

Sentinel

Installation Manual



Unitec

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SENTINEL INSTALLATION MANUAL

Revision A

This manual provides comprehensive installation procedures for the Sentinel. It includes the process of site planning, site preparation, the mechanical installation of the Sentinel and the electrical wiring of the unit.

If further assistance is needed, please contact the distributor from which the Sentinel was purchased.

When calling for assistance, you must have the following information available:

Sentinel Serial Number: _____

Distributor Name: _____

DECLARATION OF COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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1 Site Planning and Preparation

1.1 Introduction

This chapter provides guidelines for planning the Sentinel installation and preparing the site. Site preparation includes:

- Determining how and where the Sentinel will be mounted
- Installing conduit runs and required wiring

These instructions serve as general guidelines only. If your wash manufacturer's installation requirements differ from these guidelines, always meet the wash manufacturer's requirements first.

Requirements specified in local electrical and building codes must be followed and shall take precedence over the guidelines provided within this document. All units should be installed by a professional electrician **ONLY**.

The Sentinel is rated for the following environmental specifications:

- Temperature: -20° F to 115° F
- Humidity: 0% to 100%

The following symbol is used in the Sentinel:



This symbol represents the presence of earth-grounded equipment.

1.2 Positioning the Sentinel

1.2.1 In-Bay Applications

For in-bay automatics and other applications where the Sentinel is installed at the wash entrance, it should be placed 10'-14' from the wash to ensure the proper timing and flow of customers.

For curb mount applications, the front surface of the Sentinel should be even with the edge of the curb. To achieve this dimension, the base frame should be installed so its leading edge is 7 in. from the edge of the curb.

1.2.2 Express Wash Applications

Express Exterior sites should be designed to provide 9 ft. wide traffic lanes at the Sentinels. The traffic control (or barrier) gate should be located approximately 10 ft. from the center of the Sentinel and an underground vehicle detection loop is required under the gate arm. In some cases, it may be desirable to install a 2nd loop between the gate and tunnel entrance (referred to as the merge loop) to properly manage the vehicle queue.

If the Unitec Reach Free ID (RFID) option is included, the RF Antenna should be located adjacent to the Sentinel. Figure 1 provides guidelines for the design of an Express lane with the Sentinel, gate and RFID (antenna) option. Refer to the installation instructions provided with the gate and RFID option for guidance in installing these devices.

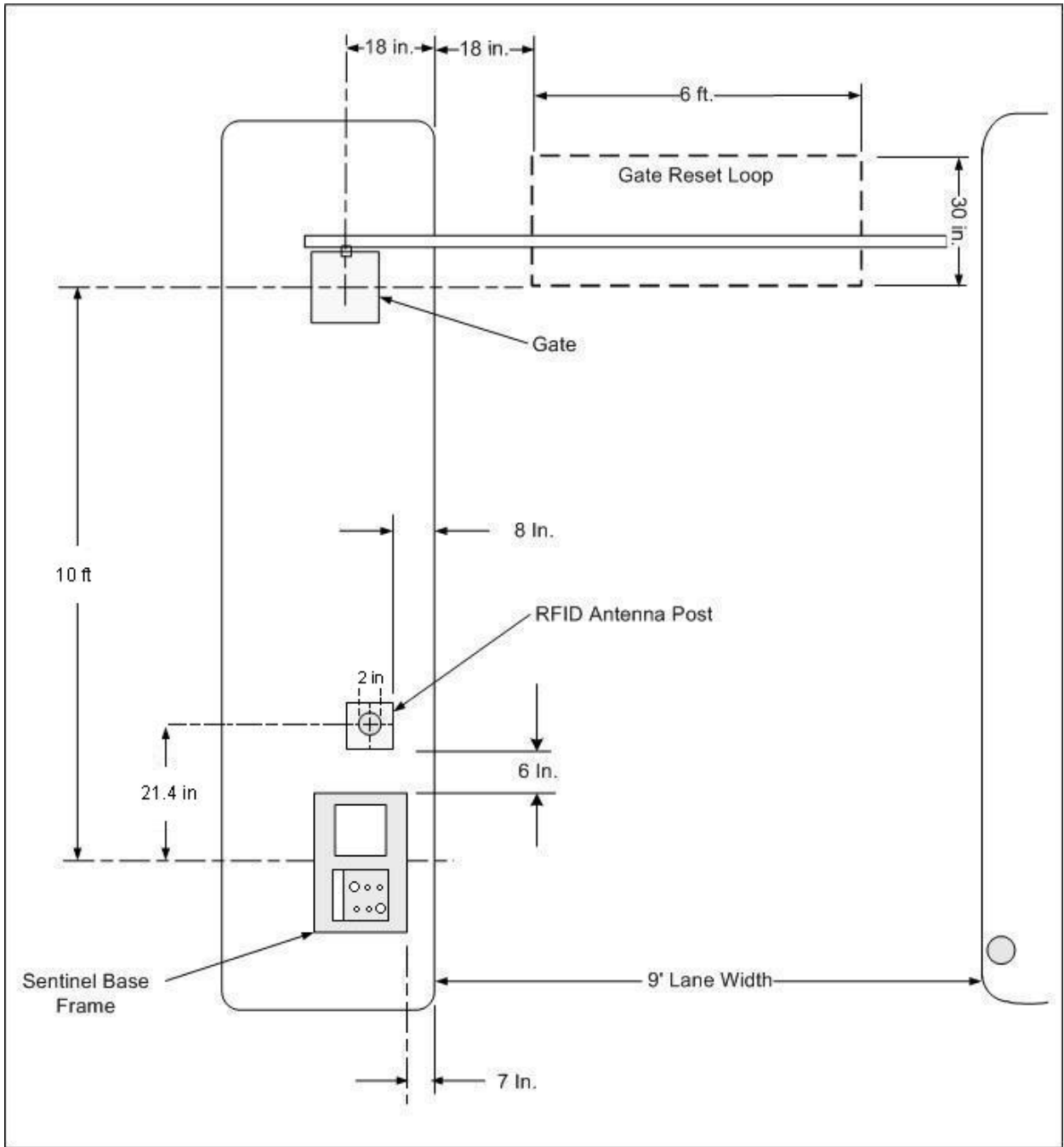


Figure 1. Express Exterior Island

1.3 Electrical Preparation

1.3.1 Conduit Installation

A typical installation will require 3 conduit runs for, power, data and wash control lines. DO NOT run data wires in the AC Power or Wash Control conduits. Additional conduit runs may be needed when a gate or the Sentinel RFID option are to be used. Conduit size should be at least ¾ in, a larger conduit may be required depending on the quantity and gauge of wires to be installed. Refer to local and national electrical codes to select the proper conduit type and size. Figure 2 provides guidelines for conduit planning.

