

# MCB

## Who's On First?

Abbott & Costello's "Who's On First" routine became so famous that in 1967 the pair became the first people not affiliated with baseball to be inducted into the Baseball Hall of Fame. Unlike the more famous version, our Who's On First will help to simplify the complex processes of Branch Circuits and Supplemental Protectors.

### How are Branch Circuits (UL489) and Supplemental Protectors (UL1077) defined?

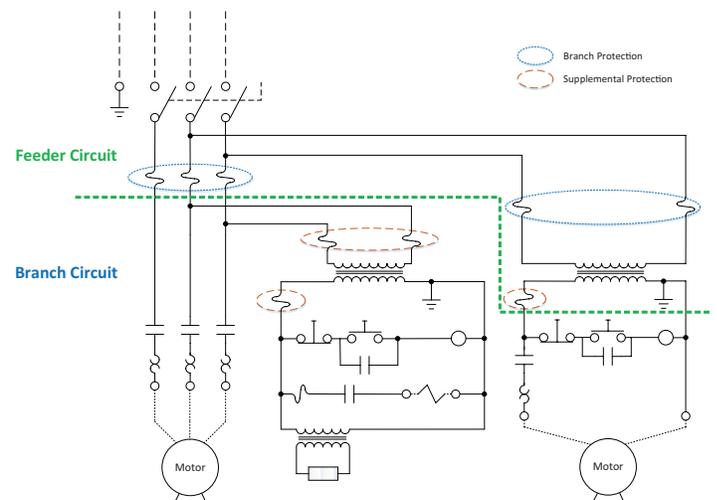
A branch circuit is defined as a circuit which has the first overcurrent device. UL489 has additional spacing requirements (over surface, through air) compared to supplemental protection. Branch protection breakers also have some different spacing, and slight mechanical differences, internally to the breaker, as compared to a Supplemental Protector.

A Supplemental Protector is defined as an overcurrent device for protection of the end circuit. Or, said another way, may be added to a circuit to provide an extra level of protection for a specific component. These devices require the use of an upstream protective device, or Branch Protection. It is not designed to be used as a substitute for Branch Protection (per NEC Article 240.10).

### Where can supplemental protectors be used in the circuit or equipment?

If the Branch Protection is adequate to protect the circuit and/or components, a supplemental protector can be inserted. If the supplemental protector is part of the circuit, and then removed, and the Branch protection meets the above protection requirements, the supplemental protector is properly applied.

Drawing based on UL "Description of terminology", Figure 6.1 effective April 25, 2003 for UL508A, UL489 & UL1077 (UL copyrighted)



### UL Copyrighted Index

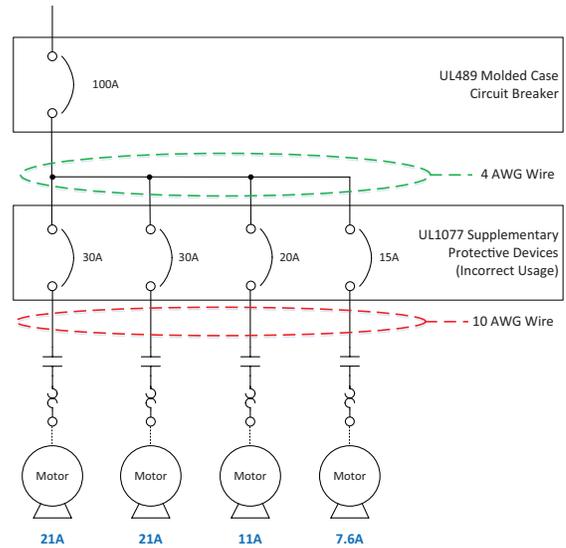
1. Load (provided in field)
2. Field wiring terminals
3. Alternate field terminals
4. Field wiring
5. Power circuit internal wiring
6. Overload relay & heater elements
7. Contactor/controller
8. Starter
9. Combination motor controller
10. Branch circuit protection
11. Fused disconnect switch or circuit breaker
12. Control transformer
13. Control transformer fuse / supplementary protection
14. Control transformer ground (for 1000 VA max control transformer)
15. Control circuit devices and wiring/Class 1 circuit Isolated secondary circuit
16. Solenoid or other control device - provided in field
17. Supplementary protection
18. Class 2 transformer
19. Class 2 circuit
20. Power transformer fuse/branch circuit protection
21. Power transformer - for motor load and control circuit
22. Control circuit/Class 1 circuit/common control circuit
23. Equipment ground and equipment ground terminal
24. Bonding conductor/bonding jumper
25. Grounding electrode conductor terminal
26. Grounding electrode conductor (provided in field)

