



RedStorm™ 2.1

Parking Guidance System

Technical Manual

Last Revised:
11/06/2018

Table of Contents:

- 03 • 1.0 Theory of Operation
- 05 • 2.0 Planning Recommendations
- 09 • 3.0 Specifications
- 11 • 4.0 Installation
- 15 • 5.0 System Start-up and Testing
- 19 • 6.0 SuperMaster Controller Menus
- 23 • 7.0 Maintenance
- 25 • 8.0 Troubleshooting and FAQs
- 27 • 9.0 Appendix



Zappos – North Garage | Las Vegas, NV

1.0 RedStorm Theory of Operation

The RedStorm Parking 2.1 Guidance System is a simple vehicle count system. It can be operated as a stand-alone system without a PC, as a Parking Guidance System integrated with RedStorm Sign Control and Reporting Software, or integrated with both the RedStorm Software and Signal-Tech Smart Signs.

The basic RedStorm 2.1 System operates by knowing the capacity of each zone, counting the number of vehicles moving between zones, and calculating the number of available spaces. Communications are handled over a hard-wired RS485 network.

The RedStorm 2.1 System uses differential counting to determine the number of available spaces. Every RedStorm installation will have predefined “zones” based upon the customer’s requirements. These zones can vary in configuration from an entire facility, to individual decks/levels, to nested areas inside a level, such as VIP, ADA, Monthly Only etc. Every zone will have at least one transition point. These points will be defined during the planning process and are simply where one zone leads to another (source to destination). When vehicles travel through these transition points, dedicated hardware monitors and counts vehicle activity.

The dedicated hardware at each transition is a DZ Counter and either up to four (4) pairs of Signal-Tech Overhead Sensors or up to eight (8) third-party loop detectors, depending on type. All Overhead Sensors or loop detectors connected to a specific DZ Counter must use the same counting logic. The vehicle counts are adjusted by removing one vehicle from a zone’s count and adding one vehicle to the adjacent zone’s count (-1 source: +1 destination).

Signal-Tech’s Overhead Sensors use infrared scanning to count vehicles. Their precise optical sensor measures its field of view upon initial power up. When something in its field of view changes, the relay output is triggered until its field of view is returned to its original state. The DZ Counter uses bidirectional A/B logic to count vehicles and determine the direction of travel. Overlap filtering (refer to Figure 1-1) is used to differentiate between vehicular and pedestrian traffic by measuring the amount of time the source (A) and destination (B) sensors are concurrently tripped. Traffic with an overlap of 300 milliseconds (ms) or longer is considered vehicular traffic and counted as a +1 vehicle count. Traffic under 300ms is considered pedestrian foot traffic and is not counted. The DZ Counter records the counts resulting from Overhead Sensor activity.

When third party inductive loops are used as the sensing devices the counting logic used is one of three types: **HALF IN/ HALF OUT**, **ALL IN** or **ALL OUT**. The DZ Counter must receive a pulse of 100ms or greater to register it as a +1 vehicle count.

Each DZ Counter monitors and stores IN/OUT vehicle counts from its sensing devices and communicates them upon request to the SuperMaster Controller.

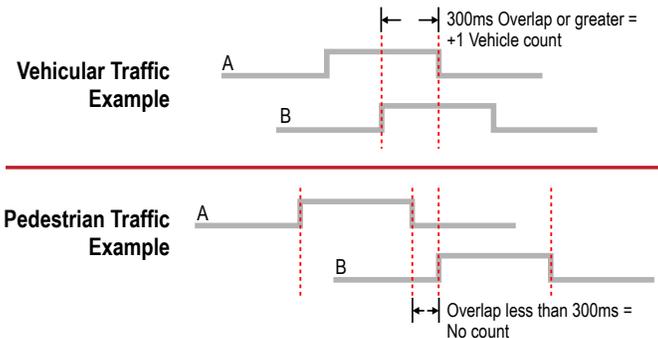


Figure 1-1. Example of overlap filtering

The SuperMaster Controller (SM) is the central point for communications in the RedStorm System. SM gathers the count information from all the DZ Counters, performs the necessary calculations, updates the vehicle counts in memory and then broadcasts the new count information to all the Space Available Signs connected locally through the RS-485 network. The SuperMaster will log the count information to the external SD card, which may be retrieved later to view system statistics and performance for troubleshooting.

When connected to the RedStorm Sign Control and Reporting Software (Software), the SM transmits the RedStorm dataset to the Software upon request via the facility network for monitoring, analysis, reporting and export.

When the RedStorm 2.1 System is integrated with Software and Signal-Tech Smart Signs, the LED sign messages can be controlled automatically through the user defined schedule in the Software, through real-time RedStorm parking activity conditional statements (such as redirect traffic to Garage B when Garage A reaches 95% capacity) or a combination of both.

There are four (4) main components to the System:

- **Overhead Sensors** or **third party inductive loops**,
- **DZ Counters** (differential zone counters),
- **SuperMaster Controller** and
- **Space Available Signage**.

Optional components are:

- **RedStorm Sign Control and Reporting Software** and
- **Signal-Tech Smart Signs**.

The Software and Smart Signs communicate via Ethernet using the facility network.



Walter Reed National Military Medical Center – Liberty Garage | Bethesda, MD

2.0 Planning the RedStorm 2.1 System

2.1 Requirements for Planning Traffic Flow

- Use physical lane delineation to direct and separate traffic flow at vehicle entrances, exits and all vehicle count transition points within the garage or lot for optimum performance of the system. (refer to Figure 2-1)
- Ensure that all vehicles are directed to travel under the Overhead Sensors (within the sensing range of the sensors) or over in-ground loop detectors to ensure each vehicle is correctly counted. A vehicle must drive under the Overhead Sensor or over the in-ground loop to be accurately counted.
- Clearly designate separate travel areas for pedestrian and vehicular traffic. Heavy pedestrian traffic may interfere with vehicle count accuracy.

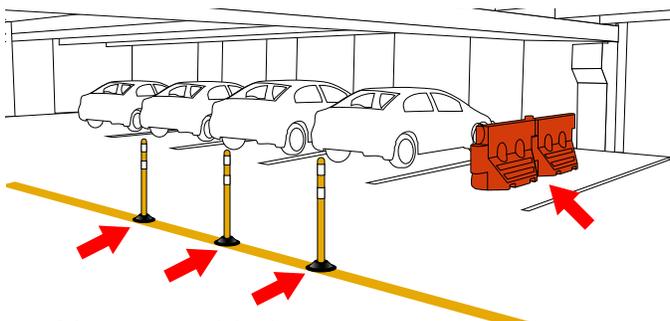


Figure 2-1. Examples of Lane Delineation

Please note:

- *Maximum vehicle speed must be 10mph or less for proper vehicle detection to occur.*
- *Vehicle counts are updated in real-time. System count updates occur in 60 seconds or less. Count updates on signs are not instantaneous.*
- *Motorcycles may not be accurately detected due to size.*
- *In PAIRED MODE lanes are treated as bidirectional.*

2.2 RedStorm System Planning Requirements

2.2.1 RedStorm RS485 Network

- Daisy-chain network topology is required. (refer to Figure 2-2)

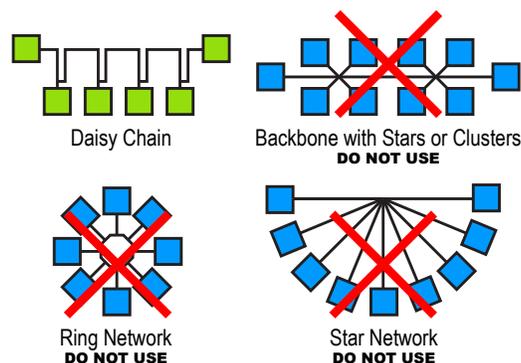


Figure 2-2. Example of Daisy Chain Topology

- A RedStorm 2.1 System has one (1) SuperMaster Controller (SM) and can support up to a maximum of eight (8) RS485 networks. Each SM can support a maximum of 26 DZ Counters. Each RS485 bus can support a maximum of 64 devices. Each DZ Counter and each 7-segment display is treated as an individual device.
- At a minimum, a three (3) conductor, 18 gauge cable must be used between sensing devices and the DZ Counters.
- Communication cabling lengths **MUST** be kept as short as possible. The length of each RS485 cable **BUS MUST NOT** exceed 4,000 feet. Refer to TIA/EIA-485-A guidelines for additional requirements.
- Communication and power wiring **MUST** be run through separate conduits to avoid cross-over interference. All wiring must be grounded. Additional protection against voltage transients on the network is highly recommended.
- A trained RedStorm Installer should plan and install your RedStorm Parking Guidance System. Contact Signal-Tech to find the RedStorm Partner nearest you.
- Connect the RedStorm 2.1 System to an uninterruptible power supply (UPS) to prevent vehicle count interruption during a power disruption. The UPS is not part of the RedStorm System and **MUST** be provided by others.

2.3 Typical RedStorm 2.1 System Topology

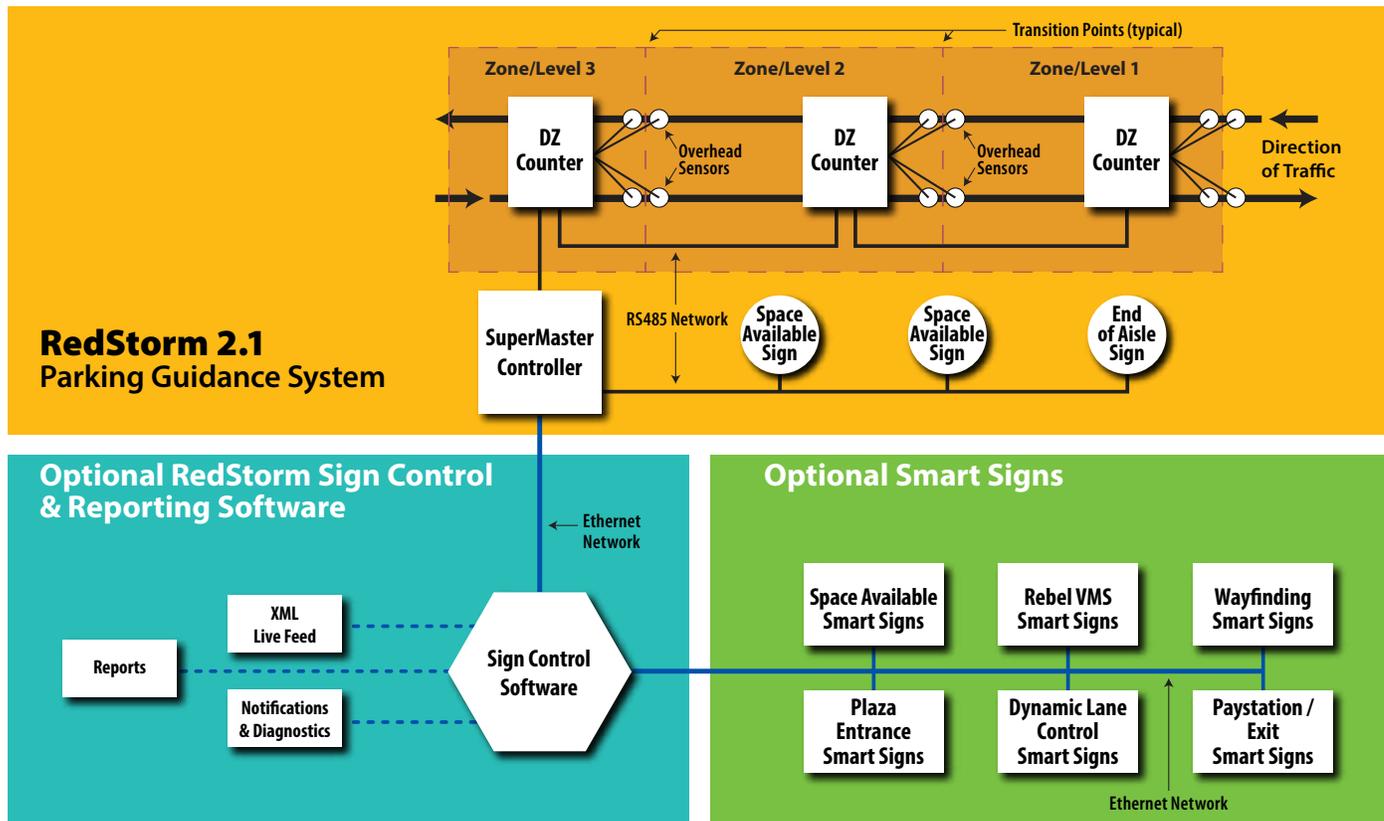


Figure 2-3. RedStorm Component Topology

2.3.1 Optional Components

- **When using RedStorm Sign Control and Reporting Software**

RedStorm 2.1 SuperMaster is equipped with a RJ45 Ethernet port for connecting to the software. Each RedStorm 2.1 System will require a static IP lease on the network. Facility Network MUST be DHCP enabled! (see Figure 2-3)

- **When using Smart Signs**

Smart Signs are controlled through the RedStorm Sign Control and Reporting Software. The Smart Signs and Software communicate over Ethernet on the facility network. Each Smart Sign requires an input power source and a physical Ethernet connection. Each Smart Sign will require a static IP lease on the network. Facility Network MUST be DHCP enabled!

