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RT NO. DOT-TSC-NHTSA-79-62.III

DOT-HS-805 278

DEPARTMENT OF  
TRANSPORTATION

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DATA BASE FOR LIGHT-WEIGHT  
AUTOMOTIVE DIESEL POWER PLANTS  
Volume III: Miscellaneous Data

B. Wiedemann, R. Schmidt, et al.  
Volkswagenwerk  
Research Division  
3180 Wolfsburg  
Federal Republic of Germany



1979  
FINAL REPORT

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VIRGINIA 22161

Prepared for

U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
Office of Passenger Vehicle Research  
Washington DC 20590

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| 1. Report No.<br>DOT-HS-805 278                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  | 2. Government Accession No.                          |                                                                                                                                                                | 3. Recipient's Catalog No.                                                       |  |
| 4. Title and Subtitle<br>DATA BASE FOR LIGHT-WEIGHT AUTOMOTIVE DIESEL POWER PLANTS, Volume III: Miscellaneous Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |                                                      |                                                                                                                                                                | 5. Report Date<br>December 1979                                                  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |                                                      |                                                                                                                                                                | 6. Performing Organization Code                                                  |  |
| 7. Author(s)<br>B. Wiedemann, R. Schmidt, et al.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |                                                      |                                                                                                                                                                | 8. Performing Organization Report No.<br>DOT-TSC-NHTSA-79-62.III                 |  |
| 9. Performing Organization Name and Address<br>Volkswagenwerk*<br>Research Division<br>3180 Wolfsburg<br>Federal Republic of Germany                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |                                                      |                                                                                                                                                                | 10. Work Unit No. (TRIS)<br>HS017/R0411                                          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |                                                      |                                                                                                                                                                | 11. Contract or Grant No.<br>DOT/TSC-1193                                        |  |
| 12. Sponsoring Agency Name and Address<br>U.S. Department of Transportation<br>National Highway Traffic Safety Administration<br>Office of Passenger Vehicle Research<br>Washington DC 20590                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |                                                      |                                                                                                                                                                | 13. Type of Report and Period Covered<br>Final Report<br>June 30 '76-July 30 '77 |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |                                                      |                                                                                                                                                                | 14. Sponsoring Agency Code                                                       |  |
| 15. Supplementary Notes<br>*Under contract to: U.S. Department of Transportation<br>Research and Special Programs Administration<br>Transportation Systems Center<br>Cambridge MA 02142                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |                                                      |                                                                                                                                                                |                                                                                  |  |
| 16. Abstract<br>The effects of fuel economy, emissions, passenger car safety and other variables due to the installation of light-weight Diesel powerplants were studied. Experimental data was obtained on naturally aspirated and turbocharged Diesel engines installed in subcompact and compact passenger vehicles. The data includes fuel economy as a function of engine type and horsepower, as a function of vehicle inertia weight and as a function of regulated emission constraints. Unregulated emissions have been characterized during the course of the work. The compatibility of the Diesel engine studied with passenger car structures incorporating advanced frontal crashworthiness capabilities was also verified.<br><br>The report consists of three volumes. Volume I, the Executive Summary, presents a summary of the data obtained and a review of the important conclusions. Volume II, the main body of the report, provides a discussion of the fuel economy and emissions obtained, a description of the engine/vehicle systems tested and the results of factory driveability tests. Volume III, the appendixes, presents miscellaneous data used during the program. |  |                                                      |                                                                                                                                                                |                                                                                  |  |
| 17. Key Words<br>Diesels, CI-Engines, Passenger Cars,<br>Fuel economy, Safety, Emissions,<br>Automobiles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |                                                      | 18. Distribution Statement<br><br>DOCUMENT IS AVAILABLE TO THE PUBLIC<br>THROUGH THE NATIONAL TECHNICAL<br>INFORMATION SERVICE, SPRINGFIELD,<br>VIRGINIA 22161 |                                                                                  |  |
| 19. Security Classif. (of this report)<br>Unclassified                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  | 20. Security Classif. (of this page)<br>Unclassified |                                                                                                                                                                | 21. No. of Pages<br>206                                                          |  |
| 22. Price                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |                                                      |                                                                                                                                                                |                                                                                  |  |



## **PREFACE**

In support of the National Highway Traffic Safety Administration, Office of **Passenger Vehicle Research**, the Department of Transportation-Transportation Systems Center contracted with Volkswagenwerk AG, Federal Republic of Germany to develop a data base on light-weight Diesel engines suitable for passenger cars. Volkswagen research, pre-production and production Diesel engines were used for the test portion of the work and for the 'analytical extrapolation.'

A Volkswagen research vehicle with advanced crashworthiness characteristics was provided by Volkswagen to demonstrate and document compatibility with an advanced diesel engine design (Integrated Research Vehicle). Through the effort the Diesel engines were evaluated in the context of an integrated vehicle system with the aspects of fuel economy, environment, consumer requirements and cost in mind.

The authors wish to acknowledge the guidance provided by Mr. H.Gould and Dr.R.John of the Department of Transportation-Transportation Systems Center and Dr. K. Digges of the Department of Transportation-National Highway Traffic Safety Administration.

Our working team consisted of the following persons:

Miss C. Schwarz, Messrs. R. Graupmann, W. Lange, K.-J. Lemke, H. Leptien, Dr. G. W. Schweimer and M. Willmann.

They were supported by:

Miss J. Dommschack and Messrs. H.-D. Beckmann, P. M. Deja, P. Jirousek, W. Kiegeland, W. Kurpiers, Dr. K.-H. Lies, J. Nitz, E. Pommer, K.-H. Schneider and P. Seifert together with members of the staff from the VW prototype shop, the VW transmission development department and the VW measuring and testing department.

# METRIC CONVERSION FACTORS

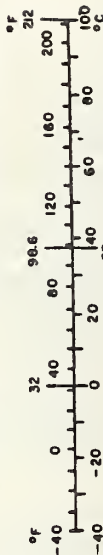
## Approximate Conversions to Metric Measures

| Symbol                     | When You Know          | Multiply by                | To Find             | Symbol          |
|----------------------------|------------------------|----------------------------|---------------------|-----------------|
| <b>LENGTH</b>              |                        |                            |                     |                 |
| in                         | inches                 | 2.5                        | centimeters         | cm              |
| ft                         | feet                   | 30                         | centimeters         | cm              |
| yd                         | yards                  | 0.9                        | meters              | m               |
| mi                         | miles                  | 1.6                        | kilometers          | km              |
| <b>AREA</b>                |                        |                            |                     |                 |
| in <sup>2</sup>            | square inches          | 6.5                        | square centimeters  | cm <sup>2</sup> |
| ft <sup>2</sup>            | square feet            | 0.09                       | square meters       | m <sup>2</sup>  |
| yd <sup>2</sup>            | square yards           | 0.8                        | square meters       | m <sup>2</sup>  |
| mi <sup>2</sup>            | square miles           | 2.6                        | square kilometers   | km <sup>2</sup> |
|                            | acres                  | 0.4                        | hectares            | ha              |
| <b>MASS (weight)</b>       |                        |                            |                     |                 |
| oz                         | ounces                 | 28                         | grams               | g               |
| lb                         | pounds                 | 0.45                       | kilograms           | kg              |
|                            | short tons (2000 lb)   | 0.9                        | tonnes              | t               |
| <b>VOLUME</b>              |                        |                            |                     |                 |
| tsp                        | teaspoons              | 5                          | milliliters         | ml              |
| Tbsp                       | tablespoons            | 15                         | milliliters         | ml              |
| fl oz                      | fluid ounces           | 30                         | milliliters         | ml              |
| c                          | cups                   | 0.24                       | liters              | l               |
| pt                         | pints                  | 0.47                       | liters              | l               |
| qt                         | quarts                 | 0.95                       | liters              | l               |
| gal                        | gallons                | 3.8                        | liters              | l               |
| ft <sup>3</sup>            | cubic feet             | 0.03                       | cubic meters        | m <sup>3</sup>  |
| yd <sup>3</sup>            | cubic yards            | 0.76                       | cubic meters        | m <sup>3</sup>  |
| <b>TEMPERATURE (exact)</b> |                        |                            |                     |                 |
| °F                         | Fahrenheit temperature | 5/9 (after subtracting 32) | Celsius temperature | °C              |

\*1 in 1-2 54 (revised). For other exact conversions and more detailed tables, see NBS Mon. Publ. 780, Units of Weights and Measures, Price \$2.25, SO Catalog No. C13.10-785.

## Approximate Conversions from Metric Measures

| Symbol                     | When You Know                     | Multiply by       | To Find                | Symbol          |
|----------------------------|-----------------------------------|-------------------|------------------------|-----------------|
| <b>LENGTH</b>              |                                   |                   |                        |                 |
| mm                         | millimeters                       | 0.04              | inches                 | in              |
| cm                         | centimeters                       | 0.4               | inches                 | in              |
| m                          | meters                            | 3.3               | feet                   | ft              |
| km                         | kilometers                        | 1.1               | yards                  | yd              |
|                            |                                   | 0.6               | miles                  | mi              |
| <b>AREA</b>                |                                   |                   |                        |                 |
| cm <sup>2</sup>            | square centimeters                | 0.16              | square inches          | in <sup>2</sup> |
| m <sup>2</sup>             | square meters                     | 1.2               | square yards           | yd <sup>2</sup> |
| km <sup>2</sup>            | square kilometers                 | 0.4               | square miles           | mi <sup>2</sup> |
| ha                         | hectares (10,000 m <sup>2</sup> ) | 2.5               | acres                  |                 |
| <b>MASS (weight)</b>       |                                   |                   |                        |                 |
| g                          | grams                             | 0.035             | ounces                 | oz              |
| kg                         | kilograms                         | 2.2               | pounds                 | lb              |
| t                          | tonnes (1000 kg)                  | 1.1               | short tons             |                 |
| <b>VOLUME</b>              |                                   |                   |                        |                 |
| ml                         | milliliters                       | 0.03              | fluid ounces           | fl oz           |
| l                          | liters                            | 2.1               | pints                  | pt              |
| l                          | liters                            | 1.06              | quarts                 | qt              |
| l                          | liters                            | 0.26              | gallons                | gal             |
| m <sup>3</sup>             | cubic meters                      | 35                | cubic feet             | ft <sup>3</sup> |
| m <sup>3</sup>             | cubic meters                      | 1.3               | cubic yards            | yd <sup>3</sup> |
| <b>TEMPERATURE (exact)</b> |                                   |                   |                        |                 |
| °C                         | Celsius temperature               | 9/5 (then add 32) | Fahrenheit temperature | °F              |



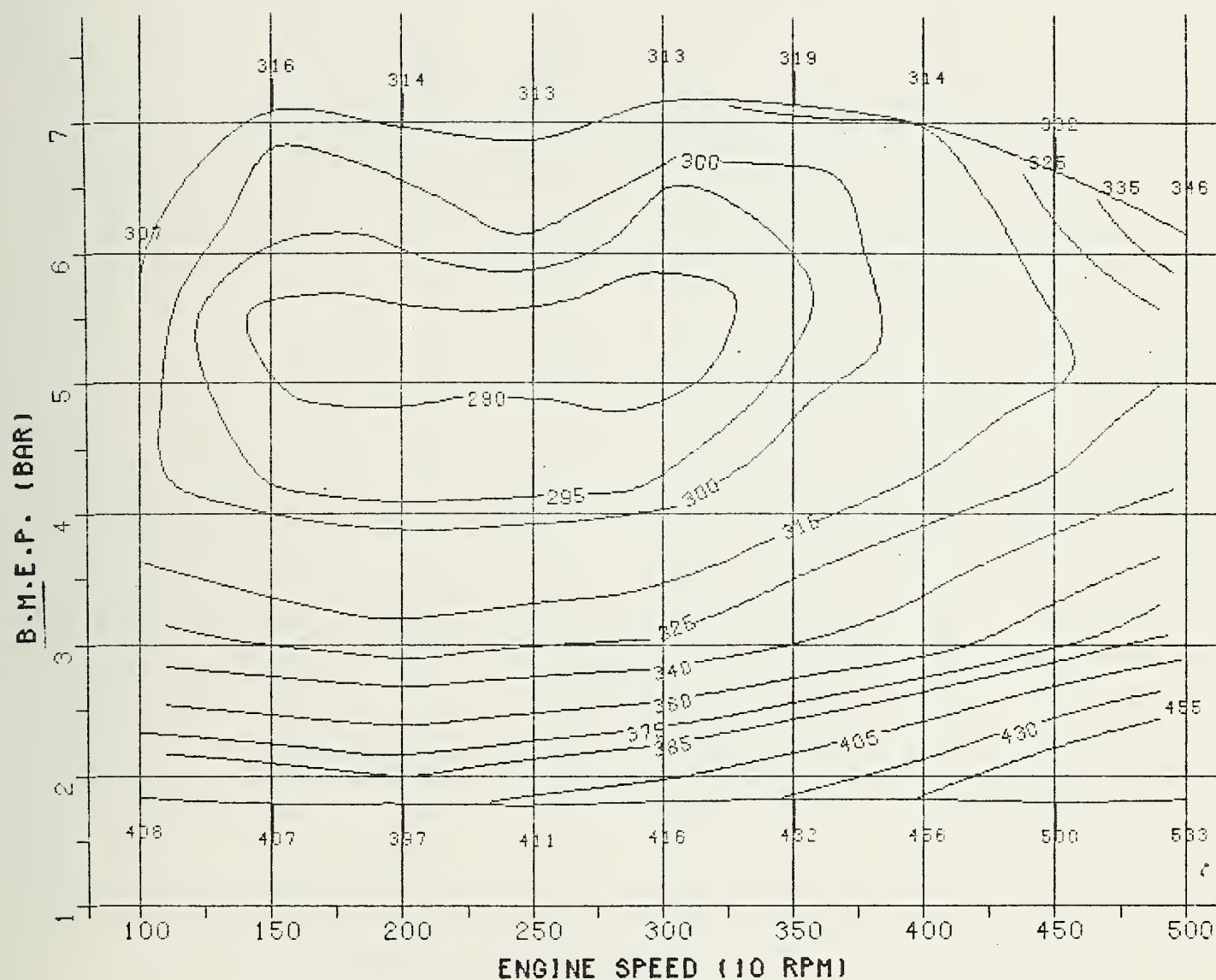
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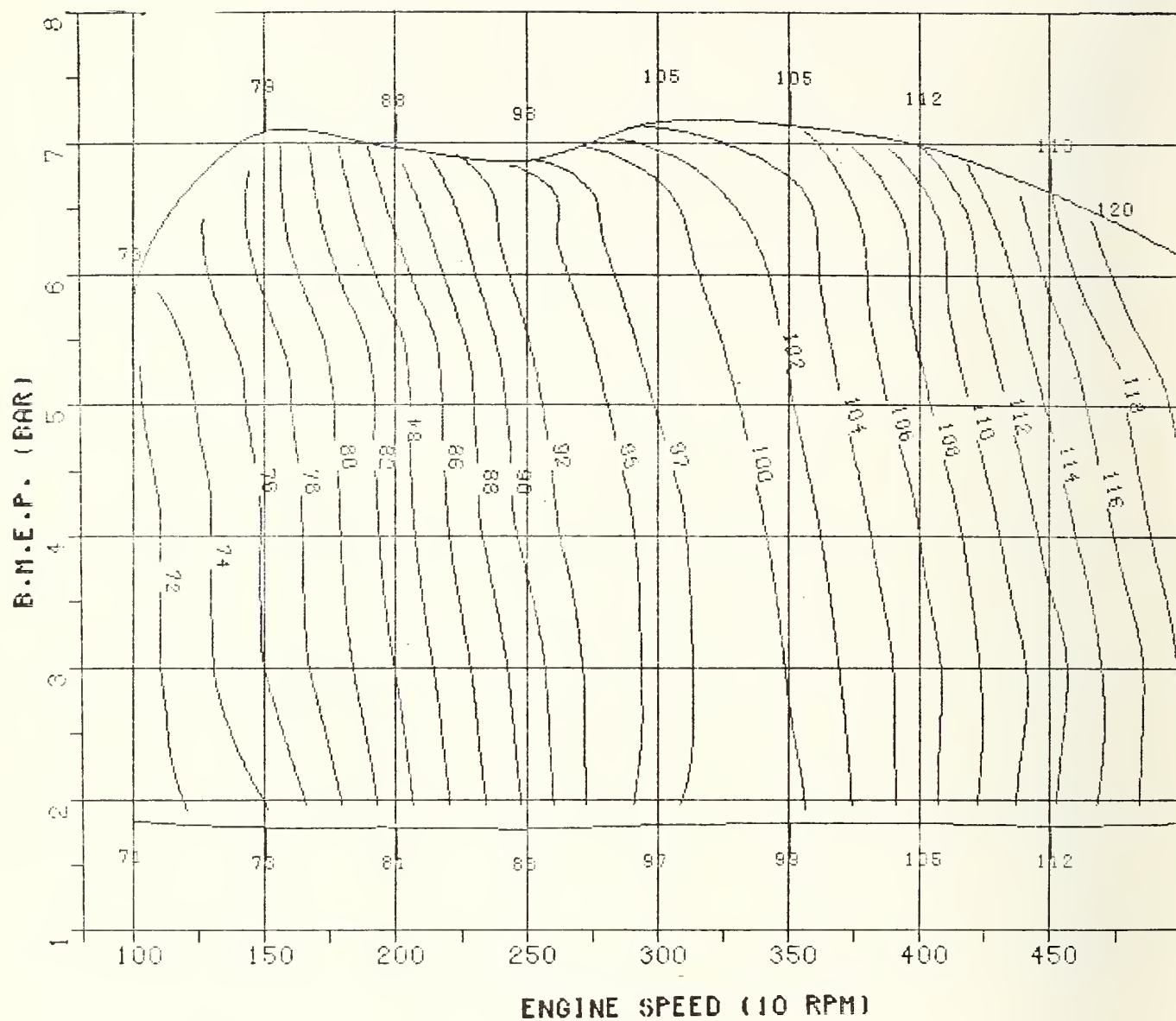


