C4

SPECIFICATIONS

SMARTRISE

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Product Specifications

This specification is for the Smartrise C4 Traction Elevator Controller and includes:

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Product Specifications Table

Maximum car speed	2000 fpm
Configuration	Simplex - group up to 15 cars
Landings	96
Motor control (induction or permanent magnet capable)	KEB/ Magnetek
Landing system	Absolute
Power requirement	208 – 600 VAC, 50/60 Hz, 3-phase
Environment	32 - 104º F, 0 - 40º C; Humidity 95% non-condensing
*Standard enclosure (height includes floor mount legs)	Medium: 45” w x 28” h x 16” d (1143 x 711 x 406 mm) with knock-outs. Large: 45” w x 40” h x 16.75” d (1143 x 1016 x 425 mm) with knock-outs.
Available NEMA enclosures	NEMA 1, 4, 4X, 12

*Variations available

Code Compliance

The elevator controller shall use a microprocessor-based logic system and shall comply with all applicable elevator and electrical safety codes including: (Contact Smartrise if a necessary code is not listed below.)

Elevator Safety Code Compliance

- ASME A17.1/CSA B44
- NYC Appendix K
- Massachusetts 524 CMR
- NFPA 70/CSA C22.1 Electrical Codes (U.S. & Canada)
- CSA B44.1/ASME A17.5 Elevator and Escalator Electrical Equipment Standards
- EN 12016 EMC Immunity Standards
- ADA & ICC/ANSI A117.1 Accessibility Standards

ADA Requirements

Compliance

The elevator shall comply with ICC/ANSI A117.1, the American National Standard for Accessible and Usable Buildings and Facilities.

Leveling Accuracy

The controller shall have a self-leveling feature that shall automatically bring the car to floor landings within a tolerance of 0.25" (6.35 mm) or better under all loading conditions up to the rated load.

Hall Lanterns

The controller shall have outputs to drive the visible and audible signals that are required at each hoistway entrance to indicate which elevator car is answering a call. Audible signals shall sound once for up, twice for down. (In-car lanterns located in cars, visible from the vicinity of hall call buttons, and conforming to the above requirements, shall be acceptable.)

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 facilitate announcement of car direction and floor number. (Voice annunciator is required for destination-based dispatching elevators or for elevators with speeds greater than 200fpm).

Non-Proprietary Equipment

Only universally “Serviceable and Maintainable” non-proprietary elevator control equipment shall be accepted. Non-proprietary standards recognize specific owner’s rights:

- The right to all information needed for diagnosis, service, and repair.
- The right to access on-board computers, including the information they store and the ability to diagnose, repair, and/or reprogram these systems.
- The right to select from among multiple sources for maintenance and repair in a competitive marketplace.

Environmental Considerations

The elevator controller shall operate within the following environmental conditions:

- Ambient temperature: 32F degrees to 104F degrees (0C degrees to 40C degrees). Higher temperature ranges are available.
- Humidity: Non-condensing up to 95%
- Altitude: Up to 7500 feet (2286 m)

Smartrise specializes in the manufacture of control products for adverse environmental conditions. For example, dust-proof, waterproof, corrosion-resistant, explosion-proof, or air-conditioned controller cabinets can be engineered to meet specific applications. Please contact Smartrise Sales for details.

Controller Features

- Non-Proprietary (open architecture, universally serviceable, manuals/drawings provided)
- Minimized hoistway switch requirements (slowdown, emergency terminal, hoistway access limit switches and leveling magnets not required)
- Hoistway and System Configuration (on board interface or through the Smartview Suite)
- Diagnostics (on board interface or through the Smartview Suite)
- Status Indicators (LCD messages and individual status LEDs)

Operating Modes

- Simplex-Group
- Automatic: Selective Collective/Single Button Collective/Single Automatic Push Button
- Inspection: Machine Room, In Car, Car Top, Access
- Fire Service Operation (multiple pre-configured code-specific selections)
- Hospital Operation
- Massachusetts EMT Operation
- Sabbath
- Swing Operation (from group or duplex control)
- Recall Operation
- Attendant Operation
- Earthquake Operation (ASME/ANSI or California)
- Emergency Power Operation
- Capture for Test
- Test Mode

Emergency Power

The group shall provide a screen(s) allowing assignment or editing of emergency generator attributes in relation to cars in the elevator group. This screen shall provide:

- Ability to assign or edit assignment of selected cars to one of up to two emergency generators
- Set the active polarity (high/low) of the emergency generator alerting input
- Set a time in seconds which must elapse before cars may be run on emergency power (allowing the generator power to stabilize)
- Determine how or if emergency recall is activated per car and the sequence in which cars are recalled
- Set the number of cars that may be recalled simultaneously
- Set a recall timeout such that, if a car should fail to recall within this period, the group shall move on to the next eligible car

- Determine how or if recalled cars should be run on emergency power and the sequence in which they are to be run
- Set the number of cars that may run simultaneously on emergency power

Emergency Power Options

- Building Emergency Generator
- Smartrise Traction Auxiliary Power Supply

Monitoring Options

C4 GUI

A basic system monitoring and controlling application available with every controller. The application has a user-friendly graphical interface that will run on any device with a web browser. No internet connection is required.

