



**LEC6M2 Series
CONTROLLER KIT
OPERATIONS MANUAL
(2 thru 6 Stop Residential Elevators)**



**Electro-Mech Industries Inc.
250 Hamilton Road
Arlington Heights, IL 60005**

**Phone: 847-593-4900
Fax: 847-593-1394**

***** 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) KIT CONTENTS:

The following items are included with the 6M2(xx)K supply:

Note: This manual applies for all 6M2 applications

1 - 2-6 Stop Controller

If Hydraulic: P.N.: 6M2H2 with 425VA UPS

If VVVF: P.N.: 6M2VFxxxxxxx

If Gearless: P.N.: 6M2TECGRLS

1 – Car Top Box, with the following items (P.N.: CTBS6)

- Selector Interface PCB
- Terminal strips for all connections
- Car Top Stop Switch
- Alarm Buzzer

1 – Selector Head, with the following Prewired Switches (P.N.: SELECTOR6K)

- Upper Terminal Limit
- Lower Terminal Limit
- Upper Final Limit

3 – Limit Switch Cams

1 – Communication Cable for Selector

1 – Set of Magnet for 6 Stops

- 6 – 11” Magnets
- 9 – 5.5” Magnets

1-2) 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.
Arlington Heights, Illinois
847-593-4900

1-3) GENERAL INFORMATION:

The EMTAL6 control board contains the following features:

- Same control board is used for hydraulic or electric Elevators
- ETL recognized for Residential Elevators
- Supports 2 through 6 stop units
- Supports Porta Power Gate operators (maximum of 2)
- Supports Swing Door operators (maximum of 6)
- Supports 24VDC Electric Locks (Maximum 6)
- 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
- Re-assignable floors (maximum 6 openings)
- Emergency Lowering capable (with required ancillary equipment)
- Temporary Run mode for use during installation and trouble shooting

1-4) 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 descend until the Lower Terminal Limit (LTL) is opened. When this occurs the normally open side of LTL makes and activates TC24 (IN1). The car stops and then runs UP to the lowest terminal landing.

Note: High speed can be activated during reset by constant pressure of the “B” key of the P-Tool.

- **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 1:** Emergency Lowering will only operate if the required ancillary components are installed
 - **Note 2:** The “BZ” output is disabled once the car reached the lower terminal floor.
 - **Note 3:** The “EL” output will remain active until normal power is restored or the back up power supply is exhausted.
 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:** A reset must be performed to return the car to normal operation.

1-4) 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. Floor Re-Assignments:

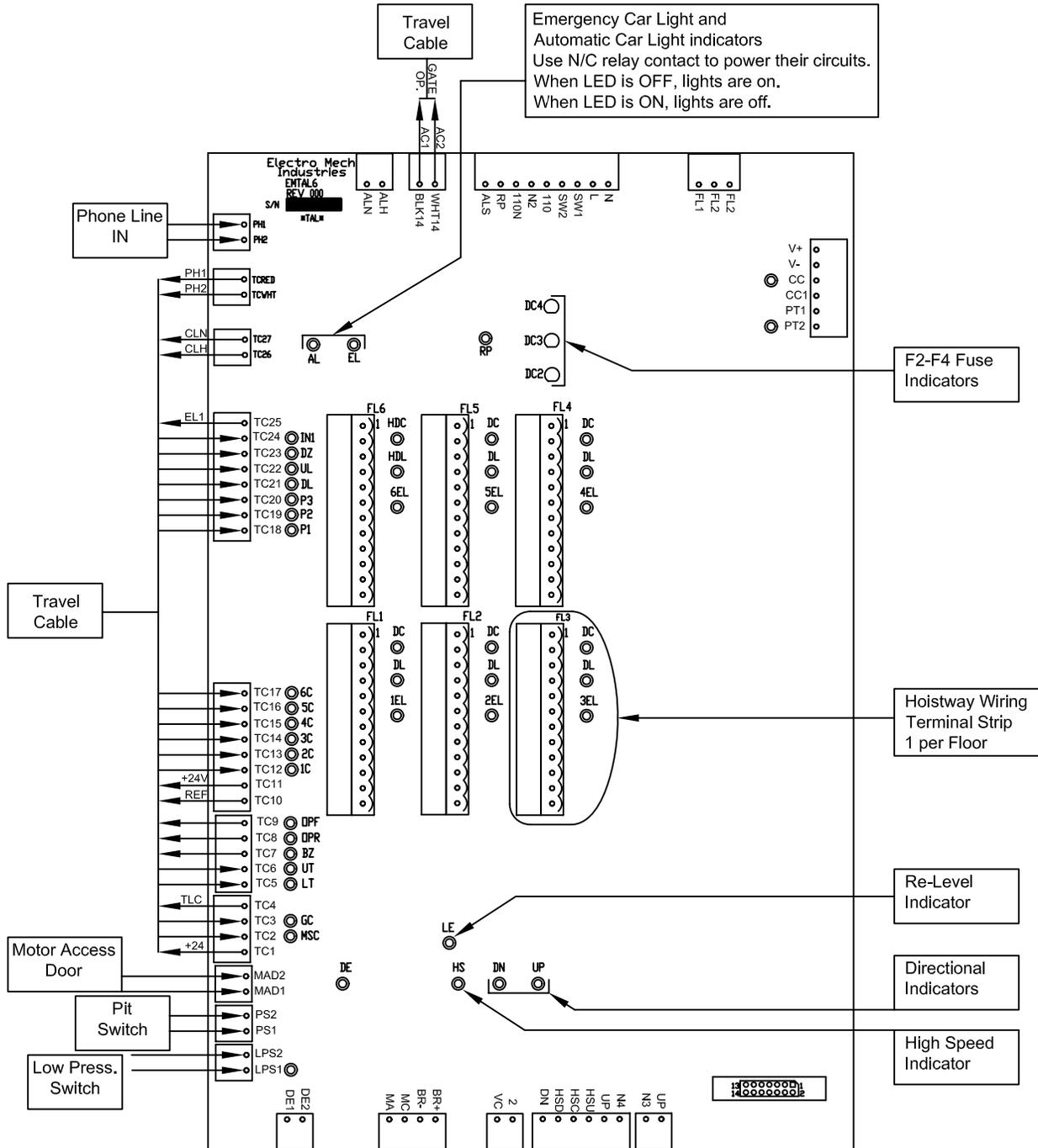
This feature allows for separate call(s), door lock and gate operation on pass through installations. The maximum number of openings is six. The best way to describe this feature is by the following example: Number of Stops = 4 with rear openings on floors 2 & 4. In the parameters: Number of Floors =4, Call 5 Assignment=2 and Call 6 Assignment=4.

