tres

transponder and reader engineered systems

tres900
Operations Manual

Table of Contents

Product Description

Scope

This document describes the physical characteristics, functional requirements and software features contained in the **tres900** which is a 902~928MHz product. It lists the product specifications, as well as environmental and operational criteria.

Purpose

The purpose of this document is to describe the **tres900** features, functions and options. Included in this document will be details on the installation, the operations and any other special considerations necessary to setup and operate the product.

Summary

tres900 is the brand name for a new line of 902~928 MHz RFID Readers and Tags. We are a U.S. company comprised of seasoned RFID professionals, including engineers, marketing, and distribution specialists. We have co-designed a product line that is ideally suited to the supply chain, document tracking, and parking markets. We will be selling our products through Systems Integrators and OEM channels.

RFID systems provide an automatic means to identify physical objects without the need for line-of-sight communication. The main components of a RFID system are tags, readers, and host computer. RFID tags are attached to physical objects as a means to identify them. RFID readers convert the radio waves sent from the tags to get the digital data and send the collected data to the host computer.

Product Identification

To identify the **tres900** newly developed 902~928MHz Passive Tag, Reader, Wiegand + RS232 Serial IO outputted simultaneously and a TCP/IP Ethernet + RS232 serial IO outputted simultaneously version, the shipping label is marked with the complete model part number and final assembly number. Detail ordering is described later in this document.

Reference Documents

 ➢ TBD

Revision History

 ➢ Rev 01, 09/23/11 - Initial Draft by Rick Langevin
 ➢ Rev 02, 10/12/11 - Added Ethernet section for Readers that have TCP/IP
 ➢ Rev 03, 12/14/11 - Updates to drawings and specifications
 ➢ Rev A, 03/02/12 - Initial Release of the manual after edits from many people
 ➢ Rev B, 03/08/12 - Added Parts List changes
 ➢ Rev C, 04/18/12 - Added trouble shooting guide
 ➢ Rev D, 05/25/12 - changes made for power requirements & more trouble shooting info
 ➢ Rev E, 07/20/12 - added trademark notations
 ➢ Rev F, 09/21/12 - warranty details and cleanup
 ➢ Rev G, 12/11/12 - picture for RS232 + pictures reflecting recommended power supply

Product Operations

Hardware Description

The **tres900** Reader comes with many rich features like multi-protocol and multi-tag reading, integrated and environmentally protected packaging, long-distance reading and writing, and the ability of reading multiple tags moving at high speed.

The **tres900** Reader is a fully integrated reader with a RF module, digital signal processing (DSP) module, power conditioning module, built-in circular polarized antenna and packaged in a weather-proof and UV protected housing. The circular polarized antenna allows it to work in asset management applications and its programmable triggering modes enable the reader to work in either self-triggering or master/slave modes. Versatile I/O interfaces enable the **tres900** to work with serial RS-232, Wiegand, and TCP/IP Ethernet.

The **tres900** Reader is a multi-protocol UHF reader, which supports ISO18000-6B and EPC protocols. It can read and write UCODE, TI, Alien and many other labels. The reader's firmware is upgradable, enabling it to support protocol expansion and feature upgrades, giving it the ability to grow with the maturing RFID technologies.

The integrated high-gain and circular polarized antenna allows the reader to achieve a respectable read range, and the internal DSP module enables the reader to manage multi-tag arbitration at high speed, thus making it suitable for material management applications.

Reader

The RFID Reader is a device that captures and processes tag data. These devices are called readers or interrogators. Readers are connected to the antenna and are connected to the RFID network infrastructure. The Reader provides the energy of which a fraction is used to energize and wake up the tag. The reach of the reader is determined by the design of the antenna (both Tag and Reader) and the power and configuration of the reader. The Reader detects and filters data bits emitted from compatible RF Tags then converts the bits into the associated computer format of serial RS232, Wiegand, and/or TCP/IP Ethernet communications protocols. Advanced error detection algorithms provide error-free operation.

