Trolley Scan (Pty) Ltd

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BROCHURE

Your one stop UHF passive RFID technology provider.

- Long operating ranges
- Multiple Transponders
- Small transponder size
- Complete systems of readers/transponders/antennas
- Systems capable of measuring exact range also available
- Software packages for operating RFID systems
- Standardised solutions for common applications.

Although developed originally as a "barcode replacement" technology, this technology has application in all applications where computer systems need to have "vision".

RFID systems are used generally in the data capture part of an application. Transponders are attached to the items being monitored and a RFID reader identifies these transponders as they pass. The data from the RFID system would be fed to a computer and the computer would run a program to solve the application wanted by the end-user.

The performance of the RFID system as a whole is dependant on the performance of the readers and the performance of the transponders. Increased range can be obtained by using the more complex and expensive transponders. The excellent performance obtained from Trolley Scan comes from optimising the performance of the readers and the performance of the transponders. The Trolley Scan range is compatible between all versions of their readers and their transponders.

In most cases users would use the *Compact fixed reader* attached to a serial port of a computer, and have *Ecochiptags* attached to the items to be identified. In cases where the

assets are distributed a *Portable reader* can be used. In cases where the exact position of the item is to be determined, a *RFID-radar reader* could be used.

There are a variety of different types of transponders that have different sensitivities resulting in different operating ranges from the different readers.

In addition to readers and transponders, Trolley Scan also offer some standardised software packages that can be installed on the clients computer together with the RFID hardware to provide a quick solution to some common applications.

For some standardised applications, such as asset tracking, instrument store management, notebook tracking, notebook barriers and the like, Trolley Scan have "Systems in a box" solutions which have the RFID components and the software to be run on a laptop or computer.

Product range

Readers

Compact fixed reader - Mains operated compact fixed Reader with patch antennas, cables. Outputs ID number on RS232 port which can be converted to USB via an adapter. Can read multiple transponders in a zone at a time at high read rates. Can read transponders passing at up to 300kph. Used as the basic data capture device in most applications where the reader is mounted at a fixed point. Ideal for continuous operation.
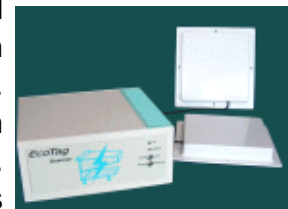
Small portable reader - Battery powered portable Reader with antennas, charger and cables. Outputs ID number on RS232 port. Can be fitted with a Bluetooth interface to transfer data continuously to a laptop computer via radio link. Can read multiple transponders in a zone at a time at high read rates. Suitable for burst operation.

OEM fixed reader modules - All the working parts of the compact fixed reader except for power supplies and cases. Allows manufacturers to do their own packaging.

Solar powered readers - For monitoring livestock/wild game in remote fields. Fitted with GPRS modem for relaying data

Transponders

Ecochiptags Credit card sized passive transponders - 200uW sensitivity - very long operating life giving read ranges up to 13 meters in ideal conditions.

Ecowoodtags Credit card sized passive transponders for attachment to wooden items - 400uW sensitivity - very long operating life

Laundrytags 160mm long thin wire passive transponders - waterproof - flexible very rugged - 1000uW sensitivity. For putting in clothing, laundry and even used in the labelling of trees.

Booktags 180mm long thin antenna passive transponders for labelling books, files and documents.200uW sensitivity - very long operating life

Lap top computer tags - 200mm long rubber passive tags for attaching to laptop and notebook computers giving detection ranges up to 20 meters when attached to a metal surface - 20uW sensitivity - very long operating life**.**

Long range Stick Ecotags - Battery assisted (active) stick type transponders with 25 to 30 meter range (5uW sensitivity). Battery life 3 months on continuous use. Cased in hard rubber. (Generally used with the radar reader).

Long range Claymore tags - Battery assisted (active)transponders with 40 meter range (0,6uW sensitivity). Battery life 6 months on continuous use. Made to be attached to metal or large objects. Cased in hard rubber. (Generally used with the radar reader).

Cattletags/Bokkietags - UHF passive RFID transponders embedded in polyurathane eartag for cattle and wild game. Offers 10 meter read range with fixed reader.