Floor 2 Rear: Car call would connect to "TC16". All hoistway wiring would be connected to FL5 (J27). If an auto gate is used, parameter "Floor 5 Gate=R". When 5C is activated the car will move to floor 2 and open the rear door only.

Floor 4 Rear: Car call would connect to "TC17". All hoistway wiring would be connected to FL6 (J28). If an auto gate is used, parameter "Floor 6 Gate=R". When 6C is activated the car will move to floor 4 and open the rear door only.

1-5) 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.

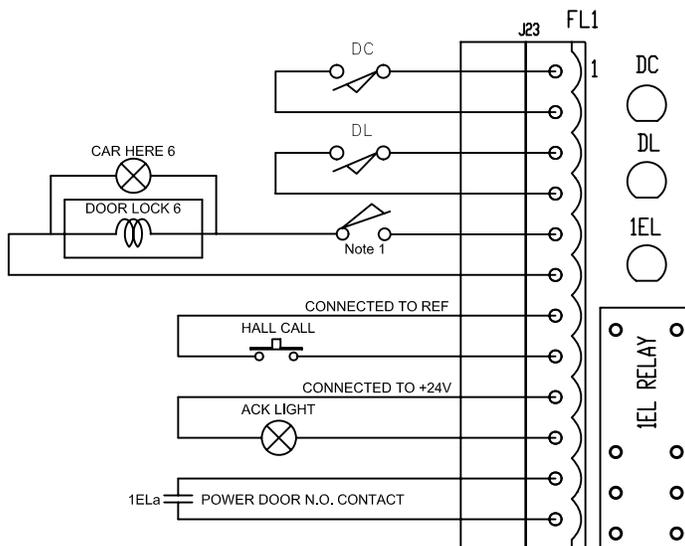


1-6) WIRING INFORMATION:

1. **Schematic Drawings:** (Refer to the drawings with the SCH suffix) These drawings show a system with all features and control options that are available with the 6M2 controller.
2. **Hook up Drawings:** (Refer to the drawings with the FLD suffix) These drawings show a system with all features and control options that are available with the 6M2 controller.
3. **Travel Cable Requirements:**
27-18AWG conductors, 1-BLK & WHT 14AWG, 1-Twisted pair RED & WHT
4. **Hoistway Cable:**
 - * **Requirements:** Qty:12, 18AWG Stranded conductors per Floor
 - * 16 strands / 30AWG
 - * 300V Minimum Insulation rating)

NOTE: DO NOT USE "THERMOSTAT" WIRE

- * **Connections:** The 6M2 controller is set up on a "home run" principle. Each floor has a 12 position terminal strip and LED indicators for ease of installation and troubleshooting. The following is an example of a "Floor Terminal Strip":



Note 1:

- A. Recommended for all installations using electric locks
- B. Required by NY state when using electric locks
- C. Switch is activated by a car mounted cam

- ° **Note:** The entrance points for all field wiring should be determined and knockouts installed with the sub-panel removed from the enclosure. This eliminates the possibility of metal shavings dropping into the controls. If you do not remove the sub-panel, you must take adequate measures to protect it from metal shavings.

2-1) CONNECTING P-TOOL

*** WARNING ***

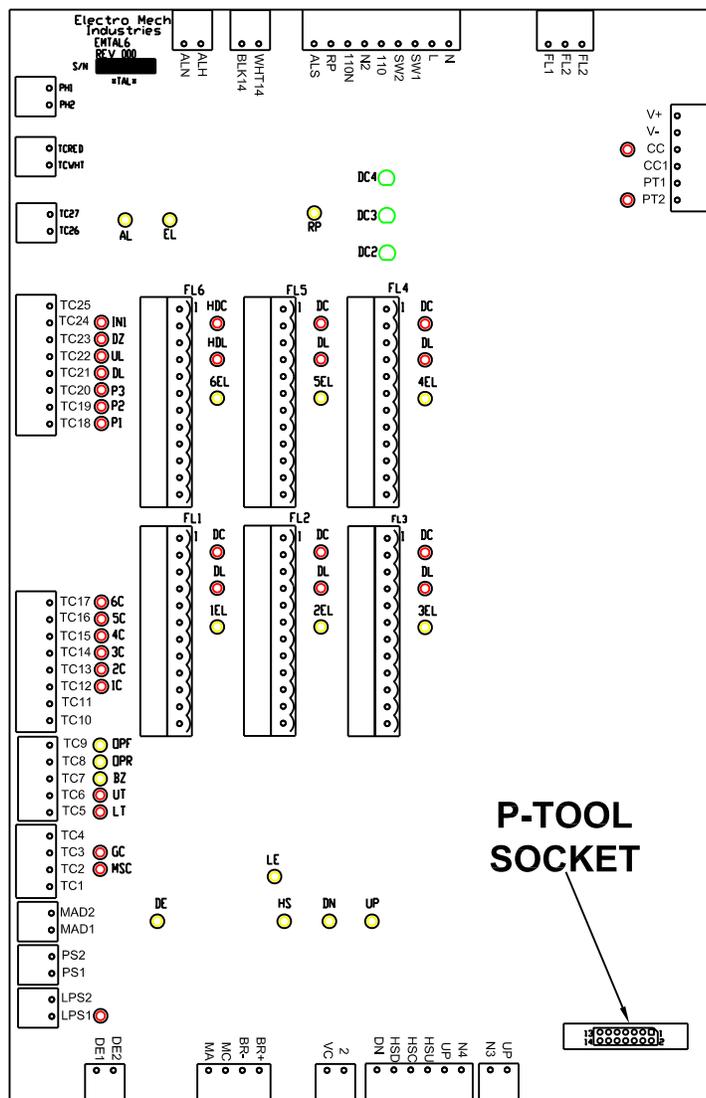
USE OF THE PROGRAM TOOL IS FOR PROFESSIONAL ELEVATOR TECHNICIANS ONLY!

