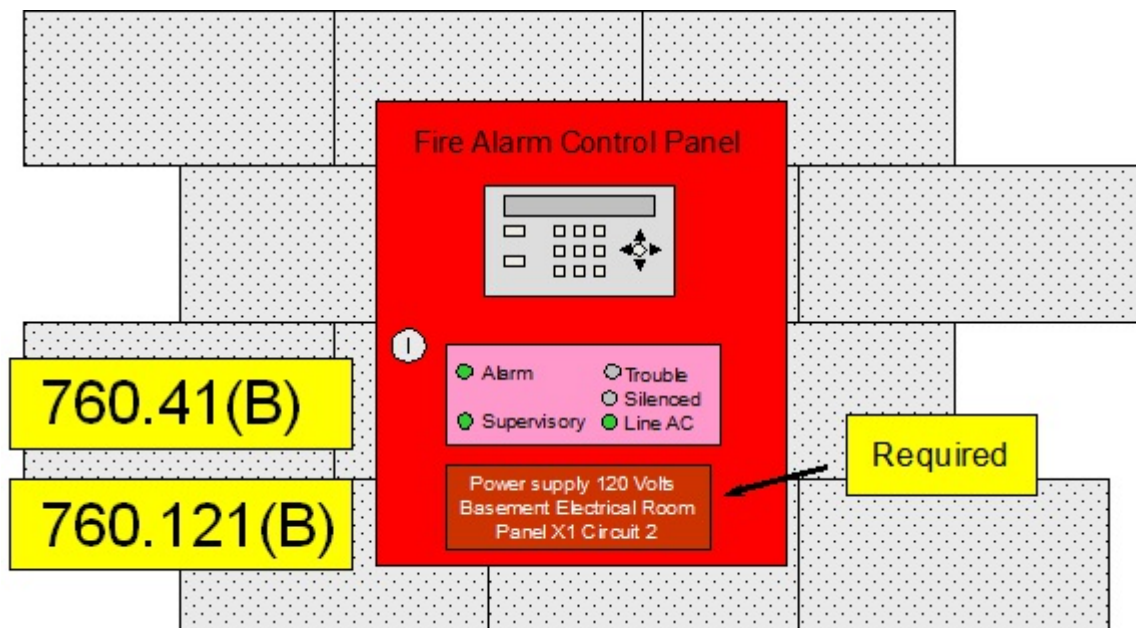


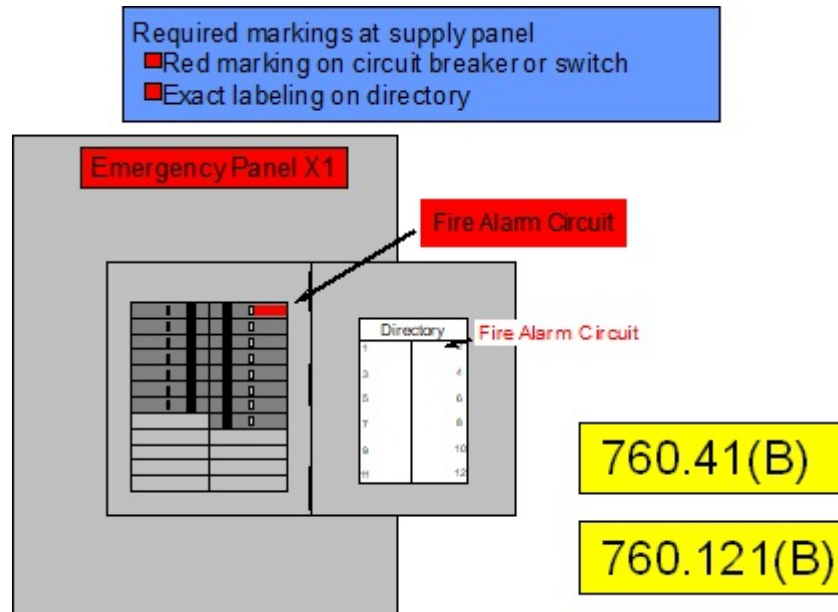
Fire Alarm Circuit Wiring

Rules for the wiring of fire alarm circuits are found in *Article 760* or the *National Electrical Code*. This Tech Note illustrates some basic fire alarm circuit requirements. A fire alarm initiation circuit is one that either automatically or manually activates the system to sound an alarm. This circuit must also activate a visual alarm indicator for the hearing impaired. Both the initiation circuit and the