



Award in Installation of Access Control and Door Entry Systems

CQ11180



Learning Objectives:

At the end of this lesson, students will be able to understand the different types of access control systems and door entry systems, evaluate the benefits and drawbacks of each system, and identify the necessary components and installation requirements for a successful access control system.



Electronic Access Control Systems (EACS)

- Introduction to Door Entry Systems
- Introduction to Access Control Systems
- A guide to getting started with access control
- Network Access Control (NAC)



What is an access control system?

An access control system allows you to manage, monitor and maintain who has access to for example your doors.

Introduction to Door Entry Systems

What is a door entry system?

A door entry system serves as a doorbell and intercom to give you control over who enters the site, and at the same time, it acts as a security *system* for controlling staff *access* throughout the building.

Introduction to Door Entry Systems

What is a door entry system?

Using an access control system allows you to manage access or entry to almost anything: file access, workstation access, printer access and in our case, door, facility, building or office access.

Introduction to Door Entry Systems

What is the difference between access control and door entry system?

Access control is a system that allows authorised persons to gain entry to a secured area. It involves the authorisation of users, the tracking of access attempts, and the restriction of access to certain areas.

Introduction to Door Entry Systems

What is the difference between access control and door entry system?

An access control system typically implements automatic data validation. Upon submission of credentials, the system assesses the validity of the data provided, and depending on the outcome, will either grant or deny access.

Introduction to Door Entry Systems

What is the difference between access control and door entry system?

When a visitor arrives at the entrance of the premises, they will need to press the call button on the door entry panel. This will alert someone on the other end, who will then decide to grant or deny access.

Introduction to Door Entry Systems

What types of door entry systems are available on the market?

There are many different kinds of door entry systems on the market.

There are two types of door entry systems:

- Traditional door entry
- ¹₀ Smart door entry systems

Introduction to Door Entry Systems

What types of door entry systems are available on the market?

The traditional system includes a door entry panel, power supplies, locks, and handsets with a concentric door entry system.

For example: Bell, BPT, and Videx.

1

1

Introduction to Door Entry Systems

What types of door entry systems are available on the market?

Smart door entry systems, Video door entry system and Audio door entry systems.

They employ IP or wireless technology.

For example: Ring, Salto, Nortek, Amalock and Fermax

1

2

Introduction to Door Entry Systems

Fundamental of a circuitry

An installer of door entries should possess knowledge of the fundamental circuitry of a door entry system.

Introduction to Door Entry Systems

Normally open

A normally open (NO) and normally closed (NC) loop system is an electrical circuit that allows for control and monitoring of various functions within a system. A NO loop system is one in which the circuit is open when the system is idle, and closes when a signal is sent.

Introduction to Door Entry Systems

Normally open

In a typical normally open circuit, there is an electrical source, a switch, and a light bulb. The electrical source provides power to the circuit and the switch is used to control the flow of electricity.

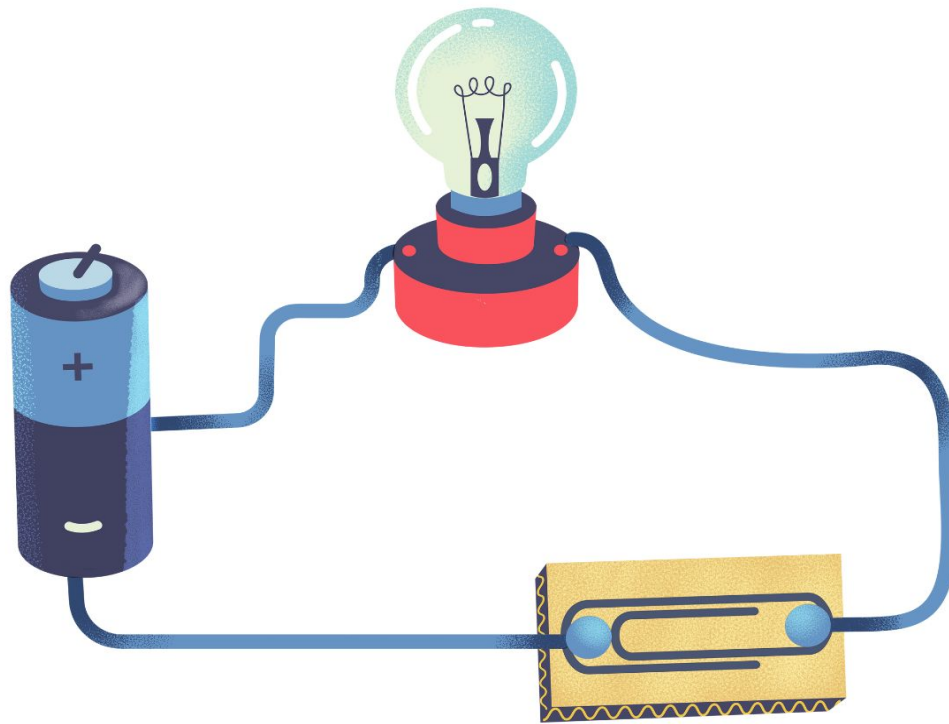
Introduction to Door Entry Systems

Normally open

When the switch is open, the light bulb is off.

When the switch is closed, the electricity flows from the electrical source to the light bulb and the bulb lights up.

Introduction to Door Entry Systems



Introduction to Door Entry Systems

Normally close

a NC loop system is one in which the circuit is normally closed when the system is idle, and opens when a signal is sent. In terms of automation and safety systems, these loops are often used as a failsafe measure.

Introduction to Door Entry Systems

Normally open

A NO loop system could be used to shut down a piece of machinery if it detects a hazardous condition, such as a high temperature. The NO loop would be constantly monitoring the temperature, and when it exceeds a certain threshold, the loop would open and the machinery would shut down.

Introduction to Door Entry Systems

Normally open



Introduction to Door Entry Systems

Normally open

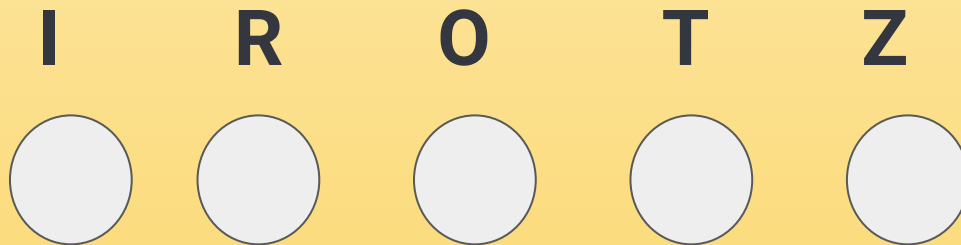
Ex: Wire a NC and NO circuit



Introduction to Door Entry Systems

Bell 3-way audio door entry system

Ex: Bell handset



Introduction to Door Entry Systems

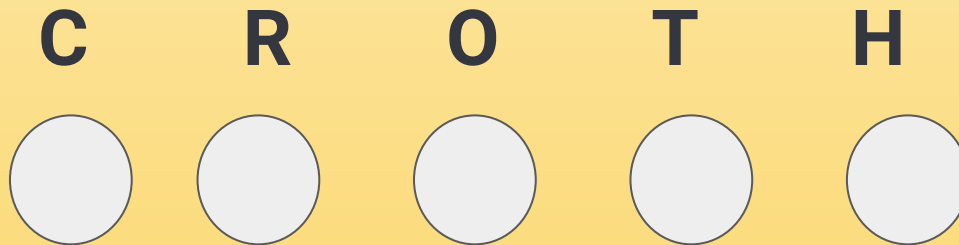


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Introduction to Door Entry Systems

Bell 3-way audio door entry system

Ex: Panel wiring



Introduction to Door Entry Systems

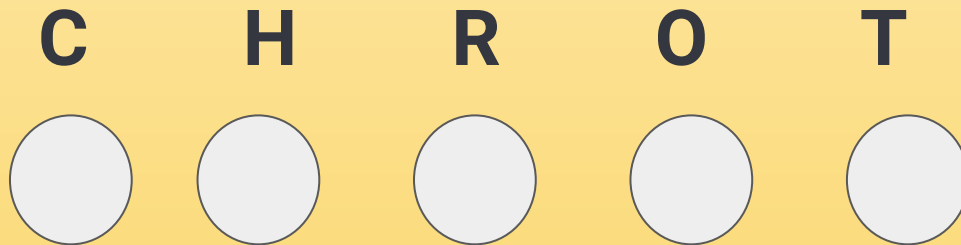


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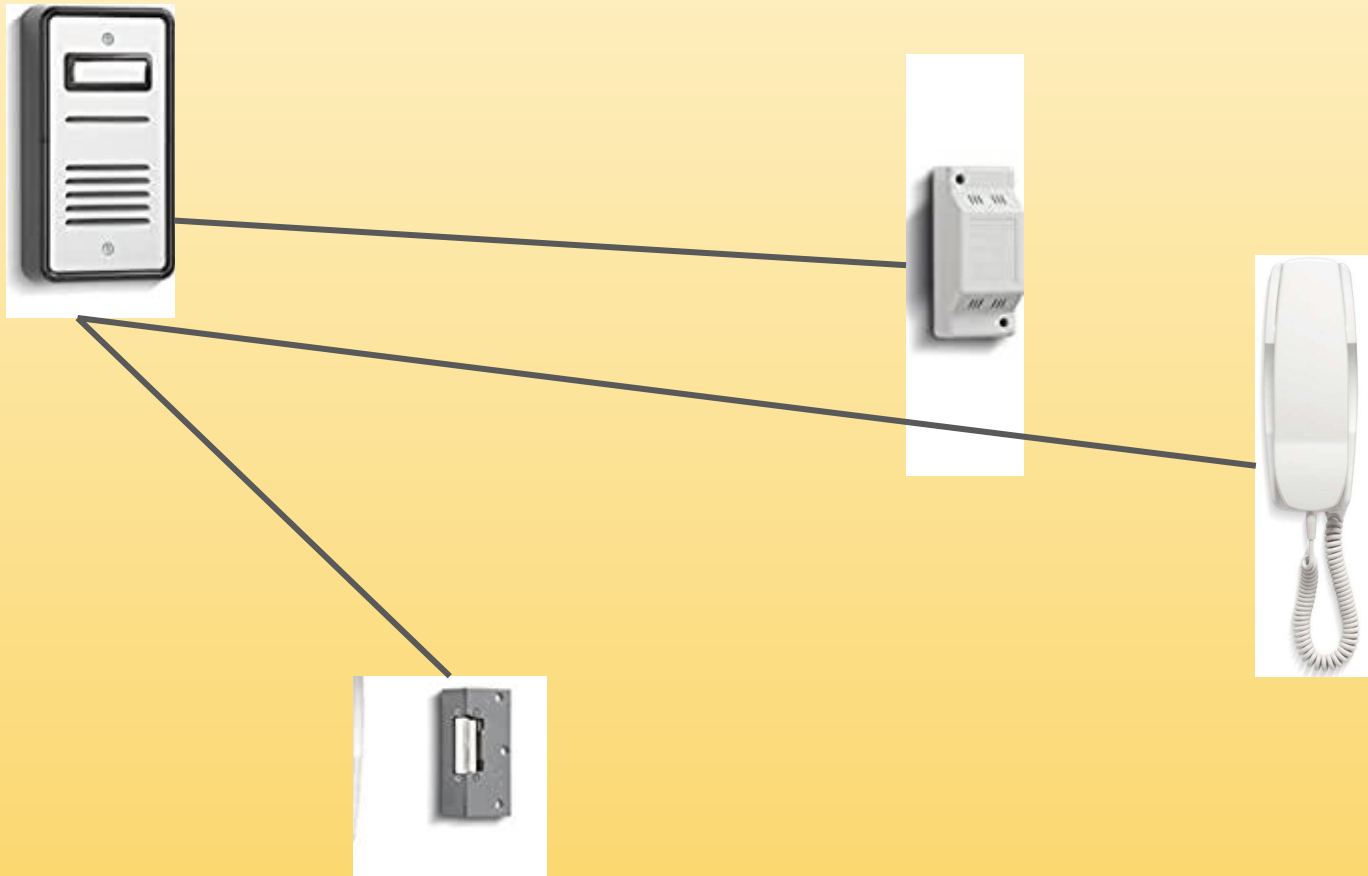
Introduction to Door Entry Systems

