

Elevator Group Supervisory Control System

# FLEX-NX Series

FLEX-NX300

FLEX-NX200 / NX201

FLEX-NX100

Destination Reservation Guidance System

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# Elevator Group Supervisory Control System

## FLEX-NX Series

**The Elevator Group Supervisory Control System has been further improved! Passenger waiting times will be shortened.**

With an increase in the number of high-rise buildings, large-scale facilities, tower apartments and condominiums, elevators are the core transportation mode in these structures. Consequently, a rapid and accurate traffic control system is essential for elevators to respond to complicated and heavy traffic demand.

Fujitec has made further advancements in the Elevator Group Supervisory Control System by concentrating on the development of leading-edge technologies.

As a result, the new generation system utilizes optimal group supervisory control functions, such as the Virtual Passenger Optimization Method, which controls elevator traffic by forecasting the distribution of all future passengers and the Destination Reservation Guidance System (an optional specification with additional charges), which enhances the transport efficiency by registering the destination floors in advance.



### Applications for FLEX-NX Series

Recommended Applications		Applicable Scope		
Number of Stops				
		FLEX-NX300/NX200/NX201	FLEX-NX100	
Number of Elevators	2units		2 to 8	2 to 3
	3units	FLEX-NX100	up to 63	4
	4units	FLEX-NX200/NX201		up to 16
	5units			
	6units	FLEX-NX300		

■ : For Large-Scale Buildings  
 ■ : For Mid-Size Buildings  
 ■ : For Small-Size Buildings

**NEW**

### Virtual Passenger Optimization Method

The system predicts traffic demand in the whole building, including passengers expected to arrive later.

The average waiting time can be reduced by up to 10%\*.

In conventional group supervisory control systems, elevator calls are assigned by using a predicted response time from the hall call registration to the arrival of an elevator as the evaluation index.

The predicted response time, however, only equals the waiting time of the person who first registered a hall call. Ideally, it is necessary to evaluate the waiting times of all passengers, including future users that arrive at the stop.

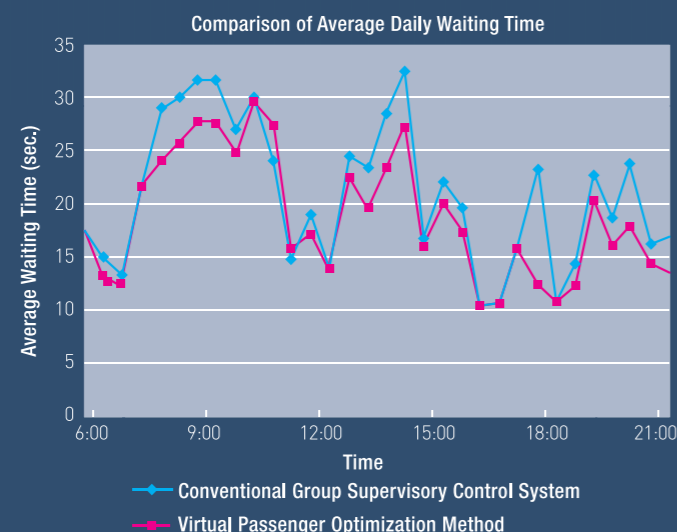
Fujitec has newly employed the Virtual Passenger Optimization Method, which virtually calculates the long-range waiting time of each passenger, based on extrapolated passenger arrival rates by travel direction at each floor, from past learned data in order to execute the group supervisory control.

The system probabilistically extrapolates the number of passengers who arrive later at a stop where a hall call had already been registered or passengers who arrive at a stop where no hall call had been registered and then the system comprehensively calculates the passenger waiting time.

With such a design, it is possible to accurately reflect and predict the traffic situation of the whole building for the elevator traffic control, thereby enabling a reduction in the average daily waiting time for all passengers by up to 10%.

\* Compared to our conventional products. The value is based on validated results from a simulation that reproduced daily passenger traffic in a high-rise condominium. For office buildings, the average waiting time will be reduced by up to 5%. The reduction in the average passenger waiting time may differ depending on the elevator system configuration or on traffic conditions.