The Reader can also operate on variable power sources of 8 to 16 VDC. Connection to the Reader is made using low-cost shielded twisted pair cables (22 AWG up to 22 feet, over 22 feet see recommended wire chart at end of this document).

Tags

An RFID-tag is a device which is attached to objects and/or assets to be identified. When radio signals are received, information is transmitted back to the RFID reader. RFID tags consist of the following components: the microchip (or IC), the antenna, the connection between IC and antenna and the substrate on which the tag is produced. The microchips are the brains of the tag. The antenna handles the communication from either the Tag to the Reader or from the Reader to the Tag.

Passive tags reflect the RF signal transmitted to them from a reader or transceiver and add information by modulating the reflected signal. A passive tag does not use a battery to boost the energy of the reflected signal.

Quick Start Guide

Package Inspection

The shipping package includes a **tres900** Reader with a pigtail cable for connecting power and communication to and from the Reader, a CD with documentation with programs used for setting up and testing the Reader, and an antenna mounting bracket. Please check to confirm all items are present upon receiving the reader package. If any questions, please contact our dealer immediately or contact our after-sales support directly.

Appearance

The Reader is silvery white cuboids (see Figure below). There are screw holes on its back panel for mounting and installation.

Reading Tags

Simply connect your power to the Reader. At this point you will hear an audible tone (beep) from the Reader, indicating power is on and unit working. If Tags are within range you will hear a beep each time a Tag is read with each successive read. Congratulations, you have just successfully installed the Reader and are achieving Tag reads. If there is more than 1 Tag within range all should be reading successfully.

Reader Cable Definition

In Figure below shows the labels and where they go for the cable attached to the Reader.
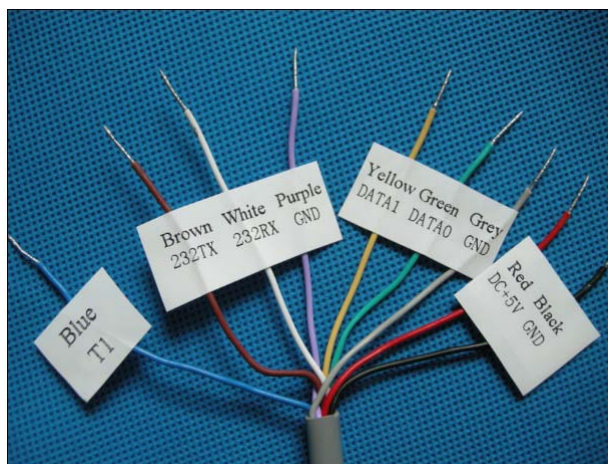
Reader Cable Color Code Chart

The below chart details the color coded cable to the signal and Reader function in which it is connected to. This chart is for the Wiegand and RS232 version of Readers.

Color	Signal Name	Function
Brown	RS232 TX	RS232
White	RS232 RX	RS232
Purple	RS232 GND	Ground
Yellow	DATA1	Wiegand
Green	DATA0	Wiegand
Gray	Ground	Wiegand
Blue	T1	Reader Control
Red	Power +V	+8 to +16 volts
Black	Power -V	-volts ground

Power Requirements

The Reader can be powered from regulated, linear, or switching power sources having the characteristics defined in the Specifications section of this document (8 to 16 volts). **tres900** can sell you a power supply suitable for use with the Reader or your own power supply can be used. The recommended power supply is the tres-PSS12-035: Power Supply, 85-264VAC, 35W, 12VDC @ 3A regulated, which is supplied with each Reader. The Reader unit Warranty is based on its use.

Wiegand Output

This is a standard Wiegand protocol with Data 0 (**GREEN** wire) and Data 1 (**YELLOW** wire) normally resting at +5 volts and moving to zero voltage (**GRAY** wire - Ground) on logic 0 or logic 1.