CONNECTING THE P-TOOL TO THE CONTROL BOARD

1. Socket position is on lower right side 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)



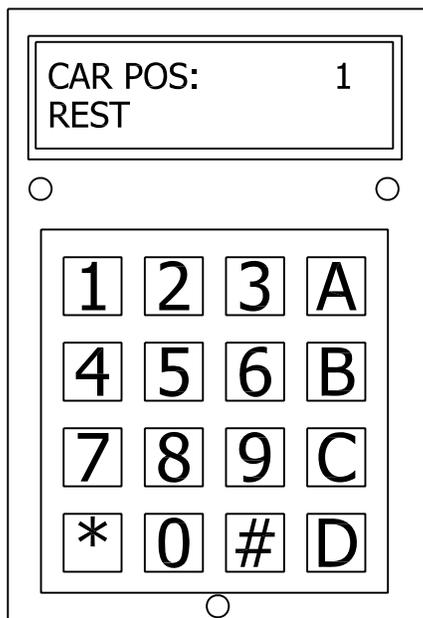
2-2) PROGRAMMING TOOL FUNCTIONS

The Programming 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 unit while in Temporary Run Mode

Note: When using the P-Tool in the program mode, the Elevator will not respond to Calls

Note: You can not enter the Program mode if the unit is running. The unit must be "at rest".



NORMAL DISPLAY:
TOP LINE = CAR POSITION
BOTTOM LINE = CAR STATUS

HOT KEY FUNCTIONS:
(*) - RESET
(A) - VIEW MENU

MENU OPTIONS:

1-NORMAL: DISPLAYS THE CARS' POSITION AND STATUS

2-PROGRAM: ALLOWS YOU TO EDIT SYSTEM PARAMETERS

3-LOG: VIEW THE LAST 20 EVENTS

4-COUNT: THREE COUNTERS ARE PROVIDED. TOTAL, TRIP AND RE-LEVEL

2-3) PROGRAM MODE

CAR POS: 1 REST	PRESS (A) TO VIEW THE MENU	ONCE IN PRORAMMING MODE: TO MAKE A CHANGE PRESS THE KEY FOR THE DESIRED NUMBER AND PRESS THE (#) KEY TO ACCEPT THE CHANGE.
NORM (1) PROG (2) LOG (3) COUNTER (4)	PRESS (2) TO VIEW OR CHANGE PROGRAMMING	
Password Then # Prog:	TYPE IN THE PASSWORD THEN PRESS THE (#) KEY FACTORY DEFAULT: 1,2,3,4,5	(A) TO RETURN TO THE MAIN MENU (B) TO SCROLL UP (C) TO SCROLL DOWN (D) TO CLEAR THE CURRENT VALUE. (#) TO ACCEPT THE CHANGE (*) TO PERFORM A RESET
Number of Floors (6)	TYPE IN THE DESIRED NUMBER OF FLOORS AND PRESS # (ADJUSTABLE FROM 2 - 4)	
Automatic PB (0)No (1)Yes (1)	SELECT NO IF CONSTANT PRESSURE OPERATION IS DESIRED.	
Hydraulic App (1) (0)NO (1)YES	IF DRIVE SYSTEM IS HYDRAULIC SELECT "YES" OTHERWISE SELECT "NO" IF "NO" IS SELECTED, RE-LEVELING IS DISABLED	
Delay Up Stop X 0.01sec (000)	TYPE IN THE TIME AND PRESS # TO SET THE TIME THAT THE MOTOR WILL CONTINUE TO RUN AFTER "UL" DROPS OUT. ALLOWS CAR TO STOP HIGHER IN THE DEAD ZONE. (ADJUSTABLE 0-200 X10ms 000 = DISABLED)	
Run Timer (090) SEC	TYPE IN TIME AND PRESS # TO SET THE MAXIMUM RUN TIME (ADJUSTABLE FROM 30 - 180 SECONDS)	
Car Light Timer (01)Minute	TYPE IN THE TIME AND PRESS # TO SET THE TIME THE CAR LIGHT SHALL REMAIN ON AFTER THE COMPLETION OF A CALL (1-10 MINUTES)	
Non-interference Timer (02) Sec	TYPE IN THE TIME AND PRESS # TO SET THE TIME BEFORE A NEW CALL CAN BE ACCEPTED (2-60 SEC)	
Car Call Cancel Timer (10) Sec	TYPE IN THE TIME AND PRESS # TO SET THE TIME AFTER WHICH THE CALL WILL BE DROPPED IF THE CAR IS UNABLE TO RESPOND (ADJUSTABLE 0 - 60 SECONDS)	

2-3) PROGRAM MODE (continued)

