VERSUS
TECHNOLOGY, INC.

Versus Information System

Hardware and Wiring Installation Guide

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WARNING! This product is not designed, intended, authorized or warranted for use in any life support or other application where product failure could cause or contribute to personal injury, death, or severe property damage. This product or its systems are covered by one or more of the following U.S. Patents: 4,906,853; 5,017,794; 5,027,314; 5,119,104; 5,276,496; 5,355,222; 5,387,993; 5,548,637; 5,572,195; 6,104,295; 6,154,139.

FCC STATEMENT: Components complying with part 15 of the FCC Rules. Operation is subject to the following two conditions: 1) This device may not cause harmful interference, and 2) this device must accept any interference received, including interference that may cause undesired operation.

Modifying or tampering with the transceiver's or receiver's internal components can cause a malfunction, invalidate the warranty, and will void your FCC authorization to use these products.

Revision date: 9/2003

Contents

1. Introduction

1.1 Purpose of This Guide

This document is intended to provide the information required to install the hardware and wiring components of a VIS system. Read this entire document before proceeding with the installation. A general understanding of wiring and telephone installation techniques is assumed.

1.2 Computer Requirements

The VIS software runs in the Microsoft Windows 2000, NT or XP environments and requires a computer system with reasonable capacity and speed.

1.2.1 Server Computer Requirements

The **minimum** computer requirement for the server computer running the Data Server, Badge Server and Configuration Utilities are:

Operating System	Windows 2000 or XP, Pro or Server version recommended
Processor	Current shipping model or better
Memory	256 MB RAM or more, depending on operating system
Hard drive	40 GB or equivalent
2nd Hard Drive	40 GB hard drive for purpose of redundancy
Floppy Disk Drive	3.5 1.44 MB
CD-ROM	48X CD-ROM or better, CD-RW optional
Sound Card	Standard sound card or better (optional)
Speakers	Standard Speakers (optional)
Network Card	Standard Ethernet Card
Modem	56K Data/Fax Modem (optional)
Tape Backup	10/20GB, SCSI, Travan-5 or Equivalent (recommended)
UPS	UPS recommended

These are minimums only; additional resources may be needed depending on the size of the system.

1.2.2 Computer Workstation Requirements Including Relay Controlled Devices

As part of the Versus System, relay controlled devices (such as corridor lights) can be connected to relay boards, which are then connected to a computer that contains a relay control board. The computer that contains the relay control board will also have the Relay Control software installed for configuring the relays.

The computer requires a PCI slot for the PCI-DIO96H relay controller card. One PCI-DIO96H relay controller card can have two CIO-ERB48 relay boards connected to it. One workstation can have up to five PCI-DIO96H relay controller cards installed, assuming there are five PCI slots available in the computer. This means that one computer could control up to 480 relays.

Operating System	Windows 2000 or XP, Pro or Server version recommended
Processor	Current shipping model or better
Memory	256 MB RAM or more, depending on operating system
Hard drive	40 GB or equivalent
Floppy Disk Drive	3.5 1.44 MB

CD-ROM	48X CD-ROM or equivalent, CD-RW optional
Sound Card	Standard Sound Card
Speakers	Standard Speakers
UPS	UPS recommended
Network Card	Standard Ethernet Card
PCI Slot(s) ***Required for relay applications***	One PCI slot required for every 96 relays. Computer case large enough to house a 12-inch relay card. 5 cards can be installed in one computer, assuming 5 PCI slots are available.
Relay Control Card ***Required for relay applications***	PCI-DIO96H

1.3 Terms and Definitions

The following terms will be used throughout this hardware installation guide, to refer to system components and modes of operation.

Bridging Clip – A small metal clip used in a punch-down block to short the left-hand columns to the right hand columns of punch-down terminals.

Collector – This device gathers the tracking data from as many as 24 sensors, processes it as required, and sends it via the 2-pair collecting network to the concentrator. Each system must contain at least one collector, and many systems will contain more than one.

Concentrator – This device provides an interface between the 2-pair network that connects collectors together (the "Collector Network") and the computer system. It assembles the data from the various collectors and bundles it for delivery to the host computer. Each system must contain at least one concentrator, and many systems will contain only one.

Impedance – A measure of a characteristic of wire that is very important when digital data signals are to be sent over the wires at high speeds. All wires have impedance determined by their makeup and twisting called the "characteristic impedance" of the wire. Most solid twisted pair wire is about 100 ohms impedance, and the coaxial cables used are 50, 75, or 93 ohms.

Sensor – A device that gathers infrared light energy and converts it to an electrical signal, which is then sent over a single pair of wires to a collector.

Sensor Connection – A single pair cable that connects a sensor to a collector port. All of the sensor connections in a system may be referred to as the "Sensory Network."

Plenum – Any area that serves as a duct or passage for breathable air. Many office buildings use the space above the suspended ceiling as a return air "plenum" for the heating and air conditioning systems. Most laws require any cables that run in an air plenum to be made of materials which will not burn, or which will not release toxic gases when burned.

Punch-down Block – This device is used to connect sensor wires to the collector in an organized fashion. A special tool is used to "punch" the wire onto the punch-down block terminals, which causes the terminals to penetrate the wire insulation and cut off excess wire in one easy step. Punch-down Blocks are the preferred method of connection for solid wire in telephone systems.

RJ – Acronym for Registered Jack. VIS uses some modular-style connectors identified by their 'RJ' designations. RJ-11 is a generic term, often used to refer to a six-position jack, though it specifically refers to a single-pair connection in a six-position shell. RJ-12 refers to a two-pair connection in a six-pair shell, and RJ-25 refers to a three-pair connection in a six-pair shell.

Shielded Wire – A type of wire wrapped in a braided or foil shield that protects it from electrical interference. Use of shielded wire may be the only solution in a very high-noise environment (see Section 4.5.4.1).

STP – Acronym for Shielded Twisted Pair. This is wiring usually used in audio system installations where electrical interference is a prime concern (see Shielded Wire).

Twisted Pair – The wire used to interconnect sensors, collectors, and interfaces is twisted into pairs to make the wire characteristics more uniform and to cancel out many types of interference to which the wires might be subjected (see UTP).

USOC – Acronym for Universal Service Ordering Codes. The connectors and wiring adhere to the USOC wiring practices standard wherever possible.

UTP – Acronym for Unshielded Twisted Pair. This is the typical solid, paired wire used in phone system installations. It has no outer shield layer (see Twisted Pair).

1.4 Versus Hardware Parts List

Part Number	Description
VER-1830-A	Asset Tag IR/RF Anti-Tamper
VER-1830-B	Asset Tag IR/RF
VER-1700	Locator Badge
VER-1780	Personnel Alert Badge
VER-2402	Collector
VER-2015	Ethernet Concentrator
VER-4422	IR Sensor
VER-4450	RF Sensor
VER-4444	Serial Sensor

Part Number	Description
VER-4442	Supervised Sensor
VER-3010	Digital I/O Board
VER-3015	External Relay Board
VER-4052/54	Remote Station
VER-0004	Badge Tester
VER-3600	Wiegand Converter
VER-4440	Auto Assigner
VER-3500	Perimeter Alarm Sentinel
VER-1875	RF/PAS Asset Tag

1.5 Versus Information Systems Estimated Bandwidth Requirements

Notes: Estimate based on 100 badges on mobile individuals 24 hours a day, 7 days a week.
Estimate based on averages taken from actual data using EtherPeek.
Estimate based on the following system layout:

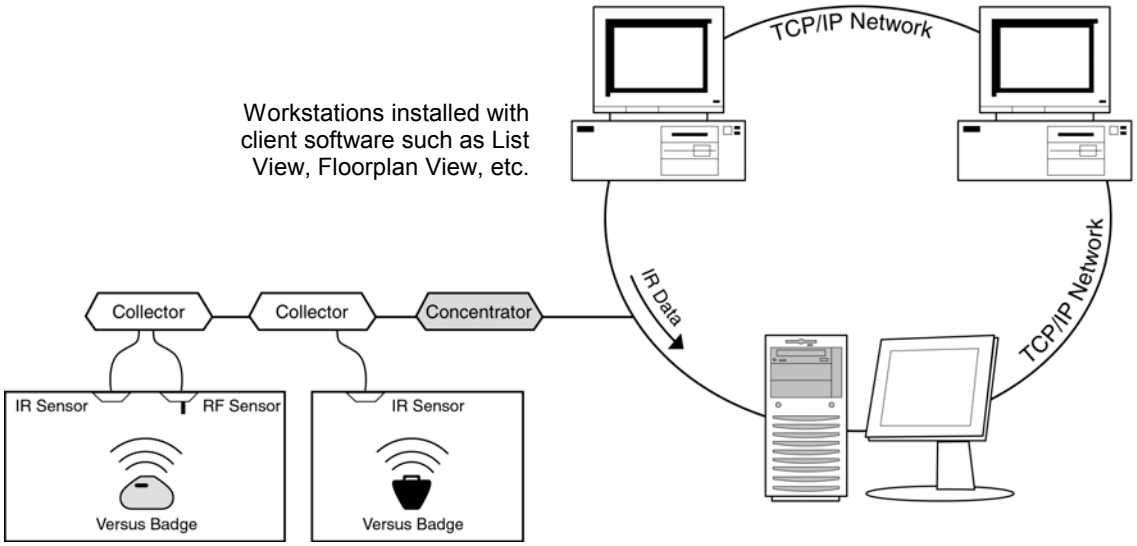
2 Ethernet Concentrators (with 4 collectors each) @ 4 kbit/sec each	8 kbits/sec
1 Host/Data Server	4 kbits/sec
6 List View Clients (1 also used for reports) @ 2 kbit/sec each	12 kbits/sec
Total bandwidth required	**24 kbits/sec**

This estimate shows that the Versus Information System should have very minimal impact on existing infrastructure. The above estimate is based on personnel tracking applications; in most equipment tracking applications, the actual bandwidth requirements should be less.

2. System Description

The Versus Information System is a reliable, flexible platform for locating personnel and equipment. The system badges, worn by staff or attached to assets, emit signals that contain information about the badge. The information is sent through the sensory network to a host computer that retrieves the information and translates the data into names of rooms, personnel, and equipment. Workstations throughout the facility can access the location data with various client software programs, which can display current locations of personnel and equipment, display alarms on the monitor, send pager messages, and store data for later use in reports.

System Structure



2.1 Infrared (IR) Tracking

The use of infrared (IR) signals for tracking has distinct advantages, since it allows accurate locating using signals that will not penetrate walls or floors. A system of strategically placed sensors receives IR signals as badges move between rooms of a building.

2.2 Radio Frequency (RF) Signals

In addition to the IR signal, a low-power radio frequency (RF) signal is incorporated into some badges. RF signals penetrate walls and ceilings, allowing the RF signal to act as a backup if the IR signal is blocked. If the IR signal is blocked and an RF sensor receives the RF signal, the last known IR location of the badge is shown. RF badges and sensors can also be used for security purposes at locations where tracking assets is important.

2.3 System Hardware Components

The Versus Information System is made up of a network of badges, sensors, collectors and concentrators.

2.3.1 Badges

Badges are worn by personnel or attached to equipment. Badges send infrared (IR) or radio frequency (RF) signals to the sensors installed in each room. This signal contains encoded digital information that is used to identify and obtain the status of the badge. Motion, timing, battery state, and auxiliary information are all included in the signal.

All Versus badges that include IR technology have a unique feature that serves to extend battery life. They contain a motion-sensing device that causes the badge to transmit most frequently when in motion and gradually reduce this frequency when there is no motion.

There are several types of badges. Badges can include IR, RF, or IR and RF technology, depending on the needs of the facility. Some badges also include a button for alarm notification. Consult the badge specification sheets for more information on battery and component functions.

2.3.1.1 IR Badges

Because IR badges use near-visible light to communicate with the sensors, the signal can be hidden from the sensors by clothing or obstacles. It is important to be aware that IR badges should not be covered or hidden from view.

The Locator Badge (VER-1700)

The Locator Badge can be used for locating people or equipment. This badge is ideal for locating applications where only location is required, and communication or alert capabilities are not needed.

The Locator Badge sends infrared signals from two emitters located at the top left and right corners of the badge case. The signals are directed upward and somewhat forward at a wide angle to be received by the sensors. Better performance occurs by keeping the badge in an upright position.

- Battery type – Lithium, 3.5 volt, 750 mAH
- IR Wavelength – 875 nanometers, 447.5 KHz

2.3.1.2 IR/RF Badges

In addition to sending IR signals, IR/RF badges send radio frequency signals that are received by RF sensors.

RF signals are used in a supervisory capacity, in cases when IR signals are hidden from view, and for sending alarm or call signals triggered by pressing a button on badges that include buttons.

IR/RF Personnel Alert Badge (VER-1780)

The Personnel Alert Badge uses IR and RF technologies. It is also equipped with a call button that, when pressed, fires RF and IR signals, which can notify the system to activate a customizable, preprogrammed response.

- Battery type – 3.0 V lithium coin cell (industry type CR2477 lithium 950 mAH)
- RF Frequency – 433.9 MHz
- IR wavelength – 875 nanometers, 447.5 KHz

IR/RF Asset Tag (VER-1830 A&B)

The Asset Tag uses IR and RF technology. It is used to identify the current location of portable assets. VER-1830A has an anti-tamper feature that sends a signal to the system if the tag is removed from the asset it is attached to. VER-1830B does not have the anti-tamper feature.

- Battery type – 3.0 V lithium coin cell (industry type CR2477 lithium 950 mAH)
- RF Frequency – 433.9 MHz
- IR wavelength – 875 nanometers, 447.5 KHz

NOTE: The Asset Tag's anti-tamper and other RF functions can be hindered if the tag is affixed to metal. Must be used on non-metal surfaces or with a bracket.

2.3.1.3 RF Badges

RF/PAS Asset Tag (VER-1875)

The RF/PAS Asset Tag uses radio frequency (RF) signaling technology in combination with Versus' Perimeter Alarm Sentinel (PAS) technology to secure portable assets from unauthorized removal. The PAS component causes the tag's RF signal to send an alarm when entering a PAS zone, thereby signaling unauthorized removal of a tagged item from a specific area.

- Battery type – 3.0 V lithium coin cell (industry type CR2477 lithium 950 mAH)
- RF Frequency – 433.9 MHz

Must be used in combination with the Versus PAS Unit (VER-3500) which is installed in portal or doorway areas to create protected PAS zones. See Section 2.3.5 for a description of the PAS Unit.

NOTE: The PAS Tag's RF function can be hindered if the tag is affixed to metal. Must be used on non-metal surfaces or with a bracket.

