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iTAG™ SYSTEM: SCOPE AND APPLICATION

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The iTAG® system was conceived to help companies track hard to manage and identify assets. iTAG®s are durable and easily visible labels that can be applied to items such as tires, wheels, employee tags, maintenance tools, batteries, starter motors, alternators, heater blowers, windshield wiper motors, ABS Systems, battery cables, and other serviceable and warrantied components. Use of the iTAG® makes it possible to easily track all of these assets in the same framework. By using this system the action, location, and involved equipment for each event can be established. This paper will focus primarily on the iTAG®'s application for managing and maintaining tires.

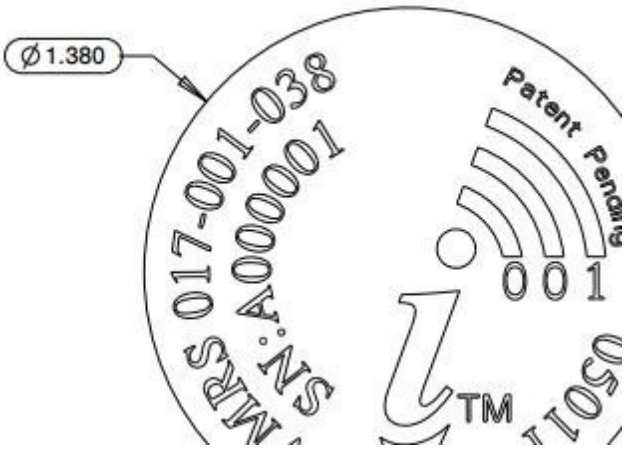

Figure 1: iTAG® drawing showing VMRS, serial, and model numbers on a 1.38 inch tag.

Figure 2: iTAG® in rubber carrier for tire application.

The iTAG® is readable not only visually as a common label, but also through the use of Near Field Communication (NFC). The included NFC hardware enables data to be transferred from the iTAG® to an NFC capable smart device by simply touching the two together. Beyond streamlined inventorying, this capability allows the linkage of assets and events. During an inspection, the iTAG® plays a key role in enabling the inspector to quickly input the identity of each unique item involved. In the case of inspecting a vehicle's tires, the measured attributes such as pressure and tread depth can be associated with the tire's unique ID by scanning the iTAG® each time the inspector moves on to a different tire.

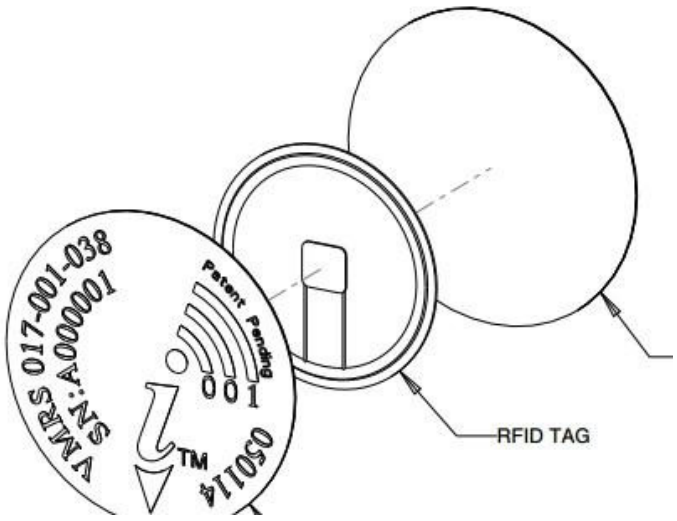

Figure 3: iTAG® structural diagram.

The unique ID on the iTAG® will not only be stored in its NFC tag, but also visibly printed on the exterior. This will make sure a smart device will not be strictly necessary to identify an asset. Each iTAG® is laser printed and can be custom configured in any color or style. There is also the possibility for bar codes or QR codes to be displayed on the iTAG® for an alternate quick-read method to NFC. This will also allow the end users to feature corporate logos, etc. on their custom iTAG®s.

Figre 4: iTAG® installed on drive tire.

The unique ID number displayed on and stored in the iTAG® is only the start of the information that could be locally stored on each individual iTAG®. In the case of tires the manufacturer product code, tire size, fleet tire code, fleet name, Department of Transportation (DOT) code, date of purchase, and other information could be included. The iTAG® can store up to 120 digits of customizable data. Again, the local information stored on the tag is not the only capability. Any number of other metrics can now be associated with the uniquely identified item in the cloud. In this way, whenever an iTAG® is scanned a complete history could be pulled from the cloud and reviewed. For tires, this could include data history of repairs, retreads, load range, tread pattern, Vehicle Maintenance Reporting Standards (VMRS) position/condition codes, and more.

Local iTag Data Storage	Cloud Data Storage
iTAG® serial number	Load range
Manufacturer product code	Tread depth
Tire size	DOT date code
Fleet tire code	VMRS position code
Fleet name	Retread code
Date of purchase	Retread DOT number
DOT code	Repair code
Etc.	Etc.

Figure 5: Potential data for iTAG® storage, local & cloud

VMRS provides a structure for consistent and clear communication between diverse parties about equipment and components. By assigning distinct codes to all kinds of different asset types, the barriers of jargon can be broken down. New codes are regularly assigned in the constantly expanding VMRS library. These codes expand across a variety of industries and bind them together with a common language.

