reduction. It is critical that the available arcing current exceeds the instantaneous trip or instantaneous override for the circuit breaker to open as quickly as possible during an arcing fault. It is not enough to just require an instantaneous trip or an instantaneous override, because the arcing current could be low enough that it takes the circuit breaker from many cycles to many seconds to open. If the arcing current is greater than the instantaneous trip or instantaneous override, most circuit breakers will clear somewhere between ½ cycle (smaller molded case type) and 3 cycles (power or "air-frame" type).

The final setting of the instantaneous trip determines whether additional arc energy reduction techniques are required. It is not the minimum setting of the instantaneous trip, as typically shipped from the factory, that is the determining factor of whether additional arc energy reduction is necessary, but rather the final setting as determined by the electrical system requirements such as inrush characteristics or selective coordination. The use of circuit breakers having an instantaneous capability that is adjusted to allow for a longer clearing time is not prohibited. That is a design consideration.

Exhibit 240.14 is an example of an electronic trip unit for a circuit breaker employing an energy-reducing maintenance switch in addition to means for adjusting other settings. The function of the energy reduction maintenance switch is to override any settings that intentionally delay the opening time of the circuit breaker. A selectively coordinated electrical system is one example of where the response time adjustments available on some circuit breakers are set to allow for localization of a fault in the circuit. When these settings are overridden, the circuit breaker responds faster to a downstream fault in the circuit. The faster response time provides the important benefit of reducing the level of incident energy to which personnel may be exposed where tasks are being performed within the arc-flash boundary. An example of a local status indicator is an LED signifying "maintenance mode," which provides qualified persons with the indication that trip settings are adjusted to reduce incident energy should a fault occur anywhere electrically downstream of the device. See the definition of *arc-flash boundary* in *NFPA 70E*; see the definition of *qualified person* in Article 100.

Once the task is completed, any settings that previously introduced an intentional delay in the circuit-breaker clearing time can be restored.

The instantaneous trip setting adjusted to a lower setting while a worker is working on the equipment and then adjusted back to the desired setting after work is complete does not determine the arc energy reduction.

EXHIBIT 240.14 An electronic trip unit for a circuit breaker that has a maintenance mode setting, which is an energy-reducing setting. *(Courtesy of Siemens Industry, Inc.)*

(C) Performance Testing. The arc energy reduction protection system shall be performance tested by primary current injection testing or another approved method when first installed on site. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer's instructions.

A written record of this testing shall be made and shall be available to the authority having jurisdiction.

Informational Note: Some energy reduction protection systems cannot be tested using a test process of primary current injection due to either the protection method being damaged such as with the use of fuse technology or because current is not the primary method of arc detection.

•*N* **240.89 Replacement Trip Units.** Replacement trip units shall be listed for use with the circuit breaker type in which it is installed.

Informational Note: The replacement trip unit can be a listed unit identical to the original or a different trip unit listed for use with the specific circuit breaker.

Part VIII. Supervised Industrial Installations

240.90 General. Overcurrent protection in areas of supervised industrial installations shall comply with all of the other applicable provisions of this article, except as provided in Part VIII. Part VIII shall be permitted to apply only to those portions of the electrical system in the supervised industrial installation used exclusively for manufacturing or process control activities.

240.91 Protection of Conductors. Conductors shall be protected in accordance with 240.91(A) or 240.91(B).

(A) General. Conductors shall be protected in accordance with 240.4.