# Environmental Protection Agency

## Horiba Emission Analysis System
## Tracer Gas Injection Procedure

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### NVFEL Reference Number

009C

### Implementation Approval

Original Procedure Authorized by EPCN #247 on 02-21-2000

### Revision Description

(1)   03-14-2000   The purpose of this change is to revise the procedure as described in EPCN #277. All steps affected by this change are identified with (1) in the margin.

(2)   09-18-2001   The purpose of this change is to update the Group Responsible name per EPCN #316

(3)   11-13-2002   The purpose of this change is to update the Group Responsible name per EPCN #337

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1.     **Purpose**

The purpose of this working procedure is to describe the equipment and steps required to perform a Propane Injection Procedure on the Horiba Emission Analysis System, Series 7200, using a Critical Flow Orifice (CFO) kit.


2.     **Test Procedure**

101     Turn on the test site air handling system and wait a minimum of 15 minutes for the site temperature to stabilize.

102     Place a CFO kit with a valid calibration sticker in the test cell and allow the kit temperature to stabilize for a minimum of 20 minutes.

103     In the test cell:
remove the cover of the cleanout port and insert the kit rosette in the cleanout port at the bottom of the tunnel assembly

or disconnect the exhaust pipe and place the kit rosette in the exhaust pipe.

104     In the control room, ensure that the Power Tech computer is powered up and VXIN is turned on according to the VXIN startup procedure.

105     On the Power Tech computer, select "CVS Blower" from the soft panel at the bottom of the screen.   See the arrow in Figure 1.
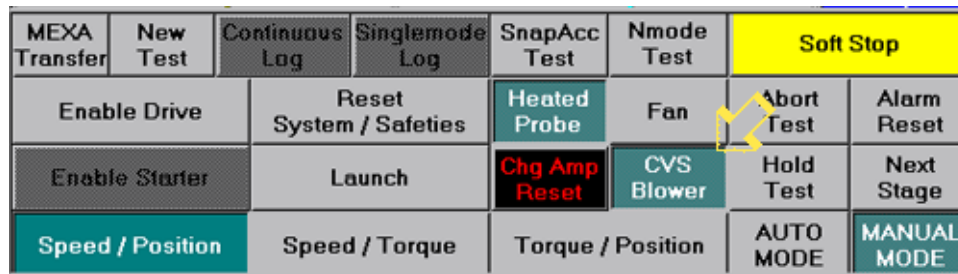


Figure 1
CVS Blower Screen

(1)     106     On the Power Tech computer secondary display screen Heated Probes subpanel, select "Dilute" to turn on the heated probe.  See the arrow in Figure 2.
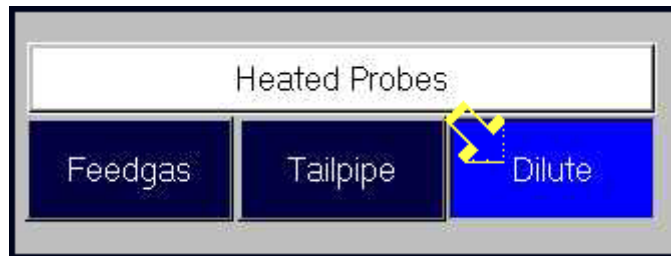


Figure 2
Heated Probe On

107    Ensure the Horiba Emission Analysis System is powered up according to the Horiba startup procedure and that the Horiba computer command screen is displayed.

