3525 La Grande Blvd., Sacramento, CA 95823
(916) 428-1708* FAX (916) 428-1728

MODEL V800
TYPE DC- SCR w/ PG2

Manual for Start Up and Final Adjustment
of the Elevator Controls V800- VV Control Unit
Used in Conjunction with

ELEVATOR CONTROLS PG2 PATTERN GENERATOR

AND

CONTROL TECHNIQUES DC-SCR

Digital Drive

Rev. 04/08/2004

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Introduction

WARNINGS:

Throughout this manual, icons will be used to accentuate certain areas of text. These icons represent safety warnings, cautions, and interest areas. These icons are explained below:

WARNING: Denotes operating procedures and practices that may result in personal injury and/or equipment damage if not correctly followed.

CAUTION: Denotes operating procedures and practices that may result in equipment damage if not correctly followed.

NOTE: Denotes useful and informative procedures.

Throughout this manual it is assumed that the field personnel is well qualified in the installation of elevator equipment. No attempt has been made to define terms or procedures that should be well known to a qualified elevator mechanic.

NOTE: It is also assumed that the elevator counterweight balance has been properly checked and corrected as necessary; Speed governor device is installed and calibrated; Safety Clamp is properly tested; and all switches for slowdown, stop, and over travel limits at both terminal landings are checked for proper type, placement, and operation.

CAUTION: The installation must be in compliance with all Local and applicable Elevator and Electrical Codes and regulations

This manual is intended only to acquaint the service technician with the information required to successfully install the microprocessor-based elevator controller. The field personnel must be familiar with all codes and regulations pertaining to the safe installation and running of elevator.

NOTE Installation and wiring must be in accordance with the national electrical code and consistent with all local codes, and elevator codes and regulations. The 3 phase AC. power supply to this equipment must come from a proper fused disconnect or circuit breaker. Improper protection may create a hazardous condition.

NOTE Wiring to controller terminals must be done in a careful, neat manner. Stranded wire conductors must be twisted together to avoid strands from being left out of terminal and create potential shorts. All terminals and cable connectors must be checked to be seated properly. When connecting flat cable connectors be certain to match pin #1 marks (arrow symbol on connectors, red stripe on cable).

CAUTION: Please restrict access to elevator control equipment and apparatus to qualified personnel only.

System Description

The V800 Type Variable Voltage system is a multi-computer network that controls the elevator. The VV system uses an Elevator Controls Corp. PG_2 Pattern Generator to supply the SCR drive with a speed profile, which with feedback from the elevator motor feedback device produces an optimum ride and performance. Figure I-1 is a block diagram of the V800-VV system.

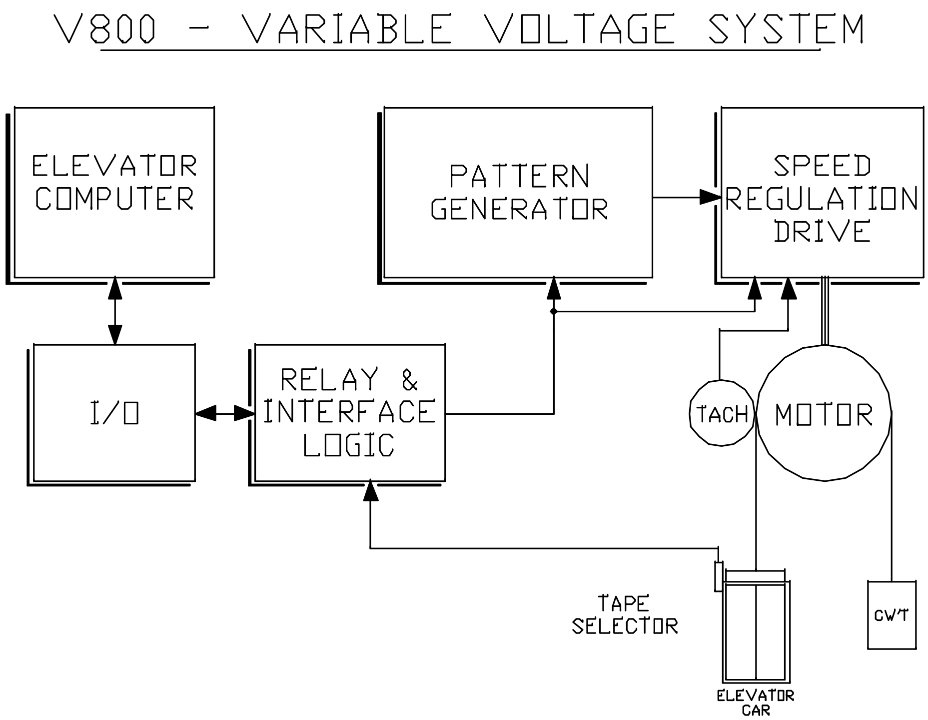

FIGURE 1

Elevator Controls Velocity Feedback system is composed of three basic elements, in addition to the relay logic interface circuitry. These elements are:

1. Elevator Car Controller Computer controls all of the elevator sequencing and signals. The elevator computer is the master computer that tells the Pattern Generator and the Speed Regulator what to do.

2. Pattern Generator has the responsibility to generate the optimum speed pattern. The pattern generator receives signals from the elevator computer thru the relay interface and generates an optimum speed pattern that is fed into the speed regulator.

3. Control Techniques SCR Drive, the speed regulator has the responsibility to make the elevator follow the speed pattern produced by the pattern generator which controls the actual speed and smoothness of the elevator, (please refer to Control Techniques - Mentor II drive manual for details on this drive).

This Manual deals with the installation and adjustment of the complete system and it is intended for use in conjunction with the SDI and drive manuals captioned above.

Section I

INSTRUCTIONS FOR INSTALLING AND ADJUSTING ELEVATOR

This Manual deals with the installation and adjustment of the complete system and it is intended for use in conjunction with the Mentor II drive manual captioned above.

I.1. Protect printed circuit boards, and drive unit, from dust & foreign materials, remove fusing.

CAUTION: BE CAREFUL NOT TO ALLOW METAL DEBRIS TO FALL ON THE CIRCUIT BOARDS

I.1.1 Complete controller mounting, installation and wiring, observe controller field terminals location in relation to wiring ducts to determine where to cut holes for field wiring ducts. Follow instructions for installation in MENTOR II manual; paragraph 2.2.2 with regards to AC/DC power & motor wiring. Refer to prints page 1 & 2 for this purpose.

I.1.2 Complete selector installation and wiring refer to instructions supplied with selector package for details.

CAUTION: Tachometer mounting and wiring is very critical for closed loop systems. The tachometer must track motor rotation accurately without slippage, bumping or vibration. Mounting directly to the shaft on the back of the motor, with an approved coupling, is recommended on geared elevators. Wiring must be done using shielded twisted-pair cable; use individual metal conduit and ground the shield at controller end only.

NOTE: Check job prints for the requirements for mounting of the speed monitoring tachometer or magnetic speed pick-up unit. . Magnetic pick-up sensor is mounted using uni-strut to detect magnets glued on to motor shaft. In any case, you must use shielded cable to wire unit to controller.

I.1.3 Refer to any Supplemental Adjusting instructions.

I.2. Procedure for startup of Elevator Controls M**icroprocessor** C**ontrol** S**ystem** M**odel V800**

NOTE: These are not final adjusting instructions.

In the following instructions it is assumed that all hatch doors are closed but not necessarily locked, all hoistway and machine room wiring is complete. The car safety must be adjusted to the manufacturer's specifications and the governor installed and roped. Test the safety by hand to insure it will hold the car. Correct any malfunction before proceeding further.

These instructions also assume a minimum of electrical trouble-shooting experience and no attempt is made here to out-guess all the possibilities that may occur. Follow the procedure carefully and if the elevator does not respond correctly, check the circuits according to your ability. If you can't locate the problem in a reasonable time, call for an adjuster or serviceman experienced in trouble-shooting and proceed cautiously. You will find the multiple L.E.D. indicators on boards and computer diagnostics very useful tools that will save you installation/troubleshooting time.

CAUTION: Read these instructions all the way through before starting to work to familiarize yourself with the procedure.

I.2.1 With power off, test all terminals for grounds. Also, test for shorts on terminals 4, 4A, 6, and 50 to each of the terminals on I/O board. If any are located, remedy the problem before proceeding or I/O boards may be damaged.

I.2.2 Move the controller Inspection and Test switches to INSP and TEST position respectively (on).

I.2.3 Remove fuses F4, F50, F7 and F8 to disable the primary controller relay voltage and the door operator.

NOTE: Always check prints to double check fuse designation and correct amperage.

I.2.4. Check the line side of the disconnect and be sure that all three legs are at the correct voltage. Now turn on the disconnect and check the voltages at L1, L2, and L3 on controller. Check prints for details on how the input power connects to the DC-Drive, Drive Field Module, and Controller.