2.4 DZ Counter Planning Requirements

DZ Counter collects vehicle counts from sensing devices and communicates them to SuperMaster Controller when requested by SuperMaster.

- DZ Counters require 120 – 240VAC input power @ <math><0.25A</math>.
- The DZ Counter is the power source for Overhead Sensors; each DZ Counter supports four (4) pairs of Overhead Sensors.
- For optimal performance locate the sensors and their associated DZ Counter within 50 feet of each other. This may be extended, by the installer, up to 350 feet using 3-conductor, 18 gauge cable.
- At a minimum, one (1) DZ Counter and one (1) pair of Overhead Sensors per lane should be placed at each transition point.
- All connections from the DZ Counter to SuperMaster **MUST** be hardwired in a daisy-chained RS485 network configuration.

2.5 Overhead Sensor Planning Requirements

Signal-Tech's Overhead Sensor is an active infrared scanning sensor with fixed cable. It is designed for overhead mounting.

- Overhead sensors **MUST** be used in pairs and **MUST** be located in areas protected from environmental elements such as rain.
- When used with a DZ Counter, the Overhead Sensors use A/B logic to detect vehicles and their travel direction. Plan to install them in a consistent orientation within the parking facility for proper operation.

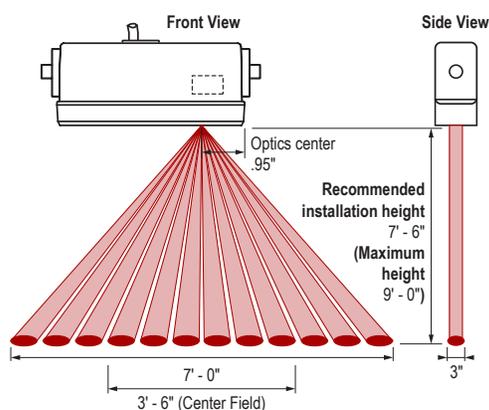


Figure 2-4. Sensor Mounting Specifications

- For best vehicle detection, mount sensor pairs 7'6" above the finished floor (AFF) (9'0" maximum) and 48" apart (60" maximum). (refer to Figures 2-4 and 4-1)
- Sensors operate on 12 – 24VDC input power and draw their power from the DZ Counter.
- **DO NOT** locate Sensors next to parking spaces, as it may result in vehicle counting errors. When unavoidable, the adjacent spaces should be removed from use through permanent delineation to maintain count accuracy.
- **DO NOT** locate Sensors close to fluorescent lighting

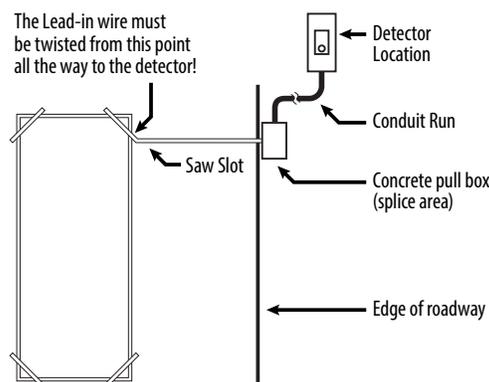


Figure 2-5. Inductive Loop Example

fixtures as the reflected light and flickering from fixtures may cause sensors to trip which will affect vehicle count accuracy.

2.6 Third Party Inductive Loops Planning Requirements

- For best performance, use loop detectors with bidirectional anti-tailgating functionality.
- Loops must be capable of outputting a 100ms or longer pulse for counting-logic interface.
- Wire length between the DZ Counter and third party loop detector system should not exceed 350 feet. (refer to Figure 2-5)
- Loops can be setup with the following counting logic: **Half In/Half Out, All In or All Out**. Refer to the inductive loop manufacturer's instructions for installation details.

2.7 SuperMaster Controller Planning Requirements

- The SuperMaster Controller should be protected from environmental elements and located in a controlled area to prevent unauthorized access to the system controls. The controller is housed in a hinged cabinet approximately 11" wide x 14" high x 7½" deep. The hinged cabinet face is clear for easy viewing.
- Mount the SuperMaster enclosure at eye level for ease of maintenance. Plan to make all electrical connections through the bottom of the enclosure and seal opening to prevent moisture from entering enclosure. Holes made elsewhere will void the system warranty.
- The SuperMaster Controller requires RS485 network communications and 120 – 240VAC power. Wiring **MUST** be run through separate conduits to avoid cross-over interference. The RS485 communication network should be protected with transient voltage suppression.

2.8 Optional RedStorm Sign Control and Reporting Software and Smart Sign Planning Requirements

- The RedStorm System is connected to the facility network through the Ethernet port on the RedStorm SuperMaster Controller.
- Smart Signs are connected to the Software by a physical Ethernet connection at each Smart Sign.
- Smart Signs and Software do not ship with assigned IP addresses. All addresses **MUST** be assigned by the facility network administrator prior to installation and setup. Use DHCP for IP address discovery during installation and setup. If DHCP is unavailable, Telnet or the Web Interface can be used to configure the Ethernet controller.



Wind Creek Casino | Wetumpka, AL

3.0 Specification of the RedStorm 2.1 Parking Guidance System

3.1 General

3.1.1 Introduction

This document provides the general specification, description and functional requirements for the RedStorm™ 2.1 Parking Guidance System.

3.1.2 Description of the System

The RedStorm 2.1 Parking Guidance System is a stand-alone vehicle counting system that runs on its own multi-bus RS485 network. It is TCIP/IP enabled and can be connected to the facility network and used with the RedStorm Sign Control and Reporting Software. It can function as a global count, level by level count or campus-style count system, and is scalable and reconfigurable in the field. For expanded functionality the RedStorm 2.1 System can be integrated with both RedStorm Sign Control and Reporting Software and Smart Signs.

The system components include:

- **Overhead Sensors** for vehicle detection
- **DZ Counters** (Differential Zone Counters) for count collection
- **Space Available LED** (light emitting diode) **Signs** for displaying the number of available parking spaces to motorists
- **SuperMaster Controller** for system control

Optional components include:

- **RedStorm Sign Control and Reporting Software** for collecting, monitoring, reporting and sharing parking data
- **Smart Signs** for directional traffic control

3.2 RS485 Network Requirements

- Daisy-chain network topology **REQUIRED**.
(refer to Figure 2-2)
- Wiring **MUST** conform to EIA/TIA-485-A standards.
- Maximum communication cable length **MUST NOT** exceed 4,000 feet for each RS485 network bus.
- Each RS485 network bus can support up to sixty-four (64) devices. DZ Counters and sign displays are considered individual devices.
- Properly grounded communication and power wiring should be run through separate conduits to avoid cross-over interference. Additional protection against voltage transients on the network is highly recommended.
- Typical System Topology (refer to Figure 2-3)

3.3 System Components

3.3.1 RedStorm 2.1 SuperMaster Controller

The SuperMaster Controller gathers data from each transition point and updates the zone counts, updates all signage and logs important statistics. The Control Center consists of one SuperMaster Controller with an Ethernet port and a 120 - 240VAC power supply for input power. Components are mounted on a panel and enclosed in a NEMA 4X rated enclosure.

Electrical	Input voltage 120 - 240VAC
	< 0.4 Amp @ 120VAC
	Internal, Real-time Clock
Communications	Supports eight (8) separate RS485 networks
	Each network supports sixty-four (64) devices with a maximum cable length of 4,000 feet per network. 9600bps, 8-N-1
Display	Backlit LCD Screen; 4 lines, 20 characters
Permanent Memory	Custom formatted, factory provided multi-media SD card. Prior to power interruption, counts are stored in permanent memory.
Optional Network Requirements	When connecting to RedStorm Sign Control and Reporting Software an Ethernet DHCP Static IP Lease MUST be used.

3.3.2 DZ Counter (Differential Zone Counter)

The DZ Counter monitors in/out vehicle counts at each transition and communicates them upon request to the

Electrical	Input voltage 120 - 240VAC < 0.25 Amp @ 120VAC
Communications	RS485 network port
Sensor Inputs	Eight (8) sensor connections

SuperMaster Controller. Each DZ Counter can support up to four (4) sensor pairs or eight (8) loop detection units. The DZ Counter is housed in a NEMA rated enclosure.

3.3.3 Signal-Tech Overhead Sensor

Electrical	Power supplied by DZ Counter. DC Power 12 – 24VDC, 100mA maximum consumption
Communications	Each sensor includes a 16 foot long cable for connecting the sensor to its corresponding DZ Counter. Cable may be lengthened (in the field by others) to a maximum of 350 feet using three (3) conductor, 18 gauge cable.
Temperature Range	-4 Degrees to 140 degrees Fahrenheit

Installed in pairs with each DZ Counter. Sensors are used to detect vehicles and their travel direction. Sensors are capable of unidirectional and bidirectional vehicle counting.

Specification

3.3.4 Space Available Signage

Custom designed signs with LED 7-segment boards for displaying counts. Signage can be sized to display counts for a single level, entire garage or campus-wide setting.

Electrical	Input voltage 120 – 277VAC or 12 – 24VDC
Construction	Pre-wired, corrosion resistant, mitered extruded aluminum cabinet with factory applied interior anti-condensation coating
Finish	Fade resistant, high-performance polyurethane acrylic enamel finish. Graphics in high performance, commercial grade vinyl; computer cut, factory applied.
Mounting	Wall, ceiling, direct burial post mount, or base plate post mount.

3.4 Optional Signal-Tech Sign Control and Reporting Software

3.4.1 The Sign Control and Reporting Software organizes and manages RedStorm Systems and Smart Signs on the facility network.

Computer Requirements	Windows 7 or higher; Server 2008 or higher Recommended: Server grade computer with backup power located in a secured area.
Network Requirements	Ethernet DHCP enabled

3.4.2 Functionality with the RedStorm Parking Guidance System

Collects and stores RedStorm System parking data.

- Has ability to interface with one or multiple RedStorm Systems on the network.
- Monitor garage/lot usage.
- Adjust counts and capacities within a zone or system.
- Assign common names to entrances, exits and transitions to simplify reporting, maintenance and troubleshooting.
- Schedule count maintenance by zone.
- Sends email alerts when atypical system activity occurs.
- Export data in .csv format.
- Create custom parking usage reports, trend and turnover analysis, predictive analysis.
- Use to reconcile revenue for theft prevention.
- Supports a live XML feed of available space counts, giving the users the ability to display open space counts through their own web services.

3.4.3 Additional Functionality when Integrated with a RedStorm System and Smart Signs

- Display counts on space available signs in remote locations via Ethernet
- Control wayfinding and directional Smart Signs based on real-time parking occupancy, event, day and /or time
- Manage garage and traffic from one platform

3.4.4 Compatible with the Following Signal-Tech Smart Signs

- **S-TCL Series** Outdoor Blank-out Direct-view LED Signs
- **S-SA Series** Space Available Signs
- **S-PHX Series** Outdoor Blank-out LED Backlit Signs
- **S-PHXF Series** Outdoor LED Backlit Signs
- **S-TCIL Series** LED Traffic Controllers
- **S-VMS Series** Rebel Programmable Displays

3.5 Optional Signal-Tech LED Smart Signs

Intelligent LED signs connected to the facility network and controlled through the Software's user defined, perpetual weekly schedule and/or conditional parameters associated with real-time parking data from a RedStorm System.

Electrical (input voltage @ the sign)	12 – 24VDC or 120 – 277VAC Based on sign series UL/cUL Listed for wet locations
Communications	A wired Ethernet network connection at the sign and a Static IP Lease on the network
Illumination and Construction	LED Illumination Construction varies by sign series
Finish	Duranodic Bronze Custom paint colors or color match services available
Mounting	Surface, ceiling, side, post and recessed mounting available

4.0 Installation of the RedStorm 2.1 Parking Guidance System

4.1 Wiring the RS485 Network

- Use RedStorm wiring diagram Appendix 9.8.
- The RS485 network **MUST** be installed in a daisy-chain wiring layout. CAT5 or CAT6 cable is recommended for the communication wiring because it is readily available and consists of good quality twisted pair cable.
- Follow TIA/EIA- 485-A guidelines.
 - ❑ Maximum cable length 4000 feet
 - ❑ Each RS485 bus can support a maximum of 64 devices. Each RedStorm System can support a maximum of 26 DZ Counters. Treat each DZ Counter and 7-segment display sign as an individual device.
 - ❑ When running a daisy chain, each “device” can consist of a SuperMaster, a DZ Controller, or a 7-segment display. While the SuperMaster does control the network, it is not necessary to have it located at one end of an RS485 daisy chain network. From the viewpoint of the network itself, each “device” looks the same.
 - ❑ Daisy chain in and out. **DO NOT** run stubs. Stubs are very likely to cause data corruption.

Critical: This is a low voltage signal and cannot be run parallel to line voltage wires in the same conduit.

