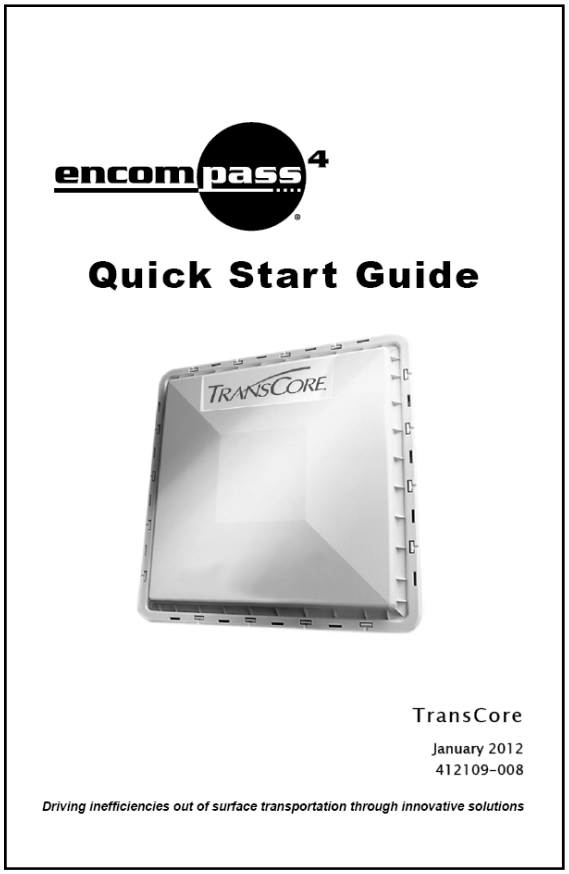
E4 Installation Prep and Wiring

Webinar

TRANSCORE

E4 Reader Guides

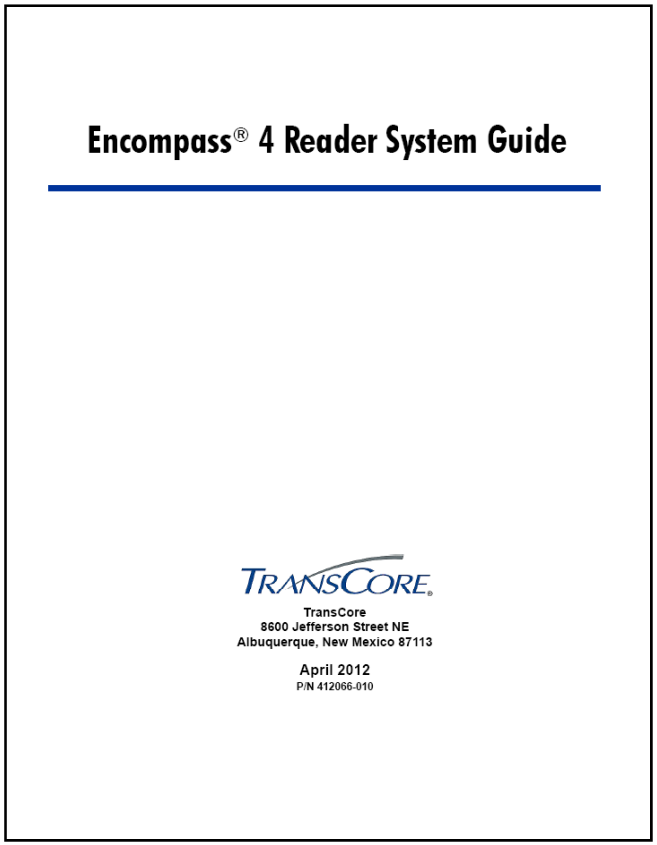

encompass 4

Quick Start Guide

TransCore

January 2012
412109-008

Driving inefficiencies out of surface transportation through innovative solutions


Encompass® 4 Reader System Guide

TransCore
8600 Jefferson Street NE
Albuquerque, New Mexico 87113

April 2012
P/N 412066-010

Download these guides from http://www.transcore.com/literature. Select the Encompass®4 System Guide or Encompass®4 Quick Start Guide from the USER GUIDES section under Literature

Reader Protocol Compatibility

Item #	Reader	Reader Protocols	Tag Protocols	Dominant Protocol
1	AI1620 (Obsolete)	ATA	SeGo + ATA	ATA
2	2101 (Obsolete)	eGo	SeGo + eGo	SeGo (eGo)
3	E2, 2110 (Obsolete)	ATA/eGo	SeGo + (ATA and/or eGo)	SeGo (eGo)
4	Encompass 4 -008	ATA	SeGo + ATA	ATA
5	Encompass 4 -009	ATA/eGo	SeGo + (ATA and/or eGo)	SeGo (eGo)
6	Encompass 4 -001	SeGo	SeGo	SeGo (eGo)
7	Encompass 4 -002	ATA/SeGo	SeGo with ATA optional	SeGo (eGo)
8	Encompass 4 -003	eGo/SeGo	SeGo with eGo optional	SeGo (eGo)
9	Encompass 4 -004	IAG/SeGo	SeGo	SeGo (eGo)
10	Encompass 4 -010	IAG/ATA	SeGo + ATA	ATA
11	Encompass 4 -019	IAG	Requires eZGo Anywhere tag	N/A
12	Encompass 4 -015	IAG/eGo	SeGo + eGo	SeGo (eGo)

All three protocols may be enabled on any configuration, but the protocols above are most efficient.
If transitioning from eGo tags to eGo Plus tags, protocols should be: SeGo + eGo, SeGo (eGo) dominant.
If transitioning from ATA-only tags, protocols should be: SeGo + ATA, ATA dominant.