2.3.2 Sensors

Sensors receive signals from badges, convert them into electrical signals and pass the data along to collectors. Up to 24 sensors (of which up to 4 can be RF sensors) can be connected to a Collector, although Versus recommends no more than 20-22 to allow for future expansion. Sensors are usually mounted in the ceiling tiles of a facility, or they can be placed in standard electrical junction boxes, where required by local building codes. There are four types of sensors, infrared (IR), radio frequency (RF), supervised and serial.

2.3.2.1 Infrared (IR) Sensor (VER-4422)

IR sensors receive IR signals from badges and convert them into electrical signals. A single unshielded twisted pair type wire transmits the signals to a Collector and provides the sensor's operating power.

The maximum run length from an IR sensor to a Collector is 1000 feet. IR sensors have 360-degree horizontal coverage, 180-degree vertical coverage, and up to 15 feet radius reception distance.

2.3.2.2 Radio Frequency (RF) Sensor (VER-4450)

RF sensors operate at 433.92 MHz receive frequency. They convert encoded RF signals emitted by badges into electrical signals, and send them to Collectors via a single unshielded twisted pair wire.

Note: No more than four RF sensors should be connected to any one Collector.

2.3.2.3 Supervised IR Sensor (VER-4442)

The Supervised Sensor is a VER-4422 IR sensor with the added ability to generate its own signal, allowing the VIS to monitor the data delivery to its Collector. Using one Supervised Sensor per Collector, the VIS can send an alert if a portion of the sensory network or facility intranet stops sending badge data. Requires the use of the Collector Checker software (sold with the Configuration Utilities) and Audio Visual Services software (sold separately).

2.3.2.4 IR Serial Sensor (VER-4444)

The Serial Sensor is an IR Sensor that can be attached to any PC to create a location zone. Unlike a standard IR sensor, no hardwiring is necessary. Simply attach it to a computer's serial port, install the software, and you have a permanent or temporary location for use with the VIS. The Serial Sensor's range is 16 feet in front of the sensor, and the computer it is attached to must be running in order for it to sense badges. To accomplish a greater sensing range, you may wire a standard IR sensor to the Serial Sensor to be used externally. An RF sensor may also be wired to the Serial Sensor.

2.3.3 Collector (VER-2402)

After sensors receive signals from badges and convert them to electrical signals, the data is passed to a Collector. Up to four Collectors are daisy-chained together, and then connected to a Concentrator.

Up to 24 sensors can be connected to one Collector, although Versus recommends no more than 20-22 at initial installation to allow for future expansion, possibly without having to add additional Collectors. No more than four RF sensors can be connected to one Collector. The Collector accepts the inputs from the sensors and assembles the inputs into larger, network-ready packets. The packets are then relayed to a Concentrator.

A punch-down connector block is included with the Collector. The connector block plugs directly into the 50-pin connector on the side of the Collector. Sensors connect directly to the Punch-down Block. The 24V power supply for the Collector is included, as well as mounting supplies.

2.3.4 Ethernet Concentrator (VER-2015)

Ethernet Concentrators receive all data passed through collectors, format the data, and send it to a computer as a data packet. Up to four collectors can be connected to one Ethernet Concentrator. Concentrators are connected to Collectors in a daisy-chain fashion.

2.3.5 Other Optional Hardware

Remote Station (VER-4052 without pull cord, VER-4054 with pull cord)

This small, wireless, radio frequency (RF) device can be mounted on a wall or other non-metal surface. When the button is pressed, a signal is sent to the system, notifying it to activate a customizable preprogrammed response. The button lights up when it is pressed, giving a visual cue that the signal has been sent.

The Remote Station is available with or without a pull cord. The button is available in clear, red, green or yellow. Clear is not available with light.

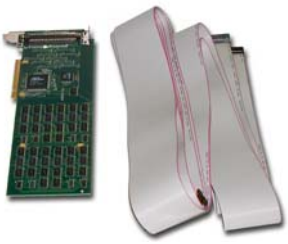
Badge Tester (VER-0004)

A Badge Tester tests the battery and auxiliary information from the badge. It will indicate whether a valid IR packet is received or if the battery needs to be replaced. If a valid IR packet is received, the tester will beep once, and the green light will illuminate. If the battery is low and needs replacing, the tester will beep twice, and the red light will illuminate.

Auto Assigner (VER-4440)

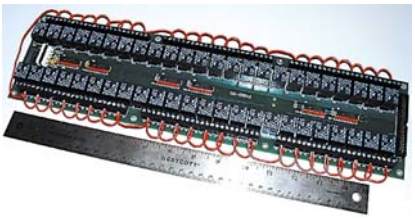
The Auto Assigner makes the badge assignment process fast and easy. By placing a Versus IR or combination IR/RF badge under the unit, the VIS Badge Wizard automatically pops up on the computer screen and fills in the badge number field without the need to manually type in each badge number during the assignment process. Requires the Event Monitor software.

Digital I/O Board (VER-3010)



The Digital I/O Board is used to control relays with the Versus system. It requires a PCI slot in the computer and room for the board, which is 12 inches in length. Up to five Digital I/O Boards can be installed in one computer, assuming there are five PCI slots available, to control up to 480 relays. Includes a ribbon cable to connect to two external relay boards. Requires at least one external relay board (VER-3015).

External Relay Board (VER-3015)



The external relay board controls up to 48 relay-controlled devices, such as corridor lights, door locks, etc. Two External Relay Boards can be connected to one Digital I/O Board. Requires Digital I/O Board (VER-3010).

Perimeter Alarm Sentinel (PAS) (VER-3500)

The PAS unit is ideal for placement at ingress and egress points. The PAS unit excites the Versus RF/PAS Asset tags to fire radio frequency signals when within range of the unit (4' – 14'). The signals are received by a nearby RF sensor and reported to the Versus Information System or the facility's access control system via a Versus Wiegand Converter.

The PAS unit plugs into a 110V electrical outlet using a 14VAC power supply that is provided with the unit. Used in combination with the RF/PAS Asset Tags (VER-1875) and RF sensors (VER-4450).

Wiegand Converter (VER-3600)

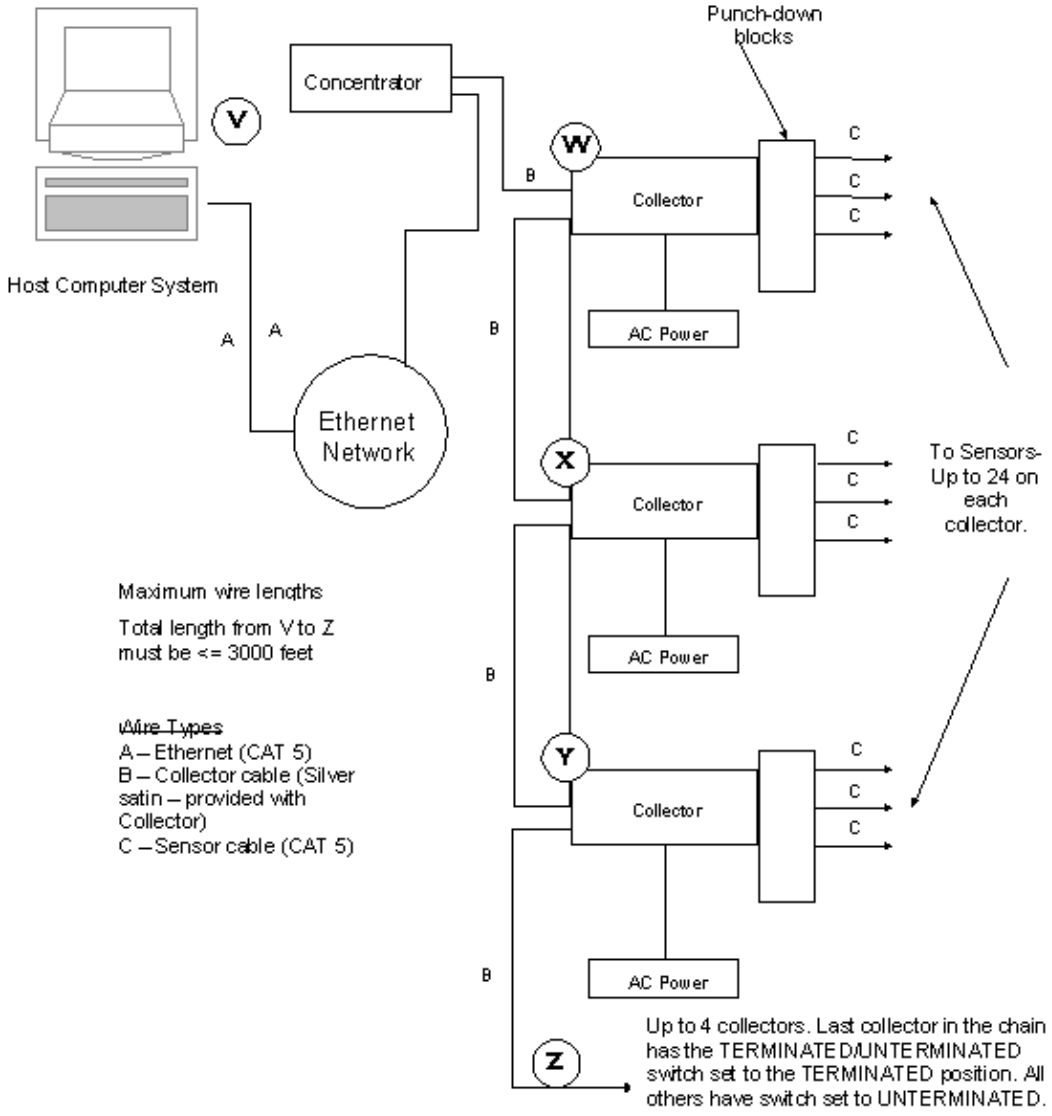
The Wiegand Converter allows the user to connect Versus infrared (IR) and/or radio frequency (RF) readers directly to any access control panel that accepts 2601 Wiegand readers. It converts the tag ID received from the Versus reader into 2601 Wiegand format and sends the tag ID to the access control panel's Wiegand reader port. The access control system can do whatever it can normally do with the information, such as send alarms, etc.

3. Planning the Installation

Planning the system design is crucial to the success of the installation. Thorough planning will make the installation go smoother, and there will be less likelihood of mistakes or oversights. When planning an installation, certain rules and limitations must be observed. The equipment has been designed to provide trouble-free operation in various environments, and adherence to the guidelines is critical for a reliable installation. The following sections will detail items that must be included in a system plan to ensure a successful installation.

The Installation Checklist, located in Section 6.4, is intended to be a record of the installation steps. Before starting the installation, fill in the checklist by referring to the contractual floorplan schematic for the quantities and numbers of zones and other components for the specific installation. The Punch-down Block Organization List in Section 6.5 will also be used during the planning stages of the installation.

General System Hardware Configuration



3.1 General Steps for Installing a Versus System

Use this checklist as a guideline for the installation steps. Each step refers to the place in the manual where there is detailed information on how to perform the step. When planning and performing the installation, it is important to keep good documentation, especially by using the **Punch-down Block Organization List** in Section 6.5. Keeping good documentation keeps the installation more organized, as well as assisting with configuring the software.

General Hardware Installation Steps

	Procedure Step	Where to find additional information
	1. Plan the installation. a. Layout the floor plans, mapping the sensor locations with an identification scheme. Map the Remote Station and Corridor Light locations as well, if the system includes them b. Plan communication room or specified area for collector and concentrator locations	Hardware and Wiring Installation Guide, Section 3.
	2. Pull sensor and collector cables, making sure to label both wire ends. Pull Corridor Light cables, if the system includes them	Hardware and Wiring Installation Guide, Section 4.1
	3. Install sensors	Hardware and Wiring Installation Guide, Section 4.2
	4. Install concentrators, collectors and punch-down Blocks	Hardware and Wiring Installation Guide, Section 4.3
	5. Connect sensor wires to collectors via the punch-down blocks • Fill in Punch-down Block Wire Organization List	Hardware and Wiring Installation Guide, Section 4.4 Section 6
	6. Test the collectors, sensors and concentrators using the Communication Room Checklist in Section 6.6	Hardware and Wiring Installation Guide, Section 4.5

Software Installation and Configuration Steps

	Procedure Step	Where to find additional information
	1. Pre-Installation Procedure: a. Computer IP address b. Note the server's computer name c. Share the C drive, Versus directory, or appropriate folders needed for software	Badge Server and Data Server Configuration Manual, Section 2
	2. Install the Concentrator Software	Badge Server and Data Server Configuration Manual, Section 3.1
	3. Assign IP addresses to the Concentrators for the network environment	Badge Server and Data Server Configuration Manual, Section 3.2
	4. Change the IP address of the server back to the original	Badge Server and Data Server Configuration Manual, Section 3.3

	5. Connect the Concentrators to the Network	Badge Server and Data Server Configuration Manual, Section 3.4
	6. Add the Concentrator Numbers to the Badge Server	Badge Server and Data Server Configuration Manual, Section 3.5.1
	7. Install the Data Server	Badge Server and Data Server Configuration Manual, Section 4.1
	8. Start the Data Server	Badge Server and Data Server Configuration Manual, Section 4.2.1
	9. Configure the Data Server	Badge Server and Data Server Configuration Manual, Section 4.2
	10. Install Configuration Utilities on Server for database configuration	Configuration Utilities Manual, Section 2
	11. Configure sensors and collectors in the Sensors and Receivers Utility a. Add room names b. Add Collectors c. Map Rooms to Collectors and Sensors, making sure to note RF sensors in the **Type** column	Configuration Utilities Manual, Section 3
	12. Add badge types in the Badge Type Utility • Add patient, caregivers, wall badges, and any other badge types needed	Configuration Utilities Manual, Section 4
	13. Test locations using **Walking Setup**	Configuration Utilities Manual, Section 3.7
	14. Set up other Configuration Utilities as needed	Configuration Utilities Manual
	15. Install client software on workstations	Individual client manuals
	16. If the system includes RF sensors, test them using the Frequencer (TCP/IP)	Hardware and Wiring Installation Guide Section 4.7 and Badge Server and Data Server Configuration Manual, Section 5.1
	17. Create Backup • Most important file to back up is the **pdcs.mdb** file	Configuration Utilities Manual, Section 13.4
	18. Verify system by checking off Punch-down Block Organization List, Relay Light List, and Communication Room checklist	Hardware and Wiring Installation Guide Section 6
	19. Final install checklist including training information	Hardware and Wiring Installation Guide, Section 6

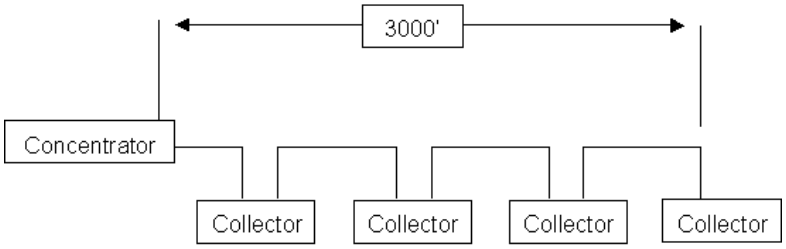
3.2 Collector and Concentrator Location Planning

When planning an installation, it is important to locate a proper place for the concentrators and collectors. Collectors should be mounted in telephone or service areas that are near the sensory networks they service. The sensor wires will run from the collectors to the various sensor locations throughout the facility. The concentrator(s) should be mounted in a location central to the collector(s) to minimize the length of collector network runs. In smaller installations, collectors and concentrators may all be located in the same place in a telephone or utility closet. The location selected should have easy access for servicing, but be secure against tampering by unauthorized personnel. Make sure the locations selected are free from extremes of heat, cold and moisture, as with any electronic equipment.

Caution: Collectors may be affected by high watt radio or paging antennas. Do not place a collector in close proximity to one of these antennas.

3.2.1 Collector Network Length Limitations

There must be no more than four collectors on any one concentrator as shown in the RS-485 loop display below. Collectors should not be placed more than 1000 feet apart. The total length of the collector network (from the Concentrator to the last Collector in the chain) must not be more than 3000 feet.

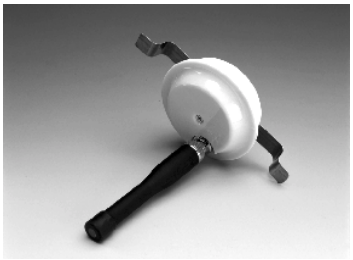


3.3 Sensor Location Planning

One of the most important steps in an installation is planning the sensor locations. A complete understanding of sensors and badges is very helpful in designing an effective system. There are several things to consider when planning the sensor locations.

IR Sensor

RF Sensor



3.3.1 Sensor Connection Length Limitations

The sensor wire runs can be up to 1000 feet in length from the Collector to the sensor. If the environment is known to be electrically "noisy," consider shorter line lengths for stronger signals and immunity to interference.

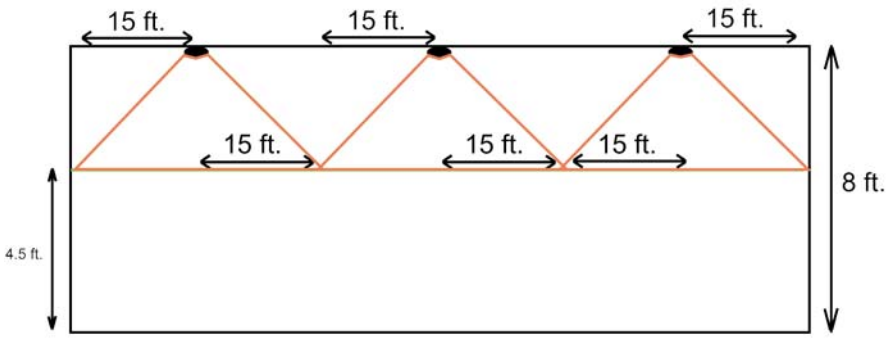
3.3.2 Infrared (IR) Sensor Location Planning

Several factors will determine where you install IR sensors, including the sensors' field-of-view, effective or overlapping coverage, and possible interference from sunlight, plasma screens, lighting and EMI noise.

3.3.2.1 IR Sensor "field-of-view"

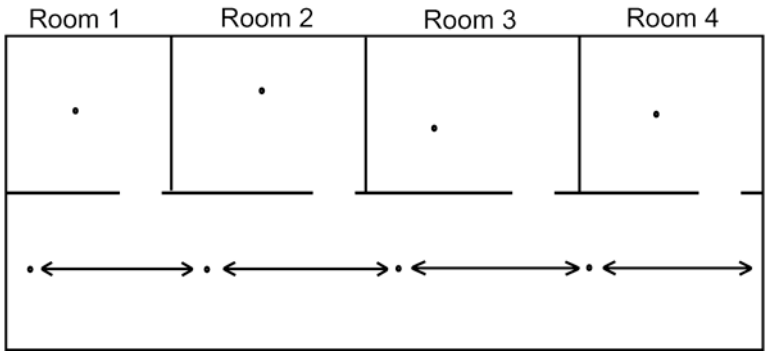
If an IR sensor is placed in a room with obstacles and reflections eliminated, the field of view of the sensor appears in the shape of six overlapping lobes forming a 15-foot radius.

The 30-foot diameter cone of coverage was determined based on the sensor being placed in an 8 foot ceiling and the badge being approximately 4.5 feet off the ground.



An IR sensor "sees" the environment under it in a largely predictable pattern. However, there are factors that can affect this field of view. The sensor is like an eye, which is sensitive only to a narrow spectrum of light, and the signals from a badge appear as a bright splash in an otherwise dark world to the sensor. Even if the badge is blocked from the view of a sensor, it can often be detected. The infrared light from a badge does not penetrate solid objects or bend around corners, but it does reflect off surfaces. This can sometimes be mistaken for "seeing around corners." The effect of reflection can be used to advantage by the system designer, but can also pose problems if the installer is unaware of it. Sensors have a given field of view when obstacles are not present, but the field of view of an installed sensor will vary due to room configurations.

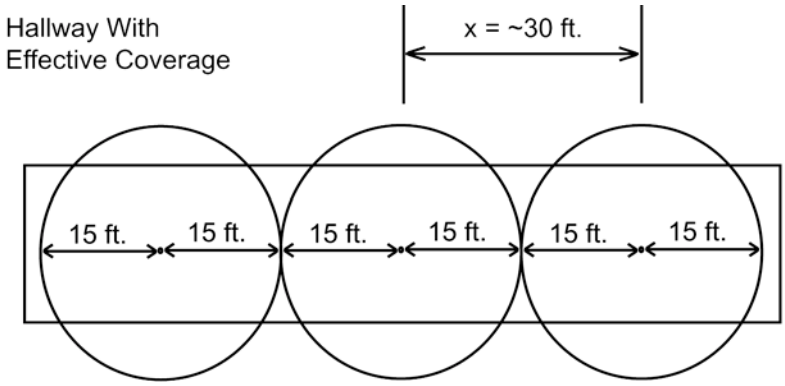
A sensor may have a field of view that extends out of the designated area through a doorway or passage. This can cause badges to be detected incorrectly and reported to be in the room when only passing by. Place sensors near the middle of rooms, but offset from doors or entryways to prevent false detection. The position of a sensor can limit its view by placing it in a location where existing obstacles will block any unwanted sensor view.



Due to the line-of-sight nature of the infrared light created by the ID badges, it is also possible to apply masking to the sensor to limit or control the field of view by opening the sensor case and placing electrical tape over the receiver "eye" whose field of view needs to be blocked. However, proper placement is always the preferred method for controlling, rather than eliminating, sensor field of view.

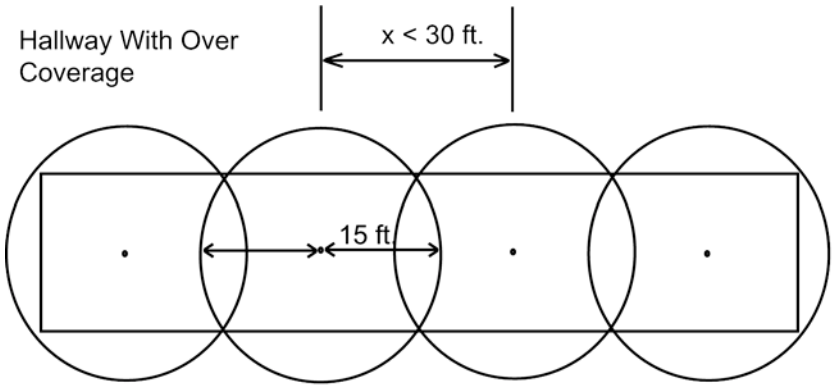
3.3.2.2 Effective coverage of rooms

A single sensor placed near the middle of the ceiling can usually effectively cover an office or meeting room. A single sensor generally covers offices or rooms as large as approximately 30 feet square. The sensor should be located so that it has the best possible view of the room. If the room is very large or has a complex shape and no single sensor position will provide adequate coverage, multiple sensors will be needed. For effective coverage, place sensors approximately 30 feet apart.



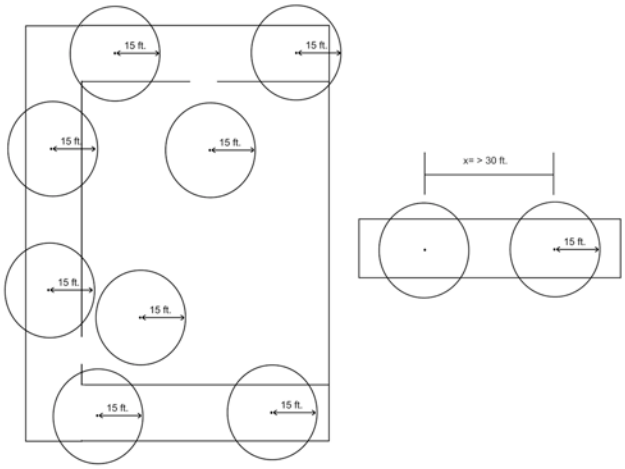
3.3.2.3 Overlapping Sensors

Sensor overlap occurs when two (or more) sensors are placed so that their fields of view overlap. This will cause some indecision in the system if both sensors see a badge at the same time. The software will not change the location of a badge when it is in an overlap area unless the option to send duplicate hits is selected in the Badge Server software. If the option is selected, a badge may appear to bounce back and forth as long as it is in an overlap condition. This increases the traffic on the system and it is not recommended that the option be selected.



3.3.2.4 Sensor Spacing Coverage

A technique for spacing sensors more then 30 feet apart may be effective for long hallways and for big rooms. This technique is primarily used for equipment tracking applications. The technique uses the idea that when a tag enters a location zone, it is there until it leaves that location zone. The VIS system can map many sensors to the same location zone (see the example sensor layout below for sensor spacing greater then 30 feet). The sensor spacing is critical for knowing where the tag is located. You will see areas in the hallways and in the big room where there is no sensor coverage. However, the system layout was designed to pick up the badge as it enters and leaves location zone areas.



3.3.2.5 Sunlight Interference

If a room has windows that allow a large amount of sunlight to enter the room, place the sensor in a position where the sunlight does not hit it directly or reflect into it from objects in the room. Sunlight can decrease sensor range and field of view if allowed to enter the sensor. Window tint films that block infrared (heat) energy greatly reduce this effect.

3.3.2.6 Plasma Screen IR Interference

The VIS locating system utilizes infrared (IR) light with a wavelength of approximately 880 nanometers. Versus IR sensors “read” IR badge signatures by detecting digitized IR light

pulses produced by the badge.

Large plasma computer displays (such as the NEC 42MP2) emit large quantities of IR, including IR light in the 880-nanometer wavelength. Like visible light, these inadvertent emissions bounce off any reflective surfaces such as walls, floors, doors, etc., effectively "flooding" the immediate area with 880-nanometer IR light.

Much like attempting to read white print on white paper, distinguishing the low-power IR light of the VIS badge from intense background IR light becomes impossible in such an environment.

Versus recommends that IR sensors not be installed in proximity to plasma screens. Because the emissions vary greatly depending on the size and manufacturer of these displays, Versus recommends allowing excess sensor wire and then testing the effectiveness of any sensors to be installed near one of these displays prior to permanently mounting the sensor in the ceiling.

3.3.2.7 IR Sensor Interference From Nearby Lighting or EMI Noise

System performance can be adversely affected by;

1. Light that is aimed directly into the sensor.
2. EMI noise emitted by nearby electrical fixtures.
3. Light fixtures that hang below the sensor and shine directly up into the sensor.

Symptoms of sensor interference are:

1. A voltage drop below 15.5 volts.
2. Badges that are not picked up by the sensor or only picked up intermittently.

Do not mount sensors near lights or electrical fixtures unless absolutely necessary. If the performance of an IR sensor is in question, move the sensor as far away from any nearby lights or electrical fixtures as is practical. If the light fixtures are causing problems, try mounting the sensors off the ends of the fixtures if you can't move them fair enough away.

To avoid problems with light interference:

If sensors must be mounted near lights;

1. Mount sensor as far from the light as possible
2. Mount sensor so that the light does not have a direct path into the sensor "eyes."
3. As a last resort, mask the eyes of the sensor that are receiving the direct light, using electrical tape. (Caution: this disables the sensor operation in that direction).
4. Mount sensors so that light fixture is not below the sensors.

To avoid problems with EMI noise:

1. Do not mount IR sensors near suspect fixtures.
2. Do not run sensor connection cables near suspect fixtures.

3.3.3 RF Sensor Location Planning

Planning the location of RF sensors depends upon the facility. In most cases, for complete coverage, they can be placed approximately 100 feet apart, because they have a sensitivity range radius of approximately 50 feet. However, because concrete and steel structures absorb the RF signal, and other materials affect the strength of RF signals, testing is necessary to determine the best placement of RF sensors. When possible, avoid placing RF sensors in areas with an overabundance of electrical devices, such as in a room with many computers.

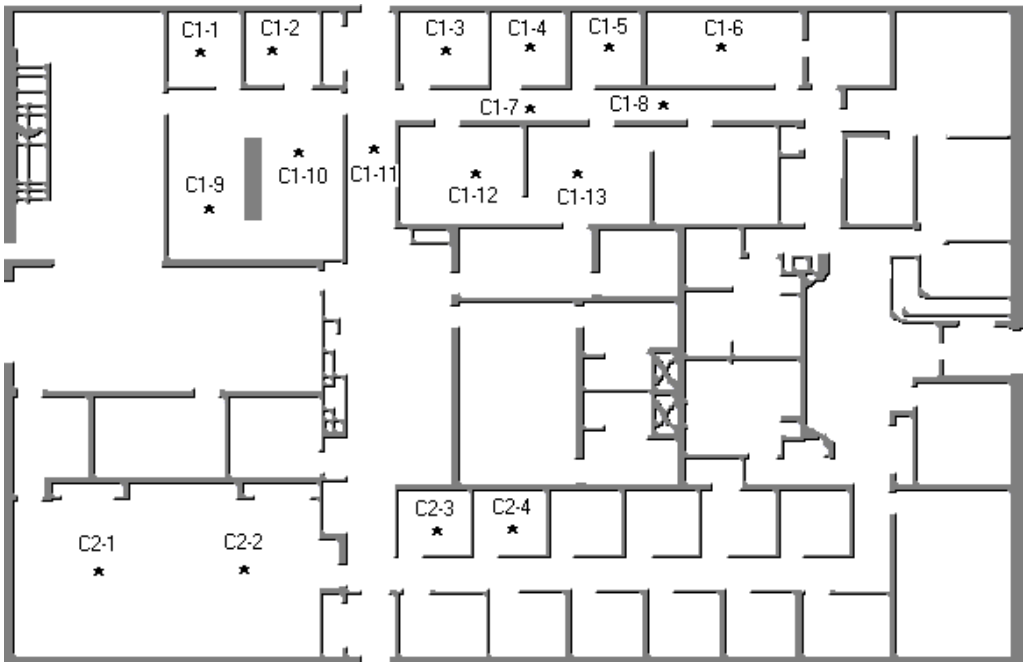
In multi-floor facilities, it is desirable to stagger locations. For example, to achieve better coverage, do not place the sensor on the third floor directly above the sensor on the second floor.

