TEXAS INSTRUMENTS

TI-RFID Product Manuals

Terms & Abbreviations

TI-RFid
A TEXAS INSTRUMENTS TECHNOLOGY

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

The **TIRIS** and **TI-RFID** logos and the words **TIRIS**, **TI-RFID** and **Tag-it** are trademarks or registered trademarks of Texas Instruments Incorporated.

Active Tag   An RF tag (transponder) which is partly or completely battery-powered. Batteries may be replaceable or sealed in. (Compare 'Passive TaG')

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

AFI   Application Family Identifier: Represents the type of application targeted by the reader. It is used to ensure that information is only extracted from those transponders meeting the required application criteria out of all the transponders present.

Alignment   An indication of the orientation of the transponder, relative to the reader antenna. (This is sometimes referred to as the coupling)

Alphanumeric   Denoting that information contains alphabet characters and numeric 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 only two states.

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

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

AQL   Acceptable Quality Level

ASCII   American Standard Code for Information Interchange. A computer code consisting of 128 alphanumeric and control characters, each encoded with 7 bits, used for the exchange of information between computer devices.

ASCII Protocol This is a simple protocol that you can use to send ASCII character commands to the 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 RS232 or RS422.

ASK   Amplitude Shift Keying

Asynchronous Transmission A method of data transmission that doesn't require timing information in addition to data. The beginnings and ends of characters, or blocks of characters, are indicated by start and stop bits.

ATI   Antenna Tuning Indicator

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 that are 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 digits 0 and 1, based on powers of 2. In computing these can be represented electrically as 'on' or 'off'.

Binary Coded Decimal A number in binary code always written in groups of four bits, each group representing one digit of the number, for example 0011 1000 is 38.

Bit   An abbreviation for Binary digit.   A single element (0 or 1) in a binary number.

Bootstrap Loader A short program that a reader/system uses to read in a more complex program to which it gives control. Typically used to download updated firmware versions into reader hardware.

Byte   Eight bits of data.

Capacity   A measure of the information that can be stored in the transponder. This may be just the bits or bytes that are assessable to the user, or may include those reserved to the manufacturer. For example: parity or control bits.

Capture Field/Area/Zone The region of the electromagnetic field, generated by the antenna, in which transponders will operate.   (See also: 'Polar/Field Diagram')

Carrier Frequency The main frequency of a transmitter which is then modulated to transmit information. (See also: 'Modulation')

CCITT   Comitè Consultatif International Telegraphique et Telephonique. An international body that produces standardisation recommendations.

CE   The CE Mark is a symbol used by the European Community to indicate that the item has passed certain safety and emission standards.

CEPT   Conference of Posts and Telecommunications.   The body responsible for European standardisation and harmonisation of radio communications.

Checksum   (CSUM) An addition to the contents of a block of data. This code can then be checked before and after transmission to determine whether the data has been corrupted or lost. (See also: 'BCC'). For example: CRC.

Closed System A system in which relevant data regarding the attributes of an object is 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: 'Licence Plate Concept')

CMD   Command

Continuous Reporting A mode of reader operation, where a transponder ID is reported (at set time intervals) continuously whilst that transponder remains in the field of the reader. (see 'In Field Reporting')

Continuous Wave Modulation (**CW**) Data is contained in a signal that is switched on and off. This is identical to ASK with 100% modulation depth.

Control Characters The ASCII character set is made up of all the possible combinations that can be made with 7 bits of information. Many of these bit patterns are mapped against recognisable characters which can be displayed on a screen or printer, whilst 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 co-ordinates the actions of the other modules and may be responsible for the communication with other external devices.

Corruption When systems have poor error checking protocols, there exists a possibility that data reported by the reader is not the data transmitted by the transponder. This is defined as corrupted data.