NO	Automatic Gate (1)Yes (0)No (0)	SELECT YES AND PRESS # IF YOU ARE USING AUTOMATIC GATE OPERATOR(S)
	Floor 1 Gate (1) (1)F (2)R (3)F+R	TYPE IN THE NUMBER REPRESENTING THE FLOOR 1 GATE ORIENTATION AND PRESS #
	Floor 2 Gate (1) (1)F (2)R (3)F+R	TYPE IN THE NUMBER REPRESENTING THE FLOOR 2 GATE ORIENTATION AND PRESS #
	Floor 3 Gate (1) (1)F (2)R (3)F+R	TYPE IN THE NUMBER REPRESENTING THE FLOOR 3 GATE ORIENTATION AND PRESS #
	Floor 4 Gate (1) (1)F (2)R (3)F+R	TYPE IN THE NUMBER REPRESENTING THE FLOOR 4 GATE ORIENTATION AND PRESS #
	Floor 5 Gate (1) (1)F (2)R (3)F+R	TYPE IN THE NUMBER REPRESENTING THE FLOOR 3 GATE ORIENTATION AND PRESS #
	Floor 6 Gate (1) (1)F (2)R (3)F+R	TYPE IN THE NUMBER REPRESENTING THE FLOOR 4 GATE ORIENTATION AND PRESS #
	Gate Open Timer (15) Sec	TYPE IN THE TIME AND PRESS # TO SET THE TIME THE GATE(S) HOLD OPEN IN RESPONSE TO A CALL. ENTERING "0" WILL HOLD THE GATE(S) OPEN UNTIL A CALL IS PLACED. (ADJUSTABLE 0-240 SECONDS)
	Gate Re-open Timer (10) Sec	TYPE IN THE TIME AND PRESS # TO SET THE TIME FOR THE GATE(S) TO HOLD OPEN IN RESPONSE TO A RE-OPEN COMMAND OR A CALL FROM THE SAME FLOOR (ADJUSTABLE 5-60 SECONDS)
	G&D Timer Cancel (1)Yes (0)No (1)	SELECT YES AND PRESS # TO CANCEL GATE/DOOR TIMERS WHEN A CALL IN ENTERED
0	Homing Floor (0)	TYPE IN THE FLOOR AND PRESS # TO SET THE HOME FLOOR (ADJUSTABLE FROM 0 - 4 0 = DISABLED)
	Homing Timer (05) Minute	TYPE IN THE TIME AND PRESS # TO SET THE TIME BEFORE THE CAR SHOULD HOME (ADJUSTABLE FROM 01 - 30 MINUTES)
	DC Timer (15)Sec	TYPE IN THE TIME AND PRESS # TO SET TIME THE SWING DOOR OPERATOR OUTPUT SHALL REMAIN ACTIVE AFTER GATE STARTS TO CLOSE (ADJUSTABLE 0-60 SEC 00 = OUTPUT REMAINS ACTIVE UNTIL A CALL IS PLACED)

2-3) PROGRAM MODE (continued)

Short Floors 1/2 (0)No (1)Yes (0)	SELECT YES AND PRESS # TO INHIBIT HIGH SPEED IN BOTH DIRECTIONS WHEN RUNNING BETWEEN FLOORS 1 TO 2 MIN FLOOR DISTANCE IS 6" FOR APB AND 13" FOR CP
Short Floors 2/3 (0)No (1)Yes (0)	SELECT YES AND PRESS # TO INHIBIT HIGH SPEED IN BOTH DIRECTIONS WHEN RUNNING BETWEEN FLOORS 2 TO 3 MIN FLOOR DISTANCE IS 6" FOR APB AND 13" FOR CP
Short Floors 3/4 (0)No (1)Yes (0)	SELECT YES AND PRESS # TO INHIBIT HIGH SPEED IN BOTH DIRECTIONS WHEN RUNNING BETWEEN FLOORS 3 TO 4 MIN FLOOR DISTANCE IS 6" FOR APB AND 13" FOR CP
Short Floors 4/5 (0)No (1)Yes (0)	SELECT YES AND PRESS # TO INHIBIT HIGH SPEED IN BOTH DIRECTIONS WHEN RUNNING BETWEEN FLOORS 4 TO 5 MIN FLOOR DISTANCE IS 6" FOR APB AND 13" FOR CP
Short Floors 5/6 (0)No (1)Yes (0)	SELECT YES AND PRESS # TO INHIBIT HIGH SPEED IN BOTH DIRECTIONS WHEN RUNNING BETWEEN FLOORS 5 TO 6 MIN FLOOR DISTANCE IS 6" FOR APB AND 13" FOR CP
Call But. Fault 0-No 1-A 2-U (2)	No: WILL DISABLE THIS FEATURE A: WILL FLASH ALL CODES TO THE CALL BUTTON LIGHTS U: WILL FLASH ONLY THOSE CODES WHICH ARE USER CORRECTABLE
Auto Shutdown Counter X10(000)	TYPE IN THE NUMBER AND PRESS # TO SET THE NUMBER TRIPS BEFORE THE ELEVATOR IS DISABLED (ADJUSTABLE 0 - 999 0 = DISABLED) THIS FEATURE WILL BE DISABLED AFTER FOUR ACTIVATIONS
CALL 3 ASSIGNMENT (3)	TYPE IN THE FLOOR NUMBER WHICH THE CAR WILL RUN TO WHEN THIS CALL IS PLACED. THE FLOOR 3 DOOR SETTINGS WILL APPLY WHEN THIS IS USED. (THIS PARAMETER DOES NOT SHOW UP WHEN THE "NO FLOORS" >= 3)
CALL 4 ASSIGNMENT (4)	TYPE IN THE FLOOR NUMBER WHICH THE CAR WILL RUN TO WHEN THIS CALL IS PLACED. THE FLOOR 4 DOOR SETTINGS WILL APPLY WHEN THIS IS USED. (THIS PARAMETER DOES NOT SHOW UP WHEN THE "NO FLOORS" >= 4)
CALL 5 ASSIGNMENT (5)	TYPE IN THE FLOOR NUMBER WHICH THE CAR WILL RUN TO WHEN THIS CALL IS PLACED. THE FLOOR 5 DOOR SETTINGS WILL APPLY WHEN THIS IS USED. (THIS PARAMETER DOES NOT SHOW UP WHEN THE "NO FLOORS" >= 5)
CALL 6 ASSIGNMENT (6)	TYPE IN THE FLOOR NUMBER WHICH THE CAR WILL RUN TO WHEN THIS CALL IS PLACED. THE FLOOR 6 DOOR SETTINGS WILL APPLY WHEN THIS IS USED. (THIS PARAMETER DOES NOT SHOW UP WHEN THE "NO FLOORS" = 6)
Modify Password (1)Yes (0)No (0)	TYPE IN C TO KEEP THE PASSWORD AND VIEW NEXT PARAMETER TYPE IN 1 AND PRESS # TO CHANGE THE PASSWORD NOTE: PASSWORD MUST BE 5 DIGITS (NUMARICAL ONLY)

