Effective Human Detection and Tracking Security Using Machine Vision

Background of Newton Security Inc.

- Newton Security Inc. is a privately owned engineering and manufacturing firm, near Seattle, Washington, that develops and markets advanced, human detection, tracking and counting systems based on machine vision and sophisticated software.

- The company was founded in 2003 to specifically develop a reliable solution to the tedious and often manpower-intensive problem of stopping tailgating and piggybacking at secure facilities.

- Newton Security products are in use around the world at airports, government buildings, data centers, research laboratories, financial institutions, power stations, manufacturing plants, unmanned immigration sites and virtually every other category of secure areas.

The Newton Approach to Security

- Totally automate the manpower-intensive expensive and tedious problem of preventing tailgating and piggybacking at secure facilities.
- Develop a line of human detection products that are adaptable to a variety of entry, exit and passageway locations and are flexible in their response to a violation.
- The products are simple to install, with no civil work or excavation of expensive flooring required
- The products are non-obtrusive architecturally, with components that are either low-profile, recessed into the ceiling or remotely mounted.
- All products are fully ADA and DDA compliant.

Newton Security Solutions Using Machine Vision Technology

- At the core of all Newton Security detection products is its unique, patented T-DAR® machine vision technology.
- T-DAR combines three-dimensional, stereo optical imaging and sophisticated Newton-developed software algorithms to detect, deter or block tailgating and piggybacking into restricted areas.
- T-DAR software is able to reliably detect, identify, count, tag and track the human form anywhere within the scanning area, while ignoring any cart, luggage or parcel accompanying them, without requiring special placement or standing zones.
- T-DAR software and hardware is installed in conjunction with hardware and software of other new or existing security systems.
- T-DAR accomplishes the deterring or blocking of tailgating and piggybacking by integrating seamlessly with, and controlling the other access readers, audible alarms, video recording devices and electronic door locks by other manufacturers which are installed at a security point.

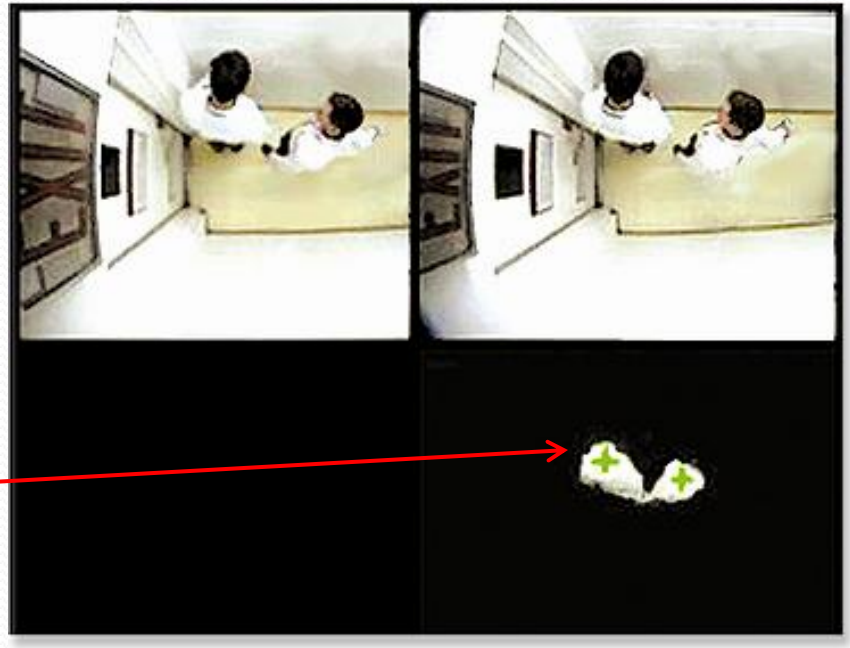
Stereo Vision Security System
U.S. Patent No. 7,382,895
Canadian Patent No. 2,481,250

Machine Vision Technology

- When more than one person is detected within the scanning area, depending on the product, the T-DAR system can respond with a silent signal to security personnel, broadcast an audible alarm and recorded warning or electronically lock doors to prevent entry into a restricted area.

- The adaptability of T-DAR gives owners and integrators the broadest latitude as to where a Newton system may be deployed to have the greatest effectiveness with the least architectural impact.

In this screen shot from the T-DAR user interface, as the software receives input from the ceiling-mounted stereo vision cameras it locates and counts the two humans by focusing only on their heads (white blobs) and tags each one with a green cross.



What is Your Security Application?

Airports
- Automated Immigration Control,
- Public to Airside,
- Control Tower,
- Anti-Return Gates etc

Banks
- Cash Centres
- High Street Branches
- Safety Deposit Centres

Health Care Centers & Research Laboratories

Government Buildings
- FBI
- Court Houses
- Embassies

Schools & Universities

Law Enforcement & Prisons

Industry/ Petrochemical

Power Plants

Data & Logistic Centers

Newton Security has a product to meet your entry security need.