sounding circuit are required by fire codes to be “supervised” which means that a trouble indication is required if something happens to these circuits that would render one or more of the devices unable to operate. There are two basic circuits that provide this supervision and they are the Class A and Class B systems. This Tech Note will illustrate how these two types of circuits operate.

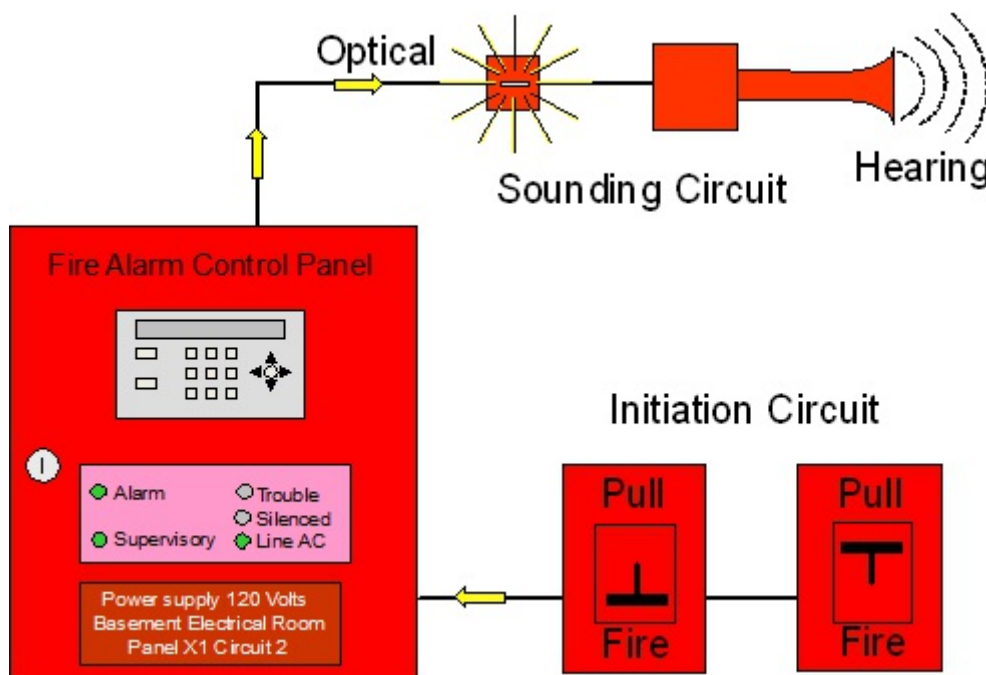
1. Fire alarm control panel requirements. Required labeling for the fire alarm control panel.