- Wire as shown (refer to Appendix 9.8)
- All wiring **MUST** be grounded. Additional protection against voltage transients on the network is highly recommended.
- Connect RedStorm 2.1 System to an uninterruptible power supply (UPS) to prevent vehicle count interruption during a power disruption. The UPS is not part of the RedStorm System and **MUST** be provided by others.

4.2 Mounting the SuperMaster Controller

- Locate enclosure at eye level in a controlled area to prevent unlawful access to the system controls. Area should also be protected from environmental elements.

Critical: To reduce risk of water damage, all conduit connections **MUST** be made on the bottom of the enclosure. Failure to adhere to this guideline will void the warranty.

- Secure housing with lockable latch for added security, as needed.
- Connect 120 - 240VAC input power. Wire in accordance with local electrical codes and weatherproof all connections made through the enclosure. (refer to Item H, in Appendix 9.9)
- Terminate the DZ Counter RS485 connections to one of

the four Ports on the SuperMaster Controller, corresponding to the port it was assigned to in the configuration files. (refer to Item G, in Appendix 9.9)

- Terminate the Space Available Signs on the local RS485 network to any of the four (4) Ports on the SuperMaster Controller. (refer to Item F, in Appendix 9.9)

4.3 Mounting & Wiring Overhead Sensors & DZ Counters

Traffic lanes **MUST** be delineated at transition points to ensure vehicles consistently travel under the sensors. Vehicles must travel under sensors to be counted by the system. If it is necessary to mount Overhead Sensors next to parking spaces, eliminate affected parking spaces with barriers.

DO NOT mount sensors near lighting fixtures, as flickering can affect count accuracy.

4.3.1 Mounting the DZ Counters

- One (1) DZ Counter is required at each transition point and is capable of monitoring up to four (4) pairs of Overhead Sensors or eight (8) loop detector inputs.
- The Overhead Sensors draw their power from the DZ Counter. For optimal performance locate the sensors and their associated DZ Counter within 50 feet of each other. This may be extended, by the installer, up to 350 feet using 3-conductor, 18 gauge cable.
- Wire DZ Counters using up to four (4) RS485 network buses and connect each bus to the SuperMaster Controller. (refer to 4.3.3 for wiring instructions)
- Secure housing with lockable latch for added security.

4.3.2 Mounting the Overhead Sensors

- Use a rigid mounting method and ensure sensors are protected from environmental elements, such as rain.

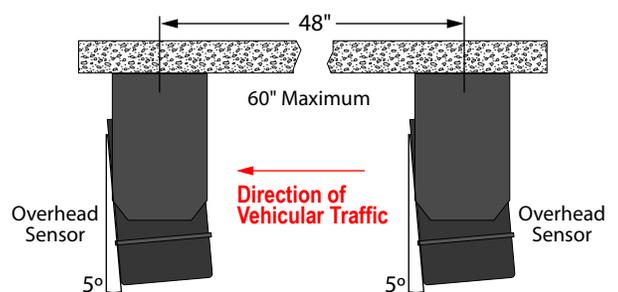


Figure 4-1. Overhead Sensor Distance and Toeing

Installation

- Mount sensors parallel to one another and in pairs over centerline of traffic; 48" apart (60" maximum) and 7'6" above finished floor (9'0" maximum). (refer to Figure 4-1)
- Each Sensor has an 84" wide infrared scanning fan; scanning fan should not overshoot into other lanes or pedestrian areas as this will affect count accuracy. (refer to Figure 2-4)
- Position each Sensor at a 5° (degree) toe-out from center toward the line of travel to avoid scanning interference from standing water, when it occurs. (refer to Figure 4-1)

4.3.3 Wiring the DZ Counter and Sensing Devices

- Use RedStorm wiring diagram Appendix 9.9.
- Connect each DZ Counter to 120 - 240VAC input power. (refer to Item L, in Appendix 9.10)
- Using CAT5/6 cable, daisy chain DZ Counters together using the RS485 network connectors on the board. Each DZ board has two identical connectors that can be used interchangeably for in and out daisy chain wiring. **DO NOT** run stubs. Terminate each bus at the SuperMaster Controller.
- Connect each Sensor's communication and power to one of the eight (8) Sensor Input Ports on the DZ Counter. Wire as shown (refer to Figure 4-2)
- Each Overhead Sensor comes with a 16 foot long cable used to connect the sensor to the DZ Counter. This cable can be lengthened to a max of 350 feet using 3-conductor, 18 gauge cable. (refer to Figure 9-2)
- Wire Overhead Sensors to the DZ Counter as bidirectional pairs. Each transition point, will have the ability to count "INs" and "OUTs". (refer to Figure 4-2)

Note: DZ Counter is agnostic to traffic direction. Observe proper A/B direction logic as shown. (refer to Figure 4-2)

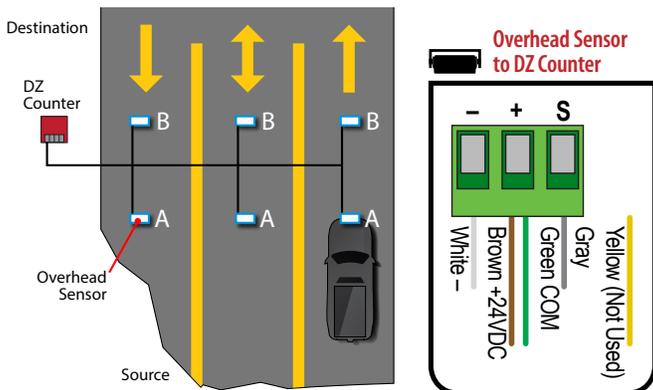


Figure 4-2. Overhead Sensor Wiring

Critical: Properly strip and terminate the wires to prevent breaks, shorts and loose terminations. Improper terminations will negatively affect system operation.

4.3.4 Addressing the DZ Counter

The SD card on the SuperMaster Controller is factory configured with the DZ address for each transition point. For ease of installation, each DZ Counter is shipped with a default address of 00 and must be set in the field during the installation phase.

Use the **Transition Point List** to find the DZ Counter address for each transition point.

Note: The Transition Point List ships in the SuperMaster Controller carton with this RedStorm Technical Manual.

- Find the transition point you've just installed. Do that by locating the **From Zone** (Source or A) and **To Zone** (Destination or B) on the List of Transition Points that best describes the transition point.
- Set the DZ Counter Address Rotary Switches (refer to Item H, in Appendix 9.10) to the 'Address' shown in the far left column. Note: in RedStorm Systems with multiple transition points from the same **From Zone** (Source) and **To Zone** (Destination), each DZ Counter must have a unique address.
- On the Transition Point List, enter a common name for the transition location in the column labeled 'Location'. This will be especially helpful for RedStorm Systems with Software as the Transition Point descriptor can be edited in the software and used in running reports etc.

4.3.5 Set the Sensor Mode and Sensor Input on the DZ Counter

Before powering up the DZ Counter, set the **Sensor Mode Selector to 4 Paired** and set the **Sensor Input DIP Switch 1 to NC** (Normally Closed). (refer to Figure 4-3) If the DZ Counter is running, press the <RESET> button to reboot.

Complete steps in 4.3 for each transition point in the system.

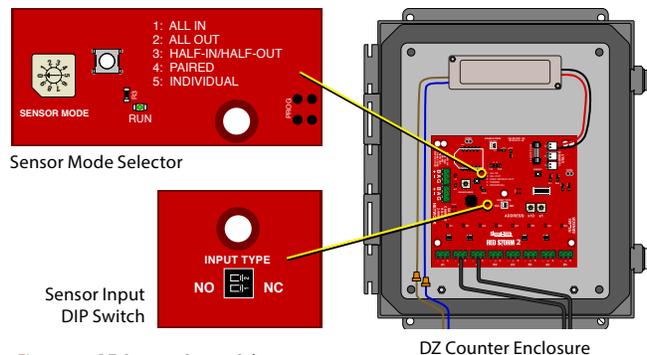


Figure 4-3. DZ Counter Sensor Selection

4.4 Wiring Third Party Anti-tailgating Loop Detectors to the DZ Counter

Connect the output relay from each loop to the Sensor Input Ports on the DZ Counter.

- Connect the + (middle terminal) of the male connector to the **COM** wire from the loop detector. Connect **S** (right terminal) to the **NO** wire from the detector. (refer to Figure 4-4)
- The loop detector can be wired to the DZ Counter in one of three ways: **HALF IN/HALF OUT**, **ALL IN** or **ALL OUT**. (refer to the wiring patterns 4.4.2, 4.4.3 and 4.4.4)
- Before powering up the DZ Counter, change the **NO/NC** Sensor input to match the loop detector, typically this is **NO** (Normally Open). Refer to manufacturer's instructions for normal operating state. To change, move DIP Switch 1 to the **NO** position. Remove the jumpers from the unused Sensor Input Ports on the DZ Counter. If the DZ Counter is running, press the <RESET> button. (refer to Items J and D, Appendix 9.10)
- Complete steps in 4.4 for each transition point with third party loop detectors.

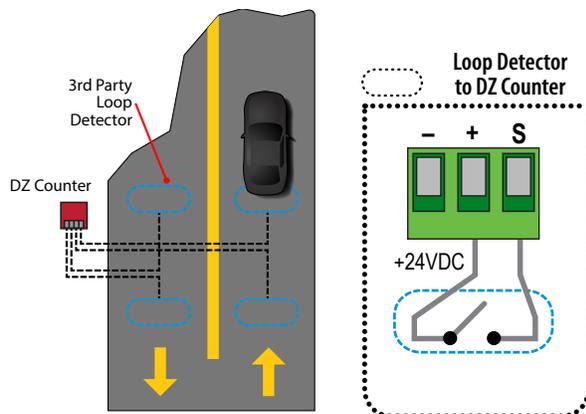


Figure 4-4. Loop Detector Wiring

4.4.1 Wiring HALF IN/HALF OUT Setup

At the transition point, one pair of loops count "INs" and one pair of loops count "OUTs". Connect output relay from each loop to Sensor Input ports. (refer to Figure 4-5)

Set **Sensor Mode Selector to 3 HALF IN/HALF OUT** (refer to Figure 4-3)

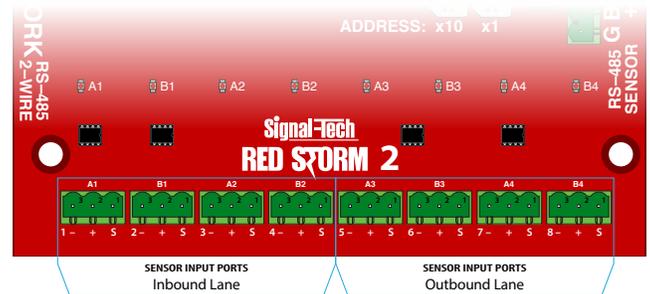


Figure 4-5. Loop Detector – HALF IN/HALF OUT Sensor Inputs

4.4.2 Wiring ALL IN Setup

At the transition point, all loops count "INs". Connect output relay from each loop to Sensor Input ports. (refer to Figure 4-6)

Set **Sensor Mode Selector to 1 ALL IN**. (refer to Figure 4-3)

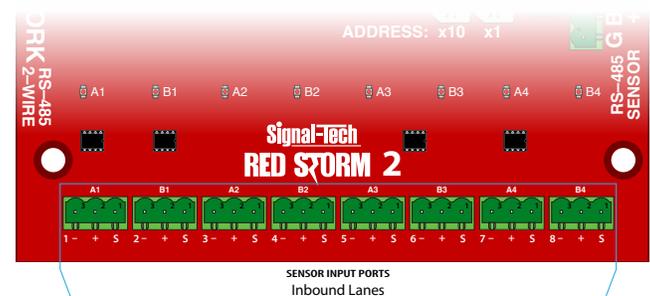


Figure 4-6. Loop Detector – ALL IN Sensor Inputs

4.4.3 Wiring ALL OUT Setup

At the transition point, all loops count "OUTs". Connect output relay from each loop to Sensor Input ports. (refer to Figure 4-7)

Set **Sensor Mode Selector to 2 ALL OUT**. (refer to Figure 4-3)

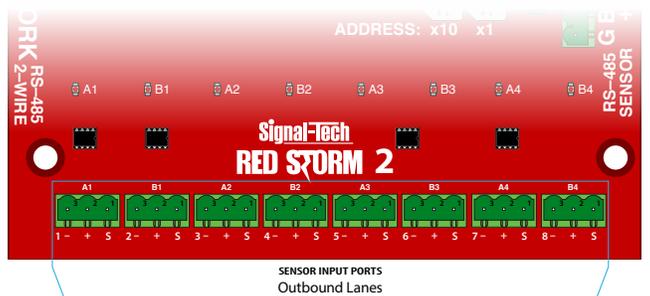


Figure 4-7. Loop Detector – ALL OUT Sensor Inputs

4.5 Mounting and Wiring Space Available Signs

To mount and power your signage, follow the installation and wiring instruction that shipped with them. If additional copies are required, please contact Signal-Tech by phone.

