Installation Manual

for

Controllers and Receivers

June, 1999

Revisions

Date	Changed by	Description
6/9/99	Zahir Abji	First Release
6/17/99	Zahir Abji	System Wiring section added and Halo Wiring Diagram corrected

NOTICE: This equipment has been tested and found to comply with the limits of a class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures. (1) Reorient or locate the receiving antenna. (2) Increase separation between the equipment and the receiver. (3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. (4) Consult the dealer or an experienced radio/TV technician for help.

NOTICE: Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

LIMITED WARRANTY

EXI Electronic Systems a division of Diversity Products Ltd. (collectively, "EXI") hereby warrants the product(s) accompanying this limited warranty (the "Product(s)") to be free of defects in materials and workmanship for a period of two years (excluding any batteries that may be added to or used in conjunction with the Products(s)) from the date of delivery of the original purchase of the Product(s) subject to the limiting conditions set forth below, provided that EXI has received notification of such defects no later than 30 days after expiration of the applicable warranty period and provided further that EXI has received a fully completed registration card (below) within 30 days from the date of original purchase of the Product(s).

The responsibility of EXI under this warranty is and shall be limited to repairing or replacing the Product(s) or any part thereof determined by EXI in its sole discretion to be defective in workmanship or material.

The installation of the Product(s) shall be deemed as acceptance by the original purchaser and any subsequent purchaser of the Product(s) (collectively the "Purchaser") of the terms set out in this limited warranty including the following further limiting conditions:

(a) EXI shall not be responsible for any repair or replacement of any Product(s) which has been found, upon inspection, to have been subjected to abuse, misuse or negligence, or any damage attributable to accident, lightning, power surge, brown-out, leaking, damaged or inoperative batteries or to have been installed, altered or repaired contrary to factory designated procedures without the prior written consent of EXI;

(b) It is understood, and the Purchaser agrees further to so inform any user of the Product(s) that the Product(s) is not, nor can it be, infallible in the detection of wandering patients, the prevention of infant abduction, the prevention of theft of assets or any other contemplated use of the Product(s). **The Purchaser will warn all users and acknowledges on it's own behalf that it has read and understands the above-mentioned limitations of the Product(s).** The Purchaser further acknowledges that the Product(s) are solely intended to provide an additional safeguard in notifying staff and accordingly do not guarantee the prevention of wandering patients or the attempted abduction of an infant or the theft of assets;

(c) It is further agreed by the Purchaser that the Purchaser has received no additional promises or statements of fact from EXI or its agents relative to the Product(s) upon which the Purchaser might have relied in purchasing the Product(s);

(d) The warranty set out above excludes and is in lieu of all other express or implied warranties, conditions or obligations, and no person is authorized to give any further representation or warranty or assume any further obligation on behalf of EXI. Although the Purchaser may have other rights, as they may vary from State to State or Province to Province, where it is legally possible to do so any statutory warranty is hereby expressly excluded. The warranty is subject to the domestic laws of the Province of Manitoba, Canada and the Purchaser agrees to attorn to the jurisdiction of the courts of competent jurisdiction in the Province of Manitoba; and

(e) EXI shall not be liable for any damages, whether direct or, indirect, incidental, consequential or arising out of contact or tort with the sole exception of the warranty set out above and any rights expressly created by applicable statute.

THIS WARRANTY IS VALID ONLY IN THE USA AND CANADA

Table of Contents

1. INTRODUCTION

1.1. Intended Audience

This manual serves as a guide for Installers of the HALO system. The major components of the system are described, as well as the system's intended functionality, so as to gain familiarity with its operation prior to installation. In order to successfully install and commission the system, it is absolutely critical to understand the capabilities of the system and its components prior to installation.

The function of the HALO system is to monitor areas within a building for the presence of HALO Tags. A Tag is sensed when it either enters an RF Field that is set up using the EXI HALO Controller (referred to as a Tag in Field or TIF), or when the Tag initiates an alarm signal (referred to as Tag Initiated Communications, or TIC).

1.2. SYSTEM OPERATION

The EXI HALO system uses Radio Frequency waves for communications between the HALO system components and the Tags. The HALO Controller continuously emits a 307 kHz RF frequency via the Exciter Antenna, setting up a field in its local area. When a Tag enters this field, a Radio Receiver within the Tag senses the 307 kHz RF field and transmits its identification information to the HALO Controller using a low level Radio Signal at frequency of 434 MHz.

