AISLECOP®

OPERATIONS AND MAINTENANCE MANUAL

www.aislecop.com

Toll Free 888-877-3861

Congratulations!

You have purchased the AisleCop® forklift/pedestrian safety system, a step on the way toward managing industrial traffic and pedestrian traffic in a more controlled, safer manner. Your business is deeply appreciated.

1. Safety

AisleCop® gates are designed as a tool to contribute to a safer working environment. They in no way remove the risks associated with pedestrian and vehicle traffic. They serve as a visual warning, to both drivers and pedestrians to be cautious in pedestrian and vehicle traffic ways**. They do not provide 100% protection from industrial traffic accidents. AisleCop® gates do not stop forklifts or other industrial traffic. Other critical factors, such as system maintenance, driver and pedestrian training and compliance, enforcement of crossing lanes, and assessment of safe crossings are the responsibility of others.**

Training is required to safely operate AisleCop® gates. Read the operation instructions contained within this manual prior to use.

- **NEVER** operate AisleCop® gates in applications for which the gates were not intended
- **NEVER** operate AisleCop® gates without proper training
- **NEVER** use accessories or attachments that are not approved by Cisco-Eagle, Inc.
- **NEVER** make modifications to AisleCop® gates without prior written approval from Cisco-Eagle, Inc.
- **ALWAYS** be aware of operation of AisleCop® gates and keep hands, feet, and loose clothing clear of moving parts at all times.

2. System Components

Your AisleCop® system consists of:

- [#] ea. pedestrian gates (Model ACPHMAA)
- [#] ea. PLC and Controls
- [#] ea. push buttons
- [#] ea. sets of column lights & audible alarms
- [#] ea. vehicle gates (Model ACPVMAA)
- [#] ea. barrier arms with foam padding for vehicle gates – [##] feet long
- [#] ea. motion detectors
- [#] ea. remote for motion detectors
- [#] ea. remote flashing beacons

Note that quantities vary per system configuration.

3. Description of Operation

Please note that systems operation is dependent on your exact AisleCop® configuration. Detailed descriptions are provided on a per-system basis.

Tips

1. If the pedestrian gates remain closed well after a pedestrian push button is depressed, it is normally because the motion detectors continue to detect "traffic" in the vehicle aisle. Note that the movement of vehicles as well as any other moving objects (pedestrians, AGVs, carts, etc.) in the vehicle aisle will be considered traffic by the motion detectors.

2. The pedestrian gates, and the accompanying tower lights and audible alarms work in concert.

System Notes

AisleCop® systems are configured for a short delay in order to allow pedestrians to cross the intersection. The pedestrian gate will remain open until all pedestrian traffic has cleared and the short time delay expires. This feature accommodates continuous streams of pedestrians desiring to cross through the crosswalk, such as during breaks or lunch time.

In order to promote safe usage, it is recommended that sufficient guarding or other physical barriers are used in conjunction with and directly adjacent to the AisleCop® Pedestrian Gates in order to appropriately funnel pedestrian traffic through these gates.

Fire Alarm

AisleCop® systems can be tied into your fire alarm system. Under a fire alarm scenario, all gates will open. The red column lights and the audible alarms remain on until the fire alarm signal is ceases. The AisleCop® system must be properly wired to the facility's fire alarm system for this feature to work.

It is important to note that pedestrian gate arms may partially block the vehicle aisle during a fire alarm scenario. Vehicle operators should move their vehicle from the aisle, exit the vehicle and proceed under customer's standard protocol for the given situation.

Power Failure

Pedestrian gates will not automatically open under power failure, but may be physically pushed open with little effort.

Auto-reverse

All gates incorporate an auto-reversing feature. A pedestrian gate arm will auto-reverse in both directions until the arm no longer impacts an obstruction and then continue its cycle.

Manual Switch

A 3-position manual switch is included on the panel of each vertical and pedestrian gate. The default position for this switch is [PLC]. In this position, the gate will take its commands from the PLC located in the primary gate. The gate may be opened or closed by moving a gate's manual switch to the [OPEN] or [CLOSE] position. Always remember to return the button to the [PLC] position when you're done.

Audible Alarm

Audible alarm's volume can be adjusted by turning the knob on the top of the column lights.

4. Pedestrian Gate Specifications

Physical Dimensions

Cabinet depth: .....14 1/8”
Cabinet width:.....14 1/8”
Cabinet height:.....39 1/2” (with standard boom arm mounted)
Unit overall width (closed gate):.....54 3/8” (with standard 40” boom arm)
Unit overall depth (open gate): .....57 5/8” (with standard 40” boom arm)
Standard Boom Arm swing radius: .....47 3/8”

Recommended Clearances

Cabinet Access Door: .....Sufficient clearance for access to internal components. Must meet all OSHA, NEC, federal, state or local codes.

Boom Arm: .....2” to 6” from end of arm to adjacent equipment or surfaces through its 90 degree swing radius.

Other Vertical Faces:.....All other vertical faces may abut adjacent equipment or surfaces excepting when doing so may cause transfer of heat, static, moisture or otherwise cause harm to or shorten the life of the AisleCop® gate.

Top: .....2” minimum and must not impact warning lights, audible alarm, use of push button or swing radius of boom arm.

Technical Data

Opening/Closing Time:.....2.3 seconds/2.3 seconds
Current Draw: .....7 Amps (peak)
Power Consumption: .....65 W
Motor Voltage:.....115 VAC
Internal Control Voltage: .....24 VDC
Weight:.....147 Lbs.
Operating Temperature Range:.....-30 to 140°F
Drive Unit:.....Torque Motor

5. Vehicle Gate Specifications

Physical Dimensions

Cabinet depth:	.....	11 3/4”
Cabinet width:	.....	13 3/4”
Cabinet height:	.....	40 7/8” (without barrier arm)
Unit overall width (closed gate):	.....	84 1/4” (with 6’-0” arm)
	.....	108 1/4” (with 8’-0” arm)
	.....	132 1/4" (with 10’-0” arm)
	.....	156 1/4" (with 12’-0” arm)
Unit overall height (open gate):	.....	116” (with 6’-0” arm)
	.....	140” (with 8’-0” arm)
	.....	164” (with 10’-0” arm)
	.....	188” (with 12’-0” arm)

Recommended Clearances

Cabinet Access Door:	.....	Sufficient clearance for access to internal components. Must meet all OSHA, NEC, federal, state or local codes.
Barrier Arm:	.....	6” minimum from end of arm to adjacent equipment or surfaces through its 90 degree swing radius.
Other Vertical Faces:	.....	All other vertical faces may abut adjacent equipment or surfaces excepting when doing so may cause transfer of heat, static, moisture or otherwise cause harm to or shorten the life of the AisleCop® gate.