The application will:

1) Display live data from elevators connected to the group (Mode of operation, Car speed, Position, current floor, destination, and door status).

2) Keep a record of faults and alarms logged by any of the elevators connected to the group. The fault code, description, solution, date stamp, and the car ID of the elevator that logged the fault will be displayed.

3) provide the ability to view and adjust parameters and settings using the graphical user interface.

4) Allow the user to load controller software, backup existing parameter setup, and restore saved backups.

Smartview monitor

An advanced monitoring and controlling application. The application has a user-friendly graphical interface that will run on a provided device.

The application will:

1) Display live data from elevators connected to the group (Mode of operation, Car speed, Position, Current Floor, Destination, and Door Status).
2) Keep a record of faults and alarms logged by any of the elevators connected to the group. The fault code, description, solution, date stamp, and the car ID of the elevator that logged the fault will be displayed.
3) Ability to view and adjust parameters and settings using the graphical user interface.
4) Include built in Maintenance Control Program (MCP).
5) Allow the user to view and edit floor security profiles.
6) View and modify the elevator motion curve graphically.
7) Allow the user to load controller software, backup existing parameter setup, and restore saved backups.
8) Collect historical data and generate reports. The report shall provide, at a minimum, hall call analysis, traffic analysis, hall call log, car call log, event log, emergency log and maintenance log in service reports.
9) Allow for multiple user levels such as: Mechanic, Lobby Monitoring, and Remote Monitoring.
10) Can be used locally over LAN (with local service) or remotely using an internet connection to a remote server.

Optional: A site view, with three-dimensional representations of site buildings, visual indicators of elevator status in buildings so equipped, and the ability to show status details upon indicator selection shall be available. (This option requires additional graphics development as agreed upon by Smartrise and the customer.)

Third Party Monitoring

Optional: An interface to a monitoring system shall be available.

Load Weighing

- Rope Sensors, Crosshead Sensors, Under Machine Sensors, Floor Sensors and more.
- Analog or Discrete Inputs

General

All power feed lines to the brake shall be opened by an electro-mechanical switch. A single ground, short circuit or solid-state control failure shall not prevent application of the brake.

The automatic leveling zone shall not extend more than 3" above or below the landing level, nor shall the doors begin to open until the car is within 3" of the landing. The car shall not move if it stops outside the inner leveling zone unless the doors are fully closed and locked.

The system shall use an automatic two-way leveling device to control the leveling of the car to within 0.25" (6.35 mm) or better above or below the landing sill. Overtravel, under travel or rope stretch must be compensated for and the car brought level to the landing sill.

The closed loop feedback power control shall be arranged to continuously monitor the actual elevator speed signal from the velocity transducer and compare it with the intended speed signal to verify proper and safe operation of the elevator.

During operation of the elevator with an overhauling load (empty car up or loaded car down), precision speed control shall be obtained by the regulation system used in the power control. The power control shall have the capability to maintain regulation under varying loads.

The controller shall provide step-less acceleration and deceleration and smooth operation at all speeds. The system shall provide the required electrical operation of the elevator control system including automatic application of the brake, which shall bring the car to rest in the event of a power failure.

The controller shall include absolute floor position which, upon power up, shall move the car to the closest floor to identify the position of the elevator. With absolute position it is not necessary to travel to a terminal to establish floor position.

The controller shall use a variable voltage, variable frequency drive to control three-phase AC induction and Permanent Magnet AC motors.

The drive shall use power semiconductor devices and pulse width modulation with a carrier frequency of not less than 8 kHz to synthesize the three-phase, variable voltage, variable frequency output to operate the hoist motor in an essentially synchronous mode.

The drive shall have the capability of being adjusted or programmed to achieve the required motor voltage, current and frequency to properly match the characteristics of the AC elevator hoist motor.

The drive shall not create excessive audible noise in the elevator motor.

The drive shall be a heavy-duty type, capable of delivering enough current to accelerate the elevator to contract speed with rated load. The drive shall provide speed regulation appropriate to the motor type.

A means shall be provided for removing regenerated power from the drive DC power supply during dynamic braking. This power shall be dissipated in a resistor bank which is an integral part of the controller. Failure of the system to remove the regenerated power shall cause drive output to be removed from the hoist motor.

A contactor shall be used to disconnect the hoist motor from the output of the drive unit each time the elevator stops. This contactor shall be monitored. The elevator shall not start again if the contactor has not returned to the de-energized position when the elevator stops.

All power feed lines to the brake shall be opened by an electro-mechanical switch. A single ground, short circuit or solid-state control failure shall not prevent application of the brake.