CRC Cyclic Redundancy Check

CRC-CCITT An internationally defined method for mathematically generating a CRC. (see 'CRC')

CTL Control Module

Current Loop (20 mA) A communications interface (TTY interface) that allows data to be transmitted over relatively long distances and in noisy environments. Point-to-point connection only.

Data Transfer Rate The number of characters that can be transferred within a given time.

DBCC Data BCC

DC Direct Current

De-tuning The change in the performance of transponders and readers caused by the presence of metal, or ferromagnetic materials.

DIN Deutsche Industrie-Norm. German standards body.

DIN rail A method of fixing units to a wall or housing. The dimensions are specified by DIN.

DIP Dual In-line Package

DMC Data Management Computer (PC)

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

DRB Digital Receiver Board

DSFID Data Storage Format Identifier: Indicates how the data is structured in the transponder's memory.

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.

EEPROM   Electrically Erasable Programmable Read Only Memory

Electronic Label A label that has an electronic RFID tag embedded inside or on it.

EM   Electro-Magnetic

EMI   Electro-Magnetic Interference

Encryption of Data A system that scrambles its data to prevent unauthorised duplication.

EOF   End Of Frame

Error Correcting Code (**ECC**) Supplemental bits in a data transfer used in conjunction with a polynomial algorithm, in order to compute the value of missing or erroneous data bits.

Error Correcting Mode Mode of data transmission in which missing or erroneous bits are automatically corrected.

Error Correcting Protocol The rules by which the error correcting mode operates.

Error Rate   The number of errors per number of transactions.

ESD   Electro-Static Discharge. The build-up of electrical potential that can cause damage to electronic modules.

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

Factory Programmed Some RFID tags have information (a number) written into them during the manufacturing process, this process turns them into read only tags.

False Activation When a 'foreign' transponder enters the field of an RF system and triggers a false activation.

FBCC   Frame BCC

FCC   Federal Communications Commission. The US regulatory body for radio equipment.

Field Programming The programming of information into the tag after it has been shipped from the manufacturer to an OEM customer, an end user, or sometimes the manufacturer's distribution locations. This information is sometimes done before the tag is installed on the object to be identified, and sometimes after, depending on the object and the application.

Field Strength The strength of the electro-magnetic signal at a specified distance from the transmitting antenna. The legal field strength limits vary with country.   Units of measurement include:

milliamps per metre	(mA/m)
millivolts per metre	(mV/m)
decibel microvolts per metre	(dBμV/m)
decibel microamperes per metre	(dBμA/m)
microvolts per metre	(μV/m)
microamps per metre	(μA/m)
See also: 'Type Approval'	

Firmware   Microprocessor programming instruction sets that are stored in a memory unit rather than being implemented through Software.

FM   Frequency Modulation

FM/FSK   Frequency Modulation/Frequency Shift Keying

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

The 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

Frequency Modulation (**FM**) Data is contained in changes of the frequency of the signal. In the binary form the data is contained in the changes between two frequencies of the signal and is known as FSK.

FSK   Frequency Shift Keying

FSM   Field Strength Meter

g   Gram

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 the transponder is required to initiate an identification.

Handshaking   A mechanism for the regulation of the flow of data between devices. For example: To prevent a computer sending more data than a printer can handle at that moment. This regulation can be achieved by both hardware methods (for example: RTS/CTS) and software techniques (for example: Xon/Xoff).

Harmonics   In addition to the radio output at its principal frequency, a transmitter produces lesser bursts of power at multiples of that frequency. These diminishing outputs are called the harmonics. (See also: 'Spurious Emissions')

HCMOS   High Speed Complementary Metal Oxide Semiconductor

Hexadecimal (**Hex**) Method of representing data to base 16, using the numbers 0 to 9 and the letters A to F. For example, the number 10 is represented in hexadecimal as 'A'.

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

Hz Hertz

IC Integrated Circuit

ID Identification

Immobilizer An electronic system requiring electronic authentication of the car key before enabling the vehicle engine (ignition, starter and fuel pump). Authentication is typically achieved with transponders.

