

**HITACHI TECHNOLOGY  
2008-2009**

# Life Infrastructure Business

Digital Media Devices  
Consumer Appliances  
Healthcare Systems

Building Systems

## LCD TV, Ultra Thin Series Moving Ahead of the Times

The popularity of large-screen flat-panel TVs has grown rapidly in the home consumer market, changing home interiors and lifestyles. Hitachi has developed an ultra thin LCD TV with a depth of 35 mm in anticipation of the coming age of full-scale convergence of broadcast and communications media. In addition to high-quality body designs that make these devices attractive elements of the interior decor, the models introduce a new value and appeal, including a remarkable layout flexibility allowing owners to easily move them from one place in the room to another.

### Untethered Dream TVs

Scenes from cartoons set in a wondrous future feature flat-panel TVs (televisions) hung on walls. Working from this inspiration, we began investigating this ideal of the dream TV anticipated by consumers. The core concept we identified for future TVs in 2011 or later proved to be “freedom” (freedom from installation constraints). By this we mean not just expanded installation possibilities, but providing the most comfortable video/audio space possible. LCD (liquid crystal display) TVs in the Ultra Thin series are next-generation products free of the various constraints associated with TVs, including constraints on where they can be installed and the need to connect tangled cables to peripheral devices. These innovations allow owners to place TVs on walls—or just about anywhere else. The main factor enabling this layout flexibility is its slimness—just 35 mm\* at its shallowest point, and the design is the world’s thinnest. Moreover, the display panel and tuner (the tuner unit) are separate components. This separation of functions, in which the tuner unit supports enhancement, allows users to add peripheral devices without detracting from the beauty of the display panel. In the most advanced models, the freedom concept is further promoted by adding a built-in HDD (hard disk drive), support for e-mail including animated images via a portal site, and other features to the tuner unit.

### New Technologies Create Beautiful Proportions

One of the key concepts of the Ultra Thin series is the idea of 360° beauty, which means the device is designed to be attractive from any viewpoint. “Fragrance” was chosen to serve as the design keyword, emphasizing a design that accounts for the individual ways in which people relate to TVs. This was inspired by the idea that TVs could in some ways become as personal as fragrance—a product that helps define one’s lifestyle. Transparent materials give the bezel display a rich, refined texture, forming a case with varying thicknesses, like a bottle of fragrance. Interior surfaces of transparent bezel is coated in dazzling paint. Minimized heat radiation holes are concentrated at the top and bottom of the panel to achieve a clean, flat, overall look, making even the rear panel pleasing to the eye. The stand clearly echoes the idea of a ring, and the display panel appears to float, weightless, in air. Various new technologies help make this beautiful shape possible. Countless problems had to be resolved, including reconciling rigidity and reduced thickness, with wrangling over dimensions as small as a tenth of a millimeter. The problem was finally resolved by designing a super-compact backlight module and power source and packaging them in an ultraslim lightweight frame in the smallest possible space, to a degree not thought achievable before. Finally, a new compact air cooling mechanism completed the design of the ultraslim device, which measures one-third the volume of conventional panels.

### A Company Targeting Innovations for Next-generation TVs

Although the position of the TV in the family has not changed, the social circumstances surrounding TV have changed drastically. As the convergence of broadcast and communications media accelerates, a new age of television broadcasting has emerged, with Japan’s scheduled switch in 2011 to digital terrestrial broadcasting serving as the watershed date. Hitachi was able to realize the world’s thinnest panels (35 mm in depth) in its Ultra Thin series by integrating a broad range of technologies, including ultraslim panel modules, thermal analysis technologies, an ultraslim power source, and new structural designs. As a company focused on innovations for next-generation TV, Hitachi will draw on the capabilities of the Hitachi Group as it continues to expand a lineup of untethered products that create free and spacious living spaces.

\* Among high-definition LCD TVs for consumers; as of October 2007.

