TEXAS INSTRUMENTS

Tag-it™ Reader System Series 6000

Reader / Antenna Set

RI-K01-320A (120 mW)

RI-K02-320A (800 mW)

Reference Guide

11-06-21-050 July 1999

TIRIS Technology by Texas Instruments™

Edition One – July 1999

This is the first edition of this manual for the **Tag-it Reader / Antenna Set**.

It contains the description of the following products:

Demo Reader Set adjusted to FCC limits (120 mW)	RI-K01-320A
Demo Reader Set adjusted to ETSI limits (800 mW)	RI-K02-320A

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Read This First

About This Manual

This reference guide for the Tag-it Reader / Antenna Set is designed for use by TI partners who are engineers experienced with TIRIS and Radio Frequency Identification Devices (RFID).

Regulatory and safety notes that need to be followed are given in Chapter 4.

Conventions

Certain conventions are used in order to display important information in this manual, these conventions are:

WARNING:

A WARNING IS USED WHERE CARE MUST BE TAKEN, OR A CERTAIN PROCEDURE MUST BE FOLLOWED, IN ORDER TO PREVENT INJURY OR HARM TO YOUR HEALTH.

CAUTION:

This indicates information on conditions, which must be met, or a procedure, which must be followed, which if not needed could cause permanent damage to the system.

Note:

Indicates conditions which must be met, or procedures which must be followed, to ensure proper functioning.

Information:

Indicates conditions or procedures that should be followed to ensure proper functioning of the system.

If You Need Assistance

Application Centers are located in Europe, North and South America, the Far East and Australia to provide direct engineering support. For more information, please contact your nearest TIRIS Sales and Application Center. The contact addresses can be found on our home page: http://www.tiris.com.

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CHAPTER 1

Introduction

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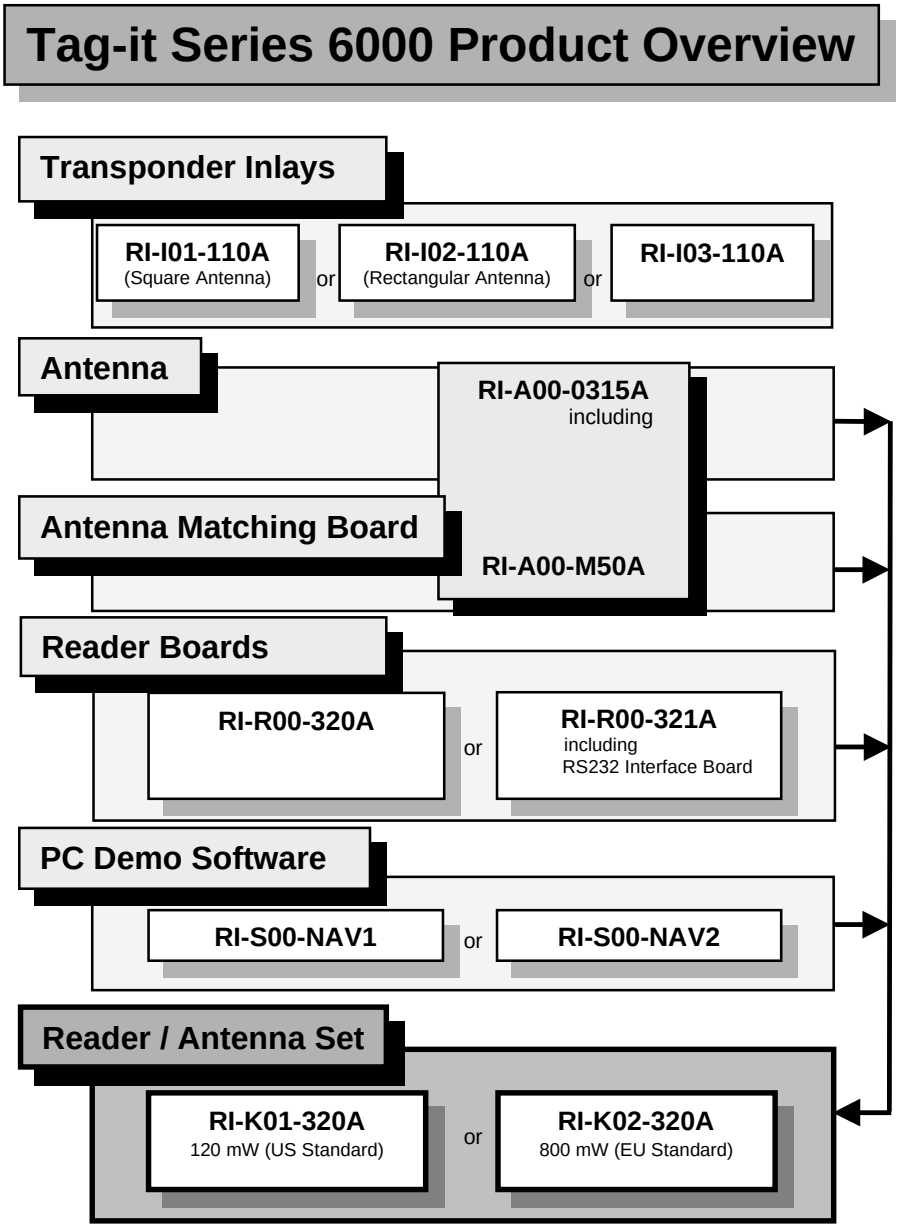
1.1 General