Wire Specifications

Shielded (22 AWG for cable length ≤ 25' and 16 AWG for lengths 25' to 500' per Wiegand specification) insulated, stranded wire is recommended and all wires should be tinned.

Serial Output (RS232)

This is a standard RS232 Serial interface that can be read by any computer that accepts RS232 communications. The Readers will output data through simultaneous output ports and can be monitored with a terminal program that displays ASCII data.

Wire Specifications

Shielded (22 AWG for communication cable length up to 25' and 16 AWG for communication lengths beyond 25') insulated, stranded wire is recommended and all wires should be stripped approximately 3/8 inches and tinned.

TCP/IP Ethernet Output

This is a standard TCP/IP Ethernet modem (ZNE-100TL module network adaptor). It will be necessary to load a program termed "ZNetCom2.66_Setup.exe" (included on the CD) in order to setup your preferred properties. If you run the setup program (Figure below) you will see the following:
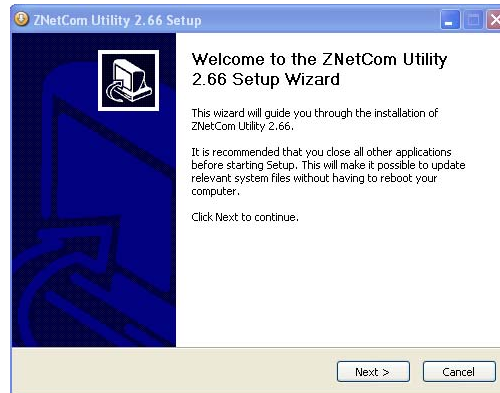
Just highlight and select the "Next" tab and follow the setup instructions. Once the program is installed you will see the following configuration screen (Figure below). You may want to change the language and do a Search, and then you can configure the IP address if you need to modify it. The default password is '**88888**'.
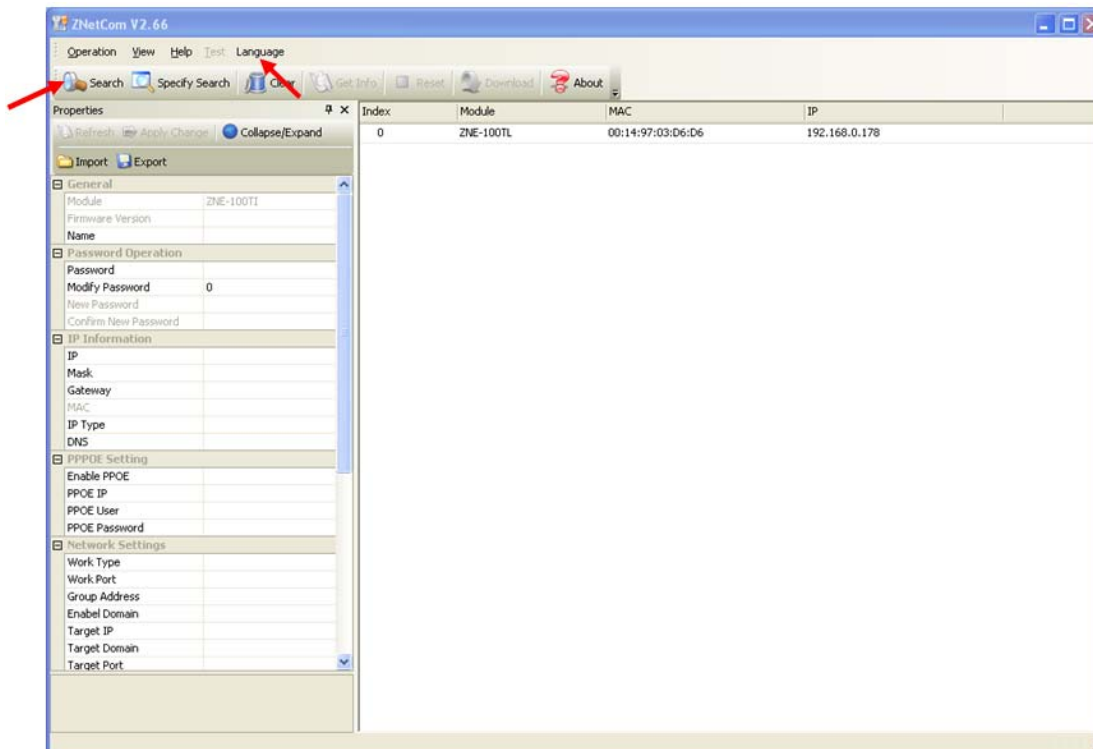
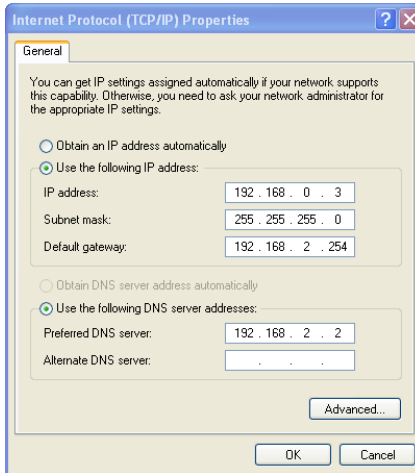## PC Configuration

