

Louisiana Life Safety & Security Association



Advanced Property Protection Technician Course Student Manual

Introduction



Louisiana Life Safety & Security Association
Advanced Property Protection Technician Course

WELCOME

to the Louisiana Life Safety & Security Association's
Advanced Property Protection Technician Course

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Goals of this Course



- Compliance with the law
 - Successful completion of this course will meet the state requirements
- Expand your knowledge
 - We will cover a broad scope of the alarm industry offering insight into how to design, install and service alarm systems.
- Bring new industry members up to speed
 - Our goal will be to bring those new to the industry up to at least a minimal level of industry knowledge. We also hope to fill in areas of knowledge for experienced professionals.
- Brush you up on codes & standards
 - Industry codes and standards are revised every 3 years to reflect new best practices and the latest technology.

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Why you are here

- Improve your knowledge
- Enhance your value to your company
- Comply with state requirements




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What LLSSA does for you

- Provides networking opportunities
- Gives you information
- We monitor and influence the state and local legislative process
- We provide training at a discounted rate for members
- Belonging gives your company credibility & exposure



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We need your involvement!

- You only get back – what you put in
- This association is your voice to government
- Speak up!



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Customer Service

Customer Service

1

What Customers Want

“What do our customers want?”

2

Most Important Things

The top 5 most important things to customers

1	Value for money, price, cost, competitiveness		48%
2	Customer Service		47%
3	Keeping promises, reliability		32%
4	Quality		29%
5	Ease of doing business		23%

lanGolding.com

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A Good Experience

- According to Forrester, nearly 95% of leaders say that providing a good customer experience is a top strategic priority, and 75% want to use customer experience as a competitive advantage



Source: Jason Bigue on Fonolo

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Meet Their Expectations

- Customer frustration stems from a discontinuity between the expectation of a service interaction, and what's actually delivered
 - A study from the MIT Sloan Review found that that customer expectations had two levels: desired (what the customer hopes to obtain) and sufficient (what the customer would actually find acceptable)



Source: Jason Bigue on Fonolo

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Manage Customer Satisfaction

- Many businesses have learned that it's often advantageous to “underpromise and overdeliver” in order to increase the likelihood of exceeding customer expectations
- Others take pride in high expectations, knowing full well that they can deliver the goods




Source: Jason Bigue on Fonolo

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Options to Contact You

- Customers expect companies to communicate with them on their preferred channel, be it in person, online, or on the phone



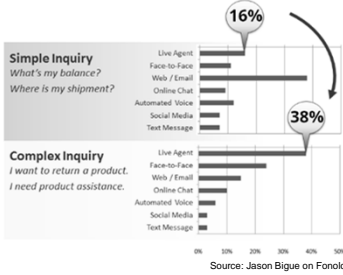
Source: Jason Bigue on Fonolo

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Channel preferences for simple & complex inquiries

Match the Customers Preference




Source: Jason Bigue on Fonolo

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Customers expect a timely response

- Response times you provide service on should be reasonable
 - One study shows that on Twitter, 53% of customers expect a brand to respond in under an hour
 - That number jumps to 72% when they have complaints




Source: Jason Bigue on Fonolo

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Customers Want Relationships

- Fostering relationships with customers can significantly increase the likelihood of exceeding their expectations, turning them in to advocates of your brand
 - A study by Wells Fargo found that 60% of banking transactions are made by customers who still prefer to do business with a teller




Source: Jason Bigue on Fonolo

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Customers Want You To Solve Their Problems!

- At the root of every customer inquiry is a desire for a quick resolution
 - Empowering your front-line agents so they have the ability to resolve customer issues is key
 - With each transfer, subsequent call or email, customers lose patience with your organization, resulting in a loss of goodwill which can significantly affect your ability to retain and grow your customer base



Source: Jason Bigue on Fonolo

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Solutions



Source: Jason Bigue on Fonolo

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Be Willing to Collaborate

- Customers absolutely do NOT want you to sell them something, even something that's wonderful
- They want you to work with them to achieve a mutual goal, by being responsive to the customer's concerns and ways of doing business
- Ideally, customers want you to become integral to their success

Collaborate

Source: Geoffrey James – Inc.com

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Bring New Perspectives and Ideas

- If customers could diagnose their own problems and come up with workable solutions on their own, they would do so
- The reason that they're turning to you and your firm is that they're stuck and need your help
- Therefore, you must be able to bring something new to the table



Source: Geoffrey James – Inc.com

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Listen, Really Listen, to the Customer

- When they're describing themselves and their needs, customers immediately sense when somebody is just waiting for a break in the conversation in order to launch into a sales pitch
- In order to really listen, you must suppress your own inner-voice and forget your goals
- It's about the customer, not about you



Source: Geoffrey James – Inc.com

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Understand ALL the Customer's Needs

- It's not enough to "connect the dots" between customer needs and your company's offering
- You must also connect with the individuals who will be affected by your offering and understand how buying from you will satisfy their personal needs, like career advancement and job security



Source: Geoffrey James – Inc.com

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Help the Customer Avoid Potential Pitfalls

- Here's where many sellers fall flat
- Customers know that every business decision entails risk but they also want your help to minimize that risk
- They want to know what *could* go wrong and what *has* gone wrong in similar situations, and what steps you're taking to make sure these problems won't recur



Source: Geoffrey James – Inc.com

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Craft a Compelling Solution

- Solution selling is definitely not dead
- Customers want and expect you to have the basic selling skill of defining and proposing a workable solution



Source: Geoffrey James – Inc.com

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Have Confidence In Your Ability



- Customers will not buy from your product or idea if you can't persuade them that you, your firm, and your firm's offerings will truly achieve the promised results
- It is nearly impossible to persuade a customer to believe in these things unless you yourself believe in them
- You must make your confidence contagious

Source: Geoffrey James - Inc.com

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Offer Consistent Company-wide Messaging



- Too often customers, get caught up in the "he said, she said" game of being told a product can do one thing from sales and another from support and product
- Ultimately, customers become confused and are left with the perception that the company is disorganized

Source: Allie Breschi

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Get on the Same Page

- To get everyone on the same page, organize sales and customer service meetings, send out new product emails, provide robust new employee onboarding, require quarterly trainings and seminars, or staff host webinars to share important projects



Source: Allie Breschi

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Ask Customers For Feedback

- Take customer suggestions seriously and act on those recommendations to improve design, product and system glitches
- Most customer support success metrics is paramount to the customer experience and this mentality should trickle down to every aspect of the organization

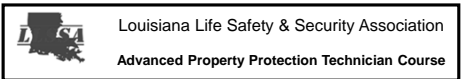


Source: Allie Breschi

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How to Deal With Customer Complaints



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Put Your Emotions Aside

- Best way you can handle any customer sharing a complaint is *without* your personal emotions getting in the way
- Calmly listen to what they are saying, then just as calmly reply and react to them with the following tips in mind...



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Avoid Challenging Their Complaint

- It's easy and - quite frankly - natural to want to tell a customer they are wrong in what they are saying
- However, this won't help you in your efforts to diffuse a customer from getting more upset while sharing a complaint. Instead of challenging their complaint, listen to what they are saying



Nicole Leinbach-Reyhle - Forbes

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Thank Your Customer

- *Genuinely* let them know you are thankful they are sharing with you their complaint or concern
- This opens up the opportunity for you to further listen to them, while hopefully giving them the understanding that you want to actually hear what they have to say



Nicole Leinbach-Reyhle - Forbes

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Acknowledge What They Say

- Try your best to really hear what they are saying.
 - Are they upset that something took too long?
 - Or possibly a product they purchased isn't what they had in mind?
- Whatever the "real reason" it is they are complaining, acknowledge it and ensure you heard what they said.



Nicole Leinbach-Reyhle - Forbes

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Offer Support

- Support comes in a variety of shapes and sizes.
 - Sometimes it's simply listening to them even more, other times it means exchanging a defective item for a new one
 - You have to be the judge here on what works best here - but keep in mind that support means giving the customer something in response to their complaint



Nicole Leinbach-Reyhle - Forbes

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Be Flexible

- If no resolution is available to make your customer happy or at the very least, content, then consider how else you can help them
- Possibly you make it a company policy to have \$10 gift cards to a local coffee shop on hand to give to upset customers



Nicole Leinbach-Reyhle - Forbes

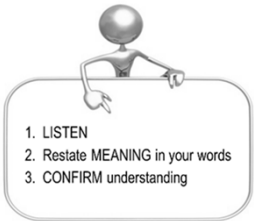
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Make Sure Your Customers Hear What You Are Saying

- Very simply, after all has been discussed, ask your customer if they have understood how you can help them or for that matter, how you are unable to do anything else to accommodate them



Nicole Leinbach-Reyhle - Forbes

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Offer an Apology - With Gratitude Attached

- End your conversation with a sincere apology and yet appreciation for your customer
- Let them know you're sorry they were inconvenienced or disappointed or upset, then also thank them for giving you the chance to work it out with them



Nicole Leinbach-Reyhle - Forbes

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Follow Up

- Consider how else you can help support customers who complain
 - One way to do this is to have upper management follow up with these customers 24 to 48 hours after they have expressed their complaint
 - Send a handwritten note sent to their home address
 - Call them personally



Nicole Leinbach-Reyhle - Forbes

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Move On

- When all is said and done, you can't dwell on customer complaints in order to move on and forward with your next tasks on hand
- Most businesses are bound to get them every now and again since very simply, you can't please everyone




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False Alarm Reduction




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False Alarm Reduction

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Overview




False Alarm Reduction 101
Causes And Impacts Of False Alarms
A Public Safety Perspective

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False Alarms Create Problems



- Many call centers
- Common goal is quick response
- Thousands of Calls
- Many requesting alarm response
- Majority are false
- Takes time from true emergencies


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Scarce Resources Bring Challenges

- Avoid wasting resources
- Can't afford to respond to false alarms
- Need to reduce false alarms!




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What is a False Alarm?

- When an alarm is reported and the responding Police or Fire agency investigates and finds no evidence of criminal activity or fire related event.