108    On the Horiba computer command screen, select the "THC" button for the MEXA analyzer. See the arrow in Figure 3. Select "Cal" from the menu displayed. See the circle in Figure 3. An automatic zero span calibration procedure will begin (green=zero, blue=span).
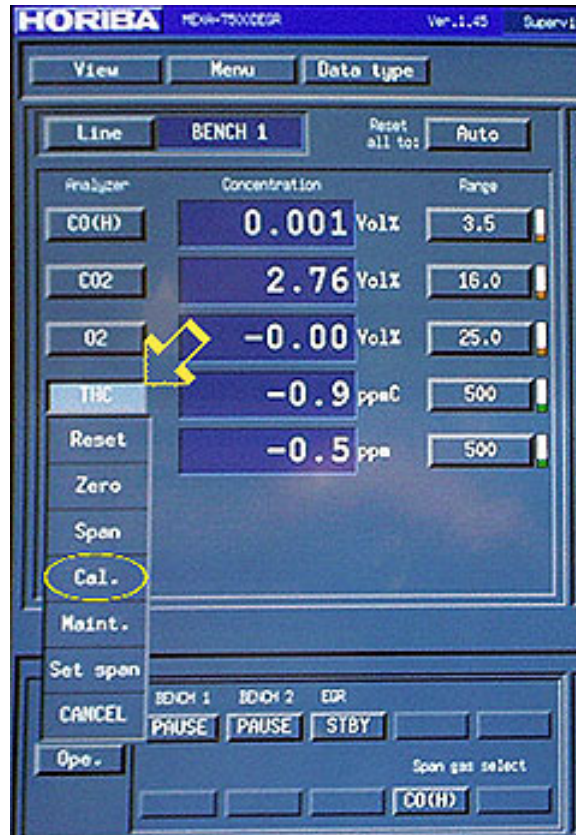


Figure 3
Cal Selection Screen

109     Ensure that the test processing computer is powered on.

Open the Excel program.

From the file menu, select Open, C:/calibration/propanes.xls.

110     Select "Propane2,YY.MM.DD.dil.xls" from the list of files.
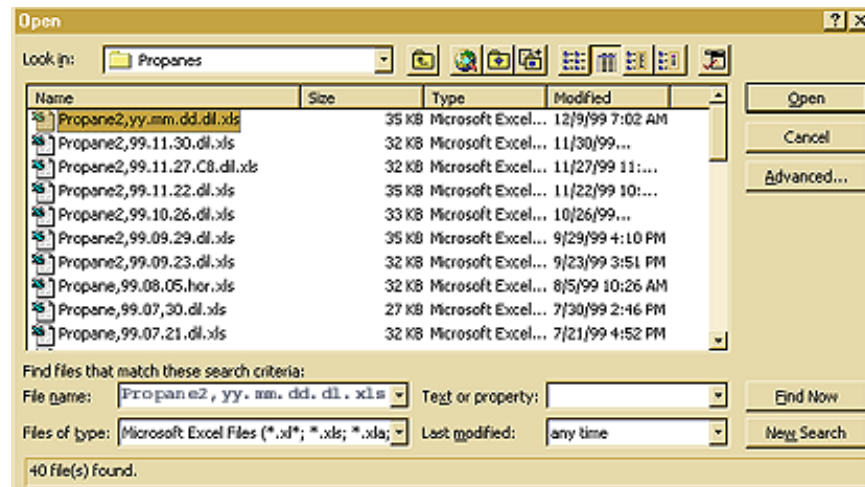
See the highlighted file name in Figure 4.



Figure 4
Open File Screen

111     On the "PROPANE PROCESSOR Input Data" screen, select each yellow field type listed underneath the categories listed below and use the keyboard to enter the appropriate information:

Test Date, see the arrow labeled A in Figure 5

Test Time, see the arrow labeled B in Figure 5

Operator ID, see the arrow labeled C in Figure 5

CVS ID, see the arrow labeled D in Figure 5

CFO Property ID, see the arrow labeled E in Figure 5

Analyzer (PRE CAT, POST CAT, DILUTE), see the arrow labeled F in Figure 5



Figure 5
Propane Processor Input Data

112     On the "PROPANE PROCESSOR Input Data" screen, check the "CFO Calibration
        Coefficients" in column 5, rows 105, 106, and 107 against the current coefficients
        listed on the CFO kit.  If they are the same, proceed to the next Step.  If they are not
        the same, change the screen coefficients to those listed on the CFO kit.  See the
        circle in Figure 6.



Figure 6
CFO Calibration Coefficients

113     Check barometer in Large Soak, return to the computer and enter the data in the
        yellow field under "Baro Pressure" on the "PROPANE PROCESSOR Input Data"
        screen.  See the arrow in Figure 7.



