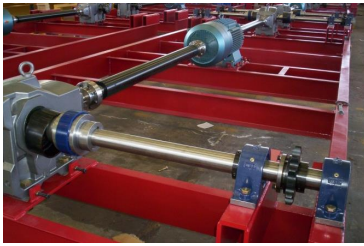


# MANUFACTURING AND INSTALLING A ROBOTIC PARKING SYSTEM



ROBOTIC PARKING SYSTEMS, INC.





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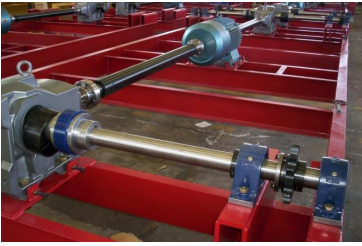
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# INTRODUCTION

Have you ever wondered what steps it takes to create an automated parking facility? This presentation will take you through, start to finish, the building of our 765 space garage at the Ibn Battuta Gate complex in Dubai, UAE.





## BETTER USE OF LAND

While a necessity, parking is not the highest and best use of land on any project. However, with Robotic Parking Systems' high-speed automated parking garages, architects and developers can use 50% of the land area for the same amount of parking.

## CREATE MORE SPACE

Minimizing the impact of parking creates more space for design and development that can be used for additional revenue, green space, common areas for the community or other uses that benefit the project as a whole. These parking facilities also offer more security, less emissions and greater convenience for users.

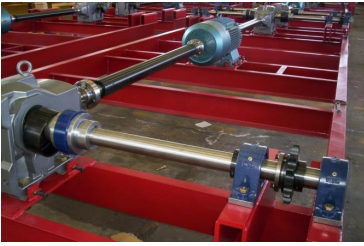
## CUSTOM DESIGN

Every Robotic Parking System starts with a custom design. Robotic Parking Systems Inc works closely with architects and developers around the world to design automated parking garages that maximize site development. The design of the parking facility considers the dimensions of the buildable area including height above and/or below grade, any building or property restrictions, the number of parking spaces needed, the expected peak traffic per hour and numerous other factors.

## RESULT

The result – creative parking solutions that fit within the available space in any project.





# MACHINE FABRICATION

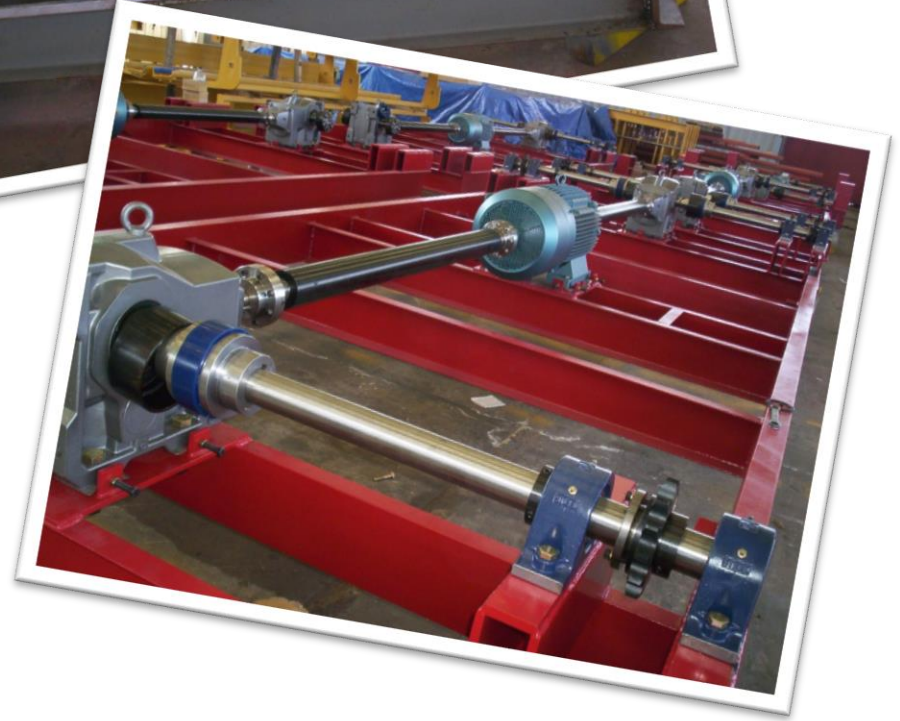
Robotic Parking Systems, Inc. has a full scale manufacturing facility in Clearwater, Florida, USA to design and build custom automated parking garages. We are not an OEM or distributor. Our machines are manufactured from raw steel to finished product using off the shelf components from US and German producers.

Following is a sample of some the machines fabricated in our factory for the Robotic Parking System.

## MACHINE FABRICATION

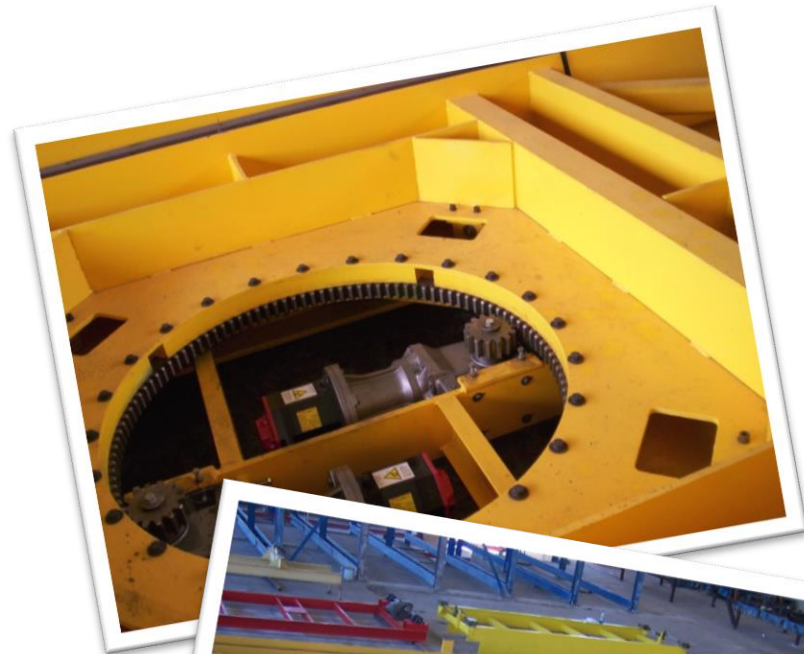
Raw steel is fabricated into frames for our vertical lift conveyor machines (VLC) that raise and lower cars between floors.

Once the frames are painted, mechanical components such as motors and gears, etc. can be installed.



## MACHINE FABRICATION

Lower Carrier Modules with Turntables (LCM w/ TT) rotate cars 180 degrees so that the car is returned to the owner facing forward for easy exit. These machines also move cars horizontally along a row in the Robotic Parking System.





## MACHINE FABRICATION

Upper Carrier Modules (UCM) move cars horizontally along an upper level.

Rack Entry Modules (REM) move the car from a Carrier into a parking slot.

Carriers and REMs fit together as a unit.



## MACHINE FABRICATION

Components for the Entry / Exit Terminals are fabricated.

The Pallet Stacker is being assembled.

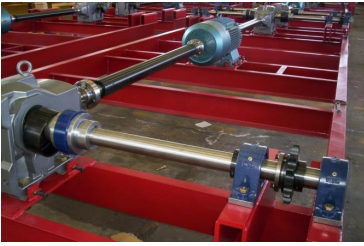




# MACHINES, RELIABILITY AND FAIL-SAFES

The Robotic Parking System consists of machines built to support independent motions on all three axis – vertically between floors, horizontally in a row, and in / out to move cars into and out of racks in the steel shelving system. Independent machines are a key factor in the system's reliability.

