Complete Installation Manual for the ECI 109-5 LCD Closed Loop Door Operator Board

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Revision Sheet

Revision Number	Date	Revision Description
1.0	12/15/2010	New Manual.
2.0	12/31/10	Added Troubleshooting Guide.
3.0	2/19/2013	Added open PL speed and open PL position.
4.0	8/29/2013	Logo change.

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Warning and Disclaimer

Thank you for purchasing equipment from ECI America, Inc. We want your new equipment to operate safely. Anyone who installs or uses this equipment should read this publication (and any other relevant publications) before installing or operating the equipment.

To minimize the risk of potential safety problems, you should follow all applicable local and national codes that regulate the installation and operation of your equipment. These codes vary from area to area and usually change with time. It is your responsibility to determine which codes should be followed, and to verify that the equipment, installation, and operation is in compliance with the latest revision of these codes.

At a minimum, you should follow all applicable sections of the National Fire Code, National Electrical Code, ASME A17.1 Safety Code for Elevators and Escalators and the codes of the National Electrical Manufacturer's Association (NEMA). There may be local regulatory or government offices that can also help determine which codes and standards are necessary for safe installation and operation. Equipment damage or serious injury to personnel can result from the failure to follow all applicable codes and standards. We do not guarantee the products described in this publication are suitable for your particular application, nor do we assume any responsibility for your product design, installation, or operation.

Our products are not fault-tolerant and are not designed, manufactured or intended for use or resale as online control equipment in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines, or weapons systems, in which the failure of the product could lead directly to death, personal injury, or severe physical or environmental damage ("High Risk Activities"). ECI America, Inc. specifically disclaims any expressed or implied warranty of fitness for High Risk Activities.

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Conventions Used

When you see the “notepad” icon in the left-hand margin, the paragraph to its immediate right will be a **special note**. Notes represent information that may make your work quicker or more efficient. The word **NOTE**: in boldface will mark the beginning of the text.

When you see the “exclamation point” icon in the left-hand margin, the paragraph to its immediate right will be a **warning**. This information could prevent injury, loss of property, or even death in extreme cases. Any warning in this manual should be regarded as critical information that should be read in its entirety. The word **WARNING:** in boldface will mark the beginning of the text.

Safety Information

Knowing the saftey hazards related to any procedure you are about to perform, know what equipment has been specifed for each specific contact, and know what tools and materials you should plan to have available beforehand. Before connecting electrial 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 the hoistway.
❖Wear safety glasses or goggles when using power tools.
❖Always wear protective gloves when installing or removing access covers, conduits, wire way 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 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 the elevator wiring can affect their satety.
❖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 electical 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.

Introduction

This manual is intended to help facilitate the installation of ECI 109-5 LCD closed loop door operator board made by Electronic Controls, Inc. The audience of the material included in this manual is for the certified installation personnel. The ECI 109-5 LCD control boards complies with modern performance specifications and meets or exceeds code requirements. Installation and adjustments must meet local, state and national codes.

System Overview

The **ECI 109-5 LCD** door controller is a microprocessor-based elevator door control board that controls all aspects of the door motion including direction, velocity, acceleration, decceleration and force.

The **109-5 LCD** replaces the Montgomery 105 door board fit, form and functions and will replace the old MAC, 3 board system.

The motor controller (MC) is a unique design for simple installation and reliable performance. The motor controller (MC) provides for total control and adjustment through the entire door cycle and includes nudging. The doors are held under power while standing closed, during running and while standing open.

Point of Contact

Information
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Installing the ECI 109-5 LCD board

For Old Mac and 104 Conversions

1. Turn OFF all power to the door operator.
2. Remove the cover(s) from the operator.
3. Remove and tag all wires at terminal strips TB1, TB2 and TB3. (See figure 1.)

WARNING: TB3 must have the wires connected
A1 - Motor red wire
A2 - Motor black wire
COM - Power supply common black wire
+45V - Power supply red wire. (See figure 1.)

4. Unplug the cam switch cable from CN1. (See figure 1.)
5. Unbolt and remove old board(s).
6. Mount the Encoder on the shaft with the 1.7 inch double Sheave. (See photo 1.)
7. The encoder can be mounted in either direction.

