MOTION CONTROL ENGINEERING, INC.
11354 WHITE ROCK ROAD
RANCHO CORDOVA, CA 95742
TELEPHONE (916)463-9200 FAX (916)463-9201

CONTROLLER INSTALLATION MANUAL

VVMC-1000 Series Turbo DF with Sweo SCR Drive

Revision F.1
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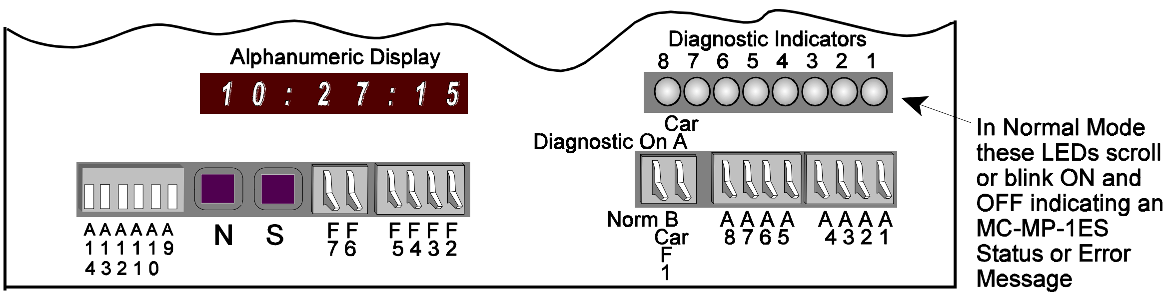
ADDENDUM
MC-MP-1ES STATUS AND ERROR MESSAGES

The following Tables list all the status and error messages available for display on the MC-MP-1ES. **Some of these messages apply only to specific types of controllers and may not appear on this controller**. For more information on the MC-MP-1ES status and error messages see the HUMAN INTERFACE and/or the TROUBLESHOOTING section(s) of this manual.

0.1 DIAGNOSTIC INDICATORS

The Diagnostic Indicators are located on the front of the Computer Swing Panel.



During normal operation these lights scan from right to left (indicating that the MP program is looping properly) or flash ON and OFF to indicate an error or status condition. If the car is connected to a Group Dispatcher in a multi-car group system, the lights will scan from right to left, then left to right, indicating proper communication between the car controller and the group dispatcher. When troubleshooting, pay special attention to these indicators. The diagnostic indicators flash ON and OFF to indicate a status or error message which often points to the source of a problem. Table 0.1 provides a complete listing of the MC-MP-1ES Status and Error Messages, and Table 0.2 provides a description of the cause and recommended response. Table 0.3 describes the software options.

More than one error or status condition may exist simultaneously, but the diagnostic indicators can display only one message at a time. The message considered of highest priority displays first. For example, if the car is on Independent Service *and* the Safety Circuit is open, all the lights will flash, indicating that the Safety String is open. Once the Safety String problem is corrected, the Diagnostic Indicators will flash the message for Independent Service. When Independent Service is turned OFF, the Diagnostic Indicators will scan normally.

TABLE 0.1 MC-MP-1ES Status and Error Messages **❍ = LED off** **● = LED blinking**

Hex	LEDs	MODE	MEANING
	Single LED scanning		Normal Operation, no errors or messages
01	❍ ❍ ❍ ❍ ❍ ❍ ❍ ●	Normal	Earthquake normal reduced speed mode (EQI is high, CWI is low)
02	❍ ❍ ❍ ❍ ❍ ❍ ● ❍	Normal	Power-up shut down due to earthquake (CWI and/or EQI high at power up)
03	❍ ❍ ❍ ❍ ❍ ❍ ● ●	Normal	Attendant Service Operation (ATS input activated)
07	❍ ❍ ❍ ❍ ❍ ● ● ●	Normal	The Hall Call Bus is disconnected (no power to hall call circuits, check fuse)
OF	❍ ❍ ❍ ❍ ● ● ● ●	Normal	The Car Call Bus is disconnected (no power to car call circuits)
11	❍ ❍ ❍ ● ❍ ❍ ❍ ●	Normal	The speed governor switch is open (overspeed governor has activated)
12	❍ ❍ ❍ ● ❍ ❍ ● ❍	Normal	Drive temperature sensor fault (DTS input is activated)
13	❍ ❍ ❍ ● ❍ ❍ ● ●	Learn	Car not at bottom landing (setup error)
14	❍ ❍ ❍ ● ❍ ● ❍ ❍	Learn	Car not on Level Up (setup error)

TABLE 0.1 MC-MP-1ES Status and Error Messages **❍ = LED off ● = LED blinking**

> **NOTE:** Some of these messages apply only to specific types of controllers and may not appear on this controller.

Hex	LEDs	MODE	MEANING
15	❍❍❍●❍●❍●	Learn	Car not on Inspection (setup error)
16	❍❍❍●❍●●❍	Learn	Car not below Door Zone (setup
17	❍❍❍●❍●●●	Learn	Car not on Level Down (setup error)
18	❍❍❍●●❍❍❍	Normal	Photo Eye Failure
1F	❍❍❍●●●●●	Normal	Timed out of service
20	❍❍●❍❍❍❍❍	Learn	Loss of IN during Learn (setup error)
22	❍❍●❍❍❍●❍	Learn	No response from Pattern Generator (setup error)
22	❍❍●❍❍❍●❍	Normal	Hoistway safety device activated (open)
23	❍❍●❍❍❍●●	Learn	PG error, loss of UP direction (setup error)
24	❍❍●❍❍●❍❍	Normal	Overload condition
29	❍❍●❍●❍❍●	Learn	Both leveling switches are ON (setup error)
32	❍❍●●❍❍●❍	Normal	Drive fault 1
33	❍❍●●❍❍●●	Normal	Brake Pick Failure (BPS input activated)
3C	❍❍●●●●❍❍	Normal	The Level Down computer input is ON.
3F	❍❍●●●●●●	Normal	Door Open Limit and Door Lock inputs are both ON.
42	❍●❍❍❍❍●❍	Normal	PG not ready
44	❍●❍❍❍●❍❍	Normal	Car safety device activated (open)
71	❍●●●❍❍❍●	Normal	Test Mode of Operation
72	❍●●●❍❍●❍	Normal	Drive Forced Shut Down (Drive fault 2)
7E	❍●●●●●●❍	Normal	The car expects a Security code to be entered
7F	❍●●●●●●●	Normal	The car is on Independent Service.
80	●❍❍❍❍❍❍❍	Normal	The car is on Inspection.
82	●❍❍❍❍❍●❍	Normal	Door lock contact failure
83	●❍❍❍❍❍●●	Normal	Door open limit failure
84	●❍❍❍❍●❍❍	Normal	Gate switch failure
85	●❍❍❍❍●❍●	Normal	Gate switch relay redundancy failure
86	●❍❍❍❍●●❍	Normal	Door lock relay redundancy failure
88	●❍❍❍●❍❍❍	Normal	In-car stop switch activated
C0	●●❍❍❍❍❍❍	Normal	The elevator is in Phase 2 of Fire Service.
C1	●●❍❍❍❍❍●	Normal	Retiring Cam protection timer elapsed
C2	●●❍❍❍❍●❍	Normal	Door close failure
C3	●●❍❍❍❍●●	Normal	The Level Up computer input is ON
C9	●●❍❍●❍❍●	Normal	Leveling sensor failure
CA	●●❍❍●❍●❍	Normal	Landing system redundancy failure
CB	●●❍❍●❍●●	Normal	Contactor proofing redundancy failure
CC	●●❍❍●●❍❍	Normal	Direction relay redundancy failure
CD	●●❍❍●●❍●	Normal	Inspection/leveling overspeed failure
CF	●●❍❍●●●●	Normal	Elevator shutdown switch or power transfer input active
DB	●●❍●●❍●●	Normal	Bottom Floor Demand or Top Floor Demand.
E0	●●●❍❍❍❍❍	Normal	The elevator is in Fire Service Phase 1 - (main)
E1	●●●❍❍❍❍●	Normal	Emergency Power Operation
E2	●●●❍❍❍●❍	Normal	Shutdown Operation (MGS input is high) - the car is recalled and shut down
E3	●●●❍❍❍●●	Normal	Car to Lobby function is active
E4	●●●❍❍●❍❍	Normal	Priority/Special/VIP Service Phase 1
E5	●●●❍❍●❍●	Normal	Priority/Special/VIP Service Phase 2
E7	●●●❍❍●●●	Normal	Heavy Load condition
E8	●●●❍●❍❍❍	Normal	Light Load condition
F0	●●●●❍❍❍❍	Normal	The elevator is in Fire Service Phase 1 - (alternate)
F1	●●●●❍❍❍●	Normal	Hospital Emergency Operation Phase 1.
F2	●●●●❍❍●❍	Normal	Hospital Emergency Operation Phase 2.
F3	●●●●❍❍●●	Normal	Door zone sensor failure (active state)
F4	●●●●❍●❍❍	Normal	Leveling sensor failure (active state)
F5	●●●●❍●❍●	Normal	Leveling sensor failure (inactive state)
F8	●●●●●❍❍❍	Normal	Motor Limit Timer (anti-stall timer) elapsed
F9	●●●●●❍❍●	Normal	Drive forced MLT
FA	●●●●●❍●❍	Normal	Insufficient Motor Field

TABLE 0.1 MC-MP-1ES Status and Error Messages ❍ = LED off ● = LED blinking

Hex	LEDs	MODE	MEANING
FC	●●●●●●❍❍	Normal	Earthquake Operation
FD	●●●●●●❍●	Normal	Failure to leave the floor
FE	●●●●●●●❍	Normal	Both the USD and the DSD inputs are active (open)
FF	●●●●●●●●	Normal	The Safety Circuit is open.

TABLE 0.2 MC-MP-1ES Status and Error Messages ❍ = LED off ● = LED blinking

LEDs	MEANING	PROBABLE CAUSE	NEEDED RESPONSE
❍❍❍❍❍❍❍● (01)	Earthquake Normal Operation	The car is allowed to run at reduced speed on Earthquake Normal Operation. (EQI is high, CWI is low; used for ANSI earthquake operation only.)	The elevator may be returned to normal service by means of momentary reset button on the earthquake board (HC-EQ2). This should be done by authorized personnel, after it has been determined that it is safe to do so. Should the system remain in this mode of operation after the reset button has been pressed, check the status of the EQI input.
❍❍❍❍❍❍●❍ (02)	Earthquake Power Up Operation	The CWI and/or EQI input was detected high at power up. (Used for ANSI Earthquake Operation only.)	The elevator may be returned to normal service by means of momentary reset button on the earthquake board (HC-EQ2). This should be done by authorized personnel, after it has been determined that it is safe to do so. Should the system remain in this mode of operation after the reset button has been pressed, check the status of the EQI and CWI inputs.
❍❍❍❍❍❍●● (03)	The car is on Attendant operation	The attendant service input (ATS) is activated.	Attendant service is maintained as long as the ATS input is activated, in the absence of any "emergency services" (e.g., fire service). Check the status of the ATS input, and determine if the status of the input is appropriate.
❍❍❍❍❍●●● (07)	The Hall Call Bus is disconnected	A problem in the wiring or fuses. There is no power to the Hall Call circuits on the HC-CIO board.	Check the Hall Call Bus fuse. Check the wires that go to the Hall Call Power inputs on the HC-CIO board in the controller.
❍❍❍❍●●●● (OF)	The Car Call Bus is disconnected	A problem in the wiring or fuses. There is no power to the Car Call circuits on the HC-CIO board.	Check the Car Call Bus fuse. Check the wires that go to the Car Call Power inputs on the HC-CIO board in the controller.
❍❍❍●❍❍❍● (11)	Speed governor activated	The overspeed governor has activated, opening the safety circuit.	Check the overspeed governor.
❍❍❍●❍❍●❍ (12)	Drive temperature sensor fault	The Drive Temperature Sensor (DTS) input is activated. This sensor monitors the temperature inside the IMC-S25 and IMC-G233 drive units.	Verify the temperature inside the drive unit. Check the fan on the drive unit. Check for a faulty temperature sensor inside the drive unit.
❍❍❍●●❍❍❍ (18)	Photo Eye Failure	Stuck photo eye input.	Check the photo eye circuitry and wires.
❍❍❍●●●●● (1F)	Timed out of service	The T.O.S. timer has expired. Can be caused by a faulty photo eye, call button or other door opening device.	The timer is used to take the car out of service when the car is held at one floor excessively. Typically this occurs when the doors are held open by continuous activation of the photo eye, a call button, or another reopening device. Check for proper operation of the devices mentioned.
❍❍●❍❍❍●❍ (22)	Hoistway safety device activated	One of the hoistway safety devices has activated, opening the safety circuit (e.g., pit stop switch, car and cwt buffers switches, up/down final limit switches).	Check all hoistway safety devices. Refer to controller wiring prints for applicable devices.
❍❍●❍❍●❍❍ (24)	Overload condition, car is overloaded	The Overload input (OLW) is activated, or perceived percentage of load in the car has exceeded the threshold value set for overload condition.	Discrete OLW input (wired to a load weigher contact): Check the status of the OLW input, and determine if the status of the input is appropriate relative to the load in the car. Analog load weigher: Check the perceived load percentage using the on-board diagnostic station. Determine if the value displayed (percentage) is appropriate relative to the load in the car.
❍❍●●❍❍●❍ (32)	Drive Fault 1	The heat sink inside the SCR (12-Pulse) drive has exceeded the allowed temperature.	Check the fans on the left hand side of the SCR drive. They normally run when the RE relay picks or the temperature on the heat sink reaches a certain threshold. If fuse FD1 inside the SCR drive opens, the fans will not operate. If the normally open auxiliary contact from the M-contactor (see job print page -SCR) does not make up, the fans will not operate when RE picks.
❍❍●●❍❍●● (33)	Brake Pick Failure	The car is shut down due to the BPS input being seen as activated during three consecutive runs indicating the brake is not fully picked. (BPS is high)	Check the brake pick switch for proper operation (the contact should open when the brake is fully picked). Check the status of the BPS input, and determine if the status of the input is appropriate (deactivated) when the brake is picked.
❍❍●●●●❍❍ (3C)	The Level Down computer input is ON	Comes on normally when the car is just above a floor. If the car is level with the floor and a message appears, it is usually the result of a switch or sensor problem.	Inspect the LD switch or sensor on the landing system and the placement of the landing system vane or magnet for that floor.

TABLE 0.2 MC-MP-1ES Status and Error Messages ❍ = LED off ● = LED blinking

LEDs	MEANING	PROBABLE CAUSE	NEEDED RESPONSE
❍❍●●●●●● (3F)	Door Open Limit and Door Lock inputs are both ON	A problem with DOL and/or DLK circuitry or wiring.	Inspect the Door Open Limit and the Door Lock circuitry and wiring.
❍●❍❍❍❍●❍ (42)	Pattern Generator not ready	PGU, DSR, EPR, and/or SPR status signals not active. Also, IBJ fault flag active.	Check for active status signals on PGU, DSR, EPR and SPR. Check for IBJ fault flag.
❍●❍❍❍●❍❍ (44)	Car safety device activated	One of the car safety devices has activated, opening the safety circuit (e.g., emergency exit contact, safety clamp switch, car-top emergency stop switch).	Check all car safety devices. Refer to controller wiring prints for applicable devices.
❍●●●❍❍❍● (71)	Test Mode of Operation	The TEST/NORM switch on the HC-RB4-SCRI board is in the TEST position.	Check the TEST/NORM switch on the HC-RB4-SCRI board.
❍●●●❍❍●❍ (72)	Drive Forced Shutdown (Drive Fault 2)	At least, one of the fuses inside the SCR drive has opened or the contacts of the M-contactor (SCR drive) did not make up.	Check the fuses inside the SCR (12-pulse) drive, and the operation of the M-contactors.
❍●●●●●●❍ (7E)	Car expects Security code	MCE Security has been initiated.	Enter floor passcode in the C.O.P. within 10 seconds. See Section 5.4.2 or the appropriate security appendix for instructions on how to program or change security passcodes.
❍●●●●●●● (7F)	The car is on Independent Service	The Independent switch inside the car has been turned on, or the TEST/NORMAL switch on the Relay board is in the TEST position.	Check the Independent Service switch inside the car. Inspect the TEST/NORMAL switch on the Relay board on the controller.
●❍❍❍❍❍❍❍ (80)	The car is on Inspection	The inspection computer input (IN) is deactivated.	Check all of the inspection switches and associated wiring.
●❍❍❍❍❍●❍ (82)	Door Lock Contact Failure	A door lock contact appears to have failed in the closed state.	Ensure that, with the doors open, there is no power on the DLS input (DLS must be low when DCL is high).
●❍❍❍❍❍●● (83)	Door Open Limit Failure	A door open limit contact appears to have failed in the open state.	Ensure that, with the doors closed, there is power on the DOL input (DOL must be high when DLS and/or GS is high).
●❍❍❍❍●❍❍ (84)	Gate Switch Failure	A car gate contact appears to have failed in the closed state.	Ensure that, with the doors open, there is no power on the GS input (GS must be low when DCL is high).
●❍❍❍❍●❍● (85)	Gate Switch Relay Redundancy Failure	A car gate switch relay appears to have failed in the "picked" state.	Ensure that, with the car gate open, there is no power on the RGS input. If the RGS input is high, a gate switch relay appears to be "picked".
●❍❍❍❍●●❍ (86)	Door Lock Relay Redundancy Failure	A door lock relay appears to have failed in the "picked" state.	Ensure that, with the hoistway doors open, there is no power on the RDLS (or RDLSR, if rear doors) input. If RDLS input is high, a door lock relay appears to be "picked".
●❍❍❍●❍❍❍ (88)	In-car stop switch activated	The in-car stop switch has been pulled, opening the safety circuit.	Check the status of the in-car emergency stop switch.
●●❍❍❍❍❍❍ (C0)	The elevator is in Phase 2 of Fire Service	The FCS controller input is ON.	Inspect the phase 2 switch and wiring. In some cases, to exit Fire Service Phase 2, the car must be at the fire floor at which Fire Phase 2 was activated, the doors must be fully open, and the phase 2 switch must be OFF (the FCOFF input must be activated) to get out of phase 2.
●●❍❍❍❍❍● (C1)	Retiring Cam Failure - protection timer elapsed	This condition indicates that the doors have been closed (DCLC = 1 or DCL = 0) but did not lock (DLK = 0) within 80 seconds.	Verify the proper operation of the retiring cam circuitry and mechanism. This failure can be reset by momentarily placing the car on Inspection.
●●❍❍❍❍●❍ (C2)	Door close failure	Defective door close limit or input.	Verify that the door close limit and inputs function properly when the doors close and open.
●●❍❍❍❍●● (C3)	The Level Up computer input is on	Comes on normally when the car is just below a floor. If the car is level with the floor and a message appears, it is usually the result of a switch or sensor problem.	Inspect the LU switch or sensor on the landing system and the placement of the landing system vane or magnet for that floor.
●●❍❍●❍❍● (C9)	Leveling Sensor Failure	One of the LU and LD sensors appears to have failed in the active state.	The computer has observed one or both of the leveling inputs active continuously throughout a floor-to-floor run. Verify the proper operation of the leveling sensor signals when moving the car in the hoistway.
●●❍❍●❍●❍ (CA)	Landing System Redundancy Failure	One of the landing system sensors or associated relays has malfunctioned.	Verify the proper operation of the door zone (DZ), level up (LU) and level down (LD) relays while the car is moving in the hoistway. An Landing System Redundancy Failure will be declared if the LSR input remains high throughout a run (indicating a malfunction of the one of the landing system sensors or associated relay), or if the LSR input is not seen during leveling (indicating a failure of a leveling sensor or relay).
●●❍❍●❍●● (CB)	Contactor Proofing Redundancy Failure	One (or more) of the main power contactors has not "dropped" properly after the car has stopped.	Inspect the main power contactors to ensure that they are working properly. Verify that the CNP input is high when the car is not in motion.

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LEDs	MEANING	PROBABLE CAUSE	NEEDED RESPONSE
●●❍❍●●❍❍ (CC)	Direction Relay Redundancy Failure	One of the direction relays appears to have failed in the "picked" state. The computer has detected that the UDF input is high without the computer generating a direction output.	Ensure that, when the car is not in motion, the UDF input is low. The UDF input being high is an indication that one of the direction relays is "picked."
●●❍❍●●❍● (CD)	Inspection/Leveling Overspeed Failure	The car has exceeded the inspection/leveling overspeed parameter (MILO) when the car is moving on inspection operation, or while in leveling.	Check for proper operation of the velocity transducer (tachometer or velocity encoder). Check for proper adjustment of tachometer scaling (GTC) and pattern gain (PG). Also check for a proper quadrature signal waveform (look for signal noise, or a fluctuating signal during steady state speed).
●●❍❍●●●● (CF)	Elevator shutdown function or Power Transfer input active	The ESS input has been activated or the PTI input has been activated.	Check the status of the Elevator Shutdown Switch input and the Power Transfer input. Verify that the status of the computer inputs (ESS) and (PTI) is appropriate relative to the status of the switch or contact that feeds the input.
●●❍●●❍●● (DB)	Bottom Floor Demand or Top Floor Demand	The controller is trying to establish the position of the car by sending it to a landing. Four possible causes are: 1. A change from Inspection to Automatic operation. 2. Pressing the COMPUTER RESET button. 3. Initial Power-up. 4. The limit switch contacts, at a terminal landing, did not remain open (USD/DSD inputs).	NOTE: If the controller has the absolute floor encoding feature, then the Bottom and Top Floor Demands should be cleared when the car stops in any door zone. The car does not have to travel to the top or bottom. Bottom Floor Demand should be cleared when all of the following conditions are met: 1. The car is at the bottom and the down slow down (DSD) input to the controller is OFF (because the switch should be open). 2. The Door Zone (DZ) input to the controller is ON. 3. The Door Lock (DLK) input to the controller is ON. If the car is at the bottom, and the message still flashes, check the Down Slow Down switch & associated wiring. Also, inspect the door zone landing system vane or magnet at the bottom floor and the door lock circuit. Top Floor Demand should be cleared when all of the following conditions are met: 1. The car is at the top and the up slow down (USD) input to the controller is OFF (because the switch should be open). 2. The Door Zone (DZ) input to the controller is ON. 3. The Door Lock (DLK) input to the controller is ON. If the car is at the top, and the message still flashes, inspect the Up Slow Down Switch & associated wiring. Also, inspect the door zone landing system vane or magnet at the top floor and the door lock circuit.
●●●❍❍❍❍❍ (E0)	The elevator is in Fire Service Phase 1 - The car is returning to the main fire return landing	The FRS input is low or the FRON or FRON2 inputs are high.	Inspect the fire sensors and the Fire Phase I switch wiring. For some fire codes including ANSI, the Fire Phase I switch must be turned to the BYPASS position and then back to OFF to clear the fire service status once activated.
●●●❍❍❍❍● (E1)	Emergency Power Operation	The car is on Emergency Power operation (EPI is low).	Check the status of the Emergency Power computer input. Verify that the status of the computer input (EPI) is appropriate relative to the status of the switch or contact that feeds the input.
●●●❍❍❍●❍ (E2)	MG Shutdown Operation	The car is on MG Shutdown Operation (MGS is high).	Check the status of the Motor Generator Shutdown Switch input. Verify that the status of the computer input (MGS) is appropriate relative to the status of the switch or contact that feeds the input.
●●●❍❍❍●● (E3)	Car to Lobby function	The CTL input has been activated.	Check the status of the CTL input, and determine if the status of the input is appropriate.
●●●❍❍●❍❍ (E4)	Priority/Special/VIP Service Phase 1	A Priority/Special/VIP Service momentary call switch is activated at any floor.	The car has been assigned a Priority/Special/VIP Service call. The car can be removed from Priority/Special/VIP Service by toggling (On-Off) the in-car Priority/Special/VIP Service keyswitch. The car should automatically return to normal service after a pre-determined period of time (typically 60 seconds) if the in-car switch is not activated.
●●●❍❍●❍● (E5)	Priority/Special/VIP Service Phase 2	The car has answered a Priority/Special/VIP call or the in car Priority/Special/VIP Service key switch has been activated (PRIS is high).	The car has been placed on in-car Priority/Special/VIP Service. The car will remain in this mode until the in-car Priority/Special/VIP Service keyswitch is turned off. Verify that the status of the in-car Priority/Special/VIP Service computer input (PRIS) is appropriate relative to the status of the keyswitch.
●●●❍❍●●● (E7)	Heavy Load Condition	The HLI input has been activated.	Discrete HLI input (wired to a load weigher contact): Check the status of the HLI input, and determine if the status of the input is appropriate relative to the load in the car. Analog load weigher: Check the perceived load percentage using the on-board diagnostic station. Determine if the value displayed (percentage) is appropriate relative to the load in the car.

TABLE 0.2 MC-MP-1ES Status and Error Messages ❍ = LED off ● = LED blinking

LEDs	MEANING	PROBABLE CAUSE	NEEDED RESPONSE
●●●❍●❍❍❍ (E8)	Light Load Condition	The Light Load Weighing input is activated.	The Light Load error message is generated whenever the load inside the car is less than the threshold specified to activate anti-nuisance operation, and car calls are registered. Response is only required if the anti-nuisance function (cancellation of car calls) appears to activate even when the car is loaded to a value above the threshold load value. Discrete (LLI) input (wired to a load weigher contact): check the status of the (LLI) input and determine if the status is appropriate relative to the load in the car. Analog Load Weigher: check the perceived load percentage using the on-board diagnostic station. Determine if the value displayed (percentage) is appropriate relative to the load in the car.
●●●●❍❍❍❍ (F0)	The elevator is in Fire Service Phase 1 - The car is returning to an alternate fire return landing	The FRS input is low, the FRA input is high or FRAON is active.	Inspect the fire sensors (especially the main floor sensor) and the Fire Phase I switch wiring. For some fire codes including ANSI, the Fire Phase I switch must be turned to the BYPASS position and then back to OFF to clear the fire service status once activated.
●●●●❍❍❍● (F1)	The car is on Hospital Emergency Operation Phase 1	A hospital emergency momentary call switch is activated at any floor.	The car has been assigned a hospital emergency service call. The car can be removed from Hospital Emergency Service by toggling (ON-OFF) the in-car Hospital Emergency Service keyswitch. The car should automatically return to normal service after a pre-determined period of time (typically 60 seconds) if the in-car switch is not activated.
●●●●❍❍●❍ (F2)	The car is on Hospital Emergency Operation Phase 2	The car has answered a hospital emergency call or the in car hospital emergency key switch has been activated (HOSP is high).	The car has been placed on in-car Hospital Emergency Service. The car will remain in this mode until the in-car Hospital Emergency Service keyswitch is turned off. Verify that the status of the in-car hospital switch computer input (HOSP) is appropriate relative to the status of the keyswitch.
●●●●❍❍●● (F3)	Door zone sensor failure (active state)	Probable causes may be: (1) a faulty door zone sensor or associated circuitry (within the landing system assembly); (2) faulty wiring from the landing system to the controller; (3) faulty computer input circuit (main relay board or HC-PI/O board).	Check the operation of the door zone sensors and associated wiring (place the car on inspection, move the car away from the floor, noting the transitions in the door zone signal(s) coming from the landing system). Verify that the computer diagnostic display of DZ (or DZ rear) matches the state of the sensor signals at the main relay board (or rear door relay board).
●●●●❍●❍❍ (F4)	Leveling sensor failure (active state)	Probable causes may be: (1) a faulty leveling sensor or associated circuitry (within the landing system assembly); (2) faulty wiring from the landing system to the controller; (3) faulty computer input circuit (main relay board or HC-PI/O board).	Check operation of the leveling sensors and associated wiring (place car on inspection, move above and below a landing, noting the transitions in the leveling signal(s) coming from the landing system). Verify that the computer diagnostic display of LU and LD matches the state of the sensor signals at the main relay board. Check also the operation of any contacts that may be placed at the “low side” (the “1-bus” side) of the LU and LD relay coils (e.g., H, INT). Check that such contacts close properly when appropriate.
●●●●❍●❍● (F5)	Leveling sensor failure (inactive state)	Probable causes may be: (1) a faulty leveling sensor or associated circuitry (within the landing system assembly); (2) faulty wiring from the landing system to the controller; (3) faulty computer input circuit (main relay board or HC-PI/O board).	Check operation of the leveling sensors and associated wiring (place car on inspection, move above and below a landing, noting the transitions in the leveling signal(s) coming from the landing system). Verify that the computer diagnostic display of LU and LD matches the state of the sensor signals at the main relay board.
●●●●●❍❍❍ (F8)	Motor Limit Timer (anti-stall timer) elapsed	The Starter Overload or the Thermal Overload has tripped, or there is a mechanical problem that prevents or slows the motion of the car.	To clear the condition, the car must be put on inspection, then back into normal operation, or the RESET button must be pressed. Immediately check the Starter & Thermal Overloads and all circuitry associated with the motor.
●●●●●❍❍● (F9)	Drive forced MLT	The system is shut down due to excessive number (4) of drive related faults within 7 normal runs.	Check the special event calendar (F7 Screen) of this car to identify the drive related faults.
●●●●●❍●❍ (FA)	Insufficient Motor Field	The Motor Field voltage is not properly calibrated.	Check the Motor Field calibration (OCMF).
●●●●●●❍❍ (FC)	Earthquake Operation	The car is shutdown on Earthquake Operation (EQI is high; used for ANSI and California Earthquake Operation.)	The elevator may be returned to normal service by means of momentary reset button on the earthquake board (HC-EQ2). This should be done by authorized personnel, after it has been determined that it is safe to do so. Should the system remain in this mode of operation after the reset button has been pressed, check the status of the EQI input.

TABLE 0.2 MC-MP-1ES Status and Error Messages ❍ = LED off ● = LED blinking

LEDs	MEANING	PROBABLE CAUSE	NEEDED RESPONSE
●●●●●●❍● (FD)	Failure to leave the floor	H (High speed) picked at the same floor for a consecutive number of times set in the FTLF option.	Place car on inspection or reset the controller to remove fault condition. Check the Special Event calendar of the controller and of the Group controller (if there is one) for any abnormal events. To reduce the number of occurrences or to troubleshoot, increase the FTLF counter or turn it OFF.
●●●●●●●❍ (FE)	Both the USD and the DSD inputs are active	Usually indicates a problem with the up slow down or the down slow down limit switches.	Inspect both switches and associated wiring. The down slow down switch should be closed, unless the car is at the bottom; then it should be open. The up slow down switch should be closed, unless the car is at the top; then it should be open.
●●●●●●●● (FF)	Safety Circuit is open	The Car Operating Panel emergency stop switch has been pulled, or another contact switch in the safety circuit is in the open position.	Check the C.O.P. stop switch. Check the other switches and contacts in the safety string. Check safety string wiring against the MCE wiring diagrams. This can also result if the FLT relay on the SCR-RI board has been removed.

TABLE 0.2 MC-MP-1ES Status and Error Messages (Learn Mode) ❍ = LED off ● = LED blinking

LEDs	MEANING	PROBABLE CAUSE	NEEDED RESPONSE
❍❍❍●❍❍●● (13)	Car not at bottom landing (setup error)	The car is not positioned at the bottom landing, or down slow limit switch is faulty, or computer input (DSD) is faulty.	Position the car at the bottom landing. Check the down slow limit switch. The switch contacts should be open when the car is at the bottom landing. Check the computer input (DSS) status.
❍❍❍●❍●❍❍ (14)	Car not on LEVEL UP (setup error)	The car is not positioned below the bottom landing, level up sensor is faulty, or computer input (LU) status.	Position the car below the bottom landing. Check for faulty level up sensor. Check the computer input (LU) status.
❍❍❍●❍●❍● (15)	Car not on INSPECTION (setup error)	The car is not on Inspection operation mode, or the computer input (IN) is faulty.	Place the car on relay panel Inspection. Check the computer input (IN) status (IN should be “low”)
❍❍❍●❍●●❍ (16)	Car not below DOOR ZONE (setup error)	The car is not positioned below the door zone, or the door zone sensor is faulty, or the computer input (DZ) is faulty.	Position the car below the bottom of the landing door zone. Check for a faulty door zone sensor. Check the computer input (DZ) status.
❍❍❍●❍●●● (17)	Car not on LEVEL DOWN (setup error)	The car is positioned slightly above the bottom landing, or the leveling sensors are faulty, or the computer inputs (LU and LD) are faulty.	Position the car below the bottom landing door zone. Check for faulty or mis-wired leveling sensors. Check the computer inputs (LU and LD) status.
❍❍●❍❍❍❍❍ (20)	Loss of IN during LEARN (setup error)	The car was taken OFF of Inspection operation during the learn process.	Place the car on relay panel Inspection and perform the learn process again.
❍❍●❍❍❍●❍ (22)	No response from PG board (setup error)	Faulty communication of status information between MP and DDP.	Verify that the boards in the Swing Panel are looping. Reconnect the three boards in the Swing Panel (MC-MP-1ES, MC-CGP, and IMC-DDP). Verify “Learn Complete” and “Learn Complete Acknowledge” in the MC-CGP & IMC-DDP DPRAM. Learn Complete is sent to the IMC-DDP while Learn Complete Acknowledge is sent to the MC-MP-1ES.
❍❍●❍❍❍●● (23)	PG error, loss of UP direction (setup error)	Up direction was lost during the Learn Operation.	Check for UP direction at terminal 10 on the HC-RB Main Relay Board and at the computer input (UP). If the error occurs at the top, the UP Normal is too close to the top landing. If the UP direction input is correct but the computer input is not, the IMC-DIO board may be faulty. Verify the connections between the Swing Panel, SI2 drive and the IMC-RI board.
❍❍●❍●❍❍● (29)	Both Leveling switches are ON (setup error)	Faulty leveling sensor, or faulty computer input (LU or LD)	Position the car below the bottom landing. Check for faulty or mis-wired level down sensor. Check the computer inputs (LU and LD) status.

NOTE: ALL OF THE SOFTWARE OPTIONS ARE NOT AVAILABLE ON EVERY CONTROLLER.

TABLE 0.3 Software Options

VARIABLE	NAME	DEFINITION
AFR	*Alternate Fire Floor Recall*	Determine the designated recall floor for alternate Fire Service Operation.
AFR2	*Second Alternate Fire Floor Recall*	Determine the designated recall floor for the second alternate Fire Service operation (Detroit Fire code).
AGNG	*Alternate Gong Option*	Causes an arrival lantern to be illuminated whenever the car's doors are open at a non-lobby landing. In the absence of actual call demand, the direction selected is a reflection of the car's last direction of travel. If the car is located at a terminal landing, the appropriate lantern will be illuminated.
APP1	*Alternate Primary (lower) Parking Floor*	When on, the car will no longer park at the original parking floor (PPF). Instead the car will park at the first alternate parking floor specified by the landing stored in this variable.
APP2	*Alternate Primary (lower) Parking Floor #2*	When ON, the car will no longer park at the original parking floor (PPF). Instead the car will park at the second alternate parking floor specified by the landing stored in this variable.
ASP1	*Alternate Secondary (upper) Parking Floor*	When ON, the car will no longer park at the original secondary parking floor (SPF). Instead the car will park at the secondary parking floor specified by the landing stored in this variable. This variable is only available on a duplex system.
ASP2	*Alternate Secondary (upper) Parking Floor #2*	When ON, the car will no longer park at the original secondary parking floor (SPF). Instead the car will park at the secondary parking floor specified by the landing stored in this variable. This variable is only available on a duplex system.
CCBC	*Cancel Car Call Behind Car Option*	If ON, and if the car has a direction arrow (SUA/SDA), no car calls can be registered behind the car's current position. For example, if a car is at the fifth floor, moving down, then no car calls can be registered for any floors above the fifth floor.
CSAR	*CSA Redundancy Check Option*	When ON, CSA redundancy checking logic is invoked. When OFF, the LSR, CNP and UDF inputs are ignored, and CSA redundancy checking logic is not performed.
DDOP	*Double Ding on Down Option*	When ON, the gong output dings twice for down direction travel and once for up direction travel. If OFF, the gong output will only ding once for both up and down direction of travel.
DDPO	*Door Lock Direction Preference Option*	Causes the car to hold its direction preference until the doors are closed. When OFF, the car will be allowed to change direction preference with the doors open (when the hall call door time elapses).
DGNG	*Door Lock Gong Option*	Determines when the arrival gong outputs are activated. The arrival gong outputs are activated after the doors begin to open. When OFF, the arrival gong outputs are activated when the car steps into the floor. This option should be OFF when hall mounted arrival fixtures are used and turned ON when car-riding arrival fixtures are used.
FTLF	*Failure to leave the floor*	The value set ibn this option determines the maximum number of times High speed may "pick" consecutively at the same landing before the car is shut down with an MLT fault. Set this option to OFF if it is desired to disable the shutdown due to this fault.
HNDZ	*Initiate high speed run while releveling (high speed while not in “dead zone”)*	This option is only available on those controllers which have been designed with a “rope stretch relevel” relay (RSR), which actively manipulates the “dead zone” perceived by the controller. Enabling this option will allow the controller to initiate a run while the car is still in the “releveling zone” (it will not have to relevel to “dead zone” before initiating a high speed run). The run is initiated only if the doors are locked and a car call has been registered.
HREO	*Reopen doors with hall button*	If enabled, this option will allow the activation of a hall call button to cause a car’s doors to reopen (if in the process of closing). If the option is turned OFF, the doors will not reopen if the doors are closing and a car call has been registered for that car.

TABLE 0.3 Software Options

VARIABLE	NAME	DEFINITION
KCE	*Keyboard Control of Elevators*	MCE's Elevator Central Monitoring System software, CMS for Windows, allows monitoring of elevators and control of certain elevator functions using a PC. The CMS option, KCE can be enabled or disabled at the local car or group level by turning the controller's Adjustable Control Variable, KCE, ON or OFF. Changing the KCE setting in the individual car's controller affects only that car. Changing the KCE setting in the Group controller affects all of the cars in that group. Consult the CMS for Windows manual for additional information.
LBBY	*Lobby Floor*	Determines the location of the lobby floor in the building.
LGNG	*Lobby Alternate Gong Option*	Causes an arrival lantern to be illuminated whenever the car's doors are open at the lobby landing. In the absence of actual call demand, the up direction lantern will be illuminated.
LLCC	*Light Load Call Cancel*	When the light load input (LLI) is ON, this variable sets the threshold above which an additional car call will cause all previous calls to be canceled with the exception of the last call entered in the system.
MFR	*Main Fire Floor Recall*	Determine the designated recall floor for main Fire Service operation.
MSAF	*Mechanical Safety Edge*	Determine if the car has Mechanical Safety Edge. This option must be turned ON if the car has Mechanical Safety Edge, otherwise it should be OFF when an infrared detector is used.
NPRE	*No Pre-opening Option*	When ON, prevents pre-opening of the doors on an approach to any landing. When OFF, the doors will start to open as soon as the car is 3" (76 mm) from level at the target floor.
PECC	*Anti-nuisance Call Cancel*	Sets the threshold for the number of car call stops without an interruption of the photo eye. If no photo eye interruption is detected when the car answers the fourth car call, the controller will cancel any additional car calls registered in the system. This function is normally referred to as anti-nuisance.
PHEP	*Photo Eye Protection*	When this variable is set to ON, it will prevent the photo eye from ever being bypassed except on Fire Service. When set to OFF, this option will enable the stuck photo eye protection logic and the photo eye will be bypassed after the car times out of service. This option must be turned ON for all jobs that use the PHE input for the door hold key switch.
PPF	*Primary (lower) Parking Floor*	Determines where the car will park in the absence of call demand. In a duplex system, this variable must be programmed as one of the landings in the building, and is set at the factory before shipment. In group systems, this variable only takes effect when the car is operating independently of the group supervisor or if there is a loss of communication with the group supervisor.
RCCD	*Reversal CCD Option*	When ON, all registered car calls are canceled when the car reverses direction.
SPF	*Secondary (upper) Parking Floor*	Determines which landing is used as the second parking floor. This variable is only available on a duplex system.

TABLE OF CONTENTS

SECTION 3

START UP SEQUENCE FOR MCE'S VVMC-1000 SERIES TURBO DF WITH SWEO SCR DRIVE

SECTION 4

FINAL ADJUSTMENT FOR MCE'S VVMC-1000 SERIES TURBO DF WITH SWEO SCR DRIVE

SECTION 5

HUMAN INTERFACE

SECTION 6

DESCRIPTION OF OPERATION AND TROUBLESHOOTING GUIDE

SECTION 7

JOB PRINTS

APPENDIX

TABLES

FIGURES

IMPORTANT PRECAUTIONS AND NOTES

We strongly recommend that this manual be read carefully before proceeding with installation. Throughout this manual paragraphs are introduced by the words WARNING, CAUTION or NOTE. These words are defined below.

WARNING - Denotes operating procedures and practices which, if not done correctly, will probably result in personal injury or substantial damage to equipment.

CAUTION - Denotes operating procedures and practices which, if not observed, may result in some damage to equipment.

NOTE - Denotes procedures, practices or information which is intended to be immediately helpful and informative.

The following general rules and safety precautions must be observed for safe and reliable operation of this system.

WARNING

Elevator control products must be installed by experienced field personnel. This manual does not address code requirements. The field personnel must know all the rules and regulations pertaining to the safe installation and operation of elevators.

WARNING

This equipment is an O.E.M. product designed and built to comply with ANSI A17.1, National Electrical Code, CAN/CSA-B44.1-M91/ASME-A17.5-1991 and must be installed by a qualified contractor. It is the responsibility of the contractor to make sure that the final installation complies with all local codes and is installed in a safe manner.

WARNING

The three-phase AC power supply to this equipment must originate from a fused disconnect switch or circuit breaker which is sized in conformance with all applicable national, state and local electrical codes, in order to provide the necessary overload protection for the drive unit and motor. Incorrect motor branch circuit protection will void warranty and may create a hazardous condition.

WARNING

Proper grounding is vitally important to the safe and successful operation of the system. Bring the ground wire to the system subplate. Choose the proper conductor size and minimize the resistance to ground by using the shortest possible routing. See National Electrical Code Article 250-95, or related local applicable code.

CAUTION

Do *not* connect the output triacs *directly* to a hot bus (2, 3 or 4 bus). This can damage the triacs. PI'S, direction arrows and terminals 40 & 42 are examples of outputs that can be damaged this way. Note: miswiring terminal 39 into 40 can damage the fire warning indicator triac.

NOTE

Environmental Considerations: Keep the machine room clean. Controllers are generally in NEMA 1 enclosures. Do not install the controller in a dusty area. Do not install the controller in a carpeted area. Keep room temperature between 0° F and 104° F. Avoid condensation on the equipment. Do not install the controller in a hazardous location and where excessive amounts of vapors or chemical fumes may be present. Make sure power line fluctuations are within ± 10%.

NOTE

The controller may be shipped without the final running program. However this unit may be installed, hooked up and run on inspection operation. Call MCE about a week before turning the elevator over to full automatic operation so the running program can be shipped.

If a program chip on a computer board needs to be changed, read the instructions and learn how to install the new chip. Plugging in these devices backwards may damage the chip.

NOTE

The HC-PI/O and HC-CI/O boards are equipped with quick disconnect terminals. During the initial installation, it may be necessary to remove these terminal connectors. Hook up the field wires to these terminals and test for no shorts to ground (1 bus) and to 2, 3 and 4 terminals before plugging these terminals back into the circuit boards.

NOTE

All traction controller have been set up with a BPS input that is fed directly by a brake contact or microswitch. BPS circuitry is an additional feature not required by code. It may enhance the reliability of the system. It prevents elevator operation in the event that the brake fails to release in its intended manner.

LIMITED WARRANTY

Motion Control Engineering (manufacturer) warrants its products for a period of 1 year from the date of shipment from its factory, to be free from defects in workmanship and materials. Any defect appearing more than 1 year from the date of shipment from the factory shall be deemed to be due to ordinary wear and tear. Manufacturer, however, assumes no risk or liability for results of the use of the products purchased from it, including, but without limiting the generality of the foregoing: (1) The use in combination with any electrical or electronic components, circuits, systems, assemblies or any other material or equipment (2) Unsuitability of this product for use in any circuit, assembly or environment. Purchaser's rights under this warranty shall consist solely of requiring manufacturer to repair, or in manufacturer's sole discretion, replace free of charge, F.O.B. factory, any defective items received at said factory within the said 1 year and determined by manufacturer to be defective. The giving of or failure to give any advice or recommendation by manufacturer shall not constitute any warranty by or impose any liability upon manufacturer. This warranty constitutes the sole and exclusive remedy of the purchaser and the exclusive liability of the manufacturer, AND IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY AS TO MERCHANTABILITY, FITNESS, FOR PURPOSE SOLD, DESCRIPTION, QUALITY PRODUCTIVENESS OR ANY OTHER MATTER. In no event shall manufacturer be liable for special or consequential damages or for delay in performance of this warranty.

Products that are not manufactured by MCE (such as drives, CRT's modems, printers, etc.) are not covered under the above warranty terms. MCE, however, extends the same warranty terms that the original manufacturer of such equipment provide with their product (refer to the warranty terms for such products in their respective manual).

SECTION - 1

GENERAL PRODUCT DESCRIPTION

1.0 GENERAL INFORMATION -

MCE's VVMC-1000 Series Turbo DF controller with Sweo SCR drive exhibits the characteristics listed below in a geared or gearless installation. The Series Turbo DF controller saves time in installation and troubleshooting. It is still very important for field personnel to read this manual before installing the equipment.