DESCRIPTION	VMRS CODE	DATE_ADDED
Tag - Data Storage, Cab	002-044-015	4/2/2014
Tag - Data Storage, Tractor/Truck	017-001-037	4/2/2014
Tag - Data Storage, Trailer	017-001-038	4/2/2014
Tag - Data Storage, Converter Dolly	017-001-039	4/2/2014
Tag - Data Storage, Tractor/Truck	018-003-053	4/2/2014
Tag - Data Storage, Trailer	018-003-054	4/2/2014
Tag - Data Storage, Converter Dolly	018-003-055	4/2/2014
Tag - Data Storage, Converter Dolly	059-043-002	4/2/2014
Tag - Data Storage, Trailer	071-024-013	4/2/2014

Figure 6: Nine digit VMRS codes assigned for ID tags.

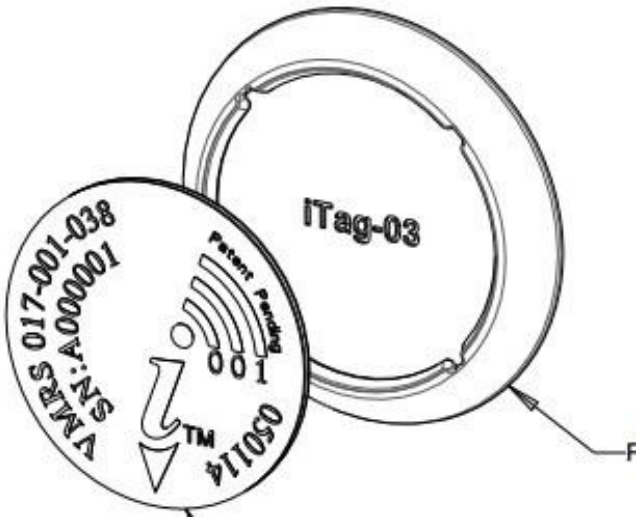

Figure 7: iTAG® and carrier.

iTAG®s are written by NFC capable devices such as smart phones or tablets. NFC has become a standard feature on smart phones as the move toward mobile payments has progressed. Even Apple now incorporates NFC hardware into their devices, though developers do not yet have access. An updated list of NFC capable devices can be found at: http://www.nfcworld.com/nfc-phones-list/. The iTag's local data storage can be written to from these devices with the use of specialized apps. The information can be made read-only so that once written, the information iTAG® can no longer be edited. Alternatively, the user can choose to leave the tag read-write capable if any revisions to the tag are foreseen.

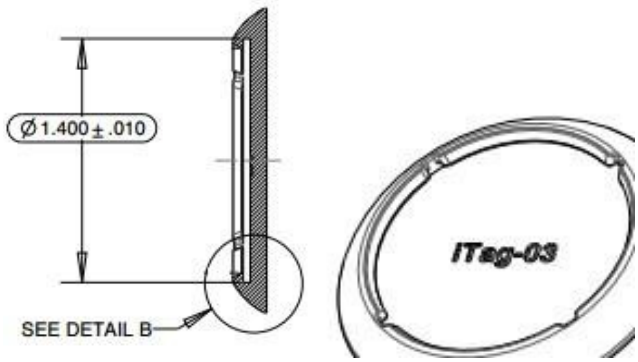

Figure 8: iTAG® carrier dimensions and pocket.

For application onto the tire, a rubber carrier holds the iTAG® so that the rubber to rubber interface necessary for vulcanization can be established. This vulcanization process is carried out to securely bond the iTAG® carrier to the sidewall of the tire. The iTAG® is held inside the carrier by adhesive as well as the mechanical action of the lip of the rubber carrier's pocket. The iTAG® carrier vulcanization process can take place as part of the retread process. Once installed, tire information can be added to the device's local storage.

The iTAG® can also be installed independent of the retread process. Using a variation on the carrier designed to interface with an adhesive, the iTAG® can be field installed directly onto the sidewall of mounted tires. An allowance of time must be made for full adhesive curing to take place before these tires should be used, but the flexibility offered by a retrofit install is advantageous while phasing in the iTAG® system.

The iTIRE® Tool is a related device that can leverage iTAG®s to record tire inspections and transfer them to the back office. These reports would contain such information as inspector ID, vehicle ID, tire ID, tire pressure, and tire condition. An inspection could proceed as follows. First the inspector powers on the iTIRE® Tool, scans their NFC employee badge, and starts an inspection by scanning the vehicle's iTAG®. Next the inspector measures the first tire's pressure and scans the tire's iTAG®. When satisfied with the reading, the inspector accepts the reading and repeats this process for the remaining tires of the vehicle. After taking the readings of the last tire, the inspection is ended and additional vehicles can be inspected or the data can be offloaded from the iTIRE® Tool via Bluetooth. This type of inspection is able to confirm that the inspector has visited areas of interest around the vehicle because iTAG®s are scanned at those locations.

iTAG®s help identify assets through not only NFC technology, but also visible ID number. They are durable and easily visible labels that can be applied to a diverse variety of serviceable and warrantable components which can be easily tracked in one combined system. Information like the action taken, location, and involved equipment for each event can be established. The ability to track this information allows organizations of sufficient scale to optimize their use of resources and save much time and money.