

# ***TI-RFid™ Product Manual Terms & Abbreviations***

## *Reference Guide*

*July 2006*



# ***TI-RFid™ Product Manual Terms & Abbreviations***

## ***Reference Guide***



Literature Number: SCBU014

July 2006



## Terms & Abbreviations

---

---

---

### Edition Four – July 2006

This is the fourth edition of this manual. It contains a list of the abbreviations and terms used in various TI-RFID manuals.

**3DES** — Triple DES. A symmetric encryption algorithm that typically uses a 128-bit secret key. The data is encrypted with the left-hand 64 bits of the key (Key A), then the result is decrypted using the right-hand 64 bits (Key B) and finally that result is encrypted again using the left-hand key (Key A) (see also DES).

**ABS** — A plastic co-polymer of Acrylonitrile, Butadiene, and Styrene

**Absorption** — At UHF frequencies, materials (notably liquids) absorb the energy from the reader's signal converting it into heat.

**Active Tag** — An RF tag (transponder) that is partly or completely battery powered. Batteries may be replaceable or sealed in. Compare with Passive Tag.

**Addressability** — The ability to address bits, bytes, fields, pages, files, or other areas of memory in a transponder.

**AES** — Advanced Encryption Standard. A symmetric encryption algorithm.

**AFI** — Application Family Identifier. ISO/IEC term describing an 8-bit code defining the family and subfamily to which a tag belongs (e.g., 0x30 = Access Control Applications).

**Air Interface** — The conductor-free medium, usually air, between a transponder and the reader/interrogator through which data communication is achieved by means of a modulated inductive or propagated electromagnetic field

**AK** — Authentication Key

**Algorithm** — A finite ordered set of well-defined rules for the solution of a task

**Alphanumeric** — Denoting that information contains alphabetical and numerical characters (for example: A1234C9). A string of alphanumeric data can also contain other printable characters, such as punctuation marks.

**AM** — Amplitude Modulation. Data is contained in changes in the amplitude of the signal. The binary form is known as ASK (Amplitude Shift Keying) because the signal has two states, normally 100% or OFF.

**ANSI** — American National Standards Institute

**Antenna (Aerial)** — The antenna is part of the system that radiates the RF energy to, and receives the responses from, the tag.

**Anti-Collision** — A reading system that allows more than one transponder in the reading field simultaneously without producing an error report or blocking transaction.

**AQL** — Acceptable Quality Level

- ASCII** — American Code for Information Interchange. A computer code consisting of 128 alphanumeric and control characters, each encoded with 7 bits, used for the exchange of data between computer devices.
- ASCII Protocol** — This is a simple protocol that you can use to send ASCII characters commands to a reader. It is possible to use a standard terminal emulator program to send ASCII commands. The ASCII full-duplex protocol can only be used with RS-232 or RS-422.
- ASIC** — Application Specific Integrated Circuit
- ASK** — Amplitude Shift Keying. The binary version of Amplitude Modulation (AM).
- Asynchronous Transmission** — A method of data transmission that does not require additional timing information. The beginning and end of characters or blocks are denoted by start and stop bits.
- ATI** — Antenna Tuning Indicator
- Authentication** — A message exchange between two elements that verifies that further communication is valid
- AWG** — American Wire Gage (Gauge)
- Backscatter** — A technique where the reader's carrier signal is reflected by a tag's antenna. The reader maintains an unmodulated transmission (carrier wave) during the tag's response, and the tag returns its data by varying the energy it reflects back.
- Baud** — The rate at which a data channel transfers bits of information. The rate is measured in bits per second (Bps). (This is not an accurate measure of the amount of information that can be transferred in a given time, as the number of bits needed for each character and start and stop bits, can vary. A more accurate measure is the Data Transfer Rate.)
- BCC** — Block Check Character. An error checking character added for data integrity.
- Binary (Bin)** — A numbering system in which numbers are expressed as combinations of the digits 0 and 1, based on powers of 2. In computing terms these can be realized electrically as Off or On.
- Binary Coded Decimal** — A number in binary code is always written as a group of four bits, each group representing one digit of a number. For example, 0011 1000 is 38.
- Bit** — An abbreviation for Binary digit. A single element (0 or 1) in a binary number.
- Boot Loader** — In Texas Instruments readers, the boot loader is used as a download tool to enable changes to be made to the Application Firmware by changing the contents of the Flash memory.
- Bps** — Bits per second
- BPSK** — Binary Phase Shift Keying (see Modulation Techniques)
- Byte** — Eight bits of data
- Capacity** — The measure of the amount of data that can be stored on a transponder. This may just be the bits or bytes accessible by the user, or may include those reserved to the manufacturer (e.g., parity or control bits).
- Capture Field/Zone/Area** — The region of the electromagnetic field generated by the antenna, in which transponders will operate (see also Polar/Field diagram)
- Carrier Signal** — A signal generated at a chosen frequency that is used to power transponders and convey data. By itself it does not convey information until the data is added to the signal by modulation, then decoded at the receiving end by demodulation (see also Continuous Wave).
- CCITT** — Comité Consultatif International Telegraphique et Telephonique. An international body that produces standardization recommendations.

