

TELONIC BERKELEY, INC.

P.O. BOX 277
LAGUNA BEACH, CALIFORNIA 92652-0277
TEL: 714/494-9401 FAX: 714/497-7331

August 19, 1999

California Environmental Protection Agency
Air Resources Board
Mobile Source Operations Division
Mobile Source Enforcement Branch

Mr. Paul E. Jacobs, Chief
Mobile Source Enforcement Branch
California Air Resources Board
P.O. Box 2815
Sacramento CA 95812

AUG 25 1999

RECEIVED

DECLARATION OF COMPLIANCE WITH THE SAE J1667 SPECIFICATIONS

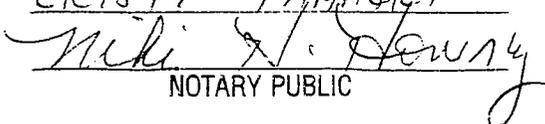
I, Kristi Tamaoki, represent Telonic Berkeley, Inc. My title is Assistant Corporate Secretary. I am authorized by Telonic Berkeley, Inc. to provide this declaration. My company manufactures and markets in the State of California the following Smoke Meter: Model 300 Celesco Brand Portable Opacity Meter. This smoke meter model is in compliance with the specifications set forth in the Society of Automotive Engineers (SAE) J1667 recommended practice, issued in February 1996 and entitled: "Snap-Acceleration Smoke Test Procedure For Heavy-Duty Diesel Powered Vehicles". Compliance with these SAE J1667 specifications is disclosed to all current or potential purchases or uses of my smoke meters through my company's brochures, as attached hereto and incorporated herein by reference.

I declare under the penalty of perjury, under the laws of the State of California, that the foregoing is true and correct and if called upon to do, I could and would competently testify thereto.

Executed this 19 day of August, 1999 at Laguna Beach, CA.


Kristi Tamaoki,
Assistant Corporate Secretary

SUBSCRIBED AND SWORN TO BEFORE ME
THIS 19 DAY OF AUGUST 1999 BY

- KRISTI TAMAOKI -

NOTARY PUBLIC

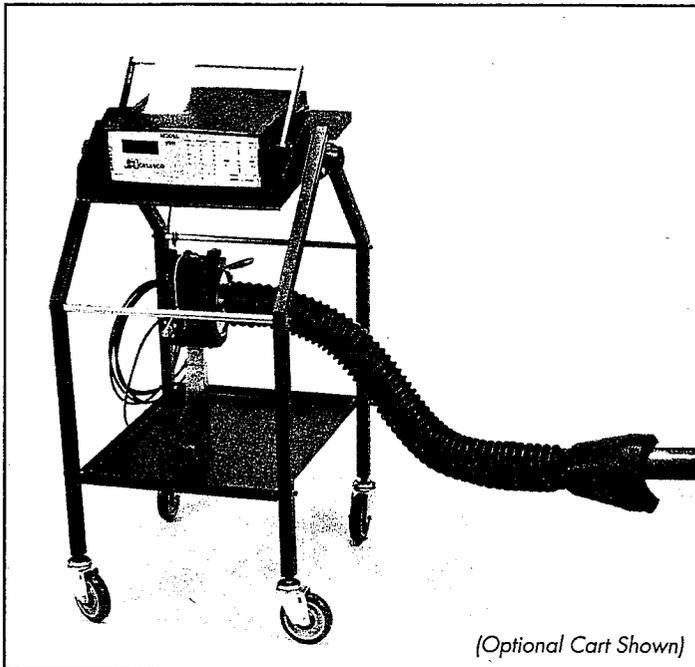




TELONIC
BERKELEY
INC.