Technical Data

Opening/Closing Time:	.....	2.3 seconds/2.8 seconds
Current Draw:	.....	7 Amps (peak)
Power Consumption:	.....	65 W
Motor Voltage:	.....	115 VAC
Internal Control Voltage:	.....	24 VDC
Weight:	.....	110 Lbs.
Operating Temp. Range:	.....	-30 to 140°F
Drive Unit:	.....	Torque Motor

6. Maintenance

AisleCop® gates are designed for a long lifetime with only a minimum of maintenance required.
To guarantee the greatest available equipment uptime and maximize the lifetime of AisleCop® gates, please follow the prescribed maintenance schedules. Use the "Maintenance Service Record" table to keep track of your maintenance activities.

Changing the Rubber End Stop
AisleCop® gates are equipped with two (2) rubber end stops to absorb the impact generated by the moving gate reaching the end positions. These rubber end stops should be replaced once per year
or after one million cycles whatever occurs first.

Checking the Exterior of Cabinet
Inspect the housing for external damage every six months. If damage is observed, also check for possible compromise of anchoring integrity.

Check the barrier arm and the attachment kit
Inspect the boom (pedestrian gates) and barrier (vehicle gates) arms for physical damage and confirm the arm attachment components are in place and tight. Perform this inspection every six months.

Checking Sensors, Loop Detectors and Loop Wires
Confirm sensors (photo eyes, motion detectors, etc.) are tightly attached to mounting fixtures and maintain clean detection surfaces. If inductance loops are used, then check the frequencies of the loops every six months. The loop wires should be replaced approximately every four years or as needed. Check the loop sealant every year for cracks or peeling. Replace as needed.

Check safety signage
Inspect for proper attachment of all safety-related signage on gate cabinetry, barrier and boom arms, and other peripheral hardware if applicable.

Maintenance Service Record

- *Gate Model: _____*
- *Gate Serial Number: _____*
- *Date of Installation: _____*

Action	Frequency	Date	Date	Date	Date	Date
Replace rubber end stops	Yearly					
Inspect cabinet/anchoring	6 months					
Inspect arms/hardware	6 months					
Sensor inspection	6 months					
Inductance loop inspection	6 months					
Inductance loop sealant inspection	Yearly					
Safety signage inspection	Yearly					

7. Drawings

System drawings are provided for each AisleCop® installation. Below is a sample list.

Drawing#	***Sht.#***	***Rev.***	***Description***	***Date***	***Customer***
Gxxxxxx	L01	-	Layout Drawing	mm/dd/yy	Customer
Gxxxxxx	E01	-	Field wire pulls between devices	mm/dd/yy	Customer
Gxxxxxx	E02	-	Electrical Wiring Diagram – Primary Pedestrian Gate Cabinet	mm/dd/yy	Customer
Gxxxxxx	E03	-	Electrical Wiring Diagram – Secondary Pedestrian Gate Cabinet #2 and #3 and Motion Detectors	mm/dd/yy	Customer

8. Ethernet Capability

Your AisleCop® Gate Systems may include Ethernet capable PLCs located in the primary gates of each of the systems. By fully utilizing the PLCs Ethernet connectivity, we are able to remotely troubleshooting the system and making small changes that would might otherwise require a site visit and leave the system not working at optimum levels or disabled for days at a time. When included, this Ethernet capability is provided to you free of charge, but must be set up in order to be utilized.

Prior to installation of the system, we highly recommend that your IT department setup and provide to us IP Address, Subnet Mask, and Gateway information for each of the AisleCop® systems. Also, please provide the following VPN information (if applicable): server addresses, user name(s) and password(s).

Note that we have nothing but the strictest respect for our customers' security. However, if company protocol dictates, or your IT department is simply more comfortable with it, the Ethernet cable may be left physically unplugged until such time that we are requested to dial in and troubleshoot and/or make changes.

9. Mechanical Installation

Locating and Positioning of Gates

Most AisleCop® systems are provided with drawings to determine the location and position of each vehicle and pedestrian gate. Reference these drawings and go through the following checklist prior to anchoring each gate.

- □ Location of gate matches provided drawing (if provided)
- □ Position of gate matches provided drawing (if provided)
- □ Arm swings down in the desired direction (vehicle gate only). Note: Arm should swing down toward the AisleCop® label side of the pedestal.
- □ Arm clears obstructions through its complete swing radius
- □ Pedestal has 24 inches (pedestrian gate) or 12 inches (vehicle gate) minimum clearance on the panel door side for easy access to internal components

Note: In any instance where OSHA, NEC, federal, state or local codes conflict with location, position or clearance of these gates, those standards shall take precedence over the guidelines herein.

Anchoring Gates

We recommend 3/8" anchor bolts, which have been included with your system(s). Please refer to the anchor bolt manufacturer's installation instructions for specific requirements. To mount AisleCop® vehicle gates to a concrete surface follow the instructions below:

1. Carefully remove the gate from its shipping crate
2. Open the barrier door
3. Place the gate on the desired position
4. Using a marker, follow the outside and inside housing contours to the concrete
5. Remove gate
6. Using the chart below, mark the mounting holes on the concrete
7. Drill and install four bolts. Make sure they stand up at least 2" above the concrete surface
8. Place gate on top of previous marked surface
9. Using U-channels provided, secure the gate to the concrete floor