- CE** — The CE mark is a symbol used by the European Community to indicate that an item has passed certain safety or emission standards.
- CEPT** — Conference of Posts and Telecommunications. The body responsible for European standardization and harmonization of radio communications.
- Checksum** — (CSUM) An addition to the contents of a block or data string, which is the result of mathematical manipulation of that data. The result can then be checked before and after transmission to determine if corruption or loss of data occurred (see also CRC or BCC).
- Cipher Text** — Encrypted information
- Circular Polarization** — An antenna design where the signal is broadcast in multiple angles allowing UHF tags to be read in more than one plane.
- Clear Text** — Unencrypted information
- Closed System** — A system in which the relevant data regarding the attributes of an object are stored in a common database, accessible via data link by referencing the individual ID code. It usually refers to a system under the control of a single owner or authority (see also License Plate Concept).
- CMD** — Command
- Collision** — Simultaneous communication by two or more transponders, which results in errors or lost data. Systems capable of reading multiple transponders simultaneously have anti-collision algorithms.
- Command Set** — Set of commands used to control readers/tags
- Continuous Reporting** — A mode of reader operation, where a tag ID is continuously reported as long as it remains in the RF field
- Continuous Wave/Carrier Wave (CW)** — A sinusoidal wave at a particular frequency. Normally the unmodulated powering signal from a reader to a tag.
- Control Characters** — The ASCII command set is made up of all the possible combinations that can be made with 7-bits of information. Many of these combinations are mapped against recognizable characters that can be displayed on a screen or printer, while others are defined as control characters, whose functions are to control devices, such as printers.
- Control Module** — In a modular assembled device, it is the unit that coordinates the actions of the other modules and may be responsible for communications with an external devices.
- Corrupted Data** — When systems have poor error-checking protocols, there exists a possibility that the data reported by the reader was not the actual data transmitted by the tag. This is defined as corrupted data.
- Cover Coding** — An encryption technique to obscure the data being transmitted to a tag
- CRC** — Cyclic Redundancy Checksum
- CRC-CCITT** — An internationally defined method for mathematically generating a CRC
- Crossed Dipole (Dual Dipole)** — An antenna composed of two dipoles at right angles to each other to improve sensitivity in different orientations
- CTL** — Control
- Current Loop (20 mA)** — A communications interface (TTY interface) that allows data to be transmitted over relatively long distances in noisy environments. Point-to-point only.
- Data Transfer Rate** — The number of characters that can be transferred within a given time
- dB** — Decibel. Reader power or antenna gain is often expressed in dB. Decibels are ratios and defined as  $\text{dB} = 10 \times \log(P_1/P_2)$ .

**DBCC** — Data BCC

**DC** — Direct Current

**DC** — Distribution Centre

**Dense Reader Environment** — An operating environment where the number of simultaneously operating readers exceeds the number of available channels

**DES** — Data Encryption Standard. A publicly available algorithm that converts plain text into cipher text and back again, typically using a 64-bit secret key.

