UNIT

25

OVERCURRENT PROTECTION

25.1 Introduction

Overcurrent protection is a complex subject because different types of overcurrent protective devices serve different purposes. In this unit you will learn:

- the role of circuit overcurrent protection.
- the difference between a circuit breaker and a fuse.
- the fundamentals of time-current curves and selective coordination.
- the difference between interrupting ratings and short-circuit current ratings. Figure 25–1

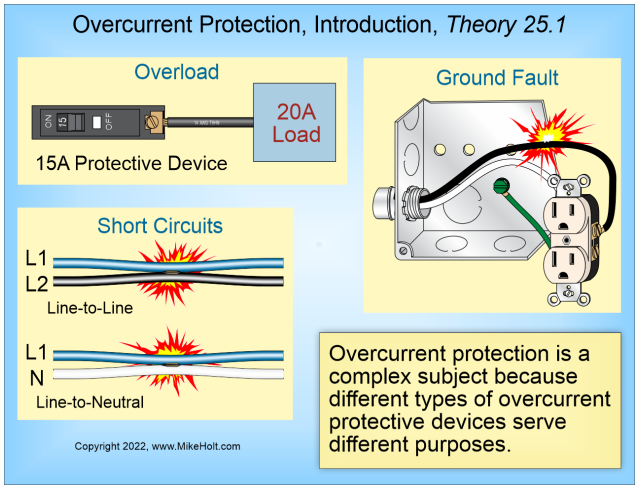


Figure 25–1

25.5 Overcurrent Protective Devices, Time-Current Curves

To protect against electric shock or prevent a fire, a dangerous overload, short circuit, or ground fault must quickly be removed by opening the circuit's overcurrent protective device. The time it takes for an overcurrent protective device to open is plotted on a time-current curve (TCC) chart. This chart has a vertical side that shows the time in seconds it will take the device to open relative to the current in amperes as shown on the bottom of the chart. Figure 25–18

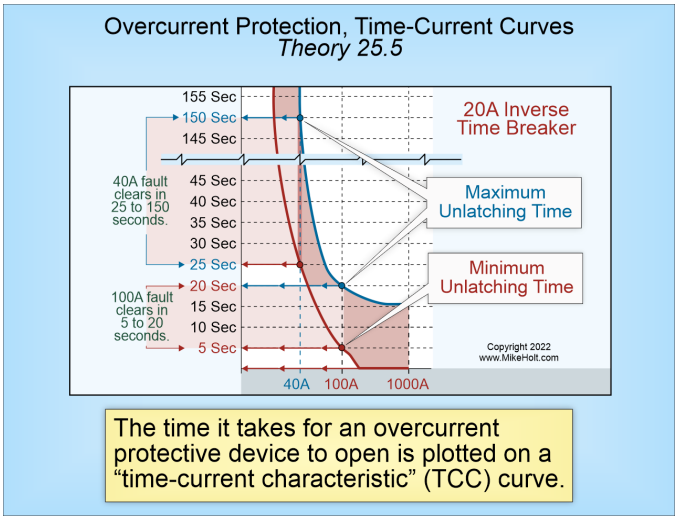
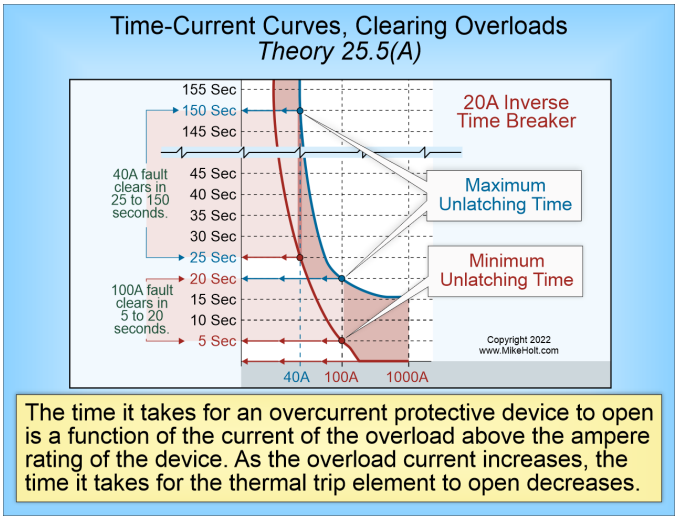