Twiggy tags - Very efficient transponders offering good performance and designed to be attached to assets, books and plastic bins fior tracking items in warehouses and factories

Small systems - Comprises readers and transponders
Small fixed system - Compact Reader, 100 creditcard sized 200 uW transponders, patch antennas, cables - Ideal for starting a new project and testing technology

Small portable system (long range)- Portable Reader, 100 creditcard sized 200 uW transponders, charger and cables (10 meter range)

RFID-radar systems

Position locating system capable of tracking multiple transponders to accuracies of centimeters and ranges up to 100 meters. Supplied as a reader, antennas and 15 long range transponders with operating distances up to 40 meters, and 5 Ecochiptags. Also supplied with display software and source code. Uses the same transponder systems that are used by the RFID reader,

Systems in a box - Comprises readers, transponders and software

Eco-antelope Livestock Tracking System - Using solar powered readers and Ecocattle tags, monitors livestock in remote fields at watering holes/feeding points and reports presence via cellphone network onto remote website. Software shows any animals not seen in the past 24 hours

RFID-asset(tm) Tracking System - Just connect to your laptop computer and you have a system for identifying and monitoring the current location of your capital assets. Used for organisations that have a large number of assets that are housed in different buildings, and which have a requirement from an auditing perspective to update the current location of these
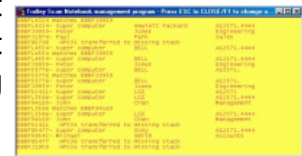
Notetrack(tm) monitoring system - If your company has a large number of notebook computers that are issued to staff, and these staff are required to take them from the building each day, this might be the solution you need. Special transponders are attached to the laptop and the staff member carries a credit card ID transponder. When passing the reader at the entrance, when the laptop is detected the matching staff member ID is also checked and if there is a match the passage is logged. If the matching staff ID tag can't be found, then an alarm condition is issued.

RFID_WIP(tm) Work in progress tracking system - A low cost "system in a box" approach to allow large manufacturing plants to track the progress of the products they are producing in their factories, from material supply to finished product. The system involves tagging items in production in their bins and mapping where all the bins are currently located with time. Uses a single portable reader with Bluetooth interface, a laptop and special software. Can generate reports and porovide data file to an Enterprise system of the progress of the various items.

Notebarrier(tm) protection system - This system is used to stop computer equipment from being removed from a computer room or classroom. Special transponders are attached to the computers and the reader is setup outside the door to the room. The reader continuously seeks signals from tags in its read zone, and as soon as a tag is detected an audible alarm is sounded.

Ecoscan(tm) store monitoring system - This system is used to provide a log file and record automatically the movement of equipment kept in an instrument store. Transponders are attached to the items, users carry personal transponders and the UHF reader is placed at the doorway, recording on a computer the passage of equipment through the doorway and the person moving the equipment.

Software

All RFID readers and RFID-radar products do not need any special interface software to operate. The equipment all works on a stand alone basis, but if it is to be connected to a computer, then interfacing is simple. They are supplied with interfacing details ands simple examples to allow the purchaser to just plug his new reader into a computer system and operate immediately.

Trolley Scan do supply additional software for those who want additional features such as looking up details automatically in databases, and displaying relevant data on network computers remotely. In addition Trolley Scan will make available simple software packages for those users who want a solution to an application and do not want to write their own software.

Application package currently available are database lookup packages, and production line management

Getting supplies

Buying from Trolley Scan	For low volumes of readers and transponders, supplies can be purchased immediately from Trolley Scan
Producing it yourselves	Trolley Scan will licence your company to produce the transponders and readers in house or through sub-contractors. There is a range of options from assembling a kit of parts bought from Trolley Scan in a low technology facility to designing your own integrated circuits and high tech assembly operation.

How do RFID passive systems operate

RFID technology makes use of two components, namely a reader and a transponder (also called a tag). The transponder is attached to the item to be identified and is programmed with a number to be broadcast when it is read by the reader. The transponder receives its operating power from an energising field that is radiated from the reader.

The reader provides and energy field that decays with distance. Transponders convert some of this available energy to power to operate. The reader energises the tags within its immediate vicinity and reads the identity of the transponders in the reading zone using a special protocol, converting the identity numbers to a computer format and providing that data to a computer network.

Multiple Transponders

With operating ranges as far as 13 to 40 meters metres even when attached to metal, it is likely that more than one transponder will be in the reading zone at a time. In order to cater for the multiple transponder situation a "protocol" is needed to allow multiple transponders to be read at the same time.