Bell 3-way audio door entry system

Ex: Panel wiring



Introduction to Door Entry Systems

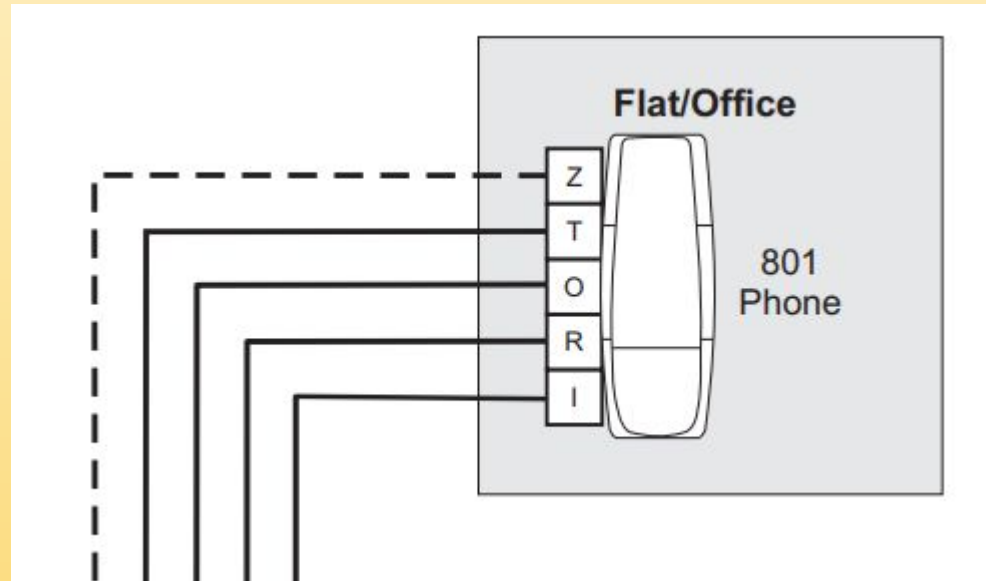


Introduction to Door Entry Systems

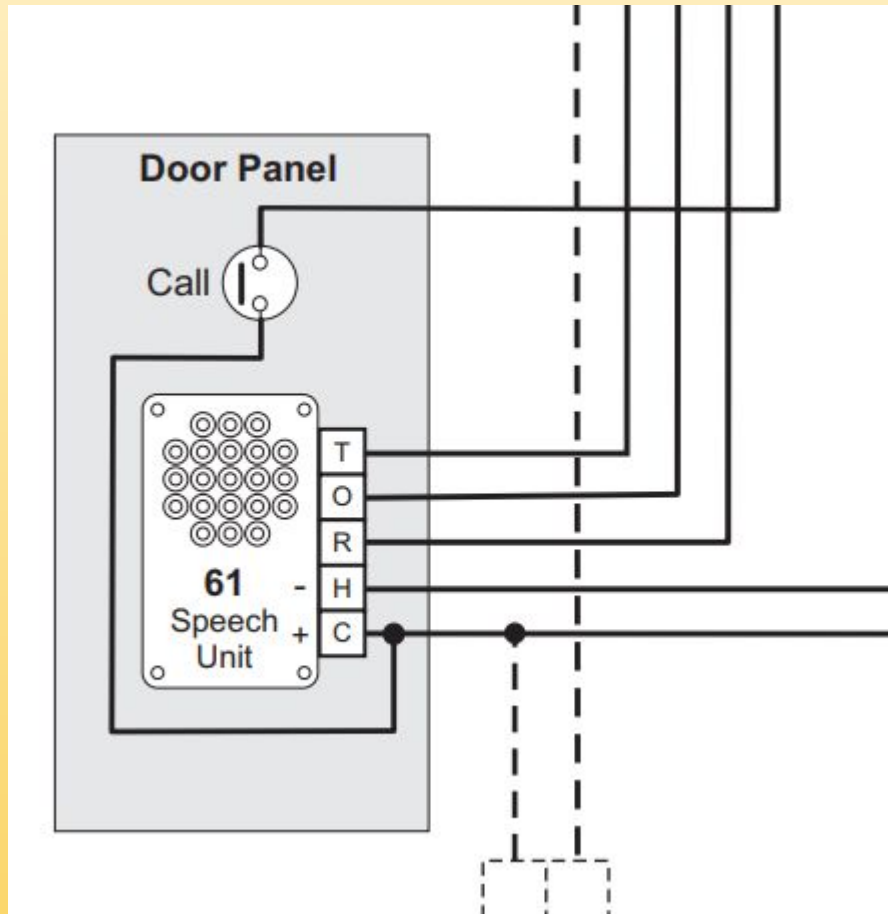
Terminal	Meaning
I	Call / call button (12V to ring)
R	Microphone
O	Common for ring, speech and lock button (0V)
T	Speaker
Z	Lock button (Z shorts to O when the lock button is pressed)
V	12V DC Phone supply

Bell audio 1-way system wiring

Handset wiring

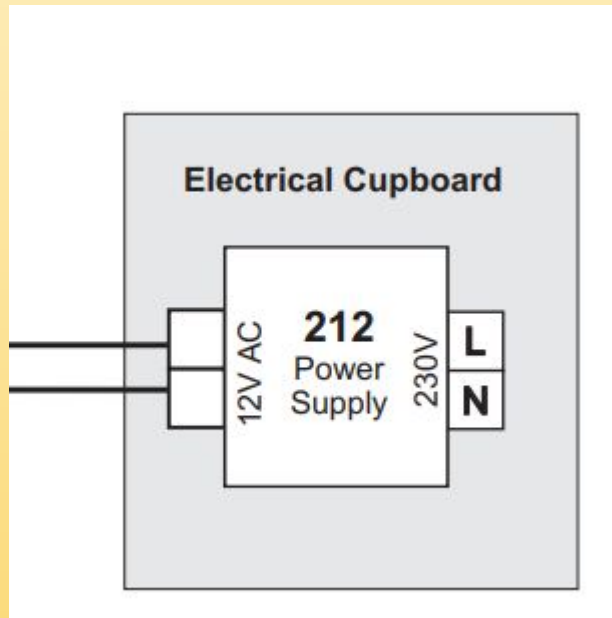


Bell audio 1-way system wiring



Bell audio 1-way system wiring

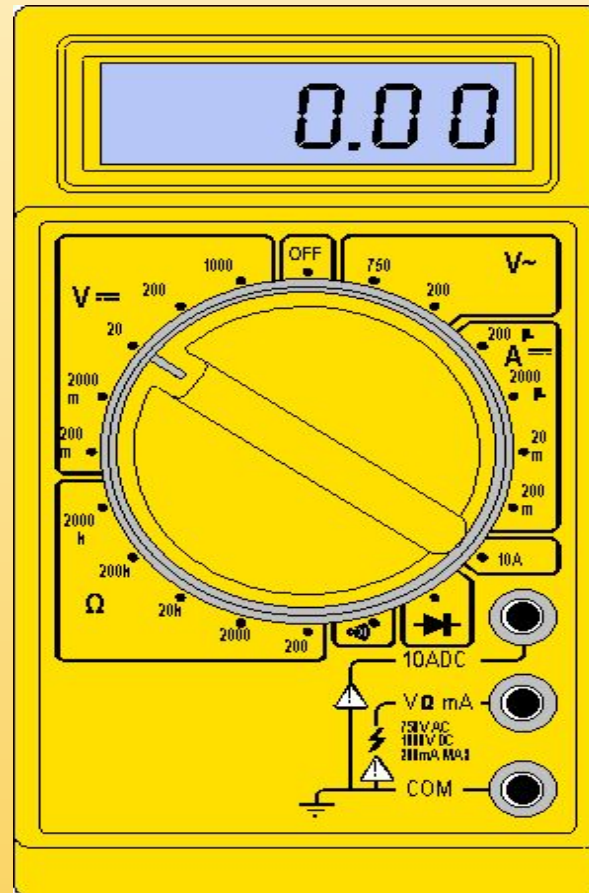
Power supply



Introduction to Door Entry Systems



MULTI-METER



What is a multimeter?

- A **multimeter** is a device used to measure voltage, resistance and current in electronics & electrical equipment
- It is also used to test continuity between to 2 points to verify if there is any breaks in circuit or line
- There are two types of multimeter Analog & Digital
 - Analog has a needle style gauge
 - Digital has a LCD display (Referenced during this PPT)

Meter leads

- **Red** meter lead

Is connected to Voltage/Resistance or amperage port

Is considered the positive connection

- **Probes**

Are the handles used to hold tip on the tested connection

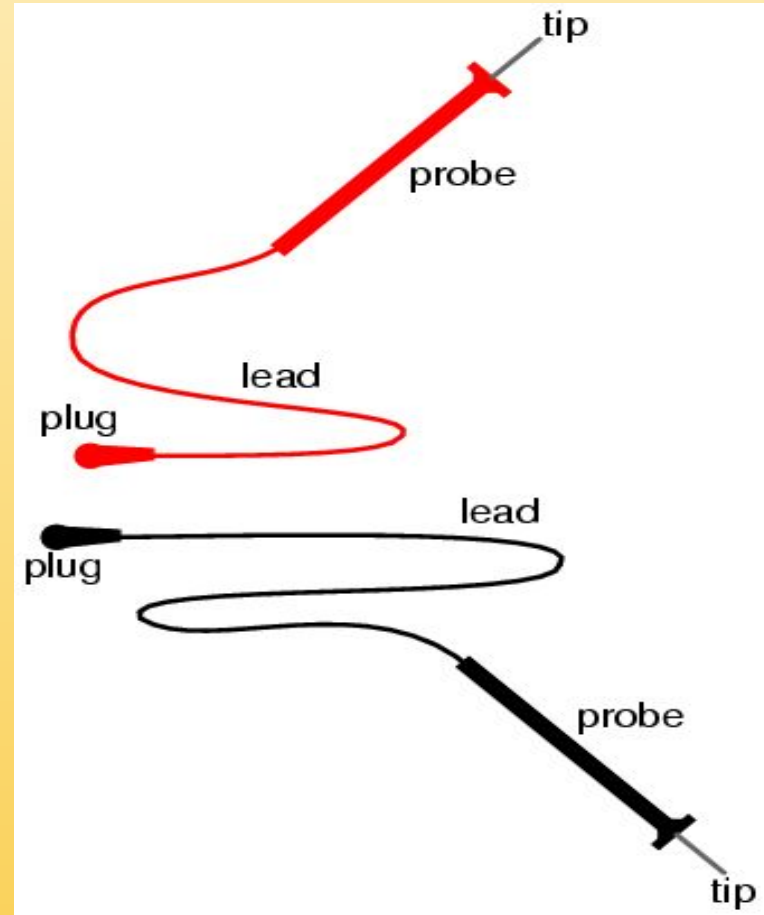
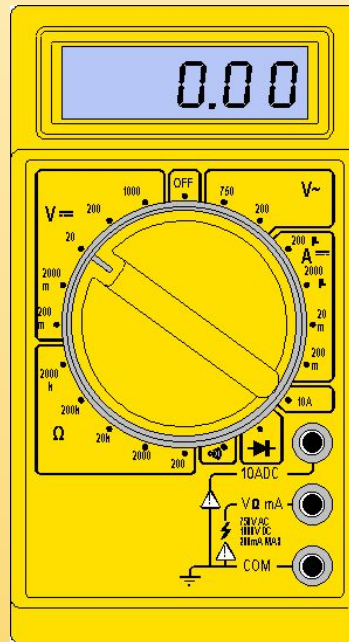
- **Tips**

Are at the end of the probe and provides a connection point

- **Black** meter lead

Is always connected to the common port

Is considered the negative connection



Display & Dial Settings

- **Digital Display**

Shows measured value.