If using the VIS to track assets with the Asset Tag (VER-1830) or RF/PAS Tag (VER-1875), the required placement of these tags may affect the number of RF sensors needed to achieve effective coverage. If the tags must be placed near a metal surface or are offset from a metal surface by a bracket, the RF signal emitted may be reduced in strength due to absorption by the metal. In these cases, more RF sensors may be needed to compensate for the lack of RF signal. If you plan to mount Asset or PAS tags near a metal surface, contact Versus Technology for more information on appropriate RF coverage.

Important: Each Collector should have no more than four RF sensors connected to it.

3.3.4 Mapping the Sensor Locations on the Floorplan

The sensor locations should be mapped out on a floorplan diagram of the facility. These are the locations where the sensor cable will be run. We suggest using a numbering scheme such as C1-1, C1-2, C1-3, C2-1, C2-2, C2-3 etc., where "C1" represents Collector 1 and "C2" represents Collector 2. Up to 24 sensors can be connected to one collector, although we recommend 20-22 to allow for future expansion. The wires should be labeled at both ends with these numbers as well.



The facility must provide a list with the names of the rooms. The room names will be used for configuring software. Once the sensors have been mapped with identification numbers, and the facility has provided a list of names of the rooms, complete the Punch-down Block Organization Chart (located in Section 6.5) with the number and the room name. You should also add the receiver numbers, which will be used for configuring the software. Number the receivers with incrementing numbers (1, 2, 3…). If there is more than one IR sensor in a particular area, they may be assigned the same receiver number if you choose, but it is not necessary. Under normal circumstances, do not assign an RF sensor and an IR sensor the same receiver number unless you are using the PAS system (contact Versus for more information). When assigning RF sensors, Versus recommends adding an RF designation to the description. See the following example chart.

Building: Main Facility

Punch-down Block Wire Organization List

Floor: 1st

Collector #: 3265458142

Room #: Comm. Room 1

Collector alias: C1

Punch-down block pair	Cable ID	Wire Color	Zone description (room name)	Receiver/ Room #	Relay #	Verified
1	C1-1		John's Office	1		
2	C1-2		Bob's Office	2		
3	C1-3		Patient Room 120	3	0,1,2,3	
4	C1-4		Patient Room 122	4	4,5,6,7	
5	C1-5		Patient Room 124	5	8,9,10,11	
6	C1-6		Patient Room 125	6	12,13,14,15	
7	C1-7		Hallway	**7**		
8	C1-8		Hallway	**7**		
9	C1-9		Nurse's Station	**8**		
10	C1-10		Nurse's Station	**8**		
11	C1-11		RF Nurse Station	9		
12	C1-12					
13	C1-13					
14	C1-14					
15	C1-15					
16	C1-16					
17	C1-17					
18	C1-18					
19	C1-19					
20	C1-20					
21	C1-21					
22	C1-22					
23	C1-23					
24	C1-24					

If there is more than 1 IR sensor in a room or area, you can give them the same receiver number, but unless you are using the PAS system, do not assign an RF and IR sensor the same receiver number.

A copy of this chart is located in Section 6.5 and can be printed for your use. Use one chart for each collector on the system. Each successive chart should have room/receiver numbers starting with the next incremental number from where the previous chart left off. Using this chart will assist you with labeling cable wires appropriately.

3.3.5 Mapping the Relay Device Locations

If the system includes relay-controlled devices, such as corridor lights or door locks, they should be mapped out on the floor plan of the facility. We suggest a numbering scheme such as R1-1, R1-2, R1-3, etc. Label each end of the wires to the relay-controlled devices with the same numbers. In addition, you will need to document the relay numbers and relay cable IDs on the Punch-down Block Organization List located in Section 6.5. For each room on the list that will have a corridor light installed, enter its numerical position on the relay board, starting at 0. In addition, there is a Relay Board Organization List in Section 6.8 for mapping the relay board with the appropriate room names and light colors. When you connect the relay wires to the relay board, you will need to refer to the list and connect them accordingly. The two-page form has numbers 0-47 on the first page and 48-95 on the second representing two relay boards with 48 relays each. Use one two-page form for each relay controller board.

Assign an ID number to the relay boards. All the relay boards connected to one computer will have the same number. We suggest a small label on the relay board with a number, such as 5000 for all relay boards connected to the first computer, 5001 for all the relay boards connected to the second computer, etc. The actual number assigned is not important, but the number will be used later when configuring the software. Write this number on the Relay Board Organization List in Section 6.8 for reference when configuring the software.

3.4 Use of Unauthorized Components

The VIS system integrates hardware and software to create a safe, reliable and efficient system. Use of components or connection to equipment not approved by the manufacturer is NOT recommended and will invalidate all warranties.

Approved third-party components include wire and connectors, terminal blocks, and other interconnection means only. Questions regarding the use of third-party equipment or components should be directed to your dealer for clarification before being connected to your system.

3.5 List of Recommended Tools

Some installation activities require special tools. Following is a list of recommended tools.

Cable Stripper	
Cordless Drill	
Diagonal Clippers	
Digital Multi-Meter	
Electric Screw Driver	
Ethernet Supplies	
Fishtape	
Hole Saw 2 3/8” Drill Attachment	
Level	
Mounting Screws	
Nut Drivers	
Punch-down Block Tool-Type 66 or Bix, whichever is appropriate	
RJ-45 Testers	
RJ Connector Terminator Tool Kit	
Scissors	
Screwdriver Assortment	
Splice Crimp Tool	
Small Hammer	
Electrical Tape	
Tape Measure	
Twist Ties	
Utility Knife	
UY Connectors	
Vise Grip Pliers	
Walkie Talkies (helpful for testing sensors)	

Weidmeuller Patch Check Plus	
Wire Strippers	

3.6 Safety and Code Considerations

Safety procedures and adherence to local building codes are the responsibility of the system installer. Versus products have been designed to be safe and reliable under the conditions in which they are intended to be used. The following sections detail those aspects of the system that might affect safety.

3.6.1 Equipment Handling

The components used in a typical installation contain internal circuits that are sensitive to static electricity. Static electricity transported by the human body may be strong enough to damage internal circuitry during installation. These components do not normally have exposed connector pins, but if handling with exposed connectors or pins is required, the installer should use an anti-static wristband connected to an electrical ground. This is especially important when temporarily disconnecting and reconnecting cables. The badges are the only system components that people can come in direct contact with. Therefore, cleaning the badges after each use is recommended. A badge should be thoroughly cleaned after each use, and wiped down with a disinfectant. The disinfectant should be alcohol-based, not water-based. Do not immerse or autoclave badges.

Warning:

Avoid touching bare contacts or connector pins when handling system components in order to prevent the accidental transfer of static to internal devices. Leave protective covers attached during installation.

3.6.2 Power Requirements

The components obtain low-voltage operating power from a local wall mounted “plug-in” transformer. Transformers provided with the systems are Underwriter Laboratory (UL) approved. No components use 120V AC line power directly, except the computer systems.

Warning:

Do not attempt to connect or disconnect concentrators, collectors, sensors, or any other system components with power applied. The hardware may be damaged. Although damage will not occur in most cases, this practice is not recommended and may void equipment warranties. Use of powering schemes not approved by the manufacturer will void equipment warranties.

As with any electrical equipment, safety is a prime concern. The system poses no safety hazard, since it uses only low-voltage DC power. However, installers must take adequate precautions to ensure that the low-voltage wires are not exposed to high-voltage electrical wires, and that wires run through ceilings and walls do not encounter dangerous electrical potentials and carry them to points where they might be exposed to human contact.

No powering device other than the plug-in units provided should be connected to the system without prior authorization from the manufacturer.

3.6.3 Grounding of Equipment

All points in a system installation are connected to a common "ground" via their interconnect wires. No attempt should be made to provide any additional earth ground or neutral connections to any sensor or collector. Adding ground connections to multiple points in a networked system may introduce electrical system noises that will interfere with normal system operation. Consult the manufacturer if special grounding requirements must be met.

CAUTION: Allowing sensor or network conductors to encounter metal surfaces and structures, or allowing wires to be routed in close proximity to high-powered equipment or devices will introduce electrical interference and may cause erratic operation and/or equipment failure.

EXCEPTION: For interference on the collector cable, **see Section 4.5.4.1 for more information on making the CAT 5 cable.**

3.6.4 Codes and Ratings of Materials Used

The materials used in the construction of individual components meet or exceed UL fire retarding requirements. However, not all these devices are rated for air plenum use. They are intended for utility closet mounting and must not be placed in airways or plenum areas, unless they can be housed in approved enclosures and sealed to meet local codes.

Installers must be aware of local fire and health codes in their selection of interconnect wiring. Plenum-rated wire and cable must be used where it will pass through breathable air spaces. Wire and cable rated for plenum use will be clearly marked. For information regarding plenum cabling, call Versus Technology, Inc. Manufacturing Department.

3.6.5 Workmanship

The following standards of workmanship must be followed during installation:

- National and local building codes must be followed.
- Tools used must be as recommended by the manufacturer, or approved equivalents.
- Connections must be made with manufacturer's recommended tools and procedures.
- Conductors must not be nicked nor wire strands cut during wire stripping.
- Wire bundles must be neatly dressed.
- Wire bundles must be spaced away from power cables and lighting.

4. System Hardware Installation

This section covers the installation of the system components. Before installing the hardware components, all planning should be completed as described in Section 3.

For instructions on installing relay boards or corridor lights, refer to Sections 4.8 and 4.9.

4.1 Cable Installation

When installing sensor and network wiring, use normal telephone installation techniques. Sensor wire runs should allow sufficient length to move ceiling tiles and to move sensors if needed.

It is the responsibility of the installer to run all cables as indicated on the floor plan schematic diagram. Each cable must be labeled at both ends with the identification of the end device to which it is connected. Use the same numbering scheme for sensors as described in the previous section, referring to the Punch-down Block Organization List (C1-1, C1-2, C1-3, etc.). Label collector cables with the identification of the collector that it runs to down the collector chain, away from the Concentrator.

4.1.1 Cable Types

Versus Technology recommends the following cable types for installing hardware components:

Sensor Cable	UTP CAT 3 is acceptable, Versus recommends CAT 5
Collector Cable	Versus provides a silver satin cable to daisy-chain Collectors and connect the last Collector to the Concentrator. If longer distance is needed between Collectors, or if Collectors are in proximity to high electrical interference, CAT 5 cable is needed. See Section 4.5.4.1 for more information on making the CAT 5 cable.
Ethernet Cable	CAT 5

Approved equivalent cable types may be used.

4.2 Sensor Installation

Handle the sensors with care to not scratch or damage the casing.

Warning:

Always disconnect power from the system before connecting or disconnecting components. Failure to do so may damage the equipment.

The UTP wire runs from the punch-down/collector to a sensor mounted in ceiling tile. Only a single pair of wire is required for each sensor. No grounding at the sensor is required.

Sensor installation calls for use of a splice connector at the sensor end of the cable run. Sensor wires have no polarity and can be connected to sensor wire-pairs in either order. In the case of two-pair UTP cable, the same pair must be used at each end of the sensor run. It is suggested that blue wire be used for consistency. Up to four sensors may be used on each CAT 5 cable if preferred, although using one cable per sensor makes troubleshooting easier.

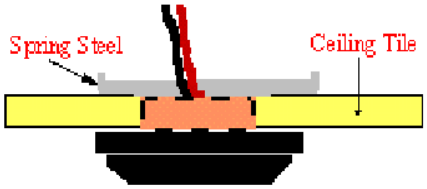
To install and wire sensors:

1. Referring to the floor plan schematic diagram, identify sensor locations and verify identification numbers.

2. Create a hole for the sensor in ceiling tile or ceiling surface using a 2-3/8" hole saw.

3. Pull the sensor cable wire-pair through the hole and connect to the sensor using UY splice connectors.

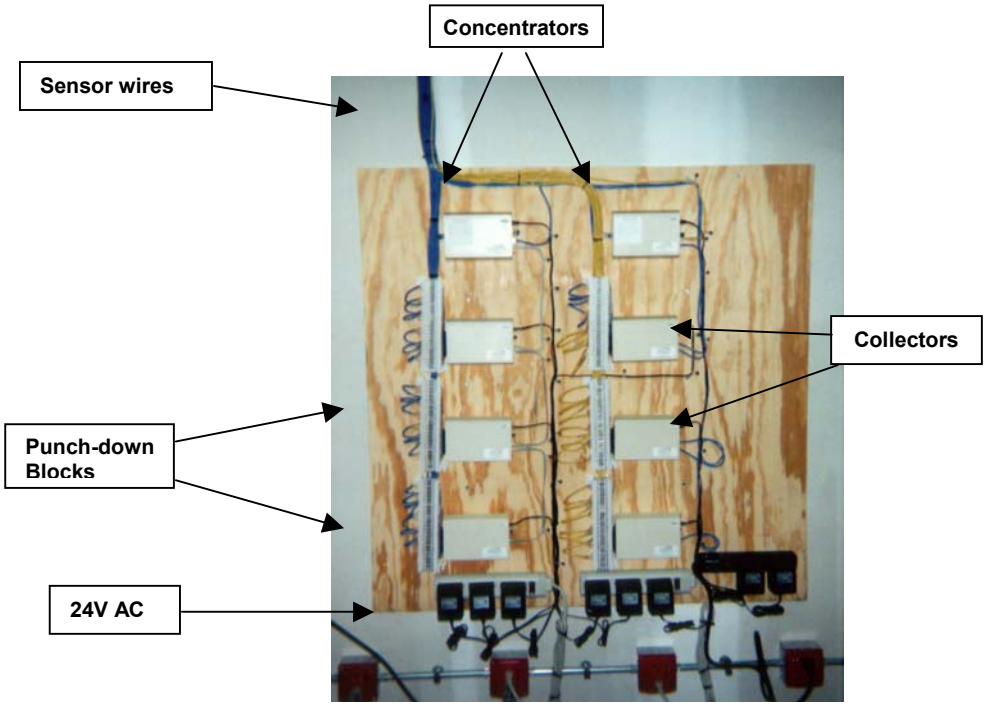
4. Gently bend the spring steel clips upward and insert the sensor into the ceiling tile hole. The steel clips and the sensor cover will “sandwich” the ceiling tile and hold securely.