2. Requirement for the emergency electrical panel that supplies power to the fire alarm control panel.

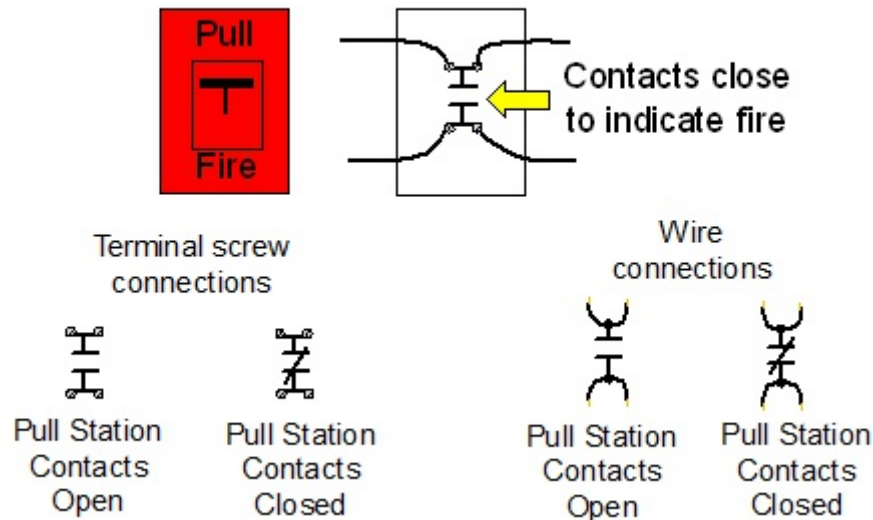


3. A fire alarm installation consists of a fire alarm control panel which supplies power to an initiating circuit consisting of manual alarm pull stations, and automatic devices such as a sprinkler system flow switch. Generally the manual pull stations are on a separate circuit. There is also an sounding alarm circuit that contains alarm warning horns and flashing lights.

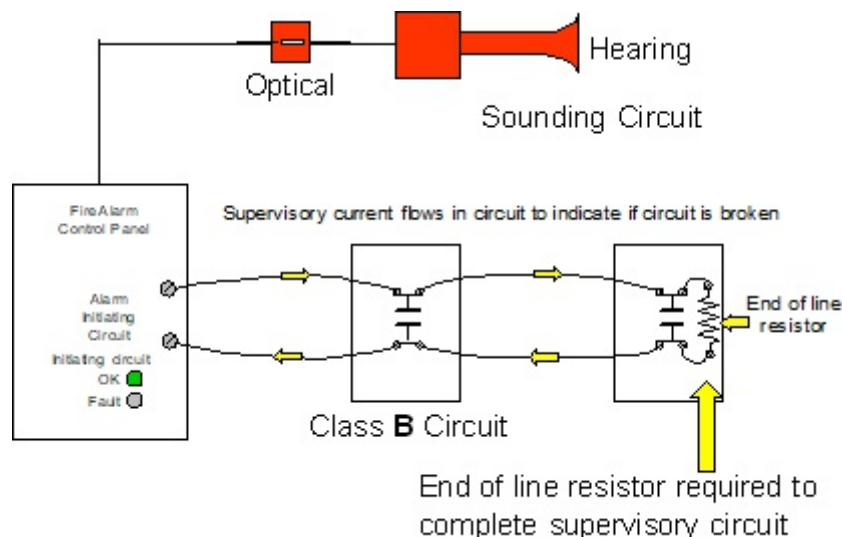


4. Below are typical diagrams of manual pull station symbols. Note there are two connection terminals or two connecting wires on each side of the pull station. The purpose of these double connection terminals and wires will be explained later.

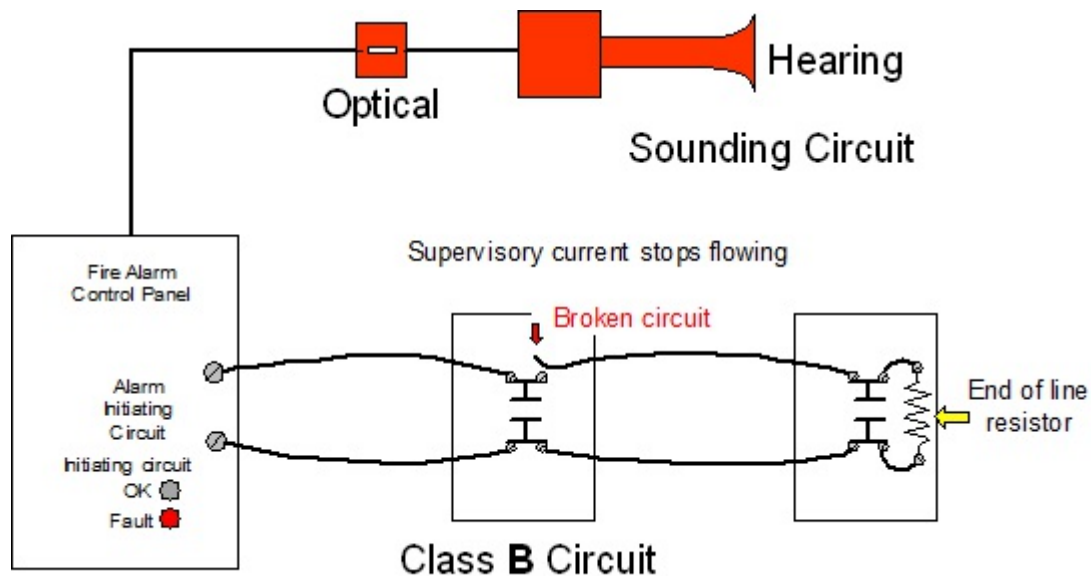
All circuits must be wires so they are supervised