After all hardware is back in place and adjusted

8. Bolt the ECI 109-5 board in place.
9. Install all the tagged wires into the correct locations on TB1, TB2 and TB3. (See figure 1.)
10. Connect the cam switch cable to CN1. (See figure 1.)

NOTE: The CN1 connector is a 13 pin male connector and some operators only h ave an 11 pin female connector. In this case connect the 11 pin female starting with the pin 1 which is the pin closest to the TEST/RUN switch S4. (See figure 1.)

11. Connect the encoder cable to connector X2. (See figure 1.)

NOTE: Do not apply power at this time.

12. Now go to completing a learn cycle.

Electric Wiring of the Control Board

NOTE: Refer any and all code installation questions to Elevator and Escalator Electrical Equipment Standard CAN/CSA-B44.1/ ASME 17.5

NOTE: Before applying power verify that the RUN/TEST switch is in the TEST position, the OPEN/OFF/CLOSE is in the OFF, center position and the doors are half way open.

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
Open Min Speed
Open Max Speed
Open Slow Down
Open Fault SP
Acceleration
Deceleration
Nudging
Open PL Speed
Open PL Position

Load Defaults
Loads default parameters.

Diagnostics
Displays information about the output section of the board.

Learning Cycle
Allows the operator to learn the limit swiches.

Technical Support
Displays company information.

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

Board Provides the Following 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 parmenter 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 hightlighted menu item causes the hightlight to move in the up direction in the menu.

2: Pressing the + button when adjusting parameters will cause an increase in thaat parameter. For increasing the parameter values and moving the curser in the up direction in the display menu.

Minus (-) Button: This button has two (2) uses.

1: Pressing the - button when on a hightlighted menu item causes the hightlight to move in the down direction in the menu.

2: Pressing the - button when adjusting parameters will cause an decrease in that parameter.

ESC Button: Pressing the ESC button returns the dispaly 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 for open or close operation when in the manual position.

Com Port: For initial programming of the board.

Microprocessor with a flash program and data ram allows field reprogramming if it is required.

Nudging.

Programmable CPU for adjustments.

Built in fuse on the voltage side for board protection. (5 amp)

LCD screen for field adjustments and display operating status.

Parameters and there Functions

Close Min Speed:	Minimum allowable speed in the closing direction.
Close Max Speed:	Maxiumum allowable speed in the closing direction.
Close Slow Down:	It is the position where the door starts to slow down.
Close Fault SP :	Closing speed if there is an encorder failure.
CL Torque Limit:	Torque setting for the closing direction.
Open Min Speed:	Minimum allowable speed in the opening direction.
Open Max Speed:	Maxiumum allowable speed in the opening directions.
Open Slow Down:	It is the position where the door starts to slow down.
Open Fault SP:	Opening speed if there is an encorder failure.
Acceleration:	How fast the operator moves once it is off either the open or close switch.
Deceleration:	How fast it operator slows down once it hit the slow down position.
Nudging:	The nudging speed.
Open PL Speed	Speed in the PL zone.
Open PL Position	Initial opening position though the lone area.

NOTE: Before applying power verify that the RUN/TEST switch is in the TEST position, the OPEN/OFF/CLOSE is in the OFF, center position and the doors are half way open.

Learning Cycle

1. Move **TEST/RUN** switch to the middle position.
2. Place the doors in the middle of the door opening.

NOTE: During the learn cycle if the operator hits open switch and it is the close the operator board will self correct for the proper direction.

3. Hit the **ENTER** button. (Operator should move open, close, open and then close)
4. If the learn cycle was completed correctly hit the **ESC** button.
5. Scoll to the **LOAD** defaults section of the menu.
6. Hit the **ENTER** button.
7 Go to **TEST** and do an open and a close to verify the direction is correct and look at the movement.

103109-5 LCD Control Board Adjusting Procedures

Manually Move the Doors

NOTE: Use the (+) button to raise the number and (-) button to lower the number. (+) Button scrolls up and (-) Button scrolls down.

NOTE: At any time during these adjustments and the TEST/RUN switch in the TEST position you can manually open and close the door with the OPEN/OFF/CLOSE switch to observe your changes.

