MAGELLAN TECHNOLOGY

Application Note

Document Tracking

Document Tracking

Recognizing the need to be able to use RFID technology to track items that have been placed very close together led Magellan to develop its StackTag® technology. This technology allows tags to be touching and still reliably communicate with the reader.

Document tracking and management is a major area of market growth where the ability to read documents that may be overlapping or touching is a fundamental requirement.

PJM StackTag® technology, uniquely among other RFID technologies, provides this functionality in a fast and reliable manner.

The Client

When the Australian Government needed help in one of its departments to ensure the accurate tracking of documents, Magellan was able to provide the solution.

The department had problems with tracking documents needed by the various ministers and department heads. A mechanism to keep the document location visible at all times was necessary.

Some documents require special handling due to security limitations and Magellan is able to provide the technology to ensure that the appropriate warnings are given when a document is moved to a less secure area.

The Process

All official documents enter the department at a single point where they are security checked. The documents are all catalogued and then sent to the appropriate clerical staff.

The staff then controls the documents, ensuring that they are sent to the appropriate people and ensuring that they come back into the archive after meetings, etc.

The Problem

Documents are not always available when they are needed. They can be misfiled, or simply misplaced by the recipient.

A method of knowing who had the last point of contact with the document would ensure the availability of documents at all times.

An added benefit would be the ability to rapidly find archived documents, and provide audit reports on the location of documents if needed.

The Solution

- A secure database system is installed in the department to record access to documents.
- The database has security levels appropriate to the needs of the department.
- The system records an audit trail of the document and the people that have handled or made requests for the document.

A **Magellan MARS Reader** is placed under the desk in the security access point. All documents are security checked and then labelled with an RFID tag. The tag information is recorded in the database along with a description of the document.

Documents are then sent to the appropriate clerk. The clerk receives the document and places it in a **Magellan Document Tray** to record the document location. The clerk may add further information to the database record and then forwards the document to the next recipient.

The recipient (researcher, secretary, analyst etc.) also has a Magellan Document Tray and the document is placed there along with others awaiting attention. The system will sound an alarm if the document is removed from the tray without the recipient providing information to the database (variable time delays can be setup as needed). This person is responsible for the document until they assign it to someone else and that person receives the document in their own Document Tray.

A **Handheld Reader** is used to help locate documents currently not in the Document Tray.

At the conclusion of the need for the document, it is either sent back to the clerk to be archived, sent to an outside department, or destroyed. The clerk updates the records as needed and sends the document on.

A **Magellan Tunnel Reader** is located at the archiving facility to allow for easy association of a particular document to an archive box, and to allow easy verification of the contents of a box when documents are called from archive.

Key System Benefits

- Documents can be easily located at any time.
- Audit trail reports are available to show the track of the document.
- Fast archival procedures allow for easy recall of documents sent to archives.
- Huge reduction in downtime searching for documents.

The Equipment

Magellan offers a range of equipment for this solution:

PJM StackTags® – one per document or folder. Self-adhesive labels are typically 76 x 45 mm.

Document Tray Reader – provide a low cost and stylish reading solution at every desk.

Multiple Antenna Reader System - provide an easy way to turn an ordinary desk into a reader/writer

Tunnel Reader – provide lightning fast and accurate checking of archive boxes without opening them.

Desktop Reader – a small unit to sit on a desk providing the ability to read and write information to a tag as needed (optional)

Handheld Reader – when a quick check of documents is needed (optional).

About PJM

PJM stands for Phase Jitter Modulation. This new system is specified in ISO/IEC 18000-3 Mode 2 and provides for very fast data rates that are as much as 100 - 400 times faster than other RFID data rates. In fact the data rate of PJM Mode 2 at 13.56 MHz HF is demonstrably many times faster than the data rates of other HF technologies and indeed UHF technologies.

Magellan and its licensees provide a family of PJM readers and two types of RFID tag, namely:

PJM ItemTag® and **PJM StackTag®**.

PJM ItemTag® is designed primarily, as are all other RFID tags today, to read tags where the individual tags used tuned coils and are well separated from each other.

PJM StackTag® is designed, uniquely, to read multiple tags which touch or are in a stack of some form. Stackable technology is essential in all RFID applications where there is a chance that tags will touch and interfere with each other. Among the more important of the new functionalities provided by Magellan's RFID systems and in particular PJM StackTag® are the following:

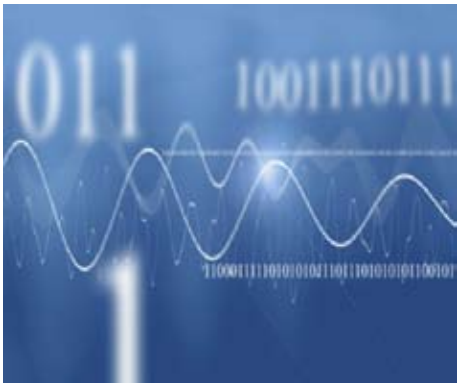
High data rate

The speed at which PJM communicates is so fast that it can communicate with many hundreds of tags practically simultaneously. PJM ItemTag® and PJM StackTag® both have a command data rate of 424 kbits per second. This is very much faster than other technologies. Apart from the major benefit of raw speed this also means that PJM tags can access much more memory in the same time than other RFID tags. Importantly, because of its high speed data rate PJM can also use a full 32 bit CRC (the minimum standard for security) and does not have to fall back on an 8 bit or 16 bit CRC like earlier legacy RFID systems.

Excellent Anti Collision function

Earlier or legacy RFID systems are limited by the fact that the tag and the reader can only communicate on a single RFID frequency or channel. PJM StackTag® and PJM ItemTag® are quite different in that each tag replies on any one or more of 8 different reply frequencies (channels), so where one channel is blocked, for whatever reason, there are seven other channels a tag can use to reply. All replies are at 106 kbits a second but, as these are over eight different reply channels, then the effective notional reply rate if all channels are in use is 848 kbits per second.

This means, particularly when multiple tags are simultaneously within the operating range of a reader, that they will be correctly identified and their several identifying messages individually and correctly received. Earlier RFID systems cannot do this as they have to use a slot protocol to achieve multiple read. Using slot protocols for anti collision means these systems are both slow and limited in the number of separate tags they can read in the same time. Such tags also cannot be read when the antennas overlap as tuned antennas typically interfere with each other to the extent that none of the touching tags can be read.



Memory Capacity

Because of the very high data rate, PJM tags have a significant speed/time advantage over other slower tags. This speed advantage translates directly into not only improved communication, and improved anti collision but also into much larger on chip memory. PJM has, for example, the speed to use a 10 kbit memory where other earlier technologies are limited to 256 bits or 512 bits because they simply cannot communicate with or use more memory in the time made available by their slow anti collision systems and slow data rates.

Un-tuned antenna

StackTags are made intentionally with un-tuned antennas. This is to ensure that the antenna of tags which touch or overlap do not interfere and either, both or many tags can be read at the same time even when touching or stacked in stacks of 25-40 tags high e.g. in gaming applications. Magellan's PJM technology also moves tags rapidly between a high and a low power mode.

High and low power mode

StackTags operate in two power states, a normal power state and a low power state where the tags draw only the lowest possible current. Tags move randomly but deliberately between the normal and low power states so that at any time the majority of the tags are in the low power state. This further eliminates the normal problems associated with parasitic coupling between the antennas of closely stacked tags and also provides the benefits of time division multiplexed operation with the added major advantage of frequency division.

Magellan calls this unique and patented feature **Frequency & Time Division Multiple Access (FTDMA).**

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