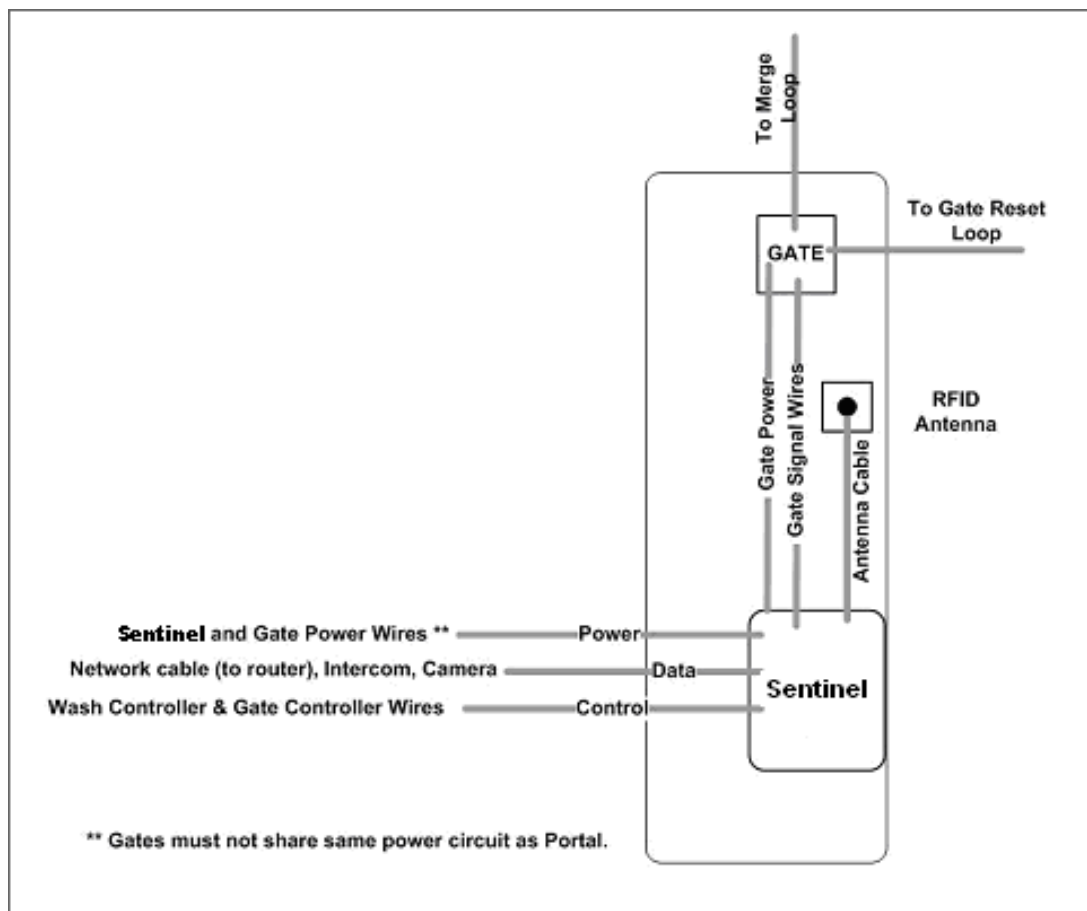


Figure 2. Conduit Runs

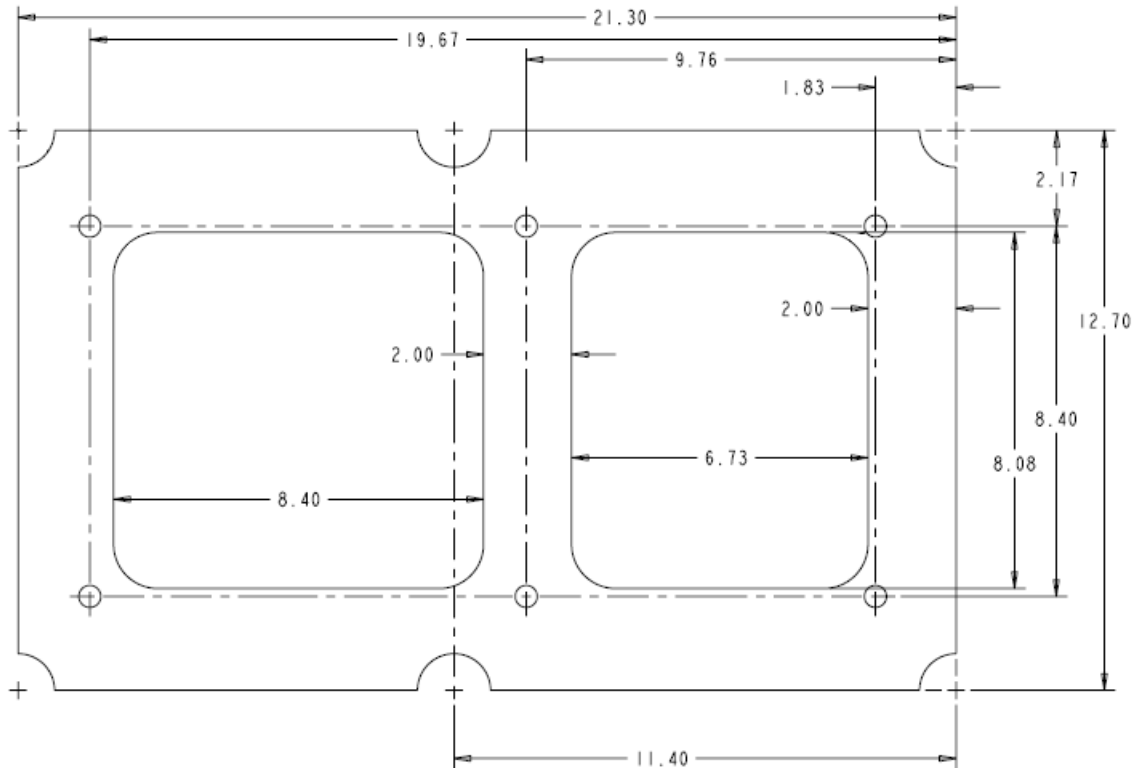


Figure 3. Bottom View of Base

1.3.2 Power Requirements

The Sentinel requires 120 VAC, 8 Amps service. In applications where barrier gates are to be used, each gate requires 120 VAC, 5 Amps service. The Sentinel and gate must be powered from separate circuits.



Note:

Ensure the protective earth ground wires do not carry any motor return current. Only the neutral wire should carry return current. Follow local electrical code when wiring the Sentinel. All units should be installed by a professional electrician ONLY.