1. Place the **OPEN/OFF/CLOSE** toggle switch in the **OFF** position.
2. Scroll down to edit parameters and hit **ENTER**.
3. Scroll down to the setting that you want to change, and hit the **ENTER** button.
4. Adjust the number to the desired setting, hit **ENTER** to save the new setting.
5. Once you have adjusted the parameters that you want to hit the **ESC** button.
6. Then check that your changes were proper by using the manual move the door section and verify your adjustments. If they are not ok then go back to section B (manually move the doors).
7. Once the parameters are set to give proper door operation place the **OPEN/OFF/CLOSE** switch to the **OFF** position.
8. Place the **TEST/RUN** toggle switch to run.
9. Observe door operation for serveral complete cycles.

Parameter Ranges

NOTE: Increasing the value of a parameter will cause an increase in that parameter. Example; Increasing Close Max Speed from 30 to 40 will cause the Close Max Speed to be faster.

NOTE: Decreasing the value of a parameter will cause an decrease in that parameter. Example; Increasing Deceleration from 35 to 25 will cause the Decel eration rate to be slower.

Close Min Speed	1-100	Open Min Speed	1-100
Close Max Speed	1-100	Open Max Speed	1-125
Close Slow Down	1-1500	Open Slow Down	1-1500
Close Fault SP	1-100	Open Fault SP	1-100
CL Torque Limit	1-100		
Acceleration	1-100		
Deceleration	1-100		
Nudging	1-100		
Open PL Speed	1-100		
Open PL Position	1-500		

Adjusting Operating Parameters (Editing Parameters)

NOTE: Use the (+) button to raise the number and (-) button to lower the number. (+) Button scrolls up and (-) Button scrolls down.

NOTE: At any time during these adjustments and the TEST/RUN switch in the TEST position you can manually open and close the door with the OPEN/OFF/CLOSE switch to observe your changes. You must ESC out of the Edit Parameters before thay are saved if a power shut down happens

1. Place the **OPEN/OFF/CLOSE** toggle switch in the **OFF** position.
2. Scroll down to edit parameters and hit **ENTER**.
3. Scroll down to the setting that you want to change, and hit the **ENTER** button.
4. Adjust the number to the desired setting, hit **ENTER** to save the new setting.
5. Once you have adjusted the parameters that you want to hit the **ESC** button.
6. Then check that your changes were proper by using the manual move the door section and verify your adjustments. If they are not ok then go back to section **B** (manually move the doors).
7. Once the parameters are set to give proper door operation place the **OPEN/OFF/CLOSE** switch to the **OFF** position.
8. Place the **TEST/RUN** toggle switch to run.
9. Observe door operation for serveral complete cycles.

Door Closing Force Adjustment

1. Now that the doors are running at the desired speed and the **RUN-TEST** switch is still in the **TEST** position, stop the doors at the mid-point in the closing direction by toggling the **OPEN-STOP-CLOSE** to the **STOP** position (center).
2. Adjust the **CCL** parameter to **0**.
3. Toggle the **OPEN-STOP-CLOSE** to the **CLOSE** position and increase the **CCL** paramerter until you have achieved desired door close operation. This should put your door closing force below the **thirty pound maximum allowed by code**.
4. To insure you are below thirty pounds, use an approved pressure gauge per manufacturer's specifica tions and directions to verify door closing force is to code. (If closing force is over the thirty pound maximum allowed by code adjust the **CCL** paramerter until the closing force is within code.)
5. Open and close the doors with the **OPEN-STOP-CLOSE** switch several times.
6. Recheck the door closing force again, to insure it is still to code, by physically stalling the doors in the dosing direction with your approved pressure gauge.

Nudging Adjustment

1. With the doors open, the **OPEN-STOP-CLOSE** switch in the **STOP** position and the **RUN-TEST** switch in the **TEST** position simulate a nudge signal by placing a jumper between **L1A** and **D04**. The **D04 LED** should light up.
2. Toggle the **RUN-TEST** switch to the **RUN position.**
3. Adjust the **N** parameter to the desired speed.
4. Toggle the **RUN-TEST** switch to the **TEST** position.
5. Remove the jumper between **LA1** and **D04**.
6. Verify the jumper between **LA1** and **D04** is removed.
7. Toggle the **RUN-TEST** switch to the **RUN** position.
8. Replace door operator cover.

