Conostan FTIR Operational Test Standard Analysis Methods and Procedure

for the Digilab Oil Analyzer and Oil Analysis Systems

I. Introduction

The Conostan FTIR Operational Test Standard is a petroleum-based fluid similar to routine oil samples analyzed by Fourier Transform Infrared (FT-IR) spectroscopy as part of a condition monitoring program. This fluid was designed for routine operational checks on a FT-IR spectrometer to ensure consistent values are reported. The installation floppy disk contains the analysis methods and information necessary to perform these tests. Note that as the Conostan Operational Test Standard is not a used lubricant nor used hydraulic fluid, the routine analysis methods for analyzing used fluids by FT-IR are not appropriate. These test standard methods and information are used to monitor important regions and responses in the infrared spectrum of the test standard, and changes from the normal or expected results obtained on the same or similar instruments with the same test standard lot number should be investigated.

II. Installation

The Conostan Operational Test Standard method procedure and method information files can be loaded onto an unmodified Digilab Oil Analyzer or Oil Analysis system (software version 2.1) via a standard "Setup" program. After the method information is loaded, the Type Equipment Code (TEC) table is manually edited to add a new TEC which will cause the Operational Test Standard analysis to be applied when such a sample is analyzed. The following steps will install the software and set up the TEC table for routine operation:

A. If you have any anti-virus software running, you should temporarily disable it as the installation process may generate false alarms. If viruses are a concern, you should use your virus scan software to scan the floppy disk before installing.

B. Insert the floppy disk in the drive, and then from the Windows Task bar, select Start, then Run. In the "Run" dialog box, enter "A:\SETUP".

C. Step through the installation prompts. Note that if you are loading this onto a system where you have modified the analysis method procedures, you should select a default directory other than "C:\WIN_IR\JOAP.INF". See the Modified Installation Notes (V) at the end of this document for further instructions for loading onto a modified system.

D. After the installation procedure is complete, remove the floppy disk and reactivate your anti-virus detection software (if it was disabled in step A).

E. Start the Digilab Oil Analysis software (if not already running), and then select "Other Functions"

F. In the Supervisor Mode, select "TEC Table Access"

G. In the dialog box at the lower half of the screen, enter the following information in these boxes:

Code:	XXCX
Method:	IR Operational Test (pull-down selection)
Component Model:	Conostan
End Item:	IR Std.

You should not change the "Entry" field, this will be automatically generated.

H. After the above information is entered, click the "Add" button (middle button in the middle group of three). The TEC Table Editor will check to ensure that the TEC "XXCX" has not already been used, then give you a final prompt to add the new TEC. Select "Add Entry".

I. Select "Save" (middle button in the right group of three). The TEC table will be sorted and saved. After the table is sorted and saved, select "End" (right button in the right group of three).

J. Select "Return to Analysis Mode". You are now ready to run a Conostan FTIR Operational Test Standard on your FT-IR Oil Analyzer.

III. Operation

The Conostan FTIR Operational Test Standard should be run on the Oil Analyzer using the same scanning conditions and sample identification procedures as is used for routine samples. The only change is that the Operational Test Standard should be entered using a TEC of "XXCX" to automatically select the IR Operational Test method procedure. The sample ID can be either a sequential number or other identifier, or a special ID to indicate a test standard. ***The Conostan standard lot number should be entered into the component serial number field for later reference and report interpretation.*** You should consult your routine laboratory procedures for any additional necessary information.

If you are using a manual or semi-automated oil analyzer, follow the routine prompts to load, scan, analyze, and clean out the sample. If you are using an autosampler, place the sample bottle in the correct location in the sample tray. After the Operational Test Standard is run, a report will be generated which can be printed, saved, or transmitted to a central database.

