

Transformers with Enhanced Diagnostics Troubleshooting Procedure

(For all P8 transformers and all P5"E" transformers)

If the neon is OUT and the primary power is ON when you arrive on-site, do not turn the primary power OFF until you look at the diagnostic LED on the end of the transformer. This is important since the fault that originally caused the sign outage may have disappeared, but the transformer tripped OFF before the fault disappeared (a "transient" ground fault).

Before working on the sign check if it is ON, OUT, or flickering.

Never change or repair any transformer wiring without first removing primary power from the transformer.

The numbered headings below represent the possible states of the neon tubing and the diagnostic LED under various fault conditions. To properly use this troubleshooting procedure, go to each numbered symptom in order until the tubing/LED indication in your situation is found, then follow the steps in order under that numbered heading and throughout the rest of the procedure (if necessary). Apply primary power (if not already applied):

1. Tubing ON, LED continuously ON

- Power was cycled ON and OFF before viewing the LED indicator. A transient fault has probably occurred – see introductory paragraph for an explanation. The enhanced diagnostics in all P8 transformers and all P5"E" transformers allows the recall from memory an indication of the last fault that shut down the transformer after transformer has successfully reset. To enter "Last Fault Recall" mode:
 - Depress service button until LED goes out, approximately 5 seconds, then release.
 - The last fault code will be indicated by the diagnostic LED per below:
 - 2 flashes – secondary ground fault with a good ground connected.
 - 3 flashes – secondary ground fault without a ground connected. Lack of ground is likely cause of the fault.
 - 4 flashes – primary voltage over 120% of rating.
 - 5 flashes – line and neutral are reversed.
 - Depress the bypass button again, hold in until the LED remains on for one second, then release and the transformer will return to normal operation.
 - If a previous fault is indicated, check the sign for contamination build up, burn marks, inadequate clearance between high voltage connections and the sign body, etc. to prevent a recurrence of a transient fault.

2. Tubing Flickering, LED continuously ON

Usually an indicator of a problem with the GTO or tubing. Check for:

- Poor GTO connections.
- Arcing between sign sections or between unconnected GTO and sign electrode.
- Broken, cracked, or degassed tubing. Try jumping out each sign section one at a time.
- If you verify none of the above conditions exist, the transformer is probably beginning to fail.

3. Tubing OUT, LED not lit

Voltage not present or too low at transformer primary terminals. If correct voltage is present, then the transformer is defective.

4. Tubing OUT (no flickering anywhere), LED continuously ON

Almost always a defective transformer. Exception: In a string of neon tubes, one piece of tubing that is broken or degassed.

5. Tubing OUT, LED 4-flashing

Primary voltage is greater than 140 volts for a 120 VAC transformer, greater than 324 VAC for a 277 volt transformer or greater than 404 VAC for a 347 volt transformer. For instance, a 120 VAC transformer might be installed on a 240 or 277 volt circuit or the line voltage may need to be lowered by the electric company.

6. Tubing OUT, LED 5-flashing

The line ("hot") wire and neutral wires are reversed. Remove primary power, reverse primary wiring line and neutral wires, and then reapply power. If LED is then continuously ON, the problem is solved.

7. Tubing OUT, LED 2-flashing or 3-flashing

Caused by a short from sign GTO or tubing to the sign frame, conduit, or other point at or near ground potential (a "secondary circuit ground fault"). This fault may be "transient." (See introductory paragraph this page)

To find the fault:

- Remove and then reapply transformer primary power.
If the tubing now lights normally and the LED is continuously ON, a transient ground fault has occurred. This is usually caused by build up of insects, a rain downpour, inadequate clearance between high voltage connections and the sign body, and so forth. Poor or non-

existent primary grounding makes ground fault detection far more likely to occur. If the LED was originally 3-flashing the transformer is poorly grounded – make sure you have a good ground connection. If the LED continues to 2- or 3-flash go to the next step.