**Detuning** — The reduction in the performance of tags or readers caused by the presence of nearby materials, noticeable metal

**DIN** — Deutsche Industrie-Norm. German standards body.

**DIN Rail** — A method of fixing modules to a wall or housing. The dimensions are defined by DIN.

**DIP** — Dual In-line Package

**Dipole** — An antenna with two straight conductors

**Diversified Keys** — Diversified keys provide a higher level of security. By taking the Master Key or subsets and using an appropriate algorithm and combining it with card data (such as the UID), further keys can be created. These are sometimes called Session Keys.

**DLL** — Dynamic Link Library. System-level software routines that can be included in application software to make programming easier.

**Downlink** — Communication from a reader to a transponder (compare with Uplink)

**Download** — The process of transferring data or programs from a server or host computer to your own computer or intelligent device

**DR** — Divide ratio

**DSA** — Digital Signature Algorithm

**DSFID** — Data Storage Field Identifier. ISO/IEC term describing an 8-bit area of memory that conformant tags use to describe their memory utilization.

**DSB** — Double sideband

**DSS** — Digital Signature Standard

**DST** — Digital Signal Transponder. TI's LF transponder that uses an encrypted challenge/response security mechanism.

**Duplex** —

- Full Duplex (FDX) — A channel capable of transmitting data in both directions at the same time
- Half Duplex (HDX) — A channel capable of transmitting data in both directions, but not at the same time

**ECC** — Elliptic Curve Cryptography. A public key cryptography algorithm. Key 9 lengths are typically smaller than RSA (see RSA).

**EEPROM** — Electronically Erasable Programmable Read-Only Memory

**EIRP** — Equivalent Isotropic Radiated Power. The power output (gain) of an artificial isotropic antenna.

**Electronic Label** — A label that contains an RFID device affixed or embedded

**EM** — Electromagnetic

**EMI** — Electromagnetic Interference

**EMV™ (specifications)** —Europay MasterCard Visa. (The specifications for chip card transactions to ensure global interoperability.)

**EMVCo** — Europay MasterCard Visa Co., LLC. Formed February 1999 by Europay International, MasterCard International, and Visa International to manage, maintain, and enhance the EMV™ Integrated Circuit Card Specification for payment systems. EMVCo is currently operated by JCB International, MasterCard International, and Visa International.

**Environment** — Gen 2 standard term which describes a zone around an operating UHF system. Where the signal strength is  $>-90$  dBm. This zone can be a circle of as much as 2000 meters.

**EPC** — Electronic Product Code™. A labeling code that, in addition to identifying the manufacturer and product, individually identifies each item.

**EPCglobal** — Organization formed to coordinate and administer EPCs and associated standards

**ERP** — Equivalent Radiated Power. Power output based on a dipole antenna

**Error Rate** —The numbers of errors per number of transactions

**ESD** — Electrostatic Discharge. The buildup of electrical potential that can cause damage to electronic devices by its discharge.

**ETSI** — European Telecommunications Standards Institute. The body that recommends standards for adoption by EC member countries.

**Factory Programmed** — Some RFID tags have information written to them during the manufacturing process. This information cannot be changed by the user.

**Far Field** —The point at which the electromagnetic field separates and the radio waves propagate away from the magnetic (near) field

**FBCC** — Frame BCC

**FCC** — Federal Communications Commission. The US body that enforces standards for radio equipment.

**FHSS** — Frequency Hopping Spread Spectrum

**Field Programming** —The programming of information into a tag after it has been shipped by the manufacturer. This might be done by an OEM, distributor, or end user and might be programmed using a special printer or once the tag has been attached to an object.