5. Mark the sensor as installed on the floor plan diagram or Punch-down Block Wire Organization List.

4.3 Collector and Concentrator Installation

An example of neatly installed punch-down blocks, collectors, and concentrators.



The punch-down blocks, collectors, and concentrators should be installed in a secure location, such as a communication or server room. The installation should allow for wiring access, neat

wire routing and dress, and connection of any sensor wire-pair to any collector input. Neat and orderly punch-down blocks are easier to troubleshoot and maintain.

To install the Collectors and Punch-down Blocks

Note: Make sure power is not supplied when connecting components.

1. Mount the punch-down block on the wall using appropriate wall-mount hardware.

2. Mount the collector adjacent and connected to the associated punch-down block, using the Velcro tape and clip provided with the unit. When using Velcro tape to secure a collector unit, make sure the solid metal end clip is firmly secure to prevent sagging of the connection between the collector and punch-down block.

To install the Concentrator(s)

The Concentrator is a “table-top” box assembly, which can sit on a level surface or be mounted on any flat surface with mounting clips. Mount all concentrators as indicated on the floor plan schematic diagram.

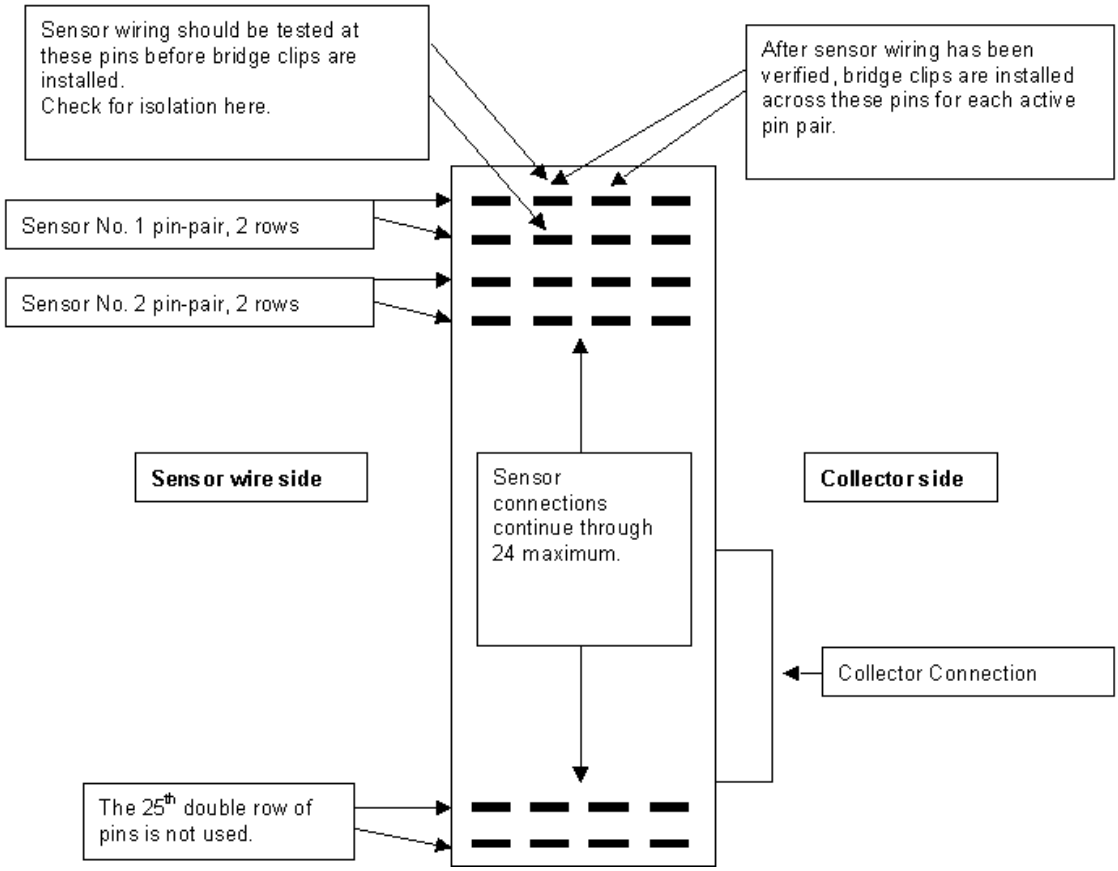
4.4 Connecting Sensors to Collectors

Sensors are connected to the collectors through punch-down blocks. The punch-down block is organized so that each two punch-down block rows, starting at the top left of the block, are one collector port that is connected to by one sensor.

Bridge-clips are used to connect left-side pins to the right-side pins, which are wired to the collector unit. If patching of sensor inputs is required, jumpers can be used from any sensor wire-pair on the left to any collector wire-pair on the right.

Make sure power is not supplied when connecting components.

Punch-down Block



To connect the sensors to the punch-down block:

Note: Connect no more than four **RF** sensors to a Collector. Up to 24 sensors total can be connected to a Collector.

For connecting the sensor wires to the punch-down block, refer to the Punch-down Block Organization Chart for the location each wire should be connected on the block.

1. Remove all bridge clips from the punch-down block.

2. Referring to the Punch-down Block Organization List to make sure each sensor wire is connected to the correct position on the punch-down block, connect the sensor wire-pairs to the appropriate punch-down block pin-pair positions using the punch-down block tool.

3. Check isolation.

   This is necessary because in the course of interconnecting many sensors to a collector, it is not uncommon to make contact with a sharp metal edge, ganged knockout box, or electrical ground with one of the conductors. It is critical, however, that such accidental connections be located and cleared before applying power to the system. The effect of these accidental connections can range from mild to severe. In

many cases, erratic behavior may be noted. In some cases, equipment damage may occur. In any case, an electrical code violation has occurred.

To verify that the system is "isolated" from building and electrical grounds:

Note: It may be helpful to disconnect the collector from the punch-down block while this measurement is made. This will isolate the sensor wiring completely.

a) Use an ohmmeter or multimeter set to the 2K (2000)-ohm scale.

b) Clip one probe to the nearest electrical conduit or electrical ground.

c) Touch the other probe to each punch-down block row in turn.

d) Every row MUST indicate an infinite (open) connection. If this is not the case, the suspect line must be traced to find the accidental connection to the structure that has been made.

4. Once isolation has been checked, replace the bridge clips on the punch-down block.

4.5 Communication Room Check

There are several items that need to be verified before applying power to the system. Use the Communication Room Checklist in Section 6.6 to check off each step as it is completed.

4.5.1 Checking the Collector Wiring

A visual check of the collector wiring should find the punch-down block secure and the collector unit connector firmly seated against the punch-down block connector. See the Collector Voltage Troubleshooting Flow Chart in Section 5.2 for checking the collector wiring.

Caution: Always test all wiring before connection of system power sources.

The collector network (2-pair) must be tested before the system power is applied to be sure that wires are not misconnected. Failure to thoroughly test the collector network wiring may result in equipment damage.

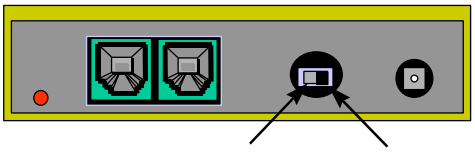
The concentrator and collector devices connect to the 2-pair wiring system using modular interfaces to allow for easy testing of the wiring before power is applied. It is recommended that installers be equipped with appropriate USOC cable testers as required to verify the installed wiring.

Note that 3-pair USOC interconnections may also be used. In this case, the third pair (outermost) is used in parallel with the second pair to improve power distribution to the collectors.

4.5.2 Terminating the Last Collector

The Collectors on the Versus Information System are connected by wires run from unit to unit in a daisy-chain fashion and carry high speed digital data to the Concentrators. It is critical that the electrical energy running through the Collector wires is absorbed at the end and does not "bounce back" down the wire and cause interference with other data coming through. To absorb the energy, the wire must be ended with a resistor on the last Collector in the chain, terminating the transmission of data.

Two models of the Collector exist, each with a different method of termination. The old style collectors are equipped with a switch that must be turned to the **Terminated** position on the last Collector in the daisy-chain, as shown below.



It is very important that the collectors which are NOT at the end of the line have this switch set to the UNTERMINATED position, and that the collector which is at the end of the line has this switch set to the TERMINATED position.

The new style Collectors are considered unterminated until a termination shunt is placed in one of the two jacks on the unit. A termination shunt is shipped with each Collector, but only those at the end of the daisy-chain will need to be terminated.

Termination Shunt

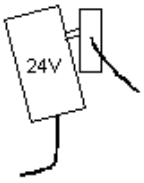
Unterminated Collector

Terminated Collector

4.5.3 Testing Sensor Voltage

Collectors are included with a 24V power supply that must be used for each collector, providing local operating power. No other power supply is adequate to power collectors. To ensure the power supplies do not pull out by their own weight, either mount the power strip outlet side up or use wire ties to hold the power supply in place.

Power supply may become disconnected if power strip is mounted sideways.



Use wire ties to hold the power supply in place.

When the collector wiring and isolation have been verified, and the cable connection between the concentrator and the collector has been tested and found correct, the next step is to apply power to the collector and check the sensor connections for the correct voltages.

► To test sensor voltage

Once power has been applied to the collector, a voltmeter check should be made of the sensors on the punch-down block to verify that they are connected correctly.

1. Set the voltmeter or multimeter to a 20-volt range.

2. Apply the probes to each sensor connection on the punch-down block.

If the reading is:	For: (Sensor type)	Then:
Approximately 16 volts	IR	The sensor is wired correctly.
Approximately 18 volts	RF	The sensor is wired correctly.
<14 volts	IR and RF	There is radio frequency or electromagnetic interference.
Approximately 20 volts	IR and RF	There is no sensor connected to this pair or the wiring to the sensor is open.
Very low or zero	IR and RF	The sensor pair is shorted. (The 25th pair on the punch-down block is unused and will read zero volts.)

When the voltmeter is applied to a sensor pair, a slight drop in voltage can be observed when the sensor is receiving a transmitting ID badge.

3. Check RF interference by switching the meter to the AC scale and reading the voltage. With no badge transmitting over the sensor there should be < 0.1 VAC on a sensor pair.

Caution!

A shorted sensor pair will not cause immediate damage to the collector. However, if allowed to remain, some heating of collector components will occur, which is undesirable. If shorted pairs are found in the sensor voltage test, remove the collector power and resolve the short as soon as possible. If the system must be powered with the short unresolved, remove the punch-down block bridging clips to disable the disruptive sensor until the wiring can be repaired.

4.5.4 Connecting Collectors and Concentrators

There are two parallel RJ receptacles on each collector. This allows collectors to be chained together from the concentrator to the last collector in the chain.

With each Collector, Versus provides a silver satin cable with an RJ-12 modular jack (6 wire) to daisy chain Collectors and connect the last Collector to the Concentrator. If longer distance is needed between Collectors, or if Collectors are in proximity to high electrical interference, CAT 5 cable is needed.

4.5.4.1 Making a Collector Wire if CAT 5 Cable is Needed

If the silver satin cables included with the Collectors cannot be used due to the distance between the Collectors or because of possible high electrical interference, connector cables will need to be made with CAT 5 cable. Cables should be tested prior to applying power. It is recommended that installers are equipped with appropriate cable testers to verify the wiring.

A key indication of connector problems with the collector cable is the red indicator light on the collectors, which may indicate a short circuit. The red light will flash every time it sees a badge fire. A constant pattern of four or five flashes may indicate there is a problem with the connectors on the cable.

To wire collectors

Note: Do not make any connections to components unless indicated by a step in the procedure. Ensure that all bridge clips have been removed from the selected punch-down block/collector unit.

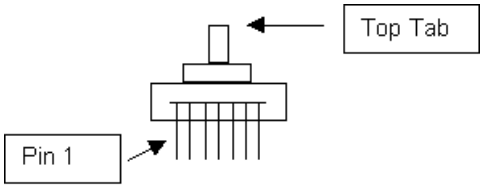
1. Refer to the contractual floor plan schematic diagram and identify the collector and concentrator locations.

2. Attach an RJ connector to each end of the collector cable, as shown below.

Collector RJ-12 Plug Wire Colors:

Plug Pin No.	CAT 5 Wire Color	Descriptio	Voltage
1	NOT USED		
2	NOT USED		
3	White/Blue	Data (+)	0-5 VDC
4	Blue	Data (-)	0-5 VDC
5	White/Orange	Ground	0 VDC
6	Orange	Ground	0 VDC

Note: With connector pins pointing toward you, cable away from you, pin 1 is to the left.



3. Using the Weidmeuller Patch Check Plus test set or an equivalent model, perform the following steps to verify straight through continuity for each collector cable run:

   a) Plug one end of the cable into the receiver unit of the test set.

   b) Set the reset switch on the receiver unit to the “On” position.

   c) Plug the other end of the cable into the Transmitter unit of the test set.

d) Set the reset switch on the transmitter unit to the “On” position. All the red LEDs will light followed by an audible squawk tone.

e) Touch the TEST button on the transmitter. After a short delay, the transmit #1 LED will light with the corresponding #1 LED on the receiver scale.

f) Touch the TEST button again to light the transmit #2 LED with its corresponding receiver #2 LED.

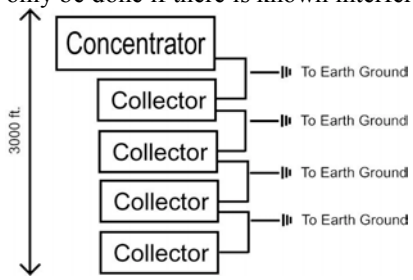
g) Repeat this process until all conductors in the cable have been verified for continuity.

4. For each collector perform the following:

a) For the collectors identified on the contractual floor plan schematic diagram as LAST, set the UNTERMINATED/TERMINATED switch to the TERMINATED position. For all other collectors, set the switch to UNTERMINATED.

b) Insert the RJ plug(s) into the collector receptacle(s) (either collector receptacle is acceptable).

In case of interference problems with the collector cable over a long distance, it may be necessary to ground the cable to an earth ground. You will need to use a shielded CAT 5 cable between the interference points. Depending upon interference, the collector wire should be grounded to an earth ground. This should only be done if there is known interference on the collector cable.



