Hardware/Wiring Installation Guide

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To Clean Badges: wipe gently with damp cloth. **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 component or its systems are covered by one or more of the following U.S. Patents: 5,276,496, 5,355,222; 5,119,104; 5,548,637; 5,572,195; 5,387,993; 5,027,314, 5,017,794, 4,906,853.

FCC STATEMENT: Components VER-1650 and VER-4450 comply 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.

Table of Revisions

Rev	Date	Description	Initials	Authorized By:
1	3/7/96	Initial Release.	RAV	
2	5/1/96	Added Eagle speaker connections; Modified tbl. 1-1, fig. 2-1 and 2-2.	RAV	
-	-	Multiple comments from reviews. Modified tbl. 3-1, 4-1, and 4-2; Added figs. 4-3, 4-5, tbl.4-3, para. 3.10, 3.11, 4.1.5	RAV	
3	8/1/96	Changed system name.	RAV	
4		Complete update to cover new high frequency equipment	DAD	
5	4/2/98	Complete Update/Revision of Hardware Manual to current specifications and displays.	EPD	
6	6/17/98	Updated/Changed hardware specifications to current procedures. Added Tech Support section. Added Wire Run Check-off Diagram to manual. Changed Manual Cover Page to reflect products.	EPD	
7	Nov. 1998	Changed collector network length diagram to represent a six collector to one concentrator specification (figure 3-2). Added to hardware section 1.4 for a display of important system components. Added to table 12-1 to include current part numbers to parts added.	EPD	
8	Dec. 1998	Added Troubleshooting Flow Charts to section 13, for possible solutions for system hardware problems. Added Figure 7-2. Sensor Wiring Floor plan. Added Battery Replacement table Section 2.4	EPD	
9	3/11/99	Added FCC compliance statements for IR/RF Badge and RF Sensor	SKB	

Table of Contents

SECTION **PAGE #**

List of Figures

List of Tables

1. INTRODUCTION

1.1 Purpose of This Guide

This guide provides the information required to install the hardware and wiring. Read this entire document before proceeding with the installation.

1.2 Scope of Use

This document is intended to provide the information required to install an IR system. A general understanding of wiring and telephone installation techniques is assumed.

1.3 Installation Sequence

The installation procedures are generally organized as follows:

1. Provide a site visit to the facility
2. Run appropriate installation wires between hardware locations
3. Document wiring configuration
4. Install hardware components
5. Test hardware wiring
6. Installer sign-off

1.4 Hardware Specifications / System Components

The identification of the components and their part numbers are as follows:

(Arcnet) External Concentrator	Model VER-2010
(Ethernet) External Concentrator	Model VER-2015
Internal Concentrator	Model VER-2020
IR Collector (24 input)	Model VER-2402
High Frequency Sensor	Model VER-4420
System Host Server	Model VER-8010
(Software Revision 3.x, Windows 95, 98, or NT OS interface)	
Paging System Computer	Model VER-8200
(Software Revision 3.x, Windows 95, 98, or NT OS interface, Application Software *Pager 3.x, Creative* Sound Blaster card AWE 64)	

1.5 Computer System Requirements

The software runs in the Microsoft Windows 95, 98 or Windows NT environment and requires a computer system with reasonable capacity and speed. The minimum computer system requirements are:

IBM-PC or "clone" Computer
Pentium II CPU at 200Mhz
32 Meg RAM
2.1 GB hard drive
Microsoft Windows 95 (recommended)

1.6 Terms and Definitions

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

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

RJ - Acronym for Registered Jack - The system uses some modular style connectors that are identified by their 'RJ' designations. RJ-11 is a generic term, which is 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.

Segment - That portion of a collector network, which begins at a concentrator, extends through one or more collectors, and then ends at the last collector on the line. Collectors to which the segment connects are said to be a part of the segment.

Data Link - The connection between the Net Card in the customer computer and the concentrator(s).

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. In some cases, a PC bus plug-in concentrator is used.

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.

Sensor - A sensor is 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. Sensors offer various options of coverage and resolution.

Collecting or Sensory Network - The 2-pair cables which connect collectors to one another and then to a concentrator.

Sensor Connection - A sensor connection is 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 - This term refers to 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. The law requires that any cables, which run in an air plenum, be made of materials which will not burn, or which will not release toxic gases when burned. (See Safety and Fire Codes.)

Punch 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 block terminals, which causes the terminals to penetrate the wire insulation and cut off excess wire in one easy step. Punch Blocks are the preferred method of connection for **solid wire** in telephone systems.

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.)

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.)

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.)

Shielded Wire - This type of wire is 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 Wiring Considerations.)

Coaxial Cable - This type of cable is a special form of shielded wire in which there is a single inner conductor held at a fixed distance from an outer braid or foil shield in a precise manner. Control of the spacing and makeup of the cable dielectric allow it to handle very high frequencies in a predictable fashion.

Impedance - This is 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.

Termination - This term may refer to the mechanical method by which a wire is connected, or it may refer to the electronic way that a wire is ended.

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

Balun - This is a small electronic winding which interfaces a 93 ohm unbalanced signal (coaxial cable) to a 100 ohm balanced line (twisted pair) or vice-versa. Its name is a melding of the terms "Balanced-to-Unbalanced", or "BalUn".

Modular Patch Block - This is a device which plugs into a Collector just like a punch block does only it provides twenty four modular RJ-12 style jacks instead of punch terminals. These RJ-12 connections are sometimes used for portable or "demo" type systems, and are not recommended for permanent installations.

DataLink Node ID - This is the ID number that is set on DIP switches on the Net Card and inside each Concentrator. The Net Card factory default setting is node 1 (one). The Concentrators are preset to node 128. If more than one Arcnet style concentrator is to be connected to the same Data Link network, the second concentrator must be changed to a different node ID number.

2. SYSTEM HARDWARE DESCRIPTION

This section contains a description of the system, which will aid in the understanding of the methods required for proper installation.

2.1 General

The system is a unique, reliable, flexible platform for locating personnel and equipment, in addition to relaying event and control information throughout a building. The system transfers information using battery-powered, infrared (IR) badge transmitters and IR sensors. The data is processed by the host computer for system utilization, display, archive storage, and printed reports. Options include one-way and two-way speaker communications and paging, as well as building controls. (Refer to page 7, Planning and Installation Guidelines.)

2.2 Infrared (IR) Tracking

The use of an IR signal for tracking has distinct advantages, since it allows accurate localization using signals that will not penetrate walls or floors. The IR signal transmissions may be usable through one or more reflections from floors, walls, and partitions. These signals are accumulated in collectors, then retrieved by concentrators for processing by the host computer. A speaker system allows equipment monitoring of alarms and paging for badge button response.

A system of strategically placed sensors receives IR signals as badge transmitters move between rooms of a building. A collector is used to receive signals from up to 24 sensors. Several collectors can be chained together to expand the number of sensors on the system. The collectors process the data from the sensors and add information, such as the room number of the sensor and charge level of the badge battery. This information is then retrieved by the concentrator, which identifies the badge and room number data for storage in a concentrator computer file. The host computer for further processing then retrieves this file.

The host computer translates the concentrator file data into names of rooms, personnel, and equipment. It also identifies alarm signals and undetected badges. This data is utilized for paging, displaying current floor locations of personnel or equipment alarms on the color monitor, and storing for later use in reports and archiving.

The paging system consists of a series of intercom modules controlled by a central device called the Audio Switching Matrix (ASM) and the Paging computer. The ASM and the paging computer work together to make the connections between intercom modules.

2.3 Badges

The badge is a small unit worn by personnel or attached to equipment. This device sends an IR signal 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.

The badge sends its IR signal from two emitters located at the top left and right corners of the badge case. They are directed upward and somewhat forward at a wide angle to be received by the sensors. Although orientation of the badge is not critical, better performance can be obtained by keeping the badge in an upright position.

Because the badge uses 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 badges should not be covered or hidden from view.

