1422E Reader

User Guide

16-0058-001 Rev B (X3) 9/17

Purpose of This Guide

This user guide is intended for skilled personnel (including trained technicians and engineers) to provide information for initializing the AI1422E Reader System. This guide provides on-site test procedures useful in troubleshooting, as well as AI1422E command codes and information on character translation.

TRANSCORE
Trusted Transportation Solutions

Information in this document is subject to change and does not represent a commitment on the part of TransCore, LP.

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Phone: (949) 453-7198

Licensing Requirements

To operate a radio frequency (RF) system in a given country, the user must first obtain permission from the regulatory agency that controls radio operations in that country. Most countries require type and safety approval, as well as licensing for RF transmitters. Users in all countries should check with the appropriate local authorities for licensing requirements.

U.S. Licensing

This AI1422E Reader System requires an FCC Part 90 license to operate in the U.S. The authorized frequency bands in the U.S. are 902 to 904 MHz and 909.75 to 921.75 MHz.

The user is responsible for filing the FCC license according to FCC regulations. Access the FCC Web site at https://www.fcc.gov/licensing-databases/forms or at wireless.fcc.gov/index.htm?job=online_filing to obtain additional information concerning licensing requirements.

An FCC license provides the user with the legal authorization to operate the RFID systems on the licensed frequencies at the site specified in the license. Only an authorized installer or service technician can set the frequency for the AI1422E Reader System to that specified in the FCC site license.

The FCC license also provides the user with protection and authorization to maintain the system should any other RFID be used in the licensed area after the AI1422E Reader System is installed.

WARNING TO USERS IN THE UNITED STATES

FEDERAL COMMUNICATIONS COMMISSION (FCC)
LOCATION AND MONITORING SERVICE STATEMENT
47 CFR §90.351

NOTE: The user is required to obtain a Part 90 site license from the Federal Communications Commission (FCC) to operate this radio frequency identification (RFID) device in the United States. The FCC ID number is FIHAI1422E. Access the FCC website at www.fcc.gov to obtain additional information concerning licensing requirements.

NOTE: Users in all countries should check with the appropriate local authorities for licensing requirements.

FCC RADIO FREQUENCY INTERFERENCE STATEMENT
47 CFR §15.105(A)

NOTE: This equipment 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 RF energy and may cause harmful interference to radio communications if not installed and used in accordance with the instruction manual. Operating this equipment in a residential area is likely to cause harmful interference, in which case, depending on the laws in effect, the user may be required to correct the interference at their own expense.

NO UNAUTHORIZED MODIFICATIONS
47 CFR §15.21

CAUTION: This equipment may not be modified, altered, or changed in any way without permission. Unauthorized modification may void the equipment authorization from the FCC and will void the warranty.

USE OF SHIELDED CABLES AND GROUNDING
47 CFR §15.27(A)

NOTE: Shielded cables and earth grounding the unit is recommended for this equipment to comply with FCC regulations.

TRANSCORE, LP
USA

AVERTISSEMENT À L'ATTENTION DES UTILISATEURS AUX ÉTATS-UNIS

DÉCLARATION 47 CFR §90.351 (CODE DES RÈGLEMENTS FÉDÉRAUX) DE LA FEDERAL COMMUNICATIONS COMMISSION (FCC) SUR LES SERVICES DE LOCALISATION ET DE CONTRÔLE

REMARQUE : L'utilisateur est tenu d'obtenir une licence d'utilisation sur site Partie 90 auprès de la Federal Communications Commission (FCC) afin de pouvoir utiliser ce dispositif RFID (radio-identification) aux États-Unis ou au Canada. Le numéro d'identification de la FCC est FIHAI1422E.Pour obtenir de plus amples informations concernant les exigences relatives aux licences, prière de consulter le site web de la FCC à www.fcc.gov.

REMARQUE : Il est recommandé à tous les utilisateurs, quel que soit leur pays, de consulter les autorités locales compétentes sur les exigences de licence.

DÉCLARATION 47 CFR §15.105(A) DE LA FCC SUR LES INTERFÉRENCES DES FRÉQUENCES RADIO

REMARQUE : Cet appareil a été testé et déclaré conforme à la catégorie d'un appareil numérique de classe A en accord avec la partie 15 des directives de la FCC. Ces normes visent à assurer une protection raisonnable contre les interférences nuisibles lorsque l'appareil est utilisé dans un environnement commercial. Cet appareil génère, utilise et peut émettre de l'énergie RF et peut être à l'origine d'interférences nuisibles aux communications radio s'il n'est pas installé et utilisé en suivant les directives du manuel d'instructions. Si cet appareil est utilisé dans une zone résidentielle, il est probable qu'il cause des interférences nuisibles. Dans ce cas, l'utilisateur pourrait être amené à remédier aux interférences à ses propres frais, selon les lois du pays en vigueur.

AUCUNE MODIFICATION NON AUTORISÉE 47 CFR §15.21

MISE EN GARDE : Il est interdit de modifier, d'altérer ou d'apporter des changements à cet appareil de quelque manière que ce soit sans autorisation. Toute modification non autorisée peut annuler l'autorisation d'utilisation accordée par la FCC et annulera la garantie.

UTILISATION DE CÂBLES BLINDÉS ET MISE À LA TERRE 47 CFR §15.27(A)

REMARQUE : Il est recommandé d'utiliser des câbles blindés et une mise à la terre avec cet appareil afin de répondre aux réglementations de la FCC

TRANSCORE, LP
ÉTATS-UNIS

RADIO FREQUENCY HEALTH LIMITS FOR AI1422 READER USING AN EXTERNAL ANTENNA IN FREQUENCY BAND OF 902.25 TO 903.75 AND 910.00 TO 921.50 MHZ

Several agencies (OSHA, FCC, IC) have environmental guidelines regulating maximum permissible exposure (MPE) or "safe" exposure levels that this product falls under. To ensure that proper safety guideline for the end users of this product, i.e. Occupational (Controlled) and General Population/Public (Uncontrolled), the recommended levels for each of the agencies are presented in the next sections with TransCore's recommendations for safety in the last section.

OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION)

OSHA (an agency of The United States of America) legislates in the Code of Federal Regulations (CFR) Title 29 Part 1910 Subpart G 1910.97 titled "Nonionizing radiation", a maximum safe exposure limit of 10 milliwatts per square centimeter (mW/cm^2) during any 0.1-hour period (i.e. 6 minutes). Using the frequency (in the middle of the band of operation of this equipment) of 915 MHz and the highest antenna gain that this equipment is certified for use in a final installation, the minimum safe distance was calculated to be 8in (20cm).

FCC (FEDERAL COMMUNICATION COMMISSION)

FCC (an agency of The United States of America) legislates in the Code of Federal Regulations (CFR) Title 47 Chapter I Subchapter A Part 1 Subpart I Section 1.1310 titled "Radiofrequency radiation exposure limits" that the maximum permissible exposure (MPE) is the following:

Occupational/Controlled Exposure

Power density = frequency(in MHz)/300 mW/cm^2 with an Averaging time of 6 Min

General Population/Uncontrolled Exposure

Power density = frequency(in MHz)/1500 mW/cm^2 with an Averaging time of 30 Min

Using the frequency (in the middle of the band of operation of this equipment) of 915MHz and the highest antenna gain that this equipment is certified for use in a final installation, the minimum safe distance was calculated. The MPE minimum distances are 14in (36cm) for the Occupational/Controlled environment, and 31.5in (80.5cm) for the General Population/Uncontrolled environment.

INDUSTRY CANADA (INNOVATION, SCIENCE AND ECONOMIC DEVELOPMENT CANADA)

Industry Canada (a Department of the Government of Canada) sets out the requirements in Radio Standards Specification RSS-102, Issue 5 guidelines, recommending a maximum safe power density in W/m^2. Thus, the maximum permissible exposure for general population/uncontrolled exposure at 915MHz is 2.77 W/m^2. The average time is 6 minutes. The maximum permissible exposure (MPE) is the following:

Controlled Environment

*Power density = 0.6455*frequency(in MHz)$^{0.5}$ W/m^2 with a Reference Period time of 6 Min*

General Public/Uncontrolled Environment

*Power density = 0.02619*frequency(in MHz)$^{0.6834}$ W/m^2 with a Reference Period time of 6 Min*

Using the frequency (in the middle of the band of operation of this equipment) of 915MHz and the highest antenna gain that this equipment is certified for use in a final installation, the minimum safe distance was calculated. The MPE minimum distances are 18in (45cm) for the Controlled environment and 47in (120cm) for the General Public/Uncontrolled environment.

TRANSCORE RECOMMENDATION ON MPE (MAXIMUM PERMISSIBLE EXPOSURE)

The calculated power densities and MPE distance for each of the agencies respective to the environment is shown below.

With the equipment installed and running at the maximum transmit power of 2.0W (33dBm), 0 dB transmit attenuation, using the highest gain antenna that the equipment is certified for, the recommendation for each of the operation environments is as follows:

1) The antenna should be installed at least 47in (120cm) from the General Population/Public i.e. Uncontrolled Environment.

2) Maintenance personnel (i.e. Occupational/Controlled Environment) must remain at least 18in (45cm) from the antenna and limit their time in the environment to 6 minutes when the system is operating.

Occupational/Controlled Environment				
Agency	Power Density (mW/cm^2)	MPE minimum distance		Time (min)
		in	cm	
OSHA	10	8	20	6
FCC	3.05	14	36	6
IC	1.95	18	45	6

General Population/Public/Uncontrolled Environment				
Agency	Power Density (mW/cm^2)	MPE minimum distance		Time (min)
		In	cm	
OSHA	10	8	20	6
FCC	0.61	31.5	80	30
IC	0.28	47	120	6

LIMITES D'EXPOSITION AUX RADIOFRÉQUENCES POUR LE LECTEUR AI1422 UTILISANT UNE ANTENNE EXTERNE SUR LA BANDE DE FRÉQUENCES DE 902.25 À 903.75 ET DE 910.00 À 921.50 MHZ

Plusieurs organismes (OSHA, FCC, IC) publient des directives environnementales qui recommandent des limites d'exposition maximale autorisée (normes MPE) ou des niveaux d'exposition « sûrs » auxquels cet appareil se conforme. Pour faire en sorte que chaque utilisateur final ait connaissance des directives de sécurité qui le concerne, que ce soit dans son travail (accès contrôlé) ou pour la population générale/le grand public (accès non contrôlé), TransCore présente les niveaux recommandés par chaque organisme dans ses recommandations sécuritaires détaillées dans la dernière section.

OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION)

Dans le Code des réglementations fédérales (CFR), Titre 29, Partie 1910, Sous-partie G 1910.97, intitulée « Nonionizing radiation » (Rayonnements non ionisants), l'OSHA (organisme américain) recommande un plafond d'exposition maximale de 10 milliwatts par centimètre carré (mW/cm^2) pendant une période de 0,1 heure (soit 6 minutes). En utilisant la fréquence de 915 MHz (milieu de la bande de fréquences de cet appareil) et le gain d'antenne maximal pour lequel cet appareil a reçu une certification d'utilisation dans une installation finale, la distance minimale sécuritaire est de 20 cm (8 po).

FCC (FEDERAL COMMUNICATION COMMISSION)

Dans le Code des réglementations fédérales (CFR), Titre 47, Chapitre I, Sous-chapitre A, Partie 1, Sous-partie I, Section 1.1310 intitulée « Radiofrequency radiation exposure limits » (Limites d'exposition aux rayonnements de radiofréquence), la FCC (organisme américain) établit les limites d'exposition maximale autorisée (normes MPE) comme suit :

Exposition professionnelle/contrôlée

Densité de puissance = fréquence (en MHz)/300 mW/cm^2 avec une durée moyenne de 6 min.

Exposition de la population générale/non contrôlée

Densité de puissance = fréquence (en MHz)/1500 mW/cm^2 avec une durée moyenne de 30 min.

En utilisant la fréquence de 915 MHz (milieu de la bande de fréquences de cet appareil) et le gain d'antenne maximal pour lequel cet appareil a reçu une certification d'utilisation dans une installation finale, la distance minimale sécuritaire est la suivante : les distances MPE minimales sont de 36 cm (14 po) pour l'environnement professionnel/contrôlé et de 80,5 cm (31,5 po) pour la population générale/environnement non contrôlé.

INDUSTRIE CANADA (INNOVATION, SCIENCES ET DÉVELOPPEMENT ÉCONOMIQUE CANADA)

Le Cahier des charges sur les normes radioélectriques 102, 5^e édition, d'Industrie Canada (un ministère du Gouvernement du Canada) établit des recommandations pour une densité de puissance maximale sécuritaire en W/m^2. Ainsi, l'exposition maximale admissible pour la population générale/non contrôlée à 915 MHz est calculée à 2,77 W/m^2. La durée moyenne est de 6 minutes. Les limites d'exposition maximale autorisée (normes MPE) sont les suivantes :

Environnement contrôlé

*Densité de puissance = 0,6455*fréquence (en MHz)^{0,5} W/m^2 avec une durée de référence de 6 min.*

Grand public/environnement non contrôlé

*Densité de puissance = 0,02619*fréquence (en MHz)^{0,6834} W/m^2 avec une durée de référence de 6 min.*

En utilisant la fréquence de 915 MHz (milieu de la bande de fréquences de cet appareil) et le gain d'antenne maximal pour lequel cet appareil a reçu une certification d'utilisation dans une installation finale, la distance minimale sécuritaire est la suivante : les distances MPE minimales sont de 45 cm (18 po) pour l'environnement professionnel/contrôlé et de 120 cm (47 po) pour le grand public/environnement non contrôlé.

RECOMMANDATIONS DE TRANSCORE SUR LES LIMITES D'EXPOSITION MAXIMALE AUTORISÉE (NORMES MPE)

Les densités de puissance et la distance MPE calculées par chaque organisme pour un environnement donné sont présentées ci-dessous.

Exposition professionnelle/environnement contrôlé				
Organisme	Densité de puissance (mW/cm^2)	Distance MPE minimale		Durée (en min.)
		po	cm	
OSHA	10	8	20	6
FCC	3,05	14	36	6
IC	1,95	18	45	6

Population générale/environnement non contrôlé				
Organisme	Densité de puissance (mW/cm^2)	Distance MPE minimale		Durée (en min.)
		po	cm	
OSHA	10	8	20	6
FCC	0,61	31,5	80	30
IC	0,28	47	120	6

Avec l'appareil installé et fonctionnant à la puissance de transmission maximale de 2,0 W (33 dBm), 0 dB d'atténuation de transmission, et en utilisant le gain d'antenne maximal pour lequel l'appareil a reçu une certification, les recommandations pour chaque environnement d'exploitation sont les suivantes :

1) L'antenne devrait être installée à au moins 120 cm (47 po) de la population générale/du grand public, c'est-à-dire d'un environnement non contrôlé.

2) Le personnel d'entretien (c'est-à-dire dans un environnement professionnel/contrôlé) doit rester à au moins 45 cm (18 po) de l'antenne et limiter son temps d'exposition à 6 minutes lorsque l'appareil est en fonctionnement.

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System Overview

System Overview

The AI1422E Reader System is a microprocessor-controlled, single-antenna unit that uses a unique communications protocol to interface with vehicle identification (ID) equipment.

This reader system uses radio frequency (RF) energy to read data from tags. The AI1422E Reader System then decodes the tag ID information, validates the ID code, and transmits tag data directly to a host processor for real-time data processing and use.

Communications (terminal) programs usually do not provide adequate data processing capability. Your host computer software can be customized to provide the required capabilities.

The AI1422E Reader System consists of the AI1422E Reader, which consists of a reader and RF module, combined with a TransCore antenna, a TransCore tag, a host processor system, and a power source. Figure 1 illustrates a typical reader system configuration.

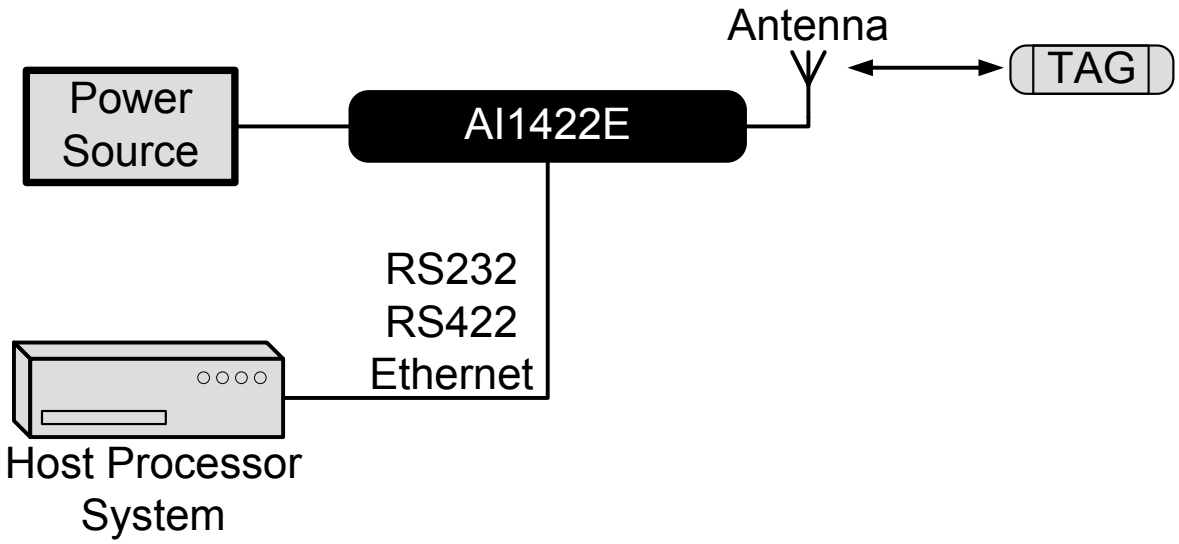

Figure 1 Typical Reader System Configuration

Transponder Interrogator

The transponder interrogator reads 60/120 bits of user-programmable data in the transponder.

The transponder interrogator is operated in a continuous read mode, and any tag entering its read field has its data automatically read and relayed to the host computer. In many applications this function is implemented by installing the reader on a vehicle with restricted movement, such as a railcar or monorail bus. The tags are embedded in the roadway at various locations in the vehicle's path. The data read from the tag allows the host computer to assess the vehicle's location and make any appropriate response to that information.

The transponder interrogator is an independent tag decoder that combines a reader and RF source to provide automatic identification and data storage within a single, compact unit. The transponder interrogator includes the following components:

- 19-inch rack-mount design (1U)
- RS232/RS422/Ethernet input/output (I/O) link
- Real-time clock
- Reader and RF module, combined in one unit

Reader Power Regulation and Filtering

The reader system uses an input voltage ranging from 24VDC to 110VDC (12VDC to 150VDC Min/Max). The AI1422E Reader System incorporates a high-performance, DC-to-DC power supply that converts voltage in this range to 24VDC. This voltage conversion is internal to the unit, and should be transparent to the end-user.

Antenna

TransCore has multiple antennas for use with the AI1422E Reader, covering multiple applications such as heavy rail, light rail, European regions, and more. Contact TransCore for assistance with antenna selection.

Tags (Transponders)

The AI1422E Reader System can use TransCore's half-frame or full-frame read-only tags. When selecting a tag for an application that requires the tag to be placed on the road bed, several design elements need to be kept in mind.

Beam-powered tags have a shorter footprint than battery or switch-powered tags, and thus the maximum top speed of the vehicle will be less, all other factors equal.

Battery tags have an inherently larger footprint, but the battery life limitation will require the operating company to replace the tags every 8 to 10 years. The presence of the battery and its reactive mass reduces the reliability of the tag, particularly when the tag is placed near high shock or vibration locations such as switches.

Switch-powered tags have RF characteristics similar to battery tags, and the tags are powered by inductive power derived from railway switch power.

Tag Mounting

All tags used with the AI1422E must be mounted on a flat metal plate. The internal antennas of these tags are tuned for the backplane of the tag to be in contact with a flat metal surface. This metal surface does not need to be extended beyond the outer dimensions of the tag, and having a larger metal surface will not affect the immediate performance of the tag.

Metal located to the sides or above the tag can affect the tag's performance. Metal surfaces or objects should not be placed closer than 1 inch (2.5 cm) to the side edges of the tag to ensure that the tag's antenna tuning remains within design criteria. Metal placed above the tag can cause shadowing of the RF beam, both in the incident and return directions, and should be avoided. The only exception to this rule would be metal placed for the purpose of affecting the read range of the tag or footprint of the system, and the placement of such metal should be done with careful planning and testing to ensure proper system performance. With battery-powered tags, the arrangement of intentional metallic obstructions may be the best way to limit the broad footprint of these tags, as well as improve the repeatability of the TLS signal with respect to its absolute position relative to the tag. These tag mounting details would need to be made by the customer on the basis of each customer's overall system design and requirements. Keep in mind that metal placed too close in proximity to the tag will affect the tag's antenna tuning, and may unintentionally affect principal design parameters such as VSWR or the impedance match of single paths internal to the tag, to name a few examples.

Antenna-to-Tag Centerline Alignment

For best performance, mount tags so that the centerline of the tags and the centerline of the reader antennas are within ±2.9 inches (±7.5 cm) of each other (Figure 2).

Antenna-to-tag Distance

Many installations have been installed with a nominal 11.8-inch (30-cm) distance from the backplane of the reader antenna to the back edge of the tag (Figure 2).

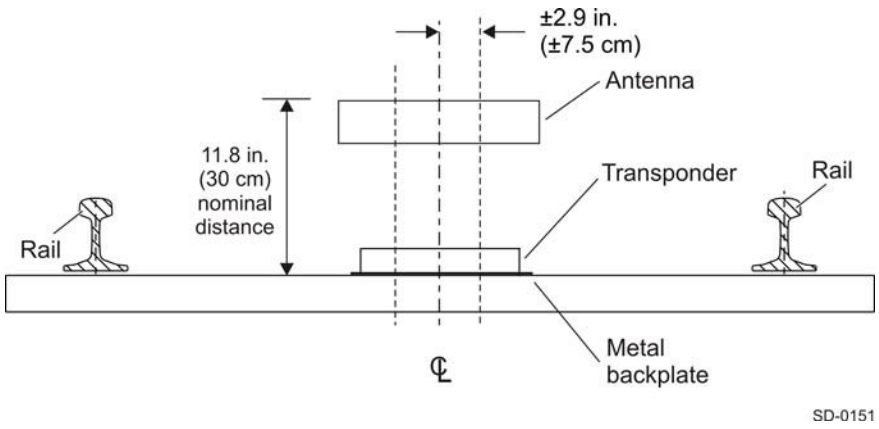

Figure 2 Antenna-to-Tag Centerline Tolerance

2

Interface Connections

Description of AI1422E Reader System

The interface connectors are located on the AI1422E Reader System front panel as shown in Figure 3.

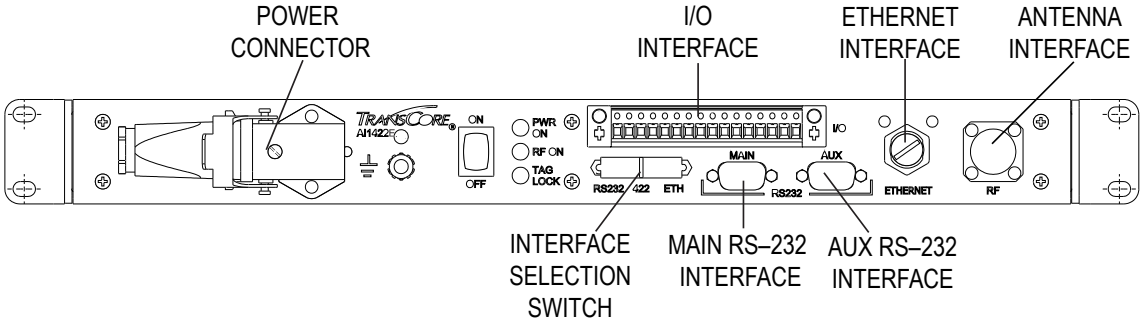

Figure 3 Front Panel of an AI1422E Reader

Antenna Interface

Attach the antenna cable directly to the antenna interface on the front panel of the AI1422E Reader System. The antenna cable length depends on the installation.

Ethernet (M12) Interface

The AI1422E Reader incorporates a Lantronix® Ethernet to Serial conversion module, which is used to add full Ethernet compatibility into the reader. This module is located on the interface board internal to the reader, and is addressable through Lantronix host software. More details on this module can be found in “Appendix C” on page 81.

The Ethernet Interface utilizes a 4-pin, D-coded M12 connector (defined in IEC 61067-2-101 Amendment 1 as the Industrial Ethernet standard). This connector is pin-to-pin compatible with RJ45 10/100Mbps Ethernet.

Figure 4 shows the connector pin designations.

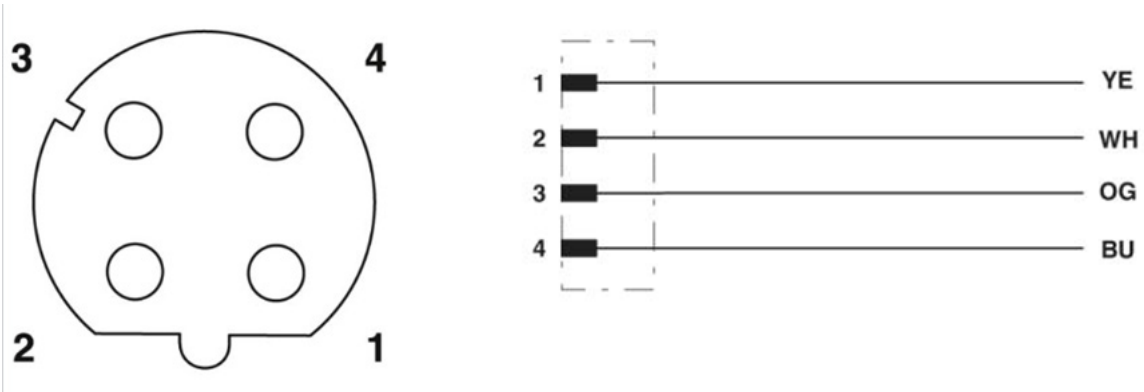

Figure 4 Pin Designations for M12 Connector

Customer I/O Interface

The customer I/O interface connector contains the tag lock, main power, RF Power outputs (solid state), trigger signals (solid state), and RS–422 (Figure 5).

A mating connector for the customer I/O interface is supplied with each unit. This connector allows a screw terminal, point-to-point wiring interface.

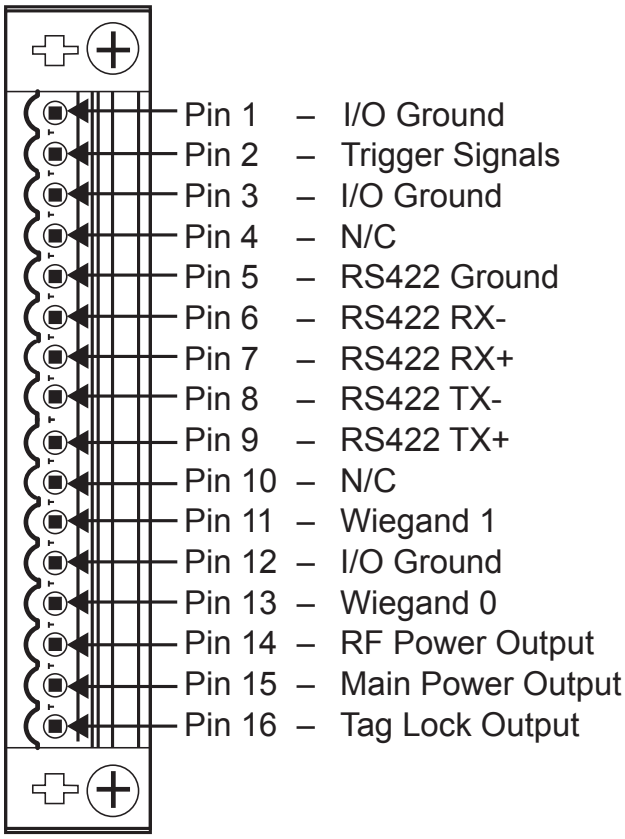

Figure 5 Customer I/O Interface Pin-out

Trigger Signals (Pin 2)

The trigger connection turns on the RF power when shorted to I/O ground and the AI1422E Reader System has been programmed with the RF Follows Trigger command (`!642`).

RS–422 Interface (Pins 5-9)

The RS–422 interface is a terminal block connector. In real-time mode, tag IDs are read and passed on to the host processor.

RF Power Output (Pin 14)

The TTL RF power LED goes active high when the reader system is configured for the RF power to be on and the ON/OFF switch is set to ON. The RF power signal may be connected to an LED for monitoring purposes.

The main power relay is referenced to $5V_{iso}$ and I/O Ground.

Main Power Output (Pin 15)

The TTL main power signal goes active high when the ON/OFF switch on the front panel is switched to on. The main power signal may be connected to an LED for monitoring purposes.

The main power relay is referenced to $5V_{iso}$ and I/O Ground.

Tag Lock Output (Pin 16)

The transistor-transistor-logic (TTL) lock signal shows the presence of a tag. The lock signal goes active high when a valid tag is in the RF field of the antenna and may be connected to an LED for monitoring purposes.

The tag lock relay is referenced to $5V_{iso}$ and I/O Ground. The falling edge of the tag lock signal can be increased by using a 10K ohm resistor.

Power Connector

The power connector on the front panel of the AI1422E Reader System is a panel mount, right angle, EPIC ® HA-3 style 3 pin plus ground rectangular connector.

Interface Selection Switch

The AI1422E Reader incorporates a communications interface selection switch, which allows on-the-fly changes to the communications mode. This switch allows selecting the reader's receive communications interface. All communications interfaces are configured for simultaneous transmit, but only the interface selected by the switch is active for commands transmitted into the reader.

Main RS–232 Interface

The main RS–232 interface is a standard DB–9 plug connector used with a host processor. In real-time mode, tag IDs are read and passed on to the host processor. Figure 6 illustrates the RS–232, DB–9 plug connector pin-outs.

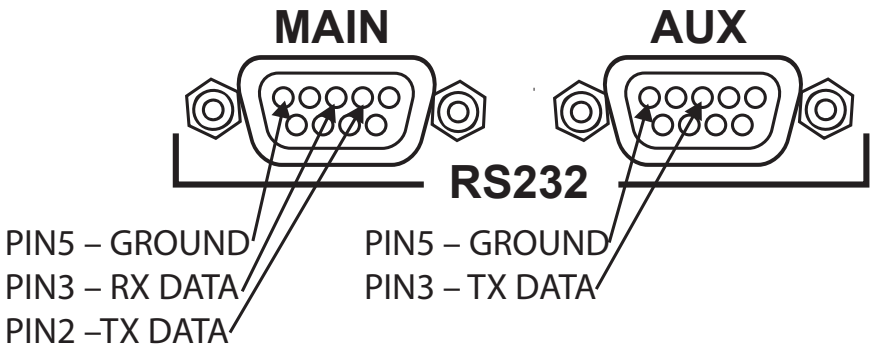

Figure 6 RS–232, DB–9 Interface Connector Pin-outs

Aux RS–232 Interface

The auxiliary RS–232 interface is used as a backup monitoring system to the main RS–232 interface. The auxiliary interface monitors data from the transponder interrogator. The auxiliary RS–232 interface is a standard DE09 plug connector. This port is not wired to receive data and cannot accept commands.

3

Installation Instructions

General

Equipment should be installed and serviced only by skilled, qualified personnel. Equipment should be installed only in RESTRICTED ACCESS LOCATIONS.

Mechanical

The AI1422E has a standard 1U sized hole pattern. For installation, use No. 10 rack US screws and torque to 25-30 in-lbs. For metric, use M6 screws and torque to 3-4 N-m. Refer to Figure 7 for diagram and dimensions.

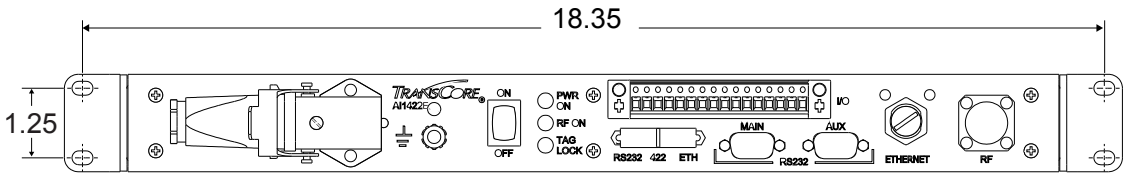

Figure 7 AI 1422E Dimensions

Electrical Power

Assembling the Power Connector

WARNING:** **Ensure that the ON/OFF switch is in the** OFF **position and the** PWR ON **indicator is not illuminated before servicing the unit.

1. Unpack the unit from the shipping crate and locate the power connector on the front panel (Figure 8).

Figure 8 Power Connector

2. Unlatch the plug from the receptacle on the unit and remove it (Figure 9).

Figure 9 Remove Plug from Receptacle

3. Locate the set screw on the plug housing. Remove the screw and plug-insert from the housing (Figure 10).

Figure 10 Remove Screw and Plug Insert

4. Locate the tabs on the plug insert. Squeeze the tabs to remove the wire harness from the insert clip (Figure 11).

Figure 11 Remove Wire Harness from Insert Clip

5. Remove the cable gland assembly from the rear of plug (Figure 12).

Figure 12 Cable Gland Assembly - Rear of Plug

6. Locate the wiring diagram label on the top panel of the 1422E and note the corresponding pin numbering on the plastic of the plug wire harness (Figure 13).

Figure 13 Pin Numbering: Plug Wire Harness

7. Thread the +Vin and -Vin wires through the cable gland, housing, and insert assemblies (Figure 14).

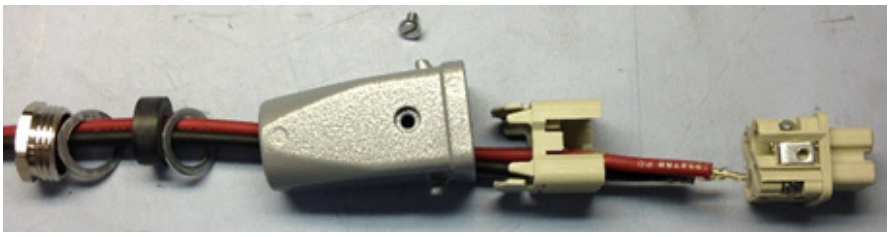

Figure 14 Thread Wires Through Assembly

NOTE: *The Power cable requires an 18 AWG stranded wire or larger, with a minimum insulation rating of 70C and 150V. Wire must meet EN 60950-1 or other applicable component standards.*

An external 10A-rated overcurrent protection device is required in-line with positive terminal for proper system operation and protection. Device must meet EN60950-1 or applicable component standard(s).

8. Loosen the wire retention screws on the wire harness. Insert the wires into their respective pins and tighten the retention screws to ensure wires cannot be removed (Figure 15).

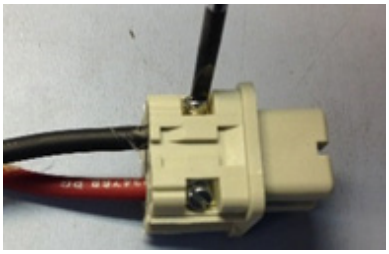

Figure 15 Insert Wires into Pins

9. Insert the wire harness into the insert clip until the tabs click into place (Figure 16).

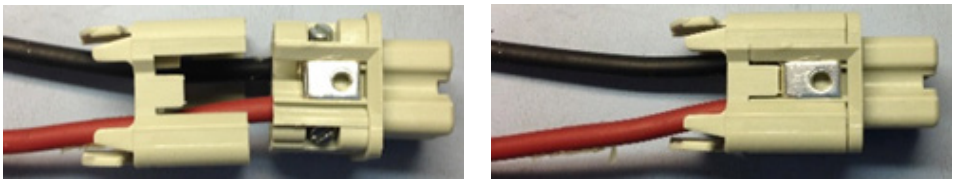

Figure 16 Insert Wire Harness into Insert Clip

10. Place the insert back into the plug housing and tighten the set screw (Figure 17).

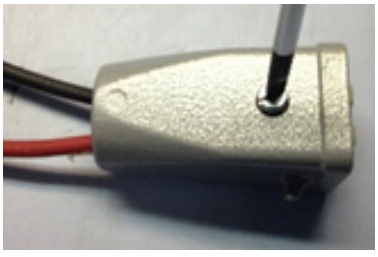

Figure 17 Reassemble and Tighten Set Screw

NOTE: If the set screw will not tighten, remove the insert and ensure the set screw is properly aligned with the hole on the plug housing.

11. Insert the cable gland assembly back into the plug housing. Using a wrench, tighten the gland nut. Connect +Vin and -Vin to the power source (Figure 18).

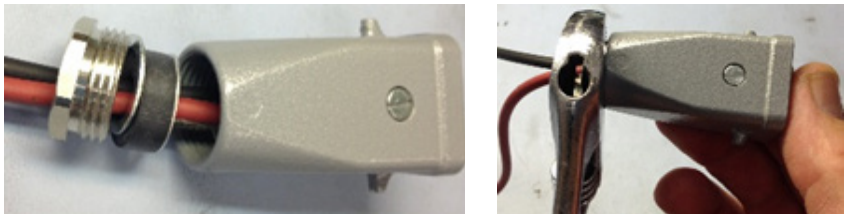

Figure 18 Reassemble Cable Gland Assembly

NOTE: Unit MUST be installed as close to the power source as possible.

Installing Wires into Connector

WARNING: Ensure ON/OFF switch is in* OFF *position and the* PWR ON *indicator is not illuminated before connecting/disconnecting from the power supply.

Connecting power

1. Ensure that the ON/OFF switch is in the **OFF** position (Figure 19).

Figure 19 Power Switch

2. Reinstall the power connector. Press the latch firmly to ensure proper connection (Figure 20).

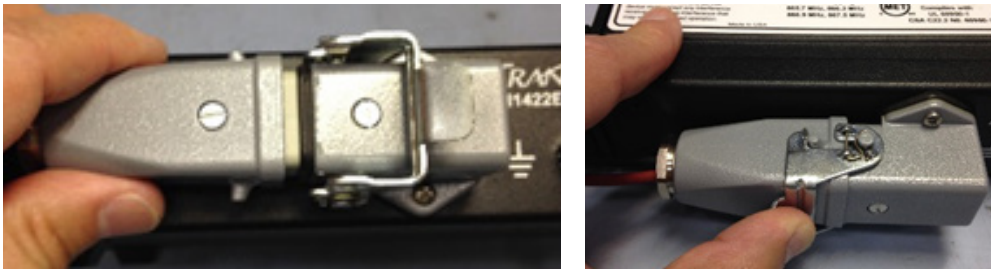

Figure 20 Reinstall Power Connector

3. Toggle the ON/OFF switch to the **ON** position and ensure the **PWR ON** indicator is illuminated (Figure 21).

Figure 21 Power the Unit to ON

Disconnecting power

1. Toggle the ON/OFF switch to the **OFF** position and ensure that the **PWR ON** indicator is not illuminated (Figure 22).

Figure 22 Power the Unit to OFF

2. Unlatch the connector (Figure 23).

Figure 23 Connector Latch

3. Gently remove plug from receptacle (Figure 24).

Figure 24 Remove Plug from Receptacle

Protective Earth Ground Terminal

For safety and proper operation, the 1422E must be properly fastened to a protective earth ground. The ground stud is located on the front panel of the 1422E between the power connector and ON/OFF switch (Figure 25).

Figure 25 Location of Ground Stud

For proper grounding, refer to the diagram in Figure 26.

NOTE: Grounding cable should be 16 AWG or larger

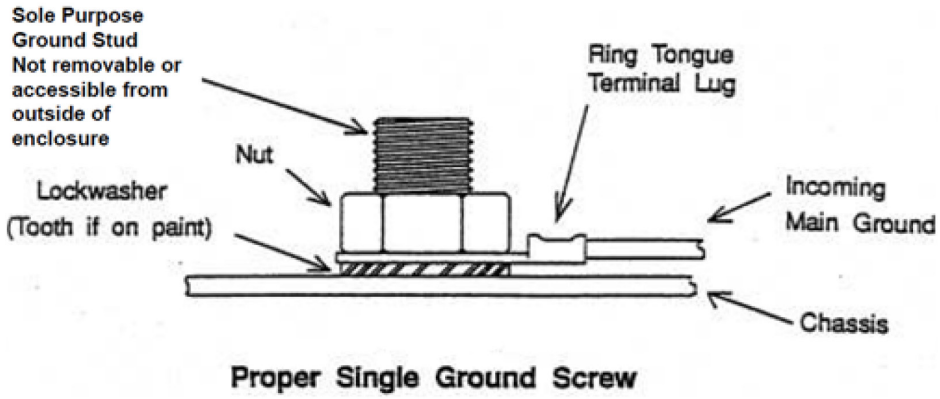

Figure 26 Proper Single Ground Screw Diagram

4

System Test Procedures

System Test Procedures

This chapter provides testing procedures that will help you fine-tune your reader system and test basic operation, measure radio frequency (RF) power, measure system noise, read tags, and monitor the system.

Required Tools and Equipment

The following tools and equipment are required:

- 50-ohm, 5-watt (W) load (N-type connector)
- Personal computer (PC) with terminal emulator software
- Appropriate power source for your reader
- Digital multimeter
- Antenna, cable, and connectors

Testing Basic Operation

To test the system operation, configure the reader system as follows:

1. Configure a terminal emulator (a PC using communications software) to 9600 baud, no parity, 8 data bits, and 1 stop bit (factory default settings for the reader).
2. Connect the emulator to the main RS–232 interface located on the front panel of the reader system.
3. Slide the Interface Selection switch on the front panel of the reader to **RS–232.**
4. Toggle the ON/OFF switch located on the front panel of the reader system to **off.**
5. Connect a power source to pins 1 (+) and 3 (-) on the DC power input front panel connector (Figure 27).

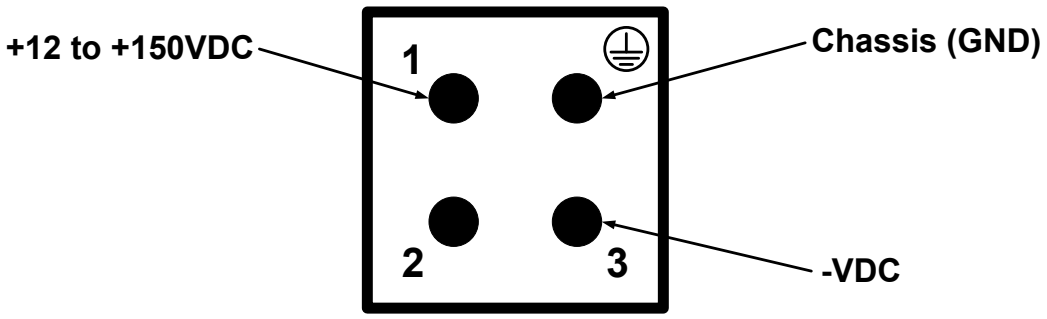

Figure 27 Power Source Connections

6. Toggle the ON/OFF switch located on the front panel of the reader system to **off**.
7. Enter the command `!01` or `~~CC` (`CC` must be entered in upper case) and press **Enter .**

Note: For information on entering command codes, refer to "Communications Protocols" on page 22.

8. Input `!22` and press **Enter .** The time and date will be returned.

   If the time and date are not received, check communications connections, cycle power, and repeat.

If the time and date are incorrect, use `!20` and/or `!21` to correct this information, then input the following commands:

`!20hh:mm:ss`	sets time
`!21MM/DD/YY`	sets date
`!642`	sets RF to follow the trigger
`!41`	enables tag reporting

NOTE: `!41` command should be used in diagnostic mode only. Do not use in normal system operation.

The `entered` command and `!Done` response will be returned after each properly executed command.

Reading the Tag

To verify that the AI1422E Reader System is correctly reading tags:

1. Toggle the ON/OFF switch located on the front panel of the reader system to **off**.
2. Using your own cable, connect the laptop PC to the reader system at the main RS–232 interface.
3. Slide the **Interface Selection switch** on the front panel of the reader to RS–232.
4. Connect the antenna to the antenna interface on the front panel of the reader system.
5. Toggle the ON/OFF switch located on the front panel of the reader system to **on**.
6. Connect a jumper between pins 14 (Ground) and 15 (Trigger Input) on the customer I/O interface to trigger the RF on ("Figure 6 Customer I/O Interface Pin-outs" on page 8).
7. Monitor the LEDs on the box and verify that the main power LED and the RF power LED are illuminated.
8. Position a programmed TransCore half-frame rail tag with a backplate within 2 to 3 feet (0.6 to 0.9 m) of the antenna. No other tag can be in this 2 to 3 foot (0.6 to 0.9 m) area during this test.
9. Verify that the lock LED is illuminated and that the PC is acquiring the tag data.

Note: If the `!41` command was issued prior to this test, the PC will be receiving a continuous stream of tag data. If the `!41` command was not issued, the reader responds with only one response. The Lock LED remains illuminated as long as there is a tag in the field, but only one response is forthcoming unless the `!41` command has been issued.

10. Remove the tag from the antenna field. The PC should stop reading the tag data.
11. Disable the trigger by disconnecting the jumper.
12. Toggle the on/off switch located on the front panel of the reader system to **off.**

Note: Repeat this test several times. Each time, the lock LED should be illuminated and the PC should be reporting the tag data.

5

Communications Protocols

Communications Protocols

The AI1422E Reader supports the following communications protocols:

- Basic
- Error correcting protocol (ECP)

The following protocol information provides reference information relevant to developing host software.

Communications are performed using the 7-bit ASCII code with optional parity, thus providing easy setup, testing, and diagnostics with standard ASCII terminals and serial printers. Parity must be enabled to achieve the specified undetected error rate.

Each message is framed within the start-of-message (som) and end-of-message (eom) characters so that the host computer can detect the beginning and end of each message. This convention is most important under marginal communications conditions during which the host may receive extraneous noise-induced characters between reader transmissions. In such instances, the host is capable of ignoring any messages that do not conform to the som...eom frame sequence.

Both data mode and command mode require a two-way message interchange when using ECP. This interchange is completed by the message recipient returning a message acknowledgment to the message sender.

With ECP, all transmissions require a message. If a message is not received, the sender will time out with the same effect as if it had received a negative acknowledgment (from the host) or an Error message from the AI1422E Reader.

Software (XON/XOFF) flow control is optionally supported. Be careful in the use of XON/XOFF since noise-induced characters may be interpreted by the AI1422E Reader as the XOFF character, which would suspend reader output without information reaching the host computer. For more information refer to “525 Display Communications Protocol Status” on page 40.

Note: TransCore recommends that XON/XOFF flow control be disabled while using ECP.

Basic Protocol

With basic protocol, messages sent to and from the AI1422E Reader and the host are transmitted without error checking. For each host transmission, the AI1422E Reader returns a Done or Error message to the host.

When the host computer is physically close to the AI1422E Reader and no sources of interference exist, the basic protocol provides reliable communications.

The host must be ready to receive reader-transmitted messages because in basic protocol the AI1422E Reader does not wait for the host to acknowledge a message before transmitting the next message. If necessary, the host may halt reader transmissions by using software or hardware. Refer to “Command Codes” on page 25 for flow control information.

Error Correcting Protocol

When the quality of data communications is imperative or may be suspect, you can invoke ECP to ensure the integrity of data transmitted between the AI1422E Reader and the host.

Note: TransCore recommends that basic protocol (not ECP) be used when commands are entered manually at the keyboard.

Wiegand output is automatically disabled when the reader is put into ECP mode.

Error correction is accomplished with the use of a cyclic redundancy check (CRC) value that is based on the message data. The originator (reader or host) calculates the CRC value of a message and includes it in the transmitted message.

The recipient (reader or host) also calculates a CRC value for the received message. If the transmitted message data is correct, the CRC value calculated by the recipient will agree with the CRC value calculated by the originator. If the CRC values do not agree, the recipient rejects the message.

Message sequence numbers are also included when using ECP. These sequence numbers are checked to determine if the message received has the correct sequence number; if not, the recipient rejects the message.

Since the seven-bit ASCII code is used and there are eight data bits per character, the eighth bit can optionally be used to support parity. Where parity is selected, the CRC value calculation includes the parity of each character in the calculation of the CRC value.

Parity is required to achieve the most reliable communications. If parity is enabled, both the AI1422E Reader and the host must issue a message if any received character has a parity error. However, the message must not be transmitted before receipt of the eom character. In this case, the AI1422E Reader will issue an Error message, and the host computer will issue a negative acknowledgment message.

6

Command Codes

Command Codes

The AI1422E Reader is delivered from the factory with specified default settings that determine how the reader operates. Commands transmitted by the host computer can change the default settings and control additional features. The commands can be transmitted by manually entering the commands at the host keyboard if the host is in terminal emulation mode.

Note: If you are using Wiegand mode, you must connect the PC or laptop to the AI1422E Reader using the RS–232 or RS–422 interface and a terminal emulation program to send commands to the reader. You can leave the Wiegand interface connected during this procedure.

Operating Modes

The AI1422E Reader has three modes of operation: Data Mode, Command Mode, and Download Mode. The software for the AI1422E Reader contains two separate programs — Boot and Application. The Boot program has control of the AI1422E Reader on startup and when operating in download mode. The Application program has control of the AI1422E Reader during a command mode operation and holds the application code. Together, they control the AI1422E Reader in the three modes of operation.

Data Mode

The AI1422E Reader is in Data Mode on power-up. While in Data Mode, the AI1422E Reader sends all communications to the host computer as data messages, such as tag IDs and reports. Reports provide information on Input 0 and Input 1 status changes, a presence without tag report, and buffer overflow information. The host computer can send only four commands to the AI1422E Reader while in Data Mode (Table 1).

Table 1 Data Mode Commands

Data Mode Commands		
Type	**Description**	**Command**
Status Request	Causes the interrogator to respond with a message containing information indicating the rolling transponder seen count and the count of host error messages.	~~@@
Retransmit Request	Requests the interrogator to retransmit the last tag ID read. (BB must be entered in upper case).	~~BB
Enter Command Mode	Disables reading and reporting of tags and changes the reader from Data Mode to Command Mode. (CC must be entered in upper case). Refer to "Switch to Command Mode" on page 32.	~~CC
Enter Command Mode	Disables reading and reporting of tags and changes the reader from Data Mode to Command Mode.	!01

There is no carriage return or line feed required for any of the ~~ commands. Commands !01 require a carriage return.

No Response is received with the ~~CC and !01 commands.

Note: The AI1422E Reader transmits ID codes to the host computer when the AI1422E Reader is in Data Mode. If the AI1422E Reader remains in Command Mode with tags passing through the read zone, all tag IDs are not reported.

Asynchronous Interrogator Data Message

The interrogator sends the transponder ID in 8-bit ASCII. The message format is as follows:

<7EH><7EH><01H><transponder count><transponder ID><CRC>

The interrogator transmits the most significant bit first. The CRC is calculated, starting with the most significant byte.

No Response is received with the ~~CC and !01 commands.

Table 2 presents the field descriptions.

Table 2 Asynchronous Interrogator Tag Data Message Fields

Field	Description	Hex	ASCII
Start of Message	These two bytes, along with the Message type byte, designate the start of the data message.	7E7E	~~
Message Type	An 01H indicates that this message is a tag data message.	01	SOH
Transponder Seen Count	After power-up, this 8-bit count begins with 01 and is updated each time a tag with a unique ID moves out of the RF field, then back into the RF field. This field is useful in determining whether a train has multiple tag reads of a given ID due to a change in the train's direction.	00 - FF	N/A
Transponder ID	The data that is programmed into the transponder. The data within the transponder is 6-bit ASCII but the interrogator translates this data into standard 8-bit ASCII.	-	ID
Cyclical Redundancy Check	An 8-bit cyclical redundancy check (CRC). Includes the Start of Header, the Seen Count and the Transponder ID. Refer to Appendix D for a description of the CRC algorithm. There is no carriage return or line feed for this message.	00 - FF	N/A

Status Request

Note: The Status Request should only be used when the train is stationary. Sending this command simultaneous to tags being read can create a condition whereby the interrogator will no longer report tags until power cycled.

The Status Request command causes the interrogator to respond with a message containing information indicating the transponder seen count and host error messages.

The request command format is as follows:

<7EH><7EH><40H><CRC>

Table 3 Status Request Message Fields

Field	Description	Hex	ASCII
Start of Message	These two bytes designate the start of the data message.	7E7E	~~
Message Type	Sending a 40H indicates that this message is a status request.	40	@
Cyclical Redundancy Check	The 8-bit cyclical redundancy check (CRC) includes the Start of Message and Message Type. See "Appendix D" for a description of the CRC algorithm. This is a fixed value of 40 hexadecimal, for this command. There is no carriage return or line feed for this message.	40	@

The response is

<7EH><7EH><02H><Transponder count><host computer messages-bad CRC><incomplete host message>

<Reserved><Reserved><Reserved><CRC>

Table 4 Status Response Message Fields

Field	Description	Hex	ASCII
Start of Message	These two bytes, along with the Message Type byte, designate the start of the data message.	7E7E	~~
Message Type	An 02H indicates that this message is a status response.	02	STX
Transponder Seen Count	The Transponder Seen Count is a single byte, hexadecimal field. At power-up, the interrogator initializes this Seen Count byte to 00. This value is incremented each time a tag with a unique ID moves out of the RF field, then back into the RF field. This field is useful in determining whether a train has multiple tag reads of a given ID due to a change in the train's direction.	00 - FF	N/A
Number of Messages from Host with Bad CRCs	At power-up, the interrogator initializes this byte with 00. It is incremented each time a message with a bad CRC is received from the Host.	00 - FF	N/A
Number of incomplete Host Messages	At power-up, the interrogator initializes this byte with 00. It is incremented each time an incomplete message is received from the Host.	00 - FF	N/A
Reserved	Reserved	0	NUL
Reserved	Reserved	0	NUL
Reserved	Reserved	0	NUL
Cyclical Redundancy Check	This field is a single byte (8-bits) cyclical redundancy check (CRC). Includes the Start of Message, Message Type, Transponder Seen Count, Number of Messages from Host with bad CRCs, and Number of Incomplete Host Messages. Refer to "Appendix D" for a description of the CRC algorithm. There is no carriage return or line feed for this message.	00 - FF	N/A

Retransmit Request

Note: The Retransmit Request should only be used when the train is stationary. Sending this command simultaneous to tags being read can create a condition whereby the interrogator will no longer report tags until power cycled.

The Retransmit Request Command tells the transponder to retransmit the last tag ID. (BB must be entered in upper case).

The request command format is as follows:

<7EH><7EH><42H><CRC>

Table 5 Retransmit Request Message Fields

Field	Description	Hex	ASCII
Start of Message	These two bytes, along with the Message Type byte, designate the start of the data message.	7E7E	~~
Message Type	Sending a 42H indicates that this message is a retransmit request.	42	B
Cyclical Redundancy Check	An 8-bit cyclical redundancy check (CRC) Includes the Start of Message and Message Type. Refer to "Appendix D" for a description of the CRC algorithm. This is a fixed value of 42 hexadecimal, for this command. There is no carriage return or line feed for this message.	42	B

The response is

<7EH><7EH><01H><transponder count><transponder ID><CRC>

Table 6 Retransmit Response Message Fields

Field	Description	Hex	ASCII
Start of Message	These two bytes, along with the Message Type byte, designate the start of the data message.	7E7E	~~
Message Type	An 01H indicates that this message is a tag data message.	01	SOH
Transponder Seen Count	After power-up, this 8-bit count begins with 01 and is updated each time a tag with a unique ID moves out of the RF field, then back into the RF field. This field is useful in determining whether a train has multiple tag reads of a given ID due to a change in the train's direction.	00 - FF	N/A
Transponder ID	The data that is programmed into the transponder. The data within the transponder is 6-bit ASCII but the interrogator translates this data into standard 8-bit ASCII.	-	ID
Cyclical Redundancy Check	An 8-bit cyclical redundancy check (CRC). Includes the Start of Message, Message Type, Seen Count and Transponder ID. Refer to for a description of the CRC algorithm. There is no carriage return or line feed for this message.	00 - FF	N/A

Command Mode

While the AI1422E Reader is in Command Mode, the host computer sends commands to the AI1422E Reader that can be used to control the operation and configuration of the reader. After the AI1422E Reader receives a command, it transmits a command response message. Typically, the command message contains `Error, Done,` or data relating specifically to the command request. These messages may be of variable length since some commands require information as part of the message.

Communications can be lost if the host computer attempts to send certain commands under marginal communications conditions. For example, if the host computer transmits the command request to change the baud rate and the AI1422E Reader properly receives the request and transmits the `Done` message, one of the two following conditions may occur:

1. If the host computer receives the `Done` message, then both the host and the AI1422E Reader switch to the new baud rate, and communications are maintained.

Note: In many applications, the host must be set to the new baud rate as it will not change automatically. The AI1422E Reader changes the baud rate immediately after issuing the `Done` *message.*

2. if the host does not receive the `Done` message transmitted by the AI1422E Reader, the host assumes that the command was not properly sent and does not switch to the new baud rate, causing a loss of communications.

Caution

The host computer should not attempt to change communications parameters or protocols during marginal communications conditions; otherwise, a loss of communications can result.

Download Mode

In Download Mode, the AI1422E Reader allows the host to download new software.

While in Download Mode, the reader communications port parameters are fixed at the following factory-default settings: 38400 baud, 8 data bits, 1 stop bit, no parity, software flow control (XON/XOFF), basic protocol.

While in Download Mode, the AI1422E Reader turns RF off, does not process tags, and does not echo host commands.

Command List

Reader commands are divided into groups based on primary function. The following sections provide information about each command in command number order. Refer to

"Command Quick Reference" on page 80 for listings of commands in both numerical and alphabetical order.

In the Command Quick Reference list, the symbols < and > represent variable message data. These symbols are not part of the message syntax. Hex digits (0–9, A–F) in either uppercase or lowercase characters may be used in data strings and for hex digits A–F.

Reader Mode Control

Group 0 commands control reader mode. The mode determines whether the reader is transmitting data to or receiving data from a host computer or terminal.

00/662 Switch to Data Mode (Factory Default)

Command `!00` switches the reader to Data Mode, which allows the reader to transmit tag data (ID codes) to the host. In addition to switching the reader to Data Mode, command `!00` automatically saves to non-volatile memory (NVRAM) any user parameters that had been changed during the command mode session. The reader enters Data Mode on power up.

The command `!662` is present for backward compatibility with previous generation AI1422 readers, and is not recommended for use.

Caution

To save user parameter changes to NVRAM, you must send command `!00/!662` ***before powering down the reader.***

Switch to Command Mode

While operating in Data Mode, the reader accepts the following commands:

Command `!01` Switch to Command Mode

Reader response: No Response

Command `~~CC` switches the reader to Command Mode, which allows the reader to accept commands from a host or terminal. While in Command Mode, the reader turns RF off and does not acquire tags.

Reader response: No Response

Communications Port Control

Group 1 commands configure the parameters used by the AI1422E Reader to communicate with a host computer or terminal. These commands set baud rate, stop bits, parity, and end-of-line delay.

100N Select Baud Rate

Command `!100N` selects the reader baud rate. The factory-default setting is 9600 baud. The N variable specifies the baud rate shown in Table 7.

Reader response: `Done`

Table 7 Select Baud Rate Commands

Command	Baud Rate Selected
1002	1200
1003	2400
1004	4800
1005	**9600 (factory default)**
1006	19.2 K
1007	38.4 K

Caution

If ECP is enabled, ensure that the ECP timeout is sufficient for the new baud rate. Refer to "525 Display Communications Protocol Status" on page 45**.**

101N Select Stop Bits

Command `!101N` selects the number of stop bits for reader character transmission. The factory default setting is 1 stop bit. The N variable specifies the number of stop bits as indicated in Table 8.

Reader response: `Done`

Table 8 Select Stop Bits Commands

Command	Stop Bits Selected
1010	**1 (factory default)**
1011	2

102N Select Parity

Command `!102N` selects the reader parity setting. The factory-default setting is parity disabled. The N variable specifies parity as shown in Table 9.

Reader response: `Done`

Table 9 Select Parity Commands

Command	Data Bits	Parity Selected
1020	**8**	**Disable parity (factory default)**
1021	7	Select even parity
1022	7	Select odd parity

Real-time Clock

Group 2 commands control the real-time clock which maintains the AI1422E internal time and date. This time and date can be appended to IDs, error messages, and sensor input reports. An internal battery supports the clock, so time and date are preserved if main power is lost.

20 Set Time

Command `!20` sets the time. Enter the time in the proper format: two-digit decimal entries with no spaces between characters and using colons as delimiters. The entry format is as follows:

`20HH:MM:SS or 20HH:MM:SS:hh`

where

HH	represents hours (00 to 23).
MM	represents minutes (00 to 59).
SS	represents seconds (00 to 59).
hh	represents hundredths of a second (00 to 99).
:	is the time delimiter.

If hundredths of a second is not specified, the reader sets the hundredths register to 00.

Reader response: `Done`

21 Set Date

Command `!21` sets the date. Enter the date in the proper format: two-digit decimal entries with no spaces between characters and using forward slashes "/" as delimiters. The entry format is as follows:

`21MM/DD/YY`

where

MM	represents the month (01 to 12).
DD	represents the day (01 to 31).
YY	represents the last two digits of the year (00 to 99).
/	is the date delimiter.

Reader response: `Done`

22 Display Time and Date

Command `!22` displays the reader's current time and date. One space separates the time and the date output.

Reader response: `HH:MM:SS.hh MM/DD/YY`

where

HH	represents hours.
MM	represents minutes.
SS	represents seconds.
hh	represents hundredths of seconds.
:	is the time delimiter.
MM	represents the month.
DD	represents the day.
YY	represents the last two digits of the year.
/	is the date delimiter.

Append Information

Group `3` commands append useful information to reader transmissions, such as IDs, error messages, and sensor input reports. Auxiliary information such as reader number, antenna number (or manual entry code), number of times the previous tag was read, and sensor input status can be appended to the ID using the Group `3` commands.

30N Append Time and Date Selection

Command `!30N` selects the option of appending the time and date to transmitted IDs, error messages, presence without tag reports, and input status change reports. The factory default setting is time and date appended (command `!302`).

The reader returns an `Error` message if its tag buffer contains data. The reset reader command `!63` may be transmitted to clear the buffer; however, tag ID data will not be reported. If this is unacceptable, allow the buffer to empty before reissuing append time and date command `!30N`. Append Time and Date commands are shown in Table 10.

The reader transmits messages with time and date appended as follows. One space separates the time from the date.

`<string>&<HH:MM:SS.hh MM/DD/YY>`

where

string	is a tag ID, error message, or report.
&	separates <string> from the time and date.
HH:MM:SS	is the time delimiter.
MM/DD/YY	is the date delimiter.

Reader response: `Done`

Table 10 Append Time and Date Commands

Command	Append Option
300	No time and date appended
302	**Time and date appended (factory default)**

31N Append Auxiliary Information Selection

Command `!31N` selects the option of appending auxiliary information to transmitted IDs, presence-without-tag reports, and input status change reports. Auxiliary information is not appended to error messages. The factory default setting is no auxiliary information appended. The N variable specifies whether or not auxiliary information is to be appended. Append Auxiliary Information commands are shown in Table 11.

The reader transmits messages with auxiliary information appended as:

`<message data>%<xx-y-zz-q>`

where

%	separates the auxiliary information and signals the host computer that auxiliary information is appended.
xx	reader ID. Value can be set with command `!60NN`.
-	auxiliary information delimiter
y	antenna number. Value fixed at 0.

zz number of reads (00 to FF hexadecimal) of the previous tag

q current status of Input 0 and Input 1 (0 to 3). Refer to “525 Display Communications Protocol Status” on page 45 These values are inverted if input inversion is enabled with command `6941.`

Reader response: `Done`

Command	Append Option
310	**No auxiliary information appended (factory default)**
311	Auxiliary information appended

Table 11 Append Auxiliary Information Commands

320 Disable EAC Page Append (Factory Default)

`Command !320` is a factory-set default that disables the EAC (embedded application code) page append.

Reader response: `Done`

321 Enable EAC Page Append

Note: This functionality was added to the Encompass® 2 Reader to handle a special unique customer requirement, and is retained in the AI1422E Reader for full backward compatibility.

Command `!321` selects the option to append an additional predefined 8 bytes of data to be read from an eGo® or eGo Plus tag when the reader is in ID only mode (not eATA) and multitag sort is enabled. The additional bytes that are read from the tag are in locations 10 through 17.

The reader transmits the message with EAC page append as follows:

The EAC append data occurs before time and date append data and AUX append data if they are enabled.

`<tag ID>&<EAC page data>`

Reader response: `Done`

ID Filtering

Group 4 commands set criteria for filtering (buffering or discarding) ID codes. These commands are useful for eliminating duplicate ID codes and selecting the type of tags read by the AI1422E Reader.

40 Disable Transmission All ID Codes

Command `!40` instructs the reader to reinstate the previous uniqueness checks.

Reader response: `Done`

41 Transmit All ID Codes

Command `!41` instructs the reader to transmit all IDs without regard for uniqueness. This command can be useful when mapping the footprint or per forming diagnostics.

After diagnostics are complete, you may want to reinstate the uniqueness check using command `!410N` Select Unique ID Code Criteria, or by using `!40` to set reader back to its original setting.

Reader response: `Done`

410N Select Unique ID Code Criteria (Anti-passback Feature)

Command `!410N` instructs the reader to buffer and transmit ID codes according to the following test: an ID is read if previously decoded IDs have changed value at least `N+1` times since the new ID was last received. IDs that do not pass the test are not read. The factory-default setting is command `!4100,` which selects a separation of one ID. Variable `N` specifies ID separation as shown in Table 12.

Each time the reader receives a tag ID, it compares the ID with the contents of a comparison register. This register contains the following four items:

Item 1 Most recently acquired ID

Item 2 Second-most recently acquired ID

Item 3 Third-most recently acquired ID

Item 4 Fourth-most recently acquired ID

When the uniqueness filter is set to separation of one ID, the newly acquired ID is transmitted only if it is different from the first item. Separation of two IDs allows transmission if the new ID is different from Items 1 and 2 in the comparison register.

Separation of three and four IDs transmit the new ID only if it is different from the first three and the first four items, respectively.

Note: A new ID can fail the filter test and not be transmitted; however, it remains stored in the comparison register.

The uniqueness test's time limit is set by Command `!441`. If an ID is buffered, it will not be accepted again unless it arrives at the reader more than the programmed time interval from the previous arrival or until the receipt of one or more other IDs reset the uniqueness.

Reader response: `Done`

Table 12 Unique ID Code Criteria

Command	Uniqueness Criteria
4100	**Separation of 1 ID (factory default)**
4101	Separation of 2 IDs
4102	Separation of 3 IDs
4103	Separation of 4 IDs

420N Select Valid ID Code Criteria

Command `!420N` directs the reader to validate an ID received only after it has been obtained a specified number of times in sequence. Values for N are 0 through 3 (Table 13). The factory setting is one acquisition (`N = 0`).

The validation procedure is executed before the unique ID test (Select Unique ID Code Criteria `[!410N]` commands). IDs that do not pass the validation test are not reported.

For example, command `!4203` specifies that the same ID must be obtained from the RF module 4 times in succession before it is considered for the uniqueness test. This feature is useful in installations where RF reflections may cause a single tag to be read multiple times or where an occasional ID might be read from fringe areas.

Table 13 Select Valid Code Commands and Frames

Command	Valid Code Frames
4200	**1 (Factory default)**
4201	2
4202	3
4203	4

440 Reset Uniqueness

Command `440` causes the ID filtering process set by Select Unique ID Code Criteria (`!410N`) to restart. It is used in conjunction with the Variable Timeout (`!44N`) commands. This command provides a method to end all uniqueness timers.

44N Set Uniqueness Timeout

Places a time limit on the uniqueness criterion set by Select Unique ID Code Criteria (`!410N`). The parameter N sets the number of minutes on the timeout clock. The factory setting is two minutes (`N=1`).

Command Timeout Clock

Command `!441`	**2 minutes (factory setting)**
Command `!442`	15 seconds
Command `!443`	30 seconds

Entering these commands effectively expires the timeout clock, which erases all current IDs in the comparison register. In effect, the first ID that is acquired after the clock expires always appears to be new and is stored. Newly acquired IDs are only tested against IDs that are registered after the clock resets.

The timeout clock is continually reset (does not expire) as long as the reader receives the same tag ID. For example, assume that the timeout clock is set for 2 minutes and there is a railcar parked on a siding in front of the reader. Without this continual reset feature, the railcar's ID would be reported every 2 minutes (each time the timeout clock expired).

450 Disable Wiegand Mode (Factory Default)

Command `!450` is a default set in the factory to disable Wiegand mode.

Reader response: `Done`

451 Enable Wiegand Mode

Command `!451` enables Wiegand mode, which allows the reader to transmit data in a format that emulates the output of a magnetic card reader.

In Wiegand mode, the reader transmits Wiegand-formatted tag data through the Wiegand interface and ASCII data (the reader accepts reader commands and responds) through the serial port interface. The reader outputs data from Wiegand-programmed tags via the Wiegand interface. Tags that are not Wiegand-formatted are not transmitted through the Wiegand interface or the serial port when in Wiegand mode, although the tag lock relay is activated on any tag acquired.

Reader response: `Done`

452 Disable Tag Translation Mode (Factory Default)

Command `!452` disables tag translation mode. Incoming full-frame tags will be directly converted to ASCII. They will not be translated from Association of American Railroads (AAR) and American Trucking Associations (ATA) format to ASCII.

Reader message: `Done`

453 Enable Tag Translation Mode

Command `!453` enables the translation of tags in AAR and ATA formats. Specific data fields, such as owner ID and car number, will be extracted from these tags, translated according to AAR or ATA standards, and converted to ASCII. Tags that are not programmed in AAR or ATA format will be directly converted to ASCII. The reader will not attempt to translate data from half-frame or dual-frame tags.

Reader message: `Done`

454 Disable Multi-tag Sort (Factory Default)

Command `!454` is a default set in the factory to disable the multi-tag sort function.

Reader response: `Done`

455 Enable Multi-tag Sort

Command `!455` enables the multi-tag sort function that allows the reader to identify unique tags within a group of Intellitag-based tags. Multi-tag sort allows full operation of the tags and reader to be carried out with a limited number of tags in the presence of the reader.

Reader response: `Done`

Note: Enabling the multi-tag sort function adversely affects the vehicle speed at which tags may be read. If there is only one Intellitag-based tag in the vehicles of the target population, multi-tag sort should be disabled.

456 Enable eGo Plus Tag Initialization During Multi-tag Sort (Factory Default)

Command `!456` enables the reader to send the eGo Plus Tag initialize command as part of the multi-tag sort function. When the reader sends the eGo Plus Tag initialize command, all tags in the RF field reenter the sort process.

Reader response: `Done`

457 Disable eGo Plus Tag Initialization During Multi-tag Sort

Command `!457` disables the reader from sending the eGo Plus Tag initialize command as part of the multi-tag sort function. Any eGo Plus Tags already identified by the reader during the sort process will not be re-identified as long as they remain powered in the RF field. The reader will only identify new tags that come into the RF field or tags that do not remain powered in the RF field.

Reader response: `Done`

480 Disable ATA

Command `!480` Disables the reader from reading ATA protocol tags.

481 Enable ATA

Command `!481` enables the reader to read ATA protocol data from tags if the reader is programmed to read this tag protocol.

482 Disable eGo

Command `!482` disables the reader from reading protocol eGo data from tags.

483 Enable eGo

Command `!483` enables the reader to read factory-programmed eGo data from tags if the reader is programmed to read this tag protocol.

484 Disable SeGo

Command `!484` disables the reader from reading SeGo protocol data from tags.

485 Enable SeGo

Command `!485` enables the reader to read SeGo protocol data from tags if the reader is programmed to read this tag protocol.

486 Disable IAG

Command `!486` disables the reader from reading IAG protocol data from tags.

487 Enable IAG

Command `!487` enables the reader to read IAG protocol data from tags if the reader is programmed to read this tag protocol.

488 Disable eATA

Command `!488` disables the reader from reading factory-programmed eATA data from tags.

489 Enable eATA

Command `!489` enables the reader to read factory-programmed eATA data from eGo Plus or eGo tags. This option must be enabled to obtain Wiegand data from eGo Plus or eGo tags.

490 Disable Alternate Group Select (Factory Default)

Command `!496` disables the alternate group select function that allows the reader to distinguish tags meeting specific criteria pre-programmed into the tags.

Reader response: `Done`

Reader Status

Group 5 commands provide status reports on the parameters and operation of the reader.

505 Display Software Version

Command `!505` displays the reader model number, software version information, and assigned serial number.

Reader message:

`Model E4 Series Ver X.XX SNSSSSSS`

where

`X.XX` Version Number

`SSSSSS` Serial number of the unit, skipping the fourth character printed on the reader product label

506 Display Hardware Configuration Information

Command `!506` displays hardware configuration information stored in the reader memory by the user. Hardware configuration information is empty by default until you set the information to any 20 character ASCII string desired using command `!696S...S`.

Reader response: An ASCII string from 1 to 20 characters in length

510 Display RF Transceiver FPGA Version

Command `!510` displays RF FPGA VER = XX.XX

511 Display RF Transceiver I Filter Chip Version

Command `!511` displays `FIL IC I VER = XX.XX`

512 Display RF Transceiver Q Filter Chip Version

Command `!512` displays `FIL IC Q VER = XX.XX`

513 Display DSP Board Actel Version

Command `!513` displays `DSP FPGA VER = XX.XX`

520 Display Power Fail Bit

Command `!520` displays the value of the reader power fail bit. The power fail bit changes from 0 to 1 when power to the reader is interrupted. To reset the bit, use command `!63` Reset Reader or command `!65` Reset Power Fail Bit. On initial power-up, the host should transmit one of these two commands to clear the power fail bit.

Reader message:

`PWRB P<0 to 1>R0`

where

P0	No power failure detected
P1	Power failure detected
R0	Not applicable to AI1422E Reader

521 Display Reader ID Number

Command `!521` displays the reader ID that is sent in the auxiliary data field.

Reader message: `RDID xx`

where

`xx = 01 to FF (hexadecimal)`

522 Display Communications Port Parameters

Command `!522` displays the selected communications port parameters, including the baud rate (`!100N`), the number of stop bits (`!101N`), the parity scheme (`!102N`), and the end-of-line delay.

Reader message: `MAIN B<2 to 7> S<0 to 1> P<0 to 2> D0`

where

B2	1200 baud
B3	2400 baud
B4	4800 baud
B5	**9600 baud (factory default)**
B6	19.2 kbps
B7	38.4 kbps
S0	**one stop bit (factory default)**
S1	two stop bits
P0	**no parity (factory default)**
P1	even parity
P2	odd parity
D0	00 ms end-of-line delay (fixed)

One space is required between each value. For example, if factory default settings are assigned, the reader message is

`MAIN B5 S0 P0 D0`

indicating 9600 baud, one stop bit, no parity, and 0 ms end-of-line delay.

Note: The information transmitted in response to command `!522` *applies to data and command mode operation only. While operating in download mode, default communications parameters are always used.*

524 Display Appended Information Status

Command `!524` displays the information being appended to the reader transmissions.

Command `!31N` appends information. Append time and date are not available to the AI1422E Reader.

Reader message: where

`IDAP T<0> D<0> X<0 to 1>`

T0	Time not appended
T1	Time appended (not valid for the AI1422E Reader)
D0	Date not appended
D1	Date appended (not valid for the AI1422E Reader)
X0	**Auxiliary information not appended (factory default)**
X1	Auxiliary information appended

One space is required between each value. For example, if factory-default settings are assigned, the reader response is

`IDAP T0 D0 X0`

indicating time, date, and auxiliary information not appended.

525 Display Communications Protocol Status

Command `!525` displays the status of command `!61N` Selected Communications Protocol, Selected Mode of Flow Control, and command `!612NN ECP Timeout`.

Reader response: `ECPS P<0 to 2> T<01 to FF> X<0 to 2> S0`

where

P0	**Basic protocol enabled (factory default)**
7-20	TransCore Proprietary
P1	ECP enabled
Txx	ECP timeout where xx = 01 to FE (hexadecimal) Timeout (ms) = 50 * xx. If xx = FF, timeout disabled
X0	Flow control disabled

X1	**Software flow control enabled (factory default)**
S0	start of message character is !

For example, if factory default settings are assigned, the reader message is:

```
ECPS P0 TFE X1 S0
```

which means basic protocol enabled, an ECP timeout of 254 (12,700 ms, 12.7 sec), software flow control enabled, and start of message character is `!`.

526 Display I/O Status

Command `!526` displays the current input/output (I/O) status. The reader message indicates whether outputs are being controlled externally by the host through command `!620N` Output Control or internally through command `!621` Predefined Output Mode. It also displays the current status of two outputs, two inputs, and the selected output pulse duration that is set by command `!67N`.

Reader response: `IOST C<0 to 1> O<0 to 3> I<0 to 3> D<0 to F>`

where

C0	Host controls outputs
C1	Predefined output mode
O0	Both outputs off
O1	Output 0 on
O2	Output 1 on
O3	Both outputs on
I0	Both inputs false
I1	Input 0 true
I2	Input 1 true
I3	Both inputs true
D0	4 ms output pulse duration
D1	8 ms output pulse duration
D2	12 ms output pulse duration
D3	16 ms output pulse duration
D4	20 ms output pulse duration
D5	24 ms output pulse duration
D6	32 ms output pulse duration
D7	40 ms output pulse duration
D8	48 ms output pulse duration
D9	60 ms output pulse duration

DA	76 ms output pulse duration
DB	152 ms output pulse duration
DC	**228 ms output pulse duration (factory default)**
DD	300 ms output pulse duration
DE	376 ms output pulse duration
DF	752 ms output pulse duration

Note: The first character of the output pulse duration value is alpha; the second character is numeric.

Table 14 shows the Output 0 and Output 1 open/closed conditions for the output status displays.

Table 14 Open/Closed Conditions for Output Status

Output Status	Output 0 Wire Pair		Output 1 Wire Pair	
O0	Closed	Open	Closed	Open
O1	Open	Closed	Closed	Open
O2	Closed	Open	Open	Closed
O3	Open	Closed	Open	Closed

Table 15 shows the Output 0 and Output 1 open/closed conditions for the output status displays for readers in IAG applications.

Table 15 Open/Closed Conditions for Output Status (IAG)

Output Status	Output 0 Wire Pair		Output 1 Wire Pair	
O0	Closed	Open	Closed	Open
O1	Open	Closed	Closed	Open
O2	Closed	Open	Open	Closed
O3	Open	Closed	Open	Closed

Table 16 shows the Input 0 and Input 1 open/closed conditions for the input status displays.

Table 16 Open/Closed Conditions for Input Status

Input Status	Input 0 Wire Pair	Input 1 Wire Pair
I0	Open	Open
I1	Closed	Open
I2	Open	Closed
I3	Closed	Closed

527 Display RF Status

Command `!527` displays the current status of the RF module. The reader response indicates whether RF is controlled externally by the host, set by command `!640`N RF Control, or internally by input set by command `!641`. Command `!527` also displays the current RF status and the uniqueness timeout.

Reader message: `RFST C<0 to 1> O<0 to 1> T<1 to 3> Fxxx Rxx Gxx Axx Ixx`

where

C0	RF controlled by host
C1	**RF controlled by presence sensor on Input 0, the red/green pair (factory default)**
O0	RF off
O1	RF on
T1	Uniqueness timeout of two minutes
T2	Uniqueness timeout of 15 seconds
T3	Uniqueness timeout of 30 seconds
Fxxx	Fixed
Rxx	Tag decoder range (distance) for ATA tags, xx = 00 to 1F hexadecimal range value
Gxx	Tag decoder range (distance) for eGo and eGo Plus tags, xx= 00 to 1F hexadecimal range value
Axx	RF power attenuation, where 00 is maximum output power and 06 is minimum output power (6 dB less than maximum power).
Ixx	IAG RF power attenuation, where 00 is maximum output power and 06 is minimum output power (6 dB less than maximum power). For example, if factory default settings

are assigned, the reader message is

`RFST C1 O0 T1 Fxx R1F G1F A00 I04`

which means that RF is enabled by presence sensor on input 0, RF signal off, uniqueness timeout of two minutes, maximum range for ATA tags, maximum range for eGo and eGo Plus tags, full RF power, and IAG power set at 4 dB attenuation.

529 Display Presence Input Status

Command `!529` displays the parameters associated with presence detection and RF control. The reader's message indicates if presence without tag reports are enabled/ disabled (`!690N` Select Presence without Tag Report Option), if input inversion is enabled/disabled (`!694N` Select Input Inversion Option), and the minimum presence true period (always true). The reader's message also reports the selected RF timeout (`!693N` Select RF Timeout Period) and the selected means of RF-off control (`!692N`) Select RF Control Algorithm). If presence without tag reports is enabled (`!6901` Enable Presence without Tag Reports), the reader transmits a report if a presence is detected without the subsequent acquisition of a valid tag.

Note: RF timeout values vary depending on the operative tag read mode and the type of tag in the read field. All times are approximate.

Reader message: `PRST P<0 to 1> D0 A<0 to 2> T<0 to F> I<0 to 1>`

where

P0	**Presence without tag reports disabled (factory default)**
P1	Presence without tag reports enabled
D0	Minimum presence true period of 0 ms (fixed)
A0	RF off on timeout only
A1	RF off on timeout or tag
A2	**RF off on timeout or presence condition false (factory default)**
T0	RF timeout of 0 ms (always expired) T14 ms
T2	8 ms
T3	12 ms
T4	20 ms
T5	24 ms
T6	32 ms
T7	48 ms
T8	60 ms
T9	92 ms

TA	152 ms
TB	300 ms
TC	452 ms
TD	600 ms
TE	752 ms
TF	**RF timeout infinite, never expires (factory default)**
I0	**input inversion disabled (factory default)**
I1	input inversion enabled

For example, if factory default settings are assigned, the reader message is

```
PRST P0 D0 A2 TF I0
```

which means that presence without tag reports is disabled, minimum presence true period is 0, RF off control on timeout or presence false, infinite RF timeout, and input inversion disabled.

530 Display RF0 Filter Status

Command `!530` displays the parameter set for the RF input, including the selected unique ID code criteria (`!410N` Select Unique ID Code Criteria) and the valid ID code criteria (see `!420N` Select Valid ID Code Criteria).

Reader message: `RF0S U<0 to 4> V<0 to 3>`

where

U0	**One ID separation (factory default)**
U1	Two ID separations
U2	Three ID separations
U3	Four ID separations
U4	Transmit all IDs
V0	Valid ID code criteria of one acquisition
V1	Valid ID code criteria of two acquisitions
V2	Valid ID code criteria of three acquisitions
V3	Valid ID code criteria of four acquisitions

For example, if factory default settings are assigned, the reader message is

```
RF0S U0 V0
```

which means separation of one ID for uniqueness filtering and a valid ID code criteria of one acquisition.

532 Display Wiegand Mode Status

Command `!532` displays the Wiegand mode status as either enabled or disabled.

Reader message: `TOF <0 to 1>`

where

0 Wiegand mode disabled

1 Wiegand mode enabled

533 Display Wiegand Retransmit Interval

Command `!533` displays the Wiegand retransmit interval. This interval specifies the delay in seconds before the reader retransmits Wiegand data for a tag still in the read zone. The factory default is 1 second.

Reader message: `WTI <01 to FF>`

where

01 to FF = seconds (1–255) in hexadecimal.

Note: The actual value of the Wiegand retransmit interval may vary depending on the operative tag read mode and the type of tag in the read field.

For example, 10 = 16 seconds and FF = 255 seconds. The retransmit interval in ATA tag read mode is about twice these values.

534 Display Tag Translation Mode Status

Command `!534` displays tag translation mode status, enabled or disabled. If tag translation mode is enabled, incoming full-frame tags in AAR or ATA format are translated according to ISO standards. Refer to "452 Disable Tag Translation Mode (Factory Default)" on page 41 for more information.

Reader message: `TT <0 to 1>`

where

0 tag translation mode disabled

1 tag translation mode enabled

537 Display Echo Status

Command `!537` displays echo mode status. In basic protocol (`!610` Select Basic Protocol), the reader may be configured to enable (`!6171` Enable Echo Mode) or disable (`!6170` Disable Echo Mode) the echo of received commands. Refer to "6170 Disable Echo Mode" on page 55 and "6171 Enable Echo Mode (Factory Default)" on page 55" for more information.

Reader message: `ECHO <0 to 1>`

where

0	Echo status disabled
1	**Echo status enabled (factory default)**

540 Display Flash Checksum

Command `!540` displays the flash memory checksum.

Reader message: `PCKS I0000 Exxxx`

where

0000	Not applicable to the AI1422E Reader
xxxx	Represents the four-byte ASCII representation of the flash memory checksum

543 Display Boot Checksum

Command `!543` displays the boot ROM checksum.

Reader message: `BCKS xxxx`

where

xxxx represents the four-byte ASCII representation of the boot ROM checksum.

549 Display User-Programmable Group Select Equals (GSE) Filter Data

Command !549 queries the reader for the user-programmable GSE filter data programmed in the reader using command !697. The response data is formatted similar to the data in the configuration command.

For example, if the command string shown in command !697 (refer to "697 Set User-Programmable Group Select Equals (GSE) Filter" on page 67) was sent to a given reader, the response to the !549 query command would be:

`!A4 0A 000501420202413 3`

The reader response contains all the data fields repeated in the same sequence as displayed in the User-Programmable GSE configuration command.

560 Request Sensor Status Change

Command !560 displays the sensor status change reporting. Status change reporting may be disabled by command !82N Select Input Status Change Report Option.

Reader message: where

SSTC E<0 to 1>M<0 to 3>

E0	**Input status change reports disabled (factory default)**
E1	Input status change reports enabled
M0	**Reporting disabled (factory default)**

M1	Changes on Input 0 reported
M2	Changes on Input 1 reported
M3	Changes on either input reported

For example, if factory default settings are assigned, the reader message is

`SSTC E0 M0`

which means that input status change reports are disabled on both Input 0 and Input 1.

570 Display Tag Protocols

Command `!570` displays the currently selected tag protocol.

Reader response: `ATA:<E, D> eGo:<I, F, D> SeGo:<I, F, D> IAG:<E, D> Sort:<E, D> TMM0`

where

I	ID (64 bits)
E	Enabled
F	Full transaction (eATA)
D	Disabled
TMM0	Fixed

577 Report Buffered Handshakes

Command `!577` reports the buffered handshakes.

Reader message: `XX`

where

`XX` is number of handshakes

582 Display Synchronization Values

Command `!582` displays the synchronization values, which are typically used to alleviate interference issues in dense populations of Interagency Group (IAG) readers.

The values are set with commands `!648NN` and `!649NN`.

Reader Response: `SYNC T<00 to FF> H<00 to 0A>`

where

T is the number of milliseconds (ms) before the reader sends a synchronization pulse to all other readers on the RS–485 bus and H is the number of milliseconds that the reader holds off starting IAG tag protocol once it receives the synchronization pulse.

Reader Control Functions

Group 6 commands set reader control functions such as reader ID, communication protocol, output pulse, and RF control.

60NN Set Reader ID Number

Command `!60NN` sets the reader ID that will be sent in the auxiliary data field (command !311). Uppercase or lowercase characters are allowed for NN; for example, hex digits A though F or a through f

where

`NN = 00 to FF (hex for 0 to 255, factory default = 00).`

Reader response: `Done`

610 Select Basic Communication Protocol (Factory Default)

Command `!610` enables the basic communications protocol.

Reader response `Done`

611 Select Error Correcting Protocol

Command `!611` enables the error correcting protocol. For more details on Error Correcting Protocol, contact TransCore technical support.

Reader response: `Done`

612NN Select Error Correcting Protocol Timeout

`Command !612` `NN` selects the timeout interval for ECP. This timeout applies to the transmission of tag, report, and error messages and to the receipt of host commands. The transmit timeout is initiated immediately after the end-of-message sequence CR/ LF is transmitted. If the host does not acknowledge the message within the specified interval, the reader times out and retransmits the message.

The receive timeout is initiated upon receipt of the start-of-message character (!). If the end-of-message character (CR) is not received within the specified interval, the reader discards the partially received message and resets its receiver.

Uppercase or lowercase characters are allowed for NN; for example, hex digits A through F or a through f.

The value for NN specifies the timeout interval as follows:

ms	50 * NN for NN = 01 to FE (1–254)
FE	Factory default (12,700 ms or 12.7 seconds)
FF	Disables the ECP timeout

Reader response: Done

Caution

Ensure that the ECP timeout is sufficient for a given baud rate.

6170 Disable Echo Mode

Command !6170 — disables the reader's echo of received host commands. If operating in basic protocol, the reader echoes by default. As the reader receives a host command, it echoes each character of the command. Once the entire command has been received and processed, the reader transmits its response. If echoing is disabled with command !6170, the reader does not echo the command, but only transmits its response. The reader never echoes while in ECP or download mode operation.

Reader response: `Done`

6171 Enable Echo Mode (Factory Default)

Command !6171 — enables the reader to echo received host commands. Command !6170 disables echo mode.

Reader response: `Done`

620N Set Output Control

Command !620N — provides direct control of two output lines that may be used to operate external hardware, such as gates or traffic lights. The value for N specifies the output status requested as shown in Table 17. Receipt of any !620N command automatically disables command !621 Predefined Output Control.

Reader response `Done`

Table 17 Output Control Commands

Command	Output Control Option
6200	**Turn off both output ports (factory default)**
6201	Turn off output1, Turn on output0
6202	Turn off output0, Turn on output1
6203	Turn on both output ports

Caution

The RF ON Indicator and RF Active Output on the I/O Connector are driven through Output 0. Utilizing this command will disable the Indicator.

621 Select Predefined Output Control (Factory Default)

Command !621 configures the reader for predefined output mode. In this mode, Output 0 drives the RF Active LED, and Output 1 is automatically asserted upon receipt of a valid unique tag ID. The output line remains asserted for the time specified by output pulse duration (!67N Set Output Pulse Duration). Any direct control command (!620N Output Control) automatically disables the predefined output mode.

Note: In Wiegand mode operation, Output 1 is not controlled by a predefined output mode.

Reader response: Done

63 Reset Reader

Command !63 resets the power fail bit, clears all buffers, resets tag uniqueness, turns off both output lines, transmits the sign-on message, and returns to the Data Mode.

Note: This command does not reset any other configuration parameters or have any command response.

64N RF Control

Command !64N directly controls the RF module. The N value controls the RF power as shown in Table 18.

Command !640 disables RF-by-input control command !642 Select RF-by-Input Control.

Reader response: Done

Table 18 RF Control Commands

Command	RF Power
640	Turns off RF
641	Turns on RF

642 Select RF-by-Input Control (Factory Default)

Command !642 configures the reader for RF-by-input control. The reader automatically turns on RF when it detects a presence through sense0 (trigger input). The reader turns off RF according to the selected RF control algorithm (!692N Select RF Control Algorithm).

Reader response: `Done`

643NN Select ATA Operating Range (Distance)

Command !643NN selects the read range for ATA tags where NN is a hexadecimal value from 00 to 1F; the range increases with increasing NN value. The range can be adjusted for 32 discrete values where 00 is the shortest range and 1F is the longest range. The default range value is 1F.

Reader response: `Done`

644NN Set RF Attenuation

Command !644NN sets the attenuation control for the output RF power where NN is a hexidecimal value from 03 to 0A. Settings for attenuation are 1.0 dB increments over a range of 7 dB of attenuation from the maximum power setting of 25 dBm at 3-dB attenuation to a minimum power level of 18 dBm.

The Set RF Attenuation command NN variables and corresponding attenuation settings are shown in Table 19.

Reader response: `Done`

Table 19 RF Attenuation Command Variables

Variable (NN)	Attenuation Setting (dB)
03	3
04	4
05	5
06	6
07	7
08	8
09	9
0A	10

645NN Set eGo and eGo Plus Operating Range (Distance)

Command `!645NN` sets the read range for eGo and eGo Plus Tags where NN is a hexadecimal value from 00 to 1F; the range increases with increasing NN value. The range can be adjusted for 32 discrete values where 00 is the shortest range and 1F is the longest range. The default range value is 1F.

Reader response: `Done`

646XX Set IAG RF Attenuation

Command `!646XX` sets the IAG attenuation control for the output RF power where XX is a hexidecimal value from 00 to 06. Setting 00 (0 dB) is the maximum power setting and 06 (6 dB) is the minimum power setting. The default attenuation value is 04.

647XXX Select RF Operating Frequency (Used only for FCC Part 90 Units)

Command `#647XXX` sets the reader RF from 860 to 930 MHz in 250-kHz steps, where XXX is a hexadecimal value from 000 to 118. After the reader's frequency is set, the value is stored in non-volatile RAM (NVRAM). This value is not altered by power-down.

If the NVRAM becomes corrupted, the correct operating frequency cannot be guaranteed. In this circumstance, the RF section shuts down and the reader sends an `Error06` message to the host. Until the frequency is reset using command `#647XXX,` the unit displays the same error message every time it is powered up or if an attempt is made to enable the RF by host or by external sensor.

Note: Frequency doesn't have a factory default and must be programmed by the end user.

The commands to set the RF operating frequency are presented in Table 20.

Reader response: `Done`

Table 20 Select RF Operating Frequency Commands

Command	RF Frequency (MHz)	US Compliant	Protocol
6470A9	902.25	Yes	ATA only
6470AA	902.5	Yes	ATA only
6470AB	902.75	Yes	ATA only
6470AC	903	Yes	ATA only
6470AD	903.25	Yes	ATA only
6470AE	903.5	Yes	ATA only
6470AF	903.75	Yes	ATA only
6470C8	910	Yes	ATA only
6470C9	910.25	Yes	ATA only
6470CA	910.5	Yes	ATA only
6470CB	910.75	Yes	ATA only
6470CC	911	Yes	ATA only
6470CD	911.25	Yes	ATA only

Command	RF Frequency (MHz)	US Compliant	Protocol
6470CE	911.5	Yes	ATA only
6470CF	911.75	Yes	ATA only
6470D0	912	Yes	ATA only
6470D1	912.25	Yes	ATA only
6470D2	912.5	Yes	ATA only
6470D3	912.75	Yes	ATA only
6470D4	913	Yes	ATA only
6470D5	913.25	Yes	ATA only
6470D6	913.5	Yes	ATA only
6470D7	913.75	Yes	ATA only
6470D8	914	Yes	ATA only
6470D9	914.25	Yes	ATA only
6470DA	914.5	Yes	ATA only
6470DB	914.75	Yes	ATA only
6470DC	915	Yes	ATA only
6470DD	915.25	Yes	ATA only
6470DE	915.5	Yes	ATA only
6470DF	915.75	Yes	ATA only
6470E0	916	Yes	ATA only
6470E1	916.25	Yes	ATA only
6470E2	916.5	Yes	ATA only
6470E3	916.75	Yes	ATA only
6470E4	917	Yes	ATA only
6470E5	917.25	Yes	ATA only
6470E6	917.5	Yes	ATA only
6470E7	917.75	Yes	ATA only
6470E8	918	Yes	ATA only

Command	RF Frequency (MHz)	US Compliant	Protocol
6470E9	918.25	Yes	ATA only
6470EA	918.5	Yes	ATA only
6470EB	918.75	Yes	ATA only
6470EC	919	Yes	ATA only
6470ED	919.25	Yes	ATA only
6470EE	919.5	Yes	ATA only
6470EF	919.75	Yes	ATA only
6470F0	920	Yes	ATA only
6470F1	920.25	Yes	ATA only
6470F2	920.5	Yes	ATA only
6470F3	920.75	Yes	ATA only
6470F4	921	Yes	ATA only
6470F5	921.25	Yes	ATA only
6470F6	921.5	Yes	ATA only

Caution: An ETSI AI1422E does not require a frequency configuration. Do not attempt to change the frequency of an ETSI AI1422E.

65 Reset Power Fail Bit

Command !65 resets the power fail bit to 0. The bit changes from 0 to 1 when power is restored to the reader. Upon reader power-up, the host transmits either command !65 or !63 Reset Reader to properly initialize this bit. The current state of the power fail bit may be displayed. Refer to "520 Display Power Fail Bit" on page 44 for more information.

Reader response: `Done`

66F Load Default Operating Parameters

Command !66F loads all the factory default operating parameters except RF operating frequency. Refer to "AI1422E Default Configuration Settings" on page 81 a listing of the defaults.

Reader response:

```
Done   All parameters loaded OK
Error  A parameter load failed
```

67N Set Output Pulse Duration

Command `!67N` sets the output pulse duration for the command `!621` Predefined Output Control. This command specifies the length of time that output line(s) will be asserted upon receipt of a valid and unique tag ID. The factory default setting is 228 ms. The variable `N` specifies an output pulse duration of 48 ms to 752 ms.

Uppercase or lowercase characters are allowed for N; for example, hex digits A through F or a through f. The command numbers and corresponding output pulse durations are shown in Table 21.

Table 21 Output Pulse Duration Commands

Command	Duration
670	4
671	8
672	12
673	16
674	20
675	24
676	32
677	40
678	48
679	60
67A	76
67B	152
67C	**228 (factory default)**
67D	300
67E	376
67F	752

Additional IDs may be acquired during the selected output pulse duration; however, the timing restarts upon each successive ID acquisition. This command should be used with discretion. For example, when the tag acquisition interval is short compared to the selected pulse duration, distinct pulses may not be generated.

Reader response: `Done or Error`

690N Select Presence Without Tag Report Option

Command `!690N` enables or disables the presence without tag report option. If the presence without tag reporting option is enabled using command `!6901`, input reports are transmitted when a tag presence is detected without the subsequent acquisition of a valid tag. The value for N specifies the reports as shown in Table 22.

Reader response: `Done`

Table 22 Presence Without Tag Report Commands

Command	Report Option
6900	**Disable presence without tag reports (factory default)**
6901	Enable presence without tag reports

692N Select RF Control Algorithm

Command `!692N` selects the algorithm for turning off RF power when RF-by-input control is enabled using command `!641` Select RF-by-Input Control.

The values for N specify the RF control algorithms as shown in Table 23.

Command `!6920` turns off RF power based on the timeout established by command`!693N` Set RF Timeout Period.

Command `!6921` allows RF power to be turned off either after the timeout period or upon acquisition of a valid tag ID, whichever occurs first. The reader turns off the RF immediately following the acquisition of a valid tag, whether or not it is unique. This control algorithm may be used in Wiegand mode to ensure that the tag data is transmitted once and only once per presence on both serial and Wiegand ports.

Command `!6922` turns off RF power either after the timeout period or upon the presence false condition, whichever occurs first.

Reader response: `Done`

Table 23 RF Control Algorithm Commands

Command	RF Power Off
6920	On timeout only
6921	Timeout or tag ID acquired
6922	Timeout or presence false (factory default)

693N Select RF Timeout Period

Command !693N selects the RF timeout period used by command !692N Select RF Control Algorithm. Values for N range from 0 through F.

Command !693F disables the RF timeout.

Uppercase or lowercase characters are allowed for N; for example, hex digits A through F or a through f. The commands and corresponding timeouts are shown in Table 24.

Reader response: Done or Error

The reader returns an Error message if a valid hexadecimal digit is not substituted for N in command !693N.

Table 24 Timeout Period Values

Command	Timeout (ms)
6930	0 (always expired)
6931	4
6932	8
6933	12
6934	20
6935	24
6936	32
6937	48
6938	60
6939	92
693A	152
693B	300
693C	452
693D	600
693E	752
693F	**Infinite (never expires, factory default)**

694N Select Input Inversion Option

Command `!694N` enables or disables input inversion. When inversion is enabled, an open circuit input is interpreted as a closed circuit, and a closed circuit input is interpreted as an open circuit. This feature allows greater flexibility in the attachment of external equipment to the reader inputs. For example, some proximity sensors indicate presence with an open circuit. In this instance, command `!6941` can enable input inversion so that an open circuit input indicates a presence. The values for N represent the two inversion options as shown in Table 25.

Reader response: `Done`

Table 25 Input Inversion Options

Command	Options
6940	**Disable input inversion (factory default)**
6941	Enable input inversion

695S...S Set Serial Number

Command !695 assigns the reader serial number according to the format:

695SSSSSS

where

SSSSSS is the serial number.

The serial number may contain as many as six uppercase or lowercase ASCII alphanumeric characters.

Reader response: Done

Note: The factory-assigned serial number of the reader contains seven characters. However, to maintain backward compatibility, the reader software allows only six characters to be entered. When setting the serial number, skip the fourth (middle) character of the seven-character number shown on the reader product label.

Once assigned, the serial number is preserved during power-down and the loading of default parameters.

696S...S Store Hardware Configuration String

Command !696S...S stores hardware configuration information into reader memory.

The hardware configuration string is assigned according to the following format:

696S...S

where

S...S is the hardware configuration string that may contain as many as 20 uppercase or lowercase ASCII alphanumeric characters.

Reader response: Done

Note: Once assigned, configuration information is preserved during power-down and the loading of default parameters.

697 Set User-Programmable Group Select Equals (GSE) Filter

Command `!697` assigns the user-programmable GSE filter.

The command string is assigned according to the following format:

```
697 MM AA DDDDDDDDDDDDDDDD
```

where

`MM` The tag uses this mask to determine which of the eight Comparison Data bytes are to be compared for the Group Select filter.

AA = This field is used by the tag to determine the start address in the tag memory for the comparison data.

DD...DD = Comparison Data: an 8-byte field (16 characters) used by the tag as the comparison data for the Group Select filter. The tag compares the data in this field to data in tag memory beginning at the Start Address to determine if the tag will respond to a reader Group Select request. Only the bytes having the corresponding bit set in the GSE Mask is used for this comparison.

As an example, to configure a reader to have only tags with data in byte locations 10, 12, and 15 (decimal) with hexadecimal values “00,” “01,” and “02,” the following command is used:

```
!697 A4 0A 0005014202024133
```

To understand how the data is interpreted, it is necessary to break down the GSE Mask field, A4, into binary:

A4 = 1010 0100

This mask equates to the tag comparing the first, third, and sixth bytes of the Comparison Data to data in the tag beginning at address location 0A (10 decimal).

The Comparison Data field is broken down in bytes with the bytes corresponding to the mask underlined in bold (for clarification):

Address: 0A 0B 0C 0D 0E 0F 10 11

Data: 00 05 01 42 02 02 41 33

where

0A (10 decimal) must be equal to “00” hexadecimal, the first byte in the Comparison Data field

0C (12 decimal) must be equal to “01” hexadecimal, the third byte in the Comparison Data field

0F (15 decimal) must be equal to “02” hexadecimal, the sixth byte in the Comparison Data field

Reader response: `Done`

Auxiliary Reader Control

Group 8 commands provide control of reader functions, such as the sense input lines.

82N Select Input Status Change Report Option

Command `!82N` selects the input lines to be monitored to report any change in input status. The enabled input lines are monitored for any changes in the logic states. If a change is detected, the reader generates an input status change message and treats it as a tag ID. If the auxiliary information option is enabled, the input status field displays the current input values. The value for N specifies the report options as shown in Table 26.

Reader response: `Done`

Table 26 Input Status Change Report Options

Command	Report Option
820	**Disable status change reports (factory default)**
821	Report change on Input 0
822	Report change on Input 1
823	Report changes on Input 0 and Input 1

830 Disable Automatic Periodic RF Status Report (Factory Default)

Command `!830` is a default set in the factory to disable the automatic periodic RF status report.

Reader response: `Done`

831 Enable Automatic Periodic RF Status Report

Command `!831` enables the automatic periodic RF status report. This function sends out a periodic RF status report if no other message (a tag read) is sent from the reader for a period of time. This message is the same message that would be sent in response to the `!527` Display RF Status command. Enabling this function is helpful in some sites where there may not be much tag activity, and the user wants an automatic way to ensure the communication channel with the reader is still intact. With this function enabled, the host system will get a message from the reader at least every three minutes.

Reader response: `Done`

7

Troubleshooting and Maintenance

This section lists routine diagnostic procedures for troubleshooting an improperly working reader system and maintenance procedures to keep the AI1422E Reader System operating correctly.

Required Tools and Equipment

The following tools and equipment are required:

- 50-ohm, 5-watt (W) load (N-type connector)
- Personal computer (PC) with terminal emulator software
- Appropriate power source for your reader
- Digital multimeter
- Loopback DE09 Connector
- Antenna and cable
- Slot head screwdriver

Troubleshooting

Loopback Mode

It is possible to reset the AI1422E Reader to default by looping back the TX from the RS232 into the RX via a short wire. Installing a loopback will cause the reader to reset its settings to factory default, which is extremely useful during troubleshooting. The procedure for resetting the reader is below.

1. Power down the AI1422E reader by toggling the main power switch to the **OFF** position.
2. Slide the Interface Selection switch on the front panel of the reader to **RS232**.
3. Install a loopback connector to the MAIN RS232 port.
4. Apply power to the AI1422E reader by toggling the main power switch to the **ON** position.
5. Wait 30 seconds for the reader to complete the factory reset.
6. Power down the AI1422E reader by toggling the main power switch to the **OFF** position.
7. The reader should now be configured for factory default settings.

Failure Modes

No Communication

To determine if there is a problem in the communications hardware, the following two commands should be repeated together for testing purposes:

`!01` escape to diagnostic mode

`!22` display time and date

If functioning properly, the time and date will be displayed after the second command, which means that the reader is communicating. If the reader is not functioning properly, then perform the following checks.

- Verify that the AI1422E Reader System has adequate power. It should have 24V DC ±0.5V DC.
- Verify that the main power switch is on.
- Verify that the main power light-emitting diode (LED) is illuminated.
- Verify that you are using a null modem cable connection.
- Verify that the Interface Selection switch on the front panel of the reader is set to the correct interface.
- Verify that the baud rate is set correctly. If an incorrect baud rate is suspected, select and send each baud rate in turn, using the !100x Baud Rate Select command, and wait for a response.

Unit Will Not Read Tags

The suggestions listed here assume that the user has already verified proper serial communications. If RF POWER LED is illuminated, the indication is that the AI1422E is querying for tags. If the LOCK LED is illuminated, the indication is that the reader system is retrieving tag data. If neither of the LED indicators are illuminated, check the following items:

- Verify that the antenna connection is good.
- Verify that the antenna cable is in good condition.
- Verify that a single, known valid tag, properly polarized, is in the antenna field.
- Verify that the trigger remains activated and the unit power is on.
- Verify that a tag is being alternated with another tag containing different data to avoid uniqueness filtering.

Unit Will Not Retain Settings

If the unit will not retain information, such as time and date stamp or baud rate between power cycles, the internal battery backup has failed and the unit must be returned for repair. Contact TransCore technical support.

Error Messages

The AI1422E Reader transmits an error message if a command received from the host is not a recognized command or if information supplied with the command is not correct. The reader sends this message to diagnostic commands if the reader fails the specified test.

Table 27 contains a list of error messages.

Table 27 Error Messages

Error Message	Description	Corrective Action
Error06	NVRAM parameters have been lost. The AI1422E Reader will not function properly because the RF section is shut off until the frequency is reset.	Reset the frequency using command `#647XXX`
Error07	The RF phase locked loop (PLL) has lost lock and is unable to operate at its intended frequency. RF output is disabled while the AI1422E Reader attempts to reset the PLL.	Reset the RF frequency. Refer to "Radio Frequency" on page 8-15 for instructions.
Error08	The RF PLL has successfully regained lock and has been reset to its proper operating frequency. The RF section is returned to its state prior to losing lock (enabled/disabled). `Error08` will only be issued after `Error07` has been issued.	No action necessary; the previous error has been corrected.
Error11	The operator is attempting to use an Intellitag-based tag in Wiegand mode while the AI1422E Reader is in ID-only mode, thus Wiegand compatibility issues.	Enable eATA mode using command `#489` if Wiegand operation is needed and the tags are programmed with Wiegand data.
ErrorRF1	Warning message that the RF board did not return an update acknowledge signal	If the reader indicates a single `ErrorRF1` event and recovers from the error, no corrective action is required. You may want to track this error message if it should occur again. If the reader indicates repeated `ErrorRF1` warning messages then return the reader to the factory.

Error Message	Description	Corrective Action
ErrorRF2	Warning message that the RF module did not return an `INIT DONE` signal	If the reader indicates a single `ErrorRF2` event and recovers from the error, no corrective action is required. You may want to track this error message if it should occur again. If the reader indicates repeated `ErrorRF2` warning messages then return the reader to the factory.
ErrorRF3	Warning message of unexpected status read, including status byte, from RF module	If the reader indicates a single `ErrorRF3` event and recovers from the error, no corrective action is required. You may want to track this error message if it should occur again. If the reader indicates repeated `ErrorRF3` warning messages then return the reader to the factory.

AI1422E Reader Repair

The AI1422E Reader is designed for whole-unit replacement and is manufactured with surface-mounted components. It requires sophisticated testing and repair equipment. All testing and repairs are performed at TransCore's factory. Please contact TransCore to obtain a Return Materials Authorization (RMA) for returning the reader.

Technical Support

Authorized dealers and distributors are responsible for the direct support of all customers. Authorized dealers and distributors needing support can contact TransCore Technical Support. Please be prepared to answer a series of questions that are designed to direct you to the best TransCore support resource available. These questions will relate to symptoms, configuration, model, and tags used.

Note: End users and facility operators contacting Technical Support will be referred to the dealer responsible for the system sale.

A

Character Conversion

Appendix A

Character Conversion

Table 28 lists the TransCore 6-bit-per-character conversion from the standard ASCII character set.

Table 28 TransCore 6-Bit-Per-Character Conversion

spc	000000	6	010110	L	101100
!	000001	7	010111	M	101101
"	000010	8	011000	N	101110
#	000011	9	011001	O	101111
$	000100	:	011010	P	110000
%	000101	;	011011	Q	110001
&	000110	<	011100	R	110010
'	000111	=	011101	S	110011
(	001000	>	011110	T	110100
)	001001	?	011111	U	110101
*	001010	@	100000	V	110110
+	001011	A	100001	W	110111
,	001100	B	100010	X	111000
-	001101	C	100011	Y	111001
.	001110	D	100100	Z	111010
/	001111	E	100101	[	111011
0	010000	F	100110	\	111100
1	010001	G	100111	]	111101
2	010010	H	101000	^	111110
3	010011	I	101001	_	111111
4	010100	J	101010		
5	010101	K	101011		

B

Technical Specifications

Appendix B

Technical Specifications

Table 29 lists the specifications of the AI1422E Reader System.

Table 29 AI1422E Reader System Specifications

Specification	Description
Size	19.0 x 1.75 x 9.0 in (48.3 x4.4x 22.9 cm)
Weight	5.0 lb (2.27 kg)
Operating temperature	-40°F to +158°F (-40°C to +70°C)
Power requirement	24V to 110VDC, 25 watts maximum
Available frequency range	902–928 MHz (FCC) 860-870 MHz (ETSI)
Approved frequency range for Federal Communications Commission and Industry Canada	902.25–903.75 MHz and 910.00–921.50 MHz
Receiver sensitivity	-60 dBm
Transmitter RF power	33 dBm (2W)
Communications port	RS–232, 1200 to 38,400 baud RS–422, 1200 to 38,400 baud Ethernet, 10/100 Mbps
Other features	Real-time clock Front Panel Ground Stud

Figure 28 gives the mechanical dimensions of the AI1422E Reader.

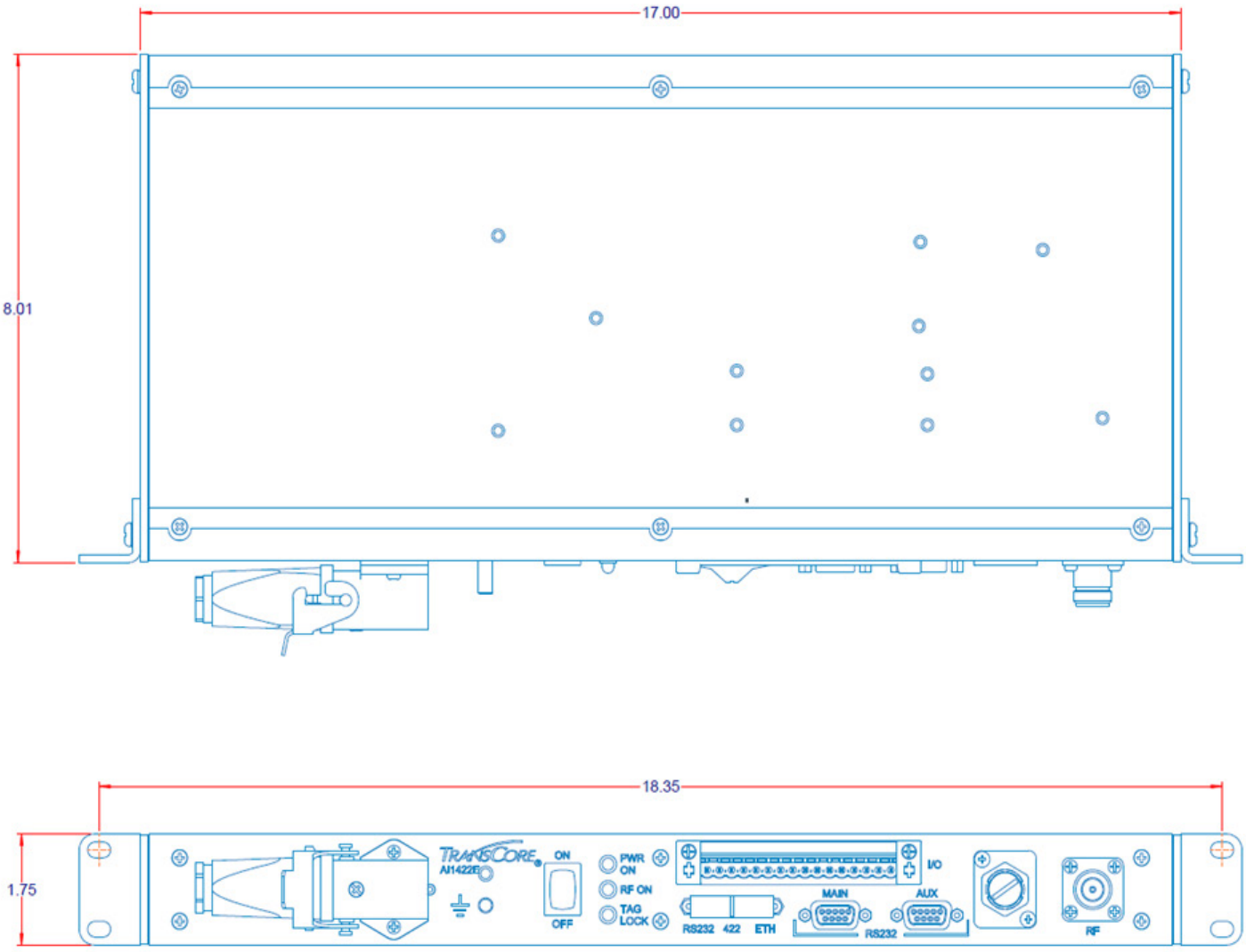

Figure 28 AI1422E Reader Mechanical Dimensions

C

Lantronix® Ethernet Module Configuration

Appendix C

Lantronix® Ethernet Module Configuration

The AI1422E incorporates an Embedded Ethernet to Serial server from Lantronix ®. In order to configure the Ethernet to Serial server, Lantronix software is required. The user guide for the Lantronix ® XPort ® Direct + Embedded Serial-to-Ethernet server can be found at www.lantronix.com/wp-content/uploads/pdf/XPort-Direct-Plus_UG.pdf.

The easiest way to connect to the AI1422E is by using the Lantronix ® CPR (Com Port Redirector) software, which will allow connecting directly to the AI1422E through the Ethernet Interface from a Windows computer. The Lantronix ® CPR software can be found at http://ltxfaq.custhelp.com/app/answers/detail/a_id/928 and documentation of this software can be found in the Lantronix ® CPR Quick Start Guide, located at www.lantronix.com/wp-content/uploads/pdf/Com-Port-Redirector _QS.pdf

Other methods of communicating through the Lantronix ® module exist. Contact Lantronix ® with questions.

Embedded Device: Lantronix ® XPort ® Direct + Embedded Serial-to-Ethernet

Lantronix ® Technical Support

Hours: 6:00am – 5:00pm Pacific Time

Mon. – Fri. (excluding holidays)

Tel: (800) 422-7044 (US Only)

Tel: (949) 453-7198

Interface through Ethernet Port

To interface through the Ethernet port of the AI1442E, connect via the M12 Ethernet port (Use an M12 to RJ45 adapter if required). A static IP address will need to be assigned to your local host if directly connected or the reader may be attached to your network.

Setting up Local Host

1. Install the stand-alone **DeviceInstaller (**Figure 29) **f**rom the following link: This is needed to know the IP address of the Ethernet to serial converter. http://ltxfaq.custhelp.com/app/answers/detail/a_id/644?_ga=1.59440430.2035039615.1475511776

Figure 29 Install the Stand-alone DeviceInstaller

Product	Comment
Stand-alone DeviceInstaller Setup application for Windows (91 MB) - ZIP Archive	No internet access required to install

2. Once installed, launch **DeviceInstaller (**Figure 30) from the **Start** menu.

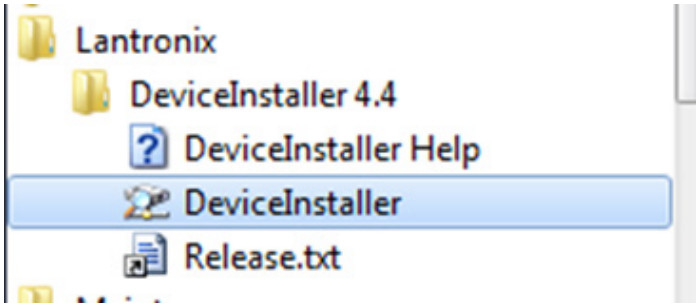

Figure 30 Launch DeviceInstaller from the Start Menu

3. If connecting directly to the computer's Ethernet port, go to the computer's network setting and change the IP address and Subnet mask of the network interface controller (NIC) card you are connecting to as shown in Figure 31 .

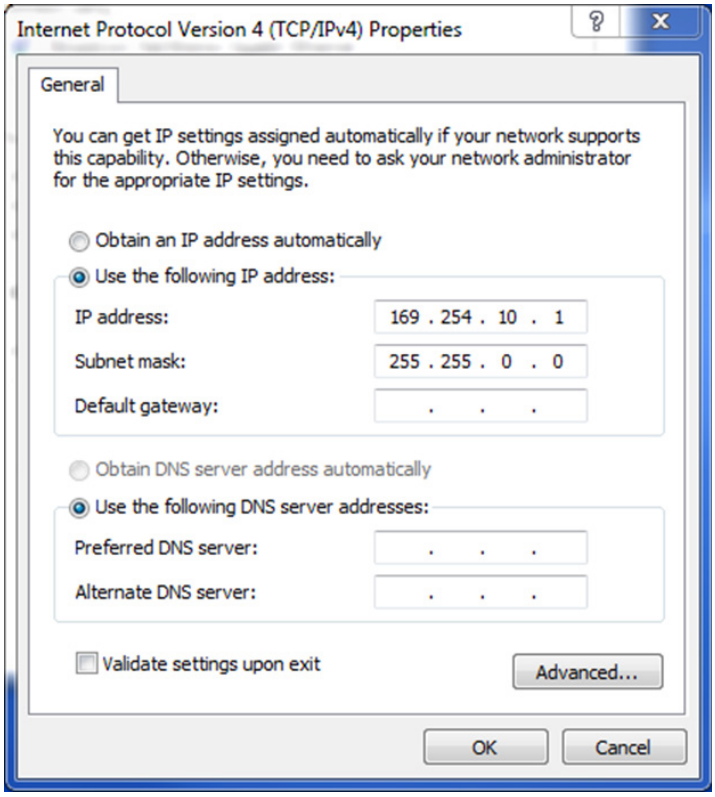

Figure 31 Change IP Address and Submet Mask of NIC Card.

4. If the computer has multiple NIC cards, you might see a prompt similar to the prompt shown in Figure 32. Select **Yes.**

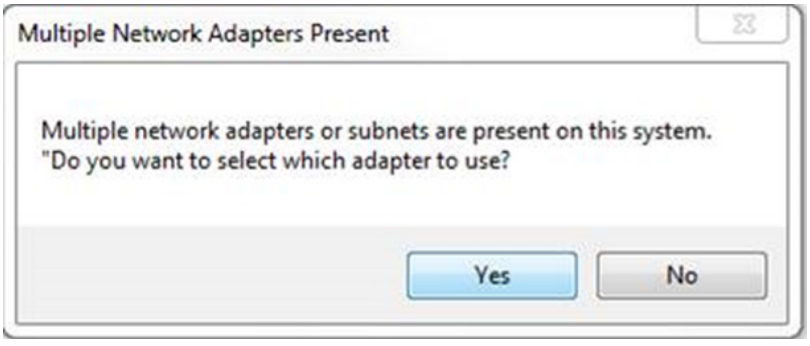

Figure 32 Prompt if Computer has Multiple NIC cards

Choose the desired adapter and then select **OK (**Figure 33**)**.

If you are connecting directly to your computer's Ethernet port, choose the network adapter with the ***169.254.10.1*** address.

If you are connecting to your corporate network, choose the **Local Area Connection.**

The selection can be changed at any time through the ***Options*** menu.

Figure 33 NIC Card Options Screen

5. If you are not connecting through a network, configure the IP Address and the Subnet mask as described in Step 3.
6. If prompted to check for updates, select **No (**Figure 34**).**

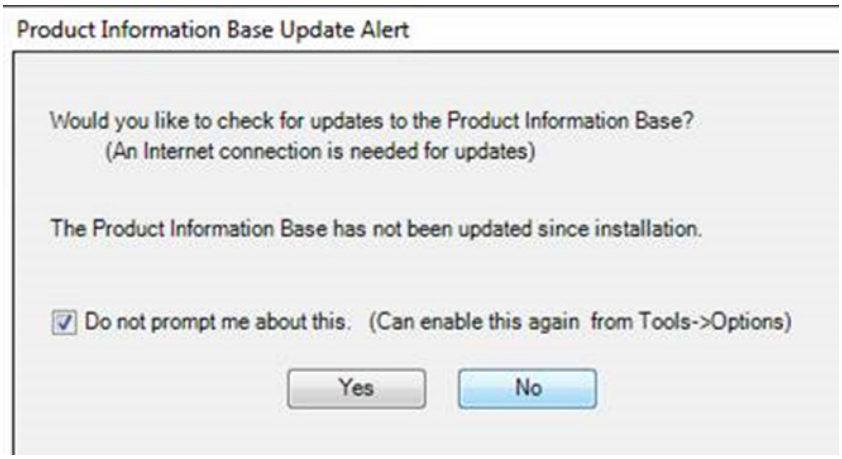

Figure 34 Check for Updates Prompt

7. If a firewall is present, disable it to allow access (Figure 35).

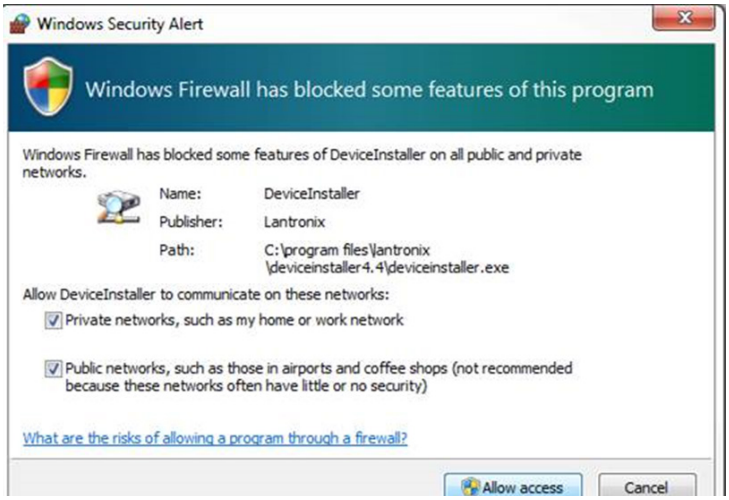

Figure 35 Disable Firewall to Allow Access

Finding IP address of Reader

1. From the Lantronix DeviceInstaller right-click on the connection you choose and hit refresh Figure 36).

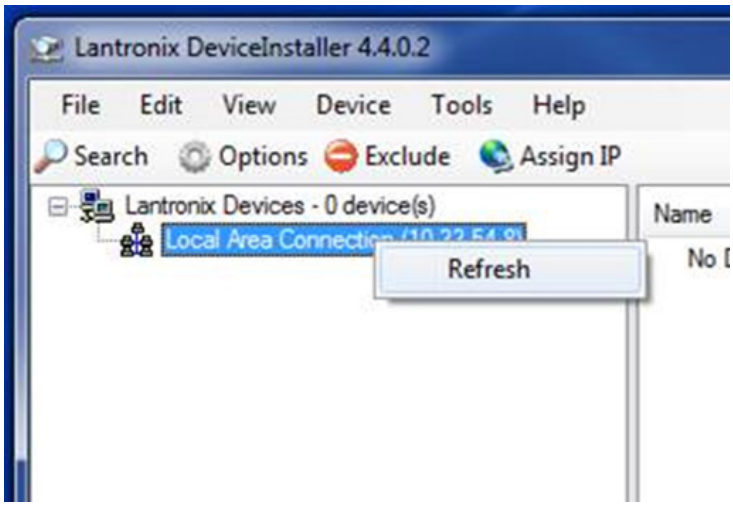

Figure 36 Lantronix DeviceInstaller Menu

2. The Xport Direct+ device will populate on the right side of the window (Figure 37).

Figure 37 Finding the IP address of a Reader

3. Use the IP address to configure your terminal emulator Connection (Ex: PuTTY). Use Telnet and Port 10001 Figure 37).

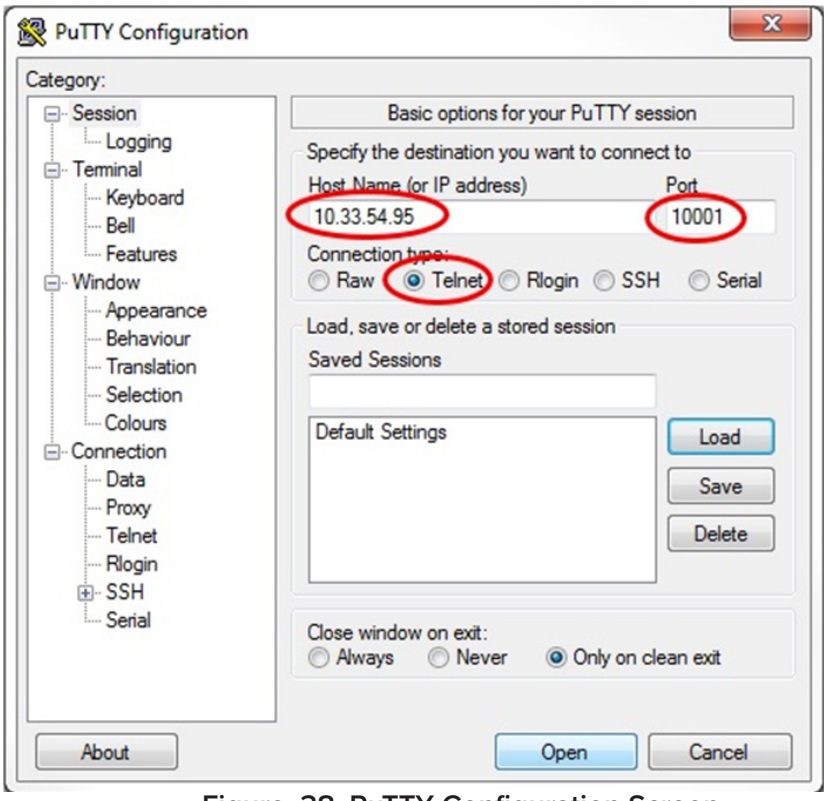

Figure 38 PuTTY Configuration Screen

4. The opened connection is similar to a serial connection.
5. Ignore the local echo of the typed characters, if using PuTTY.

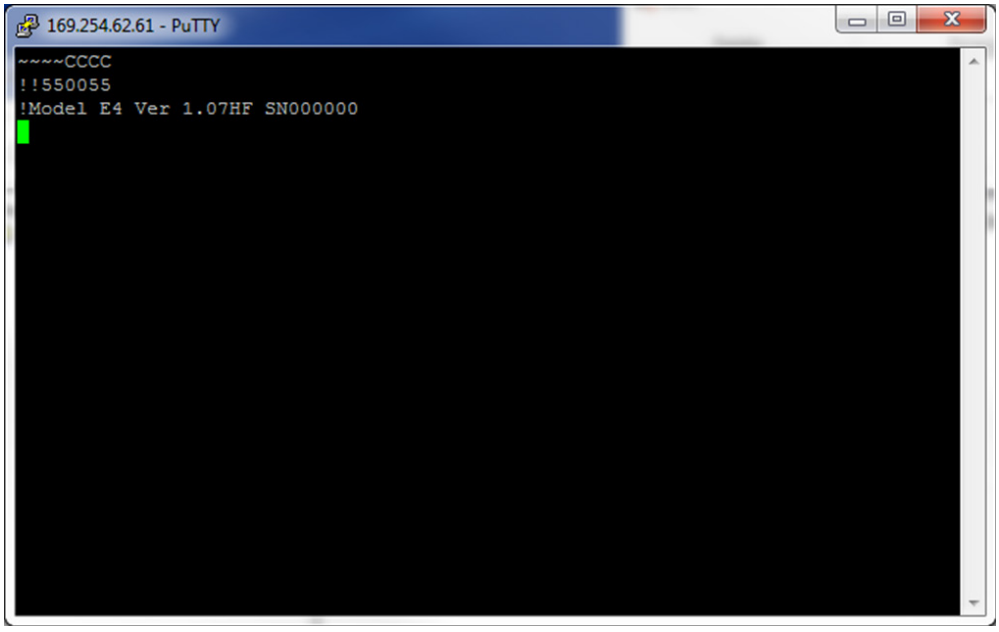

Figure 39 PuTTY Connection Screen

D

Command Quick Reference

Appendix D

Command Quick Reference

This appendix lists the default configuration settings for the AI1422E and its commands. Commands are listed both numerically and alphabetically.

Command Syntax

The command numbers consist of from 2 to 4 hex digits. The letters `N` or `S` may follow a command number. The letter `N` indicates that part of the command number is variable. The letter `S` indicates the requirement for an alphanumeric data string that is to be included immediately following the command number. Hex digits (0–9, A–F) in either uppercase or lowercase characters may be used in data strings and for hex digits A–F.

Table 30 lists factory default settings. Table 32 lists all of the commands available to users in numerical order. Table 33 lists the same commands in alphabetical order by command name.

Factory Default Settings

Note: *Table 30 lists the factory default settings for the AI1422E.*

Table 30 AI1422E Default Configuration Settings

Parameter	Setting	Command
Operating mode	Data	00
Baud rate	9600	1005
Stop bits	1	1010
Parity	None	1020
Time and data appended	Enabled	302
Auxiliary information appended	Disabled	310
Unique ID code criteria	Separation of 1 ID	4100
Valid ID code criteria	Acquisition of 1 ID	4200
Uniqueness time-out	2 minutes	441
Tag translation mode	Disabled	452
Multi-tag sort	Disabled	454
SeGo protocol tag initialization during multi-tag sort	Enabled	456
Alternate Group Select	Disabled	490
Reader ID number	00	6000
Communications protocol	Basic	610

Parameter	Setting	Command
Error protocol (ECP) timeout	12.7 sec	612FE
Echo mode	Enabled	6171
Output Control	Disabled	6200
Predefined Output Control	Enabled	621
RF-by-input control	Enabled By Sense	6421
ATA operating range (distance)	Maximum	6431F
RF attenuation	Full power(10-1422-5XX/10-1422-8XX)	64400/64403
SeGo protocol operating range (distance)	Maximum	6451F
Output Pulse Duration		67C
Presence without tag reports	Disabled	6900
RF-off control	Timeout or no presence	6922
RF timeout	Never true	693F
Input inversion	Disabled	6940
Serial number	SSSSSS	695
Store hardware configuration	Hardware configuration not known	696
Automatic periodic RF status report	Disabled	830

NOTE: Frequency doesn't have a factory default and must be programmed by the end user.

Legacy Commands

Legacy AI1422 commands will echo after a carriage return with echo off enabled. This emulates how the legacy AI1422 performed. Refer to Table 31

Table 31 Legacy Commands

Command	Function	Echo On Response	Echol Off Response
~~CC	Enter Diagnostic Mode (CC must be upper case)	(no response)	(no response)
!100x	Baud rate select		
1001 = 300 baud			
1002 = 1200 baud			
1003 = 2400 baud			
1004 = 4800 baud			
1005 = 9600 baud			
1006 = 19200 baud	!Done	!100X	
!Done			
!20hh:mm:ss	Set the time in the real-time clock	!Done	!20hh:mm:ss
!Done			
!21MM/DD/YY	Set the date in the real-time clock	!Done	!21MM/DD/YY
!Done			
!22	Display time and date	!hh:mm:ss.hh MM/DD/YY	!22
!hh:mm:ss.hh MM/DD/YY			
!40	Disable transmit all tag ID codes	!Done	!40
!Done			
!41	Transmit all tag ID codes	!Done	!41
!Done			
!505	Report firmware version number	!Model E4 Ver X.XXHFb2 SNXXXXXX	!505
!Model E4 Ver X.XXHFb2 SNXXXXXX			

Command	Function	Echo On Response	Echol Off Response
!521	Report number of handshakes	!RDID XX	!RDID XX
!640	Disable RF	!Done	!640
!Done			
!641	Enable RF	!Done	!641
!Done			
!642	RF on by sense input	!Done	!642
!Done			
!661	Manufacturing Diagnostic RAM Check (Not for customer use)	!DIAG RX EX DX CX	!DIAG RX EX DX CX
!662	Exit Diagnostic Mode	!Done	!662

Numerical Command List

The following conventions are used in Table 32:

- Items in ***bold italics*** identify factory default settings.
- Only the command-related data portion of the reader message is shown.

Refer to "Communications Protocols" on page 21 for the complete syntax of commands and messages.

Table 32 AI1422E Commands Listed Numerically

Number	Command Name	Reader Message
00	***Switch to data mode***	***Done***
01	Switch to command mode	
1002	Set baud rate = 1200 baud	Done
1003	Set baud rate = 2400 baud	Done
1004	Set baud rate = 4800 baud	Done
1005	***Set baud rate = 9600 baud***	***Done***
1006	Set baud rate = 19.2 K baud	Done
1007	Set baud rate = 38.4 K baud	Done
1010	***Use one stop bit***	***Done***
1011	Use two stop bits	Done

Number	Command Name	Reader Message
1020	***Disable parity***	***Done***
1021	Select even parity	Done
1022	Select odd parity	Done
20	Set time	Done
21	Set date	Done
22	Display time and date	Time and date
300	No time and date appended	Done
302	***Time and date appended***	***Done***
310	***Disable aux info append***	***Done***
311	Enable aux info append	Done
40	Disable Transmission All IDs	Done
41	Transmit all IDs	Done
4100	***Select one ID separation***	***Done***
4101	Select two ID separation	Done
4102	Select three ID separation	Done
4103	Select four ID separation	Done
4200	***Select 1 valid ID code***	***Done***
4201	Select 2 valid ID codes	Done
4202	Select 3 valid ID codes	Done
4203	Select 4 valid ID codes	Done
440	Reset uniqueness	Done
441	***Set uniqueness time-out to 2 minutes***	***Done***
442	Set uniqueness time-out to 15 seconds	Done
443	Set uniqueness time-out to 30 seconds	Done
452	***Disable tag translation mode***	***Done***
453	Enable tag translation mode	Done
454	***Disable multi-tag sort***	***Done***
455	Enable multi-tag sort	Done

Number	Command Name	Reader Message
456	***Enable SeGo protocol tag initialization during multi-tag sort***	***Done***
457	Disable SeGo protocol tag initialization during multi-tag sort	Done
480	Disable ATA	Done if AI1422E model supports this tag protocol. Error if tag protocol is unsupported.
481	Enable ATA	Done if AI1422E model supports this tag protocol. Error if tag protocol is unsupported.
484	Disable SeGo	Done if AI1422E model supports this tag protocol. Error if tag protocol is unsupported.
485	Enable SeGo	Done if AI1422E model supports this tag protocol. Error if tag protocol is unsupported.
488	Disable eATA	Done if AI1422E model supports this tag protocol. Error if tag protocol is unsupported.
489	Enable eATA	Done if AI1422E model supports this tag protocol. Error if tag protocol is unsupported.
505	Display version	Model [model] Ver [version no.] SN [serial no.]
506	Display hardware configuration information	S...S S...S = ASCII string (maximum length of 20 characters)
520	Display power fail bit	PWRB Px R0 P0 = no power fail has occurred P1 = power fail has occurred R0 = not applicable to the AI1422E
521	Display reader ID number	RDID xx xx = 00–FF

Number	Command Name	Reader Message
522	Display comm port parameters	MAIN Bx Sx Px D0 B2 = 1200 B3 = 2400 B4 = 4800 B5 = 9600 B6 = 19.2 B7 = 38.4 S0 = one stop bit S1 = two stop bits P0 = no parity P1 = even P2 = odd D0 = EOL delay of 0 ms
524	Display appended info status	IDAP T0 D0 Xx T0 = time not appended T1 = time appended D0 = date not appended D1 = date appended X0 = aux info not appended X1 = aux info appended
525	Display comm protocol	ECPS Px Txx Xx S0 P0 = basic P1 = ECP Txx = ECP timeout ms = 50 * xx FF = disabled ECP timeout X0 = no flow control X1 = software flow control S0 = som character is #

Number	Command Name	Reader Message
527	Display RF status	RFST Cx Ox Tx Fxxx Rxx Gxx Axx I04 C0 = RF controlled by host C1 = RF-by-presence sensor O0 = RF off O1 = RF on T1 = uniqueness timeout of 2 min T2 = uniqueness timeout of 15 sec T3 = uniqueness timeout of 30 sec Fxxx = RF output frequency, xxx = 000 to 118 Rxx = Tag decoder range (distance) for ATA tags, 00 to 1F hexadecimal range value Gxx = Tag decoder range (distance) for eGo Plus Tags, 00 to 1F hexadecimal range value Axx = RF power attenuation, 00 max to 0A min (10 dB less than max) I04 = fixed ***Note If you enter RF settings using command #642NN, the display command for RF output frequency, F is "Fxx" and indicates use of the backward-compatible frequency entry method.***

Number	Command Name	Reader Message
529	Display presence input status	PRST Px D0 Ax Tx Ix P0 = disable presence w/o tag reports P1 = enable presence w/o tag reports D0 = min presence true period of 0 ms A0 = RF off on timeout A1 = RF off on timeout or tag A2 = RF off on timeout or no presence T0: RF timeout of 0 ms (always expired) T1: RF timeout of 4 ms T2: RF timeout of 8 ms T3: RF timeout of 12 ms T4: RF timeout of 20 ms T5: RF timeout of 24 ms T6: RF timeout of 32 ms T7: RF timeout of 48 ms T8: RF timeout of 60 ms T9: RF timeout of 92 ms TA: RF timeout of 152 ms TB: RF timeout of 300 ms TC: RF timeout of 452 ms TD: RF timeout of 600 ms TE: RF timeout of 752 ms ***TF: RF timeout infinite, never expires (factory default)*** ***I0 = Input inversion disabled (factory default)*** I1 = Input inversion enabled
530	Display RF0 filter status	RF0S Ux V0 ***U0 = one ID separation (factory default)*** U1 = two ID separation U2 = transmit all IDs U3 = buffer all IDs ***V0 = valid ID code criteria of one acquisition (factory default)*** V1 = valid ID code criteria of two acquisitions V2 = valid ID code criteria of three acquisitions V3 = valid ID code criteria of four acquisitions
534	Display tag translation mode status	TT <0 to 1> 0 = tag translation mode disabled 1 = tag translation mode enabled

Number	Command Name	Reader Message
537	Display echo status	ECHO x ***0 = disabled (factory default)*** 1 = enabled
540	Display flash checksum	PCKS I0000 Exxxx xxxx = 4-byte ASCII checksum
543	Display boot checksum	BCKS xxxx xxxx = 4-byte ASCII checksum
549	Get user-programmable group select equals (GSE) filter data	The response data is formatted similar to the data in the configuration command.
552	Request sensor status change	Reader response: MUX x<0 to 3> <AI1422E> where x = 0 antenna multiplexing disabled, RF on port 0 only x = 1 antenna multiplexing between RF ports 0 and 1 when sense0 active x = 2 antenna multiplexing between RF ports 0 and 1 when sense0 active and RF port 2 when sense1 active x = 3 antenna multiplexing between RF ports 0 and 1 when sense0 active and RF ports 2 and 3 when sense1 active AI1422E = AI1422E mode selected
560	Display input status change	SSTC Ex Mx E0 = status change reports disabled E1 = status change reports enabled M0 = no reporting M1 = report change on Input 0 M2 = report change on Input 1 M3 = report change on either input
570	Display operating mode status	ATA:<E, D> eGo:<I, F, D> SeGo:<I, F, D> IAG:<E, D> Sort:<E, D> I = ID (64 bits) E = Enabled F = Full transaction (eATA) D = Disabled
577	Report buffered handshakes	XX = number of handshakes

Number	Command Name	Reader Message
60NN	Set reader ID number NN = 00–FF (00 = factory default)	Done
610	***Select basic protocol***	***Done***
611	Select ECP protocol	Done
612NN	Set ECP timeout NN = 01–FE (1–255) timeout = 50 ms * NN (if NN = FF, timeout is disabled)	Done
6140	Disable flow control	Done
6141	***Enable software flow control***	***Done***
6170	Disable echo	Done
6171	***Enable echo***	***Done***
63	Reset reader	Model [model] Ver [version no.] SN [serial no.] Copyright [date] TransCore
640	Turn off RF	Done
641	Turn on RF	Done
642	*Select RF-by-input control*	***Done***
642NN	Select RF operating frequency	Done
643NN	Set ATA operating range (distance) NN = 00 (shortest) to 1F (longest) ***1F = default***	Done
644NN	Set RF attenuation NN = 00 to 0A	Done
645NN	Set SeGo protocol operating range (distance) NN = 00 (shortest) to 1F (longest)	Done
647XXX	Select RF operating frequency from 860 to 930 in 250 kHz steps XXX = 000 - 118 (hexadecimal)	Done
65	Reset power fail bit	Done

Number	Command Name	Reader Message
66F	Load default operating parameters (except RF operating frequency)	Done
661	Manufacturing Diagnostic RAM Check (Not for customer use)	Command `!661` is to be used by manufacturing. Not for customer use.
662	Exits Command Mode.	
6900	***Disable presence without tag reports***	***Done***
6901	Enable presence without tag reports	Done
6920	Turn RF off on timeout	Done
6921	Turn RF off on timeout/tag	Done
6922	***Turn RF off on timeout/no presence***	***Done***
693N	Set RF timeout N = 0–F (always expired, 4,8,12,20,24, 32,48,60,92,152, 300,452, 600,752, infinite)	Done
693F	***Set RF timeout = infinite***	***Done***
6940	***Disable input inversion***	***Done***
6941	Enable input inversion	Done
695S...S	***Set serial number S...S = ASCII string (maximum length of 6 characters)***	***Done***
696S...S	***Store hardware configuration string S...S = ASCII string (maximum length of 20 characters)***	***Done***

Number	Command Name	Reader Message
697	Set user-programmable group select equals (GSE) filter `697 MM AA DDDDDDDDDDDDDDDD` where MM = determines which of the eight comparison data bytes are to be compared for the Group Select filter AA = determines the start address in the tag memory for the comparison data D...D = 8-byte field (16 characters) used by the tag as the comparison data for the group select filter	Done
8110	Switch on RF port 0, fire off check tag address 0 on check tag pin 0	Done
8111	Switch on RF port 1, fire off check tag address 1 on check tag pin 0	Done
8112	Switch on RF port 2, fire off check tag address 0 on check tag pin 1	Done
8113	Switch on RF port 3, fire off check tag address 1 on check tag pin 1	Done
8142X	Set check tag character on check tag pin 0	Done
8143X	Set check tag character on check tag pin 1	Done
8150	Set check tag address to 0 on check tag pin 0	Done
8151	Set check tag address to 1 on check tag pin 0	Done
8152	Set check tag address to 0 on check tag pin 1	Done
8153	Set check tag address to 1 on check tag pin 1	Done

Number	Command Name	Reader Message
830	***Disable automatic periodic RF status report***	***Done***
831	Enable automatic periodic RF status report	Done

Alphabetical Command List

The following conventions are used in :

- Items in ***bold italics*** identify factory default settings.
- Only the command-related data portion of the reader message is shown.

Refer to "Command Codes" on page 24"Command Codes" on page 24 for the complete syntax of commands and messages.

Table 33 AI1422E Commands Listed Alphabetically

Command Name	Code	Reader Message
All IDs transmit	41	Done
Appended info status display	524	IDAP T0 D0 Xx T0 = time not appended T1 = time appended D0 = date not appended D1 = date appended X0 = aux info not appended X1 = aux info appended
ATA disable	480	Done if AI1422E model supports this tag protocol. Error if tag protocol is unsupported.
ATA enable	481	Done if AI1422E model supports this tag protocol. Error if tag protocol is unsupported.
ATA operating range set NN = 00 (shortest) to 1F (longest) ***1F = default***	643NN	Done
Automatic periodic RF status report disable	***830***	***Done***
Automatic periodic RF status report enable	831	Done
Aux info append disable	***310***	***Done***
Aux info append enable	311	Done
Basic protocol select	***610***	***Done***
Baud rate = 1200 baud set	1002	Done
Baud rate = 19.2 K baud set	1006	Done
Baud rate = 2400 baud set	1003	Done
Baud rate = 38.4 K baud set	1007	Done

Command Name	Code	Reader Message
Baud rate = 4800 baud set	1004	Done
Baud rate = 9600 baud set	***1005***	***Done***
Boot checksum display	543	BCKS xxxx xxxx = 4-byte ASCII checksum
Buffered handshake report	577	XX = number of handshakes
Comm port parameters display	522	MAIN Bx Sx Px D0 B0 = 110 B1 = 300 B2 = 1200 B3 = 2400 B4 = 4800 B5 = 9600 B6 = 19.2 B7 = 38.4 S0 = one stop bit S1 = two stop bits P0 = no parity P1 = even P2 = odd D0 = EOL delay of 0 ms
Comm protocol display	525	ECPS Px Txx Xx S0 P0 = basic P1 = ECP Txx = ECP timeout ms = 50 * xx TFF = disabled ECP timeout X0 = no flow control X1 = software flow control S0 = SOM character is #
Command mode switch	01	
Data mode switch	***00***	***Done***
Date set	21	Done
Default operating parameters load (except RF operating frequency)	66F	Done
Default operating parameters load (except RF operating frequency)	66F	Done
Disable Transmission All IDs	40	Done

Command Name	Code	Reader Message
eATA disable	488	Done if AI1422E model supports this tag protocol. Error if tag protocol is unsupported.
eATA enable	489	Done if AI1422E model supports this tag protocol. Error if tag protocol is unsupported.
Echo disable	6170	Done
Echo enable	6171	Done
Echo status display	537	ECHO x 0 = disabled 1 = enabled
ECP protocol select	611	Done
ECP timeout set = 12.7 sec	***612FE***	***Done***
ECP timeout set NN = 01–FE (1–255) timeout = 50 ms * NN (if NN = FF, timeout is disabled)	612NN	Done
Even parity select	1021	Done
Flash checksum display	540	PCKS I0000 Exxxx xxxx = 4-byte ASCII checksum
Flow control disable	6140	Done
Get user-programmable group select equals (GSE) filter data	549	The response data is formatted similar to the data in the configuration command.
Hardware configuration information display	506	S...S S...S = ASCII string (maximum length of 20 characters)
Hardware configuration string store S...S = ASCII string (maximum length of 20 characters)	***696S...S***	***Done***
Input inversion disable	***6940***	***Done***
Input inversion enable	6941	Done
Input status change display	560	SSTC Ex Mx E0 = status change reports disabled E1 = status change reports enabled M0 = no reporting M1 = report change on Input 0 M2 = report change on Input 1 M3 = report change on either input
Multi-tag sort disable	***454***	***Done***

Command Name	Code	Reader Message
Multi-tag sort enable	455	Done
Odd parity select	1022	Done
Operating mode status display	570	ATA:<E, D> eGo:<I, F, D> SeGo:<I, F, D> IAG:<E, D> Sort:<E, D> I = ID (64 bits) E = Enabled F = Full transaction (eATA) D = Disabled
Parity disable	***1020***	***Done***
Power fail bit display	520	PWRB Px R0 P0 = no power fail has occurred P1 = power fail has occurred R0 = not applicable
Power fail bit reset	65	Done
Presence input status display	529	PRST Px D0 Ax Tx Ix P0 = disable presence w/o tag reports P1 = enable presence w/o tag reports D0 = min presence true period of 0 ms A0 = RF off on timeout A1 = RF off on timeout or tag A2 = RF off on timeout or no presence T0: RF timeout of 0 ms (always expired) T1: RF timeout of 4 ms T2: RF timeout of 8 ms T3: RF timeout of 12 ms T4: RF timeout of 20 ms T5: RF timeout of 24 ms T6: RF timeout of 32 ms T7: RF timeout of 48 ms T8: RF timeout of 60 ms T9: RF timeout of 92 ms TA: RF timeout of 152 ms TB: RF timeout of 300 ms TC: RF timeout of 452 ms TD: RF timeout of 600 ms TE: RF timeout of 752 ms ***TF: RF timeout infinite, never expires (factory default)*** ***I0 = Input inversion disabled (factory default)*** I1 = Input inversion enabled

Command Name	Code	Reader Message
Presence without tag reports disable	***6900***	***Done***
Presence without tag reports enable	6901	Done
Reader ID number display	521	RDID xx xx = 00–FF
Reader ID number set NN = 00-FF ***(00 = factory default)***	60NN	Done
Reader reset	63	Model [model] Ver [version no.] SN [serial no.] Copyright [date] TransCore
Report changes both	823	Done
RF attenuation set NN = 00 to 0A	644NN	Done
RF off on timeout	6920	Done
RF off on timeout/no presence	***6922***	***Done***
RF off on timeout/tag	6921	Done
RF turn off	6400	Done
RF turn on	6401	Done
RF on by input control	***641***	***Done***
RF operating frequency from 860 to 930 in 250 kHz steps select XXX = 000 - 118 (hexadecimal)	647XXX	Done
RF operating frequency select	642NN	Done

Command Name	Code	Reader Message
RF status display	527	RFST Cx Ox Tx Fxxx Rxx Gxx Axx I04 C0 = RF controlled by host C1 = RF-by-presence sensor O0 = RF off O1 = RF on T1 = uniqueness timeout of 2 min T2 = uniqueness timeout of 15 sec T3 = uniqueness timeout of 30 sec Fxxx = RF output frequency, xxx = 000 to 118 Rxx = Tag decoder range (distance) for ATA tags, 00 to 1F hexadecimal range value Gxx = Tag decoder range (distance) for eGo Plus Tags, 00 to 1F hexadecimal range value Axx = RF power attenuation, 00 max to 0A min (10 dB less than max) I04 = fixed ***Note: If you enter RF settings using command #642NN, the display command for RF output frequency, F is "Fxx" and indicates use of the backward- compatible frequency entry method.***
RF timeout = infinite set	***693F***	***Done***
RF timeout set N = 0–F (always expired 4, 8, 12, 20, 24, 32, 48, 60, 92, 152, 300, 452, 600, 752 ms, infinite)	693N	Done
RF0 filter status display	530	RF0S Ux V0 U0 = one ID separation U1 = two ID U2 = transmit all
SeGo disable	484	Done if AI1422E model supports this tag protocol. Error if tag protocol is unsupported.
SeGo enable	485	Done if AI1422E model supports this tag protocol. Error if tag protocol is unsupported.
SeGo protocol operating range set NN = 00 (shortest) to 1F (longest)	645NN	Done
SeGo protocol tag initialization during multi-tag sort	***456***	***Done***

Command Name	Code	Reader Message
SeGo protocol tag initialization during multi-tag sort disable	457	Done
Serial number set S...S = ASCII string (maximum length of 6 characters)	695S...S	Done
Set check tag character on check tag pin 0	8142X	Done
Set check tag character on check tag pin 1	8143X	Done
Set check tag address to 0 on check tag pin 0	8150	Done
Set check tag address to 1 on check tag pin 0	8151	Done
Set check tag address to 0 on check tag pin 1	8152	Done
Set check tag address to 1 on check tag pin 1	8153	Done
Set user-programmable group select equals (GSE) filter `697 MM AA DDDDDDDDDDDDDDDD` where MM = determines which of the eight comparison data bytes are to be compared for the Group Select filter AA = determines the start address in the tag memory for the comparison data D...D = 8-byte field (16 characters) used by the tag as the com- parison data for the group select filter	697	Done
Software flow control enable	***6141***	***Done***
Stop bit use one	***1010***	***Done***
Stop bit use two	1011	Done
Switch on RF port 0, fire off check tag address 0 on check tag pin 0	8110	Done
Switch on RF port 1, fire off check tag address 1 on check tag pin 0	8111	Done

Command Name	Code	Reader Message
Switch on RF port 2, fire off check tag address 0 on check tag pin 1	8112	Done
Switch on RF port 3, fire off check tag address 1 on check tag pin 1	8113	Done
Tag ID separation select four	4103	Done
Tag ID separation select one	***4100***	***Done***
Tag ID separation select three	4102	Done
Tag ID separation select two	4101	Done
Tag translation mode status display	534	*TT <0 to 1>* *0* = tag translation mode disabled *1* = tag translation mode enabled
Time and date appended	***302***	***Done***
Time and date display	22	Time and date
Time and date not appended	300	Done
Time set	20	Done
Uniqueness reset	440	Done
Uniqueness time-out set to 2 minutes	***441***	***Done***
Uniqueness time-out set to 15 seconds	442	Done
Uniqueness time-out set to 30 seconds	443	Done
Valid ID code select four	4203	Done
Valid ID code select one	***4200***	***Done***
Valid ID code select three	4202	Done
Valid ID code select two	4201	Done
Version display	505	Model [model] Ver [ver no.] SN [serial no.]

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