Power Requirements

- **Input Voltage**
  - **DC – 16-28 VDC**
  - **AC – 16-20 VAC**
- **Input Power**
  - **1700mA on initial start-up (in rush)**
  - **20 Watts normal operation with RF on (1100 mA @ 18VAC)**
  - **14 Watts with RF Off (775 mA @ 18VAC)**

Part Number	Description
76-1620-005	Transformer, 110VAC - 18VAC
76-1620-006	Transformer, 12VAC to 18 VAC
76-1620-008	Transformer, 220VAC to 18 VAC

Power Cable Sizing

Additional maximum cable length by wire gauge. Using 2 pairs of wires for power and ground

Cable Size (AWG)	24	22	20	18	16	14	12
TransCore 5-ft cable Part # 58-1620-001	23’	36’	58’	92’	144’	235’	373’
TransCore 20-ft cable Part # 58-1620-002	15’	23’	38’	60’	93’	152’	242’
TransCore 35-ft cable Part # 58-1620-006	7’	11’	17’	27’	43’	70’	110’
TransCore 45-ft cable Part # 58-1620-007	1’	2’	4’	6’	9’	14’	23’

Based on a 1.0 Volt drop at 1200 mA (RF ON) with 15% margin.
Use two pair (2 conductors for power, 2 for return).

TransCore cable is 22 Gauge

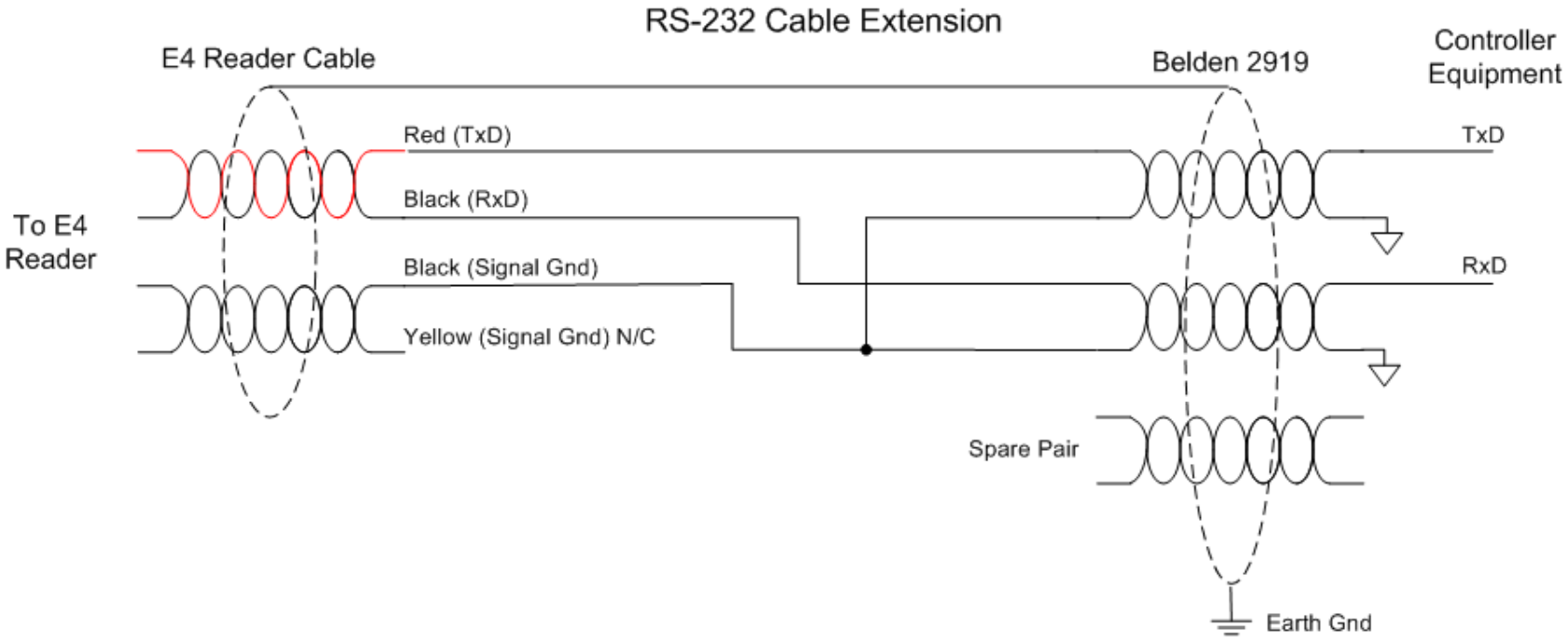
Communications – RS-232 / RS-422

- Max cable length 50 ft (15 m) 9600 baud (default baud rate)
- For cable lengths over 50 ft, use one of the following options:
  - RS-422 version of E4 reader up to 4000 feet (1200 m)
  - Use a data converter (RF, Ethernet, Optical)
  - Use lower baud rate

Data Rate (bps)	Distance in feet (meters)
2400	197 (60)
4800	98 (30)
9600	50 (15)
19200	25 (7.6)
38400	12 (3.7)
56000	8.5 (2.6)

Communications – RS-232 / RS-422

NOTE: when adding a cable extension to the RS-232 interface, use a three-pair cable such as Belden 2919. Use a twisted pair for the Black (RxD) with ground (Black of the Blk/Yel pair), and a twisted pair for Red (TxD) with ground (Black of the Blk/Yel pair). The third pair of the three-pair cable can be used for a spare in the event either of the other two pair are damaged or fail. The cable shield should be tied to a single-point Earth ground on the controller end of the cable.