The badge has a unique feature that serves to extend battery life. It contains a motion-sensing device that causes the badge to transmit most frequently when it is in motion and gradually reduces this frequency when there is no motion. Consult the badge specification sheets for more information on battery and component functions. **Note: Static electricity can damage batteries. When changing badge batteries, it is critical to be grounded using a static strap and to replace the battery on an Electro-Static Device mat to protect from any shock that would damage the battery or the badge.**

There are several types of IR badges - Personnel, Equipment, IR/RF Com Badge, and a locator tracking badge. All four types have unique code numbers that are tracked by the system. In addition, the personnel badges has a button that is pressed for intercom communications, and the equipment badge has an alarm capability which can be used to notify personnel of an alert condition triggered by a predefined alarm signal. Alert conditions on equipment are handled by the host computer, which will page the responsible personnel.

2.4 Battery Replacement

The table below provides instructions on how to replace badge batteries. Remember to use a static strap and an Electro-Static tabletop mat when changing badge batteries.

Badge	Battery Type	Replacement Instructions
P-Badge	Lithium, 3.5v 750 MAh	1. Place the P-badge face up on an Electro-Static mat. 2. Locate the screw on the front of the badge. Using a small Phillips head screw-driver, remove the screw and the top cover of the P-badge to expose the battery. 3. Gently lift the battery from the board using your thumb and finger. 4. Insert the new battery into the lead holes. Replace the top cover and gently tighten the badge screw.
Locator Badge	Lithium, 3.5v 750 MAh	1. Place the Locator badge face down on an Electro-Static mat. 2. Locate the screw on the back of the badge. Using a small Phillips head screw-driver, remove the screw and the back cover of the badge and flip it over to expose the battery. 3. Gently lift the battery from the board using your thumb and finger. 4. Insert the new battery into the lead holes. Replace the top cover and gently tighten the badge screw.
E-Badge	4x1.2 volt rechargeable Ni-cad batteries	1. Remove the battery compartment cover from the rear of the Equipment badge. 2. Remove the batteries from the compartment and replace them with the new batteries like the diagram on the bottom of the battery compartment. 3. Replace the battery compartment cover.
IR/RF Com Badge	Standard 3 AAAA	1. Remove the battery compartment cover from the rear of the Com Badge. 2. Remove the batteries from the compartment and replace them with the new batteries like the diagram on the bottom of the battery compartment. 3. Replace the battery compartment cover.

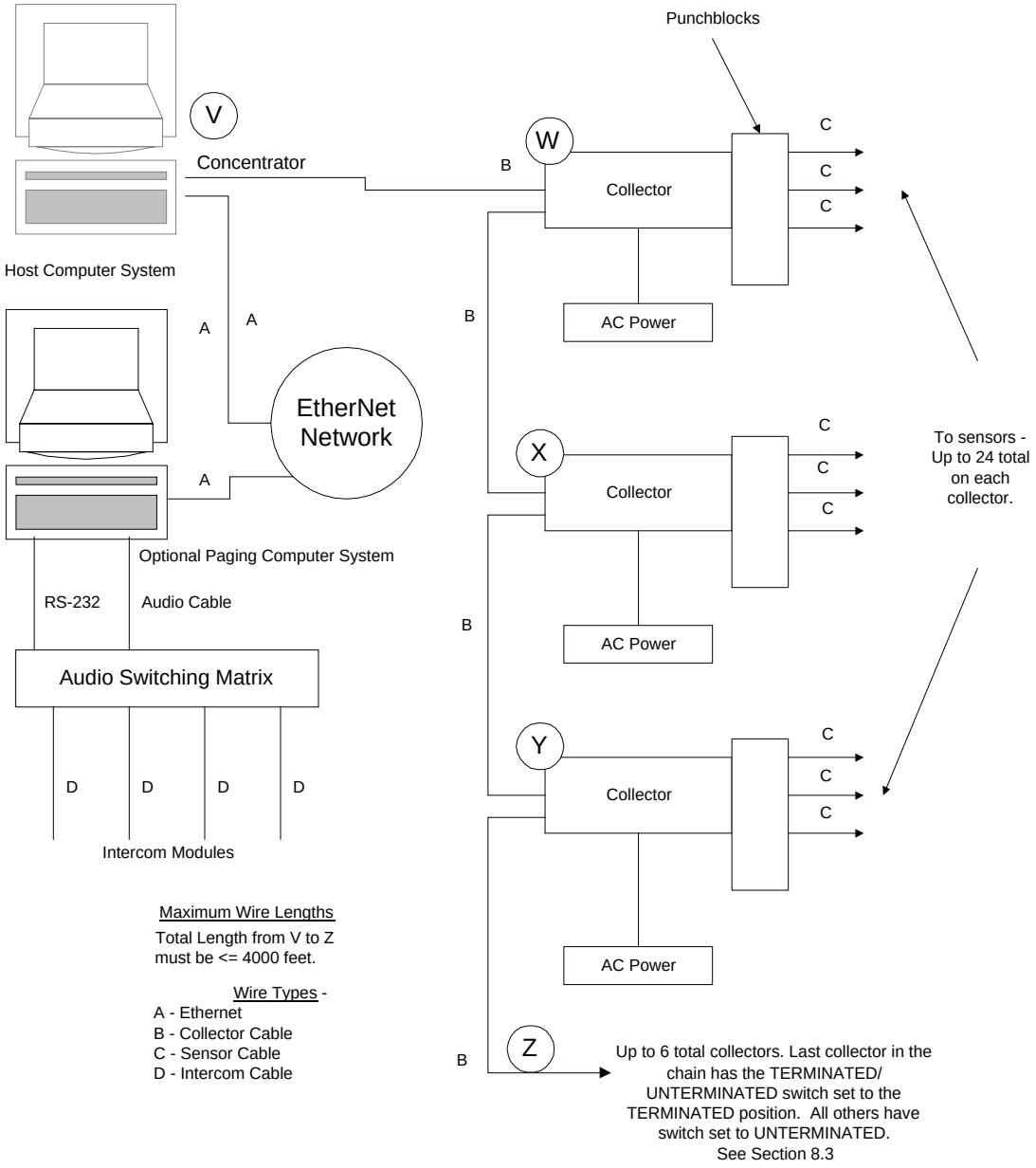
		This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: 1) This device may not cause harmful interference, and 2) this device must accept any interference received, including interference that may cause undesired operation.

3. PLANNING AND INSTALLATION GUIDELINES

3.1 General

This section contains a description of the system, which will aid in the understanding of the methods required for proper installation. 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 the things that must be included in a system plan to ensure a successful installation.

Figure 3-1. General Guidelines for Installations



3.2 Collector Network Length Limitations

There must be no more than six (6) collectors on any one concentrator as shown in the RS-485 loop display below. The total length of the collector network must not be more than 4000 feet. See Figure 3-2 for a visual representation.

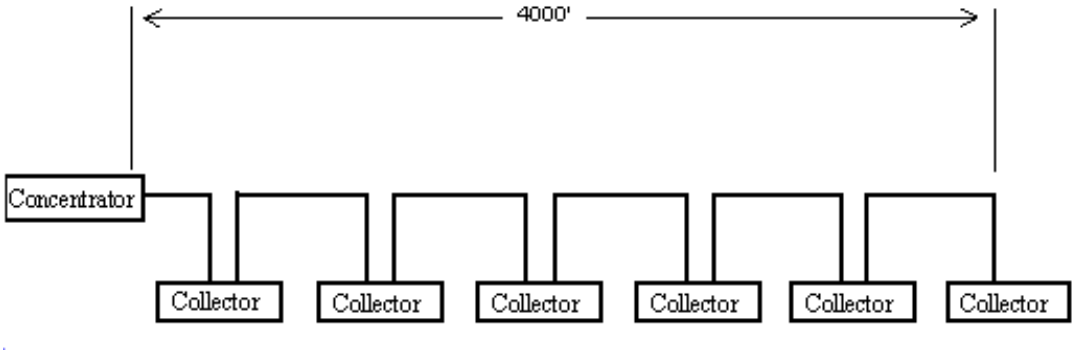


Figure 3-2

NOTE:
The total length of an *Ethernet* network must be no more than 3000 feet. Consult the Ethernet manual for more information on installation procedures.

