



# TELEDYNE INSTRUMENTS

*Advanced Pollution Instrumentation*

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## Service Note

#94-009  
2 May, 2007

### Changing M200 from High to Low Concentration

#### Scope

- A. This document provides a procedure to change the M200 NOx Analyzer from High Concentration (any or all ranges in excess of 100PPM) to Low Concentration (all ranges lower than 100PPM).

#### Tools

- A. Phillips screwdriver
- B. Solder Iron and Solder
- C. 7/16 and 9/16" wrench
- D. Pot Adjuster or small flat-blade screwdriver
- E. Laptop or other Computer with RS-232 port running Procomm or equivalent terminal program.
- F. Flowmeter capable of measuring up to 800 CC/min.

#### Procedure

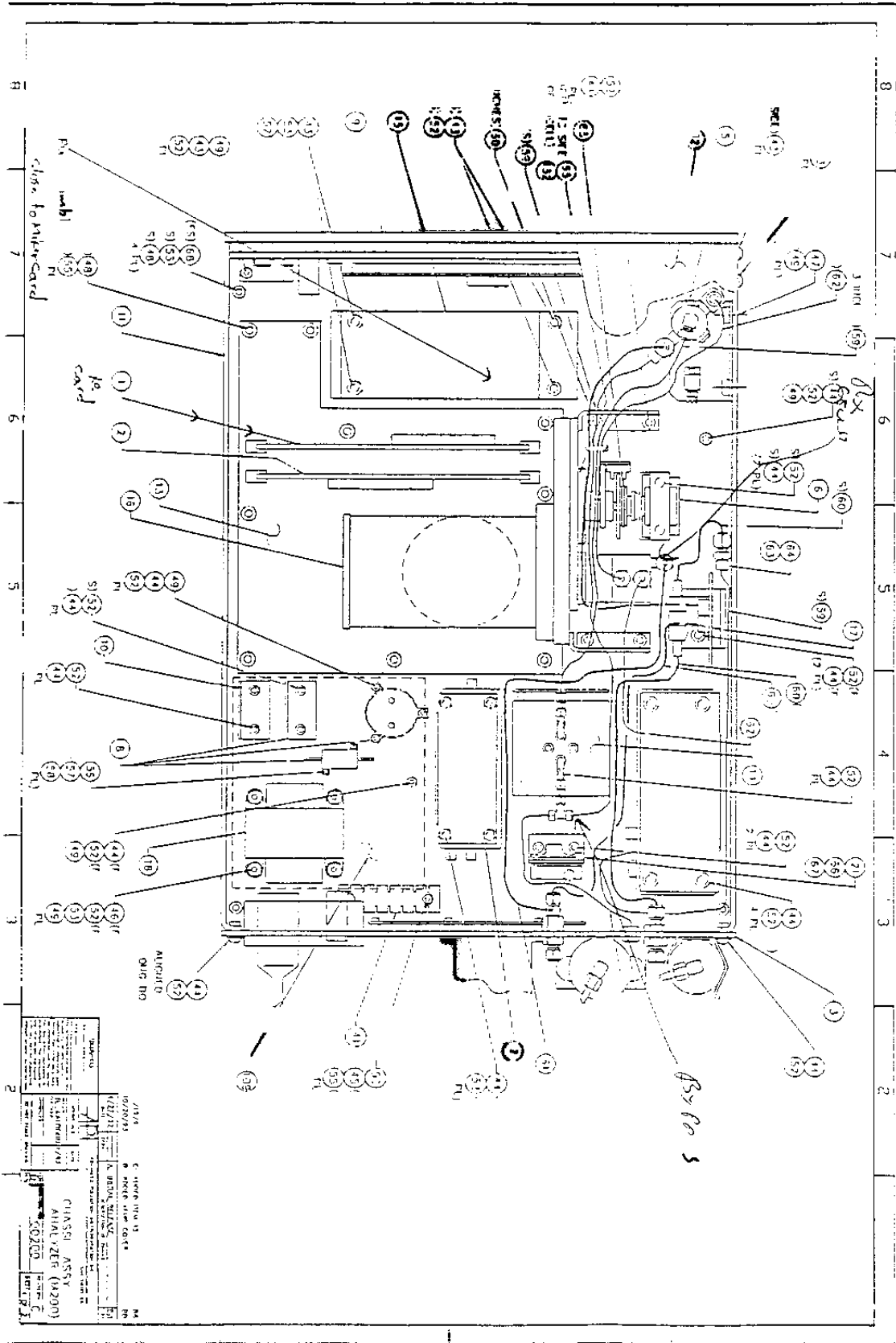
- A. Turn power off to M200
- B. Remove Bypass option by disconnecting 1/8" fittings from the tee on the bypass and installing a 1/8", union (if applicable).
- C. Remove the mixer card and change three resistors:
  - 1. R30 to 23.7K ohm, 1%
  - 2. R17 to 21K ohm 1%
  - 3. R9 to 2.49K ohm 1%This will put the mixer into physical ranges as follows:
  - 1. Physical range 0=500, phys. range 1=1000, phys. range 2=10000 PPB.
- D. Check the reaction cell. There will be an orifice marked .004". The other will either be .010 or .007". If you have the .007", you will have to change the orifice to a .012". Contact the factory to arrange for delivery (Part # 00197-1). If you have the .010", orifice you can leave it as is, or install the .012" to reduce analyzer zero noise.