APPENDIX A  
MISCELLANEOUS DATA

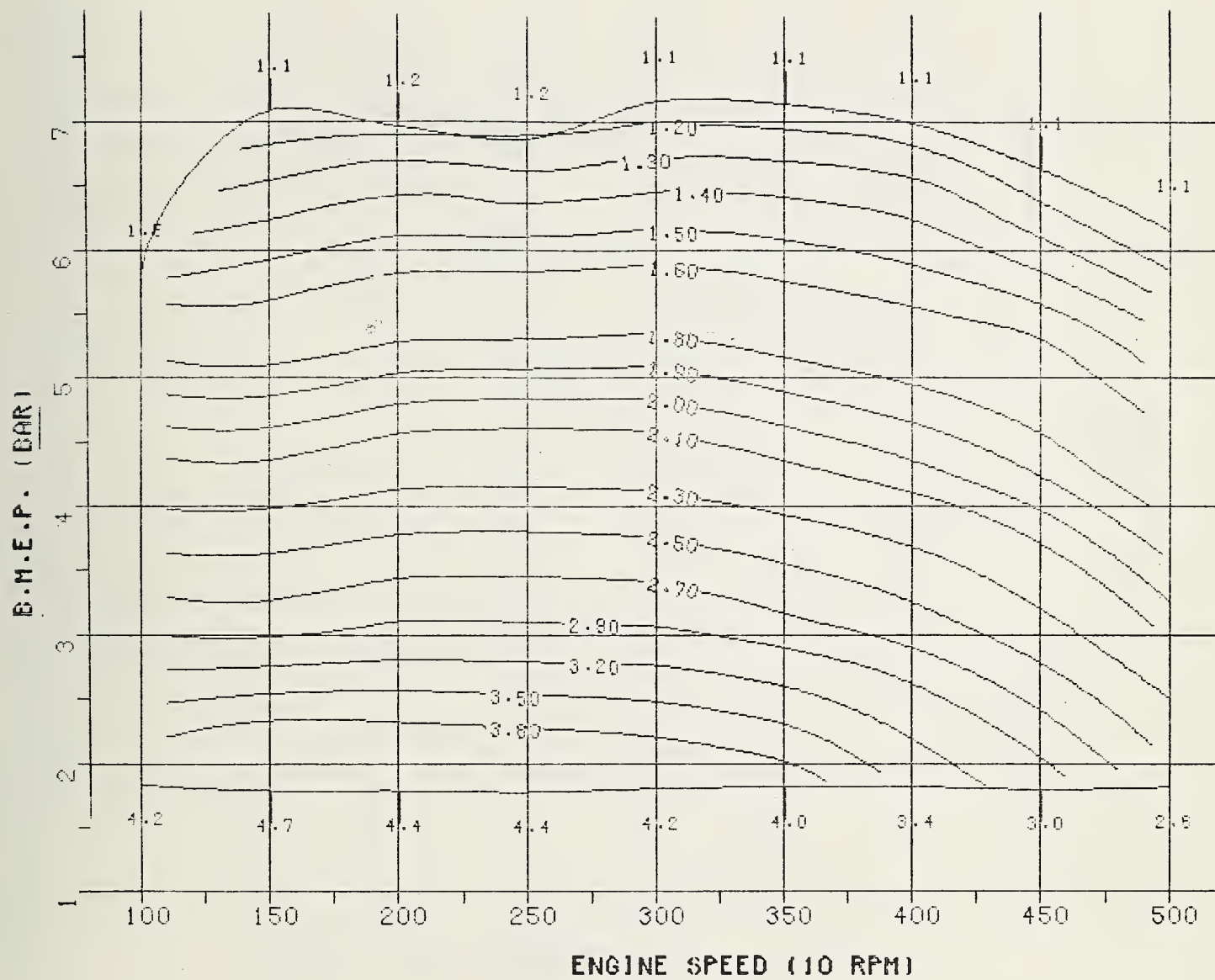




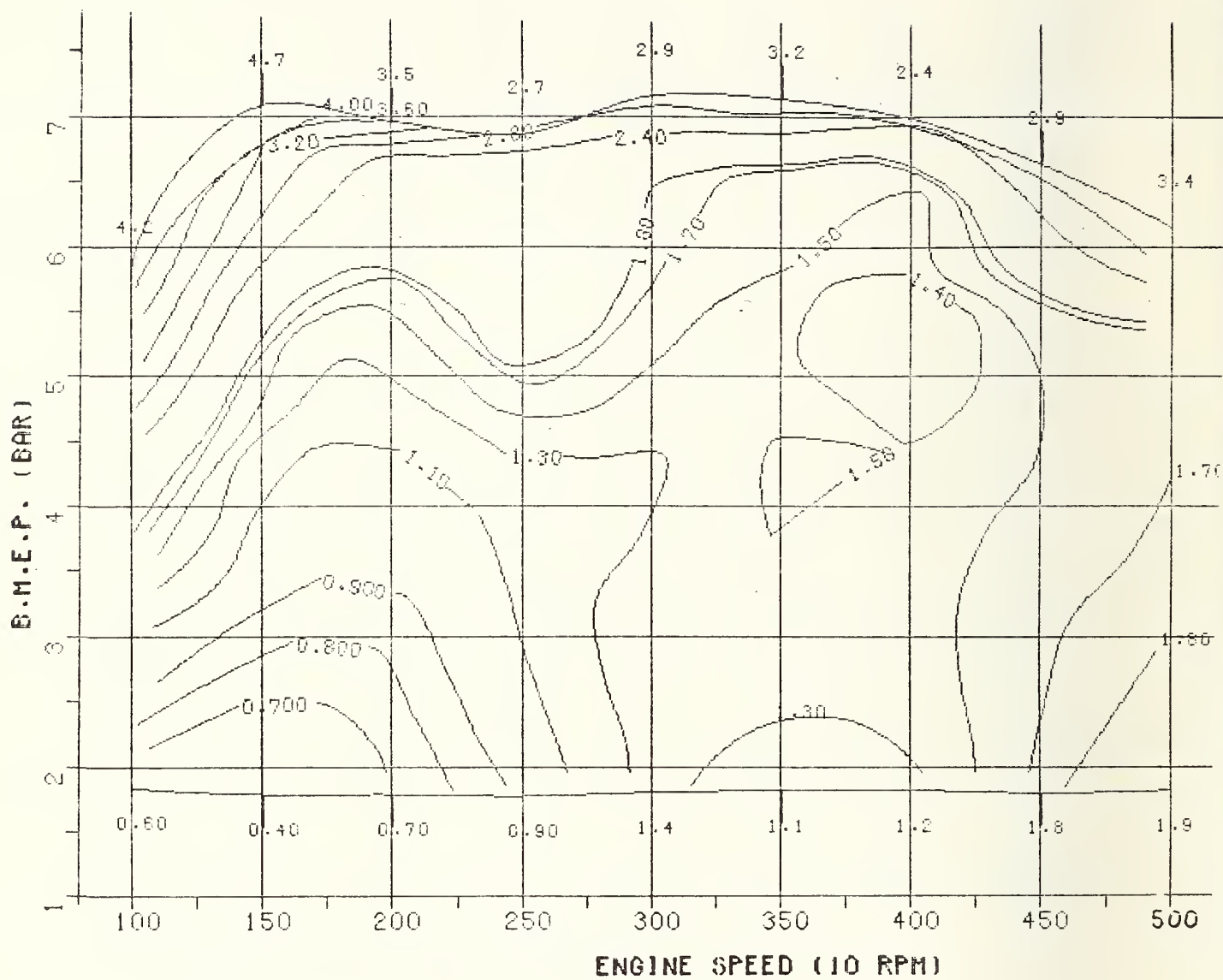
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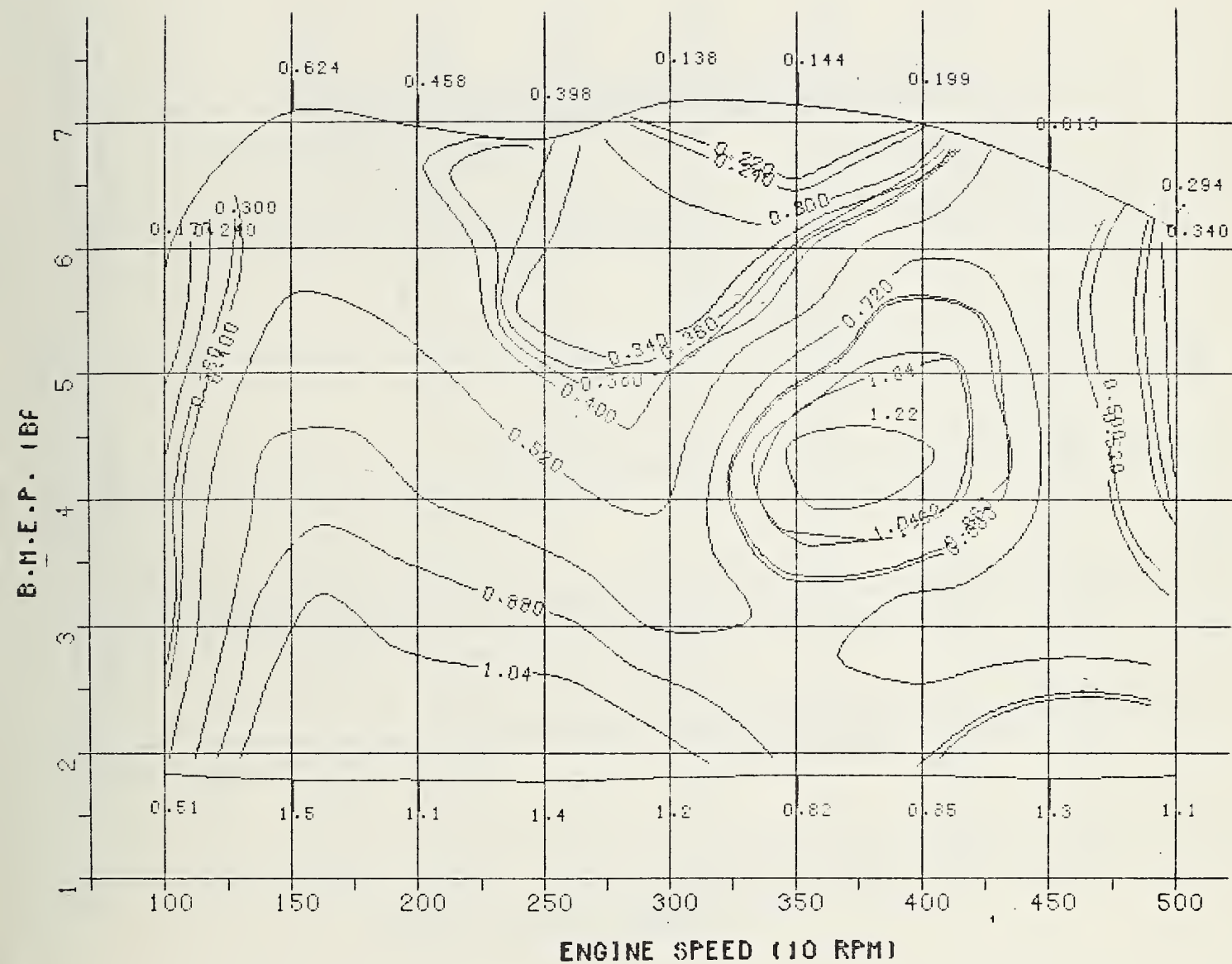
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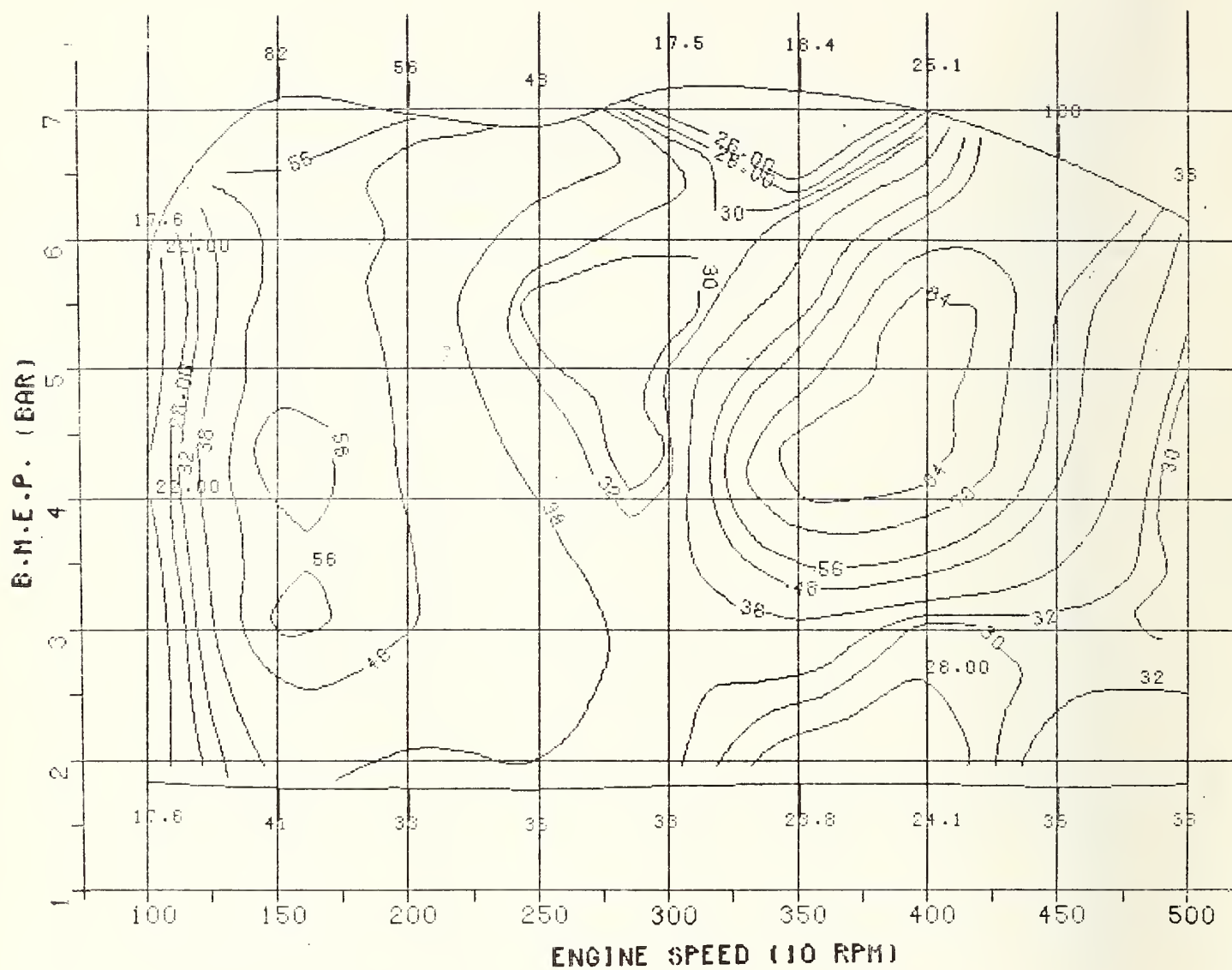
AIR TO FUEL RATIO  
50 HP N.A. 90 CID PRODUCTION DIESEL ENGINE



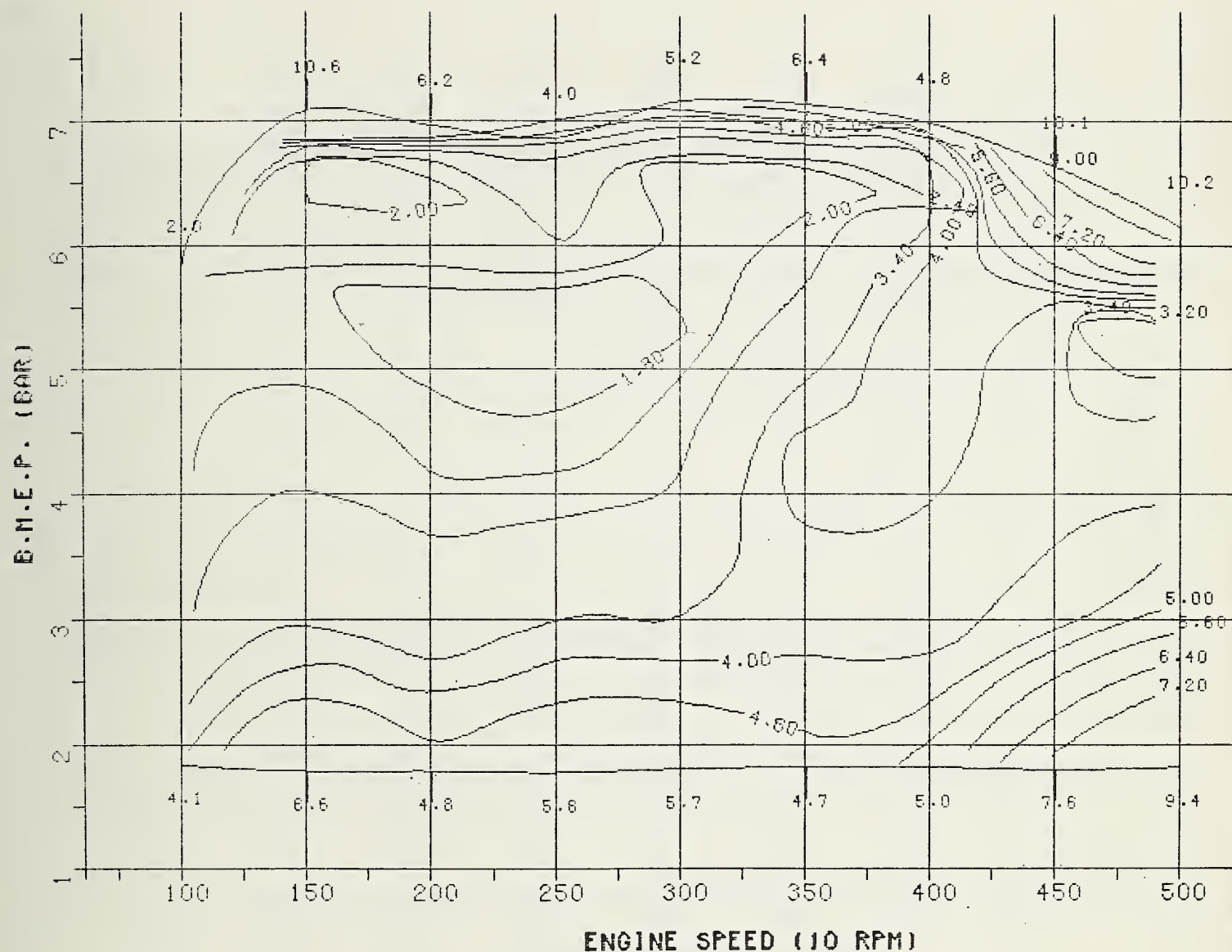
SMOKE (BOSCH NUMBER)  
50 HP N.A. 90 CID PRODUCTION DIESEL ENGINE