But it takes several steps to get to a False Alarm



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Step 1- An Alarm Activation

- Indicates a possible emergency
- An alarm activation indicates that a possible emergency requiring follow-up has been detected.
- As we know not all activations are true emergencies



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False Alarm Reduction

Step 2- An Alarm Sounds

- May sound or show the alarm
- After the alarm is triggered, one or more sounding or visual indicating devices may activate



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Step 3- Notify The Monitoring Center

- May notify a monitoring facility
- The alarm activation may then transmit an electronic signal to a monitoring facility



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Step 4 -An Alarm Dispatch Request

- Verification attempt
- Public safety agency is notified
- Public safety may request alarm permit number



This leads to a Dispatch....

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Step 5- Dispatch

- The public safety dispatch center may call the site before dispatching.
- If the alarm is cancelled before the responder arrives, fines may not apply.
- Location history may be checked
- Hazard information relayed to responder
- Type of alarm is given



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Next is the Response Slide 2-10

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Step 6 - Response

- After investigation if no fire or evidence of a crime is found.....
- It is a false alarm



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Impacts to Alarm Industry



- More Operators
 - Central stations must hire additional staff to answer the calls – whether they are false alarms or not.

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False Alarm Reduction

Impacts to Alarm Industry

- More Alarm Technicians
 - Capable, trained alarm technicians are needed to respond to their customer's sites for troubleshooting purposes.



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Impacts to Alarm Industry

- Extra Customer Service
 - Additional qualified customer service staff are required to deal with alarm users who have false alarms.
 - They will initiate contact with customers in an effort to determine the cause of the problem, whether service is needed, and to re-educate the alarm users on the proper use of their alarm system.



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Impacts to Alarm Industry

- Training
 - There may be increased training costs for alarm companies to educate their employees on how to deal with false alarms.



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Impacts to Alarm Industry

- Time
 - Trying to determine the cause of false alarms, educating the customer and fixing problems can take a significant amount of time – time that is now not available to sell new systems, sign up new customers and grow the company.
 - This could have an adverse impact on your ability to get raises and be rewarded for good work – if the money is being spent on false alarms, it won't be available for you!



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Impacts to Alarm Industry

- Fines
 - Finally, many jurisdictions assess fees or fines for excessive false alarms.
 - Those fees or fines can either be passed on to your company by the alarm user or may even be assessed directly to you by the authority having jurisdiction.



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Impacts to Public Safety

- Billions of Dollars



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False Alarm Reduction

Impacts to Public Safety

- Complacency



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Impacts to Public Safety

- When police respond to the same location over and over again and don't find any criminal activity it increases the likelihood that complacency will set in.
- This places public safety personnel in danger, as they may not be prepared for the real thing when it happens.
- Imagine responding to a burglar alarm activation at the same house or store 10 times and then on the 11th – a real burglary is in progress with armed individuals inside and you're not prepared. This is when disaster occurs.

Complacency



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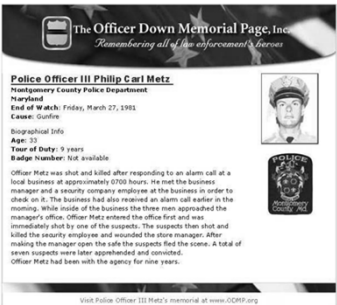
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Impacts to Public Safety

Complacency

- Officer Philip Metz, of Montgomery County Maryland, was shot and killed after responding to an alarm call.



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Impacts to Public Safety

- Increased 911 Calls
 - False alarms also increase the number of calls that must be handled by 9-1-1 center operators.
 - Governments are doing more with less so they don't have the extra money to hire more operators to handle the increased call load caused by false alarms.
 - Have you ever been in a public safety 9-1-1 center during a thunderstorm with high winds?



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Impacts to Public Safety

- Increased 911 Calls



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Impacts to Public Safety

- Delays response to Actual Emergencies



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False Alarm Reduction

Impacts to Public Safety

- Loss of faith



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Impacts to Alarm Users

- Fines and Fees



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Impacts to Alarm Users

- Service Call Costs
 - Service calls are required to troubleshoot and repair any equipment related false alarm problems.
 - If the alarm user does not have a maintenance agreement, the costs to troubleshoot and fix the problem could be significant.



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Impacts to Alarm Users

- Time and Aggravation
 - Alarm users will also have to deal with the time and aggravation involved in understanding why they had false alarms and to correct the problem.
 - This could mean time away from work to wait for service technicians, as well as listening to their neighbors complain about how their alarm went off again.



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Impacts to Alarm Users

- Loss of Faith
 - The worst case scenario for the alarm industry is that the alarm user becomes frustrated with the expense, time and aggravation associated with false alarms and just stops using the alarm system.
 - This could negatively impact whether you have a job or not.



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Impacts to Public at Large

- Public Safety Availability



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False Alarm Reduction

Impacts to Public at Large

- Vehicle Crashes



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Impacts to Public at Large


- Annoyance Factor



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Causes



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Causes of False Alarms Improper Design

- Design with the user's lifestyle & environment in mind
- Consider the users ability to get to the keypad within the entry time. Can the user remember their code? Can the user hear the entry-exit tones?



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Causes of False Alarms Improper Design

- Design with the user's lifestyle & environment in mind
- Does the user have pets? Make sure they will not interfere with the system now or in the future. Remember many pets will grow.



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Causes of False Alarms Improper Design

- Design with the user's lifestyle & environment in mind
 - Check for sounds and vibrations that could trip the system. Is there a lot of truck traffic? Will the area attract birds to the windows?



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False Alarm Reduction

Causes of False Alarms Improper Design

- Design with the user's lifestyle & environment in mind
 - Determine if sensors or wiring will be exposed to excessive wear and tear. Will the user be moving items on top of or up against the system wiring?



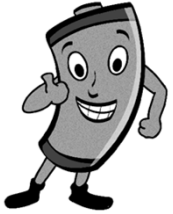
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Causes of False Alarms Improper Design

- Design with the user's lifestyle & environment in mind
 - Make sure you provide enough power for all the devices. Add up the amount of power that all the devices will need to operate properly.



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Causes of False Alarms Improper Design

- Design with the user's lifestyle & environment in mind
 - Make sure each device is set to match the users and the site.
 - For example - Will the user be moving furniture or items into or out of the view of the motion sensors.



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Causes of False Alarms Equipment

- Limited maintenance
 - To prevent false alarms you need to periodically check device settings and verify that all the devices, especially batteries, are in good working order.



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Causes of False Alarms Equipment

- Improper programming
 - It is also a good idea to make sure you check the programming to verify that time settings & features are appropriate for the user & site.
 - The reason systems have so many options is to allow you to tailor it to meet your customers needs



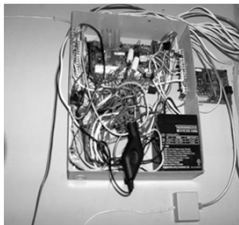
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Causes of False Alarms Equipment

- Poor installation
 - Selecting the proper device, protecting the wiring and placing each device in the best location will go a long way toward preventing false alarms.



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False Alarm Reduction

Causes of False Alarms Equipment



- Loose connections
 - Loose connections are a common cause of problems.
 - And they can be especially hard to find because they often occur intermittently.

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Causes of False Alarms Equipment



- Defective equipment
 - Equipment can go bad because of wear and tear or improper use, but equipment is usually the last problem, not the first.
 - If you just change the equipment you may not address the real problem.

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Causes of False Alarms User Error

- Lack of user training
 - One of the main reasons for user error is lack of comprehensive training on how to use the system, what to do if the system activates & how to cancel a false alarm.
 - Alarm users must constantly be re-educated on the proper use of their alarm systems and this responsibility falls directly on the alarm company.
 - Also, a plan of attack must be developed to train new employees, tenants and visitors.



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Causes of False Alarms User Error

- Not understanding system
 - Because you use the systems every day it is easy to forget that many alarm users are not as comfortable with the system as you are.
 - Users need to be comfortable with how to exit and enter and how to cancel a false alarm.
 - If all doors are not set up for entry and exit delays make sure all users know that.



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Causes of False Alarms User Error

- Not understanding system
 - Errors commonly occur when users are distracted when they enter or exit.
 - If users do not answer the phone when the monitoring center calls after an alarm, the dispatch will not be cancelled.
 - Also users need to be able to remember their alarm or pass code.



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Causes of False Alarms User Error

- Temporary users & guests
 - The alarm user needs to teach everyone who has a key to the alarm site how to use the system and how to cancel an alarm.



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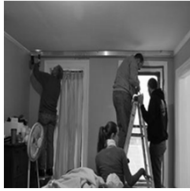
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False Alarm Reduction

Causes of False Alarms User Error

- Environmental conditions & changes
 - Someone once said – there is nothing constant but change. Changes impact alarm systems.
 - New occupants or employees move in, buildings settle on their foundations, doors and windows get loose in their frames, sites are remodeled & users acquire new furniture, pets or hang new displays.



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Causes of False Alarms User Error

- Facility maintenance
 - Like anything else, without proper maintenance the alarm system may not work as well
 - Sensors need to be cleaned, batteries need to be changed and settings need to be checked



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Causes of False Alarms Procedures



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- Failure to follow or improper procedures
 - As the famous clip from Cool Hand Luke illustrates, it can be hard to reach some people and get them to follow the procedures.

Causes of False Alarms Procedures

- Failure to follow or improper procedures
 - Sometimes people fail to follow procedures because they are just set in their ways, but often it is because the procedure is unclear or has not been properly communicated to them.
 - Users may not be aware of their local ordinance, may not appreciate the value of verifying alarms and alarm companies may be dispatching public safety for power, low battery or opening and closing signals that are more properly dealt with by others.
 - Examine your procedures and decide if they are clear, are communicated correctly and do their part to reduce false alarms.

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Causes of False Alarms Procedures

- Improper programming
 - Alarms are complex and programming panels and sensors involves many options
 - You need to pick the right options to reduce false alarms
 - Remember that mislabeled or unlabeled zones can lead to a false dispatch



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Causes of False Alarms Procedures

- Outdated information
 - It can be a challenge to keep all the contact information current, but it is critical to avoiding false alarms
 - For example, if you have the wrong phone number for the user you will not be able to make a verification call



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False Alarm Reduction

Causes of False Alarms Weather

- Storms
 - An alarm system should not activate just because there is a thunderstorm
 - If lightning directly hits the alarm site an alarm is understandable, but modern systems should not react to nearby strikes



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55

Causes of False Alarms Weather

- Tornado
 - Tornadoes are formidable and damage can be severe, but public safety will have other priorities after one strikes a community
 - Design your system so it does not add to their calls for service because of false alarms



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Causes of False Alarms Weather

- Flood
 - Severe flooding will knock out any system, but if your alarm site has a basement or lower level that is prone to flooding – keep your wiring high enough or enclose it so it will not be affected



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Causes of False Alarms Weather

- High wind
 - High winds will shake and rattle the walls, doors and windows of your site.
 - Make sure these vibrations do not lead to false alarms.



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Causes of False Alarms Weather

- Power failure
 - Power failures can drain batteries to below operating levels – especially if the battery is old or the system has more devices than the battery can handle.



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Causes of False Alarms Weather

- Surges
 - Surges may occur when power is restored or as other heavy load devices turn off – build in the correct surge protection to avoid false alarms.



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60

False Alarm Reduction

Causes of False Alarms

Weather

- Loud noise & vibration
 - Loud noises & vibrations are common during weather events – try to anticipate them.



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Causes of False Fire Alarms



- False alarm = any event not created by fire
- Not putting the system in test mode
- Cooking food
- Mechanical failure
- Home users have more control
- Commercial users must wait for fire response

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Solutions



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63

Know Your Dispatch Rate

- Measure your problem

Step	Example
1. Find Number of Alarm Dispatch Requests	1000
2. Subtract Cancellations	100
3. Equals Actual Dispatch Requests	900
4. Find total number of alarm sites	1500
5. Divided by Actual Dispatch requests by Alarm sites	Number of
6. Equals Dispatch Rate	.6

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64

Identify Stakeholders

- Involve all who have information to solve the problem
 - Sales
 - Install
 - Service
 - Monitoring
 - Customer Service
 - Management
- 
- An illustration of several stylized human figures in a line, each with a speech bubble above their head. The speech bubbles contain the text 'STAKE-HOLDER'. The figures are rendered in a simple, blocky style with grey bodies and black outlines. The speech bubbles are white with black text and black outlines. The background is a light blue gradient.



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65

Empower Stakeholders

- Empower them to make decisions and commit resources



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66

False Alarm Reduction

Define Your Problem

- Determine how many false alarms
- Examine false alarms by –
 - System type- Burg, Fire, Medical
 - Hardwire or Wireless
 - Application- Residential, Commercial, Government
 - Devices- Motion, Contact, etc.
 - New or old system
 - Type of User- Age, Disability, Multiuser, Big Box, Bank, Retail

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Set Goals

- Commit to a specific lower dispatch rate
- Target specific number of problem users
- Decide on a time frame to reach goals
 - One month, 3 months, etc



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Develop Plan

- Create materials - newsletters, video, web site
- Evaluate equipment, technologies & procedures
- Get daily alarm activity reports
- Follow-up with customers
 - Call, inspect, replace equipment, retrain, stop dispatching, private response, cancel contract



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Track Progress

- Review your dispatch rate reports
- Break it down - Consider
 - System type- Burg, Fire, Medical
 - Application- Residential, Commercial, Government
 - New or old system



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Troubleshooting



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Troubleshooting




products
processes
malfunction
maintenance
technology
search
problem
intermittent
failure
repair
development
analysis
documentation
identification
techniques
service
solving
system
manufacture

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1

Testing & Troubleshooting Aids

- Instruction Manuals
- Test equipment
- Work Order
- Contract
- Blueprints
- Manufacturer help lines
- Web sites




RESOURCES

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2

Testing & Troubleshooting Aids

- Your sense of
 - Smell
 - Hearing
 - Sight
 - Touch
 - Taste



5 Senses


Sight Hearing Touch Smell Taste

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3

Read the Paperwork

- Instruction Manuals
 - Guide you on sequence of power up
 - Tell you how it should work and perform
- Work order
 - Lets you know what the customer expects
- Blue prints
 - Tells you where things should be
- Wire Chart
 - Identifies what is connected to what




**Seriously,
READ the
instructions!**

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4

Testing New Systems

- Read the instruction manuals
- Perform tests indicated in the manuals
- Check that wiring and connections are complete
- Connect power in the sequence specified in the instructions
- Verify proper operation

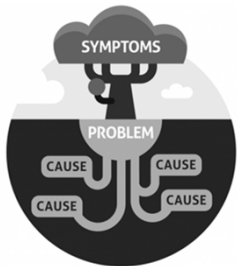


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5

Treat the Root Cause

- Do not just cure the symptom
- Correct what caused the problem in the first place



SYMPTOMS
PROBLEM
CAUSE CAUSE CAUSE CAUSE


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6

Troubleshooting

Target your Effort

- “Shotgun” approach - changing out components until the problem goes away
 - Wastes precious billing time on unnecessary components
 - Costs either you or the customer more in labor billings/charges
 - Often it only fixes the symptom
 - Doesn't look professional to the customer




SHOTGUN VS RIFLE


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Find the Problem




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Find the Problem

- Discuss the problem with the customer
- Compare the problem to past problems you have experienced
 - Look for common sources of problems




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9

Find the Problem

- Compare the current operation to desired operation
 - Ask your central station
 - Observe the situation
 - Test operation
 - Check voltage and resistance




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10

Find the Problem

- Use process of elimination
 - Substitute good parts for suspected bad parts
 - Bridge or jump out sections of a circuit
- Cool or heat a component to restore to normal operation or reveal abnormal operation
- Note changes




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11

Ask...

- What zone(s)?
- Is it time related?
- Is it event related?
- Is it user related?
- Is it environment / weather related?



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12

Troubleshooting

Ask...

- Have any other contractors been working in the area?
- Any recent remodels, roof leaks, etc.?
- Keep a log to show trends and patterns



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13

Use Process of Elimination

- Mentally eliminate everything it couldn't be
- Don't waste time with these parts of the system unless your updated diagnosis indicates reconsideration



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14

Detailed & Accurate Diagnosis

- This is an absolute must!
- "It's broke" or "It doesn't work" doesn't tell you anything
- Ask; who, what, when, where & why?



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Swingers

Problems that are erratic or intermittent - that come and go suddenly - are almost always due to bad connections - cold solder joints or internal or external connectors that need to be cleaned and resealed



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No Functions

- Problems that result in a totally dead unit or affect multiple functions are generally power supply related

**NOTHING
WORKS**

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Test Operation

- Read the Directions
- Walk test
- Sequence through the operation as the user would
- Check voltage, resistance, tones
- While checking resistance move wiring or vibrate components to verify firm connections



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18

Troubleshooting

Common Sources of Problems



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Sources of Problems

- People
- Animals, insects and rodents
- Environment- heat, moisture, airflow
- Dust, dirt and contaminants
- Remodeling or movement of items
- Improper installation or application

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20

Look Here First

- Anything that has human intervention, either during the installation, day-to-day use or maintenance will be the MOST likely place to find problems



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21

Keep in Mind...

- Components seldom "just go bad". Something caused it
- Connections inside J-boxes and attics seldom go bad (depending on geographic location)
- Wire seldom goes bad....without a cause



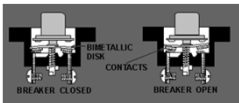
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22

"Nothing works"

- Check: power supply, fuse, transformer or circuit breaker?
- If the key pad or other components are working...its not auxiliary power



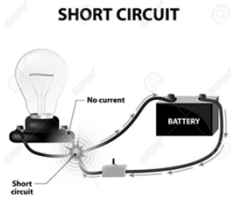
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Signs of Short Circuits

- Blown fuses, breakers or transformers
- Increased heat
- Low voltage
- High amperage
- Smoke or smell of smoke



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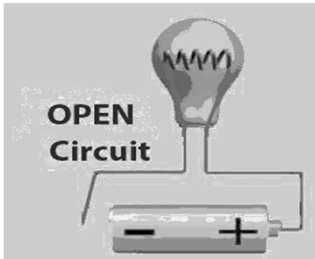
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24

Troubleshooting

Signs of Open Circuits

- Infinite resistance
- Zero Amperage
- Inoperable device



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Signs of Grounds

- Abnormal voltage readings
- Abnormal amperage readings
- Abnormal resistance readings
- Shocks
- Abnormal circuit performance
- Tripped ground fault interrupters
- Blown fuses or breakers

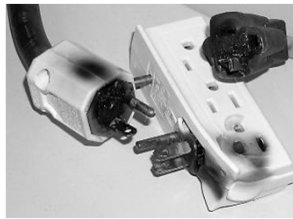
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26

Signs of Mechanical Faults

- Noisy operation
- Abnormal operation
- Visual clues
 - Cracks, burns, charred areas
- Smells
- Heat
- Circuit failure



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27

Programming

- Keep in mind all of the effects that programming can create in the system
- You must know your equipment - including ALL program options



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28

Overloading

- A very common mistake made during the original design and installation
- Too many devices drawing too much current from the panel's power supply



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29

Undersize Wiring

- Mostly a factor on;
 - Long runs (>200')
 - Data or Polling loops
 - High current devices (i.e. sirens & horns)



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30

Troubleshooting

Undersize Wiring

- Most manufacturers recommend a minimum of 22AWG wire for zones and 18AWG (minimum) for the transformer and siren
- Read the manufacturers instructions!

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31

Excessive Wire Length

- Verify wire runs over 200' with the installation instructions.
- If there is no chart in the manual - call the manufacturer
- Keep in mind, the electrons have to travel 200' out AND 200' back to the panel

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Electro-Magnetic Interference

- From Lightning - can travel great distances over power lines, telephone lines or any conductor. It can even be picked up by the zone wiring. (Use twisted wire to reduce this effect.)
- From light ballast's or utility power transformers



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Radio Frequency Interference

- From nearby radio towers, cellular sites, broadcast antenna's, etc..
- This is a rare problem, but not unheard of
- Typically interfering transmissions should be within the same frequency range to cause problems



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34

Beware of Telephone Line Options

- The addition or removal of:
 - Call waiting
 - Remote call forwarding
 - Call notes
 - DSL, VoIP
 - Any new options
- Answering machines or fax machines can also hinder downloading



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35

Lack of Cellular Service

- Antennas and/or amplifiers may be required in rural areas with little or no cellular coverage



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Troubleshooting

DSL

May require a filter in order for regular phone equipment including the control-communicator to operate



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VoIP

- Voice Over Internet Protocol
- Can work one minute and not the next
- Verify with VoIP provider
- Verify with manufacturer of alarm panel
- Warn customers to check with you before they switch



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Blocked Ventilation

- Make sure vents remain unblocked
- Check that cooling fans operate



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The Solution



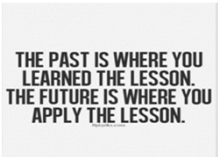
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40

Identify a Solution

- Remember what worked before
- Ask Coworkers, Supervisors
- Read the manuals
- Use manufacturer help lines, web sites
- Break down the problem into smaller parts



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Implement the Solution

- Make sure your solution will address the problem
 - Use common sense
 - Use your experience
 - Ask coworkers and supervisors
 - Refer to manufacturer manuals, websites and help lines
 - Observe



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Troubleshooting

Verify proper operation

- Test after each fix to make sure it is really fixed
- Make sure that your fix did not break something else



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Make Sure That Was The Only Problem

- You may fix what you think is the problem and leave another problem uncorrected
- Test the full system before you leave



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Document Problems & Actions Taken

- Record the steps you took to fix or change the system
- This avoids repeating the same steps if the problem happens again



**Programming
UPDATE**



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45

Project Management

Project Management

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Slide 4-1

1

Phases of Construction

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2

Phases of Construction

1. Plans and Permitting
2. Site Work and Masonry
3. Framing
4. Plumbing, Electric & More
5. Insulation, Drywall & Flooring
6. Landscaping & Exterior



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3

Plans and Permitting

- Plans are developed by an architect, licensed designer or licensed engineer
- Owner or builder apply for the building permit with the local government



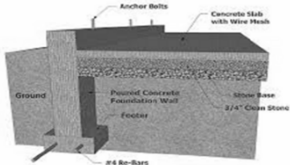
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4

Site Work and Masonry

- Land is cleared and leveled
- Footings are poured
- Underground plumbing and electrical is done
- Stem Wall & Foundation are set
- Exterior Walls are Set



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5

Framing

- Roof trusses are installed and sheathed
- Roof is dried-in with tar paper
- All interior framing is installed



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6

Project Management

Plumbing, Electric & More

- Electrical Wiring
- Plumbing
- HVAC Ducts
- Wiring for telephones, electronics and security systems
- Inspections may be required for each trade



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7

Insulation, Drywall & Flooring

- After the home passes inspections, the next item is insulation
- Then Drywall
- Then exterior finishes can be installed, such as stucco or siding.
- Cabinets and flooring follow, as well as bathroom finishes, like sinks, tubs and toilets



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8

Landscaping & Exterior

- Work On Driveways, Walkways, Pools And Patios & Landscaping



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9

Occupancy

- The final inspection happens at this point and if all goes well, a Certificate of Occupancy will be issued



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10



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Job Plan Considerations



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Sequence

- Sequence -is one item required for another?
 - You need framing before you can wire
 - You need walls before you can mount equipment
 - You need a clean site before some equipment can be installed



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12

Workforce

- Availability of workforce
 - You need to time when workers are on site with when you need them
 - Too early and you may waste time
 - Too late and you may be covered up



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13

Permits & Inspections

- Permit or inspection requirements
 - Make sure you know if you need permits
 - Permits can take 30 or more days to get
 - Inspections may take days to schedule



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14

Other Trades

- Schedule of other trades
 - You need to determine when other trades will complete things
 - You may have to check progress each day to fit your work in between trades



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15

Weather

- Before the walls and roof are finished you may not be able to work in bad weather
- Even after – heavy rain or snow may make access to the site difficult



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16

Access to job site

- What hours is the site accessible?
- Are there noise regulations that limit work?
- Do other projects limit access?
 - Ex: floor install, painting, spraying insulation



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Check Job Schedules

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18

Job Schedules

- Construction projects have schedules to coordinate all the trades
- Check them out to coordinate your work

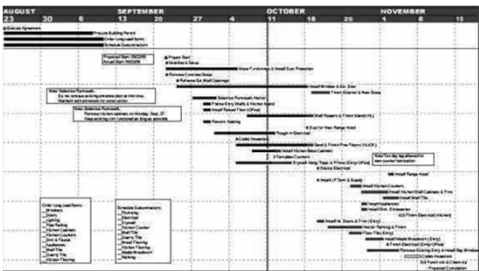
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Text Chart Schedule

Item	Start Constraint	Finish Constraint	Actual Start	Actual Finish	Percent Done
Contract Awarded	7/12/07	7/12/07	7/12/07	7/12/07	100%
Site Survey	7/14/07	7/17/07	7/15/07	7/17/07	100%
Install Team mtg	7/17/07	7/17/07	7/17/07	7/17/07	100%
Project Schedule compiled	7/17/07	7/17/07	7/17/07	7/17/07	100%
Materials Ordered	7/17/07	7/17/07	7/17/07	7/17/07	100%
Install Backbone cables	8/11/07	9/8/07	7/21/07	8/10/07	100%

20

Gantt Chart Schedule



21


Communication

- Is key to coordinate and complete the installation safely and effectively
- Ask for feedback on critical items to verify that they are understood
 - Words can mean different things to different people
 - Incorrect assumptions can be made
 - Poor listening can occur with distractions
 - Not understanding terms or jargon



22

Practical Application of Electronics




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Practical Application of Electronics

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1



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Conversions

Metric Conversions

Giga 10^{+12}

Mega 10^{+6}

kilo 10^{+3}

Up

Meter (or volt, amp, ohm etc)

milli 10^{-3}

micro 10^{-6}

pico 10^{-12}

Down

Move the decimal to the left.

Move the decimal to the right.

Example: to change kilovolts to volts multiply by 1000 or add 3 zeros ie: 1 kilovolt = 1000 volts

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2

Like Values

- Make sure you are using like values in your calculations
- In our industry - values commonly expressed as follows;
 - Voltage as volts
 - Resistance as kilohms
 - Amperage as milliamps

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3

Voltage Conversions (V)

Original Value	Desired Value	Do this
μV	V	Divide microvolts by 1,000,000
mV	V	Divide millivolts by 1,000
V	μV	Multiply volts by 1,000,000
V	mV	Multiply volts by 1,000

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4

Amperage Conversions (A)

Original Value	Desired Value	Do this
μA	A	Divide microamps by 1,000,000
mA	A	Divide milliamps by 1,000
A	mA	Multiply amps by 1,000,000
A	mA	Multiply amps by 1,000

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5

Resistance Conversions (Ω)

Original Value	Desired Value	Do this
K Ω	Ω	Multiply kilohms by 1,000
M Ω	Ω	Multiply megaohms by 1,000,000
Ω	K Ω	Divide Ohms by 1,000
Ω	M Ω	Divide Ohms by 1,000,000

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Slide 5-6

6

Practical Application of Electronics

Power Conversions (W)

Original Value	Desired Value	Do this
KW	W	Multiply kilowatts by 1,000
mW	W	Divide milliwatts by 1,000
W	KW	Divide Watts by 1,000
W	mW	Multiply Watts by 1,000

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7

Voltage Conversions (V)

Original Value	Desired Value	Do this
μ V	V	Divide microvolts by 1,000,000
mV	V	Divide millivolts by 1,000
V	μ V	Multiply volts by 1,000,000
V	mV	Multiply volts by 1,000

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8

Amperage Conversions (A)

Original Value	Desired Value	Do this
μ A	A	Divide microamps by 1,000,000
mA	A	Divide milliamps by 1,000
A	μ A	Multiply amps by 1,000,000
A	mA	Multiply amps by 1,000

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9

Resistance Conversions (Ω)

Original Value	Desired Value	Do this
K Ω	Ω	Multiply kilohms by 1,000
M Ω	Ω	Multiply megohms by 1,000,000
Ω	K Ω	Divide Ohms by 1,000
Ω	M Ω	Divide Ohms by 1,000,000

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10

Power Conversions (W)

Original Value	Desired Value	Do this
KW	W	Multiply kilowatts by 1,000
mW	W	Divide milliwatts by 1,000
W	KW	Divide Watts by 1,000
W	mW	Multiply Watts by 1,000

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Slide 5-11

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Class Exercise





Convert
20 μ A to amps

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Practical Application of Electronics



Class Exercise
Answer



Convert 20 μ a to amps

Divide 20 by 1,000,000

$20/1,000,000 = 0.00002$ amps

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Class Exercise

Convert
2K Ω to ohms

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Class Exercise
Answer



Convert 2K Ω to ohms

Multiply 2 by 1,000

$2 \times 1,000 = 2000$ ohms

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Class Exercise

Convert
20mA to amps

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Class Exercise
Answer


Convert 20 ma to amps

Divide 20 by 1,000

$20/1,000 = 0.02$ amps

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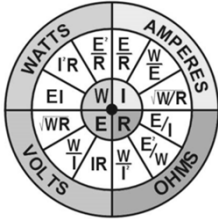
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Applying
the
Formulas

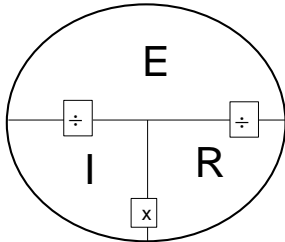


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Practical Application of Electronics

Ohm's Law Reminder



The **E**arth Is **R**ound
Reminder of
equations to solve
for unknown

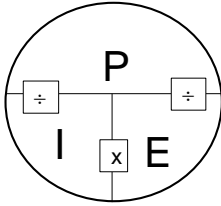
Rule of Thumb
Place thumb over
unknown value

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Power Wheel



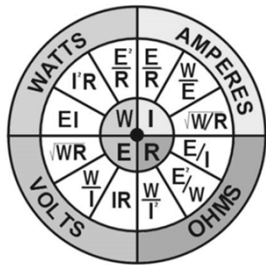
The same "Rule
of Thumb" will
work with Power.

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The Earth Is Round / rule of thumb



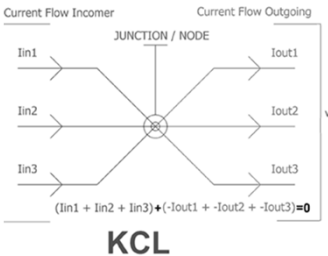
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Kirchhoff's Current Law

- At any point in an electrical circuit, the sum of currents flowing towards that point is equal to the sum of currents flowing away from that point



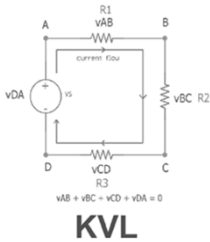
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Kirchhoff's Voltage Law

- Total inflow of energy into a system must equal the total outflow of energy from the system, plus the change in the energy contained within the system
- So therefore this implies that the directed sum of the electrical potential differences around a circuit must also sum to zero



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Series Circuit Formulas

- To find the total resistance within a series circuit use the given formula:
 - $R_{total} = R_1 + R_2$
- To find the current within a series circuit use Ohm's Law:
 - $I = E/R_{total}$
- To find the voltage within a series circuit use Ohm's Law again:
- $E=IR$, where I is the current and E is the voltage

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Practical Application of Electronics

Parallel Circuit Formulas

- To find the total current within a parallel circuit use Ohm's Law in each loop then sum, using the formula:
 - $I_{\text{total}} = E/(R_1 + R_2 + \dots)$
- To find the total resistance of all the components in a parallel circuit use the given formula;
 - $1/R_{\text{total}} = 1/R_1 + 1/R_2$
- To find the current in any particular component with resistance R_1 , use Ohm's law again:
 - $I_1 = V/R_1$

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Class Exercise



What are the formulas for determining Voltage in a circuit?

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Class Exercise Answer



$$E = I \times R$$

$$E = P/I$$

$$E = \sqrt{P \times R}$$

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Class Exercise



What are the formulas for determining Current in a circuit?

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Class Exercise Answer



$$I = E/R$$

$$I = P/E$$

$$I = \sqrt{P/R}$$

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Class Exercise





What are the formulas for determining Power in a circuit?

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Practical Application of Electronics



Class Exercise

Answer

$P = I \times E$



$P = I^2 \times R$

$P = E^2/R$

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Class Exercise

What are the formulas for determining Resistance in a circuit?

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Class Exercise

Answer

$R = E/I$

$R = E^2/P$

$R = P/I^2$

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Connecting Speakers



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Class Exercise

- How do you wire two 4 ohm speakers to a driver with an 8 ohm output?

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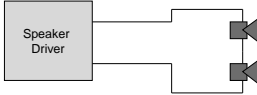


Class Exercise

Answer

- How do you wire two 4 ohm speakers to a driver with an 8 ohm output?

$R_{total} = R_1 + R_2 \quad 4\Omega + 4\Omega = 8\Omega$

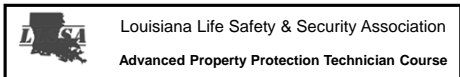


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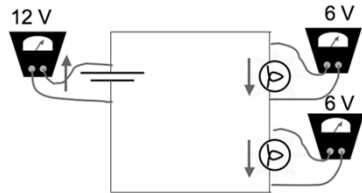
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Practical Application of Electronics



Voltage Drop



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Voltage Drop

- Voltage drop calculations determine if there is sufficient voltage/current being delivered to the last device on a circuit to ensure that the last device is within its operating range for any given gauge (AWG) wire selected.
- By calculating the voltage drop you can decide if additional power boosters are required.

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Wire Resistance

Wire Gauge #	Ohms per Foot	x 475 ft
14	0.002525	1.199Ω
16	0.00402	1.909Ω
18	0.00639	3.055Ω
22	0.01614	7.666Ω

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Class Exercise



- How do you wire two 4 ohm speakers to a driver with an 8 ohm output?

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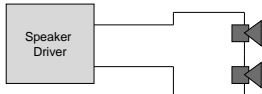


Class Exercise Answer



- How do you wire two 4 ohm speakers to a driver with an 8 ohm output?

$$R_{\text{total}} = R_1 + R_2 \quad 4\Omega + 4\Omega = 8\Omega$$



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Example Voltage Drop Camera

Wire Gauge #	Ohms at 475 ft	12 VDC Camera (.16a)		24 VAC Camera (.16a)	
		Voltage Drop R x Amps	Voltage at Last Device	Voltage Drop R x Amps	Voltage at Last Device
14	1.199Ω	.1918	11.80	.1918	23.80
16	1.909Ω	.3054	11.69	.3054	23.69
18	3.055Ω	.4888	11.51	.4888	23.51
22	7.666Ω	1.226	10.77	1.226	22.77

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Practical Application of Electronics

Example Voltage Drop

Outdoor IR Camera & Pan, Tilt & Zoom

Wire Gauge #	Ohms at 475 ft	24 VAC Camera (.78A)	
		Voltage Drop R x Amps	Voltage at Last Device
14	1.199Ω	.9352	23.06
16	1.909Ω	1.489	22.51
18	3.055Ω	2.382	21.61
22	7.666Ω	5.979	18.02

Pan tilts are not usually available in 12 VDC

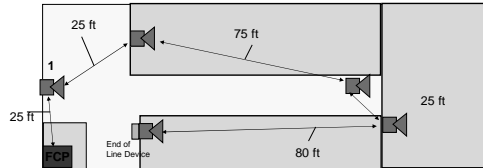
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Class Exercise

- How can you be sure all of these fire horns will have voltage to operate correctly?



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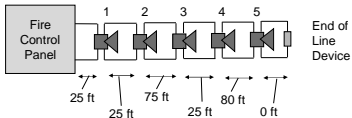
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Class Exercise Answer Step 1

- How can you be sure all of these fire horns will have voltage to operate correctly?

- Figure the total distance between devices

$$25 + 25 + 75 + 25 + 80 + 0 = 230 \text{ feet}$$



Each
Horn
Draws
.160A

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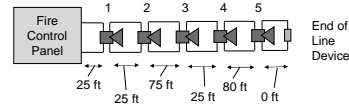
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Class Exercise Answer Step 2

- How can you be sure all of these fire horns will have voltage to operate correctly?

- Figure the total distance of the wire run
– Out and back

$$230 \text{ feet} \times 2 = 460 \text{ feet}$$



Each Horn
Draws
.160A

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Class Exercise Answer Step 3

- How can you be sure all of these fire horns will have voltage to operate correctly?

- Figure the total resistance of the wire run

Wire Gauge #	Ohms per Foot	x 460 ft
14	0.002525	1.161Ω
16	0.00402	1.849Ω
18	0.00639	2.939Ω
22	0.01614	7.424Ω

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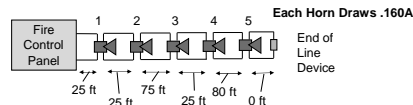
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Class Exercise Answer Step 4

- How can you be sure all of these fire horns will have voltage to operate correctly?

- Figure the total amperage used by the devices

$$.160A \times 5 = .8A$$



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Practical Application of Electronics



Class Exercise Answer Step 5

- How can you be sure all of these fire horns will have voltage to operate correctly?
- Figure the total voltage drop of the wire run

Wire Gauge #	Ohms at 460 ft	Voltage Drop $R \times \text{Amps} (.8\text{A})$	Voltage at Last Device 12 V Panel	Voltage at Last Device 24 V Panel
14	1.161 Ω	.92	11.08	23.08
16	1.849 Ω	1.47	10.53	22.53
18	2.939 Ω	2.35	9.65	21.65
22	7.424 Ω	5.93	6.07	18.07

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Class Exercise Answer Step 6

- How can you be sure all of these fire horns will have voltage to operate correctly?
- Check the acceptable operating range of your notification device
 - Common range 24V- 16V to 33V & 12V- 8V to 17.5V

Wire Gauge #	Voltage at Last Device 12 V Panel	Voltage at Last Device 24 V Panel
14	11.08	23.08
16	10.53	22.53
18	9.65	21.65
22	6.07	18.07

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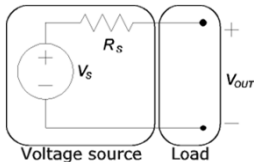
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Load Calculations



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Calculate Current Draw

- Calculate the load current in amps for this system



Quantity	MODEL NUMBER	DESCRIPTION
1	Acme 2012	12 volt Fire Alarm Control Panel
1	Acme 2001	Remote Annunciator
10	Acme 20	Smoke Detectors - 2 Wire
5	Acme 300	Horn Strobes

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Calculate Current Draw Step 1

- Calculate standby mode current draw

Battery Calculation - Standby Mode

Device Type	Number of Devices		Current (Amps)		Total Current (Amps)
Main Circuit Board	1	X	0.123	=	0.123
Remote Annunciator	1	X	0.006	=	0.006
2-wire Detector Heads	10	X	0.00005	=	0.0005
4-wire Detector Heads	0	X	0.00005	=	0
Power Supervision Relays	0	X	0.025	=	0
SUM COLUMN FOR STANDBY LOAD			0.1295	=	AMPS

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Calculate Current Draw Step 2

- Calculate alarm mode current draw

Battery Calculation - Alarm Mode

Device Type	Number of Devices		Current (Amps)		Total Current (Amps)
MAIN CIRCUIT BOARD	1	X	0.255	=	0.255
Remote Annunciator	1	X	0.052	=	0.052
2-wire Detector Heads	10		0.12	=	1.2
4-wire Smoke Detectors	0	X	0.02	=	0
Power Supervision Relays	0	X	0.025	=	0
Programmable Relay(s)	0	X	0.01	=	0
Horn Strobe	5	X	0.127	=	0.635
SUM COLUMN FOR LOAD IN ALARM			2.142	=	AMPS

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Practical Application of Electronics

Calculate Current

Draw

Step 3

• Calculate standby requirements

Battery Calculation

Calculation in Total Sheet

Page 3

Standby Load Current (Amps)	0.1295	X	Required Standby Time in Hours (24 or 60 Hrs.)	24	=	3.108
Alarm Load Current (Amps)	2.142	X	Required Alarm Time in Hours (5 minutes = 0.084)	0.084	=	0.179928
Add Standby and Alarm Load for Required Ampere Hour Battery						3.287928
Multiply by the Derating Factor of 1.2						3.945513
Would a 6Ah battery be sufficient?						Yes

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Class Exercise

• Calculate the load current in amps for this system

Quantity

MODEL NUMBER

DESCRIPTION

1	Acme 2012	12 volt Fire Alarm Control Panel
1	Acme 2001	Remote Annunciator
4	Acme 20	Power Supervision Relay
10	Acme 10	Smoke Detectors 4 Wire
5	Acme 300	Horn Strobes

Note: System requires 24 hours of standby time

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Class Exercise

Answer Step 1

• Calculate standby mode current draw

Battery Calculation - Standby Mode

Device Type	Number of Devices		Current (Amps)		Total Current (Amps)
Main Circuit Board	1	X	0.123	=	0.123
Remote Annunciator	1	X	0.006	=	0.006
2-wire Detector Heads	0	X	0.00005	=	0
4-wire Detector Heads	10	X	0.00005	=	0.0005
Power Supervision Relays	4	X	0.025	=	0.1
SUM COLUMN FOR STANDBY LOAD			0.2295	=	AMPS

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Class Exercise

Answer Step 2

• Calculate alarm mode current draw

Battery Calculation - Alarm Mode

Device Type	Number of Devices		Current (Amps)		Total Current (Amps)
MAIN CIRCUIT BOARD	1	X	0.255	=	0.255
Remote Annunciator	1	X	0.052	=	0.052
2-wire Detector Heads	0		0.12	=	0
4-wire Smoke Detectors	10	X	0.02	=	0.2
Power Supervision Relays	4	X	0.025	=	0.1
Programmable Relay(s)	0	X	0.01	=	0
Horn Strobe	5	X	0.127	=	0.635
SUM COLUMN FOR LOAD IN ALARM			1.242	=	AMPS

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Class Exercise

Answer Step 3

• Calculate standby requirements

Battery Calculation

Calculation in Total Sheet

Page 3

Standby Load Current (Amps)	0.2295	X	Required Standby Time in Hours (24 or 60 Hrs.)	24	=	5.508
Alarm Load Current (Amps)	1.242	X	Required Alarm Time in Hours (5 minutes = 0.084)	0.084	=	0.104328
Add Standby and Alarm Load for Required Ampere Hour Battery						5.612328
Multiply by the Derating Factor of 1.2						6.734793
Would a 6Ah battery be sufficient?						No

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Meter Use



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Measure Voltage

- Verify meter setting and lead placement
 - On Voltage
 - On AC or DC
 - On range that you do not expect to exceed
- Place leads in **PARALLEL** with what you are measuring
- Disconnect a battery from the panel to measure the battery voltage or the charging circuit

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Measure Amperage

- Verify meter setting and lead placement
 - On Amperage
 - On range that you do not expect to exceed
- Place leads in **SERIES** with what you are measuring

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Measure Power

- Measure for Voltage
- Measure for Amperage
- Multiply Amps x Volts

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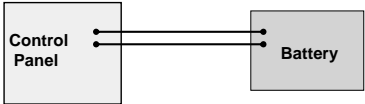
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Class Exercise



How do you measure the charging circuit voltage?



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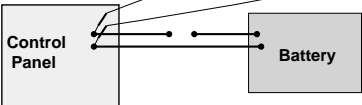
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Class Exercise Answer



Put meter on voltage
Put probes in **PARALLEL** to measure the charging circuit voltage?
Break the circuit to avoid interference from battery



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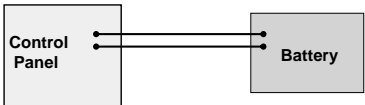
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Class Exercise



How do you measure the battery voltage?





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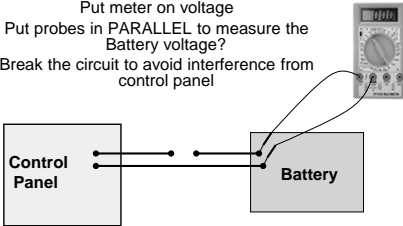
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Practical Application of Electronics



Class Exercise Answer



Put meter on voltage
Put probes in PARALLEL to measure the Battery voltage?
Break the circuit to avoid interference from control panel



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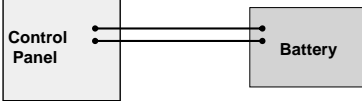
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Class Exercise



How do you measure the amps drawn by the battery?



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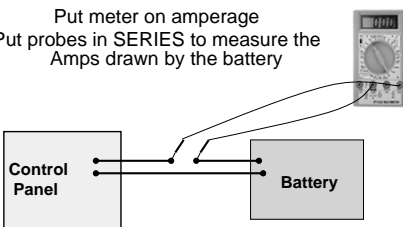
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Class Exercise Answer



Put meter on amperage
Put probes in SERIES to measure the Amps drawn by the battery



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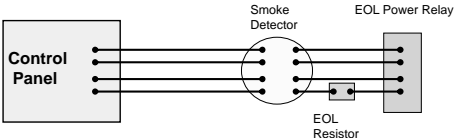
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Class Exercise



How do you measure the auxiliary power circuit voltage?



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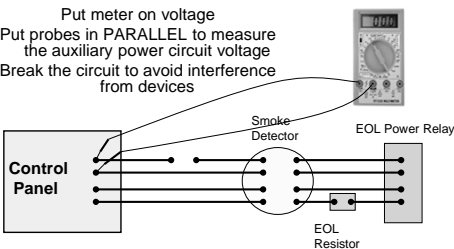
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Class Exercise Answer



Put meter on voltage
Put probes in PARALLEL to measure the auxiliary power circuit voltage
Break the circuit to avoid interference from devices



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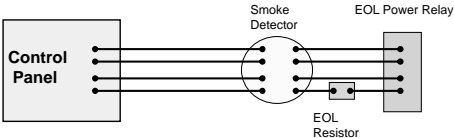
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Class Exercise

How do you measure initiating circuit resistance?





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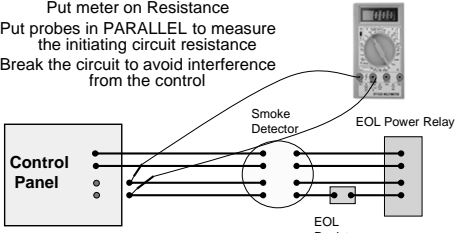
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Practical Application of Electronics



Class Exercise Answer



Put meter on Resistance
Put probes in PARALLEL to measure the initiating circuit resistance
Break the circuit to avoid interference from the control



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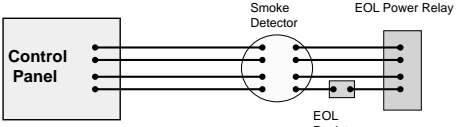
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Class Exercise



How can you tell if the initiating circuit is open, shorted or normal without measuring resistance?



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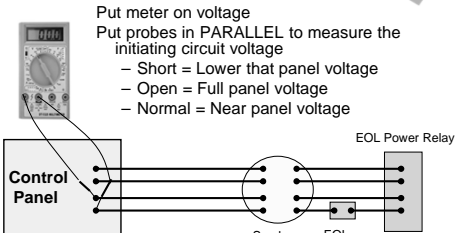
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Class Exercise Answer

Put meter on voltage
Put probes in PARALLEL to measure the initiating circuit voltage



- Short = Lower than panel voltage
- Open = Full panel voltage
- Normal = Near panel voltage



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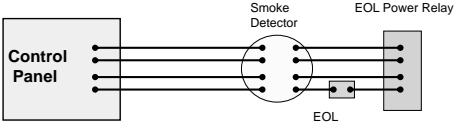
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Class Exercise



How do you measure for grounds on the initiating circuit?



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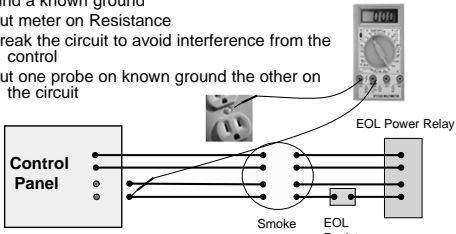
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Class Exercise Answer

Find a known ground
Put meter on Resistance
Break the circuit to avoid interference from the control
Put one probe on known ground the other on the circuit



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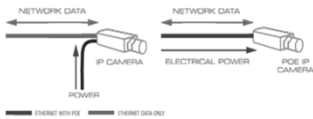
77

Practical Application of Networks

Practical Application of Networks

1

Power Over Ethernet



2

What is PoE?

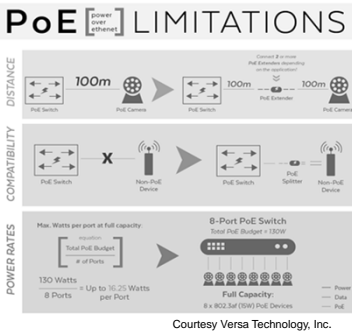
- Power over Ethernet (PoE) is a networking feature that lets network cables carry electrical power over an existing data connection with a single Cat5e/Cat6 ethernet cable.

3

PoE Explained



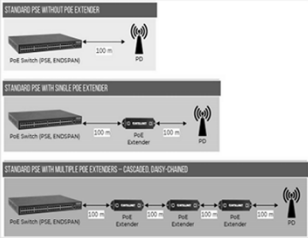
4



5

Maximum Distance of PoE

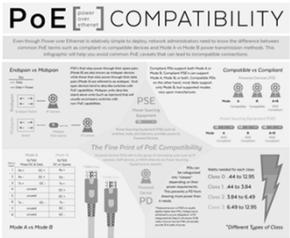
- PoE can transmit 100 meters from the switch or hub to the NIC
- Ethernet cabling standards limit the total length of cabling to 100 meters
- A PoE Ethernet Extender, however, can lengthen that span up to 4000 feet



6

PoE Compatibility

- Legacy devices, those that are not PoE compliant, require either an injector or a splitter
- PoE delivers power AND data over one cable and therefore one input
- Legacy devices receive data and power separately



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7

PoE Injector

- Sends power to PoE equipment that receives data through existing non-POE switch



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8

PoE Splitter

- Supplies power by splitting the power from the data and feeding it to a separate input that a non-PoE compliant device can use.