Figure 7
Barometer Pressure Input Data

114     On the Power Tech computer, select "Menu" at the top of the screen.  Select "Upper Display" from the menu that appears.  Select "TGI" from the next menu.

115     On the Power Tech computer select "Mexa Transfer" in the soft panel at the bottom of the screen.  See the arrow in Figure 8.



Figure 8
Mexa Transfer Screen

116     On the Power Tech computer, check the CVS flow reading in the field next to "qvEpacvsBoxcar"  See the arrow in figure 9.  The data will be used in the next step.



Figure 9
qvEpacvsBoxcar

117      On the test processing computer "PROPANE PROCESSOR Input Data" screen in the yellow field under "Flow Reading, enter the data from Step 116.  See the arrow in Figure 10.



Figure 10
Flow Reading Input Data

118      Select the "Ope." button under "Line" in the lower left corner of the Horiba Main Control Unit (MCU).  See the arrow in Figure 11.  The line selector panel will appear.  Select the button below the line for the bench under test.  From the next menu, select the line for dilute measurement.



Figure 11
Ope Selection Screen

119    Select the "Sample" button under "Line" in the lower left corner of the Horiba
       MCU.  See the arrow in Figure 12.
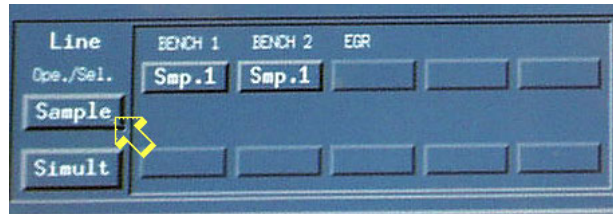


Figure 12
Select Sample Screen

"Ope." will return under "Line"

120    In the lower left corner of the Horiba MCU, select  "Standby".  See the arrow in
       Figure 13.  Select "Measure" from the menu panel that appears.  See the circle in
       Figure 13.



Figure 13
Measure Screen

121     On the Power Tech computer, check the background reading in the field next to
""conHC" field  See the circle in Figure 14.  The data will be used in the step 123.



Figure 14
conHC Screen

122     In the lower left corner of the Horiba MCU screen, select the "Standby" button.  See
the arrow in Figure 15.  Select "Reset" from the menu that appears.  See the circle in
Figure 15.  The sample pump will shut off.
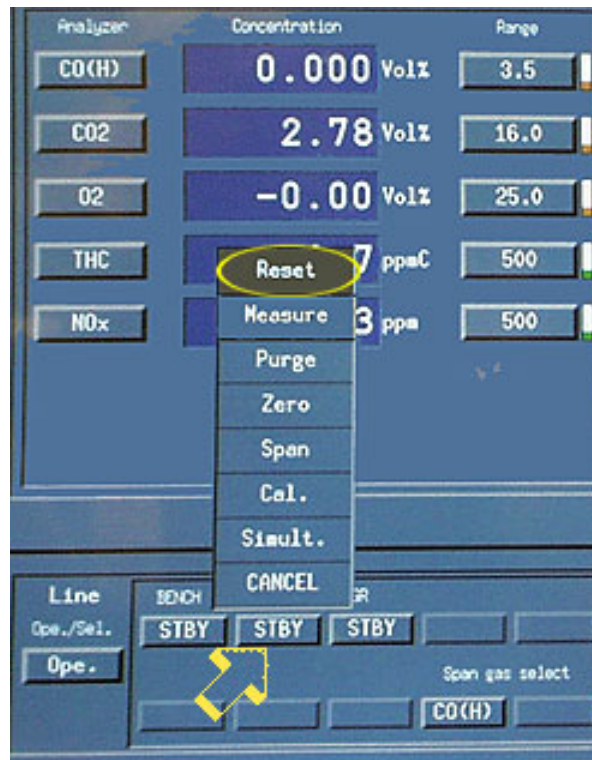


Figure 15
Reset Screen

123     On the test processing computer "PROPANE PROCESSOR Input Data" screen in the yellow field under "Bkgd Reading", enter the data from Step 121.  See the circle in Figure 16.