4.5.5 Network Wiring for Ethernet Concentrators

The computer should be equipped with an appropriate network card for connecting to the Ethernet Concentrator(s).

The Ethernet Concentrator requires CAT 5 four-pair UTP cable runs between the network card in the computer and the Ethernet Concentrator. For multiple concentrators, install a 10Base-T or 10x100Base-T network hub or connect it to an existing Ethernet network within a facility. The Concentrator cannot be connected to a 100Base-T network hub. Like Collectors, Ethernet Concentrators use a 24V power supply. For more information on the Ethernet Concentrator, refer to the Badge Server and Database Server manual.

4.5.6 Concentrator Power-up Test

When the wiring has been examined and the power supply voltage has been found to be in range, a power up of the concentrator may be performed to verify its operation. The Concentrator power

supply should be secured to the electrical outlet using a screw or cable ties to ensure that it cannot fall out or be disconnected by others working in the same area.

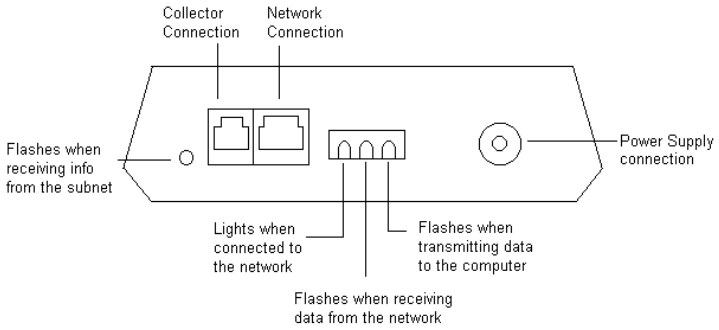
Caution!

Disconnect the modular cable from any down channel collector(s) and allow it to remain disconnected during the test. Down channel collectors could be damaged if power is applied before they have been checked.

Plug the power supply connector into the concentrator and observe the red LED indicator lights. If it fails to light, recheck the power and connections.

There are four LED indicator lights on the Concentrator. The function of each is described in the diagram below.

Ethernet Concentrator



The LED indicator light on the **Collector** will blink every time it receives badge data from the sensors. If the LED blinks in a four- or five-blink pattern, this indicates it is not communicating with the concentrator. If this is the case, there is a problem with either the network cable connection or the connection to the concentrator. If the LED blinks in a three-blink pattern, this indicates a problem with the collector, and it should be sent to Versus Technology for repair.

4.6 Walking Setup Test

After the Database Server, Badge Server and Configuration Utilities have been installed, you should perform a walking setup of the system to verify sensor locations. The Badge Server and Database Server Manual describes the installation and configuration of the Badge Server and Database Server. The Configuration Utilities Manual includes adding collectors, adding room locations, matching up the sensors with locations, and testing them with the walking setup.

4.7 Testing RF Sensors

The Frequencer is a utility that shows data being received by sensors. Data can be filtered to show only information for a specific badge or sensor. The Frequencer is instrumental in testing that all areas of the facility are covered by RF sensors.

To test RF sensor coverage:

1. Open the Frequencer, which is installed to the Versus\IRTools directory. The file is TCPFreq.exe.

2. On the Frequencer screen in the **Server IP** field, type the IP address of the computer where the Badge Server is installed. The badge hits will start appearing in the window.

3. To isolate and only test RF sensors, type the badge number of an RF badge in the **Badge** field.

4. Take the RF badge and "hide" the badge in a pocket or other place, so it is not seen by the IR sensors.

5. One person will need to sit at the computer while another person walks to all areas within the facility with the hidden badge. Both will need walkie-talkies to communicate.

6. Have the person with the badge walk around the facility and press the badge button at different locations. You will see the hits in the **Total Time**, **Total Hits**, and **Avg. Time** fields.

7. Verify that the badge is seen in all locations by the RF sensors, especially areas such as bathrooms, where there may be no IR coverage.

8. Mark the area as covered on the Punch-down Block Organization List.

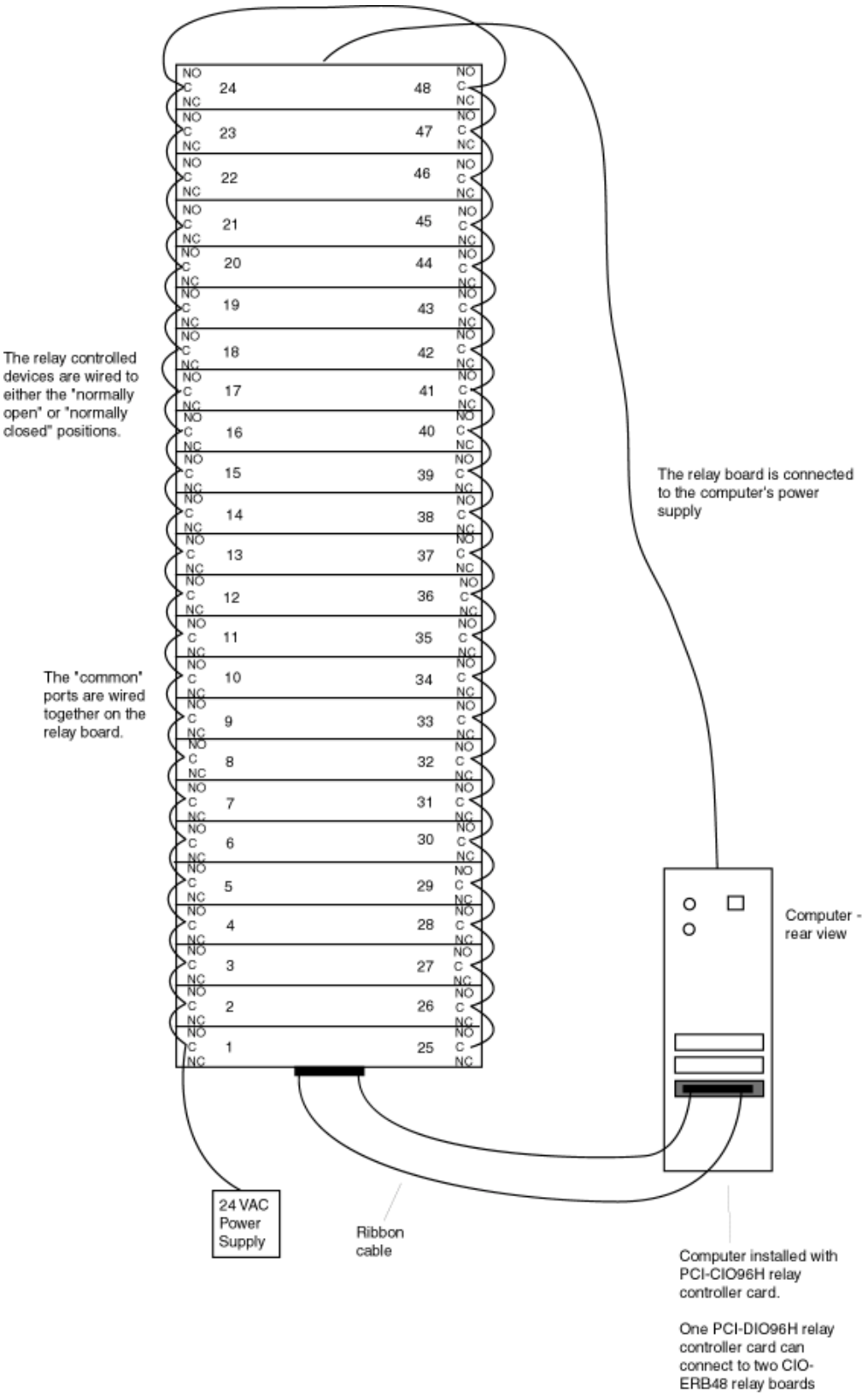
4.8 Relay Board Installation

The digital I/O board is installed into a PCI slot on the computer that will be running relays. The external relay board should be mounted in a metal utility box in a secure location such as a communication or server room. The external relay boards need to be installed within 10 feet of the computer where the digital I/O board is installed. This is because the 50-pin ribbon cable connecting them is 10 feet in length.

A 50 pin ribbon cable connects the external relay board to the PCI slot of the comptuter where the **PCI-DIO96H Digital I/O Board** is installed. One Digital I/O Board can accommodate up to 2 external **CIO-ERB48 relay boards**. One computer can have up to five PCI-DIO96H relay cards, assuming there are five PCI slots available in the computer.

The relay devices are powered by the computer power supply.

An example of wiring the relay board



4.8.1 Power Requirements

The relay board requires a 24VAC power supply. The watts needed varies with the type of relay controller device being used.

To calculate watts needed:

If you know the number of watts each device needs, you can calculate total watts needed by multiplying the number of devices times the watts needed by each.

If you do not know the watts that each device needs, but you know the amps needed by each device, you can calculate the number of watts needed as follows:

The number of amps required by each device multiplied by the number of devices multiplied by the volts (24V).

Example:

If using lights, and each light requires .04 amps, there are 48 lights on the relay board, and the power supply is 24V, the calculation is:

.04 amps x 48 lights x 24V = 46.08 watts or more required.

4.8.2 Wire Size Determination

The designer must be sure the last device on the circuit has sufficient voltage to operate the device within its rated voltage. When calculating the voltage available to the last device, it is necessary to consider the voltage drop due to the resistance of the wire. The thicker the wire, the less the voltage drop. Generally, for purposes of determining the wire size necessary for the system, it is best to consider all of the devices as "lumped" on the end of the supply circuit (simulates "worst case").

Typical wire size resistance:

18 AWG solid	Approximately 8 ohms/1000 ft.
16 AWG solid	Approximately 5 ohms/1000 ft.
14 AWG solid	Approximately 3 ohms/1000 ft.
12 AWG solid	Approximately 2 ohms/1000 ft.

Example: Assume you have 10 devices on a zone and each requires 50 mA average and 2000 ft. of 14 AWG wiring (total length = outgoing + return). The voltage at the end of the loop is 0.050 amps per device x 10 devices x 3 ohms/1000 ft. x 2000 ft. = 3 volt drop.

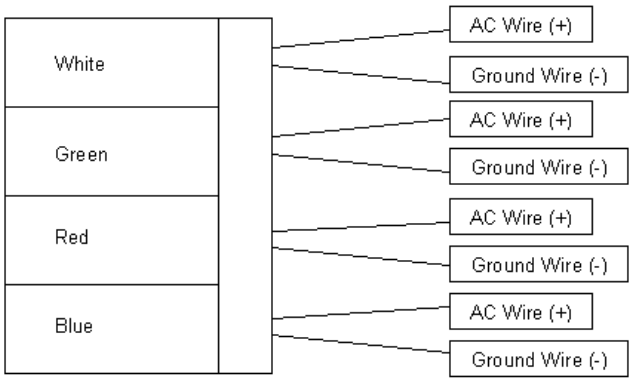
If you have a power supply that is 20 volts, each device runs at 18 volts, according to this calculation you are under voltage by 1 volt.

4.9 Corridor Light Installation

Mount the corridor lights using appropriate wall-mount hardware.

Each relay has two wires, an AC power wire and a ground wire. A four-light block has eight wires.

Corridor light



The wires connecting the corridor lights to the relay board should be 18-gauge stranded unshielded wire.

The ground wires run from the corridor light to the 24VAC power supply. You can connect the four ground wires together and run one wire back to the power supply. The AC power wires are run to the relay board. The wires are connected to the “normally open” (NO) slot on each relay.

The corridor lights are powered by a 24V AC power supply connected into one of the “common” (C) ports. Then, each common port is wired to the next common port on the relay board. See the relay board diagram in section 4.8.

4.10 Badge/Tag Wearing and Mounting

Badges are worn by personnel or attached to equipment. The badge signal contains encoded digital information that is used to identify and obtain the status of the badge. Motion, timing, battery state and auxiliary information are all included in the signal. Because IR badges use near-visible light to communicate with the sensors, the signal can be hidden from the sensors by clothing or obstacles. It is important to be aware that IR badges should not be covered or hidden from view.

RF signals are used for supervisory capacity, in the case where IR signals are hidden from view, and for sending alarm or call signals triggered by pressing a button on badges that include buttons.

There are several types of badges. Badges can include infrared (IR), radio frequency (RF), or IR and RF technology, depending on the needs of the facility. Some badges also include a button for alarm notification. Consult the badge specification sheets for more information on battery and component functions.

4.10.1 Proper Wearing of the Versus Personnel Alert Badge

To ensure the sensors receive accurate, consistent signals, badges should not be covered and should be worn as high up on the body as possible, either on the collar or in the shoulder area. Make sure the signal is not hidden from the sensors by clothing or obstacles.

4.10.2 Proper Mounting of the Versus Asset Tag

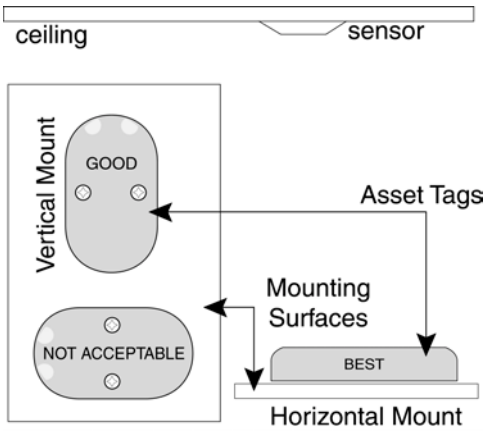
The Versus Asset Tag must be mounted on a flat, inflexible non-metal surface. Mounting the tag on metal will interfere with its RF performance, limiting the RF signal range. If a suitable non-metal spot cannot be found for use with the tag, contact Versus Technology to discuss using a mounting bracket with the tag. Mounting positions should be tested using the Frequencer before all tags are applied.

The are where the tag is mounted should have a clear view of the IR sensors. ***The battery should not be installed until after the tag has been affixed to the asset.***

Vertical Alignment

Horizontal Alignment

The tag should be mounted horizontally whenever possible, so that its face is pointing toward the sensors. If it cannot be mounted horizontally, it may be mounted vertically so that the IR windows, two clear areas at the top of the tag, are facing upwards. DO NOT mount the tag with the IR windows facing down or sideways.



1. Thoroughly clean the mounting surface with an alcohol swab of a 50/50 or 50/70 isopropyl alcohol/water solution, removing all dirt and grime. Failure to complete this step will cause the adhesion to fail.