Inductive Coupling Systems which use the inducing of a current in a coil as a means of transferring data or power are said to use inductive coupling.

In Field Reporting A mode of operation in which a reader reports a transponder ID on entering the field and will not return further reports of that transponder until a prescribed time interval has elapsed. (See 'Out Of Field Reporting')

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

> CURRENT LOOP (20 mA)
>
> RS232
>
> RS422
>
> RS485

Interference Unwanted electrical signals found in the operating environment of RFID equipment that interfere with the transponder or readers normal operation. The effect of interference can be seen in reduced system performance.

Interrogator See 'Reader'

I/O Input/output

ISL Logic Supply Current

ISR Interrupt Service Routine

k Kilo

LED Light Emitting Diode

LF Low frequency

Licence Plate Concept A concept were the fixed code contained in an RF transponder, is used as a pointer into a database, in much the same way as the police can determine your name, address, etc. from your car number plate. (See also: 'Read Only')

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

LSB Least Significant Bit

LSByte   Least Significant Byte

LS-TTL   Low power Schottky Transistor-Transistor Logic

mA   Milliampere

Master   In many communications protocols, problems with collisions or cor-
ruption of data might occur if all devices connected together commu-
nicated at the same time. One way in which this potential problem is
overcome, is to define one device as the Master and all other con-
nected devices as slaves. Only the Master can initiate communica-
tions and no Slave is allowed to communicated unless instructed to
do So.

Memory Card A Read/Write or re-programmable transponder in credit card size.
Data may be accessed via direct contact, through a microprocessor
(smart card) or via a radio link (non-contact).

Misread   A condition that exists when the data presented by the reader is dif-
ferent from the corresponding data in the transponder.

mm   Millimeter

Modulation The methods of modulating or altering the signal between reader
and transponder, in order to carry the encoded information are quite
varied. In some cases the modulation can be different between the
reader and the transponder, and between the transponder and the
reader. Some of the methods used are described below:

      Amplitude modulation (AM)

      Phase modulation (PM)

      Frequency modulation (FM)

      Pulse width modulation (PWM)

      Continuous wave modulation (CW)

MPR   Multi-Protocol Reader.

MPT   Multipage transponder

MSB   Most Significant Bit

ms   Millisecond

MSByte   Most Significant Byte

Multiple Readings A system that can simultaneously identify multiple transponders
presented to the reader.

Multiplexer A switching device that supports multiple readers, reader/writers or an-
tennas by checking each in turn or according to priority. This reduc-
es the amount of electronics in a system at the expense of all
readers being 'blind' for some of the time. A multiplexer can be free
running or steered (addressed).

Multi-protocol Reader   A reader capable of handling two or more communication
protocols.

MUX   Multiplexer

mV   Millivolt

Noise   Unwanted ambient electrical signals found in the operating environment of RFID equipment. (See also: 'Interference')

Noise Immunity An indication of the robustness of a system to operate in the presence of electrical interference.

NRZ   Non Return to Zero

OEM   Outside Engineering Manufacturer. A manufacturer who purchases Tags To Incorporate Them Into Their Own Product(S).

Open Systems Applications in which reader/writers do not have access to a common database, so data is carried in the transponder or the reader.

Orientation   The alignment of a transponder with respect to the reader antenna.

Out of Field Reporting A mode of operation in which the ID of a transponder is reported once the transponder has left the field of the reader. (See also: 'In Field Reporting')

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 A vehicle electronic system that automatically detects the driver when approaching the vehicle for the purpose of unloading the car. The driver is typically carrying a CID (Carrier Identification Device) that communicates with the vehicle electronics.

Passive Tags An RF transponder that does not contain any internal power source. It is powered by signals from an external source (usually the electromagnetic field generated by the reader antenna). (Compare 'Active Tag')

Passive Start An electronic system usually combined with PE. It replaces an immobilizer, fulfils the same function, but does not require a mechanical key/lock. Typically a key fob is used for starting.