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PoE Extender

- Device used to extend Ethernet network devices beyond the basic 100m distance limit for twisted pair Ethernet cable.



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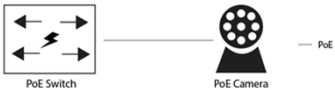
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10

PoE Switch

- A network switch with the ability to provide power over Ethernet from each interface while still being able to forward frames.
- Both managed and unmanaged PoE switches are available.



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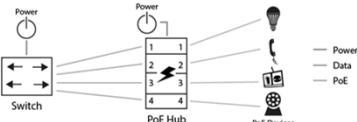
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PoE Hub

- Can be viewed as a stack of PoE injectors.
- Each PoE interface requires a data connection with the corresponding data-in side.



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Practical Application of Networks

PoE STANDARDS

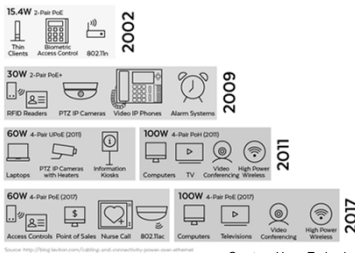
IEEE Extension	Type	Power Budget per Device
IEEE 802.3af	Type 1	15.4W
IEEE 802.3at / PoE+	Type 2	30.8W
IEEE 802.3bt / UPoE	Type 3	60W
IEEE 802.3bt	Type 4	90-95W

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PoE Evolution



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Common IP Issues



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Duplicate IP Addresses



- Problem
 - When two devices attempt to share a single IP, you see the "Address Already in Use" error
 - The blame for this often rests with your router's default DHCP configuration.
 - DHCP is probably trying to assign your new device an address at the beginning of your subnet, and another device may already occupy these low-numbered addresses with static IPs

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Duplicate IP Addresses

- Solution
 - If you've just introduced a new device or server to your network, it may have its own DHCP server
 - Simply disable the DHCP server on that device to restore sanity to your network



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IP Address Exhaustion

- Problem
 - To troubleshoot this issue, use the ipconfig command.
 - If the workstation has assigned itself an IP address that begins with 169.x.x.x, it means that no IP address was available from the DHCP server.

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IP Address Exhaustion

- Solution 1
- If you do not have a local router IP addresses are assigned on a limited basis directly from your ISP.
- You have probably run out of allowed IP addresses from your ISP.
- Add a local router

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IP Address Exhaustion

- Solution 2
- If you have a local router with DHCP, the default address pool might be too small for your network.
- Access the DHCP settings on the router to adjust the size of the address pool to meet your network's needs.

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DNS Problems

- Problem
 - Errors such as The Network Path Cannot Be Found, IP Address Could Not Be Found, or DNS Name Does Not Exist, can usually be traced to a DNS configuration issue.
 - The command line utility nslookup can be used to quickly show a workstation's DNS settings.

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21

DNS Problems

- Solution
 - Network devices can be configured to use their own DNS servers, ignoring the server assigned by DHCP
 - Checking the 'Internet Protocol Version 4 (TCP/IP)' settings for your adapter will show if an incorrect DNS server is specified
 - Try selecting "Obtain DNS server address automatically"

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Unauthorized Access to Security Networks

- IP-based security may be convenient, but it can also be dangerous if not properly secured.
- The main benefit of IP-based security has always been how easy it is to make systems operate successfully over a single network.
- That benefit might also be IP security's biggest Achilles heel.

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Slow Internet Performance

- Problem
 - Due to congestion
 - Poor quality connections
 - Overloaded port on a switch or router
 - Bandwidth allocation
 - DNS Server setup



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24

Slow Internet Performance

- Solution
 - Check modem with speed test – get vendor to improve setting
 - Temporarily adjust your DNS settings to use OpenDNS instead
 - Upgrade the connection



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Managed Ethernet Switches

- Today's managed Ethernet switches — usually layer 2 in the Open Systems Interconnection (OSI) reference model — have built-in security features.

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Managed Ethernet Switches


- Layer-2 managed switches can typically implement port security, which consists of checking incoming packets for a matching MAC address.
- If a packet with a valid MAC address is received on a particular port, the switch will allow that packet to pass through the switching fabric of the switch as normal.

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Practical Applications for Common Occupancies



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Practical Applications for Common Occupancies

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1

Practical Applications for Common Occupancies



"That's all well and good, but what's the practical application for it?"

- The goal for this section is to cover specific needs for common occupancies
- Because fire courses will cover needs for fire systems our focus is on security

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2



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Best Practices for Banks




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3

Use Separate Controls



Make sure that the vault area and rest of the bank are separately controlled to allow cleaners to be in bank after hours without access to the vault


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4

ATMs

- Make it easy for ATM and armored car providers to cancel accidental activations
- Prior to dispatching officers on an ATM alarm, consider having your central station immediately contact the ATM company's dispatcher to verify if a technician is at the site




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Money Clips

- Wire money clips so that bills need to be removed from more than one clip to generate an alarm



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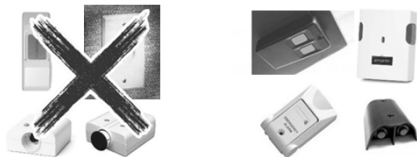
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Practical Applications for Common Occupancies

Holdup Buttons

- Replace single action hold up buttons or buttons that must be reset with a key with a dual-action hold-up button



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Holdup Procedures

- Consult with your local law enforcement agency on proper procedures to follow during a hold-up
- Use internal verification procedures
 - monitoring operator contacts the branch to obtain a codeword confirming the alarm activation prior to requesting law enforcement dispatch



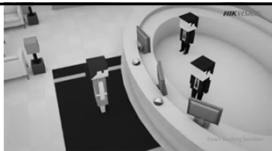
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Video Systems

- To capture images of each person coming and going put cameras at entrances and exits
- Place cameras at all ATMs to gather clear pictures of ATM user faces
- Place camera in teller areas to monitor all bank transactions
- Use a camera to provide an overall view of the bank lobby
- Monitor the safe with a camera
- Consider advanced video analytics such as motion sensing and behavioral recognition to assist in spotting suspicious activity
- Facial recognition can also prove helpful for identifying and tracking specific individuals, for instance those suspected of check fraud
- Monitor and record the video off site



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Train Users

- Train users on when to use the devices and on the benefits of using 9-1-1 to relay full information about the emergency
- Because the alarm company will usually not be able to train future employees in using the holdup button, they must "train the trainer" when turning the system over to the customer
- Best practice is to prepare detailed written procedures for the customer to show their future employees



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Best Practices for Offices



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Offices



- Do certain offices (Human Resources, Accounting, Server rooms) need to be separately controlled?
- Do you need to monitor when after hours cleaners come and go?

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Practical Applications for Common Occupancies



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Best Practices for Restaurants




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Bar



- Do not forget high value inventory behind the bar

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Restaurant Kitchen



- Sensors may trip when hanging pots and pans move


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Locked in Freezer

- Add a panic button on the freezer in case employees are locked in freezer



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Cover the Drive Thru




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Watch Those Decorations!

- Seasonal decorations, promotional signs and balloons will cause false alarms
- Be conscious of displays



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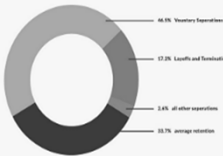
18

Practical Applications for Common Occupancies

Plan to Train Users

- Restaurants have high turnover in managers
- Best practice is to prepare detailed written procedures & or a video for the customer to show their future employees

The average turnover rate is 66.3%



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Best Practices for Retail Stores



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Roll-up metal shutters

- Do not use Glassbreak Sensors with roll-up metal shutters to protect glass windows at night



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Signs Can Lead to Alarms

- Motion sensors will not only pick up movement of humans in the premises, they will also detect movement from the “non-human” variety
- Look for items that can move within the “view” of your motion detectors causing false alarms. Frequent offenders are balloons or signs floating in front of motion sensors



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Setup the Right Coverage

- Plan for the unexpected



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Burglars Come thru Ceilings



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Practical Applications for Common Occupancies

Burglars Cut thru Walls



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Burglars Come thru Air Conditioners



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Plan to Train Users

- Retail store have high turnover in managers
- Best practice is to prepare detailed written procedures & or a video for the customer to show their future employees

For a business with 100 employees:

	Turnover Rate
All Industries	49%
Retail	65%
Hospitality	33%
Manufacturing	30%

These figures are based on the Center for American Progress estimates cited above for high-turnover, low-paying jobs

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Best Practices for Convenience Stores



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Check State & Local Laws



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Check State & Local Laws

State or Local law may require

- A silent alarm to law enforcement or a private security agency
- A security camera system capable of recording and retrieving an image to assist in offender identification and apprehension that includes:
 - One camera must have an overall view of the counter/register area and the other camera a view of the main entrance/exit area
- Display of the date and time of the recording
- Cameras to be operated at all times, including hours when the store is not open for business
- The owner shall provide the police department with digital color images in connection with crime investigations upon request
- The owner shall maintain a library of the recorded digital images for not less than 30 days
- A convenience store shall have posted at all public exits and entrances signs or decals indicating that surveillance cameras are in use



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Practical Applications for Common Occupancies

Best Practices for Big Box Stores



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Building Supply Aisle



- Signs can impact motion sensors & cameras

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Birds in Building Supply Store



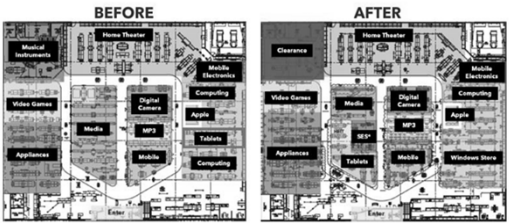
- Birds will activate motion sensors

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Electronics Store Redo



- Store redo will impact motions & cameras

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Electronics Store Open Plan

- Clear views allow motions and cameras to view most areas



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Electronics Store Store within a Store Layout

- Displays restrict views for cameras and motions



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Practical Applications for Common Occupancies



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Best Practices for Auto Sales



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Car lot




- What do you do when you see these pictures when the lot is closed?
- There is not a crime if signage and fencing do not block entry to the lot

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Car Exhaust




- How to you prevent a smoke alarm from car exhaust?

