ELEVATOR CONTROLS

SPECIFICATIONS FOR MICROPROCESSOR ELEVATOR CONTROLS

ELEVATOR EC CONTROLS

SIMPLE. SOLID. SUPPORTABLE.

Specifications for Microprocessor Elevator Controls

ELEVATOR EC CONTROLS

Simple. Solid. Supportable.

i INTRODUCTION – WHY ELEVATOR CONTROLS?

ELEVATOR CONTROLS, established in 1986, is a highly regarded manufacturer of Non-proprietary microprocessor-based elevator controls. Over **10,000 ELEVATOR CONTROLS** units are in service worldwide.

Everything we do at **ELEVATOR CONTROLS** is dedicated to Total Customer Satisfaction.

- We specify **Appropriate Technology** in our designs
  …to ensure "bullet-proof" field reliability.
- Key **PC Boards are Standardized** across our entire product line
  …to minimize spare board inventory burden.
- Our architecture provides **Universal Backward Compatibility**
  … to eliminate board and software version issues.
- Choose **Replacement PC Boards** with vintage or current components
  … to easily update older units to current technology
- Our commitment to **Quality and Support** is relentless
  … backed by the people and processes to make it happen.

Quality Philosophy

At **ELEVATOR CONTROLS**, our commitment is Total Quality Assurance. The responsibility for sustaining our demanding quality standard is shared by every employee. Engineering and manufacturing teams are equally challenged in the never-ending quality improvement process for services and products, to achieve greater customer satisfaction.

Our goal is to relentlessly improve quality in measurable ways. We strive for zero defects in every process. We are committed to providing the support, training, and time to achieve this goal.

Independent Ownership

ELEVATOR CONTROLS is independently owned and actively managed by Fernando Ortiz, President and Chief Operating Officer, and Francisco Ortiz, Vice President Product Engineering and Support.

Simple. Solid. Supportable.

At **ELEVATOR CONTROLS**, we believe that advances in technology should result in products that are easier to install, adjust, use and maintain. We describe our equipment as, "Simple. Solid. Supportable." – Expect no less when you specify **ELEVATOR CONTROLS**.

ii A HISTORY OF ACCOMPLISHMENTS

1970 Elevator Industries successfully markets inexpensive, simple relay logic controllers

1975 Microprocessor-based controls are pioneered with multiple design patents issued.

1986 Ortiz brothers acquire patents and rights to manufacture control systems and replacement boards.

1986 **ELEVATOR CONTROLS established.**

1987 Design philosophy solidified.

1987 PC-based monitoring pioneered.

1988 Modular, backward compatible controller architecture developed.

1989 Core PC boards established as standardized components for all products.

1991 V800 product platform developed.

1990's Continued product refinement and reliability improvement.

2001 **Ez-LINK**™ serial communication system introduced.

2002 Advanced **Interact**™ central and remote monitoring system introduced.

2003 V900 next generation platform integrates A17.1-2000 / B44-00 code, consolidates PC boards.

Next The history of innovation continues.

iii CONTROLLER APPLICATIONS GUIDE

V800-PVF Field Programmable Traction Controls with Position Velocity Feedback

Digitized Speed and Position Control for Mid- to High-Rise Premium Applications

TRACTION	AC	DC	MG
Maximum Car Speed	**1000 fpm** | 4 m/s	**2000 fpm** | 10.16 m/s	**1800 fpm** | 9.15 m/s
Drive Type	Flux Vector	Six-Pulse SCR	Motor Generator
Drive Control	Digital VVVF	Digital DC-SCR	EC Edge Drive
Motor Control Technique	Position & Velocity Feedback	Position & Velocity Feedback	Position & Velocity Feedback
Maximum Number Stops	64	64	64
Maximum Number of Cars	16	16	16
Configuration	Simplex, Duplex, Group	Simplex, Duplex, Group	Simplex, Duplex, Group
Landing System	Perforated Tape or Encoder	Perforated Tape or Encoder	Perforated Tape or Encoder
Short Floor	Yes	Yes	Yes
Pre-Torquing	Yes	Yes	Yes
Shipment	4-5 weeks	4-5 weeks	4-5 weeks
Recommended Use	**see Spec Section 3**	**see Spec Section 4**	**see Spec Section 4**

V800 Field Programmable Traction Elevator Controls

Digitized Speed Control for Low- to Mid-Rise Applications

TRACTION	AC	DC	MG
Maximum Car Speed	Closed Loop **350 fpm** | 1.78 m/s Open Loop **150 fpm** | .76 m/s	**350 fpm** | 1.78 m/s	**350 fpm** | 1.78 m/s
Drive Type	Flux Vector	Six-Pulse SCR	Motor Generator
Drive Control	Digital VVVF	Digital DC-SCR	EC Edge Drive
Motor Control Technique	Velocity Feedback or Open Loop	Velocity Feedback	Velocity Feedback
Maximum Number Stops	64	64	64
Maximum Number of Cars	16	16	16
Configuration	Simplex, Duplex, Group	Simplex, Duplex, Group	Simplex, Duplex, Group
Landing System	Tape or Magnetic Switch	Tape or Magnetic Switch	Tape or Magnetic Switch
Short Floor	Yes	Yes	Yes
Pre-Torquing	Yes	Yes	Yes
Shipment	4-5 weeks	4-5 weeks	4-5 weeks
Recommended Use	**see Spec Section 3**	**see Spec Section 4**	**see Spec Section 4**

H800 Field Programmable Hydraulic Elevator Controls

Economical, Reliable Control for Hydraulic Applications

HYDRAULIC	H800	HPAC
Maximum Number Stops	64	64
Maximum Number of Cars	16	16
Configuration	Simplex, Duplex, Group	Simplex
Landing System	Tape or Magnetic Switch	Tape or Magnetic Switch
Door Operator	Most Models	GAL MOD
Horsepower	to 100 HP	25 HP maximum
Shipment	3 weeks	48 hours
Recommended Use	**see Spec Section 5**	**see Spec Section 5**

iv HOW TO USE THESE SPECIFICATIONS

Step by Step

- **First,** select the equipment that meets your requirements using the Controller Applications Guide on page 3.
- **Next,** turn to the section called out under "Recommended Use" in the guide to confirm your selection.
- **Use the sections** entitled "Specifications" following to compile the spec for your project. For reference, enclosure dimensions and conditions for equipment operating environment(s) are located in Section 16, Physical Specifications.
- **Choose optional features** from Section 9 as desired.

Non-Proprietary "Serviceable & Maintainable" Equipment

ELEVATOR CONTROLS products that carry the **ELEVATOR CONTROLS** brand label are provided with onboard Non-Proprietary diagnostics and satisfy the list of requirements below.

It is recommended that the following language be incorporated into your Project Specifications to ensure that "Serviceable and Maintainable" equipment is provided:

1) **Diagnostics:** All diagnostics shall be provided onboard.
2) **Service Tool:** No service tool shall be required for equipment installation, adjustment, maintenance or troubleshooting.
3) **Parts:** Spare or replacement parts shall be available at published prices to anyone without restriction.
4) **Training:** Regularly scheduled technical training classes shall be available at reasonable cost to anyone without restriction.
5) **Telephone Support:** Telephone hotline support shall be available from trained, experienced technicians without charge.
6) **Field Support:** Field engineering support shall be available at the customer's location by prior arrangement at reasonable cost.
7) **Documentation:** All installation, adjustment, maintenance and troubleshooting manuals and documents required for proper equipment operation shall be provided with equipment at time of delivery. As-built prints shall be included. Replacement copies of these documents shall be readily available at reasonable cost.

v ELEVATOR CONTROLS LIMITED PRODUCT WARRANTY

Before attempting to install ELEVATOR CONTROLS products, please read and familiarize yourself with the respective manuals.

ELEVATOR CONTROLS warrants its products to be free from defects in materials and workmanship for a period of **15 months** from the date of shipment by **ELEVATOR CONTROLS**. Any defect appearing more than **15 months** from the date of shipment by **ELEVATOR CONTROLS** shall be deemed to be due to ordinary wear and tear. **ELEVATOR CONTROLS** assumes no risk or liability for results of the use of products purchased from it, including but without limiting the generality of foregoing: (1) the use in combination with any electrical or electronic components, circuits, systems assemblies or any other materials or substances; (2) unsuitability of any product for use in any circuit or assembly or environment.

Satisfaction of this warranty, consistent with other provision herein, shall be limited to, at the sole discretion of **ELEVATOR CONTROLS**, repair, replacement, or modification of the product, free of charge, F.O.B. factory. This warranty applies to any product which is received at the factory within said **15 months** and which, upon examination by **ELEVATOR CONTROLS**, is determined to have a defect which has not been caused by misuse, neglect, improper installation, improper application, improper operation, improper maintenance, repair or alteration, accident, or unusual deterioration or degradation of the equipment or parts thereof due to physical environment or due to electrical or electromagnetic noise environment.

Should purchaser experience trouble or difficulty with any product of **ELEVATOR CONTROLS** and request engineering assistance either by telephone or a field visit or visits by a representative of **ELEVATOR CONTROLS**, **ELEVATOR CONTROLS** may, at its sole discretion, provide said assistance. Should, in the opinion of **ELEVATOR CONTROLS**, the trouble or difficulty be a warranty problem as herein described, **ELEVATOR CONTROLS** will absorb all travel, labor, and expense costs involved. Should, in the opinion of **ELEVATOR CONTROLS**, the trouble or difficulty be a result of any other reason than the warranty described herein, the purchaser will be charged for the travel, labor, and expense costs by **ELEVATOR CONTROLS**, for providing engineering assistance, whether it be by telephone, correspondence, or field visit or visits by a representative of **ELEVATOR CONTROLS**. A schedule of fees is available on request for engineering services by **ELEVATOR CONTROLS**.

The giving of or failure to give any advice or recommendation by **ELEVATOR CONTROLS** shall not constitute any warranty by or impose any liability upon **ELEVATOR CONTROLS**. This warranty constitutes the sole and exclusive remedy of the purchaser and the exclusive liability of the manufacturer, AND IS IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS, IMPLIED, OR STATUTORY AS TO MERCHANTABILITY, FITNESS FOR PURPOSE SOLD, DESCRIPTION, QUALITY, PRODUCTIVITY, OR ANY OTHER MATTERS. In no event shall **ELEVATOR CONTROLS** be liable for special or consequential damages or for delay in performance of this warranty.

Section 1 THE ELEVATOR CONTROLS SUPPORT COMMITMENT

Telephone Technical Support shall be provided with unrestricted availability for Customers.

- Installation, adjustment and troubleshooting support are provided by knowledgeable, factory trained technicians.
- Multi-lingual telephone support is available.
- Product R&D engineers stand ready to respond to particularly challenging questions.
- Onsite product and engineering support is available worldwide by prior arrangement.
- **Call: 916/428-1708**
- **Fax: 916/428-1728**
- **E-Mail: techsupport@elevatorcontrols.com**

Section 2 GENERAL SPECIFICATIONS FOR ALL CONTROL PRODUCTS

2.0 General

This section describes features and/or requirements common to all control systems manufactured by **ELEVATOR CONTROLS**.

2.1 Code Compliance

Every elevator controller shall use a microprocessor-based logic system and shall comply with elevator and electrical safety codes applicable to the jurisdiction in which installation of equipment is intended.

Customer shall bear sole responsibility for: (1) identifying the controlling jurisdiction and; (2) verifying the code/s with which equipment must comply.

In view of the phased, jurisdiction-by-jurisdiction transition to the latest ANSI A17.1-2000 / B44-00 harmonized code, it is recommended that the installing Contractor contact the local inspecting authority for verification of code compliance required on a project-by-project basis.

The engineering data forms submitted for a project shall constitute sole authorization to manufacture equipment to comply with specific code/s. Any changes must be submitted in the form of a written data form amendment, clearly marked as superceding form/s previously submitted.

NOTICE: Equipment manufactured to meet requirements of code standards prior to A17.1-2000 / B44-00 cannot be economically field modified to switch between code editions. It is critical that the customer understand the implications of code compliance designated on data forms.

2.2 ADA Requirements

The elevator controllers shall comply with Title III of the Americans with Disabilities Act (ADA).

Car Lanterns - The controller shall have outputs to drive the visible and audible signals that are required to indicate when elevator car is answering a call. Audible signals shall sound once for up, twice for down. Optionally, Hall Lantern outputs shall be provided to drive visible and audible signals at each hoistway entrance to indicate which elevator car is answering a call.

Car Position Indicators - The controller shall have a position indicator output to drive the required position indicator which shall indicate the corresponding floor numbers as the car passes or stops at a floor. An audible signal shall sound as the position indicator changes floors.

OPTIONAL - The controller shall have a voice annunciator output to announce direction and floor number.

2.3 Operating Environment

Machine Room Temperature:	**Ambient air temperature range 32º to 104º F (0º to 40º C)**
Maximum Inside Enclosure:	**Shall not exceed 122º F** (50º C)
Operating Temperature:	**32º F to 122º F** (0º C to 50º C)
Storage Temperature:	**-22º F to 150º F** (-30º C to 65º C)
Humidity:	**10% to 90% non-condensing**
Altitude:	**Up to 7500 feet** (2286 m)

ELEVATOR CONTROLS specializes in making control products for adverse environmental conditions. For example, dust-proof, water-proof, corrosion-resistant, explosion-proof, or air-conditioned controller cabinets can be engineered to meet specific applications. Please contact **ELEVATOR CONTROLS** for details.

2.4 Out of Service Timer

An out of service timer (T.0.S.) shall be provided to take the car out of service if the car is delayed in leaving the landing while there are calls existing in the system.

2.5 Door Pre-Opening

When selected, this option shall permit doors to start to open when the car is in final leveling, from an adjustable distance from 3" (76.2 mm) from the floor. If pre-opening is not selected, the doors shall remain closed until the car is at the floor, at which time the doors shall commence opening.

2.6 Simplex Selective Collective Operation

Simplex selective collective automatic operation shall be provided for all single car installations. Operation of one or more car or hall call pushbuttons shall cause the car to start and run automatically, provided the hoistway door interlocks and car door contacts are closed. The car shall stop at the first car or hall call set for the direction of travel. Stops shall be made in the order in which car or hall calls set for the direction of travel are reached, regardless of the order in which they were registered. If only hall calls set for the opposite direction of travel of the elevator exist ahead of the car, the car shall proceed to the most distant hall call, reverse direction, and start collecting the calls.

2.7 Simplex Home Landing Operation

OPTIONAL - If no calls are registered, and after a field reprogrammable delay expires, this operation shall cause the car to travel to a predetermined home landing floor and stop without door operation. The home landing function shall cease instantly upon the appearance of a normal call.

2.8 Duplex Operation

The Smart Duplex system is described in detail in Section 7.

2.9 Group Operation

The G900 Group System is described in detail in Section 7.

2.10 Number of Stops
All controllers shall be capable of serving up to 64 landings.

2.11 Leveling
The car shall be equipped with two-way leveling to automatically bring the car level at any landing, within the required range of leveling accuracy, with any load up to full load.

2.12 Landing Systems
Refer to Section 11, LS Landing Systems, for specifications.

2.13 Uncancelled Call Bypass
A timer shall be provided to limit the amount of time a car is held at a floor due to a defective hall call or car call, including stuck pushbuttons. Call demand at another floor shall cause the car, after a predetermined time, to ignore the defective call and continue to provide service in the building.

2.14 Anti-Nuisance (Photo-Eye)
The controller computer shall cancel all remaining car calls, if an adjustable number of car calls are answered without the computer detecting a photo eye input.

2.15 Optional Peripherals
OPTIONAL - As an integral part of the controller, the capability shall be provided to attach on site or remote computer peripherals, yielding additional adjustment or diagnostic capabilities.

Section 3 MODEL V800 AC EQUIPMENT SPECIFICATIONS

Overview Model V800 AC Traction / Recommended Use

Elevator Controls Corporation is a highly regarded manufacturer of Non-proprietary, microprocessor-based elevator controls. Our equipment is designed and engineered using appropriate, proven technology… to ensure years of field reliability.

Our innovative, simplified system design makes powerful technology easy to use. Controllers are designed to make installation and adjustment simple and straightforward. All required diagnostics are provided onboard.

Key printed circuit boards are standardized across our entire product line… to minimize spare board inventory burden. Our unique design architecture incorporates universal backward compatibility… to eliminate board and software version issues and enable older equipment to be updated easily.

Elevator Controls Model V800 microcomputer based AC Controller utilizes state-of-the-art, large-scale integrated circuits and a high performance, modular circuit board design to optimize reliability while simplifying installation and maintenance.

Control boards are equipped with plainly labeled LED indicators that display elevator status and mode of operation for all computer inputs and outputs (I/O). Indicators are provided for call registration, car position, direction, etc. Additionally, a liquid crystal display (LCD) shows supplemental information in "plain English" format.

A simple to use, powerful diagnostic function is built into the Computer Microprocessor module including the ability to program elevator "personality" parameters onsite via the "**Field-Friendly**™" LCD display.