2. Wipe the surface dry with a lint-free cloth or napkin. Be sure that no fibers are left behind on the surface.

3. Peel off one liner side of the adhesive tape. ***Be sure to use the pull tabs and tape liners to prevent contaminating the adhesive tape with skin residues.***

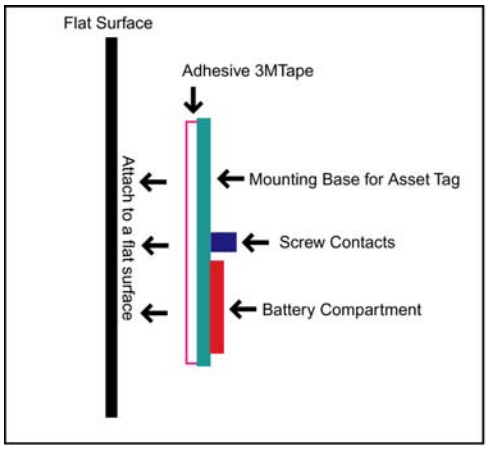
4. Position the tape over the asset tag base, making sure the anti-tamper button fits through the provided hole. Using your thumb, apply pressure over the entire base to seal the tape.

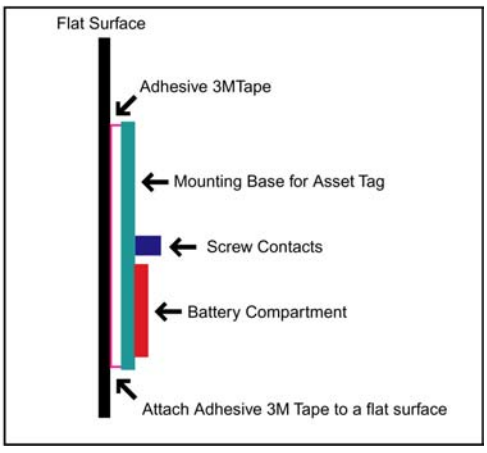
5. When ready to mount the tag to the asset, remove the second liner using the pull tab. ***Do not touch the adhesive surface or you will compromise the adhesive ability of the tape.***

6. Apply the tag base firmly to the cleaned area of the asset to allow the adhesive tape to bond with the surface. A silicone hand exercise ball can distribute pressure evenly. Once applied, *remove the tag's cover* and leave the tag undisturbed for as long as possible (preferably at least eight hours) to allow the adhesive to cure. Some surfaces may require a 72 hour cure period to achieve satisfactory adhesion.

7. After the cure time has expired, install the battery and case cover. ***The battery and cover should be installed only after the base is affixed to the mounting surface and the cure time has expired.*** Failure to follow this procedure may result in the tag lifting and decreased battery life.

   3M does not warrant that VHB will adhere to all materials and surfaces but rather specifies that you must test the surface that you intend to attach the tag. If the above instructions are followed and the VHB will not remain adhered to the asset over time, the tag must be attached using conventional fasteners.





4.10.3 Proper Mounting of the Versus Remote Station

This small, wireless, radio frequency (RF) device can be mounted on or in a wall or some other non-metal surface. When the button is pressed, a signal is sent to the system, notifying it to activate a customizable preprogrammed response. The button lights up when it is pressed, giving a visual cue that the signal has been sent.

The remote station is designed around a single gang face plate, device box and a back mounting plate. The face plate is attached to the device box by two security screws. This device can be mounted in or on the wall or other surface.

To install on a wall or other non-metal surface, verify the correct orientation required and then mount the back mounting plate to the desired wall or other surface. Attach the device box to the back mounting plate. Install the battery and tighten with the provided Velcro straps until the battery is secure. Attach the face plate to the device box with the security screws. To test the remote station, verify that the button lights up when the button is pushed.

To install in a wall, verify the correct orientation required. The wall should have a plastic gang box installed. Install the battery and tighten with the provided Velcro straps, until the battery is secure. Attach the face plate to the plastic gang box in the wall with the appropriate length screws. To test the remote station, verify that the button lights up when the button is pushed.

5. Troubleshooting Guide

These are possible hardware scenarios and solution issues that may affect the operation of the tracking system. The Collector Voltage Troubleshooting Flow Chart and the Functionality Test Flow Chart are included as troubleshooting strategies for correcting system hardware problems.

Problem: System will not start up.
Discussion: Most system failures on startup are caused by failure to properly crimp RJ Type connectors, along with failure to test the completed connection.

Problem: Collector cannot be seen by the Concentrator on the Subnet.
Discussion: If a collector works properly when unconnected to the subnet, on powering on, it blinks four to five times every five or so seconds. Once connected to the concentrator's subnet, upon power on, the collector light should come on strong after the first few seconds and then blink only upon receipt of a badge ID.

Problem: Incorrect voltages across sensor pair at the punch-down block.
Discussion: The voltage across the sensor pair at the collector punch-down block should be between 15 and 17 volts DC. A voltage above 18 may indicate an open circuit, while a voltage below 15 may indicate RF interference, or faulty sensor, or faulty wiring. RF interference may be verified by switching the meter to the AC scale and reading voltage. With no badge IDs being sent down the sensor pair, any AC voltage reading may indicate RF interference.

Problem: RF interference.
Discussion: RF interference may be checked as discussed above. Possible RF interference that affects the sensor network includes certain types of energy efficient lighting and associated electronic ballasts. The most common offenders are classified as T8 lights and have an electronic ballast in the 40 kHz range. Sensor wiring should not touch electrical conduit or ceiling grates, as they are very good at picking up RF frequencies.

Problem: Sensor not picking up ID from badge (non-working sensor).
Discussion: Smoke detectors using IR detection interfere with Versus sensors. The sensor should not be installed within two feet of smoke detectors to avoid any interference.

Problem: Collector mounting failures.
Discussion: Collector mounting failures can be avoided by using the mounting clip provided to hold the end of the collector firmly against the wall.

5.1 Badge Battery Replacement

Warning! A low battery may affect system performance. Change low batteries at first indication.

Note: Static electricity can damage batteries. When changing badge batteries, it is critical to be grounded, such as by using a static strap and an Electro-Static Device mat to protect from any shock that would damage the battery or the badge.

5.1.1 Locator Badge (VER-1700)

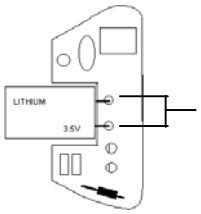
Battery type: Lithium, 3.5V 750 mAH

1. Place the Locator badge face down on an anti-static mat.

2. Using a small Phillips head screwdriver, remove the screw and back cover of the badge, and flip the badge over to remove the circuit board.

3. To remove the old battery, grasp the battery with your thumb and forefinger, and gently lift the battery **straight up**, being careful to not remove the connector rings (brass inserts) from inside the battery ports on the circuit board. If the connector rings are removed, the battery will not make a solid connection.

   If a connector ring does pull out with the battery, push it back into the battery port before replacing with a new battery.



Connector rings are inside the battery ports.

4. Insert the new battery prongs **straight** into the battery ports, making sure the battery prongs are firmly seated.

5. Replace the cover and gently tighten the badge screw.

5.1.2 Personnel Alert Badge (VER-1780)

Battery type: 3V Lithium CR2477 950 mAH

1. Locate the screw on the back of the badge. Using a small Phillips head screwdriver (or security screwdriver), remove the screw and battery cover.

2. Place the battery in the battery compartment with the + facing up.

3. Replace the battery cover, making sure to insert the tabs first.

Tabs on battery cover.

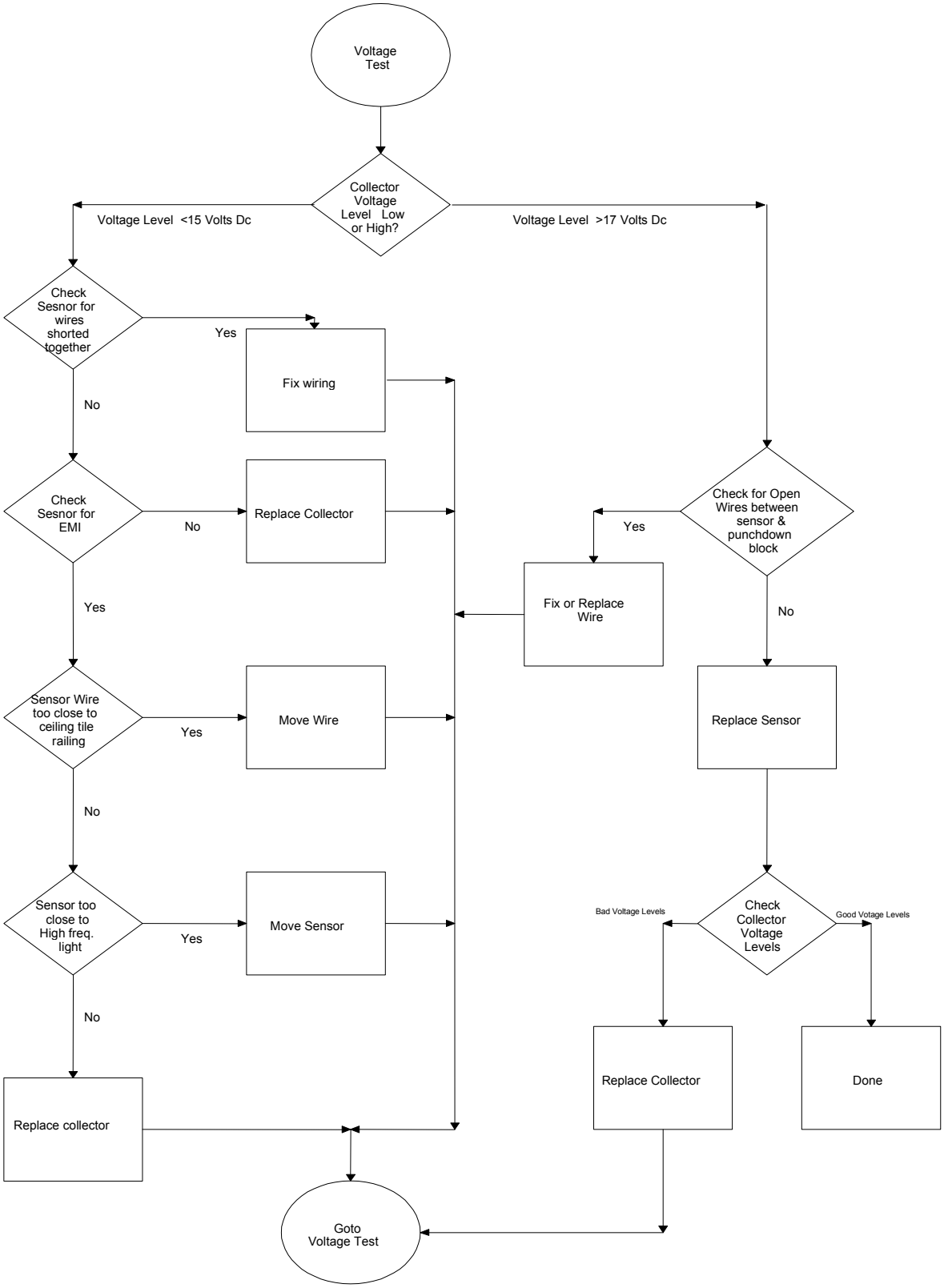
4. Replace the screw.

5.1.3 Asset Tag (VER-1830)

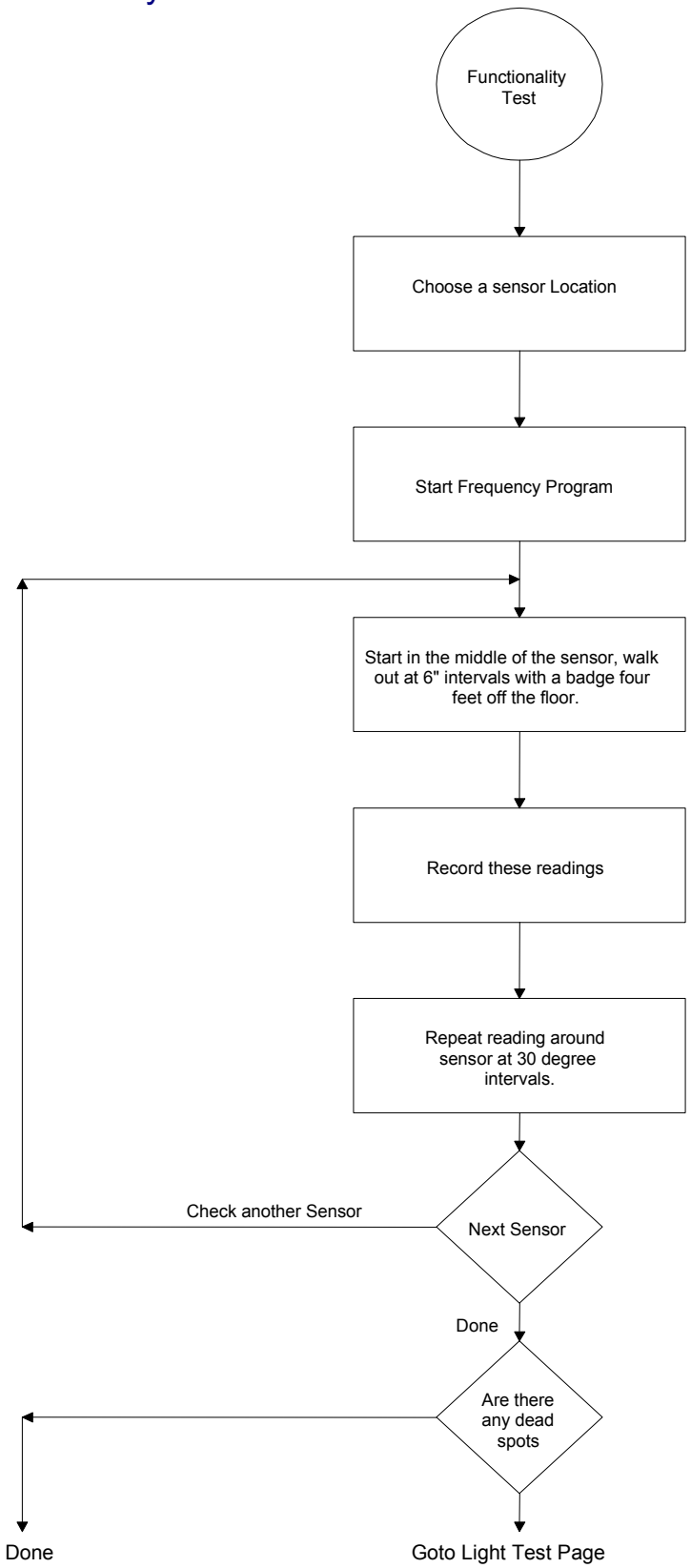
Battery type: 3V Lithium CR2477 950 mAH

1. With a Phillips head screwdriver, remove the screws on the badge.
2. Remove the top portion of the badge.
3. Place the battery in the battery compartment, matching the positive side with the marking on the tag case.
4. Replace the top portion of the badge and screws.