IV. Interpretation

After analysis, a report similar to the example shown in Figure 1 is generated. (If such a report is not automatically printed on the printer or found in the C:\WIN_IR\SPEC.REP directory, check the "Reporting and Output Options" in the Supervisor mode.) The 13 measurement regions should remain relatively constant from one test to the next, but some run-to-run variance is expected. The individual regions are highlighted graphically in Figures 2 and 3, and the individual details of the measurement areas, with their meanings, are as follows:

Region	**Area (cm^{-1})**	**Left Baseline (cm^{-1})**	**Right Baseline(cm^{-1})**	**Report**
1	4000 to 3950	No baseline	No baseline	As measured
2	2025 to 1975	No baseline	No baseline	As measured
3	664 to 637	No baseline	No baseline	As measured
4	3500 to 3150	Minimum between 4000 to 3950	Minimum between 2025 to 1975	As measured
5	1700 to 1600	Average value from 1775 to 1725	No baseline	As measured
6	1027 to 1007	Average value from 1058 to 1050	Average value from 992 to 976	As measured
7	1088 to 1069	Average value from 1107 to 1096	Average value from 1057 to 1045	As measured
8	1177 to 1169	Average value from 1281 to 1258	Average value from 1107 to 1096	As measured
9	1220 to 1211	Average value from 1281 to 1258	Single point at 1107	As measured
10	1381 to 1374	Average value from 1408 to 1393	Average value from 1281 to 1258	As measured
11	837 to 829	Average value from 818 to 798	No baseline	X 10
12	633 to 621	Minimum between 660 and 636	Minimum between 621 to 575	As measured
13	946 to 926	946	926	X 10

Notes for Regions

Region 1: This measures the general offset from zero absorbance in this area. Values that deviate from the expected values, or which fluctuate from one test to

the next on the same test standard lot, may indicate alignment problems with the spectrometer.

Region 2: This measures the general offset from zero absorbance in this area. Values that deviate from the expected values, or which fluctuate from one test to the next on the same test standard lot, may indicate alignment problems with the spectrometer or partial blocking of the infrared beam by an improperly positioned sample cell.

Region 3: This measures the general offset from zero absorbance in this area. Values that deviate from the expected values, or which fluctuate from one test to the next on the same test standard lot, may indicate partial blocking of the infrared beam by an improperly positioned sample cell.

Region 4: This measures the area of the spectrum where hydrogen-bonded O-H species (such as water) may absorb infrared energy. Values outside the expected range in this area may indicate contamination of the check sample from absorbed atmospheric water vapor. The lot number and date of the check sample should be checked, and discarded if it is too old or has been opened for too long.

Region 5: This measures the area of the spectrum where petroleum-based products show infrared absorbance from oxidation and nitration products, as well as some additive components. Values outside the expected range in this area may indicate contamination by water, or of the sampling system by previous samples or wash solvent.

Region 6: This measures the area of the spectrum where many important additives and contaminants absorb infrared energy. Values outside the expected range in this area may indicate contamination of the sampling system by previous samples or wash solvent.

Region 7: This measures the area of the spectrum where many important additives and contaminants absorb infrared energy. Values outside the expected range may in this area may indicate contamination of the sampling system by previous samples or wash solvent.

Region 8: This measures the area of the spectrum where many important additives and contaminants absorb infrared energy. Values outside the expected range in this area may indicate contamination of the sampling system by previous samples or wash solvent.

Region 9: This measures the area of the spectrum where many important additives and contaminants absorb infrared energy. Values outside the expected range in this area may indicate contamination of the sampling system by previous samples or wash solvent.

Region 10: This measures the area of the spectrum where the base oil hydrocarbons absorb infrared energy. Values outside the expected range in this area may indicate improper cell filling, contamination of the sampling system by previous samples or wash solvent.

Region 11: This measures the area of the spectrum where many fuel contaminants absorb infrared energy. The measured integrated area is multiplied by 10 for clarity. Values outside the expected range in this area may indicate contamination of the sampling system by previous samples or wash solvent.

Region 12: This measures the area of the spectrum where few contaminants and additives are expected to absorb infrared energy. Values outside the expected range in this area may indicate contamination of the sampling system by previous samples or wash solvent.

Region 13: This measures the area of the spectrum where excessive heptane wash solvent contamination will produce a response. The measured integrated area is multiplied by 10 for clarity. This reading should be 1 or 0, values above 1 may indicate excessive heptane contamination from inadequate cell washing and drying.