Drive options include:

- Closed Loop Flux Vector **Model V800 Type VF-CL**
- Closed Loop Vector + Position Velocity Feedback (PVF) option **Model V800 Type VF-CL PVF**
- Open Loop Vector **Model V800 Type VF**

The Open Loop Vector control is suitable for lower speeds, up to 150 FPM, where speed regulation accuracy ranging from 2% to 6% is acceptable. The Closed Loop Vector option is recommended for applications requiring precise speed regulation better than 1% and all applications with contract speed over 150 FPM.

Position Velocity Feedback (**PVF**), our dual-feedback system option, is available for closed loop control applications where the most demanding ride quality requirements must be satisfied. **PVF** is recommended for elevators of all speeds, especially higher speed geared and gearless

applications. It is also recommended for buildings with multiple floor heights where contract speed cannot be achieved in a single floor run.

3.0 General Specifications Model V800 AC Traction

The basic simplex elevator control system shall be comprised of a computer microprocessor, an I/O structure and a relay interface, in addition to a power supply, control transformer, contactor, and AC motor drive.

In duplex systems, the printed circuit board arrangement shall be similarly arranged for both cars, which shall communicate and share dispatching functions utilizing "**Smart Duplex**^{TM}" software. The Smart Duplex system is described in detail in Section 7.

An optional output connector for interface to a standard PC and video monitor shall provide remote communication and enable elevator system performance reports to be printed.

For group operation, the optional **G900 Group System** is available to dispatch up to 16 cars serving as many as 64 landings.

3.0.1 Fire Service

The fireman service operation and normal operating features shall be incorporated in accordance with the American National Standard Safety Code (ANSI A17.1) and applicable state and local codes.

3.0.2 Selective Door Timing

Adjustable timing parameters shall be provided to control door dwell time for passenger transfer. Independently adjustable, field reprogrammable standard and short door times shall be set without requiring a system shutdown. A minimum of four different door standing open times shall be provided. A car call time value shall predominate when only a car call is canceled. A hall call time value shall predominate whenever a hall call is canceled.

An independently adjustable parameter shall also be provided to control door reversal time. Activation of the photo eye input shall optionally cause short door timing to be used. An adjustable parameter shall be provided to control door dwell time during up peak operation, which shall be defined independent of any other door timing.

3.0.3 Door Operation

Door protection timers shall be provided for both the opening and closing directions, which will protect the door motor and will help prevent the car from getting stuck at a landing. The door open protection timer shall cease attempting to open the door after a predetermined time in the event that the doors are prevented from reaching the open position. In the event that the door closing attempt fails to make up the door locks after a predetermined time, the door close protection timer shall reopen the doors for a short time.

3.0.4 Nudging Operation

OPTIONAL - If doors are held open beyond a predetermined adjustable time, a buzzer shall sound and doors shall begin closing with reduced torque. Activation of the photo eye input shall be

ignored during nudging operation. Activation of the safety edge input shall optionally enable door reopening during nudging operation.

3.0.5 Safety Relays

All safety relays shall be DC voltage activated in order to improve low voltage relay latching. The controller shall not allow the car to run or operate in the event of any short circuit or ground fault.

3.0.6 Independent Service

Independent service operation shall be provided such that activation of a key switch in the car operating panel (COP) cancels all existing car calls and holds the doors open at the landing. When the key switch is activated, the car shall only respond to car calls disregarding all hall calls. Constant pressure on a car call button or a door close button shall be required, until the car starts to move, in order to close hoistway and car doors. All hall and jamb mounted lanterns shall be inactive when independent operation is activated.

3.0.7 Test Switch

A test switch shall be provided, in the controller, to enable operation for adjustment of the elevator. While in test mode, the elevator shall operate as in independent service without the door open function. When the test switch is activated the elevator shall be removed from any duplex or group, operating independently

3.0.8 Inspection Switch

An inspection switch and an up/down switch shall be provided, in the controller, to allow the elevator car to be controlled manually in inspection mode of operation. Inspection operation shall only be enabled when the top of car and in-car inspection switches are non-active, and all safeties and door protection circuits are on normal operation.

3.0.9 Built-in Diagnostics

The microprocessor controller shall be equipped with powerful monitoring/diagnostics logic to facilitate field troubleshooting and parameter reprogramming.

The built-in digital alpha/numerical display section of the diagnostics circuitry shall be capable of displaying elevator current error/fault status as diagnosed by the computer logic. In addition to information pertaining to data corresponding to computer memory, reprogrammable parameters, input/output status, fault retrieval, security code parameters, car and hall call registered, control program "flags", etc, as commanded by diagnostic switch settings made by a serviceman.

In addition to allowing a serviceman to enter calls, the diagnostics logic shall permit, without requiring system shut down, the reprogramming of parameters including, but not limited to, car stopping table, control timers (such as door timers, MG shut down times, maximum ETA), special functions (such as fire/parking floors, gong dinging control, group supervisory call assignment, automatic program selection parameters), and special optional features (such as building security access codes).

The controller shall also be equipped with a comprehensive number of indicators for displaying car position, direction, car/hall calls, relay indicators, etc. to facilitate elevator monitoring and troubleshooting at a glance.

3.0.10 Field Reprogrammable Parameters

The elevator controller shall include provisions for field reprogrammability including, but not limited to, the following parameters which shall be adjustable without requiring a system shutdown:

Group Controller

a. Number of cars required at the lobby.
b. Parking floor(s) assignments.
c. Up and down peak detection parameters.
d. Up and down peak minimum duration.
e. Call assignment parameters for parking cars.
f. Hall call waiting time.
g. Priority floors and corresponding waiting.
h. Stopping table for all cars including front/rear openings and direction of stop.
i. Timers: Parking, Hospital Emergency, etc.
j. Special features, including alternate call scheme stopping table, floor access codes for security operation, etc.

Car Controller

a. Door Timers: Car, Hall, Short, Lobby, etc.
b. MG shut down timers and stall protection timers.
c. Parking floors for simplex/duplex cars.
d. Stopping table including direction of stop and front/rear openings.
e. Backup dispatching car stopping table.
f. Security operation floor-access codes.
g. Normal and alternate fire return floors.
h. Special features including alternate call scheme stopping table, nudging, etc.

Field Reprogrammable System Timers

Onboard system timer parameters shall be reprogrammable and available for a minimum of the following functions:

a. Door protection timer
b. Short door timer
d. Car door timer
e. Hall door timer
f. Time out of service timer
g. Lobby door timer
h. Gong timer
i. Gong hold timer
j. Door hold timer
k. Motor limit timer

Reprogramming of parameters shall be accomplished by either of two means. An analyzer unit built into the controller shall allow interaction with the computer memory and system input/output directly. An optional CRT/keyboard package shall provide access by means of keyboard entry.

3.0.11 Loaded Car Operation

OPTIONAL - Should any car become loaded to a user preset adjustable load level, all door dwell timers shall be advanced to zero and car doors shall close without delay. Additionally, the car shall be automatically removed from group operation until the car load drops below the preset threshold.

3.0.12 Light Load Anti-Nuisance Operation

OPTIONAL - All registered car calls shall be canceled if a user preset adjustable number of entered car calls is exceeded, and the load in the car has not caused the light load switch to open. If a user preset adjustable number of car calls are answered without activation of the photo eye input, all registered car calls shall be canceled.

Model V800 Type VF-CL

Overview Model V800 Type VF-CL / Recommended Use

The **V800 VF-CL** car controller is an excellent choice to control AC motors for most geared and gearless elevators in modernization and new construction projects.

The **V800 VF-CL** provides solid state power control in a closed-loop system. Precise speed regulation – *better than +/- 1%* – is provided using quadrature encoder feedback and a closed loop drive design. Units are equipped with AC overloads and meet all applicable safety requirements.

The **V800 VF-CL** controller is recommended for all variable voltage/variable frequency AC (VVVF-AC) applications that require precise closed-loop speed regulation with 100% torque provided to zero speed. For optimum ride quality for VVVF-AC at any speed, and for all cars over 250 FPM, optional Position Velocity Feedback (PVF) is recommended. The PVF option is also recommended for buildings with significant variance in floor heights.

3.1.0 Specifications Model V800 Type VF-CL

The control system shall utilize a universal, standardized set of printed circuit boards to provide microcomputer, input/output and optional position velocity feedback functions.

Universal PC boards shall be common and interchangeable between all hydraulic, AC traction and DC traction controllers provided, which shall minimize spare board inventory requirements.

The controller design architecture shall incorporate universal backward compatibility, which shall eliminate board and software version compatibility issues and enable older equipment to be updated easily to current technology.

All diagnostics shall be accessible without requiring the need to attach external tools or troubleshooting devices.

All control equipment shall be enclosed in metal cabinets, equipped with lockable, removable doors and provided with means for ventilation.

The installing contractor shall ensure that all nonconducting metal parts in the machine room are grounded in accordance with the NFPA National Electric Code.

3.1.1 Controller

Individual elevator controllers shall store floor selector software in random access memory. Said software shall increment or decrement position information corresponding to the actual location of the car within the hoistway.

The elevator control system shall be of a closed loop, variable voltage variable frequency type, equipped with automatic two-way leveling. The control system shall incorporate an input/output control scheme which shall buffer the 120 VAC input voltage down to computer voltages.

The controller shall provide required electrical operation of the elevator control system, including the automatic application of the brake, which shall bring the car to rest in the event of power failure. When a car arrives at a floor and stops, both leads of the brake coil shall be disconnected from the source of power, in accordance with applicable codes. The brake shall be applied whenever the car is stopped at a floor and the door interlock circuit is opened.

3.1.2 Motor Drive

The motor drive shall be of a solid state, flux vector, variable voltage variable frequency, three phase AC type, mounted in each individual controller enclosure. The drive shall be a compact, self-contained unit, providing stepless acceleration, deceleration and regulation down to zero hertz. A digital encoder shall provide speed feedback.

The motor drive shall be capable of controlling an AC induction motor, positive or negative~~,~~ to the degree required, to maintain regulation under varying loads. The drive system shall control output power for the AC hoist motor which shall control the speed of the elevator.

The solid state motor drive regulation system shall incorporate a microprocessor-based servo-controller with speed feedback provided by an optical encoder (as required). Regulation shall be accomplished by means of electronic comparison of the reference signal to feedback signal currents. When any difference is present, control software shall respond accordingly to reduce the difference. Regulation shall be modified, employing linear acceleration and deceleration, to provide smooth and comfortable speed changes.

A means shall be provided for removing regenerated power from the drive system DC power supply. This power shall be dissipated in resistors or be returned to the three phase AC power line. Failure of the system to remove the regenerated power shall cause the drive output to be removed from the hoist motor.

An AC rated contact shall be used to disconnect the hoist motor from the output of the drive unit each time the elevator stops.

3.1.3 Leveling

The automatic leveling zone shall not extend more than 12" above or below the landing level nor shall the doors begin to open until the car is within 12" of the landing. In addition, the inner leveling zone~~s~~ shall extend not more than 3" above or below the landing. The car shall not move when stopped outside the inner leveling zone unless the doors are fully closed.

3.1.4 Overspeed Protection

A speed sensing means, independent from speed regulation feedback encoder, shall be provided and continuously compared to preset values for overspeed, feedback loss, leveling/inspection speed safety, and slowdown speed monitoring. The speed sensing means shall be capable of causing electric power to be removed from the motor and brake in order to prevent unsafe operation. Additionally, the motor drive system shall monitor the encoder feedback signal and cause power to be removed from the motor and brake if feedback is lost, or if a deviation in excess of a preset value is detected.

3.1.5 Interfacing Pilot Electromechanical Devices

Each individual car controller shall be equipped with interfacing pilot electromechanical devices as required for accepting necessary signals from elevator hoistway and operating switches. These shall include, as a minimum, terminal slowdown operation pushbuttons, emergency stop switches, and a governor overspeed switch.

All power feed lines to the brake shall be opened by an electromechanical switch. A single ground, short circuit or static control failure shall not prevent the application of the brake in the intended manner. Systems that do not apply the brake when the car stops at a landing shall not be accepted.

The failure of any static control device, or the occurrence of a single accidental ground or short circuit, shall not permit the car to start or run. In addition, if any hoistway door or car gate interlock is unlocked, or if any hoistway door or car gate contact is not in a closed position, the car shall not start or run.

For Group Operation: See Group Systems Section 7.

For Options: See System Options Section 9.

OPTIONAL PVF POSITION VELOCITY FEEDBACK SPECIFICATIONS For use with car controller Model V800 Types VF, SCR and EDGE

Overview Model PVF Position Velocity Feedback / Recommended Use

Elevator Controls has engineered a smart digital interface to provide microcomputer-based position and velocity feedback for both gearless and geared applications.

The **Position Velocity Feedback** (**PVF**) dual-feedback system option is available for closed loop control applications where the most demanding ride quality requirements must be satisfied. The **PVF** option provides position and velocity feedback for ultimate ride comfort and control of elevator motion. The **V800 VF-CL** equipped with **PVF** provides precise speed regulation better than +/- 1% using encoder feedback in combination with a closed loop drive design.

PVF utilizes state-of-the-art, large-scale integrated circuits and a high performance, modular circuit board design. This both optimizes reliability and simplifies installation and maintenance. The **PVF** can be used to control AC or DC motors in modernization and new construction applications.

PVF is recommended for elevators of all speeds, especially higher speed geared and gearless applications. It is also recommended for buildings with multiple floor heights where contract speed cannot be achieve in a single floor run.

3.2.0 Specifications Model PVF Position Velocity Feedback

A position feedback system shall be provided which is capable of continuously adjusting the mathematically computed optimal speed output as a function of distance from the target floor.

The control system shall produce an optimized velocity profile utilizing a dual-loop feedback system based on car position and speed. Systems that generate speed profile as a time-based function during deceleration, rather than a position-based function, shall not be accepted.

During deceleration the system shall function in such a way to provide accurate positioning of the elevator through final leveling without passenger discomfort, regardless of car load or direction of travel.

3.2.1 Position and Velocity Feedback

The control system shall be provided together with software that continuously evaluates mathematical equations in order to create an idealized, optimum velocity profile for car travel from any floor to any other floor. This system shall provide a smooth and stepless elevator ride. All system motion parameters (including jerk, acceleration, deceleration rates, etc.) shall be field programmable, within parametric limitations for system dynamics, and shall be stored in nonvolatile memory. Adjustment of these parameters shall not require the connection of any external device. Built-in programming and diagnostics with user-friendly, “plain English” display shall be provided.

3.2.2 Motor Drive

A solid-state motor drive in each individual controller shall provide power for an AC or DC hoist motor. It shall be a compact, self-contained unit that provides stepless acceleration and deceleration regulation utilizing speed feedback from a tachometer or digital encoder. Motor drive variables shall be digitally programmable without the need for any external device, or knowledge of any special programming language.

A velocity feedback device shall provide continuous comparison of actual car speed with the idealized velocity profile in order to provide accurate control of acceleration and deceleration through final leveling without passenger discomfort, regardless of car load or direction of travel.

3.2.3 Position Feedback

A position feedback system shall establish incremental car position within the elevator hoistway. Digital feedback of car position shall be provided using quadrature pulses generated as the elevator travels the entire length of the hoistway.

This system shall enable the elevator car to be positioned with accuracy of within 3/16 inch, or better. Leveling sensors shall provide car leveling accuracy of ¼ inch.

Compensation shall be provided for overtravel, undertravel, or rope stretch such that the car is brought level to the landing sill.

An electronic safety shall continuously monitor the car speed signal from the velocity transducer and compare it with the intended speed signal to verify proper and safe elevator operation.

3.2.4 Field Reprogrammable Parameters

Variables shall be field programmable without the need for any external device, or knowledge of any special programming language. Programmable parameters shall include, but not be limited to, the following:

a. Contract speed
b. Number of floors
c. Initial jerk
d. Roll over jerk
e. Deceleration jerk
f. Pattern delay
g. Acceleration
h. Deceleration
i. Leveling distance
j. Leveling speed
k. Releveling speed
l. Inspection speed
m. Tach polarity
n. Tach gain
o. Tach zero

3.2.5 Hoistway

The system shall be capable of automatically "learning" the position of each floor and all terminal slowdowns using a procedure that simply requires running the car the length of the hoistway. As part of this procedure, the correct speed at each slowdown shall be automatically recorded in non-volatile memory.

3.2.6 Built-in Diagnostics

The Position Velocity microcomputer shall be equipped with powerful monitoring/diagnostics logic to facilitate field troubleshooting and parameter reprogramming.

The built-in digital alpha/numerical display section of the diagnostics circuitry shall be capable of, but not limited to displaying elevator current error/fault status as diagnosed by the computer logic. In addition to information pertaining to data corresponding to reprogrammable parameters, input/output status, speed tracking performance, fault logs retrieval, trip sequence log and fault sequence playback, hoistway floor position and slowdown switches position data, terminal landing velocity data, and terminal speed safety clamps, etc., as commanded by diagnostic settings made by a serviceman without requiring connection of external tools or the use of a PC to accomplish the functions of the built-in diagnostics requirements.

Model V800 Type VF-OL

Overview Model V800 Type VF-OL / Recommended Use

The Open Loop Vector control is suitable for lower speed applications up to 150 FPM providing speed regulation accuracy ranging from 2% to 6%. Open loop control is not recommended for either higher speed or higher profile projects where precise speed regulation must be guaranteed down to 0 FPM. The Position Velocity Feedback (**PVF**) option is not applicable to open loop vector control.