PORTABLE OPACITY METERS

Model 300 CELESCO Brand

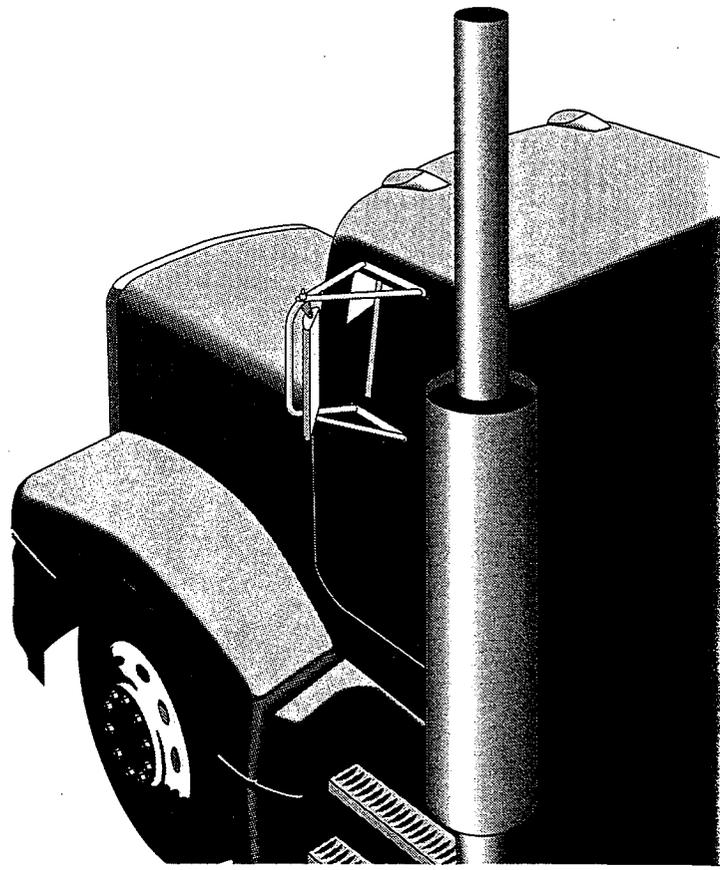


(Optional Cart Shown)

Features

- Meets SAE J1667
- Self-Centering Sensor Head
- Printed Test Report
- 80 Character LCD Display
- 30 Key/Membrane Switches
- Auto Zero/Span
- RS232 Output
- Dirty Optics Warning
- Auto Shutoff
- Ambient Temperature Display and Printout

*Accurate Exhaust
Smoke Measurement
—On the Road or
in the Shop*



Model 300 Portable Opacity Meter

Introduction

Existing federal regulations have established a quality level for exhaust emissions from diesel engines at the time of manufacture. Many State and local agencies charged with the protection of their environment are implementing regulations intended to ensure that a high standard of emission is maintained throughout the life of the vehicles and to get gross polluters off the highways. Nearly all regulations define diesel exhaust quality in terms of the opacity of the smoke plume.

Telonic Berkeley's Model 107 In-Line Opacity Meter is currently in use worldwide in Engine Audit Cells, Engine Production Test Cells, Engineering Test Cells, CVS Cells, Fuel Development & Diesel Accessories Test Cells.