Trolley Scan have developed the Trolleyponder® protocol specifically for the situation where RFID will be used to replace barcoding on groceries in a supermarket.

This protocol allows

?	up to 800 items to be read in a zone at a time
?	Tag talks first protocol
?	Transponder ID is unique.
?	Frequency agile allowing operation worldwide

EcoTag

Trolley Scan are world well-known for their EcoTag® energy enhancement features that have been included in Trolleyponder. RFID systems operate on frequencies allocated by the governments of the countries where they are in use together with caps on the power allowed for the energising field. EcoTag is a breakthrough in the efficiency of the power extraction circuitry of the transponder allowing transponders to operate on the very low power levels with good range. Currently the maximum range with Trolley Scan passive transponders when attached to metal is 20 meters.

The EcoTag technology also allows transponders to operate over a wide dynamic range of powers and to operate almost independently of polarisation restrictions.

Trolley Scan have also added along range Ecotag version based on battery assisted technology with an operating range of 25 to 40 meters.

RFID-radar

In 2006 Trolley Scan started to deliver a new concept in RFID reader systems: namely a RFID based system that could measure very accurately and quickly the exact range between the reader and the transponder. This will have a major impact in the future on RFID systems, as very long operating ranges become practical with the computer being given the identity and the exact location of each transponder in the zone. This radar system is also able to monitor movement of structures with millimeter precision over long distances, and finds applications in monitoring the movement of bridges, dam walls, buildings, mine tunnel roofing etc, providing an early warning of safety situations at a low cost.

Typical RFID specifications for passive transponders

Medium reading range for passive transponders	Typically 6 to 20 meter reading ranges even if attached to items such as wood or metal for passive transponders.
Multiple articles	800 items can be read at the same time

Low cost technology	Transponders use a simple integrated circuit, using the cheap silicon technology that is widely available, have a small silicon area, simple design, wide tolerances,no tuned circuitry and are attached to a simple antenna.
Passive	The transponder receives its energy from the reader field, thereby not using a battery and so saving cost, increasing reliability and avoiding regulatory and environmental issues.
Very efficient power conversion	The EcoTag energy conversion system allows transponders to operate at good ranges on very low energising fields. Transponders needing just 20microwatts of power in its 134sq cm aperture will operate
Fast reading	One of the fastest reading rates for high volume multiple transponder systems available.
Large number range	All transponders have a unique identity. Number long enough to babel every grain of sand on the earth 10000 unique ways..
Quick reading operation	Using tag-talks-first protocols, tags can be detected at speeds up to 300 kilometers per hour.
Simple structure	Transponders comprise only two electronic parts joined together, an integrated circuit and an antenna.
One chip fits all	As the transponders have no tuned components on board, the same transponder chip can be used for different applications by fitting the appropriate antenna to the needs of the application.
Frequency agile	The transponders contain no tuned circuits and use the backscatter modulation principle for communication, allowing the same transponder to be read by different readers operating at different frequencies, thereby making the transponder ideally suitable for International trade where different operating frequencies are used in the different regions.
Multiple reader zones can overlap	Due to very low interference narrow band technology used in the readers, many readers can operate in close proximity and independently identify the same transponder at the same time when reader zones overlap..
Wide dynamic range of receivers	The RFID receiver can process weak signals from transponders 40 meters away while simultaneously processing the strong signals from transponders as close as 1 meter.
Different antenna packaging	The transponder will work with a number of different antenna configurations and shapes which can be tailor made to the specific applications.

What applications can benefit from Trolleyponder RFID?

This technology can be used in most applications where it is useful to give a computer up to 40 meter "vision" to identify goods within the presence of a low cost RFID scanner.

The following are applications that could use this universal technology packaged in the appropriate form and delivered at the right price:

Computer vision for IT systems	Information Technology systems have been built from sophisticated computer networks and application software, but still largely rely on manual or semi automatic data capture. The integration of RFID into labelling objects used with such systems allow the computer to automatically identify objects within 40 meters of the reader and process the data automatically
Laptop computer tracking	Preventing the unauthorised removal of laptop and notebook computers from business premises by persons other than the authorised users.
Laptops in school computer centers	Preventing the removal of computer equipment from school classrooms and computer centers.
Warehousing	Tracking of containers and pallets, stocktaking
Asset tracing	Tracking the current location of company assets and updating the asset register to reflect current location.
Work in progress tracking	Tracking of the progress of products in factories monitoring the item through the various stages of manufacture.
Access control	Ability to read the identity of many people at the same time passing through doorways, tube station entrances, lift access and doorways.
Identifying capital goods	Ability to read the identity of transponders mounted inside capital goods or packaging, when in the warehouse, when being transported and even when passing through doorways for an asset tracking system.
Case-lots of low value consumer items	Same system can be used for the producer, wholesaler and retailer at case lot level of consumer goods for transferring via truck, checking in and out of warehouse.
Vehicles access control	Ability to read many vehicles in different traffic lanes for parking, toll and access control.
Containers labelling	Shipping, airfreighting and rail movement.