I.2.5. Turn power off and replace fuse F4, and the fuses feeding the PG (Pattern Generator) and the computer power supply.

I.2.6. Check the main safety circuit and door locks, verify that the SAF and DLK led’s in the controller are on. Note that the SCR Drive “Ready” output will pick the DSAF relay that has a contact in the safety circuit.

NOTE: The LSSM (Low Speed Safety Monitor) board also has contacts in the safety and leveling circuits. Verify jumpers J1 & J2 are in place on the LSSM board to bypass these contacts. The adjustment of this board will be accomplished as described in Section II, after final adjustment is complete. The jumpers must be removed after adjustment is complete.

I.3. Start-up for Control Techniques DC-SCR Drive

I.3.1. Familiarize yourself with Control Techniques MENTOR II drive manual, in particular "Procedures for Selecting and Changing Parameters, page 33" and note the following in conjunction with such manual:

a) Parameter xx.00 data must be set to 200 to satisfy security requirements before changes or adjustments can be made.

b) Parameters listed below have been changed from the factory defaults by Elevator Controls and must remain as changed for proper operation:

PARAMETER	DATA	DESCRIPTION
02.04	0005	Forward Acceleration 1
02.05	0005	Forward Deceleration 1
02.06	0005	Reverse Deceleration 1
02.07	0005	Reverse Acceleration 1
03.23	050	Threshold for 5% speed output
05.18	0	Standstill Enable OFF
06.13	1	Enable Field Control ON
07.09	0302	Set DAC 2 output = Tachometer input
09.19	0111	Sets "Drive On" output location

c) **Any changes or adjustments will be returned to the previous values if power is turned OFF unless saved by setting parameter 00.00 data to 001 and pressing RESET. (See drive manual page 33).**

d) If a tachometer is used as feedback to the SCR Drive verify that the appropriate tachometer range is selected on SW1; (refer to paragraph 5.2.1 in the MENTOR II manual, page 26). The 50V to 200V range has been factory set.

e)) If an encoder is used as feedback to the SCR Drive verify that the appropriate voltage supply is selected on SW1; (refer to paragraph 5.2.1 in the MENTOR II manual, page 26). The 15V supply has been factory set.

I.3.2. Note that the SCR Drive "Ready" light and output is not sensitive to input power phase rotation but will fault if one or more phases are lost.

NOTE: The Control Techniques SCR Drive can be used with a digital encoder as feedback in lieu of a tachometer, check the drawings for installation information and note the following parameter changes:

PARAMETER	DATA	DESCRIPTION
03.12	1	Selects encoder feedback
03.14	*	Feedback scaling= 750,000,000 / N x n

N = PPR for the encoder
n = max speed of motor in RPM

Parameter 03.14 = 732 for a 1024 PPR encoder mounted to a 1000 RPM motor

I.3.3. Verify standing motor field voltage on F1 to F2. Exact field voltages will be adjusted later.

I.4. Start-up for Pattern Generator

I.4.1. Initial adjusting of the Pattern Generator potentiometers. The following potentiometers have been factory set, verify that they are correct. Their functions and adjustments are described in Section I.5. FINAL ADJUSTMENTS:

POTENTIOMETER	SETTING	DESCRIPTION
H	10.0 VDC	High Speed = Elevator rated speed
HIL	7.5 VDC	Intermediate speed if used
HI	5.0 VDC	Intermediate speed boast if used
HL	*.* VDC	Inspection speed = 50fpm/rated speed x 10 VDC
L2	*.* VDC	Level speed 2 = 15fpm/rated speed x 10 VDC
L1	*.* VDC	Final level = 3fpm/rated speed x 10 VDC
EQ	*.* VDC	Earthquake = 25fpm/rated speed x 10 VDC
ACCEL	½ CW	Acceleration
DECEL	¾ CW	Deceleration
PATTERN DELAY	Full CCW	Delay before pattern is generated
DYNAMIC GAIN	½ CW	Pattern transition smoothing
SOFT STOP	Full CCW	Deceleration to final stop
LO SPEED SMOOTHING	½ CW	Rate of change from DECEL to Level speed
HI SPEED SMOOTHING	½ CW	Rollover from ACCEL to high speed to DECEL
SOFT START	½ CW	Rate of change from start to ACCEL
UP TRIM	As reqd.	Set UP speed = DN speed

I.4.2. Speed voltages can be measured from COM to appropriate test point by installing jumper JP2. CW rotation on the potentiometer increases the voltage. Elevators with rated speed under 250 fpm will require H, HL, L2 and L1 only. EQ (Earthquake) only if specified.

I.4.3. LED's indicating UP, DN, RUN, Speed and functions selected are located on the PG Board.

I.5. Running on Inspection

I.5.1. Place controller on inspection (by setting controller RUN/INSP Switch to inspection). Our objective here and in the next step is to get the car to move in the proper direction, and be responsive to varying speed commands, with proper tach or encoder polarity, and proper motor field and brake voltage. Adjust the HL (inspection speed) potentiometer on the PG to approximately 0.1VDC (with a jumper on J2, the voltage can be measured between test points HL and COM).

CAUTION: At this point the car may try to run away, be prepared to stop the car.

Try to run by using UP/DN switch in the controller (jump door locks, if necessary, but remove jumper as soon as it is possible to do so. Car top insp switch needs to be on "Auto" for controller UP/DN switch to function). If the car runs away, reverse the tachometer polarity by reversing the tachometer leads.

While attempting to run, adjust brake volts to desired value (refer to job prints) by adjusting brake picking and holding adjusting resistors provided.

I.5.2. Pay attention to the car drifting while adjusting brake. Run car on inspection, with inspection speed set to zero (HL voltage set to 0.0 vdc). If drift speed is excessive (greater than 1.0 fpm) adjust parameter 03.22 "Zero Offset" of the SCR Drive slightly to zero the car speed. (Range is 0 to 256 with 128 = 0 adjustment)

I.5.3. Gradually increase inspection speed, to observe performance of the SCR Drive.

CAUTION: Remember that for the moment, the brake and the application of current to the motor armature are two totally separate operations. Shutting off the SCR Drive with the brake lifted will allow the car to drift freely until the counterweight lands.

Verify that the car now runs smoothly (although it may run backwards). The polarity of the tachometer input to the Drive must be established: While running down, terminal 9 should be positive with respect to terminal 10 on the SCR Drive power module TB connector. If this is the case and car runs in the proper direction, skip to end of step. Otherwise, reverse both, motor armature wires and the tachometer wires on terminals 9 & 10. Car should now run in proper direction with correct tach polarity established. Slightly vary the inspection speed with the HL potentiometer to check the drive response.

I.5.4. Prove that the brake will properly hold at least an empty car, perform any necessary adjustments to get proper brake operation.

I.5.5. The following parameters control the motor field current, verify that the settings are correct.

Jumper J1on MDA3 card has been set to 2A or 8A as required by job specifications. Refer to drive manual paragraph 3, page 28. For field current ratings over 8 amps, refer to drive manual Chap 9, page 95.

Flip inspection UP/DN switch down to pull in "D" relay on controller. Verify motor field forcing voltage on terminals F1 to F2 is as specified in the motor data, parameters 06.11 and 06.08 are used to adjust the motor field.

PARAMETER	DATA	DESCRIPTION
06.11	*	Max field amps per table, Drive Manual – page 63
06.08	*	% max amps for fine setting
06.15	1	Enable field economy timeout
06.12	30	time delay (seconds) before economy timeout
06.09	500	Economy - % of max field amps
06.07	*	Arm voltage at start of field weakening, set to 10 - 20 volts below Motor Nameplate Rating
06.10	500	Min value of field amps to prevent excessive weakening

* Set in accordance with motor requirements

I.5.6. Advance inspection speed to get 1V on terminal 3 with respect to 20 on the DC-DRIVE TB connectors (this should be 10% of contract speed). Now inspect up, +1V should appear on term 3.

If a tachometer is used for feedback to the SCR Drive adjust the RV-1 trimpot on the drive to give 0.1, or 10% of contract speed as measured on the governor rope with a hand held tachometer.

If an encoder is used for feedback to the SCR Drive adjust the parameter 03.12 on the drive to give 0.1, or 10% of contract speed as measured on the governor rope with a hand held tachometer.

Now adjust Inspection speed (HL) on the PG to the desired inspection speed (20 to 50 fpm)

NOTE: Although not always necessary, it is advantageous to tune the SCR Drive to the motor (it is necessary if the motor is not running smoothly). To tune the SCR Drive follow the instructions below:

Set parameter xx.00 = 200 to satisfy security requirements.
Set parameter 05.27 = 1.
Make several runs of approximately 30 sec in both directions.
Set parameter 05.14 = 05.13.
Record parameter values 05.12 to 05.15 for future reference.
Set parameter 05.27 = 0.
Perform a "save parameter values" procedure.