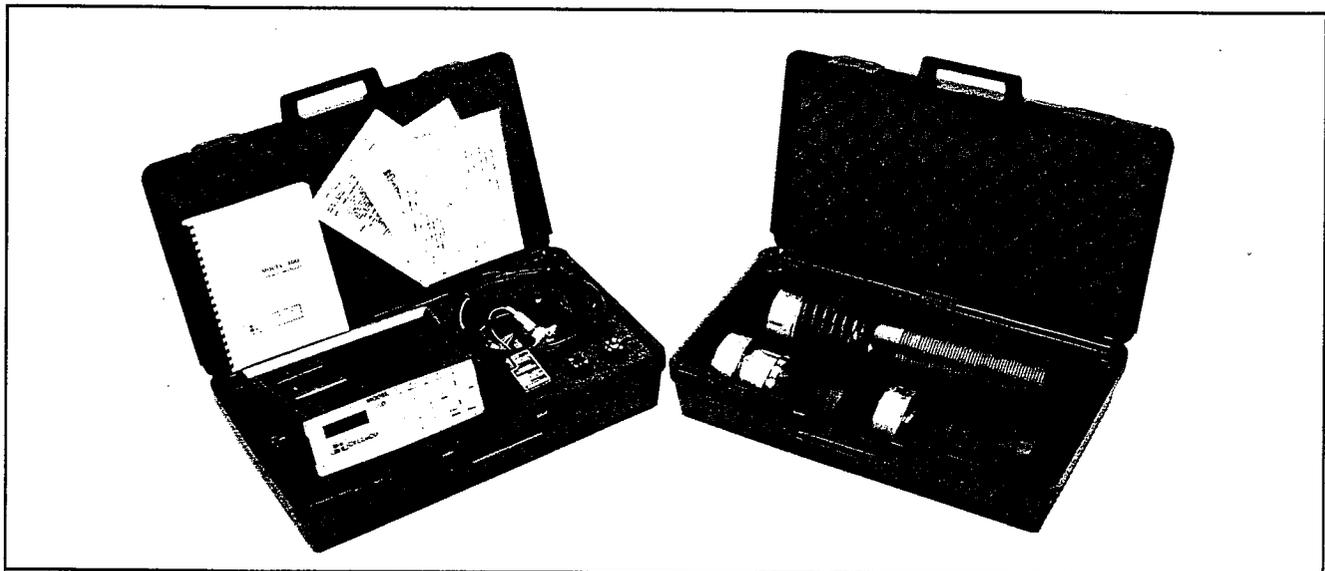
Description

The Model 300 is a rugged, battery powered portable smoke opacity meter incorporating the latest microprocessor technology, including LCD display, membrane switch keyboard and alpha/numeric thermal printer.

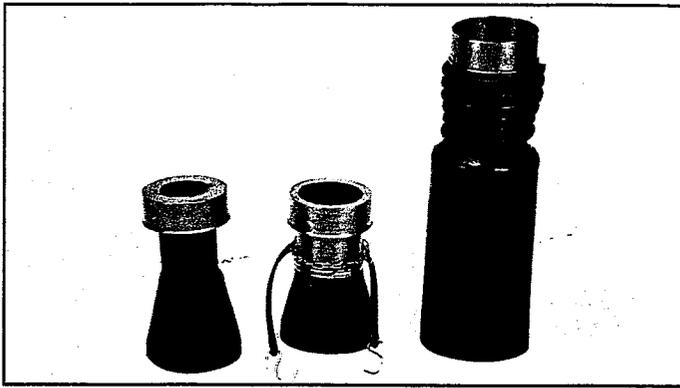
The Model 300 portable opacity meter was developed specifically to meet and exceed the requirements of SAE J1667. It consists of two basic units connected by a single cable. The sensor unit is installed end-of-line on the exhaust outlet of the vehicle under test and contains the light source (green LED) and receiver (photo detector) modules. The sensor head is a cast aluminum (black anodized) housing to provide a stable housing for the Model 300 optics. The control unit is a high impact plastic housing with internal nickel plating to provide RFI/EMI shielding. It contains the keyboard, display, printer, microprocessor controller and 20-hour lead/acid battery. The control unit implements software programs to provide many functions required to perform diesel smoke tests.

Because many local agencies require varying acceptance levels of smoke, the Model 300 provides keyboard modification of pass/fail limits.

NOTE: SAE J1667 is a recommended Snap-Acceleration (FAS) test procedure for heavy duty diesel-powered vehicles.



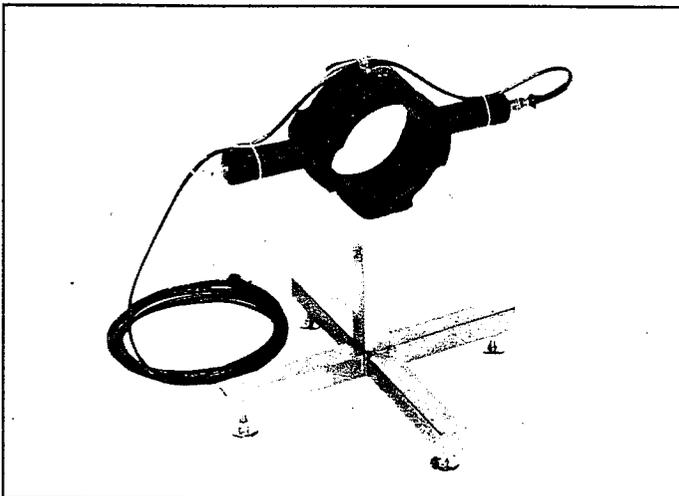
Complete Model 300 System in Optional Carrying Cases