The **V800 Type VF-OL** provides solid state power control in an open-loop system. Speed regulation is provided using sensorless vector drive control with motor slip compensation and speed estimating logic. Units are equipped with AC overloads and meet all applicable safety requirements.

3.3.0 Specifications Model V800 Type VF-OL

The control system shall utilize a universal, standardized set of printed circuit boards to provide microcomputer, input/output and position velocity feedback functions.

Universal PC boards shall be common and interchangeable between all hydraulic, AC traction and DC traction controllers provided, which shall minimize spare board inventory requirements.

The controller design architecture shall incorporate universal backward compatibility, which shall eliminate board and software version compatibility issues and enable older equipment to be updated easily to current technology.

All diagnostics shall be accessible without requiring the need to attach external tools or troubleshooting devices.

All control equipment shall be enclosed in metal cabinets, equipped with lockable, removable doors and provided with means for ventilation.

The installing contractor shall ensure that all nonconducting metal parts in the machine room are grounded in accordance with the NFPA National Electric Code.

3.3.1 Controller

Individual elevator controllers shall store floor selector software in random access memory. Said software shall increment or decrement position information corresponding to the actual location of the car within the hoistway.

The elevator control system shall be of an open loop, variable voltage variable frequency type, equipped with automatic two-way leveling. The control system shall incorporate an input/output control scheme which shall buffer the 120 VAC input voltage down to computer voltages.

The controller shall provide required electrical operation of the elevator control system including the automatic application of the brake, which shall bring the car to rest in the event of power

failure. When a car arrives at a floor and stops, both leads of the brake coil shall be disconnected from the source of power in accordance with applicable codes. The brake shall be applied whenever the car is stopped at a floor and the door interlock circuit is opened.

3.3.2 Motor Drive

The motor drive shall be of a solid state, variable voltage variable frequency, three phase AC type, mounted in each individual controller enclosure. The drive shall be a compact, self-contained unit providing stepless acceleration and deceleration down to leveling speed. Zero speed logic may use DC-current injection from leveling speed down to zero speed to accomplish final stop and application of the machine brake.

The motor drive shall be capable of controlling an AC induction motor to maintain 2 to 6% speed regulation under varying loads. The drive system shall control output power to the AC hoist motor which will control the speed of the elevator.

A means shall be provided for removing regenerated power from the drive system DC power supply. This power shall be dissipated in resistors or be returned to the three phase AC power line. Failure of the system to remove the regenerated power shall cause the drive output to be removed from the hoist motor.

An AC rated contact shall be used to disconnect the hoist motor from the output of the drive unit each time the elevator stops.

3.3.3 Leveling

The automatic leveling zone shall not extend more than 12" above or below the landing level nor shall the doors begin to open until the car is within 12" of the landing. In addition, the inner leveling zones shall extend not more than 3" above or below the landing. The car shall not move when stopped outside the inner leveling zone unless the doors are fully closed.

3.3.4 Overspeed Protection

A speed sensing means shall be provided and continuously monitored to shut down the car if either leveling or inspection speed exceeds 150 FPM. The speed sensing means shall be capable of causing electric power to be removed from the motor and brake to prevent unsafe operation.

3.3.5 Interfacing Pilot Electromechanical Devices

Each individual car controller shall be equipped with interfacing pilot electromechanical devices as required for accepting necessary signals from elevator hoistway and operating switches. These shall include, as a minimum, terminal slowdown operation pushbuttons, emergency stop switches, and a governor overspeed switch.

All power feed lines to the brake shall be opened by an electromechanical switch. A single ground, short circuit or static control failure shall not prevent the application of the brake in the intended manner. Systems that do not apply the brake when the car stops at a landing shall not be accepted.

The failure of any static control device, or the occurrence of a single accidental ground or short circuit, shall not permit the car to start or run. In addition, if any hoistway door or car gate interlock is unlocked, or if any hoistway door or car gate contact is not in a closed position, the car shall not start or run.

For Group Operation: See Group Systems Section 7.

For Options: See System Options Section 9.

Model V800 Types 1SAC, 2SAC

Overview Model V800 Types 1SAC, 2SAC / Recommended Use

The V800 One and Two Speed AC controls (1SAC and 2SAC) can be used to control AC motors for most geared elevators traveling at up to 150 fpm in modernization projects that do not require accurate floor leveling.

Control type 1SAC or 2SAC, for single or two speed AC motors, can be equipped with "**Smooth Move**™" variable voltage power drive to efficiently replace obsolete resistance speed rate controls, enhancing dependability and simplifying installation and maintenance.

3.4.0 Specifications Model V800 Types 1SAC, 2SAC

The control system shall utilize a universal, standardized set of printed circuit boards to provide microcomputer, input/output and position velocity feedback functions.

Universal PC boards shall be common and interchangeable between all hydraulic, AC traction and DC traction controllers provided, which shall minimize spare board inventory requirements.

The controller design architecture shall incorporate universal backward compatibility, which shall eliminate board and software version compatibility issues and enable older equipment to be updated easily to current technology.

All diagnostics shall be accessible without requiring the need to attach external tools or troubleshooting devices.

All control equipment shall be enclosed in metal cabinets, equipped with lockable, removable doors and provided with means for ventilation.

The installing contractor shall ensure that all nonconducting metal parts in the machine room are grounded in accordance with the NFPA National Electric Code.

3.4.1 Controller

Individual elevator controllers shall store floor selector software in random access memory. Said software shall increment or decremented position information corresponding to the actual location of the car within the hoistway.

The elevator controls system shall be of a full voltage, across the line starting type, optionally provided with a variable voltage Smooth Move™ drive, equipped with automatic two-way leveling. The control system shall incorporate an input/output control scheme which shall buffer the 120 VAC input voltage down to computer voltages.

The controller shall provide the required electrical operation of the elevator control system, including the automatic application of the brake, which shall bring the car to rest in the event of power failure. When a car arrives at a floor and stops, both leads of the brake coil shall be disconnected from the source of power, in accordance with applicable codes. The brake shall be

applied whenever the car is stopped at a floor and the door interlock is opened.

3.4.2 Motor Drive

The motor drive shall be of either a full voltage across the line starter or an optional solid state variable voltage, three phase AC motor drive type (**Smooth Move**^{TM}), mounted in each individual controller enclosure. The drive shall be a compact, self-contained unit providing acceleration control for one or two speed AC motors, and deceleration control from high to low speed transition for two speed AC motors.

The motor starter shall enable the three phase AC one or two speed AC motor to return regenerated power to the three phase AC power line.

An AC rated contact shall be used to disconnect the hoist motor from the output of the drive unit each time the elevator stops.

3.4.3 Leveling

The automatic leveling zone shall not extend more than 12" above or below the landing level nor shall the doors begin to open until the car is within 12" of the landing. In addition, the inner leveling zones shall extend not more than 3" above or below the landing. The car shall not move when stopped outside the inner leveling zone unless the doors are fully closed.

3.4.4 Overspeed Protection

For 1/2SAC control systems for cars with contract speed over 150 FPM, a speed sensing means shall be provided. This system shall be continuously monitored, and shall shut down the car if either leveling or inspection speed exceeds 150 FPM. The speed sending means shall be capable of causing electric power to be removed from the motor and brake to prevent unsafe operation.

3.4.5 Interfacing Pilot Electromechanical Devices

Each individual car controller shall be equipped with interfacing pilot electromechanical devices as required for accepting necessary signals from elevator hoistway and operating switches. These shall include, as a minimum, terminal slowdown operation pushbuttons, emergency stop switches, and a governor overspeed switch.

All power feed lines to the brake shall be opened by an electromechanical switch. A single ground, short circuit or static control failure shall not prevent the application of the brake in the intended manner. Systems that do not apply the brake when the car stops at a landing shall not be accepted.

The failure of any static control device, or the occurrence of a single accidental ground or short circuit, shall not permit the car to start or run. In addition, if any hoistway door or car gate interlock is unlocked, or if any hoistway door or car gate contact is not in a closed position, the car shall not start or run.

For Group Operation: See Group Systems Section 7.
For Options: See System Options Section 9.

Section 4 MODEL V800 DC EQUIPMENT SPECIFICATIONS

Overview Model V800 DC Traction /Recommended Use

Elevator Controls Corporation is a highly regarded manufacturer of Non-proprietary, microprocessor-based elevator controls. Our equipment is designed and engineered using appropriate, proven technology… to ensure years of field reliability.

Our innovative, simplified system design makes powerful technology easy to use. Controllers are designed to make installation and adjustment simple and straightforward. All required diagnostics are provided onboard.

Key printed circuit boards are standardized across our entire product line… to minimize spare board inventory burden. Our unique design architecture incorporates universal backward compatibility… to eliminate board and software version issues and enable older equipment to be updated easily.

Elevator Controls Model V800 microcomputer based DC Controller utilizes state-of-the-art, large-scale integrated circuits and a high performance, modular circuit board design to optimize reliability while simplifying installation and maintenance.

Control boards are equipped with plainly labeled LED indicators that display elevator status and mode of operation for all computer inputs and outputs (I/O). Indicators are provided for call registration, car position, direction, etc. Additionally, a liquid crystal display (LCD) shows supplemental information in "plain English" format.

A simple to use, powerful diagnostic function is built into the Computer Microprocessor module including the ability to program elevator "personality" parameters onsite via the "**Field-Friendly**™" LCD display.

Drive options include:

- Closed Loop with Digital DC-SCR drive **Model V800 Type SCR**
- Closed Loop + Position Velocity Feedback (PVF) option available for Closed Loop applications with DC-SCR drives **Model V800 Type SCR-PVF**
- Closed Loop VV-DC MG with Elevator Controls' Electronic Drive for Geared and Gearless Elevators employing motor-generator sets **Model V800 Type EDGE**
- Closed Loop + Position Velocity Feedback (PVF) option available for Closed Loop applications with VV-DC motor-generator sets **Model V800 Type EDGE-PVF**
- Open Loop VV-DC MG with Elevator Controls' Electronic Drive for Geared Elevators employing motor-generator sets **Model V800 Type GMB**

Model V800 Type SCR-PVF is suitable for most modernization projects where existing DC motors will be reused and new installations utilizing DC motors for geared or gearless elevators to 1800 FPM.

For cars with contract speed below 250 FPM, the **Model V800 Type SCR** is an economical alternative when ride quality requirements are less demanding and position velocity feedback is not required.

For projects requiring the retention or new installation of motor-generator sets, **Model V800 Type EDGE-PVF** is recommended. **Model V800 Type EDGE** is recommended for contract speed below 250 FPM when ride quality requirements are less demanding. For controller changeover with contract speed below 250 FPM and motor-generator sets, **Model V800 Type GMB** the most economical alternative when open loop controls are acceptable.

Position Velocity Feedback (**PVF**), our dual-feedback system option, is available for closed loop control applications where the most demanding ride quality requirements must be satisfied. **PVF** is recommended for elevators of all speeds, especially higher speed geared and gearless applications. It is also recommended for buildings with multiple floor heights where contract speed cannot be achieve in a single floor run.

4.0 General Specifications Model V800 DC Traction

The basic simplex elevator control system shall be comprised of a computer microprocessor, an I/O structure and a relay interface, in addition to a power supply, control transformer, starter/contactor, and motor drive.

In duplex systems, the printed circuit board arrangement shall be similarly arranged for both cars, which shall communicate and share dispatching functions utilizing "**Smart Duplex**™" software. The Smart Duplex system is described in detail in Section 7.

An optional output connector for interface to a standard PC and video monitor shall provide remote communication and enable elevator system performance reports to be printed.

For group operation, the optional **G900 Group System** is available to dispatch up to 16 cars serving as many as 64 landings.

4.0.1 Fire Service

The fireman service operation and normal operating features shall be incorporated in accordance with the American National Standard Safety Code (ANSI A17.1) and applicable state and local codes.

4.0.2 Selective Door Timing

Adjustable timing parameters shall be provided to control door dwell time for passenger transfer. Independently adjustable, field reprogrammable standard and short door times shall be set without requiring a system shutdown. A minimum of four different door standing open times shall be provided. A car call time value shall predominate when only a car call is canceled. A hall call time value shall predominate whenever a hall call is canceled.

An independently adjustable parameter shall also be provided to control door reversal time. Activation of the photo eye input shall optionally cause short door timing to be used. An adjustable parameter shall be provided to control door dwell time during up peak operation, which shall be defined independent of any other door timing.

4.0.3 Door Operation

Door protection timers shall be provided for both the opening and closing directions, which will protect the door motor and will help prevent the car from getting stuck at a landing. The door open protection timer shall cease attempting to open the door after a predetermined time in the event that the doors are prevented from reaching the open position. In the event that the door closing attempt fails to make up the door locks after a predetermined time, the door close protection timer shall reopen the doors for a short time.

4.0.4 Nudging Operation

OPTIONAL - If doors are held open beyond a predetermined adjustable time, a buzzer shall sound and doors shall begin closing with reduced torque. Activation of the photo eye input shall be ignored during nudging operation. Activation of the safety edge input shall optionally enable door reopening during nudging operation.

4.0.5 Safety Relays

All safety relays shall be DC voltage activated in order to improve low voltage relay latching. The controller shall not allow the car to run or operate in the event of any short circuit or ground fault.

4.0.6 Independent Service

Independent service operation shall be provided such that activation of a key switch in the car operating panel (COP) cancels all existing car calls and holds the doors open at the landing. When the key switch is activated, the car shall only respond to car calls disregarding all hall calls. Constant pressure on a car call button or a door close button shall be required, until the car starts to move, in order to close hoistway and car doors. All hall and jamb mounted lanterns shall be inactive when independent operation is activated.

4.0.7 Test Switch

A test switch shall be provided, in the controller, to enable operation for adjustment of the elevator. While in test mode, the elevator shall operate as in independent service without the door open function. When the test switch is activated the elevator shall be removed from any duplex or group, operating independently

4.0.8 Inspection Switch

An inspection switch and an up/down switch shall be provided, in the controller, to allow the elevator car to be controlled manually in inspection mode of operation. Inspection operation shall only be enabled when the top of car and in-car inspection switches are non-active, and all safeties and door protection circuits are on normal operation.

4.0.9 Built-in Diagnostics

The microprocessor controller shall be equipped with powerful monitoring/diagnostics logic to facilitate field troubleshooting and parameter reprogramming.

The built-in digital alpha/numerical display section of the diagnostics circuitry shall be capable of displaying elevator current error/fault status as diagnosed by the computer logic. In addition to information pertaining to data corresponding to computer memory, reprogrammable parameters, input/output status, fault retrieval, security code parameters, car and hall call registered, control program "flags", etc, as commanded by diagnostic switch settings made by a serviceman.

In addition to allowing a serviceman to enter calls, the diagnostics logic shall permit, without requiring system shut down, the reprogramming of parameters including, but not limited to, car stopping table, control timers (such as door timers, MG shut down times, maximum ETA), special functions (such as fire/parking floors, gong dinging control, group supervisory call assignment, automatic program selection parameters), and special optional features (such as building security access codes).

The controller shall also be equipped with a comprehensive number of indicators for displaying car position, direction, car/hall calls, relay indicators, etc. to facilitate elevator monitoring and troubleshooting at a glance.

4.0.10 Field Reprogrammable Parameters

The elevator controller shall include provisions for field reprogrammability including, but not limited to, the following parameters which shall be adjustable without requiring a system shutdown:

Group Controller

a. Number of cars required at the lobby.
b. Parking floor(s) assignments.
c. Up and down peak detection parameters.
d. Up and down peak minimum duration.
e. Call assignment parameters for parking cars.
f. Hall call waiting time.
g. Priority floors and corresponding waiting.
h. Stopping table for all cars including front/rear openings and direction of stop.
i. Timers: Parking, Hospital Emergency, etc.
j. Special features, including alternate call scheme stopping table, floor access codes for security operation, etc.

Car Controller

a. Door Timers: Car, Hall, Short, Lobby, etc.
b. MG shut down timers and stall protection timers.
c. Parking floors for simplex/duplex cars.
d. Stopping table including direction of stop and front/rear openings.
e. Backup dispatching car stopping table.

f. Security operation floor-access codes.
g. Normal and alternate fire return floors.
h. Special features including alternate call scheme stopping table, nudging, etc.

Field Programmable System Timers
Onboard system timer parameters shall be programmable and be available for a minimum of the following functions:

a. Door protection timer
b. Short door timer
d. Car door timer
e. Hall door timer
f. Time out of service timer
g. Lobby door timer
h. Gong timer
i. Gong hold timer
j. Door hold timer
k. Motor limit timer

Reprogramming of parameters shall be accomplished by either of two means. An analyzer unit built into the controller shall allow interaction with the computer memory and system input/output directly. An optional CRT/keyboard package shall provide access by means of keyboard entry.

4.0.11 Loaded Car Operation

OPTIONAL - Should any car become loaded to a user preset adjustable load level, all door dwell timers shall be advanced to zero and car doors shall close without delay. Additionally, the car shall be automatically removed from group operation until the car load drops below the preset threshold.

4.0.12 Light Load Anti-Nuisance Operation

OPTIONAL - All registered car calls shall be canceled if a user preset adjustable number of entered car calls is exceeded, and the load in the car has not caused the light load switch to open. If a user preset adjustable number of car calls are answered without activation of the photo eye input, all registered car calls shall be canceled.