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Best Practices for Urgent Care




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Urgent Care



- Consider there could be medicine in every exam room

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Best Practices for Gun Stores



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Practical Applications for Common Occupancies

Gun Stores

- ATF Requirements
- Obtain an alarm system.
- There is no logical justification for a firearms business to be unalarmed.
- Many States require an alarm system on specific types of businesses, particularly firearms dealers.
- Are you in compliance with State and local law on your alarm system and other security requirements?

Masked burglars flee empty-handed from Fayetteville gun store



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Gun Stores

ATF Requirements

- Evaluate your existing alarm system.
 - Is it sufficient for the nature and size of your business?
 - Are all points of entry protected?
 - Do you have, or need, a panic button?
 - Tamper alarm?
 - Cellular backup (cellular backup is considered an industry standard to protect during power failures and/or if power/phone lines are cut)?
 - Have you met with the local authorities to agree on protocols when the alarm is tripped?



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Gun Stores

ATF Requirements

- Evaluate the need for or condition of your video camera system.
 - Do your cameras face in a direction that will capture people's faces and features?
 - Are you recording at all times?
 - In some instances, insurance savings may offset updating obsolete or inferior equipment



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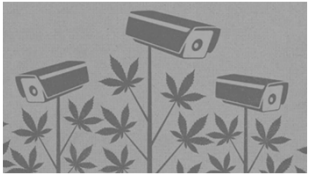
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Best Practices for Marijuana Stores



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Marijuana Stores



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Marijuana


- Law May require
 - 24/7 video surveillance of all entrances and exits to dispensaries and growing facilities & all internal areas of the dispensary
 - For transactions, cameras should capture the images of the employee, the customer, register, and the product exchange
 - Video be retained for a set period of time

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Practical Applications for Common Occupancies



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Best Practices for Schools




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Partner Alliance for Safer Schools (PASS)

- The PASS Guidelines were developed to provide administrators with a means to effectively evaluate security infrastructure currently in place, prioritize investments and maximize security gained by leveraging available resources.
- The Guidelines identify and classify best practices for securing K-12 facilities in response to urgent needs for information identified by the education community
- For More info - <https://passk12.org/>



Partner Alliance for Safer Schools

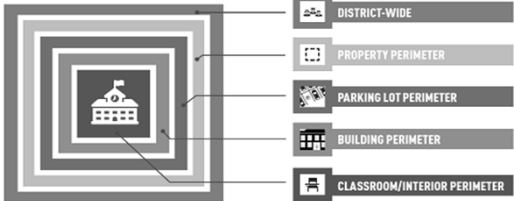
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Layers of Protection

LAYERS OF PROTECTION



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Safety & Security Components

SAFETY AND SECURITY COMPONENTS

- Policies and Procedures
- People (Roles and Training)
- Architectural
- Communication
- Access Control
- Video Surveillance
- Detection and Alarms

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District Layer Access Control

	Tier 1	Tier 2	Tier 3	Tier 4
DISTRICT-WIDE LAYER (cont.)				
ACCESS CONTROL				
• Command Staff/Responder Access to Keys or Credentials for Emergency Entry		✓	✓	✓
• Access Control System Equipped With Remote Door Release Capability				✓
• All Command Staff Possess Keys and/or Access Credentials				✓
• All Responders Possess Keys and/or Access Credentials				✓
• Electronic Access Control for ID & MRP Rooms w/Key Swiche				✓
SECURITY BUILDINGS				
• Implement Security Plan Specific to Auxiliary Buildings		✓	✓	✓
TRANSPORTATION				
• Interoperable Radio System for All Buses and School Vehicles		✓	✓	✓
• GPS Tracking System for All Student Transportation Vehicles			✓	✓
• Bus Video Surveillance System			✓	✓
• Cash Board Check-In			✓	✓
• Biometric Board Check-In				✓

Note – the school determines its own tier based on a threat assessment

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District Layer Video

	Tier 1	Tier 2	Tier 3	Tier 4
DISTRICT-WIDE LAYER (cont.)				
VIDEO SURVEILLANCE				
• Use and Data Retention Policy		✓	✓	✓
• MOUs with Law Enforcement for Sharing Video Data		✓	✓	✓
• Incorporation of Video Surveillance into Emergency Response Plans		✓	✓	✓
• Camera Standardization			✓	✓
• Recording System Standardization			✓	✓
• Video Verification of Alarms to Monitoring Service or Security Operations Center (SOC)				✓

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Practical Applications for Common Occupancies

District Layer - Alarm

	TIER 1	TIER 2	TIER 3	TIER 4
DISTRICT-WIDE LAYER (cont.)				
DETECTION AND ALARMS				
» Intrusion Detection System for All Buildings Centrally Monitored	✓	✓	✓	✓
» Duress Alarms Centrally Monitored	✓	✓	✓	✓
» Duress Alarms Sent to Law Enforcement		✓	✓	✓
» Duress Alarms Monitored by a District-Wide SOC			✓	✓
» Intrusion and Duress Alarms Monitored by a District-Wide SOC				✓

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Property Perimeter Layer

	TIER 1	TIER 2	TIER 3	TIER 4
PROPERTY PERIMETER LAYER				
ACCESS CONTROL				
» Manual Access Gates		✓	✓	✓
» Electronic Access Gates			✓	✓
VIDEO SURVEILLANCE				
» Fixed Camera, Wide Area Coverage		✓	✓	✓
» Wide Dynamic Range Cameras		✓	✓	✓
» Infrared (IR) Cameras or Lighting			✓	✓
» Wireless Video Data Transmission			✓	✓
» PTZ Camera Coverage			✓	✓
» Littering Detection Analytics			✓	✓
» Perimeter Video Analytics				✓
» People Identification at Gates or Points of Entry				✓

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Building Perimeter Layer- Access

	TIER 1	TIER 2	TIER 3	TIER 4
BUILDING PERIMETER LAYER				
ACCESS CONTROL				
» All Exterior Doors Secured With Lock or Exit Device	✓	✓	✓	✓
» Patented/Restricted Key System	✓	✓	✓	✓
» Key Management System	✓	✓	✓	✓
» Cylinder Dogging With Indicator	✓	✓	✓	✓
» Door Status Monitoring		✓	✓	✓
» Electronic Access Control of Primary Entrances	✓	✓	✓	✓

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Building Perimeter Layer- Video

	TIER 1	TIER 2	TIER 3	TIER 4
BUILDING PERIMETER LAYER				
VIDEO SURVEILLANCE				
» Video Intercom at Visitor Entrance Points		✓	✓	✓
» Interior, Fixed Camera Coverage for All Entrance Points		✓	✓	✓
» Wide Dynamic Range Cameras (When Conditions Require)		✓	✓	✓
» Exterior, Fixed Camera Coverage at All Entry Points			✓	✓
» Littering Detection Analytics at Entry Points				✓

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Building Perimeter Layer- Alarm

	TIER 1	TIER 2	TIER 3	TIER 4
BUILDING PERIMETER LAYER				
DETECTION AND ALARMS				
» Intrusion Detection System on all Exterior Access Points	✓	✓	✓	✓
» Intrusion Detection System Monitored 24/7	✓	✓	✓	✓
» Partitioned Intrusion Detection			✓	✓
» Automated Threat Detection				✓

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Classroom/Interior Perimeter Layer

	TIER 1	TIER 2	TIER 3	TIER 4
CLASSROOM/INTERIOR PERIMETER LAYER				
ACCESS CONTROL				
» Office, Classroom or Security Classroom Function Locks		✓	✓	✓
» Stand-Alone Electronic Locks With Fob			✓	✓
» Networked Electronic Locks				✓
VIDEO SURVEILLANCE				
» Fixed Camera Coverage of All Common Areas		✓	✓	✓
» Fixed Camera Coverage of Vestibule and/or Lobby Area		✓	✓	✓
» Fixed Camera Coverage of Stairwells, Hallways and Restroom Entrances			✓	✓
» Fixed Camera Coverage of Restricted Areas			✓	✓
» Audio-Analytic Integration				✓

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Practical Applications for Common Occupancies

Classroom/Interior Perimeter Layer

	TIER 1	TIER 2	TIER 3	TIER 4
CLASSROOM/INTERIOR PERIMETER LAYER				
• DETECTION AND ALARMS				
» Intrusion Detection System Covering All Hallways and Public Areas		✓	✓	✓
» Intrusion and Duress (Panic) System Unified		✓	✓	✓
» Intrusion Detection System Covering All Classrooms				✓
» Unified Communication and Detection System Monitored 24/7				✓
» Unified Communication and Detection System Monitored by District-Wide SOC				✓
» Alarms, Communications, Video Surveillance and Access Control Unified				✓
» Automated Threat Detection				✓

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Causes Of School False Alarms



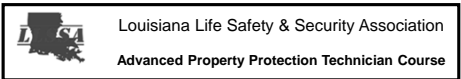
Lack of proper training for people given access to the school, such as teachers, coaches, workers, meeting attendees, etc...



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Best Practices for Worship Facilities

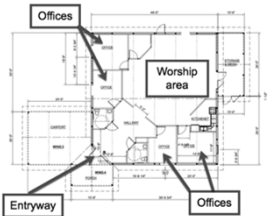


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Worship Facility



To deal with multiple users you may need separate control of areas

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Keep Clear of Motion Detectors

- Changing decorations may impact motion sensors



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Causes Of False Alarms...



Lack of proper training for people given access to your building, such as teachers, workers, meeting attendees, etc...



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Practical Applications for Common Occupancies



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Best Practices for Residences



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Secure the Doggie Door



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2nd Floor Windows

- Consider 2nd Floor Windows



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Exercises

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Home Exercise



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Home Exercise



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Practical Applications for Common Occupancies

Strip Mall Exercise

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Convenience Store Exercise

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Car Dealer Lot Exercise

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Urgent Care Exercise

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