- **Meter Dial**

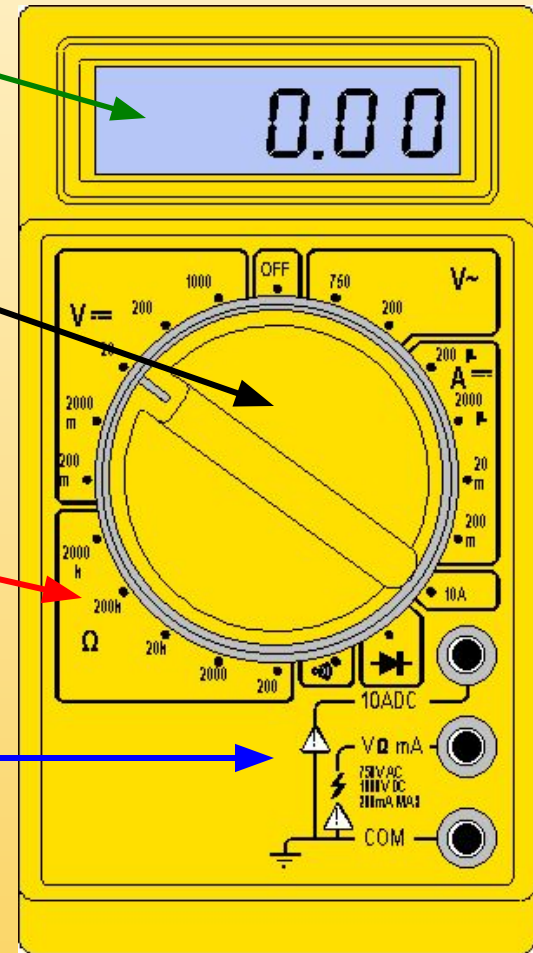
Turn dial to change functions.
Turn dial to OFF position after use.

- **Panel Indicator**


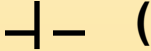

Shows each function and setting range to turn dial to.

- **Probe Connections**

Specific for each function.



Common DMM Symbols

~	AC Voltage		Ground
— ---	DC Voltage		Capacitor
Hz	Hertz	μF	MicroFarad
+	Positive	μ	Micro
—	Negative	m	Milli
Ω	Ohms	M	Mega
	Diode	K	Kilo
•)))	Audible Continuity	OL	Overload

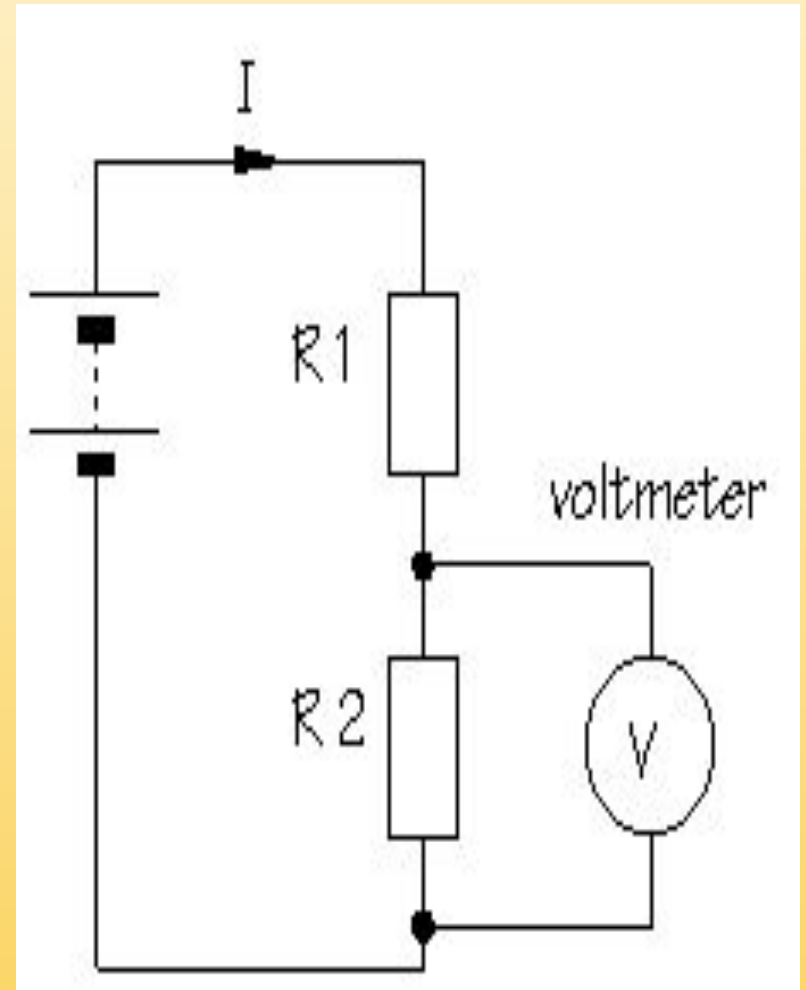
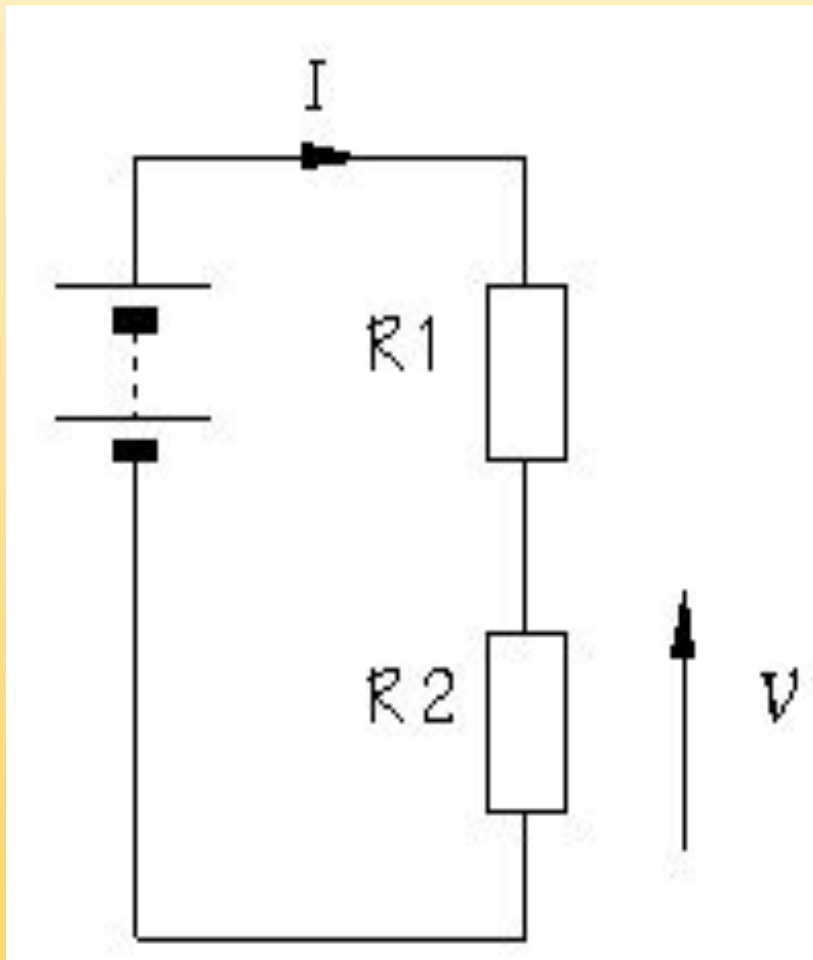
These symbols are often found on multimeter and schematics.

They are designed to symbolize components and reference values.

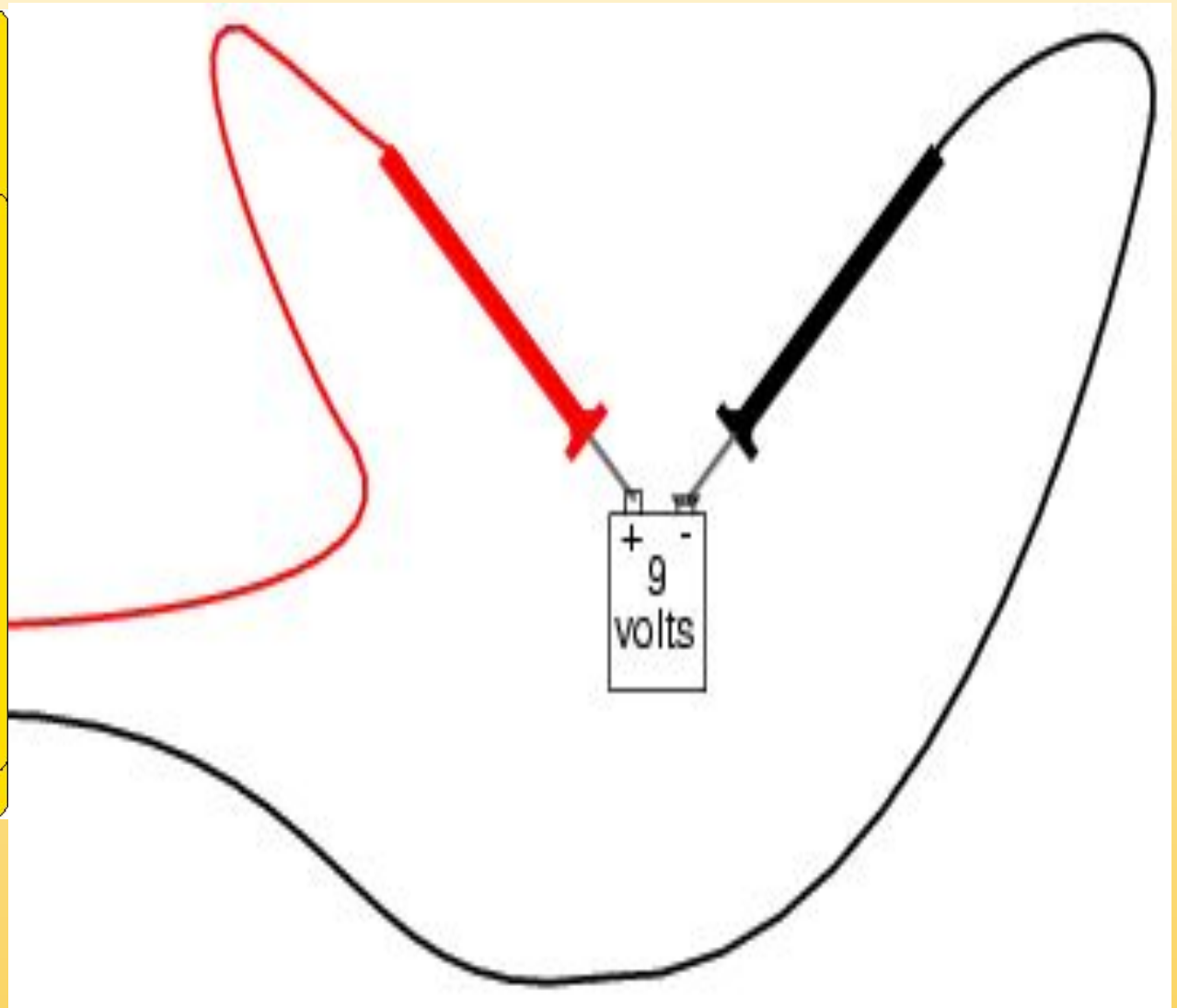
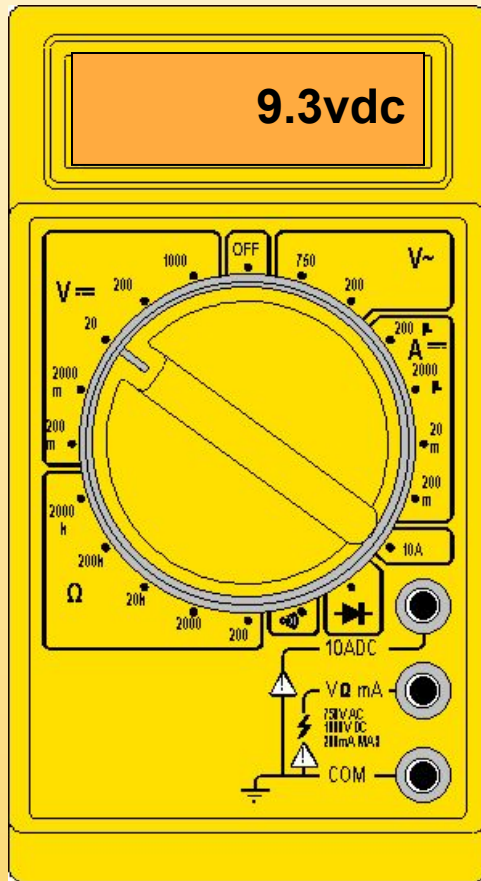
Measuring Voltage