A Continuum of Anti-Tailgating Security

- The Newton Security product line delivers scalable levels of protection ranging from basic, single-person entry detection and alarm, to the highest precision of detection and entry prevention.

- Newton Security anti-tailgating and anti-piggybacking products reduce or eliminate the violations enabled by hurried, inattentive or overly courteous employees, or by clever or brazen "social engineering" intruders.

- Newton Security manufactures two types of T-DAR based anti-tailgating and anti-piggybacking security product lines:

  - Door systems that control single, double, swinging, sliding and folding doors

  - Mantrap and lobby systems with one or more entrance doors and one or more exit doors fitted with interconnected electromechanical locks.

A Continuum of Anti-Tailgating Security

- **The primary difference between the two product lines is as follows:**
- All of the door systems detect and alert the security desk to tailgating and piggybacking incidents and sound a local alarm, but none of the systems have the capability to stop a violator.
- Both of the mantrap and lobby systems effectively detect and prevent tailgating and piggybacking by communicating with the access reader systems and controlling the electro-mechanical door locks, allowing only one authorized person to pass through a vestibule or airlock at a time.

T-DAR Entry Vision

T-DAR Door Shield
Model DS100

T-DAR Door Shield
Model DS200

T-DAR Lobby Shield

T-DAR Mantrap Shield

Newton Security Product Line

PRODUCT	PROTECTION LEVEL
T-DAR Mantrap Shield Series	Highest level of anti-tailgating and anti-piggybacking detection and blocking in an airlock / mantrap / portal application.
T-DAR Lobby Shield Series	Delivers high level anti-tailgating and anti-piggybacking detection and blocking for entry foyers, vestibules and lobbies
T-DAR Door Shield Series	The only technology with precise anti-tailgating detection and alarming/recording for single or double doors.
T-DAR Entry Vision	Single door, frame-mounted basic anti-tailgating detection system

T-DAR Entry Vision Model EV100

Basic Single Door Anti-Tailgating Detection System

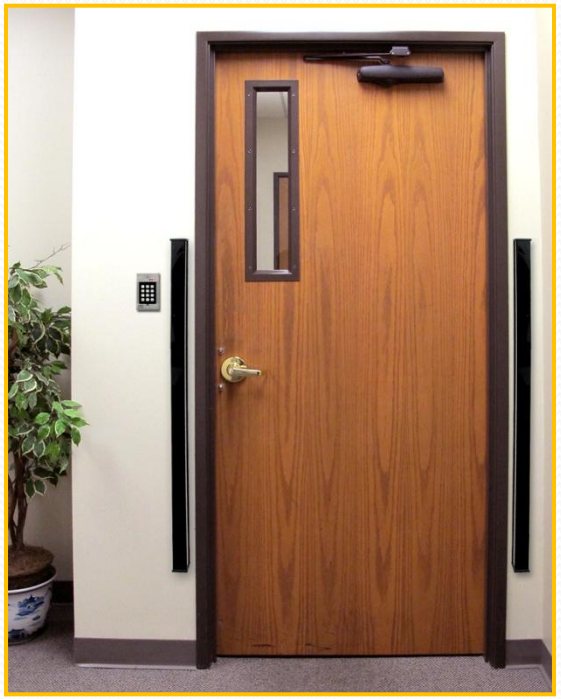
Entry Vision - Basic Anti-Tailgating Detection System

- The T-DAR Entry Vision Model EV100 is a door frame or wall-mounted tailgate detection and direction control system that adds an additional layer of security to any existing access-controlled single door.

- The sophisticated detection system uses stereo vision and proprietary Newton software to admit only one person into a restricted area for each valid authorization, while allowing carts or luggage to accompany them without an alarm.

- The technology enables the system to perform in full ambient light or in total darkness.

- Entry Vision software integrates seamlessly with existing access control systems.



The T-DAR Entry Vision system is composed of two, dark modules shown here attached to the wall.

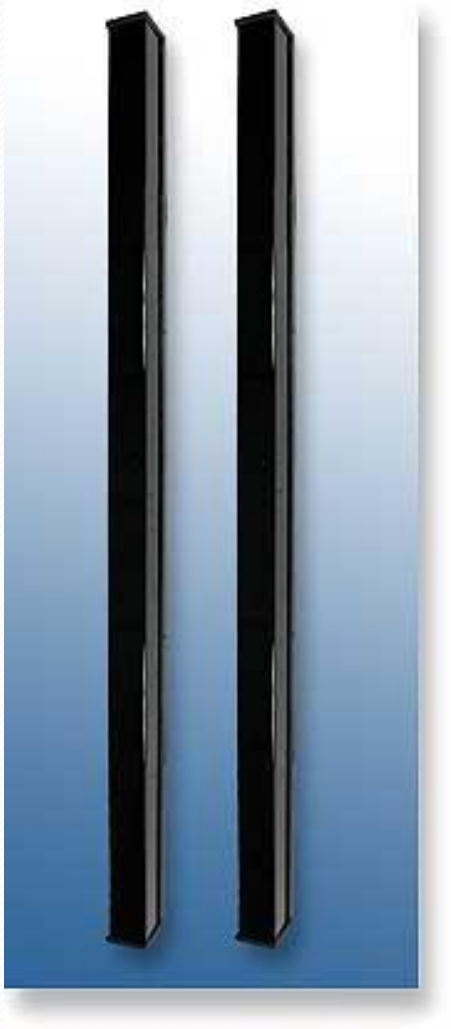
The access control keypad for the electronic door lock is on the left.