I.5.7. Remove jumper 4A-24 and check primary safety circuit (all items) and repair as necessary. Check car top stop switch and the up and down buttons. Inspect full length of hoistway for free running clearances. Check all door locks.

I.5.8. Check access operation (if provided) including proper door lock bypassing.

I.5.9. Verify terminal switches and slowdown limits, stop limits, and over travel limits are all properly set according to hoistway print.

I.5.10. Verify all connectors in the system are correctly seated, if you haven't done so before. Ribbon and plugable field wire connectors can wiggle loose when the system is being worked on. Press firmly on all connectors to seat them. Be sure duplexing telephone cables are installed along with any #18 wire cross-connects (If more than one car) according to hoistway print.

CAUTION: BE SURE CARD CONNECTORS ARE SNAPPED IN ALL THE WAY.

Install F50 fuse if used on this controller.

At this point the system should run correctly on inspection. If you are still having problems, review steps above and repeat as necessary.

Follow steps I.5.11 through 14 before proceeding to Final Adjustment of the Elevator in section I.6.

I.5.11. Set the leveling switches on the car top to give proper dead zone, +/- 1/4". For all EC control systems, LU and LD need to be off (0VDC) when the car is level. Set all leveling and slow down magnets in their proper location. The correct vane lengths and switch arrangements are specified on your job selector information. See your controller prints for a correct wiring schematic.

I.5.12. The door operator must be correctly adjusted. Remember to reinstall the door fuses. Clutches must have proper clearances for running in the hoistway. Check the print for any special instruction on your job.

I.5.13. Make sure all hoistway doors and car doors are closed and locked. Run the car on inspection mode through the entire hatch, making sure it is clear of obstructions. Door zone and level vanes should already be installed and adjusted to level the car within 1/4" of the floor.

I.5.14. Now move the car on inspection to the bottom level. Move the TEST switch to the on position. This will put the system on independent mode when inspection mode is turned off. TEST also disables door opening (TEST mode does NOT disable door closing). Move the car below the floor unto the leveling input with the inspection UP/DN switch, turn the inspection off. The car should re-level up into the floor. Check that the relays sequence properly for re-leveling.

I.6. Final Adjustment

(Read thoroughly before continuing)

I.6.1. Turn inspection mode off (TEST should be on). Place a car call two floors above. The car will run up and slowdown into the third floor. Observe how the system responds, especially the brake, motor and sheave. Decide what part of the system needs to be adjusted first and focus on that as you perform final adjustment below. You may need to stop and readjust other parts of the system during this procedure. Any problems with the brake or door clutch clearances will become apparent here. Correct these problems as they come up before continuing with this adjustment.

✍ NOTE: to place car calls from the machine room, connect a wire from the 3-bus terminal (Ground) to the car call field terminals on the I/O board. TEST mode requires a constant car call input to run the car. TEST also has a software noninterference timer (five to seven seconds) when the system will not respond to a new call.

The noninterference timer is located in memory address FF9C, and can be modified to a 2 second value to allow faster response to car calls while the car is operating under test mode; Please be sure the timer is reset to the pre-modified value before car is turned off from test mode of operation. Please refer to Field Reprogramming manual for instructions on how to use the Direct Access mode of the 'On Board Diagnostics' tool

If car does not respond, refer to "Elevator Controls' Guide to Error Condition Codes" sheet which will aid the adjuster in determining why the elevator is not responding. Pay particular attention to the multiple L.E.D. indicators on the I/O board. If car is leveling, the LVL indicator will be off, and car cannot respond until leveling process is complete. If any of the door opening devices or call inputs are active, the corresponding indicator will be lit. If the SD (or SU for up) indicator is on and Down relay is not picked, check normal limit switch. Also check DSD2 and USD2 LED's, both must not be off or reversed. These are the corresponding terminal landing slowdown switches that open when car is at the corresponding terminal floor. Pay attention to liquid crystal display on the elevator computer board.

- Verify leveling switches on cartop to give proper dead zone (+/- 1/4")
- Be sure TM switches or slowdown limits, stop limits, and overtravel limits are all properly set in accordance with hoistway print.
- Check access operation (if provided) including proper door lock bypassing.

I.6.1. Put car on inspection at bottom landing. Put 2/3 of contract load in the car. Now start adding weights in 50 or 100 pound increments and moving car on inspection each time UP and DN. Adjust brake tension to stop and hold 125% of contract load by tripping any stop switch except car stop switch open while running down on inspection. Hold the "DOWN" button in while you trip open the stop switch (preferably on the inspection station). The car should stop on the brake.

With the car loaded with 125% of contract load, set the inspection speed on the PG equal to the Leveling speed (approximately 4 FPM) and verify that the car will move up and down with the load at approximately the same speed. If the car does not move down, increase parameter 3.09, Speed loop P gain and parameter 03.10, Speed loop I gain on the SCR Drive.

Return the inspection speed to the desired value. Change from inspection operation to TEST mode with car at floor level. Run the car with one, and multiple floor runs as you make adjustments below to "mold" speed curve.

You will need to make sufficient runs to be sure that the system responds how you want. Take your time here; adjustment procedures are not inherently quick.

NOTE: a dual-trace storage oscilloscope can be a great help here. Observing the pattern output and the tach from the drive can save a lot of time and hassle. Connect one probe to terminal 3 with ground on 20 on the TB connector on the SCR Drive, this is the pattern signal and is a +10 to -10 volt DC signal, with +10 volts being contract speed in the UP direction, -10V is contract speed in the DN direction. Connect the second probe to pin 13 on the TB connector, this is the tachometer feedback signal, -10 volts is contract speed in the UP direction.

CAUTION: If grounding pin on your oscilloscope plug is electrically connected to the negative probe lead, then you MUST NOT attempt to connect the negative lead to the equipment or damage will occur. In this case, if your scope has 2-channels with channel B invert feature active, remove negative leads from probes, press A+B button on scope. Use A and B probes to measure signals.

NOTE: a pair of hand-held radios and a helper can be a great help. After the speed pattern is adjusted as well as possible from the machine room, the adjuster should ride the car while a helper adjusts the system per the adjuster's instructions. There is simply no substitute for riding a car while adjusting.

The speed profile drawing, Figure I.6.1 below, has the speed pattern broken into sections that can be individually adjusted by the trim pots listed.

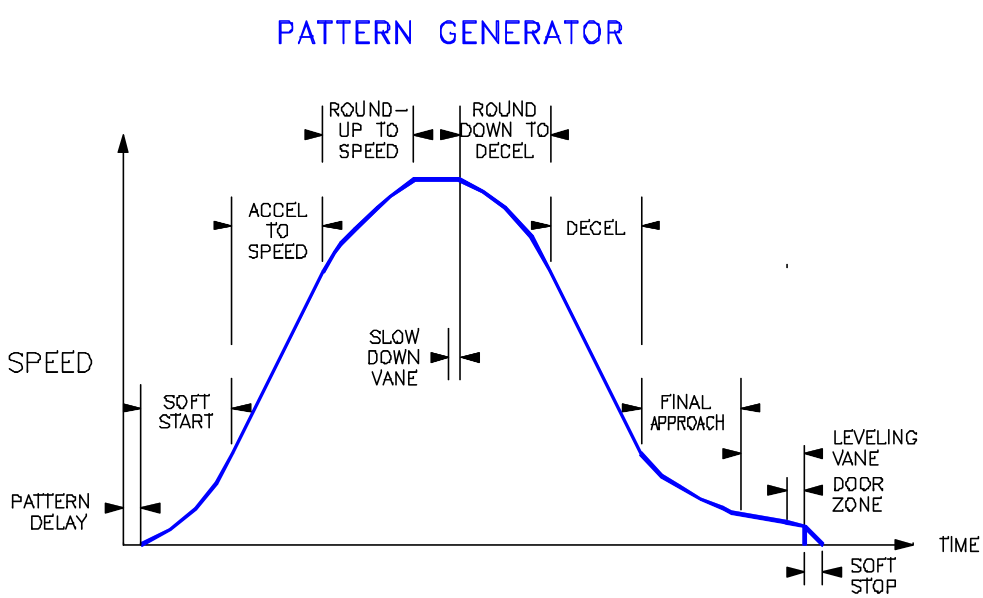

FIGURE I.6.1

Adjusting the speed pattern can be more of an art than a science. You have two goals: ride comfort and brake-to-brake time. You will have to decide which to work on at any one time. The two goals are not exclusive; you can achieve both. The table below, provides the adjuster with information to fine-tune elevator for best performance and comfort. Please read thoroughly and make any adjustments needed.