- Voltage (V) is the unit of electrical pressure; one volt is the potential difference needed to cause one amp of current to pass through one ohm of resistance
- Voltage is broke up into 2 sections AC & DC
 - Alternating Current (AC)** is house voltage (**110vac**)
 - Direct Current (DC)** is battery voltage (12vdc)
- On switched meters use one value higher than your expected value
- Be very careful to not touch any other electronic components within the equipment and do not touch the tips to each other while connected to anything else
- To measure voltage connect the leads in parallel between the two points where the measurement is to be made. The multimeter provides a parallel pathway so it needs to be of a high resistance to allow as little current flow through it as possible

Measuring Voltage



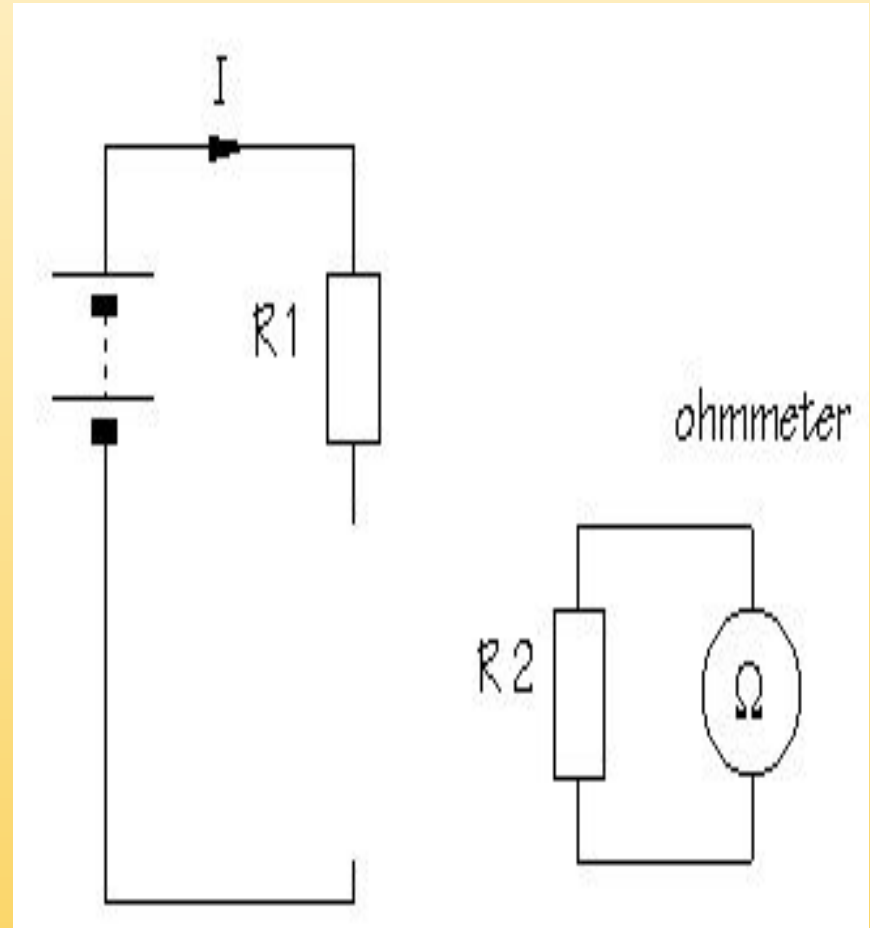
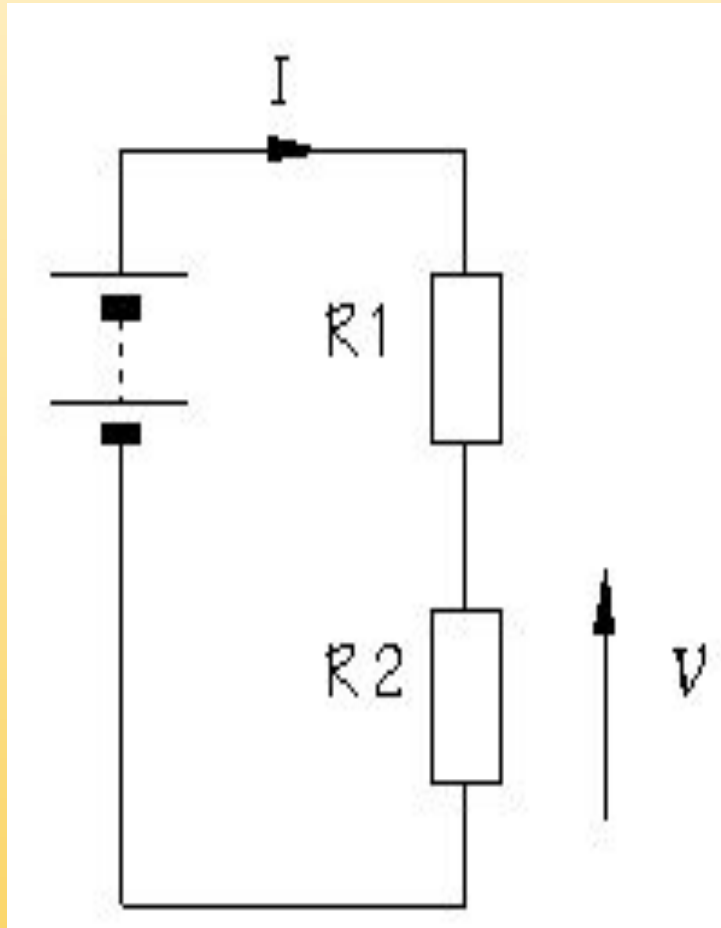
Measuring Voltage



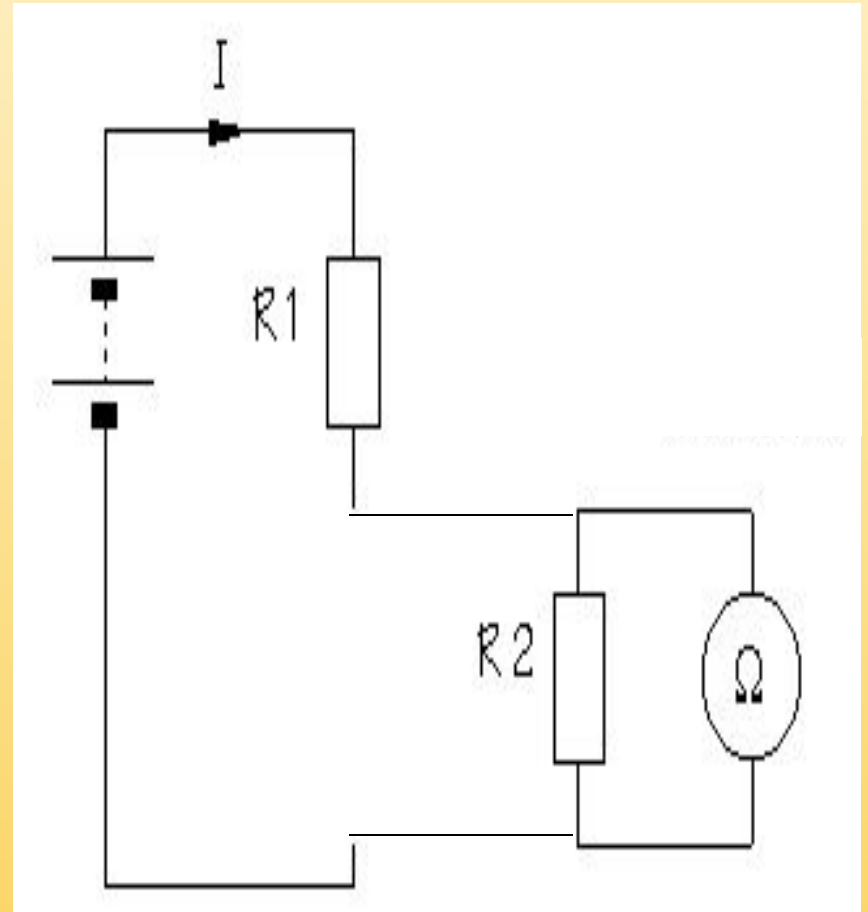
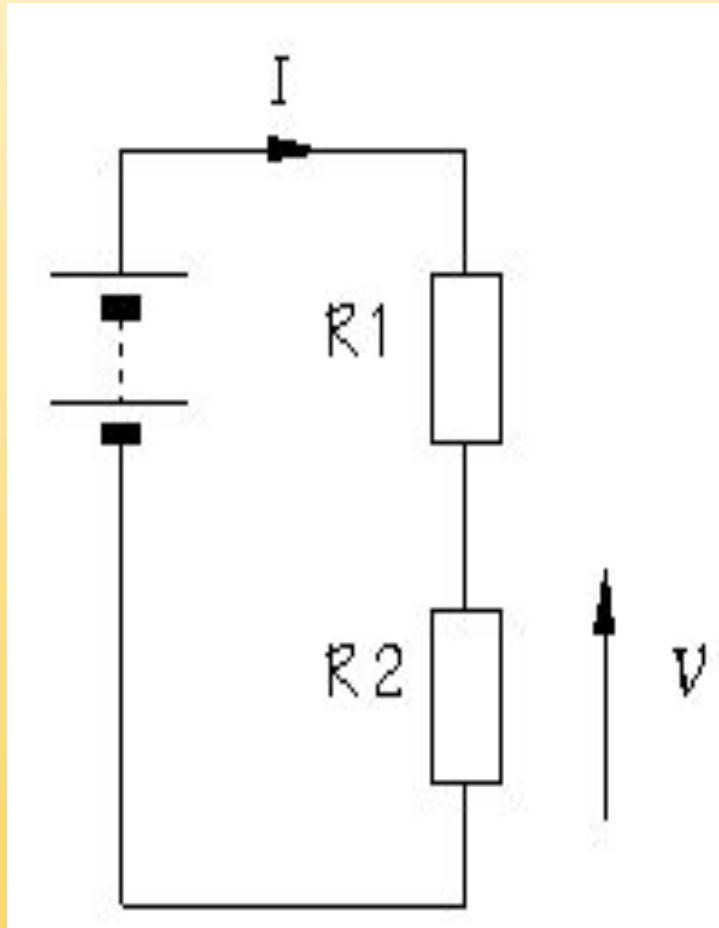
Measuring Resistance and Continuity

- **Resistance (Ω) is the opposition to current**
- **Resistance is measured in Ohm's**
- **Disconnect power source before testing**
- **Remove component or part from system before testing**
- **Measure using lowest value, if OL move to next level**
- **Testing for continuity is used to test to verify if a circuit, wire or fuse is complete with no open**
- **Audible continuity allows an alarm if circuit is complete**
- **If there is no audible alarm resistance of 1ohm to .1ohm should be present**

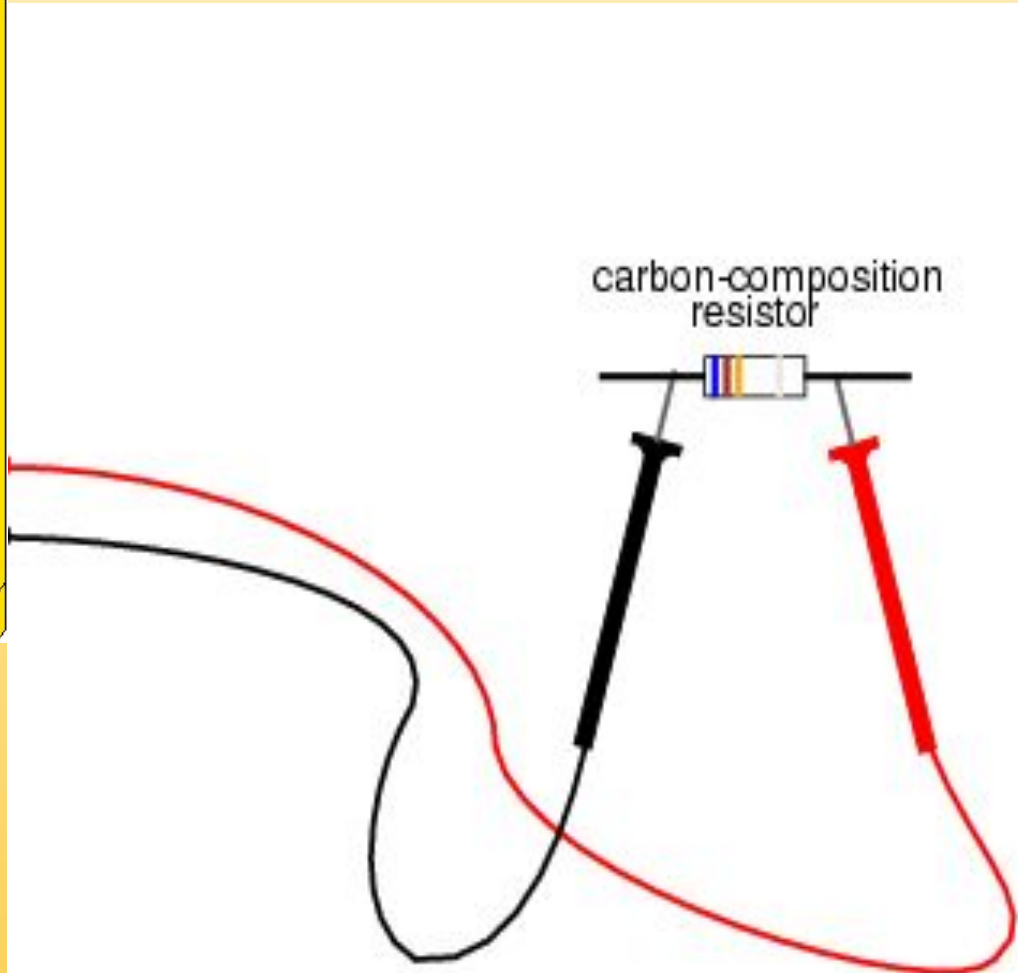
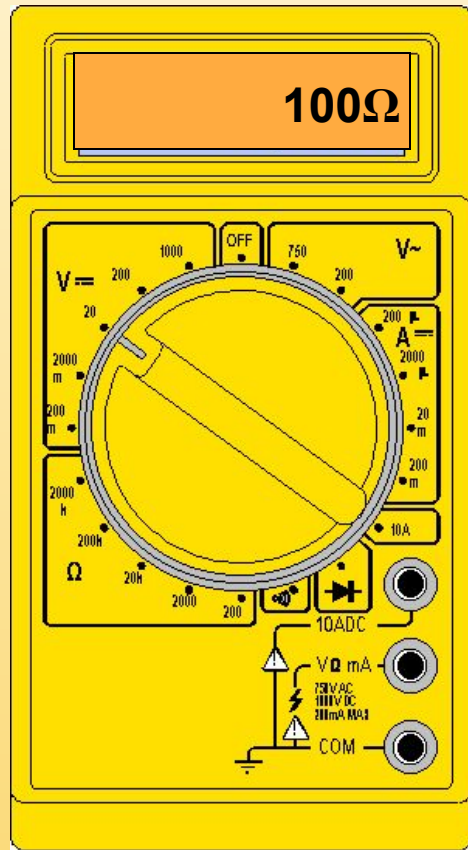
Measuring Resistance



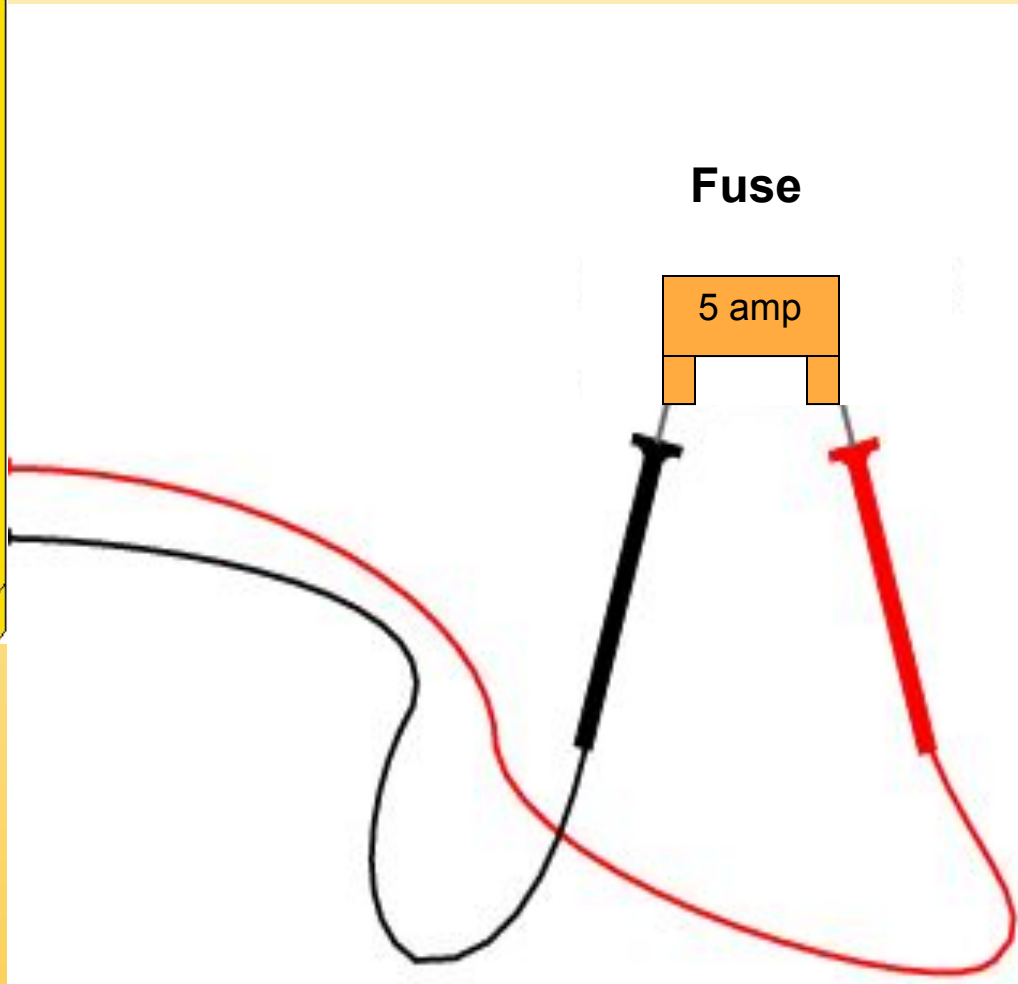
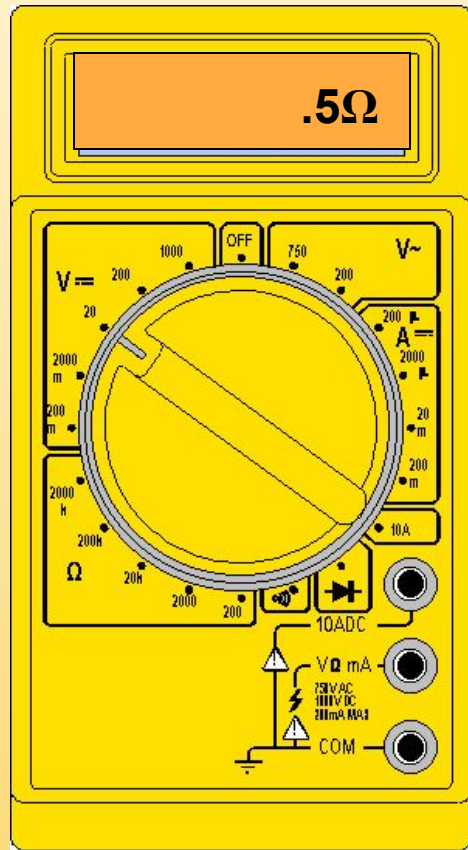
Measuring or Testing Continuity



Measuring Resistance



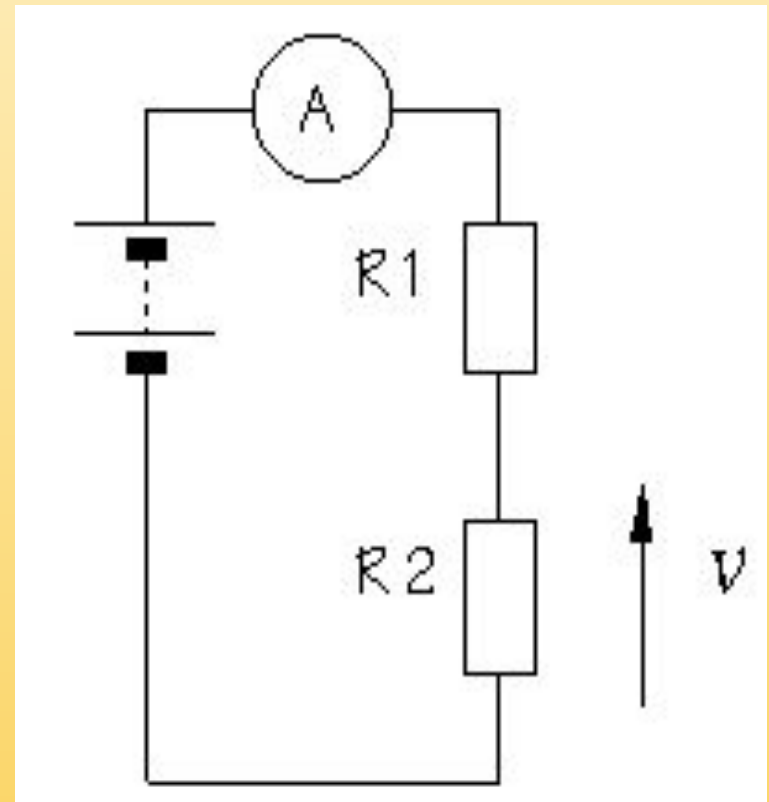
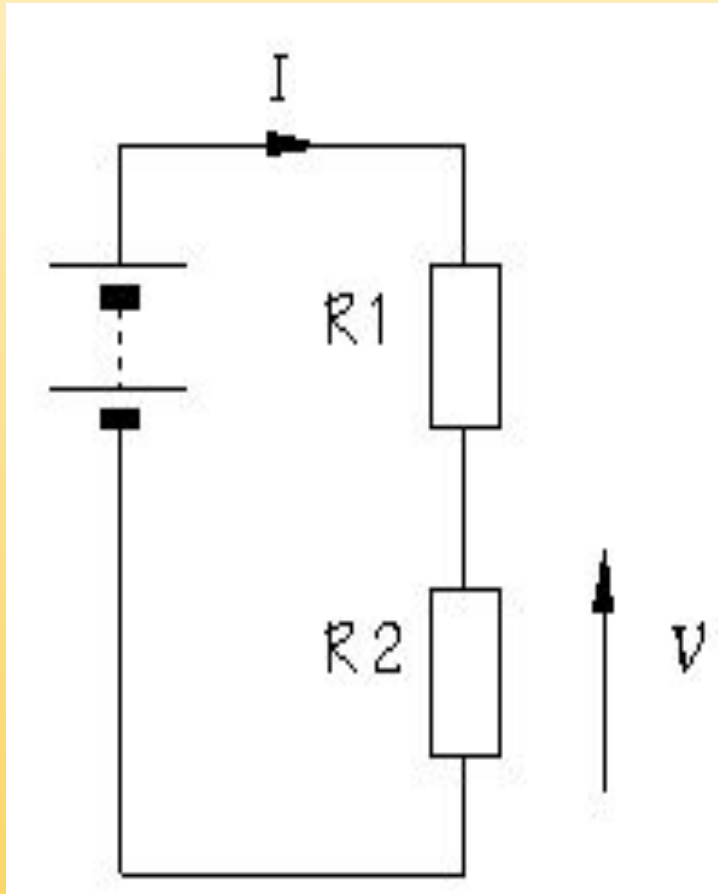
Measuring Continuity



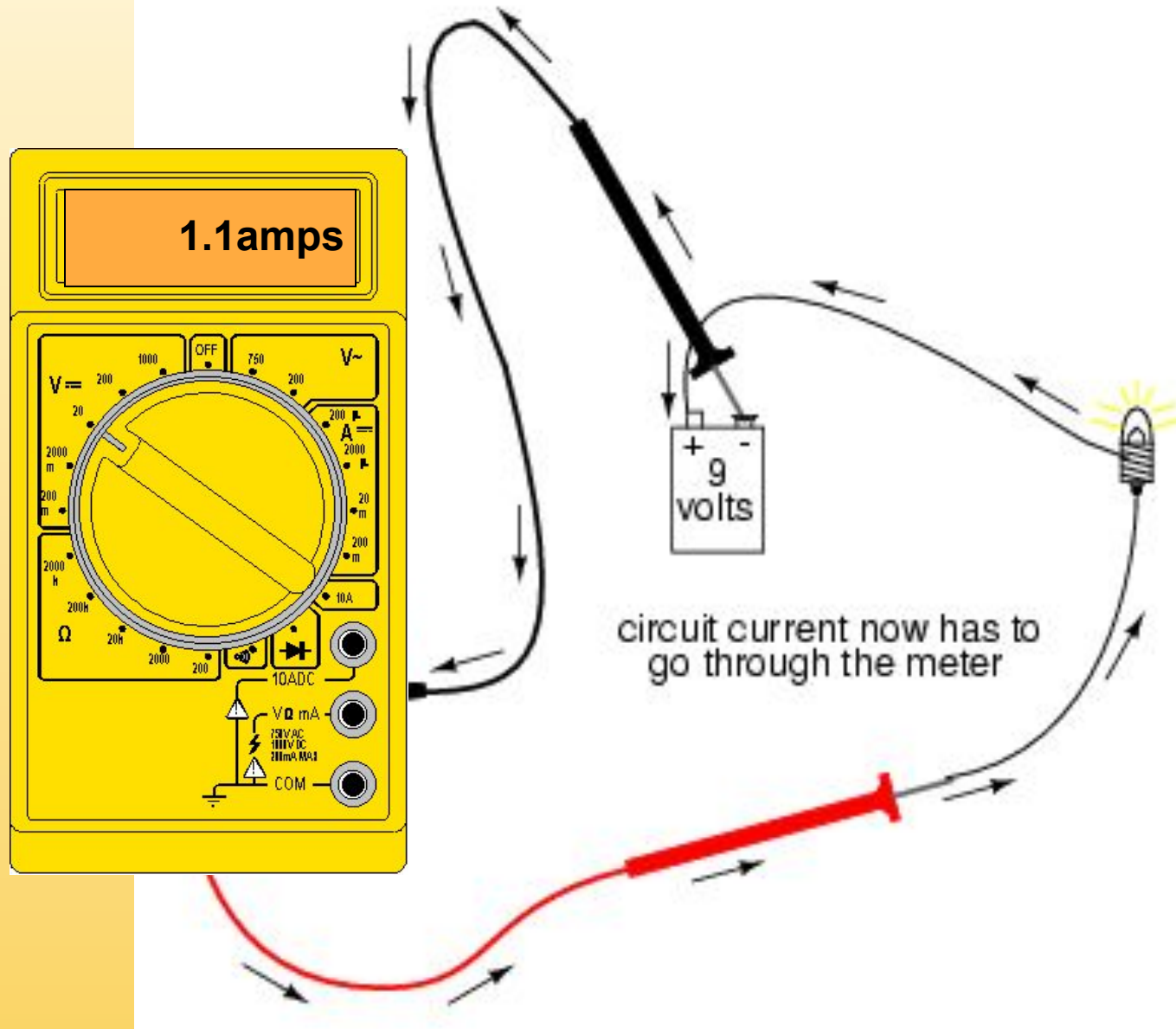
Measuring Current

- **Current (amps) is the flow of electrical charge through a component or conductor**
- **Current is measured in amps or amperes**
- **Disconnect power source before testing**
- **Disconnect completed circuit at end of circuit**
- **Place multimeter in series with circuit**
- **Reconnect power source and turn ON**
- **Select highest current setting and work your way down.**

Measuring Current



Measuring Current



Review

- A meter capable of checking for voltage, current, and resistance is called a *multimeter*,
- When measuring Voltage the multimeter must be connected to two points in a circuit in order to obtain a good reading. Be careful not to touch the bare probe tips together while measuring voltage, as this will create a short-circuit!
- Never read Resistance or test for Continuity with a multimeter on a circuit that is energized.
- When measuring Current the multimeter must be connected in a circuit so the electrons have to flow *through* the meter
- Multimeters have practically no resistance between their leads. This is intended to allow electrons to flow through the meter with the least possible difficulty. If this were not the case, the meter would add extra resistance in the circuit, thereby affecting the current

Introduction to Door Entry Systems

Common Faults:

Lock release does not operate

1. Connections to the Lock release are open/short-circuited (note power supply fuse may have blown).

Introduction to Door Entry Systems

Common Faults:

Lock release does not operate

2. Poor connection or damaged wire in the lock release circuit. Check cable to lock release and cable to Z / O terminals on the phone.

Introduction to Door Entry Systems

Common Faults:

Lock release does not operate

3. Voltage drop issue; cable diameter is too small, try doubling up on the lock button cores Z & 0 going to the phone(s).

Introduction to Door Entry Systems

Common Faults:

Lock release does not operate

4. Dodgy lock release button on the phone.
Simulate a lock button press by shorting Z & O
to prove.

Introduction to Door Entry Systems

Common Faults:

Lock release does not operate

5. Lock release current is too high (if using a third party lock release). An additional relay and suitable power supply maybe required. Check the lock release current plus 0.5A for the system does not exceed the power supply rating.

Introduction to Door Entry Systems

Common Faults:

Lock release does not operate

6. Lock release jammed due to over tight fitting; check there is some 'play' between the lock and lock release. Do not fit the tongue on the door too deep.

Introduction to Door Entry Systems

Common Faults:

Lock release does not operate

7. Faulty lock release. Connect Z side of lock release to H on the speech unit to force 12V across it and test.

Introduction to Door Entry Systems

Common Faults:

Lock release buzzes, but doesn't unlock

1. Poor connection or damaged wire in the lock release circuit. Check cable to lock release and cable to Z / O terminals on the phone.

Introduction to Door Entry Systems

Common Faults:

Lock release buzzes, but doesn't unlock

2. Voltage drop issue; cable diameter is too small, try doubling up on the lock button cores
Z & O going to the phone(s).

Introduction to Door Entry Systems

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Lock release buzzes, but doesn't unlock

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Simulate a lock button press by shorting Z & 0 to prove.

Introduction to Door Entry Systems

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Introduction to Door Entry Systems

Common Faults:

Lock release buzzes, but doesn't unlock

5. Lock release jammed due to over tight fitting; check there is some 'play' between the lock and lock release. Do not fit the tongue on the door to deep

Introduction to Door Entry Systems

Common Faults:

Lock release operates all the time.

1. Short on the lock button cable core going to Z on the phones. Probably to power supply common (Terminal H or O).

Introduction to Door Entry Systems

Common Faults:

Lock release operates all the time.

2. Lock release button stuck in or faulty.
Disconnect Z terminal from the phone in question and see if the fault disappears.

Introduction to Door Entry Systems

Common Faults:

Phone doesn't ring

1. Broken wire between the call button for that flat and the phone (Terminal I). Try a spare core.
2. Broken wire between the phone (Terminal O) and the speech unit. Check if the lock button or speech work, if either does then the O connection is ok.

Introduction to Door Entry Systems

Common Faults:

Phone doesn't ring

3. No voltage getting through to I and O terminals on the phone. Check at least 10V across I and O when the call button is pressed or shorted.

Introduction to Door Entry Systems

Common Faults:

Phone doesn't ring

4. Dodgy call button. Short the 2 terminals to prove.

5. Missing connection between C on the speech unit and the call buttons (no phones ring).

6

6

Introduction to Door Entry Systems

Common Faults:

Phone ring's but not heard at the entrance

1. Missing 'R' or shorted connection between phone and speech unit. There will also be no speech heard at the entrance.

Introduction to Door Entry Systems

Common Faults:

Loud tone/howl at the entrance speaker and phone, whenever the handset is taken off hook.

Either or both volume controls are adjusted too high. Normally both A and B should be adjusted to between one third and one half of full rotation to achieve good speech volume without feedback.

Introduction to Door Entry Systems

Common Faults:

Loud tone/howl at the entrance speaker and phone, whenever the handset is taken off hook.

2. The ≥ 0 connection is not properly made. Misconnection of the 0-line between the speech unit and the telephone will dramatically reduce the feedback threshold. Check your wiring for this fault. If the phone rings or the lock button works this cause is unlikely (they also use the 0).

Introduction to Door Entry Systems

Common Faults:

Loud tone/howl at the entrance speaker and phone, whenever the handset is taken off hook.

3. There is an air gap between the speech unit and the grill. The speech unit must be placed firmly against the rear of the grill of the entrance panel; if necessary use packing materials to achieve this.

Introduction to Door Entry Systems

Common Faults:

Loud tone/howl at the entrance speaker and phone, whenever the handset is taken off hook.

4. The Entrance Panel and Telephone are located too closely together. If the caller can be heard directly (i.e. without the use of the entry phone system) then the units are too close!

Introduction to Door Entry Systems

Common Faults:

Loud tone/howl at the entrance speaker and phone, whenever the handset is taken off hook.

5. The environment is too noisy. If the entrance panel is placed in a noisy environment such as on a busy high street, it may be difficult to obtain satisfactory volume levels. Try sacrificing the volume in one direction to the benefit of the other.

Introduction to Door Entry Systems

Common Faults:

Loud tone/howl at the entrance speaker and phone, whenever the handset is taken off hook.

6. The entrance panel is placed in an >acoustic well=. If the entrance panel is surrounded by reflecting walls e.g. a basement flat then acoustic feedback may occur at lower volume levels. Try changing the position or orientation of the panel.

Introduction to Door Entry Systems

Common Faults:

Loud tone/howl at the entrance speaker and phone, whenever the handset is taken off hook.

7. Twisted-pair cable has not been used. The maximum volume achievable can be reduced with other types of cable, especially when the amount of cable or length of runs become significant.

Introduction to Door Entry Systems

Common Faults:

1 Way speech / No speech from phone to entrance

1. Missing or shorted 'R' connection

Introduction to Door Entry Systems

Common Faults:

1 Way speech / No speech from entrance to phone

1. Missing or shorted 'T' connection

Introduction to Door Entry Systems

Common Faults:

Low frequency hum heard (50Hz)

1. Cores R and O are not in the same pair. 2. Twisted-pair cable has not been used. 3. There is a mains cable running next to the door entry cable.

Standalone Access Control

Standalone and network access control systems are two types of access control systems. Standalone systems, which are ideal for homes and small businesses, consist of a single control unit connected to door controllers and readers.

Introduction to Door Entry Systems

If you are new to the world of physical door entry system, you might have some questions like:

- What is a door entry system?
- What are the components of a door entry system?
- What system should I choose?

Standalone Access Control

Paxton keypad



Standalone Access Control

How to program a TOUCHLOCK compact

When the system is powered up for the first time the keypad will beep 3 times a second. This indicates that the keypad is waiting to be initialised.

Standalone Access Control

How to program a TOUCHLOCK compact

Enter your chosen 6 digit programming code and press the bell button, confirm your programming code by entering the same 6 digit code and pressing the bell button.

Standalone Access Control

How to program a TOUCHLOCK compact

To program user code you must use the programming menu. To do this, enter the 6 digit programming code and press and hold number 8 till you hear a beep.

Standalone Access Control

How to program a TOUCHLOCK compact

Now enter the code and press the bell button, re-enter the same code, and press the bell button followed by number 4.

Standalone Access Control

How to program a TOUCHLOCK compact

First enter programming mode and then hold down '8' for 3 seconds. Enter the new user code followed by the bell button. Enter the new code again followed by the bell. A final key press defines the action type This will be a '4' to enter the code as a normal code; '6' for a toggle code and '8' for a duress code.

8

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Standalone Access Control

How can I change the door open time?

Enter programming mode and hold down "5" for 3 seconds. Enter the time required door open time, in seconds between 1 and 60. (e.g. for 5 seconds type in "0" then "5".) The default value is 7 seconds

Standalone Access Control

How can I make the keypad work with a fail open lock?

As the default the keypad powers the lock to release it. To set the default to provide power to keep the door locked, first enter programming mode, hold down "1" for 3 seconds. Press the "6" button. The lock wires will now operate for fail open locks.

8

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Standalone Access Control

How can I stop the keypad from beeping?

The keypad can be made to work in silence if, for example, it is located near to where someone is working. Enter the programming code and hold down "3" for 3 seconds. Press the "6" button and the keypad will no longer beep when keys are pressed.

Standalone Access Control

How can I use the exit button wires?

The exit button wires can be used as either a standard exit button, where the door opens for the door open time following a button press, or as a toggle device where the button will toggle the door open until it is pressed again or a toggle code is entered on the keypad.

Standalone Access Control

How can I use the exit button wires?

Enter the programming code and hold down "7" for 3 seconds. Press the "6" button to set the button to toggle the lock.

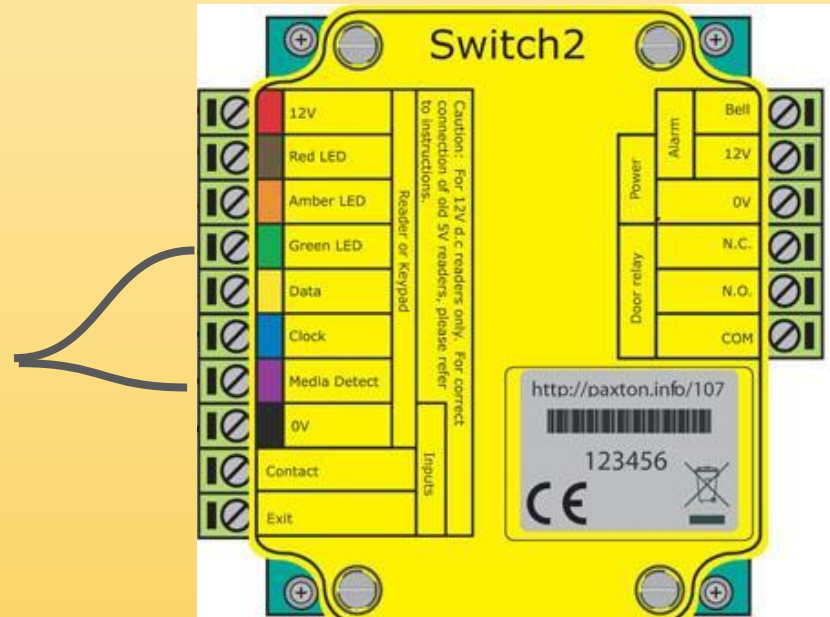
Standalone Access Control

How can I use the exit button wires?

Initialising the keypad

Loop Green and Media direct (Violent)

Power the system

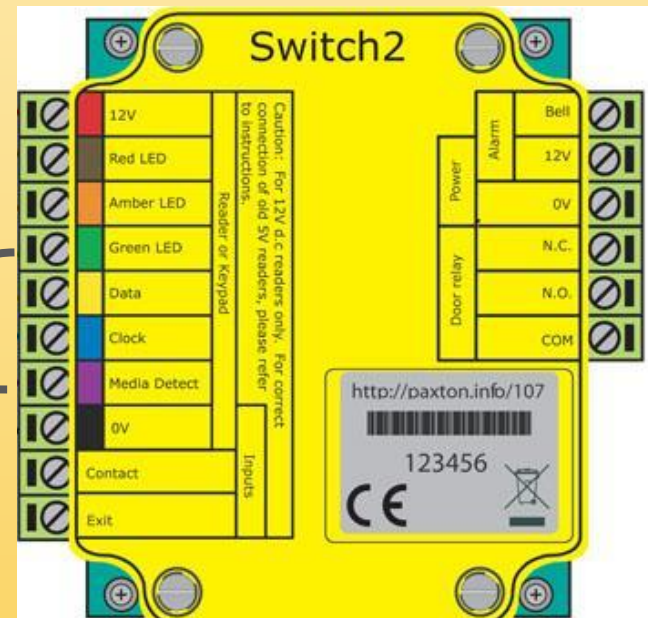


Standalone Access Control

How can I use the exit button wires?

Initialising the keypad

When the system is powered up for the first time the keypad will beep 3 times a second. This indicates that the keypad is waiting to be initialised.



Standalone Access Control

How can I use the exit button wires?

Initialising the keypad

Swipe the enrolment card, then the customer card with its accompanying mirror card.

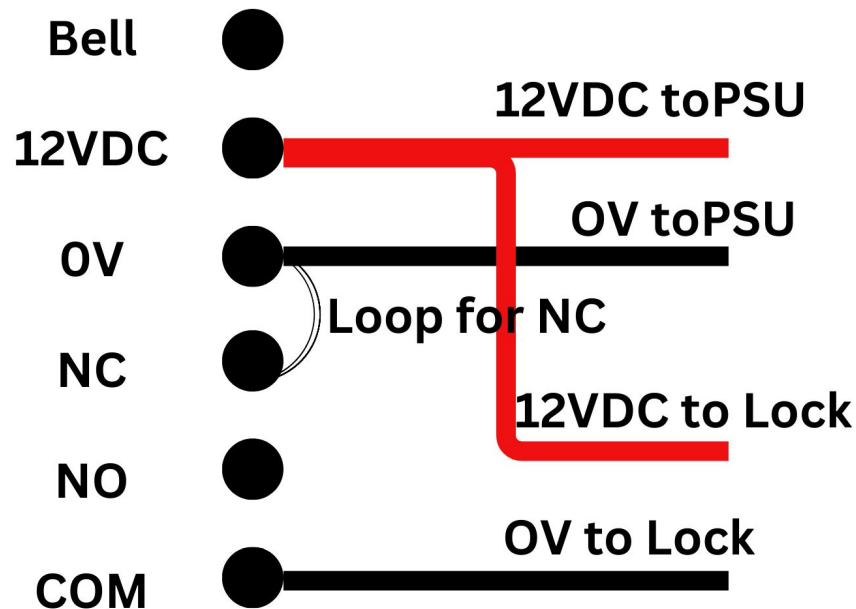


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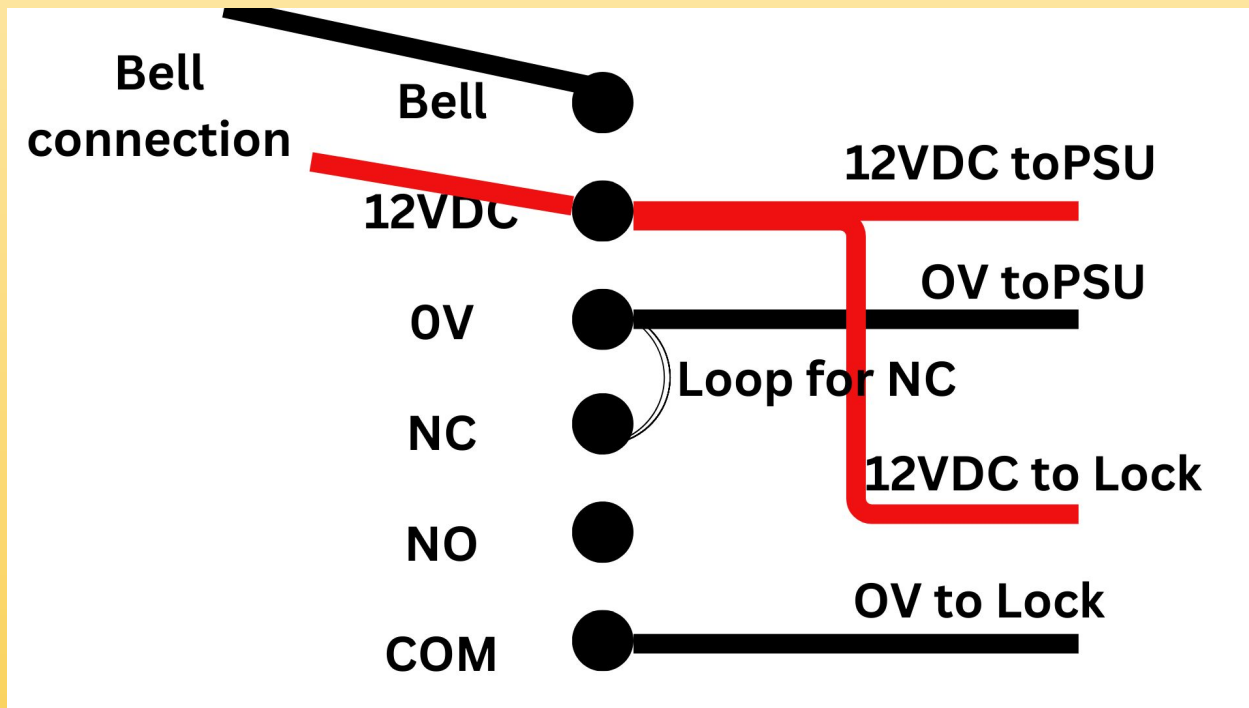
Standalone Access Control

How can I wire a NC lock (Fail-safe)?



Standalone Access Control

How can I wire a Bell?



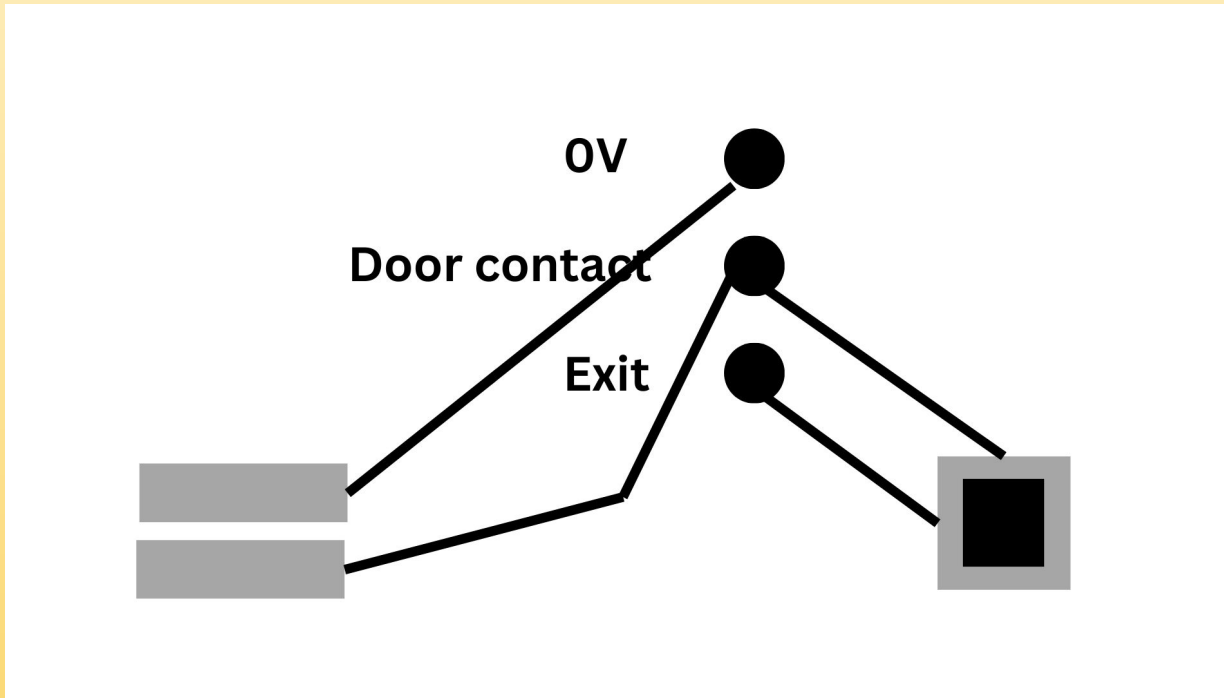
Standalone Access Control

How can I wire a Bell?

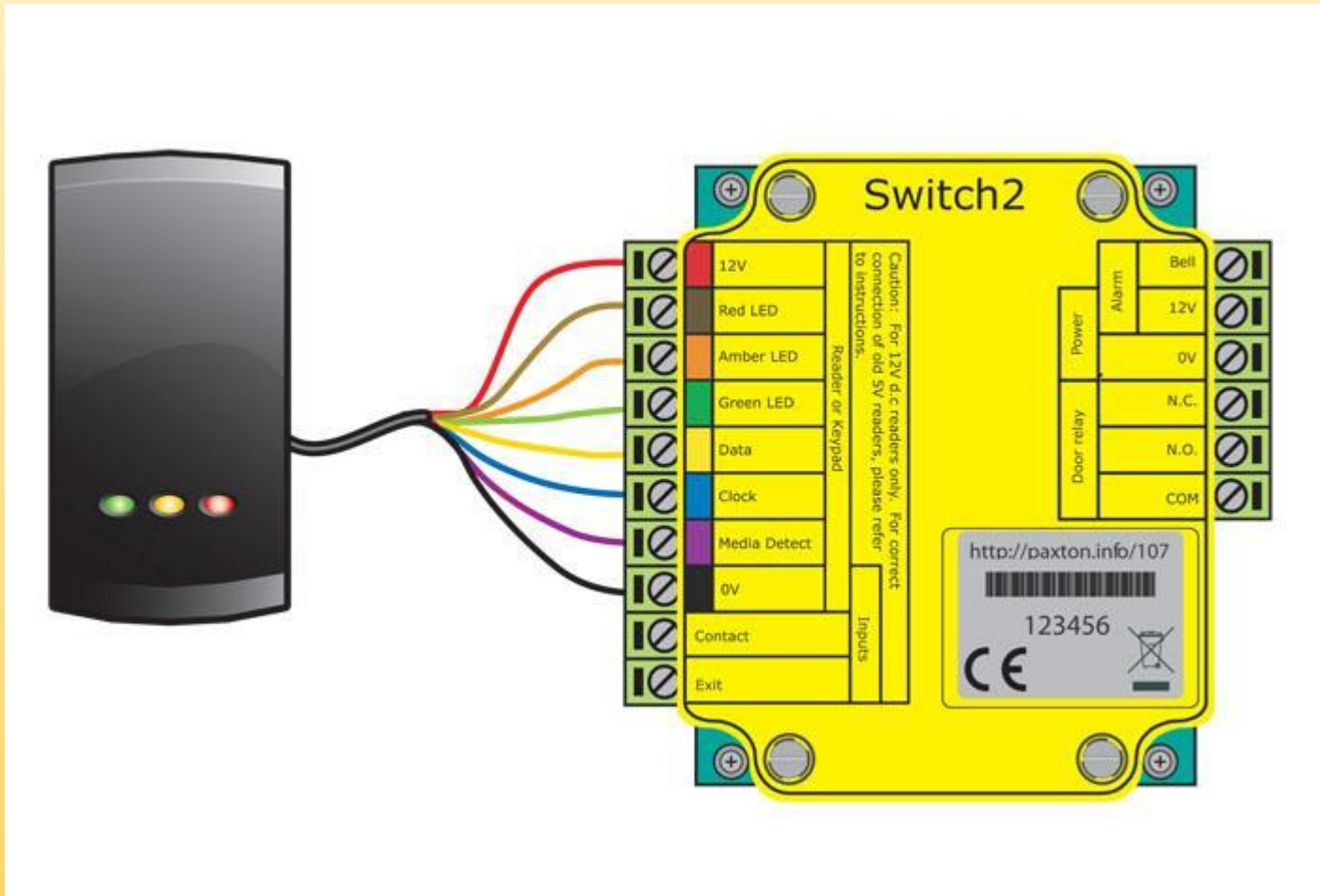
An alarm sounder may be connected to the "Bell" and "12V" terminals. Only sounders up to 1A at 12V DC should be used. In the event of an alarm the "Bell" terminal is connected to 0V, sounding the alarm. When door contacts are not connected, the alarm output can be used as a door bell. When using a Paxton keypad the alarm will sound when the door bell button on the keypad is pressed.

Standalone Access Control

How can I wire a door contact and exit button?



Standalone Access Control



Why do we need access control?

The purpose of access control is to provide quick, convenient access control for authorised persons, while at the same time, restricting access for unauthorised people. Here are more reasons why access control is playing a significant role in your organisation:

Why do we need access control?

Compliance

Some companies need to be compliant with health data regulations (HIPAA) or credit card data regulations (PCI) or even with cyber standards such as SOC2. being able to pull compliance reports for access control can be a big request.

Voltage drop

- Power supply voltage will drop over long cable distances due to wire resistance
- Operating access control devices with inadequate voltage makes them run hotter, wear out faster, operate erratically or not at all
- Rule of thumb for access control devices is that voltage drop cannot exceed 5% of the supply voltage

Voltage drop

Using the Voltage Drop Calculator:

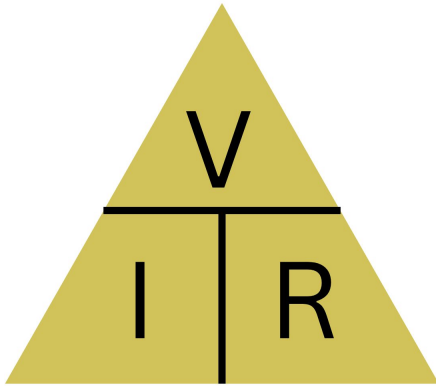
- To understand the voltage drop calculator, use the formula:

- $V_{\text{drop}} = I \times R$

- I = the calculated peak current draw R = wire resistance for the number of feet used

Voltage drop

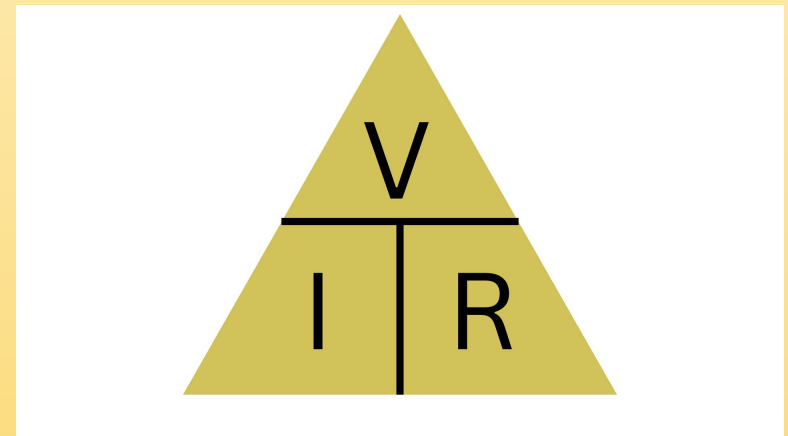
Using the Voltage Drop Calculator:
Ohm's law



Voltage drop

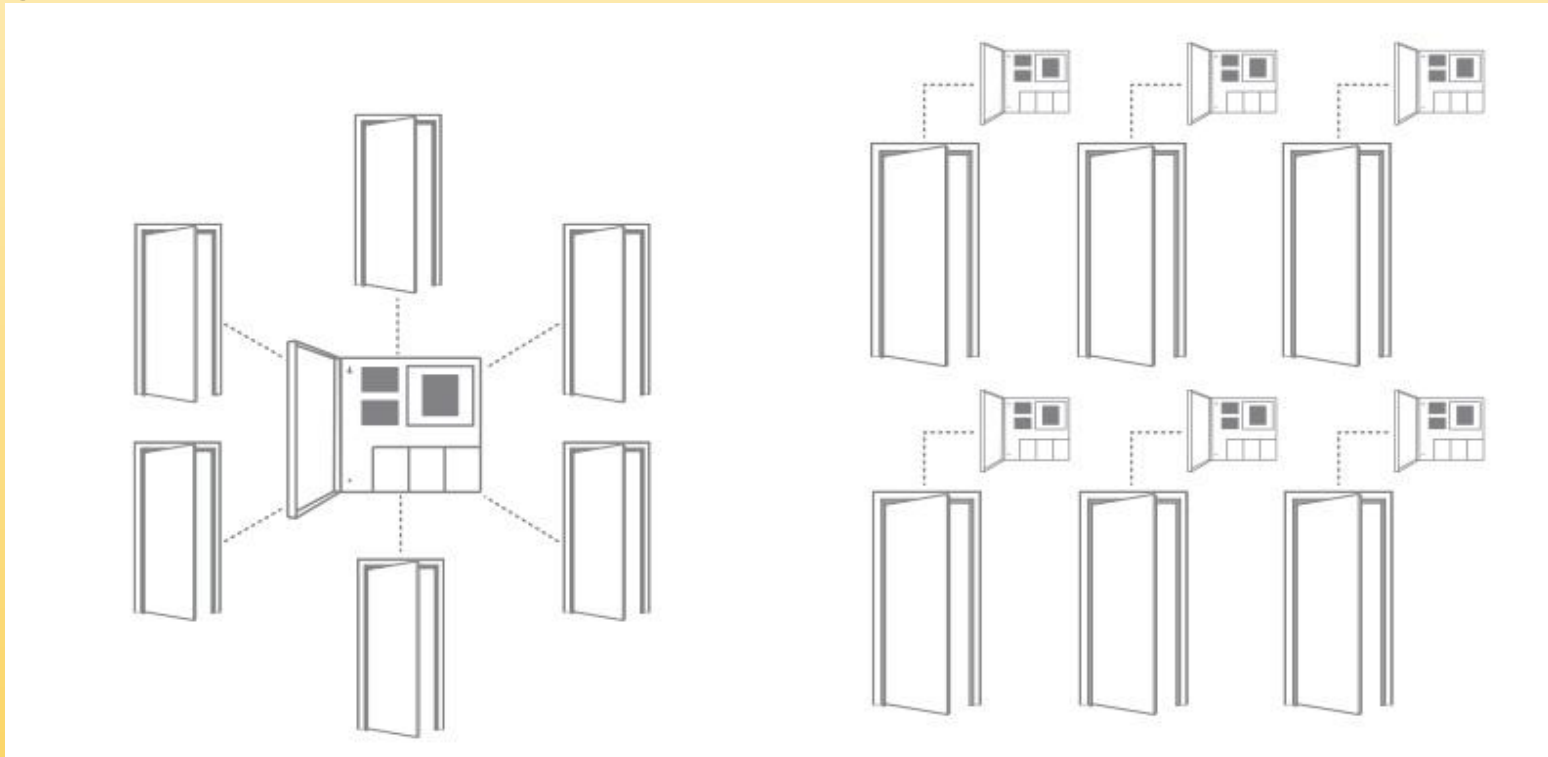
Using the Voltage Drop
Ohm's law

When using this formula,
double the cable distance
because two conductors are
being used for + and - DC.
Larger loads or longer wire
distances require heavier
gauge cable.



Network Access Control systems:

Centralised and Decentralised Access Control System:



Credentials

This is your electronic “key” and what you have that gets you access. It could be access cards, ID badges, ID cards or smartphone based mobile app access.

Centralised Access Control System

A system that is designed to provide a single point of control for an organisation's access control needs. It is used to manage who has access to which areas, resources, and services within the organisation.

Basic components of a network access control system

1. Access Control Software: This software manages and monitors access to the system and is responsible for granting or denying access to users.
2. Access Control Hardware: This includes the physical access control devices such as card readers, keypads, biometric scanners, and door locks.

Basic components of a network access control system

3. Network: This is the communication infrastructure that connects the access control system components, including the access control software, access control hardware, and the server.

4. Authentication Server: This is a computer that stores and verifies user credentials such as passwords or biometric data.

Basic components of a network access control system

5. Data Logging Server: This is a computer that stores data from access control events, such as when a user entered or exited a secured area.

Basic components of a network access control system

A network access control system is designed to control access to a network by authenticating users and regulating their access rights. The system typically uses a set of policies and rules to determine who can access the network, when they can access it, and what kind of activities they can engage in.

Questions 1

Which device that converts information from the access card to the data to interpreted by the control panel?

Credential reader

Locks

Powersupply

Questions 2

What type of lock is always fail-safe?

A magnetic lock

Questions 3

What is the purpose of the request to exit device?

To bypass the DPS to Allow the alarm free exit from a controlled space.

Questions 4

Access control panels communicate with the system server via proprietary information Protocol or via

TCP/IP

Introduction to Door Entry Systems

Audio:

The door entry system incorporates audio control. When access is requested, the person inside the premises can talk to the person and grant or deny access.

Video:

The door entry system incorporates audio and video control. When access is requested, the person inside the premises can talk and see the person through a camera and grant or deny access.

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Introduction to Door Entry Systems

What are the components of a door entry system?

Introduction to Door Entry Systems

Stand Alone Range:

- PC based stand alone
- Non-pc based stand alone

Introduction to Door Entry Systems

Components:

- Keypads
- Controllers or monitors
- Power supply
- Door locks
- Exit button