- Remove primary power and disconnect both GTO cables from the transformer. Reapply primary power. What is the LED indication?
 - 2-flashing or 3-flashing:** the transformer is defective.
 - Continuously ON:** a ground exists somewhere in the GTO and/or tubing. Go to the next step.

7. Locating a secondary circuit ground fault in GTO or tubing system (after verification ground fault exists in Step 6)

- Remove primary power and connect only one GTO cable to the transformer. Reapply primary power. What are the Tubing and LED indications?
 - Tubing OUT, LED 2- or 3-flashing:**

Indicates a ground fault somewhere between the transformer bushing with GTO cable presently connected and the first electrode connected to that GTO (A 3-pulse also indicates a poor ground connection):

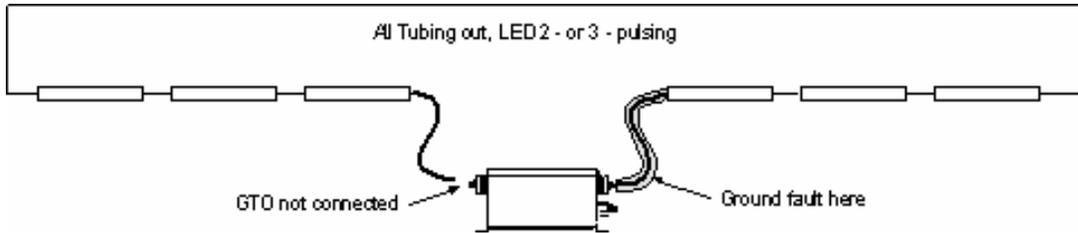


Fig. 1

To find ground fault, skip down to “8. Causes / Find ground fault” section below:

- Immediately after primary power is applied, part of tubing flashes brightly four times, after which the tubing goes out and the LED is 2- or 3-flashing:**

Indicates a ground fault immediately beyond the brightly-flashing tubing:

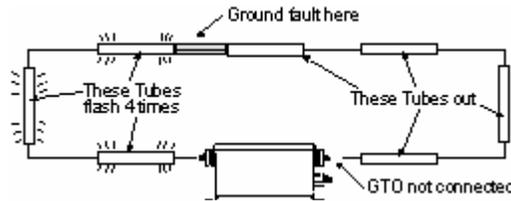


Fig. 2

To find ground fault, skip down to “8. Causes / Find ground fault” section below:

- Tubing dim or flickering, LED continuously ON:**

Indicates a ground fault closer to the opposite transformer high voltage output.

- Remove primary power; disconnect the GTO cable attached earlier to the transformer. Now, connect the remaining GTO cable to the other transformer high voltage bushing. Reapply primary power. Look again for symptoms 7a and 7b in order above.

8. Causes / Find ground fault:

Inspect the sign for these possible causes of a ground fault:

Note: The ground fault will be in the area of the sign system revealed in either 7a or 7b above.

- GTO detached and shorting to sign frame, conduit, flashing, damp face of building, etc.
- GTO failed and shorted to conduit, flashing.
- Insects or other foreign matter between a high voltage connection and sign frame, conduit, flashing, etc.
- Mid-point of tubing deliberately connected to sign frame, flashing, ground, etc. (Usually happens when a “.G-2” type transformer is used to replace a failed transformer in a midpoint wired system – re-wire tubing into a “virtual midpoint” configuration – if both GTO wires were connected, Fig. 1 would represent a midpoint wired system).

If inspection of the sign does not reveal the precise location of the ground fault, use the “Service” mode:

- With primary power applied, depress the Service button for 2 seconds -- this disables the secondary ground fault protection for about 30 minutes. Watch the sign carefully for electrical arcs, smoke, or listen for any buzzing sound. If an arc or smoke is observed, quickly note its origin and again depress the Service button for 2 seconds (forces the transformer back into ground fault detecting mode again) or remove primary power.