

## **Wheeler Road Gate House Lightning Strike 10/27/2007**

The Wheeler Road Gate House was installed and placed in service on September 19, 1996.

The Gate House had a previous lightning strike in September 1997. The card reader and other components were damaged. Additional details are not known whereas associated documentation is not locatable.

During the afternoon of October 27<sup>th</sup> 2007 the vicinity of the gate house was again struck by lightning. The damage was:

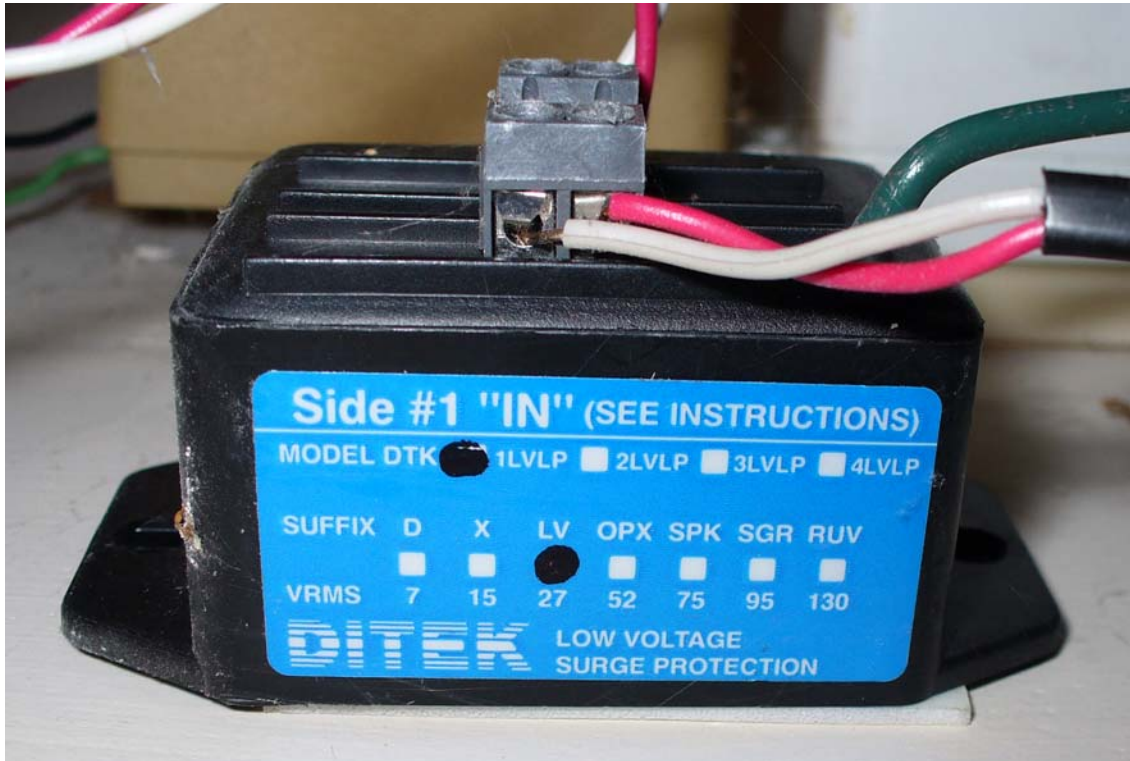
- 1) An insulator shattered that supported a primary wire adjacent to the utility transformer supplying power to our gate. Note the scorch marks on the insulator fragments suggesting this may have been the primary strike point.



