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

EM50-OWI-024
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# ORGANIZATIONAL WORK INSTRUCTION

# EM50

# OPERATION OF

# SOC400 FT-IR SPECTROMETER

# Revision D

| APPROVING AUTHORITY | NAME | TITLE | ORG | DATE |
|---|---|---|---|---|
| Group Leader | DeWitt Burns | Environmental Effects Branch | EM50 | 4/27/2005 |

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

# DOCUMENT HISTORY LOG

| Status (Baseline/ Revision/ Canceled) | Document Revision | Effective Date | Description |
|---|---|---|---|
| Baseline | | 12-10-01 | Baselined OWI |
| Revision | A | 01-15-03 | Revised to clarify warnings/cautions, to include sample handling comments, and to include training by certified operators |
| Revision | B | 02-10-04 | Revised to correct an inaccurate reference identification, and to include training by certified operators and SOC representatives. |
| Revision | C | 08-25-04 | Revised per HQ Rules Review Action. |
| Revision | D | 04/27/05 | Changes made due to reorganization |

OPERATION OF SOC400 FT-IR SPECTROMETER

## 1. SCOPE

### 1.1 Scope.

This document establishes the organizational work instruction for operation of the Surface Optics Corporation Model 400 FT-IR Spectrometer (SOC400).

### 1.2 Purpose.

The purpose of this document is to outline the steps necessary for obtaining FT-IR spectra using the SOC400 Spectrometer and it's accessories.

### 1.3 Applicability.

This document applies to the SOC400 FT-IR Spectrometer used by EM50. This work instruction is not a substitute for formal training in SOC400 operation. Untrained personnel shall not attempt to use this document to operate the SOC400 unless supervised by trained, certified operators.

## 2. APPLICABLE DOCUMENTS

| | |
|---|---|
| | Surface Optics SurfaceIR™ Operations Manual |
| | Grams/32™ Operations Manual |
| | SOC400 Portable FT-IR User Guide by Paul Shelly, Boeing Commercial Airplanes |
| MPD 1280.1 | Marshall Management Manual |
| EM50-OWI-002 | Document and Data Control |
| EM50-OWI-003 | Control of Quality Records |
| EM50-OWI-004 | Control of Customer Supplied Product |
| MPR 8730.5 | Control of Inspecting, Measuring, and Test Equipment |

## 3. DEFINITIONS

Warning - Warnings are used when failure to observe instructions or precautions could result in injury to personnel.

Caution - Cautions are used when failure to observe instructions could result in damage to equipment.

Note - Information to help clarify multi-person procedures or simultaneous multiple operations.

# 4. INSTRUCTIONS

Work performed and data generated within EM50 that affects the quality of products as specified in the scope of MPD 1280.1 shall be documented and controlled per EM50-OWI-002.

## 4.1 Instrument Purge Requirement

Use a purge of missile-grade air or dry, high-purity nitrogen to ensure that absorbencies due to moisture and carbon dioxide are minimized. Use a flow rate of 15 standard cubic feet per hour (SCFH) plus/minus 10 SCFH.

To prevent moisture or other contaminants from condensing within the optics system, the purge shall be maintained or the instrument shall be stored in a dessicated environment when power has been disconnected.

Caution – Maintain a dry environment when power has been disconnected.

## 4.2 Selection and Installation of Analysis Accessory

4.2.1 Install the appropriate analysis accessory based on guidelines provided in the SOC400 Portable FT-IR User Guide. Analysis accessories that require contact with the sample shall not be used if there is potential for transfer of contamination from the sample to the instrument. The Material Contamination Team Lead shall be consulted prior to initiation of any analysis where potential transfer of contamination to the instrument is a concern.

Caution – Ensure that the instrument is not used in contact mode when there is potential for transfer of contamination from the sample.

4.2.2 To change the analysis accessory:

4.2.2.1 Turn the instrument power switch located on the back of the SOC400 to the “OFF” position.

4.2.2.2 Disconnect power to the 12-volt power supply.

Warning – Remove electrical power to the SOC400 during removal/installation of analysis accessories.