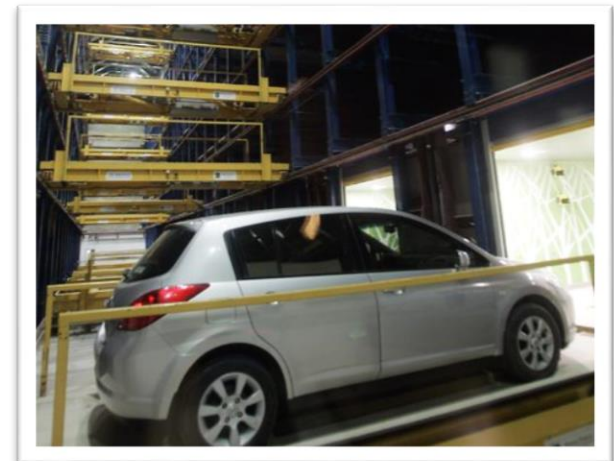


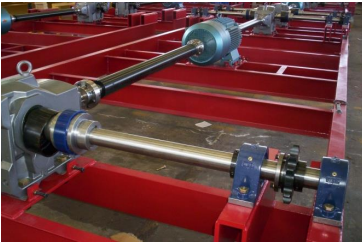


At least two of each type of machine are installed per area in the automated parking facility for redundancy. Both of the machines can perform the same tasks at the same time. Therefore, if one machine needs maintenance or repair, there is always a backup machine to keep the cars moving into and out of the garage.

***No single failure will ever result in the system being inoperable.***

Performance for the Robotic Parking System based on our operations and maintenance data over the last 16 years is 99.9% uptime.





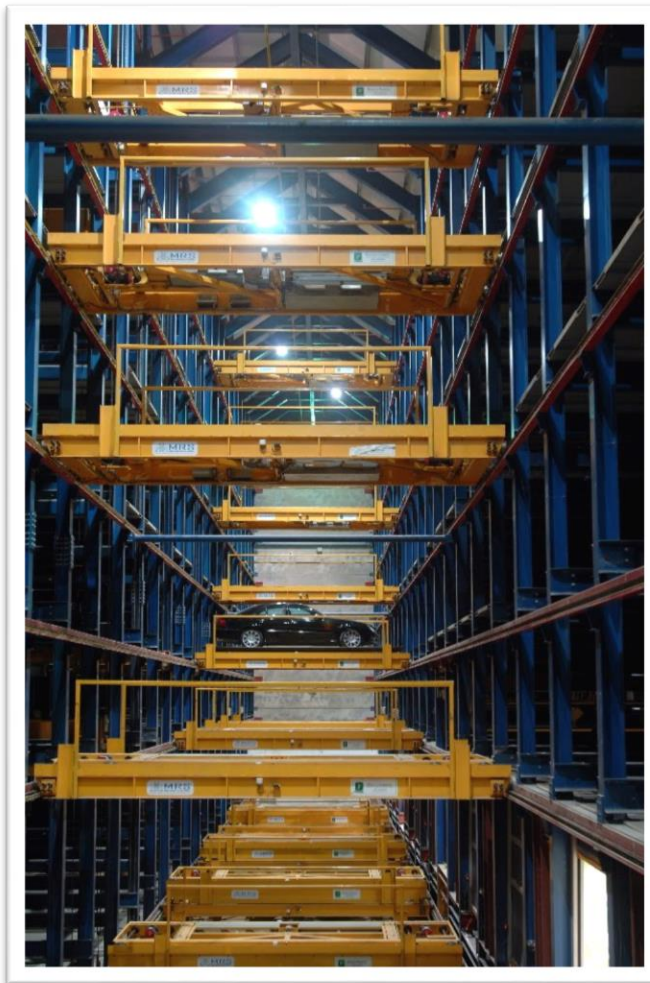
Sixty robotic machines are used at the 765 space Ibn Battuta Gate garage, for example. If one machine fails or needs maintenance that's only 1.67% of the total robots in the garage. The only consequence of a robot failure is that a few cars take about 200 seconds for retrieval instead of 160 seconds.

Machine redundancy is complemented by other fail-safes such as redundant computer servers, universal power supply and back-up power generator to ensure continual operation.



## MACHINES, RELIABILITY AND FAIL-SAFES

Additionally, with each motion being handled by multiple independent machines, the Robotic Parking System can offer unprecedented speed in the storage and retrieval of vehicles. The high-speed efficiency of the Robotic Parking System and fast retrieval times ensure rapid throughput (the number of cars in and out per hour) and a satisfying user experience.





## MACHINES, RELIABILITY AND FAIL-SAFES

If anyone knows the operational details of a property, it's the property managers. And, they appreciate our reliability statistic of 99.958% uptime *(for the period August 2009 through April 2013.)*

Anne Marie Shein, Senior Property Manager Ibn Battuta Gate, stated, "Since the automated car park opened three and a half years ago, you and your staff have provided excellent operations service and ensured that the automated car park is well-maintained and running flawlessly."





# ELECTRONICS

While the frames and the electro-mechanical components are being assembled for the robotic parking machinery, the major electrical panels as well as the electrical boxes for individual machines are prepared.



The Robotic Parking System uses only off-the-shelf, high-quality electrical and mechanical components with L10 lifetimes of 40,000 hours or above. As part of its strategic partnership with Robotic Parking Systems, General Electric supplies electronics and automation controls for the automated garage.

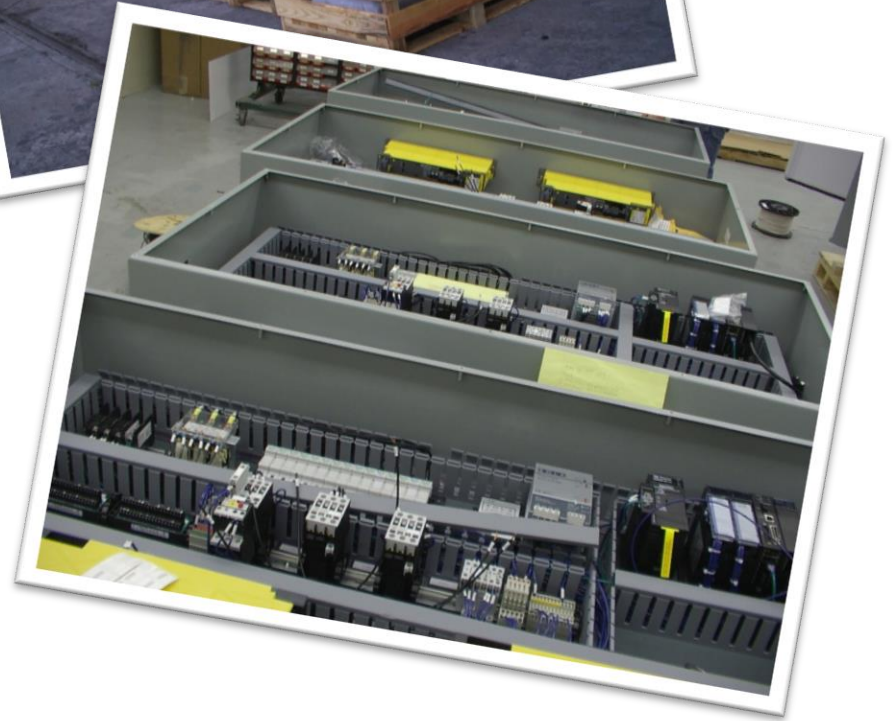
All major components have at least one backup. True redundancy translates into a greater level of reliability and ensures uninterrupted operations. No single failure will ever result in the system being inoperable. Uptime of the system is unprecedented.



## ELECTRONICS

Electrical panels are assembled, tested and crated for shipment to the job site.