2-4) FAULT LOG MODE

CAR POS: 1
REST

PRESS (A) TO VIEW THE MENU

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

PRESS (3) TO VIEW THE LOG

EVENT DESCRIPTION
2UL

THE FIRST LINE IS A DESCRIPTION OF THE EVENT
2U=EVENT OCCURED AT 2ND FL WHILE TRAVELING UP
L= LAST EVENT

NO EVENTS

(C) VIEWS PREVIOUS EVENT UNTIL "NO EVENTS" IS SEEN

ONCE IN LOG MODE:

THE LOG STORES 20 ERRORS IN A LAST IN FIRST OUT FORMAT.

(A) TO RETURN TO THE MAIN MENU

(B) TO VIEW LATER EVENT

(C) TO VIEW EARLIER EVENT

(D) TO CLEAR THE LOG

Note: PASSWORD IS REQUIRED TO CLEAR LOG

(*) TO PERFORM A RESET

2-5) VIEW & CLEAR COUNTERS

CAR POS: 1
REST

PRESS (A) TO VIEW THE MENU

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

PRESS (4) TO VIEW COUNTERS

TRIP: 0
TOTAL: 0

THE "TRIP" AND "TOTAL" RUN COUNTERS ARE DISPLAYED

UP LEVELING
0

(C) TO VIEW UP RE-LEVELING COUNTER

ONCE IN COUNTER MODE:

THE SYSTEM HAS THREE COUNTERS.

TRIP: INCREMENTS EACH TIME THE CAR MOVES IN RESPONSE TO A CALL. RESETTABLE

TOTAL: SAME AS TRIP BUT NOT RESETTABLE

UP LEVELING: INCREMENTS EACH TIME THE CAR MOVES UP WITHOUT A CALL. RESETTABLE

(A) TO RETURN TO THE MAIN MENU

(B) TO VIEW PREVIOUS COUNTERS

(C) TO VIEW NEXT COUNTER

(D) TO CLEAR THE COUNTERS

Note: PASSWORD IS REQUIRED TO CLEAR COUNTERS

(*) TO PERFORM A RESET

2-6) PARAMETER SETTINGS

Parameter	Board Default	Job Settings	Job Settings
Password:	12345		
Number of Floors	6		
Single Automatic PB	YES		
Hydraulic App	YES		
Delay Up Stop	0		
Run Timer	90		
Car light Timer	1		
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		
Floor 5 Gate	1		
Floor 6 Gate	1		
Gate Open Timer	15		
Gate Re-open Timer	10		
G&D 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		
Short Floor 4-5	NO		
Short Floor 5-6	NO		
Call Button Fault	U		
Auto shut down counter	0		
Call 3 Assignment	3		
Call 4 Assignment	4		
Call 5 Assignment	5		
Call 6 Assignment	6		

3-1) 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 PS1 to TC4
- From TC4 to TC5
- From TC5 to TC6

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

- Hold keys 1,5 and 0 on the P-TOOL, then power up
- Inputs C2, C4 and C6 activated (low), then power up

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

- "A" key of PTOOL
- While input 5C is activated (low)

The platform will travel DOWN SLOW by constant pressure to either of the following:

- "D" key of PTOOL
- While input 1C is activated (low)

The platform will travel in HIGH SPEED in either direction by constant pressure to either of the following:

- "B" key of PTOOL
- While input 3C is activated (low)

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

4-1) 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. You will see a "V" followed by an identifier (1.3, 1.4 etc).

5-1 SELECTOR DESCRIPTION OF OPERATION

The EMTAL6 Controller board requires six selector inputs for proper operation:

LU = Level Up	P1 = Binary Position 1
LD = Level Down	P2 = Binary Position 2
DZ = Door Zone	P3 = Binary Position 3

The inputs are 24VDC active HIGH; meaning that +24VDC must be present at the appropriate controller terminal to turn on the input.

Up Travel Logic Sequence:

- When an up call is registered, the “UP”, “RP” and “HS” computer outputs will be activated.
- Each time **UL** is activated along with **DZ** the internal floor counter will increment one level
- When the internal floor counter increments to the landing where the call is registered, the “HS” computer output will deactivate and the car will continue up the hoistway at leveling speed.
 - To stop the car after it is running in leveling speed **UL** turns off while **DZ** remains on. The “UP” computer output is deactivated then after 3 seconds “RP” computer output is deactivated.

Down Travel Logic Sequence:

- When a down call is registered, the “DN”, “RP” and “HS” computer outputs will be activated.
 - Each time **DL** is activated along with **DZ** the internal floor counter will decrement one level
 - When the internal floor counter decrements to the landing where the call is registered, the “HS” computer output will deactivate and the car will continue down the hoistway at leveling speed.
 - To stop the car after it is running in leveling speed **DL** turns off while **DZ** remains on. The “DN” computer output is deactivated then after 3 seconds “RP” computer output is deactivated.
- **NOTE:** If the Selector binary position outputs do not match the internal floor counter, the car will stop and return to the last known floor.