- E. If it is necessary to change the orifice, remove the reaction cell as follows:
1. Disconnect the heater connector and remove two 1/8", and one 1/4" tubes from the reaction cell.
  2. Remove 4 screws and the reaction cell can be withdrawn from the analyzer.
  3. Remove the 1/8" fitting for the orifice you need to swap and remove the spring, filter, o-rings and orifice from the manifold.
  4. Re-assemble the manifold by installing the o-ring, orifice o-ring, filter, spring and fitting.
  5. Install the Rcell back on the sensor housing.
- F. After installing the Rcell onto the sensor housing, find the 1/8" black tube from the switching valve and connect this tube to the .010" or .012" orifice you installed.
- G. Connect the 1/8" black tube from the ozone generator to the .004" orifice.
- H. After reinstalling the mixer and Rcell, turn power on. Select the test function HVPS=XXX. Adjust the HVPS to 700 VDC. Leak check the analyzer at this time to assure all is okay.
- I. Attach the vacuum pump and measure the sample and dry air flows. Write them down.
- J. Select the test function "O3 flow=XXX CC/min. Adjust R3 of the Flowmeter PCB until the displayed flow matches the measured flow.
- K. Press SETUP-MISC-MORE and enter the Password. Press FLOW and set the Sample Flow warning Low to 300. Set Sample Flow warning High to 1000. Set O3 Flow warning Low to 50 and O3 Flow warning Hi to 150. Press EXIT until you are in the Sample menu.
- L. Connect the RS232 from your computer to the analyzer.
- M. Input the command "V PHYS - RANGE0=500" without the quotes. The analyzer should respond with XXX:XX:XX 0000 PHYS-RANGE0=500 (0-1000) or a similar message. Where = :XX:XX is the Julian day and the time in 24 hour time.
- N. Input 'IV PHYS - RANGE1=1000" and 'IV PHYS-RANGE2=10000". The analyzer should respond again, telling you these ranges are set.

