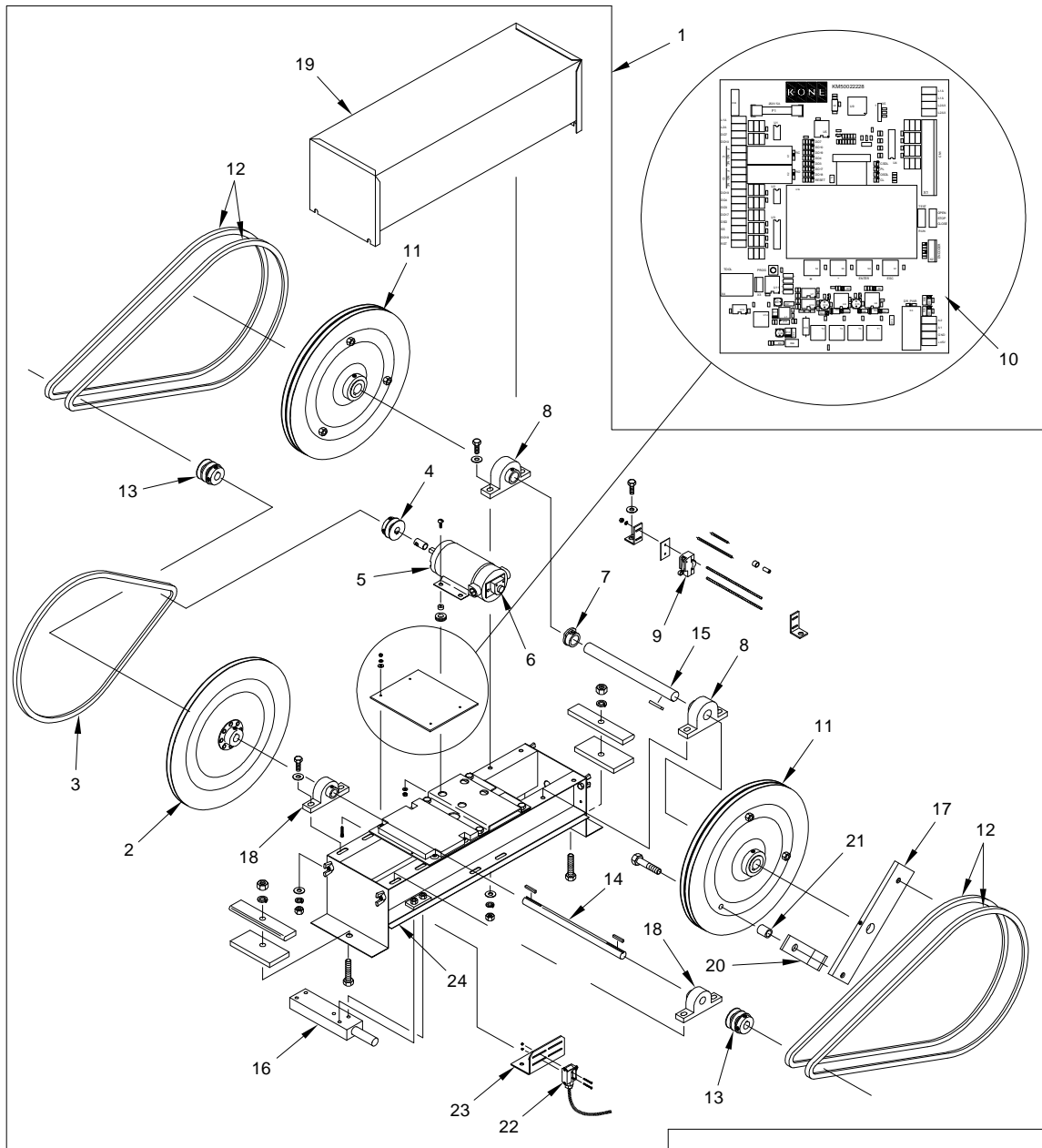
NOTE! If you have a nudging, proceed to step 8. If not, proceed to step 13.

8. Open the doors. Place the OPEN-STOP-CLOSE switch in the STOP position and the RUN-TEST switch in the test position. Simulate a nudging signal by placing a jumper between terminals L1A and D04. LED should illuminate.
9. Place the OPEN-STOP-CLOSE switch to the CLOSE position and adjust the NUDGE parameter to the desired speed.
10. Remove the jumper between L1A and D04.
11. Cycle the door a few times to insure satisfactory operation.
12. Place the RUN-TEST switch in the RUN position and the OPEN-STOP-CLOSE switch in the OFF position.
13. Replace cover.

6-003676 (2012-02)

18 REPLACEMENT PARTS

Closed Loop Door Operator



5026595(2012-03)

KEY	PART NO.	PART NAME	REMARK
1	USP31947001	Door operator, Closed loop	Complete assembly; RH
	USP31947002	Door operator, Closed loop	Complete assembly; LH
2	US19502029	Sheave, single	15-1/4 in. diameter
3	US19501021	Belt	4L 550 Frac hp V-type (A53)
4	US19502031	Sheave, single	1.7 in. pitch
5	USP22442001	Motor and encoder	Encoder shaft magnet
6	USP22444001	Encoder service kit	Includes encoder, centering tool, spacer tool, hardware and instructions
7	US25078	Cam, door operator	5 or 6 required
8	US38351	Pillow block	1 in. bore
9	US100165	Switch, micro	For PMSSC door operators
10	KM50022228	PC Board	Main board; Closed loop door control
11	US19502028	Sheave, double	15-1/4 in. diameter
12	US19501022	Belt	4L 680 Frac hp V-type (A66)
13	US19502030	Sheave, double	1.7 in.
14	US58819	Shaft	3/4 in. first reduction
15	US58820	Shaft	Door operator camshaft
16	USP24187	Shaft, pivot ass'y	
17	US25082***	Crank arm, door operator	Per listing information
18	US19500032	Pillow block	3/4 in. dia. bore
19	USP24186	Cover, door operator	
20	US95468001	Bracket, stop angle	
21	US95467001	Spacer, drive sheave	
22	USP35015001	Microswitch assembly	Door closure switch
23	US102022001	Fitting, mounting, closure switch	Door closure switch
24	US49744	Bottom Cover	
NS	US46208	Transformer	32V 250VA; 2 required for high performance option
NS	US46217020	Rectifier, bridge	25A, 200v
NS	US49732	Capacitor, electrolytic	41000 uF, 50 WV for high performance power supply
NS	USP31364	Switch and cam assembly	Use for adding a switch
NS	US91651002	Cable, motor encoder	Length = 24 inches.

NS = Not shown

6-003677 (2012-02)

19 APPROVALS AND VERSION HISTORY

Compiled by: KTD US / Technical Writer / Michele Clearman

Checked by: Technical Services - Americas / SEB PCM Engineer / John Princell

Approved by: Technical Services - Americas / Director SEB PCM and Product Reliability / John Brill

Issue	Date	Description	REF CR	Approved by
(-)	2012-03-05	Recreation of PFM8-630		John Brill