Adjustments Notes

1. This equipment must be installed, adjusted and maintained to confirm to code requirements.
2. Parameters must be set to conform to kinetic energy code limitations for both maximum and average kinetic energy for ALL doors/all floors (specialty or otherwise heavy doors taken into account).
3. Parameters must be set to conform to closing force limitations. The closing force may not exceed 135 N (30 lbs). During the closing, the kinetic energy may not exceed 10 joules (7.4 lbs. Ft.).

NOTE: Refer any and all code installation questions to Elevator and Escalator Electrical Equipment Standard CAN/CSA-B44.1/ ASME 17.5.

Board Fuses

Board Location	Fuse Type
F1	AGC5

Diagnostics Screen

The Diagnostics 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 full cycles of the door operation since being programed.
DOOR STALL TIMER= 17 seconds in either direction once the door is stalled.

NOTE: A complete cycle starts at the Full Close, Full Open then back to Full Close.

Door Stall Timer

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** to the **OFF** position and the **TEST/RUN** to the **RUN** position.

Input & Output Terminals

The PM/SSC door operator control 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 120VAC @ 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 limiit 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 to 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.

F NC NO
C 1-C relay. Auxiliary C relay switching contact. Designates a form "C" contact on

F NC NO
O relay. Auxiliary O relay switching contact. Designates a form C contact on 1-0

OPTION

DSD to SS Used on some projects for load balancing or other customer requirement.

For Old MAC and 104 Conversions

1. Turn OFF all power to the door operator.
2. Remove the cover(s) from the operator.
3. Remove and tag all wires at terminal strips TB1, TB2 and TB3. (See Figure 1)

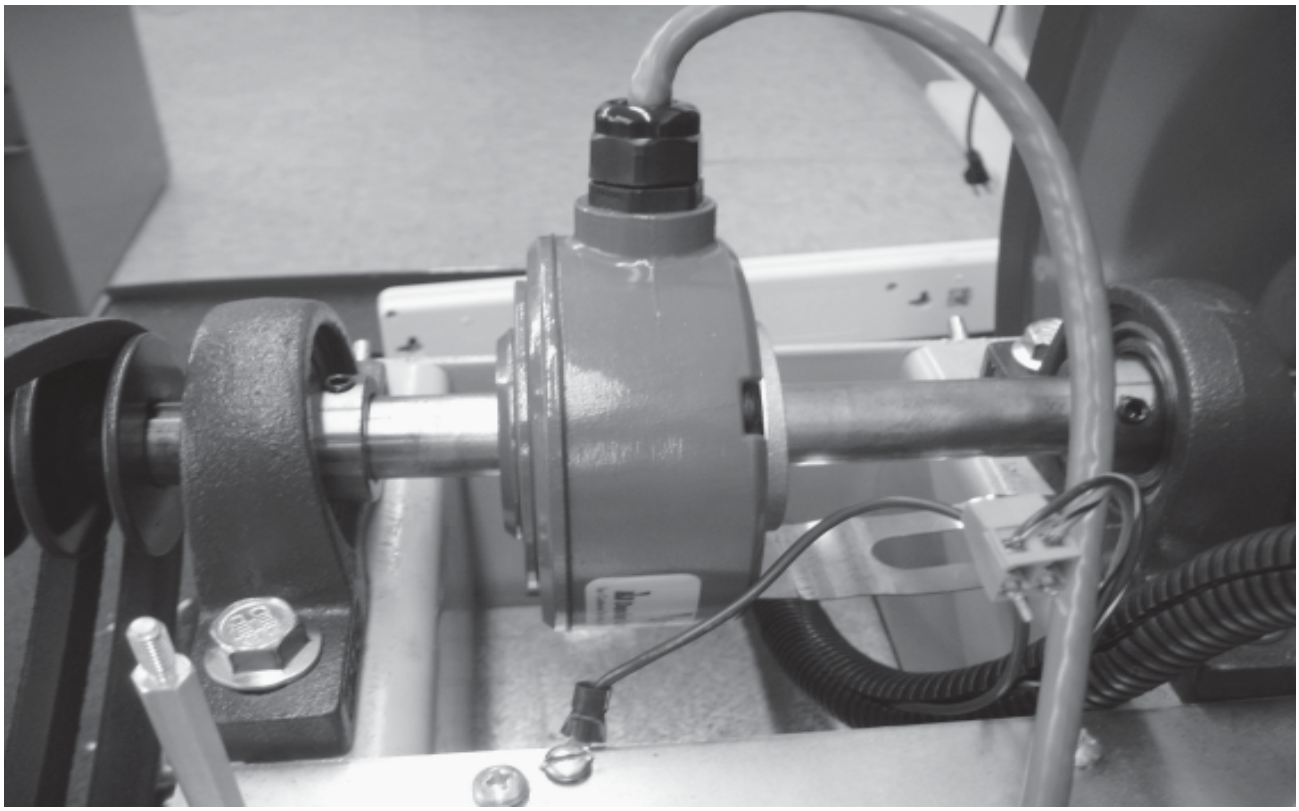
WARNING: TB3 must have the wires connected
A1 - Motor red wire
A2 - Motor black wire
COM - Power supply common black wire
+45V - Power supply red wire. (See figure 1.)