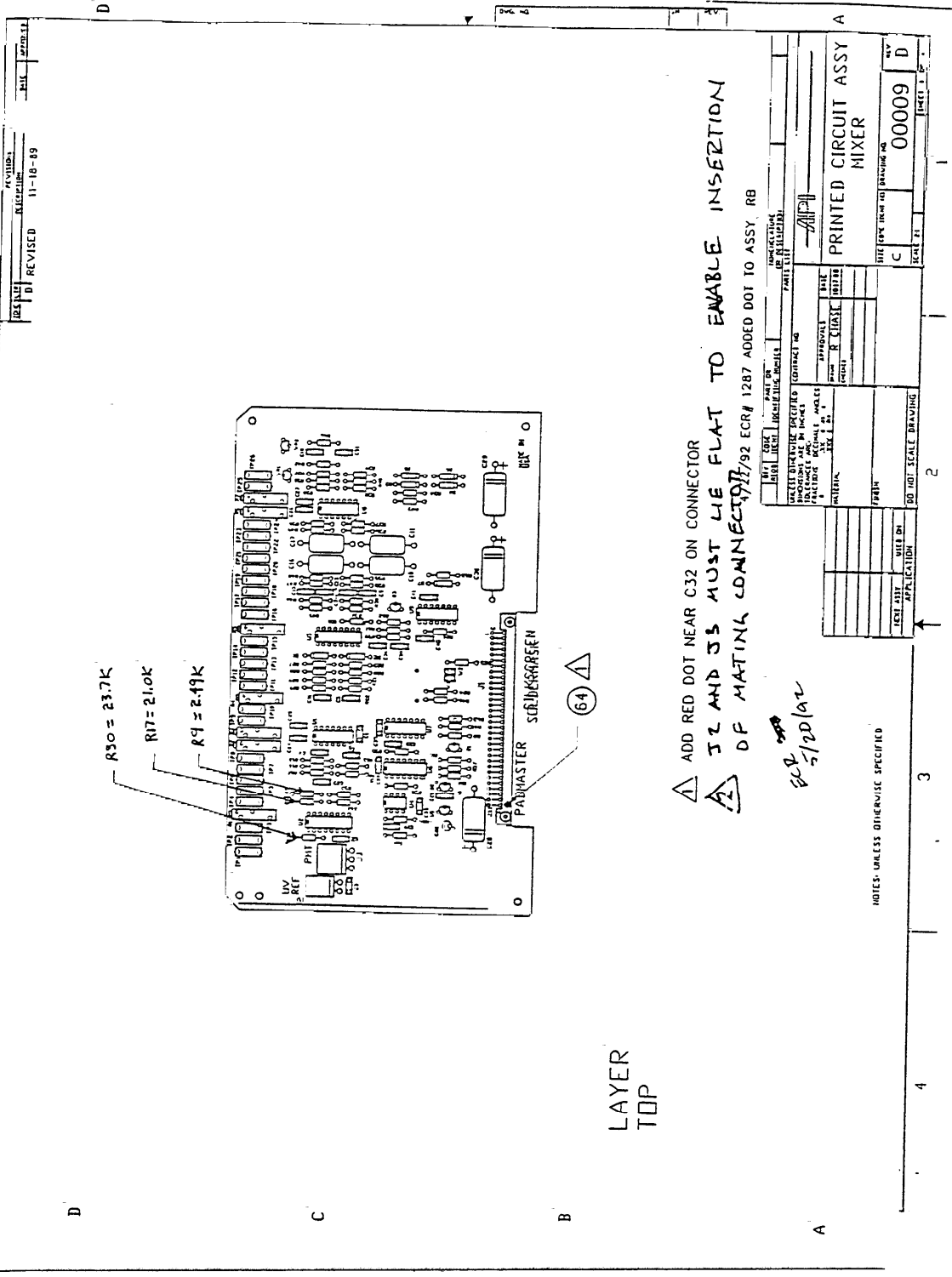
- O. Input the following command: 'IV SFLOW - SET=500". Select the test function SAM FLOW =XXX CC/min. Subtract the displayed flow from the measured flow and add the difference to 500. Input 'IV SFLOW - SET=XXX" where XXX is the calculated flow from above. This should make the displayed flow read close to the actual flow. You can make a slight adjustment to correct it using R1 of the Flowmeter PCE.
- P. Use the Quick Cal procedure to calibrate the Model 200 analyzer.