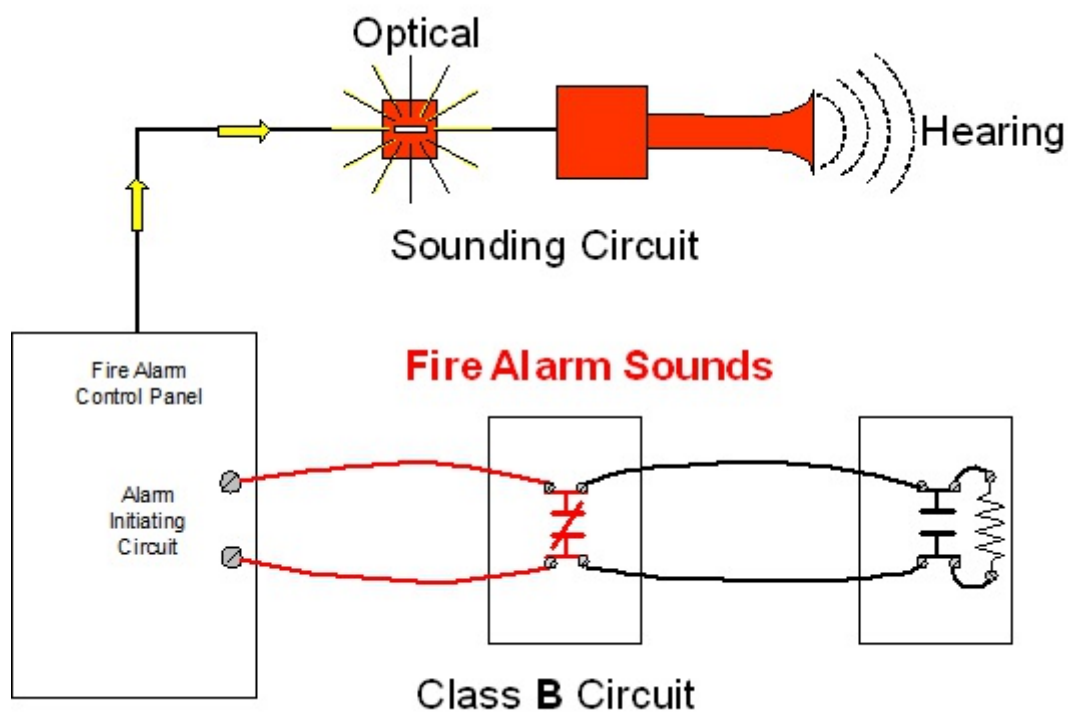
5. This is a **Class B** fire alarm initiating circuit. It is required that a method must be in place to indicate if there is a break in the circuit that would prevent any initiation device from indicating a fire alarm if activated. In order to accomplish that task requires two connections on each side of each initiation device. For a Class B system an *end-of-the-line resistor* is required. That resistor completes a supervisory circuit coming from the control panel that indicates that the entire system and every device on the system is functioning properly. Any break in the circuit will initiate a trouble signal that will alert maintenance personnel to fix the problem.