Courier parcels and documents	Remote identity, sorting, routing and track-and-trace information
Parcels and mail bags	Remote identity, routing, track-and-trace information.
Airline baggage	Identifying, sorting and routing - not confused by the transponders that will be read from labelled goods within the luggage due to the use of RFID systems.
Compact discs and video retailing and rental	EAS, identifying and stock taking
Laundry for hospitals and hotels	Identity, sorting and routing after bulk washing
Motor vehicle tyres	Transponder embedded into tyre provides positive identification of case for identifying, wear tracking, usage tracking, anti theft.
Files and documents	Identifying, track-and-trace, locating, association with person carrying documents past doorways - suitable for insurance industry/ government records.
Passport, driver license	Anti-counterfeiting, identifying
Manufacture	Labelling components for JIT manufacture, storing, routing, warehousing, identifying
Library books	Identifying, EAS, self service checkout/check-in, book location.
Loyalty cards for retailing	Remote identification of client and association with database
Gaming chips	Identity, anti-counterfeiting
Pharmaceutical/ pathology	Tracking controlled and restricted drugs, warehousing, manufacture date, identifying high value drugs. Tracking pathological samples during processing
Farm animals	Electronically identifying herd animals for counting and control, for documentation of milk yield, for controlled feeding and dosing, for disease control and anti stock theft.
Labelling clothes and shoes	Identifying, stocktaking, size distribution, self service, EAS. Reading clothes washing properties for an automated washing machine

Dismantling items	For green legislation requiring the dismantling and sorting of old capital items, robot identification of parts and type of material.
Sports events	Timing marathon athletes, cyclists, mountain bikes, MotoX, fun runs, walks
Hospitals	Tracking patients, access control, preventing baby removal, patient location and identification, computer authorisation of surgical procedures
Penal systems	House arrest - verification of presence
Marking hotel possessions	Remote identity of possessions in clients luggage
Forestry	Tracking logs and products. Inventory control of trees and plants in a nursery
Safety zones around industrial machinery	Creating an exclusion zone around working mining and loading equipment to ensure no person approaches the machinery while it is working.
Safety zones at industrial plants	Automatic monitoring of persons entering different dangerous zones in an industrial plant to ensure that only appropriately trained persons enter the zone.
Equipment store	Monitoring movement of specialised tools and equipment from instrument stores providing log files of usage.
Grocery retailing	High speed scanning of baskets, trolleys and carts, stock-taking, EAS, goods receiving - the ultimate application

Issues in choosing a Transponder system

Comparing Active/Passive UHF transponder systems
Transponder systems are active or passive. The active versions have their own batteries on board for powering up the transponders and radiate a signal on a designated frequency, while the passive versions are usually very energy efficient and can operate on the energy received from the reader field.
Standalone active transponders (such as the remote control for a gate) also generate their own operating frequency which means that they have no frequency agility. Passive and Battery assisted systems get their operating frequency from the energising field and can operate over a wide bandwidth. Trolleyponder systems are passive but battery assisted versions are available for long ranges (40 meters).

	Passive(Trolley ponder)	Battery assisted	Active
Energy source	efficient conversion of RF energy radiated from reader	On Board battery	On Board battery
Transponder life	Infinite	Medium	Typically a 6 months to a few years
Cost	Cheap	US$6.00	Up to US$25
Multiple transponders	Up to 800	Up to 300	Up to 50
Frequency agi	Operate on frequencies from 860Mhz to 960Mhz allowing international trade	Operate on frequencies from 860Mhz to 960Mhz allowing international trade	Operate on fixed single frequency
Range	1 to 20 meters.	Up to 40 meters	Varies depending on height above ground (up to 100 metres)
Interference	Responds only when in energising field	Responds only when in energising field	Can be detected by any system operating within range on same frequency
Reader	Complex technology	Complex technology	Simple technology

## Comparing frequencies for passive transponders

The operating performance of a passive transponder is firstly dependant on the operating frequency of the system.