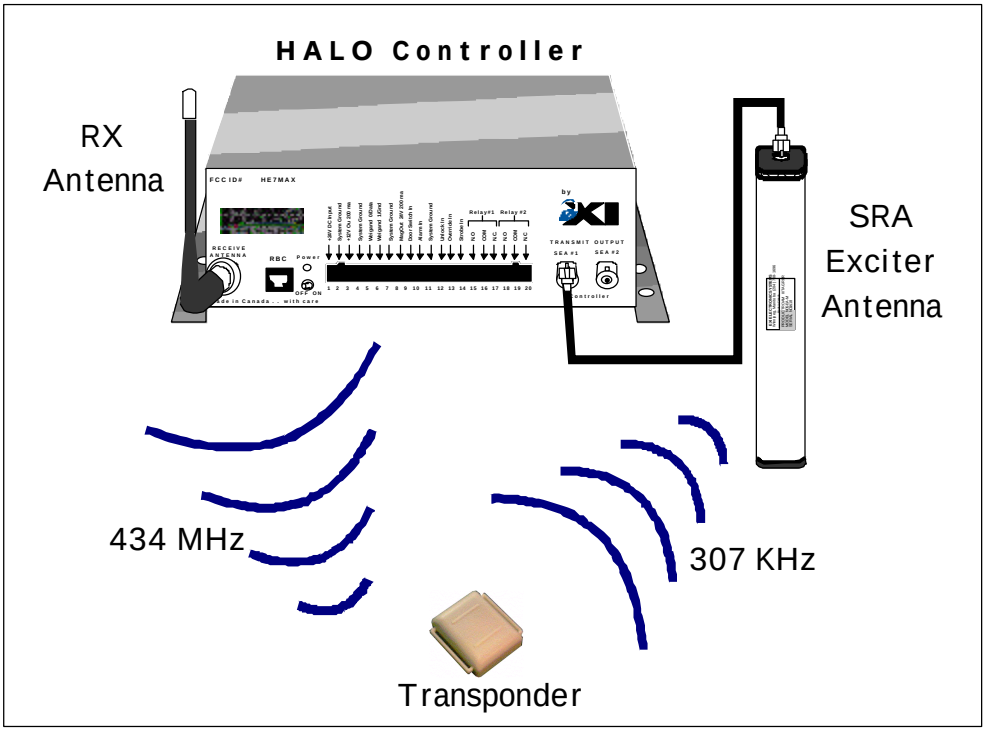


Figure 1 - Controller Operation

2. DECISIONS TO MAKE PRIOR TO INSTALLATION

2.1. SYSTEM WIRING

The HALO network is based on the RS-485 electrical interface standard, which is 2-wire multi-node bus. The EXI HALO elements are designed such that many more than the RS-485 limit of 32 Drivers and 32 Receivers can be co-exist on the same network. The baud rate used in the HALO system is 57,600 bps, and therefore in order to avoid data corruption it is important to ensure that a clean signal is always present. Using the right type of cable, network topology, and not exceeding total cable length are critical factors in ensuring that the system will operate reliably.

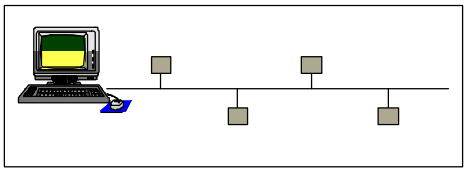


Figure 2 - "Bus" Topology

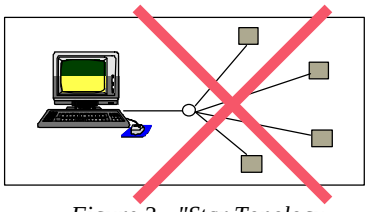


Figure 3 - "Star Topology

Cable capacitance is a large factor in determining the quality of the signal on the network, and EXI recommends that cables with capacitance of greater than **15 pf** per foot should be avoided. The network should be constructed using a "multi-drop bus" type topology, avoiding any "star" type configuration. The system is designed to operate with up to 4,000 ft of cable with the recommended topology and cable. The total cable length varies depending upon the cable capacitance and effective resistance, topology, and number of devices on the network. If the estimated total cable length is greater than 4,000 ft, a RS-485 Repeater will be required to ensure that the system works reliably, or works at all.

It is also recommended that a Repeater be used to isolate HALO Elevator Controllers from the main system to minimize noise pick-up and loading of the system. Cables used in Elevator shafts should be stranded and not solid, and should be resilient enough to withstand the continuous flexing that it will experience for many years in the elevator shaft.

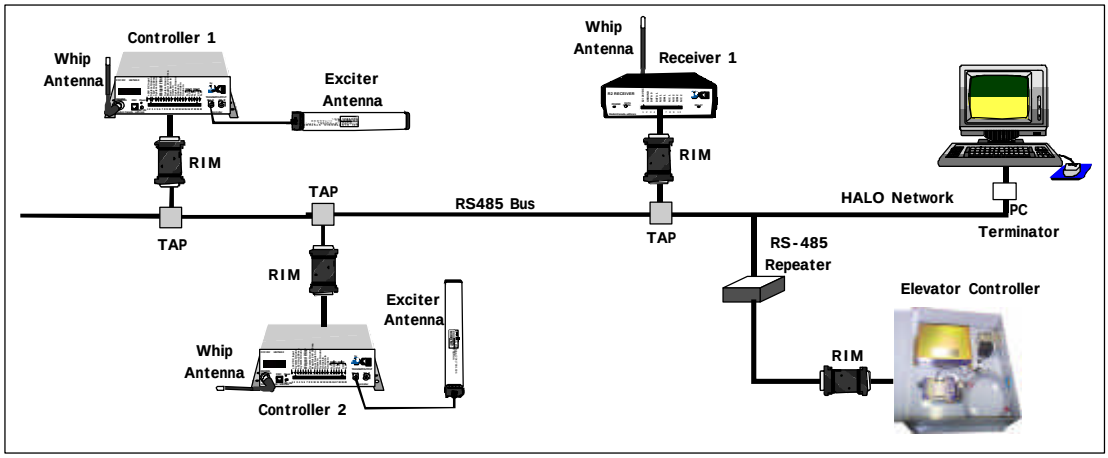


Figure 4 - Typical HALO Configuration

2.2. CONTROLLER CONFIGURATIONS

The HALO controller handles all communication with the Tags, provides audible and visual indicators of what state its in and prevents egress when necessary. The controller chassis may be horizontally or vertically mounted, on a wall, ceiling or shelf and should be mounted so that the front face panel is easily accessible. Since it is preferable to leave the RX antenna attached directly to the controller, the exact location of the controller will affect the reception of the tags and should only be finalized after setting up the field. This device is fully capable of operating in stand-alone mode although it does provide for communication to several different types of central reporting systems. The front panel provides easy access to a number of different output formats as well as allowing inputs to alter some of its automatic functions as necessary. Local alarm and bypass annunciation is available through several different user interface devices. These devices are discussed in more detail in Section 2.4 KEYPAD OR PINPAD?

The Tag serial numbers as well as status information is output in **Weigand** format on 2 of the output pins. This is a standard format used by many Card Access Systems. The **MagOut** line will engage a **Magnetic Door Lock** when Tag's are detected in the field. Due to NFPA 101 regulations being adopted in many locations, it may be mandatory to provide an automatic door release with 15 seconds after a door has been locked up. The controller provides 2 Form-C dry contacts rated at 2 Amps @ 30VDC. They switch ON to indicate the 2 different alarm conditions – **T**ag **I**n **F**ield (**TIF**) and **T**ag **I**nitiated **C**ommunication (**TIC**). These **Relays** can be used to turn on remote signaling devices such as:

- Nurse Call system annunciators (should have latching function)
- EXI model "SSM" 2-zone audible alarm with selectable tone sequences
- EXI model "ANN-6L" Audible-Visual 6-zone, LED type non-supervised Annunciator
- EXI model "APEX", supervised Annunciator system through inputs of an **APEX I/O-8**

Contact EXI for more information on each of the above systems and wiring diagrams for many different situations.