1.3.3 Site Wiring Requirements

Wiring requirements will vary by site depending on the type of wash equipment and the Sentinel configuration. The following table shows site wiring, which may be needed. As wires are pulled through conduit, ensure there is at least 6 ft. of wire extending from the end of the conduit stub.

Circuit Description	Wire Qty	Wire Requirements
Sentinel Power (115-120 VAC, 8 Amps).	3	16 AWG minimum, black/white/green
Gate Power (115-120 VAC, 5 Amps).	3	16 AWG minimum, black/white/green
Network connection (to router)	1	Cat 5 communications cable, 295 ft max length
Wash Signaling (required if the Sentinel will be connected to the wash controller)	Varies	Refer to wash equipment manufacturer's instructions
Intercom (Required to interface with site intercom)	4	22 AWG minimum
Camera (Required for Sentinel camera option)	1	Type RG59/U coaxial cable
Gate Control – from gate controller to Sentinel (Required if gate controller is used)	4	18 AWG minimum
Gate Control - from gate controller to gate (Required if gate controller is used)	3	18 AWG minimum
Gate Control – from Sentinel to Gate (Required if gate is used without gate controller)	4	18 AWG minimum
RFID Option (from RFID Antenna to Sentinel)	1	Cable is supplied with RFID kit

2 Mechanical Installation

2.1 Hardware Required

Prior to beginning the installation, take the time to verify that all the following required parts are present and accounted for.

Items supplied with the Sentinel:

- Allen Wrench For Door
- Key set for door
- Key set for vault door
- IEC-320-C14 Female AC Power Connector

Items supplied with the Base:

- (6) ½: Hex Nuts
- (6) ½" Flat Washers
- (6) ½" Lock Washers

2.2 Recommended Tools

2.2.1 Mechanical Installation Tools

The following tools are recommended for the typical mechanical installation of this Sentinel unit and base:

- ¾" deep well socket and socket wrench
- Open end 9/16" wrench
- Small, thin blade, flat-tip screwdriver
- Hammer
- Dual-plane Level
- 50' foot tape measure

The following items may be required only when installing the Sentinel into an existing concrete slab:

- 2.5" Concrete hammer drill bit
- Saw or Pipe cutter (capable of cutting 2 in. diameter steel pipe)

2.3 Base Installation



Note:

Pull all wires through conduits before mounting the base. See Electrical Planning for wiring requirements.

The Sentinel base frame is designed to be embedded in a concrete pad, but can also be surface mounted in cases where concrete has already been poured. Unitec highly recommends that the base be embedded into concrete, because using this method makes the unit more secure and less likely to be able to be removed by a truck with a chain. Surface mounting is less secure.

In order to mount the base frame correctly, the conduit holes on the top plate of the base frame should be located in the forward left position when the unit is facing the lane, as shown below, and in Figures 1 and 5.

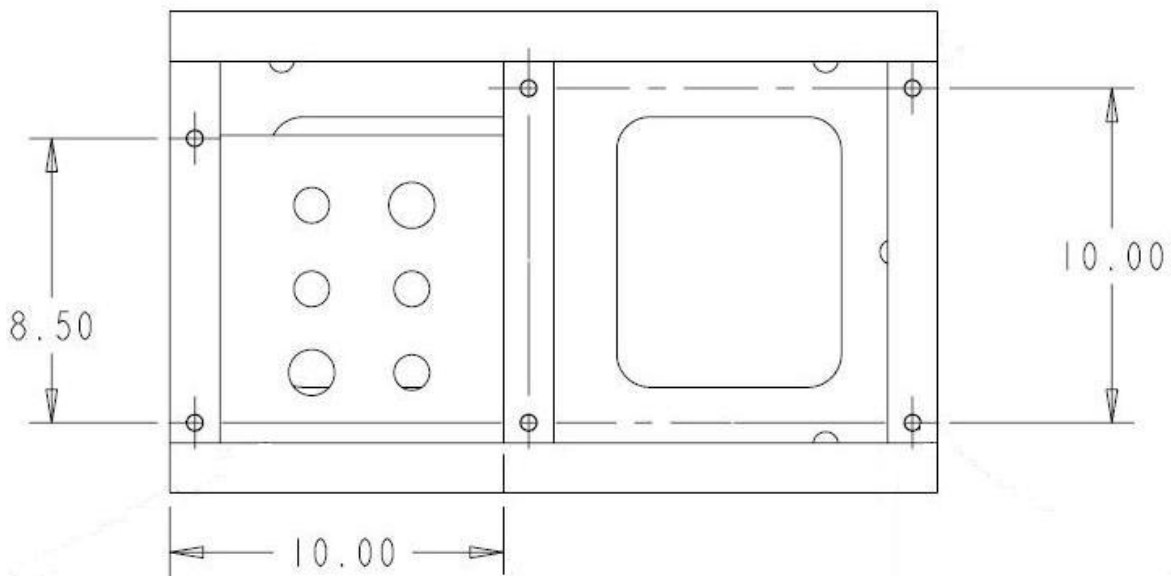


Figure 4. Top Plate of Base Frame

The frame includes (2) surface plates, as shown in Figure 4 below, to accommodate different mounting heights. When installing the base on a curb, the frame should be set so that the upper mounting plate is flush with the concrete surface. When no curb is used (standard height base), the frame should be set so that the upper mounting plate is flush with the concrete surface.