The controls shall be arranged to continuously monitor the performance of the elevator so that, if car speed exceeds 150 fpm during access, inspection, or leveling, the car shall shut down immediately, requiring a reset operation.

Optional - Failure of the brake to lift as detected by a mechanical switch (if provided) shall cause the control system to take the elevator out of service at the next stop where it shall remain out of service until the condition is corrected.

Programmable Logic

All available programming options (Please consult your Smartrise Sales Representative for options) or parameters shall be field programmable, without need for any external device or knowledge of any programming languages. Programmable options and parameters shall be stored in non-volatile memory. At a minimum, there shall be a 32-character alphanumeric display used for programming and diagnostics. Programmable parameters and options shall include, but are not limited to, the following:

- Number of Stops/Openings Served (Each Car)
- Simplex/Duplex/Group
- Single Automatic Pushbutton Selective Collective/Single Button Collective
- Programmable Fire Code Options/Fire Floors (Main, Alternates)
- Digital Position Indicators/Single Wire Position Indicators
- Programmable CE Microcom floor labels
- Programmable Door Times
- Programmable Motor Limit Timer
- Programmable Car Fan and Light Timer
- Door Nudging, Automatic and Fire Operation
- Emergency Power
- Parking Floors
- Lobby Floor
- Door Pre-opening
- Hall or Car Gong Selection
- Retiring Cam Option for Freight Doors
- Independent Rear Doors
- Standard Security
- Emergency Hospital Service
- Attendant Service
- Anti-nuisance - Light Load Weighing and Photo Eye
- High Speed Inspection Enable
- Door behavior selections
- Door type selection

- Fault Bypass – Inspection Operation
- Fault Bypass – Automatic Operation

Field selectable, preprogrammed Fire Service operations compliant with the following Fire Codes:

ASME 17.1 and other City and State Codes. Contact Smartrise sales rep.

Intended Operation of Critical Components

Failure of any single magnetically operated switch, contactor, or relay to release in the intended manner; the failure of any static control device, speed measuring circuit, or speed pattern generating circuit to operate as intended; the occurrence of a single accidental ground or short circuit shall not permit the car to start or run if any hoistway door or gate interlock is unlocked or if any hoistway door or car door or gate contact is not in the made position. Furthermore, while on car top inspection or hoistway access operation, failure of any single magnetically operated switch, contactor or relay to release in the intended manner, failure of any static control device to operate as intended or the occurrence of a single accidental ground, shall not permit the car to move even with the hoistway door locks and car door contacts in the closed or made position.

Hoistway Equipment Minimization

The control system shall allow slowdown, emergency terminal, and hoistway access limit switches to be eliminated. These switches shall exist as virtual switches in system software. The control system shall eliminate leveling magnets and/or vanes.

Status Indicators

Dedicated permanent status indicators shall be provided on the controller to indicate when the safety string is made, when the door locks are made, when the elevator is operating at high speed, when the elevator is on independent service, when the elevator is on Inspection or Access, when the elevator is on fire service, when the elevator Out of Service Timer has elapsed, and when the elevator has failed to successfully complete its intended movement, and display other special or error conditions detected by the microprocessor.

Every field connection input or output shall have a dedicated LED such that no volt meter or other test equipment is required to see when an input or output is active.

Out of Service Timer

An out of service timer shall be provided to take the car out of service if the car is delayed in leaving the landing while calls exist in the system.

High or Low Speed Inspection

A selection shall be provided on the controller to select high or low speed during access or inspection operation given the access or inspection operation speed does not exceed 150 feet per minute.

Door Operation

Door protection timers shall be provided for both opening and closing directions to protect the door motor and 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 if 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. If, after a predetermined number of attempts, the doors cannot successfully be closed, the doors shall be opened and the car removed from service.

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. In the event of a door reopen caused by the safety edge, photo eye, etc., a separate

short door time value shall predominate. A separate door standing open time shall be available for lobby return.

If the doors are prevented from closing for longer than a predetermined time, door nudging operation shall cause the doors to move at slow speed in the closed direction. A buzzer shall sound during nudging operation.

Door Pre-Opening

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

Fire Service Operation

Fire Phase I emergency recall operation, alternate level Phase I emergency recall operation and Phase II emergency in-car operation shall be provided according to applicable local codes.

Independent Service

Independent service operation shall be provided in such a way that actuation of a key switch in the car operating panel will cancel any existing car calls, and hold the doors open at the landing. The car will then respond only to car calls. Car and hoistway doors will only close with constant pressure on a car call pushbutton or door close button. While on independent service, hall arrival lanterns or jamb-mounted arrival lanterns shall be inoperative.

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.

Single Automatic Pushbutton Operation

Single automatic pushbutton operation shall be user selectable if desired.

Single Button Collective Operation

Single button collective operation shall be user selectable if desired.