PB I   Power Burst one

PB II   Power Burst two

PC   Personal Computer

PCB   Printed Circuit Board

PE   Passive Entry

Penetration   This term is used to indicate the ability of a particular radio frequency to pass through non-metallic materials. Low frequency tagging systems are said to have good penetrative properties as their transponders can be read when behind or encased in other materials. Microwave tagging systems, while having greater ranges, are less capable of penetration of materials.

Phase Modulation (**PM**) Data is contained in changes in the phase of the signal. The Binary form is known as PSK.

Phantom Transaction The report of a non-existent transponder.

Pick Rate   The percentage detection rate for an RF system. This is a function the speed of throughput, transponder orientation, number of transponders present, etc.

PLC   Programmable Logic Circuit

Polar/field Diagram A graphical representation of the field strength of a transmitting antenna.

Port Concentrator A device that accepts the output from a number of communication interfaces and introduces them into a communications network.

Power Levels The levels of power that radiate from a reader or tag, they are usually measured in volts/meter.

Programmer   An electronic device for entering or changing data in an RF transponder at close proximity or in electrical contact with it.

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 some deliberate action is required to initiate transponder identification. (See also: 'Hands Free')

PS   Passive Start

PSU   Power Supply Unit

PTT   Postal Telegraph and Telephone. A national authority which operates the public telecommunications network and sets national standards and policy on telecommunications issues.

Pulse Width Modulation (**PWM**) Data is contained in the duration of pulses.

PWM   Pulse Width Modulation

RAM   Random Access Memory

RA-RFM   Remote Antenna Radio Frequency Module

Range   The maximum distance between the antenna and a transponder in a radio frequency system at which the signals can be properly received, either for reading the data encoded in the transponder or for re-programming. This distance may be affected by environmental conditions.

RC   Remote Controller

Read   The action of obtaining the information contained in a tag.

Reader (**Interrogator**) In an RF system, the device containing the digital electronics which 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.

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/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 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 re-coded. (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.

RF-ID 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 which is programmed at the time of manufacture, and thereafter can only be read. (Sometimes referred to as 'Factory programmed')

ROM Read Only Memory

RS232 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, at distances up to 15 metres. More recent implementations of the standard may allow higher baud rates and greater distances.

RS422 A balanced interface standard similar to RS232, but using differential voltages across twisted pair cables. More noise immune that RS232 and can be used to connect single or multiple devices to a master unit, at distances up to 3000 metres.

RS485　　An enhanced version of RS422, which permits multiple devices (commonly 32) to be attached to a two wire bus at distances of over a kilometre.

R/W　　Read/Write Transponder. Denoting a transponder that can be re-programmed many times by an external RF signal, whilst the transponder itself remains attached to an object. For re-programming the transponder may need to be travelling 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

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.

SID　　Simultaneous Identification (anti collision process)

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.

SOF　　Start Of Frame

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.

Synchronization A mechanism that allows multiple readers to operate in close proximity by synchronisation of their transmissions.

S/W　　Software

TAG　　Transponder (see 'RF Tag')

TBD　　To Be Determined

TBP　　TIRIS Bus Protocol

TI　　Texas Instruments Incorporated

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 RS232 interface or up to 31 readers using RS422/485. The TIRIS Bus Protocol can be used with RS232 or RS422/485.

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 which 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.

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. A representative sample(s) of the production model must be tested at an approved laboratory before it can be marketed. The specifications (known as MPT regulations in the UK) are different for each country because different frequencies and field strengths are allowed. Europe-wide regulations are presently under development.

TX-MOD Transmitter Module

UART Universal Asynchronous Receiver Transmitter

UID Unique Identifier: A number that uniquely identifies the transponder. This is used for addressing each transponder individually.

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 Supply Logic

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

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

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.