Windows XP users should first enter the system control panel, click "Start" → "Control Panel", and then select the "network connection" icon; select the "Local Area Connection" icon for the ZNE-100TL module network adaptor, then select the property option and choose "internet protocol (TCP/IP)" within the "Routine" Tab to check its "Property", as Figure below.

Choose "Use the IP address below", and fill in the IP address "192.168.0.3", network mask "255.255.255.0" and default MAC address "192.168.0.1" (the part of DNS is not needed to be entered). Click the OK button to confirm the setting, and wait for the system to complete the configuration.

Factory Default Setting of IP Address

The default IP address of reader is 192.168.0.178.

HyperTerminal Setup with IP Address
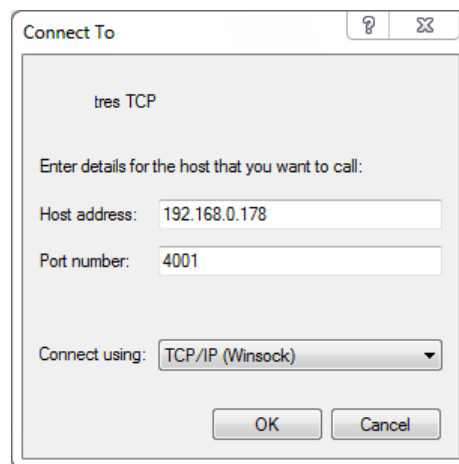
Power Level Control

The program in the CD called "treslevel.exe" is a handy utility that allows you to control the output power of the Reader. What this means is if you are getting 30' read range but only want 15', then change the Output Level from 30.0 dBm to 20.0 dBm. Once installed you connect your Reader to the PC via RS232 port and run this program.

Specifications

Item Details	Specifications
Operating Frequency	902MHz～928MHz (860-960 MHz built-in)
RF Protocol	ISO18000-6B, EPC Class 1, EPC Class 1 GEN 2
Operating Method	FHSS or fixed frequency (configured by software)
Antenna	Internal 7dBi circular polarized w/ 0.65:1.0 H/V power ratio
Max RF Power	30 dBm (1 Watt)
Power Flatness	＜0.5 DB
RF Power Range	20~30 dBm, Software Adjustable
Tag ID Modes	Timed Mode - automatically reads at fixed time Trigger Mode - external trigger control to read
Wiegand Timing Parameters	Pulse Width Time 80μS, Pulse Interval Time 2mS
Identify Tag Time	<8ms Identify single tag)
Reading/Writing Tag Time	Reads every 8 bytes in less than 5ms Writes every 4 bytes in less than 25ms
Reading/Writing Tag Distance	18' to 25', depends on variables defined later
Communication Interface	RS-232, Wiegand 26 bit, TCP/IP
Input	One way trigger input
Power Supply (suggested)	8-16VDC @ 2Amp
Power Consumption (peak)	1.5 A max. @ 12VDC
Size	10.24" x 10.24" x 3.54" (260mm×260mm×90mm)
Package Size	17.13" x 11.42" x 5.04" (435mm×290mm×128mm)
Gross Weight	7.0 lb (3.20kg)
Net Weight	4.2 lb (1.91kg)
Work Temperature	-4°F to 158°F (-20°C to +70°C)
Storage Temperature	-40°F to 185°F (-40°C to +85°C)
Working Status Indication	Audible Beeper