Figure 16
Bkgd Reading Input Data

(3)     124     Return to the test cell and verify that the CFO kit pressure reading needle is at zero. If not, adjust it to zero.

To ensure that you reading the CFO kit pressure reading correctly, use the mirrored surface on the face of the gauge and align the needle so you do not see the reflection of the needle.  See Figure 17 for proper alignment.  See the arrow in Figure 18 for an example improper needle alignment.  Notice that there is no reflection of the needle in the mirrored surface when properly aligned.

Proper alignment of the needle ensures that you get the correct pressure readings. Use this method for a setting and reading zero and sample pressures.



Figure 17
Properly Aligned CFO Pressure Needle Reading
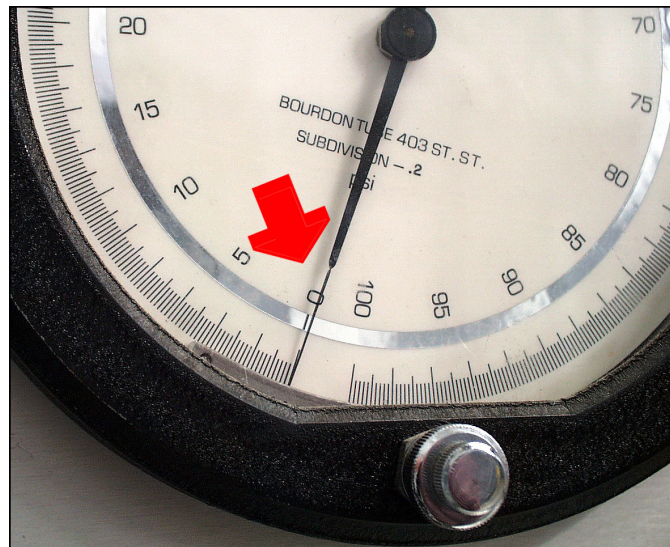
Figure 18
Improperly Aligned CFO Pressure Needle Reading

125       Open the valve on the CFO kit propane tank.  Use the regulator on top of the bottle to adjust the pressure to 90 ±5 psi.  See Figure 19.  Allow a minimum of 10 minutes for stabilization.  Read the set pressure again and verify that you are within ±5 psi of 90 psi.
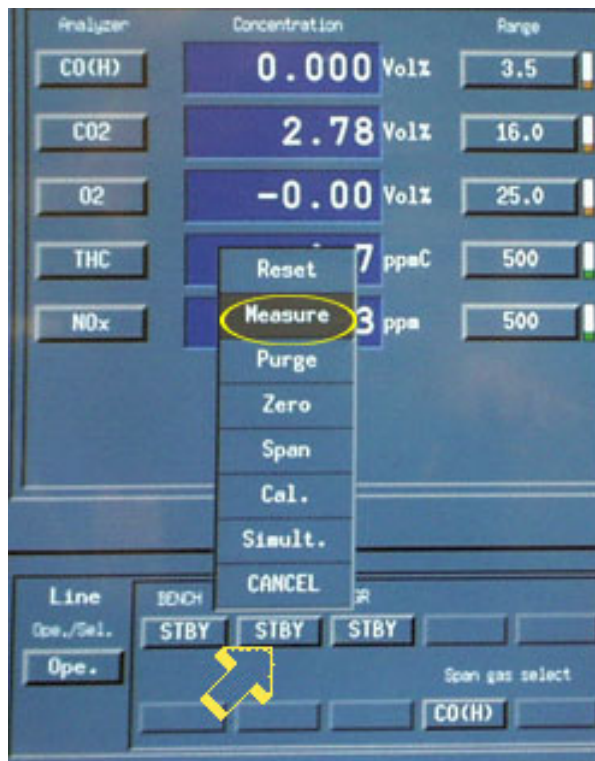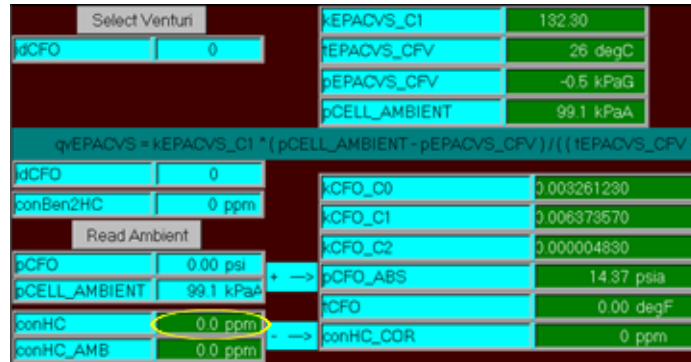