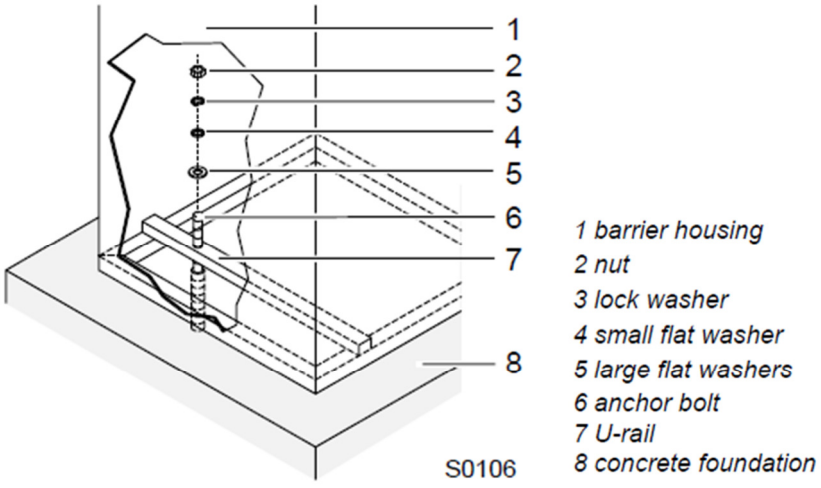


Figure 1. – Gate Install Detail

Arm Mounting – Vehicle Gates

Vehicle gates are equipped with a long railroad crossing style arm (shipped loose) that attaches to the pivoting bracket on the pedestal with 4 ea. 5/16-18 x 3" hex head cap screws, 4 ea. 5/16-18 hex nuts, and 8 each 5/16" SAE washers. The arm may include an aluminum block, shipped loose. To insert the aluminum block into the bracket end of the arm, use a Phillips screwdriver to remove the plastic end cap, insert the aluminum block, align it with the holes in the arm and reattach the plastic end cap. Align the holes in the bracket with the holes in the arm and insert the bolts through both the bracket and the arm. Washers should be used on both the bolt head and hex nut sides. Use two 1/2" crescent and/or socket wrenches to tighten the fasteners.

Figure 2. – Vehicle Gate Arm Mounting

Arm Mounting – Pedestrian Gates

Pedestrian gates are equipped with a boom style arm (shipped loose). Each arm has a hub that rests over the drive shaft that protrudes out of the top of the pedestal. Carefully slide the hub of the arm over the drive shaft until it comes to a rest. The hub of the arm should sit approximately 1/8 inch off of the top of the pedestal. One at a time, insert a 3/8-16 x 1-1/4" hex head cap screw into each of the three threaded holes in the arm hub. Confirm position of arm is correct prior to tightening bolts – incorrect positioning of arm could lead to damage of motor, drive shaft, arm and/or pedestal. Use a 9/16" crescent or socket wrench to tighten each of the bolts. The bolts should be tightened sufficiently enough for the drive shaft and internal arm mechanism to move when the arm is moved manually.

Figure 3. – Pedestrian Gate Arm Mounting

Mechanical Installation – Manual Gates

For proper operation of the magnetic lock on each gate, the gates, hinge post and receiver post must be installed to be completely plumb, square and flush (measure twice and install once). It is imperative that gates be anchored prior to electrical installation and testing of gates. Improperly secured gates could tip causing damage to the gate and/or severe injury to personnel. The gap between the gate and receiver post should be between 1/8" and 1/4" to ensure proper engagement of the bolt into the striker. These gates are supplied with 3/8" anchor bolts be used to fasten handrail to concrete floors. To mount manual gates to a concrete surface follow the instructions below:

Recommended tools: Phillips Screwdriver, 5/32" Allen Wrench (included), bubble level, permanent marker, chalk line or length of twine, tape measure, hammer drill, concrete drill bit appropriately sized for concrete anchors. Shims are to be provided by others.

1. Carefully remove the gate from its shipping crate or skid.

2. Place the hinge post with attached gate in the desired position.
3. With a marker, mark concrete through the holes of the hinge post footplate.
4. Move handrail or gate to the side.
5. Per anchor manufacturer's installation instructions, drill holes into mounting surface. Up to four anchors may be used to attach each hinge post and receiver post to the floor.
6. Return hinge post with attached gate to mounting position and insert anchors. Tighten loosely and check post for plumb. Washers or other shims may be used between the post footplates and the floor to ensure the post is plumb and the gate is level. Tighten anchor bolts and recheck for plumb and square.
7. Using a chalk line or twine to check alignment, place receiver post opposite the installed gate with 1/8" to 1/4" gap between the gate and post. Repeat steps 2 – 6 for receiver post.
8. Double check alignment of all gates and handrail prior to completion of installation. Ensure the handrail and gate is level and plumb and that the bolt in the gate and the striker in the receiver post are properly aligned when gate is in the closed position.
9. The gates' hinges have been pre-tensioned at the factory, but the tension may be adjusted using an included 5/32" Allen Wrench by tightening to increase tension (not more than 6 clicks) and loosening to reduce tension. To reduce tension, insert Allen Wrench fully into open end of hinge and tap with a hammer until the spring releases and turns the wrench. Note that proper tension is required for the gate to close and engage the electric strike properly.

Note that gate systems with electric strikes are "fail safe" and electric strikes will not engage until provided with appropriate power. This feature is to ensure a safe egress in the event of a power failure, etc.

Electrical Installation – Manual Gates

Electrical enclosures are provided with terminal blocks designated for power (see appropriate termination diagram). The customer should bring power to the enclosure via properly insulated conduit or other permanent means. Electrical devices that require interface between each system's stand-alone panel and devices on the gate (striker, proximity switch, etc.) require field wiring by others. It is recommended that a qualified local electrical installer provide the electrical installation for these and other systems provided.

Warning Lights (Additional)

Due to walls, doors, obstructions or customer preference some AisleCop® systems utilize supplemental warning lights. Regardless of whether the lights are surface mounted or pipe mounted, they should always be positioned for maximum visibility by vehicles and pedestrians. In most situations lights should be mounted at approximately 5 feet above the floor or as closely as possible as clearance permits.

Motion Detectors

Most AisleCop® systems utilize a series of digital radar motion detectors. These sensors act as the "eyes" of the system and work in concert with the system's PLC to determine if and when to open gates. As such, these motion detectors are vital in ensuring the system operates correctly. Verify all of the following conditions are met when mounting motion detectors for your AisleCop® system:

□ The device is mounted so that it is vibration free

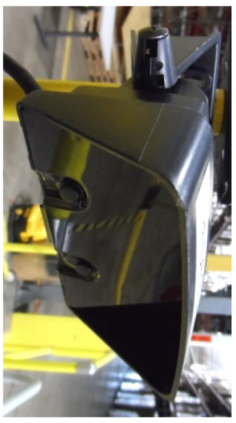
□ There are no moving objects in the field of the sensor, such as adjacent machinery, robots, personnel, etc. that would falsely trigger the motion detector

- □ Fluorescent light tubes are not in the direct line of sight of the motion detector
- □ The motion detector is not installed behind an object(s) that significantly impedes its field
- □ Temperature must be maintained in the range of -4°F to 131°F; Humidity must not exceed 95%

Basic configuration of motion detectors has been done in the factory prior to shipping. If an installation option has been included with this system, Cisco-Eagle, Inc. will provide additional onsite configuration. Otherwise, this configuration will be the responsibility of the end user.