Product Ordering Guide

Part Number	Description
tres900	902-928 MHz UHF Passive Tag Reader - FCC Part 15, CE, Wiegand/Serial output, reads EPC Class 1 Gen2 tags, Indoor/Outdoor, mounting bracket, Circular Polarized Antenna
tres900E	902-928 MHz UHF Passive Tag Reader - FCC Part 15, CE, TCP/IP output, reads EPC Class 1 Gen2 tags, Indoor/Outdoor, mounting bracket, Circular Polarized Antenna
tres900-PRGM	Programmer for EPC Class 1 Gen2 tags - software included, License Required
tres900-SFW	Software License for tres900 PRGM - 1,000 tag capability
THC-PS094B	Steel Pedestal - 2" pipe, black powder coated up to 94" high mounting, AVI applications
tres-WS421G	Windshield Sticker - EPC G2 - adhesive to windshield - TRES logo - 4 in. x 1 in
tres-WS421C	Windshield Sticker - EPC G2 - adhesive to windshield – excluding logo - 4 in. x 1 in
tres-ISOM	Graphics Quality ISO PVC Personnel Card - 3.37 in x 2.125 in x 30 mil
tres-MM3980-ST	Metal Mount tag - Blue Plastic casing - 3.81 x 1.06 x .56 in
tres-MMSMST-MC	Super Slim Metal Mount Tag - incl. 2 Std. Color Logo - 1.25 X .375 X .125
tres-MMURFT-MC	Adhesive Tag - Metal/All Surface Mount - Incl. 2 Std. Colors - 2.88 x 1.38 x .09 in.
tres-MMURFHT-MC	RFID Hard Tag - Metal/All Surface Mount - Incl. 2 Std. Colors - 4.13 x 1.75 x .20 in.
tres-HT600-G	HangTag with tres Generic Graphics 6.0 x 2.125 x .04 inches
tres-HT600	HangTag with Custom Graphics 6.0 x 2.125 x .04 in. - 4 Color - PMS Colors
tres-HT650	HangTag with Custom Graphics - 6.5 x 3.5 x .02 in. - 4 Std C (Black, Red, Green, Yel, Blue)
tres-HLT1240	Head Lamp Tag - Clear Adhesive w/copper inlay - incl. Programming, 4.125 x .75 x .002 in.
tres-PSS12-035	Power Supply, 85-264VAC, 35W, 12VDC @ 3A regulated (11-14VDC)