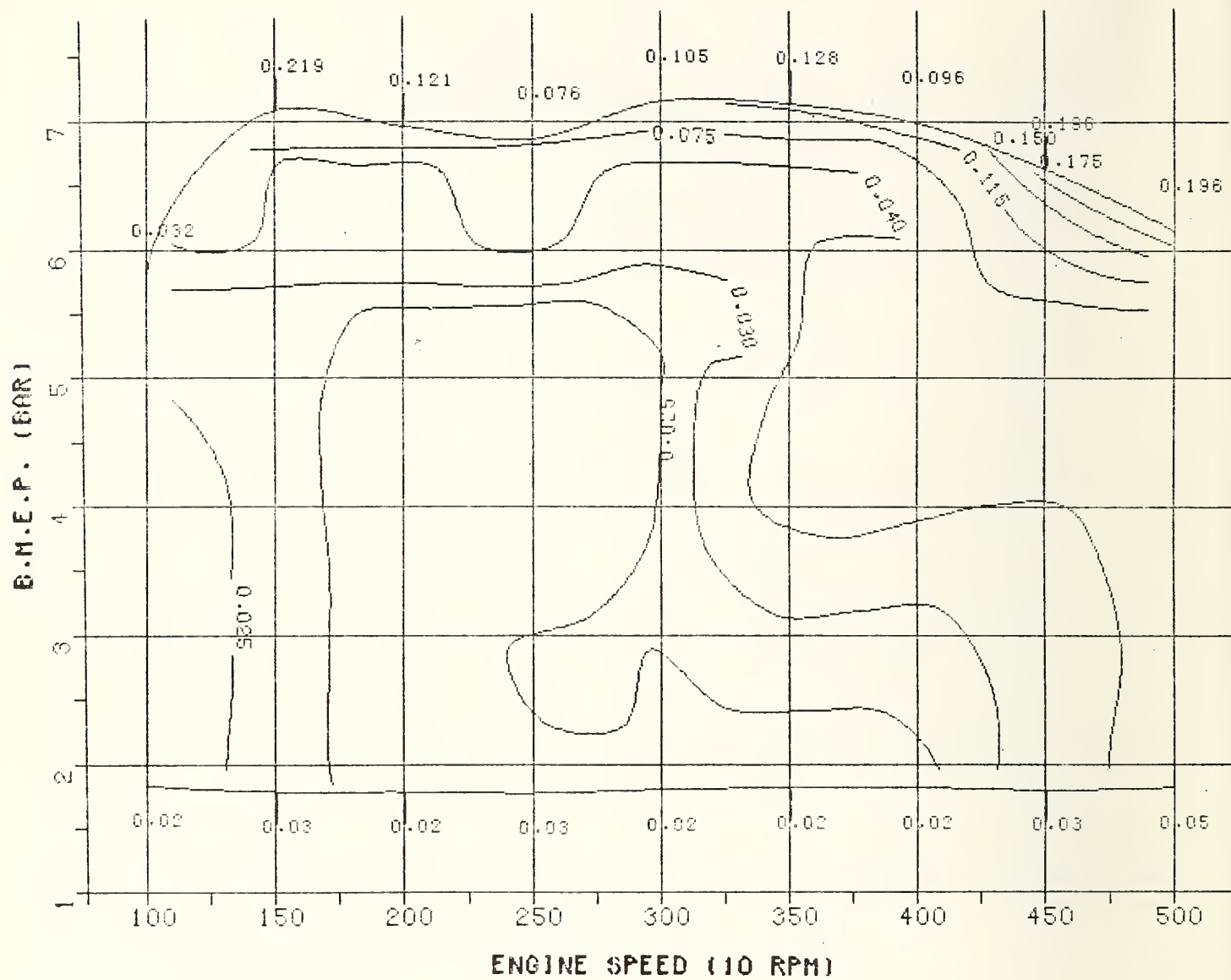
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50 HP N.A. 90 CID PRODUCTION DIESEL ENGINE



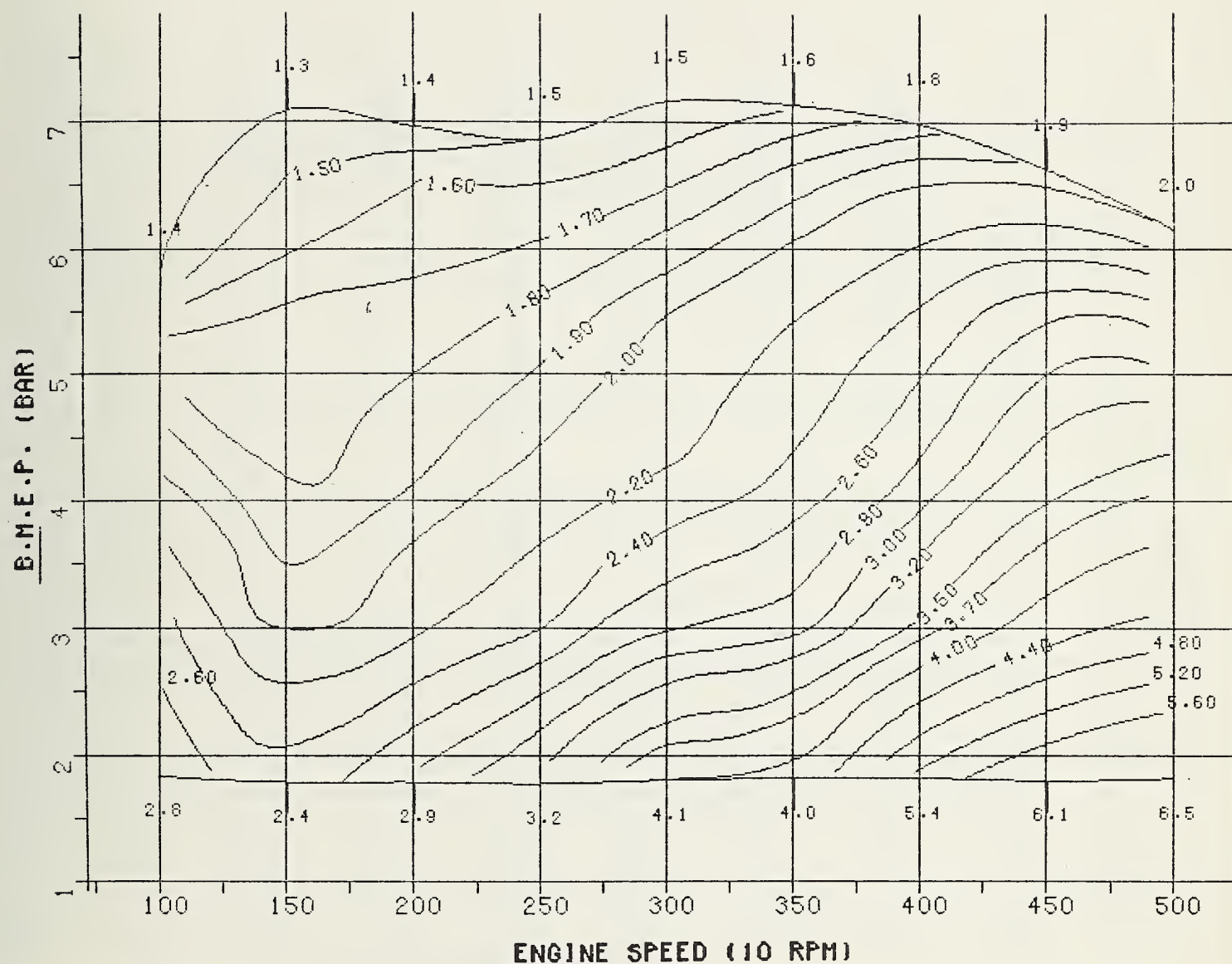
HC CONCENTRATION (PPM)  
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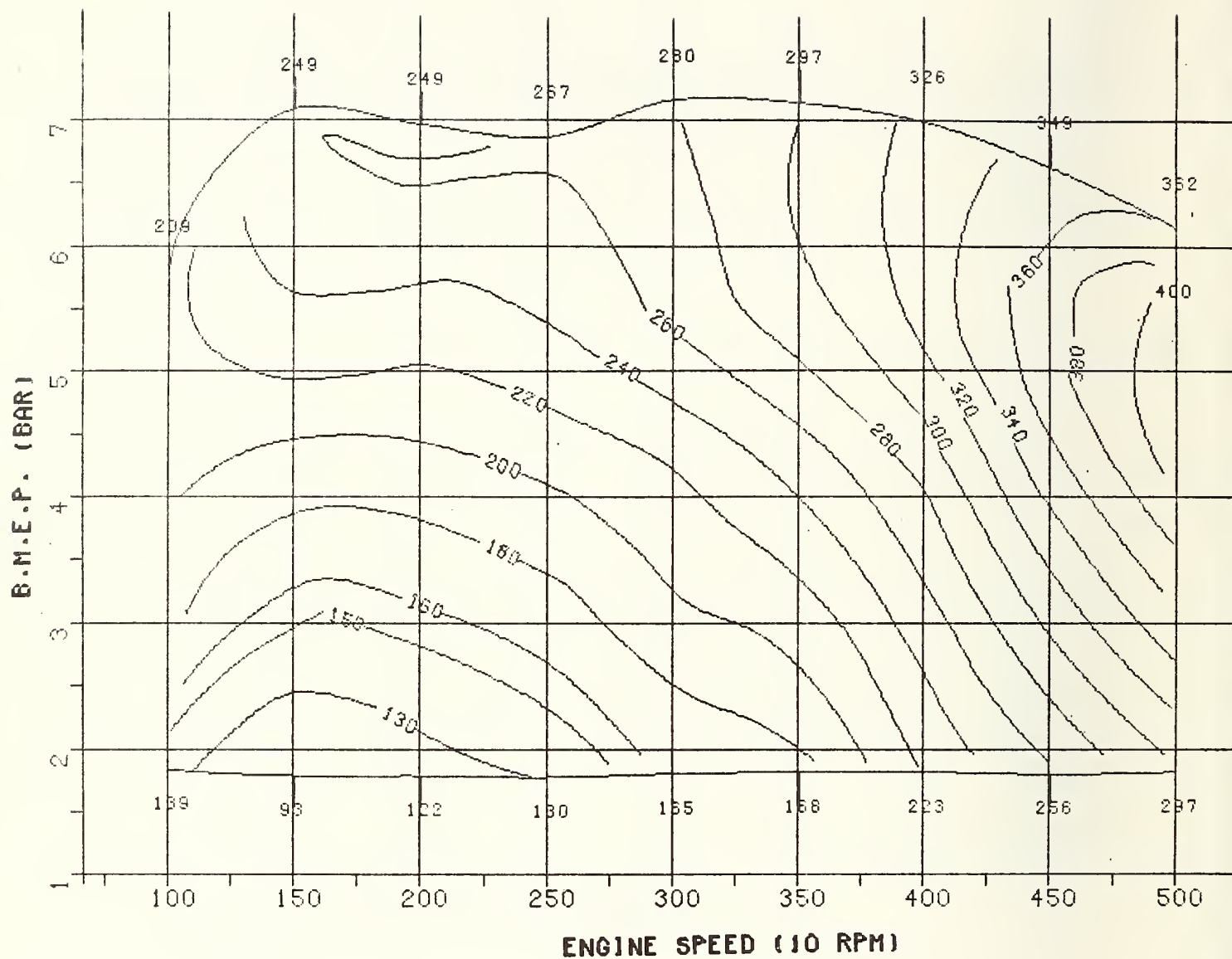
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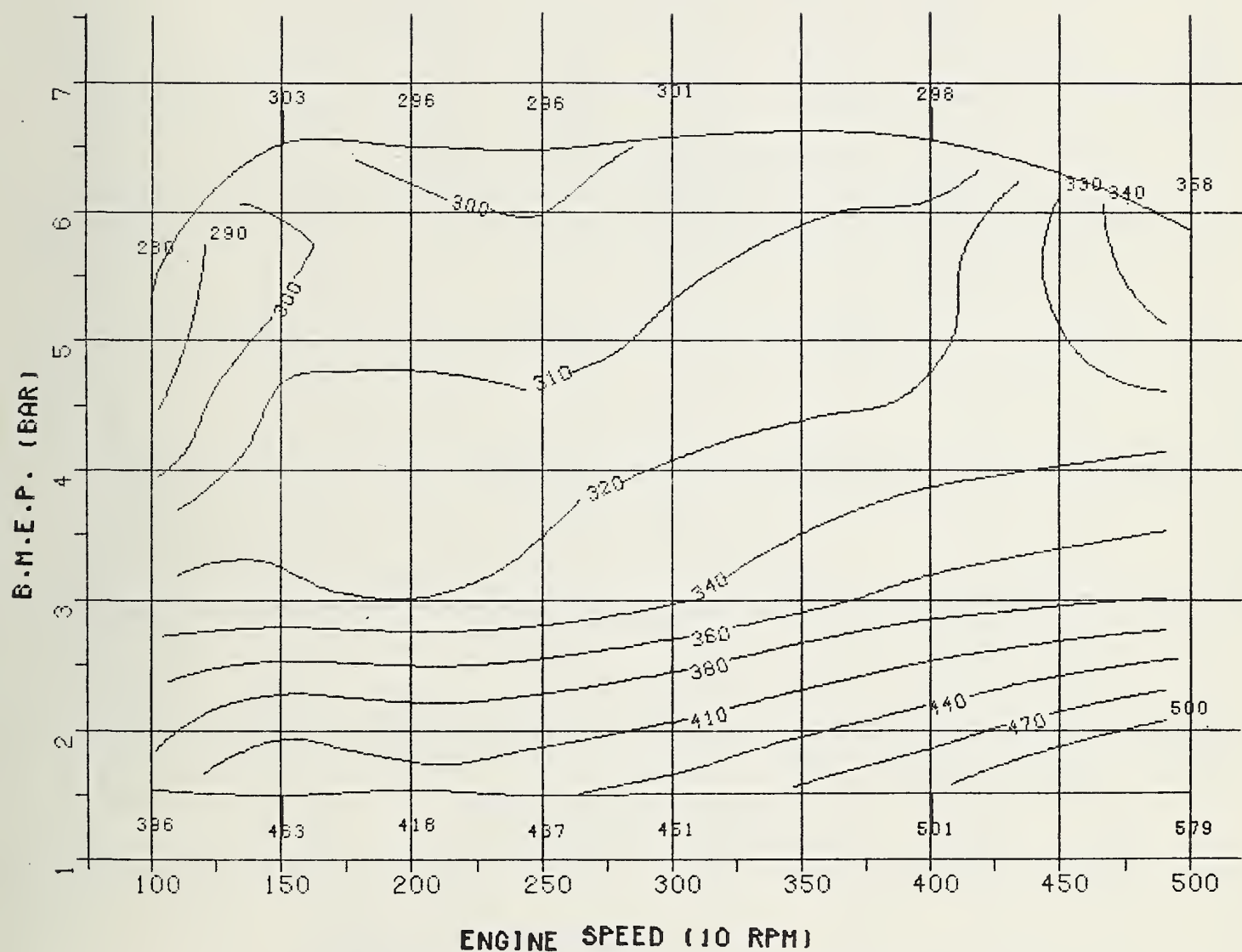
CO CONCENTRATION (%)  
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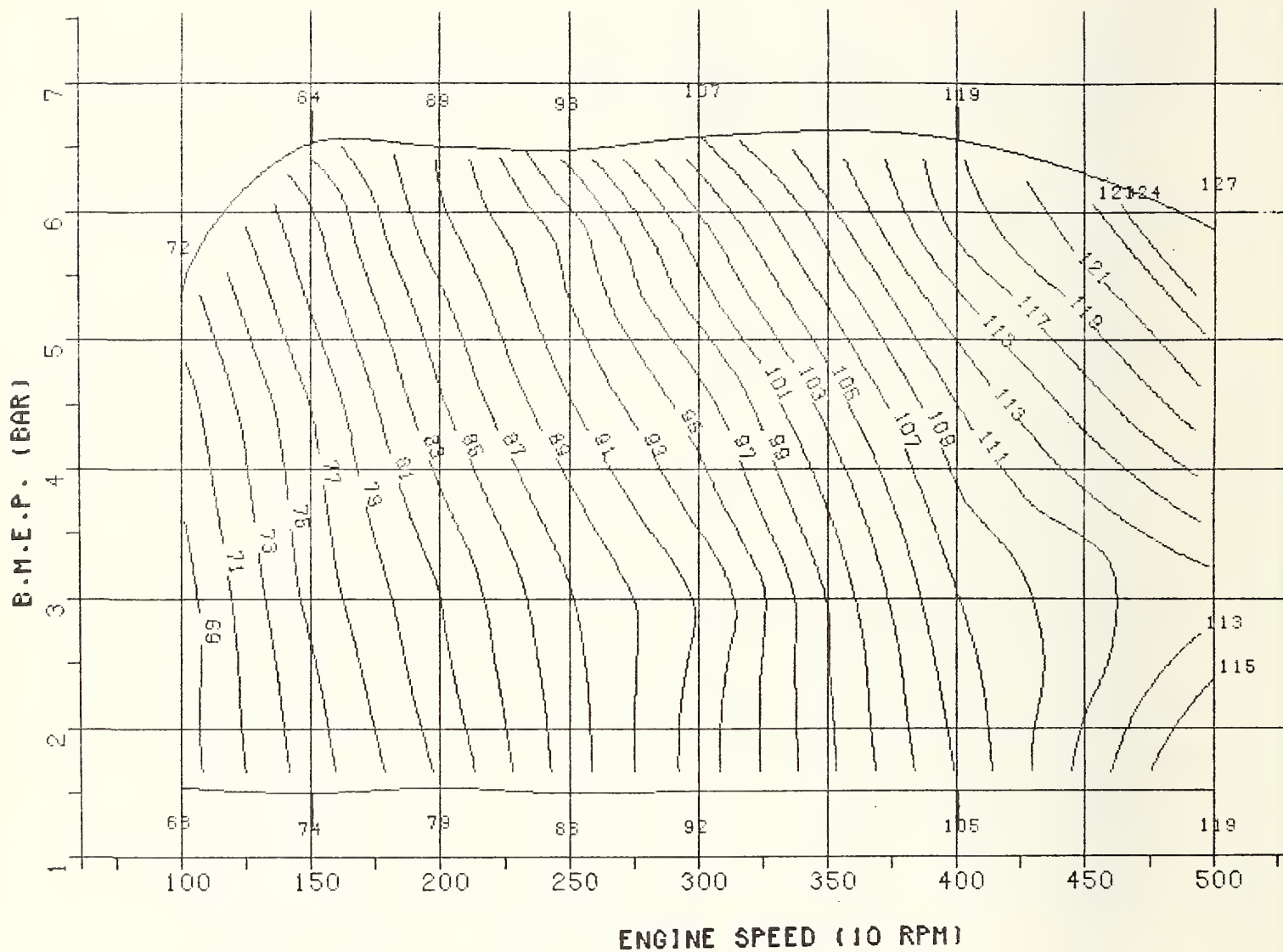
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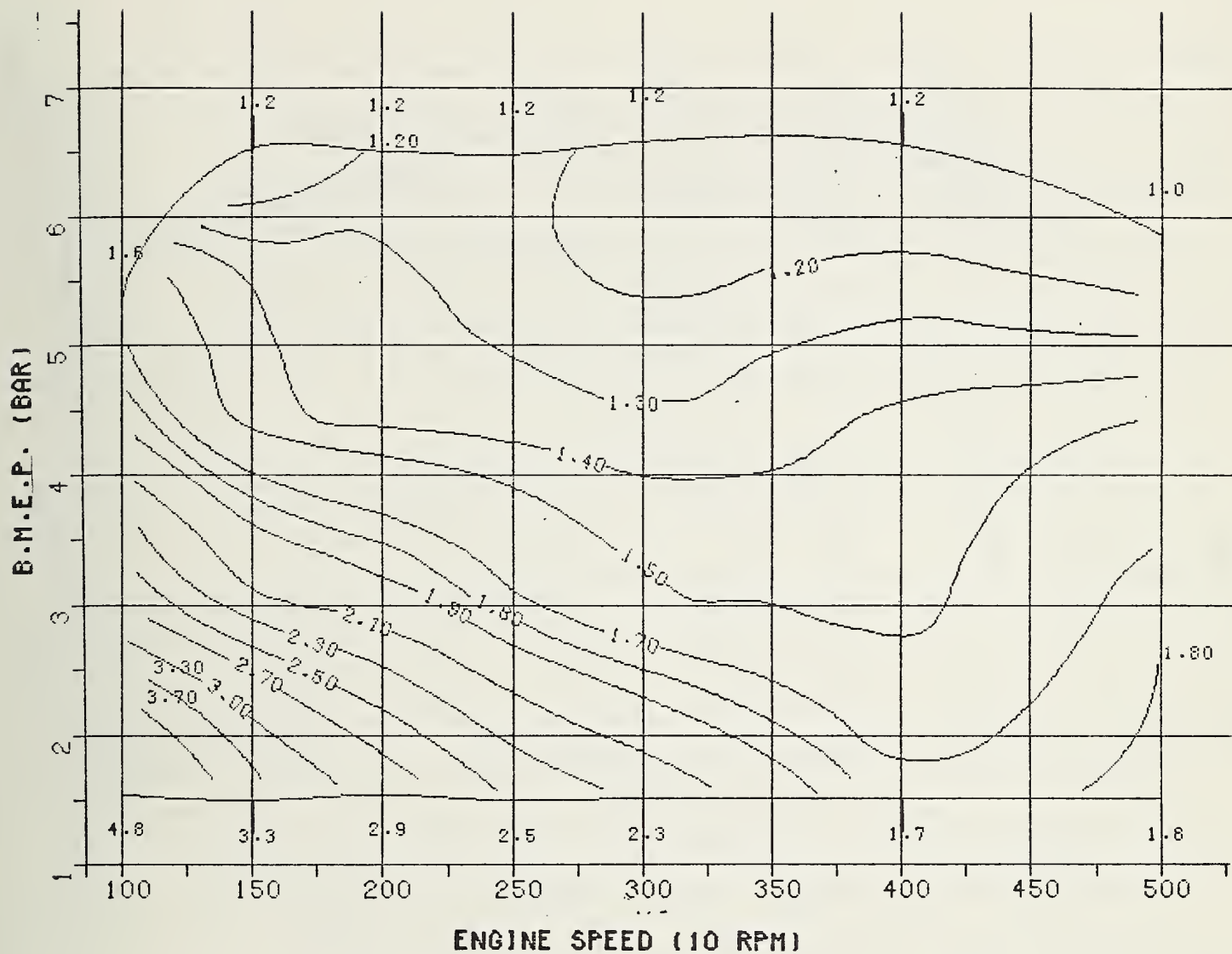
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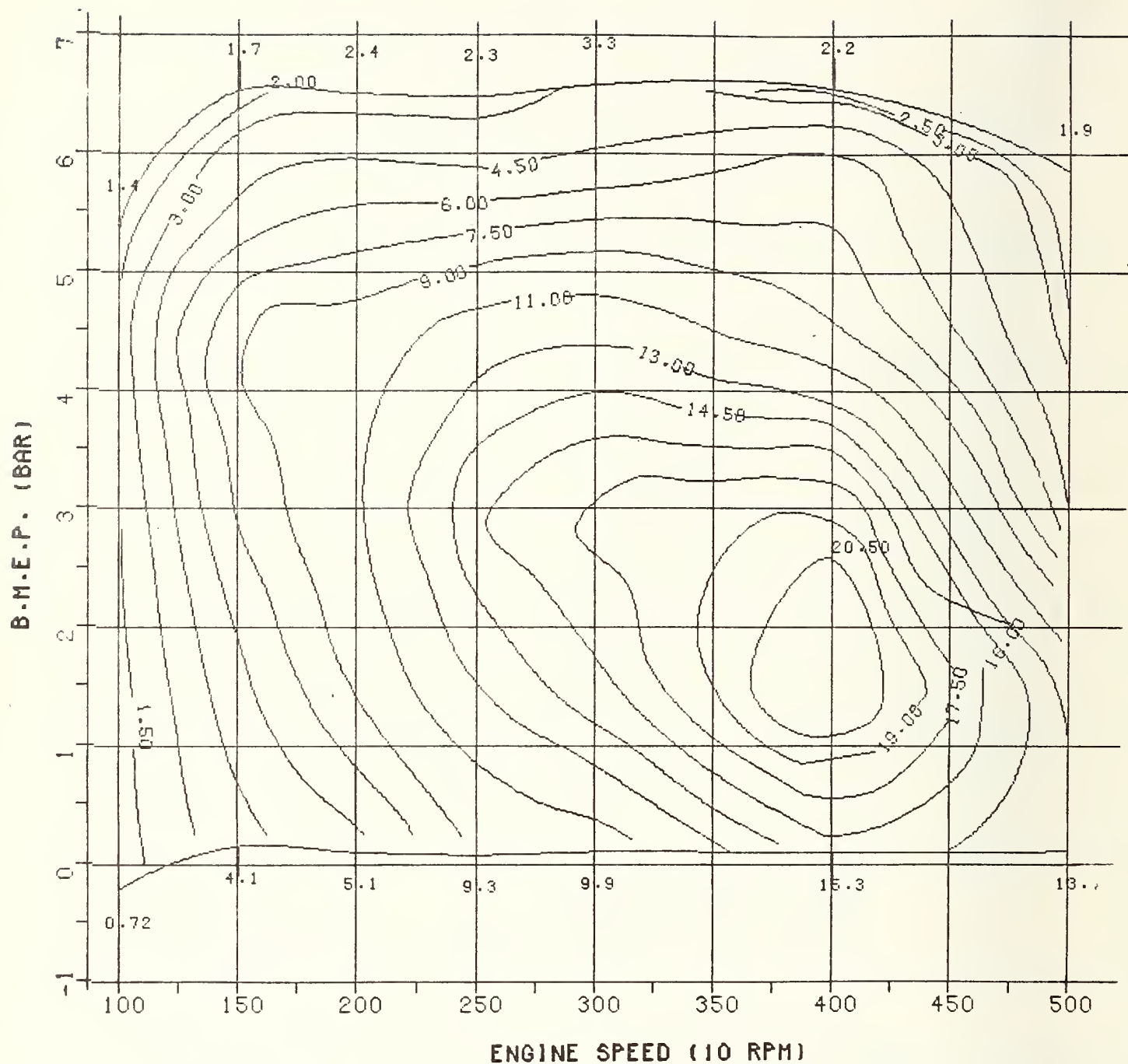
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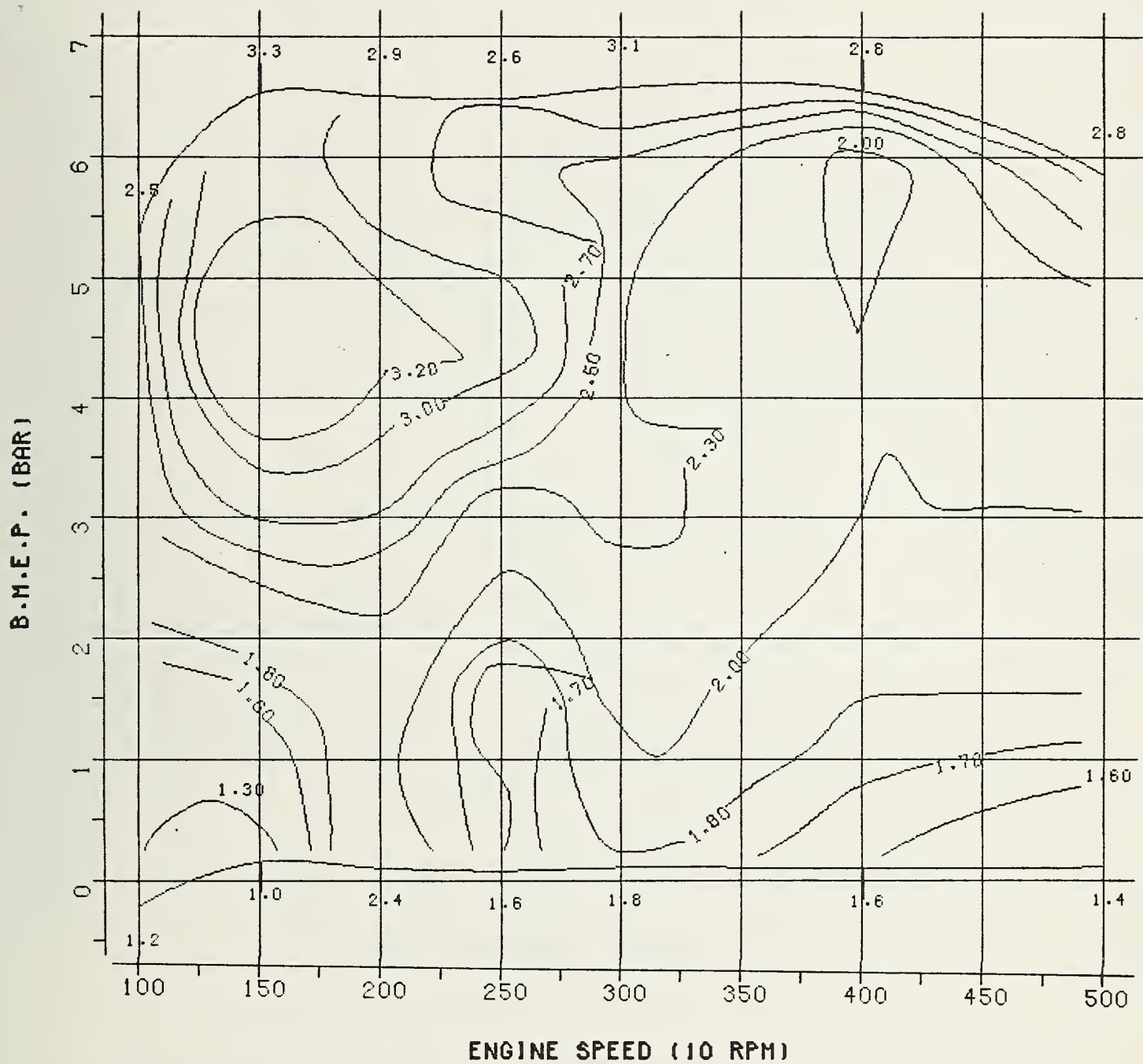