9/23/94

G:\DOC\admin\kaylen\200H12LO.DCT



DATE	1/27/73	BY	J. J. [unclear]
DESCRIPTION	CLASSICAL ASSY MILITARY ZER (42200)		
REV	1	DATE	1/27/73
REV	2	DATE	1/27/73
REV	3	DATE	1/27/73
REV	4	DATE	1/27/73
REV	5	DATE	1/27/73
REV	6	DATE	1/27/73
REV	7	DATE	1/27/73
REV	8	DATE	1/27/73
REV	9	DATE	1/27/73
REV	10	DATE	1/27/73
REV	11	DATE	1/27/73
REV	12	DATE	1/27/73
REV	13	DATE	1/27/73
REV	14	DATE	1/27/73
REV	15	DATE	1/27/73
REV	16	DATE	1/27/73
REV	17	DATE	1/27/73
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REV	59	DATE	1/27/73
REV	60	DATE	1/27/73



REV D  
REVISED 11-18-89

R30 = 23.7K  
R17 = 2.10K  
R9 = 2.49K

LAYER TOP

ADD RED DOT NEAR C32 ON CONNECTOR  
J2 AND J3 MUST LIE FLAT TO ENABLE INSERTION  
DF MATING CONNECTOR 1287 ECR# 1287 ADDED DOT TO ASSY. RB

TEST UNIT APPLICATION	DATE DR	DD FORM 1 SCALE BRANDING
		2
		3
		4
NOTES: UNLESS OTHERWISE SPECIFIED		
PART NO. 70011111 CONTRACT NO. 70011111 DATE 10/18/88 APPROVED BY R. KILPATRICK MATERIAL 100% MIL-STD-883C FRSN PRINTED CIRCUIT ASSY MIXER 00009 SHEET 1 OF 1 REV D		

## MODEL 200 NOX ANALYZER "QUICK CALIBRATION CHECK"

NOTE: capitalized words are messages on the analyzer front panel.

1. Select the range the analyzer will be calibrated for.
  - a. From the SAMPLE menu, press <SETUP> to enter the SETUP menu. (See Figure 1 for appearance of front panel in SAMPLE mode and Figure 2 for front panel in SETUP mode).
  - b. Press <MISC>.
  - c. Press <RANGE>.
  - d. Enter the PASSWORD <818>.
  - e. Press <PMT>.
  - f. Select the range, for example, 500 ppb, then press <ENTR>.
  - g. Press <EXIT> 3 times to return to the SAMPLE menu.
  
2. Store the concentration of span gas in the analyzer.
  - a. On the front panel, enter the SETUP menu.
  - b. Press <IZSC> (Internal Zero/Span and Calibrate menu).
  - c. Enter the PASSWORD (if enabled) <818>.
  - d. Press <SPAN>.
  - e. The NO, analyzer reads the concentration of two components, namely NO, and NO. The expected span values for each of these must be entered in the analyzer. Enter the concentration of NOX into the analyzer then press <ENTR>.
  - f. The analyzer will then prompt for NO span concentration. Type this value into the keyboard and press <ENTR>. The values for NOX and NO should be approximately 80% of the selected range, such as 400 ppb and the 500 ppb range or about 800 ppb and the 1000 ppb range.
  - g. Press EXIT 2 times to return to the SAMPLE menu.
  
3. Adjust the PMT output to read span concentration entered in step 2 above.

NOTE: Step "all is not normally needed to span the analyzer. It is included here in case the span pot (R2) shifted during shipment.

  - a. With a known concentration of span gas in the analyzer, say, 400 ppb of NO span gas on the 500 ppb range, adjust the gain on the mixer card until the PMT TEST function reads the correct value.
    - i. Look up the concentration of span gas on the y-axis of the chart in Figure 3. (400 ppb is located on the y-axis.)
    - ii. Follow the concentration horizontally to the plotted line, then determine the x-axis value at that point. For 400 ppb, the value is 3.1 which is the voltage required at TP24.