Product Dimensions
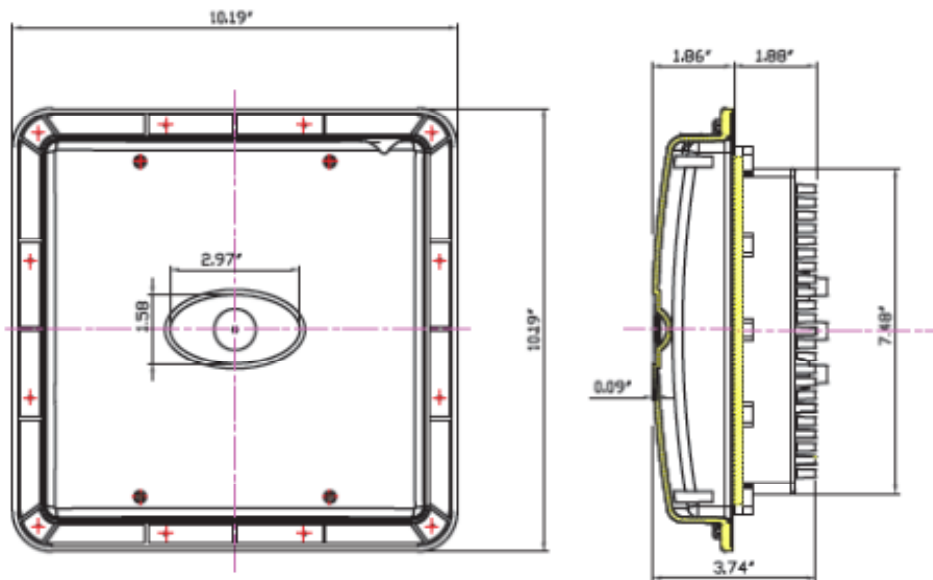
Reader Installation Guide

This section contains information for configuring the Reader's power and signal cabling. Power and communications are provided through a supplied pigtail cable at the bottom of the Reader.

Mounting

The mounting bracket is designed specifically for mounting the **tres900** Reader. The Reader could be installed on a pole or on wood, concrete, or brick structures and aim the antenna

toward zone of coverage. Figure 7 below shows how the bracket looks assembled on a pole. The tool of choice would be a 3/8" (10 cm) wrench.

CAUTION
THIS EQUIPMENT MUST BE GROUNDED

Figure 7

Installation Overview

The Reader is supplied in a weatherproof enclosure for direct outdoor installation or can be placed indoors, such as in a guardhouse, or close to other electronic equipment. The Reader outputs the decoded ASCII data to an access control unit via standard data cabling. Systems are available that output data in both the standard Wiegand and serial RS232 outputted simultaneously and/or the TCP/IP Ethernet and serial RS232 outputted simultaneously.

Trigger Function

If the Reader is configured for triggering mode, the reader will only read a tag when the **BLUE** trigger wire (T1) is tied to ground. Normal ways to accomplish this is by using Loop Detectors to detect the presence of a vehicle to open a gate, or as a safety device to prevent the gate from closing on a vehicle in its path.

Vertical Plane

Vertical orientation is adjusted so as to aim the antenna at a spot about twenty feet (6.5 M) on the road from the vehicle. From this spot forward, the detection area will increase as you get closer to the gate.

Tag Vehicle Installation

A vertical orientation is the optimal orientation of the Tag in order of signal response performance. If not a windshield tag, then install the Tag using double-sided tape or Velcro™. Ensure the label-end of the Transponder is mounted in a vertical position for optimum read range. Prior to installation, make certain the desired location complies with all state and local vehicle code laws.

Parallel Surfaces Rule

Passive RF tag actually gets its' power from the reader. That is to say that, the reader is emitting RF and the tag must be able to absorb that RF, accelerate the signal and to reflect it

back to the reader. Therefore, if the surface of the reader and tag are close to parallel, this principal will result in better tag reads.