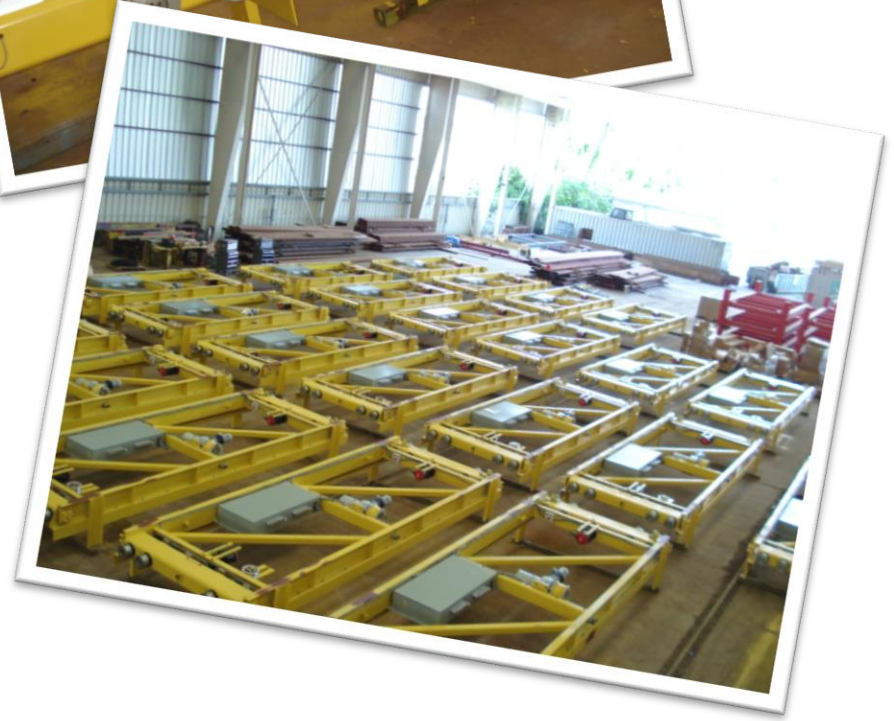
Electrical boxes for individual machines are assembled for installation on the machinery.



## ELECTRONICS

Electrical boxes are installed on individual machines.

With 100,000+ sq ft of manufacturing floor space, Robotic Parking Systems can build projects of any size, and deliver quality products on time.

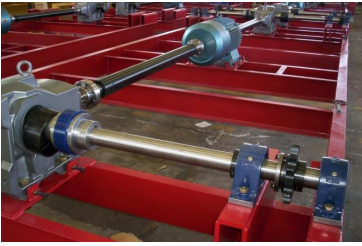


## ELECTRONICS

Additional electrical components such as sensors, wireless radios and other items are assembled for shipment to the job site.







# TESTING AND CERTIFICATION

Quality control is maintained using our 114 car research and testing garage located within our production plant. This facility allows us to test and certify every machine before it's shipped to the customer's job site.

Factory personnel are highly trained, motivated and have all certifications necessary for the highly specialized processes.

## TESTING AND CERTIFICATION

Our factory is located in Clearwater, FL, USA.

Testing machines inside the fully functional Robotic Parking System in our factory.

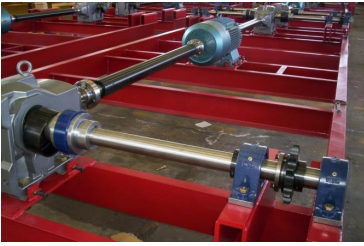


## TESTING AND CERTIFICATION

Independent machines for the Robotic Parking System are tested and certified as they move vehicles on three axis – vertically between floors, horizontally in a row, and in / out to move cars into and out of racks in the steel shelving system.







# SHIPPING TO THE JOB SITE

After the Robotic Parking System machines are tested and certified they are packaged along with other components for shipment to the job site.

## SHIPPING TO THE JOB SITE

Machinery and other components are packaged for shipment.



## SHIPPING TO THE JOB SITE

Machinery, electronics and equipment are loaded onto trucks or into containers for shipment to the job site.





## SHIPPING TO THE JOB SITE

Loading machinery and electrical panels.





# PREPARING THE JOB SITE

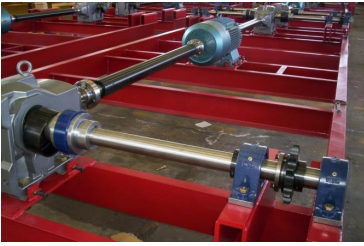
While the Robotic Parking Systems' machinery and equipment is being built at our Clearwater, FL factory, the job site – in this example in Dubai – is prepared, the slab is poured and steel begins to arrive.

## PREPARING THE JOB SITE

The Robotic Parking System can be installed using either a steel or concrete supporting structure.







# ERECTING THE STEEL FRAME

The next step in manufacturing and installing the Robotic Parking System is erecting the steel frame.



The compactness of the steel shelving system is the key to minimizing the impact of parking in a project and allowing architects and developers to use 50% of the land area or less for the same amount of parking. You don't need to allocate space for conventional ramps, aisles for driving from one area to another, additional width of a parking space to accommodate turns and opening of car doors, pedestrian areas, stairs, elevators, and more.

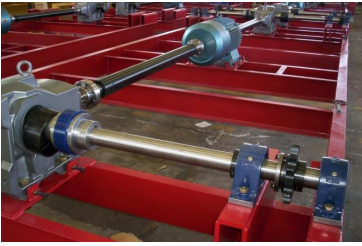
This creates more space for the project that can be used for additional revenue, green space, common areas or other uses that benefit the project as a whole.

## ERECTING THE STEEL FRAME

Erecting the steel shelving system.







# INSTALLING VERTICAL LIFTS AND HOIST SYSTEM

As the steel continues to be erected, electro-mechanical Vertical Lift Conveyor (VLC) machine components are installed at the top of the steel shelving system. These robust, durable and safety-compliant industrial modules are used to raise and lower cars between floors. Our Vertical Lifts are equipped with long lasting chain gearbox transmissions, variable frequency drives that allow speed adjustments, safety locks and electronics that allow an automated operation.

## INSTALLING VERTICAL LIFTS AND HOIST SYSTEM

The Vertical Lift Conveyors (red machines) are installed at the top of the structure.



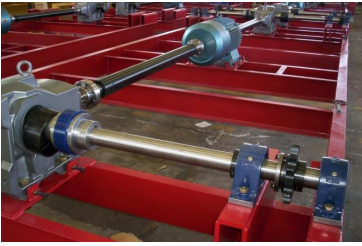
## INSTALLING VERTICAL LIFTS AND HOIST SYSTEM

A hoist system is installed at the top of the central area of the shelving support system which is used for installing additional machinery inside the Robotic Parking System and for future maintenance in the garage.

Work continues on the steel frame and shelving system.







# INSTALLING MACHINERY ON SITE

Once the steel structure is in place additional Robotic Parking Systems' machinery can be installed within the automated garage. Using independent machines moving the cars vertically, horizontally and into and out of the racks in the shelving system, this 765 space garage can handle 250 cars per hour with up to 32 cars in motion simultaneously at any time. The throughput can be faster than conventional garages and provides a very satisfying user experience.

## INSTALLING MACHINERY ON SITE

Independent Carrier Modules that move the vehicles horizontally along a row are installed in each level of the Robotic Parking System.

Lower Carrier Modules (LCM) are installed on the bottom level and include turntables to rotate the car 180 degrees for easy exit from the facility driving forward.



## INSTALLING MACHINERY ON SITE

Lower Carrier Modules (LCM) are installed.

A car is being turned on the Lower Carrier Module in the completed parking facility.





## INSTALLING MACHINERY ON SITE

Upper Carrier Modules (UCM) are installed on the upper levels to move the cars horizontally along a row of the racking system.



## INSTALLING MACHINERY ON SITE

Additional machinery is installed in the Robotic Parking System.





# BUILDING THE FAÇADE

Imagination is the limit! Architects and developers can hang any type of façade onto the clean outside structural support system of a Robotic Parking facility.





The industrial lifts, machines, pallets and the computer control systems are installed inside the supporting structure and never interfere with the façade. This gives architects a free hand in designing the external appearance of the building.