3.3 Sensor Connection Length Limitations

The single pair sensor connections may be up to 1000 feet in length. If the environment is known to be electrically "noisy," consider shorter line lengths to assure stronger signals and more immunity to interference.

3.4 Location of Collectors, and Concentrators

When planning an installation, it is important to locate a proper place for the concentrators and collectors. In smaller installations, these items may all be located at the same place in a telephone or utility closet. Be sure that the location selected has easy access for servicing, but that it can be secured against tampering by unauthorized personnel.

The concentrator should be mounted in a central location to the collector(s) to minimize the lengths of collector network runs. Many installations will find the concentrator simply mounted adjacent to the first collector. Collectors should be mounted in similar telephone or service areas such that they are near the sensory networks they service. Of course, be sure that the locations selected are free from extremes of heat, cold, and moisture as with any electronic equipment.

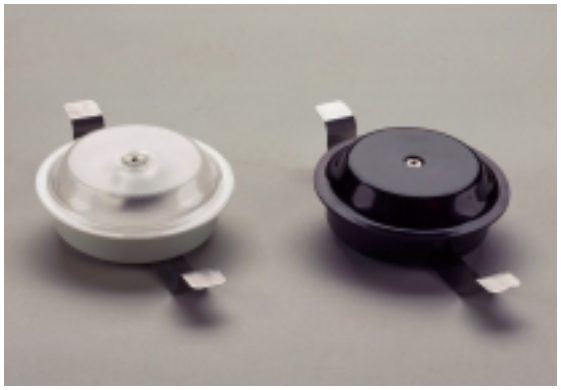
NOTE: * Collectors may be affected by high watt radio or paging antennas.*** DO NOT PLACE A COLLECTOR IN CLOSE PROXIMITY TO ONE OF THESE ANTENNAS**

Internal Concentrator VER-2020

Note: If you are not using an Ethernet or Arcnet external concentrator and your site is less that 150 sensors then you may choose to use an Internal Concentrator (a plug-in PC card) instead.

3.5 Sensor Location Planning

Perhaps the most important step in an installation involves planning the sensor locations. A complete understanding of sensors and tags is necessary to design an effective system. Experience will prove to be invaluable in effective system design. (Sensor S/N VER-4422 also available with white cover.) See Section 7 for the sensor to punch-down wiring table. This is a helpful example of proper sensor wiring planning and location techniques.



IR Sensor	VER-4422 white VER-4420 black	
RF Sensor	VER-4450 –white only	This device complies 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

3.6 Understanding High Frequency Sensor "Field-of-View"

The basic sensor "sees" the environment under it in a largely predictable pattern. However, there are other factors that can affect the way a sensor sees. The sensor is like an eye, which is sensitive only to a narrow spectrum of light, and the ID tag appears as a bright splash in an otherwise dark world to the sensor. Even if the tag is blocked from the view of a sensor, it can often be detected. Though the infrared light from a tag does not penetrate solid objects or bend around corners, it does reflect from surfaces in the room. This can sometimes be mistaken for "seeing around corners." The effect of reflection can be used to advantage by the clever system designer, but can also pose problems for the unwary installers. The area that a sensor can see in a given situation is referred to as the sensors "field of view." Sensors are specified to have a given field of view when obstacles are not present, so actual installed field of view may differ.

If a 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 16-foot radius. Lower ceilings reduce the effective sensor pattern diameter considerably due to angles involved.

3.7 Effective Coverage of Rooms

When planning the location of a sensor in a room, one should take into account the human factors involved. The majority of activity in most offices occurs towards the center of the room, and people do not often stand in corners, or near walls. A single sensor placed near the middle of the ceiling area can usually effectively cover a normal office or meeting room. If the office is oddly shaped or very large, two sensors may be required. Offices or rooms as large as 30 feet square are generally well served by a single sensor.

3.8 Special Problems with Sensor Coverage

The placement of sensors is usually a simple matter, but there are some special things to remember when planning a system installation. The system planner should consider that a sensor may have a field of view which extends out of the designated area through a doorway or passage, and that tagged persons might be detected incorrectly and reported to be in the room when only passing by. Consider placing sensors away from doors or entryways to prevent this. Sensors can be positioned so as to limit their view by placing them in locations where existing obstacles serve to block the unwanted sensor view.

Due to the line-of-sight nature of the infrared light created by the ID tags, it is also possible to apply masking to the sensor to limit or control the field of view. This masking of the sensor has been done with great success, but may require some experimentation to refine for each application. However, proper placement is always the preferred method for controlling, rather than eliminating, sensor field of view.

If the room has windows that allow a large amount of sunlight to enter the room, the sensor is best placed in a position such that the sunlight is not reflected directly into it by the floor or furniture. Extremes of daylight 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.

Of course, the sensor should be located such that it is afforded the best possible view of the room and the persons in it. If the room is of complex shape and no single sensor position will provide adequate coverage, multiple sensors should be considered.

3.9 Overlapping Sensors

Sensor overlap occurs when two (or more) sensors are placed such that their fields of view are coincident (overlap) in some area. Allowing the field of view of one sensor to overlap that of another will, as one would expect, cause some indecision in the system if both sensors observe an ID tag at the same time. The software will not change the location of a tag when it is in an overlap area unless the software is told to ignore overlaps. If overlaps are ignored a tag may appear to bounce back and forth as long as it is in an overlap condition.

3.10 High Frequency Light Interference

NOTE*: Certain types of energy efficient lighting and associated electronic ballast's may interfere with the operation of a sensor that is within in the range of the light fixture.*

In addition, the light emitted by fluorescent fixtures adds a high degree of noise to the sensor environment. The sensor should be mounted such that light from florescent fixtures is not in direct sensor view. Excessive noisy fluorescent energy can cause intermittent sensor reception and reduced range. "Warm White" and other tubes designed to emit more red color energy are more of a problem than conventional "cool white" tubes.

- The use of High Frequency sensors will avoid most light interference problems.

The most common offenders are classified as T8 lights and have electronic ballast in the 40 kHz range.

3.11 Use of Unauthorized Components

Your system is an innovative, high technology system that 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 any and 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.

4. INSTALLATION GUIDELINES

4.1 General

When installing a system, certain rules and limitations must be observed. The system is designed for trouble-free operation in all environments, and adherence to these guidelines is critical for a reliable installation. The following sections will detail the things that must be included in a system to ensure a successful installation.

4.2 List of Materials

Installation activities require a minimum amount of materials, some of which may be purchased by the installer independent of Versus. For materials supplied by Versus, refer to the packing list and confirm that all listed hardware and wire can be identified. For installer-purchased material, insure that the remaining materials are available for the installation shown by the floor plan schematic diagram.

4.3 List of Tools

Some installation activities require special tools. Refer to Table 4-3 for a list of recommended tools.

Table 4-3. List of Tools

Tool	
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	
Paper/Pens	
Punch-down Block Tool-Type 66	
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	
Weidmeuller Patch Check Plus	
Wire Strippers	

4.4 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.

4.5 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.

WARNING

Make every effort to 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.

4.6 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 120-volt AC line power directly, except the computer systems.

WARNING

Use of powering schemes not approved by the manufacturer will void equipment warranty.

Notice: The hardware may be damaged if connections are made with the system power applied. Do not attempt to connect or disconnect sensors, collectors, concentrators, intercom modules or any other system components with power applied! Although damage will not occur in most cases, this practice is not recommended and may 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 wire runs do not come in contact with high-voltage electrical wires.

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

4.7 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.

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 wire runs through ceilings and walls do not come in contact with 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.

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

4.8 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.

4.9 Workmanship

The following standards of workmanship shall be followed during installation:

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

4.10 Cable Types

Refer to Table 4-10 for a summary of the cable types recommended for installation. Approved equivalent types may be used. Approved equivalent cable types may be used. Color coding tables have been included in order to provide a systematic approach to all cabling in all installations.