It is important to determine location the direction, range, and area of each motion detector's field prior to installation. Drawings may be provided to determine these attributes. Standardly, each standard AisleCop® system is provided with three motion detectors: one for detecting motion in the pedestrian aisle(s) and two for detecting motion in the vehicle aisle(s) with additional sensors provided as needed. To ensure a good line of sight, and to avoid background noise and false triggers, it is typically recommended that all sensors are mounted high (10Ft or 3M) and pitch at a downward facing angle (-15° to -30°). See the following photos for mounting positions and charts motion detector ranges. A motion detector is typically surface mounted with its included retainer bracket. The angle of each motion detector should be adjusted and fixed by tightening the two screws on either side of the bracket and motion detector. Refer to the motion detector manual included with the motion detector or online for additional information.

Horizontal Mounting Position



Vertical Mounting Position

Figure 4. – Motion Detector Mounting Positions

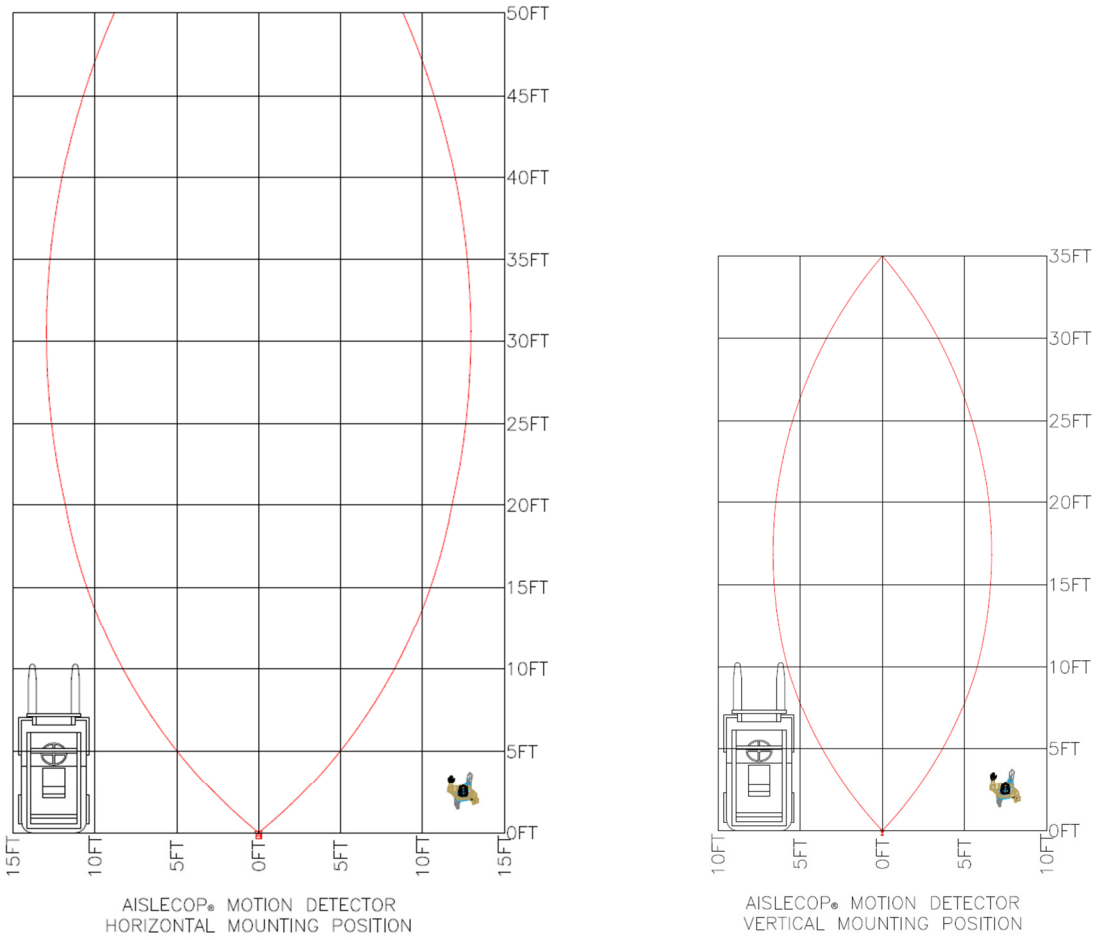


Figure 5. – Motion Detector Ranges

Notes: the area within the red lines represents the area in which motion may be detected when the sensor is set to its highest sensitivity (sensitivity/sensor field may be adjusted to accommodate a smaller area). The ranges are linear perpendicular distances from the transceiver face of the motion detector. The motion detector does not reliably detect movement past the range depicted below for each respective mounting position. Reference photos for mounting positions.

10. Electrical Installation

Wire Pull Distances

Most AisleCop® systems utilize a 2 Amp power supply. Utilizing this 2 Amp limit, the following chart outlines the recommended minimum wire gage for connecting 24VDC communications in the field.

Distance of Wire Pull (feet)	25	50	75	100	125	150	175	200	225	250	Above 250
Recommended Min. Wire Gage	18	18	18	18	16	16	14	14	14	14	**Call**

Wiring Terminations and Field Wiring Pulls

Most AisleCop® systems are provided with electrical drawings that include electrical wiring diagrams and field wiring pulls. When referring to electrical wiring diagrams note the Field Terminations legend as shown below.

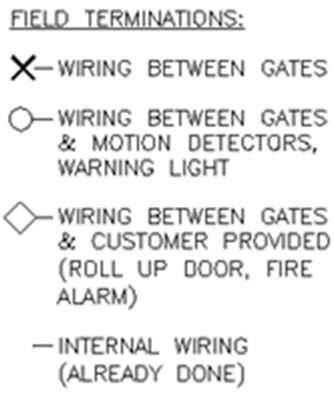


Figure 6. – Field Termination Legend

120VAC must be supplied to each gate, wired directly into terminal blocks inside each pedestal, indicated on the wiring diagram by diamond-shaped terminations on the 120V power terminal block. Note that when wiring the back plane inside the AisleCop® pedestal may need to be removed in order to complete wiring terminations. Instructions on wiring power and devices in the field are covered later in this section.