4. Unplug the cam switch cable from CN1. (See figure 1.)
5. Unbolt and remove old board(s).

After all hardware is back in place and adjusted:

6. Bolt the ECI 109-5 LCD board in place.
7. Install all the tagged wires into the correct locations on TB1, TB2 and TB3. (See figure 1.)
8. Connect the cam switch cable to CN1. (See figure 1.)

NOTE: The CN1 connector is a 13 pin male connector and some operators only have an 11 pin female connector. In this case connect the 11 pin female starting with the pin 1 which is the pin closest to the TEST/RUN switch S4. (See Figure 1)



Modernize (Convert) any Mac Operator into Close Loop Operation (for less) w/ Board 109-5Kit. A Modernization's team dream product; adding additional profit to the bottom- line!

In addition to being a smarter board Big Savings are realized in reduced installation cost: One Man can easily install the conversion kit as neither motor nor operator needs to be replaced. Additionally, in group situations once the first operator has been set-up the parameters can be up loaded to the tool and then down loaded into the additional operators. (The up loaded data can be stored in the job's profile information back at the office for additional back up capabilities.)

Not only do you save hundreds of dollars in labor cost, it's competitively priced. The Savings continue with reduced shipping cost; the entire kit weights only 4lbs. Our Specialized encoder installs on the idler shaft eliminating any belt slippage that can occur in our competitors unit. Additionally, our board was designed to utilize the existing motor encoder if the operator was already set-up for closed loop operation such as with the Kone/MAC-105. The boards, tools or kits come with comprehensive installation manuals and free technical help.

Order by part number:

- P/N 109-4 is drop in replacement for the 104 board as well as all earlier MAC 3 board group revisions for open loop performance.. An additional wiring harness may be necessary in certain appli cations when replacing earlier vintage 3 board group door operator board assembly's ; please order by p/n 109-4/3H
- P/N 109-5 is drop in replacement for Kone/ MAC105 closed loop operators
- P/N 109-5KIT converts any MAC Operator into closed loop operation kit includes 109-5Board & Encoder.
- P/N SDT-1109 is the Hand Held Service Tool for Board 109-5
- P/n ECI-109-5ENC Shaft Encoder
- ECI stocks all motors, encoders and accessories for MAC operators