Re-leveling (Hydro Only)

After the car has stopped at floor level in response to a call, the car will re-level up when **UL** and **DZ** are on together, and will stop when **LU** is off. The car will re-level down if **DL** and **DZ** are on together, and will stop when **DL** is off. Releveling is deactivated for single speed and VVVF winding drums.

Positive Encoding:

The EMTAL6 Controller board achieves positive encoding via three independent Binary positioning magnets. Door Lock outputs will be activated only when the correct positioning magnet(s) is/are present. If during a run the controller sees an incorrect binary input, the car will stop and return to the last known floor.

Short Floors: The minimum travel distance is 12 inches (with the standard EMI Selector).

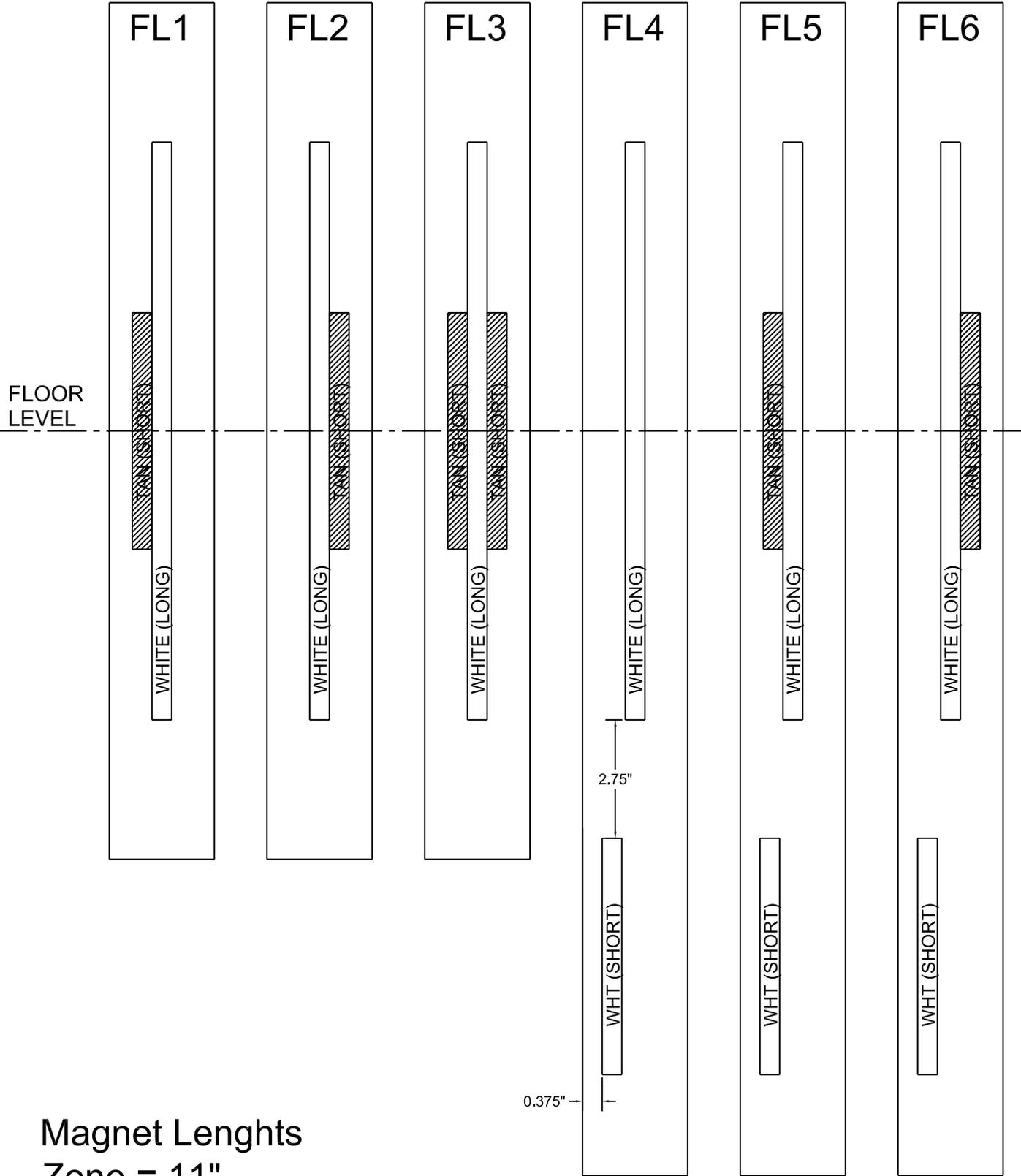
Short Floor Up Logic Sequence from floor A to floor B:

- When an up call is registered, the “UP” and “RP” computer outputs will be activated.
- Before the car moves the computer will have the following signals from the selector: **DZ** on, **PA** on.
- Once the car moves away from floor A, the computer will see the following selector signals:
 - **DL** on, **UL** on, **PA** off, **DZ** off, **DZ** on, **PB** on, **DL** off then **UL** off.
 - Stop the car when **UL** turns off. The “UP” computer output is deactivated then after 3 seconds “RP” computer output is deactivated.

Short Floor Down Logic Sequence from floor B to floor A:

- When a down call is registered, the “DN” and “RP” computer outputs will be activated.
- Before the car moves the computer will have the following signals from the selector: **DZ** on, **PB** on.
- Once the car moves away from floor B, the computer will see the following selector signals:
 - **UL** on, **DL** on, **PB** off, **DZ** off, **DZ** on, **PA** on, **UL** off then **DL** off.
- Stop the car when **DL** turns off. The “DN” computer output is deactivated then after 3 seconds “RP” computer output is deactivated.