The **Door Switch** is used by the HALO controller to disable alarm reporting when the door is closed. This is known as the **Nurse Saver Feature**. Although Tags are still detected and reported to a central system, no alarms are annunciated until the door opens. At that time, all the Tags are re-read by the controller so that only the Tags that are still in the field will cause an alarm. The door switch is also useful during bypass as the controller will detect the door opening and then terminate the bypass as soon as the door closes.

A remote system or switches can use three input lines to alter the normal operation of the controller. **Unlock In** provides a temporary release of the door. **Alarm in** will cause an immediate lockup of the door with the local and remote alarm annunciators on. **Override In** will disable the controller so that no tags are read and nothing will be reported to the Host computer. Shorting the appropriate line to ground will activate the function.

Please refer to the **HALO Controller Operation Manual** for a more detailed description of the controller functions.

2.3. LOCATION FOR SRA EXCITER ANTENNAS

The most important aspect of the entire installation is the correct positioning of the SRA Exciter Antenna. Take note of the following:

- Ensure that no tag can reach the protected area without passing through a field.

- The field should not extend into other rooms or areas that are regularly occupied by tags. These tags could keep a controller in a pre-alarm state preventing the door from opening if magnetic door locks are being used.
- The tag should also be detected at least 4 feet from the door in order to give the magnetic door lock time to energize.
- Proximity to other fields could also be a factor. If a Tag is able to receive communication from 2 different controllers in the case of field overlap, it will try to respond to both controllers. Each controller will see Tag communication when it doesn't expect it and report it as noise.

Ceiling height, door approach width and metal in the vicinity, need to be considered when planning the location for the exciter antennae. The field should extend to the floor and from wall to wall. A dropped ceiling consisting of a grid and non-foil backed ceiling tile are the easiest construction materials to work with. Check above the lay-in tile to see how much space you have and the proximity of metal objects such as pipes, cables and air plenums. The SRA may also be dropped inside a wall cavity. Sometimes it's simpler to mount the SRA on the side of a wall above the door or along the hallway about 5 feet from the floor.

Extensive metal close to the Exciter can distort the field in unpredictable ways. Metallic objects will absorb and/or reflect radiated energy, which affects the field. This phenomenon can increase or decrease the field strength in areas causing hot spots or holes in your field. It can even change the shape of the field with tag detection sometimes occurring as much as 35 ft away. At times this effect can be used to advantage but the desired result can only be determined experimentally.

Although it is not possible to completely predict the performance of the field for every situation, some information about the field will help to shorten the process of determining the best location for the SRA. In the absence of any site irregularities, the field is symmetrical perpendicular to the antenna length. A cross-section through the length of the antenna is roughly oval as shown below.

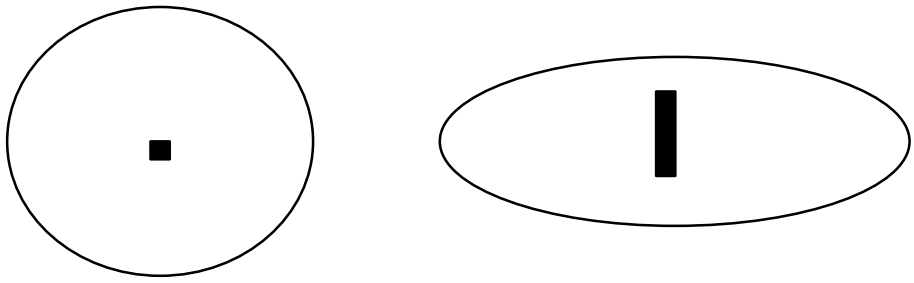


Figure 5 – Antenna Field

Although the field strength is adjustable, the maximum distance for good coverage is approximately 10 feet. Sometimes 2 exciters are necessary to get adequate coverage.

The location of the SRA is limited only by your imagination. If you have a location where you would like to mount it, try it. If it doesn't work, try something else. The important thing is that it must work well in its location. Each field needs to be fully tested to ensure adequate coverage of the protected

If it's not possible to create a proper field with the exciter inside, an SRA-E exciter antennae for outdoors could be placed on an outside wall to limit the penetration of the field into the building.

area. The procedure to fully test the field is described in the "**INSTALLING CONTROLLERS**" section of this manual.

Watch out for foil backed ceiling tile.

2.4. KEYPAD OR PINPAD?

Each of the user interface devices provide local audible and visual alarm and bypass indication as well as a means for the user to input requests to the system. If a staff member needs to be able to inititiate a bypass function from either side of the door, there will have to be two user interface devices of the same type installed. The type of device to select is dependent upon the situation and the user requirements.

KEYPAD – different codes for bypass and reset – everybody uses the same codes

PINPAD – different codes for bypass and reset – everybody has their own codes

2.5. LOCATING THE RECEIVER ANTENNA

The area to be protected has to be blanketed by controllers and receivers so that all critical areas have coverage. Elevator Interfaces cannot be included in the area calculations since the elevator is not always on the floor. Walls, equipment and excess metal could affect the pickup range. Although greater distances are possible, a maximum of 50'between devices is recommended.

It is essential that the RX antennas have no metal barriers blocking the signals from the Tags although some metal objects may enhance communication by reflecting the signal further than it would normally transmit. Wire glass sometimes found around nurseries can cut down the range. The only way to be sure of adequate coverage is by testing the results. After all devices are installed and operational, ensure that the entire area has coverage. Experience will shorten this process as the installer learns what site conditions cause problems.

One of the issues to think about is the storage and handling of the tags when not on the patients. Tags that are not on a "body" or stored in a proper container are periodically transmitting TIC alarms. Unnecessary alarms can occur while cleaning Tags and when transferring a Tag to or from a patient. The Host computer software allows the staff to put the Tag into a special status so that it will ignore all TIC alarms coming from that Tag. However, any equipment driven by the relay outputs of the devices will still be triggered and the staff also has to remember to put the Tag back into active status when done. It is best to avoid the problem if at all possible.