Simplex Parking Operation

Optional: If no calls are registered, this operation shall cause the car to travel to a predetermined Parking landing floor and stop without door operation. If the car is traveling to the home landing and a call appears from the opposite direction, the car shall slow down, stop, and then accelerate in the opposite direction, toward the call. The parking function shall cease instantly upon the appearance of a normal call and the car shall proceed nonstop in response to any normal call. Option to park with the doors open is available.

Duplex Operation

For duplex configurations, each elevator shall have its own computer and dispatching algorithm. Should one computer lose power or become inoperative, the other shall be capable of accepting and answering all hall calls. When both computers are in operation, only one shall assume the role of dispatching hall calls to both elevators.

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.

Test Switch

A controller test switch shall be provided. In the test position, this switch shall allow independent operation of the elevator with the door open function deactivated for purposes of adjusting or testing the elevator. The elevator shall not respond to hall calls and shall not interfere with any other car in a duplex or group installation.

Inspection

To enhance safety, an inspection switch, enable switch, and an up/down toggle switch shall be provided in the controller and on the car top to place the elevator on inspection operation and allow the user to move the car. Activation of the car top inspection switch shall render the controller inspection switch inoperative.

Uncanceled 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.

Anti-Nuisance (Photo Eye)

The controller shall cancel all remaining car calls, if a user-determined number of car calls are answered without the computer detecting a change in the photo eye input (indicating that no one is passing through the car door opening).

Anti-Nuisance (Load weigh)

The controller shall cancel all remaining car calls, if a user-determined number of car calls are placed without the computer detecting a change in the load weighing device input (indicating that no one is entering or leaving the elevator).

Absolute Floor Position

The controller shall include absolute floor position, which upon power up, shall move the car to the closest floor to identify the position of the elevator.

Diagnostics

The control system shall provide comprehensive means of accessing the computer memory for elevator diagnostic purposes. It shall have permanent indicators for important elevator status conditions as an integral part of the controller.

The microprocessor boards shall be equipped with on-board diagnostics for ease of troubleshooting and field programmability of specific control variables. Field changes shall be stored permanently, using non-volatile memory. The microprocessor board shall provide the features listed below:

- On-board diagnostic switches and an alphanumeric display to provide user-friendly interaction between the mechanic and the controller.
- An on-board event log shall store and display time-stamped events for diagnostic purposes. (Viewable only with monitoring software.)
- An on-board real time clock shall display the time and date and be adjustable by means of on-board switches.
- Field programmability of specific timer values (i.e., door times, etc.) may be viewed and/or altered through onboard switches and pushbuttons.
- The elevator controller shall have extensive diagnostic capability. A built-in LCD display or equivalent shall allow access to major user functions and diagnostic features. The display shall be a multi-character, multi-line type with associated keypad to allow users to enter information. The display shall show data and menus in readily understood character format. No numeric, hexadecimal, or binary codes are acceptable.

- Dedicated indicators shall be provided in a conspicuous location on the elevator controller to indicate important system statuses, such as when the safety string is made, when the door locks are made, when the elevator is on Inspection/Access, etc. In addition, other special or error conditions detected by the main processor or safety subsystem shall be displayed.

Controller Optional Features

NEMA Landing/Positioning System

NEMA 4, 4X, and 12 rated landing/positioning systems are available for harsh hoistway conditions.

Controller

The elevator controller shall be a microprocessor-based system, designed specifically for the purpose of elevator applications.

Elevator control and logic shall be implemented independently of safety control and logic, and independently of safety redundancy control and logic.

Safety redundancy shall be independently operated, non-software, incorporate independent pre-run check, incorporate independent circuit path, and comply with ASME A17 & CSA B44 safety code standards.

The elevator controller shall provide significant memory capacity for configuration, parameter storage, event recording, real-time diagnostics, and program execution.

The elevator controller shall be configured and packaged in such a way that a single failure, such as external “jumpers” and/or user activity cannot bypass (intentionally or unintentionally) the primary and secondary safety systems in any passenger mode of operation. For non-passenger, other modes of operation shall be provided to bypass safety functionality for the purpose of inspection/manual operation and testing.

The elevator controller configuration shall be re-programmable and user adjustable in the field.

The elevator controller shall have extensive diagnostic capability.

A built-in LCD display shall allow access to user functions and diagnostic features in readily understood character format.

Dedicated indicators shall be provided on the elevator controller to indicate a host of system statuses, such as field input and outputs devices, and other special or error conditions detected.

The elevator controller shall support any device’s web browser for wired and wireless communication and interaction, to allow the user to access the controller configuration, parameters, view elevator information, initiate and facilitate setup, adjustment, and troubleshooting. The interface shall be designed specifically for elevator applications and shall display information from the controller.

The user shall be able to manage and manipulate parameters including:

- Retrieve from the elevator controller and view/edit
- Retrieve from the elevator controller and save to a file on a device
- Retrieve from a device, view/edit, and download to the elevator controller
- Manage separate configurations for multiple elevator controllers

The user shall be able to select specific groups or subsets of parameters to send or retrieve from the elevator controller.