Comparison Simulation with Conventional Group Supervisory Control System



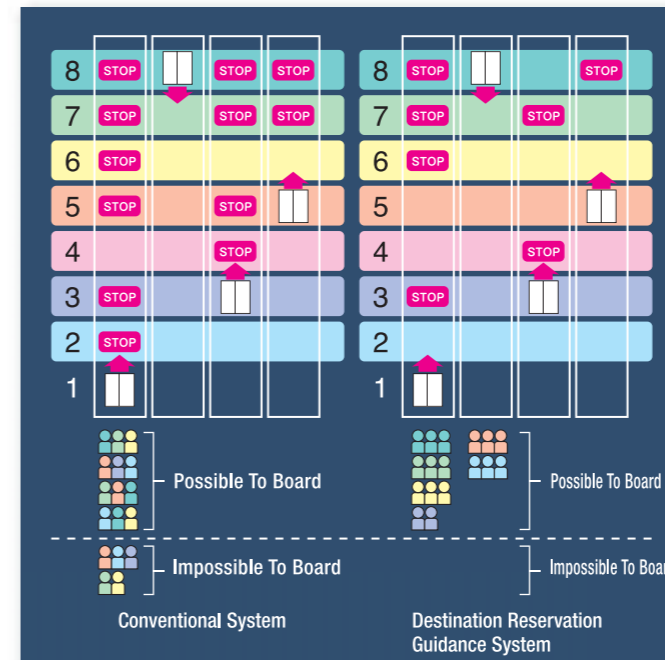
\* The graph shows the results of a simulation to reproduce the daily traffic in an actual high-rise condominium having three elevator units and 33 stops.

**NEW**

### Destination Reservation Guidance System (Optional specification with additional charges)

The system accepts the advance registration of a destination floor and chooses the optimal elevator car.

It reduces the journey time in an office building during the up-peak period by up to 30%\*.



For a short duration many users are concentrated on the lobby floor of office buildings during the up-peak period. Conventionally, elevator users register a hall call in the desired direction and board an arriving elevator irrespective of the destination floor.

Therefore, the elevator may stop at many floors when transporting passengers, resulting in a longer journey time.

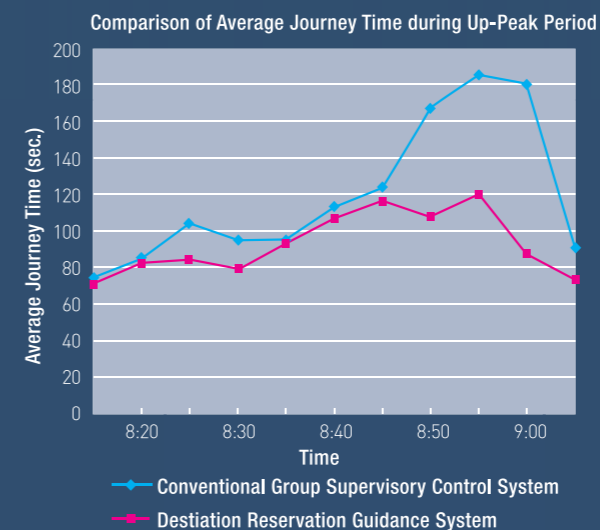
With the Destination Reservation Guidance System (optional specification), a passenger uses the Destination Floor Registration Panel installed near (or within) the elevator hall to register a destination floor.

The system uses this data to limit the number of destination floors assigned to each elevator in order to improve transport efficiency; thereby not only easing congestion, but also enabling a reduction in the journey time by up to 30%.

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\*Compared to our conventional products. The value is based on validated results from a simulation that reproduced daily passenger traffic in an office building. The reduction in the journey time may differ depending on the elevator system configuration or traffic conditions.

Comparison Simulation with Conventional Group Supervisory Control System



\* The graph shows the results of a simulation to reproduce the traffic during the up-peak period in an office building having six elevators and 20 stops.