Critical: *Space Available Signs that are powered up should be clearly marked to indicate system is under test and that counts should be disregarded until testing is complete.*

4.6 Installing and Configuring the RedStorm Sign Control and Reporting Software

Refer to separate instructions packet



Walter Reed National Military Medical Center – America Garage | Bethesda, MD

5.0 Start-up of the RedStorm 2.1 Parking Guidance System

5.1 Verify and Test Communications between the SuperMaster Controller and each DZ Counter

- Once all the communication and power has been properly terminated, power up the system.
- The SuperMaster LCD Screen should be displaying the home screen. (refer to Figure 5-1)
- Press <ENTER> to advance to the next screen.

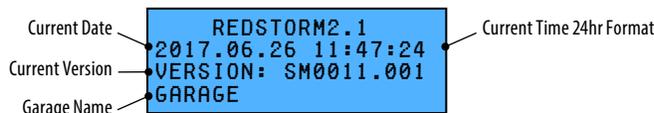


Figure 5-1. RedStorm Home Screen

• Troubleshooting Tip: If the power up was noisy, the screen may be lit but blank, if so push the upper right navigation button to bring back the display.

- Verify SuperMaster to DZ Counter communications.
- The system is currently running. The first line says **STOP**; selecting it and pressing <ENTER> would halt all communications. (Note the DZ Counters will still count vehicles, but no zone counts or signs will be updated.)
- At this point we want to verify communications and addresses of the DZ Counters, so we will use the down arrow key to select **VIEW** and press <ENTER>.

(refer to Figure 5-2)

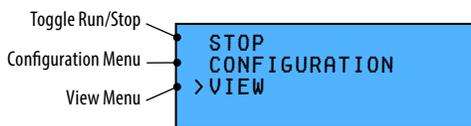


Figure 5-2. RedStorm VIEW Menu Screen

• Troubleshooting Tip: Every ten minutes the SuperMaster will record current count info to the SD Card. When this happens the screen will momentarily display "WRITING TO SD". When complete it will return to the menu screen you were on.

THE SD CARD MUST BE LOADED INTO THE SD SLOT

If the card is not fully inserted a "NO CARD" message will appear on the screen until it is properly inserted.

- The **VIEW** menu allows you to step through the status for each DZ Counter in your RedStorm System.
- To verify communications, move the cursor down to Controllers and press <ENTER>. (refer to Figure 5-3)
- This screen is now displaying the information for

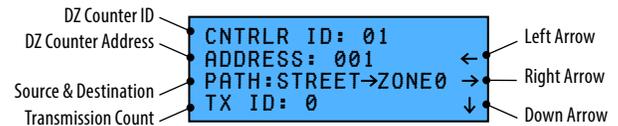


Figure 5-3. RedStorm DZ Counter Info Screen 01

DZ Counter 01. (refer to Figure 5-3) By using the left and right arrow buttons, all DZ Counters can be viewed. A line of interest is the **TX ID**. This is the transmission ID number of the current data packet. This number will increment every time there is a successful transmission to that DZ Counter. This number rolls over to 1 after it reaches 255.

• Troubleshooting Tip: Any DZ Counter that has a TX ID that is not changing or is stuck at zero may have a wrong address set or else the communication wiring needs to be verified. The red (RX) and blue (TX) LEDs on the first 4 ports indicate these communications. When SuperMaster transmits data, a blue LED will blink, and when the DZ Counter responds, a red LED will blink. With the exception of the sign ports, each transmission should have a corresponding response.

- While in this screen, use the up and down arrow keys to view additional information. There are nine (9) lines of information for each DZ Counter. Pressing the <DOWN ARROW> 4 times from that screen will display the following information:

- **Port** is the communication port that SuperMaster uses to communicate to this DZ Counter.

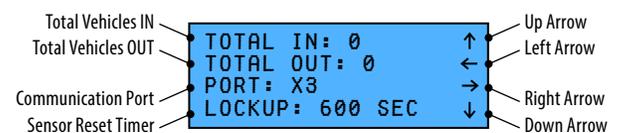


Figure 5-4. RedStorm DZ Counter Info Screen 02

- **Lockup** is the amount of time in seconds, that the sensors can remain continuously tripped before the DZ Counter will assume the sensor's environment has changed significantly enough to require a new baseline reading.

- Press the down arrow again to show the last option.
- **Overlap** is the minimum time that the **A** and **B** sensor must be triggered concurrently to count a vehicle. (used in PAIRED MODE) (refer to Figure 1-1)

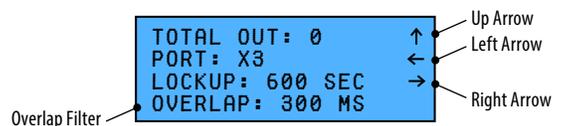


Figure 5-5. RedStorm DZ Counter Info Screen 03

5.2 Verify and Test the Signal-Tech Overhead Sensors with the DZ Counter

- Verify the sensors have been mounted correctly; over centerline of traffic lane, 48" - 60" a part, 7'6" above finished floor (max 9'0" AFF) and at a 5° (degree) toe-out from center towards the direction of traffic flow.
- Using the Transition Point List that shipped with the system, make sure the detection equipment sequences the signals properly.

Overhead Sensor setup uses bidirectional counting logic. This configures the eight (8) Sensor Input Ports on the DZ Counter into pairs (A1,B1),(A2,B2) etc. (refer to Figure 4-2)

A valid sequence from source (A) to destination (B) is treated as an IN count (+1). Conversely, a valid sequence from destination (B) to source (A) is an OUT (-1). The source and destination are predefined in the RedStorm Transition Points List.

Note: In PAIRED MODE lanes are treated as bidirectional even if they are actually unidirectional.

Note: PAIRED MODE can only be used on sensor pairs sharing the same source and destination zones. For example, if one lane of an entrance leads to Zone 1 from the main street, and the other lane leads to Zone 2 from the main street, a different DZ is needed to monitor each lane.

- Make sure **NO/NC Sensor Input** on DZ Counters is set to **NC** (Normally Closed). (refer to Item I in Appendix 9.10) If not, move the DIP Switch 1 to the **NC** position and press the <RESET> button. (refer to Item C in Appendix 9.10)
- The red and blue DZ Transmit/Receive LEDs – **TX** and **RX** should begin to flash indicating network activity. (refer to Item A in Appendix 9.10)

Note: In installations with multiple DZ Counters on the same network, the red LEDs will flash more frequently than the blue LEDs.

- Test the sensors at the transition point with a vehicle traveling inbound from the source (A) to the destination (B).
- As the vehicle passes into view of the first sensor, the LED labeled (A), above the sensor pair being tested, should turn off. (Only this sensor should turn off).
- When the vehicle reaches the second sensor, the LED labeled (B), above the sensor pair being tested, should turn off. (Only sensors (A) and (B) above the sensor being tested should turn off).
- When the vehicle travels past the first sensor the LED

labeled (A), should illuminate.

- After the vehicle travels past the second sensor the LED labeled (B) should illuminate.
- If the sensor setup is correct, the green +1 LED will flash one time and a count of +1 IN will be stored on the DZ Counter for transmission to the SuperMaster Controller. (refer to Item O in Appendix 9.10)
- Now verify the OUT count. Repeat the above process with the same sensors but vehicle should travel in the opposite direction.
- In the reverse sequence, the LED labeled (B) will turn off first, then the LEDs labeled (B) and (A) will be off together, then (B) will illuminated followed by (A). Upon completion, the red -1 LED will flash one time and a count of -1 OUT will be stored on the DZ Counter. (refer to Item Q in Appendix 9.10)

Note: A/B Mode counting logic requires 300ms or greater trip overlap to count as a vehicle. Any filtering overlap less than 300 ms will not be treated as a count. An oscilloscope can be used in the field to verify the timing of these signals.

5.3 Verify and Test Third Party Loop Detectors and the DZ Counter

- Verify that each loop detector relay is connected to the DZ Counter at each transition point. Refer to loop detector manufacturer's instructions.
- Verify the appropriate counting logic is set. Choices are:

5.3.1 ALL IN – At the transition point, **All** four (4) loops count "INs".

5.3.2 ALL OUT – At the transition point, **All** four (4) loops count "OUTs".

5.3.3 HALF IN/HALF OUT – At the transition point, two (2) loops count "INs" and two (2) loops count "OUTs".

5.3.1 Verify and Test ALL IN Count Logic

Using ALL IN counting logic configures each of the eight (8) Sensor Input Ports on the DZ Counter to count INs independently. **ANY** pulse of 100ms or greater on **ANY** port will be treated as an IN count (+1 count). (refer to Item K in Appendix 9.10)

Note: ALL IN MODE setting applies to ALL Loop Detectors attached to this DZ Counter.

- Make sure **NO/NC Sensor Input** on DZ Counter is set to match the loop detector operation, which is typically

NO (Normally Open). If not, move DIP Switch 1 to the **NO** position and press the <RESET> button.

(refer to Items I and C in Appendix 9.10)

- Set the Sensor Mode Selector Switch to 1 for **ALL IN**.
(refer to Item R in Appendix 9.10)
- The red and blue DZ Transmit/Receive LEDs – **TX** and **RX** should begin to flash indicating network activity.
(refer to Item A in Appendix 9.10)

Note: *In installations with multiple DZ Counters on the same network, the red LEDs will flash more frequently than the blue LEDs.*

- Test to verify loop detector setup is correct with a vehicle traveling **Inbound** from the source to the destination.
- When a vehicle travels through the **Inbound** lane transition point, the DZ Counter's +1 LED should flash once for each valid IN detection (+1 vehicle count).
(refer to Item O in Appendix 9.10)

5.3.2 Verify and Test ALL OUT Count Logic

Using **ALL OUT** counting logic configures each of the eight (8) Sensor Input Ports on the DZ Counter to count **OUTs** independently. **ANY** pulse of 100ms or greater on **ANY** port will be treated as an **OUT** count (-1 count).

(refer to Item K in Appendix 9.10)

Note: *ALL OUT MODE setting applies to ALL Loop Detectors attached to this DZ Counter.*

- Make sure **NO/NC** Sensor Input on DZ Counter is set to match the loop detector operation, which is typically **NO** (Normally Open). If not, move DIP Switch 1 to the **NO** position and press the <RESET> button.
(refer to Items I and C in Appendix 9.10)
- Set the Sensor Mode Selector Switch to 2 for **ALL OUT**.
(refer to Item R in Appendix 9.10)
- The red and blue DZ Transmit/Receive LEDs – **TX** and **RX** should begin to flash indicating network activity.
(refer to Item A in Appendix 9.10)
- **Note:** *In installations with multiple DZ Counters on the same network, the red LEDs will flash more frequently than the blue LEDs.*
- Test to verify loop detector setup is correct with a vehicle traveling **Outbound** from the destination to the source.
- When a vehicle travels through the **Outbound** lane transition point, the DZ Counter's -1 LED should flash once for each valid **OUT** detection (-1 vehicle count).
(refer to Item Q in Appendix 9.10)

5.3.3 Verify and Test HALF IN/HALF OUT Count Logic

Using **HALF IN/HALF OUT** counting logic configures the left four (4) Sensor Input Ports on the DZ Counter to count as **INs** (A1, B1, A2, B2) and the right four (4) Sensor Input Ports count as **OUTs** (A3, B3, A4, B4). **ANY** pulse of 100ms or greater will be treated as an **IN** or **OUT** count respectively (+1 or -1 count). *(refer to Item K in Appendix 9.10)*

Note: *HALF IN/HALF OUT MODE setting applies to ALL Loop Detectors attached to this DZ Counter.*

- Make sure **NO/NC** Sensor Input on DZ Counter is set to match the loop detector operation, which is typically **NO** (Normally Open). If not, move DIP Switch 1 to the **NO** position and press the <RESET> button.
(refer to Items I and C in Appendix 9.10)
- Set the Sensor Mode Selector Switch to 3 for **HALF IN/HALF OUT**.
(refer to Item R in Appendix 9.10)
- The red and blue DZ Transmit/Receive LEDs – **TX** and **RX** should begin to flash indicating network activity.
(refer to Item A in Appendix 9.10)
- **Note:** *In installations with multiple DZ Counters on the same network, the red LEDs will flash more frequently than the blue LEDs.*
- Test to verify loop detector setup is correct with a vehicle traveling **Inbound** from the source to the destination.
- When a vehicle travels through the **Inbound** lane transition point, the DZ Counter's +1 LED should flash once for each valid **IN** detection (+1 vehicle count).
(refer to Item O in Appendix 9.10)
- Test to verify loop detector setup is correct with a vehicle traveling **Outbound** from the destination to the source.
- When a vehicle travels through the **Outbound** lane transition point, the DZ Counter's -1 LED should flash once for each valid **OUT** detection (-1 vehicle count).
(refer to Item Q in Appendix 9.10)

5.4 Test and Verify Communications with each Space Available Sign on the RS485 Network

- Power up signs. Upon initial start-up each display will show its address for 2 seconds and then fade out and remain blank.

Note: Refer to the *Transition Point List for Space Available sign addresses*.