Source: Hitachi, Ltd. [32V model or larger, display only (excluding protrusions)]



Masatoshi Shiiki, Manager, Department of Imaging Devices Research, Materials Research Laboratory, Hitachi Research Laboratory (front right); (from the left) Masayuki Oki, Designer, Home Solution Design Department, Design Division; Ryuji Kurihara, Engineer, Flat Panel Display Engineering Department; Ken Tsukamoto, Engineer, Display Mechanical Engineering Department, Flat Panel Display Business, Digital AV Products Division; Akiko Komai, Assistant Manager, Product Planning Department, Products Strategy, Strategic Sales & Marketing Division, Consumer Business Group

## Ultra Thin Series: Advanced, Internet-ready LCD TVs

The new UT42/37 XP770 and 32-WP770 are advanced Internet-ready LCD (liquid crystal display) TVs (televisions) in the ultra-slim Ultra Thin series. These TVs allow users to enjoy high-quality VOD (video on demand) based on the acTVila\* service or to view

animated images uploaded via the Internet from remote PCs (personal computers) using the Video Mail fee-based service provided by Hitachi's TV portal site.

Due to its thinness (35 mm in depth) and the separation between the monitor and the tuner unit, this ultra-slim monitor can be placed anywhere. This design decision also makes it dramatically easier to connect peripherals. The tuner unit incorporates a 250-Gbyte HDD (hard disk drive) (by Hitachi Global Storage Technologies) in addition to the "iVDR slot" equipped in current models and uses removable HDDs—iVDR-S (information versatile disk for removable usage—secure; sold separately)—allowing users to record digital high-definition programs without degradation of image quality.

\* See "Trademarks" on page 90.



LCD TVs in the Ultra Thin series UT32-WP770 (left), tuner unit (middle), and edge view of display panel (right)

## Lineup of Six Plasma and LCD TV Models in the 02 Series

Plasma/LCD (liquid crystal display) TVs (televisions) in the 02 Series, which feature new display panels and provide even deeper blacks, are now available.

The plasma models in this series include the P50-XR02 [featuring a 1080 full-HD (high definition) black display panel], the P42-HR02 (featuring a 1080 HD black display panel), and the P37-HR02. All models feature a new box rib structure for the panel to make displayed blacks even deeper and more vivid than before and for even sharper images.

In addition to a built-in 250-Gbyte HDD (hard disk drive) (by Hitachi Global Storage Technologies), these models feature a removable HDD [iVDR-S (information versatile disk for removable usage—secure)] port compatible with the SAFIA (security architecture for intelligent attachment device) data security standard, allowing users to expand or replace the HDD and move content.

The LCD TVs in this line incorporate IPS (in-plane switching) display panels for natural-looking images from virtually any viewing angle. These models also

feature iVDR slot ports to allow users to record digital broadcasts. A new design approach featuring a sleek black exterior for both plasma and LCD TVs adds a refined, high-quality design touch to top-notch imaging performance.



P50-XR02 high-definition plasma TV (left), L42-XV02 high-definition LCD TV (right), and iVDR slot and iVDR-S (top right)

## Blu-ray Disc Camcorder

DZ-BD9H/DZ-BD7H/DZ-BD70 Blu-ray Disc\* camcorders feature the world's first 8-cm BD/DVD (Blu-ray Disc/digital versatile disc) drives. Other major components, including new image processing LSIs (large scale integrations), are also newly developed, creating a system ideally suited for handling 1,920×1,080 high-definition video data in all processes, from image processing to recording to media. The DZ-BD9H hybrid model features both an internal 60-Gbyte HDD and the 8-cm BD/DVD drive to record approximately nine hours' worth of images. The recorded images are easily copied

to BD/DVD using only the camera, for presentation to family and friends. An 8-cm BD can record about an hour's worth of images, a timeframe comparable to the tape long used as the primary consumer video recording medium. The disk media enables convenient cuing and replay. Recorded full high-definition images can be stored without modification in an ordered index.

\* See "Trademarks" on page 90.



Blu-ray Disc camcorder DZ-BD9H/DZ-BD7H/DZ-BD70

## Hard Disk Camcorder



Hard disk camcorder DZ-HD90

Compact, hard disk-based DZ-HD90 video camera was introduced.

This system can capture approximately nine hours of full 1,920×1,080 high-definition video data on an internal 60-Gbyte HDD (hard disk drive). Simply by connecting a commercially available Blu-ray disc writer (drive) with an eSATA (external Serial Advanced Technology Attachment) cable, users can easily copy captured video to a 12-cm BD/DVD for presentation to friends and family. The 12-cm BD holds around three hours of video data. The disk media format allows rapid cuing and replay. Recorded full high-definition images can be stored without modification in an ordered index.

