MITSUBISHI ELECTRIC

*Changes for the Better*

for a greener tomorrow

Quality in Motion

GROUP CONTROL SYSTEM

Smart & User Friendly

# ΣAI-2200C

Smart & User Friendly

# ΣAI-2200C

## Intuitive & Comfortable

Comfortable elevator operation and ride under ever-changing usage conditions – that's the concept realized with the ΣAI-2200C group control system from Mitsubishi Electric. Incorporating the latest advancements in fuzzy-logic, this system utilizes intuitive control to provide smooth operation and a stress-free ride. The moment a hall call button is pressed, the optimal car to respond to the call is selected based on factors such as waiting time, travel time, current car occupancy and energy consumption, and the Immediate Prediction Indication feature is simultaneously activated to reduce user irritation generated when waiting for the car to arrive.

Behind all this are Mitsubishi Electric's cutting-edge technologies, designed to add vitality and dynamism to building functionality.



# Principle

Based on our policy, "Quality in Motion", we provide elevators and escalators that will satisfy our customers with high levels of comfort, efficiency, ecology and safety.


Mitsubishi Electric elevators, escalators and building management systems are always evolving, helping achieve our goal of being the No.1 brand in quality.
In order to satisfy customers in all aspects of comfort, efficiency and safety while realizing a sustainable society, quality must be of the highest level in all products and business activities, while priority is place on consideration for the environment.
As the times change, Mitsubishi Electric promises to utilize the collective strengths of its advanced and environmental technologies to offer its customers safe and reliable products while contributing to society.

## We strive to be green in all of our business activities.

We take every action to reduce environmental burden during each process of our elevators' and escalators' lifecycle.






# Milestones of Group Control Technologies

ΣAI-2200C is an advanced group control system which is composed of many group control features.
With these features, it improves average waiting time.

| Year | 1980 | | 1990 | | 2000 | | 2010 | 2014 |
|---|---|---|---|---|---|---|---|---|
| Group control system | OS-2100 | OS-2100C | AI-2100 | AI-2100N | ΣAI-2200 | ΣAI-2200C | | |
| Standard group control features | | | | | | | | Individualized Car Allocation |
| | | | | | | | | Energy-saving Operation — Allocation Control |
| | | | | | | | | Cooperative Optimization Assignment |
| | | | | | | Dynamic Rule-set Optimizer | | |
| | | | | | Distinction of Traffic Flow with Neural Networks | | | |
| | | | | | Car Allocation Tuning | | | |
| | | | | | Fuzzy Logic | | | |
| | | | | | Expert System | | | |
| | | | | Learning Function | | | | |
| | | | Psychological Waiting Time Evaluation | | | | | |
| Average waiting time* (index) | 100 | 85 | 72 | 58 | 50 | | | 45 |

*The average time until the assigned car arrives at the hall after a passenger presses a hall button.

# ΣAI-2200C — A Comfortable Elevator Journey in Today's Complex Buildings

## Key Benefits of ΣAI-2200C

### Less travel time

In addition to reduction of waiting time, this group control system reduces travel time (from boarding a car to arriving at a destination floor) by individualized car allocation.

### More flexible car allocation

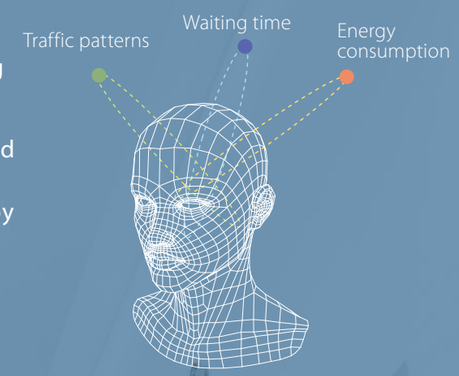
Traffic conditions in a building change constantly. This group control system has a function to allocate the cars flexibly in response to the traffic conditions by sending the cars to a congested floor during periods of heavy traffic.

### Total Evaluation Factors for Best Car Allocation

- Your waiting time or an increase in waiting time throughout the building
- Expected travel time
- The possibility of a car being bypassed due to a full load
- The possibility of long waits caused by future calls
- Energy consumption

**Determine the optimum car**

Please refer to video library on our website for details.




