

**Product: MMU-1600****Title: Canadian Flashing Greens**

Release Date: September 19, 2008

Scope: All Reno A&E Monitors.

All Reno A&E monitors support Canadian flashing greens. This is done through the use of the factory option "Green Flash". Any monitor shipped to Canada should have this factory option turned on. If you need to use this feature but it is not turned on, contact Reno A&E Technical Support for resolving this issue.

There are only a couple of modifications made to the monitor's fault testing to support flashing greens:

- Red Fail Fault time is changed from 800 milliseconds to 1.5 seconds.
- Red Fail Reset time is changed from 300 milliseconds to 200 milliseconds.
- Green-Yellow Dual Indication Reset time is changed from 300 milliseconds to 100 milliseconds
- Green-Red Dual Indication Reset time is changed from 300 milliseconds to 100 milliseconds

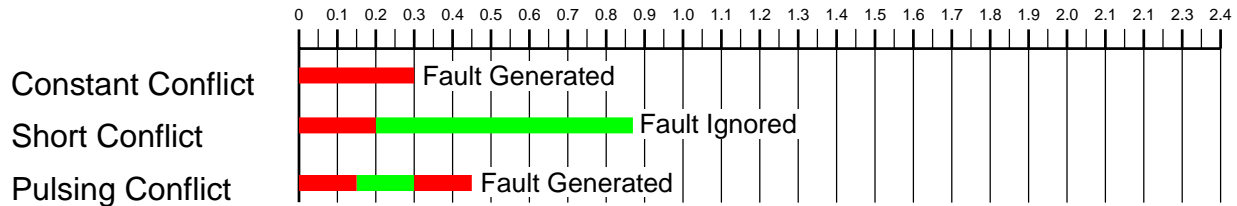
To understand how these timing changes effect actual fault detection one must understand how Reno A&E monitors look for faults.

Conflict and Red Fail testing both use a fault time accumulator. Anytime a fault condition is detected the fault accumulator timer is started. When this timer reaches the fault time, the fault is latched. If the fault condition goes away before the fault time is reached, a reset timer is cleared and then started. If the fault condition is not detected for a continuous period of time equal to the reset time, then the fault time accumulator is cleared. If the fault condition returns before the reset time has been reached, the fault time accumulator resumes timing from where it left off. So, once a fault condition is detected, either the fault time will be reached and a fault generated or the reset time reached and the fault condition will be ignored.



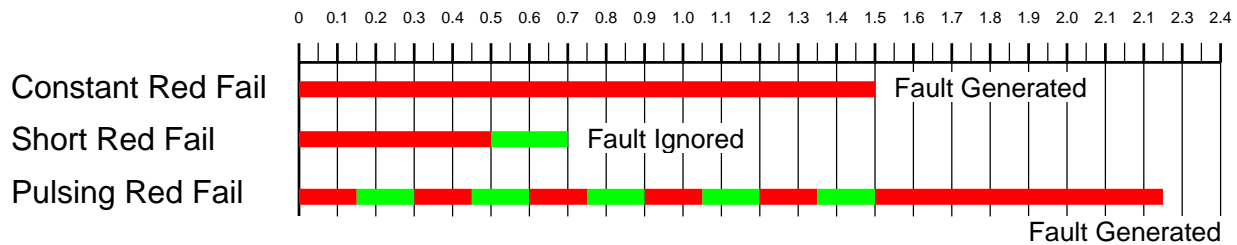
For Conflict testing the monitor uses 300 milliseconds as the fault time and 666 milliseconds as the reset time. This will catch conflicts with flashing greens as long as the off time of the flash does not exceed 650 milliseconds. If a 50% duty cycle is assumed, then the slowest flash rate that can be used is 0.77 Hertz. The practical upper limit for the flash rate is 5 Hertz (100 milliseconds on, 100 milliseconds off). The monitor can deal with faster flash rates (15 Hertz) but most controllers cannot change an output faster than every 100 milliseconds.

Conflict Fault Scenarios:



For Red Fail testing in Green Flash mode the monitor uses 1500 milliseconds as the fault time and 200 milliseconds as the reset time. These timings will correctly catch dark heads as long as the flash rate is 2.5 Hertz or less (assuming a 50% duty cycle).

Red Fail Fault Scenarios:



For the Dual Indication testing a fault time accumulator is also used but its reset conditions are a little more complex. Anytime a fault condition is detected (two active colors at the same time) the fault accumulator timer is started. When this timer reaches the fault time, the fault is latched. For a Dual Indication fault condition there are two ways in which the fault can go away, the channel has only one color active or the channel has no colors active. If the channel returns to only one color active, a normal reset timer is cleared and then started. If the one color active condition is detected for a continuous period of time equal to the normal reset time, then the fault time accumulator is cleared. If the fault condition returns before the normal reset time has been reached, the fault time accumulator resumes timing from where it left off. If the channel goes to a no color active condition, a dark reset timer is cleared and then started. If the no color active condition is detected for a continuous period of time equal to the dark reset time, then the fault time accumulator is cleared. If the fault condition returns before the normal reset time has been reached, the fault time accumulator resumes timing from where it left off. So, once a fault condition is detected, either the fault time will be reached and a fault generated or the reset time reached for one of the reset conditions and the fault condition will be ignored.



For standard Dual Indication testing the monitor uses 600 milliseconds as the fault time, 1000 milliseconds as the normal reset time, and 300 milliseconds as the dark reset time.

For Green-Yellow and Green-Red Dual Indication testing in Green Flash mode the monitor uses 600 milliseconds as the fault time, 1000 milliseconds as the normal reset time, and 100 milliseconds as the dark reset time. These timings will correctly catch dual indications as long as the flash rate is 5 Hertz or less (assuming a 50% duty cycle).

Green-Red Dual Indication Fault Scenarios:

