



<b>ATF-LS-FRL</b>		Published Online: <b>March 2018</b>
<b>FireTOSS Calculation Documentation Requirements</b>		
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This document lists the requirements for documenting and reviewing calculations that are incorporated into the compiled FireTOSS code that is used by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), Fire Research Laboratory (FRL). FireTOSS is the set of custom software applications that make up the FRL's Laboratory Information Management System (LIMS) [1]. The Calculations program is an application that uses instrument data and parameters to calculate engineering quantities and perform statistical analysis of experimental data. The program is run at the conclusion of every experiment that is run in the FRL. The Calculations program source code, and all required documentation, is maintained by a designee of the FRL Laboratory Section Chief (LSC). Changes to the Calculations program are tracked via SVN repository.

Documentation of the Calculations program falls into three categories: documentation and review of analysis subroutines, instrument review, and unit conversion review. Analysis subroutines contain the underlying engineering and statistical algorithms in the Calculations program. They shall be documented according to the requirements listed in the Computer Algorithm Documentation section below. Each analysis subroutine shall be subject to technical review according to the requirements listed in the Computer Algorithm Review section.

FireTOSS instruments for which engineering or statistical calculations are performed shall be subject to technical review according to the requirements listed in the FireTOSS Instrument Calculation Review section.

All unit conversions shall be subject to technical review according to the requirements listed in the FireTOSS Unit Conversion Section.

A list of all analysis subroutines, instruments, and unit conversions in the Calculations program shall be maintained by the (LSC) or designee.

### **Computer Algorithm Documentation**

The Computer Algorithm Documentation form provides the reader with a general understanding of the algorithm. The documentation, at a minimum, shall provide the following information:

- A general description of the program/routine which includes the following information:
  - Name of program / routine
  - Type (Standalone program or subroutine)
  - Unique identification (UI) number
  - A description of the purpose
  - Limitations of the algorithm
  - Language
- A list of input parameters, including the data type and units.
- A list of output parameters, including the data type and units.
- A list of error codes.
- A listing of the code.
- A revision history.

The document file name shall be structured as follows:

FRL Computer Algorithm Documentation\_Algorithm Name XXXX

where XXXX represents the Unique identification (UI) number assigned to that algorithm and Algorithm Name shall be replaced with the actual Algorithm Name.

### **Computer Algorithm Review**

Each analysis algorithm in the FireTOSS calculation program shall be subject to a technical review. The Computer Algorithm Review Form serves as a guide for this review. The review cannot be performed by the author of the algorithm. The review is divided into four components. The first component is a general review of functionality and a check on whether the code incorporated version control and was archived correctly. The second component is an administrative review of the Computer Algorithm Documentation Form to ensure that it is complete and accurate. The third component is a review of the code. The primary focus of this review component is to ensure that the code has been written in a way that makes sense -i.e. that meaningful variable name have been used and that it has been documented adequately. There is also a check to ensure that any underlying theory has been implemented correctly. The fourth review component consists of a comparison against independent code using a minimum of five data sets. The reviewer is encouraged to use data sets that test the limits of the algorithm.

The document file name shall be structured as follows:

FRL Computer Algorithm Review Form\_Algorithm Name XXXX

where XXXX represents the Unique identification (UI) number assigned to that algorithm and Algorithm Name shall be replaced with the actual Algorithm Name.

### **FireTOSS Instrument Calculation Review**

While each analysis algorithm is reviewed independently, the calculations program calls multiple subroutines for instruments associated with an experiment at the conclusion of each experiment. A review shall be performed to ensure that calculations are performed correctly and that data and parameters are stored correctly for each instrument. The FireTOSS Instrument Calculation Review Form is intended to serve as a guide for the review of calculations associated with individual instruments.

The document file name shall be structured as follows:

FRL FireTOSS Instrument Calculation Review Form - Instrument

where Instrument shall be replaced with the actual Instrument Name.

### **FireTOSS Unit Conversion Review**

Engineering quantities can be expressed in a wide range of units. FireTOSS uses a base system of units but has the capability to express quantities in alternate units. Quantities are expressed in alternate

units through a linear conversion. Each conversion shall be reviewed and the review shall be documented using the FireTOSS Unit Conversion Review Form.

The document file name shall be structured as follows:

FRL FireTOSS Unit Conversion Review Form

## **References**

1. FireTOSS LIMS Documentation, ATF Fire Research Laboratory.