Table 4-10. Recommended Cable Types

Sensor Cable	CAT 5
Collector Cable	CAT 5
Ethernet Cable	CAT 5
Intercom Cable	7 cond. with drain, 26 AWG shielded cable

4.11 Installation Checklist

The installation checklist (Section 14, page 36) is intended to be a record of the installation steps. Before starting the installation, fill in the checklist by referring to the contractual floor plan schematic for the quantities and numbers of zones and other components for the specific installation. Instructions for filling in the checklist will be provided in the installation steps.

5. CABLE INSTALLATION

This section contains tips to aid in the installation of cables. When installing sensor and network wiring, normal telephone installation techniques should be employed. **Sensor wire runs should allow sufficient length to move ceiling tiles and perhaps to move sensors if needed.** The paragraphs are in order of component type (for ease of identification and discussion of related topics) and are followed by the procedural steps.

5.1 Cable Installation

It is the responsibility of the installer to run all cables as indicated on the provided floor plan schematic diagram. Each cable must be labeled at both ends with the identification of the end device to which it is run (e.g., sensor, collector, or intercom unit). Collector cables should be labeled with the identification of the collector that it runs to down the collector chain, away from the concentrator.

CAUTION:
Note that specific pin-color relationships have been defined in this section. Cables using RJ-series plugs may appear to be usable, when in fact, they may not be correctly wired. Use only cables pre-wired by the manufacturer or wired as described in this section.

6. INSTALLING AND CHECKING SENSORS

Sensors are installed in ceiling tiles or ceiling surfaces using a 2-3/8" hole saw. The sensor is placed into the hole and secured using the spring steel clip and the sensor cover to "sandwich" the ceiling tile. The spring steel clip securely holds the sensor against the ceiling tile allowing for easy access for installing or replacing sensors.

> CAUTION:
> The sensor casing material is soft and is easily marred and scratched. Handle the sensors with care.

6.1 Sensor Wiring

> CAUTION:
> Always disconnect power from the system prior to connecting or disconnecting components. Failure to do so may damage the equipment.

Normally, the UTP is run from the punch down 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.

Normal infrared (IR) sensor installation calls for use of a splice connector at the sensor end of the cable run. Sensor wires have no polarity and may be connected to sensor wire-pairs in either order. In the case of 2-pair UTP cable, the same pair must be used at each end of the sensor run. It is suggested that the blue pair always be used for consistency.

6.2 Sensor Wiring Steps

Perform the following steps to wire and install sensors:

> NOTE:
> Do not make any connections to components unless indicated by a step in the procedure.

1. Refer to the contractual floor plan schematic diagram and identify sensor locations and identification numbers.
2. Insure that the collector has been previously installed.
3. Remove all bridge clips from the punch-down block.
4. Perform the following for each sensor:
   a) Connect the sensor cable wire-pair to each sensor using UY splice connectors.
   b) Gently bend the spring steel clips upward and insert the sensor into the ceiling tile hole.

c) Connect the sensor wire-pair on the collector end to the associated punch-down block pin-pair using the punch-down block tool.

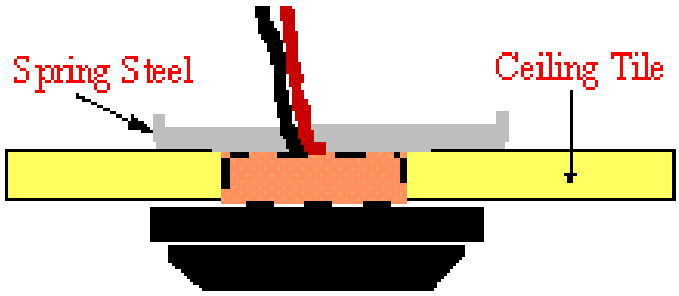
d) Mark the sensor as installed on the Installation Checklist.

5. Checking Isolation:

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 prior to system start up. 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 been produced.

To verify that the system is "isolated" from building and electrical grounds, use an ohmmeter or multimeter set to the 2K (2000)-ohm scale. Clip one probe to the nearest electrical conduit, electrical ground, or metal water pipe and then touch the other probe to each punch block row in turn. 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.

NOTE:
It may be helpful to disconnect the Collector from the punch block while this measurement is being made. This will isolate the sensor wiring completely.



6. Repeat steps 4 and 5 for each collector.

7. Replace the bridge clips.

7. PUNCH-DOWN BLOCK INSTALLATION AND ORGANIZATION

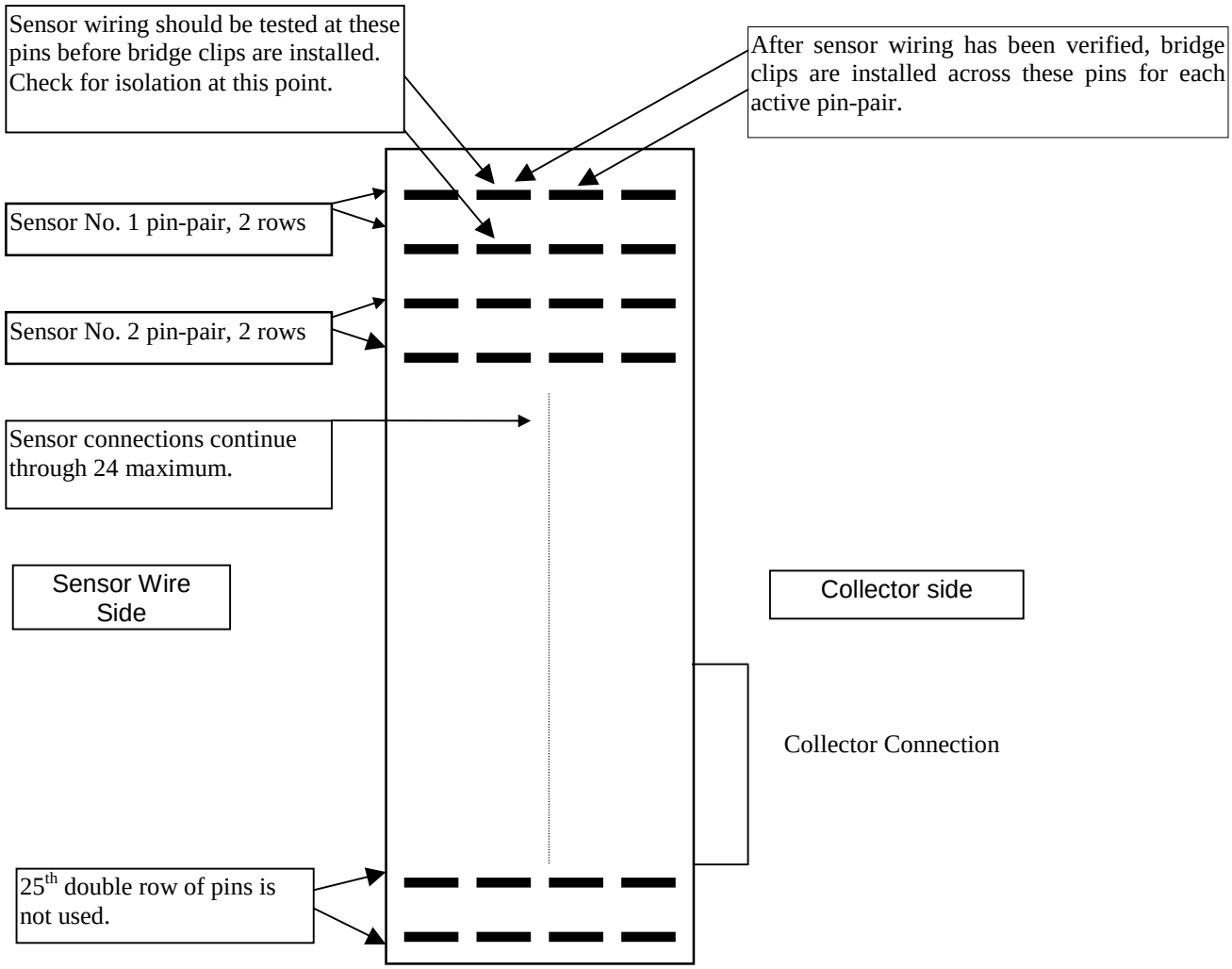
The collector punch-down block is organized so that each two punch-down block rows, starting at the top, left of the block are one sensor port. The last two rows are not used. Refer to the Punch-down Block Diagram (page 21).