Entry Vision - Basic Anti-Tailgating Detection System

- Entry Vision Model EV100 system is composed of two modules:
  - The Detector module housing three tracking cameras
  - An Emitter module with a strip of infrared (IR) illuminators.

- The Entry Vision stereo vision detection system captures much more information than legacy break-beam units and can easily discerns humans from carts and luggage, as well as the direction of travel.

- Model EV100 enables owners and integrators to exercise choice in connecting the type of output response devices that would be most appropriate: a flashing light, an audible alarm, initiating video recording, or sending a silent signal to security control.



Entry Vision - Basic Anti-Tailgating Detection System

- The Entry Vision terminal board is equipped with four opto-isolated outputs used to signal alarm conditions, provide simple diagnostics, or control external devices such as door locks.

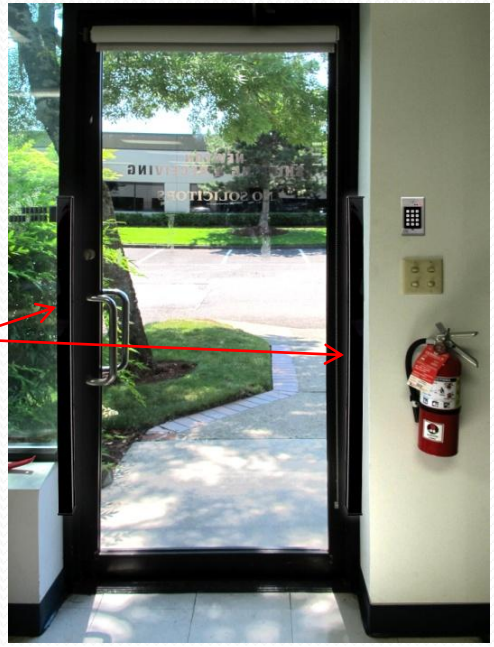
- The Entry Vision system is adaptable to any single doorway and wall mount requirement by easily re-aligning components.

- In addition to tailgating detection, the technology of Entry Vision Model EV100 may be easily adapted into these traditional entry control products:

  - *Elevator Control*
  - *Escalator Control*
  - *Person Counting*
  - *Asset Tracking and Verification*
  - *Directional Control*
  - *Optical Turnstiles*
  - *Barrier Arm Turnstiles*
  - *Barrier Gates (Wing Style)*
  - *Automated Immigration Gates*

Entry Vision modules mount to door frames or walls.

The system performs in full ambient light or in total darkness.



T-DAR Entry Vision Model EV100 Technical Information

ITEM	SPECIFICATIONS
Dimensions (each unit)	2.63 in. X 2.25 in. X 46 in. (67 mm X 57 mm X 1,17 m)
Weight (each unit)	7 lbs. (3 kg)
Construction	Extruded aluminum and extruded plastic filter
Mounting attachments	Mounting via four holes on the back panel
Operating temperature	40° to 110° F (4° to 43° C) High & low temperature systems available
Storage temperature	0° to 125° F (- 18° to 52 ° C)
Power input voltage*	12 - 24 VDC @ 2A
Inputs	4 Opto-isolated digital
Outputs	4 Relays 2A each
USB connection	Micro USB
**Power Supply NOT Included*	

T-DAR Entry Vision is Highly Adaptive

- **Primary features of the Entry Vision Model EV100 include:**
  - No maintenance - Entry Vision has no motors, gearboxes or other moving parts.
  - Simple to install - no civil works such as the digging up of expensive flooring or knocking out walls.
  - Adapts to existing doorways - T-DAR door systems can be installed into existing openings using existing doors and hinges.
  - Entry Vision adapts readily to most access systems and electro-mechanical locks and latch sets.
  - Allows mixed traffic - Entry Vision can be used as an entry and egress point for both pedestrian and carts, without the need of special standing or scanning zones.
  - User friendly - within two weeks all employees will be accustomed to the system.
  - Entry Vision is able to be used as an ADA and DDA handicapped passage.
  - Entry Vision systems are pre-programmed, no commissioning is required.
  - Entry Vision operates in full ambient light or total darkness

T-DAR Door Shield Series

Precise anti-tailgating detection and alarming/recording for single or double doors

T-DAR Door Shield – For Single and Double Doors

- **The T-DAR Door Shield model line is the only technology to deliver precise anti-tailgating detection and alarming/recording for both single doors and double doors.**
  - Model T-DAR DS100 - Single detection head for single door systems is superior to any combination of card reader and magnetic lock alone and can be installed on single doors, as well as on swinging and sliding doors.
  - Model T-DAR DS200 - Two detection heads for double doors are highly-effective in detection and deterrence against tailgating without requiring multiple sensors, pressure mats or infrared (IR) systems.