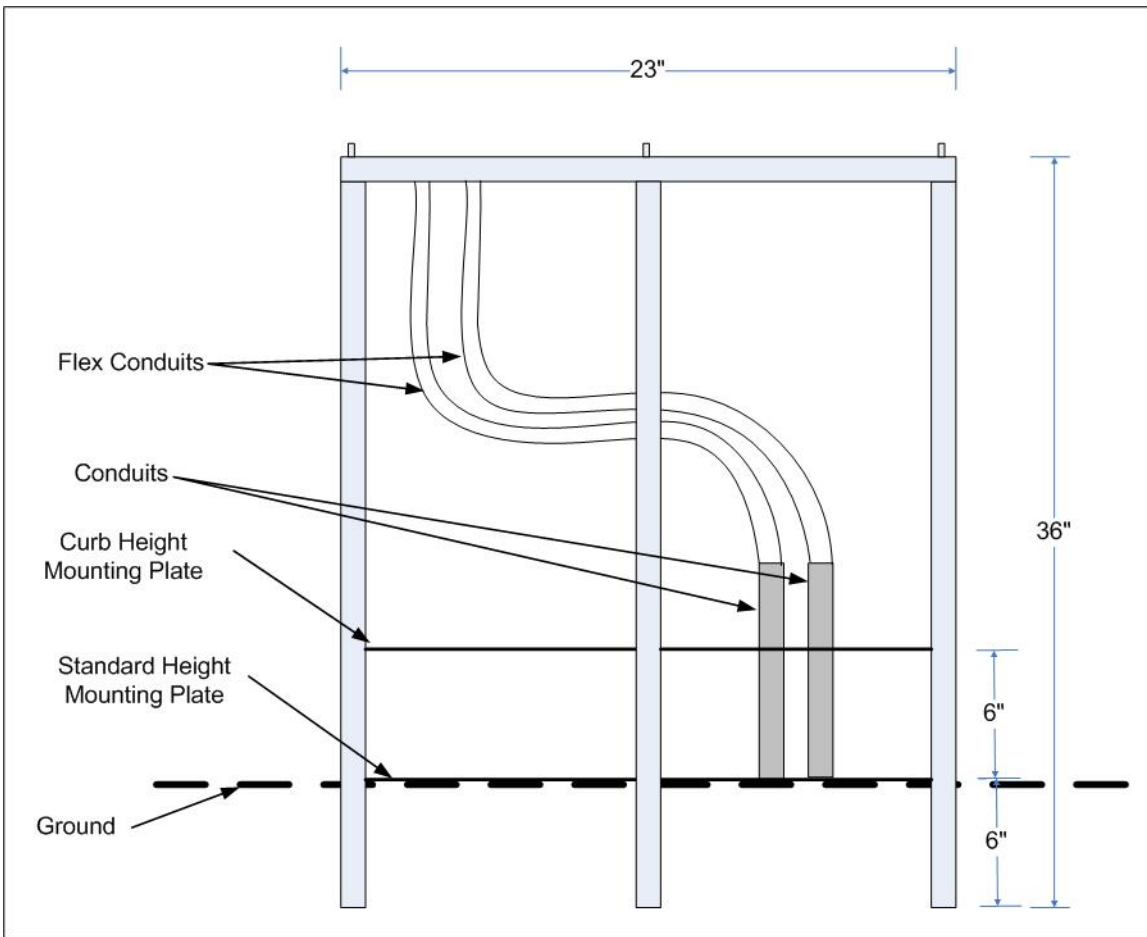


Figure 5. Sentinel Base with Mounting Plates

When the base is to be surface mounted, the legs of the frame will need to be cut so that the appropriate mounting plate can be bolted to the concrete surface. The cut edges of the pipe should be coated with a rust preventative paint to deter corrosion. The frame is to be secured to the concrete using the (6) concrete anchor bolts provided.

With the frame in place, the wires run through the conduit stubs should be routed through the conduit plate on the top left side of the frame. Flexible conduit should be installed between the conduit stub and mounting plate to protect and separate the high and low voltage circuits. The flex conduit should be secured to the conduit plate using a suitable nut.

2.4 Mounting the Sentinel

Before setting the Sentinel in place, ensure the field-installed wires are routed to a point where they can be accessed and pulled through the wiring holes on the bottom of the Sentinel and that the plastic sheath has been fitted over the base.

1. Open the Sentinel and remove the bill dispenser.

2. Carefully set the Sentinel on top of the base so the (3) studs of the base pass through the mounting holes on the bottom of the Sentinel.
3. Secure the Sentinel to the studs with the flat washer, lock washer and hex nut (in that order) supplied with the base.
4. Pull the wires up through the cable entrance ports on the bottom of the Sentinel enclosure.
5. Verify the unit's final position.
6. Use the dual-plane level to verify that the unit is level. Make appropriate adjustments if necessary.
7. Tighten the 3 nuts with the socket wrench. When this has been successfully completed, there should be no movement of the case whatsoever.

3 Electrical Installation

3.1 Hardware Required

Unitec does not provide connectors for terminating the field-installed wires. These wires will vary by application but connectors that may be required include:

- RJ-45 Modular Plugs (for terminating the CAT-5 network cable).
- BNC Connectors (for terminating coaxial cable for the camera options)

3.2 Recommended Tools

In addition to the mechanical mounting of the Sentinel unit to the base (and the base to the concrete), there will be a number of electrical connections that must be made. These connections will require the use of the following common electrical tools:

- Small, thin tipped, straight screwdriver (1/8" tip, for green Phoenix connectors)
- Wire strippers (capable of handling 10-23 AWG wire)
- Diagonal cutters
- Needle nose pliers
- Modular plug crimp tool (if CAT 5 or phone lines need to be terminated)

3.3 General

NOTE: Before starting, ensure all required wires have been routed to the Sentinel (as described in the Site Preparation section).

The following figure shows the location inside the Sentinel where the field wires will connect.

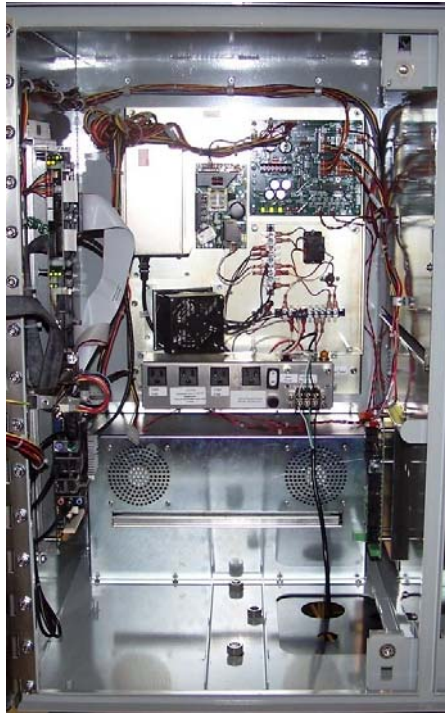
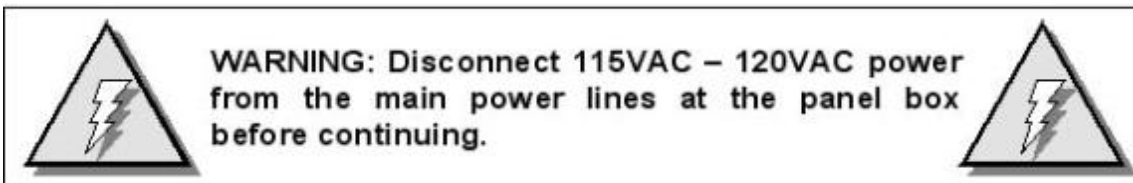


Figure 6. Sentinel Interior

3.4 Connecting Power



1. Locate main power wires. There will be three 16 AWG (or greater) environmentally rated black, white, and green colored wires.
2. Route the main power wires up through the conduit to the Sentinel's power panel. Remove excess wire length, leaving sufficient length to reach the power panel. Remove the plastic shield on the power terminal block.
3. Secure the Neutral (White), Ground (Green), and Line (Black) wires to the appropriate terminal screws on the power panel. (See figure below). Re-tighten the screws to hold the wires in place.