### Less irritating

This group control system evaluates not only actual waiting time but also psychological waiting time by assessing the probability of full-load bypass and prediction error, etc. The optimal car allocation based on the evaluation minimizes irritation of all passengers.

### Less waiting time

ΣAI-2200C reduces not only passengers' waiting time but also long-wait. The longer passengers wait for a car, the more they become irritated.

### More building space

Destination Oriented Allocation System (DOAS) increases handling capacity. Compared to the conventional control system, DOAS allows reduction in car size and hoisting area. The space saved can be used effectively for other building facilities.

### More energy-saving

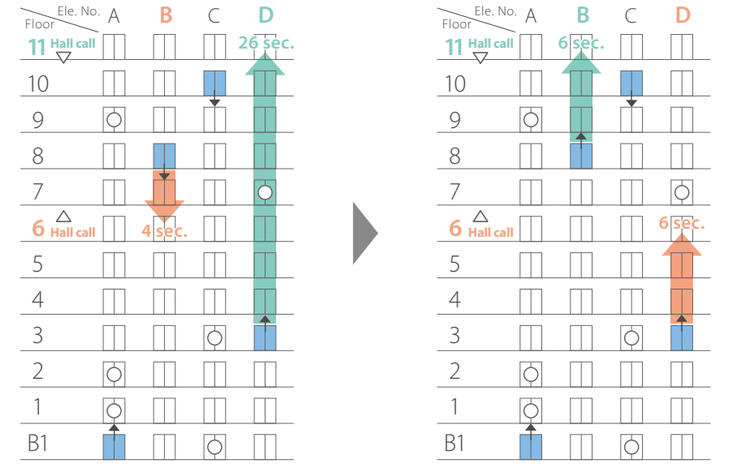
With Mitsubishi Electric's smart control technology, when a passenger presses a hall call button, the system selects the elevator that best balances operational efficiency and energy consumption. Selection is based on each elevator's potential energy consumption according to its current location and passenger load.

# Cutting-edge Technologies for Allocation Control

## Cooperative Optimization Assignment

**Forecasting a near-future hall call to reduce long waits**

When a hall call is registered, the algorithm predicts a near-future call that could require long waits. Through evaluation of the registered hall call and the forecasted call, the best car is assigned. All cars work cooperatively for optimum operation.



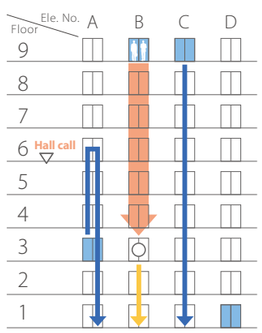

## Energy-saving Operation — Allocation Control (ESO-W)

**Maximizing operational efficiency and minimizing energy consumption**

This system selects the elevator in a group that best balances operational efficiency and energy consumption. Priority is given to operational efficiency during peak hours and energy efficiency during non-peak hours.

Car allocation that maximizes operational efficiency does not necessarily translate to energy efficiency. A car uses energy efficiently when it travels down with a heavy load, or up with a light load. Accordingly, if multiple cars have the same traveling distance, this system chooses the car that requires the least energy.

Through a maximum 10% reduction in energy consumption compared to our conventional system, this system allows building owners to cut energy costs without sacrificing passenger convenience.




**Initial conditions: non-peak period**
**Car A**: Parked at the 3rd floor
**Car B**: About to leave the 9th floor with several passengers
**Car C**: Parked at the 9th floor
**Car D**: Parked at the 1st floor
Under the conditions above, when a hall call is registered at the 6th floor to go to the 1st floor, waiting time and traveling distance will be the same regardless of whether car A, B or C responds to the call.

**In response to the call, the cars will operate in the following ways:**
Car A will travel up with no passengers and then down with only one passenger (requires more energy than car B).
Car B will travel down with more passengers than car A (requires the least energy).
Car C will travel down with no passengers and then down with only one passenger (requires the most energy).