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Model V800 Type SCR

Overview Model V800 Type SCR / Recommended Use

The **V800 SCR** car controller is an excellent choice to control DC motors for most geared elevators in modernization and new construction projects. For cars with speeds above 250 FPM or requiring the most demanding ride quality, **Model V800 Type SCR-PVF** is recommended.

The V800 SCR provides solid state power control in a closed-loop system. Precise speed regulation – *better than +/- 1%* – is provided using quadrature encoder (or tachometer feedback) in combination with closed loop drive design. All units are equipped with overloads and meet all applicable safety requirements.

4.1.0 Specifications Model V800 Type SCR

The control system shall utilize a universal, standardized set of printed circuit boards to provide microcomputer, input/output and optional position velocity feedback functions.

Universal PC boards shall be common and interchangeable between all hydraulic, AC traction and DC traction controllers provided, which shall minimize spare board inventory requirements.

The controller design architecture shall incorporate universal backward compatibility, which shall eliminate board and software version compatibility issues and enable older equipment to be updated easily to current technology.

All diagnostics shall be accessible without requiring the need to attach external tools or troubleshooting devices.

All control equipment shall be enclosed in metal cabinets, equipped with lockable, removable doors and provided with means for ventilation.

The installing contractor shall ensure that all nonconducting metal parts in the machine room are grounded in accordance with the NFPA National Electric Code.

4.1.1 Controller

Individual elevator controllers shall store floor selector software in random access memory. Said software shall increment or decrement position information corresponding to the actual location of the car within the hoistway.

The elevator control system shall be of a closed loop, DC-SCR type, equipped with automatic two-way leveling. The control system shall incorporate an input/output control scheme which shall buffer the 120 VAC input voltage down to computer voltages.

The controller shall provide required electrical operation of the elevator control system, including the automatic application of the brake, which shall bring the car to rest in the event of power failure. When a car arrives at a floor and stops, both leads of the brake coil shall be disconnected from the source of power, in accordance with applicable codes. The brake shall be applied

whenever the car is stopped at a floor and the door interlock circuit is opened.

4.1.2 Motor Drive

The motor drive shall be of a solid state, closed loop, fused, full-wave regenerative DC-SCR digital drive type, with outputs for the hoist motor armature and hoist motor field mounted in each individual controller enclosure. The drive shall be a compact, self-contained unit, providing stepless acceleration, deceleration and regulation down to zero speed. A digital encoder or speed tachometer shall provide the speed feedback signal.

The motor drive shall be capable of controlling a DC motor, positive or negative, to the degree required, to maintain regulation under varying loads. The drive system shall control output power for the DC hoist motor which shall control the speed of the elevator.

The solid state motor drive regulation system shall incorporate a microprocessor-based controller with speed feedback provided by an optical encoder or speed tachometer (as required). Regulation shall be accomplished by means of electronic comparison of the reference signal to feedback signal currents. When any difference is present, control software shall respond accordingly to reduce the difference. Regulation shall be modified, employing linear acceleration and deceleration, to provide smooth and comfortable speed changes.

A means shall be provided for removing regenerated power from the drive system. This power shall be returned to the three phase AC power line.

Overload protection device shall be provided in the armature circuit and a DC contactor shall be used disconnect power to the motor armature any time the car stops and brake is applied

4.1.3 Leveling System

The automatic leveling zone shall not extend more than 12" above or below the landing level nor shall the doors begin to open until the car is within 12" of the landing. In addition, the inner leveling zones shall extend not more than 3" above or below the landing. The car shall not move when stopped outside the inner leveling zone unless the doors are fully closed.

4.1.4 Overspeed Protection

A means for sensing motor field current shall be provided to ensure that regulation is maintained at all times. Under conditions where direct current flow in the shunt field of the motor is insufficient to prevent an overspeed condition, electric power shall be removed from the armature and brake. In addition, the power control shall be arranged to monitor the voltage of the hoist motor that shall be compared continuously to the predetermined pattern and the reference from the machine speed feedback device.

The power control shall be arranged to continuously monitor the performance of the elevator such that if the car speed exceeds 150 fpm during access, inspection, or leveling, the car shall shut down immediately, requiring a serviceman to reset it.

4.1.5 Interfacing Pilot Electromechanical Devices

Each individual car controller shall be equipped with interfacing pilot electromechanical devices as required for accepting necessary signals from elevator hoistway and operating switches. These shall include, as a minimum, terminal slowdown operation pushbuttons, emergency stop switches, and a governor overspeed switch.

All power feed lines to the brake shall be opened by an electromechanical switch. A single ground, short circuit or static control failure shall not prevent the application of the brake in the intended manner. Systems that do not apply the brake when the car stops at a landing shall not be accepted.

The failure of any static control device, or the occurrence of a single accidental ground or short circuit, shall not permit the car to start or run. In addition, if any hoistway door or car gate interlock is unlocked, or if any hoistway door or car gate contact is not in a closed position, the car shall not start or run.

For Group Operation: See Group Systems Section 7.

For Options: See System Options Section 9.

OPTIONAL PVF POSITION VELOCITY FEEDBACK SPECIFICATIONS For use with car controller Model V800 Types VF, SCR and EDGE

Overview Model PVF Position Velocity Feedback / Recommended Use

Elevator Controls has engineered a smart digital interface to provide microcomputer-based position and velocity feedback for both gearless and geared applications.

The **Position Velocity Feedback** (**PVF**) dual-feedback system option is available for closed loop control applications where the most demanding ride quality requirements must be satisfied. The **PVF** option provides position and velocity feedback for ultimate ride comfort and control of elevator motion. The **V800 SCR** equipped with **PVF** provides precise speed regulation better than +/- 1% using encoder feedback in combination with a closed loop drive design.

PVF utilizes state-of-the-art, large-scale integrated circuits and a high performance, modular circuit board design. This both optimizes reliability and simplifies installation and maintenance. The **PVF** can be used to control AC or DC motors in modernization and new construction applications.

PVF is recommended for elevators of all speeds, especially higher speed geared and gearless applications. It is also recommended for buildings with multiple floor heights where contract speed cannot be achieve in a single floor run.

4.2.0 Specifications Model PVF Position Velocity Feedback

A position feedback system shall be provided which is capable of continuously adjusting the mathematically computed optimal speed output as a function of distance from the target floor.

The control system shall produce an optimized velocity profile utilizing a dual-loop feedback system based on car position and speed. Systems that generate speed profile as a time-based function during deceleration, rather than a position-based function, shall not be accepted.

During deceleration the system shall function in such a way to provide accurate positioning of the elevator through final leveling without passenger discomfort, regardless of car load or direction of travel.

4.2.1 Position and Velocity Feedback

The control system shall be provided together with software that continuously evaluates mathematical equations in order to create an idealized, optimum velocity profile for car travel from any floor to any other floor. This system shall provide a smooth and stepless elevator ride. All system motion parameters (including jerk, acceleration, deceleration rates, etc.) shall be field programmable, within parametric limitations for system dynamics, and shall be stored in nonvolatile memory. Adjustment of these parameters shall not require the connection of any external device. Built-in programming and diagnostics with user-friendly, “plain English” display shall be provided.

4.2.2 Motor Drive

A solid-state motor drive in each individual controller shall provide power for an AC or DC hoist motor. It shall be a compact, self-contained unit that provides stepless acceleration and deceleration regulation utilizing speed feedback from a tachometer or digital encoder. Motor drive variables shall be digitally programmable without the need for any external device, or knowledge of any special programming language.

A velocity feedback device shall provide continuous comparison of actual car speed with the idealized velocity profile in order to provide accurate control of acceleration and deceleration through final leveling without passenger discomfort, regardless of car load or direction of travel.

4.2.3 Position Feedback

A position feedback system shall establish incremental car position within the elevator hoistway. Digital feedback of car position shall be provided using quadrature pulses generated as the elevator travels the entire length of the hoistway.

This system shall enable the elevator car to be positioned with accuracy of within 3/16 inch, or better. Leveling sensors shall provide car leveling accuracy of ¼ inch.

Compensation shall be provided for overtravel, undertravel, or rope stretch such that the car is brought level to the landing sill.

An electronic safety shall continuously monitor the car speed signal from the velocity transducer and compare it with the intended speed signal to verify proper and safe elevator operation.

4.2.4 Field Reprogrammable Parameters

Variables shall be field programmable without the need for any external device, or knowledge of any special programming language. Programmable parameters shall include, but not be limited to, the following:

a. Contract speed
d. Number of floors
e. Initial jerk
d. Roll over jerk
e. Deceleration jerk
f. Pattern delay
g. Acceleration
h. Deceleration
i. Leveling distance
j. Leveling speed
k. Releveling speed
l. Inspection speed
m. Tach polarity
n. Tach gain
o. Tach zero

4.2.5 Hoistway

The system shall be capable of automatically "learning" the position of each floor and all terminal slowdowns using a procedure that simply requires running the car the length of the hoistway. As part of this procedure, the correct speed at each slowdown shall be automatically recorded in non-volatile memory.

4.2.6 Built-in Diagnostics

The Position Velocity microcomputer shall be equipped with powerful monitoring/diagnostics logic to facilitate field troubleshooting and parameter reprogramming.

The built-in digital alpha/numerical display section of the diagnostics circuitry shall be capable of, but not limited to displaying elevator current error/fault status as diagnosed by the computer logic. In addition to information pertaining to data corresponding to reprogrammable parameters, input/output status, speed tracking performance, fault logs retrieval, trip sequence log and fault sequence playback, hoistway floor position and slowdown switches position data, terminal landing velocity data, and terminal speed safety clamps, etc., as commanded by diagnostic settings made by a serviceman without requiring connection of external tools or the use of a PC to accomplish the functions of the built-in diagnostics requirements.

Model V800 Type EDGE for Motor Generators

Overview Model V800 Type EDGE / Recommended Use

The **V800 EDGE** car controller is an excellent choice to control DC motors for most geared and gearless elevators in modernization and new construction projects requiring the use of VV-DC with motor-generator sets. For cars with speeds above 250 FPM or requiring the most demanding ride quality, model **V800 Type EDGE-PVF** is recommended.

The **V800 EDGE** provides solid state power control in a closed-loop system. Precise speed regulation to +/- 1% is provided using tachometer feedback in combination with closed loop drive design. All units are equipped with overloads and meet all applicable safety requirements.

4.3.0 Specifications Model V800 Type EDGE

The control system shall utilize a universal, standardized set of printed circuit boards to provide microcomputer, input/output and optional position velocity feedback functions.

Universal PC boards shall be common and interchangeable between all hydraulic, AC traction and DC traction controllers provided, which shall minimize spare board inventory requirements.

The controller design architecture shall incorporate universal backward compatibility, which shall eliminate board and software version compatibility issues and enable older equipment to be updated easily to current technology.

All diagnostics shall be accessible without requiring the need to attach external tools or troubleshooting devices.

All control equipment shall be enclosed in metal cabinets, equipped with lockable, removable doors and provided with means for ventilation.

The installing contractor shall ensure that all nonconducting metal parts in the machine room are grounded in accordance with the NFPA National Electric Code.

4.3.1 Controller

Individual elevator controllers shall store floor selector software in random access memory. Said software shall increment or decrement position information corresponding to the actual location of the car within the hoistway.

The elevator control system shall be of a closed loop, variable voltage, DC motor generator type, equipped with automatic two-way leveling. The control system shall incorporate an input/output control scheme which shall buffer the 120 VAC input voltage down to computer voltages.

The controller shall provide required electrical operation of the elevator control system, including the automatic application of the brake, which shall bring the car to rest in the event of power failure. When a car arrives at a floor and stops, both leads of the brake coil shall be disconnected from the source of power, in accordance with applicable codes. The brake shall be applied

whenever the car is stopped at a floor and the door interlock circuit is opened.

4.3.2 Motor Drive

The motor drive shall be a solid state power control mounted in each individual controller enclosure. The solid state power control shall be a closed-loop design and shall provide the power output for the machine brake, hoist motor shunt field, and generator shunt field. The drive shall be a compact, self-contained unit, providing stepless acceleration, deceleration and regulation down to zero speed. A permanent magnet tachometer shall be installed on each hoisting machine to provide the speed signal to the power control.

The power control shall be capable of controlling the DC generator field, positive or negative to the degree required, to maintain regulation under varying loads. The generator system shall control output power for the DC hoist motor which shall control the speed of the elevator.

The solid state motor drive regulation system shall incorporate a controller with speed feedback provided by a tachometer (as required). Regulation shall be accomplished by means of electronic comparison of the reference signal to feedback signal currents. When any difference is present, the drive shall respond accordingly to reduce the difference. Regulation shall be modified, employing linear acceleration and deceleration, to provide smooth and comfortable speed changes.

A means shall be provided for removing regenerated power from the drive system. This power shall be returned to the three phase AC power line.

A reverse phase device shall be provided and a thermal overload shall be provided on each AC input power line. When a car arrives at a floor and stops, both leads of the brake coil shall be disconnected from the source of power in accordance with applicable codes. The brake shall be applied any time the car is stopped at a floor and the door interlock is open.

4.3.3 Leveling System

The automatic leveling zone shall not extend more than 12" above or below the landing level nor shall the doors begin to open until the car is within 12" of the landing. In addition, the inner leveling zones shall extend not more than 3" above or below the landing. The car shall not move when stopped outside the inner leveling zone unless the doors are fully closed.

4.3.4 Overspeed Protection

A motor field current sensing means shall be provided which shall cause electric power to be removed from the armature and brake, unless the direct current flowing in the shunt field of the motor is sufficient to prevent overspeeding of the motor. In addition, the power control shall be arranged to monitor the voltage of the hoist motor, which shall be compared continuously to a predetermined pattern and reference information from the machine tachometer.

The power control shall be arranged to continuously monitor the performance of the elevator such that if the car speed exceeds 150 fpm during access, inspection, or leveling, the car shall shut down immediately, requiring a serviceman to reset it.

4.3.5 Interfacing Pilot Electromechanical Device

Each individual car controller shall be equipped with interfacing pilot electromechanical devices as required for accepting necessary signals from elevator hoistway and operating switches. These shall include, as a minimum, terminal slowdown operation pushbuttons, emergency stop switches, and a governor overspeed switch.

All power feed lines to the brake shall be opened by an electromechanical switch. A single ground, short circuit or static control failure shall not prevent the application of the brake in the intended manner. Systems that do not apply the brake when the car stops at a landing shall not be accepted.

The failure of any static control device, or the occurrence of a single accidental ground or short circuit, shall not permit the car to start or run. In addition, if any hoistway door or car gate interlock is unlocked, or if any hoistway door or car gate contact is not in a closed position, the car shall not start or run.

For Group Operation: See Group Systems Section 7.

For Options: See System Options Section 9.

OPTIONAL PVF POSITION VELOCITY FEEDBACK SPECIFICATIONS For use with car controller Model V800 Types VF, SCR and EDGE

Overview Model PVF Position Velocity Feedback / Recommended Use

Elevator Controls has engineered a smart digital interface to provide microcomputer-based position and velocity feedback for both gearless and geared applications.

The **Position Velocity Feedback** (**PVF**) dual-feedback system option is available for closed loop control applications where the most demanding ride quality requirements must be satisfied. The **PVF** option provides position and velocity feedback for ultimate ride comfort and control of elevator motion. The **V800 EDGE** equipped with **PVF** provides precise speed regulation better than +/- 1% using encoder feedback in combination with a closed loop drive design.

PVF utilizes state-of-the-art, large-scale integrated circuits and a high performance, modular circuit board design. This both optimizes reliability and simplifies installation and maintenance. The **PVF** can be used to control AC or DC motors in modernization and new construction applications.

PVF is recommended for elevators of all speeds, especially higher speed geared and gearless applications. It is also recommended for buildings with multiple floor heights where contract speed cannot be achieve in a single floor run.

4.4.0 Specifications Model PVF Position Velocity Feedback

A position feedback system shall be provided which is capable of continuously adjusting the mathematically computed optimal speed output as a function of distance from the target floor.

The control system shall produce an optimized velocity profile utilizing a dual-loop feedback system based on car position and speed. Systems that generate speed profile as a time-based function during deceleration, rather than a position-based function, shall not be accepted.

During deceleration the system shall function in such a way to provide accurate positioning of the elevator through final leveling without passenger discomfort, regardless of car load or direction of travel.

4.4.1 Position and Velocity Feedback

The control system shall be provided together with software that continuously evaluates mathematical equations in order to create an idealized, optimum velocity profile for car travel from any floor to any other floor. This system shall provide a smooth and stepless elevator ride. All system motion parameters (including jerk, acceleration, deceleration rates, etc.) shall be field programmable, within parametric limitations for system dynamics, and shall be stored in nonvolatile memory. Adjustment of these parameters shall not require the connection of any external device. Built-in programming and diagnostics with user-friendly, “plain English” display shall be provided.

4.4.2 Motor Drive

A solid-state motor drive in each individual controller shall provide power for an AC or DC hoist motor. It shall be a compact, self-contained unit that provides stepless acceleration and deceleration regulation utilizing speed feedback from a tachometer or digital encoder.