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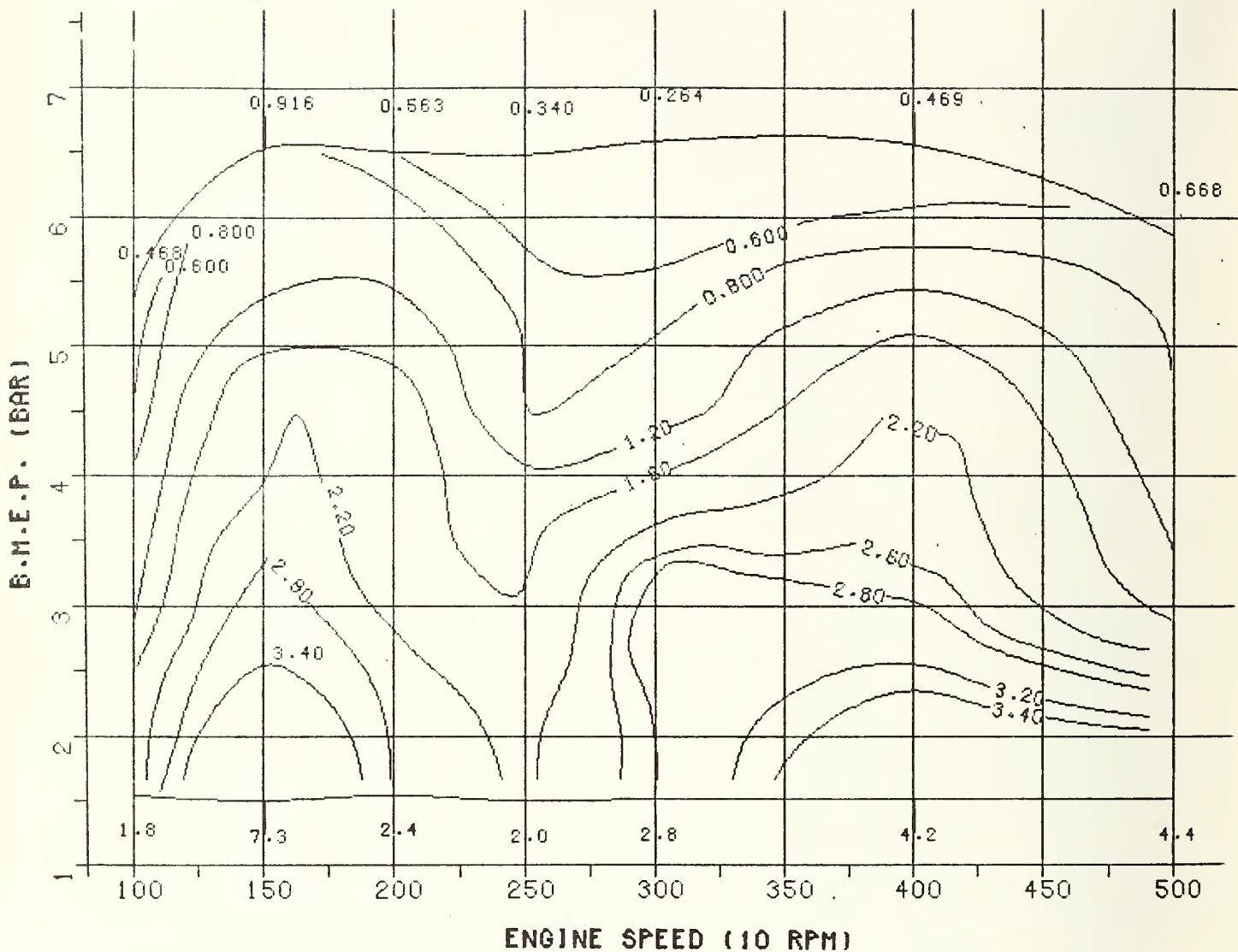


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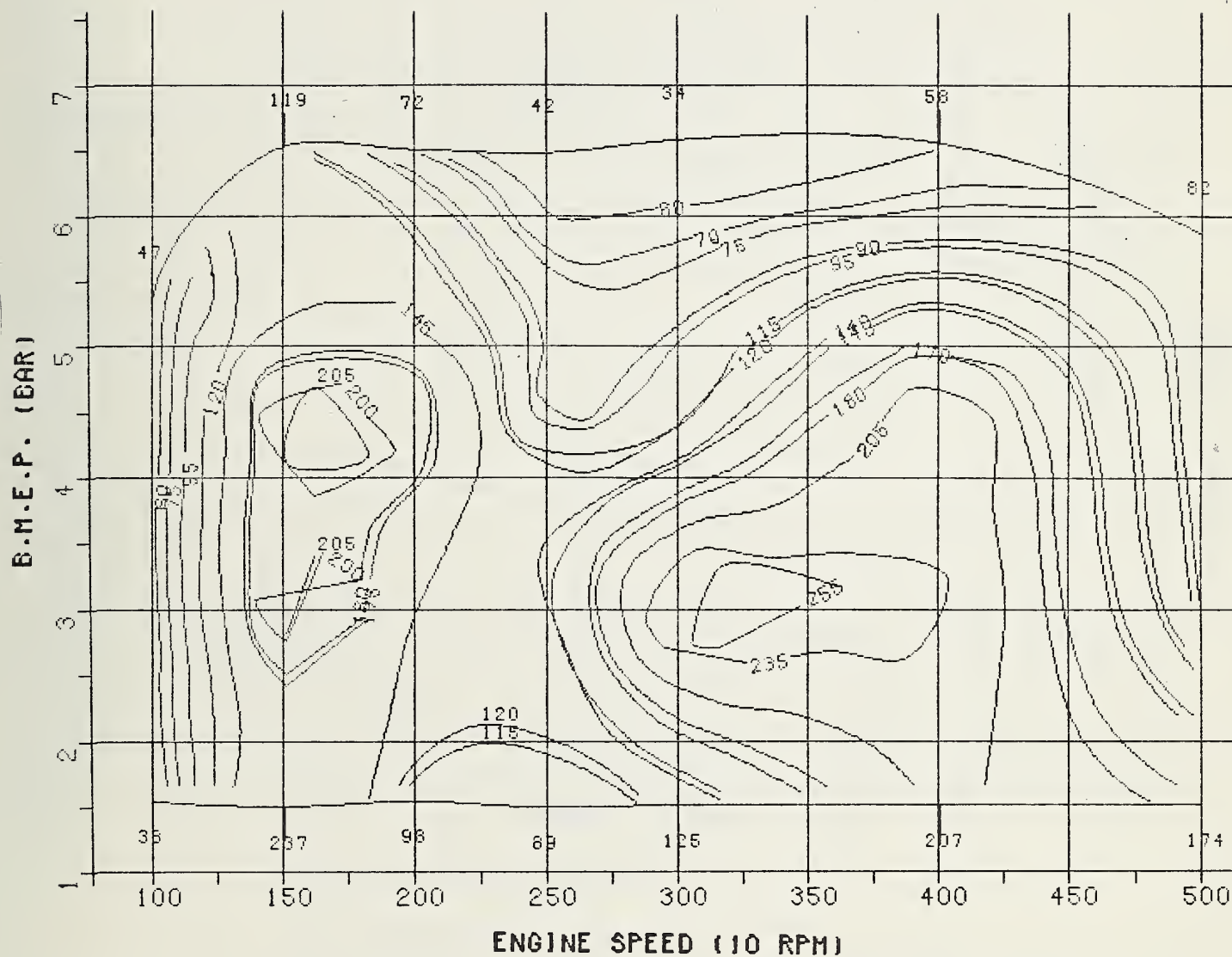




