Product Summary:

The GKH-2011 Automatic Under Vehicle Inspection Systems (AUVIS) is the dual view, embedded solution for the fully automatic identification of foreign objects or modifications to a vehicle’s undercarriage. Vehicles drive over the environmentally sealed scanner at speeds up to 35 KPH while Gatekeeper’s system scans and compiles two high-resolution images of a vehicle’s undercarriage to create the vehicle’s digital “fingerprint”. The patented dual view of 60° forward and 60° backward looking makes the search of a vehicle much more comprehensive. In addition the GKH-2011 is not limited by vehicle length or width. An overview/driver camera captures the normal view of the vehicle/driver and displays this on the high-resolution touch screen.

After the vehicle has cleared the scanner, it will take 2 – 3 seconds for Gatekeeper’s Automatic Foreign Object Detection software to automatically compare the subject vehicle’s undercarriage to a safe vehicle (stored in the database) and display both on the screen. The system then immediately identifies any foreign object or modifications to the undercarriage by circling them with a red ring as shown below, and at the same time activates an audio and/or visual alarm.

The system can be integrated with other access control technologies such as automatic license plate reader (LPR) & RFID reader, bollards and barriers of many types along with additional CCTV cameras etc. The GKH-2011 has the Gatekeeper standard features of a system traffic light, Watch List, automatic verification of license plate against vehicle undercarriage (providing LPR is integrated), vehicle make and model identification, Auto Wash, activity reports and all GKH-2011’s are network enabled requiring only to connect the systems to a common network to allow a central operator to either observe or operate any scanner on the network simply by clicking on a lane icon. The GKH-2011 is also able to be integrated with other database systems enabling regular updating of vehicles on a government or police watch list for example.
Overview of Gatekeeper Technology.

Below are the primary features & capabilities that separate Gatekeeper from all other under vehicle inspection systems. In combination with these is the actual performance record of the Gatekeeper systems gained from deployment worldwide from the cold of Northern Russia to the heat of the Middle East.

Core Technology – Gatekeeper’s technology uses Area Scan Image Processing technology which allows vehicle images to be normalized regardless of the speed of the vehicle as it crosses the scanning platform. Image capture and processing technologies such as recorded video streams, or line scanning processing are not capable of automatic identification and searching because they require the human operator to view/compare the images and decide if there is any object or modifications that could pose a threat. Live/recorded video and line scanning systems have been proven to be poor inspection technologies as they rely heavily on human knowledge, attention span and intervention.

Two Views of the Vehicle Under Carriage (virtual 3D images) – Gatekeeper’s systems compile two high resolution digital images of a vehicle under carriage and create a virtual “finger print” of the vehicle. Two independent views are necessary to provide the maximum amount of visual information to permit automatic identification and automatic searching. The two views or virtual 3D image makes it more difficult to hide objects, explosives etc on top of an axel or cross beam under a vehicle.

Automatic Vehicle Identification – Gatekeeper’s system uses the vehicle finger print to automatically identify the vehicle by matching the image against a data base of vehicle finger prints. The system does not rely on license plates etc to recall the vehicle from the database it is done via Gatekeeper’s patented pattern recognition algorithms. The two images are converted into a digital computer file and stored in a SQL data base where they can be matched against the entire data base. When a match is found the identity of the vehicle make & model can be (user defined) displayed on the operator terminal.

Automatic Foreign Object Detection – Gatekeeper’s system use Area Scan Digital Image Processing technology to convert vehicle under carriage digital images into computer files that are matched against a data base of known safe vehicle images. The Gatekeeper software automatically compares the subject vehicle to a safe vehicle and immediately identifies any foreign objects or modifications to the under carriage that may pose a threat. When a difference between the reference image and new scanned image is identified by the system it automatically places a red ring around the difference i.e. explosive or change to undercarriage etc and activates an audio and/or visual alarm to alert the operator of the threat.

System Performance Requirements

- Maximum Vehicle Speed – 35 Kilometers per hour
- Vehicle length: cars to very large/long trucks
- Decision Response Time – (the length of time from when the vehicle clears the scanning platform until the system automatically identifies the vehicle, automatically searches the under carriage and displays the decision results on the operator terminal)
  - 2 – 3 seconds
Gatekeeper 2011 Specifications

Software Operating System

Automatic Foreign Object Detection System (AFODS)

- *Patented* digital “stitching” of continuous motion vehicle image to create high-resolution digital image regardless of vehicle speed up to 35 KPH
- *Patented* digital image algorithms automatically match scanned vehicle “fingerprint” with vehicle database, detect foreign objects and provide audible and visual alerts to the operator terminal.
- *Patented* bi directional (contemporaneous dual inspection view – forward and backward) scanner providing a virtual 3D view of the undercarriage of a vehicle

. Operating System: Windows XPE
. Database: Windows SQL
. System Architecture: Open
. Online Assistance: Global Reach™

. Features: *Patent Pending* ability to Identify Vehicle makes and models based on under vehicle image only. System contains a Watch List for wanted vehicles, Vehicle Verification vs. License Plate and numerous database features.