Door Shield Model T-DAR DS100
single door system

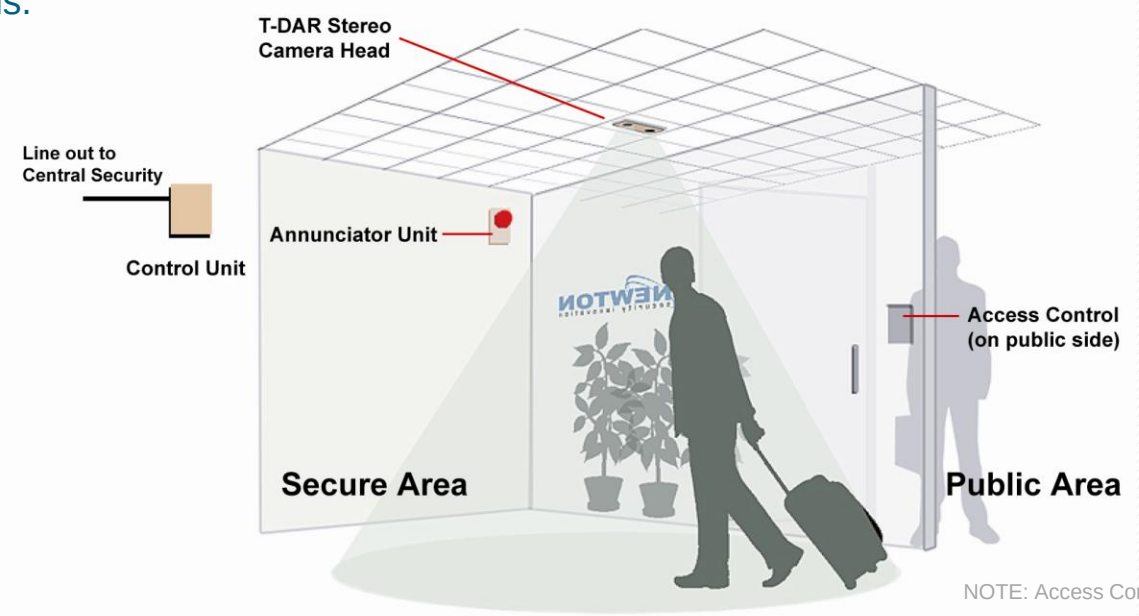
Door Shield Model T-DAR DS200
double door system

T-DAR Door Shield Model DS100 – Single Door

- T-DAR Door Shield Model DS100 is highly-effective in the detection and deterrence against tailgating and piggybacking and can be installed on single, swinging and sliding doors to allow entrance of only a single person at a time, or single person with a cart.

- The Model DS100 performs dynamic scanning, the ability to identify and track human forms even when they are in motion going through the doorway.

- The Model DS100 is superior to any combination of card reader and magnetic lock alone, but offers less protection than the T-DAR Lobby Shield or T-DAR Mantrap Shield barrier systems.



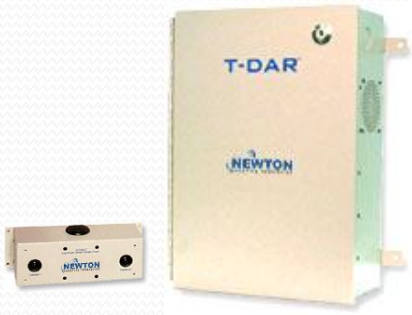
NOTE: Access Control by others

T-DAR Door Shield Model DS100 – Single Door

- T-DAR Door Shield Model DS100 Operation Overview:
  - One person authorized entry, including card stacking for multiple entries
  - Allows for carts, parcels and other carriers
  - Alarm activates upon multiple entry violation sending signal to access control
  - Can be configured to transmit recorded video to central security over a video or digital link