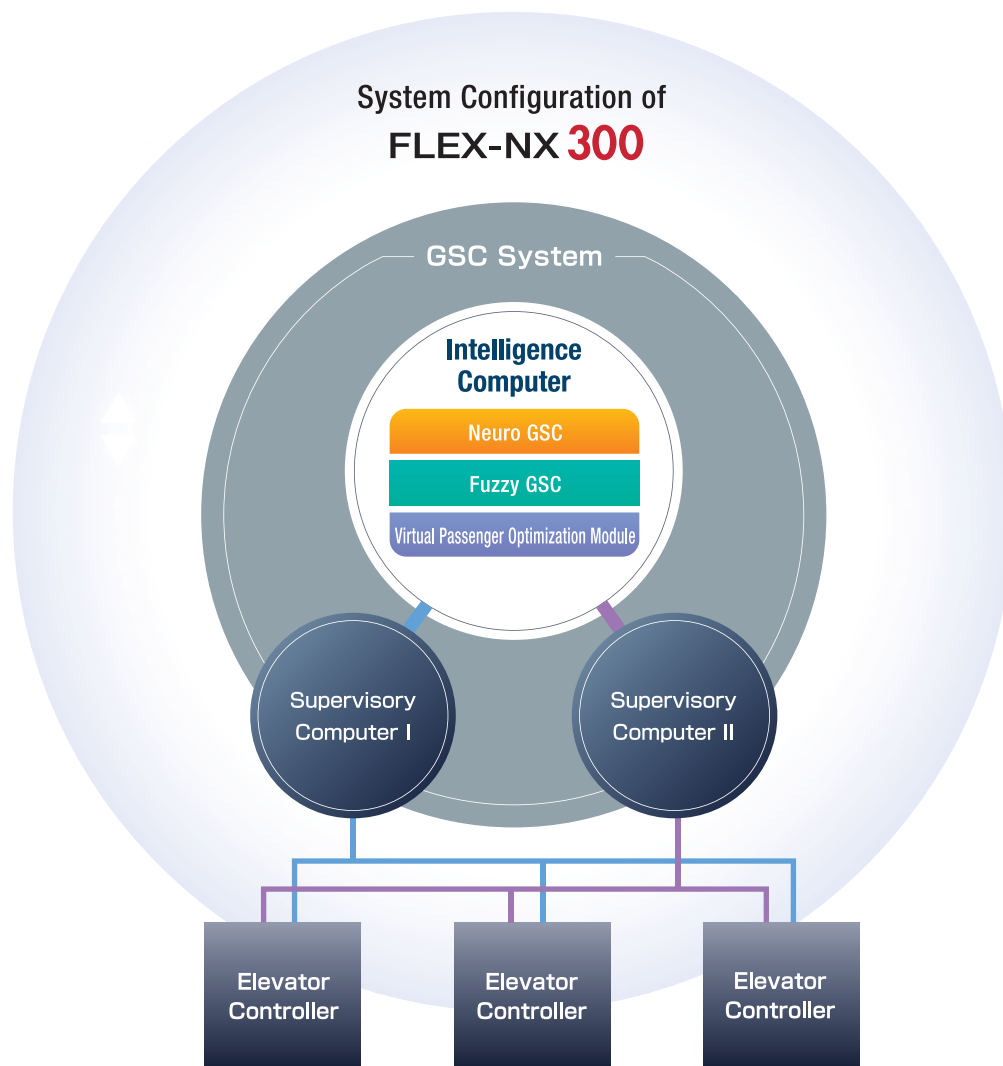
For Large-Scale Buildings

# Incorporating a Neuro Group Supervisory Control

# FLEX-NX 300

The FLEX-NX300 is an Elevator Group Supervisory Control (GSC) System that is well-suited for large-scale buildings.

The FLEX-NX300 GSC System consists of the Intelligence Computer, which incorporates the Neuro GSC, the Fuzzy GSC and the Virtual Passenger Optimization Module, along with two supervisory computers providing high-speed processing and high reliability.



## Featuring the Advanced Neuro Group Supervisory Control

This system is an advanced Group Supervisory Control System which automatically learns control rules suited to traffic conditions in various building through a neural network. The neural network is modeled after human brain functions and is capable of learning the optimal elevator car assignments by itself.

Adoption of the Neuro GSC System will substantially improve the accuracy of the advance notice of approaching elevators.

## Flexibly Responding to In-Building Changes

There is no need to modify the program even if the traffic demand fluctuates as a result of a change of tenants or the relocation of tenants to other floors in the building. The neural network incorporates a self-learning ability that automatically executes updates while keeping elevators in operation, even if an unexpected circumstance arises.