Bridge-clips are normally 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.

The punch-down block is to be mounted on the wall at the designated site using appropriate wall-mount hardware. The collector unit is mounted to the selected wall site, adjacent and connected to the associated punch-down block, using the Velcro tape provided with the unit or other appropriate mounting bracket. When using Velcro tape to secure a collector unit, it is important that the solid metal end clip is firmly secured to prevent sagging of the collector to punch down block connection.

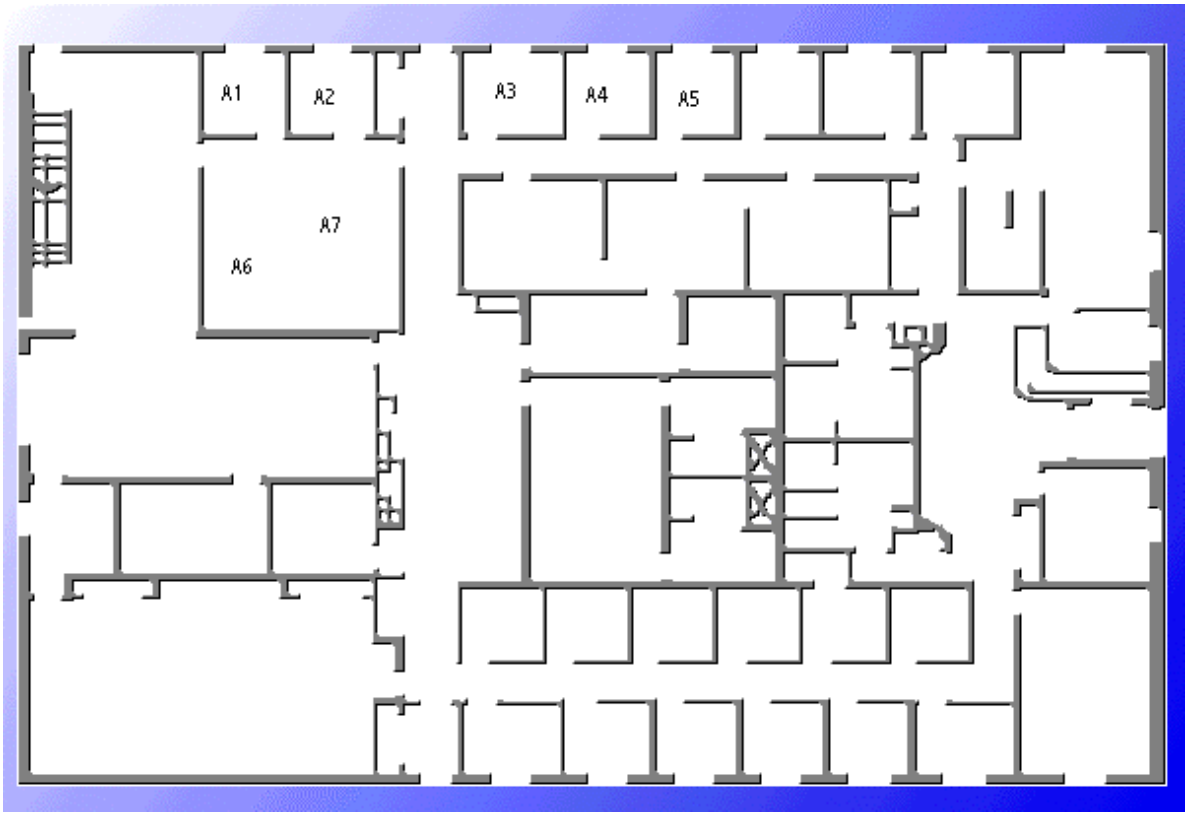
Install the punch-down block/collector unit(s) so as to allow for wiring access, neat wire routing and dress, and connection of any sensor wire-pair to any collector input. Neat and orderly punch-down blocks are easier to troubleshoot and maintain.

Figure 7-1. Punch-down Block Diagram



This floor plan and collector table is an example of a punch-down block wiring organization chart. It describes the sensor numbers and the room assignments where each sensor and zone is located on the punch-down block wiring.

Figure 7-2. Sensor Wiring Floor Plan



See the sensor and punch-down block wiring table on the next page for correct wiring locations and connections.

Collector #_____

Punch-down Block Pair	Cable ID	Zone Description
1	A1	Gary's Office
2	A2	Henry's Office
3	A3	Bob's Office
4	A4	Jon's Office
5	A5	Sharon's Office
6	A6	Conference Room
7	A7	Conference Room
8	A8	
9	A9	
10	A10	
11	A11	
12	A12	
13	A13	
14	A14	
15	A15	
16	A16	
17	A17	
18	A18	
19	A19	
20	A20	
21	A21	
22	A22	
23	A23	
24	A24	

1. The punch-down block pair represents a pair of sensor wires.

2. The Cable ID represents the identification of the cable run from a location within the facility back to the punch-down.

3. The room name or location name is then put into the Zone Description category.

8. INSTALLING AND CHECKING COLLECTORS

Locate the punch block and collector unit(s) carefully to allow for wiring access, neat wire routing and dress, and expansion space for future collectors that may be added as the system is expanded.

8.1 Checking the Collector Wiring

A quick visual check of the collector wiring should find that the punch block is secure and that the collector unit connector is firmly seated against the punch block connector. **See section 13.1 the Collector Voltage Troubleshooting Flow Chart for checking the collector wiring.**

> CAUTION:
> Correct two-pair wiring is essential. Crossed or reversed pairs can cause equipment damage in some cases. ALWAYS TEST ALL WIRING PRIOR TO 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 install crews be equipped with appropriate USOC cable testers as required to verify the polarity and validity of installed wiring.

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

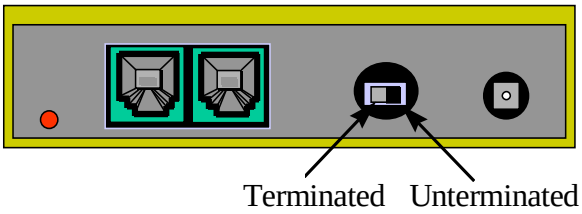
8.2 Checking Isolation

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 prior to system start up. The effect of these accidental connections can range from mild too severe. In many cases, erratic behavior may be noted. In some cases, equipment damage may occur. In any case, an electrical code violation has been produced.

To verify that the system is "isolated" from building and electrical grounds, use an ohmmeter or multimeter set to the 2K (2000)-ohm scale. Clip one probe to the nearest electrical conduit, electrical ground, or metal water pipe and then touch the other probe to each punch block row in turn. 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.

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

8.3 Setting the "Last Unit" Switch



Collector

When installing collectors, the collection network wires are run from unit to unit in a daisy chain fashion. Each collector has a small switch on it that is used to identify it as the last collector on a line. 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.

NOTE:
The last collector in a segment must have the terminate switch set to the *Terminate* position.

Why? With high speed digital data, it is critical that the electrical energy that runs down the wires is absorbed at the end and does not "bounce back" down the wire and cause interference with other data coming down. To exactly absorb all the energy coming down a wire, the wire must be ended at the last device in the chain with a resistor, which has value that equals the characteristic impedance of the wire. Each collector unit is equipped with such a resistor that is connected when the switch is in the TERMINATED position.

8.4 Power-up Test

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.