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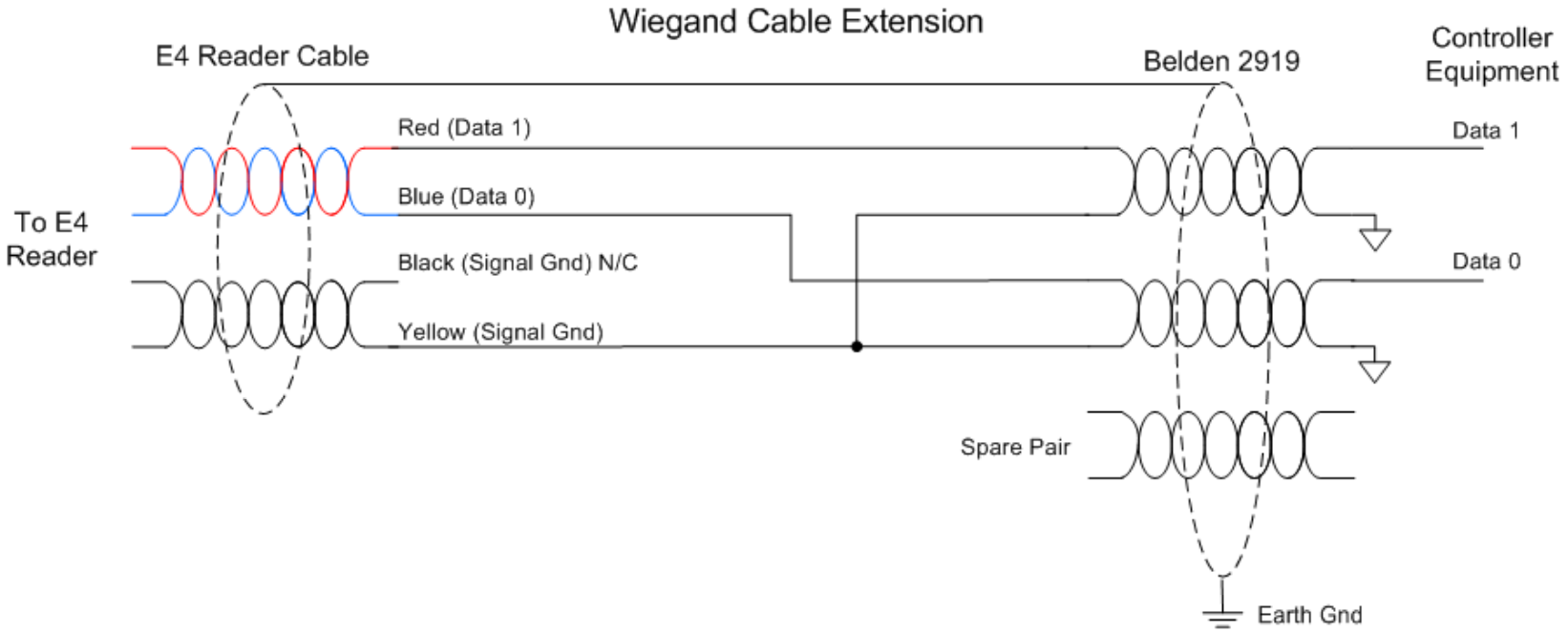
Communications - Wiegand

- Requires tag to be programmed with Wiegand format.
- Available on both RS-232 and RS-422 versions of the E4.
- Wiegand is most often required for installations where legacy magnetic stripe card readers are being replaced by E4 readers.
- Readers can interface with equipment requiring the Wiegand +5 V data0-data1-ground interface.
  - The Red/Blue twisted pair is assigned for Wiegand communication. The Black/Yellow twisted pair is needed for Wiegand ground.
  - Factory default is Wiegand Disabled. To enable you must send command #451. If operating with eGo or SeGo protocols, send #489 first, otherwise an error message will be returned for the Wiegand command.
  - Maximum recommended distance is 500 feet (152.4 meters).
- Output 0 does not activate when Wiegand is enabled – use Tag Lock output instead.

Communications - Wiegand

- NOTE: when adding a cable extension to the Wiegand interface, use a three-pair cable such as Belden 2919. Use a twisted pair for the Red (Data1) with ground (Yellow of the Blk/Yel pair), and a twisted pair for Blue (Data0) with ground (Yellow of the Blk/Yel pair). The third pair of the three-pair cable can be used for a spare in the event either of the other two pair are damaged or fail. The cable shield should be tied to a single-point Earth ground on the controller end of the cable.

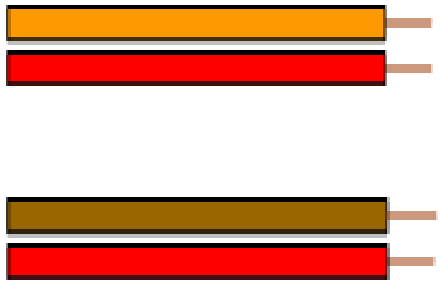


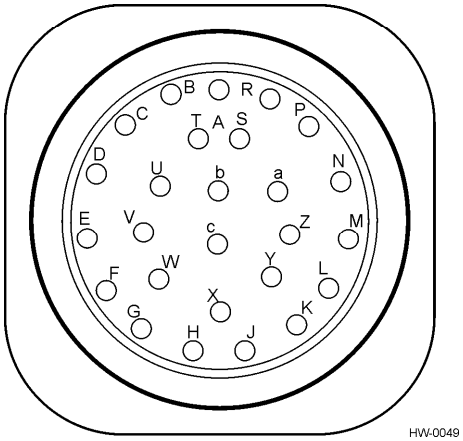
Wiring – E4 Power

Signal	Pair	Color	Circ. Pin
Pwr In	Org/Red	Orange	G
Pwr Rtn	Org/Red	Red	H
Pwr In	Brn/Red	Brown	J
Pwr Rtn	Brn/Red	Red	K
Ground	Drain Wire	N/A	Case