## Further Reduction in Passenger Waiting Time

With the adoption of the Virtual Passenger Optimization Method, which probabilistically extrapolates the passenger waiting time including passengers expected to arrive at a stop in the future, the prediction accuracy in the group supervisory control will be enhanced, thereby further reducing the waiting time.

## Reliable Multiple Backup Systems

Normally, the Neuro Supervisory Control is implemented while the Intelligence Computer and the Supervisory Computer I are working together. In addition, as a backup system, the Neuro Supervisory Control can continue operations by working with the Supervisory Computer II, should the Supervisory Computer I fail.

## Neuro Group Supervisory Control

The Neuro Group Supervisory Control System consists of the Fuzzy GSC and the Neuro GSC. The Fuzzy GSC determines which elevator car is assigned to a call by utilizing the knowledge of the group supervisory control expert and the Neuro GSC checks the car assigned by the Fuzzy GSC to determine if there is another more suitable car.

When a hall call is generated, the Fuzzy GSC recommends a suitable elevator car, based on the statistical-analysis learning function, knowledge database, and the waiting-time evaluation index that is extrapolated by the Virtual Passenger Optimization Module, and then the Fuzzy GSC sends the data to the Neuro GSC. In the Neuro GSC, checks are made to the call-assigned cars by using the neural network that acquires knowledge in the same way as the human brain. In this way, the most suitable elevator car is assigned while the two GSCs are complementing and cooperating with each other.

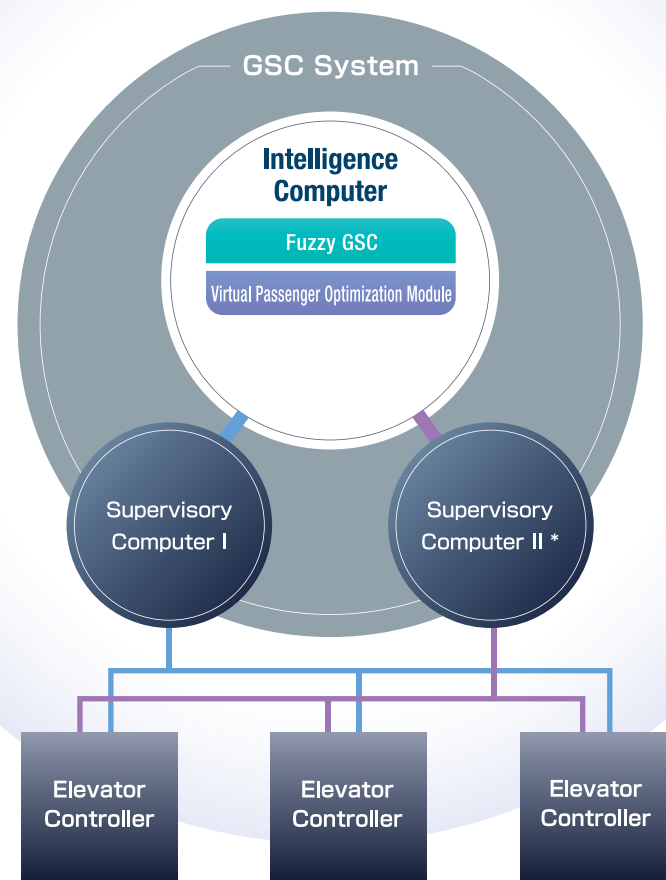
## For Mid-Size Buildings

### Incorporating the Advanced Fuzzy Group Supervisory Control System

# FLEX-NX 200 / NX 201

The FLEX-NX200/NX201 is the Elevator Group Supervisory Control System best suited for mid-size buildings. The group supervisory control system consists of the Intelligence Computer, which incorporates the Fuzzy GSC and the Virtual Passenger Optimization Module, along with two supervisory computers (only one for FLEX-NX201).

#### System Configuration of FLEX-NX 200 / NX 201



\* FLEX-NX201 does not incorporate the Supervisory Computer II.

#### Advanced Fuzzy Group Supervisory Control System

The FLEX-NX200/NX201 system features an efficient group supervisory control by applying fuzzy logic and also by incorporating the know-how of group supervisory control experts. The Fuzzy Group Supervisory Control System includes the learning function that allows the system to learn the building's traffic demand for specified time periods and a knowledge base, which accumulates knowledge concerning optimal elevator control. The above not only enables a reduction in the average passenger waiting time but also further enhances the accuracy of advance notice of the approaching elevator cars.