The controller shall maintain an event log that records events and faults. They shall be displayed in chronological order and time stamped for analysis or review.

Data displayed shall include the type of event or fault, the date and time of it, the position of the elevator, and the status of various flags at the time of the occurrence. The event log shall be able to be saved and reviewed offline.

The interface shall support remote connection over-the-air, and a mechanism shall be provided to prevent the unauthorized alteration of elevator configuration parameters.

A controller switch shall be provided to enable the normal operation of the elevator out of public use for the purposes of adjustment and testing. The elevator shall have the door open function deactivated, shall not respond to hall calls and shall not interfere with any other car in multi-car operation.

Switches for controller inspection, enable, and up and down shall be provided to place the elevator on Inspection operation and allow the user to move the car from the machine room. The cartop inspection switch shall render the controller inspection switch inoperative. The elevator control and safety functions shall be part of an integrated system designed for ease of use, with diagnostics and parameter adjustments accessible through a common user interface.

The brake supply shall be capable of providing adjustable values of output voltage to provide smooth lifting, holding and releveling. These values shall be adjusted via parameters. The controller shall provide logic to detect different mode of brake failure. These failures shall cause the elevator to be removed from service at the next stop and remain out of service until the condition is corrected.

The system shall use an absolute position device to establish real time car position to an accuracy of .5 mm over the entire length of the hoistway.

The system shall control the leveling of the car to within 0.25" (6.35 mm) or better above or below the landing sill. Conditions of overtravel, under travel, or rope stretch shall be compensated for and the car brought level to the landing.

A system for pre-torqueing the hoist motor shall be made available to ensure consistently smooth starts. An electronic load sensor shall be required to implement the pre-torqueing feature.

Door pre-opening as the car approaches a landing shall begin a maximum of three inches from level-at-floor position.

AC Motor Drive

The control system shall utilize an AC drive.

The drive shall be capable of producing full torque at zero speed and shall not require DC injection braking in order to control car deceleration.

The drive shall be capable of controlling geared and gearless machines, induction and permanent magnet motors. The drive shall also work with different types of encoders such as EnDat, incremental, sine/cosine, and Hiperface.

The drive shall have built-in motor overload protection. External overload is not required.

The drive shall have the capability of being adjusted or programmed to achieve the required motor voltage, current, and frequency to properly match the characteristics of the AC elevator hoist motor.

The drive shall not create excessive audible noise from the elevator motor.

The drive shall be heavy-duty, capable of delivering sufficient current required to accelerate the elevator to contract speed with rated load. The drive shall provide speed regulation appropriate to the motor type.

For non-regenerative drives, means shall be provided to remove regenerated power from the drive DC power supply during dynamic braking. This power shall be dissipated in a resistor bank that is an integral part of the controller. Failure of the system to remove regenerated power shall cause the drive output to be removed from the hoist motor.

A regenerative drive option is available to return power to the AC line during dynamic braking. This system is very effective for higher horsepower and gearless applications.

A contactor shall be used to disconnect the hoist motor from the output of the drive unit each time the elevator stops. This contactor shall be monitored and the elevator shall not start again if the contactor has not returned to the de-energized position when the elevator stops.

The controller shall provide stepless acceleration and deceleration and provide smooth operation at all speeds.

DC Motor Drive

The drive shall be designed as an integral part of the control system providing access and adjustment of all diagnostic and configuration parameters.

The controller shall provide precise speed control.

The control system shall include dynamic braking to assist in bringing the car to a smooth, controlled emergency stop and to help limit car speed in the event of brake failure.

The control system motor field supply shall be regulated and functionally integrated with the drive in order to accomplish motor field forcing and armature voltage control.

A drive isolation transformer shall be provided as part of the control system to further reduce power line distortion and line notching. The transformer shall be matched to the characteristics of the drive and elevator hoist motor.

Quattro Drives

The control system shall fully support Magnetek Quattro Drives including:

- Magnetek Quattro AC
- Magnetek Quattro DC

Dispatching

C4 Dispatcher provides coordinated dispatching, parking, special operating modes, emergency power response, security, and interaction with existing (legacy) controls.

You configure and interact with the C4 dispatcher using the onboard LCD of the controller or the Smartview Suite.

The C4 dispatcher is built-into the elevator controller and is not in a separate enclosure cabinet.

Using a predictive knowledge base along with current and historical traffic information and artificial intelligence, C4 dispatcher anticipates and adapts to changing building traffic demand. The C4 dispatching engine continuously runs multiple scenarios to ensure that every decision maximizes efficiency. Self-optimizing technology adapts without intervention – the longer it runs, the better it gets.

The C4 intelligent parking system allows selection of user defined, automatic, or hybrid operation parking. Cars may be parked manually or dynamically, by floor, or by building sector.