**Field Strength** —The strength of the electromagnetic signal at a particular distance from the transmitting antenna. The legal field strength limits vary with region. Units of measurement include:

- milliamperes per metre (mA/m)
- millivolts per metre (mV/m)
- decibel microamperes per metre (dB $\mu$ A/m)
- decibel microvolts per metre (dBiV/m)
- microvolts per metre ( $\mu$ V/m)
- microamperes per metre ( $\mu$ V/m)

**FIPS** — Federal Information Processing Standards

- FIPS 46-2: Data Encryption Standard
- FIPS 140-2: Security Requirements for Cryptographic Modules
- FIPS 180-1: Secure Hash Standard
- FIPS 186: Digital Signature Standard

**Firmware** — Microprocessor programming instruction sets that are stored in a memory unit rather than being implemented through software

**Flash Memory** — A constantly powered nonvolatile memory that can be erased and reprogrammed at the block level.

**FM** — Frequency Modulation. Where data is indicated by switching the carrier frequency (see FSK, the binary version).

**Frequency** — The number of times a signal executes a complete excursion though its minimum and maximum values and returns to the same value (cycles).

The radio spectrum can be divided into the following frequency bands:

VLF	Very low frequency	3 kHz to 30 kHz
LF	Low frequency	30 kHz to 300 kHz
MF	Medium frequency	300 kHz to 3 MHz
HF	High frequency	3 MHz to 30 MHz
VHF	Very high frequency	30 MHz to 300 MHz
UHF	Ultra high frequency	300 MHz to 3 GHz

**FSK** — Frequency Shift Keying. Where data is indicated by switching the carrier signal between two set frequencies (see ASK, BPSK, and PR-ASK).

**FSM** — Field Strength Meter

**Full Duplex (FDX)** — A communications channel capable of carrying data in both directions at the same time.

**g** — Gram

**Gain** — A measure of how much energy an antenna will collect or emit in a specific direction

**Gen2** — Generation 2 standard from EPCglobal that defines the coding and air interface for UHF tag operation

**Half Duplex (HDX)** — A channel capable of transmitting data in both directions but not at the same time

**Hands Free** — A situation where no deliberate presentation of a transponder is required to trigger identification

**Handshaking** — A mechanism for the regulation of data flow between devices (e.g., to prevent a computer sending a printer more data than it can buffer at that moment. This action can be achieved using hardware (e.g., RTS/CTS) or software control (e.g., XON/XOFF) techniques.

**Harmonics** — In addition to the main output at its centre frequency, a transmitter creates lesser bursts of power at multiples of the carrier frequency. This series of diminishing outputs is called the harmonics (see also Spurious Emissions).

**Hexadecimal (Hex)** — A method of representing data to the base 16, using the numbers 0 to 9 and the letters A to F. For example, the decimal number 10 would be represented in hexadecimal notation as A.

**Host Computer** — The computer that controls other devices. In the case of one or more units on the same network, this computer is the master.

**HSM** — Hardware Security Module

**Hz** — Hertz

**IC** — Integrated Circuit

**ID** — Identification

**IEC** — International Electrotechnical Commission

**Immobilizer** — A system requiring electronic authentication of the car's key before the fuel and ignition circuits are enabled. Authentication is typically achieved with transponders.

**Inductive Coupling** — When data and power is transferred between reader antenna and tag by inducing a current in a coil, this is said to use inductive coupling.

**Inlay** — The unpackaged electronics of a tag. Usually a fully working device comprising an antenna and IC.

**Interface** — An electrical or physical standard for the interconnection of devices. Some common interfaces are:

- Current loop (20 mA)
- RS-232
- RS-422
- RS-485

**Interference** — Unwanted electrical signals found in the operating environment of RF equipment that interferes with the reader's or transponder's normal operation. The effect of interference can be seen in reduced system performance.

**Interrogator** — See Reader

**Inventory** — The process of identifying multiple tags in an RF field

**I/O** — Input/Output

**ISO** — International Organization for Standardization

ISO 7810/13	International Standards for Identification Cards
ISO 7816	International Standard for Identification Cards – Integrated Circuit Cards
ISO 11784/5	International Standards for Animal Identification
ISO 14443	International Standard for Proximity Card Systems
ISO 15693	International Standard for Vicinity Card Systems
ISO 15963	International Standard for Unique ID of RFID Tags
ISO 18000	International Series of Standards for RFID

**JTAG** — Joint Test Action Group. IEEE Std 1149.1 (JTAG) Standard Test Access Port and Boundary Scan Architecture defines debugging and diagnostics methodologies. A JTAG bus is often used for downloading data to a module.