#### Further Reduction of Passenger Waiting Time

With the adoption of the Virtual Passenger Optimization Method, which probabilistically extrapolates waiting time including those expected passengers in the future, the prediction accuracy of the waiting time in the group supervisory control will be enhanced, thereby further reducing the waiting time.

#### Immediate Car Arrival Announcement

The system adopts an "immediate prediction of car arrival" function that announces which elevator car will arrive immediately upon the pressing of a hall button.

#### Reliable Multiple Backup Systems

Normally, the fuzzy supervisory control is implemented while the Intelligence Computer and the Supervisory Computer I are working together. In addition, as a backup system, the fuzzy supervisory control can continue operations by working with Supervisory Computer II, should the Supervisory Computer I fail.

\* With FLEX-NX201, should the Supervisory Computer I fail, each elevator car serves each floor.

#### FLEX-NX201 for Machine-Room-Less Elevators

The FLEX-NX201 system incorporates a space-saving design, while featuring the group supervisory control performance equivalent to the FLEX-NX200. This system is best suited for machine-room-less models where there is no available installation space for the GSC panel.

\* With the FLEX-NX201, the following functions are restricted:

- Machine Room PC Terminal cannot be installed.
- Having restricted backup functions, the FLEX-NX201 system is not recommended for installations in office buildings, hospitals and other facilities where high degrees of reliability and maintainability are required.

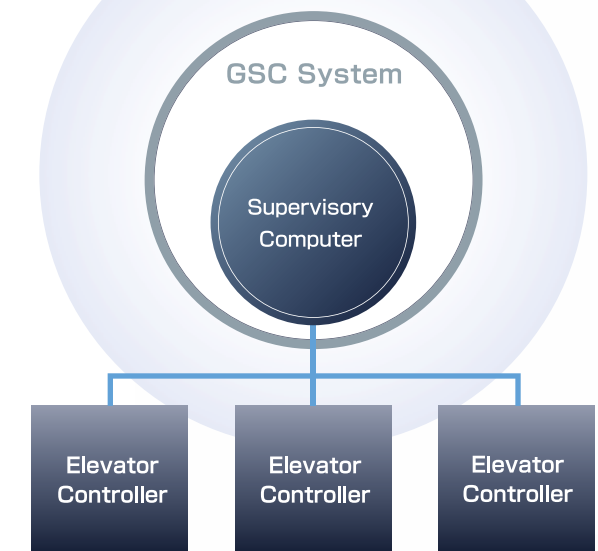
## For Small-Size Buildings

Well-suited for small-size buildings with a relatively small amount of traffic

# FLEX-NX 100

The FLEX-NX100 system is an elevator GSC system that is well-suited for small-size buildings with a relatively small amount of in-building traffic.

#### System Configuration of FLEX-NX 100



#### Selecting the Elevator Car with Minimal Waiting Time

When a hall call occurs, the system selects an elevator car that can respond to the call in the minimum amount of time based on the current positions and the travel directions of the cars.

Even if the operational status of the elevator cars changes thereafter, the system will flexibly deal with the changes and reassign the car with minimal waiting time, thereby offering efficient service.

#### Advance Notice with the Car Approach Lamp

The system makes no immediate announcement of an approaching car, but it can announce the car's arrival with the car approach lamp.

#### Reliable Backup System

The system includes a system backup function with service floors assigned to each elevator to continue operation.


# Destination Reservation Guidance System (Optional specification with additional charges)

## Registering the destination floor at an elevator hall to ensure smoother service during busy periods!

With the Destination Reservation Guidance System, the passenger uses the Destination Floor Registration Panel installed near (or within) the elevator hall to register the destination floor. The GSC system improves service by assigning the optimal elevator for each of the registered destination floors and assigning passengers to multiple elevator cars. Thus the system can reduce the number of stops, thereby reducing the journey time even during busy periods such as the up-peak period.


### Destination Floor Registration Panel

The passenger uses the Destination Floor Registration Panel to register a destination floor. Upon completion of the registration, the assigned elevator car is announced.



### Destination Floor Indicator

The Destination Floor Indicator is installed above the landing door of each elevator. The indicator displays the destination floors that are assigned to that elevator.