. System automatically distinguishes between vehicle types (bus, truck, SUV, car etc) without operator assistance and produces composite stitched images of identical high quality without the need to adjust scanner settings or lighting.

Language: User defined – multi language GUI, Keyboard and LPR

SYSTEM PHYSICAL PROPERTIES

Embedded Frame

Unit mounts flush with the road surface and extends 35.5cm below grade. The embedded unit includes drainage and conduit exit points as per attached drawings.

Dimensions:
Length 168cm x Width 155cm x depth 35.5cm
Number of pieces: 4
Weight: 350 kg (approx)
Environmental: Galvanized steel

Scanner: *Patented Design*
Dimensions: 70 cm wide x 12 cm high x 1 meter long, 1 piece
Weight: 14 kg (approx)
Power Source: 24 VDC from Junction Box
Environmental: Sealed unit to protect against heat, dust, water and vibration.
Temperature range: -35c to 70c
Humidity range: 0 to 98% relative, non-condensing
Operating Environment

All outdoor equipment has been designed for installation in harsh climate conditions and has been designed to comply with the following standards:

- Low Temperature: MIL-STD-810E, Method 502.3, -40 °C storage; -20 °C operating
- Altitude MIL-STD-810E, Method 500.3 Proc. I: 15,000'; Method 500.3 Proc. II: 6,000'
- Sun Radiation: MIL-STD-810E, Method 505.3 Proc. II
- Fungus: MIL-STD-810E, Method 508.4 materials only
- Winds: Constant winds of 30 m/sec
- Rain: MIL-STD-810E, Method 506.3 Proc. I
- Salt Spray: MIL-STD-810E, Method 509.3 materials only.

**Environmental:** Sealed unit to protect against heat/cold, moisture, sand, dust, oil, humidity and vibration.

**Temperature range:** -35°C to 70°C

**Humidity range:** 0 to 95% relative, non-condensing

**Viewing Angle: Patented** 2 high resolution images at 60 degree angles for maximum visibility into hard to see areas of a vehicle undercarriage. One looking forward and one looking backward producing a virtual 3D view of the undercarriage.

**Undercarriage illumination:** 2 x 178cm strip of High Performance programmable LEDs-lighting matched to scanner optimal light frequency.

**Scanning Camera**

- **Type:** Area Scan – high-resolution monochrome
- **Frame Rate:** 300 FPS
- **Connection:** Gigabit
- **Filters:** Band-pass
GKH-2011 scanner and light rails placed in preformed 40cm deep vault before cover plate is placed over system.

**Operator Terminal**

*Indoor Operator Terminal:*
- **Screen Type:** 48.26 cm Flat, Color Screen
- **Resolution:** 1280 x 1024
- **Brightness:** >850 CD/m²
- **Weight:** 3.62 Kg (approx)
- **Temperature range:** 30c to 50c
- **Humidity range:** 0 to 90% relative, non-condensing.
- **Processor:** i5 dual Core
- **Memory:** 4.0 GB
- **Storage:** 500 GB HD (larger HD Optional)
- **Connections:** 2 Ethernet (1000 BASE T), 6 USB, DVI, VGA and serial ports.
Overview/Driver Cameras
Type: IP camera – Color VGA - Optional 3 Megapixel IP Camera
Sensor: Sony CCD Image Sensor
Lens: Auto Iris, 5/50mm lens
Filter: IR Cut
Video Compression: M-JPEG
Resolution: 720 x 480 NTSC
Frame Rate: 30 fps at 720 x 480
Protocol: TCP/IP
Enclosure: Optional environmental controls for temperature in extreme climates.

Traffic Light
Vehicles/drivers are controlled by a traffic light that indicates when a vehicle may drive forward or when the vehicle should stop and wait to be inspected.
Type: Green Arrow and Red Cross
Power: 24 VDC
Control: Automatic via Ground Loop and Operator Terminal GUI.
An example of a system pole layout that includes traffic light, overview camera (top camera), License Plate Reader Camera and system junction box.