## MODEL 200 NOX ANALYZER "QUICK CALIBRATION CHECK"

- iii. Adjust R2 on -the mixer card until the PMT TEST function is -the correct value on the front panel. (For example, 3100 mv, or the voltage at TP24 equals  $3.1 \pm 10\%$  volts.)
  - iv. There will be between 40 and 200 mv of noise. Adjust R2 so that the noise is centered around the appropriate voltage. For 3100 mv, the noise might then go from 50 mv above that voltage to 50 mv below it.
- b. On the front panel in the SAMPLE menu press <CALM> and enter the password <818>. The front panel SAMPLE and CAL indicator lights flash when the analyzer is in CALM mode.
  - c. Press <SPAN>.
  - d. Press <ENTR> when the analyzer output is stable. This usually should be about 10 minutes after the span gas is connected to the sample inlet port.
  - e. The NO, and NO output on the front panel should now read the concentration of span gases entered in Step 2 above. If the concentration is still drifting, wait until the concentrations become stable and again press <ENTR>.
  - f. Check slopes: Should be  $7.5 \pm .3$ .
4. Adjust the analyzer zero point.
- a. Input zero air into the sample port.
  - b. Adjust R7 so that the noise, probably about 100 mv, is centered around zero.
  - c. Press <CALM> from the SAMPLE menu and enter the PASSWORD <318>.
  - d. Press <ZERO>.
  - e. After a stable reading has been obtained, press <ENTR>. (It usually takes about 10 minutes for the reading to stabilize near zero.) The front panel should now read 0 pb for NO, NO<sub>x</sub>, and NO<sub>2</sub>.
  - f. Check Offsets: Should be  $0.0 \pm 50$ .

NOTE: Electric test and optic test may require adjustment. Instructions for adjusting them are included in case they shifted during shipment.

5. Adjust Electric Test au,--nut value.
- a. From SAMPLE menu press <SETUP>.
  - b. Press <DIAG> to enter the diagnostic menu and enter PASSWORD <313>.
  - c. Press <NEXT> until ELEC TEST appears an the front panel.
  - d. Press <OFF> switch. The switch will change to <ON> and the test will begin.
  - e. Wait about 5 min. for readings to stabilize.