16-20 VAC, prefer 18 VAC

16-28 VDC, prefer 18-24 VDC





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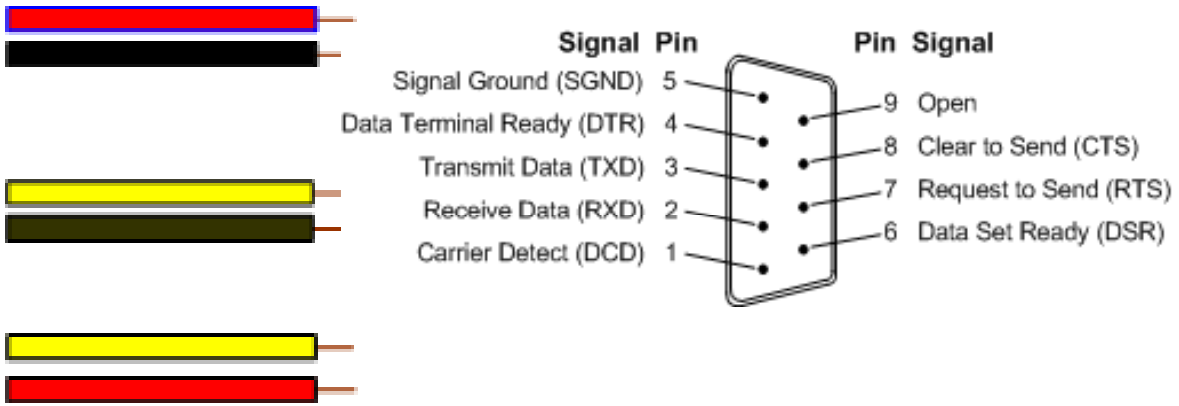
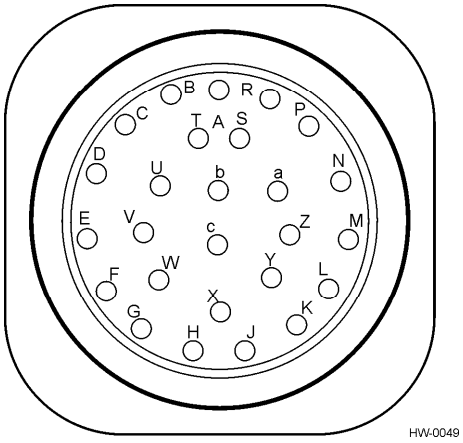
Wiring – RS-232 COMM

Signal	Pair	Color	DB-9	Circ. Pin
RxD	Red/Blk	Black	2	A
TxD	Red/Blk	Red	3	B
SGnd	Yel/Blk	Yellow	5	b
RTS *	Yel/Red	Yellow	7	C
CTS *	Yel/Red	Red	8	D

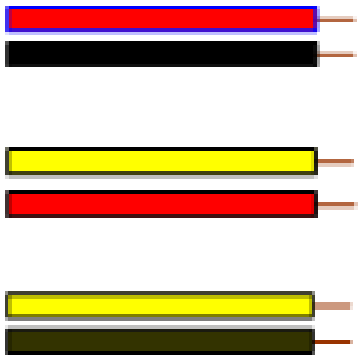
* Only if using hardware handshaking

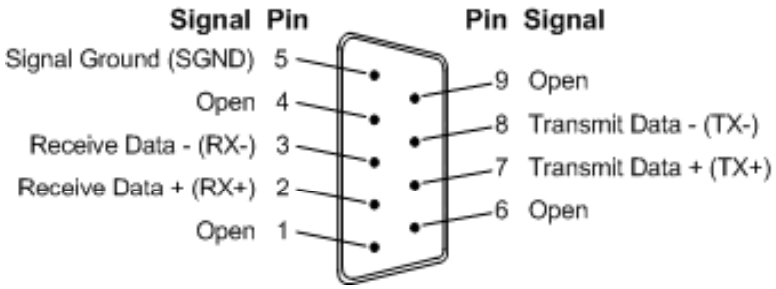


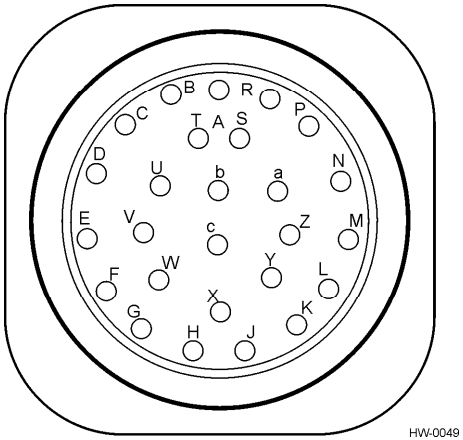


Wiring – RS-422 COMM

Signal	Pair	Color	DB-9	Circ. Pin
Rx+	Red/Blk	Black	2	A
Rx-	Red/Blk	Red	3	B
Tx+	Yel/Red	Yellow	7	C
Tx-	Yel/Red	Red	8	D
SGnd	Yel/Blk	Yellow	5	b







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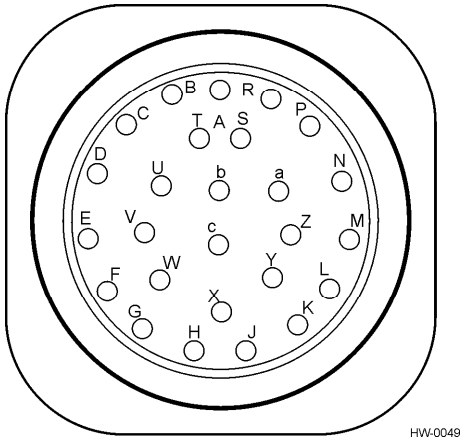
Wiring – Wiegand Interface