5-2) MAGNET CONFIGURATION



Magnet Lengths
 Zone = 11"
 Position = 5.5"

5-3 SELECTOR SEQUENCE REQUIREMENTS

RUNNING UP						
CAR LOCATION	DZ	UL	DL	P1	P2	P3
@ FL 1	X			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	X	
@ FL 3	X	O		X	X	
	X		X	X	X	
	X		X	O	O	
	O		X			
ALL OFF			O			
		X				
	X	X				
	X	X				X
@ FL 4	X	O				X
	X		X			X
	X		X			O
	O		X			
ALL OFF			O			
		X				
	X	X				
	X	X		X		X
@ FL 5	X	O		X		X
	X		X	X		X
	X		X	O		O
	O		X			
ALL OFF			O			
		X				
	X	X				
	X	X			X	X
@ FL 6	X	O			X	X

X= LED ON
O= LED HAS TURNED OFF

RUNNING DOWN						
CAR LOCATION	DZ	UL	DL	P1	P2	P3
@ FL 6	X				X	X
	X	X			X	X
	X	X			O	O
	O	X				
ALL OFF		O				
			X			
	X		X			
	X		X	X		X
@ FL 5	X		O	X		X
	X	X		X		X
	X	X		O		O
	O	X				
ALL OFF		O				
			X			
	X		X			
	X		X			X
@ FL 4	X		O			X
	X	X				X
	X	X				O
	O	X				
ALL OFF		O				
			X			
	X		X			
	X		X	X	X	
@ FL 3	X		O	X	X	
	X	X		X	X	
	X	X		O	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

5-4) LIMIT SWITCH INSTALLATION

Misc. Hardware Contents:

- 2- Left handed Cams & Securing Plates
- 1- Right handed Cam & Securing Plate
- 6- 10-32 Screws

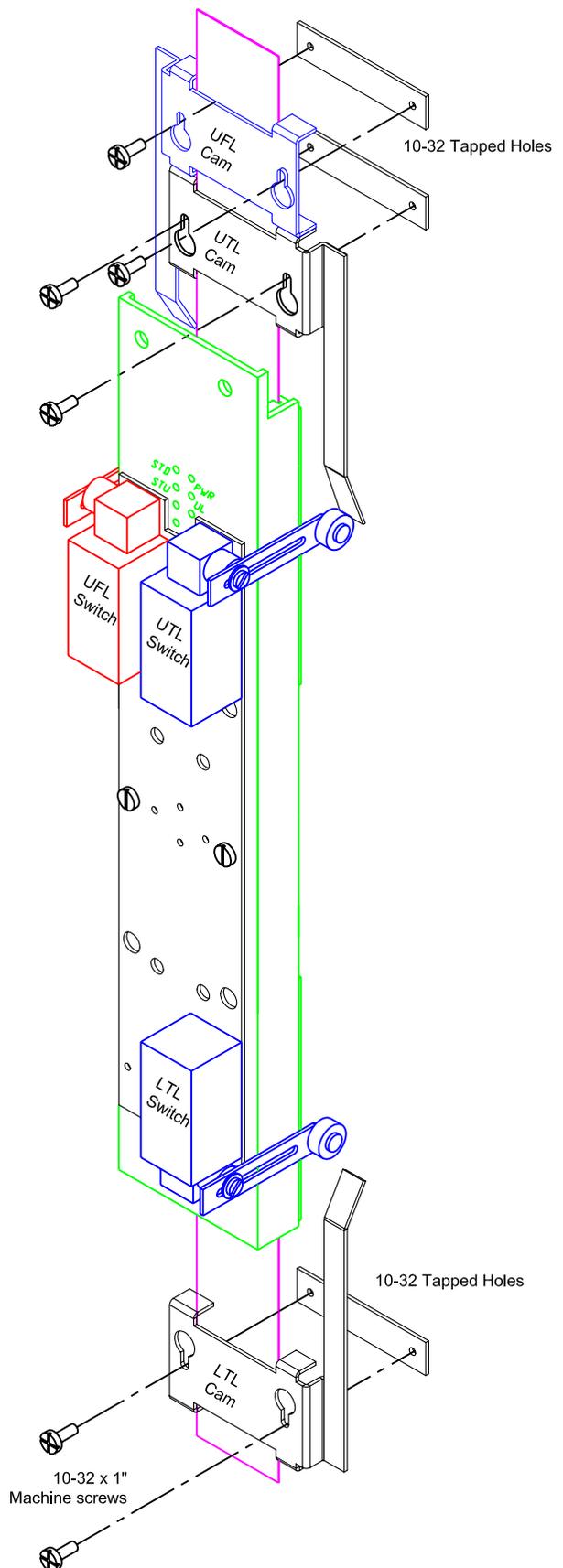
Installation Procedure:

1. Rotate Switch arms 90 degrees towards back of Selector Head
2. Secure LTL Cam to 2" tape using 10-32 Screws
3. Secure UTL Cam to 2" tape using 10-32 Screws
4. Secure UFL Cam above UTL Cam using 10-32 Screws
5. Connect wire harness to Car Top Box

Wire Color Codes & CTB Connections:

CTB Term.	Wire Color	Function
UTL	RED	UPPER TERM. LIMIT
LTL	YEL	LOWER TERM. LIMIT
TLC	BLK	TERM. LIMIT COMMON
LT(NO)	WHT	LT NO CONTACT
FL1	ORG	FINAL LIMIT
FL2	ORG	FINAL LIMIT