## MODEL 200 NOX ANALYZER "QUICK CALIBRATION CHECK"

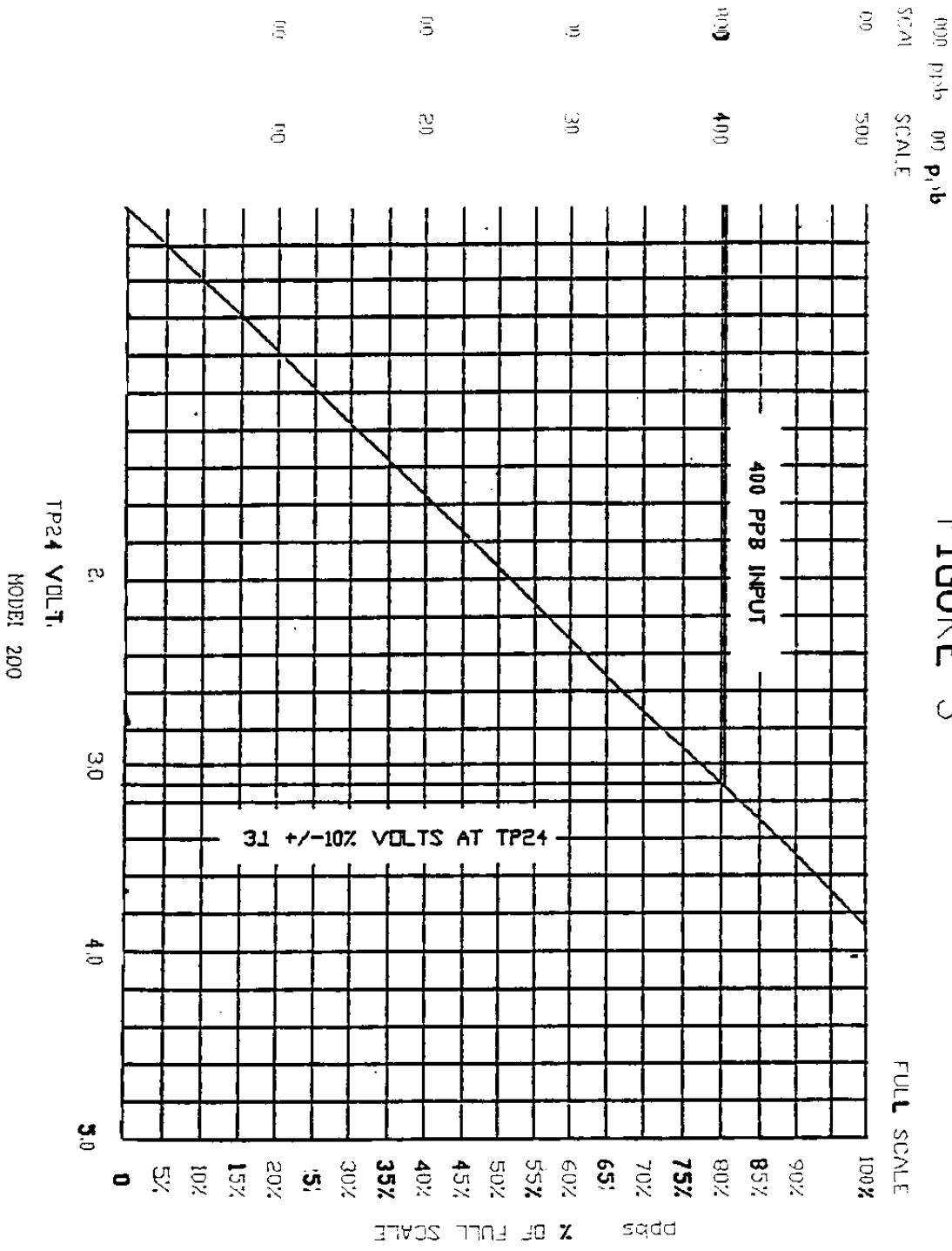
- f. Adjust R5 to read  $3.0 \pm 1$  t TP24 or 3000 mv for PMT voltage on front panel.
  - g. Press <ON> switch and test will turn off.
  - h. Be sure to note new electric Test Value for checking (periodically).
6. Adjust optic test output value.
- a. From SAMPLE mode press <SETUP>.
  - b. Press <DIAG> to enter the diagnostic menu and enter PASSWORD <818>.
  - c. Press <NEXT> until OPTIC TEST appears on the front panel.
  - d. Press <OFF> switch to change front panel to <ON>. The test will begin.