4.2.2.3 Install the selected accessory according to directions provided in the SOC400 Portable FT-IR User Guide.

4.2.2.4 Reconnect power to the 12-Volt power supply.

4.2.2.5 Restart the instrument by pressing the power switch while the instrument is lying on its side.

4.2.2.6 Allow from 15 minutes minimum for the instrument detector to warm up.

4.3 Pre-Test Preparation

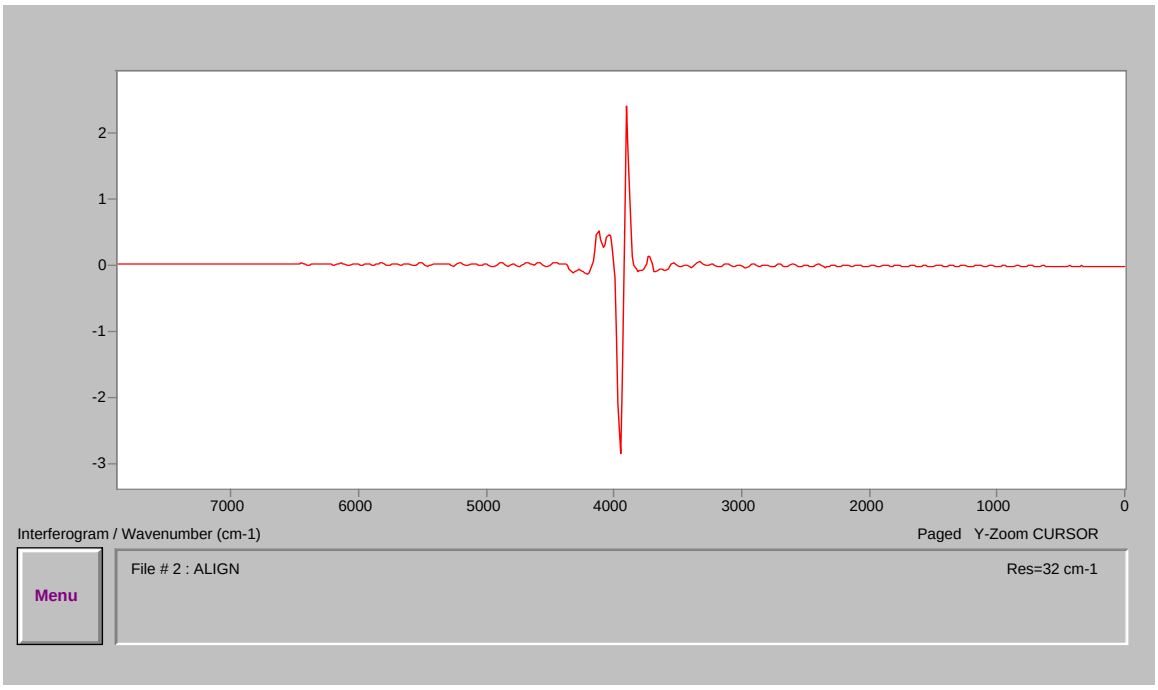
If the selected analysis accessory uses a manually controlled aperture, ensure that the aperture diameter is adjusted to prevent the detector from becoming overheated. The aperture diameter shall be reduced if the interferogram peak-to-peak magnitude for the reference standard reaches or exceeds the limits of the interferogram display. Methods for viewing the interferogram display vary depending upon the software used to run the instrument, as follows:

Caution – Ensure that the detector does not become overheated.

SurfaceIR™ Software – Select “Measurement” pull-down menu, then select “Instrument Alignment”.

Grams/32™ Software – Select “Collect” pull-down menu, then select “Alignment Scanning”.

An example acceptable interferogram is shown below:




Note – The detector interferogram peak-to-peak magnitude should be evaluated using the baseline reference standard from which the background spectrum will be obtained.

## 4.4 Sample Analysis

4.4.1 Samples shall be handled using clean, approved gloves.

4.4.2 Identify the sample to be analyzed. If it is a customer-supplied sample, it shall be logged per document EM50-OWI-004.

4.4.3 Select analysis parameters. Example parameter settings for each accessory are provided in the SOC400 Portable FT-IR User Guide.

4.4.4 If a non-contact analysis technique is being employed, adjust the standoff between the instrument and sample to optimize the signal reaching the detector. To determine the optimized standoff distance, monitor the detector interferogram signal strength as the sample is slowly moved closer to and then away from the analysis accessory. The standoff distance is optimized when the interferogram peak-to-peak magnitude is maximized without overloading the detector (Section 4.3).

4.4.5 If a contact analysis technique is being employed, ensure that the entire aperture of the analysis accessory is covered by the sample. Also ensure that there is no potential for the instrument to become contaminated (Section 4.2.1). Evaluate the detector signal interferogram to confirm that the detector is not overloaded (Section 4.3).

4.4.6 Perform sample analysis as follows:

4.4.6.1 Obtain a background spectrum from an appropriate baseline standard. A baseline standard shall be a clean sample of the same material type and surface finish as the potentially contaminated sample, or a gold reference standard.

4.4.6.2 Analyze the sample. For a contact analysis, hold the sample against the accessory aperture. For a non-contact analysis, hold the sample at a constant, optimized (Section 4.4.4) distance from the analysis accessory.

## 5. NOTES

None.

## 6. SAFETY PRECAUTIONS AND WARNING NOTES

This work instruction is not a substitute for formal training in SOC400 operation. Untrained personnel shall not attempt to use this document to operate the SOC400 spectrometer unless supervised by trained, certified operators.

## 7. APPENDICES, DATA, REPORTS AND FORMS

When evaluating flight hardware or conducting in-process inspection of quality sensitive components, a data sheet shall be filled out with test results. This data shall be presented to Quality personnel for stamping. MSFC Quality may choose whether or not to be present for the sample analysis.

## 8. RECORDS

Records shall be retained in accordance with Document EM50-OWI-003. Copies are to be maintained in EM50 for a period of not less than 2 years.

## 9. TOOLS, EQUIPMENT, MATERIALS

As required.

## 10. PERSONNEL TRAINING AND CERTIFICATION

The leader of the Environmental Effects Group shall be responsible for ensuring that all personnel using the SOC400 FT-IR Spectrometer are trained. Training is accomplished by on-the-job training with experienced personnel, by SOC representatives and by certified operators. Records of personnel training shall be kept in the group office.