A velocity feedback device shall provide continuous comparison of actual car speed with the idealized velocity profile in order to provide accurate control of acceleration and deceleration through final leveling without passenger discomfort, regardless of car load or direction of travel.

4.4.3 Position Feedback

A position feedback system shall establish incremental car position within the elevator hoistway. Digital feedback of car position shall be provided using quadrature pulses generated as the elevator travels the entire length of the hoistway.

This system shall enable the elevator car to be positioned with accuracy of within 3/16 inch, or better. Leveling sensors shall provide car leveling accuracy of ¼ inch.

Compensation shall be provided for overtravel, undertravel, or rope stretch such that the car is brought level to the landing sill.

An electronic safety shall continuously monitor the car speed signal from the velocity transducer and compare it with the intended speed signal to verify proper and safe elevator operation.

4.4.4 Field Reprogrammable Parameters

Variables shall be field programmable without the need for any external device, or knowledge of any special programming language. Programmable parameters shall include, but not be limited to, the following:

a. Contract speed
f. Number of floors
g. Initial jerk
d. Roll over jerk
e. Deceleration jerk
f. Pattern delay
g. Acceleration
h. Deceleration
i. Leveling distance
j. Leveling speed
k. Releveling speed
l. Inspection speed
m. Tach polarity
n. Tach gain
o. Tach zero

4.4.5 Hoistway

The system shall be capable of automatically "learning" the position of each floor and all terminal slowdowns using a procedure that simply requires running the car the length of the hoistway. As part of this procedure, the correct speed at each slowdown shall be automatically recorded in non-volatile memory.

4.4.6 Built-in Diagnostics

The Position Velocity microcomputer shall be equipped with powerful monitoring/diagnostics logic to facilitate field troubleshooting and parameter reprogramming.

The built-in digital alpha/numerical display section of the diagnostics circuitry shall be capable of, but not limited to displaying elevator current error/fault status as diagnosed by the computer logic. In addition to information pertaining to data corresponding to reprogrammable parameters, input/output status, speed tracking performance, fault logs retrieval, trip sequence log and fault sequence playback, hoistway floor position and slowdown switches position data, terminal landing velocity data, and terminal speed safety clamps, etc., as commanded by diagnostic settings made by a serviceman without requiring connection of external tools or the use of a PC to accomplish the functions of the built-in diagnostics requirements.

Model V800 Type GMB for Motor Generators

Overview Model V800 Type GMB / Recommended Use

The **V800 GMB** car controller is an excellent choice to control DC motors for most geared elevators in modernization projects requiring the use of variable voltage DC with motor generator sets. For cars with contract speed below 250 FPM, the **Model V800 Type GMB** is an economical alternative when ride quality requirements are less demanding and position velocity feedback is not required.

The **V800 GMB** provides solid state power control in an open-loop system providing generator series field speed regulation accuracy ranging from approximately 2% to 5%. Open loop control is not recommended for either higher speed or higher profile jobs where precise speed regulation must be guaranteed *down to 0 FPM*. The Position Velocity Feedback (**PVF**) option is not applicable to Open Loop GMB control. Units are equipped with overloads and meet all applicable safety requirements.

4.5.0 Specifications Model V800 Type GMB

The control system shall utilize a universal, standardized set of printed circuit boards to provide microcomputer, input/output and optional position velocity feedback functions.

Universal PC boards shall be common and interchangeable between all hydraulic, AC traction and DC traction controllers provided, which shall minimize spare board inventory requirements.

The controller design architecture shall incorporate universal backward compatibility, which shall eliminate board and software version compatibility issues and enable older equipment to be updated easily to current technology.

All diagnostics shall be accessible without requiring the need to attach external tools or troubleshooting devices.

All control equipment shall be enclosed in metal cabinets, equipped with lockable, removable doors and provided with means for ventilation.

The installing contractor shall ensure that all nonconducting metal parts in the machine room are grounded in accordance with the NFPA National Electric Code.

4.4.1 Controller

Individual elevator controllers shall store floor selector software in random access memory. Said software shall increment or decrement position information corresponding to the actual location of the car within the hoistway.

The elevator control system shall be of an open loop, variable voltage DC motor generator type, equipped with automatic two-way leveling. The control system shall incorporate an input/output control scheme, which shall buffer the 120 VAC input voltage down to computer voltages.

The controller shall provide required electrical operation of the elevator control system, including the automatic application of the brake, which shall bring the car to rest in the event of power failure. When a car arrives at a floor and stops, both leads of the brake coil shall be disconnected from the source of power, in accordance with applicable codes. The brake shall be applied whenever the car is stopped at a floor and the door interlock circuit is opened.

4.4.2 Motor Drive

The motor drive shall be a solid state power control mounted in each individual controller enclosure. The solid state power control shall use SCR's to control output power for the machine brake, hoist motor shunt field, and generator shunt field. The drive shall be a compact, self-contained unit, providing stepless acceleration, deceleration and generator series field regulation down to zero speed with electronic soft-stop circuit control.

The power control shall use the generator series field, properly compounded and equipped with adequate current shunt to maintain regulation under varying loads.

A means shall be provided for removing regenerated power from the drive system. This power shall be returned to the three phase AC power line.

A reverse phase device shall be provided and a thermal overload shall be provided on each AC input power line. When a car arrives at a floor and stops, both leads of the brake coil shall be disconnected from the source of power in accordance with applicable codes. The brake shall be applied any time the car is stopped at a floor and the door interlock is open.

4.4.3 Leveling System

The automatic leveling zone shall not extend more than 12" above or below the landing level nor shall the doors begin to open until the car is within 12" of the landing. In addition, the inner leveling zones shall extend not more than 3" above or below the landing. The car shall not move when stopped outside the inner leveling zone unless the doors are fully closed.

4.4.4 Overspeed Protection

A motor field current sensing means shall be provided which shall cause electric power to be removed from armature and brake, unless the direct current flowing in the shunt field of the motor is sufficient to prevent overspeeding of the motor.

The power control shall be arranged to continuously monitor the performance of the elevator such that if the car speed exceeds 150 fpm during access, inspection, or leveling, the car shall shut down immediately, requiring a serviceman to reset it.

4.4.5 Interfacing Pilot Electromechanical Device

Each individual car controller shall be equipped with interfacing pilot electromechanical devices as required for accepting necessary signals from elevator hoistway and operating switches. These shall include, as a minimum, terminal slowdown operation pushbuttons, emergency stop switches, and a governor overspeed switch.

All power feed lines to the brake shall be opened by an electromechanical switch. A single ground, short circuit or static control failure shall not prevent the application of the brake in the intended manner. Systems that do not apply the brake when the car stops at a landing shall not be accepted.

The failure of any static control device, or the occurrence of a single accidental ground or short circuit, shall not permit the car to start or run. In addition, if any hoistway door or car gate interlock is unlocked, or if any hoistway door or car gate contact is not in a closed position, the car shall not start or run.

For Group Operation: See Group Systems Section 7.

For Options: See System Options Section 9.

Section 5 MODEL H800 HYDRAULIC EQUIPMENT

Overview Model H800 Hydraulic Controller / Recommended Use

Elevator Controls Corporation is a highly regarded manufacturer of Non-proprietary, microprocessor-based elevator controls. Our equipment is designed and engineered using appropriate, proven technology… to ensure years of field reliability.

Our innovative, simplified system design makes powerful technology easy to use. Controllers are designed to make installation and adjustment simple and straightforward. All required diagnostics are provided onboard.

Key printed circuit boards are standardized across our entire product line… to minimize spare board inventory burden. Our unique design architecture incorporates universal backward compatibility… to eliminate board and software version issues and enable older equipment to be updated easily.

Elevator Controls Model H800 microcomputer based Hydraulic Controller utilizes state-of-the-art, large-scale integrated circuits and a high performance, modular circuit board design to optimize reliability while simplifying installation and maintenance.

Control boards are equipped with plainly labeled LED indicators that display elevator status and mode of operation for all computer inputs and outputs (I/O). Indicators are provided for call registration, car position, direction, etc. Additionally, a liquid crystal display (LCD) shows supplemental information in "plain English" format.

A simple to use, powerful diagnostic function is built into the Computer Microprocessor module including the ability to program elevator "personality" parameters onsite via the "**Field-Friendly**™" LCD display.

Elevator Controls manufactures two configurations of Hydraulic controller models. **Model H800** is a field programmable, microprocessor based hydraulic controller capable of handling standard and non-standard applications with simplex, duplex and group configurations.

The **H800** control family is suitable for all hydraulic elevator speeds and most valve and door operator systems offered in the industry. Special valve interface circuits are also available.

Model H-PAC is a low cost, off-the-shelf field programmable controller typically available for immediate shipment. It is capable of handling standard hydraulic applications to five stops (in line) and built to specific production parameters.

Both the **H800** and **H-PAC** are fully field programmable, using dedicated microprocessors, EEPROM and VSLI technology to provide reliable functionality including onboard diagnostics. Both are **Field Friendly**™, performance proven, and readily serviceable.

Equipment options include:

- Choice of Motor Starter:
  - Electronic soft starter
  - Y-Delta
  - Across the line (for smaller horsepower units)

- Optional Built-in Battery Lowering Device (external mount for power freight doors)

5.0 General Specifications H800 Hydraulic Controller

The basic simplex elevator control system shall be comprised of a computer microprocessor, an I/O structure and a relay interface, in addition to a power supply, control transformer, contactor, and AC motor drive.

In duplex systems, the printed circuit board arrangement shall be similarly arranged for both cars, which shall communicate and share dispatching functions utilizing "**Smart Duplex**^{TM}" software. The Smart Duplex system is described in detail in Section 7.

An optional output connector for interface to a standard PC and video monitor shall provide remote communication and enable elevator system performance reports to be printed.

For group operation, the optional **G900 Group System** is available to dispatch up to 16 cars serving as many as 64 landings.

5.0.1 Fire Service

The fireman service operation and normal operating features shall be incorporated in accordance with the American National Standard Safety Code (ANSI A17.1) and applicable state and local codes.

5.0.2 Selective Door Timing

Adjustable timing parameters shall be provided to control door dwell time for passenger transfer. Independently adjustable, field reprogrammable standard and short door times shall be set without requiring a system shutdown. A minimum of four different door standing open times shall be provided. A car call time value shall predominate when only a car call is canceled. A hall call time value shall predominate whenever a hall call is canceled.

An independently adjustable parameter shall also be provided to control door reversal time. Activation of the photo eye input shall optionally cause short door timing to be used. An adjustable parameter shall be provided to control door dwell time during up peak operation, which shall be defined independent of any other door timing.

5.0.3 Door Operation

Door protection timers shall be provided for both the opening and closing directions, which will protect the door motor and will help prevent the car from getting stuck at a landing. The door open protection timer shall cease attempting to open the door after a predetermined time in the event that the doors are prevented from reaching the open position. In the event that the door closing

attempt fails to make up the door locks after a predetermined time, the door close protection timer shall reopen the doors for a short time.

5.0.4 Nudging Operation

OPTIONAL - If doors are held open beyond a predetermined adjustable time, a buzzer shall sound and doors shall begin closing with reduced torque. Activation of the photo eye input shall be ignored during nudging operation. Activation of the safety edge input shall optionally enable door reopening during nudging operation.

5.0.5 Safety Relays

All safety relays shall be DC voltage activated in order to improve low voltage relay latching. The controller shall not allow the car to run or operate in the event of any short circuit or ground fault.

5.0.6 Independent Service

Independent service operation shall be provided such that activation of a key switch in the car operating panel (COP) cancels all existing car calls and holds the doors open at the landing. When the key switch is activated, the car shall only respond to car calls disregarding all hall calls. Constant pressure on a car call button or a door close button shall be required, until the car starts to move, in order to close hoistway and car doors. All hall and jamb mounted lanterns shall be inactive when independent operation is activated.

5.0.7 Test Switch

A test switch shall be provided, in the controller, to enable operation for adjustment of the elevator. While in test mode, the elevator shall operate as in independent service without the door open function. When the test switch is activated the elevator shall be removed from any duplex or group, operating independently

5.0.8 Inspection Switch

An inspection switch and an up/down switch shall be provided, in the controller, to allow the elevator car to be controlled manually in inspection mode of operation. Inspection operation shall only be enabled when the top of car and in-car inspection switches are non-active, and all safeties and door protection circuits are on normal operation.

5.0.9 Built-in Diagnostics

The microprocessor controller shall be equipped with powerful monitoring/diagnostics logic to facilitate field troubleshooting and parameter reprogramming.

The built-in digital alpha/numerical display section of the diagnostics circuitry shall be capable of displaying elevator current error/fault status as diagnosed by the computer logic. In addition to information pertaining to data corresponding to computer memory, reprogrammable parameters, input/output status, fault retrieval, security code parameters, car and hall call registered, control program "flags", etc, as commanded by diagnostic switch settings made by a serviceman.

In addition to allowing a serviceman to enter calls, the diagnostics logic shall permit, without requiring system shut down, the reprogramming of parameters including, but not limited to, car

stopping table, control timers (such as door timers, maximum ETA), special functions (such as fire/parking floors, gong dinging control, group supervisory call assignment, automatic program selection parameters), and special optional features (such as building security access codes).

The controller shall also be equipped with a comprehensive number of indicators for displaying car position, direction, car/hall calls, relay indicators, etc. to facilitate elevator monitoring and troubleshooting at a glance.

5.0.10 Field Reprogrammable Parameters

The elevator controller shall include provisions for field reprogrammability including, but not limited to, the following parameters, which shall be adjustable without requiring a system shutdown:

Group Controller

a. Number of cars required at the lobby.
b. Parking floor(s) assignments.
c. Up and down peak detection parameters.
d. Up and down peak minimum duration.
e. Call assignment parameters for parking cars.
f. Hall call waiting time.
g. Priority floors and corresponding waiting.
h. Stopping table for all cars including front/rear openings and direction of stop.
i. Timers: Parking, Hospital Emergency, etc.
j. Special features, including alternate call scheme stopping table, floor access codes for security operation, etc.

Car Controller

a. Door Timers: Car, Hall, Short, Lobby, etc.
b. Parking floors for simplex/duplex cars.
c. Stopping table including direction of stop and front/rear openings.
d. Backup dispatching car stopping table.
e. Security operation floor-access codes.
f. Normal and alternate fire return floors.
g. Special features including alternate call scheme stopping table, nudging, etc.

Field Programmable System Timers

Onboard system timer parameters shall be programmable and available for a minimum of the following functions:

a. Door protection timer
b. Short door timer
d. Car door timer
e. Hall door timer
f. Time out of service timer
g. Lobby door timer
h. Gong timer

i. Gong hold timer
j. Door hold timer
k. Motor limit timer

Reprogramming of parameters shall be accomplished by either of two means. An analyzer unit built into the controller shall allow interaction with the computer memory and system input/output directly. An optional CRT/keyboard package shall provide access by means of keyboard entry.

5.0.11 Loaded Car Operation

OPTIONAL - for roped hydraulic elevators; for other applications, please call: Should any car become loaded to a user preset adjustable load level, all door dwell timers shall be advanced to zero and car doors shall close without delay. Additionally, the car shall be automatically removed from group operation until the car load drops below the preset threshold.

5.0.12 Light Load Anti-Nuisance Operation

OPTIONAL - for roped hydraulic elevators; for other applications, please call: All registered car calls shall be canceled if a user preset adjustable number of entered car calls is exceeded, and the load in the car has not caused the light load switch to open. If a user preset adjustable number of car calls are answered without activation of the photo eye input, all registered car calls shall be canceled.

MODEL H800 HYDRAULIC EQUIPMENT

Overview Model H800 / Recommended Use

The **H800** car controller is an excellent choice to control Hydraulic elevators in modernization and new construction projects of any type, including both direct-acting hydraulic applications and roped hydraulic applications.

5.1.0 Specifications Model H800

The control system shall utilize a universal, standardized set of printed circuit boards to provide microcomputer and input/output functions.

Universal PC boards shall be common and interchangeable between all hydraulic, AC traction and DC traction controllers provided, which shall minimize spare board inventory requirements.

The controller design architecture shall incorporate universal backward compatibility, which shall eliminate board and software version compatibility issues and enable older equipment to be updated easily to current technology.

All diagnostics shall be accessible without requiring the need to attach external tools or troubleshooting devices.

All control equipment shall be enclosed in metal cabinets, equipped with lockable, removable doors and provided with means for ventilation.

The installing contractor shall ensure that all nonconducting metal parts in the machine room are grounded in accordance with the NFPA National Electric Code.

5.1.1 Controller

Individual elevator controllers shall store floor selector software in random access memory. Said software shall increment or decrement position information corresponding to the actual location of the car within the hoistway.

The control system shall incorporate an input/output control scheme, which shall buffer the 120 VAC input voltage down to computer voltages.

5.1.2 Motor Starter

Choice of Motor Starter shall include: electronic soft starter, Y-Delta, or across the line (for smaller horsepower units).

5.1.3 Leveling

The automatic leveling zone shall not extend more than 12" above or below the landing level nor shall the doors begin to open until the car is within 12" of the landing. In addition, the inner leveling zones shall extend not more than 3" above or below the landing. The car shall not move when stopped outside the inner leveling zone unless the doors are fully closed.