Individual elevators shall be dispatched in a manner which minimizes the average time it takes for hall calls to be answered. Elevator position, speed, door status and direction of the hall call shall be taken into account. Each elevator controller shall be capable of dispatching groups of up to eight cars. If the current controller dispatcher is taken off line, the next designated controller shall immediately assume dispatching control.

There shall be four distinct dispatching modes: balanced, lobby-peak, demand-up-peak and demand-down-peak.

Balanced mode shall optimize elevator dispatching for periods when the up and down hall call demands are randomly distributed throughout the building and approximately equal. This mode shall minimize the average wait time of all hall calls, giving no preference to up versus down calls.

The lobby-peak mode shall optimize elevator dispatching for periods when the hall calls at the lobby(s), in a specific direction, are significantly higher than all other hall call demands in the building. Certain cars

shall be designated to service up or down hall calls at the lobby(s). The remaining cars shall be dispatched in balanced mode, to answer all other hall calls in the building. This mode shall give priority service to up or down hall calls at the lobby floor(s) in order to accommodate disproportionately high traffic at the lobby. The cars that are selected for lobby-peak mode shall bypass all other hall calls.

Demand-up-peak (and down-peak) modes shall also be supported, for periods when the up (down) hall-call demand at all floors is significantly higher than the down (up) hall-call demand at all floors and give priority to all up (down) hall calls.

The dispatching software shall decide which mode to use. It shall evaluate the number of hall calls, car calls, their distribution and frequency as well as additional system inputs, to select the optimal dispatching mode to address the current building demand.

Artificial Intelligence shall be used to implement balanced mode, lobby-peak mode, automatic mode selection, and dynamic parking. In balanced mode, AI shall be used to determine the optimal hall-call assignment for each building configuration. In lobby-peak mode, AI shall be used to automatically determine the number of cars that shall be assigned for lobby-peak only service. In automatic mode, these methods shall be used to determine the optimum mode of operation at any given time. Finally, both methods shall be used to determine the optimum parking at any given time.

Artificial intelligence shall be an integral part of the system and shall therefore always be active.

Parking

Eight user-defined parking schemes, to allow programming of multiple lobby and non-lobby parking configurations, shall be supported. It shall be possible to enable or disable these parking configurations manually or based on a time schedule. Time table choices shall include time of day, day of week, day of month, or day of year, allowing specification by name of day, occurrence of named day in the month, or by date.

The user shall select which cars may be parked at each programmed parking floor. If no cars are selected the system shall assume that all cars are eligible.

Zone/Sector parking shall be supported, allowing the user to divide the hoistway into multiple, contiguous floor zones in which idle cars shall be parked according to user-assigned priority.

Parking of cars with front and/or rear doors always closed, always opened, or opened for a programmed number of seconds shall be supported.

Parking logic shall be provided with shuffle delay timers (configurable parameter) to determine the wait time before parking idle cars, and re-parking non-lobby parked cars.

Dynamic-parking, to determine the optimal parking configuration for a building at any given time, shall be supported. Using artificial intelligence and learned historical data, predictions shall be made as to where the next building hall-call demands will most likely occur, and idle elevators shall be parked accordingly. The controller shall review data and refresh dynamic parking factors every fifteen minutes.

All time related configuration parameters used to park cars, including Lobby Parking Delay, Non-Lobby Parking Delay, Shuffle Delay, etc., shall be user programmable.

The user shall be able to specify whether lobby priority cars are to park with doors opened, closed, or opened for a specified amount of time. The user shall also be able to specify whether non-lobby priority cars are to park with doors opened, closed, or opened for a specified amount of time.

Combined dynamic and user-defined parking shall be supported. In this mode, the user shall be able to configure the essential parking floors and leave the rest of the parking floors undefined. Once all the user-defined parking floors are served, the dynamic parking scheme shall park the remaining idle elevators automatically.

Hall Call Eligibility

Eight, user programmable, Hall Call Eligibility configurations shall be supported. Each configuration shall specify that some cars are eligible to answer some types of hall calls while others are not. It shall be possible to activate any Hall Call Eligibility configuration manually or automatically by time table. Time

table choices shall include time of day, day of week, day of month, or day of year, allowing specification by name of day, occurrence of named day in the month, or by date.

Physical Backup Dispatching

Optional. In the event of a catastrophic failure of the hardware on which the C4 dispatcher operates, an additional C4 dispatcher can be paralleled to be switched over immediately.

Operating Features

Security Management: Physical hall lock support per floor/riser, independent front/rear opening control per car/floor/riser/direction of travel, car operating panel floor registration control per riser.

Dispatching Penalty and Advantage Assignment: Allows you to set conditions that will favor assignment of calls to cars depending upon real time traffic conditions including car operating modes, car readiness, and call coincidence (floor call at registered car call destination)

Emergency Power Operation: Recall (Phase 1) and Service (Phase 2) management per cars in group

Destination-Based Dispatching

Dispatching shall be destination based, allowing passengers with the same or efficiency-compatible destination floors to be grouped in specific elevator cars so fewer stops are required per car.