Cleaning of the Tags could be done in a room that is outside the range of any devices. The staff may prefer to bring a patient to a particular room to put on a Tag and then remove the Tag at the door as they walk the patient out. The site administration people should be consulted about these issues prior to installing the system

3. INSTALLATION PROCEDURES

3.1. INSTALLING CONTROLLERS

3.1.1. PREPARE CONTROLLER FOR FIELD SET UP

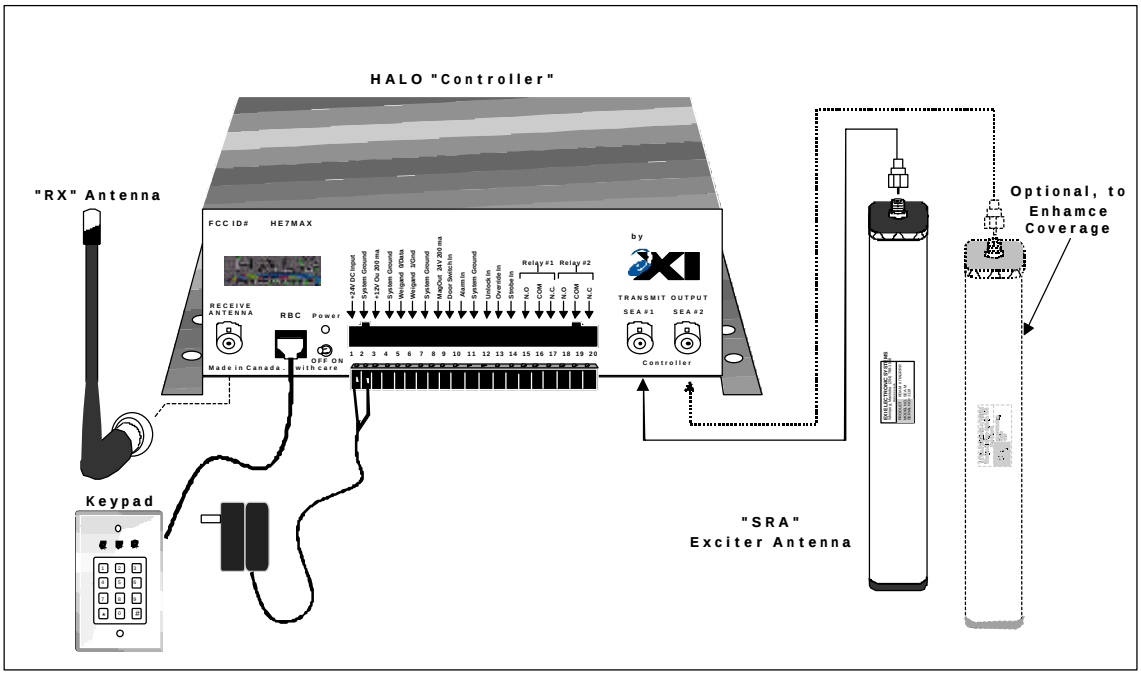


Figure 6 - HALO Controller Typical Hook-up Diagram

Assemble the controller pieces as illustrated in the above diagram. This is only a preliminary assembly in order to set up the field. If necessary, obtain an AC extension cord so that the system may be temporarily energized at this location. Connect a user interface device such as a DKX Keypad. Make sure the jumper on the back is in the maximum volume position so you can hear the beeper from a distance. Check inside the controller to insure that the proper voltage is selected for the device you want to use. PinPads use 5V while the Keypad requires 13V.

The RX antennas can also be installed on a length of coaxial cable when the best position for the antenna is different than the best placement for the device. The RX antenna should be oriented in the horizontal plane with the maximum surface of the antenna exposed to the longest distance requirement.

Duct tape is metallic and should never be used on the SRA Exciter Antennae

Install the RX antenna onto the Controller and plug in the R2-SRA. Try to place the RX antenna in the approximate final location so that the test will be realistic. Open the controller cover and turn the rotary **Mode** switch to position 0 for Test mode. In this mode the controller will turn on the beeper each time it successfully reads a Tag. Connect the power supply and power-up. The frequency of beeping will tell you how good the reception is.

3.1.2. TEST CONTROLLER AND SET UP FIELDS

After reading Section 3.2 on **LOCATION FOR SEA EXCITER ANTENNAS**, choose a suitable location for the SRA. Setting up a field is a matter of trial and error. The primary considerations here are the field shape and strength. The field has to fill the area in front of the door all the way to the floor so that no tag can reach the door without being detected.

> The most important aspect of the entire installation is the correct positioning of the SRA Exciter Antenna. A little time spent here will save countless hours of frustration and service calls later.

To set up a field, start by placing the tag at the range you want for the field at the height a tag is usually going to be found. The tag needs to be detected far enough from the door to allow the magnetic door lock time to energize. The tag should be placed on a non-metallic surface for testing. You might want to do a preliminary field setup by holding the SRA at the approximate location you want to install it but be aware that your body could be affecting the field. The SRA should be temporarily placed and the field adjusted for range using this stationary tag. Since the Tag will be read easier in some orientations with respect to the SRA, it is also necessary to test with the Tag in a variety of positions.

> Apply double-backed foam tape to the side of the antenna to temporarily attach it to a vertical surface for testing purposes. Take care that the antenna doesn't fall as sudden hard jolts may render it useless.

With the SRA and tag in position use the SRA RANGE ADJUST control on the top right corner of the controller circuit board to set up your field strength. Turn the control shaft clockwise all the way to the end for maximum field range. If the device is not beeping at this point, the SRA will need to be repositioned. Once the SRA is positioned so that the device is beeping, turn the control shaft counter clockwise slowly until the beeping stops. Then return clockwise approximately 1/16 of a turn or so that the beeping resumes. Repeat this process for various orientations of the Tag. Make sure the Tag can be read in any position.

Now that the field range is set up, you need to determine the shape and consistency of the field.

> **SOME NOTES ON SENSITIVITY:** All radio frequency (RF) devices are sensitive to polarization. Everyone has had a portable radio that got much louder if it was positioned at a particular angle. Another example is the TV antenna on your house. If you turned your TV antenna on it's side, you would receive a weaker signal and the deterioration of picture quality would be dramatic if the TV signal you received was already marginal.
>
> Unfortunately all other RF receivers suffer from the same electronic phenomenon. The Roam II Tag has to first receive from the controller before it will transmit its serial number. We can expect that there will be better response from the tag in one orientation. A strong field will ensure that even an improperly oriented Tag will respond.

TROUBLESHOOTING: If the controller is having trouble detecting tags, try different positions for the RX antenna. Raising the detection **THRESHOLD** with the rotary switch on the far left of the controller circuit board can remove some of the background noise as well as reduce interference from Tags talking to nearby controllers.