5.1.4 Intentionally Left Blank

5.1.5 Interfacing Pilot Electromechanical Devices

Each individual car controller shall be equipped with interfacing pilot electromechanical devices as required for accepting necessary signals from elevator hoistway and operating switches. These shall include, as a minimum, terminal slowdown operation pushbuttons and emergency stop switches.

The failure of any static control device, or the occurrence of a single accidental ground or short circuit, shall not permit the car to start or run. In addition, if any hoistway door or car gate interlock is unlocked, or if any hoistway door or car gate contact is not in a closed position, the car shall not start or run.

For Group Operation: See Group Systems Section 7.

For Options: See System Options Section 9.

Section 6 OVERLAYS

Overview Overlays / Recommended Use

Elevator Controls Corporation is a highly regarded manufacturer of Non-proprietary, microprocessor-based elevator controls. Our equipment is designed and engineered using appropriate, proven technology… to ensure years of field reliability.

For permanent use or as a modernization tool, Elevator Controls offers custom overlays which augment existing systems. These include overlay panels for **Group Supervision**, **Cross Registration** and **Cross Cancellation.**

Group Supervisory Overlay provides state-of-the-art dispatching for existing (typically relay-logic type) control systems. By capturing signals from existing controllers, the Overlay allows a new dispatching system to communicate with existing control equipment. In many cases, the Group Supervisory Overlay is used during system modernization, allowing existing and modernized cars to work together within the same dispatching system. The resulting efficiencies enable more cars to be taken out of service at the same time – *without compromising hall wait times* – facilitating more aggressive scheduling of modernization work and faster return of modernized cars to service.

Cross Registration facilitates efficient distribution and assignment of hall calls between an existing group of elevators and a new group of elevators.

Cross Cancellation simultaneously assigns hall calls to both existing and "new" cars groups, canceling the redundant call once a car from either system reaches the floor originating the call.

6.1.0 Specifications Group Supervisory Overlay

A group supervisory overlay system utilizing an Elevator Control's G900 Group System and one OVL800 Overlay per elevator shall be provided. Each overlay cabinet shall provide all the necessary inputs, outputs, computer, power supply and interface relays to connect to each existing elevator controller. One group system cabinet shall be provided to connect to each overlay cabinet.

Signals shall be provided from the existing elevator controller to the individual OVL800 Overlay cabinet including, but not limited to, car position, motor generator status, door open limit, door close limit, up car motion, down car motion, independent and inspection operation. In addition, signals from door open button, door close button, infrared detector or safety edge, Fire Phase II switch and call cancel button shall also be provided. These standard signals shall be made available to the overlay from the existing controller.

Signals shall be provided from the individual OVL800 Overlay cabinet to the existing elevator controller including, but not limited to, start motor generator, move up, move down, slowdown, up hall lantern, down hall lantern, open doors, close doors, illuminate lights and sound buzzers as required for proper operation. These standard signals shall be made available to the exigent controller from the overlay.

All input signals to the OVL800 Overlay from the existing controller shall be dry contacts of relays to maintain electrical isolation between the overlay and existing controller.

All output signals from the OVL800 Overlay to the existing controller shall be dry contacts of relays to maintain electrical isolation between the overlay and existing controller.

Car call registration and lamp illumination shall be by means of a single wire.

OVL800 Overlays shall communicate status information to and from the G900 Group system via serial link. The group shall determine which car is assigned the hall call in a manner described in Section 7 – Dispatching Options.

Hall call registration and lamp illumination shall be by means of a single wire.

Once the group assigns a hall call to an individual overlay, that overlay shall determine if the call is above, below or located at the elevator's present position. If the elevator is located at the same floor as the hall call, the correct logic direction shall be established, appropriate hall lantern shall illuminate, and the doors shall open. If the hall call is above or below the elevators present position, the elevator shall move to the floor where the hall call is located. Once the elevator slows down and logic direction is established, the appropriate hall lantern shall illuminate and doors shall open. Door timing shall be established. Once door time expires the doors shall close and hall lantern shall be extinguished.

All safety related features, including but not limited to safety circuit; door locks; and other electrical protective devices shall not be part of the Group Supervisory System but shall remain part of the existing elevator controller. The one exception is the In-Car Stop Switch, which shall be bypassed during Fire Phase I Recall Operation. Fire Phase I and II shall be part of the Group Supervisory Overlay System.

Group options including Emergency Power, Security and Remote Monitoring shall be made available as part of the Group Supervisory Overlay System when specified.

The elevator contractor shall provide complete "as-built," straight line wiring diagrams of the existing system in order for an OVL800 overlay system to be designed.

6.1.1 Specifications Cross Registration System

A Cross Registration System shall be provided allowing efficient assignment of hall calls between an existing group of elevators a newly installed group of elevators. The system shall include necessary hardware and software to collect registered hall calls in the new group system. The new group system shall determine, through an ETA calculation, if a newly installed elevator can respond to the registered hall call being considered for assignment within an adjustable (0 to 120 seconds) ETA time. If not, the hall call shall be transferred to the existing group, for assignment to one of the existing elevators. A second adjustable timer (0 to 2 seconds) shall be provided to ensure sufficient transfer time to register hall calls in the existing group.

As more new elevators are put into service, and fewer existing elevators remain, the adjustable ETA timing parameter shall be manually increased. This method shall allow the new elevators, operating more efficiently, to respond to a greater number of the assigned hall calls.

Each hall call push button and hall call registered light shall be routed to an auxiliary cross registration cabinet containing the necessary interface relays and switching circuitry to disconnect the hall calls from the existing group and reconnect them to the new group. The new group system shall have the responsibility to illuminate and extinguish the hall call register lights. The dry contacts of relays representing each hall call shall be provided to transfer the hall call to the existing group when the ETA time expires.

When a hall call is transferred and registered in the existing group a relay shall energize to indicate to the new group that the hall call is registered in the existing group. A dry contact of the hall call relay shall be connected to the new group to confirm that the existing group has accepted the hall call. When an elevator in the existing group cancels the hall call the relay will de-energize and remove the confirmation signal to the new group. The new group shall extinguish the hall call register light.

6.1.2 Specifications Cross Cancellation System

A Cross Cancellation System shall be provided which will allow corresponding hall calls to be assigned simultaneously to both the new group and existing group. One car in each group shall be dispatched and proceed to the registered hall call. The first car to arrive shall cancel the corresponding hall call in both groups. The second car, if in motion, shall make a no call stop or be reassigned to another hall call.

Hall calls and hall call registered lights remain connected to the existing group. Hall call cancellation circuitry in an auxiliary cross cancellation cabinet shall be connected between the new and existing groups.

The auxiliary cross cancellation cabinet shall contain the necessary relays and interface circuitry to register and cancel the hall calls in the new group.

A dry contact from a relay representing each hall call in the existing group shall be provided and connected to the cross cancellation cabinet. When a hall call relay is energized in the existing group the corresponding hall call shall be simultaneously registered in the new group.

A dry contact from each hall call cancellation relay shall be connected from the cross cancellation cabinet to the existing controller to cancel the corresponding hall call in the existing group.

While the cross cancellation cabinet is in operation, hall calls shall be prevented from latching into memory in the new group. There shall be a field programmable option, with on board diagnostics and display, when programmed, shall allow latching of hall calls when the cross cancellation cabinet is no longer required.

Section 7 DISPATCHING OPTIONS

Overview G900 Group System / Recommended Use

Elevator Controls Corporation is a highly regarded manufacturer of Non-proprietary, microprocessor-based elevator controls. Our equipment is designed and engineered using appropriate, proven technology… to ensure years of field reliability.

Our innovative, simplified system design makes powerful technology easy to use. Controllers are designed to make installation and adjustment simple and straightforward. All required diagnostics are provided onboard.

Key printed circuit boards are standardized across our entire product line… to minimize spare board inventory burden. Our unique design architecture incorporates universal backward compatibility… to eliminate board and software version issues and enable older equipment to be updated easily.

Elevator Controls Model G900 microcomputer based Group System utilizes state-of-the-art, large-scale integrated circuits and a high performance, modular circuit board design to optimize reliability while simplifying installation and maintenance.

Control boards are equipped with plainly labeled LED indicators that display elevator status and mode of operation for all computer inputs and outputs (I/O). Indicators are provided for hall call registration and group controller mode of operation. Additionally, a liquid crystal display (LCD) shows supplemental information in "plain English" format.

A simple to use, powerful diagnostic function is built into the Computer Microprocessor module including the ability to program elevator "personality" parameters onsite via the "**Field-Friendly**™" LCD display.

An optional output connector for interface to a standard PC and video monitor shall provide remote communication and enable elevator system performance reports to be printed.

The **G900 Group System** is recommended where two or more elevators, up to sixteen per bank, are to function coordinated by a supervisory control system equipped with artificial intelligence and real time dispatching algorithms to regulate car to hall call assignments so as to optimize traffic handling and minimize call waiting time, and all group functions including fire service, emergency power operation, etc.

7.1.0 Specifications G900 Group System

The system shall provide a means of supervising and coordinating the individual elevator cars in a group of two to sixteen cars to maximize the level of efficiency in serving the varying elevator traffic needs in the building, while minimizing passenger waiting time.

The group supervisory system shall be implemented with state-of-the-art, solid state technology by utilizing a multi processor microcomputer. The microcomputer system shall be comprised of one or more individual microprocessors, which will directly control up to sixteen elevators.

For group operation, each controller shall have a dedicated serial phone type jack connection to the group system. Systems that require daisy chain interconnection between controls shall not be accepted. The use of relay logic to implement the group supervisory functions shall not be accepted. The system shall be designed so that in the event of a major change in the building, the pertinent variables relating to system performance can be easily reprogrammed with no hard wiring changes or system shut down.

The group controller design architecture shall incorporate universal backward compatibility, which shall eliminate board and software version compatibility issues and enable older equipment to be updated easily to current technology.

The microcomputer PC board utilized to perform group control functions shall be interchangeable with the microcomputer PC board in the car controller that performs car control functions. This interoperability shall be provided across the entire control product line, which shall minimize spare board inventory requirements.

All diagnostics shall be accessible without requiring the need to attach external tools or troubleshooting devices.

All control equipment shall be enclosed in metal cabinets, equipped with lockable, removable doors and provided with means for ventilation.

The installing contractor shall ensure that all nonconducting metal parts in the machine room are grounded in accordance with the NFPA National Electric Code.

7.1.1 Primary Dispatching Methodology

The Group System shall electronically calculate and continuously evaluate the traffic demand. It shall automatically change the method of supervision or the assignment of hall calls to various cars in the group as appropriate to maximize efficiency in response to the demand of prevalent traffic.

The system shall continuously inventory the number of cars in service, car location, direction, hall call demand and car call demand distribution throughout the building. Then, based upon estimate of the time required to serve calls, determine which car is in the best location to answer each hall call. If it is determined that the car in the best location will exceed a desired minimum response time estimate, another available car shall be selected in order to improve response time despite increased distance from the floor at which the call originated.

This scheme shall optimize the efficiency of car movement in the building while providing a desired response time as defined by field reprogrammable system parameters.

The efficient movement of elevator in response to hall calls under this scheme shall not only provide the desired response time but shall also enhance the lifetime of elevator equipment by minimizing wear and tear due to needless movement of the elevators.

As conditions change in the building, the system shall continuously and dynamically update, assign, and reassign cars to hall calls in order to satisfy current real time conditions.

Interval dispatch shall not be accepted since delaying cars shall have only the unintended effect of increasing overall system response time and reducing passenger handling capacity.

The Group System shall be easily reprogrammed to accommodate any combination of front or rear elevator door openings.

A powerful and comprehensive balanced mode shall be utilized to efficiently dispatch two-way traffic including heavier up or down traffic, and up peak and down peak modes to handle extreme conditions such as those encountered at the beginning and end of a typical workday.

The balanced mode shall provide a comprehensive, optimized and flexible traffic dispatching scheme, including detection and response to imbalances where traffic is much heavier in one direction than the other. The Group System shall operate effectively in handling the full range of traffic volume from zero to very heavy traffic.

The method of call assignment shall be selected based on real time, electronic calculations designed to continuously evaluate traffic demand and system status. Automatic and continuous adjustment of call assignment method and call reassignment shall be transparently implemented to optimize estimated time of arrival (ETA), consistent with minimum elevator travel. The system's dynamic selection algorithm shall make preliminary car-to-call assignments based on best call response time, derived from the car's position and direction. The final assignment shall evaluate multiple parameters including, but not limited to, the following:

a. Number of hall calls ahead of the car.
b. Number of car calls ahead of the car.
c. Response time to stops ahead of the car.
d. Coincident calls.
e. Maximum hall call response time.

The results of this evaluation shall produce final call-to-car assignment or the placement of the call into a high priority call map, wherein it shall be assigned to another car which may be further away from the call but whose assignment will result in a better response time, to provide the shortest possible waiting time for passengers.

As cars become available without demand, the system shall distribute cars to predetermined, field reprogrammable parking floors within unoccupied zones, according to a fixed zone parking scheme. If the lobby zone is unoccupied and unassigned, any available car shall be moved to that zone without delay. The next car that becomes available for service shall be moved if necessary,

after an adjustable delay (and in absence of demand), to the closest unoccupied and unassigned zone.

For systems with MG sets, if a car's MG set shuts down, the system shall not change the car's parking floor assignment. An available car, without demand for service, shall park with its doors closed. As demand on the system increases, cars shall be started up and placed in service in response to demand.

If a call exists for which not all cars are eligible to respond, such as a rear call where only two out of four cars answer rear calls, the system shall automatically make an optimum selection from only those cars eligible to respond.

7.1.2 Emergency Dispatch Operation

In the unlikely event wherein the Group System fails to assign hall call demand to any cars, the individual car processors shall revert to auxiliary dispatch operation. This mode shall enable cars to continue to run and stop at their assigned floors, both in the up and down direction.

Auxiliary dispatch operation shall place all elevators in the group in continuous service until Group System operation is restored. Assignment of floors under auxiliary dispatch operation shall be programmed such that only one car shall serve any particular floor and all cars shall serve the main lobby floor.

7.1.3 Backup Dispatch Operation

In the unlikely event of a total Group System shutdown, the system shall enable two cars to operate as a duplex, or a single car to operate as a simplex, until Group System operation is restored.

7.1.4 Lobby Up Peak Traffic

Lobby up peak operation shall detect and respond to up peak demand by returning all cars to the lobby, where they shall reverse and leave on a first-car-in, first-car-out basis. Cars shall close their doors and leave the lobby when they are either loaded to a predetermined adjustable level, or when the lobby door time expires. Cars shall travel to their highest call whereupon they shall reverse and travel nonstop back to the lobby. Lobby up peak traffic shall have priority over down calls. A down service timer shall provide service to down calls during lobby up peak operation. The selected or next car to arrive shall park with its doors opened and cars subsequently arriving at the lobby shall park with their doors closed.

7.1.5 Down Peak Traffic

Down peak operation shall detect and respond to down peak demand by reversing cars at their lowest call, whereupon they shall travel nonstop to the highest call in the building. From there they shall collect down calls as encountered, until the cars are loaded (to a predetermined adjustable level). Cars shall then bypass hall calls until a low call reversal has been made.

The next up-traveling car shall stop and reverse at the floor below the floor where the prior car's load sensing switch operated, placing it in hall call bypass mode. It shall then collect down calls in the same manner as the car before ~~did~~, until loaded, then bypass hall calls to its low reversal floor.

All cars shall continue to operate in this manner until the load reversal floor is one floor above the lobby, or a car makes a low reversal without bypassing hall calls. Cars shall then travel to the highest call registered, restarting the sweeping operation.

Down peak traffic shall have priority over up calls during down peak operation. An up service timer shall ensure service in response to up calls during down peak operation.

7.1.6 Up Peak Traffic

Up peak operation shall detect and respond to up peak demand by reversing the cars at their highest call whereupon they shall travel nonstop to the lowest call in the building. From there they shall collect up calls as encountered until the cars are loaded (to a predetermined adjustable level). Cars shall then bypass hall calls until a high call reversal has been made.

The next down traveling car shall stop and reverse at the floor above the floor where the prior car's load sensing switch operated, placing it in hall call bypass mode. It shall then collect up calls in the same manner as the car before, until loaded, then bypass hall calls to its high reversal floor. All cars shall continue to operate in this manner until the lead reversal floor is floor one below the top floor, or a car makes a high reversal without bypassing hall calls. Cars shall then travel to the lowest call registered, restarting the sweeping operation.

Up peak traffic has priority over down calls during up peak operation. A down peak service timer shall ensure service in response to down calls during up peak operation.

7.1.7 Fire Service

The fireman service operation and normal operating features are to be incorporated in accordance with the American National Standard Safety Code (ANSI A17.1) and applicable state and local codes.

7.1.8 Out of Service Feature

The system shall automatically remove any car from group operation, should it be delayed from responding to its demand for a predetermined adjustable period of time. Any calls assigned to this car shall automatically be transferred to another car in service. The system shall automatically restore a~~ny~~ car ~~back~~ to the group operation when the reason for the delay has been corrected. Additionally, if the reason for the delay is a stuck call button, the car shall proceed to close its doors, move away from the floor, and return to normal service.