## Vacuum-chilled Refrigerator

A worldwide first introduction\*<sup>1</sup> to the market of a refrigerator featuring a vacuum-chilled space protects nutrients in foods in a low-oxygen environment.

[Main features]

(1) The refrigerator incorporates a unique vacuum storage system. The vacuum-chilled space placed at the bottom of the refrigerator is kept under low-oxygen conditions at an atmospheric value of approximately 0.7, protecting nutrients susceptible to oxygen such as DHA (docosahexaenoic acid), vitamins, and amino acids. In the case of DHA found in mackerel, for example, the residual ratio is improved by 46% compared with conventional refrigerators after three days' storage. In addition, the discoloration of fruits and meats is reduced, and the flavors of coffee and tea are maintained longer than in conventional refrigerators.

(2) The large inner volume of 601 L, the largest capacity in the industry\*<sup>2</sup>, provides a width that can easily accommodate large dishes. Compared with refrigerators of 10 years ago\*<sup>3</sup>, capacity is increased by some 150 L for a refrigerator occupying the same space.

(3) Energy savings are also significantly improved due to original technologies, such as the molded vacuum insulator, another first in the industry\*<sup>2</sup>, and a newly developed compact high-performance compressor. Consequently, electricity costs have been reduced by about half compared with refrigerators of 10 years ago\*<sup>3</sup>.

(4) In addition to nanotechnology-based sterilization and deodor-



Vacuum-chilled refrigerator R-X6000

izing, the newly-adopted allergen-free filter suppresses the activity of molds and viruses to ensure that the inside of the refrigerator is cooled with clean, cold air.  
(Hitachi Appliances, Inc.)

\*<sup>1</sup> For household CFC (chlorofluorocarbon)-free refrigerator-freezer; published on September 10, 2007.

\*<sup>2</sup> For Japanese CFC-free refrigerator-freezer; as of September 10, 2007.

\*<sup>3</sup> Comparison with R-S45MVP1 of 10 years ago, which is comparable in size.

## Drum-type Washer-dryer Provided with a Blow-ironing Function

A drum-type washer-dryer provided with a "blow-ironing" function has made its debut as the first of its kind on the worldwide market\*<sup>1</sup>. This machine is provided with a "blow-ironing" function that smoothes out wrinkles with a high-speed air current blowing at 360 km/h in the drying process. A fine finish results

that eliminates the work of ironing. (Washing load: 9 kg; washing and drying load: 7 kg.)

[Main features]

(1) A newly-developed jet-fan motor generates a high-speed current of air that smoothes out wrinkles while clothes are dried. Loads of approximately 2 kg are cleanly finished without ironing, and ironing work is substantially reduced for loads of up to approximately 4 kg.

(2) The motor that drives the drum rotates at 1,600 revolutions per minute, representing the fastest

spin cycle of any device on the market. The key to this achievement is the newly developed Neo56DD (direct drive) motor, with the largest number of poles\*<sup>2</sup> of any comparable motor in the industry.

(3) As a result of the synergetic effect between "blow-ironing" and the high-speed spin cycle, the operating time for washing and drying a wash load of 7 kg is 150 min, approximately half the time of conventional wash and dry cycles\*<sup>3</sup>. What is more, power consumption is reduced to approximately 2,100 Wh when "blow-ironing" is applied, which is also approximately half of the equivalent power consumed by conventional machines.

(4) The machine offers the lowest noise in the industry\*<sup>4</sup>, at 27 dB for the wash cycle and 37 dB for the spin cycle, through the combination of the newly developed DD motor and three vibration-reducing technologies.

(5) The volume of tap water required to wash a load of 9 kg is reduced to 75 L (this is the least volume of water in the industry\*<sup>4</sup>), thanks to original washing technology.

(Hitachi Appliances, Inc.)

\*<sup>1</sup> Published on September 26, 2007, for household washer-dryer

\*<sup>2</sup> As of September 26, 2007, for household washer-dryer

\*<sup>3</sup> Comparison with conventional drum type washer-dryer, WD-74B (2002 model, two revolutions), from Hitachi Appliances

\*<sup>4</sup> As of September 26, 2007, for household washer-dryer (when a load of 9 kg is washed in a standard cycle)



Drum-type washer-dryer provided with a "blow-ironing" function

## Cyclone-type Cleaner

A cyclone-type cleaner has now been placed on the market. The cleaner catches not only house dust but also bacteria and viruses\*<sup>1</sup> with a collection efficiency of 99.999%\*<sup>2</sup>. The device produces clean exhaust, and offers more durable suction power and improved usability.