T-DAR Door Shield Model DS100 – Single Door

Common applications of T-DAR Model DS100 Door Shield. systems



Basic Model DS100 system

Camera mount examples

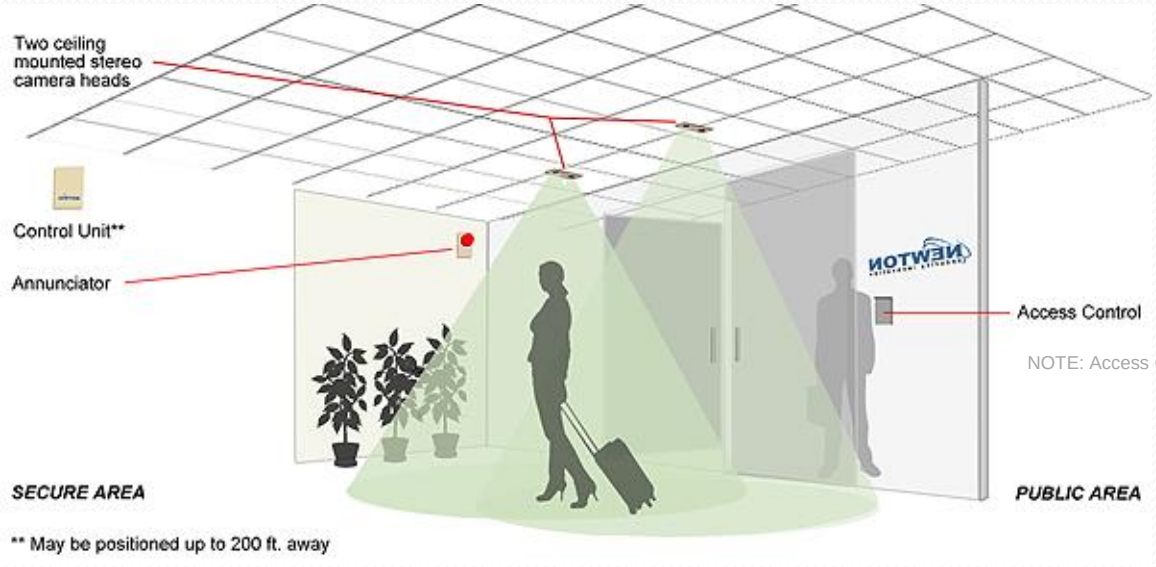
Optional Annunciator alarm unit

T-DAR Door Shield Model DS200 - Double Doors

- The T-DAR Door Shield Model DS200 is installed on double door combinations, as well as on folding doors and provides highly-effective detection and deterrence against tailgating and piggybacking.

- The Model DS200 allows entrance of only a single person at a time, or single person with a cart.

- The Model DS200 is superior to any combination of card reader and magnetic lock alone, but offers less protection than the T-DAR Lobby Shield or T-DAR Mantrap Shield barrier systems.



T-DAR Door Shield Model DS200 - Double Doors

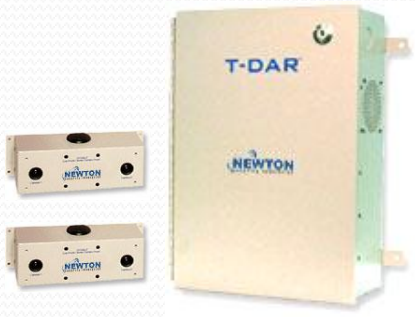
- The Model DS200 performs dynamic scanning, the ability to identify and track human forms even when they are in motion going through the doorway.
- The T-DAR detection system operates with two, unobtrusive ceiling-mounted camera heads and does not require multiple sensors, pressure mats or infrared (IR) systems.
- Entry of multiple, authorized persons or escorted visitors may be accomplished by “card stacking,” or having each person in a group swipe an identity card or enter biometric information before crossing through the doorway, one at a time.

T-DAR Door Shield Model DS200 - Double Doors

Typical Model DS200 installation in a drop ceiling.

Model DS200 installation in a high ceiling location using wall brackets.

A non-standard application for a row of main entry doors into a building lobby



Basic Model DS200 system

Camera mount examples

Optional Annunciator alarm unit

T-DAR Door Shield Systems Are Highly Adaptive

- **Primary features of both single and double Door Shield systems include:**
  - No maintenance - T-DAR door systems have no motors, gearboxes or other moving parts.
  - Simple to install - no civil works such as the digging up of expensive flooring or knocking out walls.
  - Adapts to existing doorways - T-DAR door systems can be installed into existing openings using existing doors and hinges.
  - Both door systems adapt readily to most access systems and electro-mechanical locks and latch sets.
  - Allows mixed traffic - T-DAR door systems can be used as an entry and egress point for both pedestrian and carts, without the need of special standing or scanning zones.
  - User friendly - within two weeks all employees will be accustomed to the system.
  - T-DAR door systems are designed to be used as ADA and DDA handicapped passages
  - Thorough documentation – Newton Security provides manuals, installation procedures and a checklist for your installer.
  - Additionally, post-installation, on-site commissioning and training can be scheduled. ..

Continuum of Security

- The Entry Vision and the two Door Shield systems provide reactive flow control by way of their detection and alarm functions.
- Each of the three door systems is superior to any combination of card reader and magnetic lock alone, but offer less protection than the tailgating and piggybacking solutions found in the T-DAR Lobby Shield or T-DAR Mantrap Shield barrier systems.
- Lobby Shield and Mantrap Shield systems provide proactive, high security barriers to tailgating and piggybacking with the ability to lock doors and prevent entry.
- Both the Lobby Shield and Mantrap Shield are stand-alone systems requiring no outside monitoring, control or management.
- A primary benefit of both the Mantrap Shield and Lobby Shield systems is the reduction of overall security costs by reducing the need for monitoring personnel within a facility.
- The return on investment can be swift. If for instance a facility is using a 24/7guard service, a T-DAR Mantrap Shield or Lobby Shield will pay for itself in a matter of months.