POTENTIOMETER	**FUNCTION**	**EFFECT**
Pattern Delay *	Delays start of pattern	Allow time for brake to pick
Soft Start *	Adjusts jerk into acceleration	Softens initial start or jerk
Accel	Adjusts acceleration ramp	Too fast an accel causes excessive current, too slow lengthens floor to floor time
Hi Speed Smoothing	Adjusts rollover in and out of high speed	Has great effect on slowdown distance, if too fast causes bumps or overshoot
Decel	Adjusts deceleration ramp	Too slow can cause overshoot, too fast can cause excessive leveling time
Lo Speed Smoothing *	Roll into final approach	Prevents jerking into leveling speed
Dynamic Gain *	Smoothes transitions to accel and from decel	
L2	Leveling or approach speed into door zone	If too fast can cause jerk at door zone
L1	Final leveling speed	If too fast can cause bump
Soft Stop	Ramp too stop	Can cause overshoot and oscillation

- Led's indicate when these potentiometers are effective

I.6.2. Make a series of multiple floor runs up, then down. At every run adjust, as necessary, any of the speed curve parameters depicted on figure I.6.1. If car vibrates, check tach mounting and wiring, if correct, reduce Speed Gain adjustments, parameters 03.09 and / or 03.10 (refer to page 53 in the drive manual). As soon as car is able to run at top speed, perform step I.6.3 below, then repeat this step as necessary.

PARAMETER	DATA	DESCRIPTION
03.09	30	Speed loop P gain
03.10	15	Speed loop I gain

CAUTION: Higher numbers (higher gain) may cause oscillation, lower numbers cause sluggish response. If necessary adjust parameters 03.09 and 03.10. It is not recommended to set parameters 03.09 over 80 or 03.10 0ver 40.

I.6.3. Now, while making a long floor run, verify that the car runs at contract speed when 10 volts is applied to SCR Drive TB connector terminals 3 to 20. If not, Adjust speed trimpot RV-1 on the drive to get contract speed as measured on the governor rope.

NOTE: If using a digital encoder for feedback, adjust parameter 03.14, Encoder Feedback Scaling, on the drive to get contract speed as measured on the governor rope.

Verify proper armature voltage at top speed up and down. If armature voltage is too low, verify proper running motor field volts. If necessary, adjust the motor field voltage using parameters 06.07 and 06.10 on SCR Drive. (Refer to paragraph I.3.9 above), to increase motor field, thus causing the armature voltage to reach the rated voltage.

I.6.4. The car should now be running at contract speed with no overshoot on acceleration and should be undergoing a reasonable deceleration. The idea is to get a smooth overall deceleration into the leveling zone, but to not spend much time at a steady leveling speed.

I.6.5. Cars requiring a slower one floor run speed (Intermediate speed), require additional slow down magnets, which have been supplied and must be mounted as shown on the tape layout drawing. Potentiometers HI and HIL on the Pattern Generator and the HIL timer on the HLS board will require adjustment. The functions of these additional adjustments are as listed in the following table:

POTENTIOMETER	**FUNCTION**	**EFFECT**
HI	Desired speed at slowdown	Should match multi floor slowdown
HIL	Target speed to hold acceleration until slowdown is actuated	Adjust with timer to prevent bump into HI speed
HIL timer	Adjusts time HIL is actuated	

CAUTION: Adjustments made in step I.6.2 cannot be changed. Any changes to the deceleration portion of the speed curve will require readjustment of the multi-floor runs.

I.6.6. The adjustment should now be complete. Verify and correct proper floor leveling, and make sure door zone sensors are adjusted to prevent door pre-opening outside +/- 2" from floor level

CAUTION: IT IS RECOMMENDED TO ELIMINATE ANY PRE-OPENING AT ALL, UNLESS SPECIFICALLY SPECIFIED. THE V800 CONTROLLER HAS A JUMPER OPTION FOR JOBS REQUIRING PRE-OPENING (SEE PRINTS).

I.6.7. Verify all connectors in the system are correctly seated, if you haven't done so before. Ribbon and plugable field wire connector can wiggle loose when the system is being worked on. Press firmly on all connectors to seat them.

SECTION II

II.1. Low Speed Safety Monitor Adjustment

✍ NOTE: The Low Speed Safety Monitor (LSSM) contains several circuits required by code, ANSI/ ASME A17.1, and other safety circuits and therefore should be adjusted carefully, The safety monitors of the LSSM are:

1. Elevator Overspeed
2. LSSM Tachometer Monitor
3. Leveling Disable
4. Leveling and Inspection Overspeed
5. Terminal Slowdown monitor

CAUTION: The following adjustments should not be attempted until the final adjustment of the car is complete or this procedure will have to be redone.

✍ NOTE: TP-8 is ground, all measurements are to be made with the negative lead attached to TP-8. Do not use any other ground point for this purpose. If an oscilloscope is used, be certain that the ground lead is isolated from the line or the board will be damaged.

CAUTION: Verify: Jumpers J1 & J2 on the LSSM board are in place. Be sure to remove jumper when adjustment is complete.

II.1.1.A Set Up utilizing Pulse Input:

✍ NOTE: **Skip to II.1.1.B if Tachometer is used for speed monitor feedback.**
Jumper J3 on the LSSM board is set to “FREQ”.
“TEST” switch on HLS (relay) board is on; this disables door operation.
Make a multi-floor run so that the car achieves contract speed and measure and record the **highest** voltage on TP-6 with respect to TP-8 on the LSSM board.

II.1.1. B. Set Up utilizing Tachometer Input:

✍ NOTE: **Skip to II.1.2 if Pulse Input is used for speed monitor feedback.**
Jumper J3 on the LSSM board is set to “VOLTAGE” and resistor R45 is installed.
“TEST” switch on HLS (relay) board is on; this disables door operation.
Make a multi-floor run so that the car achieves contract speed and set VR6 so that the voltage on TP-6 with respect to TP-8 on the LSSM board. is approximately 8 volts.

II.1.2. OVERSPEED potentiometer setting: with the car running at contract speed, turn the "OVERSPEED" trimpot CCW until the board does an Overspeed trip. The "OVERSPEED" LED and the "SAFETY TRIPPED" neon should be lit. This verifies that the Overspeed circuit is working. Now multiply the tach voltage recorded from II.1.1 above by 1.15. Set the "OVERSPEED" trimpot to give that voltage at TP-3. This sets the Overspeed trip point to 115% of maximum normal speed.

II.1.3. TACH LOSS potentiometer setting: The SCR Drive is set to activate the output tied to the LSSM board's "AS" input at 5% of contract speed (parameter 3.23). While making one floor runs, slowly turn the "TACH LOSS" trimpot CW until the board does a tach loss trip. This verifies that the LSSM tach loss circuit is working. The motor drive has it's own "Tach Loss" monitor. Multiply the voltage recorded from II.1.1 above by 0.03. Set the "TACH LOSS" trimpot to give that voltage at TP-1. Put the car on test and make several runs to verify that there is no tach loss tripping.

II.1.4. LEVEL DISABLE potentiometer setting: Put the car on inspection and position it on a leveling vane. Ground TP-5. This should make the "LEV DISABLE" LED light. Remove jumper J2 from the LSSM board. Put the car back on test. The car should not move. Remove the ground jumper from TP-5. The car should now level into the floor. This verifies that the leveling disable circuit is working. If the contract speed is below 500 fpm, multiply the voltage recorded from II.1.1 above by 0.3. If the contract speed is 500 fpm or more, multiply the voltage by 0.2. Set the "LEV DISABLE" trimpot to give that voltage at TP-5. This sets the leveling disable threshold to 30% or 20% of maximum normal speed, depending on the contract speed.

II.1.5. LEVELING and INSPECTION OVERSPEED potentiometer setting: Put the car on inspection. While running the car, turn the "LEV/INSP" trimpot CCW until the board trips. The "LEV/INSP" LED and the "BOARD TRIPPED" neon should be lit. This verifies that the leveling and inspection Overspeed circuit is working. Leave the board in the tripped state. With the car stopped, remove the jumper from J1. The SAF relay should drop. Replace the jumper. Put the car on test. Make a multi-floor run and measure the voltage at TP-6 when the car speed has stabilized after any initial speed overshoot. This is the tach voltage when the car is running exactly at contract speed. Multiply that voltage by 140. Divide the number you get by the contract speed of the elevator. This is the tach voltage at 140 fpm. Set the "LEV/INSP" trimpot to give this voltage at TP-4. This sets the leveling and inspection speed trip point to 140 fpm.

EXAMPLE: Contract speed = 400 fpm
Tach Voltage @ contract speed = 5.00 V
5.00 X 140 = 700; 700 / 400 = 1.75 (the answer)

Set TP-4 to 1.75 V.