[Main features]

(1) Generates clean exhaust, with a collection efficiency of



Cyclone-type cleaner

99.999% through the adoption of Hitachi's original dust-collecting components, in addition to a three-flow path high-compression cyclone, and a plasma ULPA (ultra low penetration air filter) structure.

(2) The device enables easy cleaning of the entire house, with functions such as one to detect the type and irregularity of the floor, automatically optimizing operation, and a suction adapter, equipped as standard, that beats any fleas out of a carpet, and securely vacuums up the insects.

(3) A newly adopted electrically operated spiral dust-removal mechanism, driven by a dedicated motor, suppresses filter clogging, eliminating the need for maintenance\*<sup>3</sup> for approximately 10 years\*<sup>4</sup> and ensuring strong, long-lasting power.

(4) The workload of cleaning and emptying the dust case has been reduced via universal design incorporating an automatic dust case ejection mechanism.

(Hitachi Appliances, Inc.)

\*<sup>1</sup> Testing institution: Kitasato Research Center of Environmental Sciences; Microbiological examination species and collection efficiency: spherical bacteria, 99.999%; Virus examination species and collection efficiency: bacteriophage, 99.99%.

\*<sup>2</sup> Testing institution: Sumika Chemical Analysis Service, Ltd.; Test item: particle measurement; Test method: measurement of exhaust dust at particle sizes of 0.3 μm or larger.

\*<sup>3</sup> Results using the test dust prepared by Hitachi when the device is used for dust removal after each cleaning, according to the method recommended by Hitachi. The results differ according to the type of dust and cleaning conditions.

\*<sup>4</sup> Not the warranty period of the product.

## IH Cooking Heater with Three Heaters that can be Used with Any Metal Container

A new series of IH (induction heating) cooking heaters that can be used with any metal container has now been placed on the market, including the triple-power IH model, HT-B10TWFS which adopts a central induction heater.

[Main features]

(1) The induction heater on the right side, which is compatible with any metal container, heats the pan itself even when an aluminum or copper pan is used, thanks to Hitachi's original technology. Consequently, the temperature of the top of the heater does not exceed that of the bottom of the pan. This eliminates the problems of difficult stains that come from boiling over.

(2) The right and left induction heaters have a large heating power of 3 kW, placing the device in the top class in the industry, while the central heater has a heating power of 1.6 kW, which is sufficient for ordinary cooking.

(3) The cooking range has been expanded by adopting an oven function that enables 10 cooking temperature increments for the built-in grill.

(Hitachi Appliances, Inc.)



IH cooking heater with three heaters that can be used with any metal container

## Industry's First Premium Air Conditioner, Moisturizing the Skin Using an Ion Mist

In a first for the air-conditioning industry\*<sup>1</sup>, Hitachi has launched a premium air conditioner that moisturizes the skin using an ion mist.

[Main features]

(1) A nano-level ion mist with droplet diameters between 20 and 50 nm is produced from outside and inside air, without the need for added water, and released into the room. The ion mist penetrates into the keratin layer of the skin, moisturizing the skin dur-



Premium air conditioner moisturizing the skin using an ion mist

ing the operation of the air conditioner—a perfect response to many people's concern about dry air.

(2) In addition to the adoption of stainless steel for the filter, ventilating flue, and louver, silver ions are applied to the indoor fan and titanium catalysts are added to the heat exchanger, ensuring that the interior of the indoor equipment remains sterile. As a result, the air current from the air conditioner is always clean.

(3) Top energy-saving performance\*<sup>2</sup> is obtained due to advanced technologies such as the high-efficiency ECO scroll compressor and the new PAM (pulse amplitude modulation) engine, allowing for highly efficient control of operations based on the information from an array of sensors on the exterior and interior components; operating conditions are checked four thousand times per second.

(4) The simple shape, the interior face with a mirror-like luster and depth which is produced by the metallic coating on the backside of transparent material, and the premium design of high-quality wood-grain frames, are all combined to suit the design of a modern living environment.