5.2 Collector Voltage Troubleshooting Flowchart



5.3 Functionality Test Flow Chart



6. Installation Forms

This section includes forms for testing and installation purposes.

Forms

6.1 Computer Setup

Customer:	Date:

Operating System	Processor & Speed	RAM	RAID	Type: Server/Client

Computer Settings	Versus Set	Customer Changed
Computer Identification		
Domain		
IP Address		
Subnet		

Computer Passwords	Username	Password
Administrator		
User		
User		
User		

Software	Name	Version	Software	Name	Version
1			7		
2			8		
3			9		
4			10		
5			11		
6			12		

Setup:	Special Setup Criteria
1	Power features set to NEVER
2	
3	
4	

Options:	Type	Yes/No/NA
Backup		
Remote Access		
Anti-Virus		
Restrictions		
Security		

Other Specifications:

6.2 Installation Plan

Customer Name:
Customer PO #(s): _____
Sensors:_____RF Sensors:_____
Collectors:_____ Room & Location Names Required
Ethernet Concentrators: _____ IP Address Required
Badges: _____ Qty: _____ ; _____ Qty: _____ ; _____ Qty: _____
Software:_____
_____

Additional Information: (i.e. badge drawer, focused sensors, relays…these require additional time)

Time Estimates:

1. # of installation days by contractor: _____
2. # of verification days by Versus Technology _____ * crew size of ___ _____
3. # of training hours _____ * crew size of ___ _____
4. # of on-site configuration _____ * crew size of ___ _____
5. Total Versus Installation _____

Required: PO, Install Checklist, and Proposal/Quote

Floorplan(s): Sensor Placement Drawings

Installation: Begin Date___/___/____ End Date ___/___/___
Requirements for Installation:

	Room Keys
	ID Badges
	Support Contacts/Personnel w/phone #s 1. 2. 3.

Installer company and contact name:_____
(Versus or outside contracting familiar with regulations)

	Floorplan(s) to Installers with Wiring Specification and if needed site visit
	Hardware and Wiring Installation Manual
	Wiring Specifications
	Component List
	Punch-down Block Wiring List
	Communication Room Checklist
	Relay Board Organization List

Sensors, collectors, concentrators, wiring installed and mounted correctly

	Required facility sign off of contractors work

Versus verification of installation work

	Communication Room Check List
	Floorplans
	Punchdown Block Wiring
	Relay Board Organization

Versus Computer Server Setup: # of Computers _____

Check	Requirements
	Jazz Drive
	Additional Hardware components:
	PC Anywhere Software
	Versus Software:
	Anti-virus software:

Facility Software & Hardware Requirements:

	Required Room/Location Names:
	Computer Room Location(s) for server(s):
	Phone line or TCP/IP routing services **Password Required:**
	IP Addresses for all network devices
	Software Client locations
	Develop Badge/Tag Types:

Network Requirements:

Identification of Computers	
Domain	
IP Address	
Subnet	
Default Gateway	
DNS Host Name	
DNS Domain	
DNS Services	
WINS Address	Primary Secondary Check: Enable DNS for Windows Resolution Uncheck: Enable LMHosts Lookup

On-Site Configuration

	System Hardware Testing completed see final installation Comm Room Checklist
	Software Setup: Configuration of Sensors & Room Names and Collectors
	Computer passwords Username: _____ Password: _____ Username: _____ Password: _____ Username: _____ Password: _____
	Software/system backup
	Sensor Software Verification (Walk Around with Training)
	Using the Software Training
	Assigning Badges
	How to wear a badge
	How the system works training
	Who is responsible for the system communication i.e. where do I ask my questions
	How to change batteries option
	How to send back RMAs

Additional Planning: (Additional configuration or time issues)

Training

1. General Usage by End User - Low Level Training # 1
   - Different Views
   - Badge Assignment

Date	Who

2. Training for Supervisory trainers - Medium Level Training # 2
   - How the System Works / Components
   - Different Views
   - Badge Assignment
   - Application Flows

Date	Who

3. Overall Key Operations for overall system administrator - High Level Training # 3
   - How the System Works / Components
   - Location of Hardware Components
   - Ethernet / Network Knowledge
   - Different Views
   - Configuration Utilities including Badge Assignment
   - Application Flow
   - Troubleshooting
   - Backup Procedures
   - Clearing Out Logs
   - Overall System Maintenance

Date	Who

Final Customer Sign off:

Final Verification Check off required: see Final Verification sheet

6.3 Final Verification

Final verification and sign off for: _____

Primary responsible party: _____ _____
(Name) (Signature)

PO Verification	Check
1. The hardware components: Collectors _____, Ethernet Concentrator ____, Sensors & Wiring _____ and computer(s) _____have been installed and are acceptable	
2. Training on backup procedures and preventive maintenance including battery replacement has occurred to appropriate responsible party (see below # 7)	
3. Software CD has been issued and installed and clients are acceptable	
4. Software & Hardware documentation have been issued and explained	
5. Support & Troubleshooting have been covered (see #6 below)	

6. Training has occurred to appropriate personnel and everyone is aware of their current responsibilities:

_____ _____
(Primary Responsible Party) (Signature)

7. Customer's Designated Support Contacts

a. System administrator: _____ _____ _____
(Name & Title) (Phone #) (E-mail)

b. Support contact: _____ _____ _____
(Name & Title) (Phone #) (E-mail)

8. The Versus System is working correctly according to contractual agreement

_____ _____ _____
(System Administrator) (Signature) (Date)

_____ _____ _____
(Primary Responsible Party) (Signature) (Date)

_____ _____ _____
(Versus Representative) (Signature) (Date)

6.4 Installation Checklist

The table and inspection report in this section will be used to indicate the completed installation and test of hardware and wiring. The installation codes will be as follows:

C = Cable checked I = Installed hardware

Make copies of the table and enter the numbers of the hardware as they are installed. Indicate a cable check completion with a "C" and a hardware installation completion with an "I" in each numbered cell of the table. The installer will be directed by the steps of the installation to make these entries as the checks and installation are made.

Copies of the entries should be kept with other installation documentation.

Item	Quantity	Hardware Installation	System Installation
Installation Hardware			
Sensor Cable			
Collector Cable			
UY connectors			
UR connectors			
Network Cable			
Cable Labels			
Cable ties			
RJ 12			
RJ 45 (for shielded cable use shielded RJ 45 connectors)			
Versus Products			
IR Sensors (VER-4422)			
RF Sensors (VER-4450)			
Supervised IR Sensor (VER-4442)			
IR Serial Sensor (VER-4444)			
Remote Stations (VER-4052)			
Remote Stations (VER-4054)			
Collectors (VER-2402)			
Concentrator (VER-2015)			
Locator Badges (VER-1700)			
Personnel Badges (VER-1780)			
Asset Tags IR/RF Anti-Tamper (VER-1830A)			
Asset Tags IR/RF (VER-1830B)			
Digital I/O Board (VER-3010)			
External Relay Board (VER-3015)			
Software Licenses			
Software Backups			

Other optional tools – depending on installation	Quantity	Hardware Installation	System Installation
Sensor Splice Crimp Tool			
Punch-down Tool - Type 66			
RJ Connector Terminator Tool Kit			
Ethernet Connector Terminator Tool Kit			
Ethernet Supplies			
Electric Screwdriver			
Cable Stripper			
Screwdriver Assortment - Incl' Small			
Nutdriver Assortment - Incl' ASM Sizes			
Diagonal Clippers - Small & Large			
Digital Multi-Meter			
Utility Knife			
Flashlight			
Visegrip Pliers			
Small Hammer			
Cordless Drill			
2 3/8" Hole Saw			
Fishtape			
Center Punch			
Step-Drill			
Knock-Out Punch			

6.5 Punch-down Block Wire Organization List

Collector # _____ Building: _____

Collector Alias _____ Floor: _____

Room #: _____

Punch-down block pair	Cable ID	Wire Color	Zone description (room name)	Receiver/ Room #	Relay #	Relay Cable ID	Remote Station ID	Verified
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								

6.6 Communication Room Checklist

Floor: _____ Location/Room #: _____

Check	Installation Verification
	Check Power Strip Mounting
	Check 50 Pin Connector Status to Punch-down Block
	Hub/Port Availability
	Network Cable installed/Continuity Test
	Ethernet Concentrator Administered
	Collector Voltage Testing ~ 15.5 to 16.9
	Collector Termination
	Collector Cabling
	Concentrator Room Label Information

Optional

	Collector Layout Sheet
	Relay Unit Configuration
	Computer Setup and Hardware Configuration

Number of Collectors: _____

Powered up

C#	Identification #	Termination

Number of Ethernet Concentrators: _____

Port/Hub #	IP Address #	ID #

Additional Comments:	Fixed	Date

_____ _____

(Installation Person) (Date)

6.7 Preventative Maintenance Inspection Report

Customer _____ Customer Number_____ Date_____

Call Number_____

Equipment Serial Number _____ Software Revision _____

Configuration (✓)

___ Host Computer Setup
___ Collector Setup
___ Software Intellimotion 3-Pack
___ Pager Computer Setup (Optional)
___ Punch-down Block Configuration
___ Software Pager (Optional)
___ Work Station Computer (Optional)
___ Concentrator Setup (Optional)
___ Software Misc. (Optional)
___ Network Wiring
___ Sensors
___ Sensor Wiring
___ ASM (Optional)
___ ASM Audio Wiring (Optional)

Tools

1. Standard hand tools
2. Multimeter
3. RJ Tester 4, 6 & 8 Pins
4. Hardware & Software Manuals
5. ESD Mat and Wrist Strap

Visual Inspection (✓)

Inspect the following for excess wear and/or any visual signs of damage.

1. ___ General
2. ___ Computers
3. ___ Concentrator Mounting
4. ___ Reseat socketed Components/connectors
5. ___ Connectors
6. ___ Sensor Mounting
7. ___ ASM Mounting
8. ___ Cable insulation
9. ___ Collector Mounting

Cleaning (✓)

1. ___ Clean all internals of dust
2. ___ Clean external surfaces
3. ___ Clean ASM Area
4. ___ Clean sensor work area(s)
5. ___ Clean ASM work area(s)
6. ___ Clean All computer stations
7. ___ Clean infrared tag

Calibration (✓)

1. ___ N/A

Electrical Safety Checks (✓)

1. ___ Wall Receptacle Test
2. ___ Sensor Voltage Test
3. ___ Collector RJ Line Continuity Test

Checkout Procedure (✓)

System

___ Connections Sensor/ASM

___ Display

___ Intercom Modules

Computers

___ Software Setup

___ Startup and Restart

___ PC Anywhere & Modem

___ Network

Concentrator

___ Connection between Computers and Network (Optional)

Collectors

___ Wiring Punch-down

___ Mounting

___ Random flashing Red LED

Sensors

___ Sensor Test Software

___ Voltage Check

___ Software Move Test

ASM

___ LED Power ON

___ Intercom Connections

___ ASM Test Software

Battery Install

___ Battery Installation

___ Tracking on System

___ Activates Page (Optional)

Backups

___ Backup Data from Computer Install

Training

___ Completed

Corridor light List
Relays 0-47

Relay ID: _____

Wire Color	Light Color	Punch-block position	Room name	Verified
0	NC			
0	NO	23		
0	C			
0	NC			
0	NO	22		
0	C			
0	NC			
0	NO	21		
0	C			
0	NC			
0	NO	20		
0	C			
0	NC			
0	NO	19		
0	C			
0	NC			
0	NO	18		
0	C			
0	NC			
0	NO	17		
0	C			
0	NC			
0	NO	16		
0	C			
0	NC			
0	NO	15		
0	C			
0	NC			
0	NO	14		
0	C			
0	NC			
0	NO	13		
0	C			
0	NC			
0	NO	12		
0	C			
0	NC			
0	NO	11		
0	C			
0	NC			
0	NO	10		
0	C			
0	NC			
0	NO	9		
0	C			
0	NC			
0	NO	8		
0	C			
0	NC			
0	NO	7		
0	C			
0	NC			
0	NO	6		
0	C			
0	NC			
0	NO	5		
0	C			
0	NC			
0	NO	4		
0	C			
0	NC			
0	NO	3		
0	C			
0	NC			
0	NO	2		
0	C			
0	NC			
0	NO	1		
0	C			
0	NC			
0	NO	0		
0	C			

Wire Color	Light Color	Punch-block position	Room name	Verified
0	NC			
0	NO	47		
0	C			
0	NC			
0	NO	46		
0	C			
0	NC			
0	NO	45		
0	C			
0	NC			
0	NO	44		
0	C			
0	NC			
0	NO	43		
0	C			
0	NC			
0	NO	42		
0	C			
0	NC			
0	NO	41		
0	C			
0	NC			
0	NO	40		
0	C			
0	NC			
0	NO	39		
0	C			
0	NC			
0	NO	38		
0	C			
0	NC			
0	NO	37		
0	C			
0	NC			
0	NO	36		
0	C			
0	NC			
0	NO	35		
0	C			
0	NC			
0	NO	34		
0	C			
0	NC			
0	NO	33		
0	C			
0	NC			
0	NO	32		
0	C			
0	NC			
0	NO	31		
0	C			
0	NC			
0	NO	30		
0	C			
0	NC			
0	NO	29		
0	C			
0	NC			
0	NO	28		
0	C			
0	NC			
0	NO	27		
0	C			
0	NC			
0	NO	26		
0	C			
0	NC			
0	NO	25		
0	C			
0	NC			
0	NO	24		
0	C			

Corridor light List
Relays 48-95

Relay ID: _____

Wire Color	Light Color	Punch-down position	Room Name	Verified	Wire Color	Light Color	Punch-down position	Room Name	Verified
	0 NC					0 NC			
	0 NO	71				0 NO	95		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	70				0 NO	94		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	69				0 NO	93		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	68				0 NO	92		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	67				0 NO	91		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	66				0 NO	90		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	65				0 NO	89		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	64				0 NO	88		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	63				0 NO	87		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	62				0 NO	86		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	61				0 NO	85		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	60				0 NO	84		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	59				0 NO	83		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	58				0 NO	82		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	57				0 NO	81		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	56				0 NO	80		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	55				0 NO	79		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	54				0 NO	78		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	53				0 NO	77		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	52				0 NO	76		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	51				0 NO	75		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	50				0 NO	74		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	49				0 NO	73		
	0 C					0 C			
	0 NC					0 NC			
	0 NO	48				0 NO	72		
	0 C					0 C			