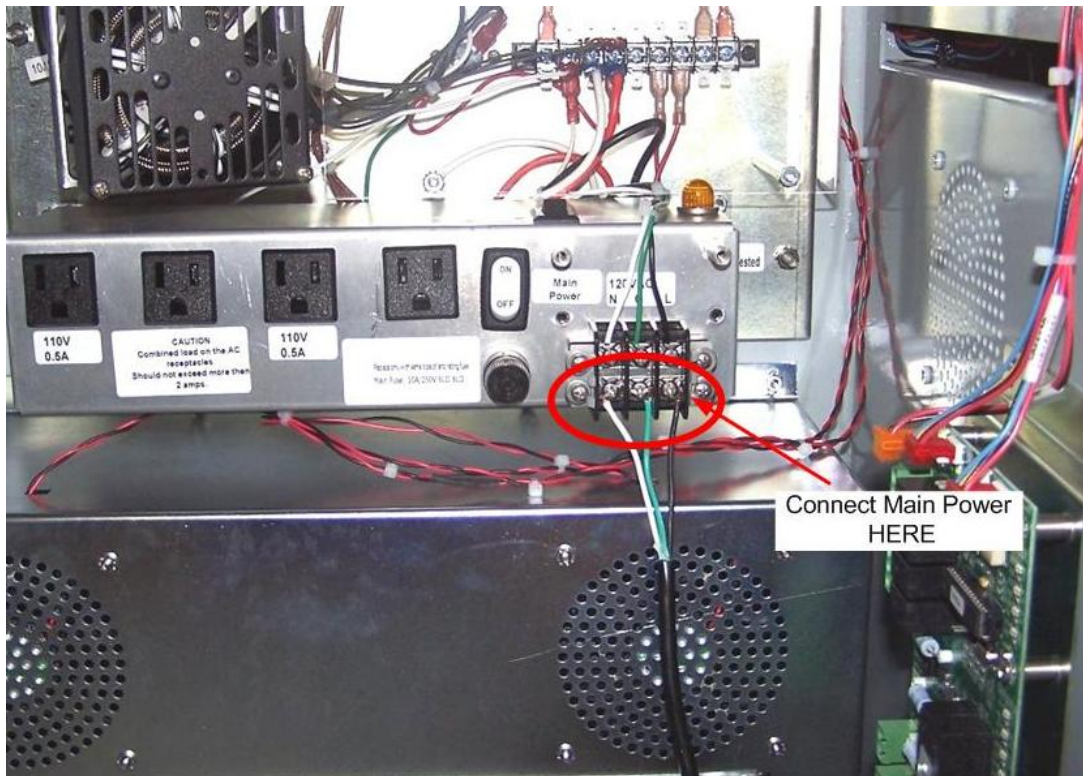


Figure 7. Neutral - Ground – Line Connections

4. Use wire ties to route and secure any extra cable. Replace the plastic shield.

3.5 Network Connection

The Cat 5 cable will need to be terminated at each end with an RJ-45 modular plug. This termination should be performed by a technician who is experienced in assembling network cables as a slight misalignment in the wire termination can cause communications problems. For reference, Appendix B provides guidelines for terminating a network cable with a modular RJ-45 plug.

The Network (Ethernet) port is located at the bottom edge of the mother board. There should be a surge suppressor installed in the Ethernet port. Insert the terminated CAT 5 cable into the other end of the surge protector. The facility end of the Cat-5 cable connects to one of the LAN ports on the Unitec router. The router's WAN port should be connected to the Internet Service device (e.g. DSL or Cable modem). Other Unitec devices may need to be connected to the router's LAN ports. Refer to Appendix B for details on connecting devices to the router.

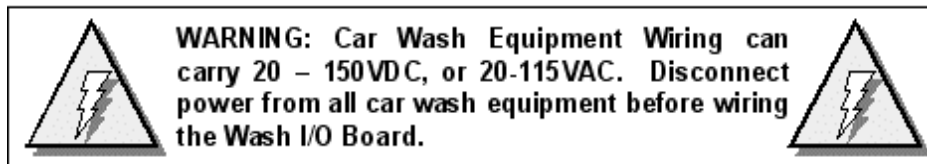
3.6 Wash Control Wiring

3.6.1 Overview

In applications where the Sentinel will communicate with the Wash Controller, the wash control wires will need to be connected to the Wash I/O Board.

Most wash manufacturers use a five-wire system to provide the arming signals for the selected wash packages. One common line and four arming input wires are fed from the wash's PLC to the Wash I/O board. In addition to these five wires, a Wash-In-Use (WIU) Hot and WIU Neutral are required to reset the wash electronics. Typically, these are also provided by the PLC.

Each wash manufacturer has its own specific color code system and wash relay pin-outs; therefore, it is important to review the appropriate wash documentation prior to beginning this portion of the installation.



3.6.2 Wiring the Wash Relay Interface

To wire the wash relays, connect the wires that come from the PLC to the appropriate pin numbers in the phoenix connector using the following procedures:




Note:

The wiring for the Sentinel Wash I/O board is the same as the wiring for the Wash Select II wash interface.

3.6.2.1 Preparation

- You will need a thin tipped, flat head screwdriver to open and tighten the relay connections of the Phoenix connector.
- Review the wash manufacturer's documentation to determine the color codes for the wiring of the wash pin-outs for your wash equipment before beginning this installation.
- Phoenix connectors are shipped already inserted in the appropriate sockets on the Wash I/O board.
 1. Remove the Carrier Board/Wash I/O Board Cover Plate using a 5/16" socket wrench.
 2. Locate the Wash I/O board on the inside lower right-hand wall of the Sentinel case.
 3. On the Wash I/O Board, locate the 10-pin Phoenix connector labeled J17 on the lower right-hand corner of the Wash I/O board.

 **Note:** “Wash Output #” refers to the number associated with the arming wires. Refer to the wash manufacturer documentation for more information.


4. Connect the wash relay arming wires, the wash relay common wire, and any spare option relay wires to the appropriate pins, as indicated in the following table. Use the screwdriver to open and/or secure the manufacturer wash wires to each of the Unitec relay locations.

Table 1. Wash Relays


Pin	Signal
Pin 1	Wash Output #1
Pin 2	Wash Output #2
Pin 3	Wash Output #3
Pin 4	Wash Output #4
Pins 5-8	Spare Option Relays (Outputs 5-8 respectively)
Pin 9	Wash Relay Common
Pin 10	N/A

5. Plug the Phoenix connector into the Wash I/O board socket J17.
6. Continue to Wash-In-Use wiring procedures.


3.6.3 Wiring the Wash-In-Use Interface

 **Note:** Follow local electrical code when wiring the Sentinel.


Wash equipment requires a reset circuit. This circuit is generally identified as the “Wash-In-Use” (WIU) signal. It is not uncommon for values of this voltage to be as much as 115-120 VAC, so it is extremely important to verify that there is no power applied to any of the wash components before proceeding.