(Hitachi Appliances, Inc.)

\*<sup>1</sup> X series of room air conditioner; launched March 5, 2008.

\*<sup>2</sup> RAS-X40X2, a 4.0-kW-class room air conditioner for household use; as of February 7, 2008. Annual power consumption: 1,293 kWh.

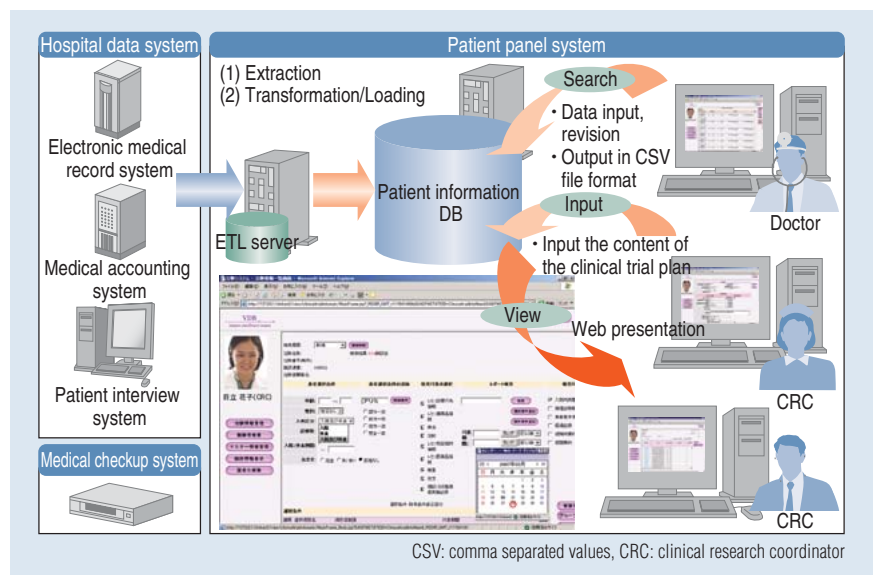
## Patient Panel System Allowing Quick Search for Candidate Patients for Clinical Trials

In the effective development of new drugs, it is important to select the appropriate trial subjects within a short period of time. Hitachi has developed a candidate patient search system for clinical trials (patient panel system) in order to both reduce time to market for new drugs and answer to the needs of a range of participants:

the pharmaceutical manufacturers involved in new drug development (the clients of the clinical trials); medical institutions that aim to provide high-quality medical services (the trustees of these trials); and the administrative agencies dealing with healthcare, which also aim to provide the most up-to-date medical services.

Using the present system, searches may be executed using keywords or numerical parameters for various combinations of patient data, such as patient identification information (age, sex, etc.), disease name, prescription, clinical examination, checkup information. These details are extracted from the hospital data system comprised of electronic medical, medical accounting, and patient interview records as well as the medical checkup system. Using a patient panel system comprised of the ETL (extraction, transformation, and loading) server, the patient information DB (database) and the search/input/presentation inter-

face, an easy crossover search may be performed on a given medical institution's DB. Compared to conventional systems, the present search system has succeeded in providing improved precision and in reducing the time required for the selection of candidate patients for clinical trials.



# Measures to Prevent Global Warming and to Conserve Energy

The Kyoto Protocol went into effect in February 2005 as a measure intended to reduce GHG (greenhouse gas) emissions, primarily CO<sub>2</sub>, and thereby to prevent global warming. During the First Commitment Period from 2008 to 2012, Japan imposed numerical targets for GHG reductions—namely, 6% from 1990 levels. However, at this point, actual GHG emissions have already increased approximately 8% from 1990 levels. As even stronger measures are now expected, Japan's Ministry of the Environment has been working to establish a structure for the Voluntary Emissions Trading Scheme since 2005, with the goal of reducing CO<sub>2</sub> emissions.

As an ESCO (energy service company), Hitachi signed on to this project between Hitachi and Nihon Canpack Co., Ltd. to reduce CO<sub>2</sub> emissions at the Akagi Plant belonging to Nihon Canpack Co., Ltd. Energy conservation facilities introduced under the current ESCO project provide power, steam, and cooling based on cogeneration equipment that runs on low-CO<sub>2</sub>-emission natural gas. Since no gas pipeline had been laid in the area, the natural gas was supplied by co-establishing an LNG (liquefied natural gas) satellite facility, where LNG delivered by truck is stored in tanks for gasification and to supply gas fuel to sites where the gas is needed. The primary facilities introduced in this project are listed below.