Transferring radio energy to a transponder happens via magnetic and electric propagation fields. At frequencies below 100MHz, the magnetic field propagation is dominant, indicated by the use of coils for antennas. Above 100 Mhz, the electric field becomes dominant, usually using antenna systems such as dipoles, Yagis and patch antennas.

The transponders systems operating at 125Khz and 13.56Mhz use Magnetic propagation. As shown in experiments at school with iron filings on a piece of paper over a magnet to show the lines of force, it is difficult to increase the distance of the lines from the central magnet except by increasing the separation of the magnets North and South poles.
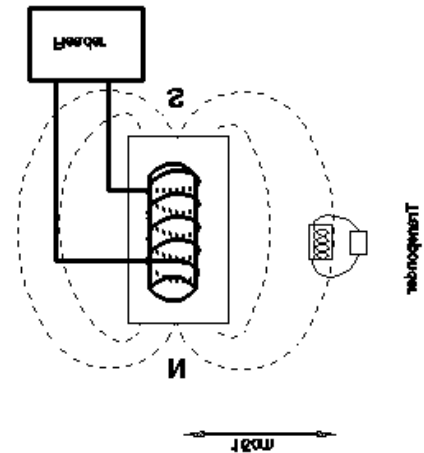
The transponders operating on the 860-930MHz UHF frequencies and the 2,45GHz frequencies use electric field propagation. In electric field propagation the energy radiates away from the source at the speed of light, spreading out over the surface area of a sphere centred on the source and of radius of the distance travelled This energy travels forever, even as far as the moon. The energy density decreases as the square of the distance, - that is for every doubling of distance the energy density is quartered.
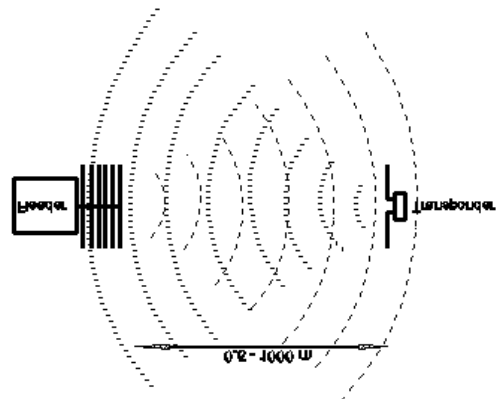
The energy arriving at the transponder is collected in the antenna aperture. The antenna aperture is a function of the operating frequency as shown in the table below

Frequency	Aperture(sq cms)
869Mhz	149
915Mhz	134
2450Mhz	18

The collected energy is converted to power to operate the transponder. The amount of power needed to operate is the sensitivity of the transponder. Trolley Scan provide transponders with sensitivities as low as 200uWatts for the credit card sized versions and 20uW for the notebook versions.

From the above the operating range versus frequency of operation is as shown in the following table
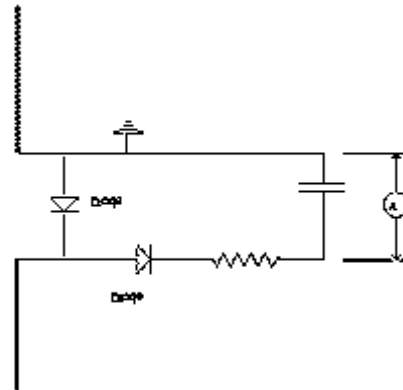
Frequency	Typical range	Propagation	Comments
125kHz	5cms	Magnetic	1000 turn coils
13.56Mhz	50cms	Magnetic	5 turn coils on credit card sized former
860-930Mhz	4-20 meters	Electric	Simple dipole
2450Mhz	1 meter	Electric	Simple dipole

A white paper of the performance of the different frequencies is available from Trolley Scan on request

The importance of EcoTag®
The Patented EcoTag technology allows Trolley Scan to produce much more energy efficient transponder systems than previously available, as well as allowing different antenna shapes to be used with smaller footprints without losing sensitivity.

A conventional dipole type antenna would have a power circuit as shown in this circuit diagram. The impedance of the dipole antenna is 72 ohms. RF energy collected in the aperture of the dipole is converted to an AC voltage which is then doubled and peak detected to give a voltage on the capacitor that can be used to power up the transponder circuit.