WARNING: Car Wash Equipment Wiring can carry 20 – 150VDC, or 20-115VAC. Disconnect power from all car wash equipment before wiring the Wash I/O Board.



3.6.3.1 Preparation

 **Note:** Wash equipment wiring may vary, and not all equipment manufacturers use the wash-fault interface. Refer to the manufacturer’s documentation for additional information.

- Make sure all power is disconnected from the wash equipment prior to beginning this procedure.
- You will need a thin tipped, flat head screwdriver to open and tighten the relay connections of the Phoenix connector.
- Review the wash manufacturer’s documentation to determine the color codes for the wiring of the wash pin-outs for your wash equipment before beginning this installation.
- Phoenix connectors are shipped already inserted in the appropriate sockets on the Wash I/O board.
 1. On the Wash I/O Board, locate the 6-pin Phoenix connector labeled J18 on the lower left-hand corner of the Wash I/O board.
 2. Remove the Phoenix connector from the socket.
 3. Turn the connector so that the wire inputs are facing up as shown below.

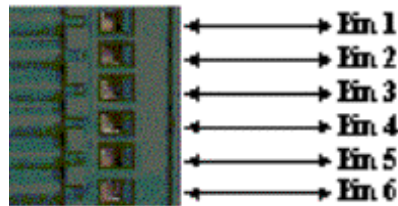


Figure 8. 6-Pin Phoenix Connector

4. Referring to the figure above, connect the following wires to the appropriate pins, as indicated in the following table. Use the screwdriver to open and/or secure the manufacturer wash wires to each of the Unitec relay locations.

Table 2. Wash-In-Use Connections

Pin	Signal
Pin 1	Wash-In-Use Hot
Pin 2	Wash-In-Use Neutral
Pin 3	Wash-Fault-Hot
Pin 4	Wash-Fault-Neutral
Pin 5	Wash-Complete-Hot
Pin 6	Wash-Complete-Neutral

5. Plug the Phoenix connector into the Wash I/O board socket J18.
6. Replace the protective metal plate that covers the Wash I/O board and the carrier board.

3.7 Intercom Systems

3.7.1 Overview

The use of an intercom system allows two-way communications between customers at the Sentinel and staff elsewhere on site. A customer activates the Sentinel's intercom output by pressing the help button. Without an intercom, the intercom output can be used to activate a bell, light or other device to alert an attendant that help is needed.

The intercom wires connect to the Display IO board on the back of the main door. Jumpers and adjustments to control its operation are also located on that board. 2, 3, and 4 wire intercoms are supported. A digital intercom is recommended if the intercom wiring is sharing conduit with other communications wiring, but not required. Unitec does not supply intercom systems.

3.7.2 Intercom Connections

The Intercom has two connectors which control the way in which the intercom is wired and the mode of operation. J16 is the interface and connects to the customer's intercom unit. J35 is used to select mode of operation (two, three, or four wire intercom systems). Twisted pair / fully shielded cable is recommended for optimum performance.

3.7.3 Intercom Adjustments

The Intercom system has the ability to sense when voice band audio signals are present. This allows the speakers in the unit to revert to a passive intercom mode. This bypasses the internal audio section and allows the left speaker to be used as an intercom.

3.7.4 Connection Overview

Call Function: The unit will initiate a call function by closing the contacts on RL5. By default, J16-Pin 1 (H1) and J16-Pin 2 (H2) will always reflect the contact closure of RL5. This is the default for the four-wire mode when both the call function and audio are completely separated. More detailed instructions on this follow.

Audio: When the Sentinel intercom mode is active, the audio section is floating and is not relative to ground. By default, J16-Pin 3 (SP+) and J16-Pin 4 (SP-) will always be connected to the audio section.

Four Wire Intercom Configuration: Two separate pairs (four wires) are used for both the call function and audio in the four-wire configuration. In this mode, J17 receives no jumpers.

3 Wire Intercom Configuration: This mode requires two conductors for audio and one additional conductor for the call function. This mode uses a common ground for both audio and the call function (SP-). Jumper pins 3&4 of J17 and connect H1, SP+ and SP- .

2 Wire Intercom Configuration: This type of intercom system has both the Call Function and audio sharing the two conductors. Jumper pins 3&4 and 1&2 of J17 and connect the two conductors to SP+ & SP-.

3.8 Camera Connection

The (optional) surveillance camera is attached to the front door of the Sentinel. The camera is intended for use with a DVR or similar monitoring device installed at the site. The coaxial cable routed to the camera is used to connect it to the monitoring device. The coax cable will need to be terminated with a BNC connector similar to the one shown in Figure 9.



Figure 9. BNC Male Plug for Camera Connection

3.9 Gate Wiring

In multi-lane applications, a Unitec or 3rd party gate controller is required. Refer to the instructions provided with the gate controller for connecting wires between it and the Sentinel. If needed, a gate can be used with a single Sentinel and no gate controller. Refer to for instructions on connecting the Sentinel to the gate.

3.10 Connecting the Reach Free ID Option

Refer to the installation instructions supplied with this product option.

4 System Startup

For fully detailed instructions, please see the *Sierra Management Application Programming Manual* on the www.StartwithUnitec.com website.

1. Power up the Sentinel.
2. Using a laptop, login into the Sierra Management System.
3. Enter the Site information and credit networking information, wash information, and setup a device profile.
4. Download the device profile.
5. The Sentinel will reboot and be in full operational mode.