Figure 19
Propane Tank

126　　　In the lower left corner of the Horiba MCU, select "Standby." See the arrow in Figure 20. Select "Measure" from the menu panel. See the circle in Figure 20.
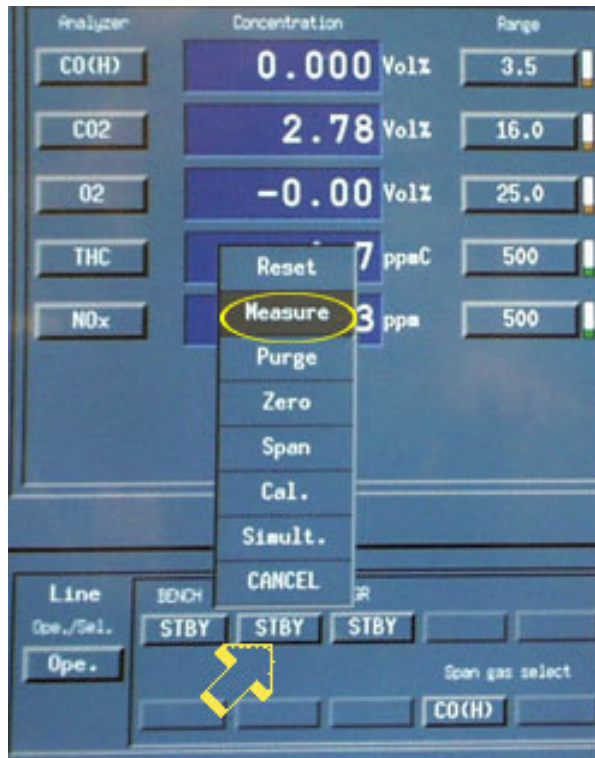


Figure 20
Measure Selection Screen

127     Return to the test cell and take the pressure and temperature reading from the CFO
        kit.  See the arrows in Figure 21.  The data will be used in Step 128.



Figure 21
Critical Flow Orifice Kit

128     On the test processing computer "PROPANE PROCESSOR Input Data" screen in
        the yellow cells below "CFO Temp (F)" and "Gauge Press", enter the temperature
        and pressure data from Step 127.  See the circle in Figure 22.



Figure 22
CFO Temp & Gauge Press Input Data

129     On the Power Tech computer, check the sample reading in the field next to
        ""conHC" field.  See the circle in Figure 23.



Figure 23
conHC Sample Reading Screen

130     On the test processing computer "PROPANE PROCESSOR Input Data" screen in
        the yellow field under "Sample Reading", enter the data from the Step 129.  See the
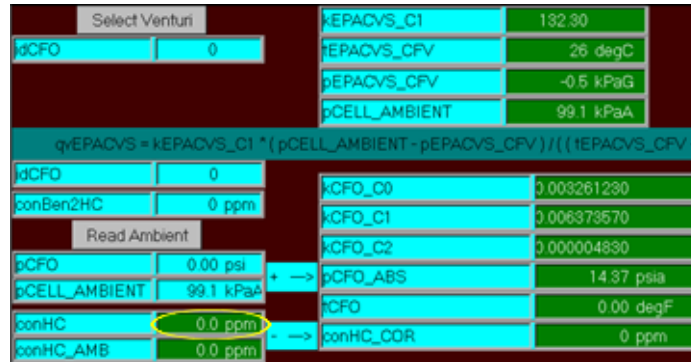        circle in Figure 24.