Microswitch Wiring

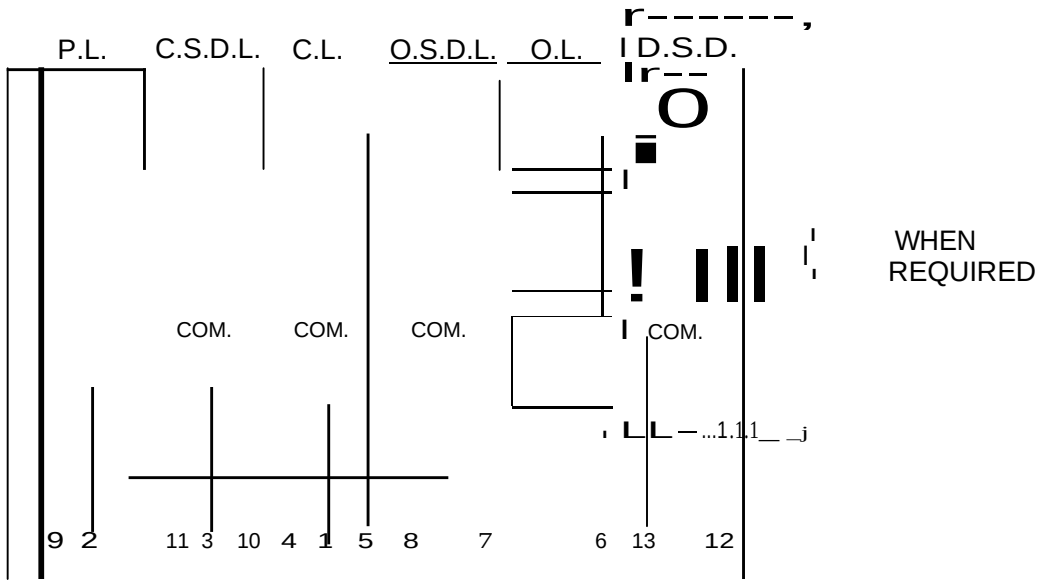


DIAGRAM 1

DIP SWITCH
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

REV:	DESCRIPTION	DATE
A	RELEASE FOR PRODUCTION	18/31/10

Electronic Controls, Inc.

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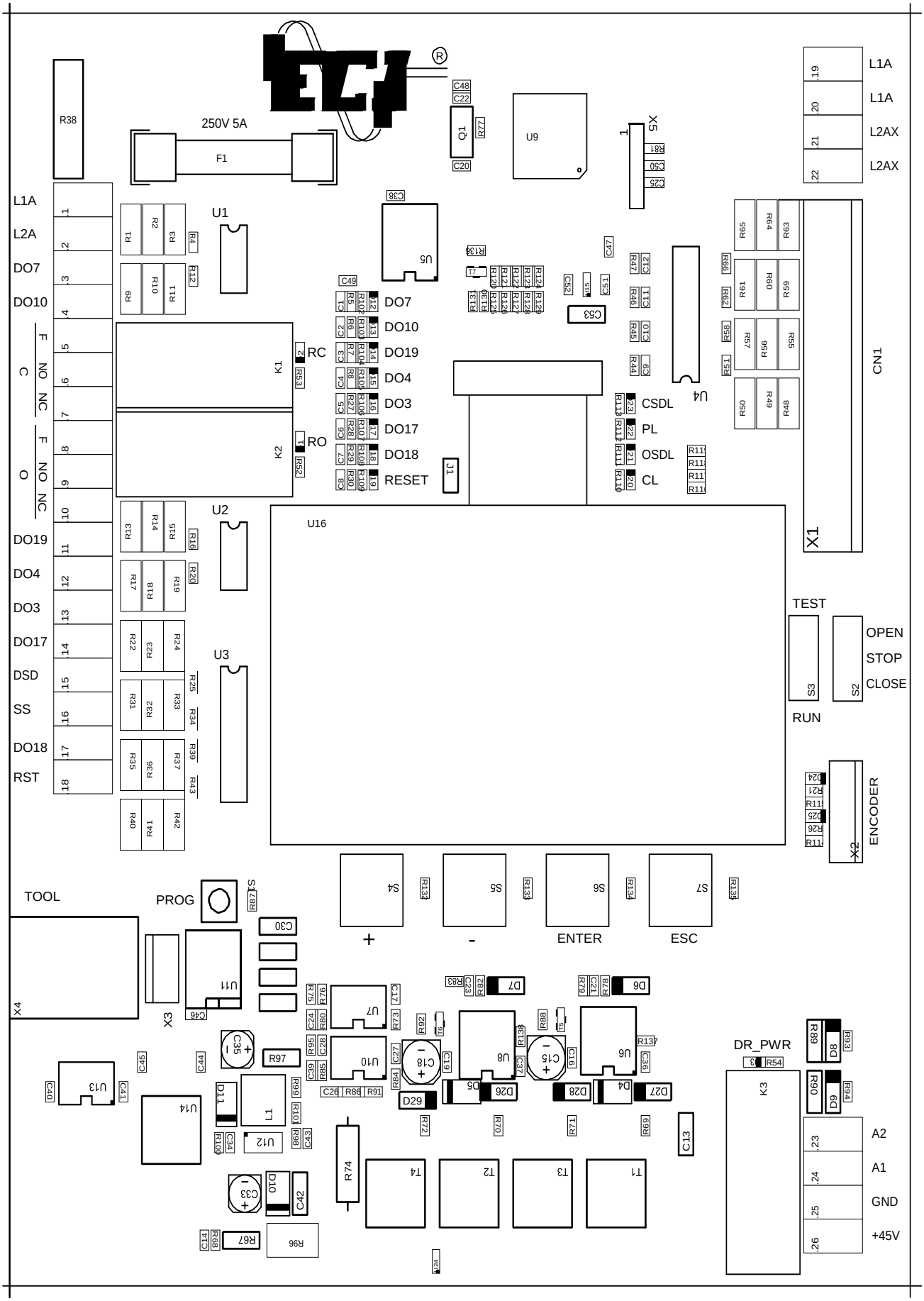
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L2A
DO7
DO10
DO19
DO4
DO3
DO17
DSD
SS
DO18
RST
C
NC
NO
F
O
RC
RO
DO7
DO10
DO19
DO4
DO3
DO17
DO18
RESET
CSDL
PL
OSDL
CL
L1A
L1A
L2AX
L2AX
CN1
X1
X5
250V 5A
F1
U1
U2
U3
U4
U5
U9
U16
K1
K2
TEST
OPEN
STOP
CLOSE
RUN
S2
S3
ENCODER
X2
TOOL
PROG
X4
X3
ENTER
ESC
DR_PWR
K3
A2
A1
GND
+45V