Holding the tag in a closed fist, pass the Tag slowly through all the areas that you need the field to cover twisting your wrist back and forth slowly as you move. **DON"T FORGET DOWN BY THE FLOOR**. The device should continue to beep at a steady rate. An uneven rate indicates that the controller is not able to read the tag successfully every time. The final step is to ensure that the field does not extend into other rooms or areas that are regularly occupied by tags. These tags could inadvertently keep a controller in an alarm state.

3.1.3. FINALIZE CONTROLLER INSTALLATION

Fasten SRA exciter antenna. If installing the SRA above a ceiling tile, use a marker pen to draw an outline of the SRA in its desired position on the upper side of the tile. Once you are certain of the SRA location, use a small amount of "Liquid Nail", "Firestone 500", silicone caulk, or similar product to cement the SRA to the tile, preventing it from falling on the floor should the tile be lifted for any reason.

If the SRA is to be dropped inside a wall cavity, do not let it hang on the coax cable nor hang so low that it touches the bottom steel plate. Loop the coax cable and wrap a band of electrical tape around it as shown below. Ensure the SRA will hang at the correct height by marking the cable prior to dropping the SRA inside the wall. Secure the cable when the SRA is hanging in the correct position.

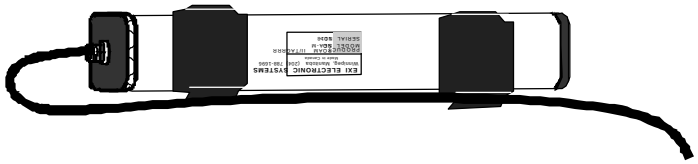


Figure 7 - Securing the Exciter Antenna Cable

Mount the Controller permanently and position the RX antenna. Mount the user interface device(s) where planned

The DKX and the PINPAD panels are designed for flush wall mounting in a standard 2-gang electrical box. Should surface mounting be necessary, an optional SMB box is available. Adjust the sound level for the beeper by moving the jumper on the back of the panel to the next set of pins until the desired sound level is achieved. Should a louder local alarm be desired, either use a Wiremold box extension and break out the knock out holes before mounting the panel, or remove the Piezo and relocate it above the ceiling so the Piezo opening has a direct path into the corridor.

The Keypad installation is similar to the above except it only needs a 1-gang electrical box. Also, there is no volume control for the beeper on the Keypad.

Install door switch. Hook up Maglock and any peripheral devices. Make sure the Maglock will release in case of a Fire Alarm.

Power up and test the field again.

3.1.4. SET CONTROLLER SWITCHES FOR NORMAL OPERATION

Flip open the Controller lid to set the switches inside for the desired operation.

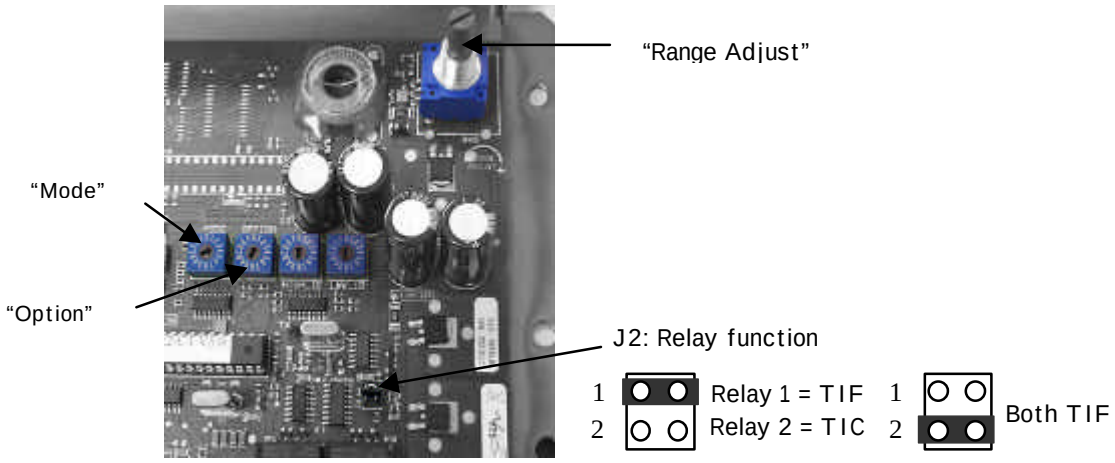


Figure 8 – Controller Switch Identification

MODE SWITCH SETTING

Change switches to desired operating mode as outlined below.

Mode	*Controller Function*	*Response*
0	Test Mode	
1	Patient Monitoring with DKX	Alarm ends on its own – fixed maximum bypass time
2	Patient Monitoring with DKX	Continuous alarm - fixed maximum bypass time
3	Patient Monitoring	Alarm ends on its own – fixed maximum bypass time
4	Patient Monitoring	Continuous alarm - fixed maximum bypass time
5	Article Surveillance – Protection	Alarm ends on its own – bypass extended by new tag
6	Article Surveillance – Protection	Continuous alarm - bypass extended by new tag
7, 8, 9	Reserved for Article Surveillance - Monitoring	
A	Authorized Entry	4 second release
B	Authorized Entry	8 second release
C	Authorized Entry	Keep released while tag in field
D,E,F	No Function	

Modes 1 and 2 will only allow Bypass when the field is clear of Tags and the user enters a sequence of key presses on the DKX as described in the **HALO Operation Manual**. Keypads are for Article Surveillance and Patient Monitoring Modes 3 and 4. The Pinpad can be used with any of the Modes.

OPTION SWITCH SETTING

With a HOST computer in the system, the recommended switch setting for the "Authorized Entry" mode is Option 0 (No Tags are authorized). "Patient Monitoring" or "Article Surveillance" modes should have Option 1 selected (All Tags will be stopped).

These settings let the HOST have complete control over which Tags are allowed access to or from the protected areas. The following table shows the selected function for each switch position, depending on the mode selected.