PRINCIPAL CHARACTERISTICS

Car Speed	Up to 1200 fpm
Jerk	9.99 ft/second^3, max 6.00 ft/second^3, nominal 1.00 ft/second^3, min
Acceleration	9.99 ft/second^2, max 3.00 ft/second^2, nominal 1.00 ft/second^2, min
Number of Stops	63 (currently available)
Number of Cars in Group	12 (maximum)
Floor Leveling Accuracy	+/-¼ inch, guaranteed +/-⅛ inch, normally achieved
Minimum Floor-to-Floor Time	4.3 sec for 12-ft floor heights provided that rotating equipment delivers necessary torque levels
Environmental Limits	104° F ambient 12,000 ft altitude 95% humidity

1.0.1 EQUIPMENT CATEGORIES - The VVMC-1000 Series Turbo DF controller with Sweo SCR drive consists of four major pieces of equipment.

Car Controller

Car Top Selector (landing system)
Diagnostic Tools and Peripherals
Group Dispatcher (two or more cars)

1.1 CAR CONTROL GENERAL DESCRIPTION -

The car control is divided into four primary functions. These functions, with the printed circuit board types associated with each one, are described in Figure 1.1.

Car Operation Control (COC)
Car Communication Control (CCC)
Car Motion Control (CMC)
Car Power Control (CPC)

1.1.1 CAR OPERATION CONTROL (COC) - Normal car operation consists of responding to hall and car calls, and proper operation of the doors.

Special Operations - for details of each operation, see MCE's Elevator Control Products Specifications.

Inspection/Access
Independent service
Fire service
Emergency power
Hospital service
Security operation
Attendant service

Additional special operations are provided with specifications, as required.

1.1.2 CAR COMMUNICATION CONTROL (CCC) - The car communication control coordinates the flow of information between the individual car controller and other computers. These include group dispatchers and other peripherals (i.e., terminals, modems, printers, etc.). The car communication control also coordinates car operation and car motion control.

1.1.3 CAR MOTION CONTROL (CMC) - The car motion control implements the ideal velocity signal relative to position in the hoistway. The car motion control gathers the exact car position and absolute floor encoding from the car top selector. This provides a true position feedback loop to facilitate creation of the ideal pattern. The car motion control also makes possible independent monitoring of car velocity at terminal landings and monitors various safety functions related to the car top selector.

1.1.4 CAR POWER CONTROL (CPC) - The car power control receives direction commands from car operation control (COC) and the ideal velocity command from car motion control (CMC). It sends the necessary outputs to the rotating equipment to affect the desired elevator movement. Proper tracking of the ideal velocity command is ensured by the velocity feedback signal from the elevator driving machine.

1.1.5 PHYSICAL LAYOUT OF CAR CONTROLLER - Figure 1.2 shows a typical layout of the car controller in a standard MCE traction cabinet. Below, is a brief description of each block.

1. *Power Supply*: The power supply powers the computer and its peripheral boards.

2. *Main Processor Input/Output Boards*: In this block there are a number of different input/output boards. The layout and arrangement of the boards may vary from controller to controller. Possible boards in this block are as follows.

HC-PI/O	Power Input/Output Board
HC-CI/O	Call Input/Output Board
HC-PIX	Position Indicator Expander Board
HC-IOX	Input/Output Expander Board
HC-RD	Rear Door Board

3. *Computer Swing Panel*: The Computer Swing Panel encases the following boards. See Figure 1.3.

MC-MP	Main Processor Board
MC-CP	Communication Processor
IMC-DDP	Digital Drive Processor
MC-MRS	Main Communication Interface Board
MC-ARS	Auxiliary Communication Interface Board

4. *Pattern Generator Processor Input/Output Subsystem*: This block includes a relay board and a general input/output board. The relay board provides for all the VVC-2-G drive interfaces and other functions. The input/output board includes the safety processor. See Figures 1.4 and 1.5. These boards are as follows.

IMC-GIO	General Input/Output Board
IMC-RB	Relay Board for Pattern Generator

5. *Relay Board*: The HC-RB board contains, typically, thirteen four-pole relays as well as terminals for field wiring. Test pads surround each relay to help with

troubleshooting. A Test switch and Relay Panel Inspection switch are provided on the board. See Figure 1.6.

6. *SCR Drive Interface Board*: The HC-SCR board contains interface relays and electronic components for the SCR drive. The SCR drive reset button is also located on this board. The SCR drive is part of the SCR drive subsystem.

7. *Transformers*: Transformers are usually located on the lower part of the cabinet.

8. *SCR Drive Subsystem*:

   - The SCR Drive, which includes two circuit boards and a power module
   - The Motor Field Module
   - The DC Contactor
   - The DC Overload

9. *Relays, Fuses and Terminal Blocks*: These blocks indicate door operator circuitry, terminal blocks (for customer wiring), fuse holders, fuses and other circuitry needed for a specific job.

10. *Pattern Conditioning and Safety Monitoring Module*:

    - VVC-2-G Drive Unit
    - Terminal Strip

11. *Resistor Cabinet*: Power resistors are located in the power resistor cage just above, but separate from, the main control cabinet to isolate these heat producing components.

1.1.6 FUNCTIONAL DESCRIPTION - This section describes the functional importance of the major controller blocks described in Section 1.1.5.

1. *Power Supply*: The power supply is a triple output linear power supply to provide +5VDC for the computer boards and +/-15VDC for the IMC-GIO board.

2. *Main Processor Input/Output Boards*: HC-PI/O (Power Input/Output Board) - The power input/output board receives associated inputs and provides outputs for individual car functions. These include Door Operation Limit switches, direction sensing, position indicators, direction arrows and arrival gongs. See Figure 6.1.

   HC-CI/O (Call Input/Output Board) - This board processes the hall call and car call pushbutton inputs and call acknowledgement outputs. It displays the status of each call. The call circuit pushbuttons are similar to a relay system: one wire per call with two power supply buses. See Figure 6.3.

HC-PIX (Position Indicator Expander Board) - This board provides additional PI outputs if more than eight are required.

HC-IOX (Input/Output Expander Board) - This is a multi-purpose input/output board designed to accommodate additional inputs and outputs, as required.

HC-RD (Rear Door Board) - This board provides for the additional logic necessary when an additional independent rear door is required.

3. *Computer Swing Panel*: The Computer Swing Panel has three interacting circuit boards. These boards have memory and processing computer chips. Each circuit board performs a specific task, while it shares resources through a common memory block with the other computers. The sophisticated network of circuit boards, inside the Swing Panel, ensures full integration of the control decision-making process between the computers. See Figure 1.3.

The following is the functional description of each board in the Swing Panel.

MC-MP (Main Processor Board) - The main processor board regulates car operation control. The MC-MP board is also responsible for On-Board Diagnostics and provides for interactive communication between the elevator mechanic and other boards.

MC-CP (Communication Processor) - The communication computer board is responsible for car communication. The MC-CP board communicates with other cars and the group dispatcher through a high speed serial link. It can also communicate with any industry standard data terminal, CRT, modem, printer or computer. It does this with its RS-232 serial links for diagnostics or data logging.

IMC-DDP (Digital Drive Processor) - The pattern generator computer board uses the hoistway transducer signals as position feedback to create an ideal speed pattern for car motion.

MC-MRS (Communication Interface Board) - The communication interface board is used by the MC-CP board to communicate with the dispatcher or data terminals.

MC-ARS (Auxiliary Communication Interface Board) - This board provides additional RS-232 ports for additional computer peripherals.

4. *Pattern Generator Input/Output Subsystem*: This subsystem includes two boards and performs three distinct functions.

   - It acts as the input/output module for the IMC-DDP board.
   - It monitors the speed of the car at each terminal landing.
   - It provides the interface between the pattern generator and the drive.

   IMC-GIO (General Input/Output board) - This board provides for input and output to the pattern generator computer. It also includes a dedicated safety processor that monitors the car speed at each terminal landing. A four digit Alphanumeric Display continuously reads the car speed.

   IMC-RB: This board is an interface between the HC-RB relay board and the VVC-2-G drive unit and meets code requirements for a normal terminal stopping device and final terminal stopping device. This board also converts high voltage signals to low voltage signals for use by the IMC-DDP computer. It receives the position pulser and the tachometer feedback signals, as well.

   INPUTS:

   QUADRATURE SIGNAL - This board receives the quadrature signal from the hoistway transducer by reading the holes on the perforated steel tape. It then sends the position information to the IMC-DDP board and locates the car in the hoistway within .1875" accuracy.

   OLM SIGNAL - This board also receives the OLM (outer level marker) signal which is 12" from the floor.

   TERMINAL SWITCHES - Up to four Terminal switches for each terminal landing can be used on this board. The safety computer on this board monitors car speed at each Terminal switch brought to this board. When the safety processor determines the car is overspeeding, it disconnects the IMC-DPP generated pattern from the drive unit and substitutes the emergency pattern set by the installer.

   CAR STATUS - Specific signals (direction, high speed, leveling, inspection, etc.) are brought to the IMC-GIO board and allow the pattern generator to create the appropriate pattern.

   TACHOMETER SIGNAL - The raw tachometer signal is processed by reducing its voltage to a range which can be accommodated by the VVC-2-G drive unit.

OUTPUTS:

This system converts the digital speed pattern to an analog speed reference. Once this is verified by the on-board safety processor, it is sent to the VVC-2-G drive. It creates a speed signal which indicates the car is traveling over 150 fpm, which prevents the car from leveling into a landing.

5. *HC-RB (Relay Board)*: This board satisfies most of the code requirements for relay contact redundancy. In addition, it satisfies requirements for normal terminal stopping devices. It also provides the necessary circuitry for operating the car on inspection or access, without the benefit of computers. In conjunction with the HC-PI/O board, this board comprises the high voltage interface between the MC-MP computer and individual car logic functions such as door operation, direction outputs, direction sensing, main safety circuits, leveling circuitry, etc. See Figure 1.6.

6. *SCR Drive Interface Board (HC-SCR)*: This board interfaces with the SCR drive and the SCR drive reset button. The M contactor coil is powered through this board. See drawing with -SCR as a suffix. The HC-SCR board contains the sensing circuits that protect the SCR drive from overcurrent conditions. Six wires are brought from the resistor bank into TB1 (terminals 1 through 6) on the HC-SCR board. The HC-SCR monitors the voltage drop across the current limiting resistors connected to these wires. If an overcurrent condition is detected, this circuitry will trip the safety and shut down the drive.

7. *Transformers*: Transformers are provided, as necessary, according to the power requirements of each individual load and the available AC line.

8. *SCR Drive*: The SCR drive unit has four major components: the motor field module, control circuit board, firing circuit board, and a power module. The two circuit boards are sandwiched together through a connector and the combination can be removed from the chassis. The DC contactor disconnects the DC loop. The DC overload opens up the DC loop when the current exceeds the safety threshold.

9. *Relays, Fuses, Terminal Blocks, etc.*: Additional relays, fuses and terminals are provided, as required, for other additional functions. These might be door operation, reverse phase sensing, safety functions, and so on.

10. *VVC-2-G*: The drive unit relays outputs to the SCR drive and brake from the velocity signal generated by IMC-DDP board and direction signals produced by the IMC-RB board. In addition it contains the emergency terminal stopping

device, the inspection/leveling overspeed device, and tachometer monitoring circuitry.

11. *Resistor Cabinet*: Any power resistor that generates significant heat such as door resistors and SCR drive current limiting resistors, are in the power resistor cage. This prevents their heat from affecting other electrical components.

1.2 LANDING SYSTEM CONTROL BOX (LS-QUAD-2 or LS-QUAD-2R) -

Models LS-QUAD-2 and LS-QUAD-2R Landing System Control Box are designed to be mounted on the car top. Figure 1.7 shows the LS-QUAD-2 Landing System Control Box. Each contains the following parts.

a. Two sets of tape guides which hold the perforated steel tape in exact alignment with the control box.

b. A pair of optical transducers which provide a quadrature signal for car position.

c. Leveling (LU, LD), Door Zone (DZ) and the Outer Leveling Marker (OLM) magnetic proximity sensors. For jobs with rear doors, the model LS-QUAD-2R landing system provides additional front and rear door zone sensors (DZF, DZR).

d. Magnetic proximity sensors for absolute floor position encoding (RD, PR, R0, R1, R2, R3, R4, R5).

e. A circuit board processing the sensor signals sent to the elevator controller. All sensors have indicators on this circuit board. The quadrature signals and Outer Leveling Markers (OLM) are 50VDC; all other signals are 120VAC.

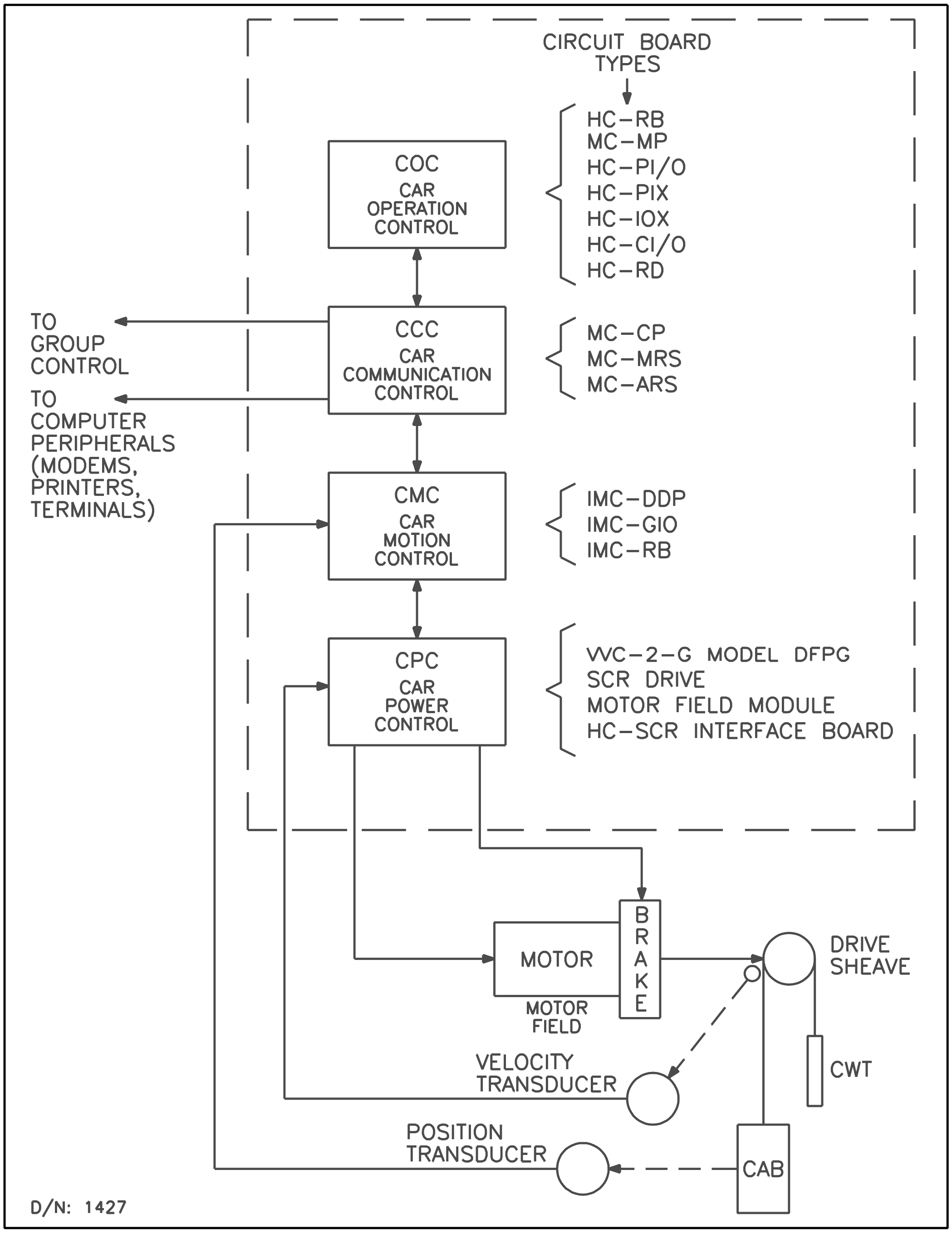
1.3 HUMAN INTERFACE TOOLS AND PERIPHERALS -

See Section 5 and the MCE Computer Peripherals Manual for detailed information.

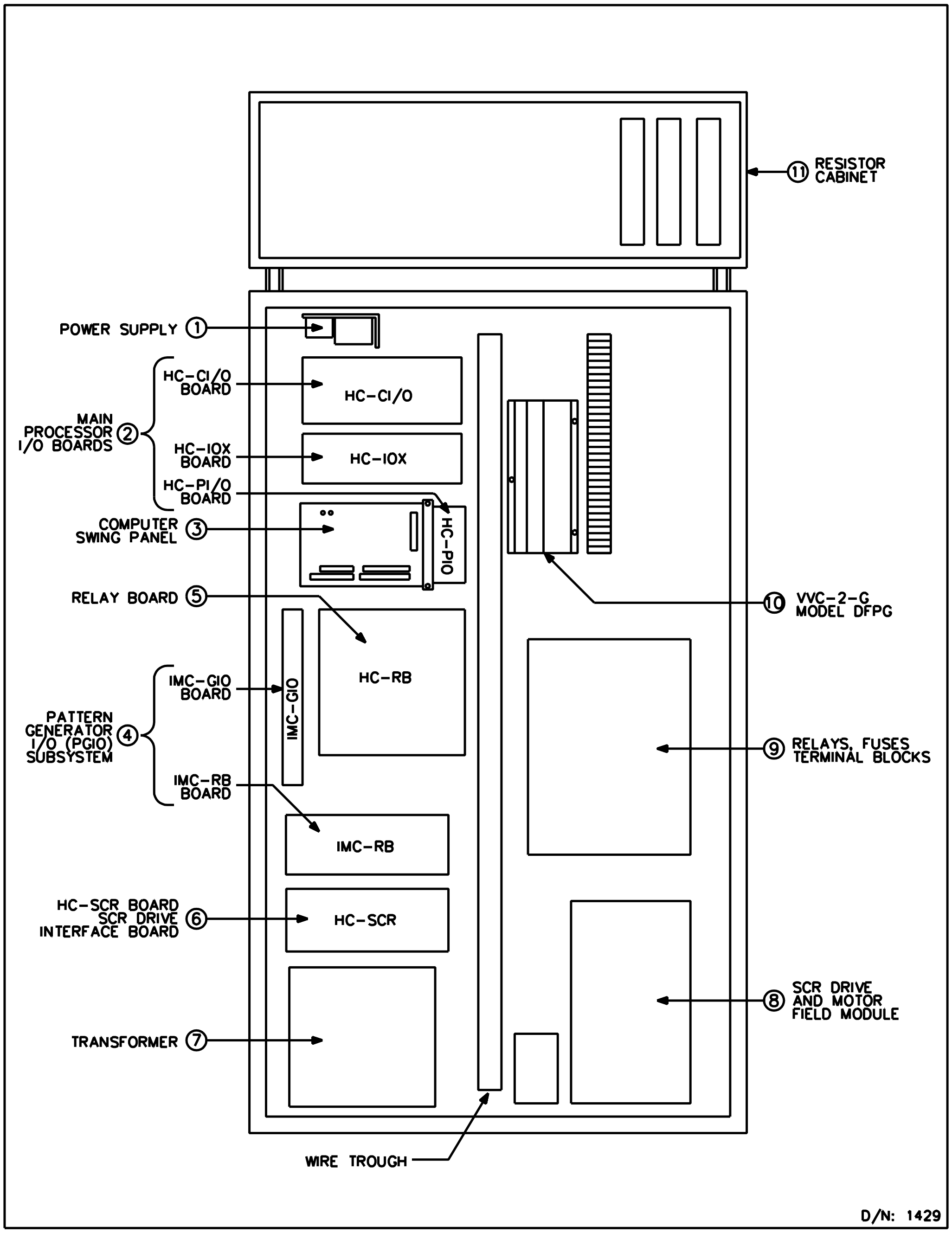
1.4 GROUP DISPATCHER (two or more cars) -

See MCE Group Supervisor Manual.

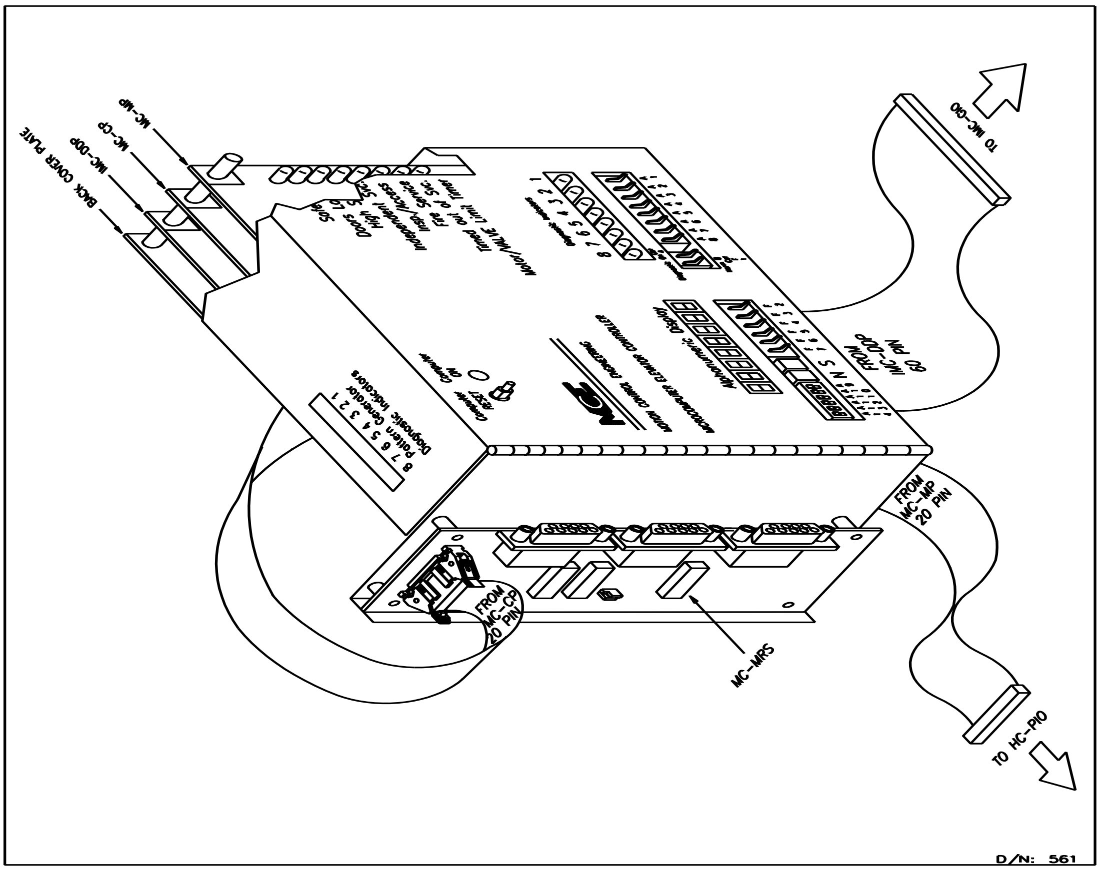
CAR CONTROLLER FUNCTIONAL LAYOUT
FIGURE 1.1



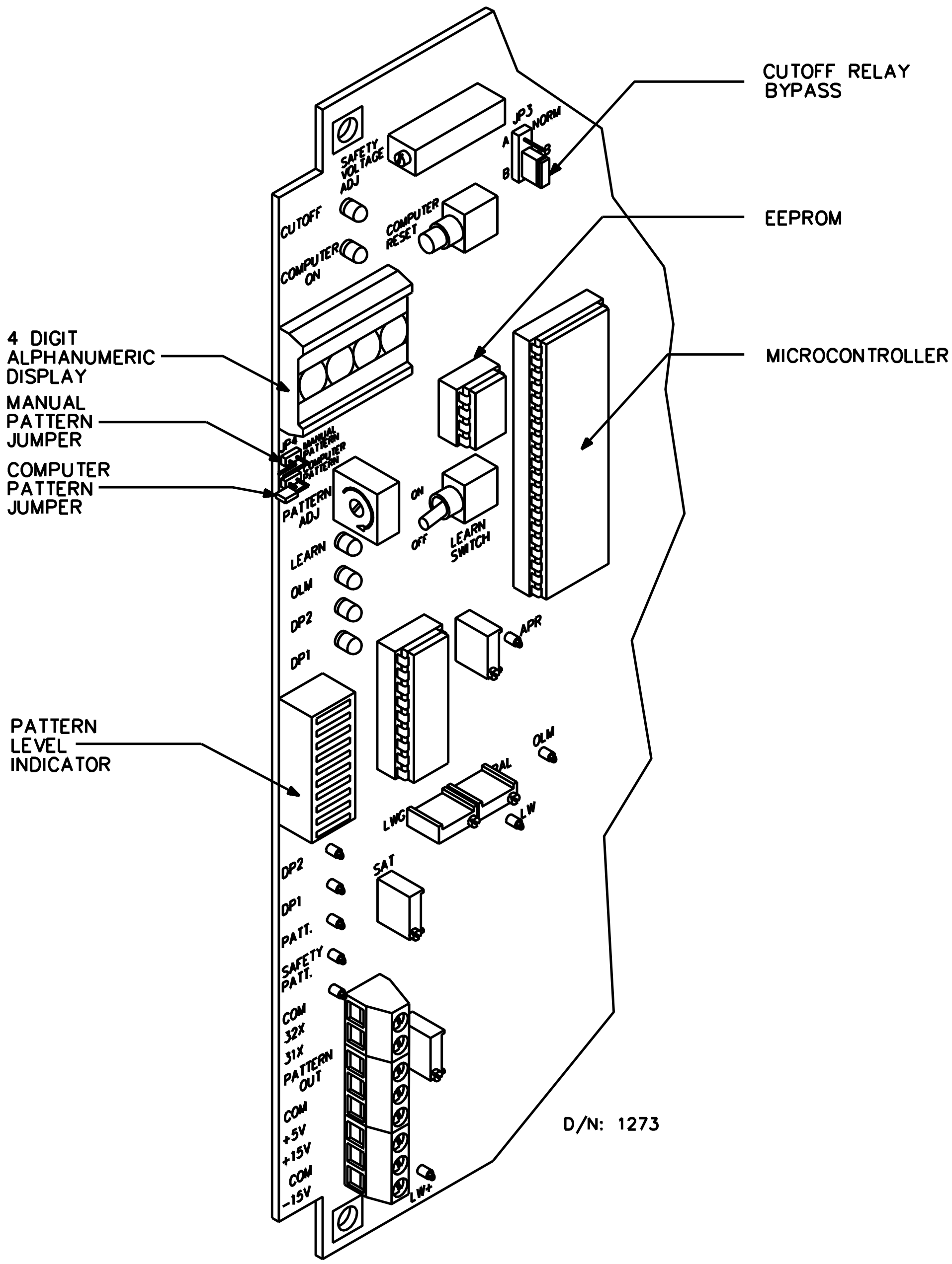
TYPICAL PHYSICAL LAYOUT VVMC-1000 SERIES TURBO DF SCR
FIGURE 1.2



COMPUTER SWING PANEL
FIGURE 1.3

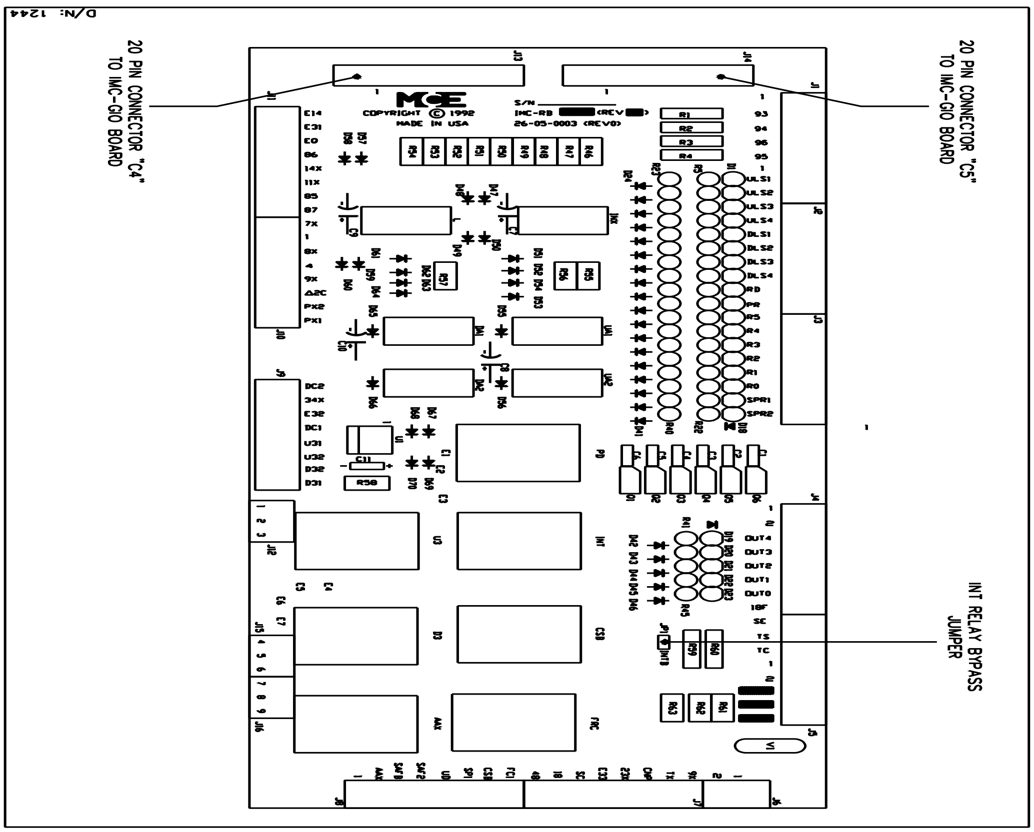


PATTERN GENERATOR I/O SUBSYSTEM (IMC-GIO)
FIGURE 1.4

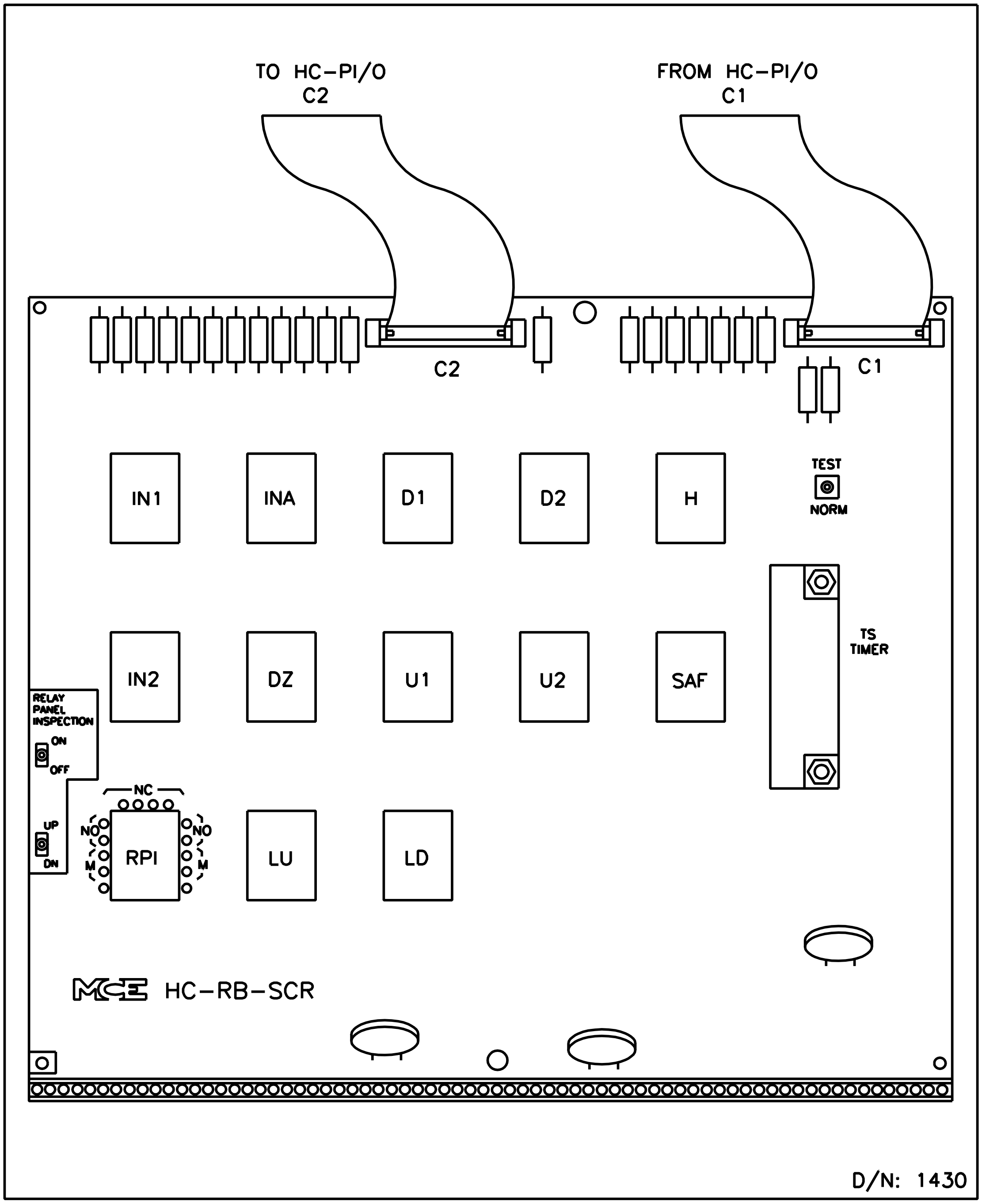


* The EEPROM on this board contains important information related to the car in which it is installed. If the board is changed, retain the EEPROM or perform the learn operation.

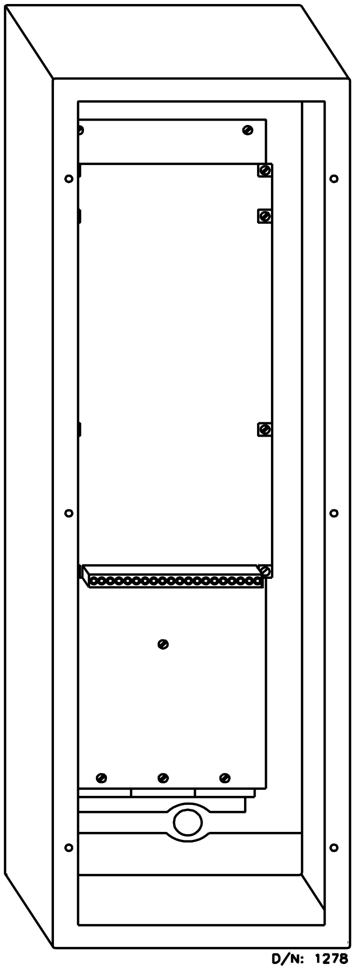
IMC-RB RELAY BOARD LAYOUT
FIGURE 1.5

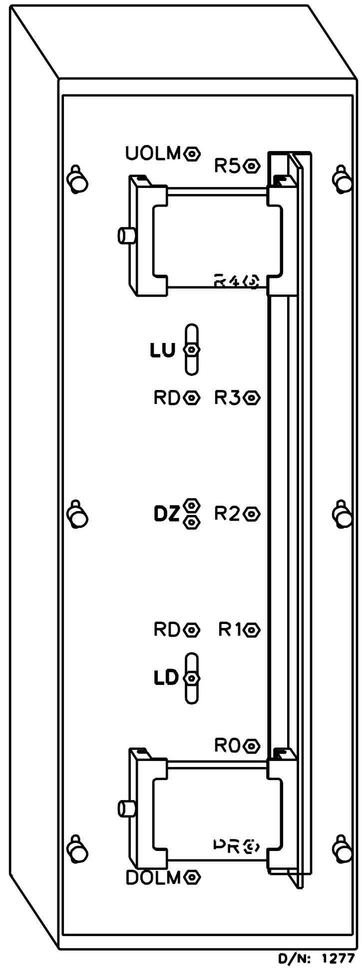


HC-RB RELAY BOARD LAYOUT
FIGURE 1.6



LS-QUAD-2 DETAIL
FIGURE 1.7





REAR VIEW WITH COVER OFF

This shows the terminal strip on the front of the HC-DFLS board used for customer connections.

FRONT VIEW OF LS-QUAD-2

Adjust the level up (LD) and level down (LD) sensors by sliding sensor with a finger or screwdriver. Do not open box to move them. Note that the LU and LD sensors must be the same distance from the door zone (DZ) sensors.

SECTION - 2

INSTALLATION OF VVMC-1000 SERIES
TURBO DF SCR CONTROLLER

2.0 GENERAL INFORMATION -

This section contains important recommendations, instructions on site selection, environmental considerations, wiring guidelines and other factors which will help ensure a successful installation.

2.1 SITE SELECTION -

A proper location for the control equipment would have the following attributes.

- Adequate working space for comfort and efficiency is available.

- Logical arrangement of the equipment has been undertaken. The location of other equipment in the machine room, proper routing of electrical power, and control wiring has been considered. Note that MCE controls do not require rear access.

- The equipment is not installed in a hazardous location.

- Provision of space for future expansion has been provided, if possible.

- A telephone has been installed in the machine room. This is a desirable feature as it makes remote diagnostics available and makes any startup and adjustment assistance easy if the installer is not familiar with the equipment.

- Areas in the machine room which are subject to vibration have been avoided or reinforced to prevent equipment cabinets from being affected.

- Adequate lighting in the machine room has been provided for the control cabinets and machines. A good working area, such as a workbench or table, is also present.

2.2 ENVIRONMENTAL CONSIDERATIONS -

Here are some important environmental considerations. Adherence to these guidelines will help prolong the life of the elevator equipment and minimize maintenance requirements.

- An ambient temperature should be maintained which will not exceed 104° F. Operation at ambient temperatures of up to 110° F is possible, but not recommended due to probable shortening of equipment lifetime. This means adequate ventilation is required, and air conditioning may be necessary.

- The air in the machine room should be free of excessive dust, corrosive atmosphere or excessive moisture so that condensation is avoided. A NEMA 4 or NEMA 12 enclosure may be provided to meet these requirements. If open windows exist in the machine room, it would be advisable to locate cabinets away from the windows so that severe weather does not damage the equipment.
- Very high levels of radio frequency (RF) radiation from nearby sources may cause interference to the computers and other parts of the control system. Using hand-held communication devices in close proximity to the computers may also cause interference.

- Power line fluctuation should not be greater than +/-10%.

2.3 RECOMMENDED TOOLS AND TEST EQUIPMENT -

For proper installation, the following tools and test equipment are recommended.

- Digital multimeter, such as a Fluke series 75, 76, 77 or equivalent
- Oscilloscope, preferably storage type scope
- Hand-held tachometer
- AC clamp-on ammeter
- Walkie talkies
- DC loop ammeter
- Assorted soldering tools, rosin flux solder, electronic side cutters and longnose pliers, flashlight, MCE screwdriver (provided with controller)

2.4 INSTALLATION, WIRING GUIDELINES AND INSTRUCTIONS -

Proper procedures where wiring materials and methods are concerned is essential to obtain the best results in installations. Good basic wiring practices and ground requirements are discussed in this section and observation of the following will help to accomplish this goal.

2.4.1 THE WIRING PRINTS - It is important to be familiar both with the following information and the wiring prints provided in Section 7 of this manual.

NOTE

Drawing Number Format - Each print in Section 7 has a Drawing Number indicated in the title block. The first six digits (or positions) of this block contain the MCE Job Number. The seventh digit is the elevator car number to which this print refers. If the seventh position is the letter G, this denotes the group controller. The eighth position is the page number. If the eighth position contains the letters SCR instead of a number, this denotes the drive page. In this manual the drawing numbers will often be referred to by the eighth digit.

NOTE

Drawing Name - Some drawings have a drawing name directly above the title block or at the top of the drawing. The drawing name refers to a particular drawing.

- It is important to be familiar with Elevator Car Wiring Print drawing number (-1).
- It is important to be familiar with Elevator Hoistway Wiring Print drawing number (-2).
- Most of the power connections and non-drive related power supplies are shown on drawing number (-3).
- The interface with the VVC-2-G drive unit is shown on drawing number (-D).
- The SCR drive and its interface is shown on drawing number (-SCR).
- Group interconnects to individual car cabinets (two or more cars) are shown on the drawing entitled Group Interconnects to Individual Car Cabinets.
- Review additional wiring prints and details as provided.

- The remainder of the prints in Section 7 are detailed drawings of the VVMC-1000 Series Turbo DF control system.

- Refer to a specific part of the schematic by the Area Number which can be found at the left hand margin of the schematic.

2.4.2 GROUND WIRING - All grounding in the elevator system must conform to all applicable codes. Proper grounding is essential for system safety and helps minimize noise-induced problems. Good grounding practices are as follows.

- The grounding wire to the equipment cabinet should be as large or larger than the primary AC power feeders for the controller and should be as short as possible.

- The grounding between equipment cabinets should be arranged like a daisy chain or like a tree but without any loops.

- Install the grounding wire from the controller ground terminal to building structure (if steel), water pipe or equivalent.

- The conduit containing the AC power feeders must not be used for grounding.

- If isolation transformers are used, they should be properly grounded (see drawing -SCR).

2.4.3 HOISTWAY CONTROL EQUIPMENT INSTALLATION AND WIRING - This section will cover recommended procedures for installing the perforated steel tape with mounting brackets, Hoistway Limit switches, hoistway terminal strips and their wiring.

2.4.3.1 INSTALLATION OF PERFORATED STEEL TAPE - Refer to the drawing in Section 7 - Top Tape Support Assembly and Bottom Tape Support Assembly and follow the assembly procedures shown. Note that the tape can be hung in any of three positions (that is, distance from the rail). Select the best tape mounting position by determining the best physical location on the car top to mount the LS-QUAD-2 or LS-QUAD-2R landing system control box in relation to the available tape positions. The LS-QUAD-2R landing system for rear doors requires more room between the rail and the hoistway wall than the LS-QUAD-2.

2.4.3.2 INSTALLATION OF HOISTWAY LIMIT SWITCHES -

- Be sure the cam operating the Limit switches keeps Slowdown Limit switches depressed until the Normal Direction Limit switch is open.

- Be sure both the Normal and Final Limit switches are depressed for the entire run-by travel of the elevator.

- For faster elevators, the face of the cam operating the Limit switches must be sufficiently gradual so that the impact of the switch rollers striking the cam face is relatively silent.

2.4.3.3 INSTALLATION AND WIRING OF HOISTWAY TERMINAL STRIPS AND TRAVELING CABLES - The traveling cable must have at least one twisted shielded pair to be used for the position pulser quadrature signal from the landing system box (LS-QUAD-2 or LS-QUAD-2R) and shielded cable should be used all the way to the controller. If two or more shielded pairs are still available, route the two OLM signals from terminals 93 and 94 in the landing system box through a shielded pair (especially if there are more than eight floors). The shield is best grounded only at the controller.

2.4.4 ELEVATOR CAR CONTROL EQUIPMENT INSTALLATION AND WIRING -This section covers the recommended procedures for installing and wiring the landing system box (LS-QUAD-2 or LS-QUAD-2R), magnetic strips on the steel tape, TM switch on the car top (if used) and diode installation details for certain door operators.

2.4.4.1 INSTALLATION OF LANDING SYSTEM CONTROL BOX (LS-QUAD-2 or LS-QUAD-2R) - Refer to the drawings in Section 7 - Option #1, and Option #2 For Mounting Landing System Box to Elevator Crosshead, and Option #1 and Option #2 For Conduit Knockout.

- An ideal location should have already been selected for the landing system box in step 2.4.3.1 above.

- There are holes on both sides and on the bottom of the landing system box for mounting to support brackets or structural channels. The mounting of the box should be firm and solid so that it cannot be knocked out of alignment. Use ¼" diameter screws with 20 threads per inch.

- To install the tape into the tape guides on the LS-QUAD-2 landing system box, remove the two thumb screws on the two guide assemblies, insert the tape and reinstall the guides with the thumbscrews (tighten firmly). For the LS-QUAD-2R landing system box, remove the three 8-32 screws holding the protective 1" wide channel covering the back of the door zone sensors on the upper tape guide bracket. Then remove the single standoff which is in the way of the thumbscrew holding the tape guide. Now remove the thumbscrews holding the upper and lower tape guides, insert the tape, and reinstall the guides with the thumbscrews (tighten firmly). Reinstall the standoff (don't overtighten) and the protective channel.

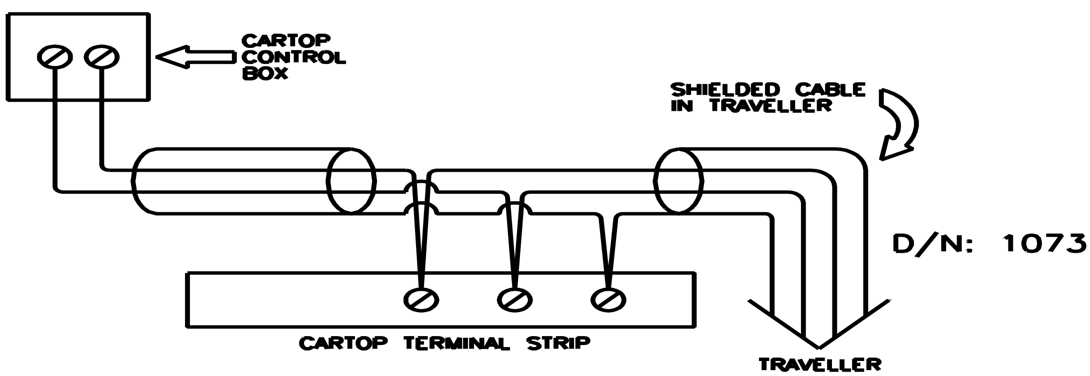
- After inserting the steel tape into the tape guides, check the position of the landing system box. The car should be at the top of the hoistway, making it easy to see if the box alignment is causing any stress or binding on the tape guides. *It is imperative that the box be absolutely vertical side-to-side and front-to-back.* This allows easy tape movement and avoids excessive wear on the tape guides. It is critical to avoid premature failure of the tape guides.

