



**4M2 SERIES
CONTROLLER
OPERATIONS MANUAL**
Revised 11-6-15
(2 thru 4 Stop Residential Elevators)



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***** WARNING *****

The information in this manual is intended for the sole use of professional elevator technicians.

Electro Mech Industries Inc. assumes no responsibility for injury, illness, damage to property, or death as a result of the use or misuse of any information contained in this manual.

Installation, maintenance, or repair of the elevator, must be performed by qualified, experienced, and trained elevator technicians. Technicians must have five years of hands-on experience with elevator equipment.

The procedures in this manual are to be used as a general guide for the elevator technician. Working in the elevator hoistway and on elevator equipment can be dangerous. All Safety Rules associated with installing elevator equipment must be followed at all times. Proper protective equipment must be used at all times during installation, maintenance and repair of the elevator equipment.

Read this manual carefully. Be thoroughly familiar with all parts and procedures before attempting any installation, maintenance or repair functions on this equipment. Failure to do so may cause damage to equipment, improper installation, unsafe operation, possible injury or death.

***** WARNING *****

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1-1) SUPPORT:

If you do experience a problem, or are not sure of the correct operation, please call the factory for assistance. In most instances we can help resolve the situation quickly without extensive loss of time on the job site.

When assisting on a unit, it is more efficient to talk directly to the installation technician. This not only reduces the chance of miscommunication, it also reduces the time required for the technician to get the information he needs. When calling, always have the unit's serial number and a P-Tool available.

We are available to accept your calls from 8:00 am to 5:00 pm, Central Time, Monday through Friday.

Electro-Mech Industries Inc.
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1-2) GENERAL INFORMATION:

The 4M2 control board contains the following features:

- Same control board is used for all 3 models of Elevators
- UL recognized for Residential Elevators
- Supports 2 through 4 stop units
- Supports Porta Power Gate operators (maximum of 2)
- Supports Swing Door operators (maximum of 4)
- Allows use of GAL or Electric Locks (24 vdc)
- Supports Retiring Cam function (Additional relay req'd)
- Automatic or Constant Pressure Controls
- Allows for "Short Floors" (12 inch minimum for Automatic operation and 24 inch minimum for Constant Pressure operation)
- Red LED's on inputs
- Yellow LED's on outputs
- 110 vac coils on Contactors and Valves
- 20 event Fault Log feature
- Log viewable with Programming Tool
- Parameters can be field modified
- Fault Flash code to help identify the type of problem
- Trip and Re-level counters
- Sabbath Control feature
- During a power failure or Overload activation, the car, if not at a floor, will automatically lower to the next level down.
- Control can be set to a Temporary Run mode for use during installation

1-3) SPECIAL OPERATIONS:

1. **Board Re-set:** Any time that the controller is powered up, or the star key on the P-Tool is pressed, the system will automatically go into a Re-set sequence. During this sequence, **if all of the required safety circuits are made** (normal run requirements), the Unit will respond as follows:
 - A. If not at a floor, unit will automatically lower itself to the first floor encountered.
 - B. If at floor level, unit will re-set and then return to normal operation.
 - C. If in a floor Zone but not level, unit will move to that floor level.

➤ **Warning:** If you jump out key safety circuits and then the power is turned on, or the re-set key is pressed, the unit may move when not expected. This can create a hazardous situation that could cause injury or even death. **Do not jump out safety circuits.** Provisions have been made to run unit on Temporary Mode, which will be explained in this manual.
2. **Emergency Lowering during Power Failure:** Once the controller senses a loss of power, the emergency light output “EL” will activate and the buzzer output “BZ” will pulse for 1sec every 15 sec. The elevator will respond as follows:
 - A. Power loss during an UP run, the destination call will be dropped and the unit will automatically lower itself to the next lowest floor. If that floor is not the lowest landing, car can be moved to a lower landing by pressing the selected floor button.
 - B. Power loss during a DOWN run, the destination call will be dropped and the unit will automatically lower itself to the next lowest floor. If that floor is not the lowest landing, car can be moved to a lower landing by pressing the selected floor button.
 - C. Power loss while at a floor, unit will stay at the floor level. If a call is placed to a lower floor, and all normally required safety circuits are in the correct state, the unit will lower to the requested floor.

➤ **Note:** The “EL” and “BZ” output will disable themselves 30 sec after the lower terminal floor had been reached.
3. **Run Timer:** If the Run Timer times out unit will respond as follows:
 - A. Hydraulic unit running up, unit will respond the same as in Emergency Lowering.
 - B. Hydraulic unit running down, unit will stop and shut down. If unit is level at a floor and power gates are being used, the gate will open.
 - C. Drum units running up or down, unit will stop and shut down. If unit is level at a floor and power gates are being used, the gate will open.

➤ **Note:** In order to reset a drum unit after a Run Timer trip, you must manually move the car to a floor level before a reset can be performed. Floor level is selector inputs DZ & PX on and UL & DL signals off.

1-3) SPECIAL OPERATIONS: (continued)

4. **Power Gate:**

- A. If the open command is given (OPR or OPF) and the gate does not open within 2 seconds, the open command will turn off for ten seconds and then retry the open command. After 3 attempts without the gate opening, the unit will wait for another open request.
- B. Sequence is the same for closing; a failure will allow 3 attempts before call is cancelled.