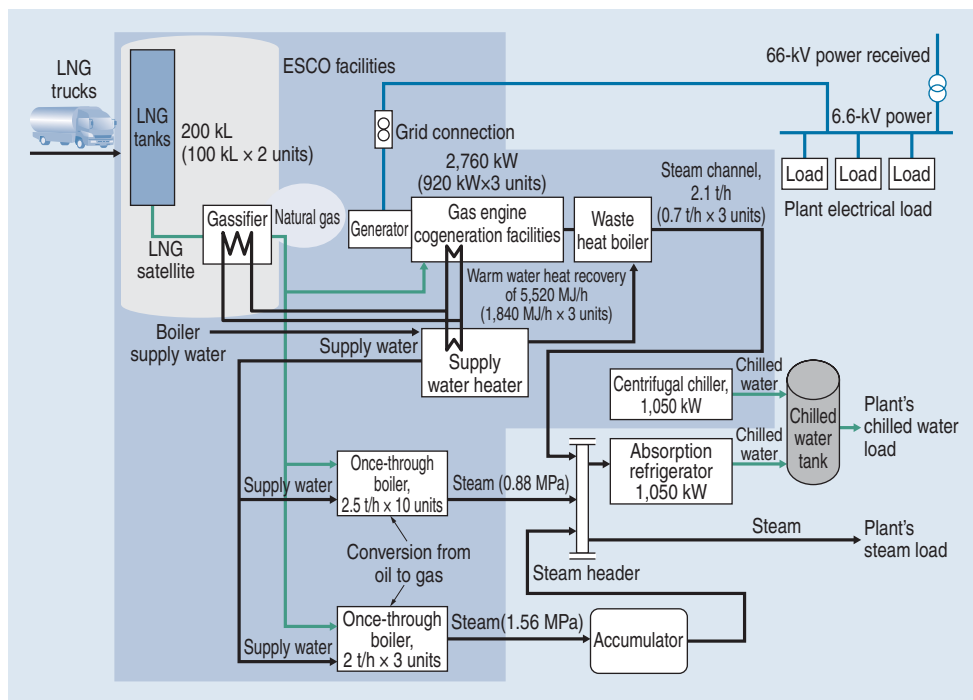
Appearance of ESCO facilities at Nihon Canpack Co., Ltd. Akagi Plant

- (1) Gas engine cogeneration facilities (920 kW × 3 units)
- (2) Gas burning small-scale once-through boiler (2 t/h × 13 units)
- (3) High-efficiency centrifugal chiller (1,055 kW × 1 unit)
- (4) LNG supply facilities (100 kL × 2 units)

This project achieved reduced energy consumption by a crude oil equivalent basis per year of 1,500 kL (10% energy savings) in 2006. Similarly, annual CO<sub>2</sub> emission reductions of approximately 12,500 t (approximately 39% reductions) have been achieved.

However, actual CO<sub>2</sub> emissions at the Nihon Canpack Co., Ltd. Akagi Plant have risen, due to increased production. Accounting for both emissions reductions and production increases, reductions in total CO<sub>2</sub> emissions in 2006 amounted to approximately 7,500 t. In accordance with prerequisites for the Japanese Voluntary Emissions Trading Scheme, Hitachi has acquired emissions rights of approximately 5,000 t from other participating businesses.

Based on experience accumulated to date through the ESCO project in Japan, Hitachi launched ESCO projects in the Philippines, Singapore, Thailand, and other parts of Southeast Asia starting in 2006. By cooperating with onsite corporations, Hitachi plans to further expand the scale of ESCO projects in Southeast Asia.



Overview of ESCO facilities using natural gas





# New Standardized Elevator

Requirements for elevator design have become increasingly stringent in recent years, including requirements for enhanced security, safety, countermeasures for earthquakes and other disasters, and requirements for universal accessibility design. The new standard elevator has achieved new levels of functionality to accommodate these needs.