The Tag-it Reader / Antenna Set is intended to serve as a ready-to-use reader system for demonstration purposes or application installations where this particular form factor and performance is suitable. The read / write distance is determined by the size of the integrated antenna as well as by the power level that has been limited to meet emission constrains as required by the appropriate PTT approvals.

1.2 Tag-it System

The following Chart “Tag-it System” shows the major Tag-it System product components and how they are integrated in the Reader / Antenna Set.

Figure 1 Tag-it System



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Tag-it Reader / Antenna Set

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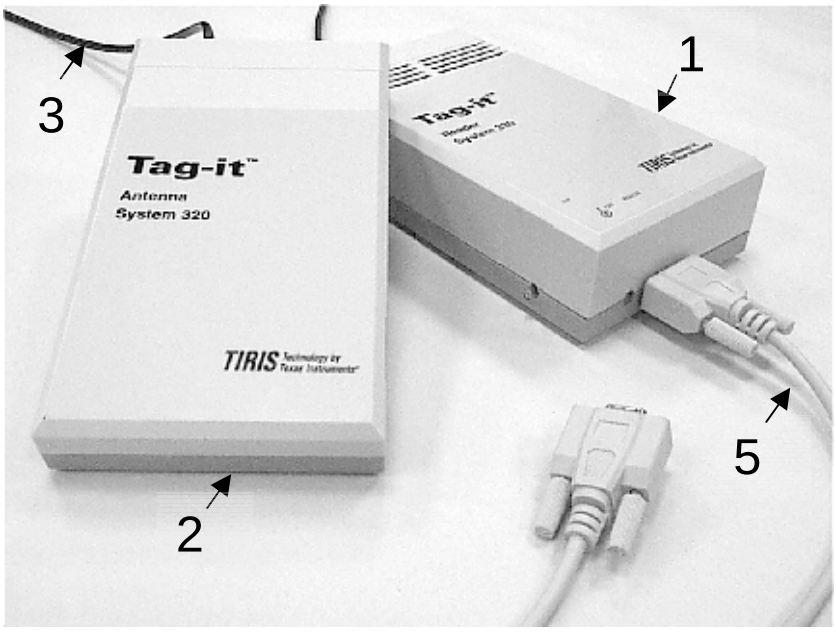
2.1 Product Description

The TIRIS Tag-it Reader / Antenna Set consists of an antenna box and a housed reader which is controlled by a host system to communicate with individual transponder tags. The host system can either be a PC, any other computer, or some other kind of intelligent device (e.g. ticket printer). The integrated control module provides functionality for linking with host computer system (via RS232 interface) as well as reading or writing transponder signals.