Figure 24
Sample Reading Input Data

131     On the test processing computer keyboard, press <Enter>.  The Excel spreadsheet
        program will automatically calculate and display the results in the form of percent-
        of-error below the "Error" cell.

        Verify that the result under "Error" is equal to or less than ±2%.  See the circle in
        Figure 25.  If it is, proceed to the next step.

        If the error is greater than ±2.0%, contact a senior technician for further instructions.

| 19 |  |  |  | Results |
|----|--|--|--|---------|
| 20 |  |  |  |  |
| 21 | Injected Mass Rate |  |  | Error |
| 22 | 1.63079031 |  |  | -1.09004633 |
| 23 | Recovered Mass Rate |  |  |  |
| 24 | 1.61301394 |  |  |  |
| 25 |  |  |  |  |

Figure 25
Percent of Error Display

132     Select "File" on the test processing computer screen, then select "Print" from the
        menu displayed.  Select "Print" in the printer dialog box.

133     Place the printout in the site Propane Calibration folder.

134     Select "File" on the test processing computer screen, then select "Save as" from the
        menu displayed.  In the "Save as" dialog box, select the file name
        "Propane2.yy.mm.dd.dil.xls" which will then appear in the file name box at the
        bottom of the dialog box.

135     Edit the file name by using the keyboard to enter  the year, month and date of the
        test in the yy.mm.dd format.  Use the mouse to select  the "Save "button.

136     Select "File" on the test processing computer screen, then select "Exit" from the
        menu displayed.  When the dialog box, "Do you want to save the changes you made
        to Propane2.yy.mm.dd.dil.xls?" appears, select the "No" button.

137     On the test processing computer, close remaining screens until the standard desktop
        remains.  If further tests are not scheduled, shut down the computer.

138     Return to the test cell and close the valve on the propane tank.

139 Select "Displays" from the top portion of the Power Tech computer screen and select "Upper displays" from the menu. Select "EPAX_TDD" from the next menu.

140 Return to the test cell and ensure that the CFO kit pressure has fallen to zero.

141 In the control room, on the soft panel portion of the Power Tech computer screen select "CVS Blower" to turn it off. Select "Heated Probe" to turn it off. If further tests are not scheduled, perform the VXIN shutdown procedure.

(1) 142 On the Power Tech computer Heated Probes subpanel, select "Dilute" to turn off the heated probe. See the arrow in Figure 26. If further tests are not scheduled, perform the VXIN shutdown procedure.
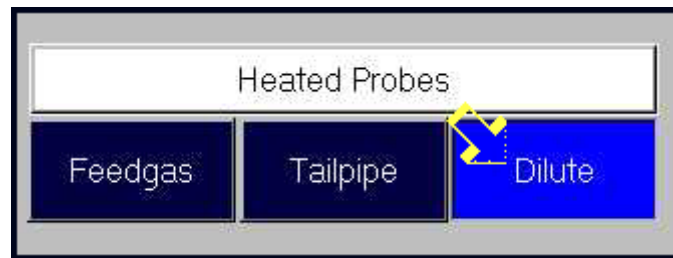
Figure 26
Heated Probe Off

143 If further tests are not scheduled, turn off the air handling.

144 Return the CFO kit to the appropriate storage area.

## 3. Acceptance Criteria

3.1 Allow the test site temperature to stabilize for a minimum of 15 minutes before starting the procedure.

3.2 The CFO propane kit used must have a valid calibration sticker.

3.3 Allow the CFO propane kit temperature to stabilize for a minimum of 20 minutes after it has been moved into the test site.

(3) 3.4 The CFO kit pressure reading needle must be properly set to zero after temperature stabilization and before the valve is opened.

3.5 Allow a minimum of 10 minutes for the propane tank to stabilize after opening the valve and adjusting the pressure to $90 \pm 5$ psi.

3.6 The percent of error must be equal to or less than $\pm 2.0\%$ (displayed under "Results" on the "Propane Processor" data screen).