- Move the elevator to the top and bottom of the hoistway to check for smooth tape movement and for no excessive pressure on the guides. Correct problems immediately.

- Refer to the drawing in Section 7 - Option #1 for Conduit Knockout, and Option #2 for Conduit Knockout, for connecting conduit to the LS-QUAD-2 landing system box. Be sure to follow the instructions closely. Use existing pre-punched knockout holes, if provided.

- If the shielded cable for the quadrature signal is brought to a car top terminal strip, another piece of shielded cable must connect from there to the terminal strip on the circuit board in the landing system box. The shield should not be connected at the end in the landing system box. See Figure 2.1.

POSITION PULSER SHIELDED CABLE WIRING
FIGURE 2.1



- If the OLM signals from terminals 93 and 94 in the landing system box are routed through shielded cable as suggested in step 2.4.3.3 above and if the shielded cable for the quadrature signal is brought to a car top terminal strip, the wiring method should be similar to that shown in Figure 2.1.

2.4.4.2 INSTALLATION OF MAGNETIC STRIPS ON THE STEEL TAPE -

NOTE

The magnetic strips provided with the LS-QUAD-2 or LS-QUAD-2R landing system may be either north or south pole types (usually south). The poles marked indicate the side *away* from the adhesive side. The magnets should always be attached to the steel tape from the adhesive side.

a. Carefully read and follow both the Target Installation instructions in the prints in Section 7 and the remainder of these instructions before proceeding.

b. Before installing the magnets, clean the steel tape thoroughly with an appropriate solvent. No oil should be left on the tape as it will interfere with the adhesive backing on the magnets.

c. There are normally two lanes of magnets installed on the facing side of the perforated tape. One lane consists of individual floor magnets (leveling magnets) only, which are each 6" long. The other lane consists of the binary targets (absolute floor position encoding magnets) which are all multiples of 2½" (e.g., 2½", 5", 7½" and 10") in length. The edge and preset magnets are all multi-pole magnets and are used only as installation guides.

d. Floor magnets which operate the LU, DZ and LD sensors should not be installed permanently because they may have to be readjusted. Use clear Scotch tape for temporary installation. Install permanently R0 through R5 and PR magnets, provided the car is positioned within ¼" of the floor - *this is extremely important*. Extreme care is required for the installation of these magnets. If this procedure is not carried out precisely all the magnets may have to be reinstalled during the final adjustment.

e. If there are rear doors, the LS-QUAD-2R landing system has additional door zone sensors on the rear of the upper tape guide assembly. Follow the Target Installation instructions on the prints in Section 7 and install the 7½" long front and rear door zone magnets on the rear of the tape (the side facing *away* from the landing system). These magnets may be permanently installed at this time.

2.4.4.3 TM SWITCH WIRING AND ADJUSTMENT (IF USED) - Refer to the Elevator Car Wiring Print in Section 7 for details on the wiring and setting of each contact in the TM switch. Carefully examine the functioning of this switch, especially if copper to carbon contacts are used. The current levels are quite low and may not be enough to burn the oxide off of the contacts.

2.4.4.4 DOOR OPERATOR DIODE INSTALLATION (IF USED) - Certain door operators such as G.A.L. type MOM or MOH require the installation of diodes in the door operator on the car top. See the Elevator Car Wiring Print in Section 7 for special instructions regarding these diodes.

2.4.5 MACHINE ROOM CONTROL EQUIPMENT INSTALLATION AND WIRING -

2.4.5.1 CONTROLLER INSTALLATION - Here is a guideline for installing the controller cabinet(s).

- First mount the controllers securely to the machine room floor and cut holes to bring wires into the cabinet. See Figure 2.3 - Controller Board Layout - Typical Example for recommended hole locations. There may be labels also in the cabinet, for identifying areas for wiring hole locations. Note that the standard MCE car control cabinet does not require rear access and the doors are reversible and removable for ease of wiring.

CAUTION

Do not remove protective covering from boards until it is time to bring wires into the terminals.

Do not allow any metal chips to fall into the electronics.

2.4.5.2 CONTROLLER WIRING - Figure 2.3 shows the recommended routing for the field wiring. Perform the following steps.

a. The wires used should be brought in from a location which allows use of the wiring duct inside the control cabinet. The terminals are located conveniently near wiring ducts.

b. When routing field wiring or power hookups, *stay away* from the *left side* of the HC-CI/O and HC-PI/O boards.

c. When it is time to hook up the wires to the controller, remove the protective covers from the boards and interconnect the wires according to the hoistway and car wiring prints.

d. If the car controller is part of a group, a separate conduit or wiring trough must be provided for the high speed serial link from each car controller to the group cabinet.

e. Main AC power supply wiring size is determined by the electrical contractor. Proper motor branch circuit protection is provided according to the applicable electrical code in the form of a fused disconnect switch or circuit breaker for each elevator. Each disconnect or breaker must be clearly labeled with the elevator number.

f. If the car is part of a group, there are several additional details relating to the wiring of the group cabinet and its interconnects to the individual cars. They are as follows.

    1. If a group controller cabinet is provided, refer to the Group Supervisor Field Wiring Print in Section 7. If a single phase AC main power source for this group controller is specified on this print, a correctly sized (according to the applicable electrical code) fused disconnect switch or circuit breaker must be used which draws its power from the same AC bus that powers the individual elevator cars. If more than one bus is available and one is an emergency power bus, use the emergency power bus so that during switch-over to emergency power, the group logic is also on emergency power.

    2. The wiring details for the high speed communication link are fully detailed in the drawing in Section 7 - Instructions For Connection Of High Speed Communication Cables and they should be followed exactly. Again note the requirement for routing the high speed interconnect cables through a separate conduit or wiring trough.

    3. If applicable, also wire according to the drawing in Section 7 - Group Interconnects To Individual Car Cabinets. Be sure to ground all cabinets according to Section 2.4.2 above.

    4. The field wiring to the group supervisory cabinet is found in the drawing in Section 7 titled Group Supervisor Field Wiring Print.

2.4.5.3 DC HOIST MOTOR WIRING -

a. Be sure to follow all notes on the schematic regarding the possible rearrangement of the motor field. This could involve splitting the field in half which could entail having to find the proper wire inside the motor to make the split. Use #14 wire size minimum on all field wiring from controller to motor field (and brake if current levels require it). Follow wire size guidelines in prints.

b. The armature wiring must be brought to terminals A1M and A2M in the control cabinet. For details of armature wiring refer to drawing (-SCR).

2.4.5.4 ISOLATION TRANSFORMER WIRING - Make sure that wire sizes are properly selected to comply with applicable codes. For details of isolation transformer wiring, see drawing with (-SCR) as a suffix.

2.4.5.5 TACHOMETER INSTALLATION AND WIRING -

a. Be sure that the tachometer wheel (for gearless applications) is running on a precise surface (i.e., brake drum surface, etc). *Any* vibration of the tachometer will create vibrations in the car.

b. Do *not* get the tachometer close to a magnetized area (motor field winding, etc.) because it will cause the car to have different speeds while going up or down, even though the tachometer puts out the same voltage in both directions.

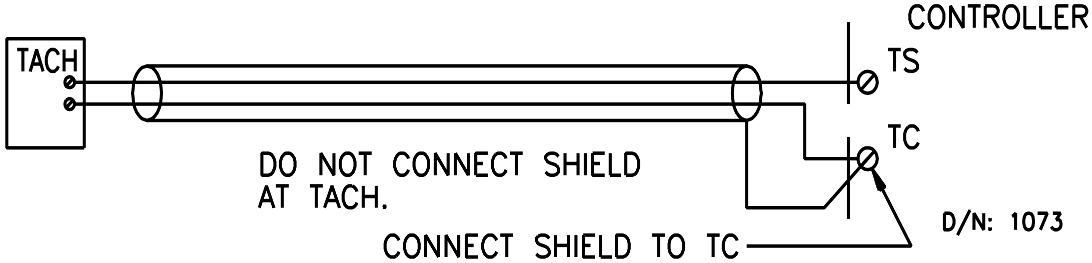
c. Alignment of the tachometer coupling is extremely important for geared machines. In general, most vibration problems come from the tachometer and/or its mounting. It is important that the tachometer mounting is very rigid and that the coupling is perfectly aligned before adjusting the drive unit. *In a geared installation do not drive the tachometer from the sheave* because the gear lash cannot be compensated for by the drive unit.

d. Vibration caused by the tachometer *cannot* be corrected inside the drive. Rough surfaces, either on the tachometer wheel or where the tachometer wheel runs can also cause vibrations. Remember that the tachometer must connect to the motor through a coupling or by a follower wheel.

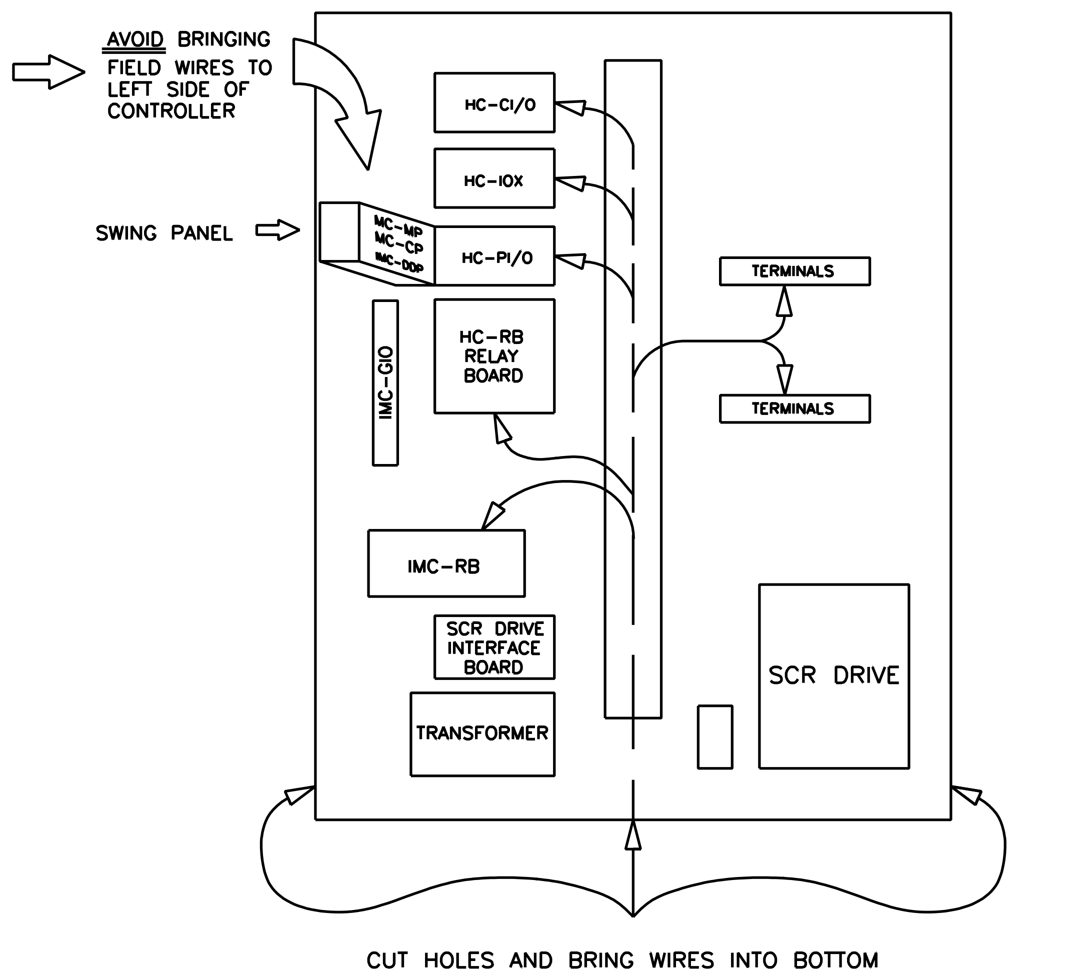
e. Do not run the tachometer directly from a gearless motor in such a way that the tachometer rpm equals the motor rpm. Always use a follower wheel for gearless applications.

f. Use a twisted pair shielded cable to connect from the tachometer to the controller terminals TS and TC. *Do not* connect the shield at the tachometer end but insulate the shield so it does not touch anything. Connect the shield at the controller end to terminal TC. For up rotation of tachometer, the polarity must be negative (-) on terminal TS with respect to terminal TC.

TACHOMETER INSTALLATION
FIGURE 2.2



CONTROLLER BOARD LAYOUT - TYPICAL EXAMPLE
FIGURE 2.3



A) CALL TERMINALS ARE LOCATED ON HC-CI/O BOARD.
B) ALL POSITION INDICATORS, ARROWS, AND GONG ENABLE TERMINALS ARE LOCATED ON HC-PI/O BOARDS OR IF A GONG BOARD IS PROVIDED, POSITION INDICATORS ARE ALSO PROVIDED ON GONG BOARD (HC-GB).
C) TERMINALS 1-72 AND 85, 86, 87, 88, AND 89 ARE LOCATED ON HC-RB MAIN RELAY BOARD.
D) TERMINALS FOR THE DOOR OPERATOR ARE ON RESPECTIVE DOOR BOARDS, OR ON SEPARATE TERMINAL BLOCKS.
E) SEVERAL TERMINALS 1 AND 2 ARE PROVIDED ON DIFFERENT LOCATIONS.
F) OTHER TERMINALS MAY BE SUPPLIED ON SEPARATE TERMINAL BLOCKS.
G) TACH, OLM, POSITION PULSER AND ABSOLUTE FLOOR ENCODING SIGNALS ARE TERMINATED INTO IMC-RB BOARD.

D/N: 1431

SECTION - 3

START UP SEQUENCE FOR MCE'S VVMC-1000 SERIES TURBO DF WITH SWEO SCR DRIVE

3.0 GENERAL INFORMATION -

In this start up section, the car will be prepared for use by construction personnel so that they may complete the car installation. This section deals with the steps involved in applying power to the controller and associated components, as well as the DC hoist motor and brake. After initial adjustment of the system, basic car movement is available on inspection operation. This system is designed to operate on inspection and access without hook up of the CRT.

WARNING

This equipment contains voltage which may be as high as 500V. There are, as well, rotating parts of motors and driven machines. The combination of high voltage and moving parts can cause serious or fatal injury. Only qualified personnel, who are familiar with this manual and driven machinery, should attempt to start up, or troubleshoot, this equipment. Observe these precautions.

1. *Use extreme caution - do not touch* any circuit board, SCR or motor electrical connection without ensuring that the unit is properly grounded and no high voltage is present. *Do not* apply AC power before grounding the equipment according to applicable local codes and instructions contained herein.

2. *Be certain* that any possible violent motion of the motor shaft and driven machinery, caused by improper control operation, will not cause personal injury or damage. Peak torques of up to ten times rated motor torque can occur during a control failure.

3. *High voltage may be present* on motor armature and field circuits whenever AC power is applied, *even if motor is not rotating*.

4. *Read these instructions all the way through before starting the work in order to familiarize yourself with the procedure*. Proceed cautiously. These instructions assume adequate electrical troubleshooting experience. Follow the procedure carefully and if the elevator does not respond correctly, check the circuits and obtain necessary assistance.

3.1 GROUND CHECK -

a. Be sure the controller cabinet has been grounded according to local code. Be sure the manufacturer's recommendations have been followed for grounding the drive isolation transformer (if used). These details are covered in Section 2 of this manual.

b. *Do a ground check before turning on the power to the system*. Refer to Figure 1.2 - Typical Physical Layout VVMC-1000 Series Turbo DF SCR and Figure 2.3 -Controller Board Layout - Typical Example, to locate the items as they appear in the ground check that follows.

NOTE

In the following test, a ground is a resistance of less than 100 ohms.

1. With power off, remove fuse F4 in the individual car controller cabinet. If a group system is being used, consult the schematics and remove the fuses that bring power to the terminals 2H and 2F.

2. Check for grounds on all terminals on the bottom of the HC-RB (main relay) board. The only terminals that should be grounded are 1 and 89.

3. Check for grounds on all terminals on the HC-PI/O and HC-CI/O boards.

4. Check for grounds on terminals F1, F2, A1, A2 and D5 if a G.A.L. MOD door operator is provided. Remove door fuses F7 and F8. Look for the terminal location on pages 1 through 3 of the job prints. For other door operators, consult the prints as to which fuses to remove and then check the appropriate terminals for grounds.

5. Check for grounds on terminals L1L, L2L, L3L, A1M, A2M on the SCR drive, motor field module and on the MF1, MF2, and B1 and B2 panel mounted terminals. Reinstall fuses feeding terminals 2H and 2F.

3.2 SCR DRIVE INFORMATION -

Before proceeding, it is important to be familiar with the following general information.

a. The primary device for controlling the DC hoist motor is the Sweo SCR drive unit. The interconnection details for this unit, the HC-SCR interface board, tachometer, hoist motor and the isolation transformer are shown on the page of the job prints with a drawing number with the suffix (-SCR).

b. It is important to be familiar with all of Section 1 in the Sweo SCR drive manual. Note that the *ACCEL* and *DECEL* adjustments on the SCR drive unit have *no* effect on *this* particular installation. These adjustments are set full clockwise and left there.

NOTE

An updated Sweo SCR drive manual comes with this system. This Sweo manual provides specific information for the SCR drive used in this installation. It does not contain any information about the elevator or MCE controller. This manual has supplements from the SWEO manual. These supplements clarify the installation and adjustment process and explain the interface between the SCR drive unit and the main controller, with references to the original Sweo SCR drive manual. This MCE elevator control system manual should be used as the primary resource for the installation and adjustment of the complete elevator control system.

c. The interaction between the drive unit, the brake, the SCR interface board and the pattern generator I/O sub system (in the car logic section) is shown on the drive (-D) page.

3.3 BEFORE TURNING ON THE POWER -

a. Remember to check all wiring and grounds to be sure of proper connections. Check hardware to be sure equipment is mechanically and electrically secure. Clear area around the motor and be certain the motor shaft rotation is unobstructed.

b. In the following instructions, it is assumed the sling is suspended from the hoist ropes, all hatch doors are closed but not necessarily locked, and all hoistway and machine room wiring is complete.

c. Check the Pit switch, Buffer switches, Car and Car Top Stop switches and any other safety switches to see that they are on. Turn on the Relay Panel Inspection switch and connect a jumper between terminals 18 and 59. Close the car door. Leave the hall doors closed, but it is not necessary to lock them at this time. However, *do* lock the doors which are accessible to the general public.

d. With all power turned off, remove one side of the ribbon cable connecting the MC-MP Board to the HC-PI/O Board at connector C3 on the HC-PI/O Board by opening the Swing Panel and pushing open the two latches on C3.

e. Unplug the screw terminal blocks from the HC-PI/O and HC-CI/O boards by moving the blocks containing the field wires toward the right. The screw terminal blocks must be unplugged from the boards. This avoids damaging the boards by an accidental shorting of output devices to a power bus such as terminals 2, 3, or 4, when the power to the system is first being turned on. Obviously, if there are no field wires in the PI, arrow, or call terminals at this point, no terminals have to be unplugged.

f. The car safety *must* be adjusted according to the manufacturer's specifications and the governor installed and roped. Test the safety by hand to be sure it holds the car. Correct any malfunction before proceeding further.

g. Connect a jumper from 4 to 8 to bypass the door locks. If the car is on the top final limit, connect a jumper from 2 to 16, but remove this jumper as soon as possible. Also connect a jumper from terminal 20X to 21X on the VVC-2-G drive unit terminal strip which is located just to the right of the unit.

3.3.1 INITIAL DRIVE ADJUSTMENTS - On the VVC-2-G drive unit, turn the labeled trimpots TC, TE, LSS, BDD, SPD, SCAL, ES, and LOC twenty turns fully counterclockwise. The trimpots may click at the end of their rotation. Turn ACC clockwise twenty turns then counterclockwise three full turns. Notice that the BT trimpot is set back from the front of the circuit board and that it is not labeled on the front of the unit (it is labeled on the circuit board). However, *do not* adjust this trimpot (it is set at the factory) unless told to do so. On the control board in the SCR drive unit, set the trimpots as listed below. These are all one turn trimpots.

Table 3.1

SCR CONTROL CIRCUIT BOARD ADJUSTMENTS	
R101 *Max speed*	Fully counterclockwise, then ⅔ clockwise
R73 *ACCEL*	Fully clockwise
R74 *DECEL*	Fully clockwise
R57 *Zero trim*	No adjustment
R56 *Rate gain*	Fully counterclockwise
R45 *IOC**	Fully counterclockwise, then ¾ clockwise
R46 *Overspeed*	Fully clockwise
R24 *IR COMP*	Fully counterclockwise, then ½ clockwise
R161 *Current limit*	Fully counterclockwise, then ⅓ clockwise
R178 *Null forcing*	Fully counterclockwise, then ½ clockwise
R197 *MAX ARM VOLTS*	Fully counterclockwise, then ½ clockwise
R198 *Max field current*	Adjusted later

3.3.2 INITIAL IMC-GIO BOARD ADJUSTMENTS - Now arrange the pattern generator I/O subsystem to provide a screwdriver adjustable speed reference signal for use by the VVC-2-G drive unit. It is possible to adjust a single turn trimpot called the Pattern Adj trimpot located on the IMC-GIO board under the four digit Alphanumeric Display. See Figure 3.2.

a. Locate the IMC-GIO board, which is to the left and below the Computer Swing Panel. Refer to Figure 3.2 and locate the two tiny jumper plugs JP4 and JP5 directly under the four digit display and in front of Pattern Adj trimpot on the IMC-GIO board. If the plug is on JP5, the computer generated pattern is routed to the drive unit. If the plug is on JP4, it provides a 0 to +15VDC pattern signal through the 10K ohm trimpot and disconnects the computer generated pattern signal. Put the plug on JP4.

b. Turn the Pattern Adj trimpot on the IMC-GIO board fully counterclockwise.

c. The IMC-GIO board can interrupt the normal speed pattern signal under certain conditions. At this stage, bypass this temporarily by moving the jumper plug on JP3 (Cut Off Relay Bypass) from the Normal position to the TFB posi-tion. JP3 is located above the four digit display, in front of the Cut Off Relay.

3.4 POWER APPLICATION -

a. Check to see if fuse F4 and the door fuses F7 and F8 are removed. Look for the location of fuses FL4 and FL5 on page (-3) of the drive prints and remove them in order to disable primary controller voltage to the VVC-2-G drive unit. Turn Test-Norm switch to Test and turn on the Relay Panel Inspection switch.

b. Check the line side of the disconnect to see that all three legs are at the correct voltage.

c. Turn on power at the main disconnect and check the voltages at L1, L2 and L3 on the panel mounted terminals. Be sure voltage on L1-L2-L3 on the SCR Drive is correct according to the print, since the drive isolation transformer secondary may have specific voltages to be used in this installation.

NOTE

If a drive isolation transformer is provided, check for proper voltage on the primary (L1H, L2H, and L3H terminals), and on the secondary feeding the AC power to the SCR Drive (L1L, L2L, and L3L).

d. Turn off power and replace fuses F4, FL4 and FL5, and then turn on the power to the VVC-2-G drive unit and the relays. Do *not* turn on the power to the doors. If the job has freight doors, allow the retiring cam to operate.

e. Turn on main power at the disconnect and observe the Ready indicator on the SCR drive. It should light within ten seconds *maximum*. If it does not light, turn off the power at the main disconnect and reverse L1 and L2 line connections only at the AC Line Disconnect switch to reverse the phasing. Restore power at the main disconnect.

f. Now the following relays must be picked: CNP on the HC-SCR board, SAF and RPI on the HC-RB board and SAF1, a panel mounted relay. Note that there is about a three second delay for SAF to pick when power is first turned on.

3.4.1 DRIVE START UP -

NOTE

When the drive is first turned on, the motor field supply module will put out a forcing value of motor field and then drop back to a standing value after a few seconds. If any adjustment is needed, turn the Max Field Current trimpot as required. To make this adjustment, turn off the main disconnect switch for at least fifteen seconds, then turn it back to the on position. Check the motor field output terminals for a voltage close to that indicated on the -SCR page of the prints. This voltage will decay to the standing value after a few seconds.

a. In order to provide power for terminal 59 the Car Top Inspection switch must be on Normal and the Inspection switch in the car operating panel must be in the off position. At this time remove the jumper from terminals 18 and 59. This allows the RPI relay to pick. The RPI relay must pick in order to allow the Relay Panel Inspection switches to work.

b. Before starting the drive, set the Current Limit trimpot fully counterclockwise then ⅓ turn clockwise. This restricts current to a low value and prevents rapid motion in the event of a runaway. Note that the Ready indicator is lit. Also hook up a meter (250VDC scale) to motor field terminals MF1 and MF2 on the motor field module.

c. Turn on the Relay Panel Inspection switch and push the up/dn switch up for about one second. The brake should lift; the SCR drive on indicator should light, and the M contactor should pick. If the SCR drive Current Limit LED lights up, increase the Current Limit trimpot setting slightly clockwise to allow more torque output. If the drive tries to run away, limit speed by setting Current Limit trimpot more counterclockwise and note the voltage on J1-1 compared to J1-10 (both with respect to J1-7 common) on the SCR drive. If the tachometer connection is correct they will have the opposite polarity. Matching polarities indicate reversed tachometer or armature connection. No tachometer voltage indicates a fault in the tachometer or tachometer wiring. If turning the Current Limit more clockwise brings the car under control, the tachometer connection is correct. More clockwise turning should cause the car to stay still or drift very slowly. The OC indicator should be off. If any of the protective devices trip on the SCR drive, the Ready light goes off. Push the Reset button on the HC-SCR board and the Ready light turns on again after a few seconds.

d. Hold the up/dn switch in one direction and slowly advance the Pattern Adj trimpot on the IMC-GIO board clockwise. The car should move in the direction of the up/dn switch. If it moves the wrong way, turn off power and reverse motor field connections to the drive *and* reverse the tachometer connections at the tachometer itself, *not* on any controller terminals. Do not try to run the car more than 20-30 fpm. Adjust Rate Gain on the SCR drive if necessary to prevent jiggling or oscillation in the motor. Operation of the car can now be conducted from the main controller by the Relay Panel Inspection and up/dn switches.

e. With the power turned on in the SCR drive, and the car not running, verify a standing value of motor field on terminals MF1 and MF2 of the motor field module as indicated on the -SCR page of the prints. If this value cannot be obtained, check the motor field connections, motor field resistance, correct jumper setting(s) and input voltage.

f. Verify that the brake has sufficient tension to hold the car under all conditions likely to be encountered during the installation phase.

3.4.2 OPERATING SEQUENCE ON INSPECTION OPERATION - During inspection operation, the operating sequence is as follows.

a. U1 & U2 (or D1 & D2) relays on the main controller relay board pick.

b. UA1 & UA2 (or DA1 & DA2) relays on the main controller IMC-RB board pick and their contacts cause P and PT to pick as well as closing terminal 9x to 7x or 8x on the drive unit (which gives it a direction input and prepares it to put out brake voltage).

c. P and BT contacts operate the logic input on the HC-SCR board which turns the SCR drive on. PT independently operates relay R which allows the M contactor to pick. The M contactor cannot pick without the Ready light on the SCR drive being lit. Also, contactors M, BT and SAFB must drop out to pick CNP every time the car stops, or the car cannot start again. The brake cannot pick unless SAFB, BT, SAF1 and BW are picked.

d. Relay OS picks after an enable signal has been received by the SCR drive and the firing circuits are activated. If the firing circuits are disabled inside the SCR drive for any reason such as a fault condition, the OS relay drops and the brake drops as a result. Also, fault conditions disable the Ready signal on J2-3 of the SCR drive which disables the Run relay on the HC-SCR board, thereby dropping out the M contactor and brake. The car is now responsive to the Pattern Adj trimpot on the IMC-GIO board.

e. The stop sequence begins when U1 & U2 (or D1 & D2) drop, causing UA1 & UA2 (or DA1 or DA2) to drop. This takes away the speed signal and direction input from the VVC-2-G drive unit which causes the speed (pattern) signal to go to zero. The P relay drops immediately which begins the timed dropout of relays PT and BT. The PT and BT timing is roughly a second but BT should drop out before PT does. BT provides a short time to get the brake dropped by means of the BDD control on the VVC-2-G drive unit. Eventually, BT forces the brake to drop by its own timing, no matter what the VVC-2-G drive unit does. The delayed drop of the PT relay keeps the SCR drive engaged to hold the car until the brake sets.

3.4.3 RUNNING ON INSPECTION OPERATION-

a. Position the car so the car top can be accessed from the top hall door. Remove jumper from terminals 2 and 16 on the HC-RB board and any other safety circuits. Make particularly sure that the Car Top Safety switch shuts off the SAF and SAFX relays when desired. Verify that the jumper connecting terminals 18 and 59 is removed. Also check to see that the brake stops and holds the car by opening the Stop switch while moving up or down.

b. Run the car from the car top inspection station, using the up/dn buttons and the Stop switch.

c. Run the car through the hoistway, checking clearances and door locks. When all doors are locked, remove the jumper from the door lock terminals.

d. Verify the operation of the Directional and Final Limit switches. One or more of the red status indicators on the VVC-2-G drive unit may be lit along with the Safety Tripped indicator. This is not important at present because the associated safety monitors have not been adjusted. Furthermore, the temporary jumper from terminal 20X to 21X keeps the VVC-2-G drive unit operating in spite of the safety monitors' status.

e. On jobs where 40% is the right counterweight value, *always* put a 40% load in the car and check for equal motor armature current up versus down at inspection speed in the *middle* of the hoistway (especially since many traction jobs do not have compensation cables or chains). Do whatever is necessary to get the counterweighing correct.

3.4.4 PREPARING THE ELEVATOR TO RUN ON AUTOMATIC OPERATION

3.4.4.1 TEST EQUIPMENT REQUIRED - The minimum array of test equipment required for proper final adjustment includes, but is not limited to, the following.

- Sufficient amount of test weights for <u>125%</u> of rated load
- A good quality hand-held tachometer
- A DC ammeter of the 50 millivolt shunt type (or a clamp-on *DC* type)
- A digital voltmeter with input impedance of 1 megohm or more
- A good quality two-channel oscilloscope with a slow sweep speed capability of 1 centimeter per second, a storage oscilloscope or a strip chart recorder

3.4.4.2 INITIAL SPEED CALIBRATION - The speed sensitivity of the SCR drive must be synchronized with the VVC-2-G drive unit. The speed or pattern signal appears on terminal 4X with reference to terminal 5X on the VVC-2-G drive unit. *At contract speed, this voltage must be ± 9.5 to 10.0V (+ = up; and - = down).*

a. Run the car on inspection and set the Pattern Adj trimpot on the IMC-GIO board so the pattern voltage, as measured on terminal J1-6 (Buffer Input +) with respect to terminal J1-5 (Buffer Input -) on the control board at the SCR drive, is exactly 1V. (Make it as exact as possible - use a digital voltmeter. Remember that + = up; and - = down.)

b. Set the Max Speed control on the SCR drive to give 0.80V on J1-10, with respect to J1-7, and adjust the Tach Adjust potentiometer, on the backplate, for 10% of contract speed. The car should run at this speed exactly, up or down.

c. Again run the car on inspection and measure the voltage on terminal J1-10 (Speed Command Input) with respect to terminal J1-7 (Common) on the control board of the SCR drive. The voltage should be 0.8V +/- 0.05V (polarity doesn't matter). If this cannot be achieved, check for proper pattern input, and input voltage on J1-6 and J1-5.

3.4.4.3 MECHANICAL CHECKS -

a. The door operator must be operating properly. Check for proper pattern voltage on terminals J1-6 and J1-5 with all door equipment, clutches, rollers, etc., properly adjusted with correct running clearances. Check controller prints to be sure all instructions have been followed regarding the installation of diodes on the door operator on the car (especially for G.A.L. door operators).

b. Make sure all hoistway and car doors are closed and locked. Run car on inspection through the hoistway to be sure hoistway is completely clear. Check to be sure magnets are installed according to installation instructions.

c. Now put <u>125%</u> of full load in car at or near the bottom landing to check the ability of brake to hold this load. *The car may slide into the pit during loading so use extreme caution!* Make mechanical adjustments to brake as necessary to stop and hold load while opening Emergency Stop switch when the car is going down on inspection speed. To move car back up with full load it may be necessary to turn the Current Limit trimpot on the SCR drive.

4. Remove all weights from car to give a no load condition.

3.4.4.4 ELECTRICAL CHECKS -

a. In case of nuisance tripping, verify that the jumper between terminals 20X and 21X on the VVC-2-G drive unit Terminal Strip is still connected. This bypasses the electronic safety shutdown until final adjustment is complete.

b. Turn on the Test-Norm switch on the HC-RB relay board. If the car is run from the HC-RB relay board, the Car Top Inspection switch must be Normal which turns the power on at terminal 59. Turn on the Relay Panel Inspection switch, and operate the up/dn constant pressure toggle switch.

c. Stop the car at the top or bottom, within the door zone (DZ relay picked). The elevator should be shut down and main power turned off.

3.5 PREPARATION FOR FINAL ADJUSTMENT -

NOTE

Read through completely before attempting final adjustment.

a. Turn off power at the main disconnect. Reconnect the ribbon cable from the MC-MP onto the C3 header on the HC-PI/O board. Pin 1 of both the ribbon cable connector plug and the header on the HC-PI/O board must match. These are designated with arrows on the connector and header. Press the connector until the latches snap in and cover the connector, securing them in place. Now turn on the power again.

b. To speed up troubleshooting, be familiar with signals given by the Diagnostic Indicators on the Computer Swing Panel. See Figure 5.1. Be conversant with Sections 5.2.2.a and b., and Tables 5.7 and 5.8 - MC-MP Board Status Displays and IMC-DDP Board Status Displays.

c. Turn the Test-Norm switch to Test in order to adjust the elevator without interfering with other elevators and to prevent use by the public.

d. To get the car to move, connect a jumper from terminal 1, or ground, to the desired car call terminal. Hold the jumper on the car call terminal until the car actually starts. The car will not move again for a few seconds just after it stops at a floor even though the jumper is on. The CRT's F3 screen can also be used to enter car calls.

e. Position Indicators and direction arrows are displayed on the HC-PI/O board. Calls are displayed on the HC-CI/O board. A feature is provided on call outputs to show that an incandescent call light bulb is burned out. In such cases the call light shines dimly if the call is not active and shines normally if the call is registered. If the job has non-incandescent indicators for calls, such as neon, check the board number (it should read HC-CI/O-N) to make sure the call boards are arranged appropriately, otherwise the indicator LED on the board will stay lit all the time. With neon, the burned bulb feature does not work.

f. Obtain a two-channel oscilloscope for the final adjustment of the elevator. While it is possible to use one without waveform storage capability, a storage-type oscilloscope with horizontal sweep is *strongly* recommended. It can achieve a speed as slow as ½ second per centimeter. If it is not convenient to purchase a storage oscilloscope, it is possible to rent one. If a storage oscilloscope is unavailable, then use a chart recorder with a minimum chart speed of 1 cm/sec.

g. Now prepare to adjust the response of the car so the empty car rollback is negligible while avoiding oscillations caused by too much feedback adjusted into the system. Set the Pattern Adj trimpot on the IMC-GIO board to 0.3V on test point P with respect to COM while running. Do not exceed 20 fpm car speed. For these adjustments, hook up the storage oscilloscope or strip chart recorder common lead to terminal TC, and the signal lead or probe to terminal TS to get the tachometer signal. If this point is too noisy, place the common lead on test point COM and other lead or probe on test point T on the VVC-2-G drive unit. The voltage on this test point will be set later.

CAUTION

Most oscilloscopes have a grounding pin on their power plug. It is recommended that the grounding pin be *defeated* with one of the commonly available ground isolation adapter plugs so that the case of the oscilloscope is *not* at a ground potential but, instead, is at the potential to which the negative probe lead is connected. Then *treat the case of the oscilloscope as if it is a lethal shock hazard, depending on where the negative probe is connected*. This recommendation is made because the ground potential on the grounding pin of the power outlet may not be the same as the controller cabinet ground. If it is not, substantial ground loop current may flow between the negative probe and the power plug grounding pin. This can ruin a $3,000 piece of test equipment!

h. Move the jumper plug from JP4 to JP5 located on the IMC-GIO board above the Pattern Adj trimpot. The car speed is slower than before; increase the car speed by turning the Pattern Adj trimpot clockwise so the car moves about 20 fpm. Adjust the SPD (speed pick delay) trimpot, on the VVC-2-G drive unit so that its Pattern Enable indicator lights just as the brake shoes clear the brake drum.

i. There are two trimpots which affect car response on the SCR drive. Adjust both as necessary with an empty car to get optimum control of the hoist motor. Remember to check for vibration throughout the entire length of the hoistway. Use the oscilloscope to view the results of adjusting for best response.

1. R56-RATE GAIN - Adjusts rate servo loop gain without affecting maximum speed or tachometer scale factor. Increasing this setting improves response but may cause speed overshoot, ringing, or a vibration such as jittering. Decreasing this setting slows drive response. The car, if empty, will probably drift in the direction of the load (up) when an attempt is made to move it down. Increase Rate Gain clockwise as much as possible while watching for severe overshoot or for oscillations such as rapid jiggling or a slow bobbing effect.

2. R24-IR COMP - Adds negative feedback from the armature current to damp out oscillations or rapid changes in torque. Full counterclockwise gives no damping, clockwise increases damping. Turn this trimpot fully clockwise if necessary.

CAUTION

After the adjustments in Section 3 have been made, the following fuses and jumpers should be in the indicated positions.

- Fuses F7 and F8 have been reinstalled.
- Jumper plug JP3 should be on the TFB position on the IMC-GIO board.
- The jumper connecting terminals 4-8 on the HC-RB board should be removed.
- The jumper connecting terminals 20X-21X should remain connected.
- The jumper connecting terminals 2-16 should be removed.
- A jumper plug should be on the JP5 position on the IMC-GIO board.

3.6 VVC-2-G DRIVE UNIT ADJUSTMENTS-

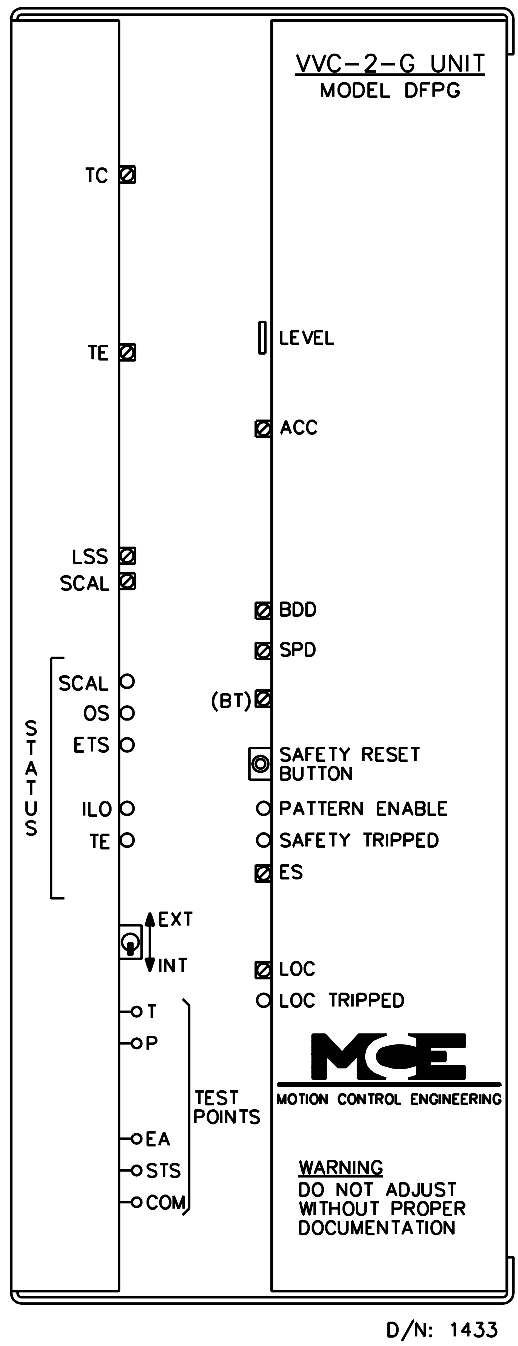
TC TRIMPOT (Tach Calibrate) - The safety circuit calibration is controlled by this trimpot. With a pattern voltage of $\pm$ 10V on test point P with respect to test point COM, adjust TC to make the voltage zero on test point EA to COM. This trimpot allows a range of tachometer voltage from 6V to 60V on terminals 27X to 9X at contract speed.

TE TRIMPOT (Tach Error) - This trimpot adjusts the amount of error permitted between the voltage from the tachometer (proportional to actual car speed) and the pattern voltage (proportional to intended car speed). Counterclockwise adjustment *increases*, while clockwise *reduces*, the amount of error permitted. Because of the precision of this control, it may be possible to shut down the car by first clipping, then immediately remaking the door lock. If excessive error is detected, the TE status indicator lights and the VVC-2-G drive unit safety will be tripped.

LSS TRIMPOT (Low Speed Safety) - This control establishes the speed setting for the Low Speed Safety monitor. If this speed is exceeded during leveling, hoistway access, or car top inspection operation, the monitor trips, the ILO status indicator lights and the VVC-2-G drive unit safety is tripped.

SCAL TRIMPOT - (Safety Calibrate)

VVC-2-G DRIVE UNIT
FIGURE 3.1



-This trimpot is adjusted to indicate that the car is at contract speed +/2%. This control is adjusted to light the SCAL LED after it has been established that the car is running at a stabilized contract speed. Turn the SCAL trimpot until the SCAL indicator comes on. After illumination, maximum brightness of the indicator will be within another ¼ turn of the trimpot. With clockwise turns, keep adjusting the trimpot until the maximum brightness of the indicator is achieved. This automatically calibrates the safety monitor circuits that trip the OS and ETS status indicators.

SCAL INDICATOR (Safety Calibrate) - See the description of the SCAL trimpot above. This indicator glows green when the car speed is within 2% of contract speed, provided the SCAL trimpot is adjusted correctly.

OS INDICATOR (High Speed Overspeed) - If the car speed goes 5% over contract speed, the overspeed safety monitor circuit trips off and lights the red OS indicator. The overspeed safety monitor circuit feeding the OS indicator depends on the proper adjustment of the SCAL trimpot (see above).

ETS INDICATOR (Emergency Terminal Stopping Device) - If the car speed is at 95% of contract speed by the time the appropriate Emergency Terminal Stopping Limit switch feeding terminal 28X or 29X is opened, the emergency terminal stop safety monitor circuit trips off and illuminates the red ETS indicator (provided the SCAL trimpot is properly adjusted).

ILO INDICATOR (Inspection and Leveling Overspeed) - If the car speed exceeds the threshold set by the LSS trimpot (150 fpm or less), the ILO status indicator glows red and the associated safety monitor trips off.

TE INDICATOR (Tach Error) - This indicator glows red if the circuit involving the TE trimpot detects too much error between intended and actual speed.

T TEST POINT (Tach) - The test point is proportional (*but not equal*) to the actual tachometer voltage. The voltage on T is proportional to car speed.

P TEST POINT (Pattern Signal) - The pattern signal test point is proportional to the intended car speed with approximately 10V equaling contract speed (+ = up; - = down).

EA TEST POINT (Error Amplifier) - The error amplifier output can be seen on this test point, and shows the difference between the T and P test points. In other words, this test point shows the difference, or error, between the *intended* speed (P) and *actual* speed (T) of the elevator.

STS TEST POINT (Synthesized Tach Signal) - This is a voltage which is produced by the adjustment of the MIC and MVC trimpots located on the HC-SCR board, and, if properly adjusted, is a voltage which is proportional to the internal EMF of the hoist motor. Therefore, this signal is used as an independent speed signal for code-required speed monitoring.

COM TEST POINT (Common) - This is the reference test point against which all other test points are measured. The oscilloscope common or voltmeter common should connect here. COM is also the same as terminal 9X.

LEVEL INDICATOR - When terminal 11X is connected to terminal 9X, the level status input is activated and the indicator is illuminated. When this input is activated, the ILO (Inspection, Leveling, and Overspeed) circuitry is also activated.

ACC TRIMPOT (Acceleration Rate Limiter) - This control allows adjustment of the time it takes to decelerate from maximum speed to zero. It establishes the maximum deceleration rate in an emergency slowdown condition. With the control set fully counterclockwise, the time required is approximately five seconds. With the control fully clockwise the time is about 0.5 seconds.

BDD TRIMPOT - (Brake Drop Delay) - This control allows adjustment of the length of time between direction dropping to brake dropping.

SPD TRIMPOT (Speed Pick Delay) - This control delays the application of the direction input to the pattern generator I/O subsystem by an amount ranging from .1 seconds to .75 seconds with turns in the clockwise direction yielding more time. This allows proper coordination of acceleration with the picking of the brake for minimum rollback, and avoidance of accelerating, before the brake lifts. Application of direction is controlled by a relay contact between 22X and 23X on the VVC-2-G drive unit.

BT (Brake Trim Control) - This trimpot calibrates the maximum output of the brake voltage. It should not be adjusted.

SAFETY RESET BUTTON - This button is provided as a means of resetting the VVC-2-G drive unit after one or more of the following conditions (OS, TE, ILO, or ETS) have caused the safety monitor circuits to trip the internal safety relay. Pushing the button resets all the safety monitors and the internal safety relay which re-closes the circuit between terminals 20X and 21X.

PATTERN ENABLE INDICATOR- The illumination of this green LED means the internal pattern disable relay is in the off position, which closes terminal 22X to 23X and enables pattern to be active. This output is controlled by the SPD trimpot.

SAFETY TRIPPED INDICATOR- The illumination of this red LED means that the safety monitor circuits have tripped the internal safety relay.