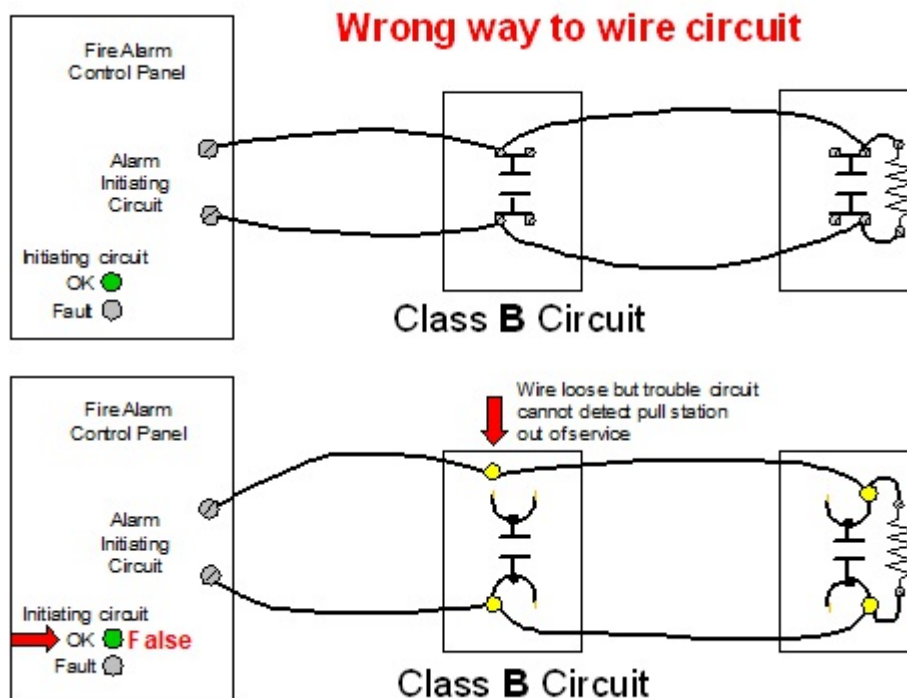
6. This example shows a wire that became detached from one of the initiating devices thus breaking the current flow in the supervisory circuit and alerting maintenance personnel that the problem must be fixed.



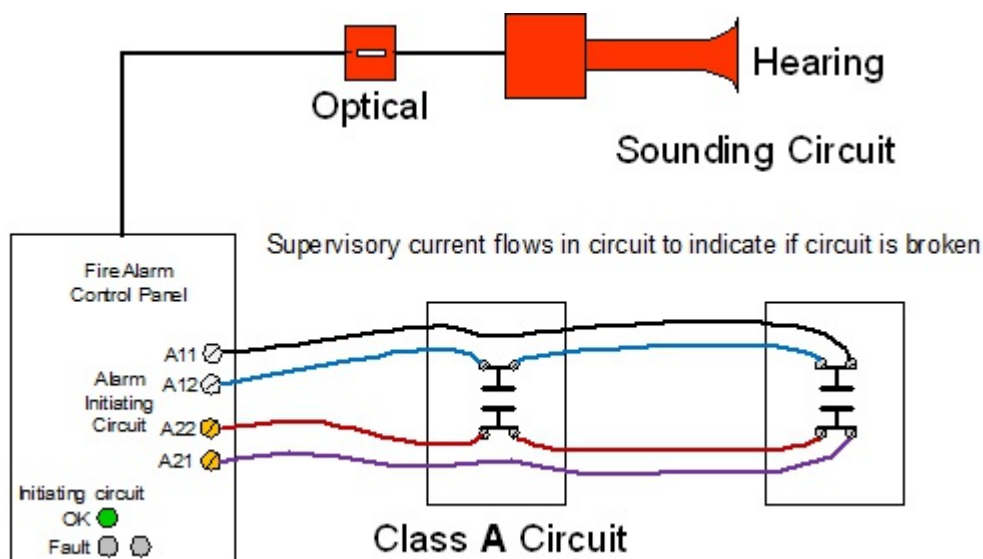
7. This diagram indicates a pull station has been activated and the alarm circuit sounds the fire alarm.