Digit Selection Structure: Tag Serial # consists of digits ABCDEF

Option Switch	*Function*	*Patient Monitoring or Article Surveillance*	*Authorized Entry*
0	Don't act on any Tags	No Tags are stopped	No Tags authorized
1	Act on all Tags	All Tags will be stopped	All Tags authorized
2	Tag Selection on digit A	Selected Tags will be stopped	Selected Tags authorized. - "no tag" + door open = alarm
3	Tag Selection on digit B	Selected Tags will be stopped	Selected Tags authorized. - "no tag" + door open = alarm
4	Tag Selection on digit C	Selected Tags will be stopped	Selected Tags authorized. - "no tag" + door open = alarm
5	Tag Selection on digit D	Selected Tags will be stopped	Selected Tags authorized. - "no tag" + door open = alarm
6	Tag Selection on digit E	Selected Tags will be stopped	Selected Tags authorized. - "no tag" + door open = alarm
7	Tag Selection on digit F	Selected Tags will be stopped	Selected Tags authorized. - "no tag" + door open = alarm
8	Tag Selection on digit A	Select Tags allowed to pass	Selected Tags authorized. - "no tag" + door open is OK
9	Tag Selection on digit B	Select Tags allowed to pass	Selected Tags authorized. - "no tag" + door open is OK
A	Tag Selection on digit C	Select Tags allowed to pass	Selected Tags authorized. - "no tag" + door open is OK
B	Tag Selection on digit D	Select Tags allowed to pass	Selected Tags authorized. - "no tag" + door open is OK
C	Tag Selection on digit E	Select Tags allowed to pass	Selected Tags authorized. - "no tag" + door open is OK
D	Tag Selection on digit F	Select Tags allowed to pass	Selected Tags authorized. - "no tag" + door open is OK
E, F	No Option		

RANGE SWITCH SETTING:

If HIGH ID > LOW ID, all Tags with digit x equal to or between the 2 numbers are selected

If HIGH ID < LOW ID, all Tags with digit x greater than or equal to LOW are selected

and all Tags with digit x less than or equal to HIGH are selected

If HIGH ID = LOW ID, only Tags with digit x = to HIGH or LOW are selected

3.2. INSTALL RECEIVERS

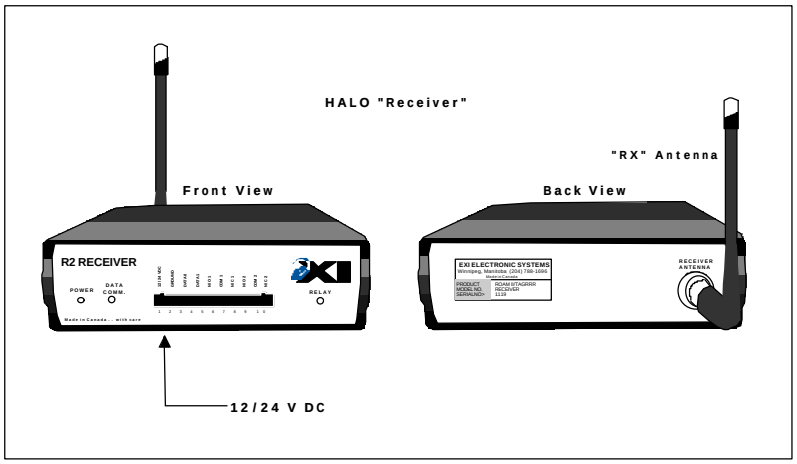


Figure 9 – HALO Receiver

Receivers are meant for use where only a "TIC" signal needs to be detected. The "Relay" light comes on to indicate relay activation when a "TIC" is detected. Receivers are not capable of creating a field of energy using Exciters, as Controllers can, and therefore do not have to be connected to the Exciter Antennae. Install the RX Antenna onto the Receiver, place the Receiver in the approximate location for final use, connect the power supply and power-up. Adjust the RX Antenna orientation for the best reception.

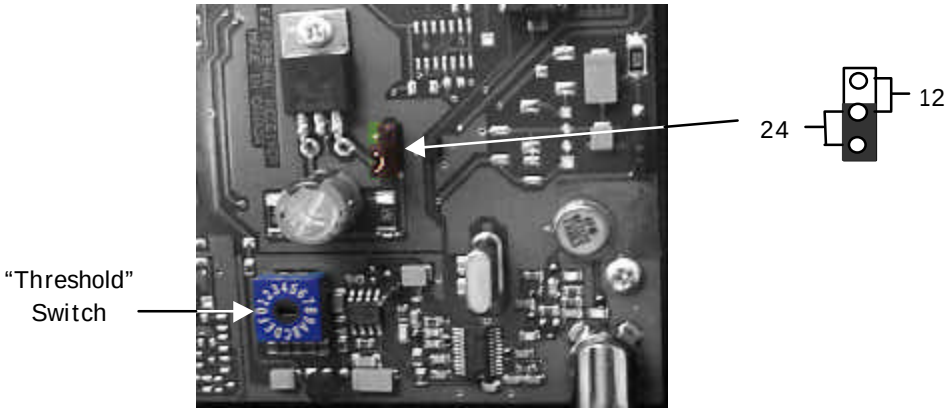


Figure 10 – HALO Receiver Threshold and Operating Voltage Setting

3.3. TESTING TIC ALARM COVERAGE AROUND THE BUILDING

With all devices installed at the location, ensure that a "TIC" can be detected from all remote corners and locations of the protected area. Also ensure that the overlapping fields of detection from the various Controller and Receiver devices are fine-tuned.

3.4. CONNECTING TO THE HOST COMPUTER

The Host Computer is included in a full-blown HALO system that needs central site monitoring and control. The Host Computer runs the HALO Application Software that provides the following major functions:

- Management of the database that stores the identities of all the system components and Tags that are deployed within the system
- Management and storage of logs of all the alarm conditions that occur during use
- Annunciation of any of the alarm conditions that may exist, showing location of such an alarm condition in a graphical format overlaid over the floor plan of the building in which the system is installed