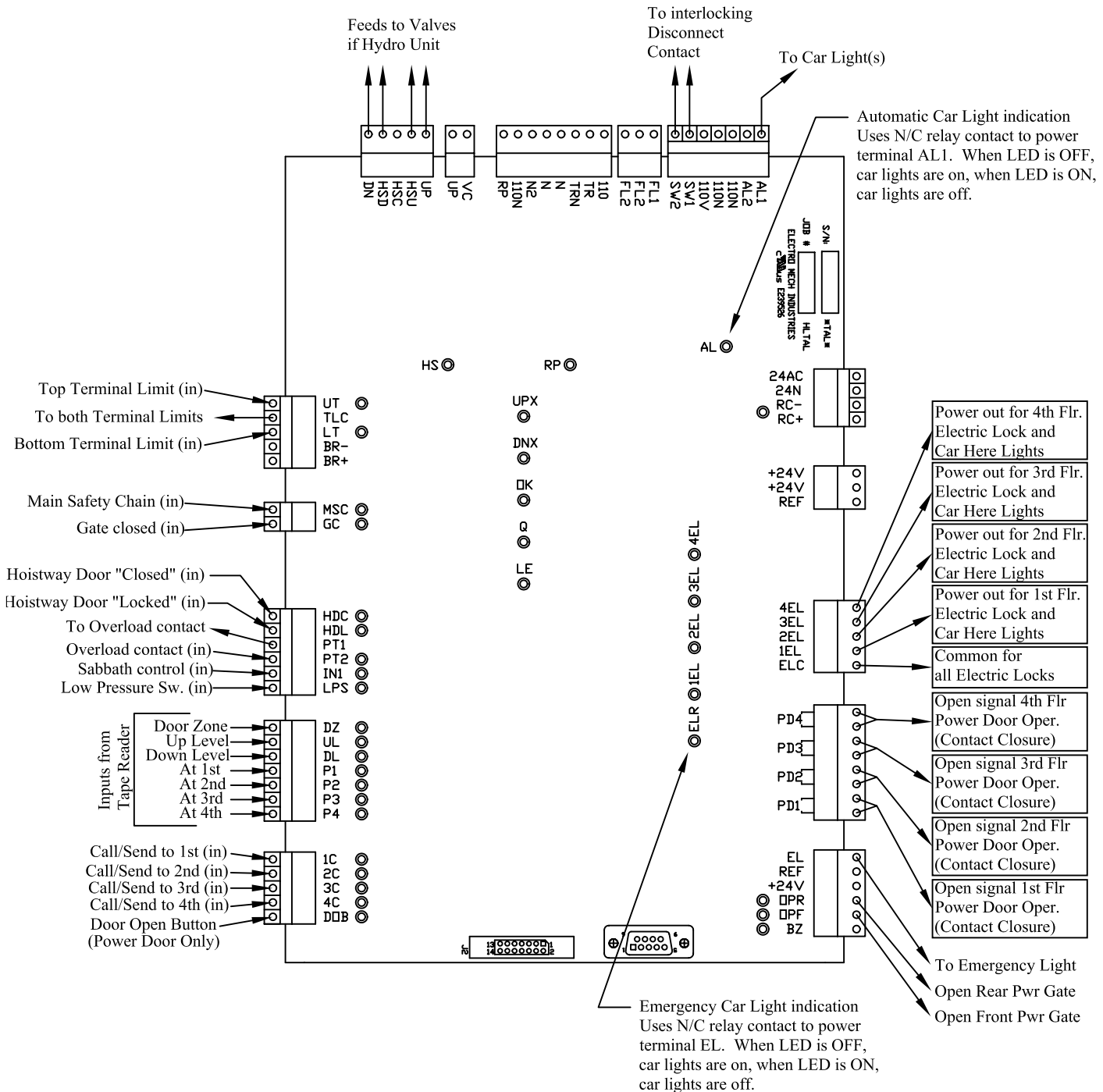
5. **Sabbath Control:** When input IN1 is activate (+24V) the unit goes to Sabbath mode and will respond as follows:

- A. Unit will travel to the Lower Terminal Floor (LTF) and disable a calls.
- B. Wait one minute at LTF , then run up to the next highest floor.
- C. Wait one minute at floor, then run up to the next highest floor.
- D. This will repeat until the Upper Terminal Floor (UTF) is reached.
- E. When the UTF is reached unit will wait one minute then run down to next lower floor.
- F. This will repeat to each next lower floor
- G. When LTF is reached the unit will wait 15 minutes then begin run cycle again.
- H. When the IN1 input is deactivated, the unit will return to normal operation.

1-4) INPUTS & OUTPUTS

Most of the inputs and outputs are easy to identify but here is a brief map to identify them and their location on the logic board.

© LED Indicator



1-5) WIRING INFORMATION:

1. **Schematic drawings:** (Refer to the drawing with the SCH suffix) These drawings show a system with all features and control options that are available with the 4M2 controllers.
 - **Note:** All wiring shown below the terminals, shown as a circle with a square around it, are circuits or connections outside of the logic board. Wiring shown above those terminals, are circuits that are on the logic board.
2. **Hook up drawings:** (Refer to the drawing with the FLD suffix) These drawings show a system with all features and control options that are available with the 4M2 controllers.
 - **Note:** Logic board terminals are shown as a square with the nomenclature inside. All other connection points are shown as circles.
3. **Travel Cable connections at the controller:** When bringing the traveling cable into the controller, be sure to allow enough length, inside the box to reach all needed connection points. Some connection points are on the logic board while others are on the terminal strip.
4. **Hoistway wiring:** You should allow enough cable to run each device back to the controller for termination. Drawings are set up based on this “home run” principle. The drawing shows optional devices that you may not have, or will not use, on your unit.
 - **Note:** The entrance points for the field wiring should be determined and knockouts installed with the panel removed from the box. This eliminates the possibility of metal shavings dropping into the controls. If you do not remove the panel, you must adequately cover it to protect from shavings.

2-1) PARAMETER DESCRIPTION & FUNCTION

The controller parameters are set to factory default. You will need to configure each controller to the specifics of that installation.

1. **Password:** Factory default is 12345. Password must be 5 characters in length and must be numbers. The A,B,C,D keys can not be used for password.
 - **Note:** If you change the password, use one that you **will not forget**. If you forget the password you will not be able to access the Program menu. The only recourse for access is to return the control board to the factory for a password re-set.
2. **Number of Floors:** {default = 2} Selection is 2,3, or 4.
3. **Single Automatic PB:** {default = Y} “Yes” is for automatic, “No” selects Constant Pressure
4. **Drive System:** {default = 0} Selections are (0) Drum or (1) Hydro
5. **Fixed Cam:** {default = 1} GAL locks require (1) Yes, EMI locks or retiring cam require (0) No
6. **Delay Up Stop:** {default = 0} Used only on Hydro applications to create a larger dead zone between top of magnet and UL sensor. This helps reduce or eliminate re-leveling due to temperature or loading variations. Time increment is **10 milliseconds**; range is 0-200
7. **Run Timer:** {default = 90} All units. Time increment is in **seconds**, range is 30-180
8. **Car light Timer:** {default = 5} This is for the automatic car light and determines the time that the car light will remain on after completion of a call when the car gate and hoistway door are closed. Time increment is **minutes**; range is 1-10.
9. **Non-Interference Timer:** {default = 10} Time between the completion of a run and the acceptance of another call. Time increment is **seconds**; range is 2-60.
10. **Car Call Cancel Timer:** {default = 10} This is the time that a call will be held while a gate or door is still open. If gate or door is not closed within this time period, the call will be dropped. Time increment is in **seconds**; range is 0-60.
11. **Automatic (Power) Gate:** {default = 0} Selections are (1) Yes, or (0) No. If Yes is chosen then parameters 12-17 will show for selection entries. If No is chosen, then you will not see these parameters. These settings control which gate open signal is present for that floor.
 - Floors that do not coincide with your number of stops may be ignored, as they will not have any effect on the system. Example: 3 stop unit, default entry may be left for the 4th floor.
 - “Rear” indicates use of two gates, the second gate may also be located adjacent.
12. **Floor 1 Gate:** Selections are (1) Front only, (2) Rear only, (3) Front & Rear opening.
13. **Floor 2 Gate:** Selections are (1) Front only, (2) Rear only, (3) Front & Rear opening
14. **Floor 3 Gate:** Selections are (1) Front only, (2) Rear only, (3) Front & Rear opening
15. **Floor 4 Gate:** Selections are (1) Front only, (2) Rear only, (3) Front & Rear opening

2-1) PARAMETER DESCRIPTION & FUNCTION (continued)