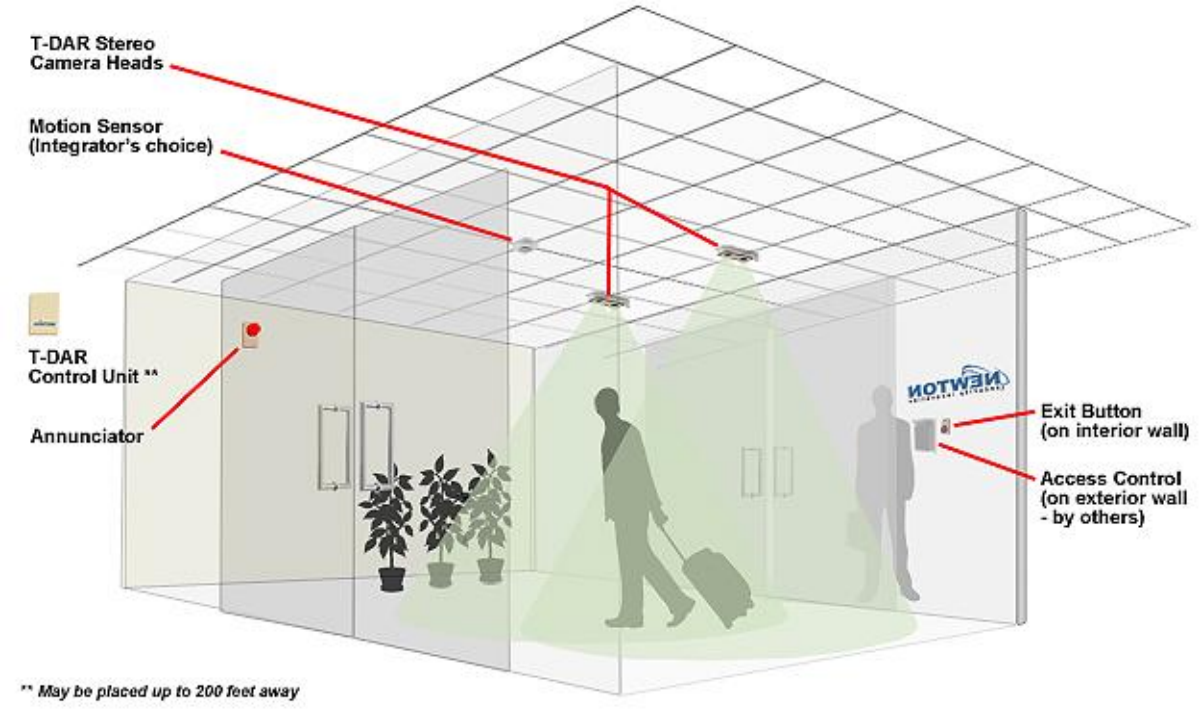
T-DAR Lobby Shield

Medium Security Vestibule Mantrap System

T-DAR Lobby Shield - Medium Security Vestibule Mantrap System

- T-DAR Lobby Shield is a package of modules to be retro-fitted into an existing building vestibule, converting that space into a medium security mantrap insuring the entry of only one authorized person at a time and eliminating the risk of tailgating or piggybacking.

- The system is a combination of interconnected electronic door locks, one or two ceiling-mounted stereo camera heads, sophisticated software and a motion detector.



T-DAR Lobby Shield - Medium Security Vestibule Mantrap System

- T-DAR Lobby Shield works with the most common vestibule door control configuration: an existing card reader or PIN unit adjacent to the locked outside single or double door.
- T-DAR identifies, tags and tracks the human in the mantrap, insuring that there is only one person present, while ignoring any cart, luggage or parcel in their possession.
- No special lighting is required; overhead office-level of 300 lux is sufficient and the system is unaffected by full ambient light from the outside.

T-DAR Lobby Shield is easily retro-fitted into a commonly configured vestibule

How T-DAR Lobby Shield Works

- **The sequence of events for a normal passage through Lobby Shield:**
  - The outer vestibule door is normally always locked.
  - The inner lobby door is normally always unlocked.
  - When a person accesses the access control reader on the outside and is approved, the outer door unlocks and the inner lobby door locks.
  - As the person enters the vestibule the system monitors the outer door(s) to detect if only one person has entered the space.
  - If there is only a single person, the outside door is locked, followed immediately by the unlocking of the inner door.
  - When the person passes into the lobby, the inner door closes and remains unlocked.
  - The Lobby Shield is now ready for the next passage.