**Car selection**
During non-peak hours when energy efficiency is prioritized, car B is selected.

## Dynamic Rule-set Optimizer (DRO)

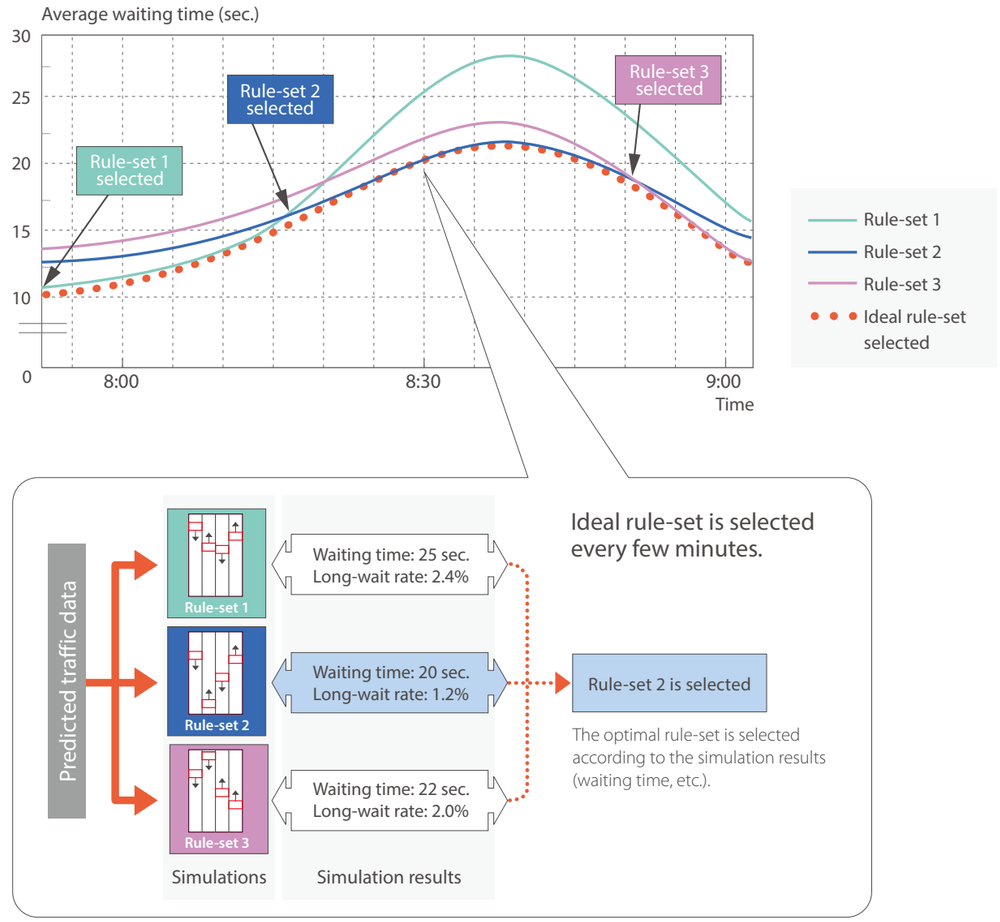
**Selects optimum car allocation through "rule-set" simulation**

The neural network technology has enabled the system to continually and accurately predict the passenger traffic within intervals of several minutes. A high-speed reduced instruction set computer (RISC) runs real-time simulations using multiple rule-sets and the predicted passenger traffic to select the rule-set which optimizes transport efficiency.

### Simulation example and performance results of each rule-set

The diagram below shows an example during a morning up peak time. An ideal rule-set is selected every few minutes according to the predicted traffic conditions.

**Performance results of each rule-set (average waiting time)**



# User-friendly Features

## Immediate Prediction Indication (AIL) for Easy-to-use Elevators

When a passenger has registered a hall call, the designated car is selected and the corresponding hall lantern immediately lights up. To inform the passenger of the car arrival, the hall lantern flashes on and off for three seconds before the arrival.

### Benefits of AIL

### 1. Improving comfort at hall

**■ Without AIL**

Passengers wait for cars wondering which car will arrive first.

