

TLM-1 TOWER LIGHT MONITOR

APPLICATION NOTE

SINGLE- and THREE-PHASE SYSTEMS

OVERVIEW

Larger tower lighting systems usually split the lamp load by placing some beacons and markers on separate 120-volt lines from the breaker panel. This application note addresses potential problems and solutions with the TLM-1 under these conditions.

CURRENT MONITORING

The TLM-1 uses a current transformer to sample the current on the lighting controller circuit. This transformer produces a voltage that is proportional to the current and scaled according to the value of the burden resistors on the circuit board. When a wire is passed through the current transformer, it comprises one turn of the primary winding of the transformer. The wire can be looped through twice to double the output if necessary. If the TLM-1 is used in a situation where 240 volts is being fed to a step-down transformer before the tower light controller, the current will be half of the 120-volt current at this point for a given load. By looping the wire through the current transformer twice at this point, the output will be doubled to make up for the lower current.

If the lighting system uses 240 volts without a step-down transformer (two 120-volt circuits from a double-pole breaker), then the current from each leg can be made to add together in the current transformer by passing each wire through it (two primary windings). In order for the currents to add they must be in phase. Since the current in each leg of a single-phase 240-volt supply is 180 degrees out of phase with respect to the neutral, the wires have to pass through the current transformer in the opposite direction in order for the individual currents to add.

THREE-PHASE SUPPLIES

Lighting systems that are powered from three-phase supplies (120/208 volts) present a problem when trying to monitor the current as described above. Unlike the single-phase system, the currents in each leg of a three-phase system are 120 degrees apart in phase. Due to this phase difference, the addition of the current of two legs through the current transformer will be the sum of the individual currents times the cosine of 120 degrees (0.5). For example, if there are 10 amperes in each leg of the lighting circuit through the current transformer, the total current the transformer would see is $(10 + 10) \times 0.5 = 10$ amperes. It is obvious that this is not a valid current sample for the TLM-1 to operate from.

Two TLM-1s would be required to monitor the system in this case, one for each leg; or wire from separate breakers that are on the same phase and pass each wire through the current transformer in the same direction to add the individual currents. Consult with your electrician about any wiring changes and compliance with local electrical codes before making changes.