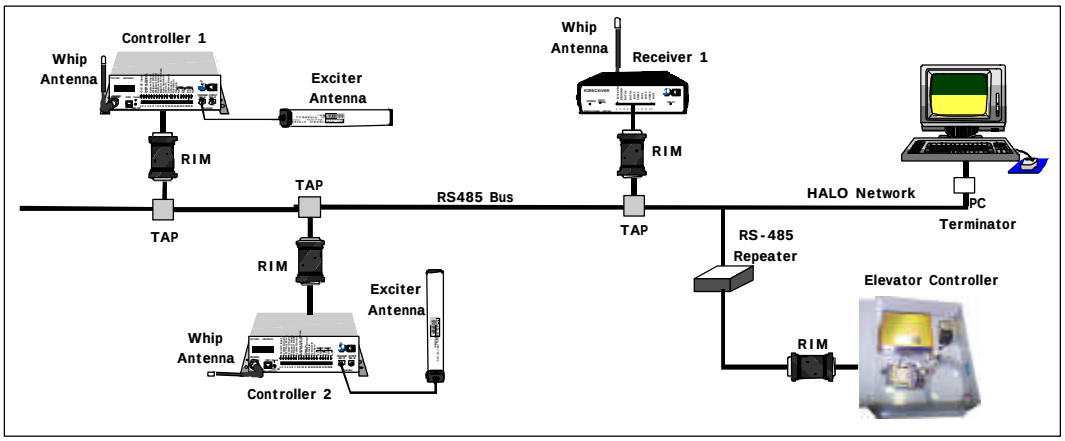
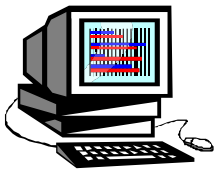


Figure 11 – HALO Network with Host Computer

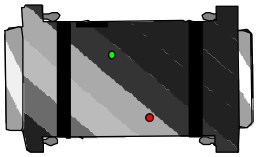
For HALO systems that only require localized alarm and control, the Host Computer may not be re-uired.

The Host Computer consists of a Pentium based computer with a 17" Color Monitor, a Keyboard, mouse, and Speakers for audible feed-back. A ZIP drive is used for periodic, data backup. The ZIP disk is removable, allowing for off-site archiving of the backed-up database.



All devices on the RS485 bus will require an **RIM** for Weigand to RS485 conversion. It is important for the computer RS485 output be connected to the "PC Terminator", and not directly to the RS485 network so as to provide the correct termination and loading required for the driver within the PC. The R2 TAP boxes may be used to provide clean connections from the RIM to the RS485 network line.