Wiegand Panel Wiring
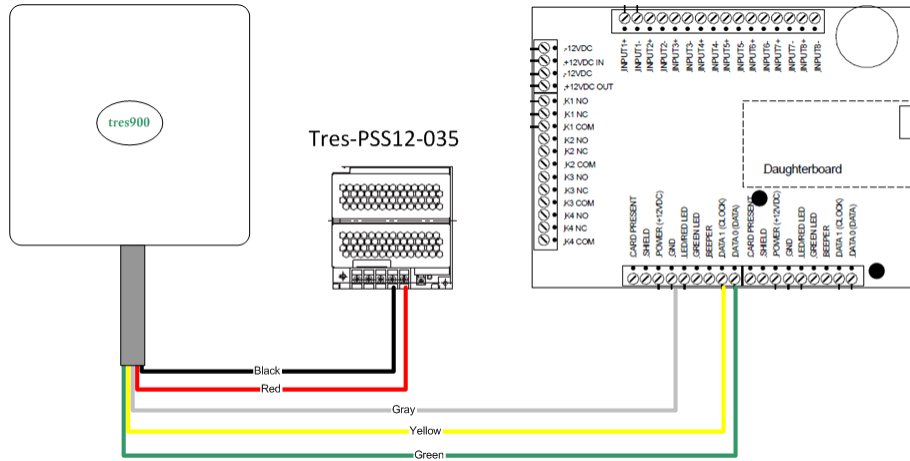
Serial Port RS232 Wiring
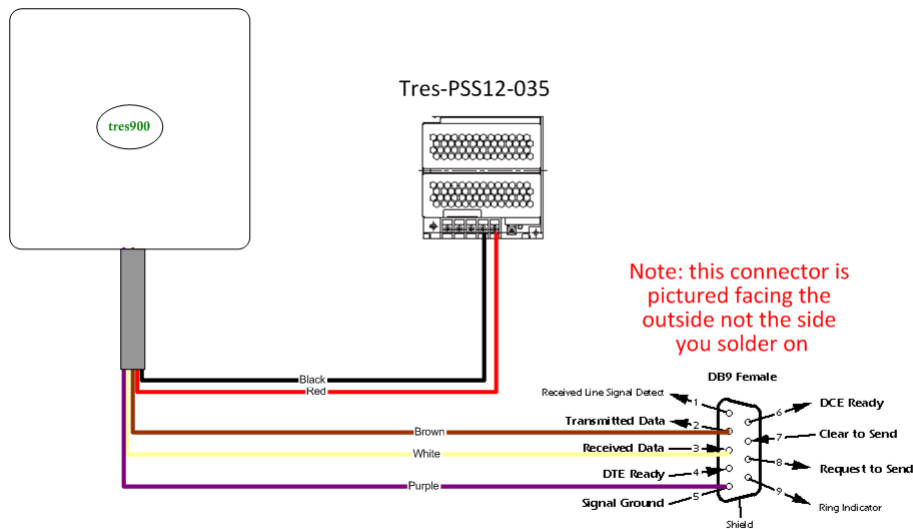
Troubleshooting Guide

Q: To confirm that the unit is operating properly
  ➢ Confirm the beeper is audible when a good tag is presented or when power is first applied. If it is not, remove power.
  ➢ Check that the **RED** and **BLACK** wires are installed correctly
  ➢ Check the voltage at the Reader pigtail cable (see wire chart below), if you under cabled the voltage drop would be too much to power up the Reader. Verify the voltage supplied to the Reader is between 8 and 16 VDC

Q: Reader just beeps and keeps beeping, about 3 x per second
  ➢ Not enough power from the power supplier, Insufficient power,

➢ Check the voltage at the Reader pigtail cable (see wire chart below), if you under cabled the voltage drop would be too much to power up the Reader. Verify the voltage supplied to the Reader is between 8 and 16 VDC

Q: Reader does not recognize a tag (no beep, no outputted tag data)
➢ If no beep, check to see if another tag works, maybe damaged tag. Verify Reader operations by connecting to a computer through the RS232 port and running a Terminal program.

Q: How can I verify that the tres900 Reader I have is Wiegand or serial or TCP/IP?
➢ Both Reader products have RS232 and one model has Wiegand and one has TCP/IP. The TCP/IP model has a cat 5 cable with an 8 pin connector attached.

Q: Tag data to panel is scrambled or Reader beeping and host not responding
➢ One or more of the Reader's wiring connections are incorrect. Power down the receiver/panel and verify the wiring connections are correct. Check that Data 0 (**GREEN** wire), Data 1 (**YELLOW** wire) and ground (**GRAY**) are properly attached between the tres900 to the host panel.
➢ Earth Ground should terminate at the back of the Reader through the mounting brackets or through the Readers Power Supply Ground wire (negative feed).
➢ Cable between Reader and panel is too long, check Wiegand specifications
➢ Check to insure the tres900 tag number and site code are properly programmed in the host panel.
➢ Check the Wiegand timing that your host is looking for and insure their timing scheme is within the SIA standard parameters.