When referring to wiring diagrams, specifically pay attention to terminations noted with an X, Circle and Diamond. They are wiring between gates, wiring from gates to motion detectors and additional warning lights, and wiring between gates and customer devices, respectively. These are terminations that will need to be done in the field. Wiring noted with no symbol has already been completed prior to shipping and should not require additional work.

When reviewing the drawings, note that terminal block numbers in the main gate correspond to terminal block numbers in secondary gates. +24V, Common, Inputs and Outputs will all need to be wired, as indicated on the drawing, at the end user's location. No additional wiring is required on vendor terminal blocks.

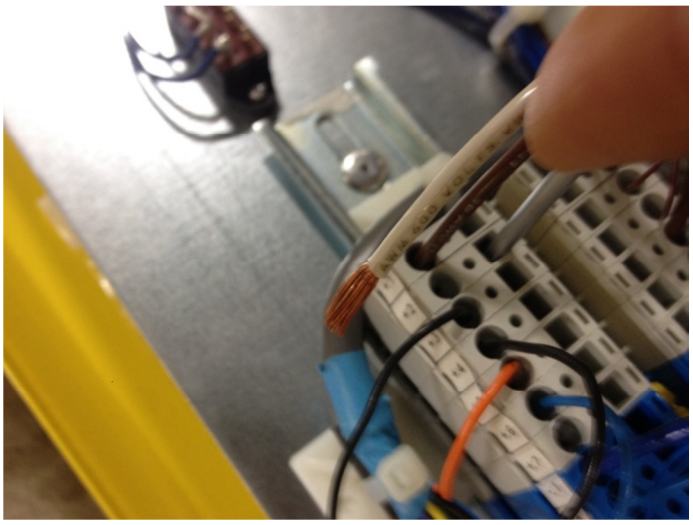
Wiring pull drawing(s) should be reviewed prior to the installation of the gates so as to establish the number of wires required for each device, the wiring of gates to one another, and peripheral devices such as motion detectors and warning lights. Power drop locations, appropriate EMT and/or flex conduit sizes, routing of conduit, obstructions near the path of the conduits, and interfaces with fire alarms and other customer provided devices should all be considered.

For additional information and specifications regarding the PLC, warning lights, motion detectors, or other peripheral devices, refer to manufacturers' manuals.

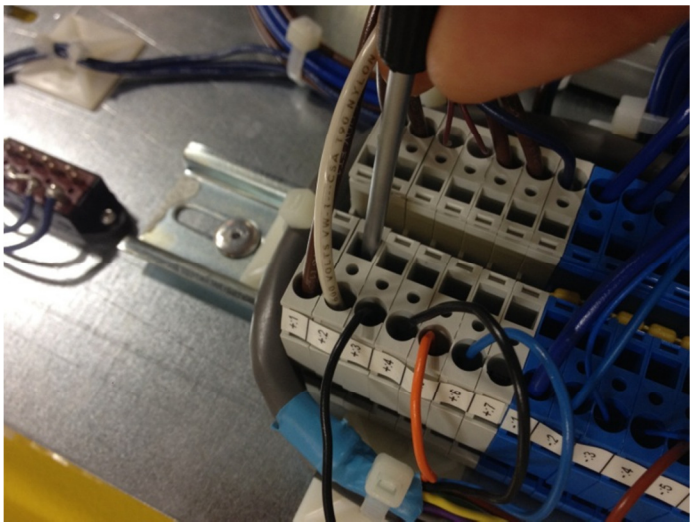
Making Terminations Using Screwless Terminal Blocks

Most of the electrical terminations inside AisleCop® gates are made using screwless terminal blocks which utilize an internal spring to hold the wires in place. Please follow these steps to when wiring field terminations.

1. Verify the correct gage of wire is being used based on the previous chart.
2. Strip the insulation off of the wire approximately ¼" from the end of the wire.
3. Insert a small, flathead screwdriver into the square hole on the top of the appropriate terminal, lever the screwdriver away from you and hold it in place.
4. Insert the wire into the round hole of the appropriate terminal and allow the screwdriver to lever back, clamping the wire in place. Take care to make sure that wire is not clamped on the insulation.
5. Pull the wire outward from the terminal block to ensure it is secure. If the wire pulls loose, repeat steps 3-5.



Steps 2 and 3



Steps 4 and 5

Fire Alarm Scenario – Wiring Requirements

AisleCop® gate systems come preprogrammed with a set of fire alarm scenario operations. In order for this scenario to work properly, a 24VDC normally open input and an output signal are required to be wired to the appropriate terminal blocks inside the primary gate of each system. When the AisleCop® system's PLC receives a close contact signal, the program will stop the current cycle and immediately enter the Fire Alarm Mode sequence. During this Fire Alarm Mode sequence, unless specified otherwise, all gates will immediately open, all applicable system red lights will flash their red lights and all audible alarms will sound until such time the PLC no longer receives the close contact signal. When the close contact signal is no longer received, the system will return to its normal operation.

11. Inductance Loops

IMPORTANT NOTES:

When the system is shipped the loop detector has already been configured and the customer does NOT have to change it. The sizes and locations of the loops have been predetermined but, the customer can update them as they see fit for their facility. The most important aspects of installing the loops are:

1. Type of wire.
2. Size and location of loops. In our application, we recommend 3' by 5' loops. Each loop is 3' away from the arm.
3. Turns of the loops. We recommend 5 turns for our loop size.
4. Twist of loop leads.
5. Distance of loops from metal object.
6. Depth of loops in the ground

Please read this chapter for the details.

IMPORTANT!

IT IS HIGHLY RECOMMENDED THAT THE INDUCTANCE LOOPS BE LAID ON THE FLOOR, TAPED DOWN AND TESTED PRIOR TO MAKING ANY PERMANENT CHANGES TO THE FLOOR. PERMANENT INSTALLATION AS DISCUSSED IN THIS CHAPTER SHOULD OCCUR AFTER THIS TESTING PERIOD

General induction loop functionality

These Vehicle AisleCop® Gates utilize a dual channel loop detector. The Loop detectors operate on the principle of inductance. The detector monitors an insulated electrical wire, placed on or below the floor surface (LOOP). Any metallic object, such as a forklift, which passes through the field will absorb electromagnetic energy and simultaneously decrease the inductance and increase the resonant frequency of the loop. For most conventional installations, when the inductance or frequency changes beyond a preset threshold in the detector electronics, the detector indicates that a vehicle has been detected.

