Circuit-by-circuit monitoring

1. Functional requirements
   1. Shall be able to completely interrupt electrical circuits.
   2. Shall be able to be controlled remotely
   3. Shall provide two-way communications to the Master Control Unit (MCU)
   4. Shall be powered by line-voltage
   5. Shall detect brownout conditions
   6. Shall configure itself upon powerup
   7. Shall temporarily store gathered information
   8. Shall package the information received for transmission over ethernet link to MCU.
   9. Shall have the capability of turning off one breaker at a time
   10. The board shall have an ADE7763 current sensor chip, which
       1. Shall detect a change in magnetic field caused be AC current
       2. Shall determine the mutual inductance between the current-carrying conductor and the di/dt sensor.
       3. Shall have a current signal that must be recovered from the di/dt signal before it can be used by the board
       4. Shall use an integrator to transform the current signal to the original form and will be off when the chip is powered on
       5. Shall contain a power supply monitor
       6. Shall be inactive when the power supply is less than 4 volts +/- 5%
       7. Shall prevent false triggering
       8. Shall detect a loss of line voltage
       9. Shall detect when the voltage exceeds a certain value
       10. Shall detect when the current exceeds a certain value
       11. Shall receive breaker status and set up flags or interrupts when needed
       12. Shall calculate active power by low-pass filtering
2. Behavioral Requirements
   1. Shall interrupt service to a circuit when current exceeds a specified threshold.
   2. Shall have different time delays based on the rating.
   3. Shall create a critical event in the event log when a part fails.
   4. Shall monitor voltage levels.
   5. Shall monitor current flow.
   6. Shall monitor kilowatt-hours used.
   7. Shall monitor power quality.
   8. Shall monitor phase angle.
3. Hardware Requirements
   1. Shall be housed in standard sized load centers or panels.
   2. Shall use hand-wiring between each circuit breaker input output and a terminal in a remotely located control means.
   3. Shall have a status detection circuit.
   4. Shall have a voltage plane monitor that will be able to monitor the status of the power supply.
   5. Shall provide clocks for all synchronous components.
   6. Shall have a power supply capable of detecting faults.
4. User Interface Requirements
   1. Shall have a self-explanatory external interface for a non-technical mind.
   2. Shall have a push-button interface
   3. Shall have a locking mechanism on the control panel
5. Power Requirements
   1. Shall not restrict the flow of power to a circuit, except when a fault is detected and the circuit shut off.
   2. Shall not exceed power regulations set forth by the state
6. Mechanical Requirements
   1. Shall fit into a standard, unmodified electric panel.
   2. Shall be fully enclosed and self-contained.
   3. Internal components shall not be accessible.
   4. Shall be banked with 4 breakers with the option of banking 8
7. Safety Requirements
   1. Shall be marked as “SWD” or “HID” (switching duty or high-intensity discharge) when needed
   2. Shall provide circuit interrupter protection for circuits supplying 120V, single-phase power to generic outlets.
   3. Shall have safety hazards marked.
   4. Shall create an open circuit when they are compromised
   5. Shall be functional enough to where consumers will not have to touch high voltage areas