Sample: OpChk1 TEC: XXCX
Lab ID: PoEn Base ID: WMA

Component Model #: Op. Check
Component Serial Number: N/A
End Item: IR Std.
End Item Serial Number: N/A
Time Since Fluid Change: 0
Total Component Operating Hours: 0
Lube (Analysis) Type: IR Performance Check

Date: 4/27/2000 Time: 21:45:38 Release 2.1

Region	Parameter	Expected Range	Result
Check Region 1	High Baseline	0 to 3	2
Check Region 2	Mid Baseline	0 to 3	1
Check Region 3	Low Baseline	0 to 5	2
Check Region 4	3300 Response	0 to 65	33
Check Region 5	1650 Response	6 to 11	9
Check Region 6	1015 Response	5 to 9	7
Check Region 7	1080 Response	1 to 5	3
Check Region 8	1173 Response	3 to 7	5
Check Region 9	1215 Response	2 to 6	4
Check Region 10	1376 Response	4 to 9	6
Check Region 11	833 Response	5 to 9	7
Check Region 12	627 Response	0 to 4	2
Check Region 13	932 Response	0 to 1	1

Notes and Warnings

No Warnings Generated

Figure 1. Example Report for Conostan FTIR Operational Test Standard

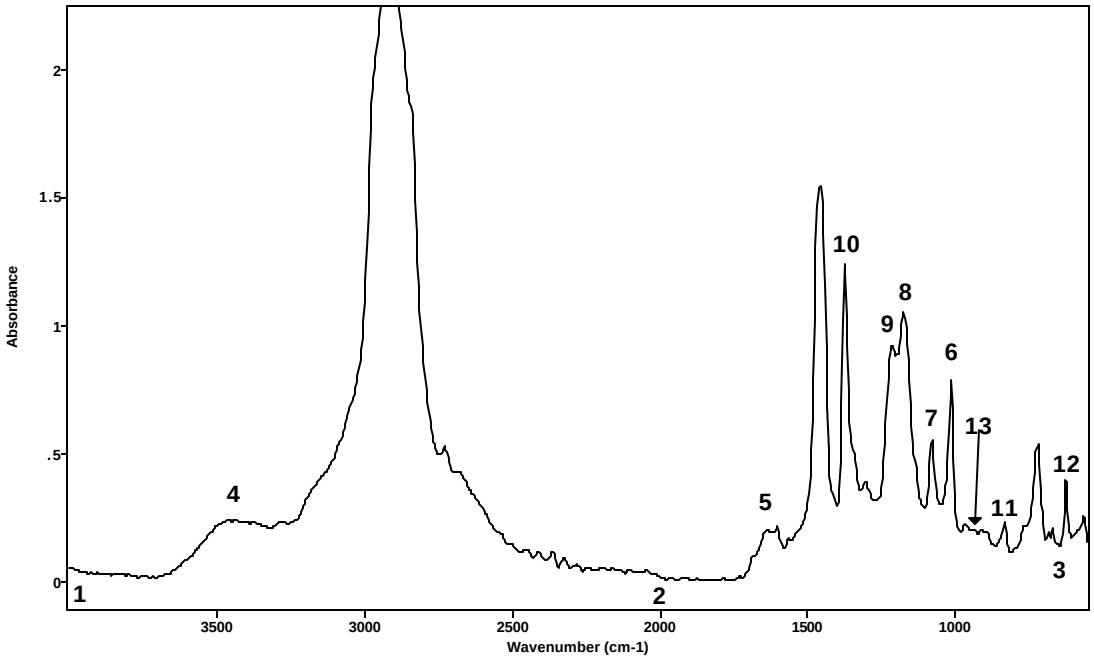

Figure 2. IR spectrum showing regions measured for the Conostan FTIR Operational Test Standard method procedure