**Shattered Insulator**

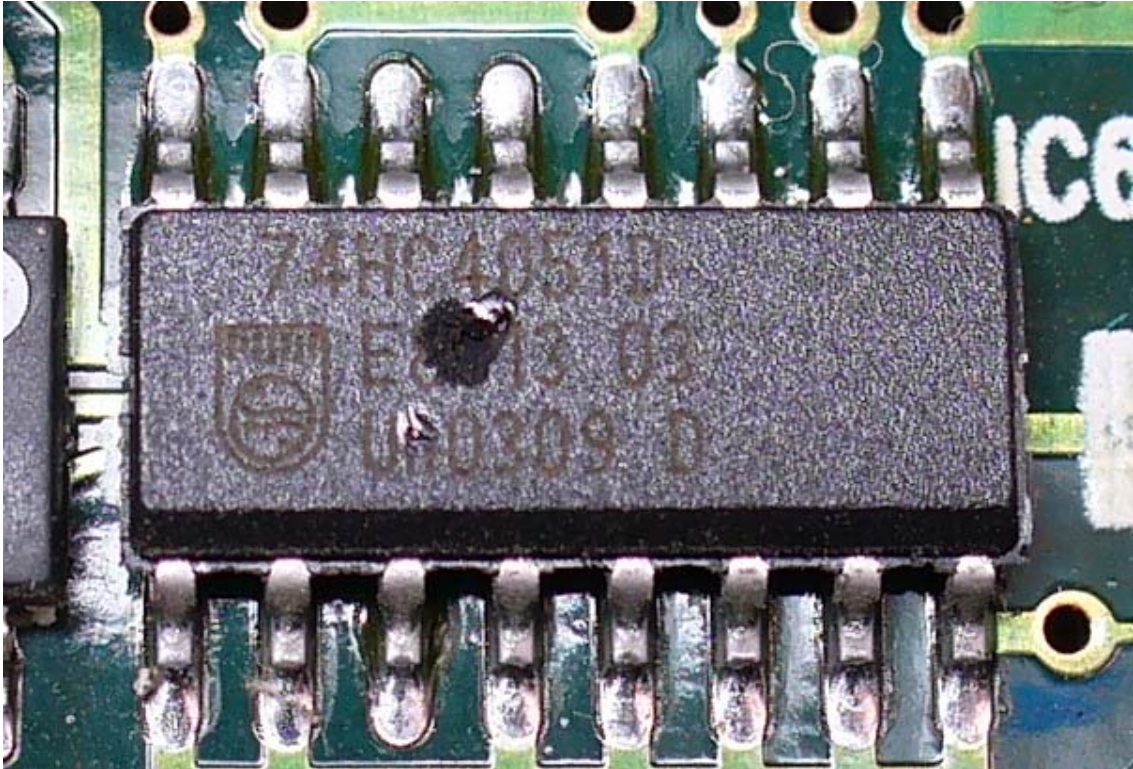
- 2) The utility transformer was destroyed.

- 3) The class 2 plug-in power transformer supplying power to the Entry Panel failed. A Low Voltage Surge Suppressor is connected between the secondary of the transformer and the load (Entry Panel) that does not appear to be damaged.



**Low Voltage Surge Suppressor**

- 4) The Entry Panel main board failed. Entry panel: DoorKing 1815, Version 22. No failure analysis was performed.
- 5) The Card Reader failed. No failure analysis was performed.
- 6) The radio receiver for remotes failed. No failure analysis was performed. As a result it is not known if the surge voltage entered through the antenna connector or power supply terminals.
- 7) The DVR failed. Failure analysis reveals that a 74HC4051 CMOS bilateral switch connected to the Video Input and Output failed explosively. This indicates that the surge voltage likely entered through the Video Input and/or Output connector(s). Due to cable routing and exposures, it is likely the surge entered the Video Input connector. The remainder of the circuitry appears undamaged and functioning.



**Damage to DVR component**

- 8) The Camera failed. No failure analysis was performed.
- 9) The control boards in both of the Gate Operators (Openers) failed. No failure analysis was performed. The status of the loop detectors also contained within the Gate Operator enclosures is unknown. Both Gate Operators were replaced instead of repaired because both were mechanically worn out and a discussion of replacing them had already begun prior to the lightning strike.

Based on observations, it appears as if failures occurred due to surges in both the power system and in signal cables. Surges in the signal cables may have been due to peripheral finger strikes surrounding the primary strike point or induced by the electro magnetic pulse generated by the lightning strike. The only surge suppressor device in the system was attached to the class 2 plug-in power transformer supplying power to the Entry Panel. All other devices were not protected.

Recommendations:

- 1) Install permanent surge suppressors in the electrical panel to protect the entire electrical system.

- 2) Plug the gate control electronics and surveillance components into a Surge Suppressor/Power Strip with a surge absorption rating of greater than 3500 joules.
- 3) Ground the antenna lead of the radio receiver with a surge suppressor and 10 Gauge or larger copper wire.
- 4) Install a Surge Suppressor and 10 Gauge or larger copper wire to the cable between the camera and DVR.
- 5) Ground the enclosures for the Entry Panel, two card readers, CDF Supra Box, and TUD Lock Box with 10 Gauge or larger copper wire.
- 6) Install a ground rod, 6 Gauge or larger copper wire, and lug to the camera pole.
- 7) Provide a 10 Gauge or larger copper wire for grounding the soon to be installed rear entry camera.
- 8) Provide 10 Gauge or larger copper wires for grounding future front and rear exit cameras.
- 9) Install a ground rod and 6 Gauge or larger copper wires for grounding the Gate Operators. The new Elite CSW 200 Gate Operators have built in surge suppression. The older Elite CSW 200 Gate Operators previously installed did not have any surge suppression.
- 10) Install a ground rod and 6 Gauge or larger copper wire and bond to the electrical panel.

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