II.1.6. TERMINAL SLOWDOWN potentiometer setting: Check the controller prints to see if the "SLDN" terminal on the LSSM board is tied to 4A bus. If it is, skip this adjustment.

While making multi-floor runs into either of the terminal landings, turn the "SLOWDOWN" trimpot CCW until the board trips as the car slows down on approach to the terminal. Now turn the trimpot back about a half a turn at a time until the board doesn't trip on terminal slowdown. Measure the voltage at TP-2 and turn the "SLOWDOWN" trimpot until it rises 0.1 V. *EXAMPLE:* If the 'non-tripping' voltage at TP-2 is 6.50 V, set it to 6.60 V. Now make multi-floor runs into both terminal landings and see that the board does not do a slowdown trip. If the board does trip, increase the voltage at TP-2 in .1 V steps until it does not trip. Finally, check to see that the voltage setting on TP-2 is less than or equal to the voltage recorded from II.1.1 above.

II.1.7. Remove jumpers J1 & J2 from the LSSM board. The adjustment is complete.

✍ NOTE: The LSSM board has two fault indications. If a fault occurs momentarily, the associated LED will illuminate and stay lit as a warning, the safety circuit will not open until the fault is maintained for at least 0.4 seconds. This is indicated by the neon lamp.

II.2. Motor Limit Timer Control

If car is running and fails to reach its call within a pre-determined time interval, the controller will automatically stop the motor, further operation of the elevator is prevented until the trouble has been corrected by cycling the inspection switch or power disconnect. The computer error code LED indicators and LCD (if provided) will display the corresponding error status. This timer is factory preset for 120 seconds; refer to Field Re-programming Manual for instructions on adjusting this timer on-site.

II.3. Multiple Door Open Times

The V800 controller is equipped with selective door timing for car, hall, and short door open times. The factory pre-set values are field-adjustable through the use of the ON-BOARD diagnostics unit. Refer to Field Re-Programming Manual for complete detail. Check door open times for proper operation and in conformance with Handicapped and applicable codes.

II.4. GUIDE FOR PERFORMING ELEVATOR SAFETY TESTS AND INSPECTION

✍ NOTE: The following procedure is intended as a guide while performing periodic inspection and safety tests of elevator. Please refer to Safety Code for Elevators and all applicable local codes for requirements.

⚐ CAUTION: Safety tests should be accomplished by qualified adjuster or serviceman. A helper should always be present and prepared to turn-off main line disconnect to remove power from elevator when needed that car is run with safety switches bypassed. Proceed with caution.

✍ **NOTE: For the following safety tests, II.4.1thru II.4.5, remove filed wire from terminal RD when Absolute Floor Encoding is used. Reconnect the wire to terminal RD when safety tests are completed.**

II.4.1. FULL -LOAD CAR BUFFER TEST.

II.4.1.1. Put full load in car, then place controller test switch to test position.

II.4.1.2. Call elevator to a floor several floors up from bottom, except top floor.

II.4.1.3. Jumper terminal 4A to all down slowdown switches terminals (DSD1, DSD2, and DT6 thru DT14 if used for higher speeds).

II.4.1.4. Place jumper from controller terminals 17 to 23. This bypasses safety switches. Also jumper terminals 29 to 33 to bypass down normal limit.

II.4.1.5. Place a car call to bottom floor to run car into buffer. After car strikes buffer and drive sheave slips under cables, quickly flip controller inspection switch to inspection to stop car. Run car up to bottom floor level and remove all jumpers above.

II.4.2. EMPTY CAR COUNTERWEIGHT BUFFER TEST

II.4.2.1. Place controller test switch to test position.

II.4.2.2. Call elevator to a floor several floors below top except bottom floor.

II.4.2.3. Jumper terminal 4A to all up slowdown switches terminals (USD1, USD2).

II.4.2.4. Place jumper from controller terminals 17 to 23. This bypasses safety switches. Also jumper terminals 28 to 30 to bypass up normal limit.

II.4.2.5. Place a car call to top floor to run counterweight into buffer. After counterweight strikes buffer and drive sheave slips under cables, quickly flip controller inspection switch to inspection to stop car. Run car down to top floor level and remove all jumpers above.

II.4.3. GOVERNOR TEST

II.4.3.1. ELECTRICAL OVERSPEED TEST: Manually trip governor overspeed switch open to verify that safety circuit drops out. Now, with governor cable lifted off the governor, spin governor while measuring speed to verify electrical and mechanical tripping speeds. A variable speed drill motor is very handy for spinning governor. Place governor cable and contact back to normal. Repeat procedure for counterweight governor, if any.

II.4.4. FULL LOAD CAR SAFETY OVERSPEED TEST

II.4.4.1. Put full load in car, then place controller test switch to test position.

II.4.4.2. Call elevator to Top floor.

II.4.4.3. Place jumper from controller terminals 17 to 23. This bypasses safety switches.

II.4.4.4. Adjust maximum speed for Overspeed tests.

II.4.4.4.1. If a tachometer is used for speed feedback, note setting of parameter 03.02 (Speed feedback) by moving link jumper LK1 on the SCR Drive MDA2 board to the “Adjust” position. Return jumper after noting the data value. While running car down on inspection, adjust speed trimpot RV1 to get car running at a speed about 1.4 or more times higher than before. If adjusting the trimpot does not speed car up enough, you'll need to turn on the 60V to 300V SW1 switch on the SCR Drive. Be sure to turn the 50V to 200V SW1 switch off. Then adjust trimpot RV1 on drive to get the 1.4 times inspection over-speed.

II.4.4.4.2. If an encoder is used for speed feedback, note setting of parameter 03.12 (Encoder Feedback Scaling) and reduce setting to get car running at a speed about 1.4 or more times higher than before.

II.4.4.5. Return car to top floor and remove car from inspection. Place a car call to bottom floor, and be prepared to measure car speed at trip point. Car will accelerate to overspeed until safety sets firmly. Flip controller inspection switch to inspection to stop car. Restore car safety and contact to normal, as well as governor contact. Set parameter 03.02 or 03.12 and SW1 to the setting noted in step II.4.4.4 above. Remove all jumpers above to place car back to normal operation.

CAUTION: After completing safety tests, be sure to remove all jumpers above.

NOTE: Reconnect field wire to terminal RD if Absolute Floor Encoding is used.

Section III

TROUBLESHOOTING GUIDE

III.1. System Not Functional In General (car won't run)

The solid state portion of the Elevator Controls' Microprocessor Controller is the most reliable part of the entire elevator plant. While it is possible that a problem may occur, one should first look to the power controller and "outside world" for malfunctions. It should also be noted that the same program loop is used for both cars of a duplex installation, and that if one car is running, the computer is working properly, even if the other car is inoperative.

IMPORTANT

For your convenience, and in order to save troubleshooting time and money, the V800 controller is equipped with multiple indicators that are designed to help you troubleshoot at a glance. You are strongly advised to pay particular attention to the indicators on the I/O board, every action the computer wants to take is indicated (DOF for example means door open function, the computer wants to open doors), and every action the "outside" controller wants the computer to perform is also indicated (DOB for example means the door open button is active). Note that a Bar on top of signal name indicates that signal is in the active mode when the LED is off, FRS and FRA are a good example, when off they indicate car is on Main or alternate fire mode. The computer error code LED display will flash a particular status/error code as detected by computer; a list of these codes is pasted on the controller door, if not, procure a copy from the Field-reprogramming manual. The computer error/status codes are also displayed in English format on the LCD display, if provided. Finally, if available, an IBM PC compatible may optionally be used for powerful trouble-shooting, diagnostics, monitoring purposes.

If a particular car is not running, first make sure that it is not on Fire Emergency Service. Normal operation of the Fire Emergency circuitry is to have 24-110V on Terminal 443 with respect to Terminal 3. * If the elevator is not operating under Fire Emergency Service, all power supplies should then be checked. The natural starting point is the three-phase input. There must be 208-480 VAC (as specified) present between all combinations of phases. Next, verify that each Power Control step-down Transformer has the correct secondary voltage. (Refer to Controller Schematic, Page 1, for terminal and fuse numbers.) Replace fuses as necessary.

The local controller power supplies should be verified. First, Terminals 4A and 4 should measure +110 VDC. Terminal 50 should measure +110 VDC (or voltage indicated on prints). 208-240 VAC should be present between Terminal Strip terminal 1 & 2 (104-120 vac for 120 volt circuits). If any of the above power supply voltages are improper, check the appropriate fuses. (Again, refer to the Power Control system Schematic Diagram).

✍ NOTE System common is the 3 buss, and unless otherwise noted all DC voltage measurements are with respect to Terminal 3.