The destination based dispatching system shall be scalable, permitting destination-based dispatching to be employed throughout a building, on specified floors, or as lobby boost installations that use destination-based dispatching only on the busiest departure floors while allowing other floors to retain traditional dispatching hall call stations.

The destination based dispatching system shall be capable of being returned to a traditional dispatching system at the will of building management. Such return shall be capable of being assigned manually or through automated timers. Should a malfunction seriously impact the destination based dispatching system, dispatching shall be returned to traditional means automatically to avoid disrupting elevator service. Such return to traditional dispatching shall require no additional fixtures to be installed. Instead, destination entry touch screens shall display touch-enabled Up and Down call symbols.

The destination based dispatching system shall use touch screen fixtures at the primary destination entry stations and in place of traditional hall call stations. Should it be desirable or necessary to uninterrupted system operation, touch screens shall revert to traditional up/down hall call functionality.

Destination Based Dispatching shall fully support ADA requirements. Primary destination entry stations, in addition to touch screen controls, shall have a Braille labeled button that, when pressed, initiates a voice-directed means of destination selection using only the Braille labeled button. Such audible direction shall include annunciation of a tone or set of tones that, when repeated by the assigned elevator car, allow that car to be readily identified and located.

Destination Based Dispatching primary entry stations shall support an optional feature allowing a user to enter a number of passengers associated with the call entry to support more efficient and accurate car assignment. Such designation shall be for two passengers, three passengers, or four or more passengers.

Elevators shall be dispatched as an automatic group

- Group dispatching algorithm shall minimize system journey time (time between latching a destination call and arriving at destination).
- Group dispatching algorithm shall not put priority on individual passenger wait times over the system journey time.
- Group dispatcher shall take into account separate walk times individually set for each destination input device. Walk times shall be field adjustable.
- Group dispatcher shall take into account field programmable car capacities as number of passengers per car.

- Group dispatcher shall have an option to operate in standard ETA mode.
- During ETA mode, destination input devices shall show only up and down call buttons and register regular hall calls.

Call Input Devices

- Passengers shall enter destination calls by touch screen destination input devices (DID).
- Destination input device shall optionally request number of passengers to help prevent piggybacking of people going to same floor.
- Destination input devices shall communicate serially via CAN protocol to the group dispatcher.
- Destination Input Device shall respond to call request with a graphical representation of a path from that particular DID to the assigned car.

Special Access ADA operation

- Destination input device shall have a mechanical button with Braille 3 dot equilateral triangle symbol for accessibility.
- When button is pressed, the destination input device shall verbally inform the passenger to press again when the desired floor is spoken.
- Destination input device shall respond to a call request with a graphical representation of the path to the assigned car and a voice announcement of the car letter and unique audible tone for that car.
- Audible tone played at destination input device shall be repeated by hallway fixture above the car.
- Elevator adjuster shall have the ability to select which tone plays for each car as a field programmable option.
- Registration of a call with ADA button shall give preference to an empty car and extend door time set by a field adjustable parameter.

Special Operation Features

- Destination input device shall have ability to display special operations screen.
- Special operations screen shall be guarded by 3 to 10-digit password entered on touchscreen.
- Special operations password may be changed on the group dispatcher in the machine room.
- Special operation screen shall allow selected individuals to recall a car to DID floor with doors open so that it may be put in independent service or taken out of service for maintenance.

Exposed COP

Devices shall include:

- Door open/close buttons.
- Alarm button.
- Emergency stop switch.
- Self-dialing hands-free phone or intercom with ADA provisions
- Three position fire key operated switch, call cancel button, and illuminated visual/audible signal system with mandated signage engraved per ASME A.17.1 standards.

Locked Panel

Provide a locked panel containing key switches required to operate and maintain the elevator, including, but not limited to:

- Independent/Attendant service switch and service indicators.
- Light switch.
- Fan switch.
- G.F.I. duplex receptacle.
- Emergency light test button.
- Inspection Service operation key switch.

Group Status Display

The group shall have a status display screen that provides group and car status. At a minimum, the display shall provide:

- Group identification
- Group mode of operation (Automatic (dynamic mode assignment by Group), Balanced, Lobby Peak, Demand Down Peak, Demand Up Peak
- Connection status for each car in the group
- Emergency power status for each of up to two generators

User Displays

Building Configuration

The controller shall support field configuration or reconfiguration of building-service parameters in the field through Smartview Suite. Such configurable parameters shall include:

- Floors served per car
- Label assignment per floor up to three characters
- Setting or editing the number of cars in the elevator group
- Label assignment per car up to three characters
- Primary dispatcher designation
- Alternate dispatcher designation

Dispatching Options

A screen allowing assignment or editing of conditions that will favor assignment of calls to cars depending upon real time traffic conditions including car operating modes, car readiness, current car assignment, and call coincidence (floor call at registered car call destination)

Mode of Operation

A screen allowing assignment or editing of different Mode of Operation sets. For each set, this screen shall provide:

- Selection of the Mode of Operation to be used when this set is active (Automatic [dynamic selection by Group according to user-defined conditions], Balanced, Lobby Peak, Demand Up Peak, Demand Down Peak).

