CLAIMS

1. A method of determining charge loss of a refrigeration system comprising:

inputting a supply/return air temperature, ambient temperature, a box temperature, and a compressor speed into an electronic controller of the refrigeration system;

calculating a real-time air side temperature difference across an evaporator;

calculating a first air side temperature difference across the evaporator by applying an algorithm having a first T-Map representative of normal operating conditions;

confirming a detection prerequisite is satisfied;

calculating a second air side temperature difference across the evaporator by applying the algorithm having a second T-Map representative of a loss of refrigerant charge;

taking an action if the real-time air side temperature difference is less than the first air side temperature difference; and

taking an action if the real-time air side temperature difference is less than the second air side temperature difference.

2. The method set forth in claim 1 further comprising:

inputting an evaporator multi-speed fan speed.

3. The method set forth in claim 1, wherein the algorithm applies a polynomial.

4. The method set forth in claim 3, wherein the first and second T-Maps are pre-programmed into the controller and provide a curve fit of a plurality of constants versus compressor speed.

5. The method set forth in claim 4, wherein the plurality of constants are six constants applied to ambient temperature and box temperature variables as part of the polynomial.

6. The method set forth in claim 1, wherein the detection prerequisite is a measured compressor speed being greater than a predefined compressor speed.

7. The method set forth in claim 1, wherein the detection prerequisite is the first air side temperature difference being greater than a predefined temperature difference.

8. The method set forth in claim 1, wherein the detection prerequisite is that the first air side temperature difference is determined after a predefined time span from initial system startup and initial pulldown.

9. The method set forth in claim 1, wherein the detection prerequisite is one of a plurality of detection prerequisites and at least includes a measured compressor speed being greater than a predefined compressor speed, the first air side temperature difference being greater than a predefined temperature difference, and the first air side temperature difference is determined after a predefined time span from initial system startup and initial pulldown.

10. The method set forth in claim 1, wherein the first and second T-Maps are representative of evaporator air side temperature difference versus ambient temperature, box temperature, compressor speed and refrigerant charge.

11. The method set forth in claim 1, wherein the refrigeration system is a transcritical refrigeration system.

12. A refrigeration system comprising:

an electronic controller including,

pre-programmed first and second T-Maps both representative of evaporator air side temperature difference versus ambient temperature, box temperature, compressor speed and refrigerant charge operating conditions, and wherein the first T-Map is representative of normal operating conditions and the second T-Map is representative of a loss of refrigerant charge, and

pre-programmed prerequisites configured to be met prior to initiating an action based on a loss of refrigerant charge; and

wherein the electronic controller is configured to calculate first and second evaporator air side temperatures based on the respective first and second T-maps and initiates an action if the measured air side temperature difference is less than the second air side temperature difference.

13. The refrigeration system set forth in claim 12, wherein the refrigeration system is a transcritical refrigeration system.

14. The refrigeration system set forth in claim 13, wherein the refrigerant is CO2.