CAUTION:
If the red LED indicator was lit in the concentrator power-up test but does not light now, remove power from the concentrator quickly and recheck the two-pair wiring. A short circuit may have occurred in the connection of the collector. *(If this occurs, a safety fuse internal to the concentrator may be blown.)*

8.5 Sensor Voltage Test

Once power has been applied to the collector, a voltmeter check should be made of the sensors on the punch block to verify that they are connected correctly. This is done using the voltmeter or multimeter set to a 20-volt range. Apply the probes to each sensor connection on the punch block and verify that the voltage reading is approximately **16** volts. If the reading is approximately **20** volts, then there is no sensor connected to this pair or the wiring to the sensor is open. If the connection is approximately **16** volts, then the sensor is wired correctly to a single sensor. If the reading is very low or zero, the sensor pair is shorted. (Of course, the 25th pair on the punch block is unused and will read zero volts.) RF interference may be verified by switching the meter to the AC scale and reading the voltage. With no tag transmitting over the sensor there should be < 0.1 VAC on a sensor pair. When all the sensor pairs that have sensors connected are reading correctly, proper sensor connections are assured.

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 noted in the sensor voltage test, remove the collector power and resolve the shorts as soon as possible. If the system must be powered with the short unresolved, remove the Punch-block bridging clips to disable the disruptive sensor until the wiring can be repaired.

NOTE:
If the voltmeter is applied to a sensor pair, a slight drop in voltage can be observed when the sensor is receiving a transmitting ID tag. This can be used to identify sensors in lieu of complete system operation.

8.6 Local Powered Collectors

Collectors are provided with a 24V-power supply that must always be used for each collector, providing local operating power. No other power supply is adequate to power collectors.

8.7 Collector Network Wiring Connections

Concentrator End Connections

The 2-pair collector network connects to the concentrator unit using a modular connection with a RJ-12 modular jack (6 wire). This provides a means to easily disconnect the collector network for testing of the 2-pair wires or for service of the collector unit.

Collector End Connections

The 2-pair collector network connects to the collector module via a modular connector with a RJ-12 modular jack (6 wire). A modular-to-modular jumper is then used from one collector unit to the next collector unit. This provides a means to easily disconnect the collector unit for testing of the 2-pair wires or for service of the collector unit.

9. COLLECTOR WIRING

The collector devices connect to the sensing network using modular interfaces to allow for testing of the wiring before power is applied. It is recommended that installers are equipped with appropriate cable testers to verify the polarity and validity of installed wiring.

There are two parallel RJ receptacles on each collector. This allows collectors to be chained together from their assigned concentrator to the last collector in the chain. A key indication of connector problems with the collector cable, either reverse polarity or a short circuit, is the red indicator light on the collectors. The red light will flash every time it sees a badge fire. A constant pattern of 4 or 5 flashes may indicate there is a problem with the connectors on the cable.

9.1 Collector Wiring Steps

NOTE:
Do not make any connections to components unless indicated by a step in the procedure. Insure 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 concentrator location.

2. Refer to the contractual floor plan schematic diagram and identify all collector locations.

3. Verify that each collector cable for each collector site and the concentrator site has been installed as indicated on the contractual floor plan schematic diagram.

4. Attach a RJ connector to each end of the collector cable as shown in Table 10-1.

5. 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 LED’s 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 transmit #2 LED with its corresponding receiver #2 LED.

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

6. Mark the collector cable as checked on the Installation Checklist.

7. 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.)

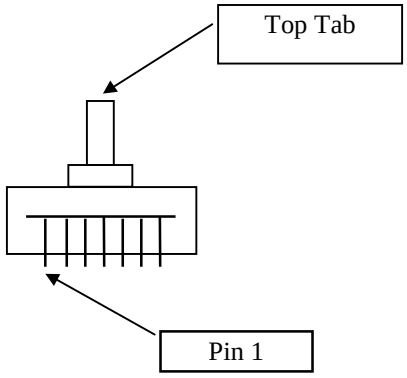
   c) Mark the collector as installed on the Installation Checklist.

Table 9-1. Collector RJ-12 Plug Wire Colors

Plug Pin No.	CAT 5 Wire Color	Description	Voltage
3	White/Blue	Data (+)	± 1 VDC
4	Blue	Data (-)	± 1 VDC
5	White/Orange	Ground	0 VDC
6	Orange	Ground	0 VDC

NOTE:

With connector pins pointing toward the installer, cable away from the installer, pin 1 is to the left. See diagram below.



10. CONCENTRATOR INSTALLATION

The selection of external or internal concentrator's depends on the installation.

10.1 Computer Network Card

The computer should be equipped with an appropriate network card for Arcnet and/or Ethernet Concentrator installation

10.2 Internal Concentrator Installation

The Internal Concentrator is installed inside the computer in an appropriate expansion slot. Follow the standard installation procedures for any computer hardware device. A network card is not required with this type of installation.

10.3 External Concentrator

The External Concentrator is a "table-top" box assembly, which can be allowed to sit on a level surface. It may also be mounted on any flat surface with mounting clips. Mount all external concentrators as indicated on the floor plan schematic diagram.

11. INSTALLING AND CHECKING THE EXTERNAL CONCENTRATOR

The Concentrator Power Supply should be secured to the electrical outlet using a screw or other means to ensure that it cannot fall out or is disconnected by others working in the same area.

Do NOT plug in the power supply cable until the installation wiring checks are completed. System damage could occur.

11.1 Network Wiring for Arcnet and Ethernet Concentrators

Arcnet Concentrator

The Arcnet Concentrator requires coaxial cable runs between the network card in the computer and the Arcnet Concentrator. For multiple concentrator's, install an appropriate hub. An Arcnet Concentrator requires a 20V power supply with a securely crimped BNC connector. This is recommended because tests have shown that screw on BNC connectors are unreliable and inconsistent. It is also recommended that Arcnet hubs utilize a UPS to protect it if the power is interrupted in a facility. This will allow the concentrator to run on a battery operated UPS supply. Concentrators can fall out without them. Correct Arcnet cabling needs to be RG62 at 93OHM, for correct specifications.

Ethernet Concentrator

The Ethernet Concentrator requires CAT 5 four pair UTP cable runs between the network card in the computer and the Ethernet Concentrator. For multiple concentrator's, install an appropriate network hub or it may also be connected to an existing Ethernet network within a facility. Ethernet Concentrators call for a 24V power supply same as the collectors. For more information on the Ethernet Concentrator, refer to the Ethernet Concentrator manual, Revision 4.