16. **Gate Open Timer:** {default = 15} Time that the power gate is open after completion of a call. This includes the time that it takes the gate to open. Time increment is **seconds**; range is 5-60.
➤ **Note:** Enhanced on Software version 1.3. Refer to sec. 5-2 for details.
17. **Gate Re-open Timer:** {default = 10} Time that the power gate is open after a door open button is activated, or a call, from the floor where the car is parked, is registered. Time increment is **seconds**; range is 5-60.
18. **PreOpening:** {default=0} Selections are (1) Yes, or (0) No. If YES is chosen it allows the gate to be opened as the car approaches the destination landing. For the car to continue to the destination landing the selector signals "DZ" and "Px" must be on. Only applicable with manual gates
➤ **Note:** Present on Software version 2.0 and above
19. **G & D Timer Cancel:** {default = 1} Selections are (1) Yes, (2) No. If Yes, is chosen, then the Gate Open time and DC time settings will be interrupted and canceled when a call is placed. Example: If you have chosen a open time for power gate or power door to be 20 seconds, and a call is registered after 10 seconds of open time, the remaining 10 seconds will be cancelled and the gate or door will start to close immediately upon the call being placed.
➤ **Note:** If your power gate and/or power door unit is being used in an application where the user may need most of the open time to enter or exit the car, then you may want to set this selection to (2) so the open time always remains at the setting.
20. **Homing Floor:** {default = 0} Allows home return feature to selected floor. Selections are (0) No homing, (1) to 1st, (2) to 2nd, (3) to 3rd, and (4) to 4th.
21. **Homing Timer:** Time car parks at a non-home floor, after the gate & door are closed, before returning to Home floor. If Gate or Door is open, unit will not Home return. Time increment is **minutes**; range is 1-30.
22. **DC Timer:** {default = 15} The time that the 1EL thru 4EL & PD1 thru PD4 outputs remain on, after a completion of a run or door re-open activation. Time increment is **seconds**; range is 0-60. If set at (0) then output will remain on until a call is placed.
➤ **Note:** The 1EL thru 4EL outputs supply the feed for Electric locks and Car Here lights while the PD1 thru PD4 outputs supply the "Open" signal for power Hoistway Door openers.
23. **Short Floors:** This feature inhibits the high speed run (VF Drum & Hydro) between the floors indicated. Minimum floor to floor allowed for Automatic pushbuttons is 12 inches. Minimum floor to floor allowed for Constant Pressure pushbuttons is 24 inches.
◆ **Short Floor 1-2:** (Short floor between 1 & 2) Selections are (0) No, (1) Yes.
◆ **Short Floor 2-3:** (Short floor between 2 & 3) Selections are (0) No, (1) Yes.
◆ **Short Floor 3-4:** (Short floor between 1 & 2) Selections are (0) No, (1) Yes.
24. **Call Button Fault:** {default = 0} Selections are (1) Yes, (0) No. If "yes", a code is flashed, at the call button when the unit is unable to accept a call. Factory setting (1) Yes. See Section 2-2 for detail on Fault Codes
➤ **Note:** Enhanced on Software version 1.3. Refer to sec. 5-2 for details.

2-1) PARAMETER DESCRIPTION & FUNCTION (continued)

25. **Re-level shutdown Counter:** (Hydro only) {default = 5} If unit re-levels the number of times set in the counter, during the time period set on the Re-level shutdown Timer, car will return to the bottom terminal floor and shut down. Range is 0-10, (0) disables the function.
26. **Re-level shutdown Timer:** {default = 2} If number of re-levels equal counter setting, before the timer setting expires, car will return to the bottom terminal floor and shut down. Time increment is **minutes**; Range is 0-10.
27. **Auto shut down counter:** {default = 0} If activated, car will shut down when number of runs equals counter setting. Number of runs equals the setting times 10. This feature auto-disables after four activations.
28. **Sabbath:** {default = 1} Selections are (1) Yes, or (0) No. See section 1-3.5 for a description of operation. It is recommended to leave this parameter to it's default.
29. **Service Interval Counter:** {default = 0} If activated, the emergency light will flash 3 times at the start of every run when the number of runs is greater than the parameter setting. Number of runs equals the setting times 10. Clearing the counter from the main menu option 4 resets this feature.

2-2) FAULT FLASH CODES:

All codes that begin with a long flash (2 seconds on) are Call for Service codes. These are problems that the user can not correct. The main purpose of these codes is so a user could convey to you, over the phone, the flash sequence. This may save a trip to the site if it is one of the User codes, or could give you an idea of what parts you may need to take with you, when you go to the site, if it is a call for service code.

- ◆ **Call For Service (1):** One long, one short. This code indicates that there is a problem is one of the following areas:

Overload Trip	Run Timer Trip	Main Safety Chain open
Door lock fault	Auto Shut Down counter	
- ◆ **Call For Service (2):** One long, two short. This code indicates that there is a problem is one of the following areas:

Re-level shutdown	Low Pressure Switch
-------------------	---------------------
- ◆ **Call For Service (3):** One long, three short. This code indicates that there is a problem is one of the following areas:

Selector Fault	Selector Encoding error	Position Error
----------------	-------------------------	----------------
- ◆ **User Code (1):** One short. This indicates that the Gate is open, or the In-car stop is in the stop position.
- ◆ **User Code (2):** Two short. This indicates that a Door is open.

3-1) PROGRAMMING TOOL (P-Tool) Functions

The P-Tool is available in either a board mount or held versions. The recommended minimum is that each installation technician have a P-Tool.

The P-Tool can be used to:

- View the status of the elevator
- Change parameter settings
- View and clear the fault log
- View and clear the counters
- Put the system into Temporary Run Mode
- Run the elevator while in Temporary Run Mode

Note: While using the P-Tool in programming mode, the elevator will not respond to calls

Note: The P-Tool is rendered in-operable while the elevator is running. The elevator must be at rest.