ES TRIMPOT (Electric Stop Control) - This control causes a pulse of reverse polarity to be generated at the instant the car stops (direction input removed). More clockwise rotation gives a stronger output pulse. Increasing this adjustment stops the car more quickly. Full counterclockwise removes any pulse. This is used for electric stopping before the brake sets.

LOC TRIMPOT (DC Loop Overcurrent Control) - This control allows calibration of the DC loop current overload tripping threshold for the DC motor. The current signal is obtained from the Sweo SCR drive and brought through terminals 25X and 9X. Fully counterclockwise rotation means LOC does not trip and more clockwise rotation means it takes less and less current to trip this overcurrent monitor. Tripping this monitor illuminates the LOC Tripped indicator and the Safety Tripped indicator which opens the contact between drive terminals 20X and 21X.

LOC TRIPPED INDICATOR- This red LED indicator lights whenever the DC loop overcurrent detector controlled by the LOC trimpot detects an excessive amount of current flowing in the DC loop between the SCR drive and DC hoist motor. This causes the Safety Tripped indicator to light.

Table 3.2

VVC-2-G DRIVE UNIT TRIMPOT SUMMARY

Trimpot	*Direction*	*Result*
TC	Clockwise	Increases T to set EA=OV with 10V on P. Does not affect car speed.
TE	Clockwise	Less difference allowed between the tach and pattern voltage.
LSS	Clockwise	Decreases maximum speed during inspection, access and leveling.
SCAL	Clockwise	Calibrates OS and ETS safety circuits (SCAL LED lights at high speed).
ACC	Clockwise	Faster rate of change of speed signal in emergency slowdown.
BDD	Clockwise	Longer delay before brake drops.
SPD	Clockwise	Longer delay before onset of speed signal (pattern). Allows more time for brake to pick.
BT	Clockwise	Less brake voltage.
ES	Clockwise	Stronger braking pulse at stop.

VVC-2-G DRIVE UNIT TRIMPOT SUMMARY		
LOC	Clockwise	Less current required to trip DC loop current overload sensor.

3.7 SWEO SCR DRIVE CONTROL BOARD TRIMPOTS -

MAX SPEED: (Maximum Speed Voltage) - Adjusts the maximum input voltage that is used as input to the drive on J1-10 to J1-7(common). The contract speed voltage from the pattern generator is 10V between J1-5 and J1-6. This control is used to reduce the voltage to 8V +/- 0.25 as measured from J1-10 to J1-7 at contract speed.

ACCEL/DECEL: These adjustments are not used on this type of controller and should be set to the clockwise position.

ZERO TRIM: (Zero Trim) - Adjusts the zero offset of the rate amplifier. This control is used to set zero drift at zero input voltage. This control is set at the factory and is normally not adjusted in the field.

RATE GAIN: (Rate Loop Gain) - Adjusts the rate loop gain without affecting the speed or tachometer scaling. Increasing the gain improves response and makes the actual speed follow the pattern more closely, but may cause speed overshoot or oscillations. Decreasing the gain slows the response and makes the error between the tachometer and pattern larger. If the gain is too low, the elevator may yo-yo (low frequency oscillations) in the hoistway.

IOC: (Instantaneous Overcurrent) - Sets the peak current at which the drive trips off due to overcurrent. Full clockwise setting is 140 to 180% of drive maximum current.

OVERSPEED: (Overspeed/Tach Loss) - Sets a trip point at which the drive trips off when the tachometer voltage exceeds the control setting. Full clockwise is about 125% of contract speed. This control is adjusted for 105% of contract speed. As a second feature, it also trips (tachometer loss trip) if the tachometer voltage does not follow the armature voltage within a reasonable tolerance.

IR COMP: (Low Frequency Damping) - Adds a negative feedback signal from the armature current to damp out oscillations or rapid changes in torque. Full counterclockwise gives no damping, clockwise increases damping.

CURRENT LIMIT: (Maximum Armature Current Limit) - This control sets the max-imum armature current the drive supplies at low speed. Peak rated current is full clockwise.

MAX ARMATURE VOLTS: (Maximum Armature Voltage)- This control sets the maximum armature voltage of the motor at contract speed. The field voltage of the motor is set to a forcing value (a value higher than nameplate) for better low speed control. This means that the armature voltage reaches the nameplate value at some point less than contract speed. The maximum armature voltage is limited at this point and the field current is reduced to allow the motor to reach contract speed. This part of the control only starts to weaken the motor field after the armature voltage reaches rated voltage (typically 240VDC). Where overshoot of armature voltage occurs, adjust the MFW trimpot on the HC-SCR board.

MAX FIELD CURRENT: (Maximum Field Current) - Adjusts the maximum field current which the field module supplies when the motor is operating below contract speed. The Max Armature Volts determines field output at contract speed so this control should not be adjusted at speed. It should be adjusted at zero speed with a direction selected. E.g., adjust while running on inspection with parameter VIN = 000 for zero speed.

NULL FORCING: (Null Forcing) - Adjusts increase in nonlinear firing angle command at low current command levels (null region) to linearize the control in the null region. Increasing this setting makes the drive more snappy at null but causes more current overshoot; a decrease in this setting slows response at null.

Table 3.3

SWEO SCR DRIVE TRIMPOT SUMMARY		
Trimpot	*Direction*	*Result*
IOC	Clockwise	Increases over current trip point. Set when accelerating up with a full load.
OVERSPEED	Clockwise	Increases overspeed tripping velocity.
IR COMP	Clockwise	Increases damping (takes out oscillations).
RATE GAIN	Clockwise	More loop gain and tighter response. Can cause oscillations if too far clockwise.
ZERO TRIM	Clockwise	Factory set, do not adjust.
ACCEL-DECEL	Clockwise	Not used (set at full clockwise).
MAX SPEED	Clockwise	More max speed volts on J1-10 with respect to J1-7. Set to 8V for contract speed.
MAX ARM VOLTS	Clockwise	Increases maximum armature volts.

MAX FIELD CURRENT	Clockwise	Increases maximum field current.
NULL FORCING	Clockwise	Increases drive's response to low current/torque command.
CURRENT LIMIT	Clockwise	Increases the maximum armature current.

3.8 EXPLANATION OF TRIMPOTS ON HC-SCR BOARD (SCR DRIVE INTERFACE BOARD) -

RY1: If present, do not adjust

RY2: If present, do not adjust

LST: If present, do not adjust

MVC: Motor voltage calibrate

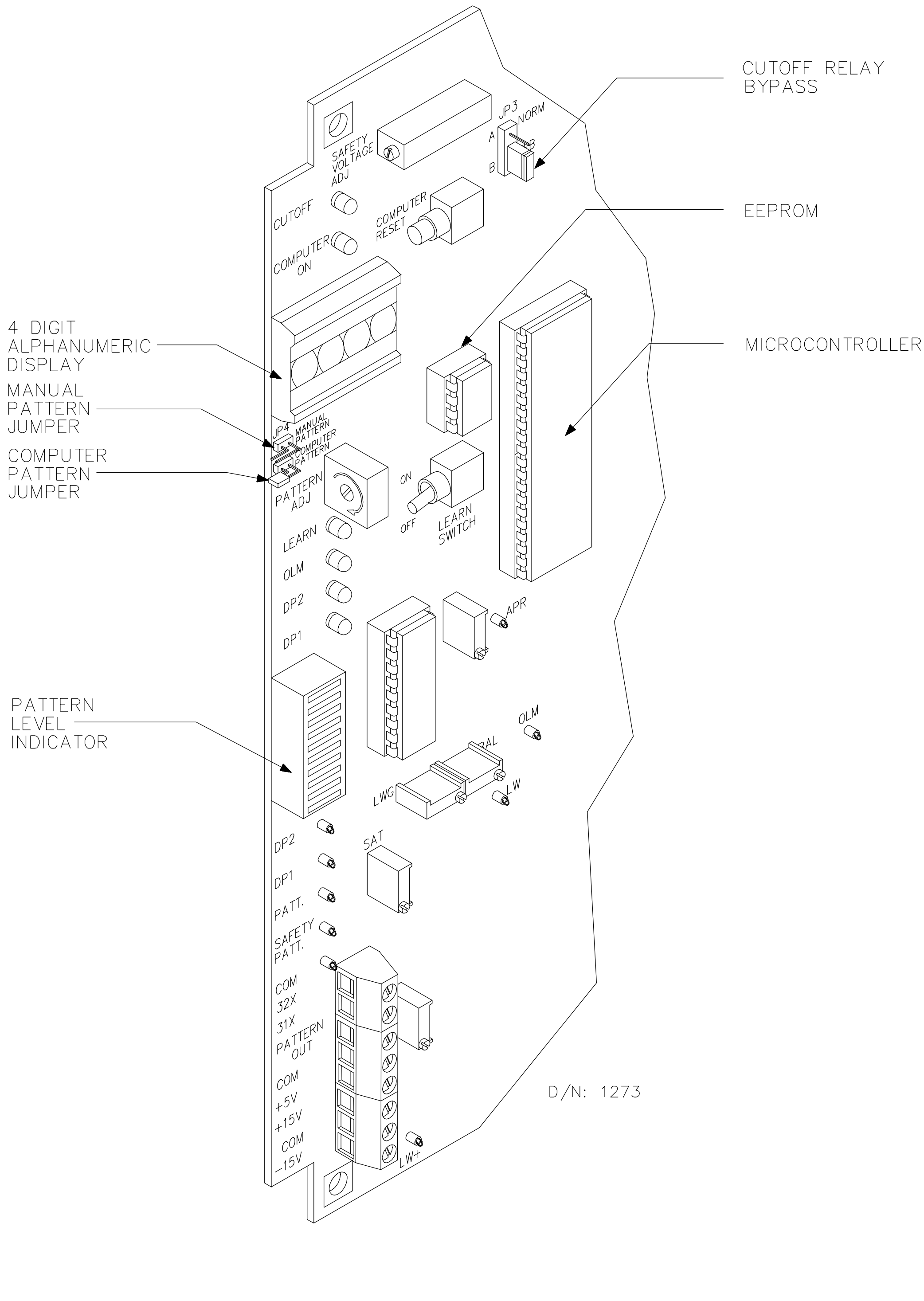
MIC: Motor current calibrate. This trimpot and the MVC trimpot are used to recreate a voltage on J1-3 with respect to J1-4, which is proportional to the motor EMF signal. This voltage is about 10V at contract speed.

MFW: Motor field weakening. Note that MVC and MIC must be adjusted properly before adjusting MFW. This trimpot is not normally adjusted, but in some installations, some overshoot of armature voltage occurs as the car approaches contract speed. Since this circuit reacts to changes in motor armature current sooner than the MAX ARM voltage circuitry, it is capable of weakening the motor field sooner so that overshoot does not occur. Clockwise rotation of MFW weakens motor field as car approaches contract speed.

3.9 TRACTION PANEL ADJUSTMENTS -

TACHOMETER ADJUST: (Tach Voltage Adjust) - This adjustment is used to set the car speed. This potentiometer is set at the factory for 50V/1000 rpm tachometers. Use this trimpot as outlined in Section 4.5.1.a.3 in order to calibrate contract speed. This is a locking adjustment and should be locked once it is set so it cannot be changed. This adjustment should accommodate tachometer voltages from 30 to 100V.

IMC-GIO BOARD ADJUSTMENTS AND INDICATORS
FIGURE 3.2



SECTION - 4

FINAL ADJUSTMENT FOR MCE'S VVMC-1000 SERIES TURBO DF WITH SWEO SCR DRIVE

4.0 GENERAL INFORMATION -

At this point, Section 5 should have been read and all the steps in Section 3 completed. Section 4 describes the sequence of steps necessary to complete the final adjustment of the elevator system. At this time, all fuses should be in place. All jumpers, except the jumper wire connecting terminals 20X and 21X, should be removed.

4.1 SET UP OF CRT TERMINAL -

The CRT terminal should now be installed. Refer to the MCE Computer Peripherals Manual for installation instructions. Also see Figure 4.2 - MC-MRS Link to CRT terminal.

a. Once the CRT is installed, turn on the CRT terminal power switch. When the CRT is turned on, it is important to remember that it *must be initialized*. Press F5 on the keyboard to begin the initialization process. When initializing the terminal, the screen goes blank and may flash a couple of times before showing a readable display. Initialization takes about ten seconds and configures the WY-60 or equivalent terminal to meet MCE requirements for communication and display characteristics. If problems arise in the CRT display functions because of power surges or line noise, reinitialization of the terminal generally clears the problem. Reinitialization of the terminal is listed on the main menu. Once the terminal has been initialized, the main menu is displayed on the screen. When this occurs, all display functions are available to the operator with a single key stroke. Each main menu function can be accessed directly from any other main menu function. It is not necessary to return to the main menu in order to enter a different display screen. Once the operator becomes familiar with the function key definitions, accessing information on the CRT is easy.

b. Press function key (F1) on the CRT terminal keyboard to display the Digital Drive Parameters screen. Adjust and verify the speed parameters which define and describe exactly how the car moves between any two landings. Initial values from the factory are a combination of calculated values and values obtained by experience, but they are only provided as a starting point. For typical values of speed parameters consult Table 4.2.

c. As mentioned before, speed parameters are stored in EEPROM non-volatile memory. When the IMC-DDP software reads from the EEPROM, it checks the validity of the data. If the data are not valid, the software creates an EEPROM read error (EPRD). Some important considerations regarding the EEPROM are as follows.

- If an EEPROM chip is replaced on the IMC-DDP board, it is likely that the new chip is either blank or contains wrong data. In this case, ignore the EEPROM read error. Proceed with the learn operation.

- If the EEPROM read error (EPRD) is encountered, reenter the speed parameters. Reset the IMC-GIO computer after the data are reentered to verify that the new data are stored in the EEPROM. Note that resetting the IMC-GIO processor is only necessary if the EEPROM read error was encountered. In the normal course of changing the parameters, it is not necessary to reset.

d. If the data are incorrect, or if changing a parameter is necessary, take the steps below.

1. Put the car on inspection using the Relay Panel Inspection switch.

2. Observe the cursor on the screen under the Desired Values column.

3. The desired parameter(s) are reached by using the TAB key on the CRT terminal keyboard.

4. Once the cursor is on the parameter to be changed, use the right or left arrow key to select the digit of the parameter.

5. Once the digit of the parameter is selected, use the I/D key on the CRT terminal keyboard to increase or decrease the value of the digit. When changes are made to the digits of the parameters in the Desired Values, the changes are made permanent by hitting the S key. When Are You Sure? (Y/N) appears, hit the Y key. The Y key saves all the values in the Desired Values column to non-volatile memory (EEPROM). Once the data are saved in the EEPROM, Actual Values and Desired Values are the same if the data entered were within the acceptable range. If any of the parameters were not within the acceptable range they are not saved, and the value shown in the Actual Values column will be default values.

If the combinations of the parameter entered are not valid, the CRT displays a message saying This Combination Of Parameter Values Is Unacceptable. There are three possible reasons for the system to consider the parameters unacceptable. Pattern Generator Trouble-shooting, in Section 6.4, goes into this in greater detail. Possible reasons for unacceptable parameters are as follows.

a. The parameters entered do not allow proper generation of stepping points in the hoistway.

b. There is a short floor in the building to which the system cannot respond.

c. Within the given parameters, the computer cannot generate a two floor run pattern. Note that if the system cannot generate a one floor run pattern it would consider that floor a short floor and creates a custom short floor pattern for the specific floor.

4.2 RUNNING THE CAR ON INSPECTION UNDER COMPUTER CONTROL -

a. No LEDs or readouts on the Computer Swing Panel should be illuminated.

b. Turn on power at the main disconnect. The Relay Panel Inspection switch should be on and the Computer On light on the upper left corner of the Computer Swing Panel should be lit. The IMC-DDP processor board which creates the digital pattern signal should be functioning properly. To determine that it is, observe the DDP Computer On indicator at the back of the Computer Swing Panel. If the indicator is on solidly, the IMC-DDP processor board is functioning. If the Computer On indicator is off, flashing, or flashing very slowly, the IMC-DDP processor board is not functioning properly. If this is the case, check the EPROM socket to verify proper insertion and orientation of the EPROM chip. If the SAF relay on the HC-RB board is energized, then the Safety On indicator in the vertical row of indicators on the right side of the Swing Panel must be illuminated.

c. The Inspection switch on the elevator car top must be in the Normal position. This places 120VAC on terminal 59 with respect to terminal 1. With the Pattern Adj trimpot on the IMC-GIO board all the way clockwise, run the car, using the Relay Panel Inspection up/dn switch, and verify that the car speed is approximately 50 fpm.

d. Verify that there is a jumper plug on JP5 on the IMC-GIO board. See Figure 3.2.

e. Verify USD/DSD inputs to the HC-PI/O board for proper operation at terminal landings. To find the proper place in the schematics look at area 9 of the individual elevator job prints in Section 7 and find the USD and DSD designations at the left margin of the page. Then follow to the right to identify the terminal numbers corresponding to the 120VAC sources for these signals. The best way to verify that these signals reach the MC-MP processor board is to use the Enhanced On-Board Diagnostics (the EOD) described in Section 5. Set switches A2, A3, A4 and A6 up. All other switches should be down or off. The second LED is for the USD flag. The sixth LED is for the DSD flag. Now run the car on inspection to the bottom landing and verify that the DSD input signal is off at the bottom. Run the car to the next landing above the bottom, and observe when the DZ relay energizes. Verify that the DSD input signal is on. To verify the USD input signal, run the car to the top landing and observe that the USD input signal is off. Run the car down to the next landing below the top, watching the DZ relay (or DZR relay if there are rear doors) to verify that the USD input signal is on. Correct any problem with the Limit switches feeding the USD and DSD inputs at this time before proceeding. Also, program in, or verify, the number of landings, contract speed, inspection speed and leveling speed on the F1 screen of the menu.

4.3 HOISTWAY LEARN OPERATION -

NOTE

The building floor heights must be successfully learned prior to running the elevator on automatic operation.

Learning the building is defined as recording the location of each floor in the building relative to the bottom floor within .1875" accuracy. This is accomplished by reading the holes in a perforated tape as the elevator travels the entire length of the hoistway from the bottom to the top. Take the following steps.

a. The car must be on Relay Panel Inspection.

b. On the IMC-GIO board, place the JP3 jumper plug in the TFB position.

c. Move the JP4/JP5 jumper plug on the IMC-GIO board from the manual pattern (JP4) position to the computer pattern (JP5) position.

d. Pull the Level Down wire out of terminal 25 at the bottom of the HC-RB relay board. Place jumper plug on JP1 jumper pins located on the upper right corner of the IMC-RB board above the CSB relay so the two pins are connected by jumpers.

e. The contract speed (VH) and the number of landings (NL) displayed on the CRT menu F1 (shift F2 for simplex) must correspond to the particular elevator being worked on. If VH and NL are not correct values, change them. Section 4.1 (d) describes how to change parameters in this screen. Once the proper values of VH and NL are displayed on the Actual Value column of this screen, proceed with the learn function. The speed during the learn operation is the same as the Correction Speed or VCR parameter. A good value for VCR is 50 fpm. Display the F3 screen for help in the learn operation. It displays car motion and the counts for each floor as the building is learned. It also displays error messages that may occur during the learn operation. Disregard error messages from the EEPROM. They are caused by the fact that the building has not yet been learned.

f. Move the car on inspection below the bottom landing door zone (DZ) and into the level up (LU) position by connecting a jumper from terminal 8 to terminal 12 (Down Normal Limit), and by connecting a jumper from terminal 2 to 16 (primary safety circuit), if necessary. Notice that the F3 screen on the CRT must display LU but not LD or DZ. A thorough knowledge of the EOD in Section 5 is necessary, especially 5.2.2.3, for viewing inputs and flags. It is essential that DSD remains off when the car is below the floor. On the F3 screen, verify the following conditions.

USD (Up Slowdown) = ON
DSD (Down Slowdown) = OFF

g. Now the system is ready for the learn operation. Set the diagnostics to the system mode. Refer to Section 5.2.4. Put the system into the learn operation by following the instructions in Section 5.2.4.2. The Alphanumeric Display on the Computer Swing Panel should say LN READY. If the system is not ready to learn, the Alphanumeric Display would indicate LRN ERR, and the Diagnostic Indicators on the lower right hand corner of the Swing Panel would flash the error condition that is causing the learn error message. In case of error indication, refer to Table 5.2 and Table 5.8 in Section 5 for a complete listing. When error conditions are eliminated, the Alphanumeric Display will show LN READY.

h. With the Alphanumeric Display indicating LN READY, learn the building by running the car the full length of the hoistway by holding the HC-RB Relay Panel Inspection switch in the up position. The Alphanumeric Display indicates LEARNING. Do not release this switch until the word LEARNED is displayed on the Alphanumeric Display and Learn Complete is on the CRT F3 screen. Premature release of the up switch would cause LRN ERR (learn error) to appear and the system would have to be brought out of the learn operation and the car sent to the bottom of the hoistway again. The learn operation would then have to be reinitiated. In case of difficulty in achieving the LN READY display, turn off switches F4 and F7 on the Computer Swing Panel, wait ten seconds and then reenter the learn operation as in step (g) above.

Note that as the car moves very slowly up on inspection, the quadrature position pulser indicators labeled DP1 and DP2 on the front of the IMC-GIO board flash on/off. The proper sequence of the status change of the DP1 and DP2 pulsers is important.

1. DP1 Turns ON
2. DP2 Turns ON
3. DP1 Turns OFF
4. DP2 Turns OFF

This sequence goes 1, 2, 3, 4, 1, 2, 3, 4, in the up direction and 4, 3, 2, 1, 4, 3, 2, 1 in the down direction. If the pulsers are out of sequence, the DP1 (terminal 95) and DP2 (terminal 96), are wired backwards and must be swapped at terminals 95 and 96.

i. Individual floor heights can be verified by multiplying the floor count displayed on the F3 menu of the CRT terminal by .1875" to arrive at the height in inches. To make sure proper values are displayed on the CRT screen, press the F3 function key on the CRT terminal keypad after the learn operation is complete.

j. When Learn Complete flashes on the CRT and the Alphanumeric Display indicates LEARNED. Wait a few seconds to allow the IMC-DDP computer to store the learned data into the EEPROM. The F3 screen may still indicate some error messages. These error messages are probably related to the motion parameters. Nevertheless, continue with the steps.

k. Remove the system from the learn operation by toggling F4 and F7 switches on the front of the Swing Panel to the off position.

l. Turn off the individual car power disconnect. Replace the Level Down wire into terminal 25. Remove the JP1 jumper from the IMC-RB board. On the IMC-GIO board, place the JP3 jumper in the Norm position.

m. Remove the jumpers from terminals 2 to 16 and 8 to 12. Turn on the main power disconnect switch for that car.

4.4 VERIFYING ABSOLUTE FLOOR NUMBERS -

All the floor magnets should have been installed on the perforated tape as instructed in Section 2.4.4.2.

a. Turn on the Diagnostic On-Normal switch on the Computer Swing Panel.

b. Dial up the diagnostic switches to address 21. The A1 and A6 switches should be up; all other A switches are down. The Pattern Generator Diagnostic Indicators on the top of the Swing Panel are now arranged to display (starting with indicator 8 and ending with 1) from left to right as follows.

RD - PR - R5 - R4 - R3 - R2 - R1 - R0

c. Move the car on inspection to the bottom landing. Stop the car so that the RD indicator shown above is illuminated. This indicates that the RDU and RDD sensors on the LS-QUAD-2 or LS-QUAD-2R landing system are centered on the leveling magnet. Note that the DZ relay must also be energized. If the LS-QUAD-2R landing system is being used, rear doors are present. Therefore, one or the other, or both, of the DZ or DZR relays must be energized, as well.

d. Starting at the bottom, run the car to each floor and verify the indications exactly as shown in Table 4.1. Do not proceed beyond this step until the exact indications listed above have been achieved. Failure to do so results in incorrect floor position indication and erratic operation. Verify that when the RD indicator is on, the DZ relay is energized on the F3 screen, or on the HC-RB relay board (it would be DZR relay on the HC-RDRB rear door relay board, if the job has rear doors). If obtaining the proper indications presents difficulties, investigate the following: missing magnets, wiring mistakes and/or a defective sensor. A defective sensor may be tested manually by moving a magnet near the sensor and observing the LED indicators inside the LS-QUAD-2 or LS-QUAD-2R landing system box. If it should be necessary to run the elevator slowly to position it, turn on the RD indicator, and turn the Pattern Adj trimpot counterclockwise temporarily.

Table 4.1

ABSOLUTE FLOOR CODE INDICATOR LISTING*

● = ON **○ = OFF**

	RD	PR	R5	R4	R3	R2	R1	R0
Floor #1	●	●	○	○	○	○	○	●
Floor #2	●	●	○	○	○	○	●	○
Floor #3	●	○	○	○	○	○	●	●
Floor #4	●	●	○	○	○	●	○	○
Floor #5	●	○	○	○	○	●	○	●
Floor #6	●	○	○	○	○	●	●	○
Floor #7	●	●	○	○	○	●	●	●
Floor #8	●	●	○	○	●	○	○	○
Floor #9	●	○	○	○	●	○	○	●
Floor #10	●	○	○	○	●	○	●	○
Floor #11	●	●	○	○	●	○	●	●
Floor #12	●	○	○	○	●	●	○	○
Floor #13	●	●	○	○	●	●	○	●
Floor #14	●	●	○	○	●	●	●	○
Floor #15	●	○	○	○	●	●	●	●
Floor #16	●	●	○	●	○	○	○	○
Floor #17	●	○	○	●	○	○	○	●
Floor #18	●	○	○	●	○	○	●	○
Floor #19	●	●	○	●	○	○	●	●
Floor #20	●	○	○	●	○	●	○	○
Floor #21	●	●	○	●	○	●	○	●
Floor #22	●	●	○	●	○	●	●	○
Floor #23	●	○	○	●	○	●	●	●
Floor #24	●	○	○	●	●	○	○	○
Floor #25	●	●	○	●	●	○	○	●
Floor #26	●	●	○	●	●	○	●	○
Floor #27	●	○	○	●	●	○	●	●
Floor #28	●	●	○	●	●	●	○	○
Floor #29	●	○	○	●	●	●	○	●
Floor #30	●	○	○	●	●	●	●	○
Floor #31	●	●	○	●	●	●	●	●
Floor #32	●	●	●	○	○	○	○	○

* For each floor number listed, the Pattern Generator Diagnostic Indicators will indicate the floor code (floor #1 equals the *lowest* floor, floor #2 equals one up from the lowest, etc.).

e. If the F3 screen of the menu is selected, move the car through the floor and view the LU, DZ and LD indicator on the CRT screen.

4.5 RUNNING ON AUTOMATIC OPERATION -

The next steps cover completion of the elevator system adjustment for proper operation. These steps also cover checking contract speed, door operation and all other functions provided on the elevator.

a. At this time, the safety function of the IMC-GIO board is bypassed, because jumper plug JP3 is in the TFB position on the IMC-GIO board. This means that the Terminal Limit switch protection is bypassed. The Alphanumeric Display on the IMC-GIO board acts as a digital tachometer to indicate the car speed, when the Learn switch located on the IMC-GIO is off. When the controller is shipped from the factory the IMC-GIO has completed the learn operation. If the car cannot run on automatic because of the error message PG Not Ready, on the F3 screen, it could be because the IMC-GIO board has been changed, or that the EEPROM chip on the board has been changed. If this is the case, position the Learn switch located on the IMC-GIO board to the Learn or up position. This allows the car to run on automatic, but the Alphanumeric Display on the IMC-GIO board does not function as the digital tachometer while the Learn switch is on learn operation. If it is not desirable for the Learn switch to be on learn operation, run the car at a reduced speed (adjusted by the Pattern Adjust Trimpot located on the IMC-GIO board) to both terminal landings. This will force some values into the IMC-GIO and the Learn switch on the IMC-GIO can then be in the off position. Section 5.3 offers a complete description of the IMC-GIO board functions and diagnostics.

b. Be sure the Pattern Adj trimpot is set to approximately the midpoint of its rotation. Turn on power and move the car on inspection to a location between floors so it is not on any leveling sensors.

c. Next, change the Test-Normal switch on the HC-RB board to Test and set the Relay Panel Inspection switch to off. The car should start moving toward a landing at the correction velocity, level into the floor and stop. If this does not happen, go to step (d) below. If the car is leveling up and down repeatedly, spread the LU and LD sensors apart on the LS-QUAD-2 or LS-QUAD-2R box on the car top. See Figure 4.6 - LS-QUAD-2 Detail. The leveling sensors are designed to move by sliding them up or down from outside the box with a finger or a screwdriver (getting inside the landing system box should not be necessary). If it is necessary to stop the car, do so by turning the Relay Panel Inspection switch on. The Pattern Generator Diagnostic Indicators, on top of the Swing Panel, should scan normally at this time and the Diagnostic Indicators on the front of the Swing Panel should indicate the car is on independent service with doors locked.

d. If there is difficulty getting the car to move, there are two possible causes.

1. Doors are not locked. Check the vertical row of indicators on the front of the Computer Swing Panel. The car should not be on inspection or fire service, and the safety circuit should be on.

2. The Cutoff indicator on the IMC-GIO board is illuminated. If this is the case, it indicates a fault on this board perceived by the computer.

e. Register a car call one floor above or below the car. The CRT terminal, F3 screen, is the best way to enter car calls on automatic operation. The high speed indicator light in the vertical row on the right of the Computer Swing Panel should light as the car attempts to start. If the Level indicator on the drive unit is on, the car is trying to level, and must complete leveling before achieving high speed. Monitor the car speed with a hand-held tachometer and be sure the car does not try to overspeed. When the car first starts, note the PI changes to the next floor prior to the middle point of the run. Then the car decelerates to the 6" point before the floor where the LU or LD sensor operates the LU or LD relay. The car continues until it reaches 3" before the floor, at which point the DZ relay picks (DZR relay, if there are rear doors). The elevator continues to level into the floor and stop. Final leveling speed should be between 6 and 8 fpm, or a reasonable leveling speed.

f. Again, run the car two or more floors to any landing except the terminal landing and observe that the car starts, accelerates and decelerates into the floor, and stops. If the car overruns the floor, a relevel function occurs. The final leveling speed on the first approach to a floor and the relevel speed are two separate program values. Access the F1 screen to change either of these speeds. The releveling operation should be observed at least once by having the car overrun the floor. If the job inserts extra resistance into the brake circuit on a relevel, make sure this resistance is low enough to allow the brake to pick sufficiently on a relevel to prevent stalling or excessive loop current during a relevel operation. The brake strength for releveling will be adjusted later.

g. Place a car call at the bottom landing. After the car stops, verify that the LD relay, on the F3 screen of the HC-RB board, is still energized. If so, move the Down Normal Limit located in area 9 of the job prints so that the Limit switch is not opened until the car is below the bottom landing by at least one or two inches. Similarly, place a call at the top landing and after the car stops observe the LU relay to see if it is still energized. If so, move the Up Normal Limit switch located in area 9 of the job prints so that the Limit switch is not opened until the car is above the top landing by at least one or two inches.

4.5.1 REACHING CONTRACT SPEED -

a. Before reaching contract speed, proper calibration of several test points must be verified. To do this, make several multi-floor runs to allow the car to reach contract speed. During the high speed portions of these runs, set voltages as follows.

1. Set Pattern Adj trimpot to generate exactly 5.0V on test point PATT with respect to GND on the IMC-GIO board. This same value should appear on J1-6 and J1-5 on the SCR drive interface board.

2. Next, set the Max Speed trimpot on the SCR drive to obtain 4.0V on J1-10 with respect to J1-7 on the SCR drive unit. This corresponds to exactly half of contract speed although the car may not be running at exactly that value.

3. Locate the Tach Adjust trimpot on the backplate of the controller. Adjust it to give exactly half of contract speed, as measured by a hand-held tachometer. The system is now calibrated so that 10.0V on Pattern to GND on the IMC-GIO board, 10.0V on J1-6 to J1-5 on the SCR drive unit, and 8.0V on J1-10 to J1-7 on the SCR drive unit equals contract speed.

b. Determine from the hoist motor nameplate what the armature voltage should be at contract speed. Set up a meter to monitor armature voltage on terminals A1M and A2M. Add enough test weights to the car to provide a balanced load condition. Monitor the car speed, and run the car on multi-floor runs while slowly increasing the Pattern Adj trimpot. As the car speed is increased, the armature voltage on terminals A1M-A2M also increases. The car probably reaches nameplate armature voltage before reaching contract speed. When this happens, bring the speed up so that the armature voltage is 2-5V higher than the nameplate. Adjust the Max Arm Volts trimpot counterclockwise to reduce the armature voltage back to nameplate value; this does *not* change the speed. The goal is to increase the Pattern Adj trimpot to its maximum.

c. As the car approaches contract speed, increasing the Pattern Adj trimpot may no longer increase the car speed. If this happens, and the armature voltage is less than the nameplate value, the Max Arm Volts setting is too low, limiting its increase. Increase Max Arm Volts to allow a higher voltage but do *not* exceed a DC value which is more than 105% of the AC voltage feeding the SCR drive (e.g., 240VAC input can only provide 252VDC maximum output). If the motor field is weakening without the Max Arm Volts being set, check the MFW trimpot on the HC-SCR board. At this point, the MFW trimpot should be set fully counterclockwise. If the car is at contract speed, and the motor armature voltage is below nameplate value, the motor field voltage must be checked, since this indicates insufficient motor field excitation, and may require that the motor field supply needs to be changed.

d. If the car is running through the floor and releveling, increase the leveling distance and decrease the leveling values for now. It may be necessary to adjust the rate gain on the SCR drive to improve the response of the system. The rate gain should be increased without causing oscillations or overshooting. As the rate gain control increases, tighter control over the car results. This control is apparent by monitoring the P and T test points with respect to COM on the VVC-2-G drive unit using an oscilloscope or chart recorder.

e. If the OC light on the SCR drive comes on during acceleration, or while running, the Current Limit trimpot should be adjusted clockwise for more armature current.

f. Use a digital voltmeter (set to DCV) to monitor test points EA to COM. Adjust TC on the VVC-2-G drive unit to provide minimum DC voltage when running at contract speed. Check T to COM and verify that it is within 0.5V of P to COM. Set the above adjustment carefully as P is the intended car speed and T is the actual car speed.

g. Hook up an oscilloscope to monitor signals as follows: *isolate* the ground pin on the power cord of the oscilloscope with one of the ground isolator devices that are commonly available. The ground pin must *not* be connected. The case of the oscilloscope *must* be allowed to float at its own potential. Hook up the ground side of the probe to test point COM on the VVC-2-G drive unit, and the hot side of the probe to test point P. Full speed equals 10V (+ = up; - = down). Set the sweep rate on the oscilloscope to 1 second per centimeter, and vertical sensitivity to 2V per centimeter (later, 5V per centimeter). Hook up the second probe to test point T. Now compare the intended speed pattern P to the actual car speed T. A direct comparison on the oscilloscope can be made, because they have the same polarity.

h. In preventing contract speed overshoot, two parameters have the most effect: acceleration rate (A2), and the jerk rate parameter (J35), with the jerk rate having somewhat greater effect. Reducing either parameter helps prevent overshoot. Also examine actual car response on test point T to verify actual lack of overshoot. Polarity on test point T is the same as P and equal in voltage (+ = up; - = down).

i. The car should be running at contract speed now. The pattern parameters can be adjusted for the desired approach to the floor, after checking the standing motor field.

4.5.2 CHANGING STANDING MOTOR FIELD AND BRAKE VOLTAGE FROM THE DRIVE UNITS -

a. *Changing the Standing Motor Field* - If a change in the standing motor field is desired, change the value of resistor R229 on the SCR drive control board in the SCR drive unit. Reducing its value decreases the standing voltage, but *only* if the following steps are performed.

- Monitor the motor field voltage on terminals MF1 and MF2.

- Place the elevator on inspection operation.

- Run the elevator on inspection and record the motor field voltage with the original resistor.

- Turn off power at the main disconnect. Resistor R229 is mounted on two pins so a second resistor can be placed in parallel. Solder in a second resistor or change any resistor that may already be there to reduce the total value by 10-15%.

- Turn on power at the main disconnect, and try to move on inspection. Adjust the Max Field Current trimpot to the same forcing motor field voltage recorded before.

- Stop running the car and check the standing motor field voltage to see if it has changed to the desired value. If not, repeat (d) through (f) with a different resistor.

b. *Changing the Brake Voltage* - If a change in the brake voltage is desired, change the setting of trimpot BT on the VVC-2-G drive unit. Notice that as the BT trimpot is turned counterclockwise, the output disappears suddenly. Find the peak value and then adjust clockwise to reduce it down 3V to 5V on the side of the peak where the output drops off slowly.

- If the brake field is too low, contact MCE Customer Service.

- If the brake field is not more than 30% high, it can be adjusted down further on trimpot BT by turning clockwise until the desired value is reached.

- If the brake field is more than 30% high, contact MCE Customer Service.

4.5.3 EXPLANATION OF VELOCITY PROFILE PARAMETERS - The movement between any two landings has been divided into seven programmable phases.

Also see Figures 4.3, 4.5 and Tables 4.2 and 4.3 for specific adjustment parameters. The seven phases are as follows.

Phase 1 - Constant Jerk (rate of change of acceleration). This is programmed as Jerk phase 1 on the CRT terminal. A higher value of Jerk Phase 1 causes the car to reach the programmed acceleration in Phase 2 more quickly. The value of acceleration at the start of Phase 1 is called Initial Acceleration and is also programmable. A higher value of Initial Acceleration causes the car to have a tendency to resist rollback at the start, but too much causes a jerky start.

Phase 2 - Constant Acceleration (rate of change of velocity). This is programmed as Acceleration Phase 2 on the CRT terminal. A higher value of Acceleration Phase 2 causes the car to reach contract speed sooner.

Phase 3 - Constant Jerk (rate of change of acceleration). This is programmed as Jerk Phase 3 and 5. A higher value of Jerk Phase 3 and 5 causes a more rapid transition from acceleration to steady state speed.

Phase 4 - Constant Velocity. In this phase, the car moves at steady state speed. The velocity is a programmable parameter which defines the maximum velocity used in this installation.

Phase 5 - Constant Jerk (rate of change of acceleration). This is programmed as Jerk Phase 3 and 5. A higher value of Jerk Phase 3 and 5, in Phase 5, causes a more rapid transition to the value of deceleration defined as Acceleration Phase 6.

Phase 6 - Constant Deceleration (rate of change of acceleration). This is programmed as Acceleration Phase 6. A higher value of Acceleration Phase 6 causes quicker slowdown.

Phase 7 - Final Approach. This phase consists of three parts.

Part 1 - Constant Jerk (rate of change of acceleration). This is programmed as J7. A higher value of Jerk Phase 7 causes a sharper transition between Phase 6 and Part 2 of Phase 7.

Part 2 - In Part 2, the mechanic may customize the shape of the approach to the floor that best suits the specific job. Part 2 consists of three segments. The first two segments provide for shaped deceleration, and the third for constant leveling speed just before the car reaches the dead zone. The shaping of the final approach is achieved by making it possible for the adjuster to choose the distance and the velocity for each of the three segments in Part 2 of Phase 7. Proper adjustment of Part 2 of Phase 7 can shorten the brake-to-brake time, as well as providing a smooth stop.

Part 3 - Part 3 allows the final leveling distance to be extended on runs that exceed the maximum one floor run speed. Proper adjustment of this parameter allows the installer to optimize one floor and multi-floor run times without incurring problems of excessive time spent in leveling or overshoot at the destination floor. This is programmed as DTC Tracking Compensation Distance, and may be adjusted from 0.00 to 1.00 in 0.01 increments. A value of 1.00 adds one foot of final stabilized leveling distance to runs that decelerate from contract speed. A value of 0.00 disables this function. On runs that do not reach contract speed, leveling distance is added based on the maximum speed achieved.

4.5.4 SHAPING THE VELOCITY PROFILE - Figure 4.5 shows a typical shape of a velocity profile. F2 screen on the CRT also displays this curve as the car travels through the hoistway. If the car is not running, a dotted line is constantly drawn at zero velocity on the F2 screen of the CRT. The typical CRT terminal used in viewing the F2 screen does not have enough resolution to show all the necessary details of the velocity graph. Use of a storage oscilloscope is highly recommended for viewing the pattern and car response. The F2 screen also shows the car PI and the car velocity. Below are some important notes and recommendations regarding the shape of the velocity profile.

a. Because car response lags the intended speed, in order to get an approximately equal acceleration and deceleration, the acceleration Phase 2 must be greater than Phase 6. Also, to prevent the bunching up of deceleration near the floor, a fairly low value of Jerk Phase 7 is recommended.

b. Ideally, the slope of acceleration in volts per second should be equal to the slope of deceleration as viewed on the oscilloscope or chart recorder while monitoring test point T to COM on the VVC-2-G drive unit. Monitor the DC motor current and verify that 250% of the full load rating of the SCR drive is not exceeded when accelerating up with a full load. If the SCR drive or motor rating is exceeded or if the acceleration or deceleration feels too violent, modify the acceleration and jerk parameters to provide the desired results.

c. If the value of acceleration adjusted on the ACC trimpot on the pattern generator is too slow to permit proper following of the pattern signal coming from the IMC-GIO board, monitor test point P to COM and compare it with terminal 10X with respect to terminal 9X. The slope of the acceleration must be as steep on test point

P as it is on the terminal 10X. If the slope on terminal 10X is steeper than the test point P, turn the ACC trimpot clockwise.

d. To get a proper start without rollback or snapping away from the floor, a variable delay has been provided in the application of the speed signal by the adjustment of trimpot SPD (Speed Pick Delay) on the VVC-2-G drive unit. The SPD trimpot adjusts the amount of delay from the time the VVC-2-G drive unit receives a direction input to the time a relay contact closure occurs from terminal 22X to 23X. This contact closure operates relay SPD which enables the IMC-GIO board's direction inputs. Therefore, the start of the pattern generator velocity signal is under the direct control of the SPD trimpot. See area 8 and 9 of the job prints in Section 7. SPD must be adjusted so that the brake shoes just clear the drum before attempting to accelerate the car. *Do this with an empty car*. The correct setting is apparent by watching the drive sheave since direct control over rollback is possible. If the start should be quicker in reaching the maximum acceleration rate, change the Jerk Phase 1 parameter to a higher value or increase the value of the Initial Acceleration parameter. Refer to Section 4.5.7 for fine tuning rollback.

e. The technique for properly setting the value for DTC requires that the installer set up the F1 screen (shift F2 for simplex) parameters to achieve the best one floor run time over the shortest one floor run in the building with DTC set to 0.00. On this particular run, the installer should observe the F3 screen to verify that the elevator is progressing through Phases 1 through 7. If Short Run is displayed, the installer must select the next taller floor for setting the velocity parameters. Selecting the correct floor to set up the motion parameters is critical because it becomes the reference point against which all other runs in the building are compared for the implementation of DTC.

Once this has been accomplished, make car runs that decelerate from contract speed and observe the stop of the elevator to see if it exhibits overshoot. If the elevator does not exhibit overshoot at the destination floor, DTC does *not* need to be adjusted. In this case the value for DTC should be left at 0.00. If the elevator *does* exhibit overshoot, DTC should be increased so that the car stops in the same manner as the one floor run. As a final check, all intermediate runs between one floor and contract speed should be observed for proper approach and stop.

4.5.5 ADJUSTING LEVELING AND FINAL STOP -

a. Observe the operation of the elevator by looking at the hoist motor and by observing the car response on test point T to COM on the VVC-2-G drive unit. The parameters VHL, VIL, VFL, DL and DFL can be changed to shape the final approach to the floor using the CRT terminal F1 screen. The idea is to flare out and blend the deceleration into a final leveling speed just prior to a stop. There are two ways to do this: a lot of stabilized leveling, or decelerating the elevator all the way into the floor for best brake-to-brake time. Remember that the car response lags the pattern, so the numbers that are programmed in for various leveling speeds are not achieved at those positions from the floor. It is recommended that the VHL speed be between 20 and 60 fpm. The higher VHL is, the longer the leveling distance should be. Start with a final leveling speed VFL between 6 and 8 fpm and a final leveling distance DFL of about 0.25 feet (three inches). Then by watching the hoist motor and the oscilloscope, change VIL speed to adjust the blending into final leveling. Remember that since this is a distance feedback system most of the stabilized leveling can be omitted. Experimentation is encouraged when dealing with this final approach to the floor because it is here that the performance and perceived quality of ride is determined. Try the full load range to ensure that the stops are consistent.

b. Since the speed reference goes to zero when the direction signal drops, the drive unit causes the machine to stop electrically. There should be enough delay in the setting of the brake to allow the sheave to stop turning before setting the brake firmly on the drum. A more positive braking action has been provided in the form of a stop pulse provided by the ES (Electric Stop) control on the VVC-2-G drive unit (clockwise = more braking action). A faster final leveling speed requires a larger stop pulse. If the brake is provided with an adjustable brake damping resistor in series with a diode across the brake coil (see drawing -D) start by adjusting this resistor to soften the setting of the brake. Less resistance gives longer delay in dropping, and a softer operation. Whether or not the resistor-diode network is being used, more delay can be introduced in dropping the brake by using the BDD trimpot on the VVC-2-G drive unit. Turn the BDD (Brake Drop Delay) control clockwise and/or adjust the brake damping resistor to provide about ½ second delay in setting the brake. This allows Electric Stop to be observed. In order to allow the drive to maintain its control over the car until the brake sets, a contract on the BT relay keeps the Run input engaged on the HC-SCR board after the direction relays have dropped. The response of the system may be so good that no adjustments are necessary to the ES control, but if more Electric Stop is needed, adjust the ES trimpot so that the motor, stopped momentarily, can be observed before the brake drops (even though it may drift some after being stopped). Next, turn the BDD trimpot counterclockwise or increase the value of the brake damping resistor so that the brake sets exactly at the point in time that the hoist motor stops turning. It may be necessary to move the up and down leveling sensors on the LS-QUAD-2 or LS-QUAD-2R landing system box on the car top to provide the desired dead zone (slide these sensors with fingers or screwdriver from the outside of the box). The ES control has enough strength to allow a fairly strong final leveling speed. Experiment with this since some of the brake-to-brake run time improvement is gained here.

c. Select a floor in the middle of the hoistway as the master floor. Move the landing box cover, if necessary, to center up the stopping on the floor. Then adjust LU and LD sensors on the LS-QUAD-2 or LS-QUAD-2R landing system box to get the car to stop exactly on the floor. Remember that the car can be stopped by having LU and LD both *de-energized or both energized*, but adjust the sensors to have *both* de-energized when stopped at the floor. Also be sure the LU sensor is as far *up* in its slot as the LD sensor is *down* in its slot, (i.e., they must be *symmetrical* around the door zone).

d. Now move all floor magnets to get precise stopping at each floor. Once this is done go back and permanently attach the floor magnets to the steel tape. Now put the car on automatic and stop at every floor to verify that the PG Ready signal is indicated on the CRT. This means that the RD sensor input is on at every floor.

e. The adjustment is now almost complete. Now that the function of all the controls is understood, try hooking one of the oscilloscope probes to the tachometer test point (probe to T, ground clip to COM) and the other probe to the pattern signal, test point P. Monitor the tachometer and repeat adjustments that need additional attention. Make *sure* there is no overshoot when maximum speed is reached.

f. Make the car overrun the floor by placing a car call above the car, and as soon as the LU relay picks on the HC-RB board, connect a jumper from terminals 18 to 26 until the LD relay picks, then immediately remove the jumper. This causes the car to relevel down into the floor. Check to see that the relevel speed is reasonable and causes no oscillations or subsequent releveling operations. Start with a relevel velocity as suggested in Table 4.3, and only change the releveling velocity if necessary. Before changing any releveling velocity be sure the car is stopping normally at the same point on a particular floor, going up and going down. This assures that the Dead Zone is properly adjusted for a normal stop.

g. Check the empty car releveling operation by connecting a jumper to terminal 18 and 26 on the HC-RB board to cause an up level after which the car stops because of picking the relay LD. Now remove the jumper from 18 to 26. The car levels down against the counterweight. If the rollback is acceptable, then brake weakening need not be adjusted. If the rollback is not acceptable, adjust any resistors that may be provided which are inserted by relay BW to modify the strength of brake weakening. The BW relay (brake weakening) contact opens due to the relay RL dropping out on a relevel. The goal is to weaken the brake so that it does not pick on a relevel but its pressure is partially removed, allowing a relevel under the brake. Do this for a relevel up, with full load in the car. Try for as much brake strength as possible without actually lifting the brake during the relevel operation.

h. There is a full load in the car at this point, so check contract speed up versus down with a hand-held tachometer to verify no more than 1% (5 fpm for 500 fpm contract speed) of speed difference.

4.5.6 CALIBRATION OF SAFETY FUNCTIONS -

a. The VVC-2-G drive unit has an independent low speed monitoring system which can trip open a safety contact if the car runs faster than a preset speed (150 fpm max) on car top inspection, hoistway access or leveling operation. The monitoring system is active when the Level input (11X) is connected to (9X) or when the access/inspection input (14X) is connected to (9X). The adjustment is labeled LSS (Low Speed Safety) and is located on the left hand board of the VVC-2-G drive unit. The circuit looks at motor armature voltage modified by motor armature current. Calibrate this circuit in the following way.

   1. The car should be either empty or have a full load.

   2. Set the MIC trimpot on the HC-SCR board fully clockwise. Run the car at maximum contract speed. The voltage on test point T should be 10V with respect to COM. Now measure test point STS (Synthesized Tachometer Signal) and adjust the MVC trimpot on the HC-SCR board to give 10V on STS at contract speed *empty car up* or *full load down*. STS to COM is the same as terminal 6X to 5X (Motor EMF Signal) on the VVC-2-G drive unit.

   3. Put the car on inspection operation by turning on the Relay Panel Inspection switch. The car speed should be 50 fpm or less.

   4. While still measuring test point STS, adjust trimpot MIC so that the voltage on STS has the same value up or down as the car is run using the Inspection up/down toggle switch. When properly adjusted, the polarity on test point STS with respect to COM reverses with direction, but the value is the same. If this cannot be achieved, try reversing the two wires on terminals GA and GC on the HC-SCR interface board.

   5. Remove jumper plug from jumper JP5 and place it on jumper JP4 on the IMC-GIO board. Turn the Pattern Adj trimpot fully counterclockwise. This establishes a trimpot adjustable value of speed reference from 0 to 15V which allows the car to run on inspection at any desired speed, using the Pattern Adj trimpot to vary the speed. Run the car on inspection up or down and adjust the Pattern Adj trimpot for 140 fpm. If the red Safety Tripped light is lit on the VVC-2-G drive unit, push the Safety Reset button and the light should go out. A jumper should still be on terminals 20X to 21X on the VVC-2-G drive unit terminal strip.

6. Turn the LSS trimpot counterclockwise 20 turns or until it clicks. Run the car up on inspection while very slowly rotating LSS control clockwise until the Safety Tripped light turns on. Push the Safety Reset button on the drive after stopping and reduce the Pattern Adj trimpot ⅛ of a turn or less counterclockwise. Run the car on inspection while adjusting the Pattern Adj trimpot slowly clockwise to prove that this low speed safety monitor circuit trips at no higher than 140 fpm. Also, check this for *both* directions. An overspeed monitor has now been calibrated for less than 150 fpm for access, inspection, and leveling. Remove the jumper plug from jumper JP4 and place it on jumper JP5 on IMC-GIO board and turn the Pattern Adj trimpot fully clockwise.

7. Now that a signal has been adjusted on test point STS that creates a voltage proportional to the motor EMF which is approximately proportional to car speed, it is important to mention that this signal also provides a Field Current Limit to the SCR drive on J2-1 (J2-14 on the HC-SCR board). Run the car at contract speed and adjust the MFW (Motor Field Weakening) trimpot on the HC-SCR board so that motor armature voltage is reduced a couple of volts. Note that this step is actually required only if a bump is felt near the tail end of acceleration to contract speed.

b. Now adjust the SCAL (Safety Calibrate) trimpot which automatically calibrates the OS (High Speed Overspeed) safety monitor indicator and the ETS (Emergency Terminal Stop) safety monitor indicator, if present.

1. Turn off the Relay Panel Inspection switch. Verify that the SCAL trimpot on the VVC-2-G drive unit is set fully counterclockwise. With the Test-Norm switch on Test run the car on full hoistway runs while slowly turning SCAL trimpot clockwise ¼ turn at a time until the green SCAL (Safety Calibrate) indicator lights. Fine tune the SCAL trimpot by waiting until the car has been running at contract speed for at least three seconds before trying to maximize the illumination of the SCAL indicator with SCAL trimpot. The sensitivity of this trimpot may be as little as a ¼ turn from off to maximum brightness, so adjust carefully.

2. Start the car at a terminal landing and arrange for a full hoistway run to the opposite terminal landing. Adjust the Max Speed trimpot on the SCR drive clockwise to make the car run faster and record the speed at which the OS indicator lights, then quickly turn the trimpot back (counterclockwise) to reduce the car speed back to contract speed. The OS indicator must trip at between 103% to 107% of contract speed (e.g., 412-428 fpm for 400 fpm, 515-535 fpm for 500 fpm, 618-642 fpm for 600 fpm, etc.).

3. Set the Overspeed trip on the SCR drive. Adjust the speed of the car to exactly 1.05 x contract speed (5% overspeed). Now on full hoistway runs, adjust the Overspeed trimpot counterclockwise on the SCR drive slowly until the drive trips off. Reset the drive and set the car back to contract speed. On full hoistway runs, slowly increase the car speed with the Max Speed trimpot, the drive should trip at 5% over contract speed. Repeat this step until it does. Return the car speed back to contract speed.

4. The Emergency Terminal Stopping device is required by code for speeds greater than 200 fpm. If the Limit switches are observed feeding terminals 28X and 29X on the drive terminal strip on the controller print that has -D as a suffix, it is because they are recommended even though the car speed may be less than 200 fpm. If it is not desirable to use the Emergency Terminal Stopping device, connect terminals 28X and 29X to terminal 2.

5. The Emergency Terminal Stopping device is automatically calibrated by performing step (1) above. The car speed must be below 95% of contract speed before the Limit switch input opens (power is removed) on terminal 28X, for down, or terminal 29X, for up. Otherwise the ETS (Emergency Terminal Stop) indicator comes on and trips the safety on the drive unit. Verify by removing the control wire from terminal 28X while traveling at contract speed in the down direction, and by removing the control wire from terminal 29X while traveling at contract speed in the up direction. This should cause the ETS and the Safety Tripped indicators to turn on in either case. Be sure to put the wires back into terminals 28X and 29X.

c. The TE (Tach Error) trimpot and indicator detects excessive error between the actual and intended car speed.

1. Put a full load in the car, run up and down at full speed and turn the TE trimpot clockwise until on an acceleration or slowdown. The Safety Tripped light turns on. Push Safety Reset every time the car stops if the unit is tripped. Turn TE counterclockwise ½ turn at a time until the unit stops tripping, then turn TE 1-½ turns counterclockwise to permit more error before tripping.

2. Run the car down at full speed with a full load and trip open the primary safety circuit (by opening the governor Overspeed Contact, for example) and see if the Emergency Stop causes the Safety Trip light to turn on. If it does, reset it and turn TE counterclockwise ½ turn and try a full load Emergency Stop going down again as before. Continue until it does not trip on an Emergency Stop. Turn TE one additional ½ turn counterclockwise. TE is now calibrated.

NOTE

On gearless double-wrapped machines with sleeve bearings, friction prevents the car from leaving the landing until sufficient torque has been developed by the machine. For large, sluggish machines, it is recommended that the TE trimpot be turned an additional three turns counterclockwise after the above adjustments, in order to avoid nuisance tripping of the TE safety.

3. Position the car at the bottom landing and then disconnect the tachometer wire from terminal TS and insulate it temporarily.

4. Position yourself so you can see the drive sheave and put your finger on the Relay Panel Inspection off/on switch on the HC-RB relay board. Be ready to turn it on to stop the elevator when it is approaching high speed on a runaway condition.

5. Read this step *entirely* before performing it. Verify that the Test-Norm switch on the relay board is in the Test position. Register a call at least two floors above the bottom landing (where the car is now). The car should run away. Turn on the Relay Panel Inspection switch to *stop* the car before it trips the governor. The TE indicator light should be visible if the pattern voltage has gone high enough before the car is stopped by turning on the Relay Panel Inspection switch. If this doesn't light the TE indicator, put the car back at the bottom *after* reconnecting the tachometer wire in terminal TS. Remove the jumper from terminal 20X to 21X. Run the car up and as it reaches about half speed, pull the wire from terminal TS. The TE indicator light should be visible and the car will shut down immediately. *Be sure* that *someone is standing by* the disconnect in case the car does not stop soon enough. The car will move quickly, so observe safety precautions.

NOTE

The car must be run *up* during this test so that the mechanical safety does not set. Keep the car away from the top. If the mechanical safety does set and the car is at the top, it will be difficult to reset the safety.

d. At this point, the car should be running well with no jumpers from 20X to 21X. The unit should not be tripping off under any load condition. With full load in the car, check the OC light on the SCR drive to be sure it does not come on, especially during acceleration or deceleration. If it does, turn the Current Limit trimpot clockwise until OC no longer lights. Be sure the IOC trimpot is fully clockwise on the SCR drive.

e. Put 125% of full load in the car at the bottom. Bring it up three floors and return it to the bottom automatically, verifying that it lowers safely and stops with 125% of full load.

f. With 125% of full load still in the car, calibrate the DC loop overcurrent monitor. Place the car at the bottom landing and register a top floor call. As the car travels up, turn trimpot LOC clockwise at least 1 turn per second until the LOC Tripped indicator turns on. If the indicator does not turn on before reaching the top, return to the bottom immediately and repeat the process while going up until an indication is obtained. Once the LOC is tripped, press the safety reset button on the VVC-2-G drive unit and turn LOC counterclockwise until the LOC indicator comes on within seven to ten seconds while the car is going up. Reduce the load to 110%. The unit must never trip while traveling the entire length of the hoistway. Remove the load so the car is empty. Take the car to the top landing. Remove one of the brake wires (B1) so the brake does not lift or have even partial power. Remove the jumper from terminals 20X to 21X on the VVC-2-G drive unit terminal strip. Run the empty car down. The drive unit must trip the LOC Tripped indicator and stop the car. The unit can now detect a non-functioning brake. Reconnect the brake wire and reset the drive.

4.5.7 CONTROLLING INITIAL START OF CAR MOTION - All Turbo DF control systems are provided with pretorque capability which can be used to eliminate rollback. If the system requires pretorque, a K-Tech load weigher (or similar system) must be installed and adjusted in order to achieve the smooth starts for which the control system was designed. Generally speaking, the need for pretorque is necessary only on gearless machines and on machines with excessively worn pins, or on machines in which the brake lining has been replaced. For those installations without loadweighing, as mentioned above, a timing circuit is provided to improve the smoothness of the starts. This timing circuit provides a smoother and more controlled lifting of the brake.

The following two sections cover the adjustment of these two types of systems. Section 4.5.7.1.5 covers the adjustment of load compensation where a K-Tech loadweigher is available. Section 4.5.7.2 covers the adjustment of the brake timing circuitry.

4.5.7.1 ADJUSTMENT OF LOAD COMPENSATION -

4.5.7.1.1 RATIONALE - The *optional* load weigher circuit is intended to provide Load Compensation (LC) for MCE gearless elevator installations. The controller may not need this circuitry and so may not be equipped with it. LC requires a fully functional Nyload weighing system manufactured by K-Tech for measuring the load in the car. The intent of this circuit is to pretorque the hoist motor in order to allow smooth motion in the starting action of the car after the brake shoes have fully cleared the brake drum. This is to eliminate any effect the lifting of the brake may have on the start of the car's motion.

4.5.7.1.2 HARDWARE - This load compensation circuit consists of the following boards.

HC-LWB	(load weigher buffer board)
IMC-RB-REV 1	(provides for load weigher connections)
IMC-GIO-REV 1	(load compensation circuitry is located on this board)

4.5.7.1.2.1 HC-LWB BOARD - This board is designed to be mounted inside the K-Tech unit to buffer the load signal and to generate a differential output to send to the controller through the traveller cable.

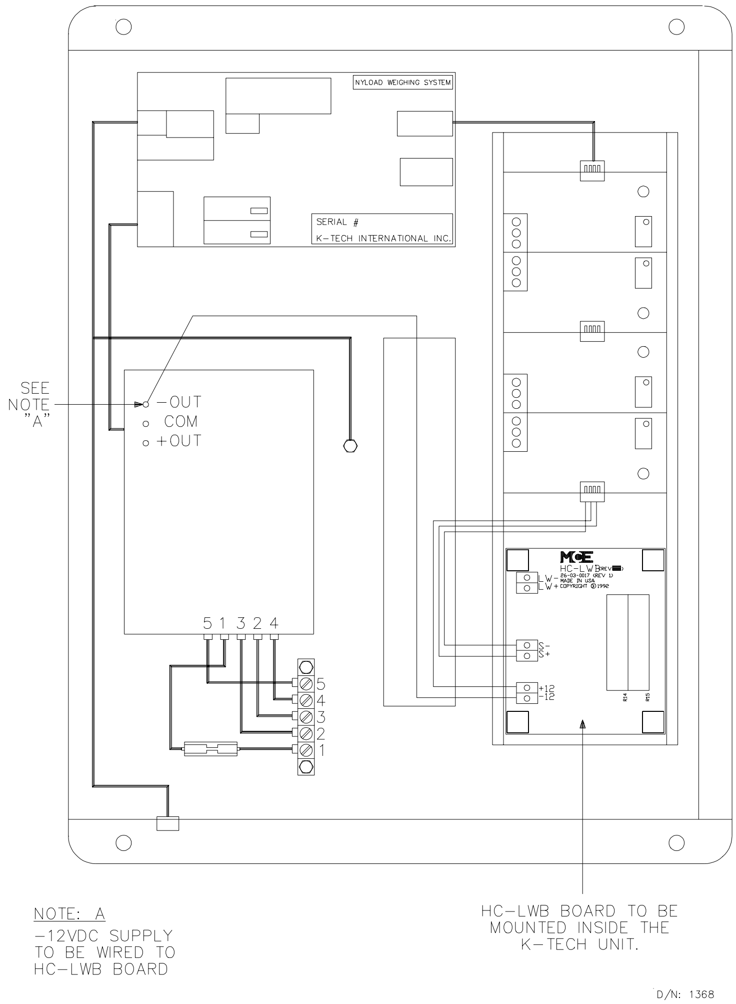
4.5.7.1.2.2 IMC-GIO BOARD - This board is a multi-purpose input/output board and one of its functions is load compensation. The IMC-GIO calibrates the load signal from HC-LWB and provides the drive unit with a bias voltage. This bias voltage, available on terminal 32X, pretorques the hoist motor so that when the brake lifts the car does not drift in the direction of the load. The bias voltage is calibrated according to the load, the position of the car and the necessary gain required.

4.5.7.1.3 INSTALLATION - The HC-LWB must be installed inside the K-Tech unit. This board should be installed inside the track provided inside the K-Tech box as shown in Figure 4.1. The black plug provided with this board should be inserted into the black header on the last board inside the K-Tech box. This header has the load signal, ground and +12V. The -12V signal should be brought directly from the power supply by soldering a wire to the -Out terminal on the power supply and connecting it to the terminal marked -12. Terminals LW- and LW+ are to be sent to the machine room via travelling cable. These two wires do *not* have to be shielded. See Figure 4.1.

Load Weigher Signal - The two differential output signals from HC-LWB (LW+ and LW-) should be wired to terminal LW+ and LW- on the IMC-RB-REV 1 board.

4.5.7.1.4 PI COMPENSATION - The position of the car in the hoistway may affect the car load as seen by the load sensor. To compensate for this, the IMC-GIO outputs an analog voltage that varies with the car's absolute position in the hoistway. This voltage is available on test point TP9 (APR, Analog Position Reference).

NYLOAD WEIGHING SYSTEM
FIGURE 4.1



4.5.7.1.5 ADJUSTMENT - To perform the load compensation adjustments, the VVC-2-G drive unit should have been fully adjusted. It is especially important that the SPD (Speed Pick Delay) trimpot has been adjusted on the VVC-2-G drive, so that the brake is fully lifted *before* motion starts, but without causing *unnecessary* delay in the start of movement. Then perform these steps.

a. From the car top, first adjust the Nyload weighing system according to the instructions provided by K-Tech. When the adjustment is done, measure the following voltages between terminals LW+ and LW- on the IMC-RB-REV 1 board.

Empty car (at bottom floor)	0.00VDC (+/- .2V)
Balanced car (at middle floor)	4.00VDC (+/- .2V)*
Full car (at top floor)	10.00VDC (+/- .4V)

* This assumes 40% counterweighing. If the counterweighing is 45%, the voltage must be 4.50V, and so on.

b. Turn LWG trimpot (on IMC-GIO board) 25 full turns counterclockwise so that there is no load-weigher compensation. Turn SAT trimpot fully clockwise.

c. Turn PO trimpot fully counterclockwise. *Do not* adjust the CMR trimpot. This trimpot has been set at the factory.

d. Put a balanced load in the car and place the car at the top floor. Place the voltmeter leads between test point LW and COM on the IMC-GIO board. Adjust the BAL trimpot so the voltage on LW test point is 0.00VDC.

e. Run the car down one floor and watch how it responds. If there is some rollback (or brakeaway) with 0.00VDC on test point LW, then that would indicate that the car is not truly balanced. To remove the rollback, carefully adjust BAL trimpot until the rollback is gone.

f. Run the car one floor down from the top floor. No rollback should be observed.

g. Remove the load from the car and return the car to the top landing. Turn LWG trimpot 25 full turns counterclockwise, and then preset it ten turns clockwise.

h. With the empty car at the top landing run the car one floor down and then up. Observe the sheave and adjust the LWG trimpot for no rollback in either direction. Now the top zone has been adjusted.

> NOTE
>
> If adjusting LWG makes the rollback worse, then locate jumper JP6 on the IMC-GIO and move it to the B position. The controller is shipped with this jumper in the A position.

i. Move the empty car to the very bottom landing. Starting with trimpot PO fully counterclockwise, turn this trimpot clockwise in order to add enough additional compensation to get smooth starts while running the car one floor up and one floor down. This trimpot compensates for the position of the car in the hoistway. The position of the car is represented by a 0V - 10V signal available on test point TP9 on the IMC-GIO board (APR, Analog Position Reference).

j. Now run the car from top to bottom on every floor and verify that there is no rollback. Then place a full load in the car and run it to the top floor while checking the starts on the top floors; touch up LWG trimpot if necessary. Run the car to all floors and observe that there is no rollback.

k. If there is a problem controlling the rollback, readjust the Rate Gain or IR COMP trimpots on the SCR drive to allow for tighter control of the car.

4.5.7.2 ADJUSTMENT OF BRAKE TIMING CIRCUITRY - Do not perform this adjustment if there is load compensation. This section describes the adjustment of trimpots TB1, TB2, SPD and Brake Weakening resistor so that the brake has a high enough initial picking voltage to allow for the quick reduction of most of the brake tension followed by a reduction in brake strength (initiated by potentiometer TB1 which controls the pick of relay TB1). Accelerate the car out of the landing under a partially picked brake (acceleration initiated by SPD trimpot and the amount of weakening adjusted by the Brake Weakening resistor). As the car begins to accelerate, continue to pick the brake until the brake shoes fully clear the braking surface at which time full brake strength is reestablished (potentiometer TB2 initiates reapplication of full brake strength by controlling the pick of relay TB2). The intent is to move the car several inches as the brake is picking smoothly and to have the brake fully picked before the car moves approximately a foot.

The following section describes adjustment of trimpots SPD, TB1 and TB2 which allow precise coordination of brake pick and subsequent acceleration of the car away from the landing.

a. Trimpot TB1 mounted on the backplate near timer TB1 should be adjusted so that relay TB1 picks as soon as approximately half the brake tension is relieved. The brake must *not* be allowed to pick fully before TB1 relay picks.

b. Observe relays TB1 and TB2 and adjust trimpot TB2 as necessary to provide about 1-1½ seconds from the time relay TB1 picks to the time relay TB2 picks.

c. Start with Brake Weakening resistor completely shorted. Now move the tap to weaken the brake so that a smooth and gradual movement of the brake to the fully picked position occurs from the time TB1 picks to the time TB2 picks.

> **NOTE**
>
> If there is a current saving contact on your brake, it may interfere with this movement. If necessary, adjust the current saving contact so that it activates closer to the fully picked position of the brake. The intent is that *the brake is picked as fully as possible before* relay TB2 picks.

Relay TB2 guarantees a full pick of the brake at the end of this timing sequence. If the brake fails to pick fully with TB2 relay picked, check the current saving brake voltage setting to be sure it is high enough to ensure that the brake is fully released.

d. Now observe the brake operation. A smooth overall brake picking movement should be present with a slight slowing of movement as relay TB1 picks. The brake should *not* be snapping up quickly to the fully picked position.

e. Next, use trimpot SPD on the VVC-2-G drive unit to coordinate the start of motion with the picking of the brake. Adjust SPD clockwise until rollback is observed in the up direction when the *empty* car is starting down from the top landing. Now turn SPD ⅛ to ¼ turns at a time counterclockwise so that the rollback is removed.

f. Observe the start of the car with the oscilloscope or chart recorder connected to test point T and COM on the VVC-2-G drive unit. The car should not be snapping away from the floor or producing a double-humped acceleration. Ride the car and evaluate the quality of the starts. It may be necessary to touch up trimpots BW and TB1 which may force recoordination of the start with the SPD trimpot as in step (e) above.

4.6 LEARNING NORMAL VELOCITY ASSOCIATED WITH EACH TERMINAL LIMIT SWITCH -

WARNING

This function must be successfully mastered before turning the elevator system over to passenger use for normal operations.

NOTE

By now the elevator mechanic should be fully conversant with IMC-GIO diagnostics in Section 5.3 of this manual. This knowledge is essential to mastery of the learn sequence of the IMC-GIO processor board.

NOTE

Each time the power is turned on in the elevator control system the IMC-GIO board goes through a self-test sequence which will delay startup of the controller. Allow ten to twenty seconds for completion.

Learning the normal velocity for each Terminal switch which feeds the IMC-GIO board is defined as recording car velocity at the time each Terminal switch is encountered on a normal approach to each terminal landing. This learn operation should be performed after all the motion parameters have been programmed satisfactorily and all other components have been fully adjusted so that the ride quality in the car is acceptable. If motion parameters are altered, the speed profile changes, thus the normal velocity associated with each Terminal switch is changed, and the IMC-GIO board learn operation must be reinitiated. The steps for learning the normal velocities associated with each terminal landing are as follows.

a. Verify that jumper JP3 on the IMC-GIO board has been moved to the normal position. Turn on the Learn switch on the IMC-GIO board to permit car movement as it disables the safety cutoff function on the IMC-GIO board.

b. Make sure that all the Terminal Limit switches are properly installed. These Limit switches may be contacts on the TM switch. The IMC-RB board has lights that verify the Terminal Limit switch inputs to the IMC-GIO board. Toggle the Diagnostic On-

Normal switch on the front of the Computer Swing Panel to the Diagnostics On position. Dial up address 24 on the A1 to A8 switches. See Figure 5.6. This verifies the proper operation of the Terminal switches using the EOD. Watch the Pattern Generator Diagnostic Indicators as the car approaches each terminal landing.

As the car moves to each terminal landing verify the opening of each Terminal switch contact by observing the corresponding LED indicator shown above. If the indicator is on it means the Terminal switch is closed, if the indicator is off it means the switch is open.

c. If the Learn switch is on and Alphanumeric Display indicates LRNT/LRNC then toggle the Learn switch on/off until the LRN message appears on the Alphanumeric Display on the IMC-GIO board. The associated LED indicator on IMC-GIO lights and the Alphanumeric Display should indicate LRN.

d. Make a full hoistway run to the top terminal landing using a car call (the Test-Norm switch on the relay board should be on Test). Notice as the car starts in the up direction the Alphanumeric Display on the IMC-GIO displays LRNU. As the car stops at the top terminal, the display reads LRN.

e. Now make a full hoistway run to the bottom terminal landing using a car call. The Alphanumeric Display reads LRND at this time. When the car stops at the bottom terminal landing, the IMC-GIO goes through a sequence of operation to write the learned data into the non-volatile memory (EEPROM). The IMC-GIO then reads the data from the non-volatile memory for verification. Once the data have been successfully stored into the non-volatile memory (EEPROM) the IMC-GIO displays a Learn Complete message LRNC. The data-storing sequence is displayed on the Alphanumeric Display with LRNW indicating that the IMC-GIO is writing the learned data into the EEPROM. LRNR indicates that the IMC-GIO is reading the stored data back for verification and LRNC indicates that the IMC-GIO learn operation is complete. Move the JP3 jumper back to the Normal position.

f. Turn off the Learn switch on the IMC-GIO board. The display indicates the last leveling speed encountered. The IMC-GIO board has now learned the normal speed of the car as the Terminal switches are encountered on an approach to each terminal landing. This provides independent overspeed safety monitoring for the terminal landings. The IMC-GIO Alphanumeric Display displays the car speed as it moves or it displays error conditions that exist. For detailed information on the IMC-GIO diagnostics, refer to Section 5.3.

g. Verify the Limit switch velocity values stored during normal slowdown at the terminal landings by depressing the Computer Reset button on the upper edge of the IMC-GIO board and releasing it. As the Computer Reset button is released, the IMC-GIO performs a self-test, followed by the display of each Limit switch input name and the pertinent learned velocity. Each value must be less than 95% of the contract velocity.

h. Verify that proper safety protection exists at the terminal landing, as provided by the IMC-GIO board. Disconnect each Terminal Limit switch input feeding this board while the car runs at contract speed. The number of Limit switch inputs vary according to the car speed. Refer to the Limit Input Terminals designated ULS1 through ULS4 and DLS1 through DLS4. If terminals ULS1 or DLS1 cannot be found, they may be connected with terminals 28X and 29X. Refer to pages 2 and 6 of the job prints in Section 7. For each terminal with a ULS prefix run the car up at contract speed and remove each wire from the terminal. In each case, the car must decelerate rapidly to a special leveling speed determined by the Safety Voltage trimpot, located on the upper corner of the IMC-GIO board. Adjust this trimpot to give the same value as the programmed Leveling Velocity. After the car comes to a stop, insert the wires into the terminals. Do the same for each terminal with a DLS prefix. Run the car down at contract speed and remove each wire from the terminal. Again, in each case, the car must decelerate rapidly to leveling speed. Adjust the ACC trimpot on the drive unit to give a very rapid deceleration rate under this condition, but avoid violent acceleration or deceleration. The acceleration rate setting on trimpot ACC should be high enough to exceed any programmed acceleration or deceleration rate. It should also have sufficiently rapid deceleration to stop the car safely, in case one of the safety functions in the IMC-GIO processor board detects insufficient deceleration at a terminal landing, or if the IMC-DDP detects other problems such as loss of position pulser signals, etc. After the car comes to a stop, insert the wires into the terminals. Every time the safety processor detects an overspeed at the terminal landing, a Terminal Slowdown event is logged into the Event Calendar under normal operation.

i. When a Terminal Slowdown is logged due to overspeed at a terminal landing after the car has slowed down, an alternate pattern is provided to move the car to the floor in order to prevent the car's getting stuck between floors. The value of the alternate pattern is adjusted by the trimpot Safety Voltage Adj located above the Alphanumeric Display next to the JP3 jumper on IMC-GIO board. Adjust this trimpot so the alternate pattern is about 6 to 8 fpm. To do so, connect one lead of the voltmeter to test point COM and the other lead to test point Safety Patt. A voltage equal to that calculated by the following equation, for an emergency speed of 8 fpm, should be measured with the equation below. This trimpot is usually adjusted at the factory before the controller is shipped.

$$\frac{80 fpm}{Contract Velocity}$$

j. The drive adjustment is now complete. Remove all jumpers, finish other adjustments (doors, etc.) and test all safety items and door locks. The performance of the elevator system depends on the proper adjustment of the drive and the use of all its features.

4.7 PROCEDURES FOR PERFORMING THE FINAL ACCEPTANCE TESTS -

WARNING

The following tests should be performed only by qualified elevator personnel, skilled in final adjustments and inspections.

NOTE

The motor field voltage should be recorded during contract speed, so it can be returned to this value after the tests, if necessary.

4.7.1 CONTRACT SPEED BUFFER TESTS -

a. *Car Buffer Test with Full Load Going Down* - To complete a full load car buffer test going down, a number of functions must be bypassed using jumpers as follows.

1. Connect a jumper between terminals 20X and 21X on the VVC-2-G drive unit terminal strip, which bypasses the safety functions.

2. Remove jumper plug on JP3 from location Norm to location TFB on the IMC-GIO board. This is to bypass the IMC-GIO safety functions.

3. Bypass the Down Normal Limit by connecting a jumper from terminals 8 to 12.

Place the elevator several floors above the bottom. Turn on the Relay Panel Inspection switch and move the jumper plug from JP5 to JP4 on the IMC-GIO board. The speed signal is now the single turn Pattern Adj trimpot on the IMC-GIO board. This should be set fully counterclockwise to start. Remember that a full clockwise setting overspeeds the car. Therefore, have a second person call out the car speed as the car is operated on inspection down and turn the trimpot quickly to at least the halfway point. Continue more slowly clockwise until contract speed is reached. The car will strike the buffer. Turn the Pattern Adj trimpot fully counterclockwise, then very slightly clockwise to provide a slow speed for moving the car away from the buffer. Remove the jumper from terminals 8 to 12. Temporarily connect a jumper to terminals 2 and 16 to move the car off the fully compressed buffer. Leave the other jumpers in place to perform the next test for the counterweight buffer. If this is the last test to be performed, go to step 4.7.3 below; otherwise, continue.

b. *Counterweight Buffer Test with Empty Car Going Up* - Steps (a) 1 and 2 should be completed. Connect a jumper from terminal 8 to 10 to bypass the Up Normal Limit switch. The car should be on Relay Panel Inspection operation with the Pattern Adj trimpot fully counterclockwise. The jumper plug on the IMC-GIO board should be in the JP4 position. Have a second person call out the car speed as the car is operated on inspection up and turn the trimpot quickly to at least the halfway point, then continue more slowly clockwise until contract speed is reached. The counterweight will then strike the buffer. Turn the Pattern Adj trimpot fully counterclockwise, then very slightly clockwise, to provide a slow speed for moving the counterweight away from the buffer. Remove the jumper from terminals 8 to 10. Temporarily connect a jumper to terminals 2 and 16 to move the counterweight off the fully compressed buffer. Leave the other jumpers in place to perform the next tests for the governor. If this is the last test to be performed, go to step 4.7.3 below; otherwise, continue.

4.7.2 GOVERNOR TESTS -

a. *Governor Electrical Overspeed Switch Test* - Trip open the Electrical Overspeed switch contact manually to verify that the main safety circuit drops out. Use the most convenient method to verify the actual electrical and mechanical tripping speeds. For example, use a drill motor to spin the governor with the governor cable lifted off the governor. Replace the governor cable.

b. *Governor and Car Safety Overspeed Test with Full Load Going Down* - Complete step 4.7.1.a.2 above. Bypass the Electrical Overspeed switch on the governor by connecting a jumper from terminals 2 to 16. Bypass the Car Safety switch on the car by connecting a jumper to terminals 16 and 18. Turn the Pattern Adj trimpot fully counterclockwise. Use the Relay Panel Inspection switches and Pattern Adj trimpot to move the car to the top of the hoistway in preparation for overspeeding the car in the down direction. The car should be fully loaded before starting the test. To complete this test, run the car down with the Relay Panel Inspection switch, while advancing the Pattern Adj trimpot quickly to just below contract speed, then more slowly clockwise to the point where the car safety sets. Stop only after the safety is firmly set, which is indicated by the drive sheave slipping under the hoist ropes.

Check the hoist ropes to make sure they are still in their proper grooves before attempting to move the car. Reset the governor jaws and the governor Overspeed switch. Remove the jumper between terminals 2 and 16. With flexible guide clamp safeties, move the car on inspection in the up direction to release the safeties. With wedge clamp safeties, release the safeties from inside the car. Once the safeties have been released, remove the jumper between terminals 16 and 18.

Move the car down on inspection to make sure the safety has completely released and returned to the normal position.

> **NOTE**
>
> If counterweight safety and governor are present, reverse directions for testing.

c. At the end of all buffer and governor safety tests, verify that there are no jumpers between terminals 2 to 16, 16 to 18, 8 to 10, and 8 to 12. Remove the jumper plug on JP3 from TFB position and place it in the Norm position on the IMC-GIO board. If steps 4.7.3, 4.7.4 and 4.7.5 are not to be completed, remove the jumper on terminals 20X and 21X on the VVC-2-G drive unit terminal strip, and turn off the Relay Panel Inspection switch to restore normal operation. Remove jumper plug from location JP4 and place it on position JP5. If the Pattern Adj trimpot is turned fully clockwise the car should reach contract speed during normal operation.

4.7.3 INSPECTION/LEVELING 150 FPM OVERSPEED TEST - For this test, refer to Section 4.5.6.a.

4.7.4 EMERGENCY TERMINAL SPEED LIMITING DEVICE TEST - For this test, refer to Section 4.5.6.b.5.

4.7.5 TERMINAL SLOWDOWN LIMIT SWITCHES - There are three ways to accomplish this test.

a. For this test, refer to Section 4.6.h.

b. An alternative method to run this test is to place the car in the middle of the hoistway, remove the jumper from JP5 and place it into JP4 on the IMC-GIO board. Turn the Pattern Adj trimpot fully counterclockwise. Place the car on inspection and run the car down, while turning the Pattern Adj trimpot clockwise until contract speed is reached. Let the car go through the bottom terminal and observe that the Terminal Slowdown switches slow down the car. Note that the pattern output must be routed through the safety cutoff relay on IMC-GIO board for this test to work. The jumper plug on JP3 shall be in the Norm position. The same test may be performed for the up direction by running the car up on inspection. Remember the deceleration rate is determined by the ACC trimpot on the VVC-2-G drive unit, so if the car goes onto the buffer the ACC may have to be turned further in the clockwise direction.

c. A third method to run this test is to place the car at a lower floor (second or third floor), then connect a jumper from 120VAC to the respective PR, R0, R1-R5, to make the controller think it is at a higher floor. Then place a call to the bottom floor and let the car go through the bottom terminal. Verify that the Terminal Slowdown switches slow down the car. The pattern output must be routed through the IMC-GIO board for this test to work. Following is an example of how this test may be performed.

   1. Place the car at the second floor.

   2. Jumper 120VAC or the 2 bus to R0 and R2 (this would make the controller think the car is at seventh floor).

   3. Place a car call to the bottom landing.

   Test the Upper Terminal Limit by using the same method described above. Only this time, place the car at a floor close to the top, making the controller think it is actually at a lower floor by manipulating the PR, R0 - R5. Then run the car up to the upper terminal floor and observe that the Terminal Slowdown switches would slow down the car. If the car lands on the buffer, turn the ACC trimpot clockwise on the VVC-2-G drive unit.

WARNING

Before the elevator is turned over to normal use, verify that no safety circuit has been bypassed. Use the list below as a partial checklist.

- No jumpers on terminals 4 and 8 (HC-RB)
- No jumpers on terminals 2 and 16 (HC-RB)
- No jumpers on terminals 16 and 18 (HC-RB)
- No jumpers on terminals 8 and 10 (HC-RB)
- No jumpers on terminals 8 and 12 (HC-RB)
- Level Down LD installed on terminal 25 (HC-RB)
- No jumper on JP4 (IMC-GIO)
- Jumper plug on JP5 must be installed (IMC-GIO)
- Jumper on JP3 must be in position NORM (IMC-GIO)
- Pattern Adj trimpot must be fully clockwise (IMC-GIO)
- No jumpers on terminals 20X and 21X (Drive unit)
- No jumpers on R0 - R6 and PR terminals (IMC-RB)
- No jumpers on JP1/INTB on IMC-RB

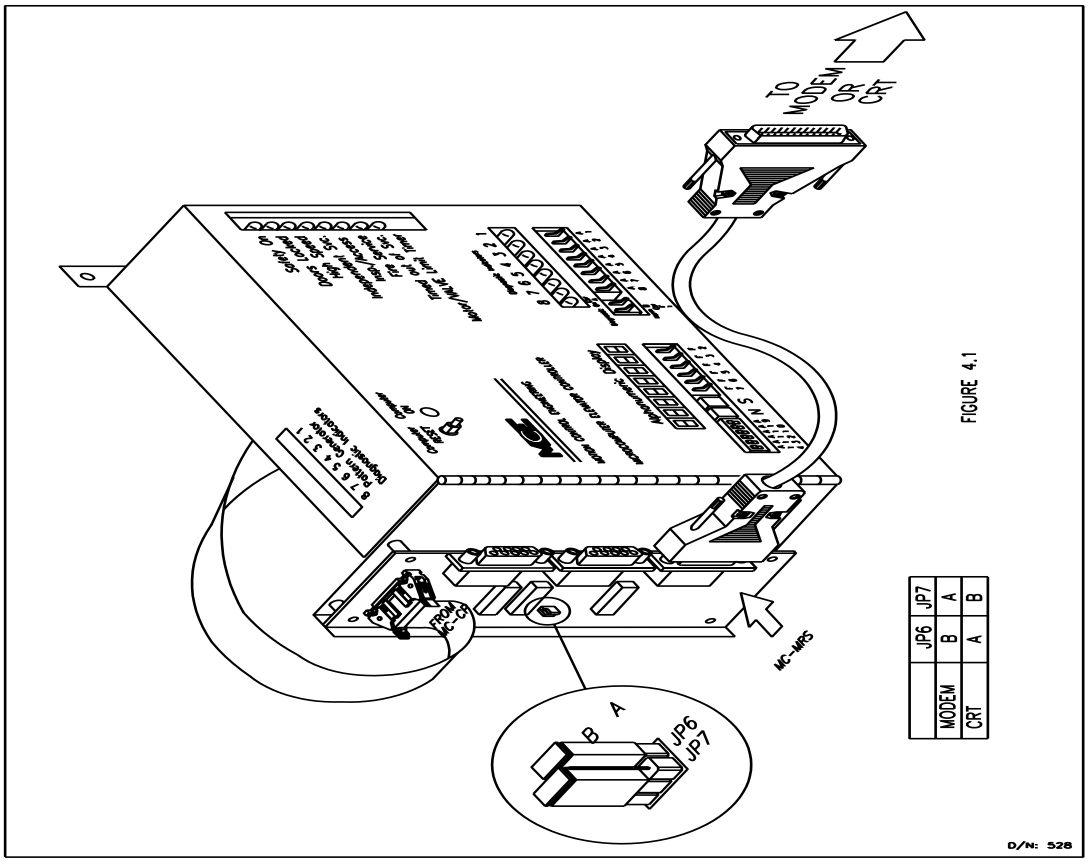
Table 4.2

TYPICAL RECOMMENDED SPEED PARAMETERS							
Parameters		***Car Speed in Feet Per Minute***					***Units***
		200	***350***	***400***	***500***	***600***	
J1	Jerk at Start	6.00	6.00	5.00	5.00	6.00	ft/s^3
J35	Jerk at Peak	6.00	6.00	5.00	5.00	4.00	ft/s^3
J7	Jerk Before Leveling	2.50	2.50	2.50	2.50	2.50	ft/s^3
A0	Acceleration - Starting	.10	.10	.10	.10	.10	ft/s^2
A2	Acceleration - Maximum	2.40	3.20	3.40	3.60	3.80	ft/s^2
A6	Deceleration - Maximum	2.20	2.90	3.20	3.30	3.50	ft/s^2
VH	Contract Speed	200	350	400	500	600	ft/min
VHL	High (Initial) Leveling Speed	030	040	045	045	045	ft/min
VIL	Intermediate Leveling Speed	015	015	015	015	015	ft/min
VFL	Final Stabilized Leveling Speed	004	003	002	002	002	ft/min
VRL	Releveling Speed	008	008	008	008	008	ft/min
VIN	Inspection Speed	050	050	050	050	050	ft/min
VCR	Correction Speed	050	050	050	050	050	ft/min
DL	Leveling Distance	0.60	0.60	0.50	0.45	0.45	ft
DFL	Final Stabilized Leveling Distance	0.10	0.06	0.06	0.05	0.05	ft
DTC	Distance Tracking Compensation	0.00	0.00	0.00	0.01	0.01	ft
NL	Number of Landings	10	10	10	10	10	Landings

Table 4.3

RANGE AND FORMAT OF THE PATTERN GENERATOR SPEED PARAMETERS				
Parameter	***Format***	***Smallest Change***	***Acceptable Range***	***Default Value***
J1	XX.XX	.01	1.00-25.00	8.00
J35	XX.XX	.01	1.00-25.00	5.00
J7	XX.XX	.01	1.00-25.00	2.00
A0	XX.XX	.01	0.10-1.00	0.10
A2	XX.XX	.01	1.00-10.00	3.50
A6	XX.XX	.01	1.00-10.00	3.00
VH	XXXX	1	100-2000	500
VHL	XXX	1	VIL-100	011
VIL	XXX	1	VFL-VHL	009
VFL	XXX	1	001-015	008
VRL	XXX	1	VFL-020	010
VIN	XXX	1	005-075	050.0
VCR	XXX	1	020-150	050.0
DL	X.XX	.01	0.10-1.50	0.25
DFL	X.XX	.01	0.01-0.50	0.10
DTC	X.XX	.01	0.00-1.00	0.00
NL	XXX	1	02-63	02

MC-MRS LINK TO CRT TERMINAL
FIGURE 4.2



DIGITAL DRIVE PARAMETERS F1 SCREEN
FIGURE 4.3

DIGITAL DRIVE PARAMETERS

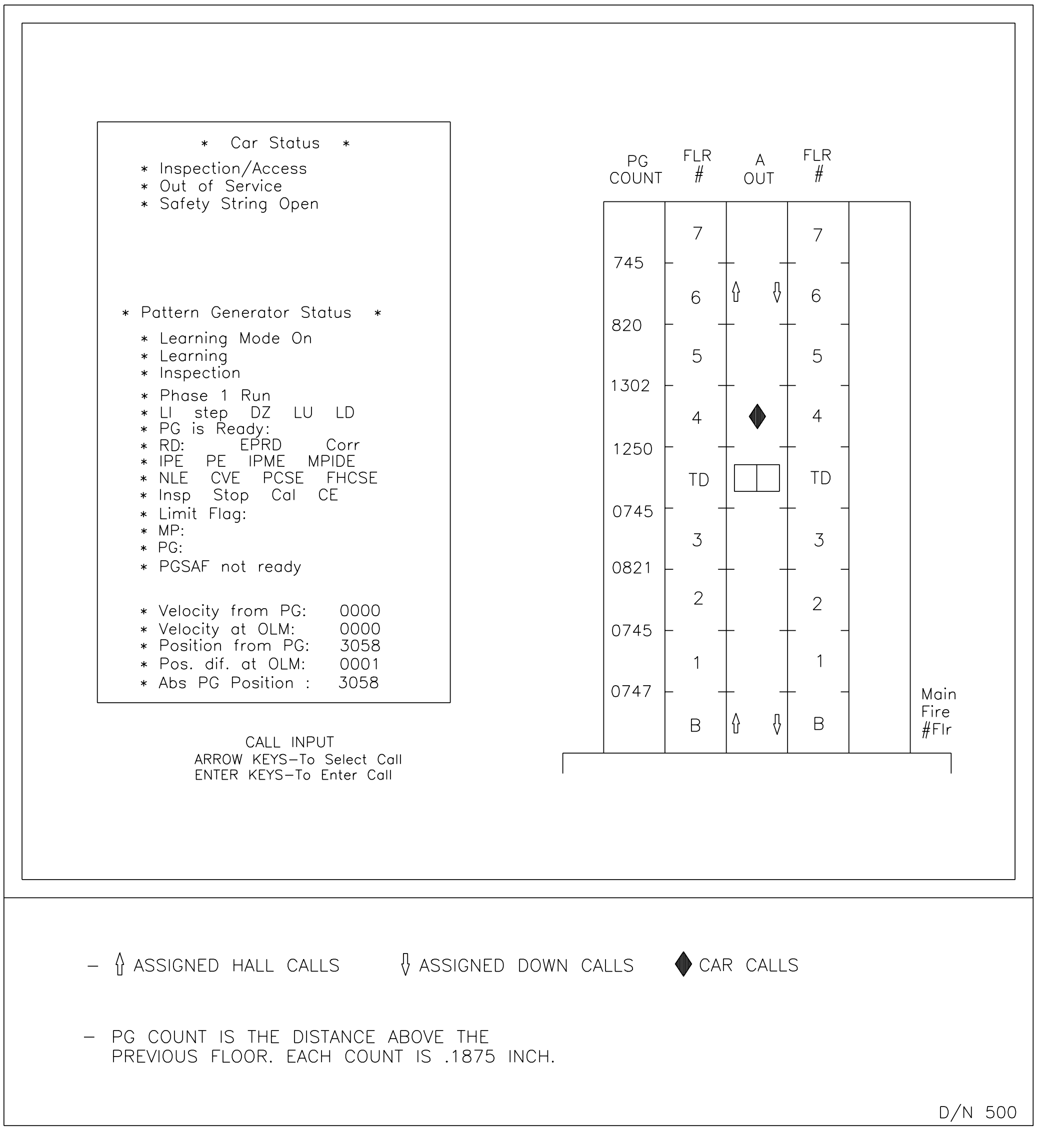
	Parameters	Actual	Desired	Units
J1	Jerk at start	6.00	6.00	ft/(s*s*s)
J3,5	Jerk at peak	4.00	4.00	ft/(s*s*s)
J7	Jerk before leveling	2.00	2.00	ft/(s*s*s)
A0	Acceleration – starting	0.10	0.10	ft/(s*s)
A2	Acceleration – maximum	3.00	3.00	ft/(s*s)
A6	Deceleration – maximum	2.50	2.50	ft/(s*s)
VH	Contract speed	350	350	ft/min
VHL	High (initial) leveling speed	030	030	ft/min
VIL	Intermediate leveling speed	015	015	ft/min
VFL	Final stabilized leveling speed	004	004	ft/min
VRL	Releveling speed	008	008	ft/min
VIN	Inspection speed	050	050	ft/min
VCR	Correction speed	050	050	ft/min
DL	Leveling distance	0.60	0.60	ft
DFL	Final stabilized leveling distance	0.10	0.10	ft
DTC	Distance tracking compensation	0.01	0.01	ft
NL	Number of landings	10	10	Landings

Accept Desired Parameters: (Y/N)

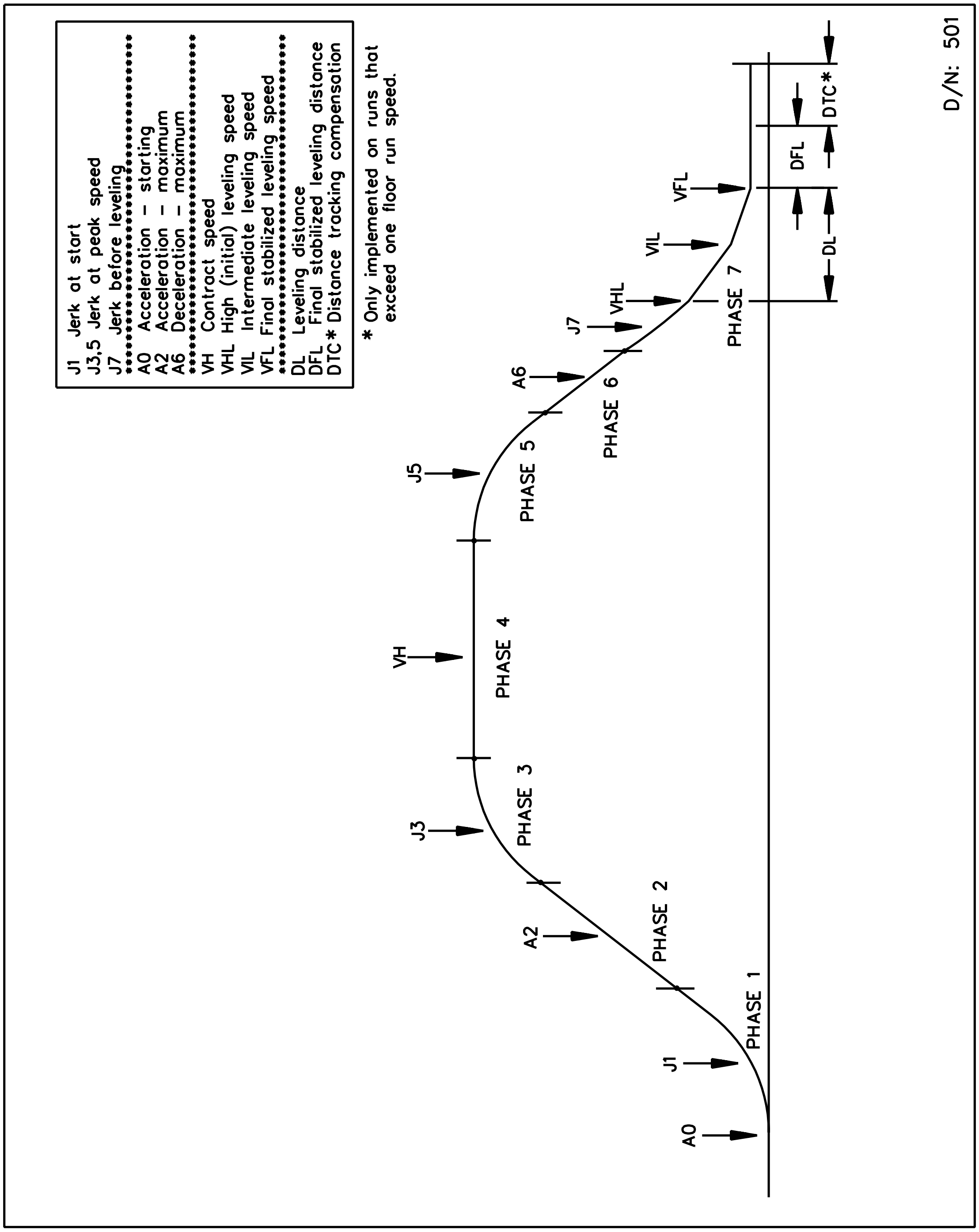
Contract velocity, and number of landings must be initialized before car can run.
Car must be on inspection to accept desired parameters.
If the parameters are changed, the safety board must be relearned.
Up and down arrow keys select parameters. Numeric keys input desired values
"S" saves desired values.

D/N: 502

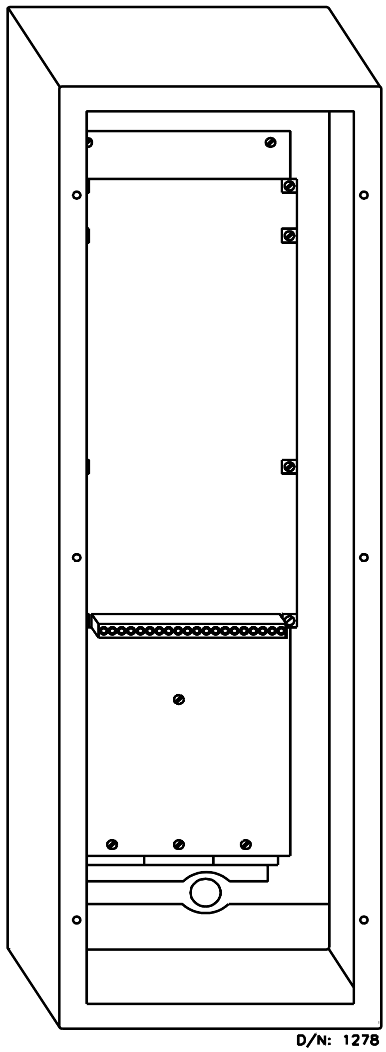
ELEVATOR GRAPHIC DISPLAY F3 SCREEN
FIGURE 4.4



TYPICAL VELOCITY PROFILE F2 SCREEN
FIGURE 4.5

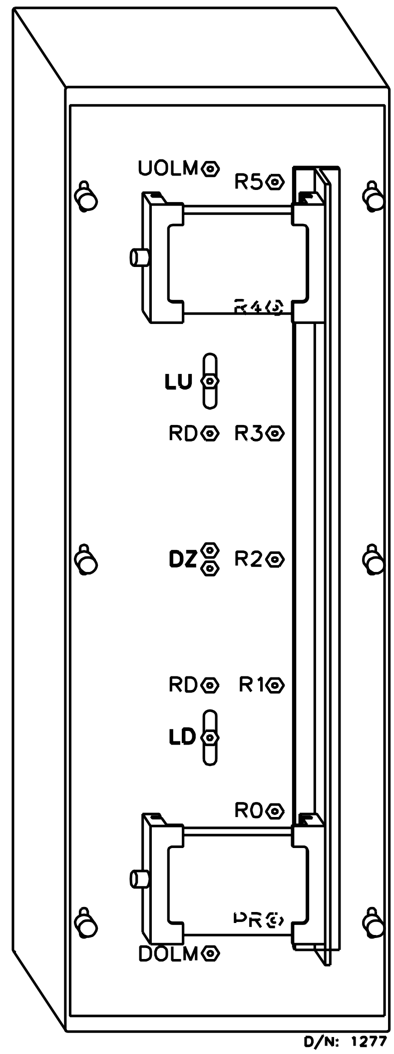


LS-QUAD-2 DETAIL
FIGURE 4.6



REAR VIEW WITH COVER OFF

This shows the terminal strip on the front of the HC-DFLS board used for customer connections.



FRONT VIEW OF LS-QUAD-2

Adjust the level up (LD) and level down (LD) sensors by sliding sensor with a finger or screwdriver. Do not open box to move them. Note that the LU and LD sensors must be the same distance from the door zone (DZ) sensors.

SECTION - 5

HUMAN INTERFACE

5.0 GENERAL INFORMATION -

Since the VVMC-1000 Series Turbo DF traction controller employs more than one processor, it requires a user-friendly, comprehensive and elaborate diagnostic tool which will help the elevator mechanic install, adjust, service and troubleshoot the equipment. The diagnostic tools available to the Series Turbo DF controllers are listed here.

- CRT terminal, with user-friendly menus
- Enhanced On-Board Diagnostics (EOD)
- IMC-GIO On-Board Diagnostics

5.1 CRT TERMINAL -

The CRT terminal provides the elevator mechanic with a set of easy to use menus for the purpose of adjusting, servicing and troubleshooting the controller. To install the CRT, see MCE Computer Peripherals Manual. The CRT is only needed for adjustment of the drive parameters and for viewing the Event Calendar (fault history). Information for troubleshooting and diagnostics is available through both the EOD and the CRT.

5.2 ENHANCED ON-BOARD DIAGNOSTICS (EOD) -

5.2.0 GENERAL INFORMATION - This controller is self sufficient in that it does not require external devices to view the necessary flags inside the computer. For a complete listing of these flags, see Table 5.3. The EOD was designed to help the elevator mechanic determine what the elevator control system is actually trying to do, or what it is perceiving. It also enables the mechanic to adjust specific system parameters (e.g., door times). The EOD is a powerful tool to use for troubleshooting the control system. For example, even though the signal from a switch might exist on the proper terminal in the controller, the elevator system may not respond to it. That is to say, it is possible for the controller not to respond, even though it is operating correctly. The mechanic must determine, through the EOD, why this has occurred. The computer is the most reliable component in the control system and the EOD points the way to the real source of the problem whether inside or outside the controller.

Since the speed pattern for the motion of the elevator (in the Series Turbo DF traction controller) is generated by the IMC-DDP computer board, the Enhanced On-Board Diagnostics encompasses the diagnostics of the IMC-DDP, as well.

The Enhanced On-Board Diagnostics (EOD) operates in three separate modes. They are normal, diagnostic and system mode. All three modes are discussed in detail in this section.

5.2.1 FUNCTIONAL DESCRIPTION OF INDICATORS AND SWITCHES OF EOD -The diagnostic indicators and switches are located on the front, top and back section of the Swing Panel. Figures 5.1, 5.2 and 5.3 show the indicators and switches on the Computer Swing Panel. Following is a brief functional description of these indicators and switches.

a. *Computer on Indicator Light* (located on the front of the Swing Panel, Figure 5.1) - The Computer On light indicates that the MC-MP computer is functioning normally and is completing its program loop successfully. Resetting the microcomputer turns this light off and it remains off while the reset button is depressed. The Computer On light turns back on when the reset button is released. The microcomputer is equipped with an auto reset feature that causes the elevator to go through a resetting process if, for any reason, the program loop can not be completed (for example, a very strong electromagnetic or line noise may cause computer malfunctioning). The computer automatically resets itself and goes back to normal operation. This prevents unnecessary trouble calls if the transient has not caused any hardware damage. The auto reset process also causes the Computer On light to turn off for brief periods. If the Computer On light flashes on/off, it means the program is not looping successfully and the processor board is malfunctioning. Check the EPROM chip to verify proper installation. See Appendix C in this manual.

NOTE

Pressing the reset button drops the safety relay and causes immediate stopping of the elevator.

b. *Group of Eight Vertical Status Indicators* (located on the front of the Swing Panel) - When these lights are on, each one has a meaning. These lights indicate the important elevator statuses in the following order.

1. Safety circuit is closed (top light).
2. Door lock contacts are closed.
3. Elevator is running high speed.
4. Elevator is on independent service.
5. Elevator is on car top inspection or hoistway access operation.

6. Elevator is on fire service operation.
7. Elevator is timed out of service.
8. Motor limit timer has elapsed (bottom light).

c. *Diagnostic Indicators* (Located on the front of the Swing Panel - Figure 5.1) The eight horizontal diagnostic indicator lights (MP diagnostic indicators) have two functions. When on diagnostic on, they indicate the contents of computer memory and when in normal mode, they indicate the prevailing status or error message.

d. *Alphanumeric Display* (Located on the front of the Swing Panel - Figure 5.1) -The eight character Alphanumeric Display provides more user-friendly interaction between the control equipment and the elevator mechanic by displaying messages in English text or abbreviations.

e. *Computer Reset Pushbutton* (Located on the upper left hand corner on the front of the Computer Swing Panel - Figure 5.1) - Pressing the reset button causes the MC-MP (main processor) and the MC-CP (communication processor) computer boards to reset. This drops the safety relay and brings the elevator to an immediate stop if the elevator is running. The elevator then goes to the closest floor to correct its position before responding to any calls. Existing call and PI information are lost each time the microcomputer is reset.

f. *The Eight Lower Address Switches* (Located on the front of the Swing Panel - Figure 5.1) - These are labeled A1 through A8 from right to left. These switches enable the elevator mechanic to look at the memory on the processor board. These switches are on in the up position and off in the down position.

g. *Car A/Car B (F1) Switch* (Located on the front of the Swing Panel Figure 5.1) -This switch, in a duplex configuration, indicates which car's information is being displayed and which car's data can be addressed by the A1-A8 switches. If the elevator system is a simplex, always place this switch in the up position for Car A.

h. *Diagnostics On-Normal Switch* (Located on the front of the Swing Panel - Figure 5.1) - This switch puts the system in diagnostic mode in the up position and in normal mode in the down position.

i. *Function Switches F2-F7* (Located on the front of the Swing Panel - Figure 5.1) - These six switches act as function switches to put the EOD in different modes of operation. The three modes of operation are discussed in detail in this section of the manual.

j. *Two Pushbutton Switches Marked N and S* (Located on the front of the Swing Panel - Figure 5.1) - These pushbuttons are used in the different diagnostic modes to scroll through a list of data.

k. *Six Higher Address Switches* (Located on the front of the Swing Panel - Figure 5.1) - A9 through A14 from right to left. These address switches are primarily used by the factory.

l. *Pattern Generator Diagnostic Indicators* (Located on the top of the Swing Panel -Figure 5.2) - The eight Pattern Generator Diagnostic Indicators have two functions. When in diagnostic mode, they indicate the contents of pattern generator computer memory, and when in normal mode they indicate the prevailing status or error message related to the IMC-DDP processor board.

m. *DDP Computer On Indicator Light* (Located on the back of the Swing Panel - Figure 5.3) - The Computer On light indicates that the IMC-DDP board is functioning normally and is completing its program loop successfully. Resetting this computer turns this light off and it remains off while the reset button is depressed. The Computer On light turns back on when the reset button is released.

   The IMC-DDP computer board is equipped with an auto reset feature that causes the IMC-DDP computer to go through a resetting process if for any reason the program loop cannot be completed. Using the reset button prevents unnecessary trouble calls if the accident has not caused any hardware damage. The auto reset process also causes the DDP Computer On light to turn off for a brief period. If the DDP Computer On light flashes on/off, it means that the program is not looping successfully and the processor board is malfunctioning. Check the EPROM chip to make sure it is installed properly (see Appendix C).

n. *CP Computer On Indicator Light* (Located on the back of the Swing Panel - Figure 5.3) - The Computer On light indicates that the MC-CP computer is functioning normally and is completing its program loop successfully. The MC-CP computer is equipped with an auto reset feature that causes the elevator to go through a resetting process if for any reason the program loop cannot be completed.

o. *DDP Computer Reset Pushbutton* (Located on the back of the Swing Panel - Figure 5.3) - Pressing the reset button causes the IMC-DDP processor board to reset. It drops the speed pattern to zero and the elevator rapidly drops its velocity to zero.

5.2.2 NORMAL MODE OF OPERATION - Normal mode is selected by moving the Diagnostic On-Normal switch to the off/down position. Make sure that the F7 switch is also in the off/down position. See Figure 5.1. Below is a brief description of the function of the indicators and switches used in this mode.

a. Group of Eight Vertical Lights used as the elevator status indicators as defined on Section 5.2.1 (b).

b. Diagnostic Indicators on the front of the Swing Panel scan normal from right to left or indicate an error or other status that the microcomputer recognizes to be the prevailing status dominating the elevator function. (If the car is slaved to the group supervisor in a multi-car group system, the lights scan from right to left then left to right.) When troubleshooting, pay special attention to these indicators. They signal exactly what is wrong with the elevator system or act as a guide to the source of the problem. See Table 5.8. The error status messages are in order of priority. For example, if the car is on independent service and the safety string is open, the indicators show that the safety string is open. Once the safety string is made, the indicators shows the car is on independent service.

c. Pattern Generator Diagnostic Indicators scan normal from right to left or indicate an error or other status that the IMC-DDP computer recognizes as the prevailing status dominating the pattern generator function. When troubleshooting, pay special attention to these indicators. See Table 5.8 for the LED representations.

d. F1 (CAR A/B), F2, F3, F4, F5 and F6 Function Switches - Each of the F switches (F1 - F6) performs a special function in this mode. In normal mode the F7 switch must be in the off or down position. If more than one of these switches are on at the same time, the Alphanumeric Display reads PLEASE SELECT ONLY ONE FUNCTION.

   If all F function switches (F1 - F7) are in the off/down position, the Alphanumeric Display would show the military time in hours, minutes and seconds. If F3 or F6 is turned on, the Alphanumeric Display would show the time.

5.2.2.1 ADJUSTMENT OF THE ELEVATOR TIMERS - To view or adjust the elevator timing functions, the F2 Switch (in normal mode), should be in the on/up position. The F2 function displays the value of the programmable timers (e.g., door times, etc.) and allows the user to change these values. In the case of a duplex system, Car A and Car B values are the same and the Car A/Car B switch does not have any effect on this function.

When the F2 switch is turned on, the Alphanumeric Display would show CCT 01S. The first word (CCT) is the flag for car call time. The number (01S) shows that the car call time has been set for 01 second. If the value is in minutes, the last letter displayed would be M instead of S. Table 5.6 shows the list of all the adjustable timers and their adjustment ranges.

Once the F2 switch is turned on, the Alphanumeric Display would show CCT 01S. To view the rest of the programmable timers, press the red pushbutton marked N. Pressing the N pushbutton advances the display to the next programmable timer. Constant pressure on the N pushbutton scrolls through the available programmable timers.

Once a programmable timer has been selected using the N pushbutton, the timer can be adjusted to a desired value by using the S pushbutton. The user can only adjust the values within a given range because the range for each value is programmed. Constant pressure on the S pushbutton increases the timer value by one (second or minute) and causes the display to flash until the value reaches the upper limit, at which point it automatically starts again from the lower limit. To select a desired value, push the S pushbutton and release it when the desired value is displayed. When the S pushbutton is released, the display flashes for three seconds and then stops flashing. After the flashing has stopped, the new timer value has replaced the old value. The same procedure can be used to view or adjust any of the timer values shown in Table 5.6.

5.2.2.2 ADJUSTMENT OF REAL TIME CLOCK - To adjust the real time clock, the F4 Switch (in normal mode) should be in the on/up position. This function switch is used to set the real time clock located on the main computer board (MC-MP). Turning the F4 switch on causes the Alphanumeric Display to display the current year. Table 5.5 shows the list of all the adjustable real time clock flags and their adjustment ranges.

To view the rest of the real time clock flags shown in Table 5.5, press the red pushbutton marked N. Pressing the N pushbutton advances the display to the next real time clock flag. Constant pressure on the N switch causes the display to scroll through all the real time clock flags.

Once a variable has been selected using the N pushbutton, the value can be changed by using the S pushbutton. Constant pressure on the S switch increases the variable value by one until the value reaches the upper limit, at which point it would automatically start again from the lower limit. To adjust the S pushbutton, press and release it when the desired value is displayed. The same procedure can be used to view or adjust any of the real time clock variables shown in Table 5.5.

5.2.2.3 VIEWING THE INTERNAL FLAGS - This function is used to display the status of all the input/output and internally generated variables related to the MC-MP computer. For a complete listing of these flags see Table 5.3. The main purpose of this function is to provide fast, easy access to desired flags listed in Table 5.3. Turn the F5 switch to the on position. The Alphanumeric Display shows ALT OFF. The first word (ALT) is the name of the flag; the second word (OFF) is the status of the flag. To select a desired flag, first find its name in Table 5.3. Make sure the F5 switch is in the on position and that the Diagnostic On-Normal switch is in the Normal position. Press the N pushbutton until the first letter of the flag displayed is the same as the first letter of the flag selected. Now release the N switch and press the S switch to scroll through the list of flags beginning with that letter.

5.2.3 DIAGNOSTIC MODE OF OPERATION - Diagnostic mode is selected by toggling the Diagnostic On-Normal switch to the on/up position, making sure that the F7 switch is in the off/down position. See Figure 5.1.

a. Group of Eight Vertical Lights are used as the elevator status indicators, as defined in Section 5.2.1 (b).

b. Diagnostic Indicators on the front of the Computer Swing Panel are used in conjunction with the function switches (F1-F7). Therefore, depending on the selected function, they display different information.

c. Pattern Generator Diagnostic Indicators are used in conjunction with the function switches (F1-F7). Therefore, depending on the selected function, they display different information.

d. F1 (CAR A/B), F2, F3, F4, F5, F6 Function Switches - Each of the F switches (F1-F6) performs a special function in this mode. In diagnostics mode the F7 switch must be in the off/down position. If more than one of these switches is on at the same time, the Alphanumeric Display reads PLEASE SELECT ONLY ONE FUNCTION. If all F function switches (F2-F7) are in the off/down position, the Alphanumeric Display reads ADD.ØØH.

5.2.3.1 VIEWING THE MC-MP AND IMC-DDP COMPUTER MEMORY FLAGS -If none of the F1-F7 switches are on, the A1-A8 switches make it possible to view the MC-MP and IMC-DDP computer memory flags. Figures 5.4, 5.5 and 5.6 show the address and location of all flags needed for troubleshooting the system. Table 5.3 lists each variable or flag related to the MC-MP computer with a brief functional description. Table 5.4 lists each variable or flag related to IMC-DDP with a brief functional description.

Once an address has been selected on the A1-A8 switches, the Alphanumeric Display shows the address (e.g., ADD.22H which means address line 22).

There is an alternate way to look at the memory without using the A1-A8 switches. To use this method, regardless of the position of A1-A8 switches, press the N pushbutton. The Alphanumeric Display shows ADD.20H and the MP diagnostic indicators signal the contents of the address displayed. Keeping the N pushbutton down increases the address shown on the Alphanumeric Display and the eight indicator lights change respectively.

Once the address reaches 33H, it automatically goes back to 20H. Releasing the N switch holds the last address displayed on Alphanumeric Display for an additional three seconds before changing the display to reflect the address selected by the A1-A8 switches.

5.2.3.2 VIEWING AND ENTERING CALLS - To view or enter calls, the F4 Switch (in diagnostic mode) should be in the on/up position. This function allows the user to view all the calls registered per floor and enter calls as desired. With the switch (F4) turned on, the Alphanumeric Display reads FLOOR 01 and the Diagnostic Indicators light up when calls have been registered. The format for the call indication is shown here.

MP DIAGNOSTIC INDICATORS ON FRONT OF SWING PANEL

○	○	○	○	○	○	○	○
UCR Up Call Rear	**UCF** Up Call Front	**DCR** Dn Call Rear	**DCF** Dn Call Front	**CCRB** Rear Car B	**CCFB** Front Car B	**CCRA** Rear Car A	**CCFA** Front Car A

Pressing the N pushbutton advances the floor number and the Diagnostic Indicator lights indicate the calls for the corresponding floor. Once the floor number reaches the top floor, it automatically starts from the bottom floor again.

To enter calls, select the desired floor as described above. Use the A1-A8 switches. Use the same format as shown above for selecting the call type. Now press the S pushbutton and hold it until the call has been registered. A call type cannot be entered which does not exist in the system. Also, if the car is part of a group, only car calls can be entered.

5.2.4 SYSTEM MODE OF OPERATION - The system mode provides a level of security so no unauthorized person can modify or change any of the system parameters intentionally or by mistake.

While in system mode, the group of eight vertical status LEDs scan from bottom to top indicating that the system mode is active. Follow the steps below to enter and exit system mode.

LOGGING INTO SYSTEM MODE		
Switch	***Position***	***Purpose/Alphanumeric Display***
Diagnostic On	Down	Time is displayed
F1-F6	Down	Time is displayed
F7	Up	PASSWORD is displayed
A1-A8	Down	If no password is needed
	Various	Set switches to password value
S pushbutton	Press ½ second	*SYSTEM* is displayed

LOGGING OUT OF SYSTEM MODE		
Switch	***Position***	***Purpose/Alphanumeric Display***
F1-F7	Down	Exits system mode and displays time

If, while in the system mode, no function switch is moved or pushbutton is pressed for a period of two minutes, the computer automatically exits from system mode and goes into normal mode.

5.2.4.1 VIEWING AND CHANGING THE SECURITY CODES - For jobs with the MCE SECURITY feature, this function allows the security codes to be viewed or changed. To view and change the security codes, set the switches as shown in the following chart. If the job does not have MCE SECURITY, the Alphanumeric Display would show NOT USED.

Table 5.1

CHANGING FLOOR SECURITY STATUS AND SECURITY CODES		
Button	***Explanation***	***Alphanumeric Display***
Press N	***For list of floors*** Scrolls through list of floors and their security status. The bottom floor is always displayed first. Release when needed floor is displayed.	***Example*** B NSCR 1 NSCR 2 SCRD In this example, B means basement, and it is not secured.
Press S	***For list of characters*** This scrolls through list of all security characters including the word END. Release S when the desired value is displayed. The word END as a security code character finishes the security code. If END is the first character, the floor has no code.	***(1) Example*** 2 1 = 3 For floor 2, the first character in the code is a 3. To change a code, press S for a list of characters. ***(2) Example*** 2 1 = END For floor 2, the first character in the security code is the word END.
Press N	***To save and continue*** If a character was changed, the next character in the code is displayed. To change more characters, repeat previous step. The last character in a code must be the word END, if the code is less than eight characters long. ***To end and save*** If END was chosen as a code character, the computer displays the current floor status. To change code for another floor repeat steps from the top.	***(1) Example*** 2 2 = 4 For floor 2, the second security character is a 4. ***(2) Example*** 2 NSCR If END was chosen for first character, this floor has no security code and is now unsecured. Using END for any other character just ends that code, but the floor is still secured.
F3 and F7 switches in down position	***To exit system mode*** Every security code must end with the word END or be eight characters long. If not, the processor remains in system mode.	***Example*** 11:04:27 Time displayed.

MCE SECURITY is initiated by the security input - BSI. To set up the security feature, see job prints in Section 7. Once in security mode, all car calls are screened by the computer and become registered only if: (1) the call is not to a secured floor, or (2) the floor is secured and its code is correctly entered within ten seconds.

The security code for each floor may consist of from one to eight characters where each character is one of the floor buttons found in the elevator car. Any floor with a security code is a secured floor. Appendix B at the end of this manual provides instructions for security operation used by elevator passengers. Room has also been provided for listing the security codes for each floor.

5.2.4.2 SYSTEM LEARN OPERATION - Since the Series Turbo DF traction controller operates under the assumption that its computer knows the exact floor and car positions in the hoistway, the Series Turbo DF computers must learn the building before any attempt is made to run the car on anything other than inspection operation. This section describes how to put the system into learn mode. For details of the learn operation, see Section 4.3 in this manual.

a. To place the system into the learn operation, the F4 switch (in system mode) should be in the on/up position. Once on learn operation, the Alphanumeric Display, the diagnostic indicators on the front of the Swing Panel, and the Pattern Generator Diagnostic Indicators on the top of the Swing Panel display specific messages which are described below. The rest of the indicators and switches are not used for this operation.

b. The Alphanumeric Display, while on learn operation, displays one of the following messages.

   LRN ERR (learn error)
   LN READY (learn ready)
   LEARNING (learning)
   LEARNED (learn complete)

c. When the Alphanumeric Display reads LRN ERR, the diagnostic indicators display the condition that has caused the learn error message. See Table 5.7 for a detailed list of those conditions.

d. In the learn mode, the Pattern Generator Diagnostic Indicators flash a code which indicates that the IMC-DDP computer is in the learn mode. See Table 5.8.

5.3 IMC-GIO ON-BOARD DIAGNOSTICS -

The IMC-GIO board is a general input/output board that includes an independent processor which monitors the performance of the car as it approaches a terminal landing. This board is equipped with its own on-board diagnostic tools. The IMC-GIO On-Board Diagnostics has three modes of operation.

- Startup operation
- Learn operation
- Normal operation

This section provides a brief description of the diagnostic tools available on the IMC-GIO board. It also gives a description of each of the three modes of operation.

5.3.1 FUNCTIONAL DESCRIPTION OF INDICATORS AND SWITCHES - Refer to Figure 3.2 for the IMC-GIO board layout.

a. *Four Digit Alphanumeric Display* - This display is located near the upper portion of the IMC-GIO board. It displays the car speed, prevailing board status and error messages.

b. *Learn Indicator* - This is a single green LED below the Alphanumeric Display on the IMC-GIO board. When this LED is illuminated, it indicates that the IMC-GIO board is on learn operation.

c. *Computer On Indicator* - This is a single red LED above the Alphanumeric Display. When this LED is illuminated, it indicates that the processor on the IMC-GIO is properly executing its program. If this LED is off or is flashing on/off, it indicates processor malfunction, and needs to be fixed before the car can be run safely.

d. *Cutoff Indicator* - This is a single red LED located above the Computer On LED. When this LED is illuminated, it indicates that the relay, on the IMC-GIO board, is not energized and the safety processor speed pattern is substituted for the drive unit.

e. *Landing System Indicators* - There are three red LEDs below the Learn LED. These indicate the OLM and the position pulser signals.

f. *Learn Switch* - This toggle switch is located behind the green Learn LED on the IMC-GIO board.

g. *Reset Pushbutton* - This pushbutton is located above the Alphanumeric Display behind the Computer On LED. This pushbutton is used to reset the processor on the IMC-GIO board. When this pushbutton is depressed the Computer On LED turns off.

5.3.2 STARTUP OPERATION - When the system is turned on or the Computer Reset button is released, the processor on the IMC-GIO board goes through a self-test. This is followed by the display of each Limit switch input name and its associated learned velocity. At this time, the Cutoff LED blinks and four relay clicks can be heard. The LED stays off and the relay stays energized. During self-test, it takes up to 30 seconds for the IMC-GIO to display all the terminal switches and their associated velocities. If the self-test is successfully performed, the Alphanumeric Display shows the car's speed as it runs, and, if the car is not running, it indicates the last speed at which the car was running. If the self-test fails, the Alphanumeric Display indicates an error message. Refer to Table 5.2 to identify the problem that has caused the IMC-GIO to fail the self-test.

5.3.3 IMC-GIO LEARN OPERATION - By turning on/up the Learn switch located on the IMC-GIO board, the IMC-GIO enters the learn operation and the Learn on LED illuminates. As the IMC-GIO goes through the learn operation, the Alphanumeric Display shows the messages listed here.

LRN	IMC-GIO on learn operation, car not moving
LRNU	Learning in the up direction
LRND	Learning in the down direction
LRNW	Writing the learned speed values to the EEPROM
LRNR	Verify the speed values in EEPROM
LRNC	Learning has been successfully completed
LRNT	In learn operation for over five minutes without completion

The learn operation is intended only for the purpose of learning the Terminal Limit switches. The IMC-GIO should be removed from the learn operation as soon as the IMC-GIO has learned the proper velocities associated with each Terminal switch. If the Learn switch is left in the on position for more than five minutes, the IMC-GIO automatically exits the learn operation and the Alphanumeric Display indicates LRNT. If, at this time, the learn is successfully completed, the car will run normally. If the learn operation was not complete and the EEPROM does not include valid data, the IMC-GIO processor prevents the car from running.

The EEPROM has already been programmed and tested at the factory. The factory values programmed into the EEPROM are for test purposes only and the learn operation must be performed before the final adjustments can be considered complete.

5.3.4 IMC-GIO NORMAL OPERATION - While on this operation, the Alphanumeric Display constantly displays the car speed as it is traveling in the hoistway. If the car is stopped, it displays the last speed at which the car was traveling before the brakes were applied. If, at any time, the IMC-GIO encounters error conditions, the Alphanumeric Display indicates one of the error conditions listed below. In this mode, the Cutoff LED is off as long as the car makes normal approaches to the terminal landings. If the car makes an abnormal approach to a terminal landing, the Cutoff LED would be illuminated, indicating that the relay is de-energized and that the normal speed pattern has been cut off from the drive unit.

Table 5.2

EEPROM ERROR CONDITIONS		
Error	***Definition***	***Correction***
ERR1	EEPROM Read error	Resocket EEPROM and microcontroller on the IMC-GIO board. If error repeats, call MCE Customer Service for replacement.
ERR2	Safety Relay/Serial input error	Verify proper operation of 12VDC relay on IMC-GIO board.
ERR3	Not used	Not used.
ERR4	Memory error during power up	Resocket microcontroller and try to turn on the power again. If error repeats, call MCE Customer Service for replacement.
ERR5	EEPROM checksum error	Resocket EEPROM and microcontroller on the IMC-GIO board. If error repeats, call MCE Customer Service for replacement.
ERR6	EEPROM handshake error	Resocket EEPROM and microcontroller on the IMC-GIO board. If error repeats, call MCE Customer Service for replacement.
ERR7	EEPROM write failure	Resocket EEPROM and microcontroller on the IMC-GIO board. If error repeats, call MCE Customer Service for replacement.
ERR8	EEPROM indeterminate error	Hoistway must be relearned.

Table 5.3

FLAGS FOR MC-MP BOARD			
ABREV NAME	**FULL NAME**	**ABREV NAME**	**FULL NAME**
ALT	Alternate Service	DOI	Door Open Intent
ATSF	Attendant Service Function	DOL	Door Open Limit Input
BFD	Bottom Floor Demand	DOLM	Door Open Limit Memory
CAC	Car Above Counterweight	DSD	Down Slow Down
CBC	Car Below Counterweight	DSH	Door Shortening (Immediate)
CC	Car Call	DSHT	Door Shortening (Final)
CCA	Car Call Above	DZ	Door Zone Input
CCB	Car Call Below	DZORDZ	Door Zone or Rear Door Zone
CCD	Car Call Disconnect	ECRN	Emergency Power Running Car
CCT	Car Call Time	EDS	Earthquake Direction Switch
CD	Car Done *(Emergency Power Return Complete)*	EPI	Emergency Power Input
CSB	Car Stop Switch Bypass	EPR	Emergency Power Return Function
CWI	Counterweight Input	EPS	Emergency Power Select
CWIL	Counterweight Input Latch	EQA	Earthquake Function Active
DBC	Door Button Close Input	EQI	Earthquake Input
DC	Down Call	EQN	Earthquake Normal
DCA	Down Call Above	ESTE	Earthquake Stop Time Elapsed
DCB	Down Call Below	FCS	Fire Phase II Input
DCC	Door Close Complete	FRA	Alternate Fire Phase I Input
DCF	Door Close Function Output	FRC	Fire Phase II
DCLC	Door Closed Contact Input	FRM	Fire Service Phase I
DCP	Door Closed Power Output	FRS	Fire Phase I Input
DDP	Down Direction Preference	FWI	Fire Warning Indicator
DELSIM	Delta Simulation	GED	Gong Enable Down Output
DHO	Door Hold Open	GEU	Gong Enable Up Output
DLK	Door Lock Input	H	High Speed Output
DMD	Demand Down	HCDX	Hall Call Disconnect
DMU	Demand Up	HCR	Hall Call Reject
DNDO	Down Direction Output	HCT	Hall Call Door Time
DNS	Down Direction Sense Output	HLD	Hold Input Fire Phase II
DOF	Door Open Function Output	HLI	Heavy Load Input

Cont'd next page

Table 5.3 cont'd.

FLAGS FOR MC-MP BOARD			
ABREV NAME	**FULL NAME**	**ABREV NAME**	**FULL NAME**
HLW	Heavy Load Weigher	RUN	Run
HML	Home Landing Select	SAF	Safety String Input
HSEL	Hospital Emergency Select	SD	Supervisory Down
IN	Inspection or Access Input	SDA	Down Direction Arrow
IND	Independent Service Input	SDT	Short Door Time
INT	Intermediate Speed Input	SE	Safety Edge Input
ISR	In Service and Ready	SLV	Slaved
ISRT	In Service Truly	STC	Stepping Complete
ISV	In Service	STD	Step Down Input
LD	Level Down Input	STU	Step Up Input
LFP	Lower Floor Parking	SU	Supervisory Up
LLI	Light Load Input	SUA	Up Direction Arrow
LLW	Light Load Weigher	TFD	Top Floor Demand
LOT	Lobby Time	TOS	Timed Out of Service
LU	Level Up Input	UC	Up Call
MGR	Motor Generator Run	UCA	Up Call Above
MLT	Motor Limit Timer	UCB	Up Call Below
NUDG	Nudging Output	UDP	Up Direction Preference
PHE	Photo Eye Input	UFP	Upper Floor Parking
PK	Parking	UPDO	Up Direction Output
PSTX	Preliminary Stepping Function Complete	UPS	Up Direction Sense Input
PTR	Permission To Run *(from Supervisor)*	USD	Up Slow Down Input
PTS	Permission To Start *(from Supervisor)*	YRQ	Wye Request
PUSD	Earthquake Power Up Shut Down	YSIM	Wye Simulation
REL	Releveling		

Table 5.4

FLAGS FOR IMC-DDP BOARD			
CE	Count error	**LRN**	On learn mode
COR	Correction run	**NSF**	PG not ready
DAN	Danger run	**PR**	Parity input
DN	Down direction input	**PGR**	SP ready
DLS1	Down limit switch input 1	**R0**	Floor code input 0
DLS2	Down limit switch input 2	**R1**	Floor code input 1
DLS3	Down limit switch input 3	**R2**	Floor code input 2
DLS4	Down limit switch input 4	**R3**	Floor code input 3
DSS	Down sense signal	**R4**	Floor code input 4
EQ	Earthquake input	**R5**	Floor code input 5
H	High speed input	**RD**	Read input
INS	Inspection operation	**S-R**	Short-run
INT	Leveling interrupt	**SFR**	SP ready
IPO*	Step generation error	**SFT**	PG tripped
IP1*	Unacceptable short floor	**STP**	Stepping
IP2*	Unable to make two floor runs	**ULS1**	Up limit switch input 1
IP3*	VIL speed too low	**ULS2**	Up limit switch input 2
IP4*	Phase 7 too long	**ULS3**	Up limit switch input 3
IP5*	Jerk value too small	**ULS4**	Up limit switch input 4
LEV	Leveling input	**USS**	Up sense signal
LI	Level inhibit	**UP**	Up direction input
LCA	Learn complete flag	**VAL**	Valid data on EEPROM

* Refer to Section 6.4.1.4 for more information and corrective action regarding these error flags.

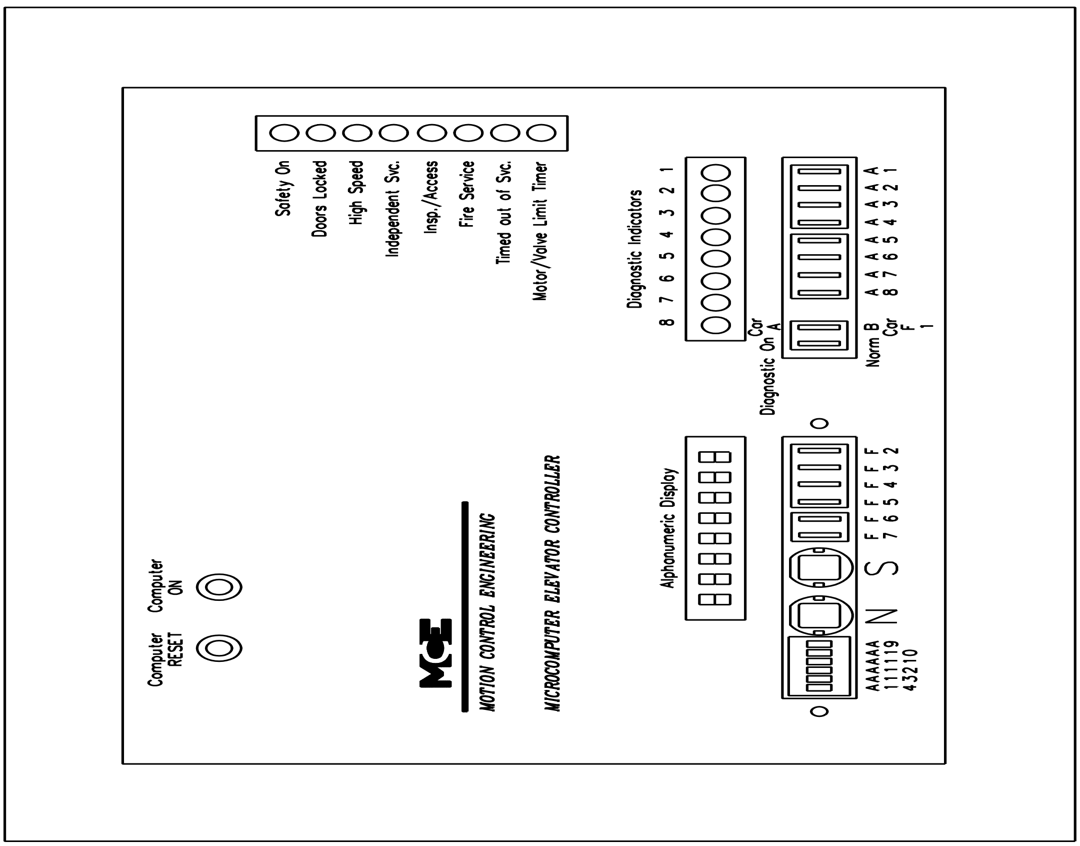
Table 5.5

CLOCK FLAGS AND THEIR RANGES	
Flags	***Timer Range***
YEAR	00-99
MONTH	01-12
DAY	MON.-SUN.
DATE	01-31
HOUR	00-23
MIN (MINUTE)	00-59

Table 5.6

TIMER FLAGS AND THEIR RANGES		
Flags	***Timer Name***	***Timer Range***
SDT	Short Door Time	01 - 16 seconds
CCT	Car Call Time	01 - 16 seconds
HCT	Hall Call Time	01 - 16 seconds
LOT	Lobby Time	01 - 16 seconds
MGT	MG Shutdown Time	01 - 26 minutes
TOS	Timed Out Of Service	16 - 60 seconds

COMPUTER SWING PANEL FRONT VIEW
FIGURE 5.1



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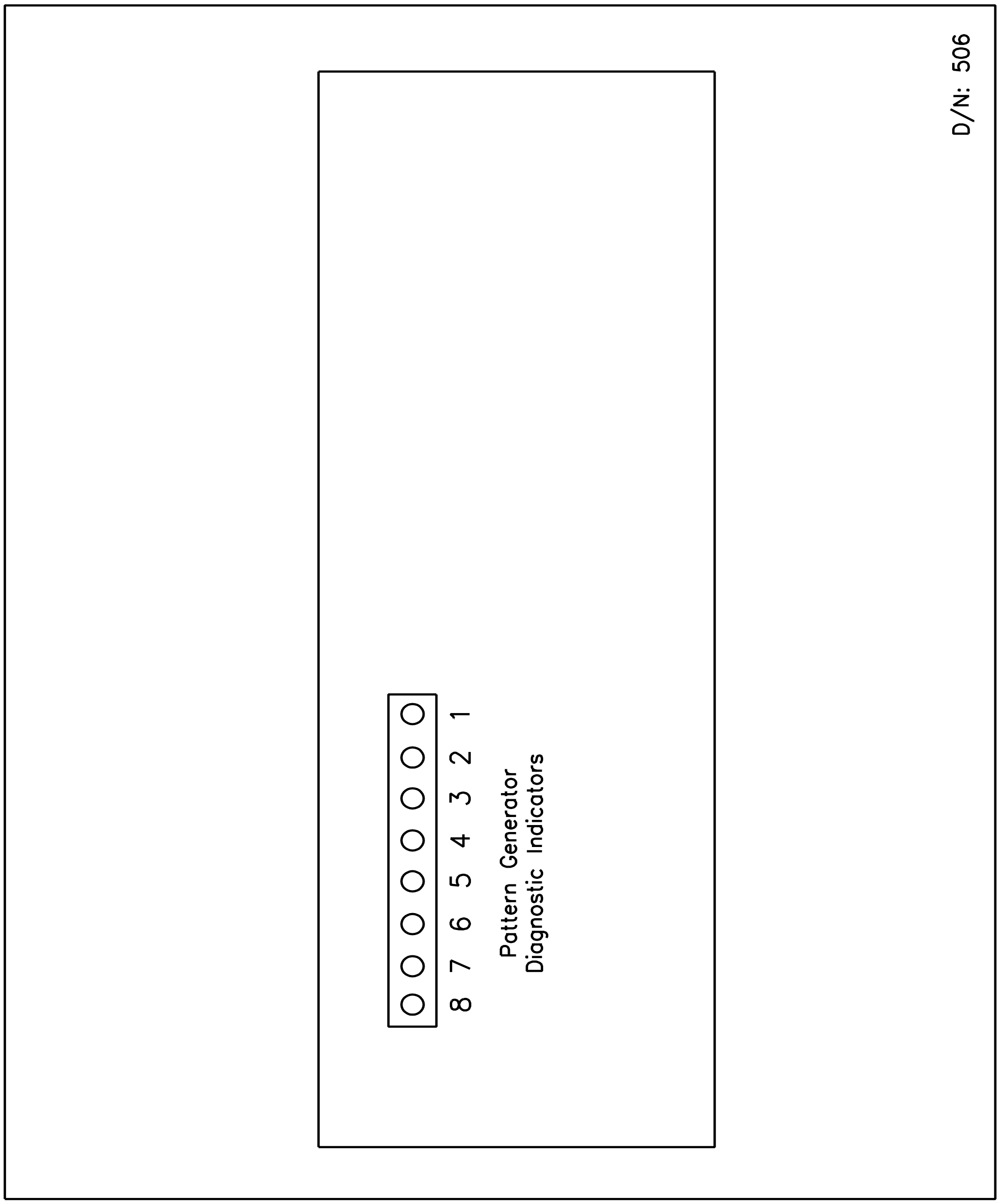
COMPUTER SWING PANEL TOP VIEW
FIGURE 5.2



COMPUTER SWING PANEL BACKPLATE
FIGURE 5.3

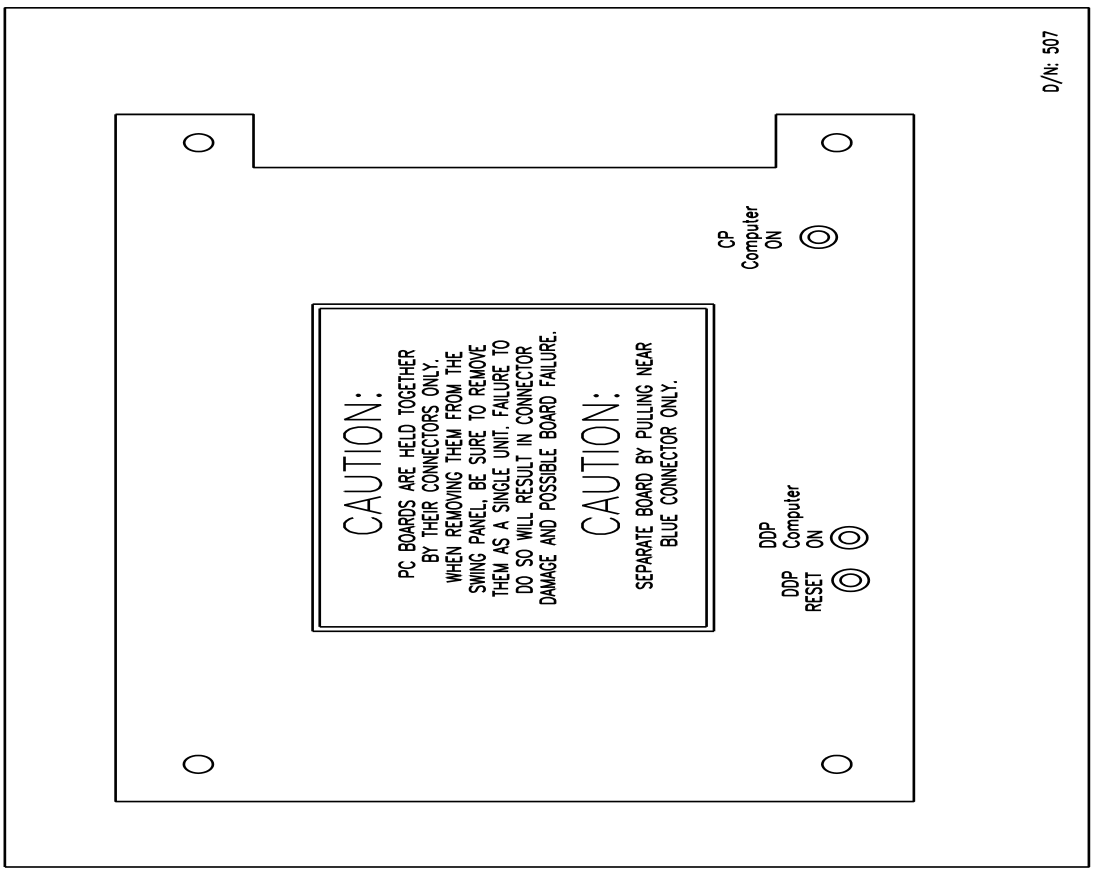


Table 5.7

MC-MP BOARD STATUS DISPLAYS*

● - LED FLASHING ○ - LED OFF

	Normal Operation	*Single Light Scanning From Right To Left*							
1.	Governor switch open	○	○	○	●	○	○	○	●
2.	Hoistway safety device open	○	○	●	○	○	○	●	○
3.	Car safety device open	○	●	○	○	○	●	○	○
4.	In-car stop switch active	●	○	○	○	●	○	○	○
5	Safety relay open	●	●	●	●	●	●	●	●
6	Both USD & DSD limit switches are open	●	●	●	●	●	●	●	○
7.	Power-up shut down due to earthquake	○	○	○	○	○	○	●	○
8.	Earthquake	●	●	●	●	●	●	○	○
9.	Motor limit timer (anti-stall timer) elapsed	●	●	●	●	●	○	○	○
10.	Bottom floor or top floor demand	●	●	○	●	●	○	●	●
11.	MG shut down operation	●	●	●	○	○	○	●	○
12.	Fire service phase I (alternate)	●	●	●	●	○	○	○	○
13.	Fire service phase I (main)	●	●	●	○	○	○	○	○
14.	Fire service phase II	●	●	○	○	○	○	○	○
15.	Hospital emergency service	●	●	●	●	○	○	○	●
16.	On inspection or access	●	○	○	○	○	○	○	○
17.	Earthquake normal reduced speed mode	○	○	○	○	○	○	○	●
18.	Emergency power operation	●	●	●	○	○	○	○	●
19.	Attendant service operation	○	○	○	○	○	○	●	●
20.	Independent service	○	●	●	●	●	●	●	●
21.	Door open limit switch is open and doors are locked	○	○	●	●	●	●	●	●
22.	Timed out of service	○	○	○	●	●	●	●	●
23.	2 bus to car calls disconnected	○	○	○	○	●	●	●	●
24.	Hall call bus disconnected (check for blown fuse)	○	○	○	○	○	●	●	●
25.	Level up	●	●	○	○	○	○	●	●
26.	Level down	○	○	●	●	●	●	○	○
27.	Heavy load condition	●	●	●	○	○	●	●	●
28.	Light load condition	●	●	●	○	●	○	○	○
29.	Door close failure	●	●	○	○	○	○	●	○
30.	Car-to-Lobby function active	●	●	●	○	○	○	●	●
31.	Car not at bottom (learn setup error)	○	○	○	●	○	○	●	●
32.	Car not on LEVEL UP (learn setup error)	○	○	○	●	○	●	○	○
33.	Car not on INSPECTION (learn setup error)	○	○	○	●	○	●	○	●
34.	Car not below DOOR ZONE (learn setup error)	○	○	○	●	○	●	●	○
35.	Car is on LEVEL DOWN (learn setup error)	○	○	○	●	○	●	●	●
36.	Loss of IN during LEARN (learn error)	○	○	●	○	○	○	○	○
37.	No response from PG board (learn error)	○	○	●	○	○	○	●	○
38.	On both leveling switches (learn error)	○	○	●	○	●	○	○	●
39.	PG error, loss of UP direction (learn error)	○	○	●	○	○	○	●	●
40.	PG not ready	○	●	○	○	○	○	●	○

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Table 5.7 cont'd

41. Elevator shutdown switch or power transfer input active	●	●	○	○	●	●	●	●
42. Contactor proof fault (CSA CNP)	●	●	○	○	●	○	●	●
43. Landing system redundancy (CSA LSR)	●	●	○	○	●	○	●	○
44. Up/Down direction fault (CSA UDF)	●	●	○	○	●	●	○	○
45. Security code being entered	○	●	●	●	●	●	●	○
46. Brake pick failure	○	○	●	●	○	○	●	●
47. Door lock bypass fault (CSA DLS)	●	○	○	○	○	○	●	○
48. Door lock bypass fault (CSA DOL)	●	○	○	○	○	○	●	●
49. Door lock bypass fault (CSA GS)	●	○	○	○	○	●	○	○
50. Car gate relay failure (CSA RGS)	●	○	○	○	○	●	○	●
51. Leveling sensor failure (CSA LEV)	●	●	○	○	●	○	○	●

**When the Diagnostic On-Normal switch is on Normal and the F2-F7 switches are down, these messages are displayed on the front of the Computer Swing Panel.*

Table 5.8

IMC-DDP BOARD STATUS DISPLAYS*

●- LED FLASHING ○ - LED OFF

Normal Operation	***Single Light Scanning from Left to Right***							
1. Elevator on learn operation	○	○	○	●	●	●	●	●
2. Elevator on inspection/access	○	○	●	●	●	●	●	●
3. Elevator on releveling/correction	○	●	●	●	●	●	●	●
4. Invalid speed parameters	●	●	●	●	●	●	○	○
5. Floor height checksum error	●	●	●	●	●	○	○	○
6. Parameter checksum error	●	●	●	●	○	○	○	○
7. Landings and/or velocity not entered (NLE, CVE errors)	●	●	●	○	○	○	○	○
8. Not learned or ID error	○	●	●	●	●	●	●	○
9. No valid data in EEPROM	●	●	●	●	●	●	●	○
10. Parity error from landing system	●	●	○	○	○	○	○	○
11. Communication problem with MC-CP board	○	○	○	○	○	●	●	●
12. RD sensor not active/PG not ready	●	○	○	○	○	○	○	○
13. Position limit error	○	○	○	○	○	○	○	●
14. Limit switch operation	○	○	○	○	○	○	●	●
15. PG earthquake input active	●	●	○	○	○	○	●	●

**When the Diagnostic On-Normal switch is on Normal and the F2-F7 switches are down, these messages are displayed on the top of the Computer Swing Panel.*

GENERAL MEMORY VARIABLES OR FLAGS FOR MC-MP BOARD
FIGURE 5.4

	SWITCH ADDRESSES								DIAGNOSTIC INDICATORS							
	A8	A7	A6	A5	A4	A3	A2	A1								
20	↙	↙	↗	↙	↙	↙	↙	↙	DOLM	PHE	DZ	DOL	DBC	SE	GEU	GED
21	↙	↙	↗	↙	↙	↙	↙	↗		DC	UC	CC			DHO	DOI
22	↙	↙	↗	↙	↙	↙	↗	↙	DCF	DCP	DOF	LOT		HCT	CCT	SDT
23	↙	↙	↗	↙	↙	↙	↗	↗			HSEL	CSB	DCC	NUDG		DSHT
24	↙	↙	↗	↙	↙	↗	↙	↙	INT/DCLC	FRA	FCS	FRS	DNS	UPS	STD	STU
25	↙	↙	↗	↙	↙	↗	↙	↗			HLW	HLI			FWI	
26	↙	↙	↗	↙	↙	↗	↗	↙	LFP	UFP						
27	↙	↙	↗	↙	↙	↗	↗	↗			EQI	IND	IN		DELSIM	YSIM
28	↙	↙	↗	↙	↗	↙	↙	↙	LLW	DLK		DZORDZ			PK	LLI
29	↙	↙	↗	↙	↗	↙	↙	↗	DNDO	LD		DDP	UPDO	LU		UDP
2A	↙	↙	↗	↙	↗	↙	↗	↙	DMD	DCB	UCB	CCB	DMU	DCA	UCA	CCA
2B	↙	↙	↗	↙	↗	↙	↗	↗	TOS	MLT	PSTX	MGR	H	REL		RUN
2C	↙	↙	↗	↙	↗	↗	↙	↙		STC	SAF	HCR	HCDX	CCD	ISV	ISRT
2D	↙	↙	↗	↙	↗	↗	↙	↗					FRM			FRC
2E	↙	↙	↗	↙	↗	↗	↗	↙	SD	SDA	DSD	BFD	SU	SUA	USD	TFD
2F*	↙	↙	↗	↙	↗	↗	↗	↗	HLD		EQA	ATSF		ECRN	CD	EPR
30	↙	↙	↗	↗	↙	↙	↙	↙					EPS	EPI	HML	ATL
31	↙	↙	↗	↗	↙	↙	↙	↗								
32	↙	↙	↗	↗	↙	↙	↗	↙	CAC	CBC	CWI	EQA	EDS	ESTE	EQN	PUSD
33	↙	↙	↗	↗	↙	↙	↗	↗		CWIL						

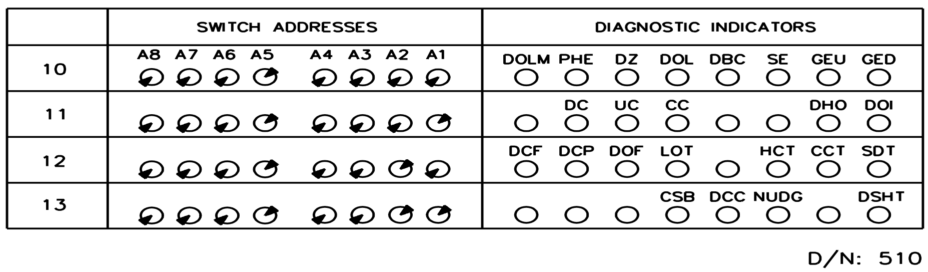
1. For system diagnostics set the (Diagnostic On/Normal) switch to "Diagnostics On".
2. For a duplex set Car A/B switch to car being examined.
3. Set the above indicated addresses on A1-A8 switches.
4. Read the variables (flags) on the 8 Diagnostic Indicators.
5. Light "ON" means variable on or active.

* FOR A CAR THAT IS PART OF A MULTI-CAR GROUP USE THESE FLAGS FOR 2F

2F	↙	↙	↗	↙	↗	↗	↗	↗	HLD	EPI	EPR	SLV	ISR	YRQ	PTR	PTS

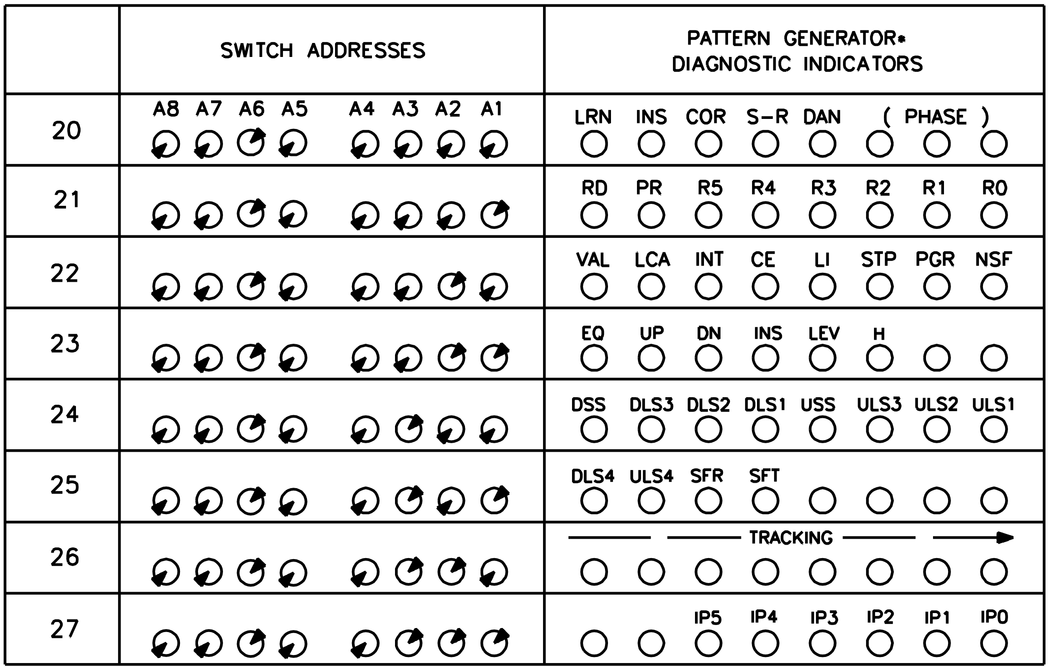
D/N: 508

REAR DOOR MEMORY VARIABLES OR FLAGS FOR MC-MP BOARD
FIGURE 5.5



NOTE: For all of these REAR DOORS memory variables (inputs, outputs, or flags) the name (such as DZ, PHE, etc.) is actually followed with an "R" suffix. DZ is actually DZR, PHE is actually PHER, and so on.

GENERAL MEMORY VARIABLE FLAGS FOR IMC-DDP PATTERN GENERATOR COMPUTER FIGURE 5.6



Description of the switch address 26 as shown on Figure 5.6 (% pattern tracking error) - this is an estimated indication of how the car is tracking the pattern, each LED (right to left) represents 12.5% error, when all LEDs are on it indicates 100% tracking error.

SECTION - 6

DESCRIPTION OF OPERATION AND TROUBLESHOOTING GUIDE

6.0 GENERAL INFORMATION -

The VVMC-1000 Series Turbo DF controllers possess features which are especially helpful in speeding up troubleshooting. Signals can be traced from field wires to the boards and the computer without mechanical removal of components, nor is it necessary to access the boards from the rear. This section covers the use of the diagnostic features and the troubleshooting process.

The Enhanced On-Board Diagnostics (EOD) is the most helpful tool for troubleshooting. Therefore, it is best to start with the EOD station. In many cases, the computer indicates the source of the problem. Refer to Section 5.2 - Enhanced On-Board Diagnostics. When viewing the diagnostic indicators, pay special attention to contradictory information. For example, the High Speed light should not be on with Doors Locked light off.

6.1 TRACING SIGNALS IN THE CONTROLLER -

In many cases the malfunction of the control system is caused by a bad input or output signal. Inputs are signals that are generated outside the controller cabinet and are brought to the designated terminals inside the controller cabinet where they are read by the computer. Outputs are signals that are generated inside the computer and are available on terminal blocks inside the controller cabinet. Since a fault on any input or output can be a cause of system malfunction, it is essential to be able to trace these signals and locate the source of the problem. The following is an example which shows how an input signal can be traced from its point of origin to its destination inside the computer. Using the EOD instructions in Section 5.2, set up the diagnostic switches so that the door zone (DZ) light can be observed. This light shows the status of the door zone (DZ) input. See Figure 5.4. Moving the car in the hoistway should cause this light to turn on/off, whenever the car goes through a floor. If the status of the DZ indicator does not change, investigate the following possible causes.

1. A defective door zone switch
2. Incorrect hoistway wiring
3. Bad termination of hoistway wiring to the DZ terminal inside the controller
4. A defect on the HC-RB relay board or HC-PI/O board

NOTE

If you have rear doors *and* at least one floor where *both* openings exist, you should use the EOD to look at the rear door zone input DZR as well. DZR enters the system on the HC-RDRB board and comes from the rear door zone sensor.

The first step is to determine whether the problem is inside or outside the controller. To establish this, use a voltmeter to probe the door zone terminal (27). This terminal is in area 3 of the job print, (areas of the job prints are marked on the left hand side of the sheets, and certain signals may be in different locations from the print area mentioned in this guide). Moving the car in the hoistway should cause the voltmeter to read 120VAC when the car is at door zone. If the signal read by the voltmeter does not change when the car passes the door zone, then the problem must be external to the controller, and items 1, 2 or 3 should be examined. If the signal read by the voltmeter *does* change as the car passes the Door Zone, the problem must be internal to the controller, and item 4 must be examined. The print shows that this input goes to the right hand side of the DZ relay to a 47K 1W resistor, to pin 8 of the C2 connector on the HC-RB relay board and then to pin 8 of the C2 connector on the HC-PI/O board.

Figures 6.1 and 6.2 show the HC-PI/O and the HC-RB boards, and indicate the location of the DZ signal. If power is present on terminal 27, there should be approximately 120VAC at the bottom of the 47K 1W resistor corresponding to DZ, whereas the top of the same resistor should read approximately 5VAC.

The HC-RB board has test pads on the front for every relay and connector. The lower left-hand side of the relay is inscribed with a legend indicating which pad corresponds to which contact of the relay or its coil. To verify that voltage from terminal 27 is proceeding to the relay coil, use the test pad on the lower right hand side of the DZ relay (the right hand side of the relay coil symbol on the job print corresponds to the right hand side on the board). It is, therefore, not necessary to remove the relay, nor to access the back of the HC-RB board in order to trace the signals on the board.

The signals can also be traced on the HC-PI/O board. See Figure 6.1 for details.

If the signal gets to the HC-PI/O board but does not get to the computer, the problem is probably on the HC-PI/O board.

6.2 DOOR LOGIC -

As complex as it seems, the door logic portion of the software only answers one question: Should the doors be open? The computer looks at selected inputs, and calls upon its logic to answer this question. These inputs and the flags generated by the computer's logic may be viewed through the Enhanced On-Board Diagnostics facility. When troubleshooting a door problem, the first priority is to inspect the action and sequence of these flags and inputs. The state of these flags indicate the problem. It is advisable to be familiar with the meaning of the associated flags. Once the computer has determined the answer to the door status question, appropriate outputs are turned on/off in an attempt to bring the doors to the desired state.

Here are the selected inputs at which the computer looks to answer the door question.

DBC	-	Door button close input
DCLC	-	Door closed contact input (retiring cam only)
DLK	-	Door lock input
DOB	-	Safety edge input (door open button)
DOL	-	Door open limit input
DZ	-	Door zone input
PHE	-	Photo eye input

The computer then generates these outputs.

DCF	-	Door close function output
DCP	-	Door close power output
DOF	-	Door open function output

These are associated computer-generated logic flags.

CCT	-	Car call time flag
DOI	-	Door open intent flag
DSH	-	Door shortening (car call) flag
DSHT	-	Door shortening flag
HCT	-	Hall call time flag
LOT	-	Lobby call time flag
SDT	-	Short door time flag

The flags and inputs shown above are used by the computer to decide whether the doors should be open or closed. The DOI (Door Open Intent) flag reflects the computer's decision. If the computer recognizes a valid reason either to open the doors or keep them open, this internal flag will be turned on, and can be viewed using the Enhanced On-

Board Diagnostics facility. The LED in the diagnostics system which corresponds to the DOI turns on when the computer decides that the doors should be open. If, on the other hand, the computer decides that the doors should be closed, the DOI flag would turn off, and the corresponding LED would no longer be highlighted.

So it is clear that the DOI flag is useful for troubleshooting door problems. It indicates the *intention* of the computer concerning the state of the doors.

Remember that if DOI is on, it turns on the DOF output which should then pick the DO relay. The door should open until the DOL (Door Open Limit) input ceases. When the DOL stops it shuts off the DOF output while the doors are standing open and DOI is on. When DOI goes away, the DCF output goes on and picks the DC relay, which moves the doors closed. As long as there is no demand to go anywhere, the signal that shuts off the DCF output is DLK (Doors Locked), or DCLC, if the car has a retiring cam. There is, however, a delay of approximately two seconds from the time the doors are locked to the DCF output turning off. If there is any demand (e.g., the DMU or DMD flags are on) and if DOI is *not* on, then the DCP output turns on regardless of the position of the door. The DCP output is provided for door closing power for those door operators requiring it, such as those made by G.A.L. corporation.

There are several door standing open time values. The one in use is determined by the type of call to which the car has responded or which has been canceled. An HCT flag is a hall call cancellation. A car call cancellation gives a CCT flag. A door reopen from a hall or car button at the lobby or a lobby hall or car call cancellation is indicated by a LOT flag. A door reopen from the photo eye or safety edge is indicated by an SDT flag. Each of these flags, HCT, CCT, SDT or LOT gives a separate door standing open time.

The door logic provides protection timers for the door equipment in both the open and the closed direction. If the doors get stuck as a result of the door interlock keeper failing to lift high enough to clear the door interlock during the opening cycle, then the doors cannot complete their opening cycle. This could damage the door motor. The door open protection timer eventually gives up trying to open the doors and the car would then be able to proceed to the next call. Similarly, if the doors do not close all the way (e.g., the doors do not lock), the computer cycles through the door opening logic at programmed intervals in an attempt to clear the problem.

The computer's logic impels it to look for a reason to *open* the doors. If a valid reason to open the doors is *not* found or if conditions are detected that prohibit the opening of the doors, the logic *closes* the doors (i.e., resets or turns off DOI). In order to open the doors, the car must be in door zone. It cannot be running at high or intermediate speed. Once the car has settled into a proper position to open the doors, there must be a condition to indicate to the logic that the doors *should* be open. Some of these conditions are listed here.

- Call demand at the current landing (or, a call has just been canceled)
- Safety edge/door open button input
- Emergency/independent service conditions
- Photo eye input

When a call is canceled, one of the following door time flags should be turned on: CCT, HCT, or LOT. When one of the reopening devices is active (SE or PHE) the SDT flag should be set. When emergency or independent service condition exists, that condition causes the DOI flag to be set. These conditions include: fire service, emergency power operation, independent service, and attendant service.

Once the intention of the computer is understood, the high voltage hardware should be inspected to see if the appropriate functions are being carried out. For example, if the doors are closed and DOI is set, the doors should be opening (i.e., the DO relay picked). If the doors are open and the DOI is turned off, the doors should be closing (the DC relay picked).

If the door control system does not seem to be doing what the mechanic expects, then understanding the computer's logic becomes important. At these times it is vital to determine whether or not the control system is doing what *it* thinks it should be doing. If the control system (high voltage section) is doing what the logic is intending it to do, it is important to determine how the logic was obtained. If the control system is *not* doing what the logic is intending it to do, then it is important to determine what is preventing the desired function from being carried out (e.g., bad relay, bad triac, etc.). The diagnostic facility on the Computer Swing Panel (and/or CRT) determines which situation is present. The output flags show which outputs the computer is attempting to turn on/off and these flags should be compared with what is actually happening in the high voltage hardware.

Consider, as an example, this problem: the doors are closed and locked on the car, but the DC relay is *always* picked. This prevents the doors from opening when they should. The important point is the intention of the computer. Inspection of the diagnostic system narrows it down. The cause of the problem must first be isolated.

- If both the DCF and DCP flags are turned off in the computer, the DC relay should *not* be picked. If the DC relay *is* picked, then it is obvious that the problem is in the output string to the DC relay.

- If either the DCF or DCP flag is *always set* in the computer, the problem is not with the output circuit. (It may be a problem with the door lock circuitry.)

- If the doors are truly physically locked, inspect the DLK flag in the computer. If the flag is not set in the computer, the fault is in the input circuit from the door lock input.

6.3 CALL LOGIC -

6.3.1 NORMAL OPERATION - In the MCE call input structure, calls are input to the system by *grounding* the appropriate call input, as labeled on the call board (HC-CI/O). Physically grounding the call input terminal illuminates the corresponding call indicator LED on the call board. Recognition and acceptance (latching) of the call by the computer causes the indicator to remain lit on the board. Cancellation of the call causes the indicator to turn off. In this call input/output structure, the single input/output terminal on the call board accepts call inputs from the call fixtures and serves as the output terminal which illuminates the call fixtures, indicating registration of the call. This means that the field wiring is identical to that which would be used for a standard relay controller.

Calls may be prevented from latching by the computer. If car calls are not being allowed to register, the computer may be purposely preventing this registration. When the computer prevents car call registration, it turns on the Car Call Disconnect flag (CCD) for that car. Inspection of this flag in the diagnostics reveals whether or not it is the computer itself preventing the registration of these calls. If the CCD flag is indeed on, the reason for this CCD condition must be discovered. There are several possible reasons for a CCD condition. Among them are fire service, a motor limit timer elapsed condition, bottom or top floor demand.

A corresponding flag exists for Hall Call registration prevention. The computer may detect conditions for preventing hall calls from being registered and set the Hall Call Disconnect Flag (HCDX). This is a system flag, as opposed to a per car flag. It is available for viewing in the diagnostic display, along with each car's operating flags. There are several possible reasons the computer might reject hall call registration. Among them are fire service, a hall call bus problem, or no available cars in service to respond to hall calls.

If a call circuit becomes damaged or stuck on because the pushbutton itself is stuck, the elevator releases itself automatically. It will probably return there later, but will release itself again automatically, thereby allowing continued service in the building.

6.3.2 PREPARATION FOR TROUBLESHOOTING CALL CIRCUITS -

IMPORTANT

If there is a call problem, first *disconnect* the field wire or wires from that call terminal to find out if the problem is on the board. Disconnect the calls by unplugging the terminals, or removing individual wires. If the individual field wire is disconnected, tighten the screw terminal lightly since contact might not be made if the terminal is grounded, using a jumper when the screw on the terminal is loose. Next, refer to Section 5.2.3.2 - Viewing and Entering Calls, and verify whether the call is being recognized by the computer. Prepare a jumper with one end connected to terminal #1, which is ground (subplate is grounded), and use the other end to enter the call by grounding the call terminal in question.

6.3.3 TROUBLESHOOTING -

1. After the wires are disconnected from the call input terminal, turn on power at the main disconnect. Put the car in a normal running mode. Use the system diagnostics to check the status of the HCDX flag and CCD flag which, if on, will shut off hall calls and car calls respectively.

2. If HCDX and CCD are normal or off, check the voltage on the call terminal in question with a meter which has a fairly high input impedance, such as a good digital meter. The voltage for which the call circuits were set up should roughly correspond to the voltage on the call terminal (it can be up to 15% less). If the voltage is lower than that, shut off the power and remove the resistor-fuse associated with the call terminal. For example, if the call terminal is the third one up from the bottom, remove the third resistor-fuse from the bottom. Turn the power back on, and read the voltage. If the necessary voltage is still not present, verify that the jumper plug, or header, is in position on the call board, and that the correct amount of power is coming into the terminals on the call board which are marked PS1, PS2 and PS3. There may be power on all these terminals, or just two, or at *least one*. This depends on the type of calls on the board.

3. The jumper plug socket is located on the right side of the call board near the call indicators. If a call board is replaced, this jumper plug must *always* be transferred to the new board, and must stay with that board position. If this plug is *not* installed, any

calls on that board may become registered if the field wiring is not hooked up. Be sure the jumper plug is in place. See Figure 6.3.

NOTE

There are three versions of the resistor-fuse. Older jobs may have either a single 22 ohm ¼ watt resistor or a single 10V zener diode. On more recent jobs, this resistor-fuse is an assembly made up of a 10V zener and a 22 ohm ¼ watt resistor.

4. Once the proper power on the call terminal is obtained, use the instructions for use of the Enhanced On-Board Diagnostics to examine the call. The call should *not* be lit. If it is lit, reset the computer for that car to be sure the CCD flag is turned off. If necessary, reset the computer on the group supervisory system to reset a hall call that is latched, if the car is part of a group. With the resistor-fuse removed, field wires disconnected, HCDX and CCD both off, and proper voltage on the call terminal, the call should *not* be registered. Shorting the call terminal to terminal 1, or ground, should register the call in the computer. This does *not* mean the call registered light on the call board will now work correctly. If the call does not register, and cancel, after following these steps, it may be an indication that a condition exists on the board that cannot be corrected in the field and the board should be replaced.

5. If the call worked correctly in the previous step, and if the call is *not* registered, the indicator for that call on the board will glow dimly if the board is *not* arranged for neon indicator lamps. If the board *is* arranged for neon indicators, the call indicator on the board will *not* glow when the call is *not* registered.

6. With a good resistor-fuse plugged into the proper call position, verify that the indicator on the call board works correctly. That is to say, it should glow brightly when the call is registered and glow dimly, or not at all, when the call is not registered. If the call indicator burns brightly as soon as the resistor-fuse is plugged in and shows no change in brightness whether the call is registered or not, a bad triac, or triac driver transistor, is indicated. If the triac is a plug-in type, try replacing it. If it is not a plug-in type, the board will have to be sent back to the factory to be repaired. Usually, if a triac has failed, it measures as a short circuit from the metal flag sticking up in the air to terminal 1 with the power disconnected and the field wire removed. If the call board is not in the system, check it for a short between the metal flag on the triac to any pad area around a mounting screw hole. The bottom-most triac

on the call board corresponds to the bottom-most terminal. The terminals and triacs follow upward in this way. See Figure 6.3.

7. If the call seems to work properly in the previous step, but stays latched on, even though the car arrives at that landing (especially if it is a car call), remove the resistor-fuse and put it back. *Be careful: the circuits may be 120VAC to ground*. If the call is now canceled, replace the board, or have it repaired at the factory.

8. If the call has passed all of the previous tests, it is working properly as long as the field wires are not attached. Before reconnecting the field wires, connect a jumper to ground or terminal 1 and press that hall, or car call, pushbutton. If a fuse blows, it is a field wiring problem. If no fuse blows, connect the call wires and test them. If connecting the call wires causes a problem, the call board may have been damaged again. The important concept is that once the call board is working properly any other problems will probably be field wiring problems.

6.4 PATTERN GENERATOR TROUBLESHOOTING -

The pattern generator hardware and software, which is described in Section 1 and 4, either creates a motion pattern or terminates the pattern because of an unsafe condition. The Enhanced On-Board Diagnostics (EOD) and the CRT help identify the reason(s) for failure to create the desired pattern or for pattern termination. Section 5 has a complete description of the use of the EOD for troubleshooting the pattern generator. The CRT provides the elevator mechanic with a convenient means of diagnosing pattern generator problems.

6.4.1 USING THE CRT TERMINAL FOR TROUBLESHOOTING THE PATTERN GENERATOR - The CRT terminal provides three basic screens which display functions relating to the pattern generator and related system statuses. Instruction on how to obtain the different screens on the CRT is in the MCE Computer Peripheral Manual.

6.4.1.1 ELEVATOR GRAPHIC DISPLAY F3 SCREEN - As shown in Figure 4.4 the F3 screen is divided into two separate blocks, the hoistway graphic display, and the car status and pattern generator status display.

a. *The Hoistway Graphic Display* - This display indicates the car position, direction arrows, car calls and assigned hall calls and the position of the doors. The distance between any two adjacent floors is displayed in the column called PG Count. The number displayed is the number of .1875" increments comprising this distance.

b. *The Car Status and Pattern Generator Status Display* - The upper portion of this display describes the current status of the car, and is self-explanatory. The remaining part of this display is the pattern generator status and may consist of the statuses of related inputs, and other messages, as well as car velocity, car position from last stop and car position measured from the bottom landing. A detailed description of these messages follows. They divide into three categories.

1. Messages relating to the prevention of the PG Ready signal, which is necessary for the pattern to begin a normal acceleration sequence. The prevention of PG Ready signal is PG Not Ready, accompanied by the message which indicates the condition preventing the PG Ready signal from being generated. These messages are listed below and are accompanied by an explanation of each message.

   EPRD: This message is EEPROM read error, which means that the data read by the PG computer from the EEPROM memory are not valid. This error can occur in several ways. These are explained below, accompanied by an additional message.

   IDME: ID mismatch. The IMC-DDP computer continuously compares the ID code stored in its own EEPROM to the car ID stored in the MC-MP board. If the two IDs do not match, the car would be prevented from running, and an EPRD error would be generated. This could occur if the elevator mechanic swaps the old IMC-DDP computer with a new one without swapping the proper EEPROM chip or if the EEPROM chip was exchanged with a chip that does not include the proper ID. Correct this situation by relearning the hoistway floor positions and reentering the speed parameters, or by keeping the original EEPROM from the old board and placing it in the new board.

   MPIDE: Invalid ID from MC-MP computer. The IMC-DDP computer expects a certain ID format from the MC-MP board and if the ID format is incorrect the MPIDE error is generated. This error can be caused by a communication problem on any of the IMC-DDP, MC-CP or MC-MP boards due to a malfunction on either board, or by a connector problem. To correct this condition, check the connection between the boards or replace board(s) as necessary.

   PCSE: Parameter checksum error. While reading the parameters from the EEPROM, the IMC-DDP continuously checks the integrity of the data read from its EEPROM. If the data are not consistent, the IMC-DDP computer will generate this error message. Check the parameters on F1 screen.

   FHCSE: Floor height checksum error. While reading the floor heights stored in the EEPROM, the IMC-DDP computer checks the consistency of the floor

heights in EEPROM. Check number of landings (NL) on the F1 screen. If NL is correct, the building floor heights may have to be relearned. See Section 4.3.
IPE: Invalid parameters. If the parameters describing the dynamic motion of the pattern generator (acceleration, jerk, etc.) are not within permissible boundaries (causing the pattern to have discontinuity), this error is generated. To correct the situation, different parameters must be tried until they are accepted by the system.

PE: Parity error from car top control box (LS-QUAD-2 or LS-QUAD-2R). If the absolute floor code read by the car top box is not valid in terms of getting a proper parity match with the parity bit read also by the car top box, the PE error is generated. See Table 4.1. This error occurs because of improper magnet installation or loss of a magnet for a particular floor or by a bad sensor inside the LS-QUAD-2 or LS-QUAD-2R, or by a wiring error.

2. Following are messages which relate to the emergency shutdown of the pattern signal because of an unsafe condition.

   LIMIT FLAGS H AND P: H flag is created if the car is overspeeding when the terminal limit switch (ULS1, ULS2 etc., or DLS1, DLS2, etc.) is opened. P flag is created in the case of complete loss of quadrature signal or 125% overspeed condition.

   LIMIT FLAG S: The car has spent more than fifteen seconds in Phase 7. The computer will not attempt a correction run to the next floor. Check the F1 screen parameters and/or drive adjustments.

3. Miscellaneous messages are as follows.

   CAL: When the car is at a floor, this indicator flashes on/off and indicates that the IMC-DDP has completed its program loop.

   INSP: Car on inspection/access operation.

   MP: The flags indicated in front of this line on the CRT are as follows: the up direction (UPDO), down direction (DNDO), and the high speed (H) outputs, generated by the MP computer. These flags are displayed whenever the MP computer issues these signals.

   DDP: The flags indicated in front of this line on the CRT are as follows: up direction (UPDO), down direction (DNDO), and high speed (H) inputs, received by the DDP computer. These flags are displayed whenever the DDP computer reads these inputs at its input terminals.

6.4.1.2 VELOCITY PROFILE F2 SCREEN - This screen shows the car speed versus time and it is particularly important because it shows abnormal pattern behavior or discontinuity in the velocity/time curve. The car position and car speed are also displayed on this screen. The resolution on this curve is limited to the CRT. Therefore, a storage oscilloscope is strongly recommended for adjustment purposes.

6.4.1.3 MCE SPECIAL EVENT CALENDAR ENTRIES SCREEN F7 - Any event that could affect the pattern generator functions is recorded inside the MC-CP computer memory. These data are available to the elevator mechanic for troubleshooting and analysis of the events.

EVENT CALENDAR ENTRIES

DATE	Month/Day
TIME	Hour/Minute
EVENT	The cause for logging the data, such as, door lock clip, stop switch pulled, etc.
PI	The car PI at the time the data were logged
ABSOLUTE COUNT	Car position relative to the bottom floor within .1875", in the number of .1875 counts
DIRECTION	Car's direction at the time the data were logged
H	High speed function
LI	Leveling inhibit - the MP prevents car from stopping at a floor
PGR	Pattern generator ready
PHS	The phase of the motion when the event occurred

6.4.1.4 LIST AND DEFINITIONS OF SPECIAL EVENTS CALENDAR ENTRIES -

a. *Car Stop Switch Activated* - The stop switch in the car operating panel has been placed in the stop position. This condition is detected by loss of the SAF computer input voltage, with the IN computer input voltage still present. Other devices may cause the loss of the SAF input without the loss of the IN input, such as the Reverse Phase sensor. Consult the schematic. This message appears each time the main safety circuit is restored and each time the main power is turned on because the main safety relays have a time delay when the power is turned on.

b. *Correction Run* - The IMC-DDP computer's pattern generator I/O subsystem received a UPG or DPG direction input as a result of the car initiating movement anywhere other than at a landing. Moving the car away from a landing while on inspection, and then placing the car in normal operation, results in a correction run.

c. *H and DIR W/O PG Ready* - The IMC-DDP computer's pattern generator I/O subsystem has its H (high speed) and UPG or DPG (up or down direction) inputs on, while the IMC-DDP computer is not ready to make a normal run (i.e., it does not have its PG Ready flag on). This can occur when the pattern generator I/O Subsystem loses the UPG or DPG input temporarily during a normal run.

d. *Terminal Slowdown* - As the car approaches a terminal landing, the IMC-GIO computer detects a higher than normal or learned velocity at the time the contact opens on one of the ULSx or DLSx terminal landing limit switches (or contacts on the TM switch). If a message appears on the F7 screen, see that the IMC-GIO board has completed or relearned the learning process if parameters on the F1 screen (shift F2 for simplex) were modified. Also, see that the IMC-GIO board has stored a velocity value for each ULSx or DLSx limit switch in the hoistway. If velocity fluctuations are suspected approaching a terminal landing, go through the learn process several times and record the learned velocities in each case. If the velocity varies by more than 5%, limit switches and roller guides should be checked.

e. *Inspection/Access Activated* - The Car Top Inspection, Relay Panel Inspection or In-Car Inspection switch is activated. There is no power on the IN input to the MC-MP computer.

f. *Loss of Direction* - The direction input (UPG or DPG) to the IMC-DDP computer has been lost during a normal run. Check to see that when U1 and U2 relays are picked, the PD, UA1 and UA2 relays are also picked. If D1 and D2 relays are picked, PD, DA1 and DA2 relays must be picked. UA1, UA2, DA1 and DA2 relays must not buzz when energized. If they do, replace the relay or interchange the buzzing relay with one from position INX or L on the IMC-RB board.

g. *Lost DLK in Phase 1-6* - The DLK input to the MC-MP computer has been lost during a normal run. The hoistway door locks may have been clipped while the car was passing a floor.

h. *Main Safety String Open* - The safety input (SAF) and the inspection/access (IN) input to MC-MP computer were both lost simultaneously as a result of one of the devices in the main safety string opening up. Restoring the safety circuit to normal causes the Car Stop Switch Activated message to appear.

i. *Motor Limit Timer* - The Motor Limit Timer has elapsed before the car has completed its movement. This condition can occur because the MC-MP computer receives a direction sensing (UPS or DNS) input for a sufficiently long time to cause the MLT timer to elapse. This usually happens because of a failure in the system to respond to a 120VAC direction signal appearing on terminals 85 (up) or 87 (down) on the HC-RB relay board. Several things can cause this. There could be problems in UA1, UA2, DA1, DA2, PD, P and H relays. Contact closure must occur between terminals 8X and 9X, or 7X and 9X, on the VVC-2-G drive unit. A speed pattern signal must exist on terminal 10X with respect to 9X on the VVC-2-G drive unit. The speed pattern signal originates on terminal PATT with respect to terminal COM on the IMC-GIO board. If this message occurs after a Terminal Slowdown, make sure there is a DC voltage between terminals 10X and 9X on the VVC-2-G terminal strip when direction is picked and the IMC-GIO safety board is tripped. If there is no voltage, or the voltage is too low, adjust the Safety Voltage Adj trimpot on the IMC-GIO board to achieve the appropriate voltage to make the car travel at leveling speed. This voltage is measured between test points Safety PATT and COM on the IMC-GIO board.

j. *Motor Limit Timer (LI)* - The Motor Limit Timer has elapsed before the car completed its movement, and the LI flag on the F3 screen was set. If the LI (Level Inhibit) flag is set, the car is prevented from recognizing the leveling and door zone inputs, so it cannot stop at a floor. It is the LI flag, not response to a direction input, that is the problem.

k. *Motor Limit Timer (INT)* - The Motor Limit Timer has elapsed before the car has completed its movement, and, in addition, the INT (Level Interrupt) relay was energized. If the INT relay is picked, it prevents the car from recognizing the leveling inputs, thus preventing the car from stopping at a floor. So it is the fact that the INT is picked that is the problem, not failure to respond to a direction input.

l. *Motor Limit Timer (LI INT)* - The Motor Limit Timer has elapsed before the car has completed its movement, the INT (Level Interrupt) relay was energized, and the LI flag on the F3 screen was set. Both of the previous conditions are in effect.

m. *OLM Position Counter Error* - While the car was traveling in normal operation, the IMC-DDP computer detected a difference between the *actual* distance required to reach the destination and the *learned* distance. This condition is detected at 12" from the floor at the Outer Leveling Marker (OLM). It can occur as a result of a disturbance of the quadrature signal (DP1, DP2). The DP1 and DP2 quadrature signals must be routed through shielded cable over the entire distance from the car top to where the signal enters the IMC-RB board.

n. *Pattern Modified at OLM* - The IMC-DDP computer has modified the velocity profile because of a change in pattern voltage. This is an internally detected condition, and should not be a cause for concern unless it occurs frequently.

o. *DDP Power On/Reset* - The IMC-DDP computer reset button has been pressed or the 5V supply to the computer system has been turned off and on.

p. *Releveling* - The car has overshot/undershot the floor. This message occurs when a car comes to a stop at a floor too quickly, and requires a relevel operation into the floor.

q. *Quadrature Pulse Relation* - The IMC-DDP computer has lost the quadrature signal from the car top landing system while the car was making a normal run. All connections between terminals 95 and 96 on the landing system and terminals 95 and 96 on the controller should be intact and in a shielded cable.