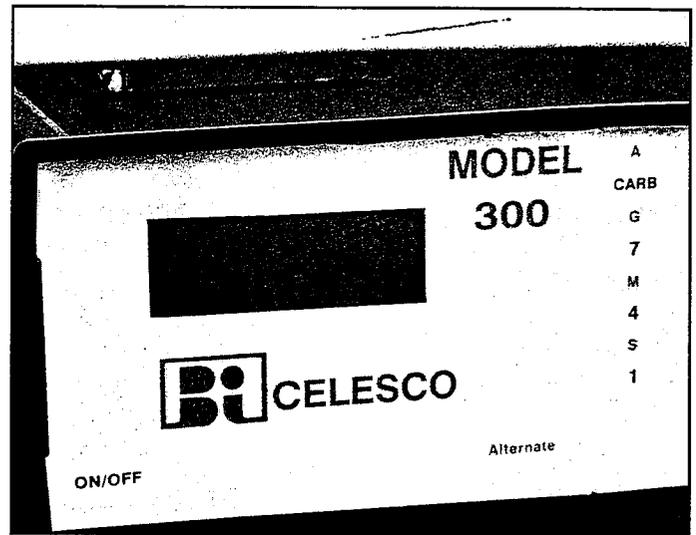
Typical Exhaust Adaptors

Features

- Meets requirements of SAE J1667
- Provides printed record of test
- New self-centering sensor heads
- Can be used for complete transient smoke evaluation with and without 0.5 sec averaging
- Optional:
 - RPM
 - Temperature correction of K
 - Barometric pressure
- Solid state "Green" LED light source
- 2 Year Warranty
- Battery Powered (rechargeable) 20hrs (12V)
- Self Diagnostics, including:
 - Auto-zero & auto-span
 - Dirty optics warning
 - Low battery & battery life info
 - Calibration prompt
 - Post test zero check
 - Auto shutoff (10min)
 - Ambient temperature printout
- RS232 interface to computer for data analysis



Sensor Head with Optics



80 Character LCD Display

Specifications

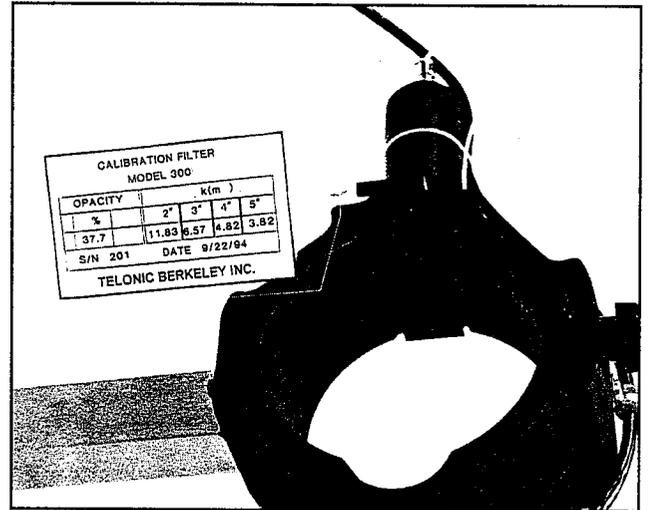
	Range	Resolution	Accuracy
Opacity:	0 to 99.9%	0.1%	±0.5%
Density:	0 to 30.0 M ⁻¹	0.01% M ⁻¹	±0.1 M ⁻¹
Zero Drift:	Less than 0.5% per hour		
SAE J1667:	Standard incorporated .5 SEC average of peak transients		
Display:	80 character LCD 4 lines 20 characters per line		
Keyboard:	30 keys, membrane switch		
Printout:	3" wide paper with all information as required by SAE J1667 and CARB		
Light Source:	Green LED @ 570nm pulsed 600 times per second		
Light Receiver:	Silicon Photodiode		
Power:	20hr, rechargeable, sealed lead/acid 12V battery can be charged from 110/220 VAC charger, or cigarette lighter adaptor		
Mechanical:	Meter Case: High impact plastic with EMI/RFI metallic shielding 12" x 11" x 5", excluding handle		
Sensor Heads:	3" to 6" diameter, self-centering exhaust adaptors		

Software Functions

- Menu Selection:** Provides a menu system whereby the operator can select the type of test and data reduction; enter specific data; calibrate the system; and set-up to transmit data to a remote terminal.
- Detector Control:** Provides precisely timed excitation pulses for the emitter, detector and sample gate. Provides detector amplifier gain control for Auto-Zero and Auto-Span.
- Acquire Analog Voltages:** Read the detector output and ambient temperature, as well as optional exhaust gas temperature, barometric pressure and RPM inputs.
- Process Data:** Filter and process input data to provide the desired output information. Includes keyboard input.
- Provide Outputs:** Provides the desired outputs to the LCD display, printer, recorder output and RS232 link.
- Store Test Results:** Stores test results in non-volatile RAM for transmission at a later time. Stores calibration data. Stores up to 10 minutes of test data.
- Initialization and Test:** Initializes the system; does self-test of memory; monitors the battery voltage; calibrates the system; detects dirty optics; Auto-Zeros and Auto-Spans the unit.