**System Trigger**

*Type:* Ground/Inductive Loop situated 2-3 meters before scanner.

**Cabling**

<table>
<thead>
<tr>
<th>Communication between Operator Terminal and Junction Box:</th>
<th>CAT6 or Multi Mode Fiber Optic Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanner to Junction Box:</td>
<td>CAT6 plus 4 / 18 AWG conductors combination cable Overview Camera: Ruggedized CAT6</td>
</tr>
<tr>
<td>Traffic Light to Junction Box:</td>
<td>3 / 18 AWG conductor cable</td>
</tr>
<tr>
<td>Light Rail to Junction Box:</td>
<td>2 / 12 AWG conductors plus 2 / 24 AWG conductor combination cable</td>
</tr>
<tr>
<td>LPR to Junction Box:</td>
<td>CAT6</td>
</tr>
<tr>
<td>Ground Loop to Junction Box:</td>
<td>2 / 18 AWG conductors plus Shield wire combination cable</td>
</tr>
<tr>
<td>AC Power to Junction Box:</td>
<td>3 / 12 AWG conductor cable. Power supplies in Junction Box are 110 – 240, 50 / 60 Hz VAC Auto sensing.</td>
</tr>
</tbody>
</table>

**SYSTEM PERFORMANCE PROPERTIES**

**Max Vehicle Length:** 25 meters standard – longer vehicles can be scanned requires setup.

**Vehicle Width:** 2.75 meters standard – wider vehicles w/optional settings.

**Vehicle Weight:** >30 ton axel weight

**Max Vehicle Speed:** 35 Km/hr
**Lighting:** High output LED arrays

**Scan Viewing Angle:** *Patented* two views one forward (60°) and one backward (60°) looking, providing two high-resolution stitched composite images of a vehicle undercarriage.

**Vehicle Scanning:** Vehicles are required to drive across the scanning platform to capture images of the undercarriage. However, in the normal flow of vehicle traffic should a vehicle stop on top of the scanner at any time for up to 10 seconds this will not affect the quality of the scanned images.

**Overview/Driver Camera:** Provides picture of driver and/or view of vehicle. Image is presented on screen along with under vehicle images.

**On Screen Video display:** displays live video feed from overview camera on operator terminal screen.

**License Plate Reader Camera:** Optional – IP/IR Camera captures license plate via Gatekeeper’s License Plate Reading software and automatically presents license plate on screen. Reads Arabic, European, Russian, Thailand, Indian and US plates.

**Operator Terminal:** Flat screen with image zooming, coordinated zoom feature with database image. Additional Vehicle data input via keyboard. Achieve retrieval and search function based on several input criteria.

**Operational Range:** 100 meters stand off from roadbed scanning unit to remote operator terminal with CAT6 cable - 15 KM with Fiber Optic or Wireless options.

**Vehicle License Tag:** Optional operator tag number input – manual or automatic if equipped with LPR (does not require license plate recognition system, RFID tag reader or similar external identifier to perform automatic foreign object detection).

**Networking:** Two operational modes – stand alone or networked. Networking via CAT6 Ethernet local area network or wide area via Internet connection. Optional fiber optic cable connection for longer distance. Server(s) and additional data storage required for larger networked applications. Under the networking option a series of scanners can be linked up via the scanning system’s network ports allowing for a central control room to either operate or control any scanner on the network by simply clicking on the icon representing the lane the central controller wishes to access. A *Distributed Database* option is also available.

**Automatic Alerts:** visual and/or audible alerts on the operator terminal when system detects a change to the vehicle undercarriage for example a foreign object. Watch List can be created to automatically alert the operator when a vehicle listed on the Watch list (local or imported database Watch Lists ) is detected.

**System Maintenance:** The system is designed for fast, simple replacement of components and remote diagnostics via Internet connection to facilitate a low level of down time.

**System Manuals:** The system comes complete with assembly/installation and operating manuals.

**Training:** Full training is available to all staff operating the equipment at the quoted rates.

**Warranty:** 1 year warranty on all system electronics – extended warranties are also available.
SYSTEM INTEGRATION & ADDITIONAL CAPABILITIES

The system can be integrated with weigh-in-motion scales, biometric systems (finger print etc), facial recognition, license plate reader, RFID identifier, Smart card reader, barriers (road blockers, bollards or similar) and many other entry control point technologies.

Operator Screen (note the automatic alarm circles generated by system in RED)
System Layout

Galvanized Steel Embedded Frame Layout
Vehicle Images (note the virtual 3D images)

Large Truck: Image compressed to fit on page

Light Truck:
SUV: