

Encompass® 3

Quick Start Guide

16-0085-001 Rev C 3/19

TransCore's Encompass® 3 family of fully integrated wireless radio frequency identification (RFID) readers are designed for use in parking, security access, electronic vehicle registration (EVR), traffic management, and low-speed electronic toll collection applications.



This quick start guide is intended for use by authorized TransCore Encompass series dealers, installers, and service personnel, and provides information for site design, reader placement, testing, installation, and troubleshooting.

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

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NOTICE TO USERS IN THE UNITED STATES
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

ISED CANADA NOTICE
TO USERS IN CANADA

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- 1) This device may not cause interference.
- 2) This device must accept any interference, including interference that may cause undesired operation of the device.

**AVERTISSEMENT À L'ATTENTION DES
UTILISATEURS AUX ÉTATS-UNIS**

**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

**DÉCLARATION ISED CANADA
AVIS AUX UTILISATEURS AU CANADA**

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- 1) L'appareil ne doit pas produire de brouillage;
- 2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RADIO FREQUENCY HEALTH LIMITS FOR THE ENCOMPASS 3 READER IN FREQUENCY BAND OF 902 TO 928MHZ

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 3in (8cm).

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 6in (15cm) for the Occupational/ Controlled environment, and 12.6in (32cm) 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 $2.77 \text{ W}/\text{m}^2$. The average time is 6 minutes. The maximum permissible exposure (MPE) is the following:

Controlled Environment

Power density = $0.6455 \times \text{frequency (in MHz)}^{0.5}$ W/m² with a Reference Period time of 6 Min

General Public/Uncontrolled Environment

Power density = $0.02619 \times \text{frequency (in MHz)}^{0.6834}$ W/m² 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 7in (18cm) for the Controlled environment and 18.5in (47cm) 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.

Occupational/Controlled Environment				
Agency	Power Density (mW/cm ²)	MPE minimum distance		Time (min)
		in	cm	
OSHA	10	3	8	6
FCC	3.05	6	15	6
IC	1.95	7	18	6

General Population/Public/Uncontrolled Environment				
Agency	Power Density (mW/cm ²)	MPE minimum distance		Time (min)
		In	cm	
OSHA	10	3	8	6
FCC	0.61	12.6	32	30
IC	0.28	18.5	47	6

With the equipment installed and running at the maximum transmit power that the equipment is certified for, the recommendation for each of the operation environments is as follows:

- 1) The Encompass 3 should be installed at least 18.5in (47cm) from the General Population/Public i.e. Uncontrolled Environment.
- 2) Maintenance personnel (i.e. Occupational/Controlled Environment) must remain at least 7in (40cm) from the Encompass 3 and limit their time in the environment to 6 minutes when the system is operating.

LIMITES D'EXPOSITION AUX RADIOFRÉQUENCES POUR LE LECTEUR ENCOMPASS 3 SUR LA BANDE DE FRÉQUENCES DE 902 ET DE 928 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/cm²) 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 8 cm (3 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/cm² avec une durée moyenne de 6 min.

Exposition de la population générale/non contrôlée

Densité de puissance = fréquence (en MHz)/1500 mW/cm² 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 15 cm (6 po) pour l'environnement professionnel/contrôlé et de 32 cm (12,6 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/m². Ainsi, l'exposition maximale admissible pour la population générale/non contrôlée à 915 MHz est calculée à 2,77 W/m². La durée moyenne est de 6 minutes. Les limites d'exposition maximale autorisée (normes MPE) sont les suivantes :

Environnement contrôlé

Densité de puissance = $0,6455 \times \text{fréquence (en MHz)}^{0,5}$ W/m² avec une durée de référence de 6 min.

Grand public/environnement non contrôlé

Densité de puissance = $0,02619 \times \text{fréquence (en MHz)}^{0,6834}$ W/m² 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 18 cm (7 po) pour l'environnement professionnel/contrôlé et de 47 cm (18,5 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	3	8	6
FCC	3,05	6	15	6
IC	1,95	7	18	6

Population générale/environnement non contrôlé				
Organisme	Densité de puissance (mW/cm ²)	Distance MPE minimale		Durée (en min.)
		po	cm	
OSHA	10	3	8	6
FCC	0,61	12,6	32	30
IC	0,28	18,5	47	6

Avec l'appareil installé et fonctionnant à la puissance de transmission maximale pour lequel l'appareil a reçu une certification, les recommandations pour chaque environnement d'exploitation sont les suivantes:

- 1) L'Encompass 3 devrait être installée à au moins 47 cm (18,5 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 18 cm (7 po) de l'Encompass 3 et limiter son temps d'exposition à 6 minutes lorsque l'appareil est en fonctionnement.

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Designing the Site Plan

The site plan is the first step before ordering equipment and installing the Encompass 3 Reader. If the site configuration differs significantly from the recommendations in this guide, contact TransCore Sales Support.

Determine the Reader and Tag Combination

The Encompass 3 Reader is capable of reading the following protocols and formats:

- TransCore Super eGo® (SeGo)
- eGo (ISO 18000-6B)
- ATA/AAR/ISO 10374
- Title 21 (T21)
- Wiegand

Reader Placement

Encompass 3 Readers may be mounted on a pole at the side of the lane (side-fire), or on a gantry or surface extending over the center of the lane (overhead). Locate the reader where it is not likely to be bumped out of alignment. Encompass 3 Readers should not directly face each other or be positioned back-to-back.

For a pole mount installation, install the reader as high as possible so that the reader can be pointed down to control the read zone and minimize interference in the adjacent lane.

Tag Placement on Vehicle

TransCore recommends mounting the tag in the center of the windshield, 2" below the rear view mirror.

Site Layout, Lane Type, and Traffic Flow

Become familiar with the configuration of the site and its proximity to other sites. Determine what the lane types will be, and identify any equipment that will be used, such as ticket machines or proximity readers.

The number of readers that will be required depends on the number of lanes at the site, how they are grouped, and total entry and exit points. Measure lane widths and the distance between adjacent lanes, taking into account any island/barrier width. TransCore recommends a lane width of 12 feet or less, with the distance between the readers at least 12 feet or more.

Interfaces to External Equipment

For effective lane layout and transaction framing, the maximum distance from the entry loop to the reader should be about 8 feet. The distance from the reader to the gate arm should be 3 to 4 feet before the gate. If the read zone is much larger than 3 to 4 feet, a following car may be read (skip read), allowing a non-tagged vehicle to enter the facility.

The readers are typically configured to be loop activated (on by presence). Readers may be alternatively set to have RF on continuously. The choice depends on traffic volume and possible interaction with the other in-lane components.

Electrical and Communications Requirements

The Encompass 3 Reader requires 16-20VAC, 47-63HZ, or 16-28VDC for proper operation. Contact TransCore Sales Support for a list of recommended transformers and cable lengths.

The reader is available in RS-232 or RS-422 models. Maximum distance for RS-232 (3-wire serial) is 50 feet at 9600 baud. Maximum distance for RS-422 (4-wire differential signal) is 4000 feet at 9600 baud. The baud rate can be adjusted to accommodate noisy environments.

Pre-Installation Testing

Bench Testing the Reader

Bench testing the reader requires the following equipment:

- Audible circuit tester (buzzer)
- Compatible power/communications cable
- PC using a terminal emulation program such as Tera Term or Microsoft HyperTerminal

The Encompass 3 Reader uses a single 26-pin (13 twisted pair) cable to interface with power, I/O, and communications signals. The reader cable can be directly connected to external devices or routed to other components via an external junction box.

Connecting Hardware

1. For AC powered units, connect the power wires from the cable to the transformer using the color coding as described in [Table 1](#). Do not apply power to the transformer at this time.

For DC powered units, connect leads to an appropriate power supply.

Table 1 Power Connections

Colored-Wire Pair	Use These Colors	Connect to Transformer Terminal Strip
Brown/Red	Orange and Brown	L1 (16 to 20V AC)
Orange/Red	Red and Red	L2 (16 to 20V AC)

2. For Encompass 3 Readers with an antenna port, connect the antenna prior to powering up the reader, using an N-type connector.
3. Connect the leads from the audible tester to the red and white pair of wires from the power/communications cable.
4. For RS-232 units, refer to [Table 2](#) for wiring instructions. For RS-422 units, refer to [Table 3](#).
5. Connect the communications cable to the appropriate terminal on the host computer.

Table 2 RS-232 Interface

Colored Wire Pair	Use This Color	Connect to Host DB9 Pin	Connect to Host DB25 Pin
Red/Black	Black	Pin 2	Pin 3
	Red	Pin 3	Pin 2
Yellow/Black	Yellow	Pin 5	Pin 7

Table 3 RS-422 Interface

Colored Wire Pair	Use This Color	Connect to Host Signal
Yellow/Red	Yellow	Receive (+)
	Red	Receive (-)
Red/Black	Black	Transmit (+)
	Red	Transmit (-)
Yellow/Black	Yellow	Signal Ground

Correct Reader Grounding

Ground the reader following the recommended grounding shown in [Figure 1](#).

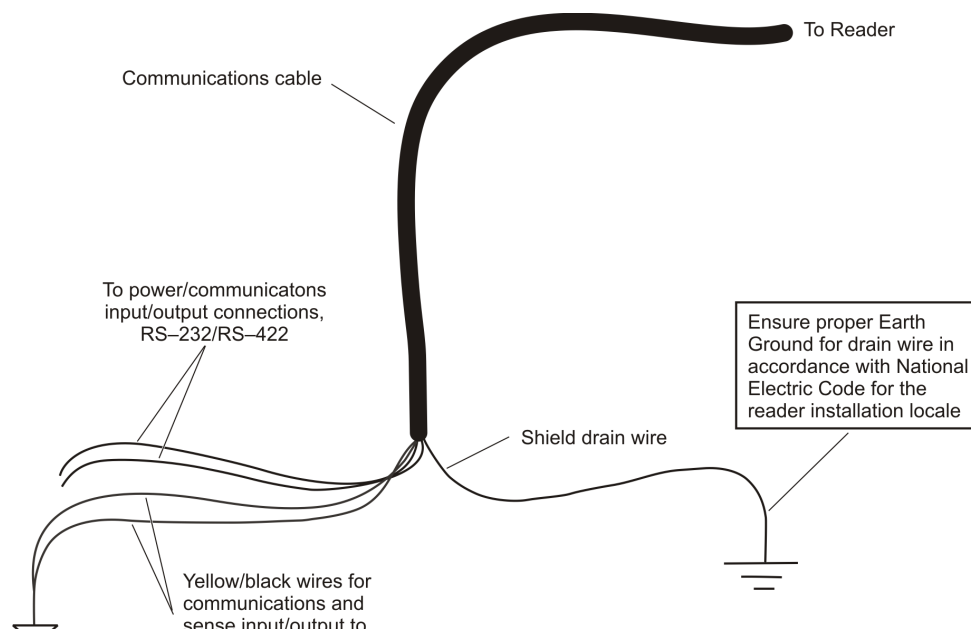


Figure 1 Recommended Reader Grounding

Setting up the Terminal Emulation Application

1. Launch the terminal emulation application.
2. In the dialog boxes choose the com port to which the communications interface is attached and set the properties as follows:
 - Bits per second: 9600 baud
 - Data bits: 8
 - Parity: None
 - Stop bits: 1
 - Flow control: None

Powering the Reader

1. Plug the AC transformer or DC power supply into an approved outlet. Switch on the power.
2. Once the reader has been powered up, a sign-on message will appear. If startup is successful, the sign-on message appears as follows:

```
Model E3 Series [software version] SNYYYYYY  
[Copyright notice]
```

Where YYYYYY is the serial number of the Encompass 3 Reader unit being used.

Configuring the Encompass 3 RF settings

The Encompass 3 Reader can be configured for different regulatory regions throughout the world. Check to ensure that the reader is set up for the region where it is being installed. The region code is set with command #642XX. The XX setting is defined in [Table 4](#).

The factory default setting is `no region code set`. The Encompass 3 Reader will not turn RF on and an `Error06` message will be generated from the reader if no region code is set.

Input the correct regional code and verify that the RF power setting is appropriate for the gain of the antenna that is being used. The factory default RF attenuation setting is 5dB (RF output power of 25dBm). The reader RF module has a maximum output of 30dBm. This setting assures that the reader will transmit RF power below the allowed limit for most countries, including the US FCC Part 15 limit.

The RF power level limit is set to not exceed 36 dBm EIRP (equivalent isotropic radiated power) for the internal Encompass 3 models. If an external antenna model is used, know the gain of the antenna, and set the RF attenuation accordingly for that country's regulatory requirements. RF attenuation command is #644xx where the XX setting is hex value from 00 (no attenuation, max power of 30dBm to a hex value of 14 (20 dB attenuation, min power of 10dBm).

Table 4 List of Regional Codes

XX=	Country
01	United States, Argentina, Canada, Chile, Colombia, Costa Rica, Dominican Republic, Mexico, Panama, Peru, Puerto Rico, Uruguay, Venezuela
02	Australia
03	Brazil
04	China
05	Hong Kong
06	South Korea
07	Malaysia
08	New Zealand
09	Singapore, Thailand
0A	South Africa
0B	Taiwan
0C	Vietnam
0D	India
0E	Jordan
0F	Philippines
10	Indonesia
11	Dubai, Qatar

Table 5 Testing Commands

Enter	Reader Response	What It Does
#01 <CR>	#Done <CR/LF>	Switches reader to command mode.
#481	#Done <CR/LF>	Sets operational mode to read ATA tags.
#40	#Done <CR/LF>	Transmits all tag IDs without regard for uniqueness.
#6401	#Done <CR/LF>	Turns RF ON.
#00 <CR>	#Done <CR/LF>	Returns reader to data mode.

Configure for Wiegand Operation

When using a Wiegand interface, configure the reader for Wiegand operation and connect the Wiegand interface wires ([Table 7](#)). If not using Wiegand tags, move to the next step, “[Test Read Tags](#)” on [page 16](#).

Table 6 Wiegand Testing Commands

Enter	Reader Response	What It Does
#01 <CR>	#Done <CR/LF>	Switches reader to command mode.
#489	#Done <CR/LF>	Sets operational mode to read eATA data from eGo Plus or eGo tags.
#451	#Done <CR/LF>	Switches reader to Wiegand mode.
#6401	#Done <CR/LF>	Turns RF ON.
#00 <CR>	#Done <CR/LF>	Returns reader to data mode and saves settings to NVM.

Table 7 Wiegand Interface

Colored Wire Pair	Use This Color	Connect to data wire of Wiegand device
Blue/Red	Blue	Data0
	Red	Data1
Yellow/Black	Black	Ground

Test Read Tags

1. Hold a tag in front of the reader to test whether its data is read out on the computer screen or on the Wiegand interface.
2. The commands listed in [Table 8](#) return the reader to factory defaults.

Table 8 Return to Factory Default Commands

Enter	Reader Response	What It Does
#01 <CR>	#Done <CR/LF>	Switches reader to command mode.
#66F	#Done <CR/LF>	Loads all factory default operating parameters except operating frequency.
#00 <CR>	#Done <CR/LF>	Returns reader to data mode.

Installation at the Site

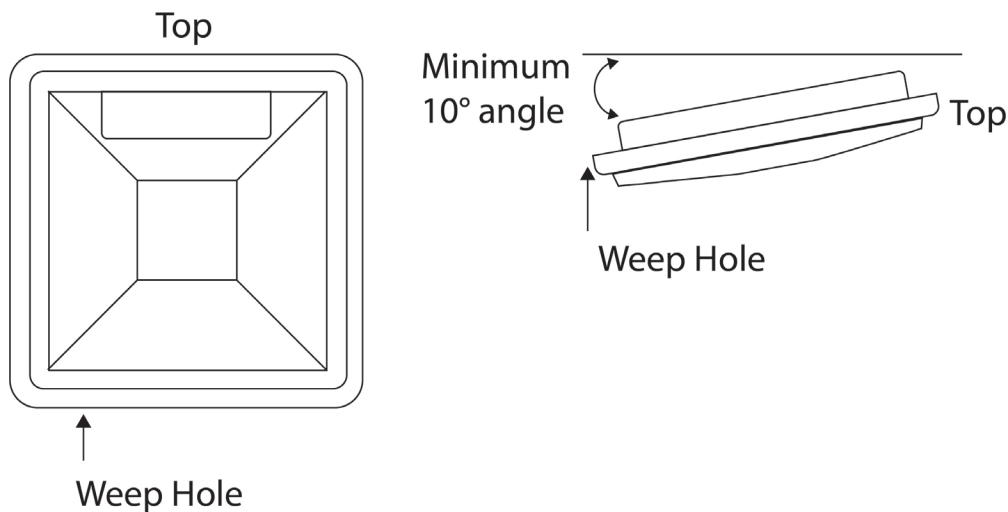
Complete pre-installation testing before installing the reader on site.

Before Starting Installation

Confirm the following:

- All construction is complete and electrical and communications cables are of the appropriate length and in place.
- A watertight junction box with terminal strip is present.
- A dedicated power supply of the appropriate voltage is present.
- The placement of the readers follows the site plan.
- The readers are in the correct positions: side-fire or overhead.

The Encompass 3 reader has a weep hole located on the bottom left side to allow moisture to escape. The reader should always be positioned so that the side with the weep hole is lower than the top. For overhead mounting, the reader angle should be at least 10° (Figure 2).



HS-0119

Figure 2 Correct Orientation of Reader

Typically, readers (or antennas) are installed either on the side of the lane, pointing into the lane (side-fire) or directly over the lane, pointed downward (center-fire or overhead).

Overhead installations are typically used in parking garages and other areas where a mounting surface already exists. These antennas are normally set to 10° down-tilt.

Side-fire installations are commonly used when the lanes are out in the open and the installation of a pole is sufficient to mount a reader.

NOTE: For side-fire reader placement, optimum tag placement is on the side of the windshield nearest the reader; for overhead reader placement, optimum tag placement is in the upper center of the windshield.

Mount Reader on Round Pole or Flat Surface

Proper reader angle may require both up-down and right-left adjustment. Ensure that the correct wall-mount or pole-mount bracket is used in the reader installation.



CAUTION:

For reliable reader operation, ensure that the reader is connected to Earth Ground. Connect the cable shield of the communications cable to Earth Ground. TransCore strongly recommends following the National Electric Code for lightning protection for the locale where the Encompass 3 Reader is installed.

Connect All Wiring

1. Connect all wiring as described in “Pre-Installation Testing” on page 12 using the “RS–232 Wiring Diagram” on page 20 or the “RS–422 Wiring Diagram” on page 21 as a guide.
2. Connect the sense input and sense output circuits using “Sense Input/Output Cabling Assignments” on page 22 as a guide.
3. Start the terminal emulation application Tera Term or Microsoft HyperTerminal. Refer to “Pre-Installation Testing” on page 12.

**CAUTION:**

Do not ground the input power supply.

Apply Power

Apply power and verify the reader sign-on message appears on the terminal emulator application laptop/computer.

Reader Set Up

1. Use reader commands to query status and set up the reader.
2. Make sure that each reader is set up to the appropriate settings.
3. Adjust reader angle and power to optimize read zone for each reader.
4. Check for interference from each reader or the environment, using a portable field spectrum analyzer if one is available.

Note: If using Wiegand tags, configure the reader for Wiegand operation and connect the Wiegand interface. Refer to [“Configure for Wiegand Operation”](#) on page 16.

5. Disconnect the computer and connect the reader to back end devices. Recheck read zone and for interference between readers.
6. System-test the reader to verify that the gate opens when a valid tag is read.
7. Once all in lane testing is complete, perform a system test using tagged vehicles passing through numerous lanes. The tag reads are sent to the gate controller back end system for validation.

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Wiring Diagram for an Encompass® 3 (RS-422) Unit

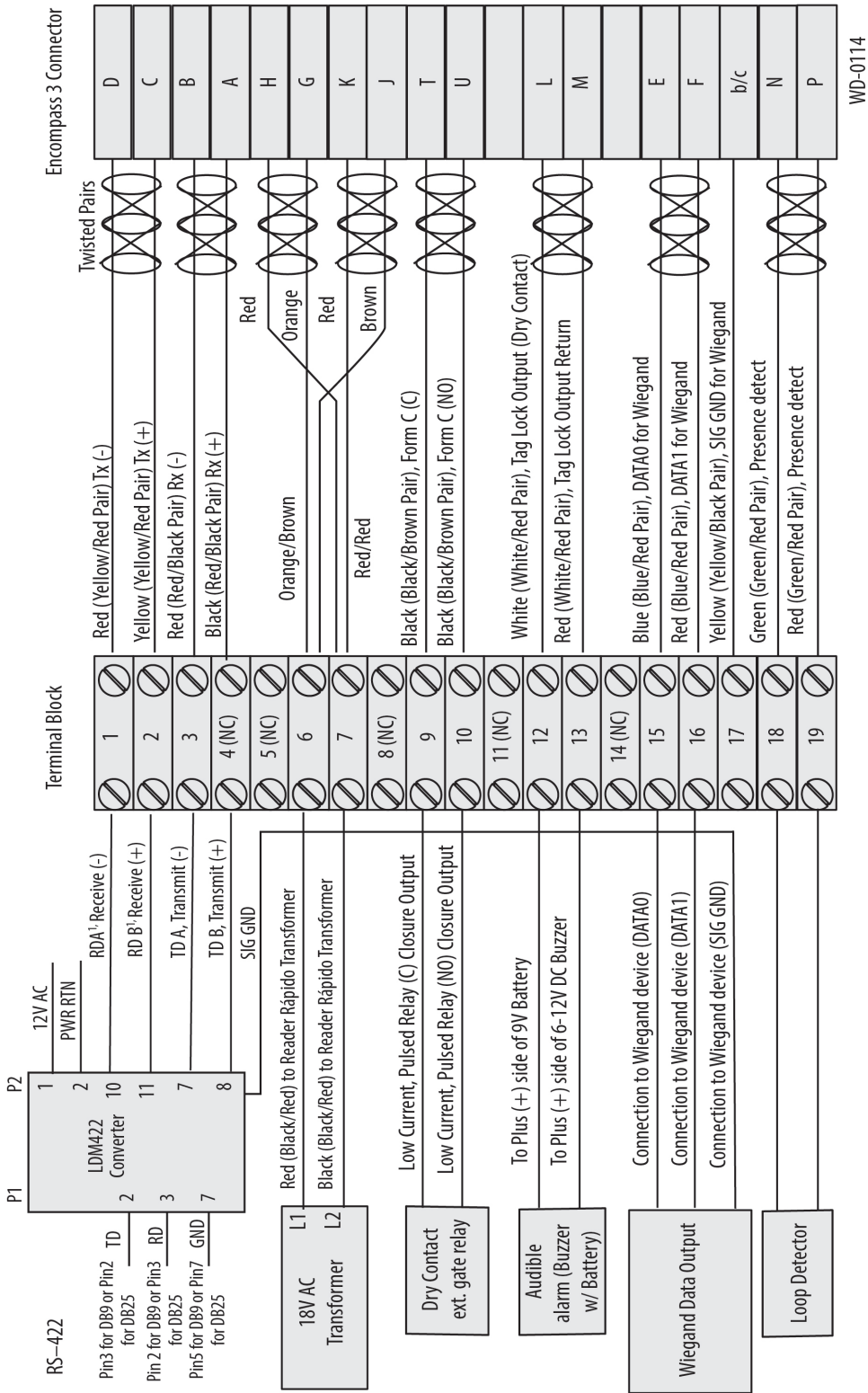


Figure 4 RS-422 Wiring Diagram

Table 9 Sense Input/Output Cabling Assignments

Pair	Pin	Color	Signal	Description	Typical Function
Blue/Red	E	Blue	WGND0	Wiegand data0	Parking/access control
	F	Red	WGND1	Wiegand data1	Parking/access control
White/Red	L	White	Lock	Tag lock output, active-closed	Testing maintenance
	M	Red	Lock_RTN	Tag lock return	Testing maintenance
Green/Red	N	Green	Sense Input0	Sense Input0 (loop)	Loop and presence detection
	P	Red	Sense Input0_RTN	Sense Input0 return; not isolated from signal ground	Loop and presence detection
Blue/Black	R	Blue	Sense Input1	Sense Input1	General-purpose sense input, not used for detecting presence
	S	Black	Sense Input1_RTN	Sense Input1 return; not isolated from signal ground	General-purpose sense input, not used for detecting presence
Brown/Black	T	Black	Sense Output0_COM	Sense Output0 (tag detect), common terminal	Switched output to control gate
	U	Brown	Sense Output0_NO	Sense Output0 normally open terminal	Switched output to control gate
Orange/ Black	V	Black	Sense Output0_COM	Sense Output0 (tag detect output), common terminal	Switched sense output for any external control (light, gate, buzzer, etc.)
	W	Orange	Sense Output0_NC	Sense Output0 normally closed terminal	Switched sense output for any external control (light, gate, buzzer, etc.)

Table 9 Sense Input/Output Cabling Assignments

Pair	Pin	Color	Signal	Description	Typical Function
Green/Black	X	Black	Sense Output1_COM	Sense Output1, common terminal	Switched sense output
	Y	Green	Sense Output1_NO	Sense Output1 normally open terminal	Switched sense output
White/ Black	Z	Black	Sense Output1_COM	Sense Output1, common terminal	Switched sense output
	a	White	Sense Output1_NC	Sense Output1 normally closed terminal	Switched sense output
Yellow/Black	b	Yellow	GND	Logic ground	Signal ground used with RS-232, RS-422, and Wiegand
	c	Black	GND	Logic ground	Signal ground used with RS-232, RS-422, and Wiegand

Reader Commands

Table 10 provides the commands frequently used in testing, setting up, and tuning the Encompass 3 Reader.

NOTE: An #Error reader response indicates that the command was entered incorrectly.

Table 10 Frequently Used Reader Commands

Enter	Reader Response	What It Does
#00	#Done	Returns reader to data mode.
#01	#Done	Switches to command mode.
#40	#Done	Transmits all tag IDs without regard for uniqueness
#450	#Done	Disable Wiegand mode
#451	#Done	Enable Wiegand mode

Table 10 Frequently Used Reader Commands

Enter	Reader Response	What It Does
#455	#Done	Enable multi-tag sort
#46NN	#Done	Set Wiegand retransmit interval NN = 01–FF seconds
#48N	#Done	Select tag mode N = 0–9 0 = disable ATA 1 = enable ATA 2 = disable eGo 3 = enable eGo 4 = disable SeGo 5 = enable SeGo 6 = disable T21 7 = enable T21 8 = disable eATA 9 = enable eATA NOTE: Only enable protocols required for the install (2 max) NOTE: Refer to Commands #838 and #839
#505	#Model [model] Ver [version no.] SN [serial no.]	Display version
#527	#RFST Cx Ox T1 Fxx Rxx Gxx Axx C0 = RF controlled by host C1 = RF-by-input control O0 = RF off O1 = RF on T1 = uniqueness timeout of 2 min Fxx = RF region code, 01 to 11 Rxx = ATA RF output range, 00 to FF (00 = max range) Gxx = eATA RF output range, 00 to FF (00 = max range) Axx = RF power attenuation, 00 to 14	Display RF status
#531	#WC x FFC y Val hhhh Where x = 0 through 5 to line up with #870 through #875 commands. Y = 0 Disabled fixed facility code Y = 1 Enabled fixed facility code hhhh = Fixed Facility code value	Display wiegand conversion settings

Table 10 Frequently Used Reader Commands

Enter	Reader Response	What It Does
#532	#TOF <0 to 1> 0 = Wiegand disabled 1 = Wiegand enabled	Display Wiegand mode status
#533	#WTI <01 to FF> seconds (1-255) in hex	Display Wiegand retransmit Interval
#570	#ATA:_ eGo:_ SeGo:_ T21 _ SORT:_ I = IT500 ID (64 bits) E = enabled F = full transaction D = disabled	Display tag mode status Note: Refer to Commands #480-#489 and #838, #839
#63	#Model [model] Ver [version no.] SN [serial no.] Copyright [date] TransCore	Reset reader
#6400	#Done	Turn RF off
#6401	#Done	Turn RF on
#641	#Done	Select RF-by-input control
#642NN (00 – FF)	#Done	Set RF region code
#643NN	#Done	Set operating range for ATA protocol (distance): (00 to FF) 00 = max range
#644NN (00 – 14) Hex	#Done	Set RF attenuation in 1.0 dB increments; 0 to 20 dB, 00=max power for max range
#646xx (00 – 14) Hex	#Done	Allows control of the read zone for T21 tags. Does not affect the performance of other tag types. 00=max power for max range
#66F	#Done	Load default operating parameters (except RF operating frequency)
#863hhhh	#Done	Set facility code value (4 hex chars) (factory default = 0000)
#870	#Done	Disable wiegand conversion (factory default)
#871	#Done	Enable 26 bit format
#872	#Done	Enable 32 bit LSU format
#873	#Done	Enable 34 bit Cardkey format

Table 10 Frequently Used Reader Commands

Enter	Reader Response	What It Does
#874	#Done	Enable 35 bit HID format
#875	#Done	Enable 37 bit McGann format
#878	#Done	Disable fixed facility code (factory default)
#879	#Done	Enable fixed facility code

Troubleshooting

Communications problems between the reader and back-end host

These problems may be caused by incorrectly wiring the communications cable, using the wrong cable, having a too-long cable run, or incorrectly setting communications parameters between host and reader.

Cable run for RS-232 exceeds 50 feet in length

Fifty feet exceeds the maximum length for RS-232 interface. The interface should be converted to RS-422, wireless modem, fiber optic, or Wiegand.

Long RF cable runs to antennas

For the external antenna-series Encompass 3 Readers, long RF cable runs between the reader and the antenna may cause signal degradation or loss. This scenario may be site-specific, but TransCore recommends limiting antenna cable runs to less than 3dB of cable loss.

RF is not on

The technician must verify that RF is on by presence or by using the command #6401 for RF ON Continuously. Command #527 may be used to verify RF status (01).

Improper grounding

Cable shielding should be connected to Earth Ground to prevent damage from lightning or power surges.

Mixed tag population

In a mixed tag population, multiple tags in the same vehicle must be separated by at least 2 inches, preferably more.

Reader not programmed correctly

The technician must verify that all parameters are set appropriately for the reader location. Command #527 may be used to verify reader parameters. If using Wiegand, the technician can use commands #532 and #533 to verify Wiegand status.

Readers pointed toward each other

Readers should not be aimed directly facing one another or be in immediate proximity back-to-back.

Tag presentation

Tags should be properly mounted in a location determined by the reader placement.

Tag-to-reader polarization

Tag polarization must match reader polarization. Tag and reader must be installed horizontally polarized.

When performing a quick test of the Encompass 3 Reader, the buzz box does not buzz.

Check all the wiring connections, and ensure that the buzz box is functioning. Ensure that the correct red and white wire pair to the leads of the buzzer are connected. Verify that RF is on (#6401).

When testing the Encompass 3 Reader, all the wires are connected correctly but the unit does not respond.

Check that the Encompass 3 Reader communication cable is connected to the correct COM port. Verify that the reader is in the correct tag read mode (#48N).

Strange signal responses come from the Encompass 3 Reader when tested with the PC.

Ensure that the reader is in the correct interface mode for the test tag using Command #570. **Nothing happens when the test tag is passed in front of the Encompass 3 Reader.**

Ensure that the Encompass 3 Reader is powered on and the reader is in the correct read mode (#48N). Verify that the reader is set to RF ON (#6401) or the red/green pair are shorted.

The Encompass 3 Reader came from another site and does not work the way the factory defaults indicate that it should.

Different commands were likely used to support the other site. Restore the factory defaults by issuing command #66F. The factory defaults will be restored except for RF operating frequency, which will be retained.

RF Interference or Poor Performance

Permanent structures and transient factors (such as large metal trucks) in the vicinity may affect RF signals. Metal objects, walls, wet pavement, and ice can reflect RF signals, degrading system performance (Figure 5).

Interference from RF and electrical sources can interfere with the optimal operation of the system.

Any RF interference at the site should be shielded, removed, or positioned farther from the Encompass 3 Reader if possible.

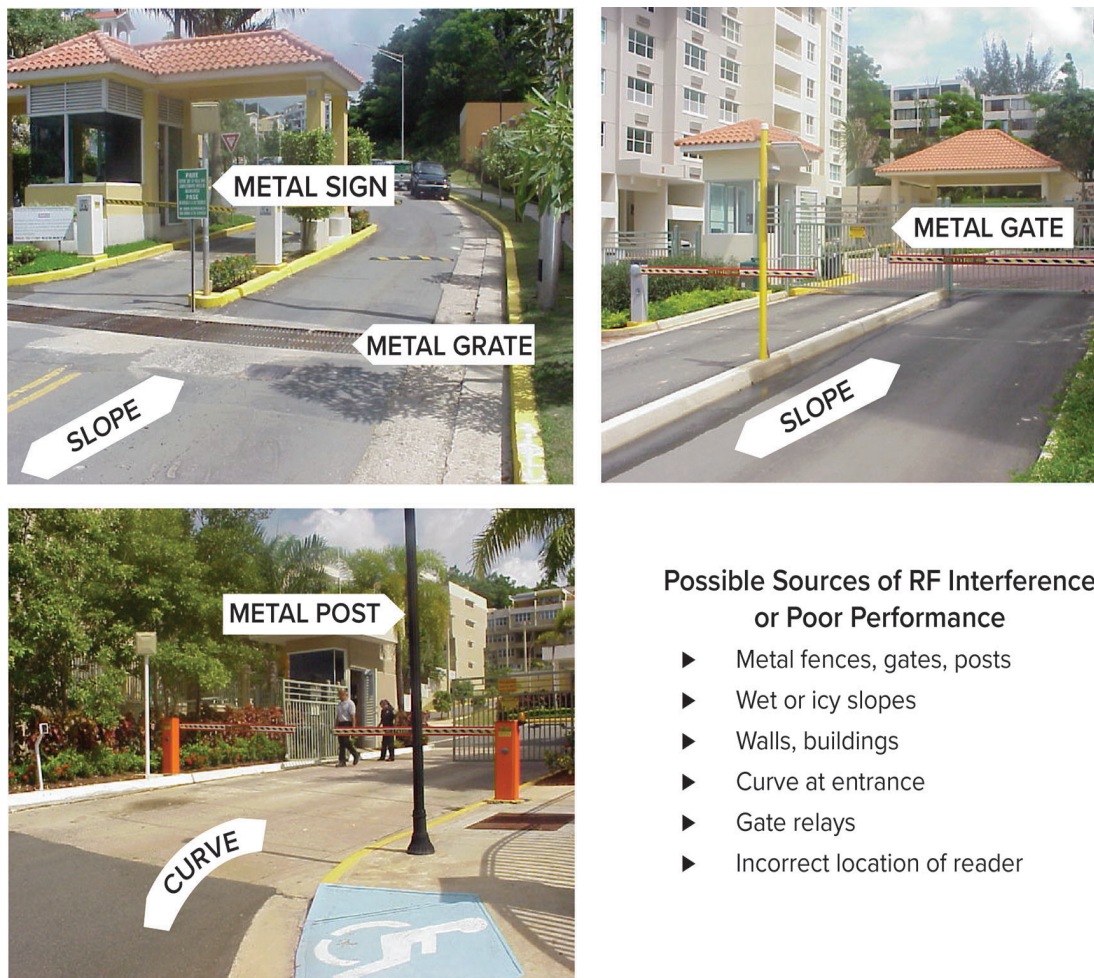


Figure 5 Sources of RF Interference

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