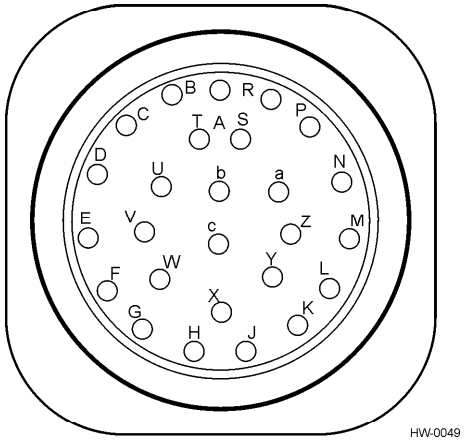
Signal	Pair	Color	Circ. Pin
Data1	Red/Blu	Red	F
Data0	Red/Blu	Blue	E
SGnd	Yel/Blk	Black	c



Wiring – External Inputs

Signal	Pair	Color	Circ. Pin
Input 0	Red/Grn	Green	N
Input 0 Rtn	Red/Grn	Red	P
Input 1 *	Blu/Blk	Blue	R
Input 1 Rtn *	Blu/Blk	Black	S

RF active with input closed, inputs designed to interface with a dry contact closure
* Input 1 Not used directly by the reader but can be used for monitoring an external device



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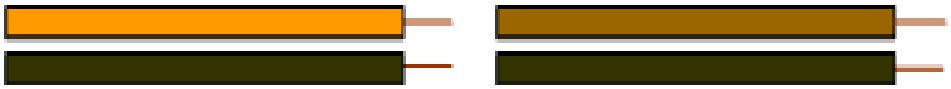
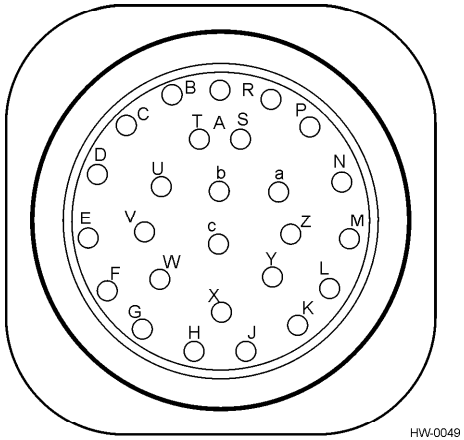
Wiring – External Outputs

Signal	Pair	Color	Circ. Pin
Output 0 (N/O)	Brn/Blk	Brown	U
Output 0 (N/O) Rtn	Brn/Blk	Black	T
Output 0 (N/C)	Org/Blk	Orange	W
Output 0 (N/C) Rtn	Org/Blk	Black *	V

30 VAC RMS or 60 VDC, at 1 A max non-inductive load. Not for direct control of elctro-mechanical devices such as motorized gates and barrier arms

* IAG Sync Negative for readers with IAG





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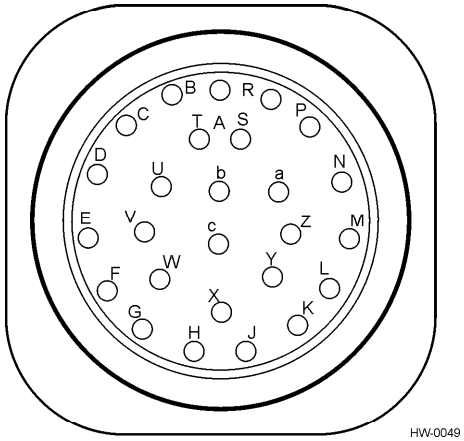
Wiring – External Outputs (Continued)

Signal	Pair	Color	Circ. Pin
Output 1 (N/O)	Grn/Blk	Green	Y
Output 1 (N/O) Rtn	Grn/Blk	Black	X
Output 1 (N/C)	Wht/Blk	White	a
Output 1 (N/C) Rtn	Wht/Blk	Black *	Z

30 VAC RMS or 60 VDC, at 1 A max noninductive load. Not for direct control of elctromechanical devices such as motorized gates and barrier arms

* IAG Sync Positive for readers with IAG



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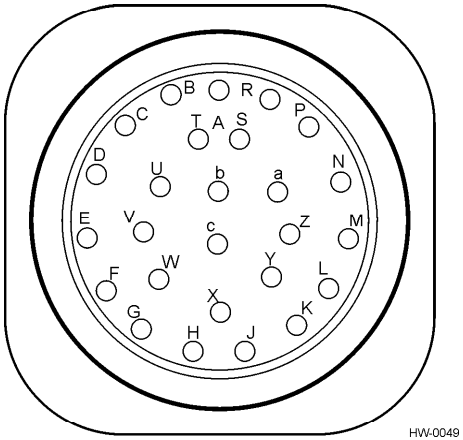
Wiring – Tag Lock/Maintenance

Signal	Pair	Color	Circ. Pin
Lock	Red/Wht	White	L
Lock Rtn	Red/Wht	Red	M

Closes when tag is in field. Can be used to connect a Buzz Box, DVM, or light



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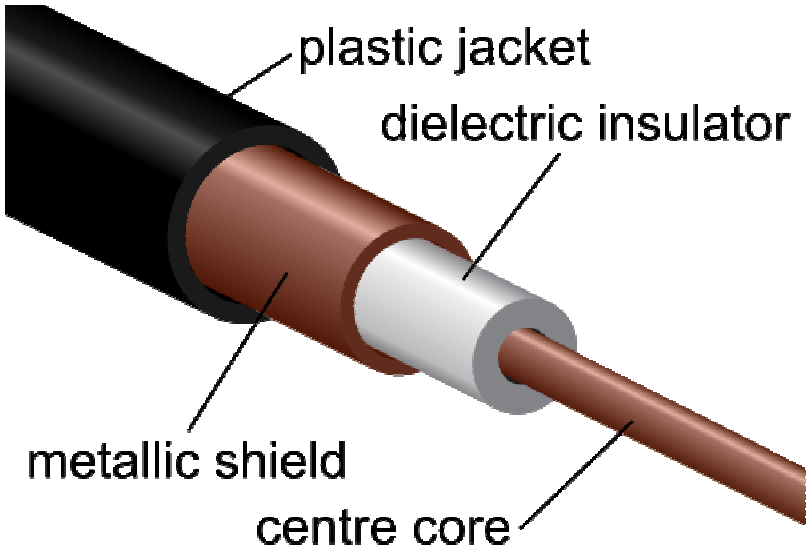
Wiring – Coax Antenna Cable