- When the communications are functioning properly, the displays will begin to show count data. If an individual display does not show its address, double check that it is getting power and data.

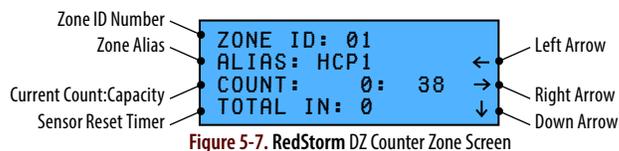
5.5 Verify Zone Capacities (Actual Total Parking Spaces)

- Physically count and document **ALL** of the total parking spaces in each zone.
- Compare with the factory settings in the RedStorm System. View current programmed zone capacities using the SuperMaster Controller.

- From the Home screen press <ENTER>



- VIEW press <ENTER>
- ZONES press <ENTER>



- Use the left and right arrows to navigate through the Zones. The line **COUNT: X:Y** represents the current count (X) and the programmed capacity (Y).

Note: A RedStorm System using the RedStorm Sign Control and Reporting Software can view and adjust zone capacities in the Software. Refer to the Software instructions for details.

5.6 Verify Current Occupied Space Count

All the currently occupied parking spaces **MUST** be counted and entered. It is typically best to start at the end of the facility farthest from the entrance/exit lanes and work your way to the bottom, counting the vehicles parked and traveling inside each zone.

- Physically count and document **ALL** of the occupied parking spaces in each zone.

- At the SuperMaster Controller enter the occupied counts for each zone.

- From the Home screen press <ENTER>
- VIEW press <ENTER>
- ZONES press <ENTER>
- Use the left and right arrows to navigate through the Zones. The line **COUNT: X:Y** represents the current count (X) and the programmed capacity (Y).
- Select **ADJUST COUNTS** press <ENTER>
- Select **IN USE** press <ENTER>
- Enter the occupied space counts for each zone.
- Use the up and down arrows to change the occupied space count and press <ENTER>
- Repeat for each zone.

Note: A RedStorm System using the RedStorm Sign Control and Reporting Software can view and adjust zone capacities in the Software. Refer to the Software instructions for details.

5.7 Verify Lane Delineation

The purpose of delineation is to keep vehicles consistently traveling underneath **ALL** sensors/over loops and to keep pedestrian traffic safe and away from the sensing areas. If vehicles do not travel in view of the sensors or loops they will not be detected or counted correctly.

- Check each transition point to make sure lane delineation is in place.
- Add missing delineation before commissioning the system.

• Troubleshooting Tip: This step is much easier to do during off peak hours and with two people in a vehicle.

5.8 Monitor the System Prior to Commissioning

This is the final step in startup. During this phase, do periodic physical counts and compare with the RedStorm System data to ensure the system is operating correctly before commissioning it into service. Space Available Signs that are powered up should be clearly marked to indicate system is under test and that counts should be disregarded until testing is complete.

Resolve discrepancies if they occur. Signal-Tech is available to assist in analyzing SD log files as needed.

6.0 SuperMaster Controller Menus and Explanations

6.1 STOP

Functions like a PLAY/PAUSE toggle. Press <ENTER> to halt all communication with the DZ Counters (Zone Controllers) and signs. Menu selection will change to **START**. Press <ENTER> again to resume communication.

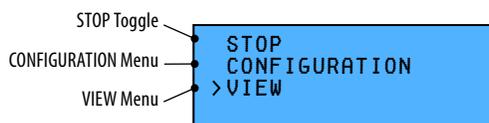


Figure 6-1. RedStorm 2.1 System Top Menu Screen

6.2 CONFIGURATION

With the exception of Date and Time, these menu options are not typically used except under instruction from Signal-Tech.

- ❑ **RESET STATUS** – Resets all statistical data except for counts and returns to the Start screen.
- ❑ **RESET ALL** – Resets all counts and returns to the top menu screen.

- ❑ **READ SD** – Re-reads the configuration files off of the SD card. This will retain all existing counts.

• **Troubleshooting Tip:** If the garage configuration stored on the card has been significantly altered, this may cause unusual vehicle counts to appear. Contact Signal-Tech to update the configuration file on the SD card.

- ❑ **READ SD RESET ALL** – Re-reads the configuration files off of the SD card, resets all counts, and returns the SuperMaster Controller to the main screen.
- ❑ **DISPLAY OVERRIDE** – Opens a new menu, with options for **FULL, OPEN, CLOSED, BLANK, SIGN ADDRESS**. Selecting one of these will cause that message to be displayed on all displays which are part of the system setup. The LCD will return to the main screen. The **STOP/START** is now **CANCEL** <selected message>. Press <ENTER> to cancel the display override mode. This is intended to be a temporary override state; if power to the board is lost, it will reboot in its normal running mode.

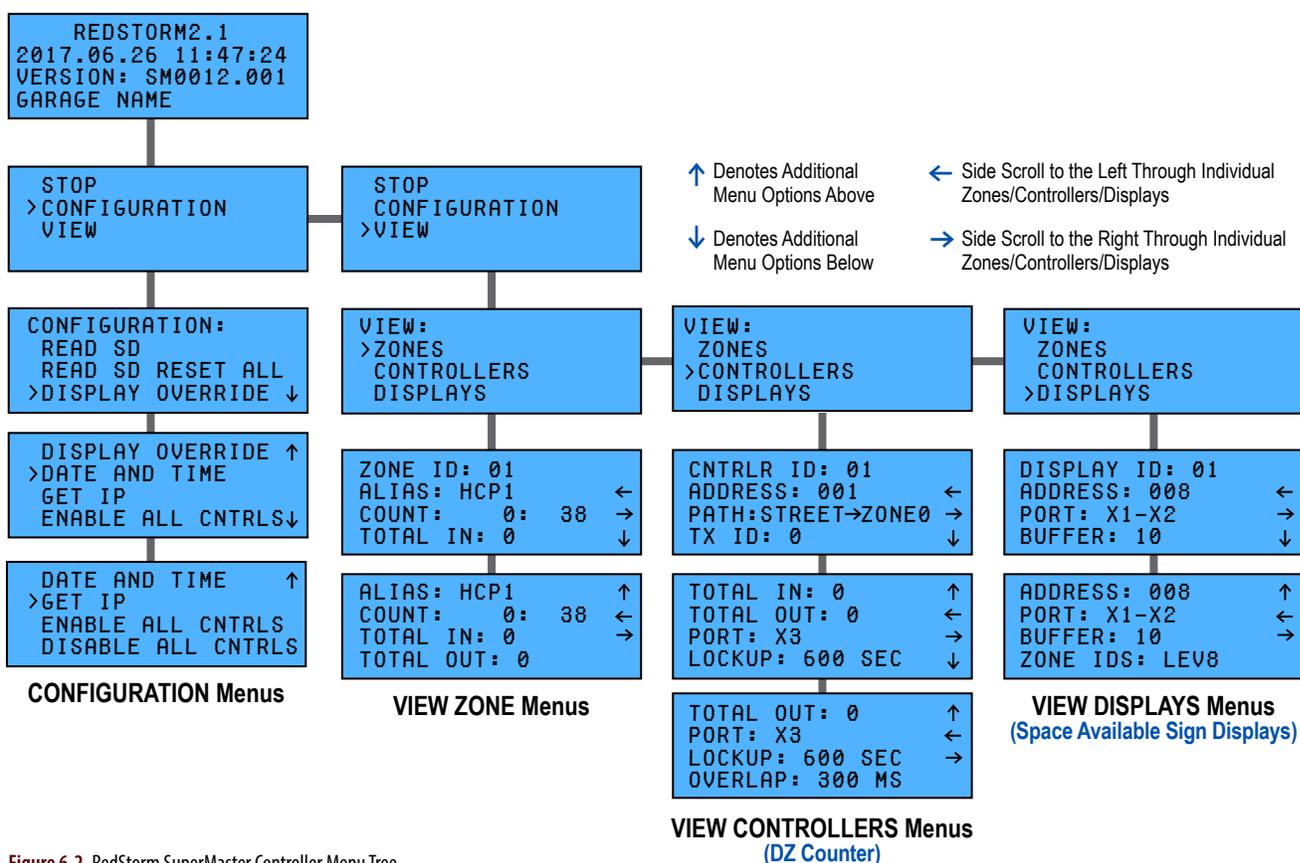


Figure 6-2. RedStorm SuperMaster Controller Menu Tree

SuperMaster Controller Menus and Explanations

- ❑ **DATE AND TIME** – Shows the date and time. YEAR. MONTH.DAY. HH:MM:SS. Press <ENTER> to adjust the date and time. Time is in 24hr format.
- ❑ **DUMP TO SD** – Immediately writes a time-stamped log file of all current counts and other running information.
- ❑ **RECONFIGURE CNTRLs** – This function is used at factory request.
- ❑ **DISABLE ALL CNTRLs** – Primarily used for debugging. This will disable communication to all DZ Counters. DZ Counters can then be re-enabled either individually in the DZ Counters menu, or with the **ENABLE ALL CNTRLs** function.
- ❑ **ENABLE ALL CNTRLs** – Primarily for debugging. This will enable communication to all DZ Counters.

6.3 VIEW

Top menu for displaying information about the **ZONES**, **CONTROLLERS** and **DISPLAYS** in RedStorm.

6.4 ZONES

Displays information about the counted Zones in the parking facility. Press <ENTER> to adjust the count or to reset total counts for individual Zones.

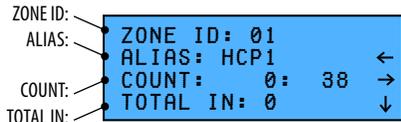


Figure 6-3. RedStorm 2.1 VIEW: Menu Screen

- ❑ **ZONE ID**: – ## : Internal ID# of the counted Zones in the configuration file.
- ❑ **ALIAS**: – The common name for the Zone.
- ❑ **COUNT**: – ##:## : Displays current Vehicle and Space counts for the Zone. First number is the vehicle count, second number is the total space count.
- ❑ **TOTAL IN**: – ## : Displays total number of vehicles that have entered the zone since the last reset.
- ❑ **TOTAL OUT**: – ## : Displays total number of vehicles that have exited the zone since the last reset.

6.5 CONTROLLERS (DZ Counters)

Displays information about the DZ Counters in the parking facility. Press <ENTER> to Reset Total Counts, Reset TX ID, Disable Counter, or Reboot Counter.

- ❑ **CNTRLR ID**: – ## : Internal ID# of the DZ Counter within the configuration file. “DS” displays only when

communications to Counter has been disabled.

- ❑ **ADDRESS**: – Address of the Zone Controller. Set by using the rotary Address switches on each DZ Counter.
- ❑ **PATH**: – **SOURCE → DESTINATION** : Indicates the two Zones that the DZ Counter is connecting, as well as the direction.

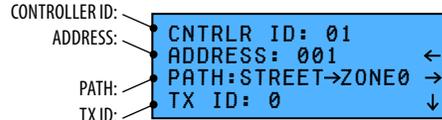


Figure 6-4. RedStorm 2.1 CONTROLLERS: Menu Screen 01

- ❑ **TX ID**: – ## : Internal ID# of the data packet being sent between the SuperMaster Controller and the DZ Counter. This number will normally be between 1 and 255. Zero indicates a communication timeout, typically from a disconnected or disabled DZ Counter, or one that has been set to an incorrect address.

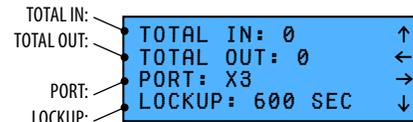


Figure 6-5. RedStorm 2.1 CONTROLLERS: Menu Screen 02

- ❑ **TOTAL IN**: – ## : Total number of vehicles IN counted as entering the destination zone by this specific DZ Counter since last reset.
- ❑ **TOTAL OUT**: – ## : Total number of vehicles OUT counted as exiting the destination zone by this specific DZ Counter since last reset.
- ❑ **PORT**: – X## : Displays the RS485 port this DZ Counter is connected to on the SuperMaster Controller. Set by the configuration file on the SD card.
- ❑ **LOCKUP**: – ### SEC : Sets the amount of time, displayed in seconds, a sensor can remain stuck until it is automatically reset. Sensor lockups can occur due to events such as a foreign object being placed in the sensor’s field of vision.
- ❑ **OVERLAP**: – ### MS : Sets the amount of time, displayed in milliseconds (ms), that both sensors must be to help filter out unwanted detection events from pedestrians walking through the detection fields of a sensor pair.



Figure 6-6. RedStorm 2.1 CONTROLLERS: Menu Screen 03

6.6 DISPLAYS

Displays information about the LED 7-segment sign displays in the system. Press <ENTER> to reach COUNT: and FULL:. These options indicate what the sign will show for each condition – current vehicle count and FULL status.