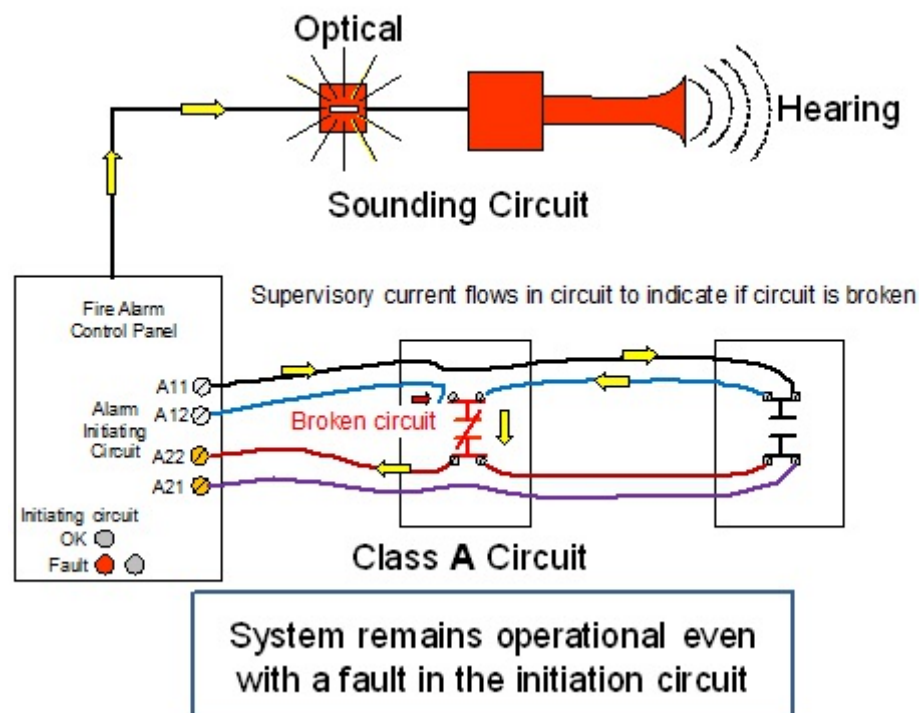
8. It is important to correctly connect the circuit wires to each device in the system. These are incorrect connections. A pull station can become disconnected without breaking the supervisory circuit. This will allow a pull station to be unable to initiate an alarm.



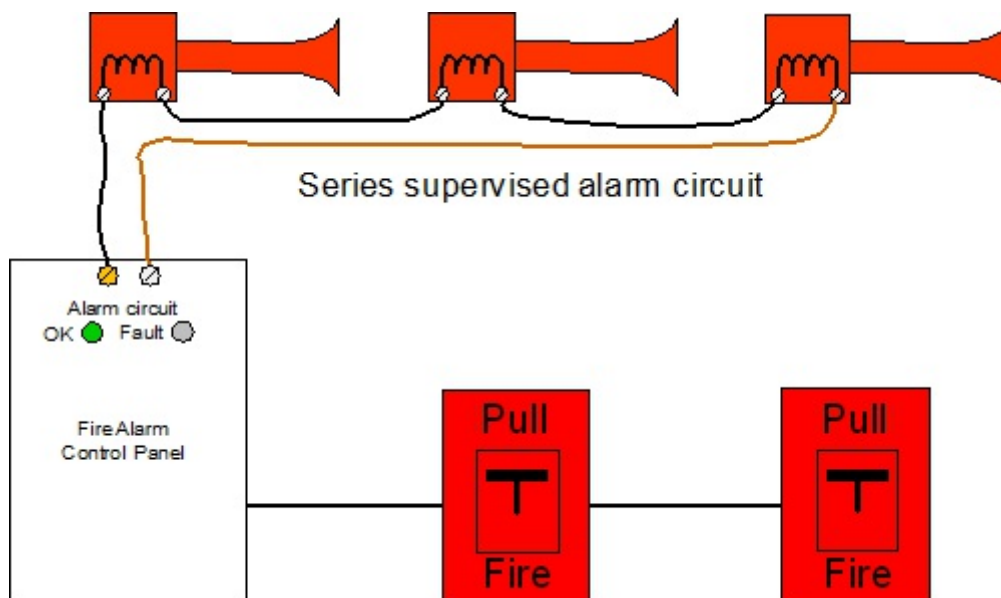
9. The **Class A** initiating circuit requires two wires for each side of the pull stations. The advantage of the Class A circuit is that a circuit can become broken and still allow every pull station in the system to continue to operate normally. Since the supervisory circuit has been broken a signal is sent to maintenance personnel to repair the system. The Class A initiating circuit does not have an end-of-the-line resistor.