### Easing the Up-Peak Congestion in Office Buildings

By assigning an elevator car to each of the registered destination floors, transportation efficiency can be improved, thereby easing the congestion in the elevator hall during the up-peak period.

### Reducing the Journey Time

Since each of the registered destination floors is assigned to multiple elevator cars, the number of stops before reaching the destination floor decreases, which reduces the journey time.

### Eliminating In-Car Operation

No in-car operation is required since the destination floor is already registered at the elevator hall. Elimination of the need for call registration in the car can insure a smoother passenger flow into the car even if there are many passengers waiting at the elevator hall.



## Elevator Hall

- Lobby Floor or Equivalent Floor
  - Operation Unit: Destination Floor Registration Panel (Touch-screen LCD display)
  - Display Unit: Destination Floor Indicator (LCD display)



- \* Hall buttons and hall lanterns are installed on the general floors. It is also possible to install Destination Floor Registration Panels on those floors. Please note, however, that, in the event the number of installation floors exceeds 16, a separate technical study will be necessary. In this case, please consult our sale representative.
- \* The left figure is an example. The locations and the number of Destination Floor Registration Panels to be installed vary with the hall layout and the installed number of elevators.

## List of FLEX-NX Series Specifications

● : Standard Spec    ■ : Optional Spec with Additional Charge

SPECIFICATION	FLEX-NX300	FLEX-NX200 FLEX-NX201	FLEX-NX100
Virtual Passenger Optimization Method	●	●	—
Destination Reservation Guidance System	■	■*1	—
Neuro Assignment	●	—	—
Self-Correction Type Initial Learning	●	—	—
Online Adaptive Learning	●	—	—
Statistical Analysis Learning	●	●	—
Self-Diagnostic Capability	●	—	—
Fuzzy Group Supervisory Control	●	●	—
Arrival Interval Control	●	●	—
Immediate Announcement of a Serving Car	●	●	—
Up-Peak Operation	●	●	■
Lunch Time Operation	●	●	—
Down-Peak Operation	●	●	■
Off-Peak Operation	●	●	■
Zoning for Express Operation	■*2	■*2	—
Transfer of Dispatch Floor	■	■	—
Separation of an Out-of-Order Elevator	●	●	●
Independent Operation	●	●	●
Parking Operation	■	■	■
VIP Operation	■	■	■
Operation with Non-Uniform Car Stops	●	●	●
Call Assignment Backup	●	●*1	—
Machine Room PC Terminal	●	●*1	—
Network Remote Terminal	■	■	■

\*1 This specification is not applicable to FLEX-NX201.

\*2 This specification cannot be combined with the Destination Reservation Guidance System.

## Various Features of FLEX-NX Series

### Standard Specifications

#### Virtual Passenger Optimization Method

This function probabilistically calculates passenger waiting time, including those future passengers expected to arrive, and enhances the prediction accuracy of the waiting time in the group supervisory control, thereby reducing the passenger waiting time.

\* This function is not applicable to FLEX-NX100.

#### Neuro Assignment

This function updates the program with the self-learning ability of the Neuro GSC and assigns a hall call to the most suitable elevator. This greatly enhances the accuracy of an advance notice of car arrival.

\* This function is not applicable to FLEX-NX200, 201, and 100.

#### Self-Correction Type Initial Learning

While letting the system learn by adding updates to the Fuzzy GSC's recommendations, the Neuro GSC automatically develops a group supervisory control algorithm which is more efficient than that of the Fuzzy GSC.

\* This function is not applicable to FLEX-NX200, 201, and 100.

#### Online Adaptive Learning

This function adjusts Neural Nets automatically so that the most suitable call assignments will be given according to traffic situations specific to each building.

\* This function is not applicable to FLEX-NX200, 201, and 100.

#### Statistical Analysis Learning

The passenger arrival frequency and corresponding car calls for each of the daily specified time periods are analyzed and stored as long-term learning statistical data, later the stored data is utilized to predict traffic demands.

\*This function is not applicable to FLEX-NX100.

#### Self-Diagnostic Capability

The expert system monitors the neuro assignments. In case of a failure, the Neural Nets are automatically rebuilt.

\* This function is not applicable to FLEX-NX200, 201, and 100.