In the upper left portion of the Power Controller System Schematic Diagram can be seen a string of normally closed safety contacts and switches connecting Terminal 4A to Terminal 24. In order for the car to run, all of these contacts must be closed, applying +110 VDC to Terminal 24 and pulling in the SAF Relay. With SAF picked, Terminal 4 will also be at a +110 VDC level.

Assuming Terminal 4 is operating properly at +110 VDC, check the operation of the computer system by observing the MPR output indicator on I/O board. This indicator should be lit, signifying that the computer system has control of the car. If the MPR LED is not lit, go to the section on Microprocessor Troubleshooting.

After verifying that the MPR indicator is on, check for proper HLS Module relay operation (The HLS module is the relay control board in controller). In order for the car to leave a landing in response to system demand, the following relays must be picked: INS, DOL, U (or D depending on desired direction), P, and SAF. H relay will also pick if slowdown for the direction of travel is made up.

Note that direction (SU/SD), and speed signals (HR/HIR) enter the HLS Module from the computer drivers on the I/O board, via the connecting ribbon cable, (pin numbers are indicated on prints, pin one is indicated by red conductor in ribbon cable); if a high speed run toward a call is required. Register a call and check the appropriate up or down arrow (SUA/SDA) LED. If neither arrow is on, make sure no special function has control of the car (INS in, INA out, and FWI -fire warning indicator- is off (Terminal 443 & 444 at 24-110V). If all the above functions are normal, registering a call must establish a direction arrow. If there is still no arrow refer to the section on Microprocessor Trouble-shooting.

Some of the above mentioned relay coils are hardware-interlocked through the door safety circuit. In order for the car to move away from a landing, all doors must be closed and locked. A locked condition is indicated by DLK indicator on I/O board lit (+12O VDC on Terminal 11, while an unlocked condition places 0 VDC on Terminal 11). If the door string indicates an unlocked condition, examine and repair the door locks as required. Should the U or D Relays remain out with a properly locked door circuit, check the operation of the relays by briefly jumping Terminals 4 to 30. U should pick. If it does, but jumping 4 to 28 does not, check and repair the UP STOP LIMIT switch. (Similarly try 4-29 and 4-33 for down.) If the U or D Relays pick on these tests (and the P Relay picks with either U or D) but do not with the registration of a call, with SU/SD indicator on I/O board lit, turn controller off and replace the ribbon cable connecting the HLS Module to the I/O. If SU/SD indicator does not lite-up, check that call registered LED indicated call latched, if you cannot get calls to latch-in, refer to the section on microprocessor Troubleshooting.

III.2. Malfunctions in an Operating System

III.2.1. Doors Operating Improperly or Not at All

Problem	Solution
Blows fused F8 and/or F7 and/or Resistor (RD1) Overheats (25ohms 225W).	Test For: (1) Damage to relays O, C, or CX. (2) Mechanical trouble on door operator on car.
Problem	**Solution**
No operation of doors, DO and DC relays operate OK, fuses F7 and F8 are OK.	Check: (1) All components in the O, C, and CX relay circuits, and (2) Mechanical trouble on door operator on car.
Problem	**Solution**
Doors operate one direction only and correct DO and DC relays are operating.	Test for contact closure across the proper relay- DC for close, DO for open.
Problem	**Solution**
Doors operate one direction only. Only one DO or DC relay will operate.	Check DOF/DCF indicator on I/O driver board. (Refer to Microprocessor Troubleshooting Guide). Turn "NORMAL-TEST” switch on HLS Module to NORMAL."
Problem	**Solution**
Door speed incorrect at either end of travel. Doors slam or drag.	Check: (1) Slowdown cams that operate slowdown resistors on door operator on car top. Readjust if necessary; and (2) Spring operated door closer on hoistway door.
Problem	**Solution**
Doors open a few inches or less at one particular landing and appear to be mechanically stuck but reclose so car can leave.	Readjust upper and lower link connections on lift rod for door lock so that lock properly clears lip of enclosure.
Problem	**Solution**
Other mechanical problems with doors.	Refer to drawings relating to mechanical portions of door operator.

III.2.2. Drive Problems

III.2.2.1 Refer to Mentor II manual supplied by manufacturer.

Note that a record of the last four drive failures have been recorded and can viewed thru parameters 10.25 thru 10.28. (Refer to page 71 in the SCR Drive manual).

III.2.2.2 The following critical drive values can be displayed on the SCR Drive digital readout, (refer to page 29 of the drive manual):

PARAMETER	DESCRIPTION	DATA	ACCESSED AT
11.01	Armature Voltage	03.04	00.01
11.02	Armature Current	05.02	00.02
05.05	Scaling of Arm Curr, set 2.5 x Rated Current	*	
11.03	Speed in FPM	03.03	00.03
03.16	Speed scaling, set to Contract Speed	*	
11.04	Speed Reference - Volts	01.02	00.04
11.05	Speed Feedback - Volts	03.02	00.05
11.06	AC line Voltage	07.06	00.06
11.07	Motor field amps (% 0f 06.11 x 10)	0603	00.07

III.2.2.3 Drive Programming – Following is a list of all drive parameters that have been changed from the drive default programming. It is recommended that the blank parameters be recorded after the elevator is completely adjusted.

QUICK REFERENCE SHEET

PARA METER	DESCRIPTION	FACTORY SET	FIELD SET	NOTES
02.04	FWD ACCEL 1	0005	0005	Sets minimum accel / decel time – unit is .1 sec
02.05	FWD DECEL 1	0005	0005	Sets minimum accel / decel time – unit is .1 sec
02.06	REV ACCEL 1	0005	0005	Sets minimum accel / decel time – unit is .1 sec
02.07	REV DECEL 1	0005	0005	Sets minimum accel / decel time – unit is .1 sec
03.09 (3)	SPEED LOOP P GAIN	030		Increase for more regulation
03.10 (3)	SPEED LOOP I GAIN	015		Increase for more regulation
03.12 (2)	DIGITAL FEEDBACK SELECTOR	0 / 1	0 / 1	0 = analog tachometer or armature, 1 = encoder feedback
03.13	ARM VOLTAGE / TACHOMETER	0	0	0 = tachometer, 1 = armature voltage feedback
03.14 (2)	ENCODER FEEDBACK SCALING	732		750000000 / (ppr x rpm) used for jobs with encoder
03.15 (1)	MAX ARMATURE VOLTAGE	Per nameplate		Drive output will not exceed this value
03.16 (2)	MAX SPEED (for display scaling)	Rated Speed	Rated Sp	Scales display viewed at 00.03 to FPM
03.23	ZERO SPEED THESHOLD	150	150	Sets output at TB3-34 for LSSM tach loss protection
04.04	CURRENT LIMIT	As required		[3 x motor full load amp / 2.5 x drive rating] x 1000, 0.1% of max
05.05	MAX IMUM CURRENT (scaled)	2.5 x drive rating	Same	Current scaling for readout at 00.02
05.12	DISCONTINUOUS I GAIN	065	*	* Set by autotune
05.13	CONTINUOUS P GAIN	033	*	* Set by autotune
05.14	CONTINUOUS I GAIN	033	*	* Set to value in 05.13 after autotune
05.15	MOTOR TIME CONSTANT	050	*	* Set by autotune
05.18	STANDSTILL ENABLE	1	0	Must be set to 0 for elevator application
06.07 (1)	BACK EMF SET POINT	Motor rating – 10		Voltage where MF weakens (sets running voltage)
06.08 (1)	MAX FIELD CURRENT 1	% of para 06.11		Sets field forcing current in % of parameter 06.11, unit is 0.1 %
06.09	MAX FIELD CURRENT 2	0500		Sets field standing current in % of parameter 06.11, unit is 0.1 %
06.10	MINIMUM FIELD CURRENT	0500		Sets field minimum current in % of parameter 06.11, unit is 0.1 %
06.11 (1)	FIELD FEEDBACK SCALING	02xx		xx = ½ amp increments up to 16 (8 amps). See note 4 for FXM5
06.12	FIELD ECONOMY TIMEOUT	030		Time after run field is reduced to standing field (seconds)
06.13	ENABLE FIELD CONTROL	1	1	Enables field control
06.15	ENABLE FIELD ECONOMY	1	1	Enables standing field timer
07.09	DAC 2 SOURCE	0302	0302	Sets output @ TB2-13 – Speed feedback to SDI (+/- 10 volts)
09.19	STATUS 3 SOURCE	0111	0111	Sets output @ TB3-17 – Drive On
09.25	STAUS 6 SOURCE	1009	1009	Sets output toTB3-34 – 15% speed output (parameter 03.23)
10.30	TACH LOSS ENABLE	0	0	(1) Will disable Tach Loss Sensing
11.01	PARAMETER VIEWED @ 00.01	0304	0304	ARMATURE VOLTAGE
11.02	PARAMETER VIEWED @ 00.02	0502	0502	ARMATURE CURRENT
11.03	PARAMETER VIEWED @ 00.03	0303	0303	SPEED IN FPM
11.04	PARAMETER VIEWED @ 00.04	0102	0102	SPEED COMMAND (+/-10 VOLTS)
11.05	PARAMETER VIEWED @ 00.05	0302	0302	TACHOMETER FEEDBACK (scaled to +/- 10 volts)
11.06	PARAMETER VIEWED @ 00.06	0706	0706	LINE VOLTAGE
11.07	PARAMETER VIEWED @ 00.07	0603	0603	MOTOR FIELD AMPS (% of 06.11 x 10)

NOTES:
Parameter xx.00 must be set to 200 to satisfy security requirements before any parameter can be changed.