Whether choosing a half-timbered, brick, aluminum, concrete or glass facade, the decision is yours. The garage can be designed to fit harmoniously into its environment. Entry / exit terminals can also be integrated into the façade environment, while observing both visual as well as functional criteria. The Robotic Parking System can be constructed in every form — above ground, underground, on roofs or inside a building complex.



In historic or inner city districts parking can be a major challenge for architects and developers. No one wants to see an ugly ramped concrete parking structure that is totally out of character for the area. Some jurisdictions have even introduced ordinances that demand an enclosed façade in order to enhance the fabric of building façades in the environment.

This is where Robotic Parking Systems can help. An automated parking system can store twice as many cars in half the space so the land area required for the parking facility can be much smaller. And, the facade can be completely customized to fit the architectural detail of the area.

## BUILDING THE FAÇADE

The façade is attached to the structural support system of the Robotic Parking System.





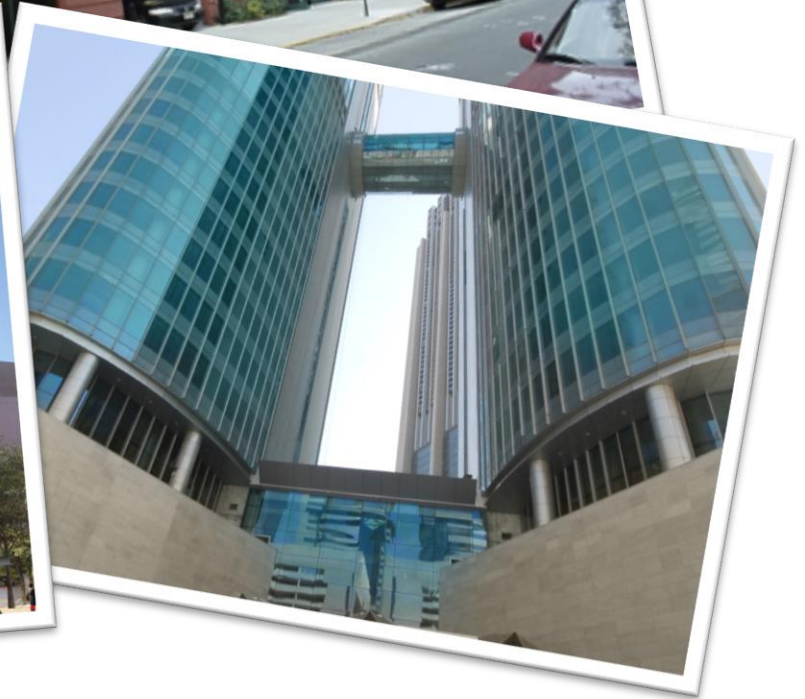
## BUILDING THE FAÇADE

The façade for this Robotic Parking System is designed to blend seamlessly with the Ibn Battuta Gate complex in Dubai.



## BUILDING THE FAÇADE

Shown here are a few other project designs that incorporate Robotic Parking Systems.





# MAIN ELECTRICAL AND BACKUP SYSTEMS

As the Robotic Parking Systems' machines are being installed and the façade completed, the main power feed for the automated parking facility is connected as well as primary electrical panels for the automation components and other equipment.

The Robotic Parking System requires about 3 Kw/Hr to park and retrieve one (1) car – this may vary + /- based on auxiliary electrical needs like lighting, air conditioning etc.



## MAIN ELECTRICAL AND BACKUP SYSTEMS

The main electrical substation feeds into the electrical room inside the Robotic Parking Systems' facility.



## MAIN ELECTRICAL AND BACKUP SYSTEMS

From the electrical room, power is distributed for general lighting, air conditioning, entry / exit stations, the control room and the hoists, machinery and other automation components.

Many of the machines, such as carriers which move the cars horizontally, are connected to the electrical system through power rails so that the machines can move freely.



## MAIN ELECTRICAL AND BACKUP SYSTEMS

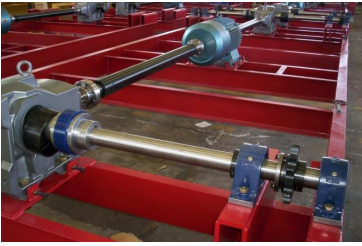
Other stationary machinery and equipment have their own electrical panels which connect directly into the electrical room.

Every Robotic Parking System design includes a back-up emergency power diesel generator with an automatic transfer switch in the electrical room so that service can continue in the case of a power outage at the substation.

The automatic transfer switch ensures a seamless transition to stand-by power within 6 seconds.







# FIRE ALARMS, FIRE FIGHTING AND SPRINKLERS

Every Robotic Parking System design includes fire alarms and sprinkler systems to ensure that the facility is fire-safe and protected. This design is based on the National Fire Protection Association's "NFPA 88A: Standard for Parking Structures" which includes a special section for automated parking structures.

Our CEO is a member of the NFPA Garage and Parking Structures Committee and was instrumental in automated parking garages being defined in this key international code. Also, based on Robotic Parking's experience and work with UAE Civil Defense, a new Civil Defense Code for robotic parking was developed to serve as a guideline for future projects in that region. This new Civil Defense Code takes into consideration the new NFPA 88A codes.

## FIRE ALARMS

Robotic Parking Systems use an aspirating smoke detection system which draws a sample of air through a network of pipes and evaluates the sample to detect smoke in specific areas of the system. This is then reported on an addressable panel as the pictures show. Aspirating smoke detectors are highly sensitive, and can detect smoke before it is even visible to the human eye.



## FIRE FIGHTING AND SPRINKLER SYSTEMS

A comprehensive sprinkler system conforming to NFPA 88A regulations is incorporated in every Robotic Parking System.

If needed based on local water supplies, a water tank is added to the design to ensure immediate access to a large volume of water necessary to address any fires.

A jockey pump pulls water into the fire fighting system from a public water supply or tank, etc.





# FIRE FIGHTING AND SPRINKLER SYSTEMS

Fire pumps force water through the pipes to the sprinklers.



## FIRE FIGHTING AND SPRINKLER SYSTEMS

Three highly sensitive and quick response sprinkler heads are used to cover every two parking slots in the steel racking system providing protection for vehicles and the automated parking garage.



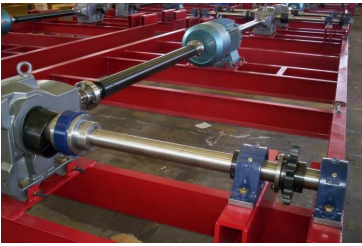


# ENTRY / EXIT TERMINALS AND LOBBY

As the façade is completed, it's time to put the finishing touches on the Entry / Exit Terminals.

The Entry / Exit Terminals for the Robotic Parking System, as well as the lobby used by customers retrieving their cars, can be custom designed by the architect or interior designer to blend seamlessly with any project's specific design theme.





Functionally, the well-lit Entry / Exit Terminals and close by lobby increase security and reduce the risk of personal injury for the users of the robotic parking garage.

Compare this to the numerous incidents in conventional garages documented in police reports. Every day there are news reports about accidents, theft and violence in conventional garages and parking lots. If you really look at this environment you can see that rows of columns or parked cars offer abundant hiding places for those who intend harm.

With a Robotic Parking System there is no need to walk to and from the car through rows of vehicles or levels of parking decks. With an automated parking system, the driver pulls into a terminal located next to the street and leaves the car to be picked up by the automated machinery. When leaving, the driver returns to a well-lit lobby where the car is quickly delivered to a ground floor terminal.

## ENTRY / EXIT TERMINALS AND LOBBY

The exterior façade of the Entry / Exit Terminals is designed to complement the project.



## ENTRY / EXIT TERMINALS AND LOBBY

The interior walls of the Entry / Exit Station are finished and roll-up safety doors are installed. These safety doors block the entrance to the interior of the garage both prohibiting and protecting users from entering the inside of the Robotic Parking System.