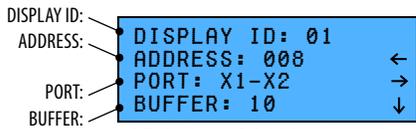


Figure 6-7. RedStorm 2.1 DISPLAYS: Menu Screen 01

- DISPLAY ID:** – ## : Internal ID# of the signs 7-segment display.
- ADDRESS:** – ### : Address of the display. Set using the Address DIP switches on each display circuit board.
- PORT:** – ## – ## : RS485 port or ports which the 7-segment display data is broadcast.
- BUFFER:** – ## : A capacity buffer count for the Zone. Default value of 5% of available spaces. When the space available capacity reaches this number or less, the FULL message setting selected under the Display program will be shown. The FULL message setting will display until the number of spaces available is more than the Buffer number.

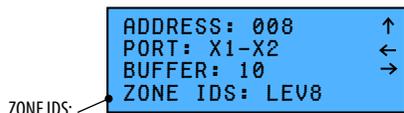


Figure 6-8. RedStorm 2.1 DISPLAYS: Menu Screen 02

- ZONE IDS:** – ## : A listing of the aggregated Zone IDs shown on this display. For example, if it is necessary to display the cumulative count of all available parking spaces above the current level, multiple zones may be added together to produce a total count to be shown on a specific display. All of these Zones' aliases will be shown on this line.



Walter Reed National Military Medical Center – MUPs Garage | Bethesda, MD

7.0 RedStorm System Maintenance

7.1 Routine Maintenance

Complete the following on a periodic basis (bi-weekly, monthly, quarterly, annually) as needed:

- Inspect and clean Overhead Sensors – monthly or quarterly.
- Inspect, repair, replace lane delineation – bi-weekly
- Audit and adjust occupied and total count values – when parking facility is re-striped or when unusual available space count information is displayed on signs.

7.2 Using the Automatic Reset Function

All differential counting systems, such as the RedStorm System do require some maintenance to correct cumulative count errors. In many instances, the majority of this maintenance can be accomplished by using the Automatic Reset function of the RedStorm SuperMaster Controller.

The Auto-Reset function will reset the Zone occupied space counts to a preset count value at a specified time every day. This helps mitigate the effects of false or phantom IN and OUT counts caused by irregular vehicular activity.

The preset occupied space values should be established by zone. Once this is done contact Signal-Tech to reprogram the auto-reset values into the System SD card.

- To enable this feature, first identify a time of day where the occupied space counts are consistently the same number. 3:00 am works well in many settings because the parking facility is near empty and typically the same number of cars are parked there every night.

Once the time is determined, collect an actual occupied space count for a period of time to establish the optimal value to use for the reset. Then contact Signal-Tech to update the configuration on the SD Card to reflect the time and reset values for each zone. Once the updated SD Card is placed back into the SuperMaster Controller, each time SuperMaster performs the reset, it will reset the Occupied zone counts to those values. No additional maintenance is required for the Auto Reset function unless the occupied space count need to be changed to a different value.

Note: *For systems with RedStorm Sign Control and Reporting Software, count maintenance can be defined by zone and day of week and occupied space counts can be adjusted using the Administrative or Web Interface.*



Penn State Behrend – Red C Garage | Erie, PA

8.0 RedStorm Troubleshooting and FAQs

8.1 Troubleshooting

8.1.1 My Available Space Counts aren't Correct

- Make sure lane delineation is in place at all count transition points. Vehicles MUST travel under Sensors or over loops to be counted.
- Enable the Automatic Reset function in your RedStorm System. Refer to the Maintenance section of the manual for instructions.
- If Overhead Sensors are being used, check the vehicle speeds. Vehicles may be traveling too fast to be counted. (refer to Figure 8-1 and Figure 8-2)

Vehicle Speed MPH (inches/sec*)	Time* to travel between Overhead Sensors (milliseconds)				
	Mounted 48" apart	Mounted 51" apart	Mounted 54" apart	Mounted 57" apart	Mounted 60" apart
5 mph (88"/sec)	818ms	784ms	750ms	716ms	682ms
10 mph (176"/sec)	409ms	392ms	375ms	358ms	341ms
15 mph (264"/sec)	273ms	261ms	250ms	239ms	227ms
20 mph (352"/sec)	205ms	196ms	188ms	179ms	170ms

Figure 8-1. Vehicle Speed Over Time

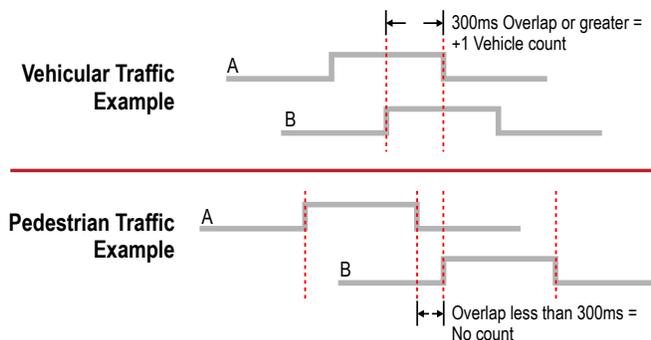


Figure 8-2. Default overlap filtering settings

- Overhead Sensors are not tripping in the correct sequence.
- Verify sensors are installed in A, B sequence. This typically takes two people, one to watch the LEDs on the DZ Counter while the other stands under each sensor to trip it. If the trip sequence does not match the support documentation simply unplug the sensor connection and swap.
- Sometimes owner/operators will back out spaces from the general count in order to have the sign display full prematurely. We recommend using the FULL Buffer feature in lieu of backing out spaces.
- Parking facilities with high motorcycle traffic may experience count discrepancies. Motorcycles are not guaranteed to be detected by the System, due to size, construction and ability to drive around delineation.

- If using Loops, ensure there is not an intermittent short in the loop wiring from shifting concrete.

8.1.2 My Overhead Sensors are Tripped when They Shouldn't Be

- There may be an obstruction under the Sensor scanning field that needs removed. Remove the obstruction. When there is no traffic in the area, press the <RESET> button on the DZ Counter to recycle the power to the Sensors. Sensors should return to normal operating mode.
- Check for water in the Sensor scanning field. Water may be reflecting the infrared signal causing a phantom count. Toe-out Sensors 5° from center toward the line of travel. If this doesn't release the Sensors try adjusting the angle of toe-out until Sensors release and begin scanning normally.
- Is the Sensor installed near a fluorescent light fixture? If yes, relocate Sensor away from the fixture so the flickering of the light does not trip the Sensor or move fixture.

8.1.3 AB Logic Timing

The AB pedestrian filtering requires a minimum of 300ms "overlap" while both sensors are tripped. This setting is stored on the SD card for each DZ Counter and can be modified by Signal-Tech engineering. An oscilloscope can be used in the field to verify the timing of these signals. (refer to Figure 8-2)

8.2 FAQs

8.2.1 How do I update the counts?

From the SuperMaster menu, follow this navigation: **VIEW → ZONES**, then using the left and right arrows locate the zone that needs updated. Once you have found the zone, press <ENTER>. Then navigate to **ADJUST COUNT** and press <ENTER>. An underscore will appear beneath a digit in the current count. Use the up and down arrows to change the number, and the left and right arrows to move the cursor. Press <ENTER> when complete.

8.2.2 How do I change the zone capacities?

The zone capacities are stored on the SD card and can only be modified by Signal-Tech Engineering. Signal-Tech Engineering can create and send an updated configuration file to place on the card.

8.2.3 How do I retrieve the log file information?

The log file is located on the SD card. To retrieve it, first stop the system from the SuperMaster main menu. Then eject the card by pushing it further into the slot. (It ejects just like a typical camera memory card). The card then can be placed into a PC. Open that drive and copy all text files to the PC to be compressed and emailed. Once copied, return the card and re-start the system.

Troubleshooting

8.2.4 How do I download and email the log file information?

(refer to Section 8-3 for details)

8.2.5 How do I connect loop detectors to the DZ Counters?

This depends on the facility's configuration.

(refer to Section 4-4 for details)

8.2.6 Can multiple loop detectors be used in parallel configuration?

Yes

8.2.7 How do I set the "FULL Buffer"?

From the SuperMaster Controller follow this navigation:

VIEW → DISPLAYS → BUFFER

- This value is the point at which the display selected will display **FULL** instead of the actual count. For example if this was set to 5, then this display will show **FULL** instead of a count value <5.
- This setting resets back to default upon power loss. If the change must be made permanent, contact Signal-Tech Engineering to update the configuration files.

8.2.8 A certain zone count is always too heavy or light?

This is an example of bias, and indicates that counts are being missed in a specific lane.

- Make sure the original delineation is still in place and effective.
- Test the sensor functionality. Repeat the process used for the sensor start-up to ensure sensors are detecting vehicles correctly. (refer to Section 5-2 for details)

8.2.9 How do I know the coverage area of the Overhead Sensors?

(refer to Figure 2-4 for details)

8.2.10 How do I wire the sensors?

(refer to Section 4.3.3 and RedStorm wiring diagram Appendix 9-8 for details)

8.3 Log Files

8.3.1 Instructions for Emailing RedStorm Log Files

The RedStorm SuperMaster Controller uses a specially formatted SD card to store parking facility configuration files, as well as system status logs. The log files are in the form of two text files, log.txt and event.txt. In the event of abnormal system behavior, the log files can be retrieved and sent back to Signal-Tech for analysis.

To retrieve these files, a computer or laptop with an SD card slot and Internet connection will be needed.

These instructions were written for a system running Windows 7. The wording of certain options in Windows XP or Windows 8 may differ slightly.

1) In the SuperMaster Controller, press the <START> button to ensure that it is at the main splash screen, then press <ENTER>.

2) The first available option should say "STOP". Press <ENTER> and the option will change to "START" and the controller will halt operation. The DZ Counters will continue to count cars normally. Once the main controller's operation is resumed, it will retrieve all stored count data from the DZ Controller's.

3) Remove the SD card from the SuperMaster controller by pressing it into the slot until it clicks and releases, and then slide it out.

4) Place the card into a SD card reader connected to a computer. Windows may open up a box asking what to do with the new device.

a. If this appears, select "open folder to view files" option.

b. If it does not, open My Computer to open Windows Explorer. From there, navigate to the Removable Disk Drive corresponding to the inserted SD card.

5) On the SD card are several files, which will include several conf*.txt files, an XML configuration file, a configuration program, log.txt and event.txt.

6) Select both the log.txt and event.txt. files.

7) Right-click the select Copy.

8) Browse to temporary folder, or to the Desktop.

9) Right-click and select "paste".

10) Select both files, then right-click, and select "Send To → Compressed (zipped) folder".

11) This creates a ZIP archive file. Name the file the garage name.

12) E-mail the compressed file to Signal-Tech for analysis.

13) Insert the SD card back into the SuperMaster controller.

14) Go back to the Start screen, press <ENTER>. If the first line of the display is "START," select that line and press <ENTER> to resume system operation. The communication LEDs along the bottom should now be blinking once again.

9.0 Appendix RedStorm Components and Wiring

9.1 RS485

Mirrored signals are run over twisted pair wiring. As its name implies, a twisted pair is simply a pair of wires of equal length that have been twisted together. Using an RS485-compliant transmitter with twisted-pair wire reduces two major sources of problems for designers of high-speed long-distance networks: radiated EMI (Electromagnetic Interference) and received EMI.

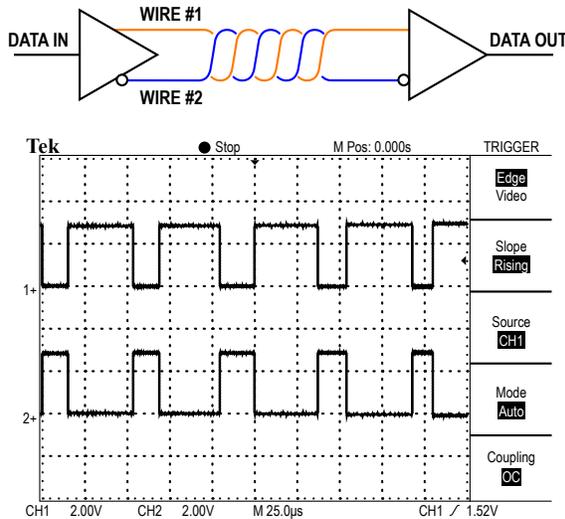


Figure 9-1. Radiated EMI Example

9.2 Radiated EMI

The high-frequency signaling coupled with long wires can radiate EMI. A balanced system used with twisted-pair wire reduces this effect by making the system an inefficient radiator. It works on a very simple principle: as the signals on the wires are equal but opposite, the radiated signals from each wire will also tend to be equal but opposite. This has the effect of canceling each other, meaning that there is no net radiated EMI. (refer to Figure 9-1)

9.3 Received EMI

Received EMI is similar to radiated EMI but in reverse. The wiring used in an RS485 system will also act as an antenna that receives unwanted signals. Because the two wires are close together and twisted, the noise received on one wire will tend to be the same as that received on the second wire. RS485 receivers are designed to know that one wire's signals that are the opposite of each other. An identical and unwanted signal that is present on both lines can therefore be filtered out, rendering RS485 quite resistant to data loss due to noise pickup.

9.4 Terminating Resistors

Typically terminating resistors are not needed in RedStorm 2.1 systems due to very low communication speeds. However in cases where reflections are seen, the terminating resistor should match the cable's impedance.