[Main features]

(1) Providing enhanced safety and security

(a) User sensors at boarding areas

Infrared sensors oriented from the elevator car to the boarding area have been installed. When the sensors detect users attempting to board the elevator after the doors have begun to close, the doors reopen, reducing pinching and collisions.

(b) Door guard catch reduction system

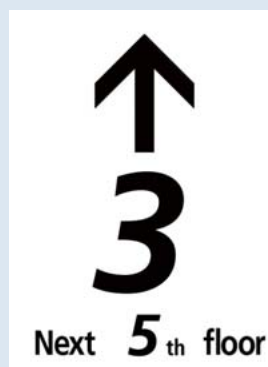
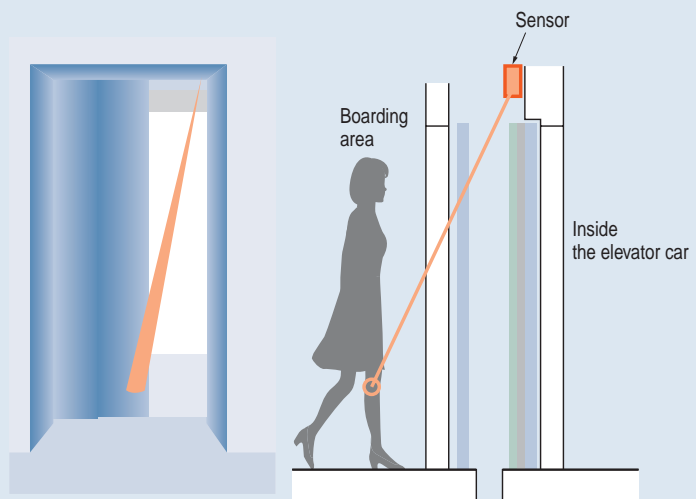
Doors open slowly, making it less likely that hands and bags inside the elevator car will catch. If the sensors installed above the elevator car entranceway detect hands or bags next to the door guards, an audible recorded warning is issued, reducing

the frequency with which objects are caught on the door guards. (c) Emergency operation during earthquakes upon detection of preliminary tremors

In the event of an earthquake, initial micro-motions are quickly detected before the most powerful seismic pulse. The elevator automatically stops at the nearest floor, and the doors open, allowing users to evacuate. Safety functions continue to operate during earthquakes. Thus even if the elevator makes an emergency stop between floors, if the safety equipment is able to recover normally, the elevator will automatically proceed to the nearest floor, reducing instances where users are trapped inside the elevator car.

(2) Expanding the scope of universal design to enable elevator access to as many people as possible

Elevator carriage LCD (liquid crystal display) indicators: 7.5-inch (about 19.1 cm) color LCD indicators have been installed in the elevator cars to indicate travel direction, floor, and other routine information, as well as to display instructions during emergencies.



Floor display

When an earthquake is detected\*

\* It is necessary to make various additions to the elevator specifications.

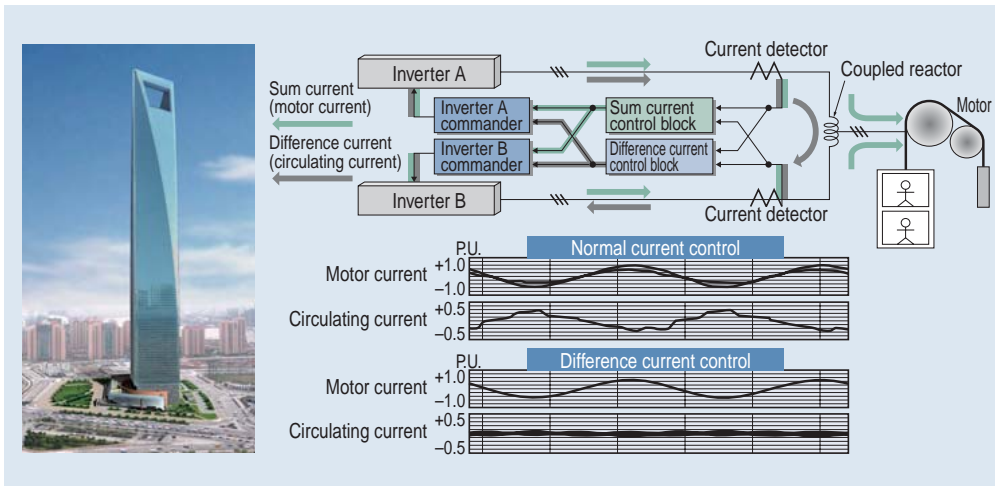
Full view inside elevator car (upper left), user sensor in boarding area (upper right), LCD indicator (lower left), and samples of indicator display (lower right)