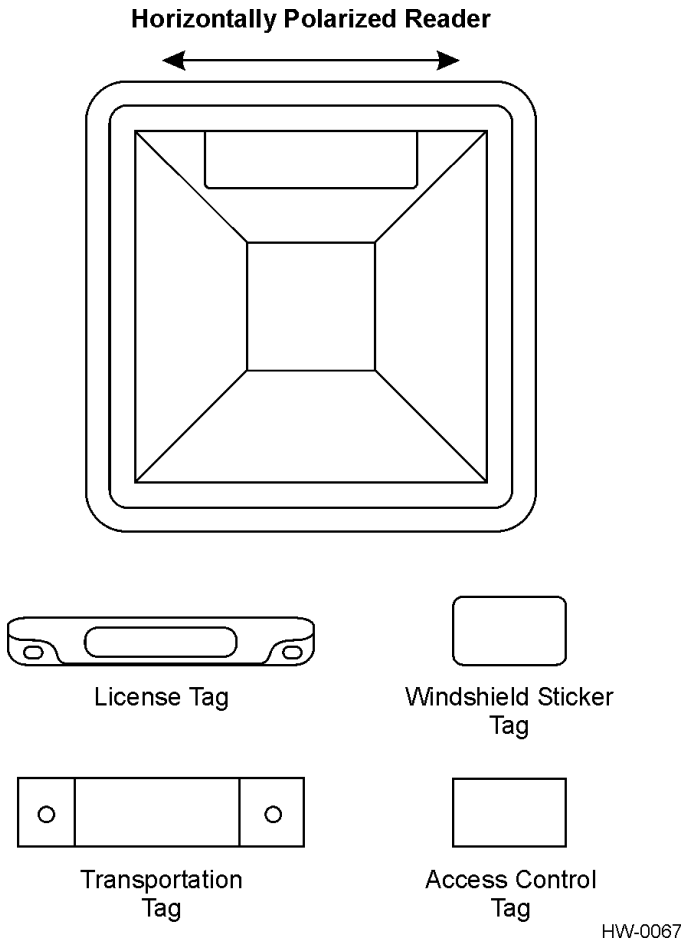
- **Antenna Cable**
  - Connectors: Male, N-Type both ends of the cable
  - 50-Ohm RF Cable
    - LMR400
    - FSJ4-50B
    - LMR600
    - Additional cables listed in the E4 Reader System Guide
  - Keep cable loss(length) to 3 dB or less
    - 1 dB is preferred for optimal performance

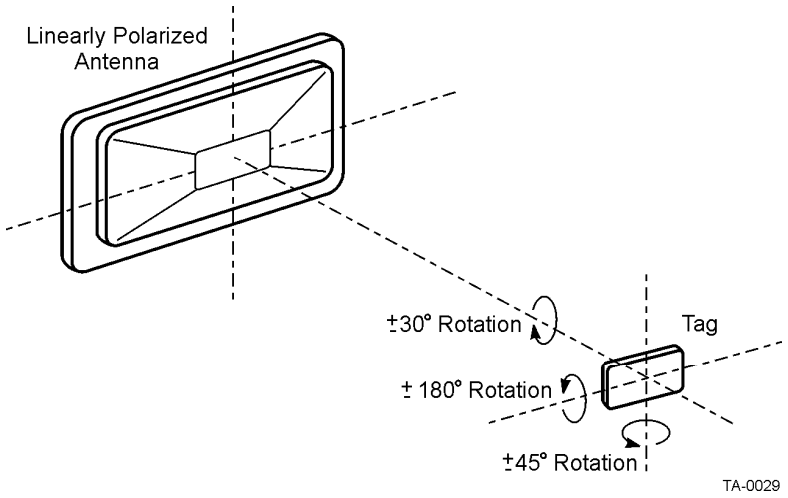
Wiring – External Antenna Installation

- Some RF antennas like the Universal Toll Antenna can act as a capacitor and develop a voltage charge during shipping.
- To avoid damaging the reader when the RF cable is connected to the reader, the antenna should be discharged to earth ground before connecting to the reader.
- The following procedure describes how to correctly discharge the voltage from the antenna:

1. Terminate the reader end of the RF cable with any N-type load or RF attenuator
2. Connect the RF cable to the antenna
3. Short the outer metal case of the load or attenuator to earth ground for approximately 1 second
4. Remove the load or attenuator from the RF cable and connect cable to reader

