



National Aeronautics and
Space Administration

George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

**STANDARD OPERATING PROCEDURE
FOR
DATA ACQUISITION
SOFTWARE VERIFICATION**

**ENVIRONMENTAL TEST FACILITY BRANCH
STRUCTURAL AND ENVIRONMENTAL TEST DIVISION
TEST LABORATORY
ENGINEERING DIRECTORATE**

THIS PROCEDURE DOES NOT CONTAIN HAZARDOUS OPERATION

**CHECK THE MASTER LIST—
VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE**

**STANDARD OPERATING PROCEDURE
FOR
DATA ACQUISITION
SOFTWARE VERIFICATION**

Originator: _____ Date: _____
David Kelley, Calibration Administrator, Environmental Test Facility, ET24

Co-Originator: _____ Date: _____
Robert C. Keener/SvT, Environmental Test Facility, ET24

Approval: _____ Date: _____
James R. Powers, Electrical Systems Manager, Environmental Test Facility, ET24

Approval: _____ Date _____
James R. Stephens, Acting Branch Chief, Environmental Test Facility, ET24

Marshall Space Flight Center ET24		
Standard Operating Procedure for Data Acquisition Software Verification	ET24-Software-SOP-001	Revision: Baseline
	Date: 2 May 2005, 2005	Page iii of iv

Release Date: <u>5 / 2 / 2005</u>	Marshall Space Flight Center Specification/Document Change Instruction	Page 1 of 1 _____.
	Spec. / Doc. No. ET24-Software-SOP-001	Copy No.:
Change No./Date	Replacement Page Instructions	
Baseline 5-2-2005	Initial issue for the ET24 Organization. Supersedes MSOP-SV-ETF-437	

CHECK THE MASTER LIST-VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

Marshall Space Flight Center ET24		
Standard Operating Procedure for Data Acquisition Software Verification	ET24-Software-SOP-001	Revision: Baseline
	Date: 2 May 2005, 2005	Page iv of iv

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE NUMBER</u>
1.0	GENERAL INFORMATION	
1.1	PURPOSE	1
1.2	SCOPE	1
1.3	APPLICABLE DOCUMENTS	1
1.4	SAFETY	1
1.5	EMERGENCY TELEPHONE NUMBERS	1
1.6	RESPONSIBILITIES	2
2.0	DESCRIPTION OF VERIFICATION PROCESS	2
3.0	SOFTWARE VERIFICATION	3
3.1	VERIFICATION PREPARATION	3
3.2	VERIFICATION OPERATIONS	3

APPENDIX A

Marshall Space Flight Center ET24		
Standard Operating Procedure for Data Acquisition Software Verification	ET24-Software-SOP-001	Revision: Baseline
	Date: 2 May, 2005	Page 1 of 4

1.0 GENERAL INFORMATION

1.1 PURPOSE

The purpose of this procedure is to direct verification of data acquisition software used for data acquisition at the Environmental Test Facility (ETF).

1.2 SCOPE

This procedure prescribes how to perform in-house verifications of the data acquisition software used in the ETF data acquisition computers, located in Buildings 4612, 4619 and 4620.

1.3 APPLICABLE DOCUMENTS

MPR 8715.1	Marshall Safety, Health, and Environmental (SHE) Program
ET24-ETF-OWI-001	Environmental Test Facility Test Operations

1.4 SAFETY

All test personnel working in this facility shall be familiar with the safety documents listed above, and shall report any safety hazards or unsafe practices to the ETF Branch Chief or the 4620/4619/4612 Building Manager Assistant.

1.5 EMERGENCY TELEPHONE NUMBERS

In case of an emergency, call **911**;

Medical	911
Ambulance	911
Fire	911
Security	911
Chemical Spills	911

Other numbers that can be used to obtain information about emergencies, security, and safety are:

Medical Center	544-2390
Security	544-4357
Safety	544-0046
Utilities	544-3919
Other Assistance	544-4357 (4-HELP)

CHECK THE MASTER LIST-VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

Marshall Space Flight Center ET24		
Standard Operating Procedure for Data Acquisition Software Verification	ET24-Software-SOP-001	Revision: Baseline
	Date: 2 May, 2005	Page 2 of 4

1.6 RESPONSIBILITIES

ETF personnel shall be responsible for the safe operation during software verification. These responsibilities include safety for personnel and the facility.

Other task assignments and responsibilities at the ETF shall be in accordance with ET24-ETF-OWI-001.

2.0 GENERAL DESCRIPTION OF VERIFICATION PROCESS

Before use, the calibration standard must have a current calibration sticker from the NASA/MSFC Calibration Lab or valid calibration documentation from the vendor.

The calibration standard is connected to a single thermocouple input channel on the scanner. The scanner is operated through the data acquisition computer running the current data acquisition software to be verified. With the data acquisition computer, the scanner is commanded to sense the input channel voltage and transmit this measurement data to the computer. The computer displays the data in degrees Fahrenheit or degrees Celsius for observation by the person performing the verification. Note that since only the one output from the voltmeter is being verified, only one card slot and card channel is needed for the verification.