- **When there is a violation with more than one person present:**
  - If the entry scan detects more than one person in the vestibule, the outer door remains unlocked and the inside lobby door remains locked.
  - There is both a flashing light and an audible alarm which includes a recorded message that directs all present to exit to the outside and for only one person to initiate the entry process again.
  - The system resets itself after 10 seconds, once the vestibule is empty.

How T-DAR Lobby Shield Works

- **This Way Out - Exiting a building through the Lobby Shield:**
  - One or more persons may exit at once through the Lobby Shield:
  - They open the unlocked inner door and enter the vestibule.
  - The inner door closes behind them and it remains unlocked.
  - An "Exit" button, located in the vestibule adjacent to the outer door, is pushed.
  - This locks the inner door and unlocks the outer door to exit the mantrap.
  - If another person, who has received authorization from access control, enters the vestibule from the outside while someone is exiting, they will be allowed to continue as a normal entry.
  - But if that person has not been authorized, an alarm will sound, the inner door remains locked and they will need to exit to the outside.

Highly Adaptive T-DAR Lobby Shield System

- **Primary features of the Lobby Shield system includes:**
  - Low or no maintenance - T-DAR Lobby Shield systems have no motors, gearboxes or other moving parts.
  - Simple to install - no civil works such as the digging up of expensive flooring or knocking out walls.
  - Lobby Shield systems can be installed into most existing vestibules using existing doors and hinges.
  - The Lobby Shield T-DAR system adapts readily to most access systems and electro-mechanical locks and latch sets.
  - Allows mixed traffic – Lobby Shield systems can be used as an entry and egress point for both pedestrian and carts, without the need of special standing or scanning zones.
  - User friendly - within two weeks all employees will be accustomed to the system.
  - Lobby Shield systems are designed to be used as ADA and DDA handicapped passages
  - Thorough documentation – Newton Security provides manuals, installation procedures and a checklist for your installer.
  - Additionally, post-installation, on-site commissioning and training can be scheduled.

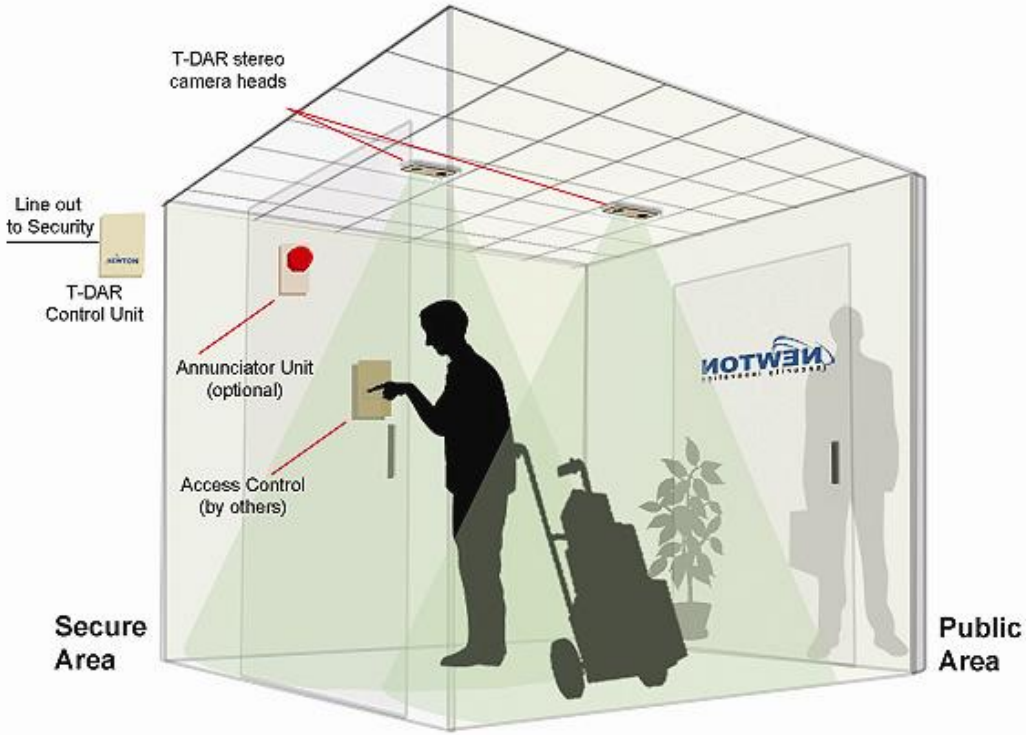
T-DAR Mantrap Shield

The Definitive Anti-Tailgating Barrier

T-DAR Mantrap Shield - The Definitive Anti-Tailgating Barrier

- Tailgating and piggybacking violations are totally prevented with the patented, stereo vision T-DAR Mantrap Shield system installed into an airlock-mantrap-portal application.