3-2) CONNECTING P-TOOL

*** WARNING ***

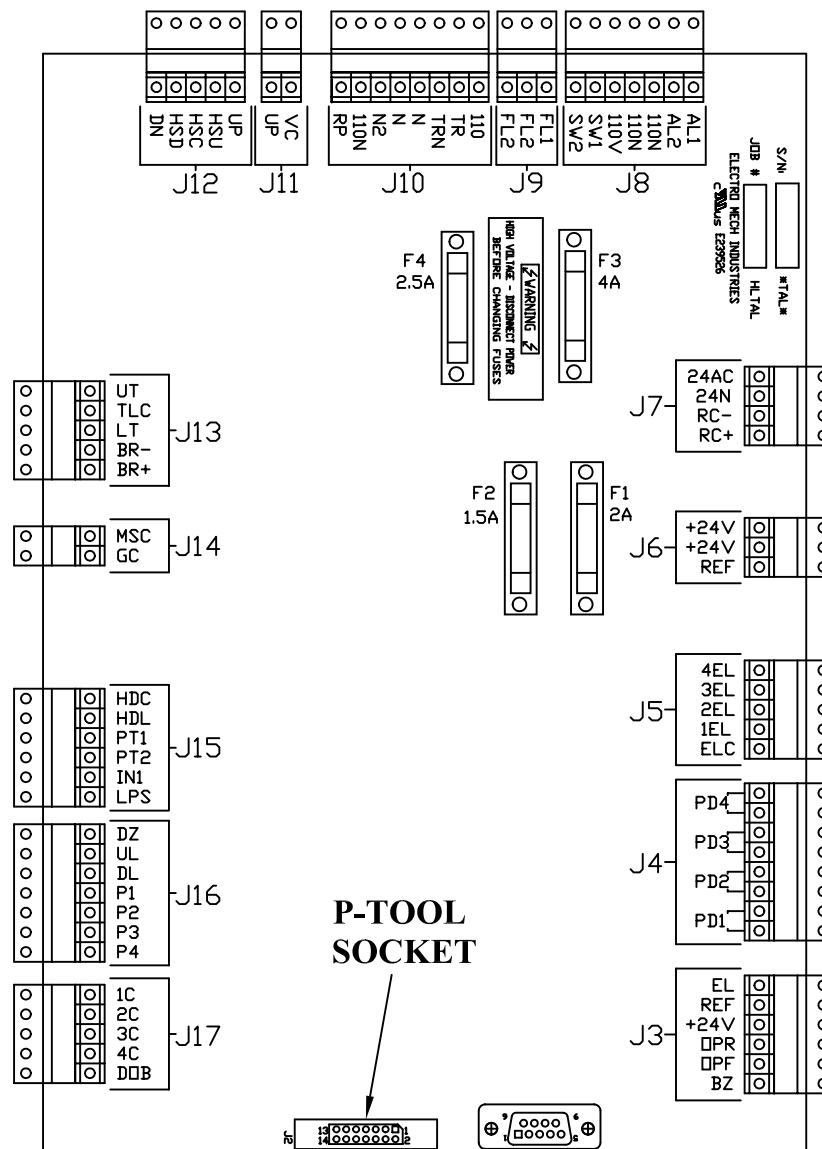
**USE OF THE PROGRAM TOOL IS FOR PROFESSIONAL
ELEVATOR TECHNICIANS ONLY!**

CONNECTING THE P-TOOL TO THE CONTROL BOARD

1. Socket position is on lower edge of board (Location shown below)
2. Move locking tabs on socket outward
3. Insert P-Tool plug into socket

Note: Plug & Socket are polarized. Match key on plug to slot on socket

4. Press the (1) Key (Display will show current status of the Elevator)



3-3) PROGRAM MODE

PROGRAMMING MODE

1. P-Tool must be connected to control board with display showing the status of the Elevator.
2. Press the (A) key to access the Main Menu Screen

(1) NORM (2) PROG (3) LOG (4) COUNTER
--

Main menu screen

3. Press the (2) key, you will be prompted to enter the password

PASSWORD THEN # PROG:

Factory set Password is
12345

4. Enter the password and then press the # key
Note: If keystrokes are too fast the unit may not accept the entry. Make sure a star symbol appears on the display before making the next entry.
Note: See section 2-1 in this manual before making any changes to the Password.

Number of Floors (2)

First Parameter
will be shown

5. You may navigate through the parameter fields by using the Keys shown below.

- (A) To Return to the Main Menu
- (B) To Scroll Up through Parameters
- (C) To Scroll Down through Parameters
- (D) To Clear the current Value
- (#) To Save the change

6. To Change a Parameter: Scroll to the Parameter, choose setting and then press the # key to save the change.

Note: Unit is out of service and will not accept calls, when in Program mode.

If no key strokes are initiated for 2 minutes, the unit will return to Normal operating mode.

7. If a Change to a Parameter is made, return to the Main menu, (A) key, return to Normal mode, (1) key, and then press the Star key to re-set the unit. This insures that the change will be initiated for the next operation.

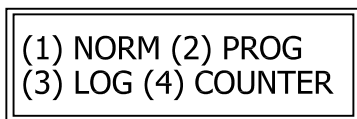
NOTE: If you change the parameter for NUMBER OF STOPS, all factory parameter settings will be lost. Board default parameters will automatically be loaded. Default & Factory settings are listed in this manual.

3-4) LOG MODE

LOG MODE

The Log stores 20 faults in a First in First out format. (1st fault drops off when 21st fault registers)

1. P-Tool must be connected to control board with display showing the status of the Elevator.
2. Press the (A) key to access the Main Menu Screen



Main menu screen

3. Press the (3) key



The first line describes the fault.

(2U) Indicates where fault occurred and was during an UP run.

(2D) Would indicate during a down run

(2R) Would indicate fault occurred while the car was at Rest.

(L) Indicates that the fault being view is the most recent event.

4. You may navigate through the parameter fields by using the Keys shown below.

(A) To Return to the Main Menu

(B) To Scroll Up through Events

(C) To Scroll Down through Events

(D) To Clear the Log

(#) To Save the change

5. When you want to clear the Log you will be prompted for the Password.

Enter the password and then press the # key. When the # key entry is made, the log will clear and bring you back to the Main Menu screen.

Note: If keystrokes are too fast the unit may not accept the entry. Make sure a star symbol appears on the display before making the next entry.

3-5) VIEW & CLEAR COUNTERS

COUNTER MODE

1. P-Tool must be connected to control board with display showing the status of the Elevator.
2. Press the (A) key to access the Main Menu Screen

(1) NORM (2) PROG (3) LOG (4) COUNTER
--

Main menu screen

3. Press the (4) key

TRIP:	5
TOTAL:	43

Trip: Counts each time the car responds to a call. (Resetable)
Sample shows that there have been 5 runs since the last time that the Counter was cleared.
Total: Same as trip but is not resetable.

4. Pressing the (C) key toggles you to the Re-level Counter

UP LEVELING	0
-------------	---

Up Leveling: Counts each time the car re-levels without a call. (Resetable)

5. You may navigate through the parameter fields by using the Keys shown below.
 - (A) To Return to the Main Menu
 - (B) To View Run Counter
 - (C) To View Re-level Counter
 - (D) To Clear the Counters
 - (#) To Save the change
6. When you want to clear the Counters you will be prompted for the Password.
Enter the password and then press the # key. When the # key entry is made, the log will clear and bring you back to the Main Menu screen.
Note: If keystrokes are too fast the unit may not accept the entry. Make sure a star symbol appears on the display before making the next entry.

3-6) PARAMETER SETTINGS

Parameter	Board Default	Job Settings	Job Settings
Password:	12345		
Number of Floors	2		
Automatic PB	YES		
Drive System	HYDRO		
Fixed Cam	NO		
Delay Up Stop	0		
Run Timer	90		
Car light Timer	5		
Non-Interference Timer	2		
Car Call Cancel Timer	10		
Automatic (Power) Gate	NO		
Floor 1 Gate	1		
Floor 2 Gate	1		
Floor 3 Gate	1		
Floor 4 Gate	1		
Gate Open Timer	15		
Gate Re-open Timer	10		
PreOpening (if Power Gate=no)	NO		
Door Timer Cancel	YES		
Homing Floor	0		
Homing Timer	5		
DC Timer	15		
Short Floor 1-2	NO		
Short Floor 2-3	NO		
Short Floor 3-4	NO		
Call Button Fault	NO		
Re-level shutdown Counter	5		
Re-level shutdown Timer	2		
Auto shut down counter	0		
Sabbath	YES		
Service Interval Counter	0		

4-1) TEMPORARY RUN MODE:

The purpose for this mode of operation is to allow the installer to move the platform up or down during the installation process. During this mode of operation safety chains MSC, LPS, GC, HDC and HDL will be disregarded. If the motor overload connected to PT1 and PT2 opens, the platform will not move.