## Ultra-high-speed Large-capacity Drive Controller

In August 2007, Hitachi made the onsite delivery of ultra-high-speed, large-capacity elevators for the Shanghai World Financial Center, an ultra-high rise building currently under construction in Shanghai. With their ultra-high-speed and high-capacity specifications, these elevators travel at 480 m/min at passenger loads of up to 3,600 kg. They feature an ultra-high lifting stroke exceeding

450 m. To control these double-deck elevators, a so-called sum/difference current control inverter control system has been adopted, featuring two inverters connected in parallel (set parallelism) to drive the motors.

The sum/difference current control circuit consists of two blocks: a sum current control block, which controls the resultant current from the two inverters, and a difference current block, which controls the circulating current between the two inverters. By fully digitizing the circuits, the two inverter currents are separated into a sum current and difference current for control operations, which are then used for inverter drive commands. This control system enables both smooth motor control and use of low-loss inverters. One future goal is to apply this control system to enable even higher capacities. (Operation started in May 2008)



Conceptual view of completed Shanghai World Financial Center (left) and the configuration of the sum/difference current control circuit (right)

## Intelligent Elevator Group Supervisory Control System with Advanced Future Forecasting Algorithm – FI-600 Series

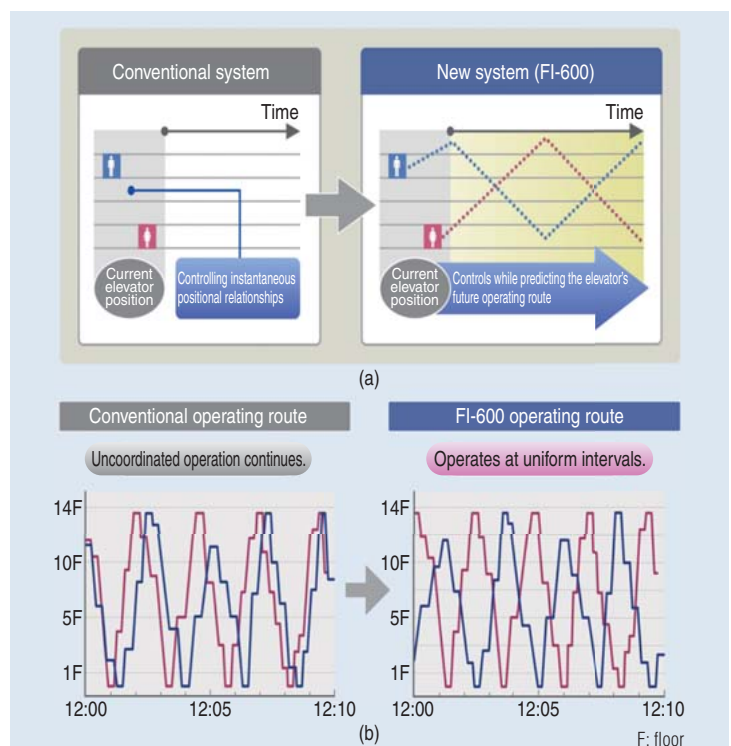
Group control elevators are systems that control multiple elevators as a single group, thereby providing efficient operating service while minimizing wait times.

The key to reducing wait times is for each elevator to operate at regular intervals. Conventional control is based on the current position of the elevator. This means optimal control may be lost during extended busy periods.

The FI-600, an intelligent elevator group supervisory control system with advanced future forecasting algorithm, implements a so-called future reference-trajectory control algorithm, predicting the future course of each elevator, then exerting control based on the elevator position predicted. The goal is to improve stability and to allow each elevator to operate at uniform intervals. Controlling wait time variance reduces wait times even further, thereby reducing the likelihood of long waits of 60 seconds or longer.

The base FI-100 model incorporates a reference-trajectory control algorithm that borrows the philosophy of uniform interval controls from the FI-600 to accommodate various needs.

Users can expect increasingly efficient, comfortable elevator functions in the future.



Concept of predictive target route control (a) and trajectories (b)