#### Fuzzy Group Supervisory Control

Efficient group supervisory control utilizes Artificial Intelligence (AI) and incorporates the know-how of the group supervisory control experts.

\* This function is not applicable to FLEX-NX100.

#### Arrival Interval Control

Door open times are finely adjusted. Elevators are kept running at equal intervals to improve the accuracy of advance notice of a car's arrival, especially during rush hours, thus reducing waiting times.

\* This function is not applicable to FLEX-NX100.

#### Immediate Announcement of a Serving Car

At the press of a hall button, a hall lantern and a chime will immediately notify people waiting at the landing which car will serve the call.

\* This function is not applicable to FLEX-NX100.

### Standard Specifications

#### Up-Peak Operation

To cope with a concentration of passengers at the main or lobby floor during up-peak periods, the FLEX-NX300, 200, or 201 automatically adjusts the arrival intervals for elevators to provide efficient service, thus improving transport efficiencies.

\* The FLEX-NX100 provides efficient elevator services under pre-scheduled management.

\* This function is an optional specification with additional charges for FLEX-NX100.

#### Lunch Time Operation

This function provides efficient elevator services during the first half of a lunch time period by distributing the call assignments in order to prevent load bypassing. During the second half of the period, preferential services are provided to the floors where calls are concentrated.

\* This function is not applicable to FLEX-NX100.

#### Down-Peak Operation

This function provides efficient elevator services to improve transport efficiency during down-peak periods when many passengers are traveling to the main floor.

\* This function is an optional specification with additional charges for FLEX-NX100.

#### Off-Peak Operation

During off-peak periods, the FLEX-NX300, 200, or 201 allows an elevator that has served all its assigned calls to return to the main floor, and it automatically distributes other elevators throughout the building to efficiently respond to future hall calls. The number of operating elevators is restricted to save energy.

The FLEX-NX100 allows elevators that have served all the assigned calls to be distributed to predetermined floors to effectively respond to future calls.

\* This function is an optional specification with additional charges for FLEX-NX100.

#### Separation of an Out-of-Order Elevator

An elevator that is not working properly will automatically be separated from the group, while the remaining elevators continue efficient operations under group supervisory control.

#### Independent Operation

A specified car can operate separately from the group to perform an independent operation, in which case it responds only to car calls.

#### Operation with Non-Uniform Car Stops

When service zones of elevators are different, that is, the number of car stops is not uniform for each car and specified cars are required to serve the roof and basement floors, the group supervisory control will remain in effect.

\* Elevator services may deteriorate in this operation mode.

#### Call Assignment Backup

The basic call assignment function is maintained even when the main GSC functions are out of order or under inspection.

#### Machine Room PC Terminal

Functions such as monitoring and traffic data collection are available from a PC terminal located in the machine room.

\* This function is not applicable to FLEX-NX201 and 100.

### Optional Specifications with Additional Charges

#### Destination Reservation Guidance System

Inputting the destination floor in advance with the Destination Floor Registration Panel optimizes elevator car assignments for destination floors, thereby improving the transport efficiency during busy periods such as up-peak periods.

\* This function is not applicable to FLEX-NX201 and FLEX-NX100.

#### Transfer of Dispatch Floor

The dispatch floor can be switched over, for instance, to a basement floor during up-peak traffic periods, and to the lobby floor during inter-floor traffic periods.

\* This function is not applicable to FLEX-NX100.

#### VIP Operation

One of the group-controlled elevators can be separated from group control for independent operation. This is usually operated with a special push button provided at a pre-selected floor or at the information desk in the lobby. When the VIP Operation is completed, the elevator will be automatically restored to group-controlled operation.

#### Zoning for Express Operation

During up-peak periods, for instance, when traffic demands greatly increase, service floors are divided into two groups – higher and lower sections – and two groups of cars are designated to serve each of the zones, thereby enhancing the transport capability.

\* This function is not applicable to FLEX-NX100.

\* This function cannot be combined with the Destination Reservation Guidance System.

#### Parking Operation

Activating the parking switch, which is provided for each elevator in the security room or other location, automatically shuts down any desired elevator.

#### Network Remote Terminal

Linking the machine room PC terminal to the LAN enables functions such as monitoring, traffic data collection and data analysis in the building, along with further advance command functions. Also, multiple groups of elevators can be monitored for control.