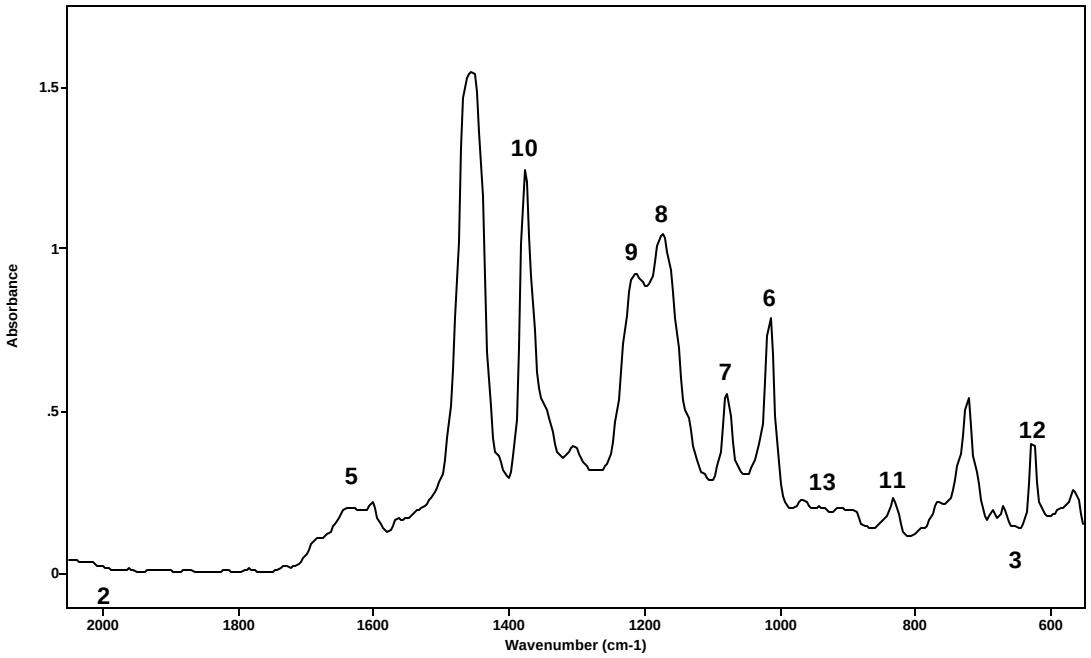

Figure 3. IR spectrum (expanded ~2000 to 550 cm^{-1} showing regions measured for the Conostan FTIR Operational Test Standard

V. Modified Installation Notes

The following steps should be taken in order to load the Conostan FTIR Operational Test Standard method information files onto a system where the default method information files have been modified. These instructions assume a familiarity with Windows 95 / 98 and the Digilab Oil Analysis software Expert Mode. You should refer to the Windows and Digilab Oil Analysis manuals for further information.

A. After starting the installation process, you will be presented with a screen to "Chose Destination Location". The default directory into which this software will be installed is C:\WIN_IR\JOAP.INF. Chose another destination directory to load the method information files, such as C:\WIN_IR\TEMP, by using the "Browse" button. If a suitable temporary does not exist, you can manually type it in the "Path:" box followed by selecting the "OK" button to create the new temporary directory.

B. After the temporary path has been set, click the "Next" button to install the files, followed by "Finish" to close the setup program.

C. In the Windows Explorer, locate the temporary directory used above. Select the 13 files QuantBasic method files named "irtst1.q" through "irtst14.q". (Note there is no file named "irtst12.q".) Drag these files into the standard method information directory C:\WIN_IR\JOAP.INF. Note this assumes you have not previously created any QuantBasic files with the same name, if so, you should rename your original QuantBasic files and edit the appropriate method procedure(s) to use the new names before continuing.

D. In the Digilab Oil Analysis software, exit to the Expert Mode, and then run the Method Procedure Builder program "BLD_PRO.AB". Select "Create New", and then enter the method procedure name of "IR Operational Test" followed by "OK".

E. In the Method Procedure Builder Editor, type some random text into the fields "Method File", "Text" and "Warning Text". It does not matter what it typed, they will only be used as temporary "placeholders". After some text has been entered, select the "Save" button.

F. Select the "New Procedure" button. Count the number of Method Procedures shown in the text box (including the one you just created at the end), and then subtract one. This is the method index number for the method you just created. For example, if the text box shows 12 Method Procedures, the new index number would be 11. Exit the Method Procedure Builder.

G. Switching back to the Windows Explorer, locate the file called "METH10.PRO" in the temporary directory created in step A. Rename this

file using the new method index number calculated above in step F. For example, if the new method index number is 11, this file will be renamed "METH11.PRO".

H. Using the Windows Explorer, drag this renamed ".PRO" file into the directory C:\WIN_IR\JOAP.INF. Answer "Yes" to the "Confirm File Replace" dialog to replace the temporary placeholder created in step E above.

I. Delete the three remaining files in the temporary directory (Methlist.tbl, _deisreg.isr and _isreg32.dll). These are no longer needed. The temporary directory can also be deleted, if desired.

J. Continue the installation procedure from Step II D above.