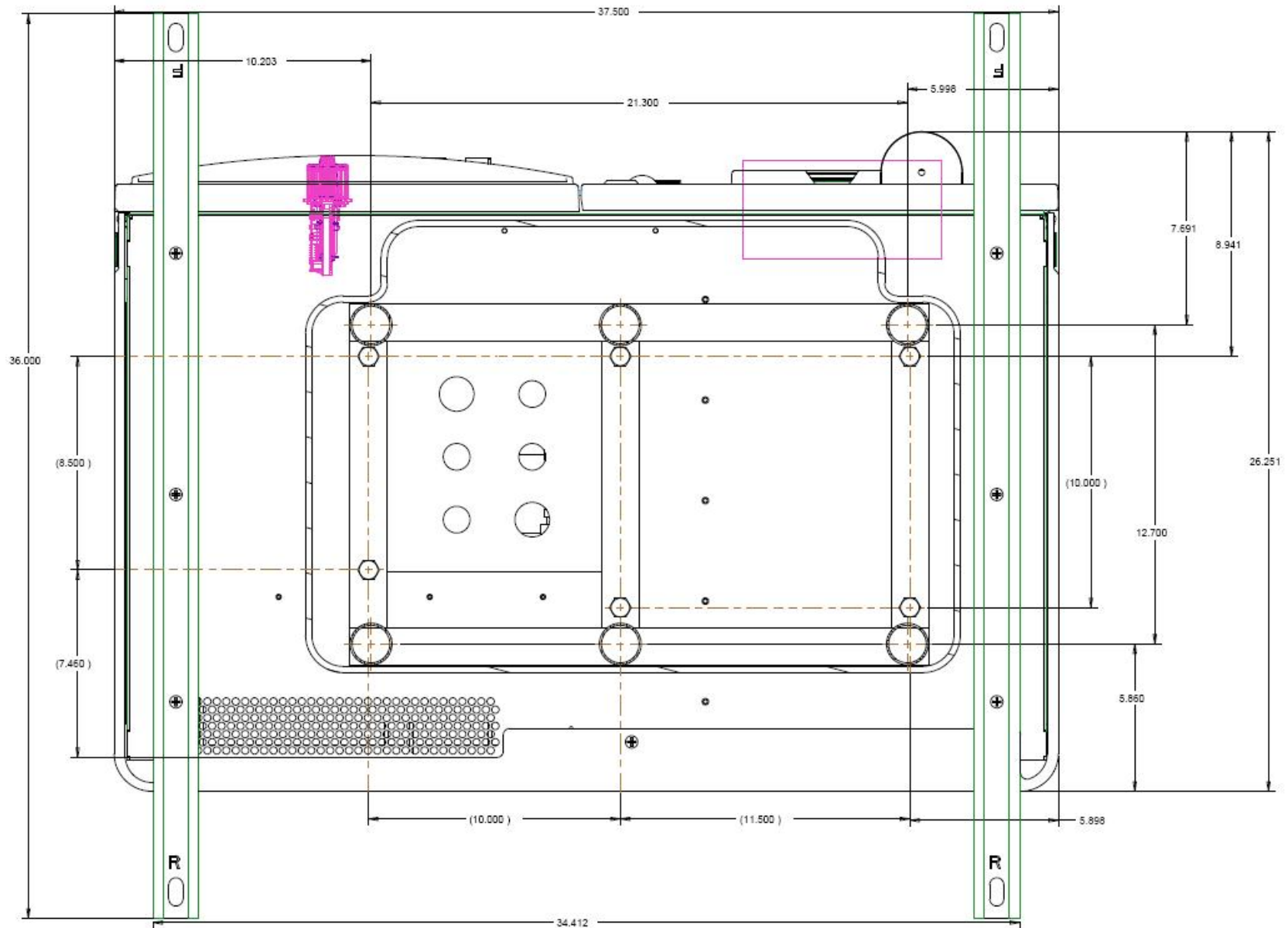
5 System Test

Once the installation is complete, a thorough test should be performed to ensure all Sentinel functions are operational. This test should verify:

- Functionality of hardware devices (through diagnostic tests in maintenance mode).
- Washes and added services are properly configured and wash outputs are properly wired.
- The wash fault (out of service) signal places the Sentinel out of service.
- Sentinel Ethernet communications (through the Cat 5 cable).
- Credit card processing (**Note:** The merchant should confirm credit card revenues are being properly deposited to their account).
- Functionality of peripherals (gate/gate controller, RFID Option, etc.).

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Appendix A. Sentinel Base - Bottom Up View



SECTION A-A
BOTTOM VIEW LOOKING UP
DRAWING FOR REFERENCE ONLY

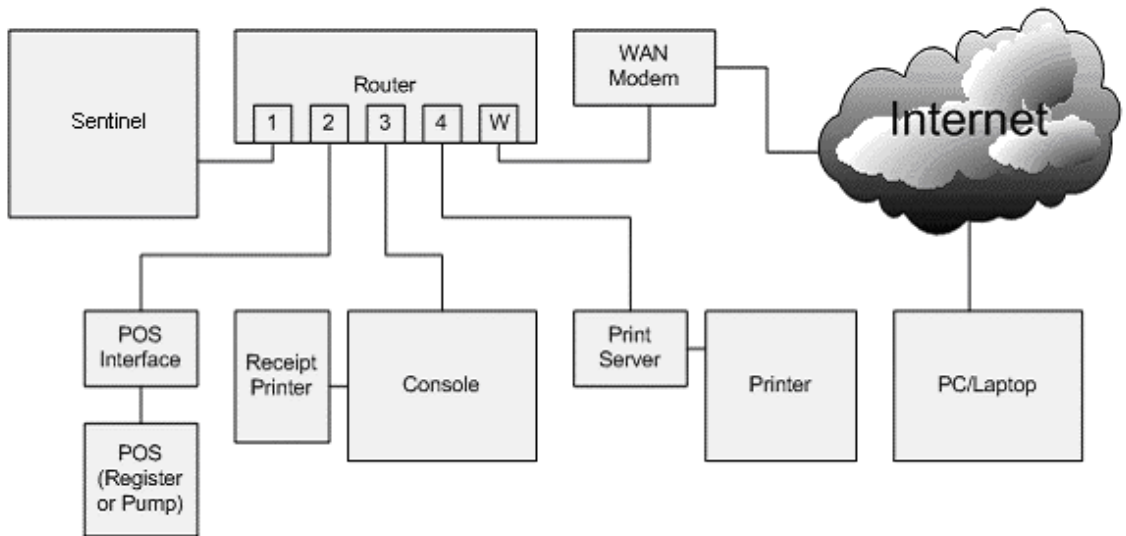
Appendix B. Sentinel Networking

Unitec supplies a pre-programmed router for connecting devices as a local network. The networked devices will vary based on options ordered and may include:

- One or more Sentinel units
- A Sentinel Console
- A POS Interface device (to communicate with a C-store POS System)
- A print server (for connecting a local report printer)