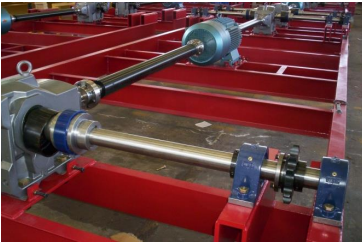




## ENTRY / EXIT TERMINALS AND LOBBY

Customers enter the secure ground floor lobby and insert their access card into a kiosk to retrieve their cars. Screens display the nearby exit terminal where the car can be retrieved. It's not necessary to wander around inside a parking garage.





# ELECTRONICS, SENSORS AND CAMERAS

Numerous electronic and automation components such as wireless radios, a variety of sensors, cameras, display screens, card readers, card dispensers and much more are installed throughout the parking system to facilitate the automated functions and to ensure the safe and smooth operation of the Robotic Parking System garage.



Many of these automation components can be seen in the Entry / Exit Terminals of the garage.

Multiple high-end laser curtains are used throughout the terminal to ensure that the vehicle is parked correctly inside the predetermined boundaries. Additional motion and positioning sensors round out the checks in the terminal area before the display screen provides further instructions to the user.

Hundreds of sensors are utilized from safety sensors that monitor the opening and closing of roll-up doors in the Entry / Exit Terminals to highly accurate proximity, distance and positioning sensors that properly position cars and machinery as well as precision scanners that tell a machine its current location.



## ELECTRONICS, SENSORS AND CAMERAS

Outside the Entry / Exit Terminal a green signal light indicates when it is safe to enter the parking bay.



## ELECTRONICS, SENSORS AND CAMERAS

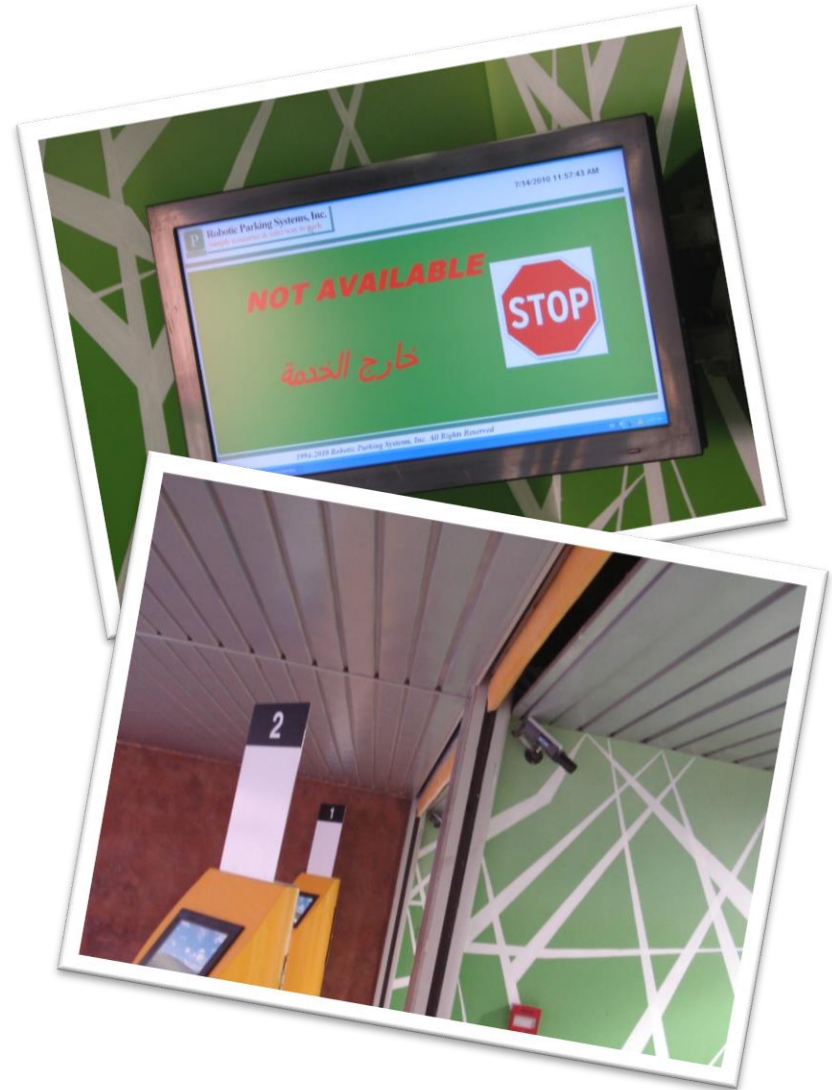
Very sensitive light curtains (sensors) are used for safeguarding areas such as the Entry / Exit Terminals that contain people.



## ELECTRONICS, SENSORS AND CAMERAS

Information received from the sensors is forwarded to the automation software. Resulting instructions in local languages are then displayed on the screens in the Entry / Exit Terminals to provide guidance to users of the Robotic Parking System.

Multiple cameras take high resolution images of a vehicle upon entry and exit for the protection of both the owner of the garage as well as the vehicle owner.





## ELECTRONICS, SENSORS AND CAMERAS

Kiosks with card readers and dispensers placed at each Entry / Exit Terminal control access to the garage and identify owners and their vehicles.

To retrieve a vehicle, the owner inserts the card into the card reader of one of the kiosks in the lobby of the Robotic Parking System. The display screen above the lobby kiosks tells the owner in which Entry / Exit bay the vehicle will be delivered by the automated machinery. This is similar to display screens in an airport that show flight arrival and departure time and gate location.



## ELECTRONICS, SENSORS AND CAMERAS

The machinery, software and automation components work together to deliver the vehicle facing outward in the designated exit bay.

A red signal light indicates that a car is entering or exiting a parking bay.

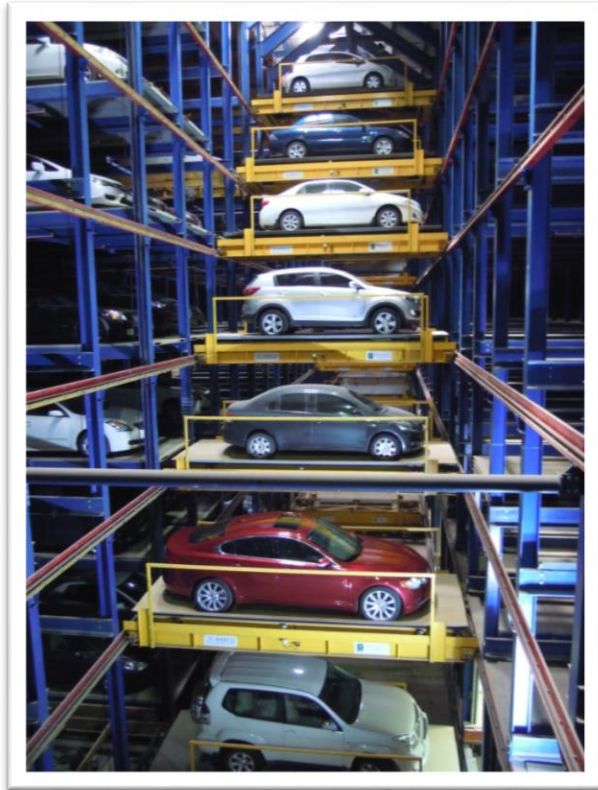
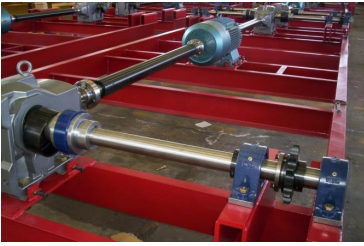




# COMPUTER HARDWARE AND SOFTWARE

The entire Robotic Parking System is engineered with extreme redundancy to guarantee a greater level of reliability and to ensure uninterrupted operation. No single failure will ever result in the system being inoperable. Uptime of the system is unprecedented.





Duplicate electronics and mechanical components and systems ensure that if one machine requires maintenance or repair, a back-up is already operating to keep cars moving into and out of the garage.

The same philosophy applies to computer hardware and software systems.

## REDUNDANT FAULT TOLERANT SERVERS

Robotic Parking Systems use redundant, ultra high-end, fault tolerant Stratus servers (fT 99.999% worldwide uptime) guaranteeing continuous availability. This ensures a worst case scenario — cars can't be retrieved because of a system failure — doesn't happen.

Stratus ftServer systems are built to prevent failures. The servers in the garage are fully redundant with components operating in parallel within a single enclosure. Every piece of data (including garage configuration, location and identity of every car, etc.) and every

command is stored in real-time on the redundant servers. If one server fails, the second server automatically takes over with no interruption of service.



# AUTOMATION SOFTWARE

GE's Cimplicity® automation software powers the Robotic Parking System. This software controls the machinery, lifts, motors, sensors and other automation components used to transport the vehicles in the parking garage.

Cimplicity is used worldwide in processes where thousands of movements are performed on a 24/7 basis such as in automobile assembly lines at GM and Ford as well as in seaports around the world for container handling.

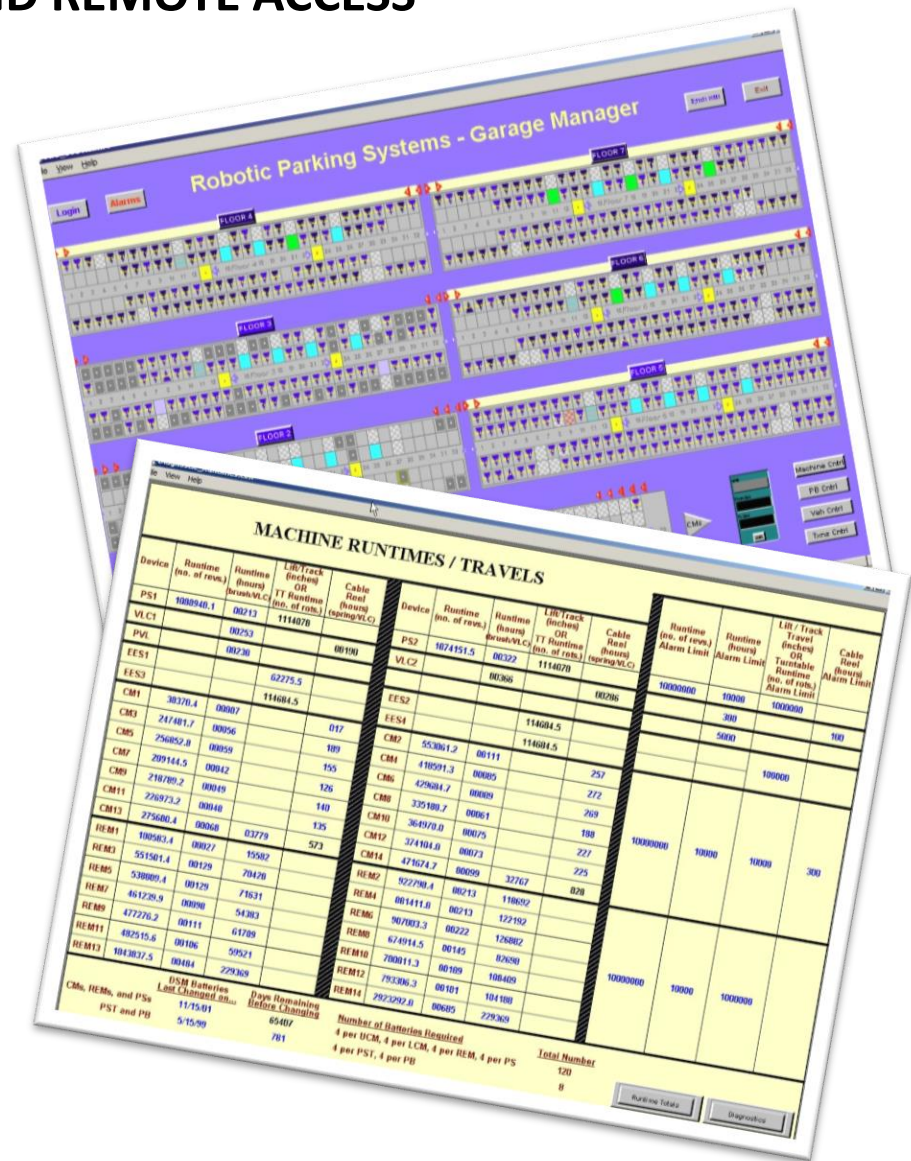




# SOPHISTICATED DIAGNOSTICS AND REMOTE ACCESS

All Robotic Parking Systems include a patented full diagnostic suite and high level warning system.

The software records every rotation of any wheel, bearing, gearbox and motor. All moving parts are monitored, and operators can see every movement and car location on display screens in real time. Supervisors can be alerted for system tasks, and any needed maintenance is immediately reported online to the service department.

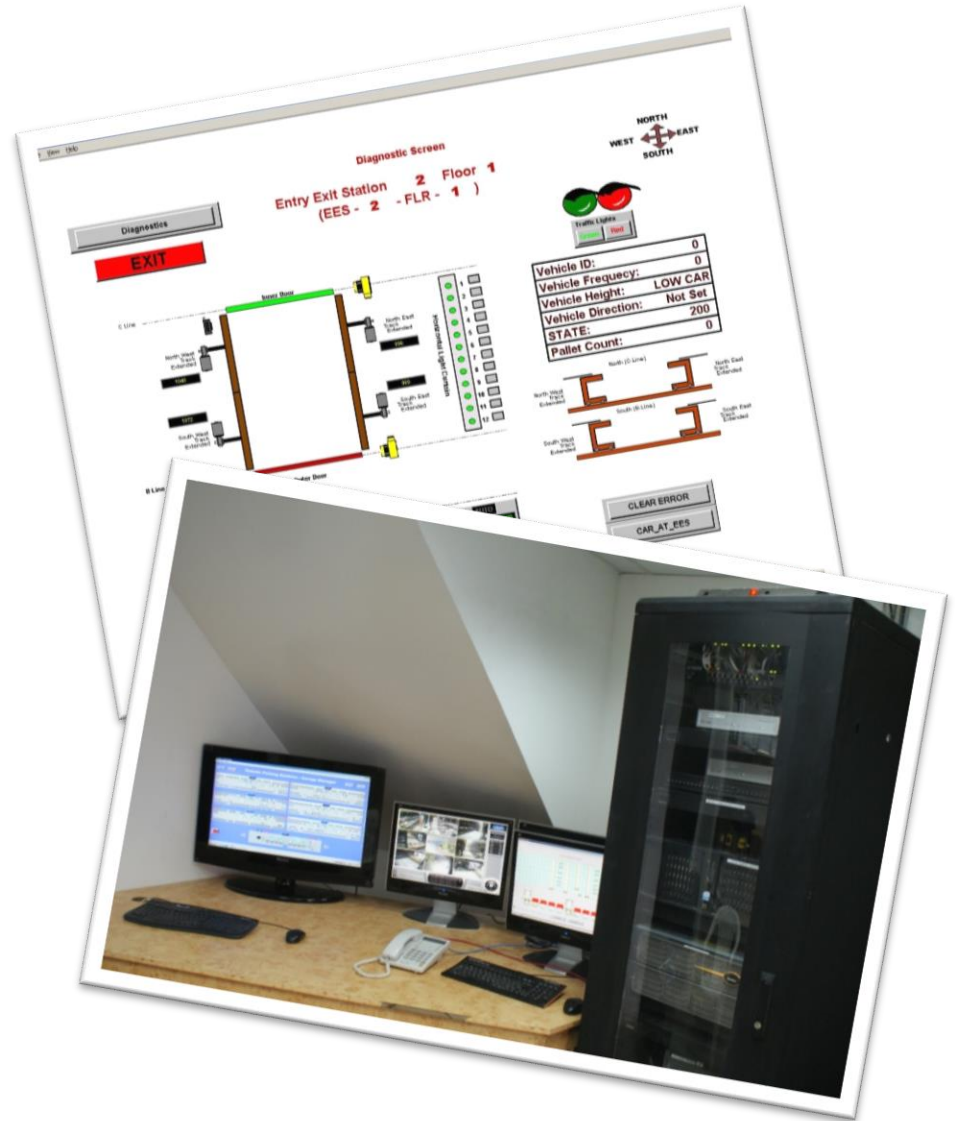


# SOPHISTICATED DIAGNOSTICS AND REMOTE ACCESS

The diagnostic system provides up to five different alarm messaging classifications. These early warning indicators and alarms recognize and report conditions before a problem does occur. Messages are sent to the computer system on site and can also be automatically forwarded to technicians' beepers or cell phones. Up to three locations can be notified simultaneously.

These early warnings ensure proactive maintenance and a high level of uptime.

Real-time remote access allows off-site trouble shooting by operators or the manufacturer, if needed.





# START UP AND TESTING THE COMPLETED GARAGE

The machines are now installed, and the façade completed. Electrical, fire fighting, automation components and software are all in place. What's next?



## START UP AND TESTING THE COMPLETED GARAGE

The next step is a comprehensive battery of synchronization, tests and adjustments to ensure that all of the elements of the Robotic Parking Systems are functioning at peak performance and that all components are communicating properly with each other. Each design specification is tested and verified including the throughput of cars and speed of retrieval, etc.



## START UP AND TESTING THE COMPLETED GARAGE

Pre-opening performance tests for this particular facility demonstrated that the garage handles 250 cars per hour with up to 32 cars in motion at any one time. This peak traffic is faster than typical conventional ramp-style garages. Additional tests showed that parking or retrieval of a vehicle can be completed within 60 to 160 seconds.

During various stages of the installation and start-up operation of the automated parking garage, maintenance and operations staff have been fully trained on the Robotic Parking Systems.



## START UP AND TESTING THE COMPLETED GARAGE

The 765 space Robotic Parking System for Ibn Battuta Gate Complex in Dubai is completed, turned over to the owner and officially opened.

You can see videos of the opening at:

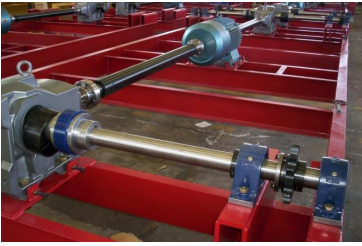
<http://www.youtube.com/watch?v=uapA9DQ03KI>

and

<http://www.youtube.com/watch?v=2ayd9J8R5kU>







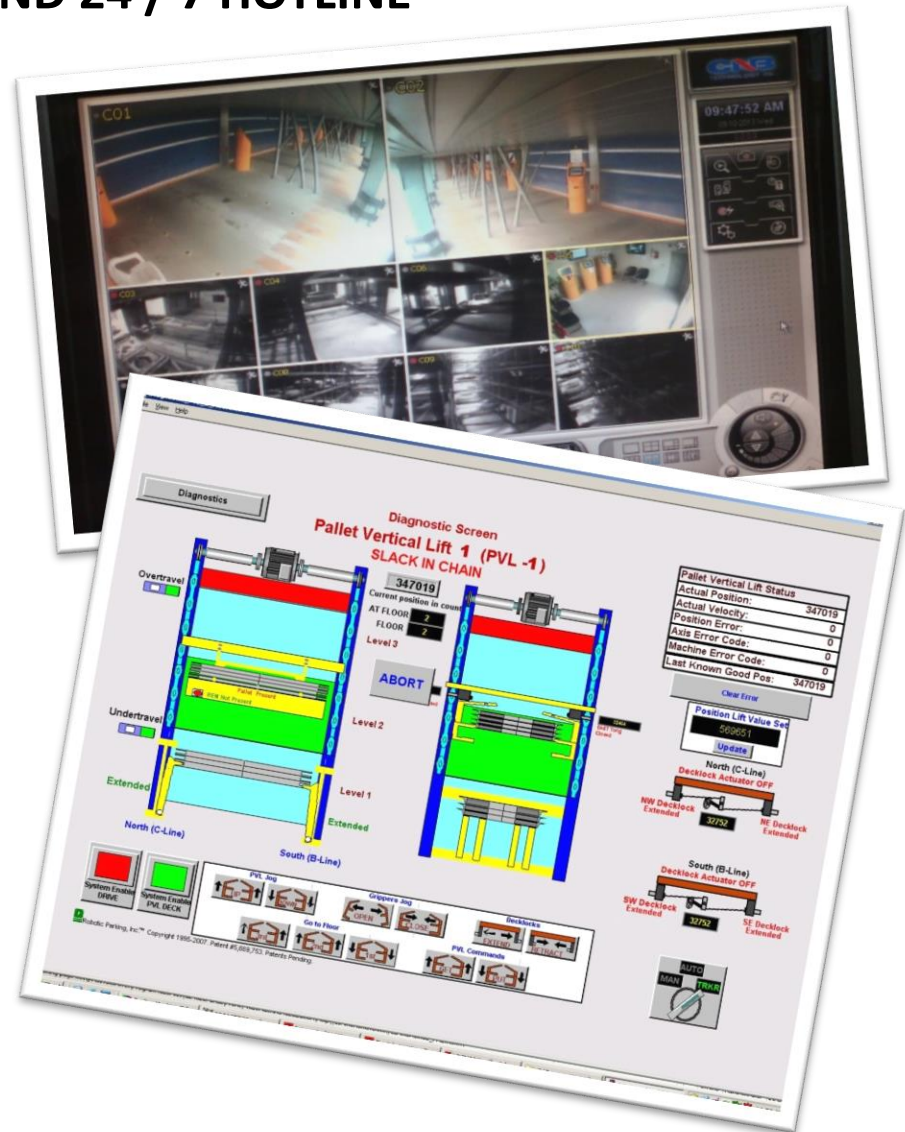
# OPERATION AND MAINTENANCE

Robotic Parking System's HMI (Human Machine Interface) is one of the most sophisticated diagnostics systems in the industry. Its patented high level warning systems provide alerts well in advance of any potential problems to ensure maximum uptime.

## COMPREHENSIVE MAINTENANCE AND 24 / 7 HOTLINE

Using local and remote access as well as the built-in diagnostic tools, the Robotic Parking System can be easily monitored and maintained from anywhere in the world. Most alert and warnings can be cleared in minutes.