Polarization



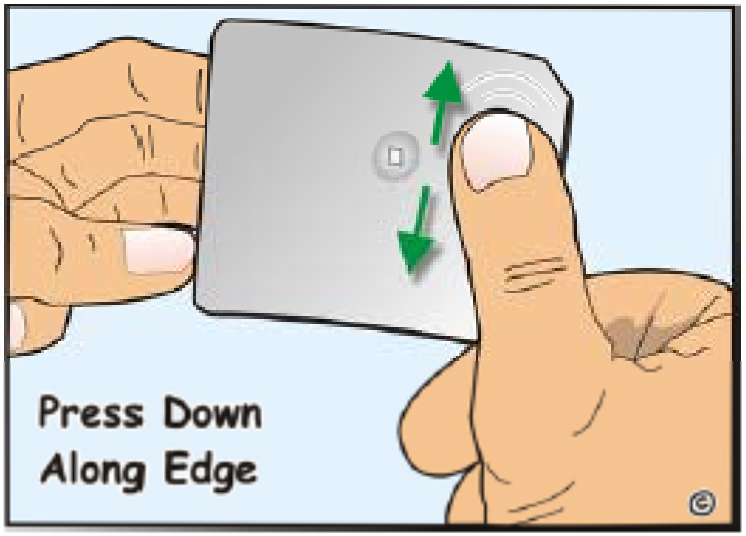


Tag Mounting - Windshield Sticker Tag

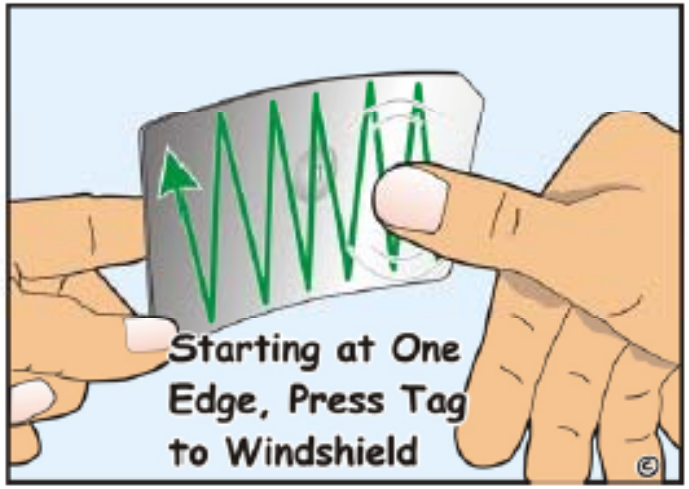
- Primary Location (for mirrors attached on the windshield)
  - WST must be mounted on glass for proper operation
  - Measure at least 1/2” below rearview mirror post
  - Clean windshield with an alcohol wipe
  - Position the tag so it is centered relative to the rearview mirror
  - Follow enclosed instructions and be certain to remove any air pockets between tag and windshield *(WST tag only)*

Tag Mounting – Windshield Sticker Tag

Make sure you have the tag in the right location (Step 1) before touching it to the glass. Hold the tag away from the glass with one hand and press one edge to the glass.



Stick the tag to the glass by rubbing your thumb up and down in a zigzag motion across entire tag surface. Be sure to rub over the tag's chip to remove as much air as possible.



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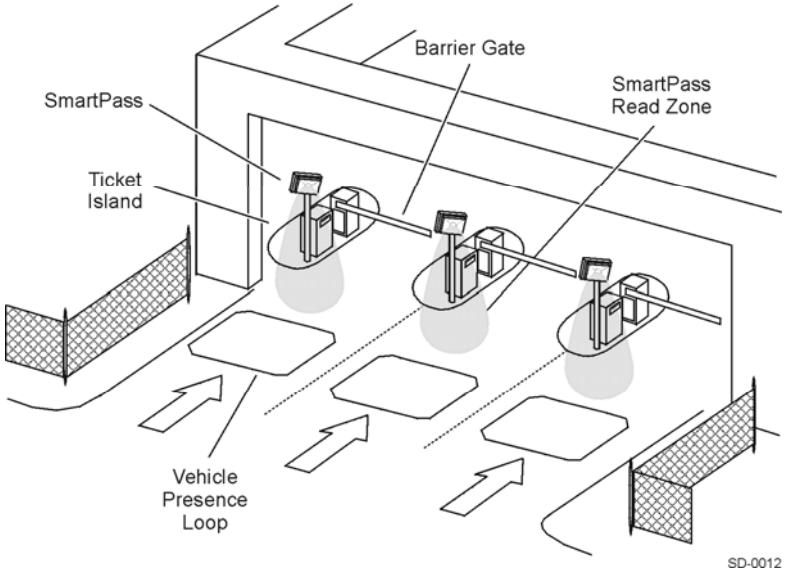
RF Control

- On continuously (#6401)
- On/Off by host control (#6401 / #6400)
- On by hardware input sense (#641)

Signal	Pair	Color	Circ. Pin
Input 0	Red/Grn	Green	N
Input 0 Rtn	Red/Grn	Red	P

Lane Configurations – Side Fire

- Reader height – 6 to 8ft
- Reader pole from curb – 1 ft
- Reader pole from gate – 3 to 4 ft
- Aimed at expected position of tag in lane
- Side Fire configurations will cover one lane width only



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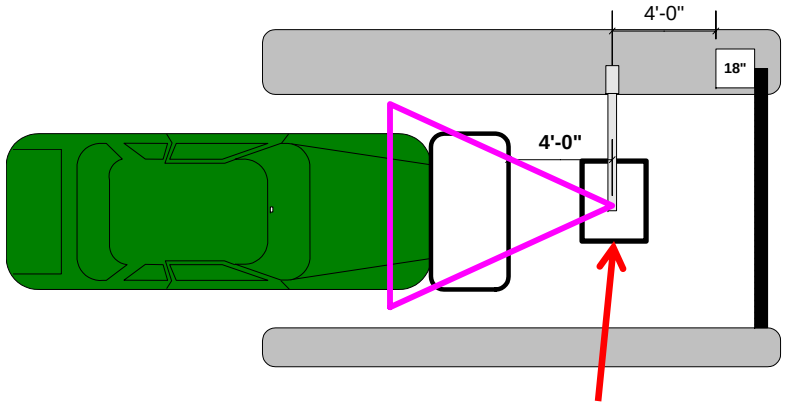
Lane Configuration - Overhead

- Antenna height – 10 to 18 ft
- Antenna Centered on lane
- Antenna to gate – 3 to 4 ft
- Aimed at expected position of tag in lane when reader is activated
- Down tilt angle typically set at 10 to 15 degrees from horizontal
- Overhead configurations will cover one lane width only



10 to 15 degree down-tilt from horizontal

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RF Signal Attenuators & Reflectors

Buildings, Concrete Structures, Wood

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RF Signal Reflections

Frequency Assignments

- Readers within 1 mile may interfere with one another
- Do not reuse any frequency in the same location.
- 2 MHz frequency spacing for adjacent readers AI1620, E2, 2110, and E4.
- Non-adjacent readers maintain a minimum of 500kHz frequency spacing.