Figure 2 Tag-it Reader / Antenna Set



The Tag-it Reader / Antenna Set consists of:

1 Reader

2 Antenna

3 Antenna cable

4 Navigator software (RI-S00-NAV1 or RI-S00-NAV2) not shown

5 RS232 interface cable (not included)

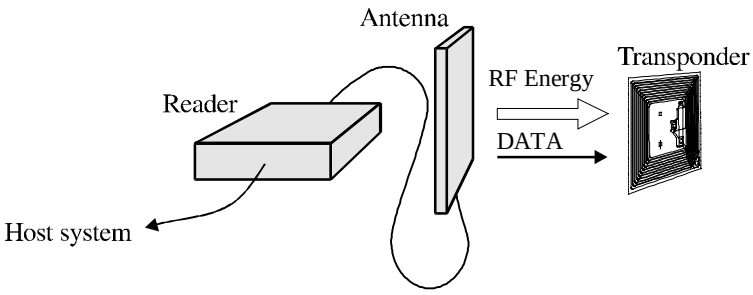
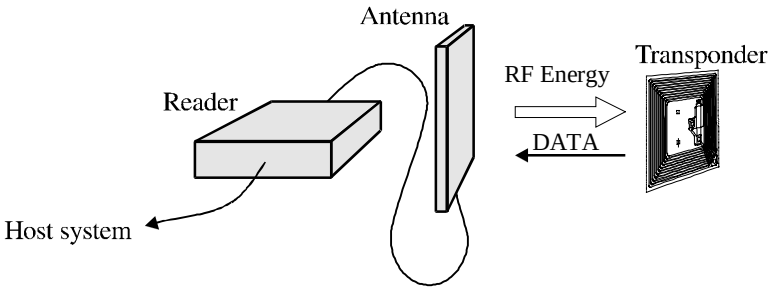
In order to meet PTT regulations, the reader and the antenna are inseparably connected by antenna cable.

Note:

Specifications for communication between the Tag-it Reader / Antenna Set and the host system are available in the Tag-it Host Protocol Reference Manual (11-04-21-001).

2.2 Functional Description

Figure 3 Communication

	**Communication Reader-to-Tag** The frequency transmitted by the antenna is used to supply the tag with operating energy and to transmit data from Reader to Tag.
	**Communication Tag-to-Reader** The tag derives the operating energy from the transmitted frequency to respond to the reader and return requested data. The antenna receives the coded signal from the tag and the reader starts communication with the host system.

2.3 Tag-it Navigator™ Software

For controlling the Tag-it Reader it is recommended to use the Tag-it Navigator, a utility and demonstration program provided by TI.

The Tag-it Navigator is a Windows® program (WIN 3.1, WIN95) capable of communicating with Tag-it Reader via a standard serial interface. It supports the Host Protocol implemented in the reader, allowing all supported commands to be executed, for example writing and reading data to and from Tag-it transponders.

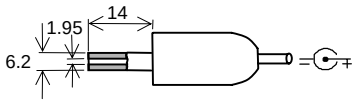
Tag-it Navigator is a tool which can be employed to assist in reader setup, tuning, or diagnosis. Additionally it can log transponder responses for initial experimentation and testing with the Tag-it system. It provides data and time information, and can display the acquired data in a number of different formats.

2.4 Installation

2.4.1 What you will need

- Linear regulated Power supply 12 V ± 5 % and min. 2 A with low voltage connector.

Figure 4 Low Voltage Connector (dimensions in mm)



- PC with RS232 Interface (male) and installed software for example: Tag-it Navigator (RI-S00-NAV1 or RI-S00-NAV2).
- RS232 Interface cable (9 Pin Sub-D connectors – both female).

2.4.2 Attaching Cables

- Connect the host (PC) to the RS232 Interface communication port.
- Attach the power supply.

CAUTION:

Make sure the power reader supply is switched to “OFF” before connecting the power cable.

2.4.3 References

For further information please see also the Tag-it Reader System Series 6000 Reader Modules Reference Guide (11-06-21-048).

2.5 Operation

2.5.1 Hardware Setup

- Install Reader as described in chapter 2.3.
- Switch on reader by pushing yellow button switch located on left side of the reader housing. Switch will be illuminated. If this is not the case, check power supply and correct connection.

2.5.2 Software Setup

- Install the Tag-it Navigator software by running the .exe-file that is provided on diskette or downloaded from the TIRIS Internet Support page. This will also create an icon "**Tagitnav**" on the Windows screen.
- After switching on the reader, start Navigator by double clicking the icon.
- If the connection with your PC is through an other communications port than COM1, the settings need to be changed throughout the "**Navigator Setup**" function that can be found in the "**Options**" pull down menu.
- Select the required **read or write** function and mode from the Navigator pull-down menus.
- A full description of the Navigator software and the available functions are implemented in the Help function that can be displayed from the Navigator screen using the Help pull-down menu.