Note: Only metallic objects can be detected. The loop frequency change depends on the size and form of monitored object (i.e. forklift), not on the material mass, which does not influence the loop.

The micro controller system self-adjusts to the connected loop. Many factors determine loop inductance, including wire size, wire length, the number of turns, lead length, and insulation. Changes in loop inductance due to temperature or aging are automatically compensated. Detectors with multiple channels (i.e. dual channel) are monitored using the MULTIPLEX METHOD, which eliminates the interference (cross-talk) between the loops connected to this detector.

Loop Inductance

Inductance

Inductance is the resistance to the change of current flow. When a current is applied to a conductor (wire), a magnetic field is formed around the conductor (wire). If the current source is removed, the magnetic field collapses into the wire trying to maintain the current flow. By winding several turns of the wire into a coil, the magnetic field is intensified which increases the inductance. The loop inductance can be measured with an inductivity meter. The unit of

measurements is the Henry (h). The inductance depends on the loop perimeter and number of turns. A bigger loop with more turns has a higher Inductance.

Vehicle detection

When a vehicle enters the loop, the body and frame provide a conductive path for the magnetic field; causing a loading effect, which in turn causes the loop inductance to decrease. The decreased inductance causes the resonant frequency to increase from the nominal value. If the frequency change exceeds the threshold set by the sensitivity setting, the detector module will output a detect signal. There has been a misconception that an inductive loop requires a mass of metal for detection. Placing a single wire around the perimeter of the loop and shorting the ends together will quickly disprove the misconception. The single wire forming a shorted turn provides a current path for the magnetic field; thus causing a loading effect similar to that of a vehicle. The shorted turn effect of the single wire coil in the proximity of the loop acts much like a shorted turn secondary of a transformer.

Wire turns required for loops

The Inductive loop detectors will tune from 70 µH to 500 µH (µH = micro Henry). It is preferable that the loop and lead-in have a minimum of approximately 70 µH for stability. The loop inductance should be equal to or greater than the lead-in inductance. If the inductance of the loop exceeds the requirements above, a proper functioning of the detector cannot be guaranteed. The loop inductance also influences the loop sensitivity. The best results are between 100 and 300 µH.

Loop Inductance calculations

The number of turns required in the loop is dependent on the loop size. The loop inductance can be calculated as follows: **$L = P/4\ (t^2 + t)$**

L = Inductance (micro Henries)
P = Perimeter (feet)
t = Number of turns

The formula can be simplified to: L = PK
Substituting a constant K for $(t^2 + t)/4$
Filling in the Number of Turns and calculating K:

Number Of Turns (t)	k (constant) k= (t2 + t)/4
2	1.5
3	3
4	5
5	7.5
6	11.5
7	14

Example: 4' x 8' with 4 turns
L = PK
P = 4'+4'+8'+8'= 24 feet
K = 5.0
L = 24 x 5.0
L = 120 micro henries

PERIMETER FEET	NUMBER OF TURNS 2	3	4	5	6	7
10	15	30	50	75	115	140
20	30	60	100	150	230	280
30	45	90	150	225	345	420
40	60	120	200	300	460	560
50	75	150	250	275	575	700
60	90	180	300	450	690	840
70	105	210	350	525	805	980
80	120	240	400	600	920	1120
90	135	270	450	675	1035	1260
100	150	300	500	750	1150	1400

Figure 4. – Wire Turn Requirements

Use the highlighted values to determine the number of turns required. ALWAYS USE AT LEAST 2 TURNS. In addition to the above result, the inductivity of the wires used in the loop must be added. Depending on the used wire, it is between 1 – 1.5 µH per every three (3) feet.

Loop Detector Sensitivity

Most loop detectors come with multiple adjustable sensitivity settings. This means that only vehicles will be detected when the relative frequency change (difference between loop frequency with vehicle and without) is higher than the adjusted sensitivity.

For example: If the sensitivity of a loop detector is adjusted to 0.05%, only vehicles that change the loop frequency by more than 0.05% will be detected.

Note: To ensure a failsafe detection of vehicles, the value of the Relative Frequency Change should be at least 10 times higher than the adjusted loop sensitivity

If the value is lower, it might not detect every vehicle (i.e. those with high floor clearance). Wrong loop dimensioning or geometry, not enough windings, not enough clearance to metal objects within the floor (i.e. steel reinforcement, floor drain, etc.), can cause a low Relative Frequency Change value.

Installing an Induction Loop

Usage of Pre-manufactured Loops

Any pre-manufactured (formed) loop can be used as long they meet our requirements explained in this manual. Please refer to loop manufacturers Installation Instructions.

Self-Made Loops

A loop can be manufactured from a single AWG 14-18 stranded XLPE insulated wire rated at 600V. The insulation type XLPE (cross-linked polyethylene) is highly recommended due to its higher quality insulation and higher resistance to abrasion, heating oil and gasoline. The wire gauge is not important to the operation of the loop detector but the wire should maintain its integrity under the pavement stress. Because asphalt is more flexible than concrete it is recommended that, a heavier gauge wire is used for loop installations in asphalt. The inductance of the loop shall be between 70 and 500 µH, which is usually achieved by having three to five turns in the coil. The loop resistance should be lower than 2Ω. The loop resistance should be measured after installing the loop but before sealing. The Loop Insulation Resistance must be measured to earth ground. The Insulation Resistance against earth ground must be a minimum of 5 MΩ at 500 Volts. If this is not the case, the loop insulation might be damaged. The temperature of the sealing must be below the temperature of the wire insulation.

To lessen the stress and abrasion of the loop wire the 90° corners shall be cut at a 45° angle or a core drilled with a minimum of 1.5” diameter (See drawings below).