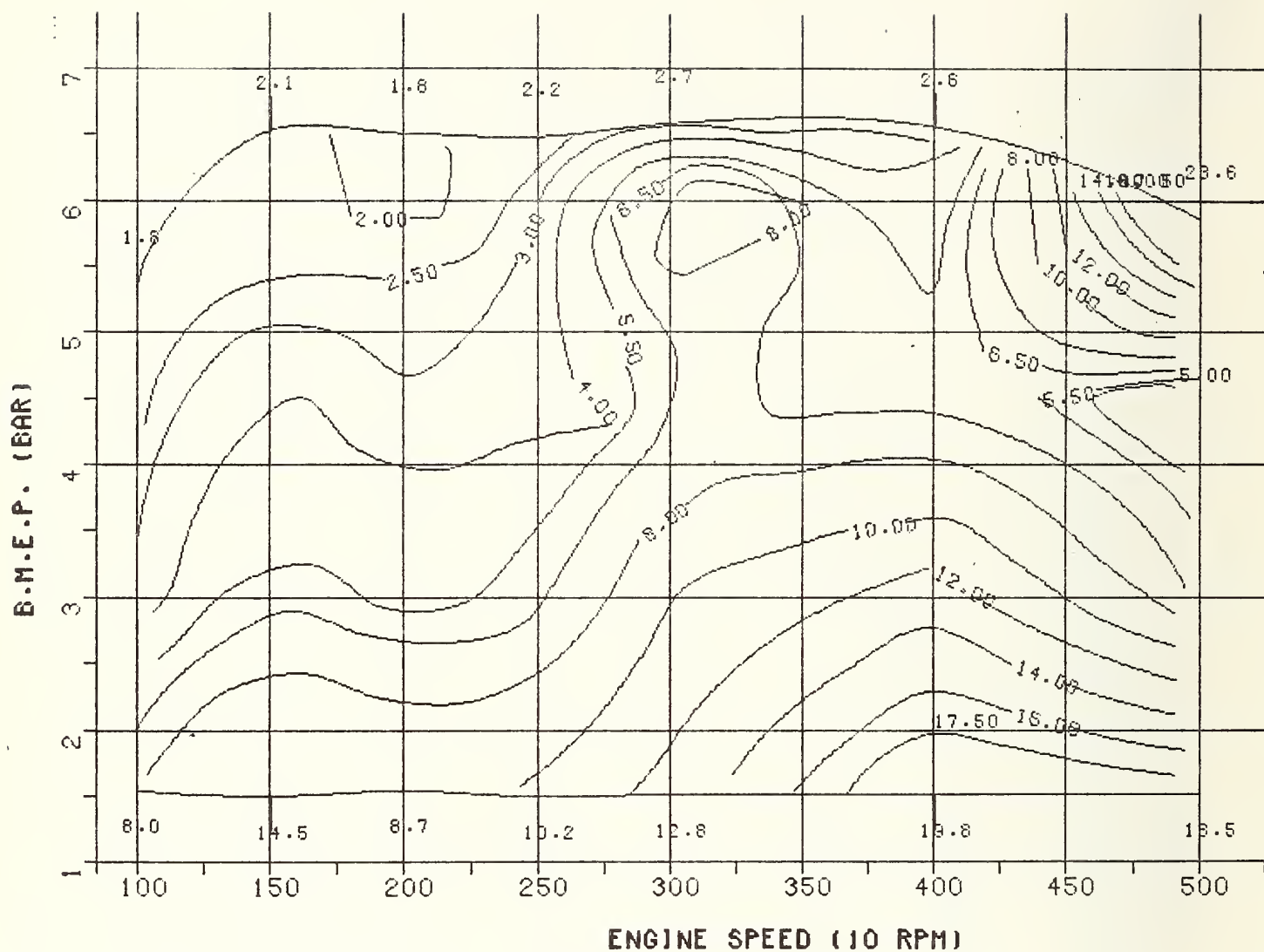
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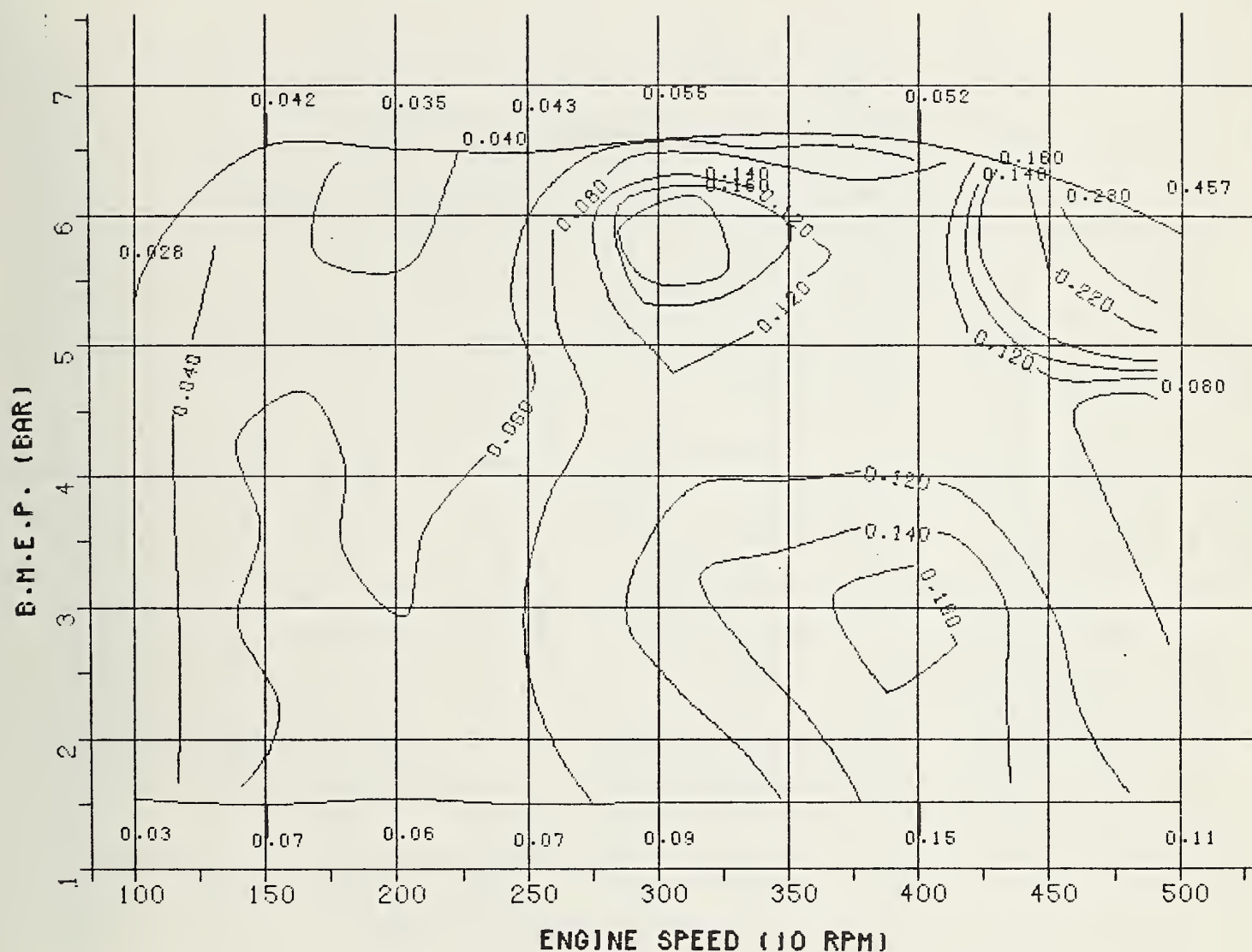
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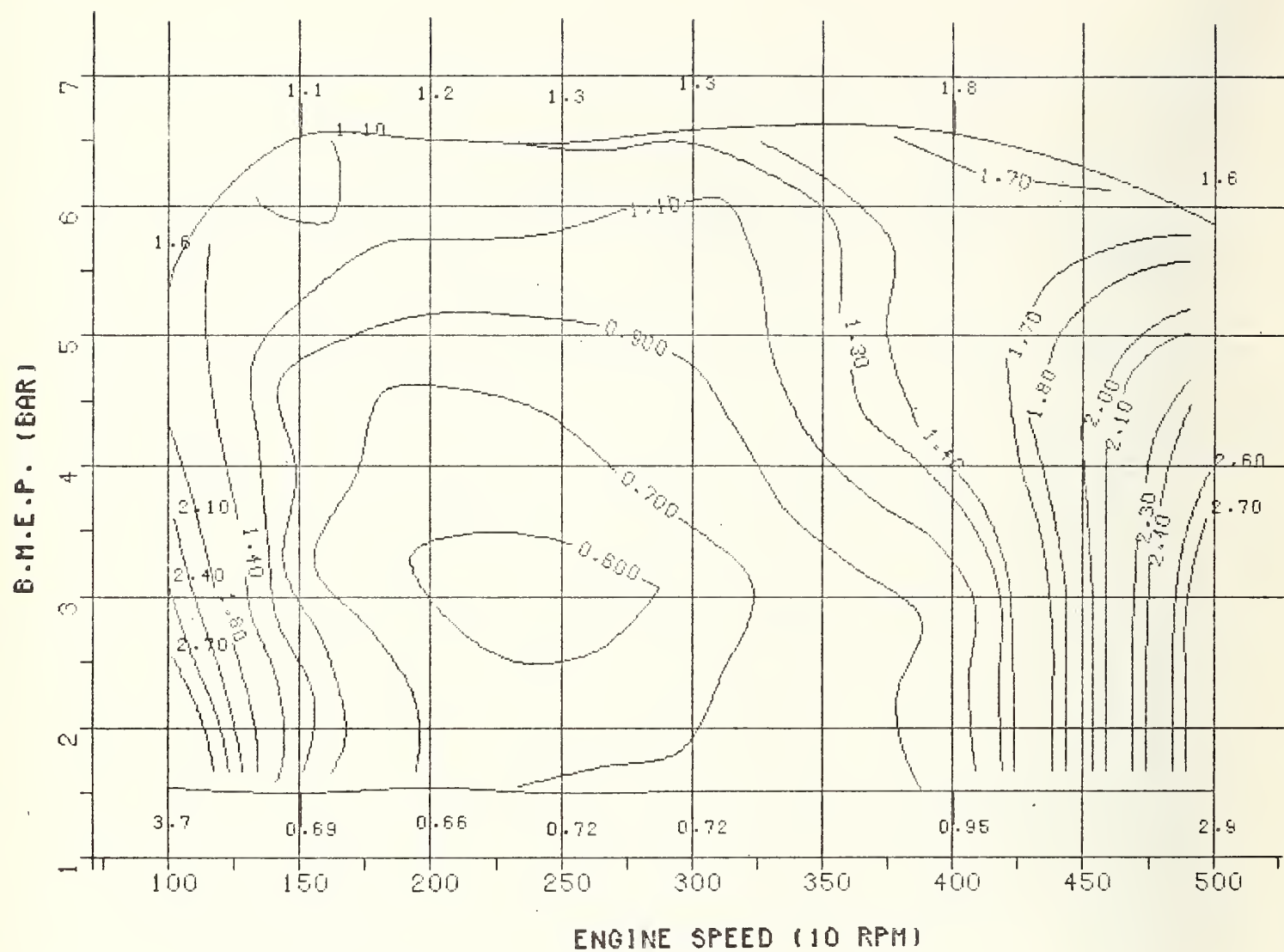
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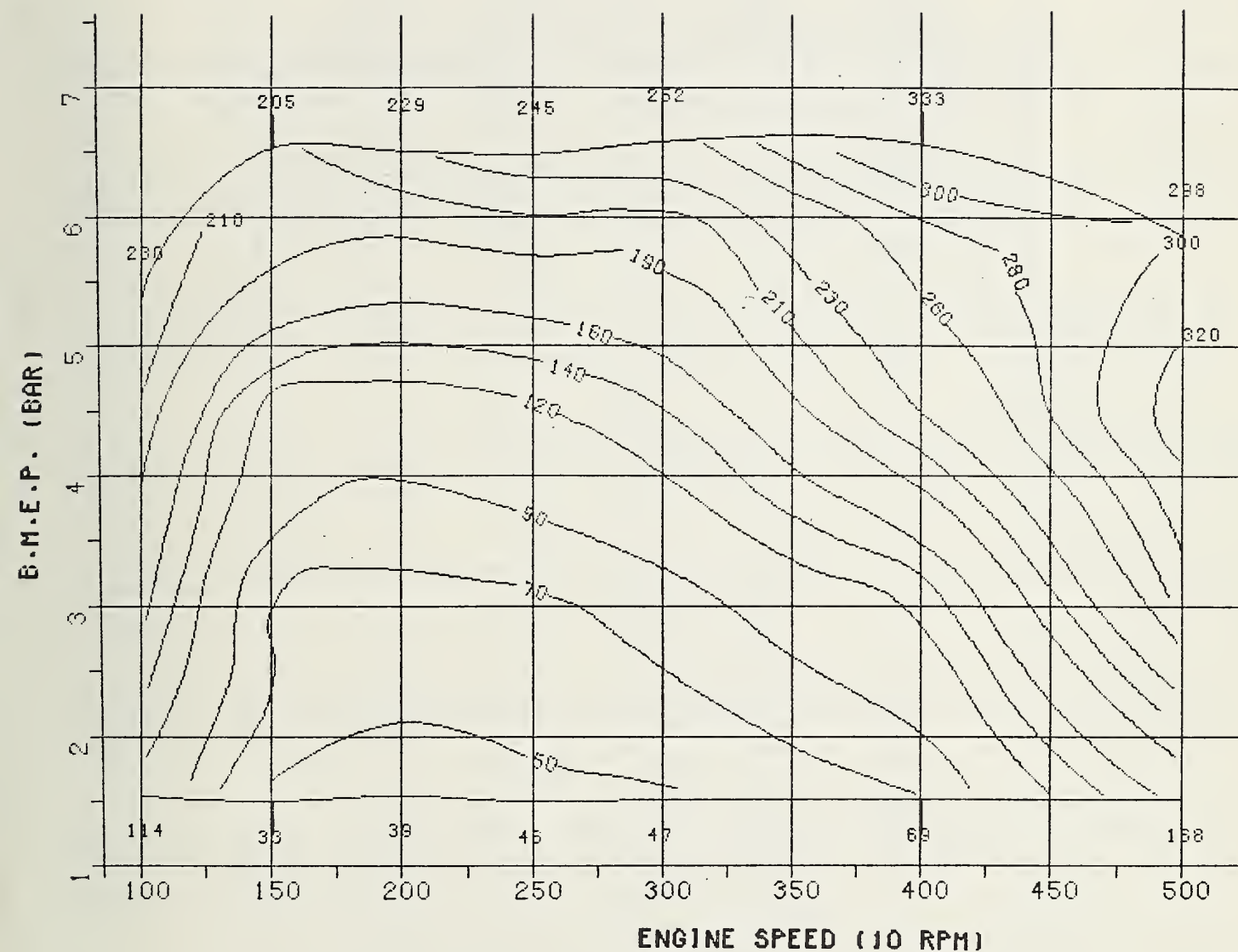
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CO CONCENTRATION (%)  
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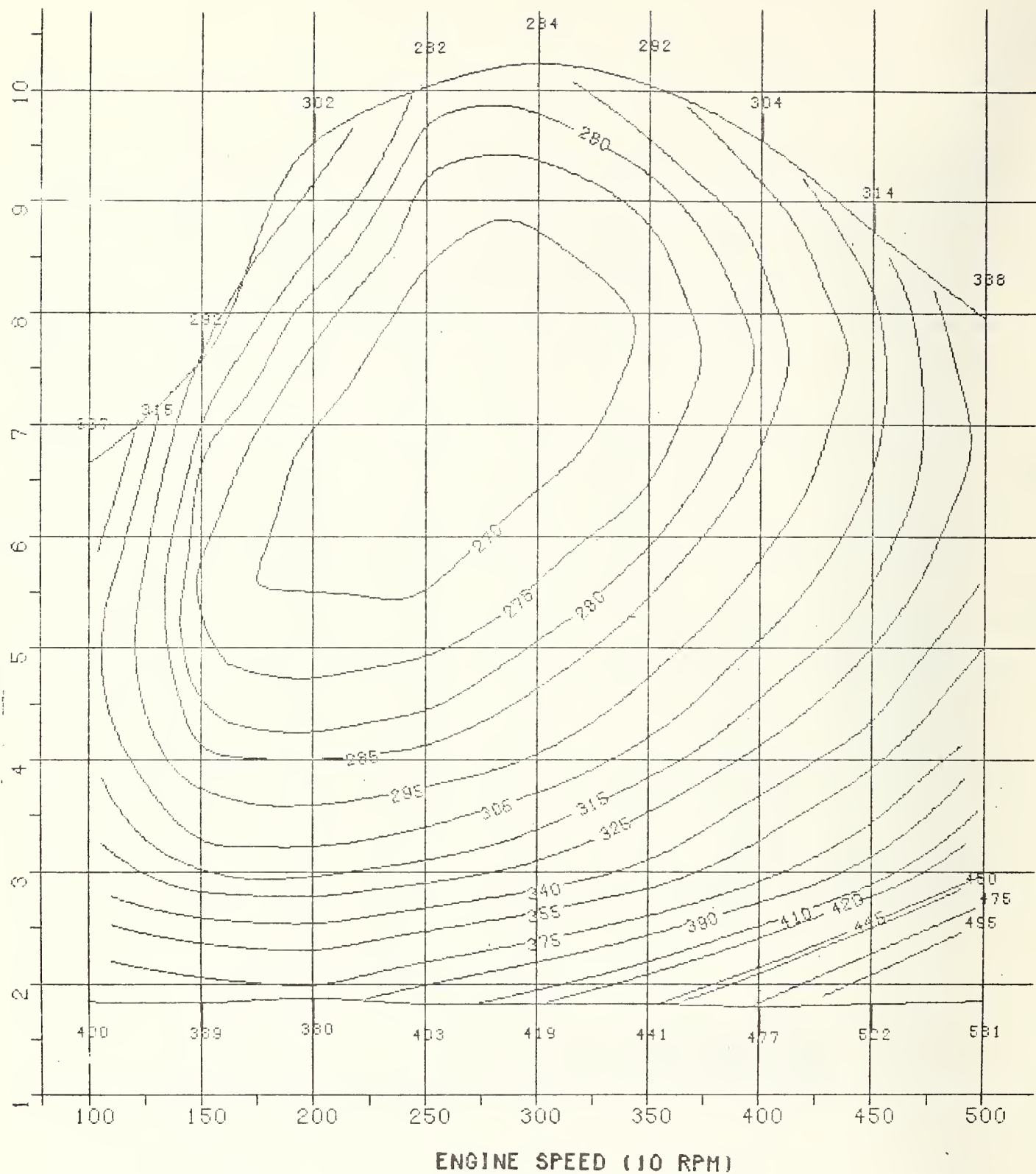