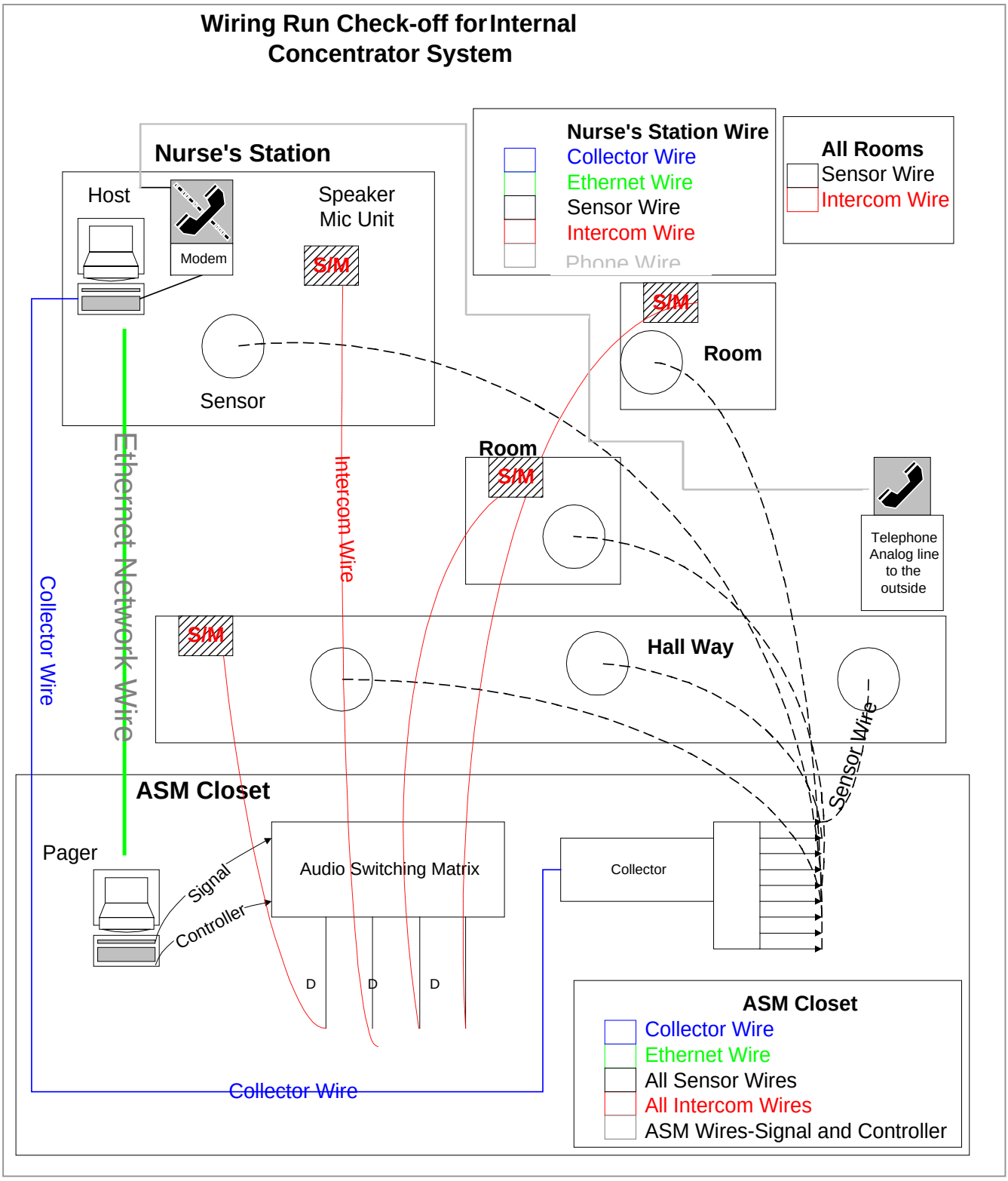
11.2 Power-up Test

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.

CAUTION:
Disconnect the modular cable from any down channel collector(s) and allow it to remain unconnected 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 observed the red LED indicator lights. If it fails to light, recheck the power and connections.

Note:
The Wire Run Check-off diagram is included in this manual as a visual reference of cable runs for system installation. See the Wire Run Check-off Sheet on the next page.


Wiring Run Check-off for Internal Concentrator System
Nurse's Station
Host
Modem
Speaker Mic Unit
SIM
Sensor
Nurse's Station Wire
Collector Wire
Ethernet Wire
Sensor Wire
Intercom Wire
Phone Wire
All Rooms
Sensor Wire
Intercom Wire
Room
Room
Telephone Analog line to the outside
Hall Way
Ethernet Network Wire
Collector Wire
Intercom Wire
Sensor Wire
ASM Closet
Pager
Signal
Controller
Audio Switching Matrix
Collector
D
D
D
Collector Wire
ASM Closet
Collector Wire
Ethernet Wire
All Sensor Wires
All Intercom Wires
ASM Wires-Signal and Controller

12. HARDWARE COMPONENTS

The table in this section provides a list of hardware, system, and sensor part numbers.

Table 12-1. Hardware Components

Part Number	Product Name
Badges	
VER-1400	Tracking Badge
VER-1450	Personnel Badge
VER-1550	Equipment Monitoring Badge
Sensors	
VER-4420 (Black), VER-4422 (White)	H/F Sensor
Network and Audio Support Components	
VER-2015	External Concentrator (Ethernet)
VER-2020	Internal Concentrator Kit
VER-2402	Collector Kit (with punch down and power supply)
VER-4600	Audio Switch Matrix
VER-4620	Speaker/Mic Unit

13. TROUBLE SHOOTING GUIDE

These are possible hardware trouble 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: 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 above18 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 tag id's being sent down the sensor pair, any AC voltage reading may indicate RF interference.

Problem: RF interference.
Discussion: RF may be checked as discussed above. Possible RF interference that effect the sensor network include, certain types of energy efficient lighting and associated electronic ballasts. The most common offenders are classified as T8 lights and have and 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.

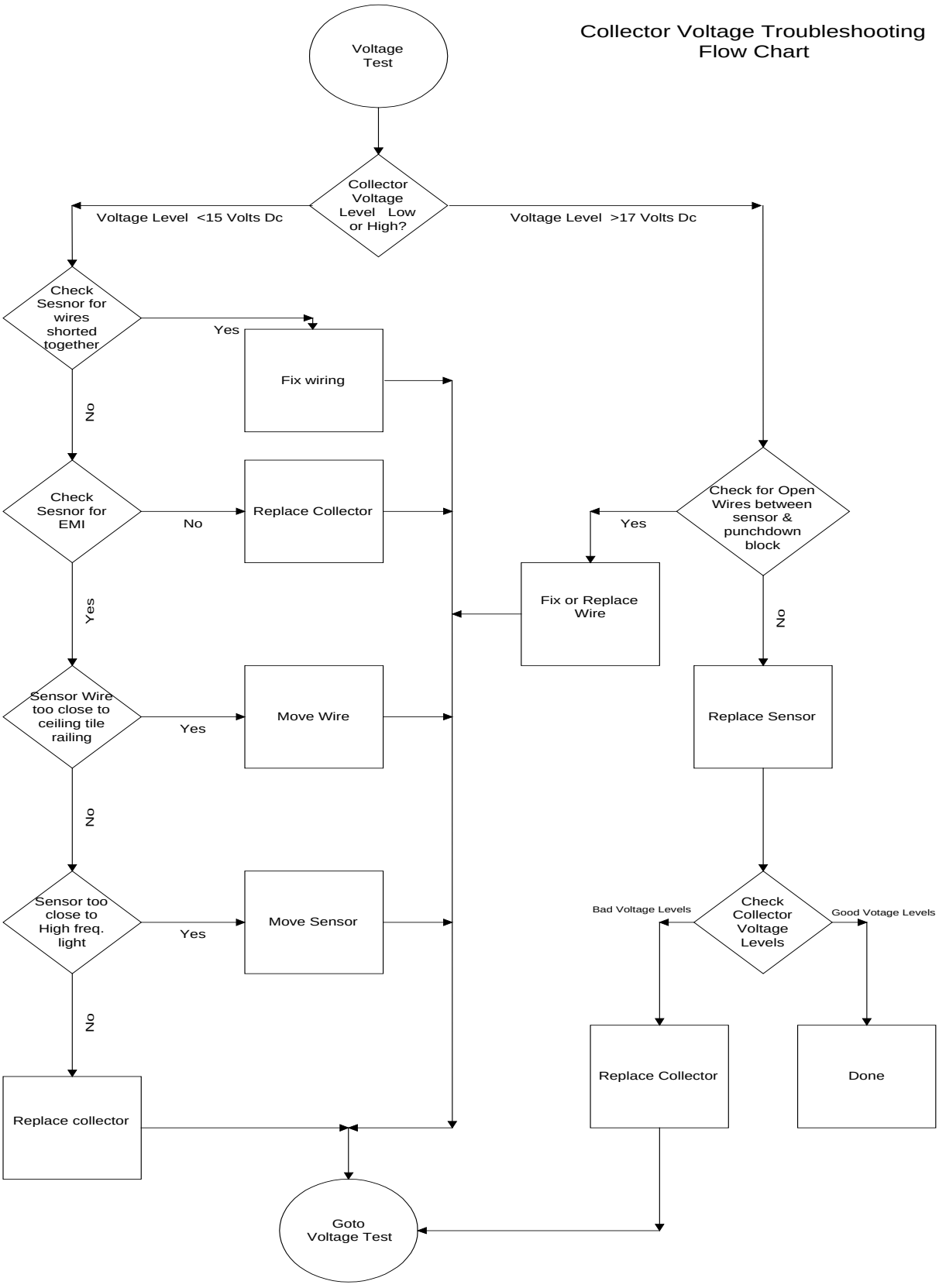
Problem: Sensor not picking up id from tag (non-working sensor).
Discussion: Smoke detectors using IR detection interfere with Versus sensors. The sensor should not be installed within two feet of smoke detectors to avoid any interference.