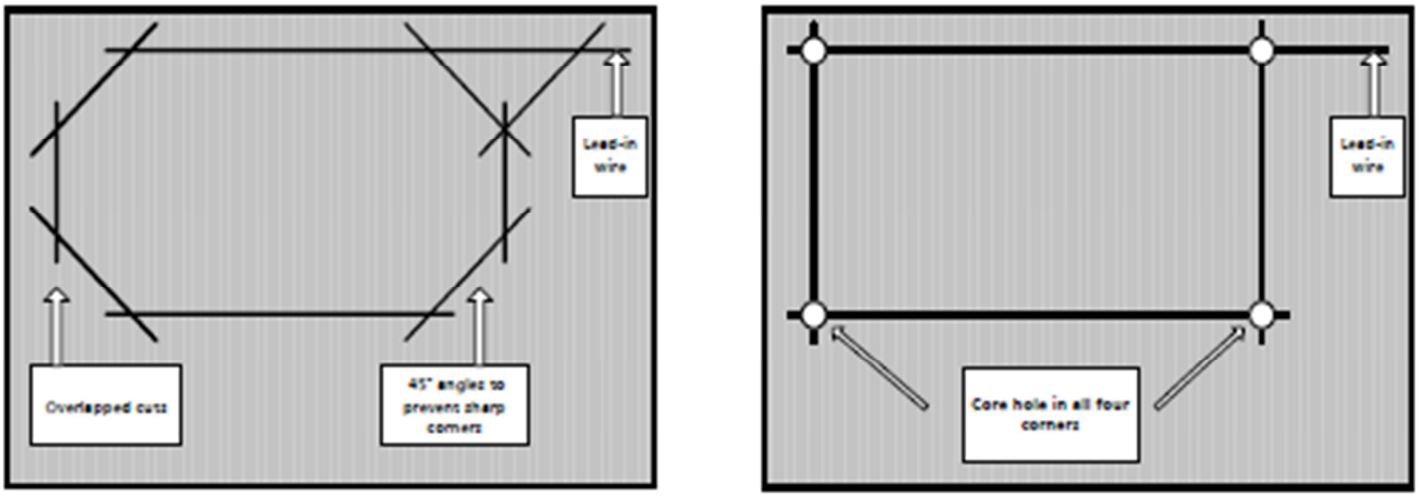


Figure 5. – Proper floor cutting/core drilling

Loop Lead Wires

The loop lead-in wire has a significant role to the functionality of the loop. Following are some important points for installing loop leads: The loop lead-in wire must be twisted about 7 times per foot up to the point where the wires connect to the detector. Leads of multiple loops should not use the same cable or conduit. If it is not possible to have separate conduits for multiple loop leads, a shielded twisted-pair wire must be used for each loop.
The lead-in length should not exceed 50 feet. Long leads can decrease the sensitivity therefore the leads should be as short as possible.

Note: It is necessary to cut the leads to the proper length. Excessive long leads looped before it is wired to the detector will decrease the loop functionality.

Do not run a loop lead through the same cut of another loop:

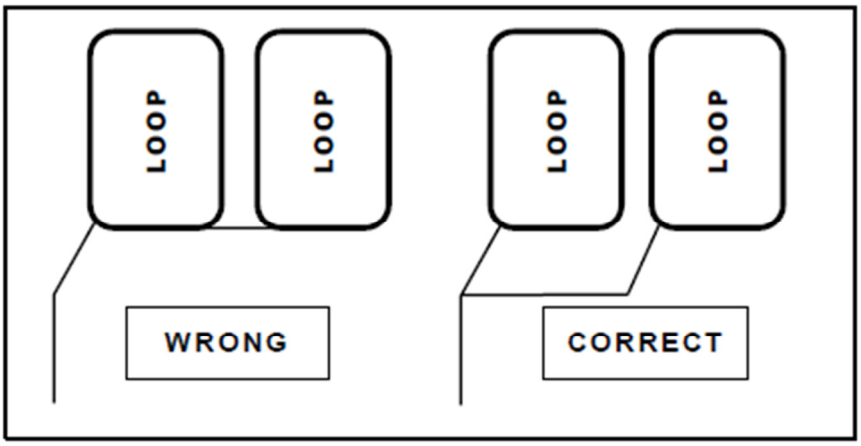


Figure 6. – Proper Loop Lead Channeling

How deep should the loop wires be installed?

The deeper the wires are below the floor surface the more they are protected from floor surface wear and the elements. The top wire should be a minimum of 1 inch below the floor surface.

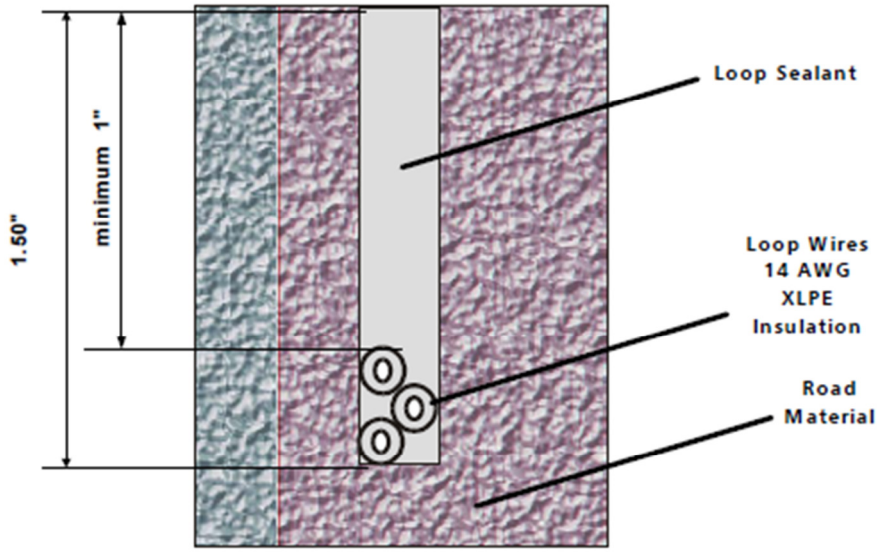


Figure 7. – Proper Loop Depth

Note: Nonconductive materials such as concrete and asphalt will not influence the loop fields. Installing the loop one inch deeper (e.g. 3 ”depth not 2” depths would have the same result as raising the vehicle one inch above the floor surface.

Loop distance from objects

A minimum distance of 1ft between the loop and all metal objects (steel reinforcements, sewer grill etc.) must be kept. If this is not the case the loop, sensitivity can decrease significantly and a proper functioning of the loop cannot be guaranteed.

The loop and loop leads must not be installed near to any underground high voltage cables.

The distance between loops and barrier housings or barrier arms should be a minimum of 10”.

The following rule should be observed: The longer the loop, the greater the spacing must be between the gate and the loop.

Following is a typical installation that shows how the loops should be installed (see below).