6.4.1.5 LIMITS OF MOTION PARAMETERS - If the parameters describing the dynamic motion of the pattern generator are not within permissible boundaries, an error message appears on the F1 and F3 screens of the CRT. On the F1 screen (shift F2 for simplex), the error message is, This Combination Of Parameter Values Is Unacceptable. On the F3 screen, IPE indicates this error message. The specific cause of the error condition is determined by the error flags at address 27H on the Pattern Generator Diagnostic Indicators. See Figure 5.6. A list of corrective actions for these error flags are as follows.

IP0: This is a STEP generation error. First, reduce jerks J1, J35 and J7. If this fails to remove the error condition, increase jerks J1, J35, and J7 and decrease accelerations A0, A2, and A6.

IP1: An unacceptable short floor has been detected.

IP2: The system is unable to generate a pattern for a two floor run. Increase jerks J1, J35 and J7 or decrease accelerations A0, A2 and A6.

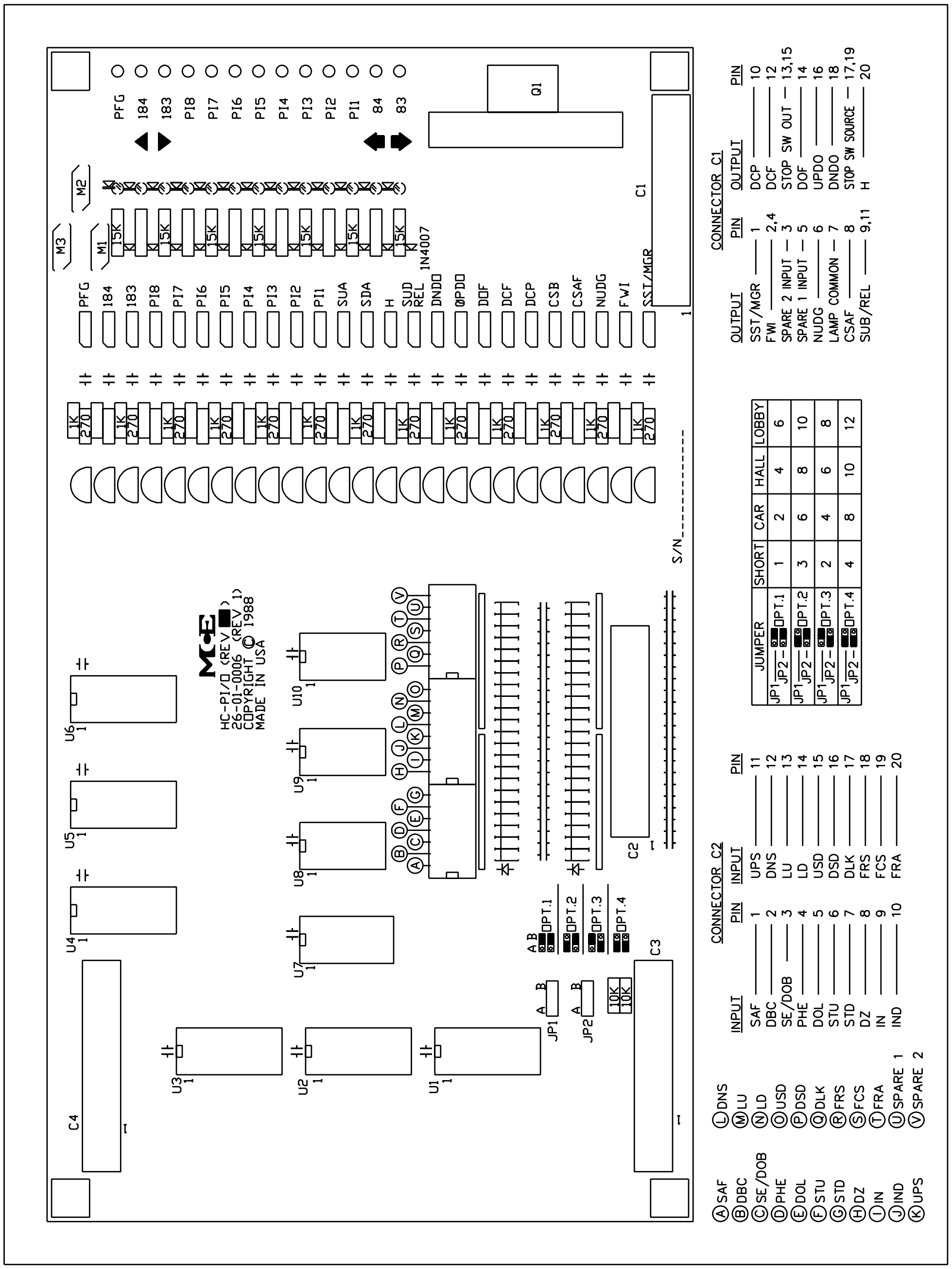
IP3: The intermediate leveling speed is too low. Increase VIL.

IP4: Phase 7 is too long. Decrease DFL and DL, or increase J7.

IP5: The jerk values are too small. Increase the smallest jerk value (J1, J35 or J7).

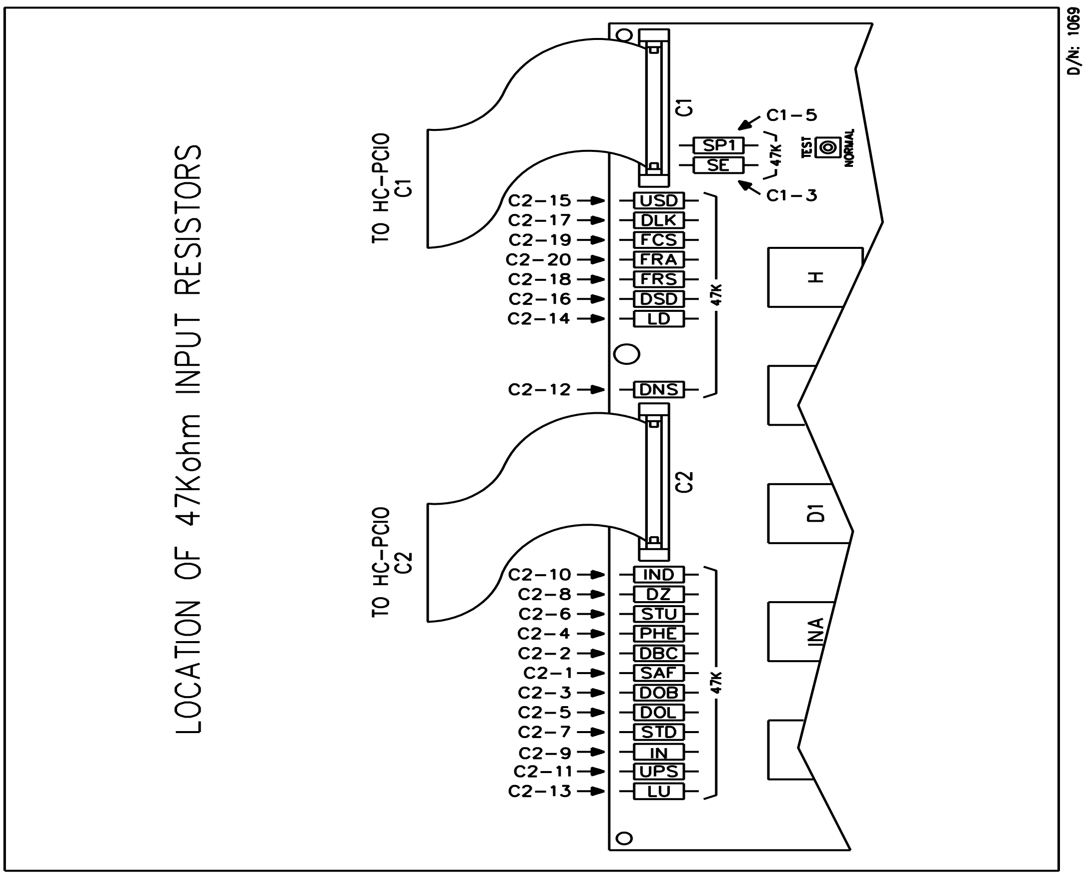
6.5.2 AUTO RESET FEATURE - The SCR drive automatically resets if a temporary power outage occurs. This could happen when power is transferred from emergency power back to commercial power in an instance where an emergency power generator was used. Since the transfer is usually very rapid and the phase sequence of the emergency generator may not match the phasing of the commercial power, the SCR drive interprets the transfer from emergency to commercial power as a line fault, and the auto reset circuit resets the drive. The circuit monitors the Ready line on the HC-SCR board. If this signal goes low the auto reset generates a reset pulse in about fourteen seconds. Subsequent resetting of the drive is inhibited for 60 seconds after each reset pulse.

HC-PI/O INPUT OUTPUT DETAILS
FIGURE 6.1

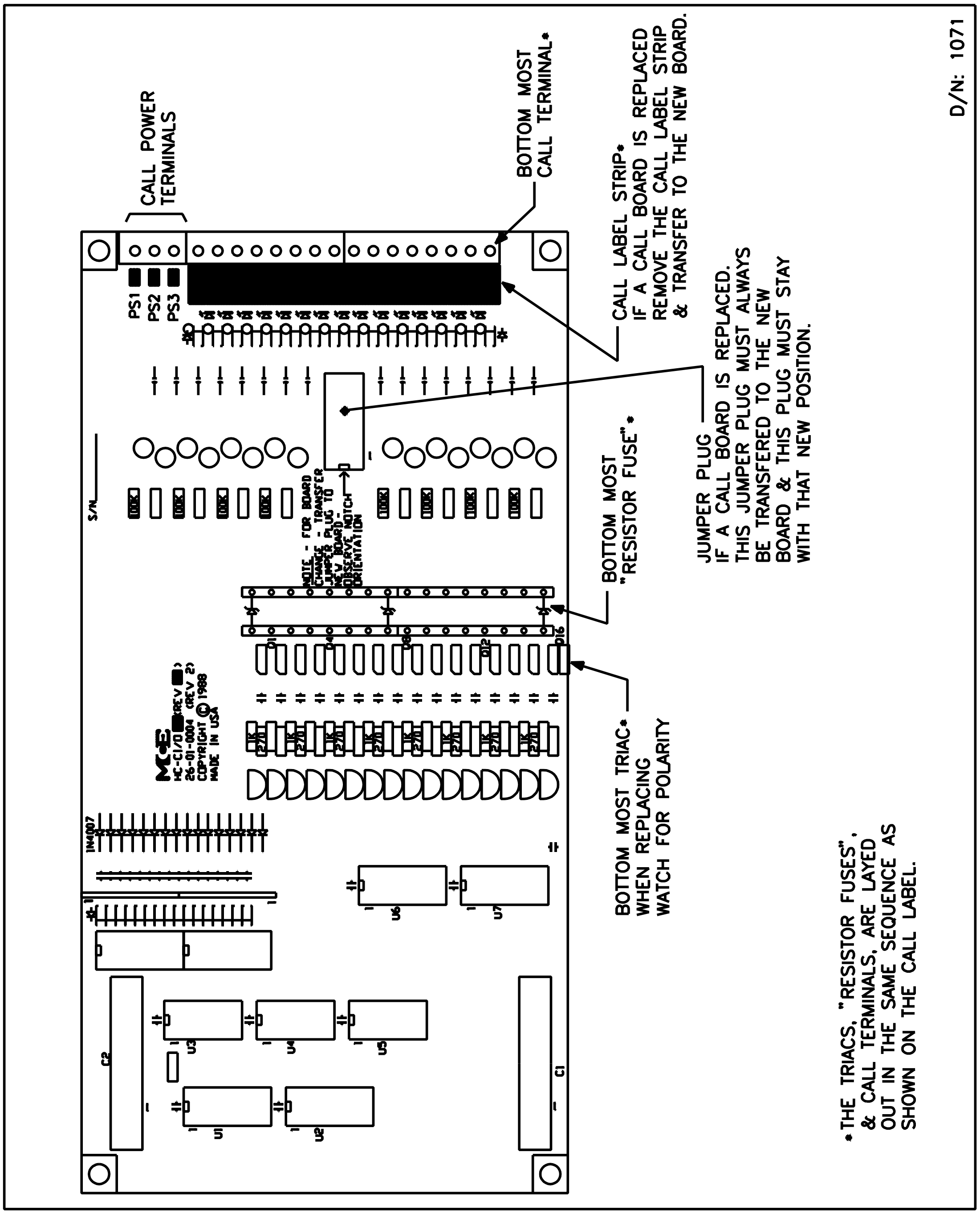


D/N: 1068

HC-RB RELAY BOARD DETAIL
FIGURE 6.2



HC-CI/O CALL BOARD DETAILS
FIGURE 6.3



SECTION - 7

JOB PRINTS

NOTES + SYMBOLS:

- MICROCOMPUTER OUTPUT OR CALL CIRCUIT
- MICROCOMPUTER INPUT
- PATTERN GENERATOR OUTPUT
- PATTERN GENERATOR INPUT
- PATTERN GENERATOR SAFETY INPUT
- POWER OR MARATHON TERMINAL
- PANEL MOUNT TERMINAL
- EYELET ON PC BOARD
- PHOENIX TERMINAL
- SOLDER CONNECTION ON REAR OF PC BOARD
- IDENTIFYING MARK INDICATING PC BOARD TYPE AND WHICH SIDE OF MARK IS ON BOARD AND WHICH SIDE OF MARK IS OFF BOARD

NOTE:
THE LIGHT ON A OMRON MY4N-AC120V COIL RELAY WILL NOT ILLUMINATE IF THE COIL IS ENERGIZED WITH DC.

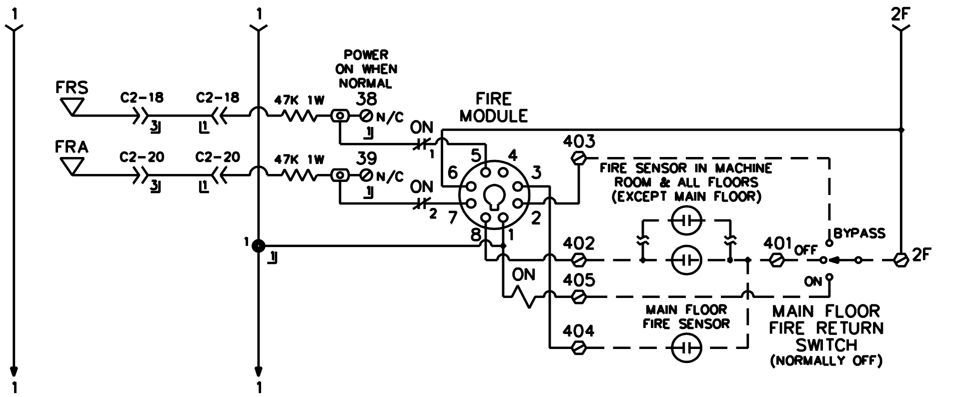
PC BOARD TYPES:

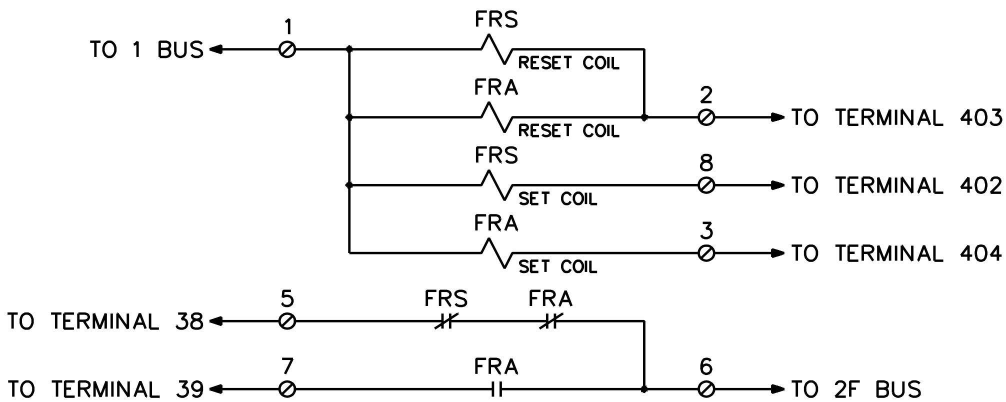
1 MAIN RELAY BOARD HC-RB
2 CALL BOARD HC-CIO
3 POWER I/O BOARD HC-PIO (CAR A) }*
4 POWER I/O BOARD HC-PIO (CAR B) }*
5 GONG BOARD HC-GB
6 TRACTION ADAPTER BOARD HC-TAB
7 REAR DOOR RELAY BOARD HC-RDRB
8 REAR DOOR LOGIC BOARD HC-RD (CAR A) }*
9 REAR DOOR LOGIC BOARD HC-RD (CAR B) }*
10 FRONT DOOR POWER BOARD HC-DB-MOD
11 REAR DOOR POWER BOARD HC-DB-MOD
12 DOOR POWER SUPPLY BOARD HC-DPS
13 P.I. EXPANDER BOARD HC-PIX (CAR A) }*
14 P.I. EXPANDER BOARD HC-PIX (CAR B) }*
15 SUICIDE RELAY TIMING BOARD HC-SRT
16 SCR INTERFACE BOARD HC-SCR
17 EARTHQUAKE BOARD HC-EQ
18 #1 INPUT/OUTPUT EXPANDER BOARD HC-IOX (CAR A) }*
19 #1 INPUT/OUTPUT EXPANDER BOARD HC-IOX (CAR B) }*
20 #2 INPUT/OUTPUT EXPANDER BOARD HC-IOX (CAR A) }*
21 #2 INPUT/OUTPUT EXPANDER BOARD HC-IOX (CAR B) }*
22 PATTERN GENERATOR INTERFACE BOARD MC-PGAS
23 PATTERN GENERATOR SAFETY BOARD MC-PGSAF
24 #1 INPUT/OUTPUT EXPANDER BOARD FOR MC-PGAS BOARD HC-IOX
25 #2 INPUT/OUTPUT EXPANDER BOARD FOR MC-PGAS BOARD HC-IOX
26 DYNALIFT INTERFACE BOARD HC-DYNA
27 AC FEEDBACK RELAY BOARD MC-ACFR
30 FRONT MOM/MOH DOOR BOARD HC-DB-MOM/H
31 REAR MOM/MOH DOOR BOARD HC-DB-MOM/H-R
32 OUTPUT ADAPTER BOARD HC-OA

*NOTE: IN A GROUP, IT IS NOT NECESSARY TO DESIGNATE BOARD TYPES BY CAR; THEREFORE, ALL CARS WILL USE "CAR A" BOARD DESIGNATIONS.

- WIRING INSIDE CONTROL CABINET
- WIRING OUTSIDE CONTROL CABINET
- UN-NUMBERED SIDE OF CONTACT IS MOVEABLE SWING SIDE.
- NUMBERED SIDE OF CONTACT IS N.O. OR N.C. AND INDICATES POLE # WITH POLES NUMBERED FROM LEFT TO RIGHT OR AS SHOWN ON PC BOARD.
- ALL UNMARKED DIODES ARE 2.5 AMP 1000 VOLT.
- VOLTAGE SPIKE SUPPRESSOR
- DOT BY RESISTOR INDICATING TOP OR LEFT SIDE AS MOUNTED
- BOX INDICATING ITEM NOT BEING USED
- N/C NO CONNECTION

NOMENCLATURE		
DATE: 11-18-92	APPROVED BY:	DRAWN BY:
MOTION CONTROL ENGINEERING, INC.		DRAWING NUMBER: NSPCBRD





VOLTS ON TERMINAL 38	VOLTS ON TERMINAL 39	RESULT
110V	0V	NORMAL
0V	0V	PHASE 1 MAIN
0V	110V	PHASE 1 ALTERNATE

FIRE MODULE FUNCTION DIAGRAM		
DATE: 3-18-91	APPROVED BY:	DRAWN BY:
MOTION CONTROL ENGINEERING, INC.		DRAWING NUMBER: FMFD

APPENDIX A

Removing Circuit Boards from the Computer Swing Panel.

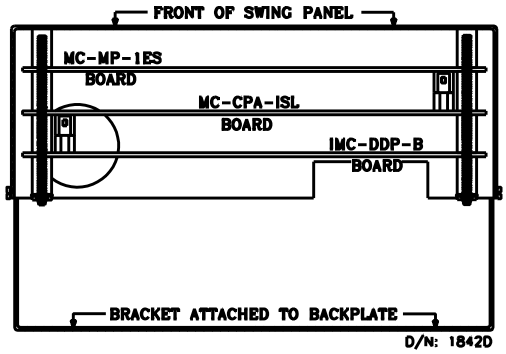


FIGURE A-1 - Computer Swing Panel With Boards, Top View

MCE Customer Service may advise an installer to remove a circuit board for troubleshooting reasons. To do so, pull the Swing Panel so that it faces left. Remove the thumbscrews holding the Swing Panel to the bracket on the back plate.

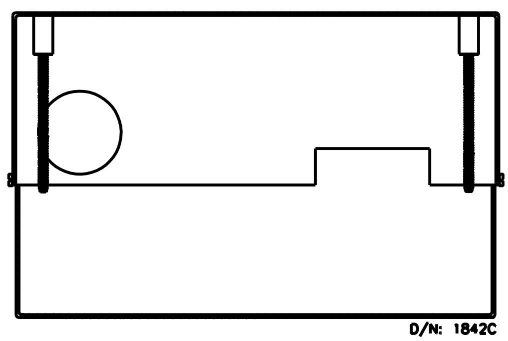


FIGURE A-2 - Computer Swing Panel Without Boards, Top View

With the Swing Panel facing left, loosen and remove the four nuts securing the back cover plate. This may require the use of a 11/32 nut driver.

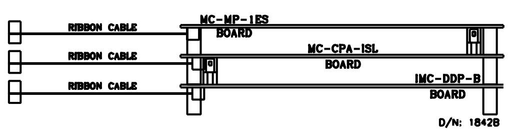


FIGURE A-3 - Computer Swing Panel Boards, Snapped Together

Remove the circuit boards from the Swing Panel. Put the nuts back on the bolts for safekeeping.

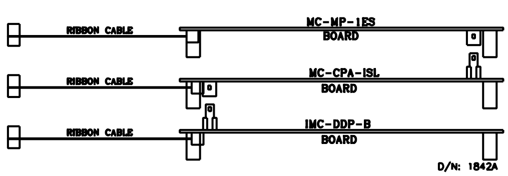


FIGURE A-4 - Computer Swing Panel Boards, Unsnapped

Unsnap the boards from each other and replace/repair the boards as necessary.

APPENDIX B

ELEVATOR SECURITY INFORMATION AND OPERATION

Building name: ____

Building location: ____

Security activation:	Key switch or Time clock	Mon:	from ________	to ______________	
		Tue:	from ________	to ______________	
		Wed:	from ________	to ______________	
		Thu:	from ________	to ______________	
		Fri:	from ________	to ______________	
		Sat:	from ________	to ______________	
		Sun:	from ________	to ______________	

Instructions: To gain access to secure floors, follow the steps below while in the elevator car. The steps may be taken while the elevator car is moving or standing still. Requests for an elevator car from a hallway or corridor are answered without restriction.

1. While in the car, press the button for the desired floor. If the destination floor is secured, the button for that floor will flash on/off.

   If the button for that floor stays solidly lit, that floor is unsecured.

2. While the destination floor button is flashing, enter the security code for that floor within ten seconds. Enter the security code by pressing the corresponding buttons on the panel.

   If the code was entered correctly and within the required time limit, the car will immediately go to that floor. If the code was not entered within the ten second time period or was entered incorrectly, the destination floor button light will turn off after ten seconds and the entire sequence must be started over again.

   If a mistake is made while entering the security code, simply wait until the destination floor button light stops flashing and start the entire sequence over again.

SECURITY CODES

Maintain a record of the security codes by noting the floor name as found in the elevator cab and each floor's code. Any floor with a security code is a secured floor.

1. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
2. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
3. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
4. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
5. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
6. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
7. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
8. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
9. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
10. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
11. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
12. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
13. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
14. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
15. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
16. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
17. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
18. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
19. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
20. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
21. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
22. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
23. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
24. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
25. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
26. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
27. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
28. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
29. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
30. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
31. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
32. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
33. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
34. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
35. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
36. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
37. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
38. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
39. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
40. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
41. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
42. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
43. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
44. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
45. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**
46. **Floor ____ security code = ___ ___ ___ ___ ___ ___ ___ ___**

APPENDIX C
INSTRUCTIONS FOR CHANGING EPROMS AND MICROCONTROLLERS

With direction from MCE Customer Service, the computer chips may need to be reinstalled in the field. Great care should be taken when changing an EPROM or microcontroller. The EPROM stores the computer program, and the microcontroller both stores and executes the program. These instructions should be followed step by step.

REPLACING AN EPROM

1. Turn off main power at the disconnect and verify that no lights are operating on the Swing Panel.

2. Take the back cover off of the Swing Panel, exposing the processor board assembly. Remove the board set from the Swing Panel. Refer to Appendix A for instructions on unloading the boards from the Swing Panel.

3. The three boards within the assembly contain one EPROM chip each for the MC-MP and MC-CP boards, and two EPROMs for the IMC-DDP board. The EPROM is a rectangular component that has a small glass window on its top, and is usually covered by a silver or white paper tag. Refer to Figures C.1, C.2 and C.3 of this section for the location of the EPROM on each board.

4. The label on each EPROM indicates the board to which it belongs. The EPROM labeled S-MP-xx-1 should be installed in the MC-MP board. The EPROM labeled S-CP-xx-1 should be installed in the MC-CP board. The EPROMs labeled S-DDP-P-1 and S-DDP-P-2 should be installed in the IMC-DDP board. Determine which board requires the EPROM change.

5. Using a small, thin bladed screwdriver, place the tip between the EPROM chip and its socket, *not* between the socket and the board. Gently pry the existing EPROM out from the microprocessor board. Do this very slowly, taking care not to bend the leads that come out of the socket. If they bend, straighten them slowly and carefully with a pair of needlenose pliers.

6. Place the new EPROM lightly (do not plug it in yet) into the socket and check to see that all pins are aligned with their corresponding holes in the socket. Also make sure that the notch on the end of the EPROM is aligned with the notch on the socket (the orientation of the notch should also correspond to the notches on all of the other chips on the board). Now push the EPROM firmly into the socket and make sure that *none* of the pins are bent during the insertion. Inspect the EPROM to make sure that no pins are bent outward or under the EPROM.

7. Reassemble the Swing Panel assembly and close the Swing Panel. Refer to Appendix A for a description of the basic structure of the three-board set.

8. Reapply power to the system. Verify the proper operation of all boards by inspecting the diagnostic indicators on the individual processor boards.

9. If, after turning on the system, the Computer On LEDs are not illuminated on all three boards, the EPROM may not have been installed properly. Repeat steps 1 through 8.

MICROCONTROLLER INSTRUCTIONS

1. Turn off the main power at the disconnect and verify that no lights or LEDs are operating on the Swing Panel.

2. Refer to Figure C.4 of this section for the location of the microcontroller on the IMC-GIO board. Using a small, thin bladed screwdriver, place the tip of the screwdriver between the microcontroller chip and its socket, *not* between the socket and the board. Gently pry the microcontroller chip from its socket. Do this slowly, taking care not to bend the last pins as they come out of the socket.

3. Place the new microcontroller lightly (do not plug it in yet) into the socket and check that all pins are aligned with their corresponding holes in the socket. Also, make sure that the notch on the end of the microcontroller is correctly aligned with the notch on the socket. The orientation of the notch should correspond with the notches on all the other chips on the board. Now push the microcontroller firmly into the socket and make sure that none of the pins are bent outward or under the microcontroller.

4. Reapply power to the system. Verify the proper operation of the IMC-GIO board by observing the TEST and PASS messages on the four character Alphanumeric Display.

5. If, after turning on the system, the TEST and PASS messages do not appear, the microcontroller may not have been installed properly. Repeat steps one through four.

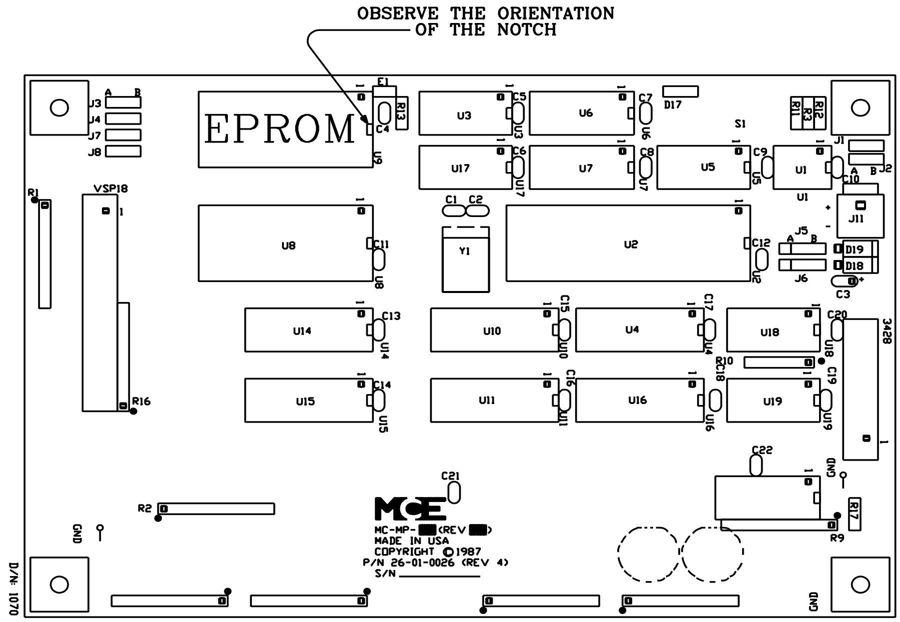


FIGURE C.1 - EPROM Location on Main Processor Board (MC-MP)

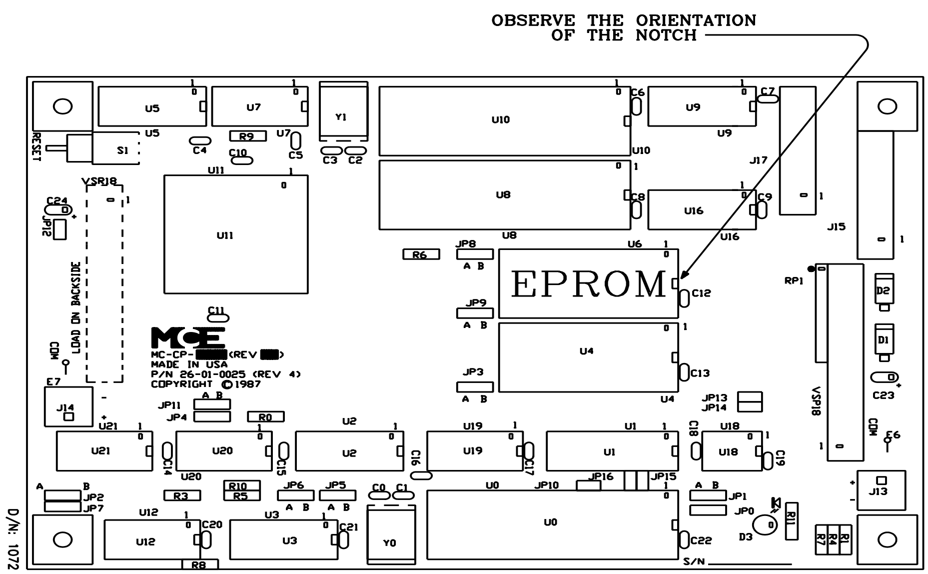


FIGURE C.2 - EPROM on Communication Processor Board (MC-CP)

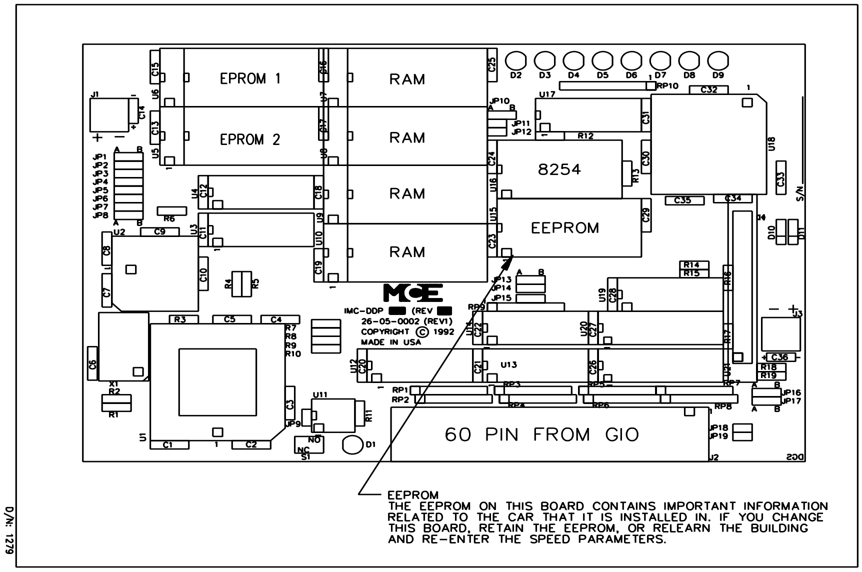


FIGURE C.3 - EPROM and EEPROM Location on Digital Drive Board (IMC-DDP)

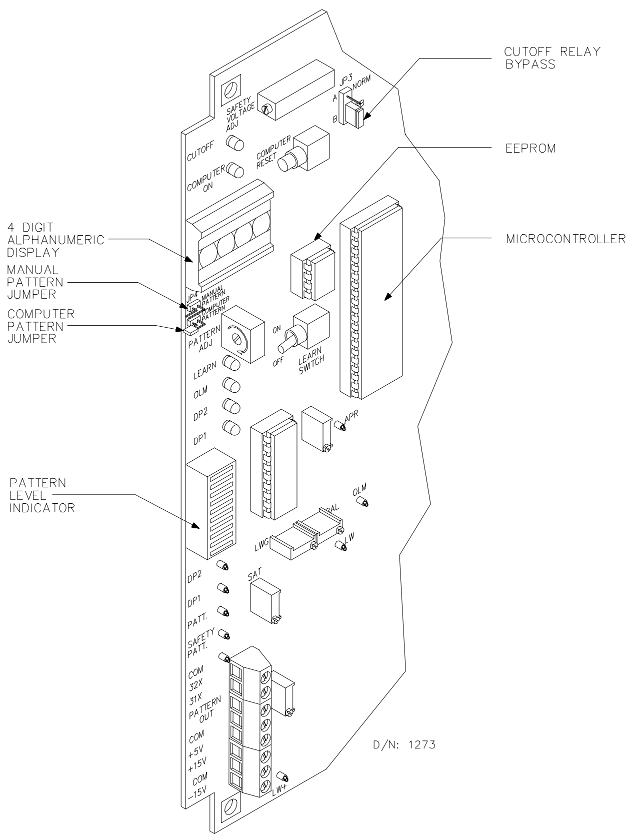


FIGURE C.4 - IMC-GIO Board Layout

APPENDIX D

INSTRUCTIONS FOR THE INSPECTION OF QUADRATURE POSITION PULSER ON THE LS-QUAD-2

If the OLD fault flag is displayed on the F3 screen, or if there are quad pulser relation messages in the Special Events Calendar then follow the steps below.

1. Using a multimeter, measure the voltage with reference to the 1 bus on terminals 95 and 96 on the IMC-RI board.

   On Voltage: 52 ± 5VDC
   Off Voltage: 0 - 1VDC (preferably 0.5V or less)

2. If any of these voltages are out of the above range, locate the error by performing the same voltage measurement inside the LS-QUAD-2 box. Terminals 95 and 96 are located on HC-DFLS board.

3. Check tape guide assembly distances against the drawing in Figure D.1. Make sure that all distances are within the ranges given in the drawing. If the sensors are too close to the running surface of the tape, add a washer between the backplate and the brass spacers for the HC-SB1 assembly. See Figure D.2. If all the dimensions are correct and the proper voltage cannot be achieved, contact the factory.

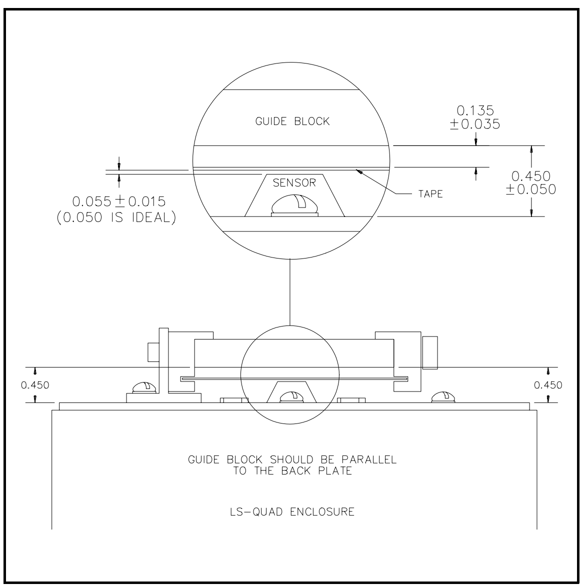


FIGURE D.1 - LS-QUAD Enclosure, Top View

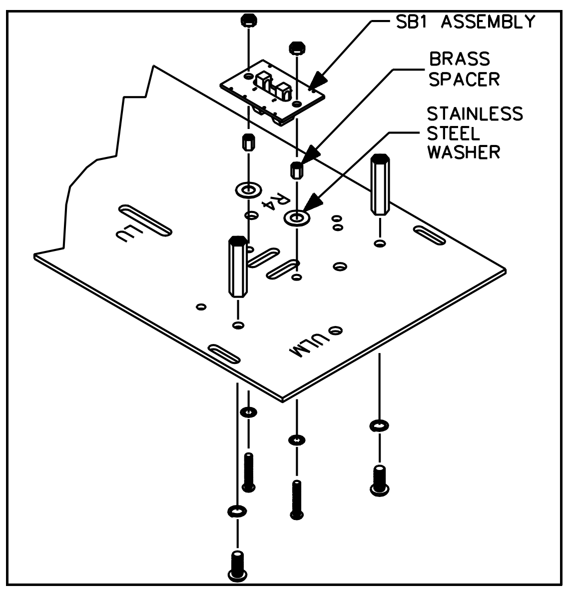


FIGURE D.2 - Attaching SB1 to LS-QUAD-2 Backplate

4. Using an oscilloscope, connect the probes from channel 1 and 2 to the DP1 and DP2 test points with reference to COM test point, on the IMC-DIO board. Observe the pulses while running the car in either direction at a constant speed of about 50 fpm. The signals should have approximately a 50% duty cycle and should be 90° out-of-phase.

The *minimum* time between any two adjacent transitions of DP1 and DP2 must be at least 18% of one cycle. Ninety degrees is 25% of one cycle.

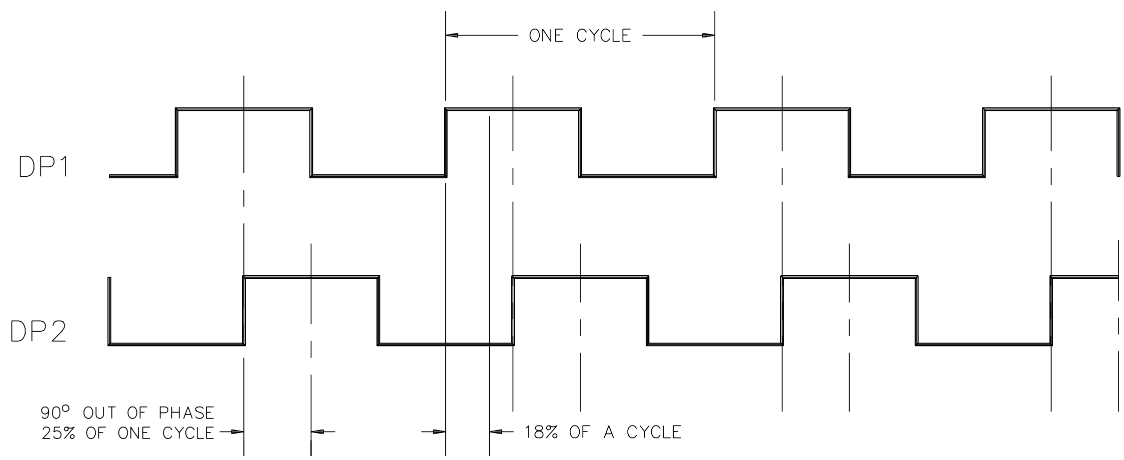


FIGURE D.3 - Signal Comparison of DP1 and DP2

If the OLD flag is still highlighted on the F3 screen and steps 1-4 have been followed, contact MCE Customer Service.

APPENDIX E

SOFTWARE OPTIONS

The following is a listing of adjustable control variables that are available on a controller. Be aware that the entire list of adjustable variables is not available on every controller.

ADJUSTING CONTROL VARIABLES

In order to access the adjustable control variables, put the car in system mode. To do this, place the F7 switch in the up position with all other switches in the down position. The controller will ask for a password. If a password exists, enter the code on the A1 through A8 switches, then press S. If there isn't a password, press S and the controller will enter system mode.

Next place the F6 switch in the up position to access the adjustable control variables. Each variable is described in the order that it appears.

Table E.1

SOFTWARE OPTION APPENDIX

Variable	*Name*	*Definition*
LOBBY	*Lobby Floor*	Determines the location of the lobby floor in the building.
PPF	*Primary (lower) Parking Floor*	Determines where the car will park in the absence of call demand. In a Duplex system, this variable must be programmed as one of the landings in the building, and is set at the factory before shipment. In Group systems, this variable only takes effect when the car is operating independently of the Group Supervisor or if there is a loss of communication with the Group Supervisor.
SPF	*Secondary (upper) Parking Floor*	Determines which landing is used as the second parking floor. This variable is only available on a Duplex system.
LLCC	*Light Load Call Cancel*	When the light load input (LLI) is on, this variable sets the threshold above which an additional car call will cause all previous calls to be canceled with the exception of the last call entered in the system.
PECC	*Anti-nuisance Call Cancel*	Sets the threshold for the number of car call stops without an interruption of the photo-eye. If no photo-eye interruption is detected when the car answers the fourth car call, the controller will cancel any additional car calls registered in the system. This function is normally referred to as anti-nuisance.
APP1	*Alternate Primary (lower) Parking Floor*	When on, the car will no longer park at the original parking floor (PPF). Instead the car will park at the first alternate parking floor specified by the landing stored in this variable.

Cont'd next page

Table E.1 cont'd

APP2	*Alternate Primary (lower) Parking Floor #2*	When on, the car will no longer park at the original parking floor (PPF). Instead the car will park at the second alternate parking floor specified by the landing stored in this variable.
ASP1	*Alternate Secondary (upper) Parking Floor*	When on, the car will no longer park at the original secondary parking floor (SPF). Instead the car will park at the secondary parking floor specified by the landing stored in this variable.
ASP2	*Alternate Secondary (upper) Parking Floor #2*	When on, the car will no longer park at the original secondary parking floor (SPF). Instead the car will park at the secondary parking floor specified by the landing stored in this variable.
AGNG	*Alternate Gong Option*	Causes an arrival lantern to be illuminated whenever the car's doors are open at a non-lobby landing. In the absence of actual call demand, the direction selected is a reflection of the car's last direction of travel. If the car is located at a terminal landing, the appropriate lantern will be illuminated.
CCBC	*Cancel Car Call Behind Car Option*	If on, and if the car has a direction arrow (SUA/SDA), no car calls can be registered behind the car's current position. For example, if a car is at the fifth floor, moving down, then no car calls can be registered for any floors above the fifth floor.
LGNG	*Lobby Alternate Gong Option*	Causes an arrival lantern to be illuminated whenever the car's doors are open at the lobby landing. In the absence of actual call demand, the up direction lantern will be illuminated.
DDPO	*Door Lock Direction Preference Option*	Causes the car to hold its direction preference until the doors are closed. When off, the car will be allowed to change direction preference with the doors open (when the hall call door time elapses).
CSAR	*CSA Redundancy Check Option*	When on, CSA redundancy checking logic is invoked. When off, the LSR, CNP and UDF inputs are ignored, and CSA redundancy checking logic is not performed.
NPRE	*No Preopening Option*	When on, prevents preopening of the doors on an approach to any landing. When off, the doors will start to open as soon as the car is 3" from level at the target floor.
RCCD	*Reversal CCD Option*	When on, all registered car calls are canceled when the car reverses direction.
DGNG	*Door Lock Gong Option*	Determines when the arrival gong outputs are activated. The arrival gong outputs are activated after the doors begin to open. When off, the arrival gong outputs are activated when the car steps into the floor. This option should be off when hall-mounted arrival fixtures are used and turned on when car-riding arrival fixtures are used.
DDOP	*Double Ding on Down Option*	When on, the gong output dings twice for down direction travel and once for up direction travel. If off, the gong output will only ding once for both up and down direction of travel.