2.6 Application

- As Tag-it tags are brought into the area around the antenna box, the retrieved ID numbers are displayed on the PC screen.
- Similarly, data can be written to the tag by entering it on the PC under the appropriate write option.
- The distance in which the tag can be read or written depends on the orientation towards the antenna. Best performance is achieved with the tag oriented parallel to the antenna housing and directly above or below the center of the antenna.

CHAPTER 3

Technical Data

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3.1 General

The specifications shown below apply to the following Tag-it Reader / Antenna Sets.

3.2 Specification Summary

Table 1 Specification Summary

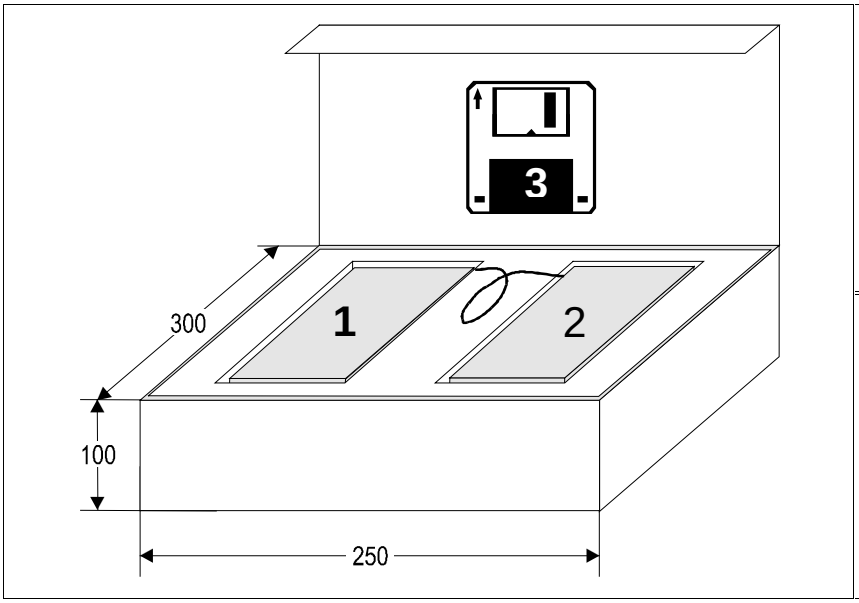
		RI-K01-320A	RI-K02-320A
Electrical Data			
RF power output		120 mW RF-output	800 mW RF-output
Operating frequency		F_c: 13.56 MHz	
Power change over operating temperature range		2dB max	
Antenna bandwidth		1 MHz @-3dB	
Antenna impedance		50 Ω at 13.56 MHz	
Return loss		20dB or better (VSWR<1:1.222)	
Antenna cable length		140 cm ± 5 cm	
Transmitter modulation		Pulse width coded, AM 100%; on-off ratio greater 40dB	
Receive frequencies and bit modulation		Manchester coded A = f_c ± 423.75 kHz; B = f_c ±484.29 kHz Low bit: transition A to B High bit: transition B to A	
Receiver sensitivity		Better –60dBm @20dBs/n; bit error rate 10^{-4}	
Operating voltage		12 V ± 5%; Low voltage, ∅ 6.6 mm; ∅ Pin = 1.90 mm	
Current consumption @ 12V:	Active typical	570 mA	850 mA
	Standby typical (transmitter off)	470 mA	650 mA
Read range			
Transponder Type RI-I01-0110A		Typical 13 cm	typical 16 cm
Transponder Type RI-I02-0110A		Typical 19 cm	typical 22 cm
Interfaces			
Power		Low voltage, ∅ Pin = 1.90 mm; ∅ 6.6 mm; depth 14 mm	
RS232 Interface		9-pin, Sub D (male)	

Environmental Data		
Operating temperatures	-20 to +55^0 C	
Storage temperatures	-40 to +80^0 C	
Vibration	Suited for static application	
Overall Dimensions (excluding connectors and switch protrusions) and Weight		
	Reader	Antenna
Dimensions	200 x 112 x 50 (mm)	200 x 112 x 30 (mm)
Weight	~ 470 g	~ 300 g
Antenna Cable Length	1.40 m	

3.3 Packing

The Reader / Antenna Set is shipped in a standard packing box. The data provided below should only be viewed as guide values. Please see the packing lists enclosed with the delivery for exact shipping data.