Before the platform can be moved the following electrical connections will need to be made:

- Drive system (hydro or drum) including motor overload
- L1, L2 & N
- SW1 & SW2

The following jumpers are required:

- From TLC to LT
- From TLC to UT
- From 24V to HDL

Temporary run mode can be initiated in either of the following:

- Hold keys 1,5 and 0 on P-TOOL, then power up
- Logic board Inputs P1, P4 and DOB tied to REF, then power up

The platform will travel UP by constant pressure of either of the following:

- “A” key of PTOOL
- While logic board input 4C is tied to REF

The platform will travel down by constant pressure of either of the following:

- “D” key of PTOOL
- While logic board input 1C is tied to REF

Note: During Temporary Run Mode, the platform will move at low speed.

To return too normal operation, remove power then power up without the initiating conditions.

5-1) IDENTIFYING THE SOFTWARE VERSION:

Periodically we enhance or add features to the operational software. If you call for assistance on a unit, you may be asked to identify the software on your unit.

There are two ways to identify your software:

- 1) The date stamp on the 40 pin EPROM.
- 2) Connect the Programming tool, perform a reset by pressing the star key and reading the version that shows on the upper right side of the display. Note, if a ? mark is displayed it is an indication that you have the first version of software. If you have a revised version, you will see a “V” followed by an identifier (1.1, 1.2, 2.1, etc).

5-2) SOFTWARE ENHANCEMENTS:

Version 1.3 Dated November 14, 2005

- **Gate Open Timer:** Range is 0-250 sec. Where "0" will park the gate(s) open.
- **Call But. Fault:** Selections are, 0-NO 1-A 2-U. If "A" is selected ALL codes will be allowed to flash. If "U" is selected only the user codes will be allowed to flash.

Version 2.0 Dated December 3, 2007

- Added parameters: **PreOpening and Sabbath**

Version 2.1 Dated March 25, 2009

- Code compliance for gate monitoring. If the hoistway door (HDC) is opened, the gate (GC) must be cycled for the system to accept a call.

Version 2.2 Dated April 8, 2013

- **Service Interval Counter:** Range is 0-250.

6-1) PRE-OPERATIONAL SAFETY CHECKS

This process will confirm that all field wiring has been performed correctly and that the safety circuits function as expected. The critical LED(s) to observe are RED and located throughout the Logic board. These LEDs are designated as follows: **LT, UT MSC, GC, HDC and HDL**

1. Remove all jumpers used during construction, then power up controller in “TEMP RUN” mode with P-Tool (refer to Section 4-1).
2. Confirm P-Tool displays “TEMPORARY MODE REST”.
3. Confirm that gate is closed and hoistway doors are closed and locked. The critical LEDs **MUST** be ON (UT, LT MSC, GC, HDC and HDL).

➤ **Note: Other LEDs may be ON as well but are disregarded for these tests**

4. Cycle each of the following applicable switches and confirm that all critical LEDs to turn OFF when the switch is opened and back ON when the switch is closed: Pit Sw., Door, UFL, LFL, Safety Slack Sw., Car Top Stop.

➤ **Note: Close all switches and confirm all critical LEDs are ON.**

5. Manually unlock a door lock. Result: HDL goes off.
6. Open a Hoistway door. Result HDC goes off; HDL remains off.
7. Open the Gate. Result: GC goes off; HDC and HDL remain off.
8. Close Gate and Open “IN CAR STOP”: GC goes off; HDC and HDL remain off.
9. Close “IN CAR STOP” switch, gate and hoistway doors

6-2) TEMPORARY MODE RUNNING TESTS

1. Run the car DOWN until the Lower Terminal Limit opens (LT turns off).
 - a. The P-Tool will indicate “Running Down” but the car must stop.
2. Install a temporary jumper between TLC to TT, LT activates. Run car down to Pit.
 - a. LPS must deactivate.
 - b. Remove the Temporary Jumper
3. Run the car UP until the Upper Terminal Limit opens (UT turns off).
 - a. The P-Tool will indicate “Running UP” but the car must stop.
4. Confirm Selector signal sequence: Refer to Section 7-1 for the required selector sequence. Confirm sequence from lower terminal floor to upper terminal floor in both directions.

6-3) PROGRAM JOB SPECIFIC PARAMETERS

1. Power down controller, remove J14 from Logic board (MSC & GC)
2. Power up controller and follow instructions of Section 3-3
 - a. Record job parameter on “Parameter Log Sheet” Section 3-6
3. After all job specific parameters have been entered:
 - a. Clear the LOG
 - b. Insert J14
4. Reset Elevator

7-1 SELECTOR SEQUENCE REQUIREMENTS

RUNNING UP							
CAR LOCATION	DZ	UL	DL	P1	P2	P3	P4
@ FL 1	X			X			
	X		X	X			
	X		X	O			
	O		X				
ALL OFF			O				
		X					
	X	X					
	X	X			X		
@ FL2	X	O			X		
	X		X		X		
	X		X		O		
	O		X				
ALL OFF			O				
		X					
	X	X					
	X	X				X	
@ FL 3	X	O				X	
	X		X			X	
	X		X			O	
	O		X				
ALL OFF			O				
		X					
	X	X					
	X	X					X
@ FL 4	X	O					X

X= LED ON
O= LED HAS TURNED OFF

RUNNING DOWN							
CAR LOCATION	DZ	UL	DL	P1	P2	P3	P4
@ FL 4	X						X
	X	X					X
	X	X					O
	O	X					
ALL OFF		O					
			X				
	X		X				
	X		X			X	
@ FL 3	X		O			X	
	X	X				X	
	X	X				O	
	O	X					
ALL OFF		O					
			X				
	X		X				
	X		X		X		
@ FL 2	X		O		X		
	X	X			X		
	X	X			O		
	O	X					
ALL OFF		O					
			X				
	X		X				
	X		X	X			
@ FL 1	X		O	X			

X= LED ON
O= LED HAS TURNED OFF

7-2) GROUNDING THE SYSTEM

It is often reported that a residential elevator has stopped operating after a storm. The reason for this is transient currents. These transient currents are caused by any of the following:

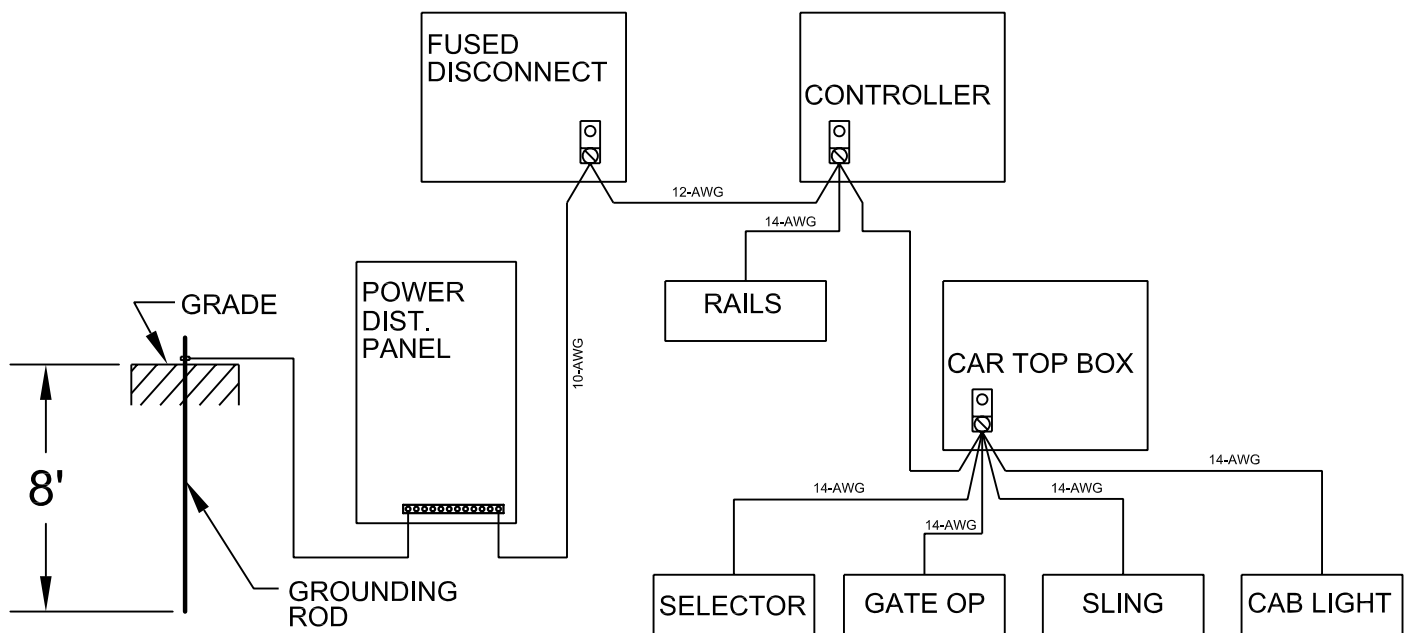
- * Improper grounding of the residence
- * Improper or nonexistent grounding of the elevator system

The following links are being provided for an in-depth explanation of grounding and bonding:

<https://www.engineereducators.com/docs/groundingandbonding2-2.pdf>

<http://www.pfeiffereng.com/Principals%20of%20Electrical%20Grounding.pdf>

The following is a representation of a properly Grounded / Bonded residential elevator system:



Note: All Ground wires must be stranded wire

LIGHTNING PROTECTION

There is no product available that will fully protect any electrical system from the effects of a lightning strike. Many field technicians have reported positive results when using a "Lightning Arrestor" with a "Surge Capacitor". These two components are to be connected directly to the elevator controller for maximum protection.

The combination that has been reported to have a positive effect is manufactured by Delta Lightning Arrestors, Inc. The part numbers are as follows:

Lightning Arrestor: LA302G

Surge Capacitor: CA302RG

7-3) BACK EMF PROTECTION

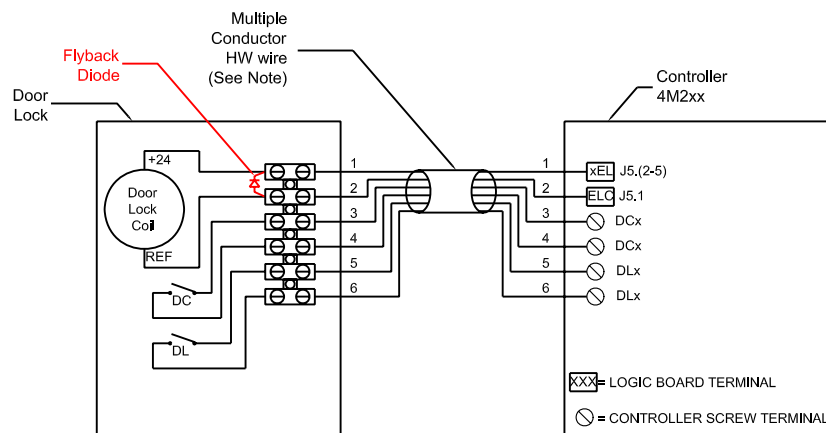
Back EMF (CEMF) is a large voltage spike with opposite polarity which is generated when an inductive load is de-energized. The amplitude of this voltage spike is dependent on the following factors:

- * Size of the Inductor
- * Nominal Voltage of the Inductor
- * The rate at which power is removed

The most common sources of CEMF within a residential elevator are the electric door locks. The typical CEMF of a 24vdc door locks is -300vdc. If the wrong type of multiconductor hoistway cable is used, this CEMF can be transmitted to the adjacent safety string conductors and be fed back into the controller. This CEMF can damage electronic circuits.

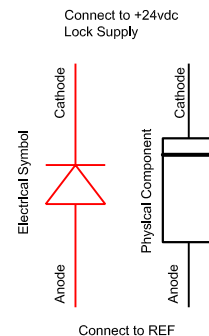
CEMF can be eliminated in DC circuits by using a flyback diode or greatly reduced by the use of a Metal Oxide Varistor (MOV). MOV's have to be used to mitigate CEMF in AC circuits.

The diode or MOV must be connected directly across the Door Lock Coil as shown below:



Note: DO NOT USE "THERMOSTAT" WIRE
Hoistway wire must be stranded.

- * 18AWG minimum (16 strands / 30AWG)
- * 300V minimum insulation rating.



Recommended Diode:
Radio Shack PN: 276-1104
Digikey PN: 1N4005-E3/54GICT-ND

Recommended MOV:
Digikey PN: 495-1404-ND

The following links are being provided for an in-depth explanation of CEMF and fly back diodes:

<http://www.douglaskrantz.com/Services/FlybackDiode.pdf>

http://en.wikipedia.org/wiki/Flyback_diode

7-4) Minimizing Re-Leveling

Overview: The elevator should not re-level when a person steps into the cab.

1. Adjust valve to achieve your preferred ride quality
(i.e. UP / DN acceleration, deceleration, leveling speeds and DN full speed)
2. Place Selector magnets in their approximate vertical location(s) on the selector tape.
3. Run car in normal mode in both directions
 - a. Verify that car does not overshoot the floor. If this occurs further valve adjustment(s) is necessary
4. Move selector magnets to their final vertical position.
 - a. Scribe a line on the selector tape at the bottom of the Zone magnet (11") at all floors.
 - b. Verify that car stops at floor level at all floors in both directions.

Note: At this point there is virtually no "dead zone". The slightest rope stretch due to loading or cooling of the oil will induce a re-level condition.
5. Cut $\frac{3}{4}$ " off of the TOP of the Zone magnet (11") at every floor.