  The user shall be able to assign sets to any Dispatching Configurations. Each Dispatching Configuration shall be capable of manual assignment by the user or of timer-based assignment by the elevator group

control. Each Dispatching Configuration shall be additionally capable of controlling Parking sets, Parking Eligibility sets, and Hall Call Eligibility sets.

Dispatching Configurations

The group shall provide a screen allowing assignment or editing of pre-programmed dispatching configurations. Each configuration shall be capable of incorporating and controlling any pre-programmed Parking Eligibility, Parking, Hall Call Eligibility, or Mode of Operation sets. This screen shall provide:

- Ability to manually select and manually assign an ad-hoc Configuration incorporating any one of the sets previously configured for Parking Eligibility, Parking, Hall Call Eligibility, or Mode of Operation
- Ability to enable or disable timer-based assignment of any Dispatching Configurations

Timer Tables

The group shall provide a screen(s) allowing assignment or editing of timer tables used by the Group to enable system features on a timed basis. This screen shall provide:

- The ability to add, edit, remove, or set the priority of system timers
- A display of the attributes of any selected timer
- The ability to enter a logical name for each timer
- The ability to set a recurrence pattern for each timer
- The ability to set starting and ending times for each timer
- The ability to assign Hall Call Eligibility, Parking, Parking Eligibility, Mode of Operating, and Security attributes per timer
- The ability to assign the status (on/off) of any or all of four shared remote outputs per timer

Split Bank Operation

The group shall provide a screen(s) allowing assignment or editing of split bank operation (splitting the elevator group into two, separate groups call “banks”). This screen shall provide:

- The ability to enable or disable split bank operation
- The ability to assign hall call risers to each bank

Management (Monitoring)

The group shall provide a screen(s) allowing authorization or de-authorization of access to third-party monitoring systems.

Legacy Group Interface

*The group shall provide a screen(s) allowing accommodation for a legacy group control (cross-registration). This screen shall provide:

- Assignment of accommodation type (cross-registration)
- Cars to be cross-registered if that accommodation is selected
- Setting or editing of threshold time (if C4 car cannot respond within this time, C4 Dispatcher will assign the call to a legacy car)
- Legacy group accommodation requires additional hardware. Not all legacy controllers can be accommodated.

Security

If the elevator group is subject to building security requirements, interface must be provided for elements external to the elevator group.

C4 Dispatcher provides means to configure security requirements pertinent to the elevator group.

Status

The group shall provide a screen(s) allowing current security status to be displayed and to override software security if necessary. This screen shall provide:

- Master security status (Active, Hardware override active, Software override active)
- Software security override capability
- Active security configuration (if multiple configurations have been programmed) and means of activation (hardware, software, timer)
- The ability to assign activation of a security configuration manually or by a timer
- The ability to override or allow override by the Master Security switch
- Manage passwords allowing access to security settings
- The ability to assign security level (no security, basic security with per floor codes, basic security with per floor and passenger codes)

Per Floor

The group shall provide a screen allowing management of security per-floor. This screen shall provide:

- The ability to assign or edit hall call security (unrestricted, locked, or secured (security requirements active) on a per-floor, per riser, per opening, per car direction, per security set basis
- The ability to determine how long the call will accept input after the security requirement has been met
- The ability to allow/disallow a car to park at a secured floor

Per Car Hall Call Response

The group shall provide a screen allowing management of security per-car. This screen shall provide:

- Determination of which cars may respond to a hall call on a per-car, per-floor basis.

Car Floor Access

The group shall provide a screen allowing management of car call registration per security configuration. This screen shall provide:

- The ability to edit any one of eight security configurations
- Floors/Openings that may be accessed per car when security is active and security requirement are satisfied
- The ability to edit the period of time within which a call must be registered after security requirements are met

Car Restriction Override

The group shall provide a screen allowing a car call security restriction to be overridden when the car is operating in a selected mode or when the call is placed from a selected source. This screen shall provide:

- Selection of the security configuration to be overridden

- Selection or editing of the sources or modes capable of overriding security (All, OBD calls, Remote calls, Attendant service, CFSS 1, CFSS 2, Independent service, Test mode, Shuttle service)

Car Operating Panel Passcode Per Floor

The group shall provide a screen allowing floor access to be restricted unless the correct COP passcode is entered. This screen shall provide:

- Selection of the security configuration to be affected
- The ability to set a required passcode for car access on a per-car, per-floor, per opening basis

Status Indicators

Every field connection input or output shall have a dedicated LED such that no voltmeter or other test equipment is required to see when an input or output is active.