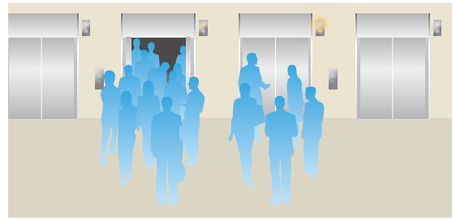
**■ With AIL**

As passengers can see which car arrives next, they have enough time to reach the car even when carrying large baggage.

### 2. Reducing user irritation at congested hall
### Second Car Prediction (TCP)

Passengers tend to gather around the allocated car especially in heavy traffic like the morning time in an office building.

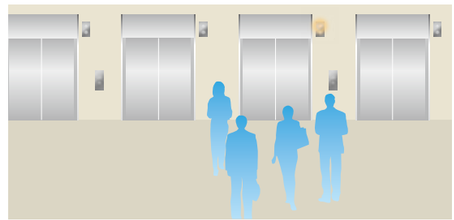
The hall lantern of the second service car also lights up to disperse the passengers for smooth boarding.



### Automatic Hall Call Registration (FSAT)

If a passenger cannot get into an allocated car due to a full load, he/she needs to press the hall button again.

If a fully loaded car leaves a floor, a hall call is registered automatically.



## Hall lanterns

LED

HLV-A21S

HLV-A31S

HLV-E65
Gold ornament

HLV-E66
Silver ornament

HLV-E71

HLH-A31S

HLV-A16S

HLH-A16S

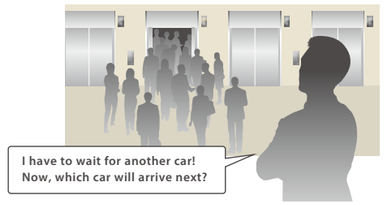
# More Efficient, More Comfort

## Destination Oriented Allocation System (DOAS)

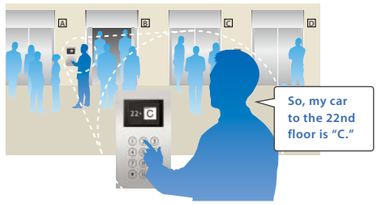
Passengers register their destination floor using a hall operating panel before entering the elevator, eliminating the need to press the button inside the car. Furthermore, dispersing passengers by destination prevents congestion in cars and minimizes waiting and travel time.


### 1. Enhancing usability for passengers at halls

**Without DOAS**
Passengers wait for cars wondering which car will arrive first. Once a car arrives, regardless of the destination, passengers rush to get into the car.

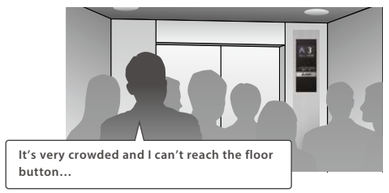



**With DOAS**
When passengers enter a destination floor at a hall, the hall operating panel indicates which elevator to take.
As passengers proceed to the assigned elevator, the car is on its way, and there is no hurry when the car arrives.

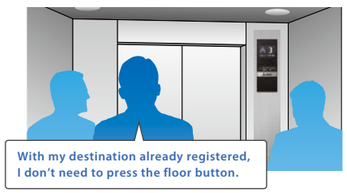



### 2. Enhancing passengers' usability in cars

**Without DOAS**
Passengers need to press the destination floor button on a car operating panel. In a busy car, they have to fight through a crowd of bodies to reach the button.




**With DOAS**
A destination floor is registered when passengers enter it on the hall operating panel. Relax and enjoy the ride in the car. The car skips unnecessary stops and quickly takes passengers to the destination floor.



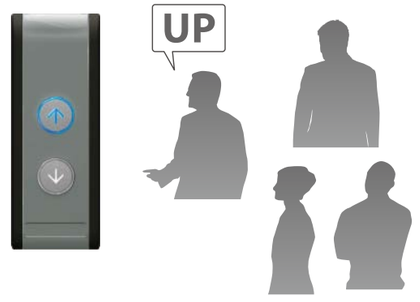



## Individualized Car Allocation based on Travel Time

This system evaluates passengers' travel time from registration of a destination floor at a hall to arrival at the destination floor and predicts their waiting time. As this system allocates an optimum car to each passenger on the basis of the predicted waiting time, passengers' travel time can be reduced.