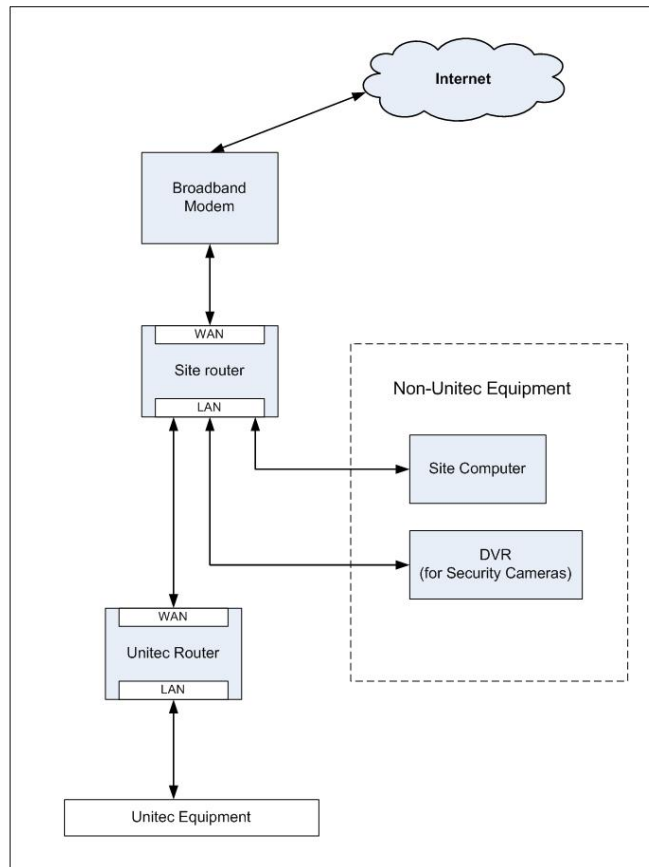
In cases where there will be more than (4) Unitec devices on the network, an Ethernet switch will need to be added. The WAN port of the switch connects to one of the LAN ports of the Unitec router. The additional devices can then be connected to the LAN ports of the switch.

The illustration below provides a sample network diagram.



Example of Networked Unitec Devices

Third party devices should not be connected directly to the Unitec router. The broadband device supplied for Internet service (e.g. DSL or Cable modem) will often have a built-in router that can be used to connect these devices. In some cases however, a separate router will need to be installed between the broadband modem and the Unitec router. The following illustration shows the use of a 2nd router for 3rd party device connections.



When a router (or modem with built-in router) is used between the Unitec router and broadband connection, it must be configured to allow external connections to and from the Sentinel. The router should be configured to:

- Forward the ports assigned to the Sentinel(s) to the Unitec router. For a single unit installation the port is 9810. In multi-unit sites, the ports would increment for each Sentinel i.e. 9811, 9812 etc..).
- Provide a static/reserved IP address to the Unitec router reserved so that the forwarded ports will always be directed to it.

- Terminating Ethernet Cables

1. Carefully remove the outer jacket of the cable. Be careful when stripping the jacket as to not nick or cut the internal wiring. One good way to do this is to cut lengthwise with snips or a knife along the side of the cable, away from yourself, about an inch toward the open end. This reduces the risk of nicking the wires' insulation. Locate the string inside with the wires, or if no string is found, use the wires themselves to unzip the sheath of the cable by holding the sheath in one hand and pulling sideways with the string or wire. Cut away the unzipped sheath and cut the twisted pairs about 1 1/4" (30 mm). You will notice 8 wires twisted in 4 pairs. Each pair will have one wire of a certain color and another wire that is white with a colored stripe matching its partner (this wire is called a tracer).



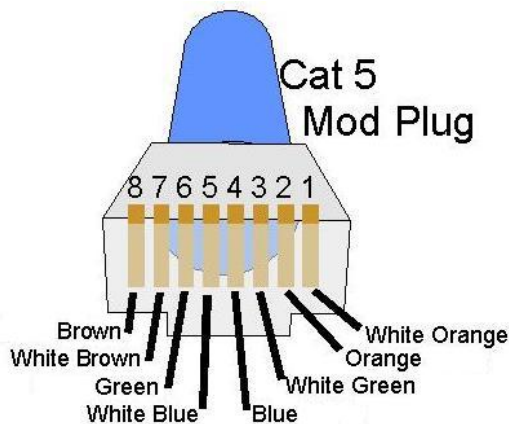
2. Inspect the newly revealed wires for any cuts or scrapes that expose the copper wire inside. If you have breached the protective sheath of any wire, you will need to cut the entire segment of wires off and start over at step one. Exposed copper wire will lead to cross-talk, poor performance or no connectivity at all. It is important that the jacket for all network cables remains intact.



- Untwist the pairs so they will lay flat between your fingers. The white piece of thread can be cut off even with the jacket and disposed (see Warnings). For easier handling, cut the wires so that they are 3/4" (19 mm) long from the base of the jacket and even in length.



- Arrange the wires in the following order (from left to right):
 - white/orange
 - orange
 - white/green
 - blue
 - white/blue
 - green
 - white/brown
 - brown



Press all the wires flat and parallel between your thumb and forefinger. Verify the colors have remained in the correct order. Cut the top of the wires even with one another so that they are 1/2" (12.5 mm) long from the base of the jacket, as the jacket needs to go into the 8P8C connector by about 1/8", meaning that you only have a 1/2" of room for the individual cables. Leaving more than 1/2" untwisted can jeopardize connectivity and quality. Ensure that the cut leaves the wires even and clean; failure to do so may cause the wire not to make contact inside the jack and could lead to wrongly guided cores inside the plug.

5. Keep the wires flat and in order as you push them into the RJ-45 plug with the flat surface of the plug on top. The white/orange wire should be on the left if you're looking down at the jack. You can tell if all the wires made it into the jack and maintain their positions by looking head-on at the plug. You should be able to see a wire located in each hole, as seen at the bottom right. You may have to use a little effort to push the pairs firmly into the plug. The cabling jacket should also enter the rear of the jack about 1/4" (6 mm) to help secure the cable once the plug is crimped. You may need to stretch the sleeve to the proper length. Verify that the sequence is still correct before crimping.



6. Place the wired plug into the crimping tool. Give the handle a firm squeeze. You should hear a ratcheting noise as you continue. Once you have completed the crimp, the handle will reset to the open position. To ensure all pins are set, some prefer to double-crimp by repeating this step.



7. Repeat all of the above steps with the other end of the cable. Test the cable to ensure that it will function in the field. Mis-wired and incomplete network cables

could lead to headaches down the road. Also, crossed wire pairs could lead to physical damage of computers or phone system equipment, making it even more crucial that the pairs are in the correct order. A simple cable tester can quickly verify that information for you. Should you not have a network cable tester on hand, simply test connectivity pin to pin.



Appendix C. POS Interface External POS Option

The external POS option allows wash codes to be purchased at Point of Sale (POS registers or gas pumps). This option includes a port conversion device, which connects between the Unitec router and the C-store POS System. A 3ft Ethernet cable is included for connecting the Ethernet port of the converter to the Unitec router. A standard 9-pin serial cable is included for connecting the Serial port of the converter to the C-Store POS however, some POS systems may require an alternate cable (or adapter). Contact the POS manufacturer for their cabling requirements.



Port Converter of External POS Interface Option