Save changed parameters by setting parameter 00.00 to 1 and pressing “reset” or changes will be lost when power is cycled.

To perform an autotune of the current loop, set parameter 05.27 = 1, run elevator up and down for several seconds, set parameter 05.14 = 05.13, reset parameter 05.27 = 0, record and save parameters.

Parameter values blank in the FIELD SET column can be set during adjusting and recorded, parameters with values listed in the FIELD SET column can not be changed, see notes below.

(1) Motor Field Current – parameters 03.15 (Max Armature Volts), 06.07 (Back EMF Set Point), 06.08 & 06.11 (Motor Field Forcing Current), are interrelated and can cause bumps or porpoising at roll over into high speed. The cause is that parameter 03.15 will not let the armature voltage exceed the setting, if the motor field current does not reduce fast enough, the commanded speed cannot be met, causing a bump. The solution is to allow the armature voltage to go higher, momentarily, or reduce the motor forcing field. The armature running voltage will reduce to that set as parameter 06.07.
If the armature voltage is clamped, parameter 10.10 will change from 0 to 1.

(2) A hand tachometer must be used to adjust actual speed of the elevator.
If a tachometer is used for feedback, adjust potentiometer RV1 on the SCR Drive to obtain correct speed (cw will increase the elevator speed).
If an encoder is used, change parameter 03.14 to adjust speed. Decreasing 03.14 increases car speed.
Be sure that switches SW 1, B thru H are in the proper position; B to D is used for encoder, F to H for tachometer, only one can be on at a time.

(3) Parameters 03.09 and 03.10 can be increased as necessary to pick a full load or for better regulation. Higher values can cause oscillations. It is not recommended to increase parameter 03.09 over 80 or 03.10 over 40. Generally 03.10 should be ½ of 03.09.

(4) When using external field module FXM5, parameter 06.11 – xx = amps (15 amps = 215).

III.2.3. Call Button Problems

Problem	Solution
Car will not respond to a specific call.	If the system does not register a call (or a group of calls) but the car functions normally otherwise, the call information is not reaching the computer data storage memory. First make sure that the call common (terminal 6 for car calls or terminal 50 for hall calls) is live with correct voltage with respect to 3 buss. Then check the terminals on the controller. One easy method of determining whether the problem is internal to the controller or in the external field wiring is to momentarily jumper 3 to the call terminal number in question. If the car responds to the call, the problem is external. If not: (1) Check that when call terminal is jumped to terminal 3, the corresponding LED lights up, then refer to microprocessor troubleshooting section to check the computer CCD (HCDX) -Car (Hall) call disconnect- function inside computer which comes on to indicate computer not accepting calls. (2) Replace the associated input/output board.
Problem	Solution
Car responds to call button but call registration lamp will not light.	After verifying that the bulb is not burned out, check to see if the problem is internal to the controller or in the external wiring. This is most easily observed by noting if associated LED is lit. If it won't show call registration, check for voltage on call common supply. Should the common voltage be correct, replace the associated input/output driver board.

III.2.4. Position Indicator Malfunctions

The position indicator is strictly under software control.

Problem	Solution
Position indicator out of step with elevator car.	Refer to section 8 in SDI's manual, review sections dealing with Floor count, pulse, terminal, and hoistway not learned errors. Verify proper operation of the DZ input, making sure that the proper signal LED operates when magnetic switch is on a vane. Also check for missing or damaged hoistway vanes.

III.3. MICROPROCESSOR TROUBLESHOOTING

The basic idea of this section is to determine if the Computer Logic Check-out indicates a faulty board, and if so which, if any, of the microprocessor system logic boards is faulty, so that a good board may be substituted. No attempt has been made to diagnose specific problems that might be on any particular board, since to do so requires specialized test equipment not generally available to elevator service mechanics.

Let us assume that you have come to the conclusion that an output is not coming out of the computer system when conditions appear such that it should. At this point it becomes necessary to determine if the computer is trying to turn on the output or not, and if not, what is preventing it from doing so.

To find out what the computer is "thinking" or trying to do, we need to look into its memory itself. This is done by using the ON-BOARD diagnostics unit in the manner described in the Field Re-programming manual.

As an example, let us say that it is observed that the door open function output fails to operate the door open relay DO in response to a door opening input signal. It is observed that the DOF door open function output LED indicator does not turn-on. We now set the diagnostics switches as described, and locate the DOF function near the bottom of the Memory Flags Listing page which indicates an address of 9B for DOF and observe that, indeed, the LED indicator corresponding to the DOF position is off. This tells us the computer is not turning on the door open output. This must mean that either the open signal input (say door open button DOB address=81) is not coming in, or computer thinks doors are already fully open (DOLF -door open limit front input is zero, address 80), or it is otherwise unsafe to open doors (DZ=0 or HIR=1). Inspection of these flags will indicate either that an input was not supplied to the system properly, or that the computer cannot see it. In the later case we suspect that the I/O board (specially if DOB and DOLF do not track input signals), or ribbon cable connecting it to computer board is faulty.

In a manner similar to the example above, any other output/input can be traced to the computer memory in search for the faulty section. The section below illustrates the logic involved in the computer to process the indicated outputs and signals.

III.3.1. OPERATIONAL LOGIC DESCRIPTION

The following description of computer logic control is described in a synthesized format (Boolean logic flow equations). They are very simple to read and understand if the following guidelines are understood:

a. The logic equations below use signal abbreviations names as listed in the Field Re-programming manual; they are used on the job prints for the input/output signals. These abbreviations are easily learned since they clearly represent the signal name (e.g., DOB=door open button, DC=Down Call cancel, etc.).

b. The small zero superscript used on a signal name indicates that the signal is active when off, or it is required for signal to go off for something to happen. Thus, $DOLF^0$ is a signal that when on, indicates doors are not fully open, when off indicates that doors are fully open.

c. The plus symbol + is used to indicates an OR function. Thus the equation: DOB+SE reads, "either door open button input OR safety edge input". Likewise the & symbol is used to indicate an AND function. Thus the equation DOI & $DOLF^0$=DOF reads "door open intent on AND door open limit off will generate a door open function output". Please note that the words AND and OR are used instead of & and + symbols when combining two smaller equations.

LOGIC FLOW EQUATIONS

III.3.1.1 Door Open Function Output -DOF:

(Demand) CCF+UC+DC OR (Input) DOB+SE+PHE+DHLD AND DZ = DOI
DOI & $DOLF^0$ = DOF.

III.3.1.2 Door Open Function Rear Output -DOFR:

SAME AS ABOVE, FLAGS ARE SUFFIXED WITH LETTER R: CCFR, UCR, ETC.

III.3.1.3 Computer Up Output -SU:

Start: DZ & DLK^0 & HIR & DMU = SU
Hold: HIR+DZ^0 AND SU & DLK^0 = SU

III.3.1.4 Computer Down Output -SD:

Same as SU above, replace DMU/SU with DMD/SD.

DMU/DMD are the demand flags, they are set any time the computer is requested to move the car in response to a call (SUA+SDA = 1), car lost (BFD+TFD = 1), parking demand (UPF+LPF = 1), fire or emergency recall (FRM+EPR).

III.3.1.5 High Speed Output -HR:

Start: DLK^0 & EQA^0 & (DMU & USD1 + DMD & DSD1) & LVL & DOI^0 = HR
Drop: CCT+HCT+CCF+CCR = HR^0 . Call answered.
OR DMU^0 & DMD^0 & (SU & STU + SD & STD) = HR^0 . Lost demand.
OR DLK+EQA+(DNS & $DSD1^0$)+(UPS & $USD1^0$) = HR^0 . Not save for HR.

III.3.1.6 Call Disconnect and Reject -CCD, HCDX, HCR:

a. CCD - Car Call Disconnect (car calls won't latch):
IN+EPI+FRM+EPS+EQA+MLT+INC+ISR^0+TFD+BFD+CCDFU+CCDFD = CCD

b. HCDX - Hall Call Disconnect (hall calls won't latch):

FRS^0+FRA^0+EQA^0 = HCDX. If duplex both car's flags are considered.

c. HCR - Hall Call Reject (calls latch but car won't respond):

INC+FRM+EQA+TOS+ISR^0+HLW+SAF^0+IN+EPS = HCR

Even if HCR=0 (CCD=0), Hall (Car) calls will be ignored by computer (even when latched-in if car stopping table indicates car should not respond to such call. see car stopping table in Field Re-Programming manual.