### 1. Evaluating travel time

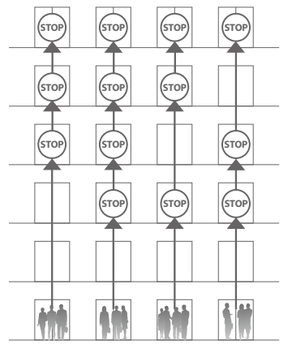
**Without DOAS**
Since not all passengers press an up or down button at the hall, the system cannot evaluate their waiting time and travel time.



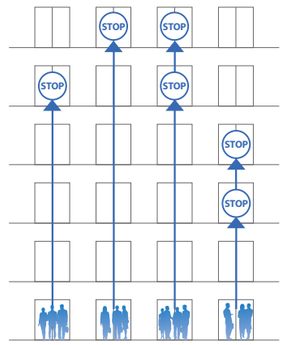

**With DOAS**
Since all passengers register the destination floor on the hall operating panel, the system can evaluate travel time of each passenger and allocate the optimum car for the passenger.


### 2. Reducing travel time

**Without DOAS**
Cars make stops at every selected floor because destination floor is not considered for car allocation .




**With DOAS**
The individualized car allocation based on the destination floors leads to shorter travel time and fewer intermediate stops.




### 3. Improvement

Compared to conventional operation systems without DOAS, this system reduces the average waiting time at the time of congestion and long-wait.

**Average waiting time at the time of congestion**


**Improved: Approximately 30%**

**Long-wait rate (60 seconds or longer)**


**Improved: Approximately 40%**

# Hall Operating Panels for DOAS


## 10.4-inch Touch Screen

### ■Surface mounted type


Without card reader


HSP-A10

With card reader*1


HSP-A15

Notes
*1: Card reader is to be supplied by customer. Please consult our local agents for details.
*2: Complies with EN81-70. The keypad arrangement can be changed if compliance with EN81-70 is not required.



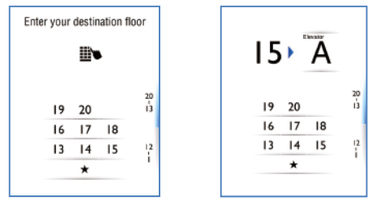
### ■Example clear displays

Keypad button type


Floor button type


### ■Color of displays

White-background displays are available.


## Keypad

### ■Dot LED display (orange when illuminated)


HSVF-C212 | HSVF-C222*2 | HSVF-C232*2 (with accessibility button)

(with speaker for audio guidance)

### ■LCD display (5.7-inch TFT color LCD)


HSVF-C262 | HSVF-C272*2 | HSVF-C282*2 (with accessibility button)

(with speaker for audio guidance)

Star: Tactile button Others: Flat buttons
(stainless-steel matte)

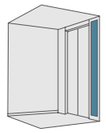
### ■Example hall operating panels with card reader*1


HSVF-C213 | HSVF-C283*2

# Signal Fixtures for DOAS

## Car Operating Panel with Concealed Car-call Buttons

For front return panel




CBH2-C739

## Hall Lantern with Elevator Number Plate LED


HLV-E116S

### Signal Fixtures for DOAS

| Location | Signal fixtures | | Standard*1 | Optional |
|---|---|---|---|---|
| Hall | Hall operating panels | HSVF-C212 | ● | |
| | | Others | | ○ |
| | Hall lanterns (elevator number plates are to be supplied by customer) | | | ○ |
| | Hall lantern with elevator number plate | HLV-E116S | | ○ |
| | Car Arrival Chime – Hall (AECH) | | | ○ |
| Car | Car operating panel with car-call buttons | | ● | |
| | Car operating panel with concealed car-call buttons | CBH2-C739 | | ○ |
| | Car destination floor indicator for keypad type car operating panel | | | ○ |
| | Car Arrival Chime – Car (AECC) | | ●*2 | ○ |

Note
*1: Elevator number plates are to be supplied by customer.
*2: Car arrival chime is standard when hall lanterns are not installed.



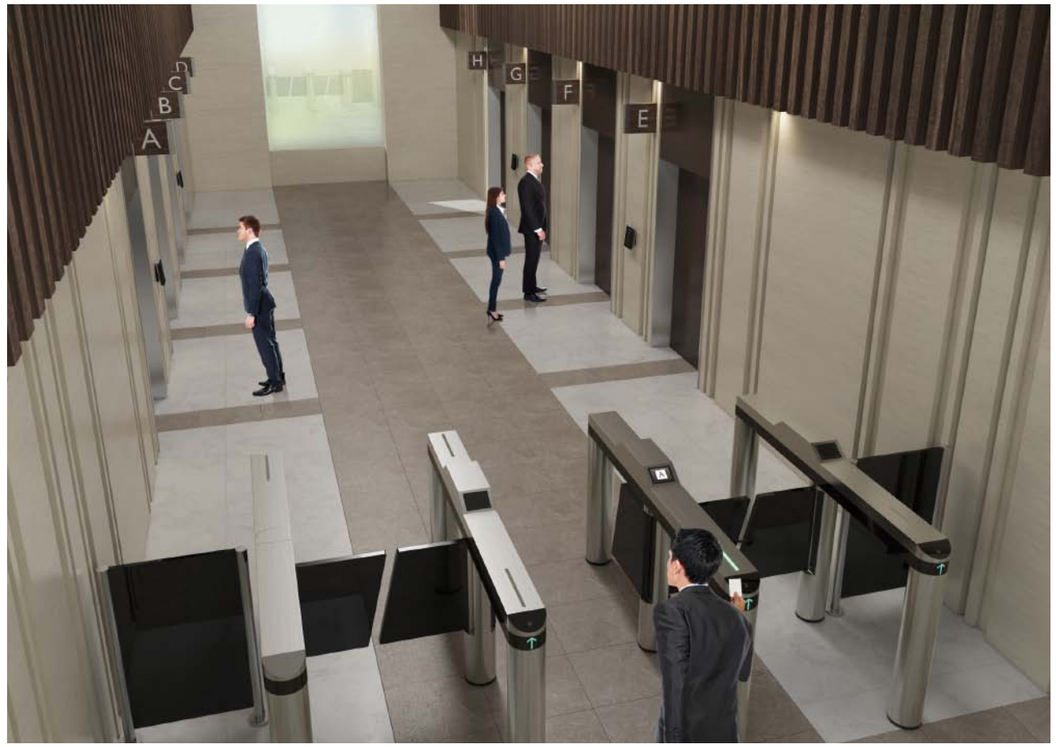
# More Security

## DOAS Integrated with Security Gate*

*Please consult our local agents for details.

The destination floor can be registered automatically after passing a card over a card reader at the security gate entrance. A card for the elevator can be linked with a building security card to allow movement in the building with a single card.

### ■ Entrance image




### ■ Improvement of congestion at elevator hall

Without DOAS

With DOAS integrated with security gate

# Group Control Features

● = Standard ○ = Optional — = Not applicable

| Feature | Description | Appl.*1 |
|---|---|---|
| **Main Features** | | |
| Car Travel Time Evaluation | Cars are allocated to hall calls by considering the number of car calls which will reduce passenger waiting time in each hall and the travel time of each car. | ● |
| Car Allocation Tuning (CAT) | The number of cars allocated or parked on crowded floors is controlled not just according to the conditions on those crowded floors but also the operational status of each car and the traffic on each floor. | ● |
| Cooperative Optimization Assignment | The system predicts a potential hall call which could cause longer waiting time. Car assignment is performed considering not only current and new calls but also near-future calls. | ● |
| Distinction of Traffic Flow with Neural Networks (NN) | Traffic flows in a building are constantly monitored using neural network technology, and the optimum operational pattern, such as the Lunchtime Service (LTS) or Up Peak Service (UPS) feature, is selected or canceled accordingly at the appropriate time. | ● |
| Dynamic Rule-set Optimizer (DRO) | Traffic flows in a building are constantly predicted using neural network technology, and an optimum rule-set for group control operations is selected through real-time simulations based on prediction results. | ● |
| Expert System and Fuzzy Logic | Artificial expert knowledge, which has been programmed using "expert system" and "fuzzy logic," is applied to select the ideal operational rule which maximizes the efficiency of group control operations. | ● |
| Psychological Waiting Time Evaluation | Cars are allocated according to the predicted psychological waiting time for each hall call. The rules evaluating psychological waiting time are automatically changed in a timely manner in response to actual service conditions. | ● |
| Group Control Self-diagnosis (GCS) | Passenger waiting times, frequency of prediction errors, etc., are automatically detected and recorded as elevator operational data for service personnel. | ● |
| Individualized Car Allocation | The system allocates an optimum car to each passenger on the basis of the predicted waiting time and passengers' travel time (applicable to DOAS). | ● |
| Destination Oriented Allocation System (DOAS) | When a passenger enters a destination floor at a hall, the hall operating panel indicates which car will serve the floor. The passenger does not need to press a button in the car. Dispersing passengers by destination prevents congestion in the cars and minimizes waiting and travel time. (Cannot be combined with some features.) | ○ |
| Motor Drive Mix (MDX) | The rate of car acceleration and deceleration is automatically increased according to the car load to reduce passenger waiting and travel time. | ○ |
| **Traffic Features** | | |
| Peak Traffic Control (PTC) | A floor which temporarily has the heaviest traffic is served with higher priority over other floors, but not to the extent that it interferes with the service to other floors. | ● |
| Strategic Overall Spotting (SOHS) | To reduce passenger waiting time, cars which have finished service are automatically directed to positions where they can respond to predicted hall calls as quickly as possible. | ● |
| Energy-saving Operation — Allocation Control (ESO-W) | The system selects the elevator that best balances operational efficiency and energy consumption according to each elevator's current location and passenger load as well as predicted congestion levels throughout the day. | ● |
| Energy-saving Operation — Power Reduction During Off-peak (ESO-A) | To save energy, some elevators are automatically put into sleep mode if there are no calls for a specified period (applicable to NexWay only). | ● |
| Energy-saving Operation — Speed Control (ESO-V) | To save energy, the car speed is automatically reduced to some extent, but not so much that it adversely affects passenger waiting time. | ○ |
| Intense Up Peak (IUP) | To maximize transport efficiency, an elevator bank is divided into two groups of cars to serve upper and lower floors separately during up peak. In addition, the number of cars to be allocated, the timing of car allocation to the lobby floor, the timing of door closing, etc., are controlled based on predicted traffic data. | ○ |
| Up Peak Service (UPS) | Controls the number of cars to be allocated to the lobby floor, as well as the car allocation timing, in order to meet increased demands for upward travel from the lobby floor during office starting time, hotel check-in time, etc., and minimize passenger waiting time. | ○ |
| Down Peak Service (DPS) | Controls the number of cars to be allocated and the timing of car allocation in order to meet increased demands for downward travel during office leaving time, hotel check-out time, etc., to minimize passenger waiting time. | ○ |
| Main Floor Parking (MFP) | An available car always parks on the main (lobby) floor with the doors open (or closed only in China). | ○ |
| Forced Floor Stop (FFS) | All cars in a bank automatically make a stop at a predetermined floor on every trip without being called. | ○ |
| Special Floor Priority Service (SFPS) | Special floors, such as floors with VIP rooms or executive rooms, are given higher priority for car allocation when a call is made on those floors. (Cannot be combined with hall position indicators.) | ○ |
| Closest-car Priority Service (CNPS) | A function to give priority allocation to the car closest to the floor where a hall call button has been pressed, or to reverse the closing doors of the car closest to the pressed hall call button on that floor. (Cannot be combined with hall position indicators.) | ○ |
| Light-load Car Priority Service (UCPS) | When traffic is light, empty or lightly loaded cars are given higher priority to respond to hall calls in order to minimize passenger travel time. (Cannot be combined with hall position indicators.) | ○ |
| Special Car Priority Service (SCPS) | Special cars, such as observation elevators and elevators with basement service, are given higher priority to respond to hall calls. (Cannot be combined with hall position indicators.) | ○ |
| Congested-floor Service (CFS) | The timing of car allocation and the number of cars to be allocated to floors where meeting rooms or ballrooms exist and the traffic intensifies for short periods of time are controlled according to the detected traffic density data for those floors. | ○ |
| Bank-separation Operation (BSO) | Hall buttons and the cars called by each button can be divided into several groups for independent group control operation to serve special needs or different floors. | ○ |
| VIP Operation (VIP-S) | A specified car is withdrawn from group control operation for VIP service operation. When activated, the car responds only to existing car calls, moves to a specified floor and parks there with the doors open. The car then responds only to car calls. | ○ |
| Lunchtime Service (LTS) | During the first half of lunchtime, calls for a restaurant floor are served with higher priority, and during the latter half, the number of cars allocated to the restaurant floor, the allocation timing for each car and the door opening and closing timing are all controlled based on predicted data. | ○ |
| Main Floor Changeover Operation (TFS) | This feature is effective for buildings with two main (lobby) floors. The floor designated as the "main floor" in a group control operation can be changed as necessary using a manual switch. | ○ |