The calibration equipment is defined on the Buy-off Sheet.

Three temperature levels are sequentially output from the calibration standard, each level manually selected by the person performing the verification. As each temperature level is output by the calibration standard and input to the scanner, the “temperature” signal voltage is:

- Sensed by the scanner,
- Transmitted by the scanner to the computer,
- Received by the computer, and
- Displayed by the software,

The person performing the verification records the input temperature level selected and the temperature displayed on the computer. **The software shall be deemed verified or in need of revision based on the differences (errors) between the displayed temperature values and the calibration source temperature values.**

The difference limit is the limit of error associated with standard Type E, K or T thermocouple wire, used at the ETF. The limit of error is specified for each input “temperature” as:

CHECK THE MASTER LIST-VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

Marshall Space Flight Center ET24		
Standard Operating Procedure for Data Acquisition Software Verification	ET24-Software-SOP-001	Revision: Baseline
	Date: 2 May, 2005	Page 3 of 4

- 300°F/149°C standard input, data acquisition system (DAS) reading between 298°F/148°C and 302°F/150°C;
- 32°F/0°C standard input, DAS reading between 30.2°F/-1°C and 33.8°F/1°C;
- -300°F/-184°C standard input, DAS reading between -310°F/-190°C and -295°F/-182°C

3.0 SOFTWARE VERIFICATION

The data acquisition software used at the ETF is verified using a calibration standard with Type E, K or T thermocouple simulation. The verification methodology is presented in the following paragraphs. This verification shall be performed in accordance with the ETF organizational work instruction (OWI). After completion of the following verification process, Appendix A shall be maintained as a quality record in accordance with the ETF Master List.

Verification has no time limit and is valid as long as there are no changes in the data acquisition system. Data acquisition software shall be verified when the data acquisition software, the computer, the data scanner or the operating system software are changed or modified.

3.1 VERIFICATION PREPARATION

- 3.1.1 Set up the calibration standard to output a millivolt signal for a Type E, K or T thermocouple.
- 3.1.2 Power **ON** the calibration standard and allow it to warm for 5 minutes.
- 3.1.3 Switch **OFF** the scanner used in the verification.
- 3.1.4 **CONNECT** the calibration standard output to the Type E, K or T thermocouple input . Make input connection to the calibration standard at the Source input jacks, maintaining like polarity with input leads.
- 3.1.5 Switch **ON** the scanner used in the verification.
- 3.1.6 Setup the data acquisition software to display temperature data from the channel to which the calibration standard is attached.

3.2 VERIFICATION OPERATIONS

CHECK THE MASTER LIST-VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

Marshall Space Flight Center ET24		
Standard Operating Procedure for Data Acquisition Software Verification	ET24-Software-SOP-001	Revision: Baseline
	Date: 2 May, 2005	Page 4 of 4

- 3.2.1 Start the software, and display the data for the input channel that the calibration standard is attached. Record the name and version of the software on the verification record (Appendix A).
- 3.2.2 Set the calibration standard to output a signal corresponding to +300°F or 149°C, and wait for display to be updated.
- 3.2.3 Record on the verification record (Appendix A) both the temperature output from the calibration standard and the temperature displayed on the computer.
- 3.2.4 Repeat steps 3.2.2 and 3.2.3 using +32°F or 0°C.
- 3.2.5 Repeat steps 3.2.2 and 3.2.3 using -300°F or -184°C.
- 3.2.6 Ensure all entries on the verification record are completed. Especially the determination of whether or not the software is considered verified or failed. This depends on the differences between the temperature values output by calibration standard and the temperatures displayed on the computer. Allowable differences are specified in section 2.0 of this procedure. If the scanner fails calibration, have it repaired or turn-in as surplus.
- 3.2.7 Switch **OFF** the scanner.
- 3.2.8 Remove the Type E, K or T thermocouple input used during the verification.
- 3.2.9 Re-connect the test chamber Type E, K or T thermocouple to the scanner if it was removed at the beginning of the calibration procedure.

CHECK THE MASTER LIST-VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

Marshall Space Flight Center ET24		
Buy-Off Sheet to Standard Operating Procedure for Data Acquisition Software Verification	ET24-Software-SOP-001	Revision: Baseline
	Date: 2 May, 2005	Page 1 of 1

Data Acquisition Software Verification

Environmental Test Facility / ET24

Date verification performed: _____

Person performing the verification: _____

Computer Equipment Control Number (ECN): _____

Calibration standard ECN: _____

Scanner ECN: _____

Calibration due date of the calibration standard: _____

Name of the data acquisition software: _____

Version or release of software: _____

Scanner slot No. : _____ Scanner channel No.: _____

Display the above specified Type E, K or T thermocouple input on the computer.

For the calibration standard, use the High, Midrange, and Low outputs for a Type E, K or T thermocouple as the verification of the computer data.

Complete the temperature matrix below for each output from cal. standard:

	Cal. Standard Temp.	DAS Temp.	Pass/Fail
High Output			
Midrange Output			
Low Output			

Include Units (F or C)