7.1.9 Selective Door Timing

Adjustable timing parameters shall be provided to control door dwell time for passenger transfer. Independently adjustable, field reprogrammable standard and short door times shall be set without requiring a system shutdown. A minimum of four different door standing open times shall be provided. A car call time value shall predominate when only a car call is canceled. A hall call time value shall predominate whenever a hall call is canceled.

An independently adjustable parameter shall also be provided to control door reversal time. Activation of the photo eye input shall optionally cause short door timing to be used. An adjustable parameter shall be provided to control door dwell time during up peak operation, which shall be defined independent of any other door timing.

7.1.10 Door Operation

Door protection timers shall be provided for both the opening and closing directions, which are intended to protect the door motor and help prevent the car from becoming stuck at a landing. The door open protection timer shall cease attempting to open the door after a predetermined time, in the event that the doors are prevented from reaching the open position. In the event that the door closing attempt fails to make up the door locks, after a predetermined time, the door close protection timer shall reopen the doors for a short time.

7.1.11 Nudging Operation

OPTIONAL- Should the doors be held open for a predetermined adjustable time, a buzzer shall sound and doors shall close at a reduced torque. Activation of the photo eye shall be ignored. Activation of the safety edge shall be optionally allowed to reopen the doors during nudging operation.

7.1.12 Independent Service

All cars shall be provided with a switch to remove them from group operation to allow a car to be operated from car calls only, and shall not interfere with hall call demand.

7.1.13 Test Switch

A test switch shall be provided, in the controller, to enable operation to facilitate adjustment of the elevator. While in test mode, the elevator shall operate as in independent service without the door open function. When the test switch is activated the elevator shall be removed from any duplex or group and shall operate independently.

7.1.14 Inspection Switch

An inspection switch and an up/down switch shall be provided, in the controller, to allow the elevator car to be controlled manually in inspection mode of operation. Inspection operation shall only be enabled when the top-of-car or in-car inspection switches are activated, and all safeties and door protection circuits are on normal operation.

7.1.15 Sequential Starting

Upon application of power, whether normal or emergency, the Group System shall be provided with the means to sequentially start only one car at a time, bypassing those cars not responsive to the start signal, until all cars have been started. This operating sequence shall ease the surge demand on the building's power supply.

7.1.16 Idle Car Shut Down (for systems with MG-sets)

As the demand on the system decreases, and individual car demand ceases, each car shall be allowed to shut down after a predetermined adjustable period of time.

7.1.17 Built-in Diagnostics

The microprocessor controller shall be equipped with powerful monitoring/diagnostics logic to facilitate field troubleshooting and parameter reprogramming.

The built-in digital alpha/numerical display section of the diagnostics circuitry shall be capable of displaying elevator current error/fault status as diagnosed by the computer logic. Such information shall include data corresponding to computer memory, reprogrammable parameters, input/output status, fault retrieval, security code parameters, car and hall call registered, control program "flags", etc. This data shall be displayed by selecting diagnostic switch settings.

In addition to allowing a serviceman to enter calls, without requiring system shut down the diagnostics logic shall permit reprogramming of parameters including, but not limited to, car stopping table, control timers (such as door timers, MG shut down times, maximum ETA), special functions (such as fire/parking floors, gong dinging control, Group System call assignment, automatic program selection parameters), and special optional features (such as building security access codes).

The controller shall also be equipped with a comprehensive set of indicators that display car position, direction, car/hall calls, relay indicators, etc. to facilitate elevator monitoring and troubleshooting at a glance.

7.1.18 Field Reprogrammable Group Parameters

Group System variables shall be field reprogrammable without the need for any external device, or knowledge of any special programming language. Reprogramming shall not require the elevator system to be shut down or removed from service. Reprogrammable parameters shall include, but not be limited, to the following:

a. Number of cars required at the lobby.
b. Parking floor (s) assignments.
c. Up and down peak detection parameters.
d. Up and down peak minimum duration.
e. Call assignment parameters for parking cars with or without M.G. set off.
f. Hall call waiting time.
g. Priority floor numbers and waiting time.
h. Stopping table for all cars including front/rear opening and direction of stop.
i. Timers: Parking, Hospital Emergency, etc.
j. Special features including alternate call scheme stopping table, floor-access codes for security operation, etc.

7.1.19 Field Reprogrammable Car Controller Parameters

The elevator controller shall include provisions for field reprogrammability including but not limited to the following parameters, which shall be adjustable without requiring a system shutdown:

a. Door Timers: Car, Hall, Short, Lobby, etc.
b. Motor generator shut down timers and stall protection timers.

c. Parking floors when simplex/duplex.
d. Stopping table including direction of stop and front/rear openings.
e. Back-up dispatching car stopping table.
f. Security operation floor-access codes.
g. Normal and alternate fire return floors.
h. Special features including alternate call scheme stopping table, nudging, etc.

Field Programmable System Timers
Onboard system timer parameters shall be programmable and be available for a minimum of the following functions:

a. Door protection timer
b. Short door timer
d. Car door timer
e. Hall door timer
f. Time out of service timer
g. Lobby door timer
h. Gong timer
i. Gong hold timer
j. Door hold timer
k. Motor limit timer

Reprogramming of parameters shall be accomplished by either of two means. An analyzer unit built into the controller shall allow interaction with the computer memory and system input/output directly. An optional CRT/keyboard package shall provide access by means of keyboard entry

7.1.20 Loaded Car Operation

OPTIONAL - Should any car become loaded to a predetermined load level, all door waiting time shall be removed, and car doors shall close without delay. Additionally, the car shall be automatically removed from group automatic operation until such time that the car load returns to an acceptable load~~ed~~ condition.

7.1.21 Light Load Anti-Nuisance Operation

OPTIONAL - All registered car calls shall be cancelled if a predetermined adjustable number of car calls is exceeded, and the load in the car has not caused the light load switch to open. OPTIONALLY, all registered car calls shall also be cancelled if a predetermined adjustable number of car calls are answered without activation of the photo eye input.

Overview Smart Duplex Automatic Control System / Recommended Use

Elevator Controls Corporation is a highly regarded manufacturer of Non-proprietary, microprocessor-based elevator controls. Our equipment is designed and engineered using appropriate, proven technology… to ensure years of field reliability.

Our innovative, simplified system design makes powerful technology easy to use. Controllers are designed to make installation and adjustment simple and straightforward. All required diagnostics are provided onboard.

Key printed circuit boards are standardized across our entire product line… to minimize spare board inventory burden. Our unique design architecture incorporates universal backward compatibility… to eliminate board and software version issues and enable older equipment to be updated easily.

Elevator Controls microcomputer based "**Smart Duplex™" control** utilizes state-of-the-art, large-scale integrated circuits and a high performance, modular circuit board design to optimize reliability while simplifying installation and maintenance.

Control boards are equipped with plainly labeled LED indicators that display elevator status and mode of operation for all computer inputs and outputs (I/O). Indicators are provided for call registration, car position, direction, etc. Additionally, a liquid crystal display (LCD) shows supplemental information in "plain English" format.

A simple to use, powerful diagnostic function is built into the Computer Microprocessor module including the ability to program elevator "personality" parameters onsite via the "**Field-Friendly™**" LCD display.

An optional output connector for interface to a standard PC and video monitor shall provide remote communication and enable elevator system performance reports to be printed.

In duplex systems, the printed circuit board arrangement shall be similarly arranged for both cars, which shall communicate and share dispatching functions utilizing "**Smart Duplex™**" software.

The "**Smart Duplex™**" system is recommended where two elevators per bank are to function under a supervisory control system. Smart Duplex™ software regulates car-to-hall call assignments utilizing a microcomputer-enhanced, "parked-car, free-car" duplex control algorithm.

For systems that require artificial intelligence and real time dispatching algorithms to regulate car-to-hall call assignments, the **G900 Group System** option is recommended. This system is capable of dispatching up to 16 cars serving as many as 64 landings.

7.2.0 Specifications Smart Duplex Control System

A smart duplex control system shall be implemented providing control and coordination of dispatching for two elevator cars including capabilities beyond those of a conventional duplex collective selective system. The system shall utilize a microcomputer incorporating state-of-the-art, solid state technology.

The "**Smart Duplex**^{TM}" control system shall incorporate two computers, one installed inside each car control cabinet. Each controller shall have a dedicated serial type phone jack, to provide a connecting link to other car, enabling communication of duplex supervision and call assignment data between the two microprocessors.

The "**Smart Duplex**^{TM}" control design architecture shall incorporate universal backward compatibility, which shall eliminate board and software version compatibility issues and enable older equipment to be updated easily to current technology.

Universal PC boards shall be common and interchangeable between all hydraulic, AC traction and DC traction controllers provided, which shall minimize spare board inventory requirements.

All diagnostics shall be accessible without requiring the need to attach external tools or troubleshooting devices.

All control equipment shall be enclosed in metal cabinets, equipped with lockable, removable doors and provided with means for ventilation.

The installing contractor shall ensure that all nonconducting metal parts in the machine room are grounded in accordance with the NFPA National Electric Code.

7.2.1 Operating Control

The system shall be designed so that an operation of one or more dispatch buttons within the car, or in the hallways, shall cause the car to start automatically, provided the hoistway door interlock and car door contact circuits have been established. The car shall reverse direction only after all car calls and hall calls in its current direction of travel have been satisfied. The car shall stop at the last car call or the furthest hall call requiring a change in direction. The car shall not respond to hall call registered for the opposite direction of travel unless it is in the process of last call reversal.

Stops shall be made in the order in which floors are reached, irrespective of the sequence in which calls have been registered, provided the call is registered sufficiently in advance of the car's arrival at that particular floor to allow a stop to be made. During this operation, the cars shall respond in a collective/selective mode.

The system shall be arranged so that one car shall normally be parked at the main landing, and the other car shall be parked at the last landing served, or at a designated floor. Both cars shall park with their doors closed. The car parked at the main landing shall be considered the "free car". Should both cars complete their calls at the main landing, the car which arrived first shall be considered the free car.

An idle free car shall respond to any landing call registered either above or below the floor at which it is located. When the free car is responding to car and/or landing calls, the parked car down call registered above a down-traveling free car.

The duplex control software shall be capable of detecting when free car demand is such that response time is predicted to exceed the relative maximum response ETA. Under these conditions, the parked car shall be dispatched to minimize passenger waiting time. The presence of continuous hall call demand for a period of time exceeding an adjustable preset value shall also cause the parked car to be dispatched. While in service, both cars shall always respond to calls registered at the landing occupied by the car as well as to calls registered by the car.

If a car is taken out of service for any reason, or fails to respond to a landing call within a adjustable preset time limit, all calls shall be transferred to the other car. Under these conditions, the in-service car shall function as a single car collective selective until the out-of-service car is returned to normal operation.

The system shall be arranged to provide basement service. Upon registration of a down landing call at the main landing and/or registration of any landing call below the main landing, if no parked car is available, the first down-traveling car shall respond. A car traveling down in response to a basement landing call and/or a basement car call shall not stop at the main landing unless a demand for down service in registration at the main landing. Likewise, an up traveling car with an upper floor call in registration shall not stop at the main landing unless a demand for up service or car call is in registration at the main landing.

7.2.2 Backup Dispatch Operation

The duplex system shall be provided including one microcomputer system per car controller. Communications between the two computers shall be accomplished via a telephone cable type connection. In the unlikely event that the dispatching computer fails, the other car's computer shall operate as a full simplex system. Hall calls shall be interconnected to both car controllers for this purpose.

7.2.3 Built-in Diagnostics

The microprocessor controller shall be equipped with powerful monitoring/diagnostics logic to facilitate field troubleshooting and parameter reprogramming.

The built-in digital alpha/numerical display section of the diagnostics circuitry shall be capable of displaying elevator current error/fault status as diagnosed by the computer logic. Such information shall include data corresponding to computer memory, reprogrammable parameters, input/output status, fault retrieval, security code parameters, car and hall call registered, control program "flags", etc. This data shall be displayed by selecting diagnostic switch settings.

In addition to allowing a serviceman to enter calls, without requiring system shut down the diagnostics logic shall permit reprogramming of parameters including, but not limited to, car stopping table, control timers (such as door timers, motor generator shutdown times, maximum ETA), special functions (such as fire/parking floors, gong dinging control, Group System call

assignment, automatic program selection parameters), and special optional features (such as building security access codes).

The controller shall also be equipped with a comprehensive number of indicators for displaying car position, direction, car/hall calls, relay indicators, etc. to facilitate elevator monitoring and troubleshooting at a glance.

Section 8 MOTORS & MACHINES

Overview Motors & Machines / Recommended Use

Elevator Controls Corporation is a highly regarded manufacturer of Non-proprietary, microprocessor-based elevator controls. Our equipment is designed and engineered using appropriate, proven technology… to ensure years of field reliability.

Elevator Controls provides motors and machines designed specifically for elevator duty applications. Controller/motor packages provide one-call ordering convenience and the assurance that all components will work well together.

Motor and Machine options include:

- Hydraulic Motors, both dry and submersible
- AC or DC motors with foot or flange mounting
- Geared Machines
- DC Gearless Machines
- AC Permanent Magnet Gearless Machines
- AC Induction Gearless Machines

Motors and machines are provided from various sources to satisfy customer specifications, delivery requirements and performance parameters unique to particular applications.

Section 9 OPTIONAL FEATURES

Overview of Optional Features

A comprehensive range of optional features has been developed to satisfy standard – and some unusual – requirements. The list of available options is continually expanding.

Our custom engineering capabilities and expertise are available to satisfy your requirements, no matter how complex. Contact **ELEVATOR CONTROLS** for more information.

Index to the following subsections:

9.1 Specifications for ACS Alternate Call Scheme Feature

OPTIONAL: The elevator system shall provide a means for switching from the main hall call push-button system to an ACS Alternate Call System. The ACS option shall allow one of the following:

a. In buildings having ALL double opening cars, the system shall switch service from one side opening to the alternate side opening.

b. In buildings having SOME double opening cars, access to the alternate side opening shall be selectively switched on/off, allowing cars to serve both sides or the main side opening only.

c. Access to floors served by only one or more cars in the system shall be restricted by switching to ACS operating mode.

d. A general "remapping" of a building's hall call service system shall be selectable, thereby adding or removing service to some floors by switching to ACS operating mode.

The implementation of ACS Alternate Call Scheme logic shall use microcomputer technology to ensure reliability of operation and ease of reprogramming. A relays-based system shall not be accepted.

The ACS system shall be placed in alternate call mode by a single input to the microcomputer system, including but not limited to a key switch or time clock, etc.

9.2 Specifications for Attendant Operation

OPTIONAL: The elevator control system shall be configured such that it can be operated with or without an attendant.

The transfer from automatic to attendant operation shall be accomplished by means of a key operated switch located in the car station. The car station shall also contain an up and down direction button, and an optionally supplied "pass" button enabling floors where hall calls have been registered to be skipped. A service demand buzzer and up/down signal lights shall in the car station shall also be supported.

When the transfer switch is in the attendant position, the car shall answer calls normally, except that by operating either the up or down button, the attendant shall establish the direction of travel, close the doors and start the car after each stop. Arrival and leveling at the landing and door opening shall be fully automatic. The doors shall remain open until direction is initiated by the attendant. If the button is released before the doors are fully closed and interlocked, the doors shall reopen.

Continuous pressure on the "pass" button shall cause the car to bypass the corridor calls and respond only to preregistered calls in the direction of travel. The bypassed calls shall remain registered to be answered by another car or on another trip.

The up and down signal lights shall indicate that an unanswered corridor call is above or below the car. These lights shall remain illuminated until all calls for that direction are answered.

Operation of an up or down corridor push-button shall sound the service demand buzzer in the car to alert the attendant.

9.3 Specifications for Emergency Power Operation

OPTIONAL: When emergency power generation is detected, elevator cars shall be automatically returned one by one to the main lobby. As each car arrives, doors will be opened and the car shall remain at the lobby with the doors opened. While each car is being returned to the lobby, all other cars shall be shut down to avoid any overload of the emergency power generating system.

Once all cars have been returned to the lobby, one or more cars shall be selected to run under emergency power, based upon the predetermined capacity of the emergency power generator. Emergency Power Operation shall not allow more cars to run than can be safely handled by the emergency power generator. The actual number of cars operated shall be an adjustable predetermined value.

9.4 Specifications for Medical Emergency Service/Code Blue

OPTIONAL: Medical Emergency Service/Code Blue shall call any in-service elevator to any floor on an emergency basis, operating independently from Group System and landing call signals. A medical emergency call switch shall be installed at each floor where the ability to enable emergency service operation is desired.

The medical emergency call key switch shall be a two-position, key-operated, momentary-pressure, spring-return-to-off type switch, with a call registration light jewel provided adjacent to each switch.

When a medical emergency call switch is activated at any floor, the call registration light jewel will illuminate at that floor only, and the elevator Group System shall instantly select the nearest available elevator in group service to respond to the medical emergency call.

Immediately upon selection, all car calls assigned to this car shall be canceled. Further, any landing calls which have previously been assigned to that car will be transferred to another car.