9.5 Underterminated Network

In an unterminated high-speed network, as the signal propagates down the wire, it encounters the open circuit at the end of the cable. This constitutes an impedance mismatch, and a reflection of the signal can be created. In the case of an open circuit all the energy is reflected back to the source and this can disrupt or destroy the contents of the data transmission.

Because of the low data rate of RedStorm 2.1, and the type of drivers that are used, terminating resistors are generally not required.

9.6 Daisy Chain Wiring

CAT5 or CAT6 cable is recommended for the communication wiring because it is readily available and a good quality twisted pair cable. (refer to Figure 9-2)

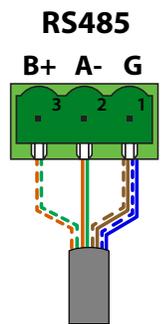


Figure 9-2.
CAT5 Typical Wiring

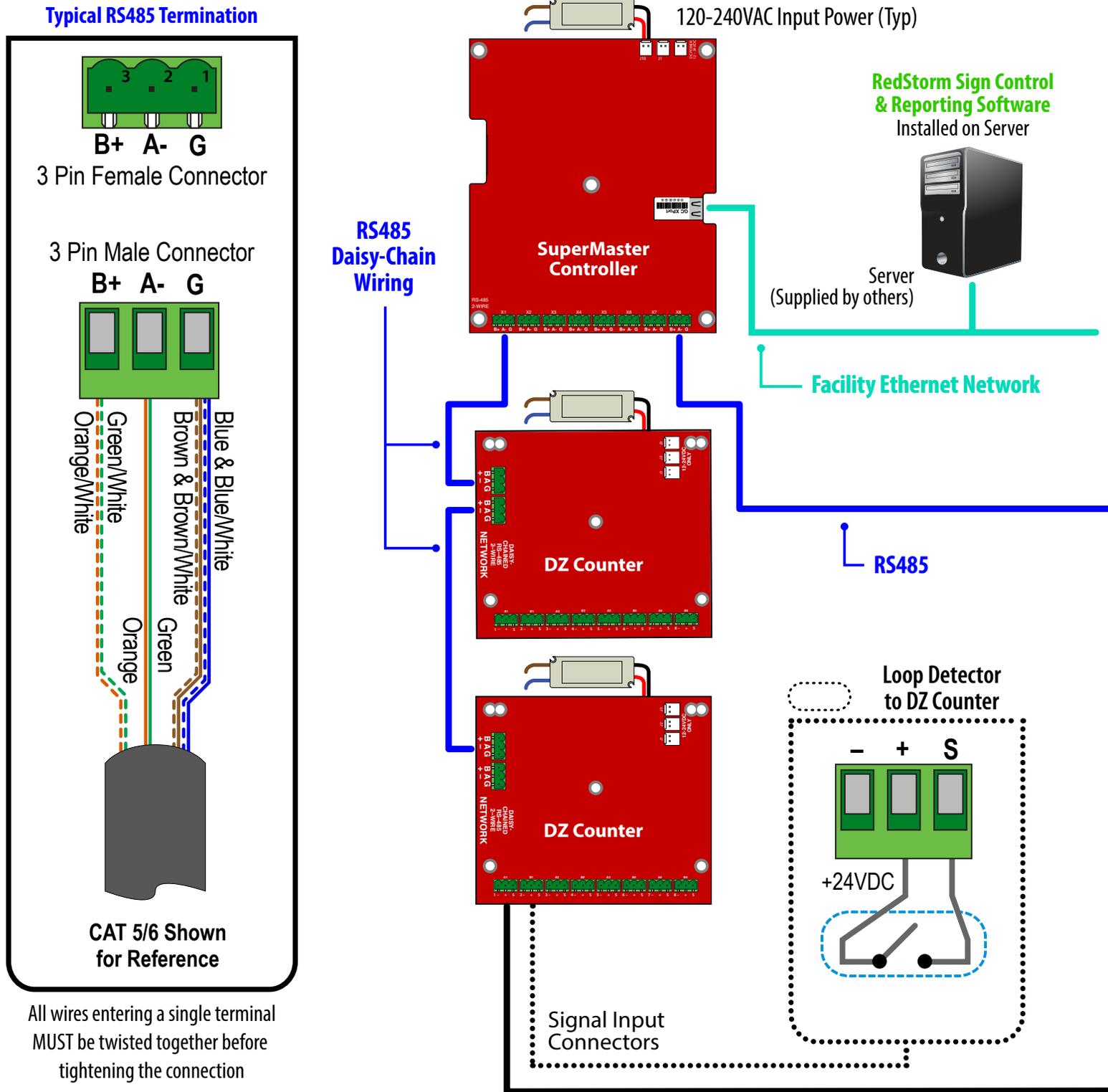
9.7 Wiring Guidelines

The communications installation **MUST** follow TIA/EIA-485-A guidelines.

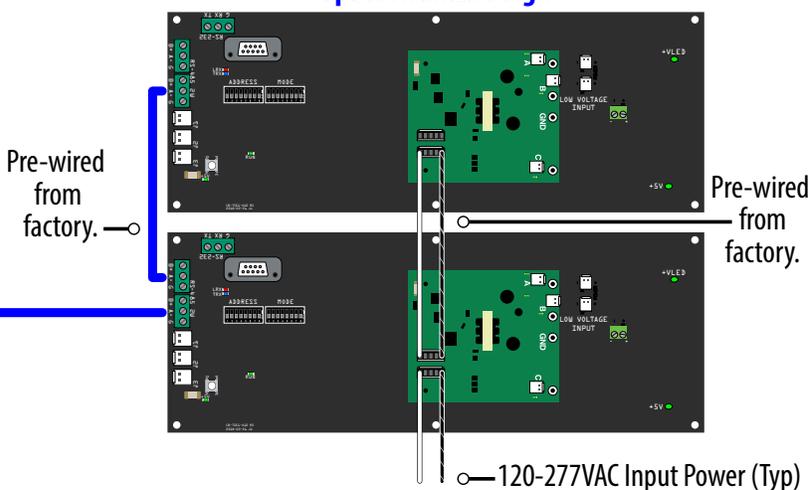
- Max cable length 4000 feet
- The maximum number of RedStorm or 7-segment display devices on a BUS is 64.
- When running a daisy chain, each "device" can consist of a SuperMaster, a DZ Controller, or a 7-segment display. While the SuperMaster is generally in control of the network, it is not necessary to have it located at one end of an RS485 daisy chain network. From the view point of the network itself, each "device" looks the same.
- Daisy chain in and out. **Do not run stubs.** Stubs are very likely to cause data corruption.
- This is a low voltage signal and cannot be run parallel to line voltage wires in the same conduit.

Appendix

9.8 RedStorm Basic Wiring Diagram

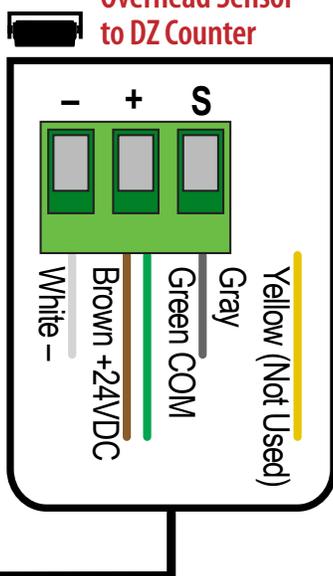


Space Available Sign



Space Available signs ONLY require 1 power and 1 communication input. Multi-level signs are internally pre-wired from the factory.

Overhead Sensor to DZ Counter



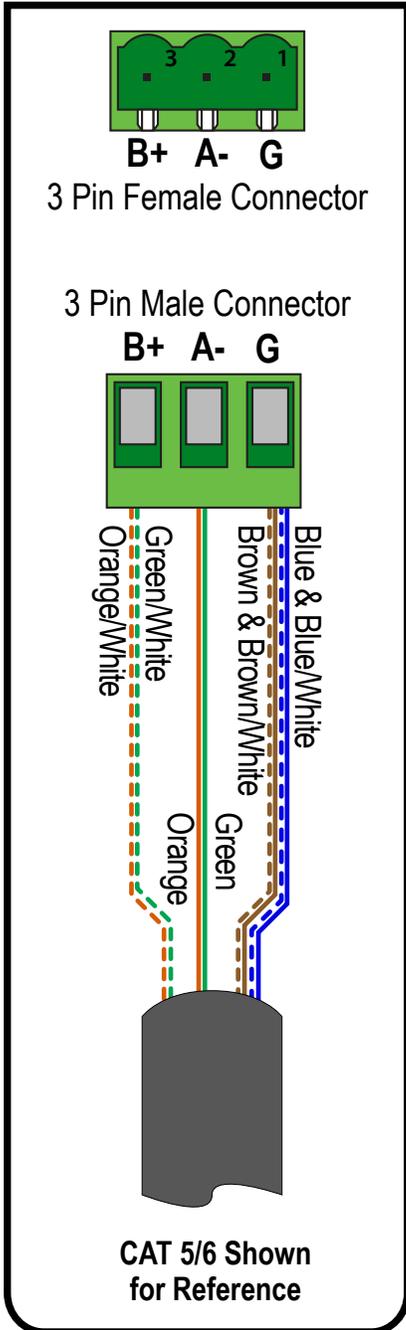
Legend

- RS485 Network Bus
- Ethernet (Facility Network)
- Overhead Sensor to DZ Counter
- Loop Detector to DZ Counter