Modes of Operation

- CARB:** Allows for performance of SAE J1667, snap idle test (free acceleration), meeting all requirements as specified. Provides permanent printout of all information specified (to be retained for two years as required by the proposed California State Self-Certification law set to go into effect January 1, 1996). Peak smoke results are 0.5 second moving average.
- Manual:** Permits basic operation of the smoke meter; indicates steady state and true peak smoke readings in both opacity percentage (%) and smoke density (k). Data can be transmitted through an RS232 port to a remote computer. Also allows monitoring of engine RPM, exhaust gas temperature, barometric pressure and ambient temperature.
- CALIB:** Allows for calibration and linearity check of smoke meter to NIST traceable standards. Prints out information for a permanent calibration record. Last calibration date is also printed out on each test report.
- Options:** Permits changing of test limits and spanning strip chart recorder.
- XMIT:** Provides for transmission of raw test results collected throughout the day via RS232 port to a remote computer for further storage and analysis.
- Data:** Not a true mode key. Turns RS232 port on and off for on-line transmission of data while being collected. The data is "real time" with no corrections. Usable in "CARB" and "MANUAL" modes only (9600 Baud).



Sensor Head with Cal Lens in Position



AC Battery Charger

Print Outputs

Print outputs meet SAE J1667 record keeping requirements developed to meet California's new self-certification law, set to go into effect in January, 1996.