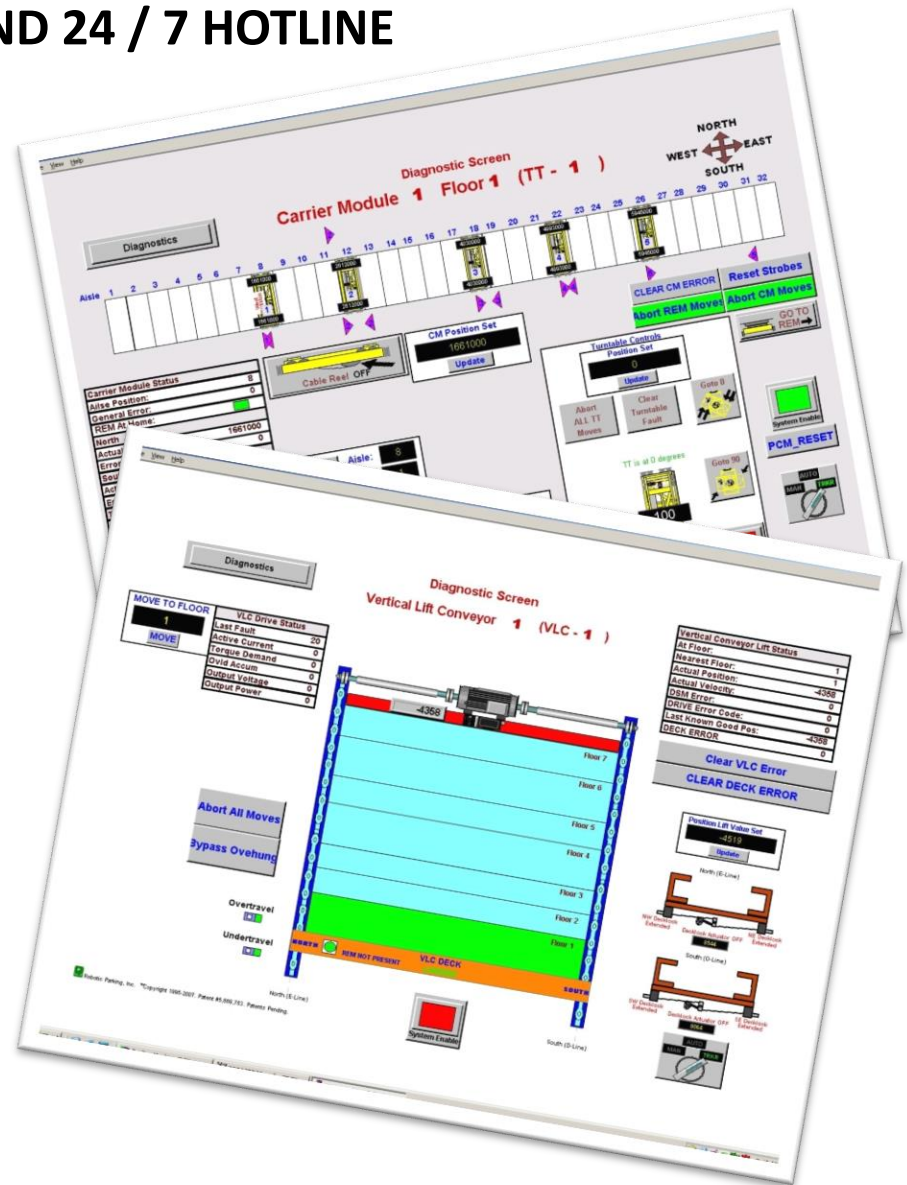
On site diagnostics, preventative maintenance and service are all performed using factory trained technicians.



# COMPREHENSIVE MAINTENANCE AND 24 / 7 HOTLINE

For added coverage, Robotic Parking Systems, Inc. installs a hotline to our headquarters and GE for remote access 24 hours / 7 days with an average 20 minute response time. The Robotic Parking System can be viewed and diagnosed in real time, and our engineers can access the system remotely to trouble shoot the system in the rare case of emergency.

These factors ensure one of the highest standards of operations in automated parking garages worldwide.

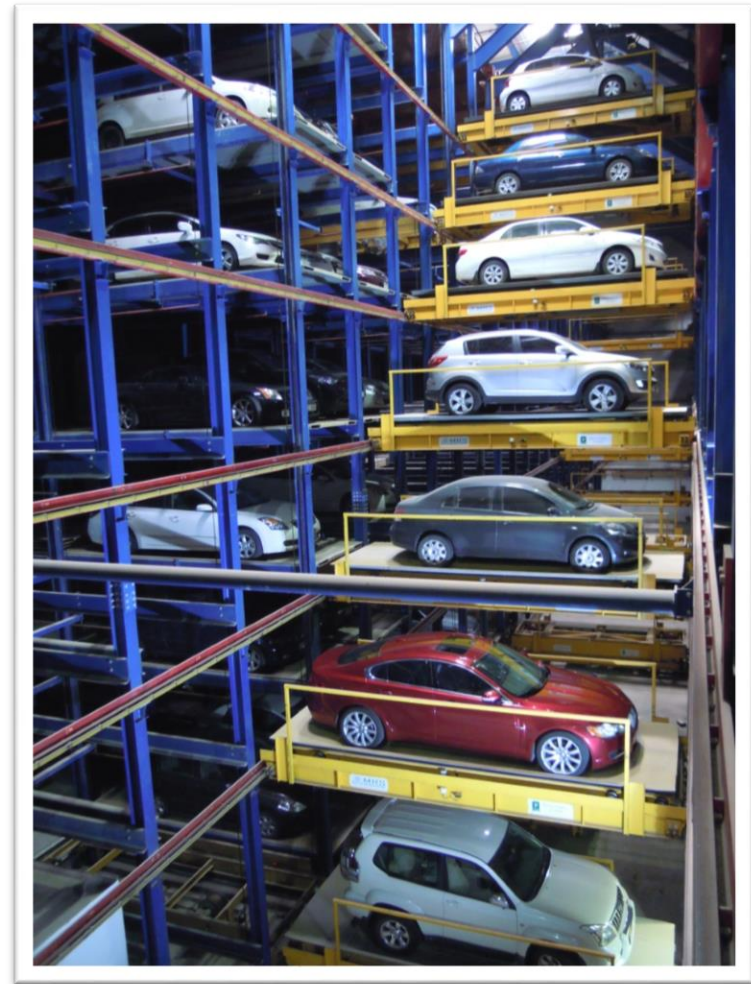




## FLEXIBLE OPERATION PROGRAMS

According to national and international standards and guidelines, a public automated parking facility needs to be manned during the hours of operation by a factory trained technician. Such an operator can also cover the service and maintenance functions.

Robotic Parking Systems, Inc. offers several operations and maintenance options to accommodate the individual needs of the owners.



## FLEXIBLE OPERATION PROGRAMS

For owners who want to use their own staff for operations and weekly maintenance functions, Robotic Parking Systems provides two sets of complete operation and maintenance manuals and will provide on-site training for these personnel.

The owner may elect to have Robotic Parking Systems provide operation services. These services are performed by Robotic Service and Operations LLC, a wholly owned subsidiary of Robotic Parking Systems Inc.

Robotic Service and Operations can also propose a full management contract for the automated parking facility.





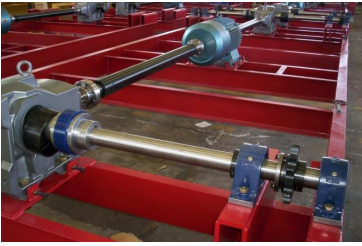
## COMMITMENT TO SERVICE

These comprehensive service and maintenance programs are indicative of Robotic Parking Systems' commitment to a high level of reliability and the smooth operation of any of its installed systems.

A recent report from an audit performed by independent technology experts on the Robotic Parking Systems' technology concludes:

- Operational safety two fold on each logical level: software and hardware
- Full redundancy by at least two identical machines per geographical area
- Hot swappable PC system supported by universal power supply and generator
- Several manual operation stations available for different machines
- Flexible definition of Entry / Exit Terminals indicated by traffic light on the fly
- Service plan based on threshold values for each component
- System is very solidly designed with lots of redundancy
- Highly redundant, cleverly designed system with good traceability
- Best practice compliance
- Mature, extensible system: over 23 years of experience with system design, installation & operations

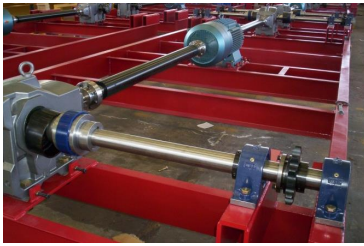




# THE RESULT

An innovative parking solution with premium advantages for everyone.

- Better parking experience – premium valet without the tip.
- Better safety and security for individuals and their cars.
- Better environment – more green space – less pollution.
- Less congestion.
- Better use of land and development space.
- Better revenues and profits.



Thank you for exploring the process of manufacturing and installing a Robotic Parking System. We trust we've given you a better understanding of automated parking facilities and welcome you to schedule a tour of our production facility in beautiful Clearwater, FL.





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