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.

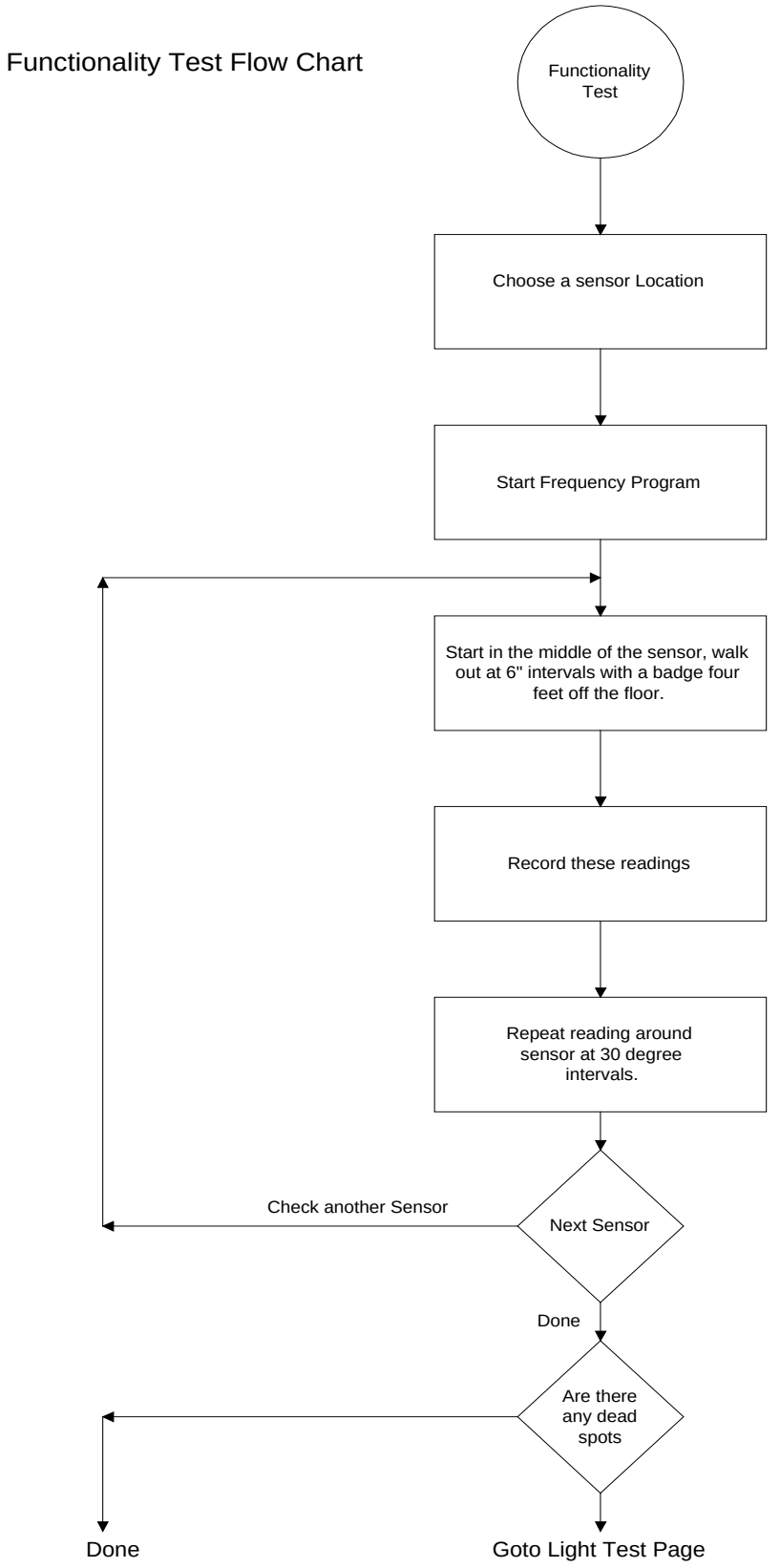
Trouble shooting guide

Condition	Possible Cause	Remedy
System fails to start up.	Faulty wiring	Re-crimp RJ type connectors.
Red light on collector flashes in a constant pattern.		
Two flashes	Power trouble	Check to be sure unit connections are secure and adequate power has been applied.
Three flashes		Disconnect the collector from the punch down block. If the flashing pattern continues the problem is in the collector. If it stops, one or more sensor inputs is reporting a constant R input**????**
Four flashes	485 Data wiring reversed	Reverse pair from collector to concentrator.
Five Flashes	No data error	No subnet data observed check the 485 line to the concentrator.
Voltage across sensor pair is < 15 Volts DC	Faulty wiring Faulty sensor RF interference	Check for RF interference. RF interference me verified by switching the voltmeter to AC scale and reading the voltage. With no tag inputs the AC reading should be > .1 volt
Voltage across sensor pair is > 18 volts.	Open circuit.	Check wires for opens.

13.1 Collector Voltage Troubleshooting Flow Chart



13.2 Functionality Test Flow Chart



14. 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 the "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	Versus P/N	Quantity	Hardware Installation	System Installation
Sensor Cable 2 pair UTP plenum 24 AWG, solid				
Collector Cable 2 pair UTP plenum 24 AWG solid				
Intercom Module Cable 7 Conductor 26 gauge, stranded , shielded w/drain				
UY connectors				
UR connectors				
Network Cable				
Cable Labels				
Cable ties				
Sensors - High Frequency				
Sensor Mounting Brackets Optional				
Collector Kits				
Concentrator				
Intercom/ Speaker Units				
Channel for wire between Speaker Units				
RJ 12				
RJ 45 (for shielded cable use shielded RJ 45 connectors)				
Host Computer System				
Pager Computer System				
Audio Switch Matrix				
Remote Monitor (Optional)				
VGA Splitter (Optional)				
Magnetic Doorlocks (Optional)				
Doorlock Control Interface (Optional)				
Personnel Badges				
Equipment Badges				
Equipment Badge Cables - Bear33				
Equipment Badge Cables - PLV				
Equipment Badge Cables - Monaghan				

Equipment Badge Cables - Newport Breeze				
Equipment Badge Cables - MDE Escort				
P-Badge Labels				
E-Badge ID Code Labels				
Hardware Installation Manual & Drawings				
Software Licenses				
Software Backups				
--Some Optional--				
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				

14.1 Preventative Maintenance Inspection Report

Preventive Maintenance Inspection Report

Customer_____ Customer Number_____ Date_____

FE _____ FE ID_____ Call Number_____

Equipment Serial Number_____ Software Revision _____

Configuration (__)

___ Host Computer Setup
___ Pager Computer Setup (Optional)
___ Work Station Computer (Optional)
___ Network Wiring
___ Sensor Wiring
___ ASM Audio Wiring (Optional)
___ Collector Setup
___ Punchdown Block Configuration
___ Concentrator Setup (Optional)
___ Sensors
___ ASM (Optional)
___ Software Intellimotion 3-Pack
___ Software Pager (Optional)
___ Software Misc. (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	1. ___ Connections Sensor/ASM	2. ___ Display	3. ___ Intercom Modules
Computers	4. ___ Software Setup	5. ___ Startup and Restart	6. ___ PC Anywhere & Modem
	7. ___ Network		
Concentrator	8. ___ Connection between Computers and Network (Optional)		
Collectors	9. ___ Wiring Punch-down	10. ___ Mounting	11. ___ Random flashing Red LED
Sensor	12. ___ Sensor Test Software	13. ___ Voltage Check	14. ___ Software Move Test
ASM	15. ___ LED Power ON	16. ___ Intercom Connections	17. ___ ASM Test Software
Battery Install	18. ___ Battery Installation	19. ___ Tracking on System	20. ___ Activates Page (Optional)
Backups	21. ___ Backup Data from Computer Install		
Training	22. ___ Completed		