Figure 12 – Sketch of RIM



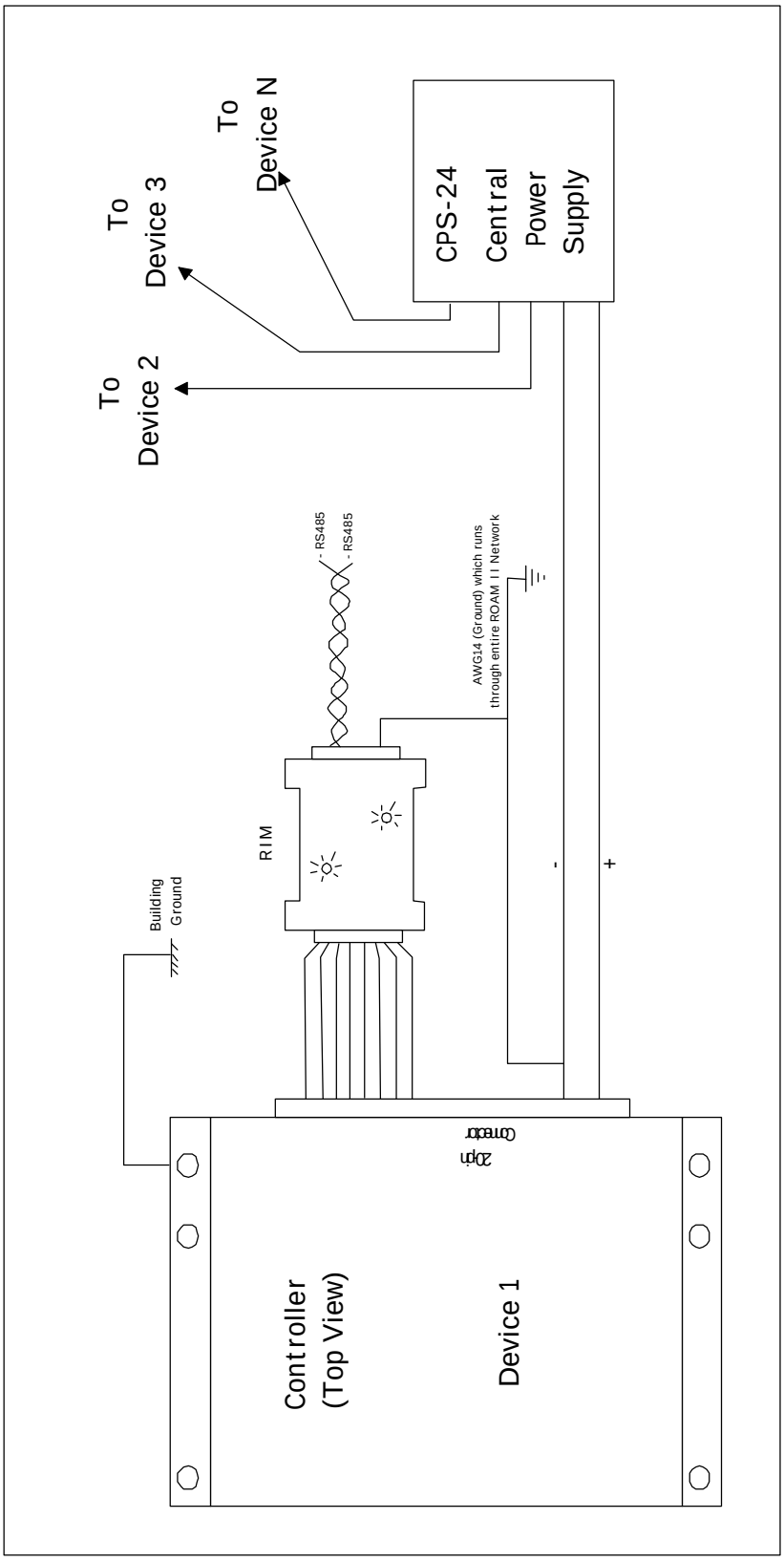


Figure 13 – HALO System Grounding

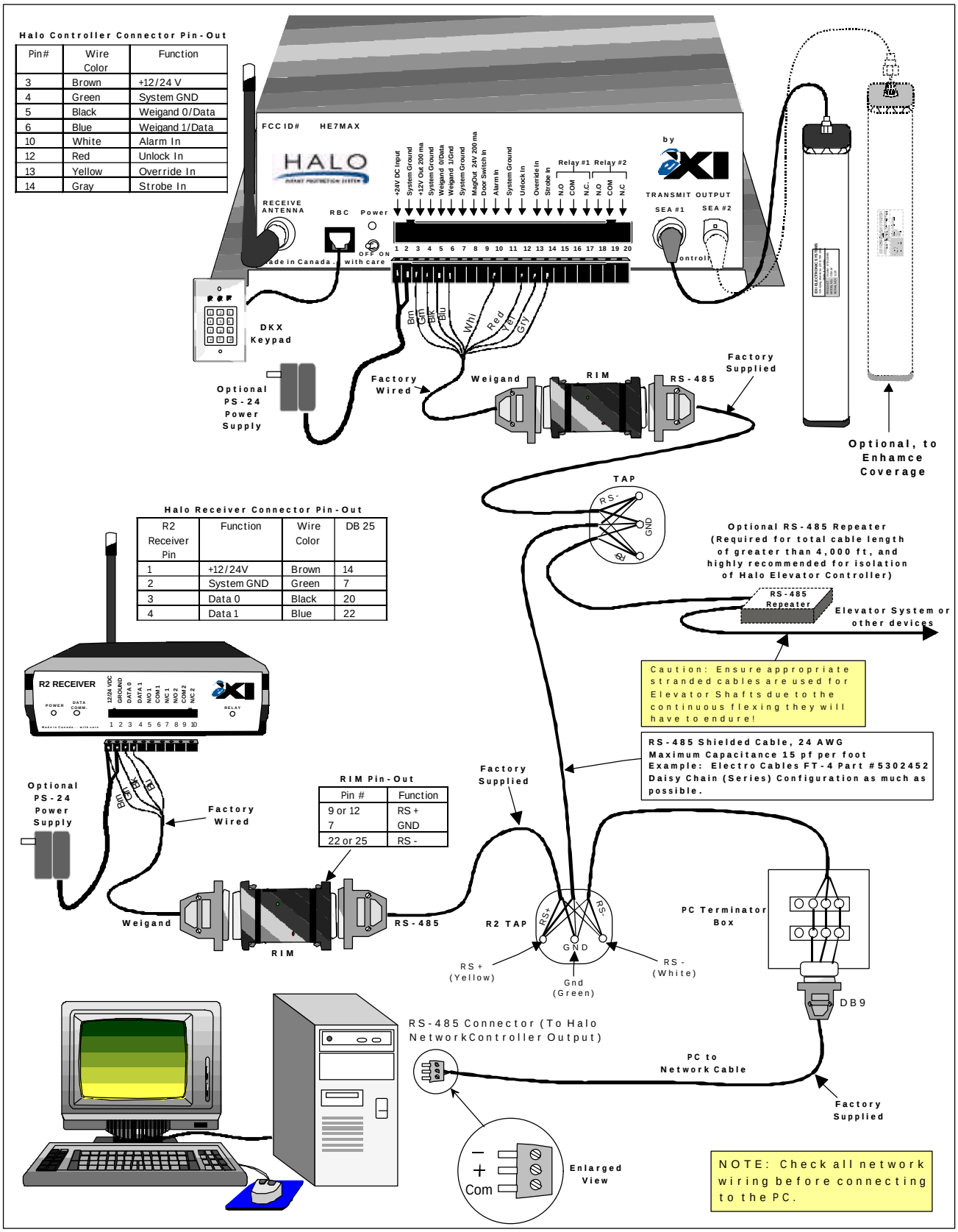


Figure 14 - Halo Wiring Diagram

4. Weigand Output Specification

Fields	# of bits	
Even Parity bit	(first)1	Parity bit + next 16 bits = 0
Control code	4	used to distinguish message types
Door bit	1	1 = Door open, 0 = Door closed
Maglock bit	1	1 = Maglock On, 0 = Maglock off
Info - 1	8	Info bytes are dependant on message type (see below for descriptions)
Info- 2	8	either bit patterns bit 7 -> bit 0
Info - 3	8	or 6 digits (1 digit = 4 bits)
Odd Parity bit	(last)1	Parity bit + previous 16 bits = 1
Total	32	

The control code that accompanies Tag serial #'s not only identifies that this message contains a Tag serial # but it also describes the state of the controller at the time.

Message Types	Control Code Decimal (Binary)	Info - 1	Info - 2	Info - 3
Tag Serial # -ABCDEF		Tag digits - AB	Tag digits - CD	Tag digits - EF
- normal	0 (0000)	"	"	"
- Bypassed	4 (0100)	"	"	"
- TIF alarm	1 (0001)	"	"	"
- Loiter	3 (0011)	"	"	"
- Host alarm	2 (0010)	"	"	"
- Unlock Req	5 (0101)	"	"	"
- TIC	7 (0111)	"	"	"
- Test Mode	10 (1010)	"	"	"
PIN # Entry 0 = no key, A = zero key	8 (1000)	eg. 4 Key presses 0 (0000) 0 (0000)	"0123" A(1010) 1(0001)	2(0010) 3(0011)
Event (elevator only)	9 (1001)	Door Opened = 00	00	01
Switch Selections	11 (1011)	Version #	Mode/Option	ID Range High/Low
Status - sent after any significant changes	12 (1100)	Noise Counter	Input states	Device Status

Status message information definition:

Noise Counter - indicates the number of times the device has detected something on its receiver but couldn't make sense of it. This counter decrements over time if noise goes away. The status message gets sent for a Noise Alarm ON (when this counter rolls over to 100(64Hex)) and then again when the Noise Alarm Clears (gets back to zero).

Input states - nothing "on" will equal 73Hex
- **bit 7** - not used
- **bit 6** - Strobe 0 = ignore other host inputs
- **bit 5** - Override 0 - override request
- **bit 4** - Unlock 0 = lock release request
- **bit 3** - bypass key 1 = pressed
- **bit 2** - Reset key 1 = pressed
- **bit 1** - Alarm 0 = Host alarm request
- **bit 0** - Door switch 1 = open, 0 = closed

Device Status - Normal (nothing happening) = 00
- **bit 7** - not used
- **bit 6** - RF field occupied by tag(s)
- **bit 5** - In Override
- **bit 4** - In Unlock
- **bit 3** - In Bypass
- **bit 2** - Host alarm
- **bit 1** - TIC Alarm
- **bit 0** - TIF alarm