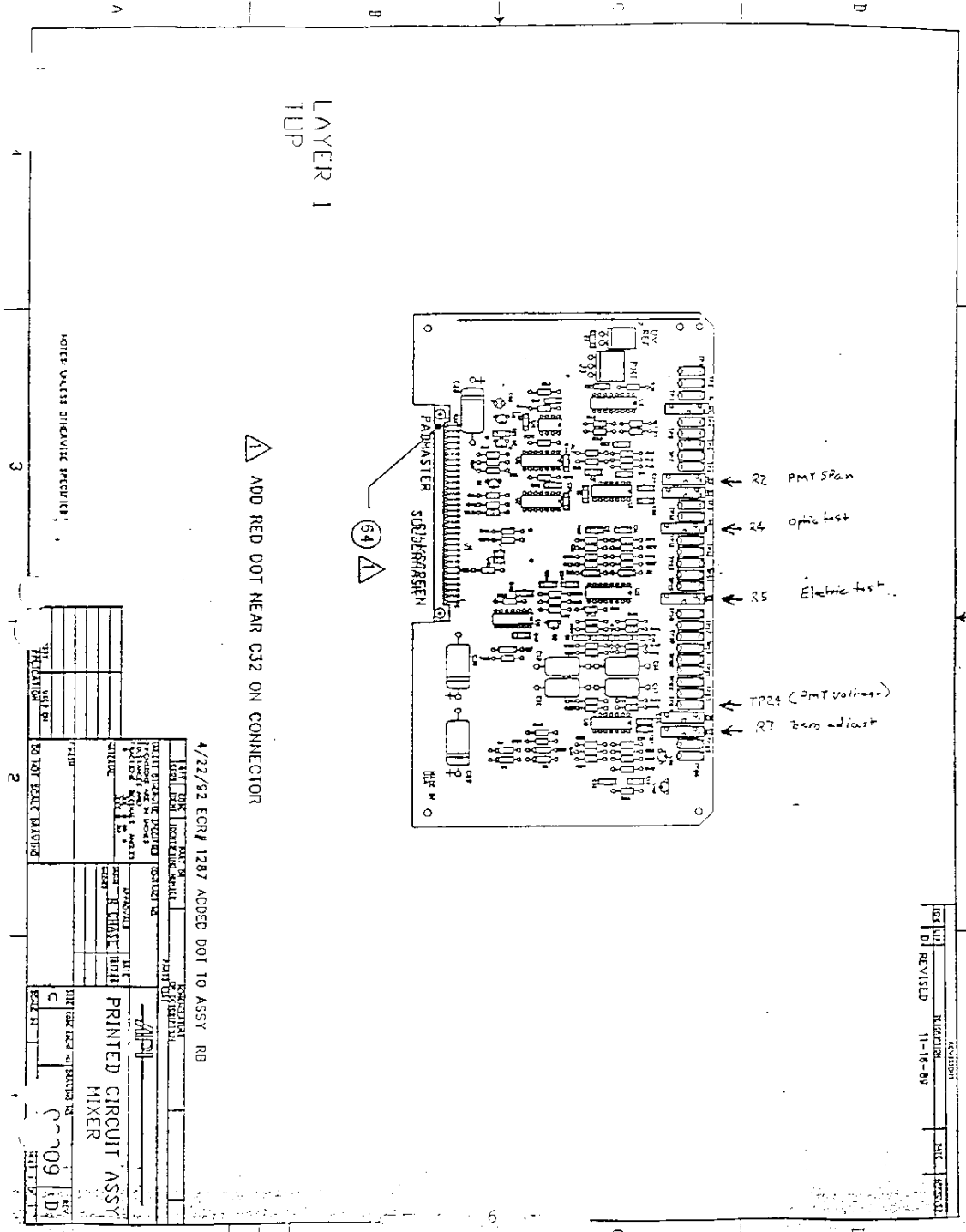
NOTE: When optic test is ON, the IZS valves switch to admit zero gas (for analyzers with the IZS option), otherwise ZERO GAS MUST BE COMING IN THE SAMPLE PORT.

- e. Adjust R4 to  $2.0 + 1$  V at TP24 or 2000 mv for PMT voltage on the front panel.
- f. Press ON switch to get test to turn off.
- g. Press EXIT 3 times to return to SAMPLE menu.
- h. Be sure to note new optic test reading for checking (periodically).