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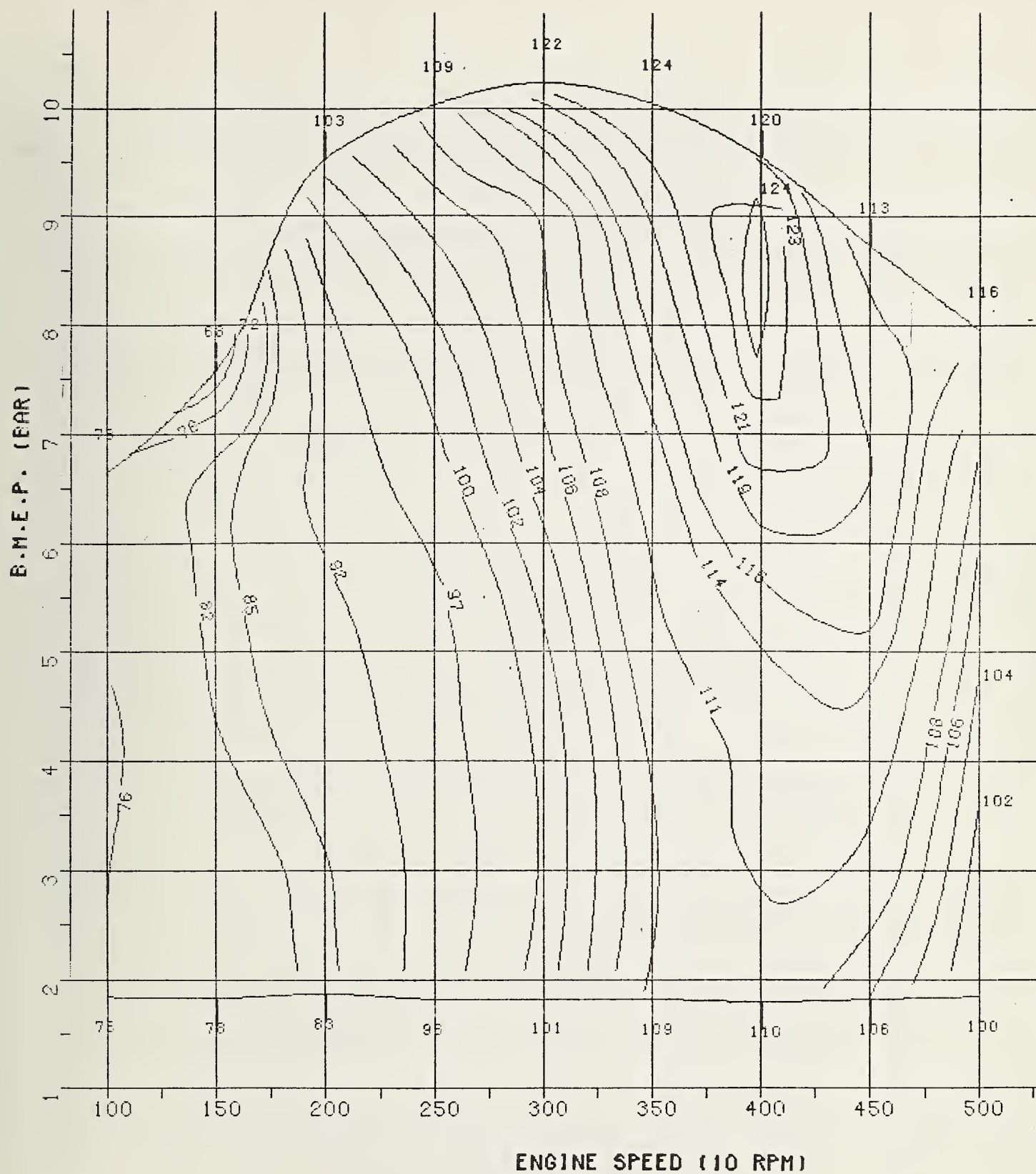


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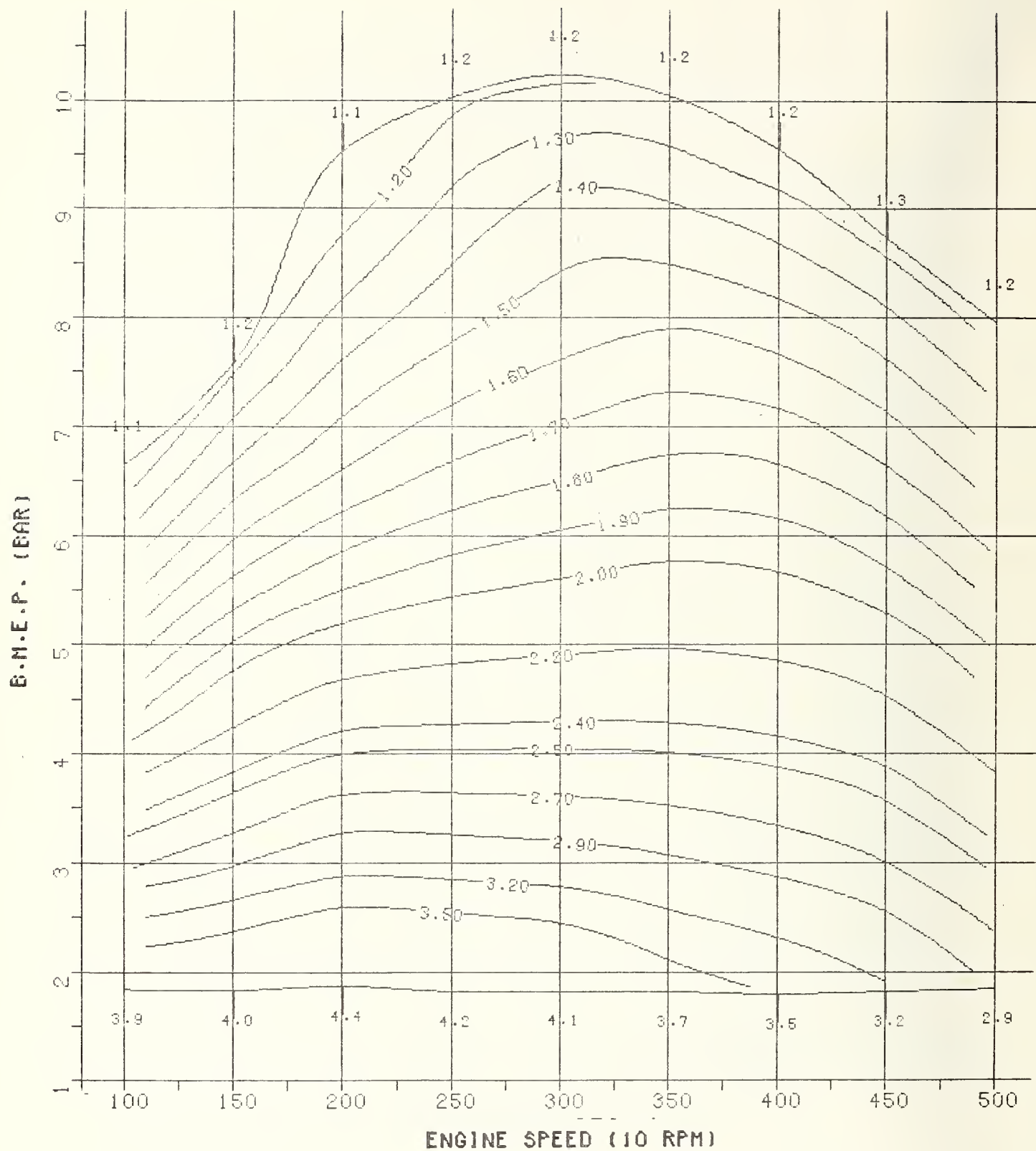
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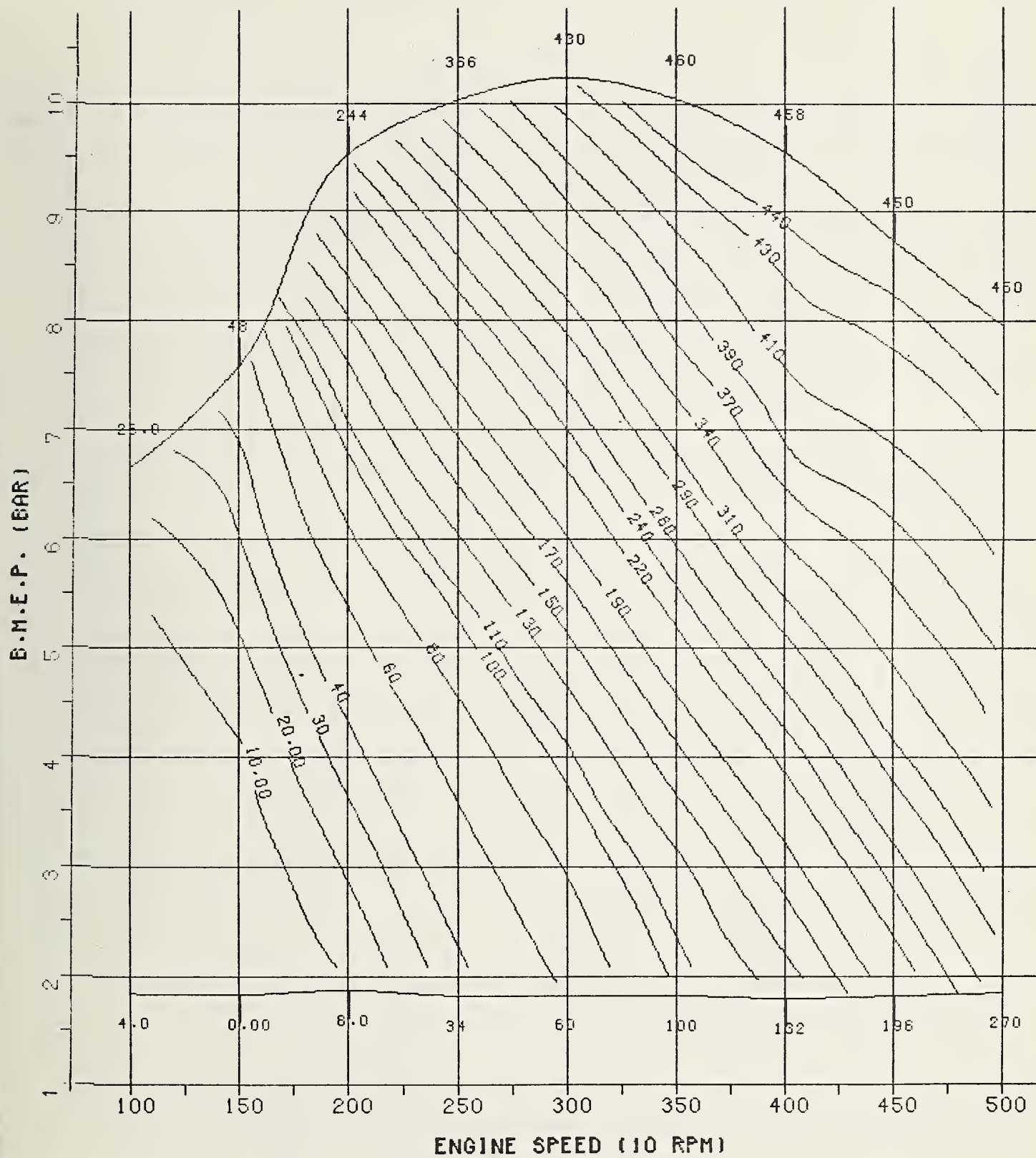
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70 HP TURBOCHARGED RESEARCH DIESEL ENGINE

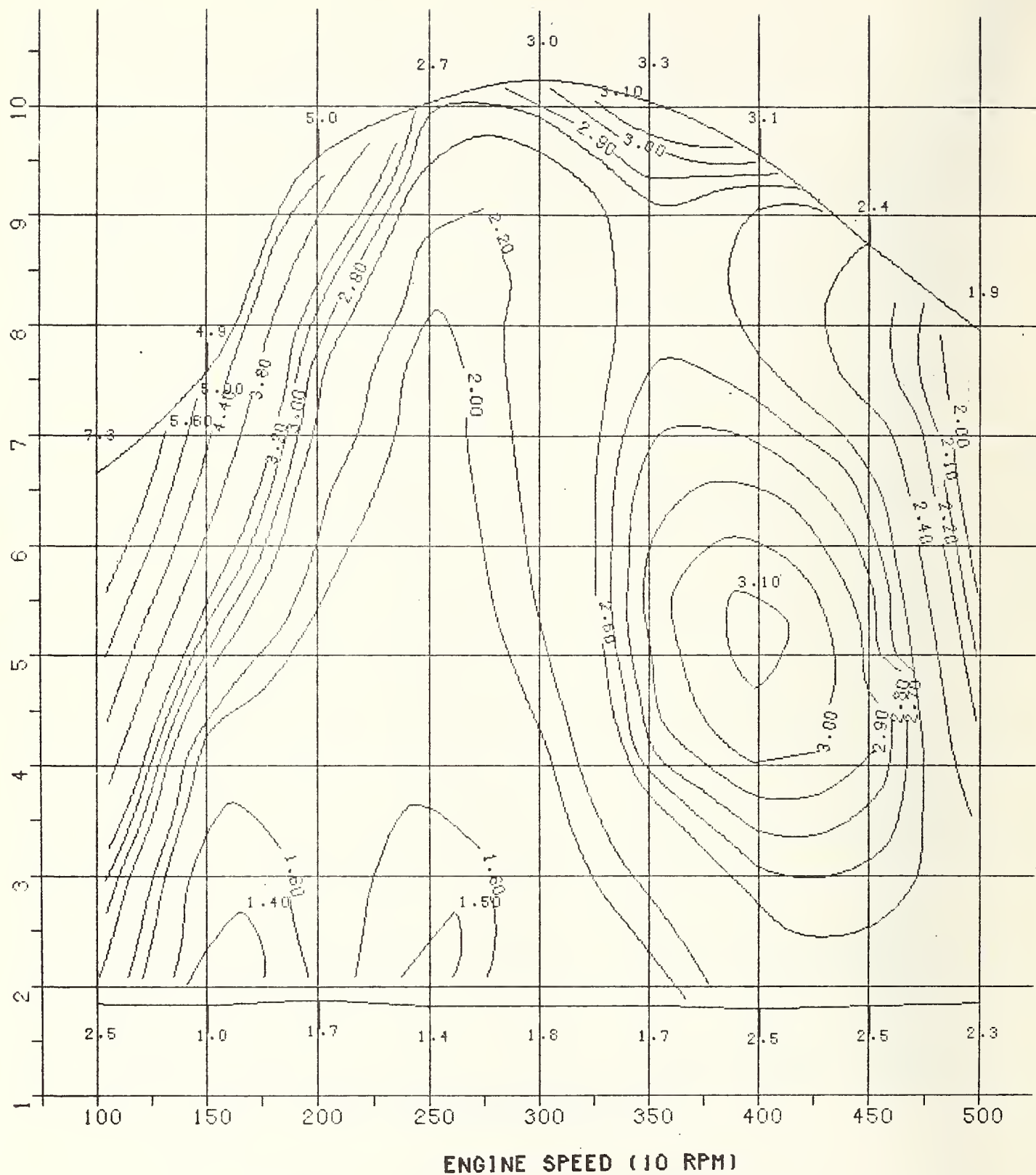


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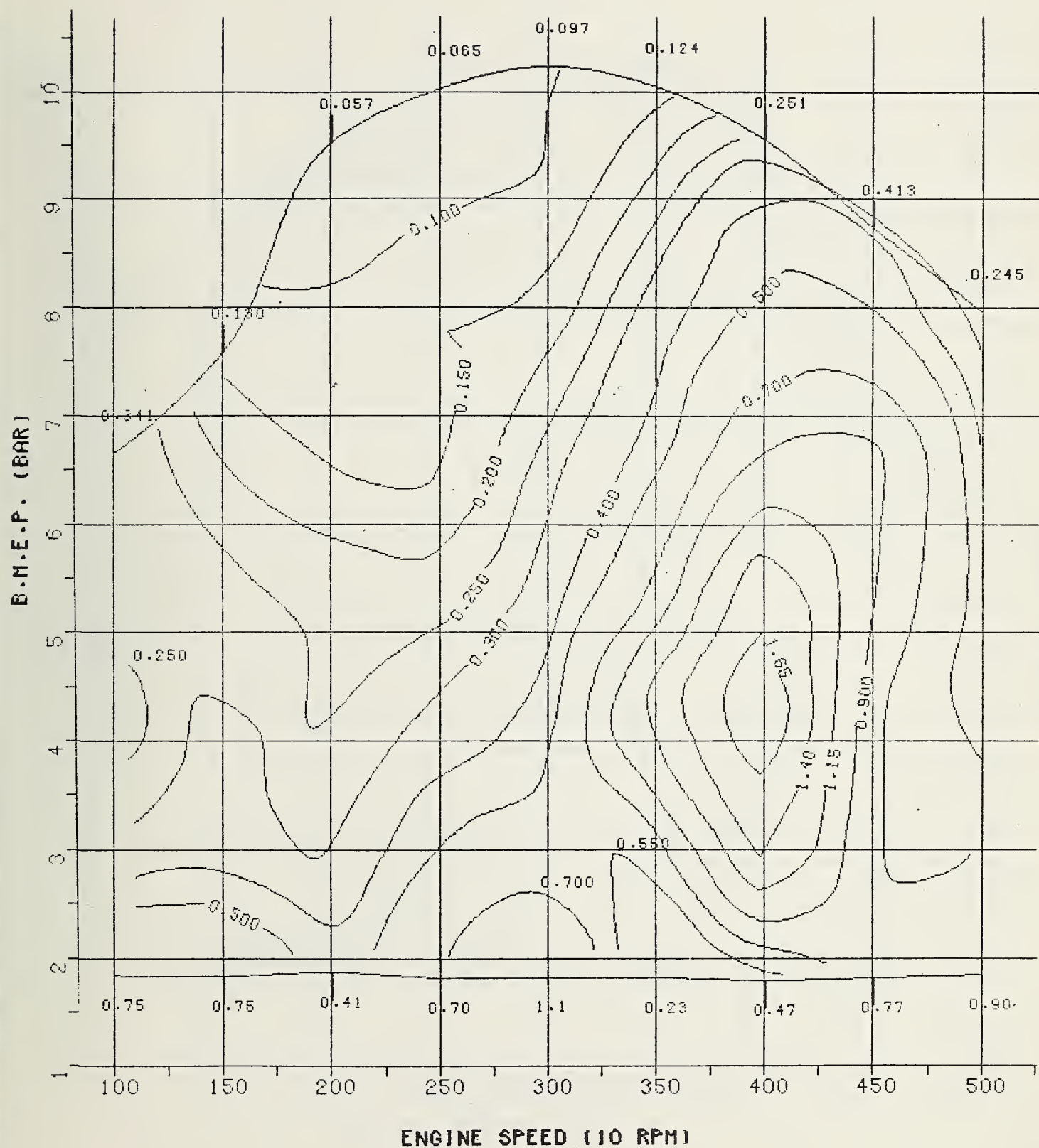