The following table shows the relationship between the power needed to be collected in the aperture and the operating voltage of the transponder

Transponder voltage(DC)	Antenna voltage(RF)	RF Power
5 volts	2 volts	54milliwatts
3 volts	1.3 volts	23 milliwatts
Ecotag transponder		0.2 milliwatts (200uwatts)

The benefits achieved with EcoTag in the design currently supplied by Trolley Scan give a 260 times improvement in power consumption compared to the standard 5 volt transponder. This means that

- ?   260 times lower transmitter power is needed for the same operating range
- ?   260 times smaller reader transmitter
- ?   260 times longer battery life
- ?   Or a 16 times operating range increase

In addition the use of EcoTag technology allow antenna shapes and footprints to be altered meaning that instead of using 160mm long dipoles, credit card sized antennas can deliver similar efficiencies. Designs can be adapted to suit the needs of transponders for attaching to wooden items (Ecowoodtag) or moulded in plastic for farm animals (Ecofarmtag). These benefits are realised while still having a transponder that will operate over a wide frequency range (860-930Mhz) allowing for international trade.

Tag talks first protocol

In order to communicate between many simple transponders and a reader, a set of instructions(rules) implemented in the transponders and readers is needed. This set of instructions is known as the protocol. Trolley Scan invented and use the Trolleyponder protocol which allows up to 800 transponders to communicate reliably with the reader, even if the all have the same identity, and yet preserve their properties of frequency agility and simple design.

There are basically two types of protocols for implementing multi-transponder situations, namely "Tag-talks-first" and "Reader-talks-first".

In a "tag-talks-first" situation, the reader puts out an energising field which is generally a carrier wave signal with no modulation at the operating frequency of the system. Tags entering the field, collect this energy in their transponder aperture, convert it to operating energy, and communicate their identity to the reader. In some cases the reader communicates the successful receipt of the message back to the transponder by a short burst of modulation on the energising field. Trolleyponder is this type of system.

In a "reader-talks-first" situation the reader puts out an energising field which is modulated with call messages to the transponders. Tags entering the field, collect this energy in their transponder aperture, convert it to operating energy, and listen for messages from the reader which is modulated on the energising field. The reader polls for transponders in its reading field by asking"Transponder number 1, are you there?" If transponder number 1 is there, then it replies "Yes" and its identity is known to the reader. This is repeated for all the possible numbers of transponders present, or a more compact "treeing" method is used. The disadvantage of this system is that the reader has to be continually calling for transponders, modulating its high power signal and causing widespread interference around the reader, even if no transponders are in the field at the time. Also this interrogation has to be repeated faster than the time it would take for a transponder to pass through its field so as not to possibly miss a transponder in transit through the field. This requires high bandwidth and widespread interference to other radio users.

The following table compares the two technologies

	"Tag-talks-first"	"Reader-talks-first"
Energising signal	Carrier wave	Modulated energising signal
Modulation bandwidth	10kHz	Up to 1 Mhz
RF power of modulated signal	20uWatts	0.5 to 4 watts
Interference zone for other readers	4 meters	1 km
Speed of transit of zone to detect tag	300kph	3kph
Interference when no tags present	Carrier wave only	Modulated energising signal
Transponder receiver complexity	Very simple	Needs to have good dynamic range

The choice of protocol impacts many decisions regarding the use of multiple RFID reader systems in close proximity. Trolley Scan are able top operate two readers within only four metres of each other due to the very small bandwidth(10kHz) used and the stable transmitted signals.

UHF tags known as EPC, or Gen 2 use the high interference "reader talks first" protocol and hence are not compatible with Trolley Scan products

A white paper of the measured radio spectrum of the different protocols is available from Trolley Scan on request

Frequency agility

Radio spectrum planning is done for each country by its own committees. Due to different technologies such as GSM and CDMA cellphones, the available spectrum in many countries is slightly different from other countries. Generally transponders that can operate efficiently on frequencies between 860Mhz and 930Mhz(plus 956Mhz for Japan) would be able to be used for international trade in all countries in the world. Most passive transponders use a backscatter modulation method of communicating from the transponder to the reader, where the transponder answers on the same frequency as the energising field. By not having tuned receiving circuits on the transponder, it is simpler to make a transponder that will be frequency agile and have a wide operating bandwidth.