**k** — kilo. Value = 1,000 (or in computing 1024).

**Kbps** — Kilo bits per second

**KEK** — Key Encryption Key

**Key Diversification** — The creation of keys for individual units from Master or Sub-Master Keys. These are sometimes called Session Keys.

**kHz** — Kilohertz

**KILL Command** — Tags incorporating a KILL command can be made permanently inoperable by a password-protected request.

**LED** — Light Emitting Diode

**LF** — Low Frequency or Link Frequency

**License Plate Concept** — A concept where the fixed code contained in a transponder is used as a pointer into a database, in much the same way that the police can read your vehicle number plate and determine your name, address, etc.

**Life (MTBF, MTTR)** — Functional period within which no maintenance, adjustment, or repair is to be reasonably expected.

**LBT** — Listen Before Talk. Under European regulations, a reader must first listen on a particular channel for other signals before it is allowed to transmit, otherwise it must select another channel. In addition, every 4 seconds the reader must release the channel for 0.1 seconds to allow other readers a chance to occupy that channel.

**LSB** — Least Significant Bit/Byte

**mA** — Milliampere

**Master** — In many communications protocols, problems with collisions or corruption of data might occur if all devices connected together communicated at the same time. One way to overcome this potential problem is to define one device as Master and all other connected devices as Slaves. Only the Master is allowed to initiate communications and no Slave is allowed to communicate unless told to do so by the Master.

**Memory Card** — A read/write or reprogrammable transponder in credit-card size. Data may be accessed by direct contact through a microprocessor (smart card) or via a radio link (non-contact).

**MHz** — Megahertz

**mm** — Millimeter

**MPT** — Multiprotocol Transponder

**Modulation Techniques** —

- **Binary Phase Shift Keying (BPSK)**—Data is passed by switching the phase of the carrier signal 180 degrees
- **Pulse Position Modulation (PPM)**—During a designated time period, the point at which a transmitter pulse occurs indicates the value of the data being passed. There are two variations prescribed by ISO15693:
  - 1 out of 256. The designated time period is divided into 256 slots. The slot in which the pulse occurs determines the ASCII value (0–255).
  - 1 out of 4. The designated time period is divided into four slots, the occurrence of the pulse in a particular slot determines if the data is a 00, 01, 10, or 11 bit pattern.
- **Phase Reversal Amplitude Shift Keying (PR-ASK)**—Data is indicated by reversing the phase.

**ms** — millisecond

**MSB** — Most Significant Bit/Byte

**MTU** — Merchant Terminal Unit

**Multipath Signal** — UHF signals can arrive at the same point by different routes because of reflections. If the signals arrive in-phase, they will enhance each other, whereas, if they arrive out-of-phase, they will cancel each other.

**Multiple Reader Environment** — An environment where the number of simultaneously transmitting readers is less than, or equal to, the number of available channels