### Misuse of Supplemental Protection

In this circuit, a UL489 molded case circuit breaker (MCCB) is correctly used as the main breaker for the four motors being controlled. However, each motor is protected by a UL1077 supplemental “miniature breaker”.

This is not correct and violates both the NEC and UL. Each individual motor circuit is a separate branch circuit and requires the use of a UL489 listed circuit breaker.

This is determined by evaluating the conductors feeding the loads. Supplemental protectors must be ignored because they are not listed branch circuit protective devices. Therefore, in this example, the 10 AWG conductors are only being protected by the 100A MCCB. **The 100A MCCB is too large to adequately protect the small 10 AWG conductors per the NEC.** The supplemental protectors must be replaced by appropriately sized UL489 listed circuit breakers.

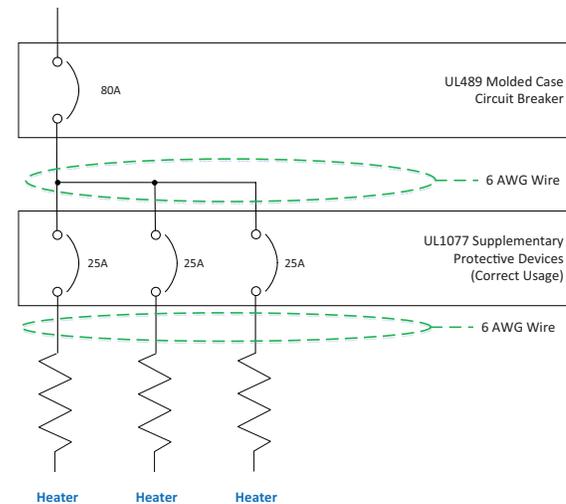


### Correct usage of Supplemental Protection

In this circuit, a UL489 molded case circuit breaker (MCCB) is again correctly used as the main breaker for the three heater loads being protected.

Each individual heater is protected by a UL1077 supplemental device. It is essential the wire feeding each individual heater is adequately protected by the UL489 breaker, and in **this case the wire size has not been decreased but remains 6 AWG throughout the circuit.** Since heaters may appropriately be connected in parallel, **the use of the supplemental devices is optional and therefore permitted.**

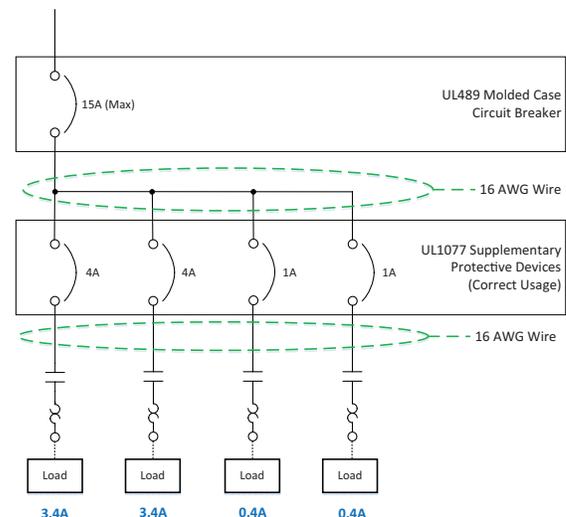
A failure of one heater may trip the associated supplemental device but not trip the upstream 80A breaker. This will allow the other two heaters to continue to function.



### Correct usage of Supplemental Protection

In this circuit, a UL489 molded case circuit breaker (MCCB) is correctly used as the main breaker for the four motors being controlled. **Since all four motors combined may be protected by a single 15A breaker, the use of the additional supplementary protectors is optional and therefore, permitted.** As mentioned above, the wire size must be suitably protected by the MCCB.

The supplemental protectors lend additional protection that is sized very closely to each motors requirements. In the event one supplemental protector trips, the remaining motors will continue to run.





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