Q: Read Range too short
➢ Ground loop could be an issue here, see if earth ground terminates at the reader. Check by powering reader without reader ground wire connected. Earth ground should terminate at the Reader, check your panel or power supply.
➢ Tag orientation should be in a vertical position for the Readers Antenna maximum performance and distance.

Wiring Guide

Selecting the correct size and type of wire will enhance the performance and reliability of your system. The size of the wire must be large enough to carry the maximum current expected without undue voltage losses. All wire has a certain amount of resistance to the flow of current. This resistance causes a drop in the voltage from the source to the load. Voltage drops cause inefficiencies. The wire sizing guide below provides the minimum wire size needed to limit voltage drops to 5% at a given distance in a 12V system.

Wire Length Table

12V Power Required W(VA)/Amps	The recommended maximum distances for 12volts, ac or dc, is the cell below the wire size, adjacent to watts (VA) or required current.								
					WIRE GAUGE				
	8awg	10awg	12awg	14awg	16awg	18awg	20awg	22awg	24awg	26awg
3W/.25A	3,733	2,396	1,508	947	595	376	234	146	93	59
4W/.33A	2,828	1,815	1,142	717	451	285	177	111	70	44
5W/.42A	2,222	1,426	898	564	354	224	139	87	55	35
10W/.83A	1,124	722	454	285	179	113	71	44	28	18

LIMITED WARRANTY

Transponder & Reader Engineered Systems, Inc. warrants its tres900 asset/vehicle tag readers, cards and tags to the original purchasers to be free from defects in material and workmanship, when they have been installed and used in accordance with Transponder & Reader Engineered Systems instructions and have not been abused, modified or tampered with. The warranty period commences with the date of shipment and extends to the time indicated below.

Scope of Warranty:

Transponder & Reader Engineered Systems sole liability is limited to the repair or (at Transponder & Reader Engineered Systems option) the replacement of the defective product or part when sent to Transponder & Reader Engineered Systems facility (freight and insurance charges prepaid) after first obtaining Transponder & Reader Engineered Systems Return Merchandise Authorization (RMA). All replaced parts shall become the property of Transponder & Reader Engineered Systems. In the event that no defect is found during the follow-up evaluation, Transponder & Reader Engineered Systems reserves the right to bill the customer for labor and time expended.

Transponder & Reader Engineered Systems will provide advance replacement of tres900 asset/vehicle tag readers submitted for warranty claim provided that the customer requests advance replacement at the time an RMA is issued. If the product to be returned is not received by Transponder & Reader Engineered Systems within 30 days of RMA issuance, or warranty is determined to be void under the conditions of this warranty statement, customer will be billed for advance replacement items subject to normal credit terms and conditions.

This express warranty is extended by Transponder & Reader Engineered Systems to the original purchaser and may not be assigned or transferred to any other party. This is the complete and exclusive warranty for tres900 asset/vehicle tag readers and tags sold by Transponder & Reader Engineered Systems, and this warranty may not be enlarged by any other statements, verbal or written, that are not a part of this warranty statement without Transponder & Reader Engineered Systems express written consent.

- Defects or damage resulting from use of the product in manners other than normal and customary.
- Defects or damage from misuse, accident, vandalism, neglect or attempted modification.
- Defects from improper installation, testing, operation, maintenance, alteration or modification.
- Damage due to improper wiring of devices not in accordance with published installation instructions.
- Attempted disassembly or repair without written authorization from Transponder & Reader Engineered Systems.
- Power surges due to malfunctioning control panel or lightning.
- Dye sublimation or thermal transfer surfaces not associated with the tags/cards' electronics, magnetic stripes or bar codes on the surface of the cards

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