Note: Length of all wires is 6 feet



6-1) PRE-OPERATIONAL SAFETY CHECKS

This process will confirm that all field wiring has been 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
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., Motor Access Door, UFL, 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, TC5).
 - a. The P-Tool will indicate “Running Down” but the car must stop.
 - b. TC24 (IN1) must activate.
2. Install a temporary jumper between TC4 to TC5, 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, TC6).
 - a. The P-Tool will indicate “Running UP” but the car must stop.
4. Install a temporary jumper between TC4 to TC6, UT activates. Run car UP.
 - a. MSC must deactivate and the car must stop.
 - b. Remove the Temporary Jumper
5. Confirm Selector signal sequence: Refer to Section 5-3 for the required selector sequence. Confirm sequence from lower terminal floor to upper terminal floor in both directions.
 - **Note: The “B” Key on the P-Tool Activates High Speed in Temp Mode**

6-3) PROGRAM JOB SPECIFIC PARAMETERS

1. Power down controller, remove J16 from Logic board (MAD1 & MAD2)
2. Power up controller and follow instructions of Section 2-3
 - a. Record job parameter on “Parameter Log Sheet” Section 2-6
3. After all job specific parameters have been entered:
 - a. Clear the LOG
 - b. Insert J16
4. Reset Elevator

- **Note: The “B” Key on the P-Tool Activates High Speed during Reset**

7-1) 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:

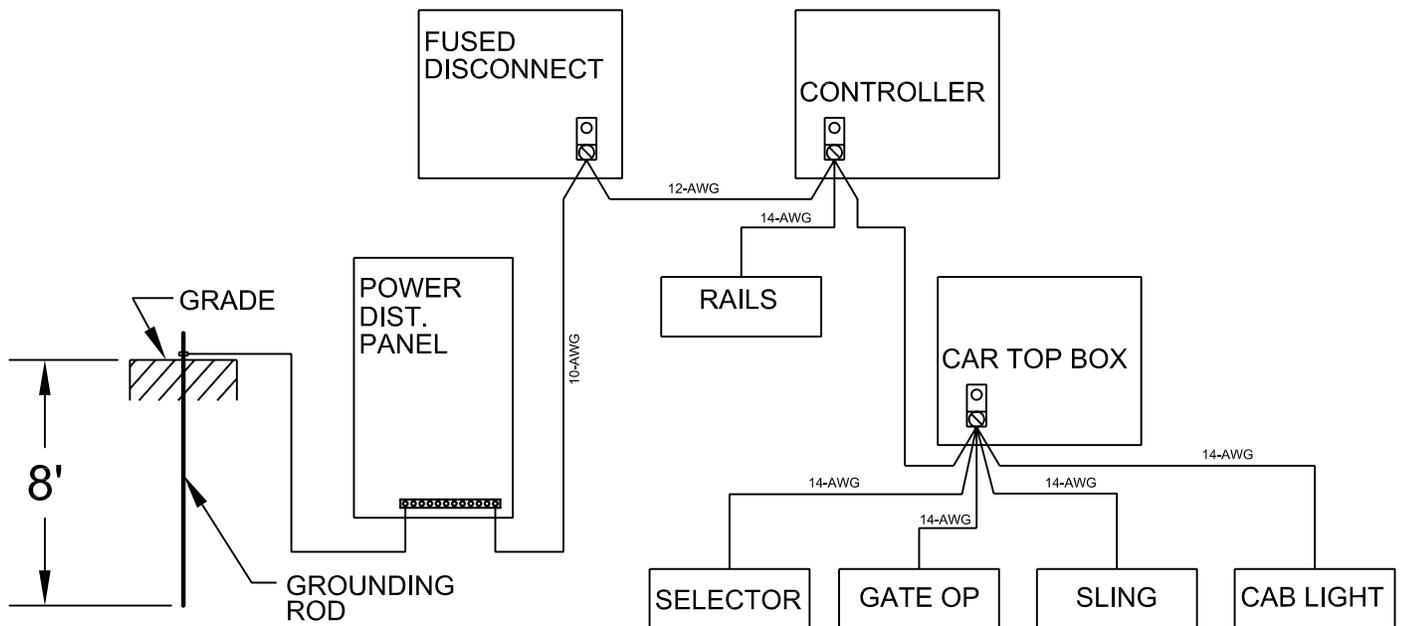
- * Improper grounding of the residence
- * Improper or nonexistent grounding of the elevator system

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

7-2) BACK EMF PROTECTION

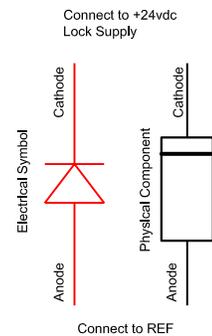
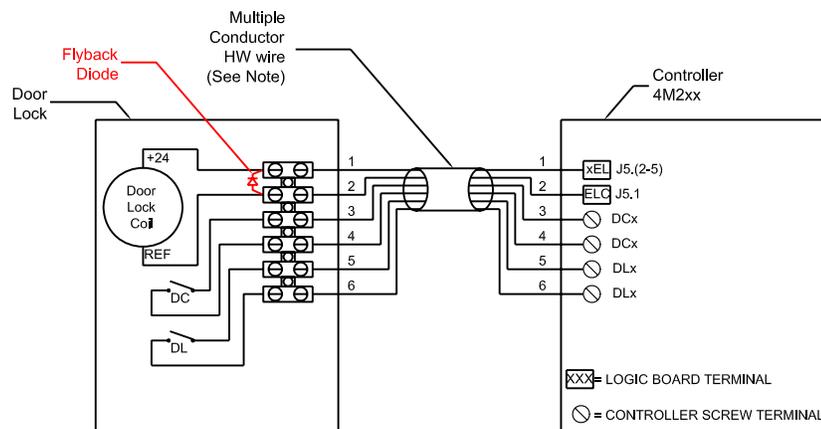
Back EMF (CEMF) is a large voltage spike with opposite polarity which is generated when an inductive load is de-energized. The amplitude of this voltage spike is dependent on the following factors:

- * 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 doors 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

7-3) 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) 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 until the back up power supply is exhausted.
- b. Remove jumper from SW1 and SW2.