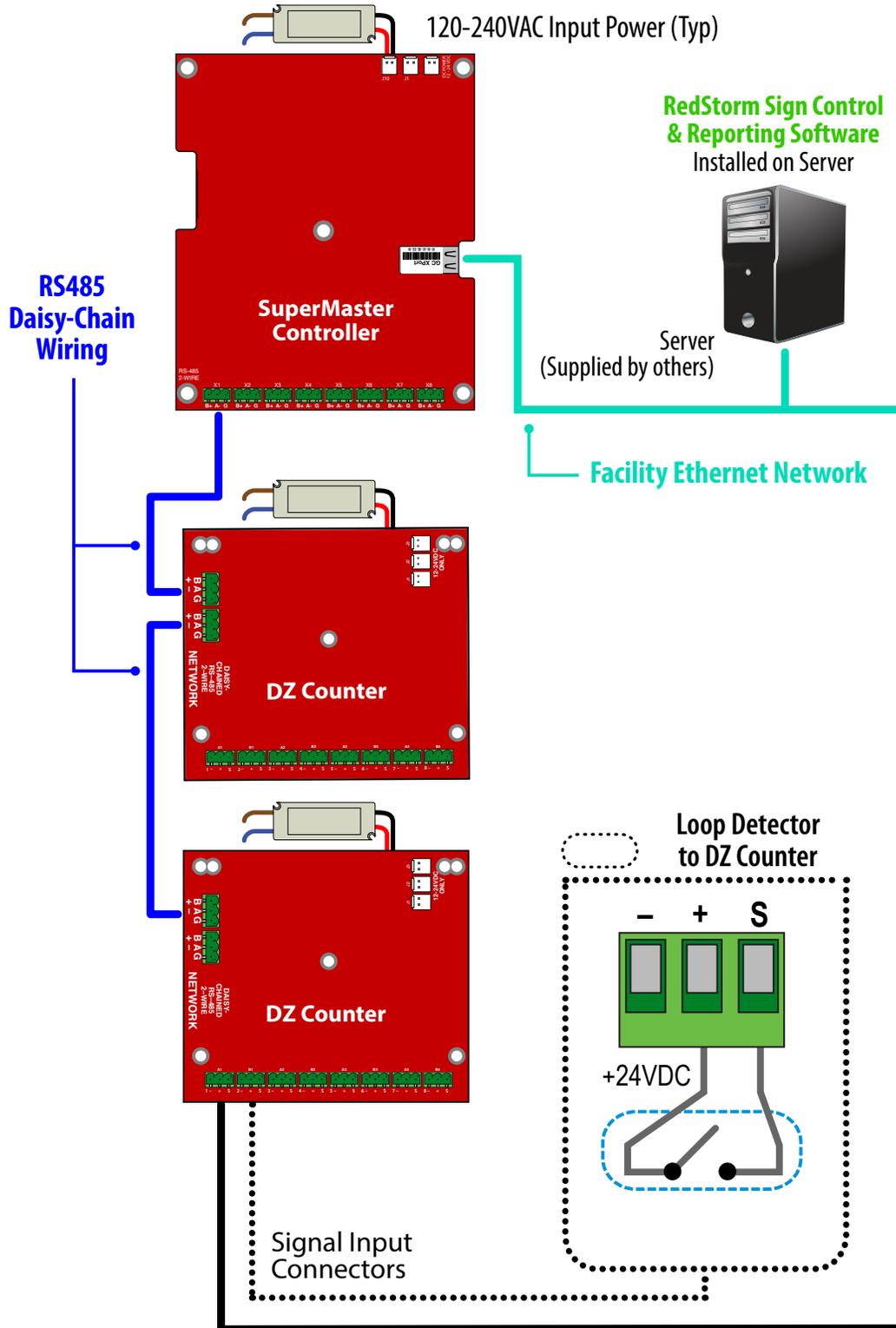
Appendix

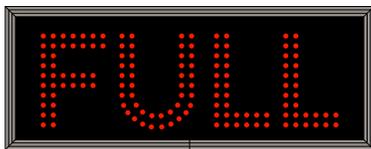
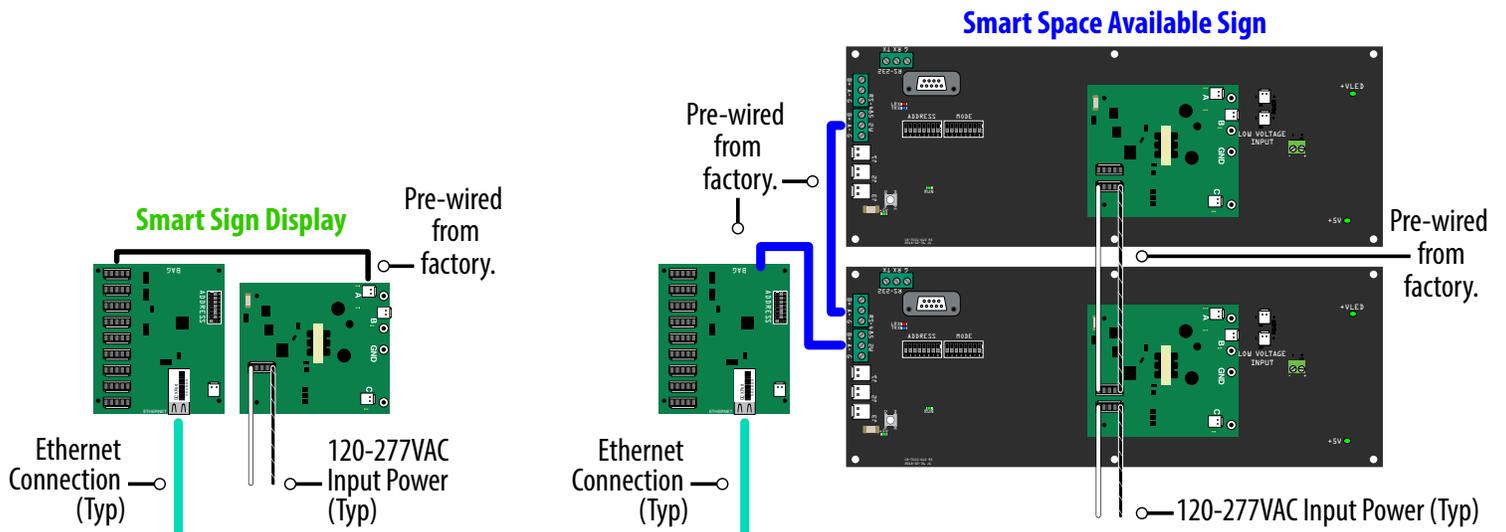
9.8 RedStorm with Smart Signs Wiring Diagram

Typical RS485 Termination

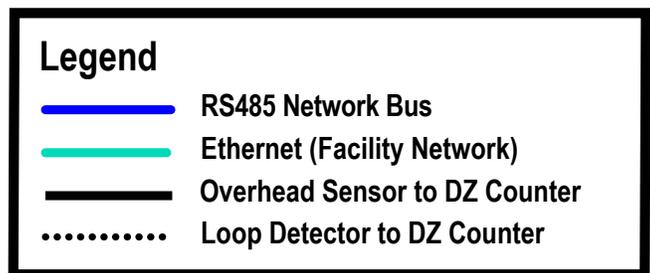
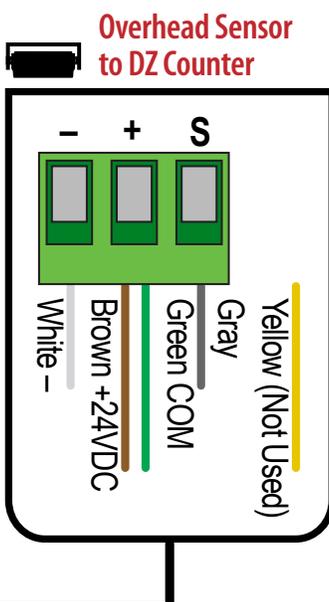


All wires entering a single terminal MUST be twisted together before tightening the connection



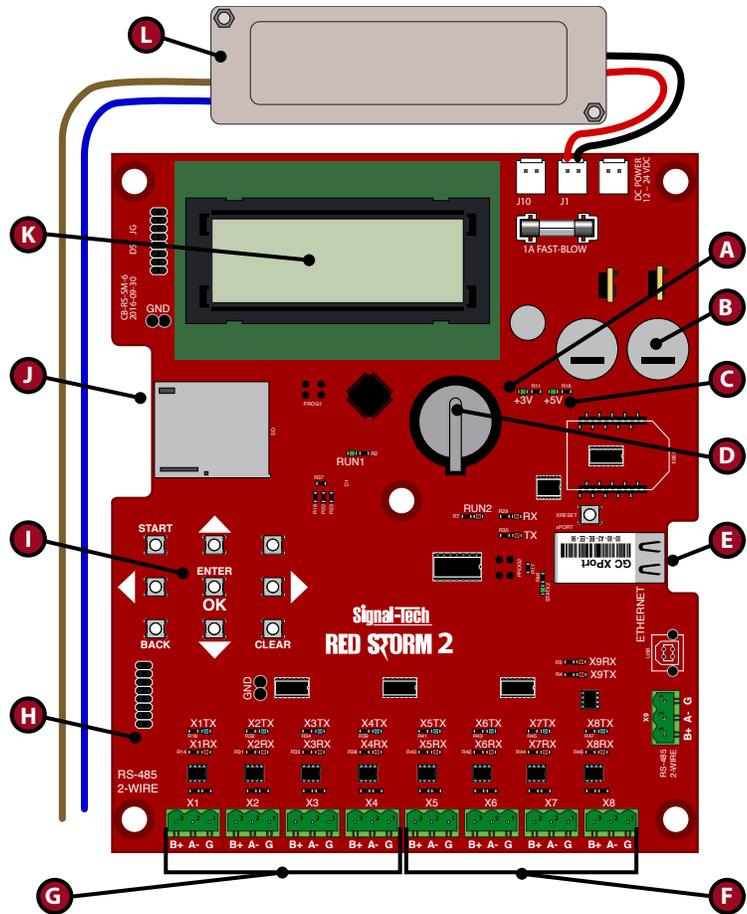


Space Available signs ONLY require 1 power and 1 communication input. Multi-level signs are internally pre-wired from the factory.



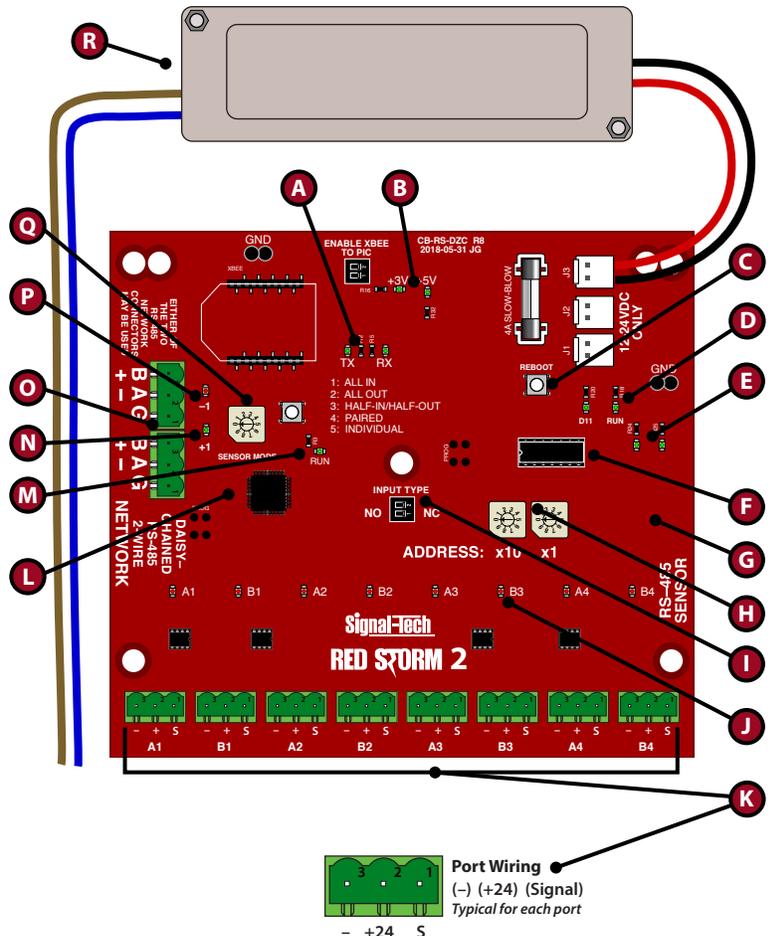
9.9 SuperMaster Controller (SM) Components

- A Power LED (3.3V)** – This green LED illuminates solidly when main power is applied
- B Capacitor Bank for Shutdown** – Stores a sufficient charge to keep processor running during a power loss, permitting the main processor to store current count values on the SD card.
- C Power LED (5V)** – This green LED flickers during normal operation, indicating that the main processor is running.
- D Real Time Clock Battery** – Allows SM to maintain the current date and time during loss of power.
(Does not adjust for daylight saving time)
- E TCP/IP RJ-45** – Ethernet port to connect the RedStorm System to the Facility Ethernet Network.
(Use when integrating with RedStorm Reporting Software)
- F (4) 485 Ports for Signs** – Configured in the SD Card Settings, multiple ports can simplify network wiring. Data transmission for each sign address is assigned to one port, or to a range of ports. Labeled X5 through X8.
- G (4) 485 Ports for DZCs** – Configured in the SD Card setting, multiple ports can simplify network wiring. Each DZC address is assigned a unique port. Labeled X1 through X4.
- H Transmit/Receive LEDs Per-port** – Transmit is blue, Receive is red. DZC ports blink red for each blue. Sign ports are used in a transmit-only mode (no responses from signs).
- I LCD Navigation Buttons** – Navigate and enter buttons for the LCD display.
- J SD Card Slot** – Stores the configuration files specific to this set-up. The count event log files are also stored on the card.
- K LCD Display** – Used for configuration of the RedStorm system. Use the navigation buttons for selections.
- L Input Power** – Main Power connection for SM.
120 - 240VAC, <0.4A@ 120VAC.



9.10 DZ Counter (DZC) Components

- A DZ Transmit/Receive LEDs** – The red RX LED will blink when data is being received from the network. The blue TX LED will blink when this DZ is transmitting data, upon request from the SM.
- B Power LEDs** – There is a 3V and 5V power indicator. Both of these LEDs are illuminated under normal conditions.
- C Reset Button** – This resets both processors. This should be done after changing the NO/NC shunt, or if either amber running LEDs should stop pulsating.
- D Comms IC Run LED** – This amber LED continuously pulsates, indicating that the comms processor is running. If it stops pulsating press the Reset Button.
- E Sensor Comms LEDs** – *Not used, for future expansion.*
- F Communication IC** – The comms chip communicates with the SM. Upon request from SM, it quickly retrieves vehicle counts from the Sensor IC and returns that information to SM. This “buffer” ensures that the Sensor IC is not disturbed by RS485 network traffic.
- G 485 Sensor Com Port** – *Not used, for future expansion.*
- H DZC Address Rotary Switches** – Allows for unique addressing of DZ Counter Boards on the same SM system. These addresses must match the planning diagram for proper operation.
- I NO/NC Sensor Input** – Allows you to match the normally–open / normally–closed output logic used by the vehicle detection devices.
- J Sensor LED Indicators** – These (8) eight red LEDs indicate the status of the attached sensor signals for each port below.
- K Sensor Input Ports** – Up to (8) eight sensors or detectors can be attached to one DZC.
- L Sensor IC** – The sensor chip continually monitors the sensor inputs and applies the necessary filters to determine if a valid event has occurred.
- M Sensor IC Run LED** – This amber LED continuously pulsates, indicating that the sensor processor is running.
- N “IN” (+1) LED** – This green LED will blink once for each valid IN detection recognized by the DZC.
- O SM ->DZC ->DZC Comms** – This is the main network port that is used to receive and respond to SM’s data commands.



- P “OUT” (-1) LED** – This red LED will blink once for each valid OUT detection recognized by the DZC.
- Q Sensor Mode Selector Switch** – Used to determine the counting logic for the attached sensing devices. PAIRED for Signal-Tech Overhead Sensors and the choice of ALL IN, ALL OUT or HALF IN/HALF OUT for third party loop detectors. INDIVIDUAL is not used.
- R Input Power** – Main power connection for DZC.
120 - 240 VAC, <0.25A@ 120VAC.



4985 Pittsburgh Avenue • Erie, Pennsylvania 16509
Toll Free: **877/547-9900** • Fax: **814/835-2300**

www.signal-tech.com