Options for in-house production of Transponders and readers

Assembly from kit	Trolley Scan can provide a kit of parts which can be assembled using a minimal amount of equipment. Trolley Scan can provide OEM readers, transponder chips, antennas and packaging

Local production	Trolley Scan can provide your needs of critical parts such as transponder chips, mixers for readers etc, with you providing your own antennas and reader boards based on information provided by Trolley Scan.
High tech design	You design your own integrated circuits and readers based on the information provided by Trolley Scan via its datapack.

Potential licensees can evaluate the technology by buying one of the small systems listed on the front page of this document.

Track Record - **Who are Trolley Scan?**
Trolley Scan are a South African based company operating from the city of Johannesburg. Our development team is regarded as one of the world's leaders and pioneers in the development of low cost UHF RFID.

In January 1991 Mike Marsh filed a world shattering patent called *An Electronic Identification System* while working for a major South African Government Research Laboratory. This technology was built into a demonstration system that was launched to the world in January 1994 showing a supermarket trolley (cart) with 38 items being scanned remotely in a couple of seconds. This technology was made available for licensing around the world.

In May 1994 Mike Marsh left the employ of the South African Government and in November 1995 started the company Trolley Scan with Trevor Hodson, aimed at developing more advanced technologies for very low cost universal transponder systems.

In March 1998 Trolley Scan filed provisional patents protecting the first of their developments known as the Trolleyponder transponder protocol, a revolutionary development by Mike Marsh and Trevor Hodson. The protocol achieves many of the benefits of the original 1991 developments, but adds many new features. The Trolleyponder protocol advances the low cost RFID scanning technology using a new method and intellectual property, to give a system with vastly increased performance and benefits, while being simpler in design, smaller in chip area, and with reduced production costs.

In May 1999 Mike Marsh invented an energy extraction system for transponders which has been trademarked as EcoTag®. This allows passive transponders to operate at good ranges in very weak energising fields (0.5 watts ERP).

In December 2003, Trolley Scan started delivering single chip credit card sized 200uW transponders which were soon followed by Ecowoodtag transponders, laundry tags, compact fixed readers and a portable reader.

In September 2005, Trolley Scan invented RFID-radar™, a system where identity and

location could be reported for multiple transponders in a reading zone, while only using very limited bandwidth. This is another world first for South African technology.

In November 2005, Trolley Scan developed the long range portable reader, capable of reading multiple transponders in a zone at ranges up to 10 meters.

In January 2006, Trolley Scan developed a long range tag with an operating range up to 49 meters.

In April 2008 Trolley Scan developed a rubber based tag for attaching to laptop computers to monitor their movement.

In May 2016 Trolley Scan launched the Solar powered GPRS modem linked Eco-antelope system to allow farmers to monitor cattle and wild game in remote fields with continuous status updates in their farm house.

In April 2017 Trolley Scan launch RFID_WIP(tm) which is a system to allow the tracking of multiple products in a manufacturing plant to show their current production status. A low cost system in a box approach capable of tracking 3000 items on the move.

Trolley Scan has provided approx 500 systems of its equipment already to users in 52 countries, ranging from governments, universities, major industrial companies and even small users.

Trolley Scan will continue to improve their products and work with their licensees to ensure the growth of mass usage of RFID transponder technology.

Additional brochures available on request.
1)Brochure on RFID-radar™ system

2)RFID-radar™ gives precision long range measurement.

3)RFID - the choice of operating frequency is the most important decision you will have to make. by Mike Marsh

4)Impact of different air protocols on the use of the radio spectrum by Radio Frequency Identification (RFID) devices in the 860 to 960MHz bands. by Mike Marsh

5)Implementing an asset tracking system for portable computers.

6)RFIDasset™ system for monitoring assets

7)Notetrack™ system for monitoring movement of notebook/laptop computers from premises

8)Notetrack™ barrier system for preventing removal of notebook/laptop or assets from premises

9)Ecoscan™ Store control for tracking equipment movements

10)White paper on using UHF RFID as a sensor system for sports timing by Mike Marsh

11)Software brochure for RFID readers

12)The impact on RF operating power needed for Passive RFID transponders that are attached to metal, wood, paper, glass and human/animal bodies.

13)Application note- Mounting options for readers at doorways to detect passing laptop/notebook computers.

14)Production line monitoring software for RFID readers

15)Tests on a timing module for sports timing

16)Video processing system

Contact information

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