- Multiplexer (MUX)** —A device that can switch between multiple readers, readers/writers, or antennas. This reduces the complexity of a system but at the expense of all units being blind at some time during the cycle. A multiplexer can be free running or steered (addressed).
- Multi-Protocol Reader** —A reader capable of handling two or more communications protocols.
- Mutual Authentication** —The process by which two units validate each other
- MUX** — Multiplexer (see Multiplexer)
- mV** — Millivolt
- Near Field** —The zone close to an antenna ( $>\lambda/2\pi$ ) where the magnetic field predominates
- Noise** — Unwanted ambient electrical signals found in the operating environment of RFID equipment (see Interference)
- Noise Immunity** —An indication of the robustness of a system to operate in the presence of electrical interference
- NRZ** — Non-Return to Zero. A binary encoding technique in which binary 1 and 0 signals are represented by high and low voltages, with no return to the 0 reference voltage between bits.
- NSI** — Numbering System Identifier
- OEM** — Original Equipment Manufacturer
- OOK** — On Off Keying
- Open Systems** —Applications in which readers/writers do not have access to a common database, so data is carried on the tag
- Operating Environment** —The region around a reader where the RF transmissions are greater than -90 dB. In free space, this is approximately a 2-km circle.
- OPT** — Outdoor Payment Terminal
- Orientation** — The alignment of a tag with respect to the reader's antenna. Some orientations couple better and transfer power more efficiently.
- Out-of-Field Reporting** —A mode of operation where the reader reports the ID when the tag leaves the RF field
- Parity** — A technique used to detect data transmission errors by adding an extra bit to each character. This bit is set to 1 or 0 to make the total number of bits odd or even, depending on the type of parity in use.
- Passive Entry (PE)** —A vehicle electronics system that detects the approach of the driver and automatically allows entry and the vehicle to be started. The driver typically is carrying a Carrier Identification Device (CID) that communicates with the vehicle electronics.
- PB I** —Power Burst One
- PB II** —Power Burst Two
- PC** — Personal Computer
- PCD** — Proximity Coupling Device. ISO/IEC term for an RF reader/writer that uses inductive coupling.
- PE** — Passive Entry (see Passive Entry)
- PEK** — Payload Encryption Key
- Penetration** — This term is used to indicate the ability of a particular radio frequency to pass through nonmetallic materials. Low-frequency systems are said to have good penetration, whereas UHF systems have a poor ability to pass through materials.

- Permalock/Permalocked** — A memory location whose lock status is unchangeable (i.e., permanently locked)
- PET** — PolyEthyleneTherephthalate. Base material for HF and UHF inlays.
- Phantom Transaction** — The report of a nonexistent transponder
- PICC** — Proximity Integrated Circuit Card. ISO/IEC term for card (proximity, vicinity, smart, or IC card).
- Pick Rate** — The percentage detection rate for an RF system. This is a function of speed of throughput, transponder orientation, number of transponders present, etc.
- PIE** — Pulse-Interval Encoding
- PLC** — Programmable Logic Controller
- Polar/Field Diagram** — A graphical representation of the field strength of a transmitting antenna
- Port Concentrator** — A device that takes the outputs from a number of communications interfaces and introduces them to a communications network
- Portal** — A multiantenna reading zone
- POS** — Point-Of-Sale terminal
- Power Level** — The output power from a reader. Usually measured in watts or volts/meter.
- PPM** — Pulse Position Module (see Modulation Techniques)
- Programmer** — An electronic device for entering or changing data in an RF transponder at close distance or with contact
- PR-ASK** — Phase Reversal Amplitude Shift Keying (see Modulation Techniques)
- Programming** — Writing data to a tag
- Protocol** — A set of rules governing the flow of information in a communications system
- Proximity** — Generally denotes applications where the reader antenna-to-tag distance is less than 100 mm (4 in). Some deliberate action is usually required to present the tag (compare with Hands Free).
- PSU** — Power Supply Unit
- PTT** — Postal Telegraph and Telephone. A national authority that operates the public telecommunications network and sets national standards and policy on communications issues.
- PWM** — Pulse Width Modulation
- R&TTE** — Radio and Telecommunications Terminal Equipment. A European directive for the approval of radio equipment.
- RAM** — Random Access Memory
- RA-RFM** — Remote Antenna Radio Frequency Module
- Range** — The maximum distance between the antenna and the tag in a radio-frequency system at which the signals can be correctly received – either for decoding or for reprogramming. This distance can be affected by noise.
- Read** — The action of obtaining data from a tag
- Read Only** — A tag that has information written into it during its manufacture. This information can only be read from the tag, never changed.