Figure 5 Packing



1 Reader:
200 x 112 x 50 mm
(78.74 x 44.09 x 19.69 in)

2 Antenna:
200 x 112 x 30 mm
(78.74 x 44.09 x 11.81 in)

3 Software Tag-it Navigator

Box Dimension:

250 x 300 x 100 mm
(98.43 x 118.11 x 39.37 in)

Weight: ~ 1 kg

3.4 Storage

The following conditions must be ensured when storing the Reader / Antenna Set for longer periods:

- store only in dry rooms,
- storage temperature is –40 °C to +80 °C

CHAPTER 4

Regulatory, Safety and Warranty Notices

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4.1 General

The Reader / Antenna Set has been manufactured using state-of-the-art technology in accordance with the recognized safety rules.

Observe precautions in operating instructions

- Important for the safe use and fault-free operation of the Reader / Antenna Set is the knowledge of and compliance to the appropriate safety regulations.
- The reference guide and particularly the safety precautions must be considered by all persons who work with the Reader / Antenna Set.

In addition, basic rules and regulations for accident prevention applicable to the site where the system is operated must also be reconsidered.

4.2 Regulatory Notes

The Tag-it system comprises a RF transmission device, and is therefore subject to national and international regulations.

TI has obtained approvals from approval authorities in a number of countries and is continuing to apply for approvals in further countries. Actual status can be advised by TIRIS sales offices.

In countries where approval has not been obtained, this system may be operated only under an experimental license issued by the relevant approval authority and must not be marketed. Before any such device or system can be marketed, an equipment authorization must be obtained form the relevant approval authority.

4.2.1 FCC Notices (U.S.A.)

This equipment (RI-K01-320A) has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Modifications to this device shall not be made without the written consent of Texas Instruments Incorporated. Unauthorized modifications may void the authority granted under Federal Communications Commission Rules permitting the operation of this device.

4.2.2 CE Conformity

A CE Declaration of Conformity is available for this Tag-it system through TIRIS Sales Offices.

Any device or system incorporating the Tag-it reader system, in full or in part, in any other than the originally tested configuration needs to be verified against the European EMC directive. A separate Declaration of Conformity must be issued by the System Integrator or user of such a system prior to marketing and operating it in European Community.

4.3 Safety Precautions

4.3.1 Human Safety

A Tag-it system RI-K02-320A-01 (800 mW) has been tested against the following standards regarding human safety in electromagnetic fields, including the effect on persons wearing implanted pace makers:

- DIN VDE 0848, part 2
- IEEE / ANSI C95.1-1991

TÜV Product Service has confirmed that the tested system meets the requirements in accordance with these standards.

In case of RI-K02-320A-01 the operator of the system needs to install means that prevent exposure of persons to the antenna field at distances of less than 45 cm. This addresses the unlikely case of impact on old pace makers that have not been produced according to current standards (EN 50061/A1). In other cases, a distance of 20 cm is sufficient.

WARNING:

Customers using the Tag-it Reader / Antenna Set are responsible for operating their system under implemented power levels and antenna configurations against relevant standards for human safety in electronic fields. Any implementation of the system that varies from the tested configuration (e.g. changes in antenna size or power output) are known to impact conformance and must be re-tested to assure safety.

4.3.2 Application Restrictions

CAUTION:

These readers are designed for integration in application systems for static installation. Prevention of vibration is strongly recommended.

CAUTION:

When integrating these readers into housings appropriate means of cooling may be necessary in order to prevent that the combination of environmental temperature and heat generated by the reader board will not exceed the specified operating temperature.

4.4 Warranty and Liability

The "General Conditions of Sale and Delivery" of Texas Instruments Incorporated apply. Warranty and liability claims for injuries to persons and property damages are void if they are the result of one or more of the following causes:

- improper use of the Readers
- unauthorized assembly, operation and maintenance of the Readers
- operation of the Readers with defective and/or non-functioning safety and protective equipment
- failure to comply to the instructions during transport, storage, assembly, operation, maintenance and setting up of the Readers
- unauthorized changes to the Readers
- insufficient monitoring of the Readers' operation or environmental conditions
- improperly conducted repairs
- catastrophes caused by foreign bodies and acts of God.