III.3.2. HARDWARE LOGIC:

III.3.2.1. Computer Power Supply.

The proper voltage to the SDI and elevator computer boards is +5VDC +/-5%; this voltage should be checked at the power supply +OUT to -OUT terminals. If you need to adjust, be very cautious, turning adjustment for too high an output will cause the unit to trip out. If this happens, lower adjustment back, then cycle power off.

III.3.2.2. Microprocessor Board.

CAUTION: Do not depress the microprocessor reset button while car(s) is running, as it will cause car(s) to stop from whatever speed they are moving. Use extreme care.

Function of Lights and Switches.

On the processor board, there are nine light emitting diodes (LED's), five push buttons, and some switches. The one LED located by itself near the top of board is an indicator that, if on, says that the processor is at least functioning in a very basic way, but does not necessarily mean that the system is functioning normally. The eight remaining LED's are in a row, and are used to display the error/status codes (so will the LCD display, in English format). In general, the car A/B switch directs the eight LED's to be indicators for CAR A if the switch is UP or CAR B if the switch is DOWN for single computer duplex systems only. Normally, however, the A/B switch is always left in A position since most systems are supplied with one computer per car. Refer to Field Re-programming manual for details on the use of switches on computer board.

There are a group of special conditions that are recognized by the processor and if one of these "errors" occurs, the processor will display the code corresponding to that condition. Then this code is looked up by the serviceman in a chart to see what the situation was that caused the processor to display the error (see Table II for an error code listing, in Field Re-programming manual). Not all errors in the system are detected and displayed by the processor; but the most frequent errors have been programmed to be recognized. Even the fact that the door lock string is open, as it sometimes is during normal operation, is an "error" code, so this code will be frequently displayed during normal operation. The error codes are arranged in priorities so that if more than one problem is present; the most important one will be the one that is displayed (on LCD display provided, multiply error codes are displayed in scrolling fashion). The CAR A/B switch will select the error codes, if any, for whichever car is selected, but both cars cannot be viewed at the same time. So, if the switch is set on CAR A and a problem occurs on the other car, it will not be displayed. In a single car elevator system the CAR A - CAR B switch should be left in the CAR A position. Same is true for most systems supplied with one computer per car.

III.3.2.3. I/O Board (I/O-E X Board)

Since the I/O board performs the task of buffering between the relatively well protected five volt computer logic environment and the 110 volt electrically noisy outside world, most microprocessor system problems occur on the I/O boards. The input buffer section of the I/O accept high-level inputs from the HLS board or car signals, and convert them to five volts signals for the computer. Also included is low-pass filtering to reduce noise susceptibility, and Schmitt triggers to increase noise margin. The relay and signal driver section of the I/O board provides high voltage switching outputs to actuate relays on HLS module and general elevator signals.

SECTION IV

DETAILED EXPLANATION OF SUPERVISORY SUBSYSTEM

IV.1. Detailed Explanation of Supervisory control Subsystem Operation

The operation of a computer is basically serial. That is, the actual logical decision-making process is concerned with one piece of data at a time. Since an elevator is a continuous, real-time machine, the supervisory control subsystem microcomputer or microprocessor is made to operate in a loop, performing a pre-determined pattern of instructions many times each second. Its speed is such that each elevator control function appears to be continuously monitored. The paragraphs that follow offer a brief explanation of the basic control loop and the functions performed by the computer during each portion of that loop.

Before any logic decisions can be made, data must be acquired, so the first portion of the control loop is called "contact scan." At this time the microprocessor interrogates each input (hall calls, car calls, and power subsystem inputs) and saves them in the data storage memory. The data from the memory is then used during the rest of the control loop. In effect, the controller takes a "snapshot" of the entire elevator system, and uses that for decision-making. These snapshots are made many times each second, so that system monitoring is essentially continuous.

After the data has been acquired, proper outputs are computed for fire service.

The next major block in the control loop deals with stepping. This system has no mechanical floor selector. When power is first applied, the Supervisory Control system checks to see if the car is at the top landing (on the up slow down limit) or at the bottom landing (on the down slow down limit). If so, the internal electronic "selector" is set to the proper value. If the car happens to be somewhere in mid-hoistway when power is first applied, the system will obtain current car position from the SDI computer, whereupon it will become synchronized.

As the car passes each floor, the internal electronic "selector" is updated accordingly. The point of this stepping is actually one slow-down distance ahead of each floor. When the car steps into any given floor, the control system determines if there are any calls registered for that floor, and if so initiates a slow down and cancels the calls. This method requires no mechanical attachments to the car, such as chains, wires, or tapes.

After the controller processes data pertaining to a moving car it scans all calls present and selects a direction preference for the car if it is not already answering a call.

The next block in the control loop is concerned with proper operation of the doors. While the car is running, this portion is bypassed, but when the car enters door zone the block becomes very active. Some functions performed by the door processing block are door holding times (hall call time, car call time, and shortened door time) door opening and closing, and permission to proceed at high speed. The car actually moves in response to signals generated during the door portion, since all interlocks and timers as well as car panel button inputs must be correct in order for the car to move.

The final block of the control loop takes the data generated by all previous calculations, as well as the calls stored in memory, and lights the appropriate car panel and hall indicator lamps. The loop is now complete, and the processor starts over with contact scan. As mentioned previously, this whole loop is repeated many times each second, so that operation is smooth and, to all outward appearances, continuous.

It should be noted that the power-up logic, in addition to correctly presetting the floor selector memory location, clears all memory locations and output buffers prior to applying any signals to the power control subsystem to insure safe, stable operation.

Section V

MAINTENANCE

The Elevator Controls Microprocessor Elevator Controller has been designed to require as little routine maintenance as possible. In fact, the mechanical interconnections are the least reliable portion of the solid state system, and the less they are disturbed, the more likely the system is to continue to function properly.

The elevator itself, however, is a complex mechanical apparatus, and therefore requires periodic routine preventive maintenance. In addition to lubrication of the various moving parts, the door lock contacts should be cleaned and inspected regularly since the exposed contacts are susceptible to dirt and corrosion. The doors also receive the most wear, often making two or even three cycles at a floor.

In addition to the door lock contacts, the various rotating machinery belts and couplings should be routinely inspected for wear. Worn belts could cause loss of control of elevator car.

If the elevator system develops problems or becomes inoperative refer to the Troubleshooting guide.

Section VI

REPLACEMENT PARTS LIST

VI.1. ELEVATOR CONTROLS PC BOARDS.

1) MPC-P8 MICRO PROCESSOR BOARD
2) MPC-IO6-INT-Vxx MAIN INPUT/OUTPUT BOARD
5) MPC-IOEX-Vxx INPUT/OUTPUT EXTENSION BOARD
6) E.C. TIMER #100D
7) MPC-SDI AND SDI I/O MICRO PROCESSOR BOARDS

Note: xx is the FIXTURE VOLTAGE

VI.2. RELAYS

1) POTTER & BRUMFIELD
   A) KHAU-17A12N-120
   B) KHAU-17D12N-110
   C) KUP-14D35-110
   D) PRD11DH0-110VDC

2) OMRON
   A) MY4AC110/120S
   B) MY4-DC12S

3) IDEC
   A) RU4S-D12
   B) RU4S-A12
   C) RR3B-ULDC110V

VI.3. FUSES

1) LITTLE FUSE
   A) 312.250 1/4 AMP 250VOLT
   B) 312-001 1 AMP 250 VOLT
   C) 312-002 2 AMP " "
   D) 312-003 3 AMP " "
   E) 314-015 15 AMP 250 VOLT
   F) MDA TYPE 3, 5, 10 & 15 AMP 250 VOLT

2) BUSSMAN
   A) FRN-R 10, 20, 30, 60 AMP 250 VOLT
   B) FNQ 5,10,15A 500 VOLT
   C) DRIVE POWER FUSES – REFER TO PAGE 4 OF DRAWINGS FOR SIZE AND RATING

VI.4. POWER SUPPLY

POWER ONE HBAA-40W-A   MICRO PROCESSOR POWER SUPPLY

VI.5. SEMI-CONDUCTORS

MOTOROLA HEP-RO170
MOTOROLA 1N5347B – 10V, 5WATT, ZENER DIODE
MOTOROLA 1N5333B – 3.3V, 5WATT, ZENER DIODE
TECOR L4004F31 – 4 AMP, 400VOLT, SENSITIVE GATE TRIAC