If the selected car is traveling away from the floor at which the medical emergency call was entered, the car will slow down, stop at the nearest floor (maintaining doors closed), reverse direction, and proceed nonstop to the medical emergency call floor. If the selected car is traveling toward the floor at which the medical emergency call was entered, it will proceed to that floor nonstop unless, at the time of selection, it happened to be slowing down for a stop, in which event, the car will stop, maintain doors closed, and immediately restart, responding to the medical emergency floor call.

Upon arrival at the medical emergency floor, the car shall remain with doors open for an adjustable time interval (that may be set within the range of 10 to 30 seconds). After this interval has expired, if the car has not otherwise been placed on medical emergency operation from within the car, it will automatically return to normal service.

A medical emergency key switch shall be located in each car operating station for selecting medical emergency service. Upon activation of the key switch, the car shall accept a call to any floor, close doors, and proceed nonstop to the selected floor. Return of the key switch to the normal position shall restore the car to normal service.

Any car selected to respond to a medical emergency call shall be removed from group service and shall accept no additional calls, emergency or otherwise, until the medical emergency key switch has been returned to the normal position.

Any car in group service may be selected. Additional medical emergency calls, as they are registered in the system, shall cause additional cars to respond as described, on the basis of one medical emergency call per car.

All of the key switches for all elevators in the medical emergency service system shall operate from the same key. The medical emergency call service key shall not operate any other key switch in the elevator system, nor shall any other key used within the elevator system operate ~~the~~ medical emergency call service switches.

If all cars are out of service or otherwise unable to answer an emergency call, the registration light shall not illuminate.

9.5 Specifications for Swing Car Operation with Inconspicuous Riser

OPTIONAL: The elevator system shall provide a means to remove one car from a multi-car Group System, and convert it to simplex collective selective. This car shall operate independently from the Group System, and respond to its own "inconspicuous" hall call riser.

While in inconspicuous hall call mode, the car shall serve any combination of floors and openings. The selection of these floors shall be by means of field reprogrammable options stored within the car microcomputer system.

Implementation of inconspicuous hall call system logic shall use microcomputer technology to ensure reliability of operation.

The system shall be place in inconspicuous hall call mode by a single input to the microcomputer system, including but not limited to a key switch or time clock, etc., or automatically by means of inconspicuous demand detection logic.

Section 10 EZ-LINK™ SERIAL COMMUNICATION

Section currently under revision.

For current specification language please contact **ELEVATOR CONTROLS**.

Section 11 LANDING SYSTEMS

Overview of Landing Systems / Recommended Use

A variety of landing systems have been developed to satisfy the requirements of most applications. Choices include a **Vane & Magnetic Switch** type system, a **Tape Selector** type system (IP8300), and a system using **Perforated Tape** in conjunction with quadrature pulse sensing (IP8300-PVF) for Position-Velocity Feedback applications. Each type is best suited for a particular application and/or elevator contract speed range.

Vane & Magnetic Switch: Recommended for use in lower speed applications to 150 fpm for Hydraulic controls or traction cars with velocity feedback or open loop up to four stops. Use for higher speeds and landings is not recommended unless required or specified.

Tape Selector (IP8300): Recommended for use in low- to mid-rise elevators to 350 fpm with velocity feedback.

Perforated Tape Selector (IP8300-PVF) **or Optional Encoder:** Recommended for use with mid- to high-rise elevators equipped with the Elevator Controls PVF Position Velocity Feedback option.

Index to the following subsections:

11.1 Specifications for Vane & Magnetic Switch Landing System

The landing system shall be comprised of a metal enclosure which shall be mounted to the crosshead with brackets and mounting hardware. The enclosure shall contain enclosed U-shaped magnetic switches, mounted in three vertical lanes. One lane shall be provided for level up, level down and door zone. Two additional lanes shall be provided, as required: one lane for up selector stepping; the other lane for down selector stepping. The ability to vertically adjust the magnetic switches shall be provided.

Metal vanes attached to brackets shall be mounted to the guide rails with either cast or spring rail mounting clips. One vane shall be mounted at each floor in such a manner as to align vertically with the level lane of the enclosure to establish the automatic leveling zone. Leveling sensors shall provide car leveling accuracy of ¼ inch or better.

At intermediate floors, one vane shall be mounted at up slowdown distance below the level vane. One vane shall be mounted at down slowdown distance above the level vane. Both vanes shall be mounted in such a manner as to align vertically with their respective selector stepping lanes.

At the top terminal landing, one vane shall be mounted at up slowdown distance below the level vane. At the bottom terminal landing, one vane shall be mounted at down slowdown distance above the level vane. Both vanes shall be mounted in such a manner as to align vertically with their respective selector stepping lanes.

If intermediate slowdown inputs are required, additional magnetic switches in their own respective lanes and vanes and brackets shall be provided.

A combination of adjustments of the car mounted enclosure and rail mounted vanes in both the vertical and horizontal directions shall allow the metal vanes to properly engage the magnetic switches taking into consideration front-to-back and side-to-side movement of the elevator.

11.2 Specifications for Tape Selector Landing System

The landing system shall be comprised of a metal enclosure with guide shoes which shall be mounted to the crosshead with brackets and mounting hardware. The enclosure shall be of the floating type to accommodate horizontal movement of the tape. The enclosure shall have magnetically actuated sensors for level up, level down, door zone and selector stepping. As an option, absolute floor encoding shall be made available.

A metal tape shall be mounted vertically from near the top of the hoistway to near the bottom of the hoistway. The top mounting bracket shall be mounted in such a position that the elevator shall not strike the bracket when at its extreme upper limit of travel. The bottom mounting bracket shall be mounted in such a position that the elevator shall not strike the bracket when at its extreme lower limit of travel. The bottom bracket shall be provided with springs to maintain proper tension of the tape.

Magnetic strips shall be applied to the metal tape to function as vanes which shall activate selector sensors. One vane shall be mounted at each floor in such a manner as to align vertically with the level lane of the enclosure to establish the automatic leveling zone. Leveling sensors shall provide car leveling accuracy within ¼ inch or better.

At intermediate floors, one vane shall be mounted at up slowdown distance below the level vane. One vane shall be mounted at down slowdown distance above the level vane. Both vanes shall be mounted in such a manner as to align vertically with their respective selector stepping lanes.

At the top terminal landing, one vane shall be mounted at up slowdown distance below the level vane. At the bottom terminal landing, one vane shall be mounted at down slowdown distance above the level vane. Both vanes shall be mounted in such a manner as to align vertically with their respective selector stepping lanes.

If intermediate slowdown inputs are required, additional magnetic vanes in their own respective lanes shall be provided.

A combination of adjustments of the car-mounted enclosure sensors and tape-mounted vanes, in both the vertical and horizontal directions, shall allow the vanes to properly engage the magnetic

sensing switches. These adjustments shall accommodate normal front-to-back and side-to-side movement of the elevator.

11.3 Specifications for Perforated Tape Selector or Optional Encoder Landing System

The landing system shall be comprised of a metal enclosure with guide shoes which shall be mounted to the crosshead with brackets and mounting hardware. The enclosure shall be of the floating type to accommodate horizontal movement of the tape. The enclosure shall have magnetically actuated sensors for level up, level down, door zone and optional floor position encoding.

A metal tape shall be mounted vertically from near the top of the hoistway to near the bottom of the hoistway. The top mounting bracket shall be mounted in such a position that the elevator shall not strike the bracket when at its extreme upper limit of travel. The bottom mounting bracket shall be mounted in such a position that the elevator shall not strike the bracket when at its extreme lower limit of travel. The bottom bracket shall be provided with springs to maintain proper tension of the tape.

The tape shall be manufactured with a series of holes centered over the entire length of the tape. The holes shall be 3/8" center-to-center. An electronic sensor with two quadrature-channels shall read each hole as the elevator travels through the hoistway. Signals from each channel shall be electronically converted to create two symmetrical square wave signals offset by 90 degrees. The square wave signals shall be decoded by the controller in such a manner as to determine speed, incremental position, and direction of the elevator the entire length of the hoistway with accuracy within 3/16 of an inch or better.

Optionally, an encoder located on the cartop or on the governor shall be used to provide quadrature signals where a tapeless system is preferred.

Position feedback from the hole-reading sensors shall be used by the controller to continuously adjust the mathematically computed optimal speed output as a function of distance from the target floor. During deceleration, the system shall function in such a way as to provide accurate positioning of the elevator through final leveling.

When the elevator is level with a respective floor, a series of sensors shall read magnets placed on the tape in such a manner as to create a binary count that is unique to a particular floor. Each floor shall have a unique binary code which shall be used to determine absolute floor position.

An additional magnet shall be placed on the tape at each floor in such a manner as to align vertically with the level lane of the enclosure to establish the automatic leveling zone. Leveling sensors shall provide car leveling accuracy within ¼ inch or better.

Section 12 LIMIT SWITCHES

Section currently under revision.

For current specification language please contact **ELEVATOR CONTROLS**.

Section 13 LOAD WEIGHING

Section currently under revision.

For current specification language please contact **ELEVATOR CONTROLS**.

Section 14 INTERACT™ CENTRAL & REMOTE MONITORING

Section currently under revision.

For current specification language please contact **ELEVATOR CONTROLS**.

Section 15 SECURITY

Overview EC Basic Security / Recommended Use

Elevator Controls Corporation is a highly regarded manufacturer of Non-proprietary, microprocessor-based elevator controls. Our equipment is designed and engineered using appropriate, proven technology… to ensure years of field reliability.

Today's environment has brought increased attention to security concerns. Regulation, restriction and control of vertical transportation within a building can be a critical component of total facility security programs intended to detect, defend and facilitate response to intrusion.

EC Basic Security prevents unauthorized individuals from entering car calls and allows only authorized individuals to access restricted floors. Basic Interact Security with Display enhances EC Basic Security by providing the ability to activate or deactivate access restrictions from a machine room Display or remote system monitoring Display running Interact™ Monitoring software.

Options include interfacing to various types of Card Reader Systems, Floor Key Lockout operation, and Anti-Terrorism Control.

15.0 General

Elevator security options available for all **Elevator Controls** controllers include EC Basic car call button Security and Basic Interact Security with Display.

15.1 Specifications Basic Car Call Button Security

OPTIONAL - EC Basic Security can be used to prevent unauthorized individuals from entering car calls and allows only authorized individuals to access restricted floors. Basic Security provides a means to prevent unauthorized registration of car calls by allowing access only to the floor/s for which an elevator passenger is authorized. Exiting from the elevator at designated lobby floors shall not be restricted.

The EC Basic Security system shall allow access to any floor or combination of floors controlled by the elevator security system to be either unrestricted or restricted. A single input to the microcomputer system, such as a key switch, time clock, etc, shall place the system in secure mode.

Secure Mode shall have the effect of rendering all car call buttons inoperative except those for floors programmed to allow unrestricted access. Access to restricted floors shall be accomplished from any floor by entering a hall call. The arriving elevator car shall require that the destination floor be followed by entry of an access code, using the standard car operating panel pushbuttons, in order to register a car call.

If the code sequence has been entered correctly, the call destination lamp shall be illuminated and the call accepted. Without entry of the correct code, car call registration shall not be accepted. Multiple attempts shall be allowed.

An optional restricted floor indicator can be illuminated to confirm that access to a restricted floor is being requested.

The access authorization sequence shall start with the destination floor button, followed by entry of a code sequence of up to eight numbers. If a sequence does not match one contained in the security system data table, the memory shall automatically be cleared and the elevator passenger denied access.

While in Secure Mode, elevators shall park at designated lobby floor/s to prevent parking at and subsequent unauthorized access to restricted floors.

Emergency operations including Fire Service shall override security operation.

15.2 Specifications Basic Interact™ Security with Display

Basic Interact Security with Display enhances EC Basic Security by providing the ability to activate or deactivate access restrictions from a machine room Display or remote system monitoring Display running Interact™ Monitoring software.

15.2.1 Car Call Access

OPTIONAL - Basic Interact Security with Display shall allow either restricted or unrestricted access to any floor or floors controlled by the elevator security system. Field programmable floor security codes shall be required for access.

The EC Basic Interact Security system shall allow access to any floor or combination of floors controlled by the elevator security system to be either unrestricted or restricted. A single input to the microcomputer system, such as a key switch, display terminal or software timer table, shall place the system in Secure Mode.

While in Secure Mode, elevators shall park at designated lobby floor/s to prevent parking at and subsequent unauthorized access to restricted floors.

Secure Mode shall have the effect of rendering all car call buttons inoperative except those for floors programmed to allow unrestricted access. Access to restricted floors shall be accomplished from any floor by entering a hall call. The arriving elevator car shall require that the destination floor be followed by entry of an access code, using the standard car operating panel pushbuttons, in order to register a car call.

If the code sequence has been entered correctly, the call destination lamp shall be illuminated and the call accepted. Without entry of the correct code, car call registration shall not be accepted. Multiple attempts shall be allowed.

An optional restricted floor indicator can be illuminated to confirm that access to a restricted floor is being requested.

The access authorization sequence shall start with the destination floor button, followed by entry of a code sequence of up to eight numbers. If a sequence does not match one contained in the

security system data table, the memory shall automatically be cleared and the elevator passenger denied access.

While in Secure Mode, elevators shall park at designated lobby floor/s to prevent parking at and subsequent unauthorized access to restricted floors.

Emergency operations including Fire Service shall override security operation.

15.2.2 The Interact Security Car or Hall Call Lockout

OPTIONAL - Interact Security shall allow the user to completely disable a car or hall call button from within the Interact Security system as if a Floor Key Lockout had been activated.

Emergency operations including Fire Service shall override all modes of Interact Security operation.

15.3 Card Reader Interface

OPTIONAL - A Card Reader Interface shall be provided. The card reader vendor shall provide a dry contact output which shall be used to restrict registration of calls. Such contact/s shall be provided per opening, per call or for groups of calls and openings as required.

Emergency operations including Fire Service shall override Card Reader Lockout mode.

15.4 Floor Key Lockout

OPTIONAL - A floor key lockout interface shall be provided to disable registration of calls. Floor Key Lockout function shall be provided per opening, per call or for groups of calls and openings as required.

Emergency operations including Fire Service shall override Floor Key Lockout mode.

15.5 Anti-Terrorism Control

OPTIONAL – Anti-Terrorism Control is intended to work hand-in-hand with other means of detection and intervention. Anti-Terrorism operation shall be enabled upon activation of an Anti-Terrorism Switch located either at the lobby, lobby console or at a remote location.

When an Anti-Terrorism Switch is activated, if the elevator is already at the lobby with doors closed, the doors shall remain closed.

If the elevator is in motion traveling away from lobby, the elevator shall stop at the next available floor without opening the doors, and return non-stop to the lobby where doors shall open. Once exiting passengers have vacated the elevator, the doors shall close.

If the elevator is in motion traveling toward the lobby, the elevator shall return non-stop to the lobby where doors shall open. Once exiting passengers have vacated the elevator, the doors shall close.

Anti-Terrorism Control circuitry shall operate with simplex, duplex and/or group controls. Any floor/s can be designated as a lobby floor.

15.6 Custom Security Functions

OPTIONAL – A wide range of customized security functions can be developed to meet complex specifications. Inquire in confidence about unique and highly customized security options to satisfy specific security requirements.

Section 16 PHYSICAL SPECIFICATIONS

16.1 General Enclosure Specs

Standard: **NEMA 1** lockable enclosure shall be provided standard for indoor non-dusty, uncarpeted environments.

Available: NEMA 4, 4X, 12, 7, 9 rated enclosures for harsh, damp or hazardous environments; air conditioned enclosures optional.

Actual Enclosure: Size and NEMA rating determined by Customer requirements, equipment size & options.

16.2 H800 Hydraulic Controllers

For controls to 100 HP the following NEMA 1 enclosures shall be offered:

Standard Enclosure: (Nom) 36" W x 30" H x 7" D
Intermediate Enclosure: (Nom) 36" W x 38" H x 10" D
Jumbo Enclosure: (Nom) 36" W x 48" H x 14" D

16.3 V800 Traction Controllers

For controls to 100 HP the following NEMA 1 enclosures shall be offered:

Standard Enclosure: (Nom) 36" W x 77" H x 12" D
Wall Mount Enclosure: (Nom) 36" W x 63" H x 14" D

16.4 G900 Group System

Standard Enclosure: (Nom) 22" W x 70" H x 24" D
(free standing with front & rear hinged doors, NEMA 1)
Wall Mount Enclosure: (Nom) 36" W x 30" H x 7" D

16.5 General Power Specifications

All systems to 100 HP are available to operate at one of the following AC voltages: 208, 220, 240, 440-480, 575, 600 @ 30-60Hz. 380/415VAC @ 50Hz also available.

V800, H800: Power input protection shall be provided in the form of either a circuit breaker or a fused disconnect in accordance with the National Electric Code and applicable local codes, sized for Motor HP plus 5HP, at the specified input voltage +/-10% and frequency +/-2%.

16.6 Operating Environment

Machine Room Temperature: **Ambient air temperature range 32º to 104º F (0º to 40º C)**
Maximum Inside Enclosure: **Shall not exceed 122º F** (50º C)
Operating Temperature: **32º F to 122º F** (0º C to 50º C)
Storage Temperature: **-22º F to 150º F** (-30º C to 65º C)
Humidity: **10% to 90% non-condensing**
Altitude: **Up to 7500 feet** (2286 m)