SAMPLE

SNAP IDLE TEST REPORT

Date: mm/dd/yyyy

Location: where vehicle was tested _____

Tested By: who actually performed the test

Meter Mfg: Berkeley Celesco

Model 300 S/N nnnn

Last Calibration Date: mm/dd/yyyy

Veh. ID No.: obtained from vehicle

Eng. Mfg.: determined from vehicle

H/P: from vehicle EOPL from head used

Ambient temp.: XX C Baro.: If installed

Measured Average EGT: XXX C

K corrected to 100 c if sensor installed

Run No.	RPM	Peak%	Peak K
1	nnnn	nn.n	nn.nn
2	nnnn	nn.n	nn.nn
3	nnnn	nn.n	nn.nn

Peak Opacity Difference: nn.n %

Difference Exceeds 5%, Invalid Test

3 Peak Average

Opacity: nn.n % K: nn.nn

Pass/Fail Status: As determined by test

Post Repair Test if inputted

Pass/Fail Status: Pass

Test Technician's Signature: _____

CALIBRATION CERTIFICATION REPORT

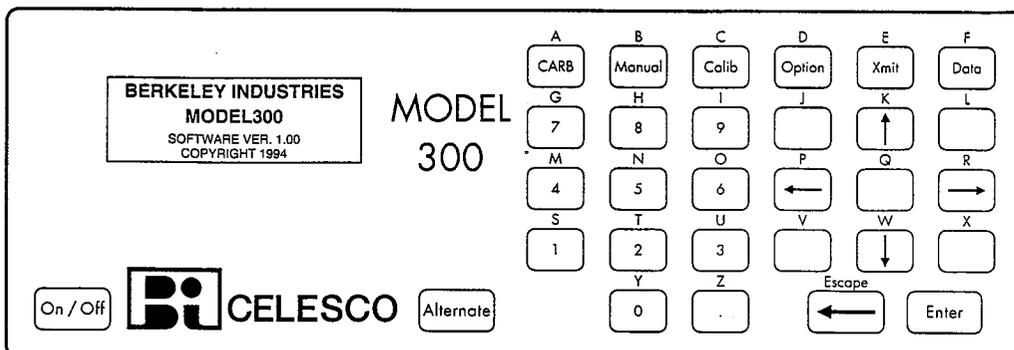
Model 300 S/N #####

Tested mm/dd/yyyy Next due mm/dd/yyyy

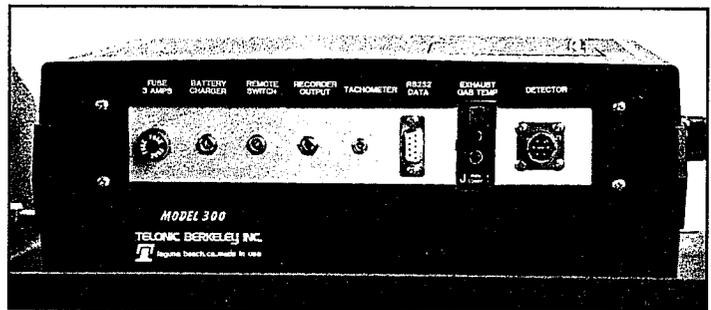
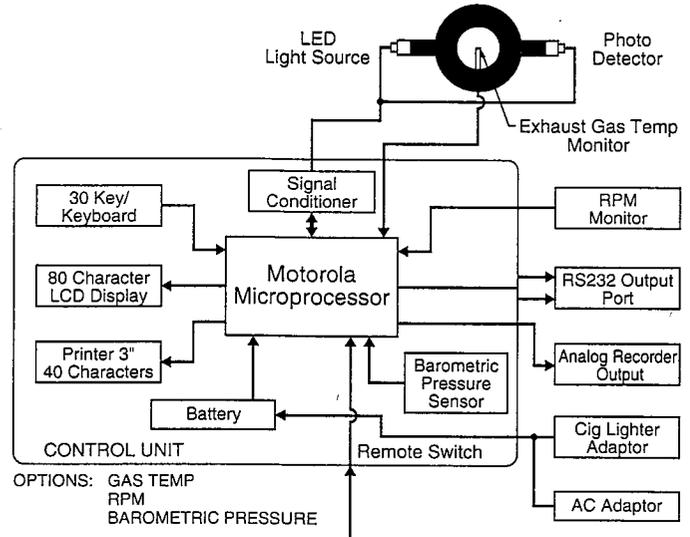
Filter Value: ##.## % Test Value: ##.## %

Spec +/- 2% Actual: ##.## %

Model 300 Front Panel



Model 300 Block Diagram



Rear Panel Connections

Keyboard Guide

MODES

- CARB** Provides for step-by-step test per SAE J1667. Peak values are .5 sec avgd. All info required can be printed out and raw data stored for later transmission to computer.
- MANUAL** Provides actual and peak smoke readings in true values of opacity (%) and density (k). Data transmitted to remote computer via RS232 port. You may also scroll down to view ambient temp, "RPM", "EGT TEMP" and "Barometric Pressure".
- CALIB** Allows calibration of smoke meter with NIST traceable screens. Printout if required. Cal. Date stored.
- OPTIONS** Permits spanning recorder output, changing pass/fail limits and other software functions (See manual).

XMIT Provides for transmission of day's test results to external computer via RS232 port. (9600 Baud).

DATA Turns RS232 port on or off for transmission of real time data. Data is raw information from system. No manipulation. Not a true mode key (CARB and MANUAL modes only).

RS232 Terminal Output

XMIT Mode: Data collected in the last 10 minutes of testing, or last 10 CARB tests, can be stored in the Model 300 Opacity Meter's static memory for transmission into a remote computer terminal at a later time. A typical format of the data transmitted is shown below:

Header: Date: 11/09/1994
VIN: -----
EOPL (meters): 0.098
Std len. (meters): 0.098
Average EGT (C): 24
Time of peaks (in Secs.) 1 2 3
 sss.ss sss.ss sss.ss

The data is then displayed with 50 millisecc. markers every 50 milliseccs.

NOTE: If an EGT probe is not installed, average EGT will show ambient temperature.