Note: The car will now stop below the floor when running UP.
6. Using the P-Tool, go to programming parameter "UP STOP DELAY"
 - a. Set this parameter to 10
 - b. Cause a re-level by opening manual lowering on valve
 - c. After relevel is complete, Increment this parameter by 10
 - d. Repeat steps "b" & "c" until selector input "DL" comes on and the car levels back down to the floor, then proceed to step 6.e.
 - e. Decrease this parameter by 5.
 - f. Cause a re-level by opening manual lowering on valve, "DL" should not activate.
 - i. If DL still activates, decrease this parameter by 5.

8) COMMON QUESTIONS:

8-1 Call button flashes

- (Q):** I press a button to call the car to my floor, the button flashes but car does not move. Why is the button flashing?
- (A):** When the car is not allowed to move, which can be for a number of reasons, a fault flash code is displayed at the button pressed. If the flash sequence is one long (2 seconds on) and then followed by a short (1/2 second on) flash or flashes, it indicates that a service representative needs to correct the problem. If the flash sequence does not include the long (2 second on) but only a short flash or flashes, this generally indicates that the user can correct the problem by, making sure the “stop switch in the car is in the run position, shutting the car gate, or shutting a hoistway door.
- (Q):** I press a button to call the car to my floor, the button lights up but the car does not move, after some time the light in the button turns off and then flashes on once. If I press the button again, the light does not stay on but again flashes on once. Why won't my unit run?
- (A):** The first time you pressed the button, the call to your floor was being held, waiting for either the car gate or a hoistway door to be closed. The car gate or hoistway door was not closed within the time period set in the parameter field, and the call was then dropped. The single flash of the button light indicates that the car gate circuit is in an open position and needs to be closed in order to allow a run. Check the “Stop” button and make sure it is in the run position and also make sure the gate is closed.
- (Q):** I press a button to call the car to my floor, the button lights up but the car does not move, after some time the light in the button turns off and then flashes twice. If I press the button again, the light does not stay on but again flashes twice. Why won't my unit run?
- (A):** The first time you pressed the button, the call to your floor was being held, waiting for either the car gate or a hoistway door to be closed. The car gate or hoistway door was not closed within the time period set in the parameter field, and the call was then dropped. If the two flashes on the button light were short (1/2 second on each), this indicates that the hoistway door is in an open position and needs to be closed in order to allow a run. Make sure all hoistway doors are closed. Note: If the two flashes were one long (2 seconds on) and then one short (1/2 second on), this is not a door open condition and you need to call a service representative.

8-2 Automatic Car Light

- (Q):** My customer wants the car lights to turn off sooner. What can I do?
- (A):** The time can be changed by the Car Light Timer parameter. Use the P-Tool and access the program section, and then change the setting for the “Car Light Timer”.
- (Q):** My customer says the car light never turn off. They can see the light shining under the door.
- (A):** The number one cause for this condition is that either the car gate is not closed, or the hoistway door is not closed. The light timer does not function until both the car gate and hoistway doors are closed. One other possible cause would be that the AL relay is not functioning. The control uses the N/C contacts of the relay to power the lights, if the relay is functioning correctly then the light could stay on.

8-3 Miscellaneous

- (Q):** If we want to add a power gate operator to a unit that was not ordered with one, do we have to buy a new controller or make major modification to the current one?
- (A):** No, with the 4M2 controls you will not need a new controller nor will there be any major modifications to the existing control. All 4M2 controls have provisions built in for control of two power gate operators and four power door operators. All you need to do is add the power operators, connect the correct wires into the controller and change some parameters (using the P-tool).
- (Q):** Do I need to put limit switch, pushbutton and interlock wiring in metallic conduit?
- (A):** Maybe, this would typically be determined by your local building codes. All power supplied to these devices is low voltage (24 VDC). Check with your local authority for determination.
- (Q):** We had a power loss while trying to go the lower level but the car stopped at the 2nd level. Do we have to get out at the 2nd level or can we ride the car down to the lower level?
- (A):** Yes, you may ride the car to a lower level. When main power is lost the car goes into “Emergency Lowering Mode” and will stop at the next lower floor that it comes to. The car can then be called or sent to a lower level if all the appropriate safety circuits are made.
- (Q):** I want to use my elevator but how do I tell if the car is at my level or needs to be called to my level?
- (A):** In our opinion, the best thing to do is press the call button before pulling on the door. If the car is at your level, the button light will extinguish when the button is released. If the light stays illuminated, then the car is at another floor. We feel this is the best operation because units that utilize electro-mechanical locks may require the pressing of the button to unlock the door.

9) FAULT TROUBLESHOOTING

FAULT	Possible Cause	Corrective Action Required
MSC open during run	Pit Switch not being used and required jumper was not installed.	Review electrical diagrams and place jumper between required terminals.
	Pit Switch open	Put Pit switch back to "Run" position and then perform controller "Reset" function.
	Top or Bottom Final Limit switch set too close to terminal landing.	Move car off of Final Limit and adjust cam or switch position if necessary, then perform controller "Reset" function.
	Car top Stop switch opened.	Put Stop switch back to "Run" position and then perform controller "Reset" function.
	Car Slack Rope / Safety switch tripped.	Evaluate the condition and location of the car. Use proper safety rules when dealing with this situation and never attempt to get under or onto the car unless the unit has been adequately assessed and the proper safety precautions have been taken. Manually reset the switch and then perform controller "Reset" function.
	Car top mounted Final Limit Sw. (Drum only)	Move car off of Final Limit and adjust switch position if necessary, then perform controller "Reset" function.
GC open during run	In-car stop switch in "Stop" position	Put stop switch to "Run" position.
	Car gate opened during run.	Close car gate.
HDC open during run	Hoistway door contacts opened while coming into or through a floor during run.	Check adjustment of door closer, spring hinges, or latch, to insure proper closing pressure and adjust if necessary.
	Door "Lock" and "Closed" contacts wired in reverse.	Check wiring and correct if necessary. For GAL interlocks, the lower contacts are the "Door Closed" contacts.
HDL open during run (General)	Door lock not locking	Check for binding between keeper and locking member and re-align if necessary.
	Door lock not locking	Interlock too far from back of door panel and keeper does not enter lock far enough, inhibiting the locking member from engaging the keeper. Make necessary adjustments.
	Door lock not locking	Door panel warped and does not allow keeper to extend into the lock far enough. Make necessary adjustments.
	Door locking but no HDL signal to controller.	Check wiring and correct if necessary.
	Door "Lock" and "Closed" contacts wired in reverse.	Check wiring and correct if necessary. For GAL interlocks, the lower contacts are the "Door Closed" contacts.
	If using Electro-Mechanical locks, HDC to HDL jumper missing.	Refer to electrical drawing and verify that required jumper is installed.
HDL open during run when leaving or passing by a floor & car does not return to floor level	Position Magnet too long. DZ signal is lost before car comes to rest after losing Position signal.	Shorten Position magnet 1/8 to 1/4 inch until car returns to floor after fault.
Overload Trip Only Single Speed drum units include a manually resettable overload. Overloads on VF Drum and Hydraulic units automatically reset after thermal cool down.	Motor incorrectly wired	Check wiring and correct if necessary then perform controller "Reset" function.
	Line Voltage too low	Measure voltage and if more than 10% below nominal, contact Power Company for correction.
	Unit run with over capacity loading	Reset or allow overload to cool down and then perform controller "Reset" function.
	Incorrect wire size used for power source	Typical wire gauge should be minimum of 10. If longer than normal lengths, from power source to controller, disconnect are required, wire gauge may need to be increased.
	Incorrect wire size used to connect motor	Typical wire gauge should be minimum of 12. If longer than normal lengths from controller to motor are necessary, increase wire size to 10 ga.