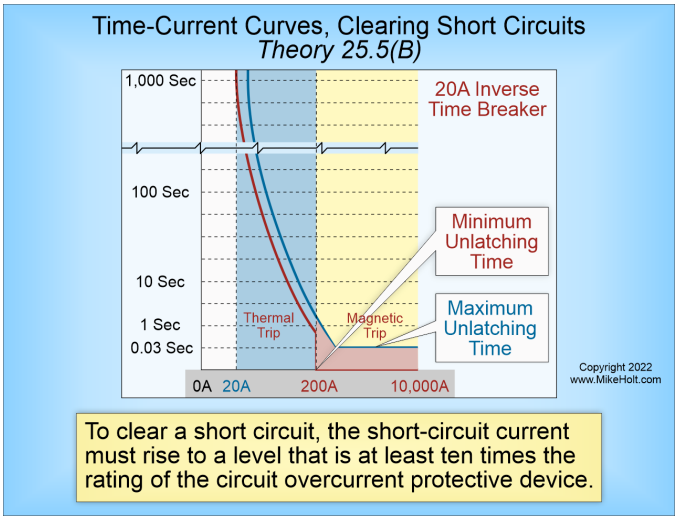
Figure 25–18

(A) Clearing Overloads. An overcurrent protective device will open and clear an overload. The time it takes for the overcurrent protective device to open is a function of the current of the overload above the ampere rating of the device. As the overload current increases, the time it takes for the thermal trip element to open decreases. ▸Figure 25–19



▸Figure 25–19

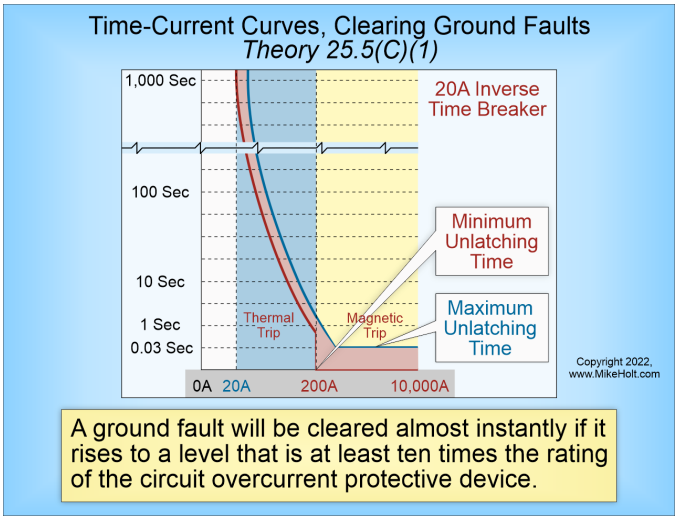
(B) Clearing Short Circuits. To quickly clear a short circuit, the short-circuit current needs to rise to a level between ten and twenty times the rating of the circuit overcurrent protective device. Once the current reaches that level, the short circuit will clear almost immediately. ▸Figure 25–20



▸Figure 25–20

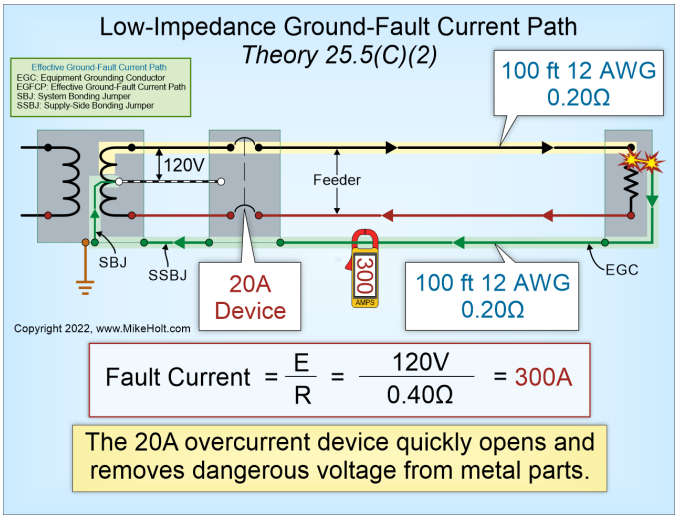
(C) Clearing Ground-Faults.

(1) General. To quickly clear a ground fault, the ground-fault current needs to rise to a level between ten and twenty times the rating of the circuit overcurrent protective device. ▸Figure 25–21



▸Figure 25–21

(2) Low-Impedance Ground-Fault Current Path. To remove dangerous touch voltage on metal parts produced by a ground fault, the fault-current path must have low enough impedance to allow the fault current to quickly rise to open the protection device. ▸Figure 25–22



▸Figure 25–22