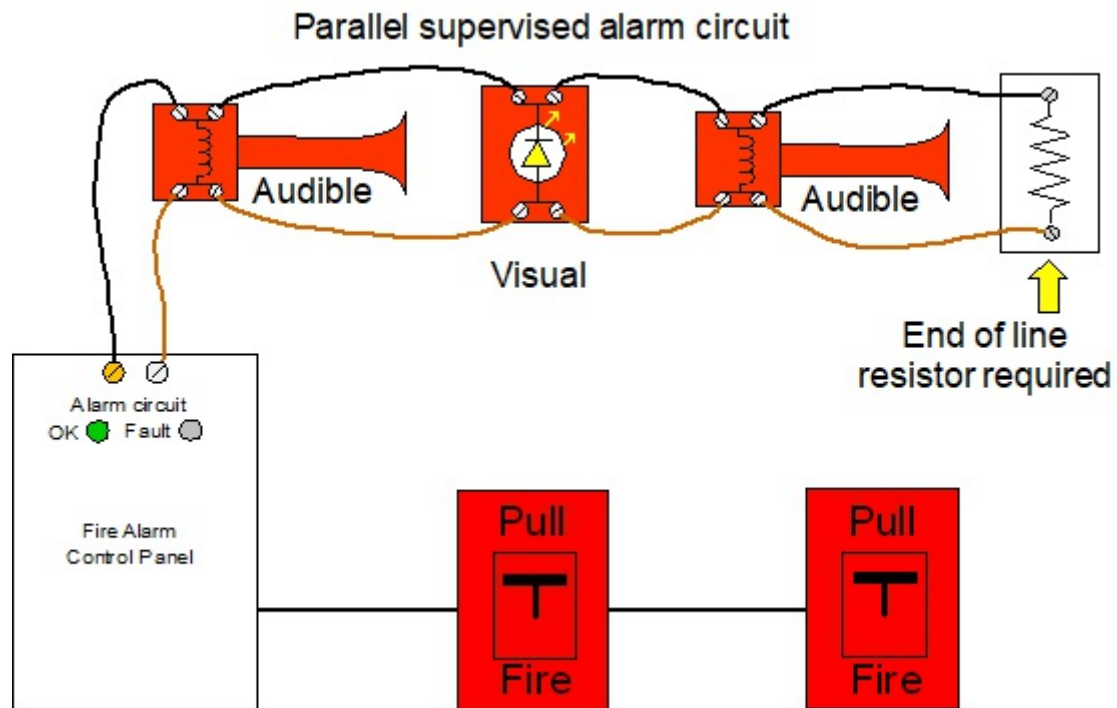
10. Notice that with this Class A initiating circuit a wire has become disconnected from one of the pull stations, but because of the two wires on each side all pull stations remain operable.



11. The **sounding circuit** also must be supervised to indicate if one or all of the sounding and light flashing devices are not operable. This is a series circuit where a small supervisory current is circulated through all of the devices.



12. Another way to install the sounding circuit is to connect all devices in parallel. In this case an end-of-line resistor is required to complete the supervisory circuit.



Conclusion: Fire alarm circuits fall under the heading of an “Emergency System” and rules for an emergency wiring system must meet the requirements of Article 700 of the *NEC*. All of the wiring for a fire alarm system must be installed separate from normal circuits. When run in raceway only wires for the fire alarm system are permitted to be installed in the raceway.