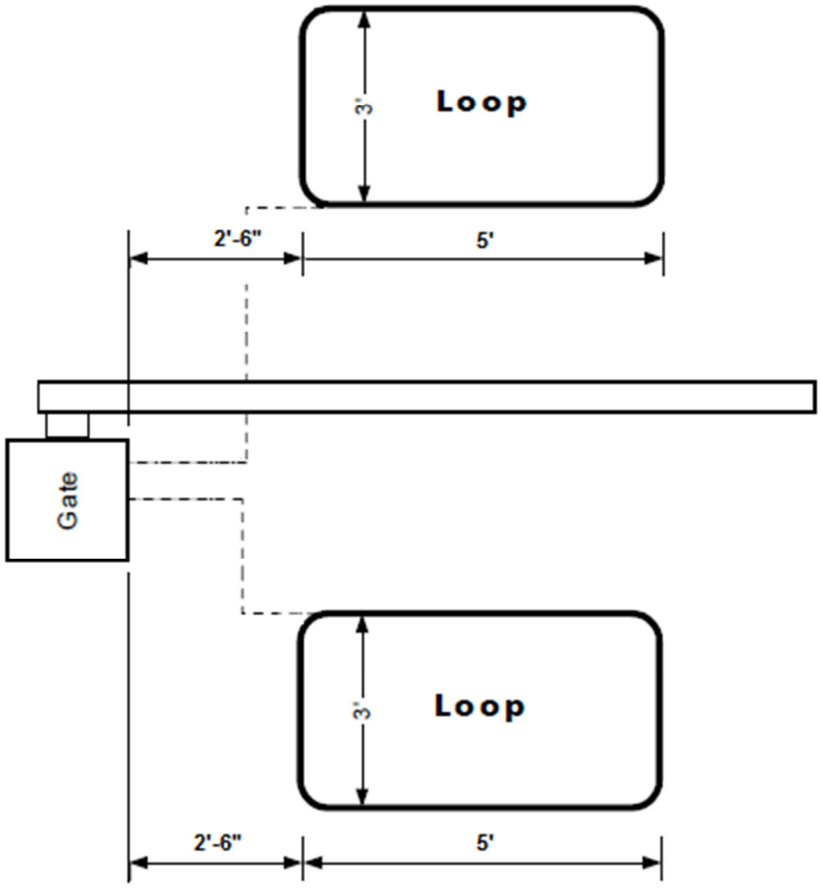


Figure 8. – Loop Positioning and Size (10 feet long arm)

12. Traffic Alert System Installation

Setup

Unpack each unit and remove any protective covering. Refer to the sketch and basic detail provided with each system, and the layout and electrical drawings provided with these systems to determine the location of each system.

All Traffic Alert Systems utilize sensors that reside on top of each box. These sensors have been placed in a low profile position to help protect them during shipping. Prior to installation of each Traffic Alert System, loosen the wing nut on the sensor mount, position each sensor in a vertical position and point it in the general direction it should be facing once installed, and then tighten the wing nut. Where applicable, separate out remote sensors and remote lights as needed for each system. Preparation for these remote sensors and lights will be discussed in subsequent sections.

Traffic Alert Systems are made to be ceiling or structure hung above vehicle aisles at a distance of approximately 8 feet to 12 feet (96" to 144") above the floor. It is important that height of your tallest vehicle is verified and that a strict "forks low" policy be implemented near Traffic Alert Systems as to ensure sufficient clearance of forklift masts.

Mechanical Installation

Once a sufficient clearance distance has been determined, install each Traffic Alert System with four (4) chains or cables with a minimum load rating of 10 lbs. For sake of stability, it is important that four (4) individual chains be used from the Forklift Alert System all the way to the overhead support structure. Units should be hung as level as possible and with

the surface of indicator lights facing in directions that allow them to be most visible by oncoming traffic. For convenience, four (4) chain clasps are included with each Forklift Alert System.

Electrical Installation

Each Forklift Alert System is supplied with a power supply and cable sufficient for 100-240VAC 50/60Hz 0.8A for 24VDC 1.0A output. **IMPORTANT NOTE: Never plug in or unplug lights or sensors while these systems are powered up. Doing so may cause an overload the system's control board(s).**

Remote Motion Sensors

Remote motion sensors may be supplied with some systems. These sensors are supplied with mounting brackets and adjustable double ball joints for convenience. Due to the varying distances from each Forklift Alert System these sensors may be, they are provided with a short connector. These connectors may be cut and the wires stripped so that the connector may be plugged into the appropriate terminal of the Traffic Alert System and wires spliced and connected with customer-supplied wires to the remote motion sensor through appropriately-sized conduit. Final electrical connections and installation are to be done in the field by others. It is recommended that a qualified local electrician determine the best method for electrical installation.

Remote Beacon Lights

Remote beacon lights may be supplied with some systems. These lights are supplied with rubber mounting feet for mounting to surfaces. Mounting hardware to be determined (by others) based on the mounting surface. Due to the varying distances from each Forklift Alert System these lights may be, they are provided with a short connector. These connectors may be cut and the wires stripped so that the connector may be plugged into the appropriate terminal of the Traffic Alert System and wires spliced and connected with customer-supplied wires to the remote motion sensor through appropriately-sized conduit. Final electrical connections and installation are to be done in the field by others. It is recommended that a qualified local electrician determine the best method for electrical installation.

Initial Setup and Testing

Once mechanical and electrical installation is completed, each Traffic Alert System should be turned on and allowed to go through its initial setup (about 1-2 minutes). Motion Sensor indicator lights will flash during this phase and some warning lights may also flash. It is recommended that the area remain clear and free of motion during this phase to insure that each system is appropriately trained to its environment. Once the setup phase is completed, each motion sensor should be tested by moving personnel and/or vehicle traffic in the areas where it is desired that motion be detected and confirming that appropriate lights flash. Adjacent areas should also be tested. If motion is being detected where it is not desired (such as pedestrian aisle), readjust the direction, angle and/or position of the motion sensor and retest the sensor.

13. Warranty

Cisco-Eagle, Inc. warrants that all AisleCop® safety gates will be free from defects in material and workmanship for one (1) year or 2 million cycles, whichever occurs first, under normal operating conditions when installed in accordance with Cisco-Eagle's installation instructions, normal wear and tear excepted. The warranty period shall start from the date of shipment of the product by Cisco-Eagle, Inc. During the warranty period, Cisco-Eagle will repair or replace at its option, any of its products which have been found to be defective. A Return Material Authorization number (RMA) must be obtained before products are returned, and products must be shipped freight prepaid to:

Cisco-Eagle, Inc.
2120 Valley View Lane
Dallas, TX 75234
Attn: AisleCop® RMA