9) FAULT TROUBLESHOOTING

FAULT	Possible Cause	Corrective Action Required
Run Timer Trip General	If attempting to run up, UT input not on, if attempting to run down, LT input not on.	Verify proper inputs are present, if not make necessary changes to correct.
Run Timer Trip & Hydro units with 6-16-04 Software & all unit with Software version 1.1	Parameter setting not long enough	Check parameter setting and modify if necessary. See factory setting formula on page 16. (For all Drum units see section 1-3 item 3 note for reset procedure)
	Low oil condition, car can not reach upper floor(s). Hydraulic units only.	Check oil level, when car is at the top floor, Motor and pump should be submerged in oil.
Run Timer Trip Single Speed Drum only with 6-16-04 Software	Timer tripped in Power outage or Overload trip lowering mode.	Change run timer parameter setting to (Total feet of travel X 6 plus 5). For all Drum units see section 1-3 item 3 note for reset procedure.
Door Failed to Open This is only for Power Gate applications	Power Gate is not opening, or Gate switch (GC input) failed to de-energize within 3 seconds after the Gate Open signal was given.	Verify that the Power switch to the Gate operator is in the ON position.
		Verify that the traveling cable connections are correct and that the Gate open signal is reaching the operator.
Door Failed to Close This is only for Power Gate applications	Gate switch (GC input) failed to energize within 10 seconds after the Gate Open signal was de-energized.	If the gate is opening; Verify that there are no jumpers jumping out the GC circuit.
		Verify gate is traveling fast enough to get closed within 10 seconds. If not, increase High speed on the gate operator to insure gate can close in less than 10 seconds.
	Gate coupling magnet detaching from gate.	Verify that gate is closing and does not detach from coupling magnet. Check for binding in gate track. Also verify that the coupling magnet is able to slightly rotate about it's mounting point.
	Gate switch out of adjustment and not sensing that the gate is in the closed position.	Adjust gate switch.
	Gate is not closed completely when close sequence stops.	Adjust gate closed switches on gate operator to allow the gate to close further.
Gate Switch Bypass	During 5 consecutive runs a Hoistway door was opened and closed, without the gate being opened and closed.	Check gate circuit for jumpers.
		Check gate switch for out of adjustment condition along with a mechanical tie which would keep the switch from opening.
Door Switch Bypass 6-16-04 Software only	Jumper wire between GC & HDC	Check for jumper and remove if found
	During 5 consecutive runs the car gate was left opened when user exited the car. when this happens, the system only senses that the hoistway door was opened and closed at the same time that the car gate was opened and closed. This situation will cause a door switch bypass fault.	Instruct the user to close the car gate when exiting the car. This will eliminate the generation of the fault.
Selector Fault	Selector signals not received in correct sequence which could be caused by a position magnet lower or higher than the leveling magnet.	Verify that the top and bottom edges of the position magnets are at least 1" from the end of the leveling magnet. Adjust or trim if necessary.
	Selector signals not received in correct sequence which could be caused by a sensor not turning "off"	Verify that a signal is not "locked on". Replace Reader if necessary.
	Selector signals not received in correct sequence which could be caused by a sensor not turning "on"	Verify that all signals are functioning at each level. Replace Reader if necessary.

9) FAULT TROUBLESHOOTING

FAULT	Possible Cause	Corrective Action Required
Position Error	Magnets grossly out of position	Check position and adjust if needed
	Two or more position signals on at the same time	Verify that a signal is not "locked on". Replace Reader if necessary.
Encoding Error	Position signal does not equal selector count. This would be caused by position magnet wrong polarity or in wrong lane.	Verify Position magnets are in correct lane and that the polarity is correct.
Re-Level Shutdown (Roped Hydraulic only)	Piston packing leaking	Check for excessive oil on piston, oil leaking down cylinder and replace packing if necessary.
	"Delay Up Stop" parameter not correct	Check parameter setting. Setting should be (50)
	"Relevel shutdown" Counter not set a factory default.	Check parameter setting. Setting should be (5)
	"Relevel shutdown" Timer not set a factory default.	Check parameter setting. Setting should be (2)
	Control Valve contaminated and leaking	Refer to Valve section in the Installation Manual for checkout procedures.

10) Maintenance:

This section is intended to be part of your Maintenance Control Program (MCR).

Any person performing maintenance on the 4M2 controller must comply with the ****WARNING**** located inside the cover of this manual.

1. Controller & Car Top Box:

- a. Verify that all cables are secured to their enclosures.
- b. Verify that the interior of the enclosures are free from debris.

2. Electrical Disconnect:

- a. Verify that the correct (type & size) fuses are installed.

3. Document then Clear LOG

4. Document then Clear Counters

5. Verify Safety Circuit Operation:

This process will confirm that all safety circuits function as expected. The critical LED(s) to observe are RED and located on the left side of the logic board. These LEDs have the following designators:

UT, LT, MSC, GC, HDC, HDL and LPS

- a. Cycle each of the following applicable switches and confirm that ALL critical LEDs turn OFF when the switch is opened and back ON when the switch is closed: Pit Switch, Upper Final Limit, Lower Final Limit, Slack Rope Switch and Car Top Stop

Note: To perform this test the gate must be closed and the hoistway doors must be closed and locked.

- b. Manually unlock a hoistway door. Result: HDL goes OFF.
- c. Open a hoistway door. Result HDC goes OFF and HDL remains OFF.
- d. Open the gate. Result GC goes OFF; HDC and HDL remain OFF.
- e. Close the gate. Result GC turns ON; HDC and HDL remain OFF.
- f. Open "IN CAR STOP". Result GC goes OFF; HDC and HDL remain OFF.

Note: Repeat test "b" and "c" for each hoistway door.

6. Terminal Limits (Hydro):

- a. With the car at the upper terminal floor:
 - i. Initiate "TEMP MODE".
 - ii. Run the car above the floor
 1. Verify that the car stops before the stop ring is contacted
- b. With the car at the lower terminal floor:
 - i. Open the manual lowering valve
 1. Verify that the car stops before LPS goes off

7. Emergency Lowering:

To perform this test a jumper must be placed between terminals SW1 and SW2.

- a. While the car is running UP in response to a call, turn OFF the main disconnect
 - i. The car should stop and run down to the next landing.
 - ii. The car should respond to calls from lower landings.
 - iii. The emergency light will remain illuminated for 30 sec after the car reaches the lower terminal floor.
- b. Remove jumper from SW1 and SW2.