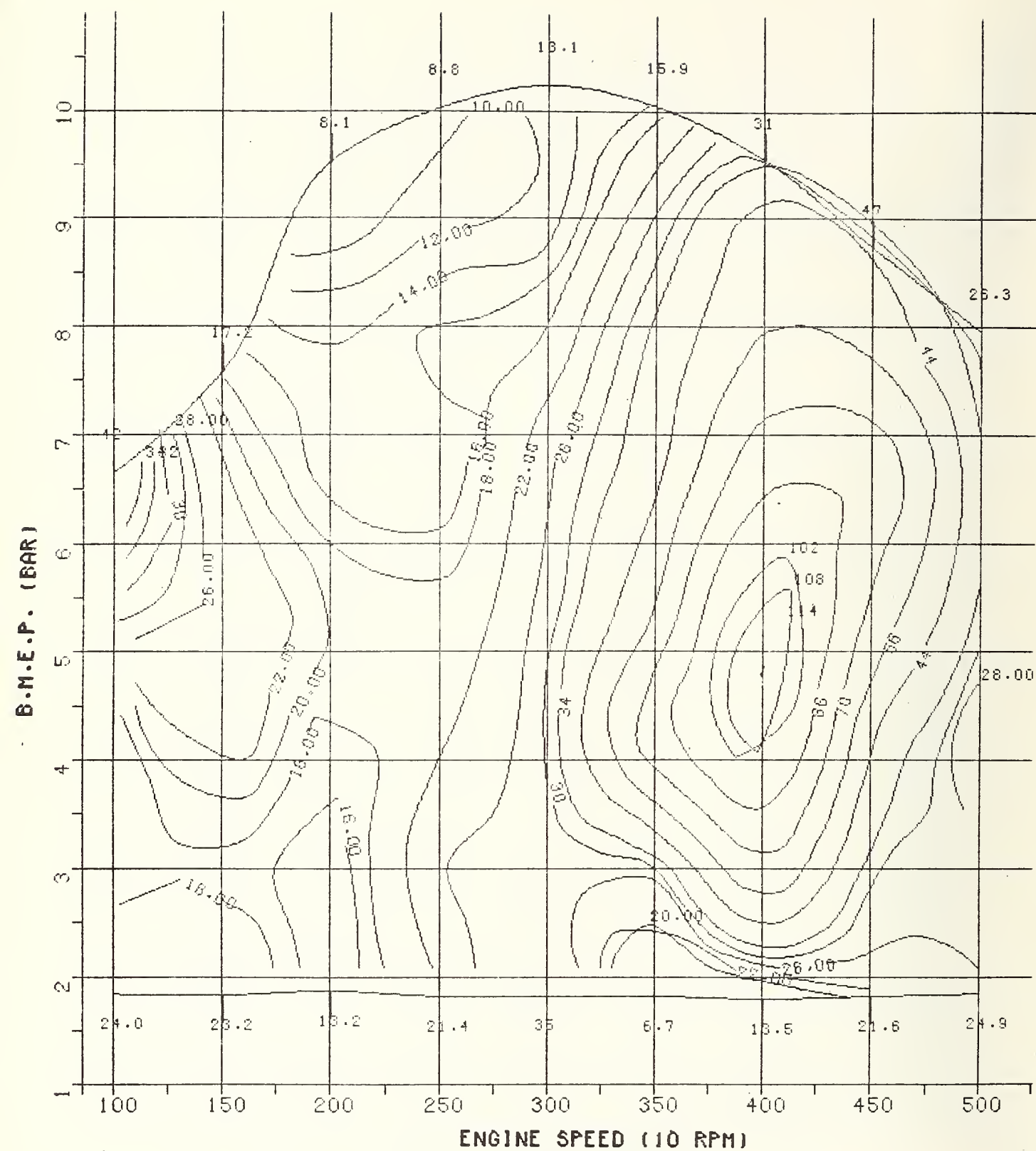
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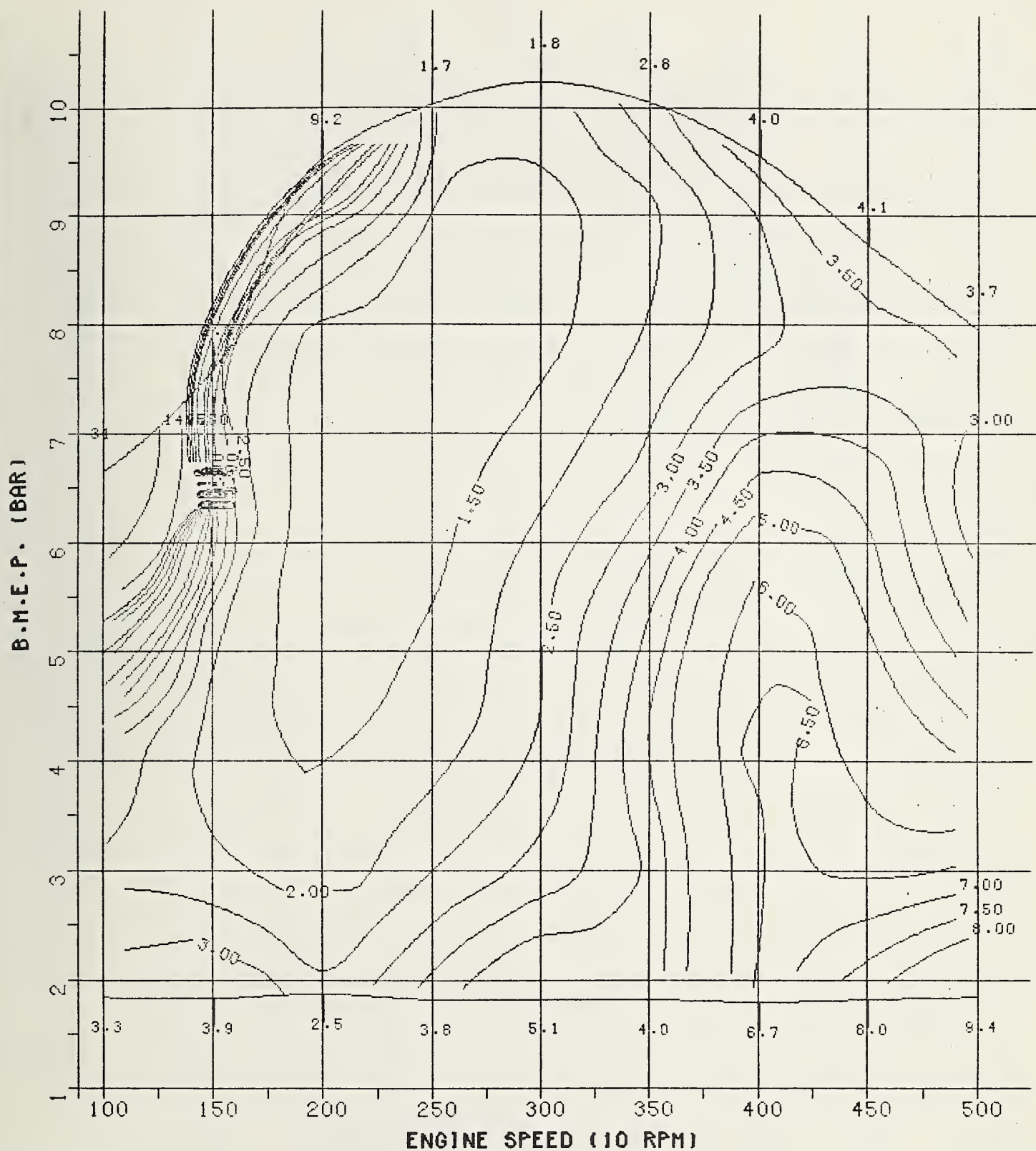
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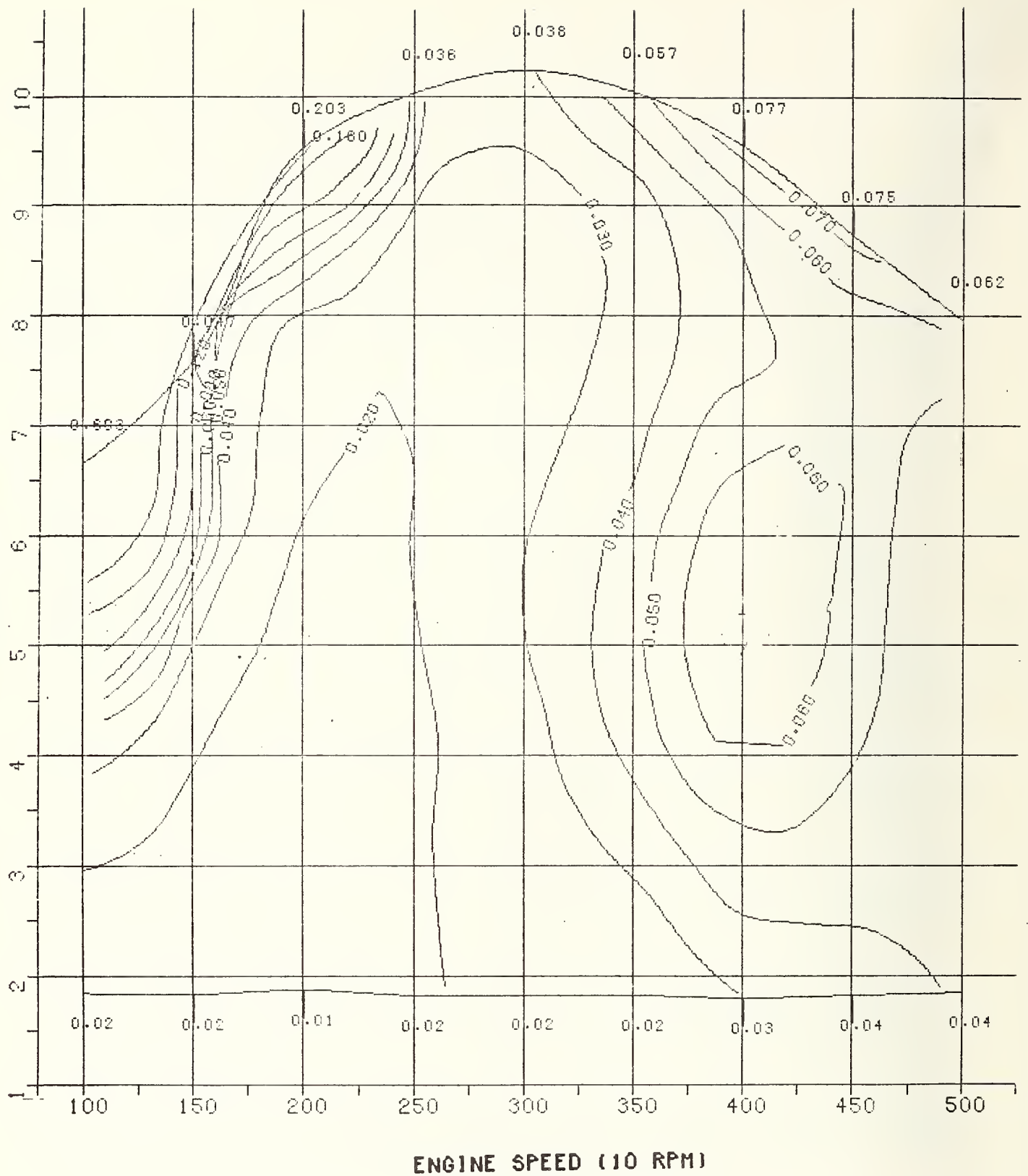
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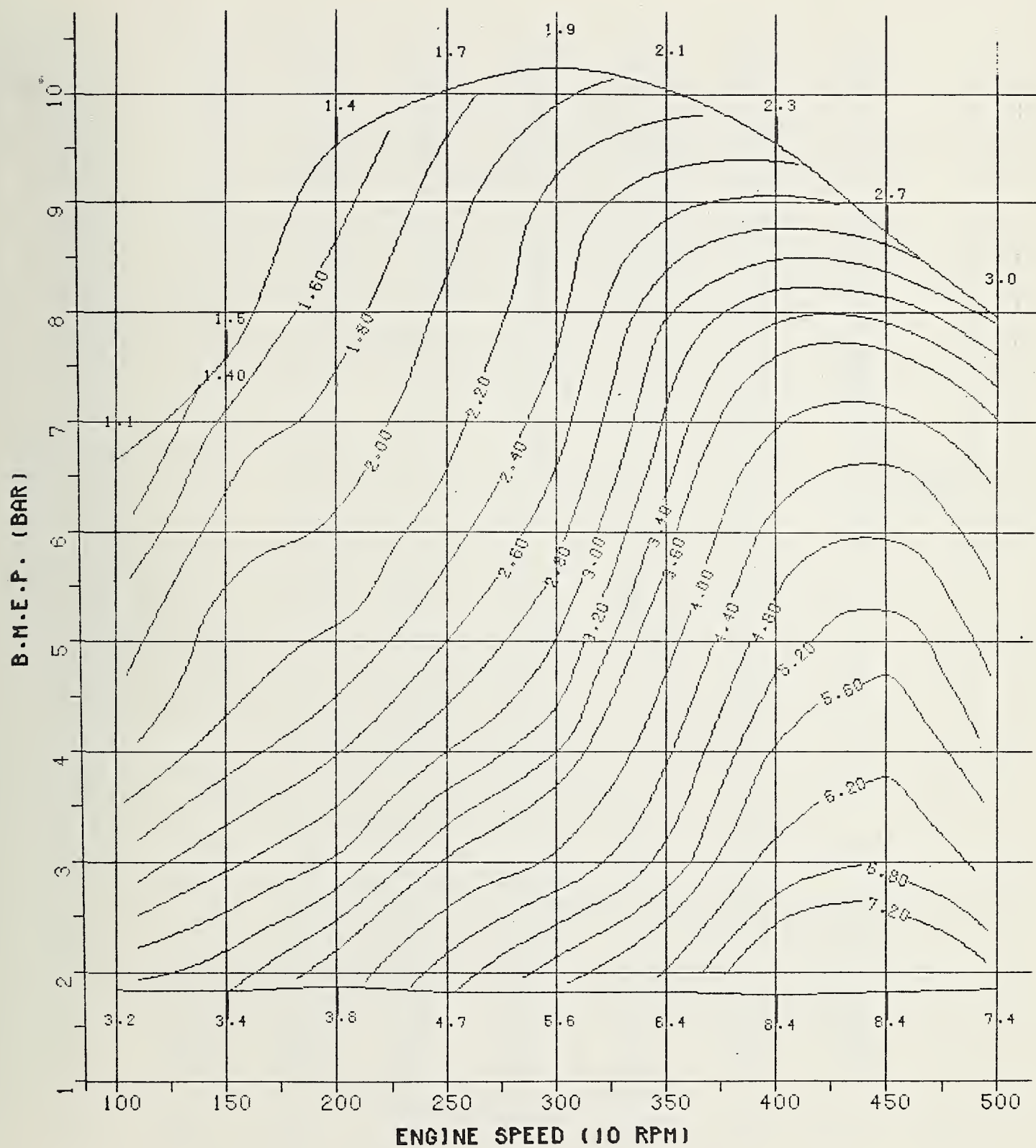