Sample:

Time	Opacity %	
sss.05	nn.n	} Readings in opacity every 50 milliseccs
sss.10	nn.n	
sss.15	nn.n	

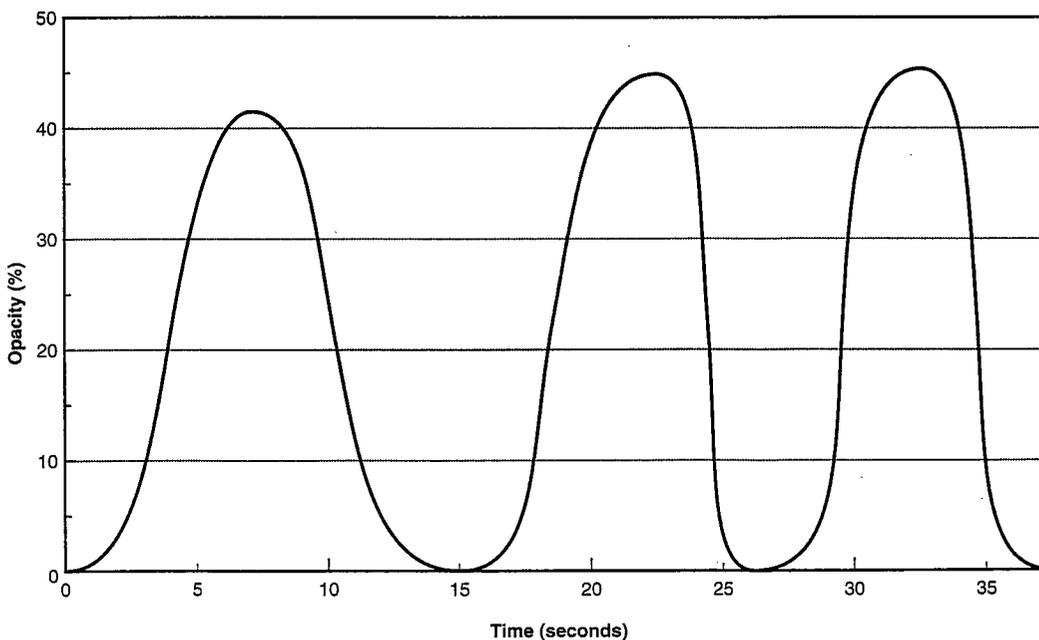
635.00 (635 secs. or 12,000 lines of data)

DATA Mode: This data is available at the RS232 port while the tests are actually running (no header)

Time	Opacity %
sss.05	nn.n
sss.10	nn.n
sss.15	nn.n

635 (Starts at zero again when the output reaches 635 secs.)

Data Presentation: The data collected by the computer in either the XMIT or DATA mode can be manipulated by many different available programs. For example, the data collected can be displayed as a Histogram as shown below:



Ordering Information

BASIC MODEL 300 - X - X - X - X

Control Options

- | | |
|-----------|----------------------|
| 0 = Std. | 5 = 1 & 3 |
| 1 = Baro | 6 = 2 & 3 |
| 2 = Temp | 7 = 1, 2 & 3 |
| 3 = RPM | 8 = Language Special |
| 4 = 1 & 2 | 9 = No Printer |

Exhaust Options

- 0 = Std 3" to 6" & 4" to 6" Exhaust Adaptor with sensor
- 1 = 0 + 3" to 6" Exhaust Adaptor with 3' Hose (3" dia.)
- 2 = 0 + 4" to 6" Exhaust Adaptor with 3' Hose (4" dia.)
- 3 = 0 + 1 + 2
- 4 = 0 + 5" to 6" Exhaust Adaptor with 5" Exit Diameter
- 5 = 5" to 6" Exhaust Adaptor with 3' Hose (5" dia.)
- 6 = 0 + 3 + 4 + 5

Mounting Options

- 0 = None
- 1 = Sensor Stand
- 2 = Cart with Sensor Mount
- 3 = 1 & 2
- 4 = Carrying Case (Sensor/Control/Unit)
- 5 = Carrying Case (Exhaust Adaptors)
- 6 = 4 + 5

Calibrator Options

- 0 = 40% Approx. Value
- 1 = 0-10% Approx. Value
- 2 = 0-20% Approx. Value
- 3 = 1 + 2 (10% & 20%)

To order Model 300, use the following order format:

Standard Product: Model 300-0-0-0

Includes: Control Unit:

- 80 Character Display
- 30 Key/Membrane Switch
- 40 Character Printer, 2 Rolls
- 20 hr Battery
- Remote Switch

Sensor Head:

- Emitter/Detector
- 6 Meter Cable
- 3" to 6" Exhaust Adaptor
- 4" to 6" Exhaust Adaptor
- Calibrator (Approx. 40%)