- The T-DAR Mantrap Shield tailgating barrier is a stand-alone system requiring no outside monitoring, control or management. The system can control a space as small as 5 ft. X 5 ft. (2,50 X 2,50 m), or as large as necessary by adding more camera heads.



T-DAR Mantrap Shield - The Definitive Anti-Tailgating Barrier

- T-DAR Mantrap Shield software and hardware is installed in conjunction with hardware and software of other new or existing security systems to create a secured space equipped with two or more electronically controlled interlocking doors. Such a high security airlock may be a specifically constructed for that purpose, or easily retrofitted from an existing room or corridor within the building.

- T-DAR scans the mantrap interior, communicates with the access control system and controls the sequencing of the electronic door locks ensuring that only a single, authorized person is present before allowing them access into the secure area.

Mantrap Shield in airlock converted from a corridor

Mantrap Shield installed into two purpose-built airlocks

Mantrap Shield in airlock converted from a small room

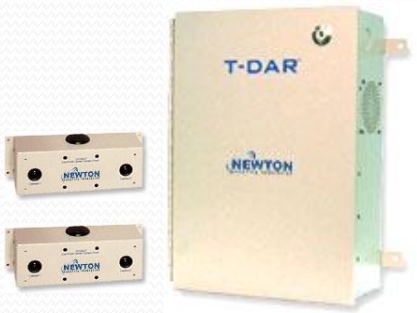
T-DAR Mantrap Shield – How It Works

- **The following is the sequence of events for a normal passage:**
  - The Secure vestibule door is normally always locked.
  - The Public vestibule door is normally always locked.
  - When a person accesses the control system reader on the public door and is approved, the T-DAR system scans the vestibule to ensure that it is unoccupied.
  - If the vestibule is unoccupied, the T-DAR system will unlock the public door.
  - As the person enters, the system scans the doorway to determine if more than one person is present. The T-DAR system then locks the public door after it closes.
  - The person will then access the control system reader on the secure door and be approved. The Mantrap Shield scans the room to verify there is only one person present and then unlocks the secure door.
  - The person passes into the secure area and the door closes and locks.

- **A violation occurs with more than one person entering the vestibule:**
  - If the entry scan detects more than one person enter the vestibule, an alarm signal will be sent to security.
  - When more than one person enters the room, the T-DAR annunciator will announce "only one person at a time allowed through door, please exit and try again."
  - The system resets after all persons have left the vestibule through the public door.

T-DAR Mantrap Shield – How It Works

- **The Mantrap Shield is a multidirectional anti-tailgate system:**
  - There are two optional modes of operation on egress for the T-DAR Mantrap Shield. The system will operate as a multidirectional or as a uni-directional tailgate system.
  - When operating as a multi-directional system, Mantrap Shield will stop tailgating on entry, as well as stop tailgating on egress. The operating procedure on egress will be similar to that of the entry procedure (carding in and carding out).
  - When operating as a uni-directional system, Mantrap Shield will stop tailgating on entry, but allow multiple people to egress the vestibule from the secure area without alarming.



Basic T-DAR Mantrap Shield system

Adaptive camera head mounting units

Optional Annunciator alarm unit

T-DAR Mantrap Shield Systems Are Highly Adaptive

- **Primary features of both single and double Door Shield systems include:**
  - Low or no maintenance - T-DAR Mantrap Shield systems have no motors, gearboxes or other moving parts.
  - Simple to install - no civil works such as the digging up of expensive flooring or knocking out walls and the Mantrap Shield adapts readily to most access systems and electro-mechanical locks and latch sets.
  - T-DAR Mantrap Shield systems can be installed into existing corridors, small rooms using existing doors and hinges, or as part of a new, purpose-built airlock.
  - Mantrap Shield systems can be used as an entry and egress point for both pedestrian and carts, without the need of special standing or scanning zones.
  - The Mantrap Shield system supports a wide variety of Newton Security-developed software options that allow for differing customer needs or required applications.
  - User friendly - within two weeks all employees will be accustomed to the system.
  - Mandtrap Shield systems are designed to be used as ADA and DDA handicapped passages
  - Thorough documentation – Newton Security provides manuals, installation procedures and a checklist for your installer.
  - Additionally, post-installation, on-site commissioning and training can be scheduled.

Conclusion

- **The Newton Security Inc. (NSI) product line delivers scalable levels of protection ranging from basic single-person entry detection and alarm, to the highest precision of detection and entry prevention.**
  - Newton detection products are technically advanced, using patented T-DAR stereo machine vision which is superior to other legacy systems which are often decades old.
  - NSI detection products are highly adaptable. The hardware components and software seamlessly incorporate with either existing building security systems or new equipment installations.
  - NSI hardware components are exceptionally flexible. They easily adapt and deploy into existing physical facilities or new construction, and have a low installation impact because they do not require major wall or floor demolition or renovations.
  - T-DAR Mantrap Shield and Lobby Shield products significantly reduce overall security costs and pay for themselves in a short period.

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Thank You