Troubleshooting Guide

Closing Speed too Slow:

Check for binds in the door system.
Increase the Closing Max Speed.
Increase the Closing Torque Limit.
Increase the Acceleration Speed.

Opening Speed too Slow:

Check for binds in the door system.
Increase the Opening Max Speed.
Increase the Opening Torque Limit.
Increase the Acceleration Speed.

Door not fully Closed:

Check for binds in the door system.
Decrease the Close Slow Down.
Move the limit switch.

Door not fully Open:

Check for binds in the door system.
Decrease the Open Slow Down.
Move the limit switch.

Doors are Slamming Open:

Decrease the Opening Max Speed.
Increase the Open Slow Down.
Move the Limit Switch.

Doors are Slamming Close:

Decrease the Closing Max Speed.
Increase the Close Slow Down.
Move the Limit Switch.

Door Operator not working in Automatic Mode:

Toggle switch is either in the test or middle position.

Door Operator not working in Test Mode:

Toggle switch is either in the run or middle position.

No power on the board:

Check the incoming voltage.
Check the fuse on the board.

Nudging Speed to Slow:

Increase the Nudging Speed.

Nudging Seep to Fast:

Decrease the Nudging Speed.

Door Closing Force is to High:

Decrease the CL Torque Limit.

Warranty Policy

Electronic Controls, Inc warrants this product to be free from manufacturing and workmanship defects under normal use for a period of twelve months (12) from the date on which the product was shipped. In the event this product or any other component part is found to be defective within the warranty period, the purchaser must notify Electronic Controls, Inc within the warranty period and the product or component must be returned to Electronic Controls, Inc within thirty (30) days after notice of the warranty claim.

Electronic Controls, Inc entire liability under this warranty and the purchaser's exclusive remedy shall in sole discretion of Electronic Controls, Inc be either of the following:

Replacement of the defective product or defective component part. (Or) Repair the defective product or the component part.

This limited warranty does not extend to any labor or other expense incurred by the purchaser and only covers the repair or replacement of the product or component part supplied by Electronic Controls. Any misuse or unauthorized service of the product or any of the component parts shall render this warranty null and void.

In no event will Electronic Controls, Inc be liable for any damages, including but not limited to, any lost profits, lost savings or other incidental or consequential damages arising out of the use or inability to use the product. Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to all purchasers.

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