A/C Charger/Cigar Lighter
Adaptor Instruction Manual

Model 107 In-Line Opacity Meter

Features

- Less Drift
- Rapid Transient Response
- Greater Precision
- $\pm 0.5\%$ Accuracy
- Improved Linearity
- Lower % Opacity Reading

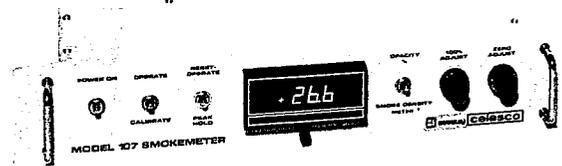
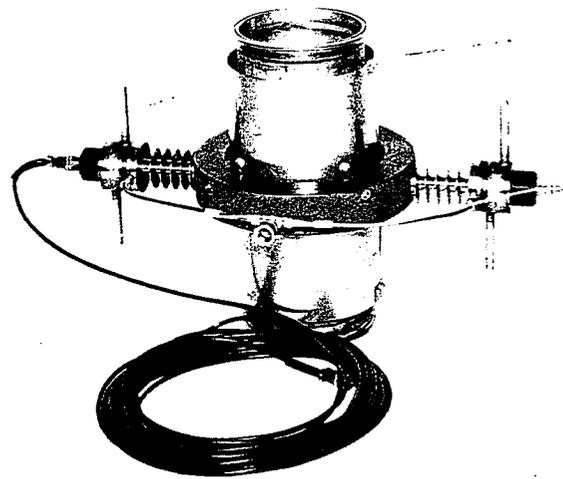
For continuous, in line, full-flow smoke measurement. Designed for use in diesel engine test cells. Used by Cummins, Caterpillar, Detroit Diesel, Perkins Diesel and other major diesel engine manufacturers, Model 107 permits exhausting smoke outside the cell.

Assures measurement accuracy because smoke is confined to fixed volume. Optical path length is also fixed, further insuring accuracy and repeatability.

- Meets requirements for diesel engine Federal test cycle
- Measures opacity in the 0-100% range
- Permanent solid-state light source
- For 6-inch stack (2-and 4-inch optional)
- Rack-mounted, all solid-state control unit
- Not affected by exhaust temperature or vibration
- Measures smoke density (K) in the 0-20 m^{-1} range

Options Available

Line Power:	90 – 130 VAC or 180 – 260 VAC
Linearity Calibration:	In-situ linearity measurement with three neutral density filters in the range of opacity, 10%, 20%, or 40% nominal. Actual filter values traceable to EPA standards.
Recorder Output:	0 – 5 VDC (0 – 100% opacity) 1 – 5 VDC (0 – 100% opacity)
Computer Interface:	BCD output, 100/sec conversion rate
ISO-Pak:	Meets ISO specification and includes: Temperature probe—TC shielded probe with TC connector and pressure tap.
100°C Correction:	Corrects K (m^{-1}) smoke density to 100°C gas temperature.



Specifications

Opacity Scale:

Range:	0 to 100%
Resolution:	0.1%
Accuracy:	$\pm 0.5\%$ opacity due to nonlinearity, 24 hour drift, etc.

Smoke Density K Scale:

Range:	0 to 20 m^{-1}
Resolution:	0.01 m^{-1}
Accuracy:	0.1 m^{-1} to smoke density of 2 m^{-1} , $\pm 5\%$ of reading above 2 m^{-1}

Response Time:

0.01 sec to 90%

Readout:

3-1/2 Digit Digital Display

Recorder Outputs:

10mV per % (1 VDC at 100% opacity)
100mV per m^{-1} (optical density)

Light Source:

Light Emitting Diode

Angle of Projection:

99% within 3 degrees half angle

Spectral Output:

520 to 610 nm: peak = 570 nm

Pulse Rate:

600 Hz

Receiver:

Silicon Photodetector

Angle of View:

99% within 3 degrees half angle

Spectral Response:

400 to 1100 nm

Operating Temp:

Control Unit:

10 degrees to 50 degrees C

Sensor Unit:

70 degrees C Max Cell Ambient

800 degrees C Max Gas Temp

Cooling Water:

25 degrees to 45 degrees C

Power:

90 – 130 VAC or 180 – 260 VAC

50/60 Hz, 10 watts

Stack Diameter:

6" 4" 2"

Path Length:

137mm 95.5mm 44.7mm



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