NO. NOX  
**FIGURE 3**





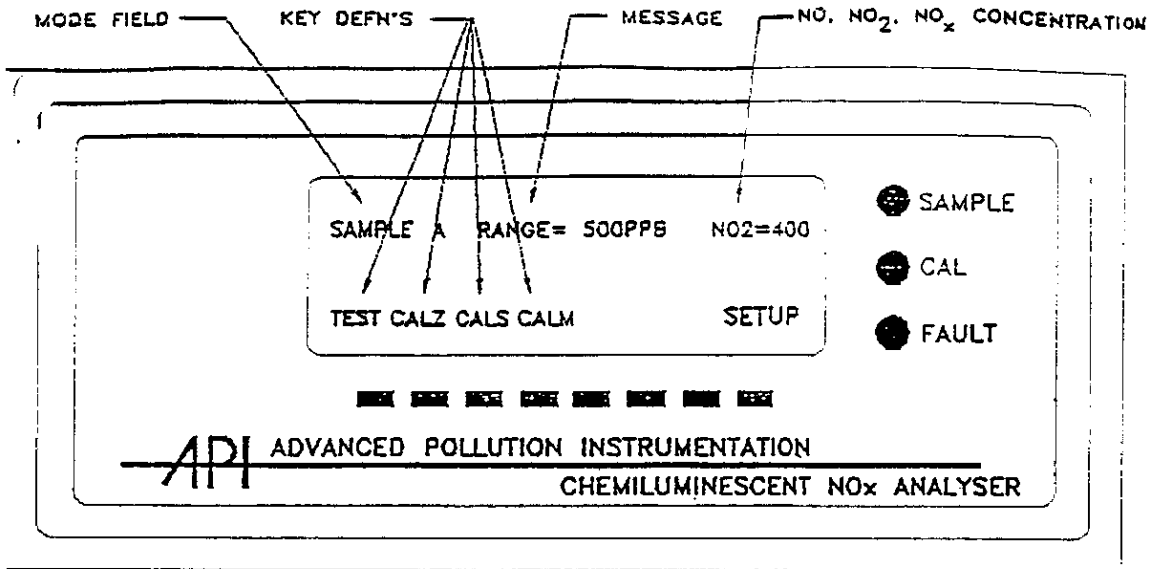


FIGURE 1

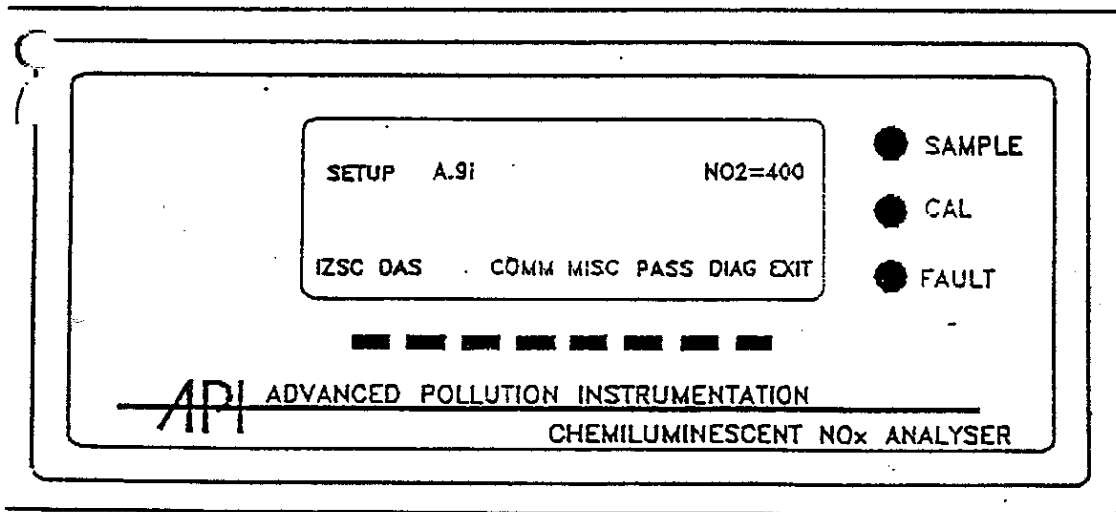


FIGURE 2