- Read Rate** — The maximum rate at which the complete data can be transferred from a transponder to a reader. It is usually expressed in reads per second.
- Read/Write** — Many applications require new data to be written into the tag, or that the data contained in the tag is changed. Tags with this possibility are read/write tags and can also be referred to as memory cards or memory modules.
- Reader (Interrogator)** — In an RF system, the reader is the device containing the digital electronics that triggers the transponder to respond, and extracts and validates the information from the transponder's modulated RF response. It may also pass the data on to a controlling process such as a host computer.
- Reader/Writer** — An electronic device that can act as both reader and programmer for an RF transponder at a distance from it, i.e., while the transponder remains attached to the object it identifies
- Reprogrammable** — Same as for R/W, except that the RF transponder has to be in a fixed location, close to or in the programmer for it to be recoded (sometimes called Field Programmed)
- Request Packet** — Communication protocol command packet sent from a host computer to a reader.
- Response Packet** — Communication protocol response packet (in response to a Request Packet) sent from a reader back to the host computer
- RF** — Radio Frequency
- RF/DC (Radio Frequency/Data Communication)** — A system by which remote devices communicate with a host computer via a radio link. For example, hand-held readers can send the information collected back to a controlling process, without the need for fixed wiring for the data cables. One common use is on forklift trucks.
- RFID** — Radio Frequency Identification
- RFM** — Radio Frequency Module. Contains all the analogue functions of a TI-RFID reading unit that are needed to initialize a TI-RFID transponder and to detect its return signal.
- RF Module/Stage** — The part of a reader/interrogator that creates the RF signals
- RF Tag** — See Transponder
- RFU** — Reserved for Future Use
- RO** — Read-Only transponder. Denoting an RF transponder that is programmed at the time of manufacture and, thereafter, can only be read (sometimes referred to as Factory Programmed).
- ROM** — Read-Only Memory
- RS-232** — A common physical interface standard specified by the EIA for the interconnection of devices. The standard allows for a single device to be connected (point-to-point) at baud rates up to 9600 bps and at distances up to 15 meters. More recent implementations of the standard may allow higher baud rates and greater distances.
- RS-422** — A balanced interface standard similar to RS-232, but using differential voltages across twisted-pair cables. More noise immune than RS-232 and can be used to connect single or multiple devices to a master unit, at distances up to 3000 meters.
- RS-485** — An enhanced version of RS-422 that permits multiple devices (commonly 32) to be attached to a two-wire bus at distances of over a kilometer
- RSA** — Rivest Shamir Adleman algorithm. RSA is the most widely used public key cryptography. Typical key lengths are 1024 and 2048 bits.

- R/W** — Read/Write transponder. Denoting a transponder that can be reprogrammed many times by an external RF signal, while the transponder itself remains attached to an object. For reprogramming, the transponder may need to be traveling at a reduced speed and closer to the write head than for normal reading operation (sometimes referred to as in-use programmed or programming on the fly).
- Rx** — Receive (usually referring to an input or output line)
- Rx MUX** — Receive Multiplexer
- RXSS** — Receive Signal Sensitivity Level
- SAM** — Security Access Module. This can be a hardware or software module that serves to store secure information (e.g., Master keys).
- SAMPT** — Selective Addressable Multipage Transponder
- SAW** — Surface Acoustic Wave. A technology used for automatic identification, in which low-power microwave radio frequency signals are converted to ultrasonic acoustic signals by a piezoelectric crystalline material in the transponder. Variations in phase shift in the reflected signal can be used to provide a unique identity.
- SCI** — Serial Communications Interface
- Screening** — The process of masking RF transmissions to avoid unwanted operation of transponders outside the desired reading field
- Session** — An inventory round for a set of tags
- SHA-1** — Secure Hash Standard-1. This is an algorithm designed to take a message and condense it to create a nonreversible output (digest) of 160 bits. No two messages create the same digest.
- SID** — Simultaneous Identification (anti-collision process)
- Singulation** — The identification of a single tag from a group of many
- SKU** — Stock Keeping Unit. The unit database entry for a product (e.g., case of eight cans of baked beans).
- Slave** — Some communications use a Master/Slave protocol. Only the Master unit is allowed to initiate communications, and Slave devices are not allowed to respond unless instructed.
- Slot** — The point in an inventory round where an individual tag is allowed to respond
- Slotted Random Access Anti-Collision** — An anti-collision algorithm, where tags write a pseudo-random number into a slot counter. This slot counter value is decremented when instructed by the reader, and the tag only responds when the value reaches zero.
- SMA** — Type of 50-Ω RF connector
- SOF** — Start Of Frame
- SPI** — Serial Peripheral Interface
- Spurious Emissions** — Unwanted harmonic outputs. The Type Approval testing includes measurement of the harmonics of the reader, to ensure they are within the limits laid down.
- SRAM** — Static Random Access Memory. SRAM cells have feedback loops to preserve their 1 or 0 states by consuming a very small amount of power.
- Strap** — An RFID chip mounted on a carrier to make subsequent inlay production easier
- Synchronization** — A mechanism that allows multiple readers to operate in close proximity by synchronization of their transmissions
- S/W** — Software