FCC Licensing

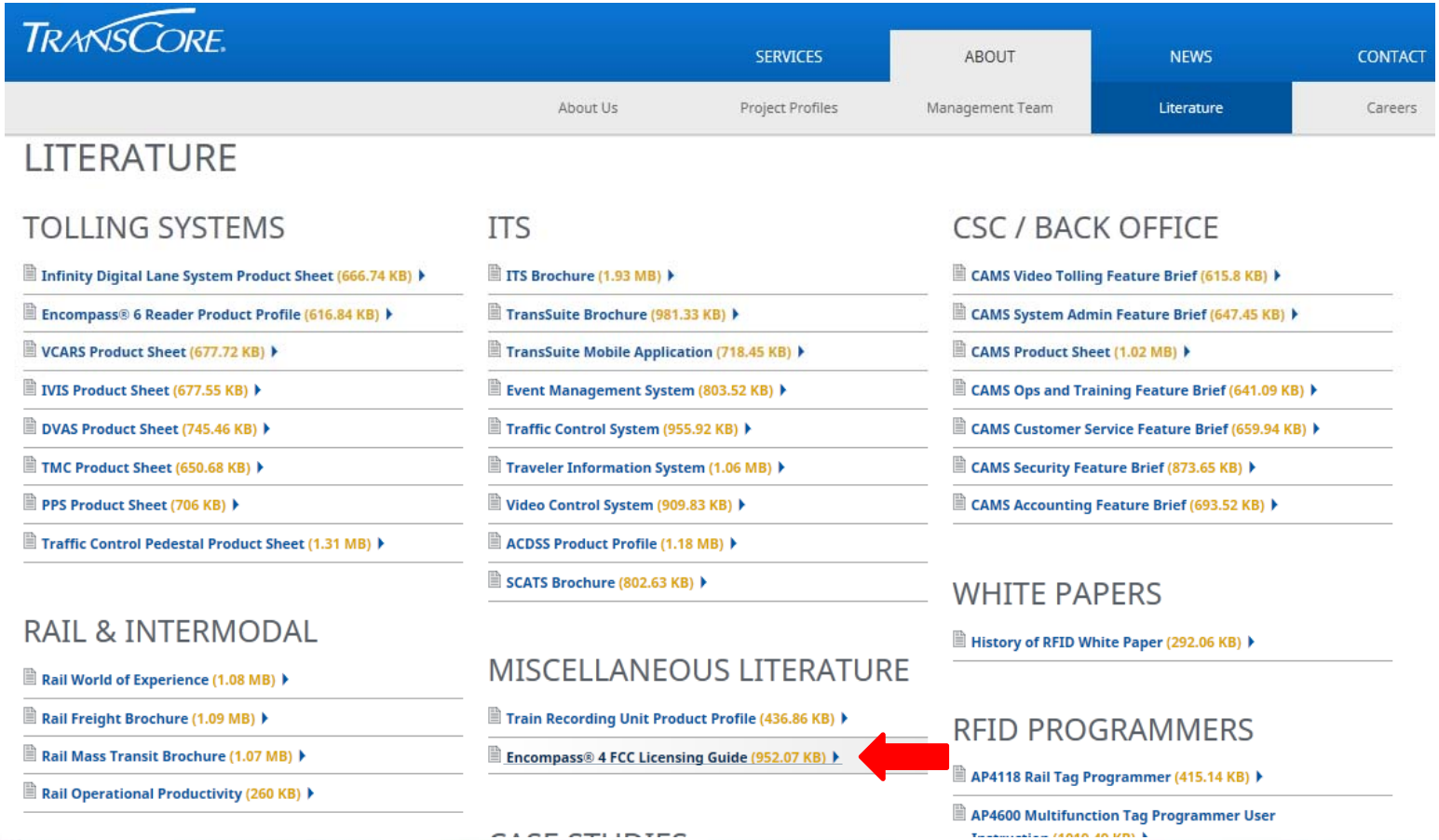
- E4 readers must be licensed with the Federal Communications Commission (FCC).
  - The user is responsible for obtaining a license from the FCC.
  - The user must file for a license according to FCC regulations.
  - Transcore dealers should provide assistance and support as necessary to complete these forms.
- An FCC license provides the user with the legal authorization to operate readers at the specified frequencies at the site specified in the license.
- The FCC license also provides the user with legal protection and authorization to maintain the system should another user try to install other RF product within the same band in the licensed area after the reader has been installed.

FCC Licensing (Continued)

- The applicant will be required to provide the following site-specific information for each reader:
  - Site elevation
  - Antenna structure height
  - Antenna height
  - Site location including Latitude and Longitude coordinates to the nearest tenth of a second
  - The type of reader system and antenna installed
- The following link can be used to access the FCC “Universal Licensing System”: http://wireless.fcc.gov/uls/index.htm?job=home

FCC Licensing (Continued)

- The TransCore website provides a document to provide assistance to fill out the FCC license application, located under : “Literature”, “Miscellaneous Literature”, Encompass® 4 FCC Licensing Guide



Field Installation and Test Equipment

- Recommended
  - Laptop with RS-232 and terminal emulator and laptop power supply
  - RS-232 cable
  - Multimeter
  - Test tags
  - Beeper box or multimeter with audio output
  - Specialized Tools (wire stripper, crimper)
- Desired
  - Spectrum Analyzer
  - Oscilloscope
  - Cable testers (RF and comm)
  - Serial line protocol analyzer

Field Installation and Test Equipment

- It is highly recommended to test your setup BEFORE installing equipment in the field!!

Questions?

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