| Feature | | | Description | Appl.*1 |
|---|---|---|---|---|
| **Signal and Display Features** | | | | |
| Car Arrival Chime | Car (AECC) | ΣAI-2200C without DOAS | Electronic chimes sound to indicate that a car will soon arrive. (The chimes are mounted either on the top and bottom of the car, or in each hall.) | — |
| | | ΣAI-2200C with DOAS | | ●*2 |
| | Hall (AECH) | ΣAI-2200C without DOAS | | ● |
| | | ΣAI-2200C with DOAS | | ○*3 |
| Flashing Hall Lantern (FHL) | | ΣAI-2200C without DOAS | A hall lantern, which corresponds to a car's service direction, flashes to indicate that the car will soon arrive. | ● |
| | | ΣAI-2200C with DOAS | | ○*3 |
| Immediate Prediction Indication (AIL) | | | When a passenger has registered a hall call, the best car to respond to that call is immediately selected, the corresponding hall lantern lights up and a chime sounds once to indicate which doors will open. | ○*3 |
| Second Car Prediction (TCP) | | | When a hall is crowded to the extent that one car cannot accommodate all waiting passengers, a hall lantern will light up to indicate the next car to serve the hall. | ○ |
| Voice Guidance System (AAN-G) | | | Information on elevator service such as the current floor or service direction is given to the passengers inside a car. | ○ |

Notes
*1: Application of features in this table applies to operation system ∑AI-2200C. Applicability of features differs depending on the elevator models or operation system. Please consult our local agents for details.
*2: AECC feature is standard when hall lanterns are not installed.
*3: These features cannot be combined with DOAS when hall lanterns are not installed.

## Features that cannot be combined with DOAS

### Group Control Features
- Bank-separation Operation (BSO)
- VIP Operation (VIP-S)
- Intense Up Peak (IUP)
- Up Peak Service (UPS)
- Main Floor Changeover Operation (TFS)

### Operation and Service Features
- Automatic Hall Call Registration (FSAT)
- See-through Elevator Operation (STH)
- Attendant Service (AS)
- False Call Canceling – Automatic (FCC-A)
- False Hall Call Canceling – Hall Button Type (FHC-P)
- Hospital Emergency Operation – Block Sign (HE-B)
- Automatic Bypass (ABP)

### Door Operation Features
- Extended Door-open Time Adjustment (DKO-TB)
- 1-Door 2-Gate (1D-2G)/2-Door 2-Gate (2D-2G)

### Signal and Display Features
- Hall Information Display (HID)
- Hall LCD Position Indicator (HID-S)
- Immediate Prediction Indication with Indicator (AILI)
- Second Car Prediction (TCP)

for a greener tomorrow

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.

**MITSUBISHI ELECTRIC CORPORATION**
HEAD OFFICE : TOKYO BLDG., 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

Visit our website at:
http://www.mitsubishielectric.com/elevator/

⚠ **Safety Tips:** Be sure to read the instruction manual fully before using this product.

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