- 
- Tag** — Transponder (also RF Tag, see Transponder)
- TBD** — To Be Determined
- TBP** — TIRIS Bus Protocol
- TI** — Texas Instruments
- TI-RFid™** — Texas Instruments Radio Frequency Identification System
- TIRIS™** — Texas Instruments Registration and Identification System
- TIRIS Bus Protocol** — This is a binary protocol suitable for communication between a controlling device and one or more readers (for example, with a single reader using an RS-232 interface or up to 31 readers using RS-422/485). The TIRIS Bus Protocol can be used with RS-232 or RS-422/485.
- Token** — A three-dimensional form factor inlay or tag. Sometimes known as a keyfob.
- Tote** — A reuseable supply container that can be hand carried
- TPU** — Token Personalization Unit
- Transmitter (Exciter)** — The electronics that drive an antenna are called the transmitter or exciter. Together with the antenna and a receiver, they are called a reader or scanner.
- Transponder** — An electronic TRANSMITTER/resPONDER that is attached to the object to be identified and, when appropriate signals are received, transmits information as radio signals to a reader. Sometimes referred to as a Tag.
- Transport Key** — A code that protects a secure chip through the processes following wafer fabrication
- TTL** — Transistor-Transistor Logic
- Tx** — Transmit (usually referring to an input or output line)
- Type Approval** — Certification that an RF device meets the performance specifications relevant to the type of application and operational frequencies for which it is to be used
- TX-MOD** — Transmitter Module
- UID** — Unique Identifier. Refers to the unique 64-bit code found in ISO 15693-conformant tags, and is used for addressing each transponder individually.
- UL** — Underwriters Laboratories. US safety body and laboratory.
- Uplink** — Communication between a transponder and a reader
- USART** — Universal Synchronous/Asynchronous Receiver Transmitter. IC that converts the parallel data of a microprocessor to a serial form to communicate with the outside world.
- USB** — Universal Serial Bus
- V** — Volt
- VCD** — Vicinity Coupling Device. The reader/writer device that uses inductive coupling to provide power to the VICC (transponder) and also to control the data exchange with the VICC (transponder).
- VICC** — Vicinity Integrated Circuit Card. A card into which integrated circuits and coupling means have been placed and in which communication to such integrated circuits is done by inductive coupling in vicinity of a coupling device (transponder card for vicinity communication range).
- VSL** — Virtual Supply Logic
- Wiegand** — The effect (pulses) created when ferromagnetic wires are passed through an interrogator. Lately, this term has become synonymous with a reader that has a Wiegand two-wire interface over which data is returned to a controlling process.

**WORM** — Write Once/Read Many. Denoting an RF transponder that can be part, or totally programmed once by the user and thereafter only read.

**Write** — The transfer of data to a tag. The tags internal operation may include reading the data in order to verify the operation.

**Write Rate** — The rate at which data can be transferred to a tag, written into the tag's memory, and verified as correct. It is measured in bits (or bytes) per second.

**ZMK** — Zone Master Key

TI-RFid and TIRIS are trademarks of Texas Instruments.

All other trademarks are the property of their respective owners.

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

<b>Products</b>		<b>Applications</b>	
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>	Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>	Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>	Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>	Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>	Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Low Power Wireless	<a href="http://www.ti.com/lpw">www.ti.com/lpw</a>	Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
		Video & Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
		Wireless	<a href="http://www.ti.com/wireless">www.ti.com/wireless</a>

Mailing Address: Texas Instruments  
Post Office Box 655303 Dallas, Texas 75265