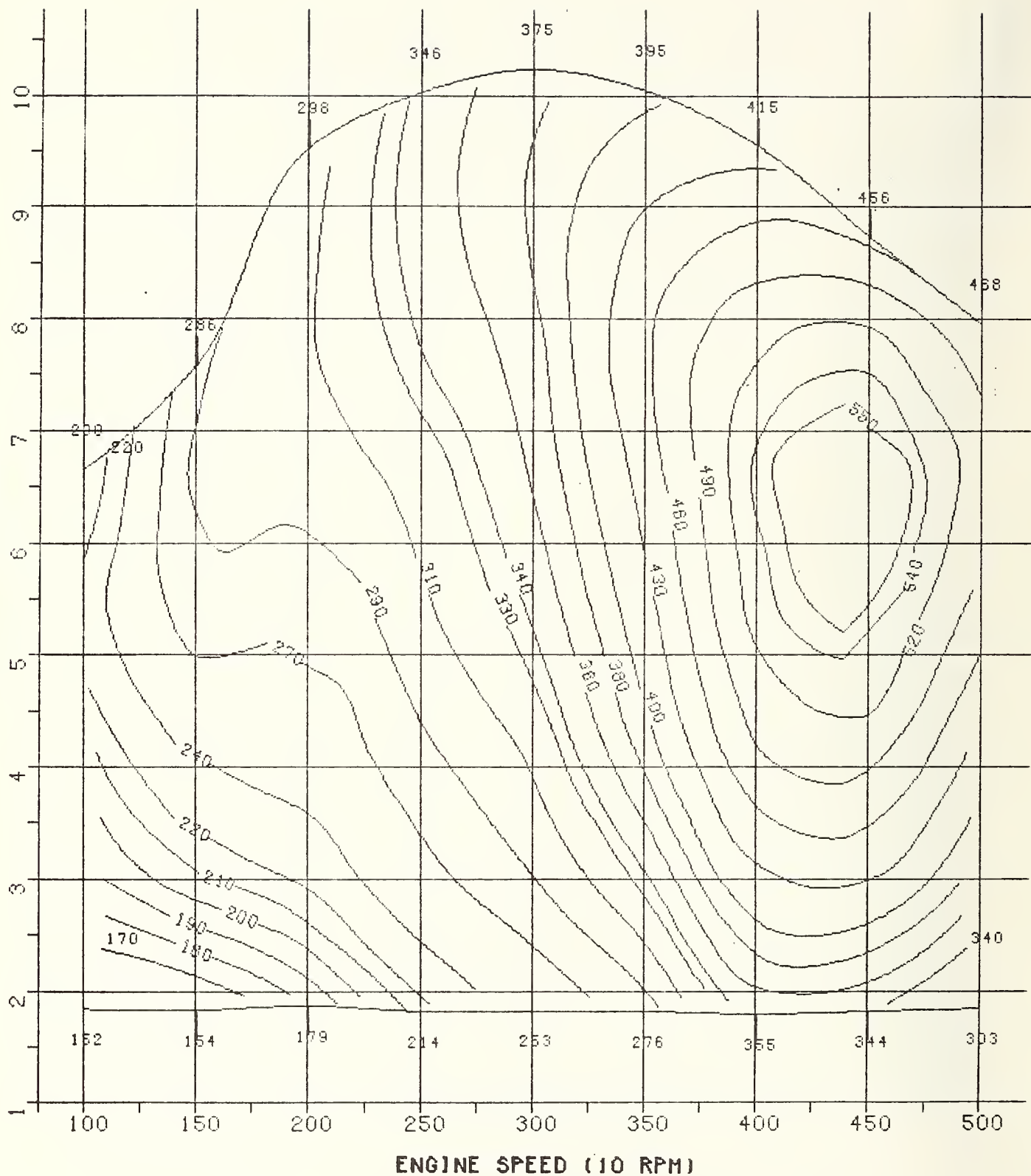
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CO CONCENTRATION (%)  
70 HP TURBOCHARGED RESEARCH DIESEL ENGINE



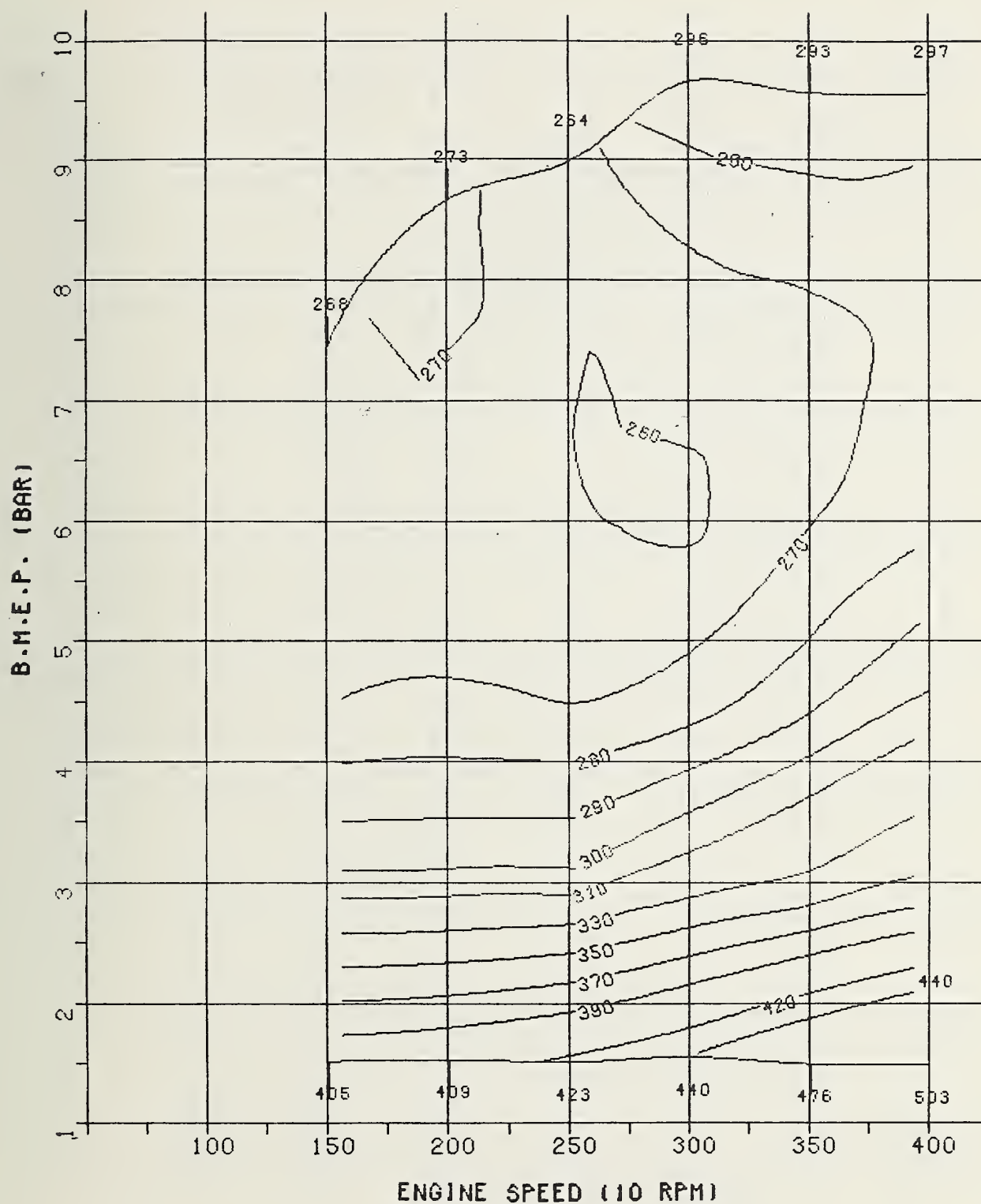
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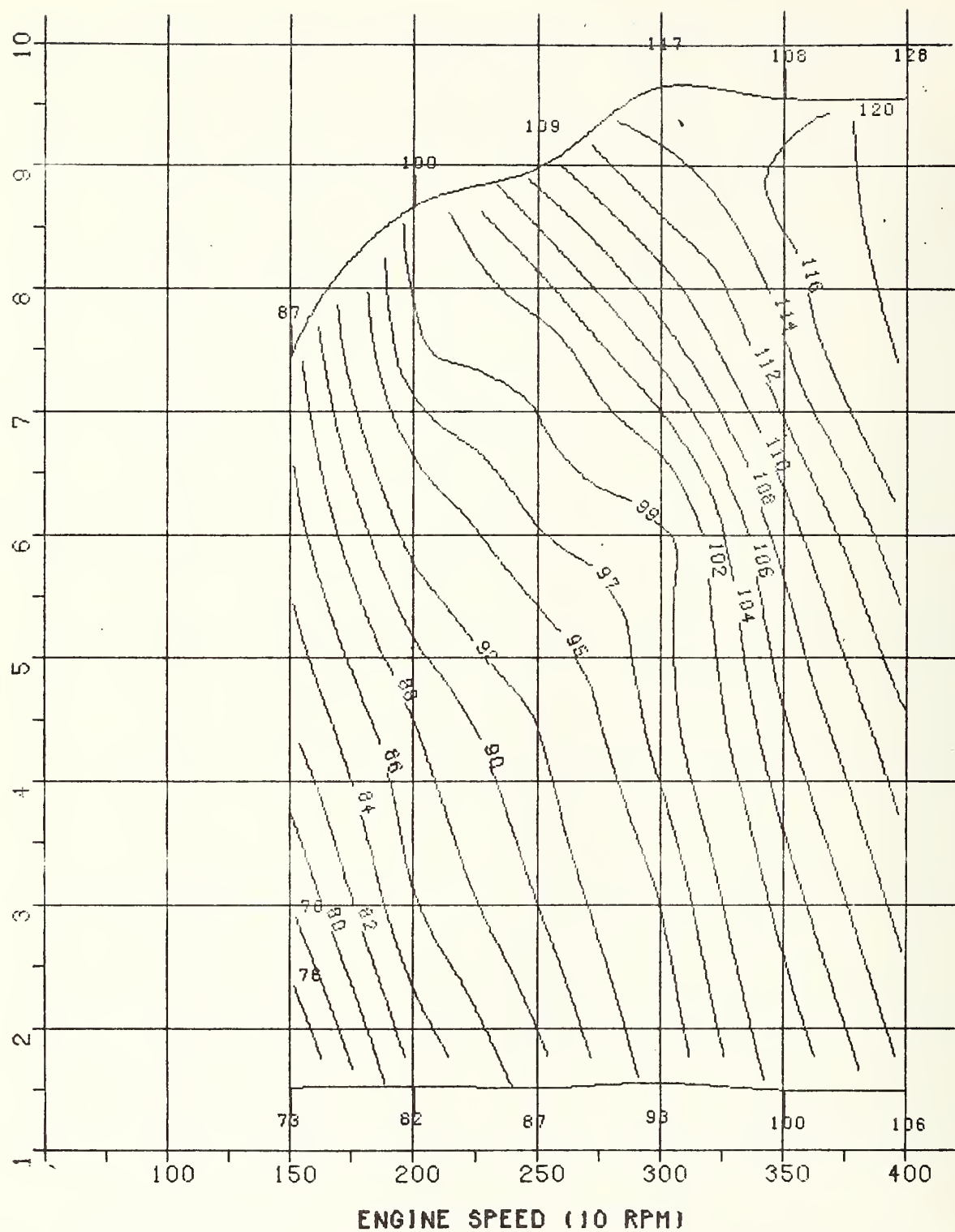
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70 HP TURBOCHARGED RESEARCH DIESEL ENGINE

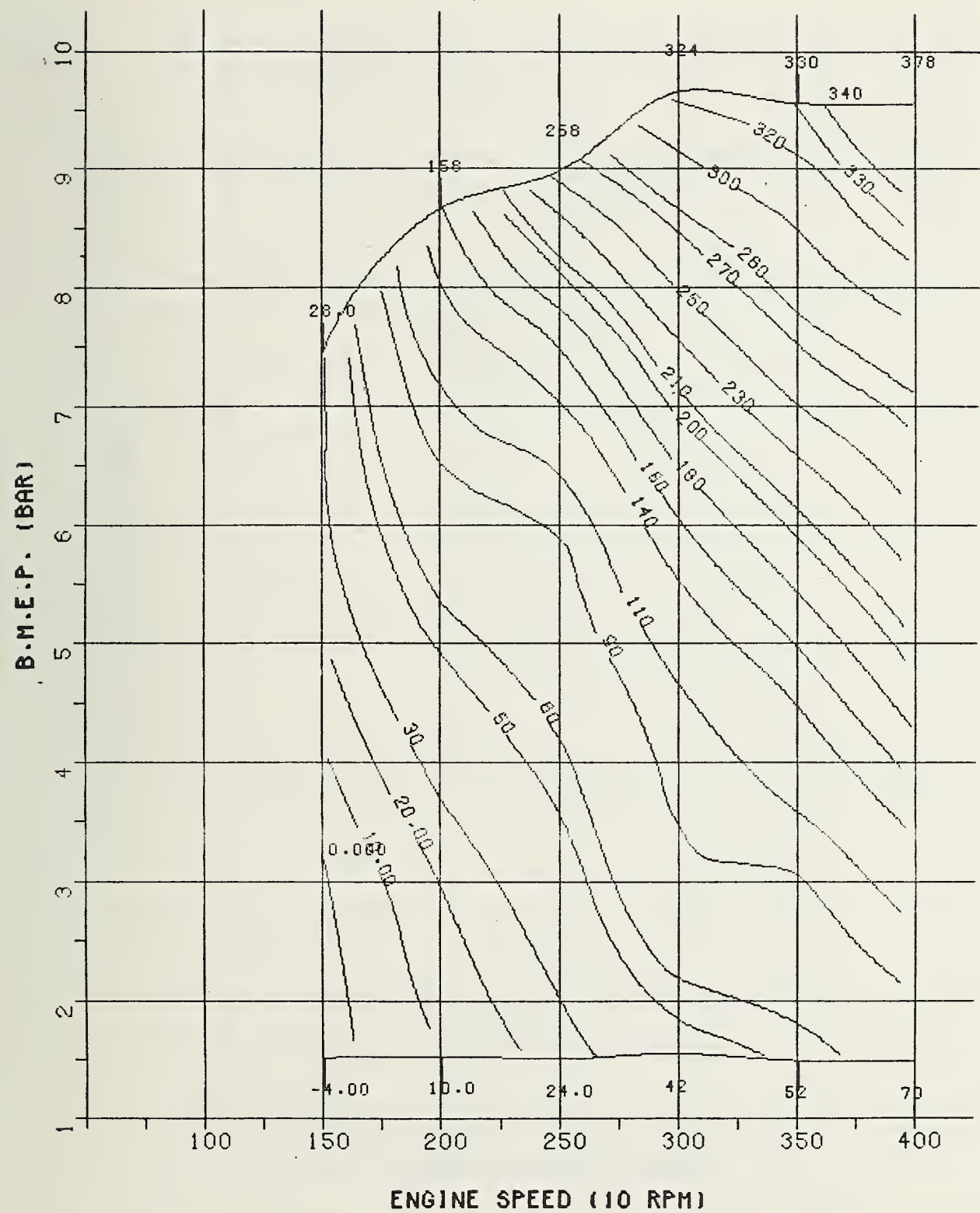


SPECIFIC FUEL CONSUMPTION (G/KWH)  
70 HP TC DIESEL ENGINE WITH MODULATED E.G.R.

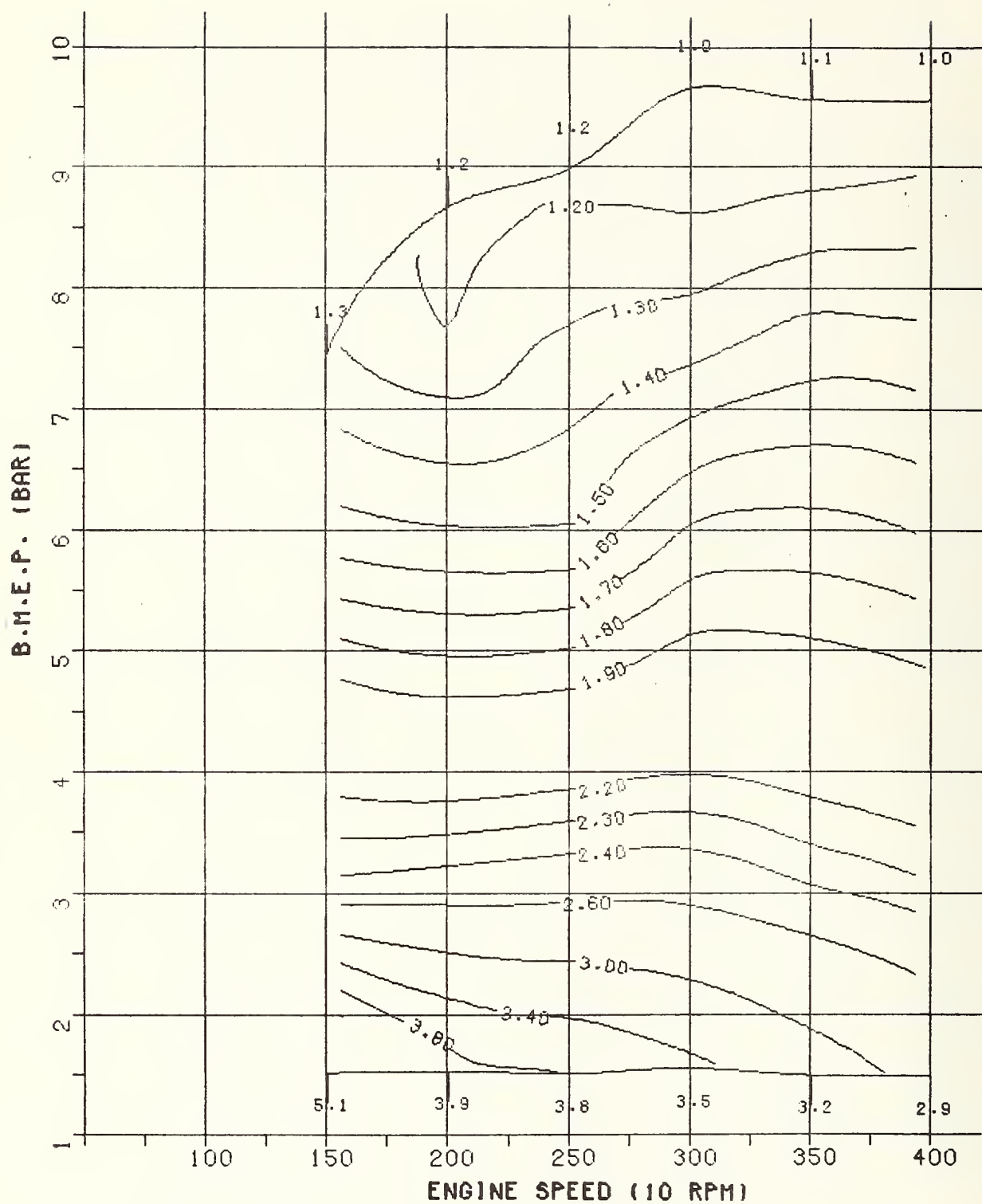
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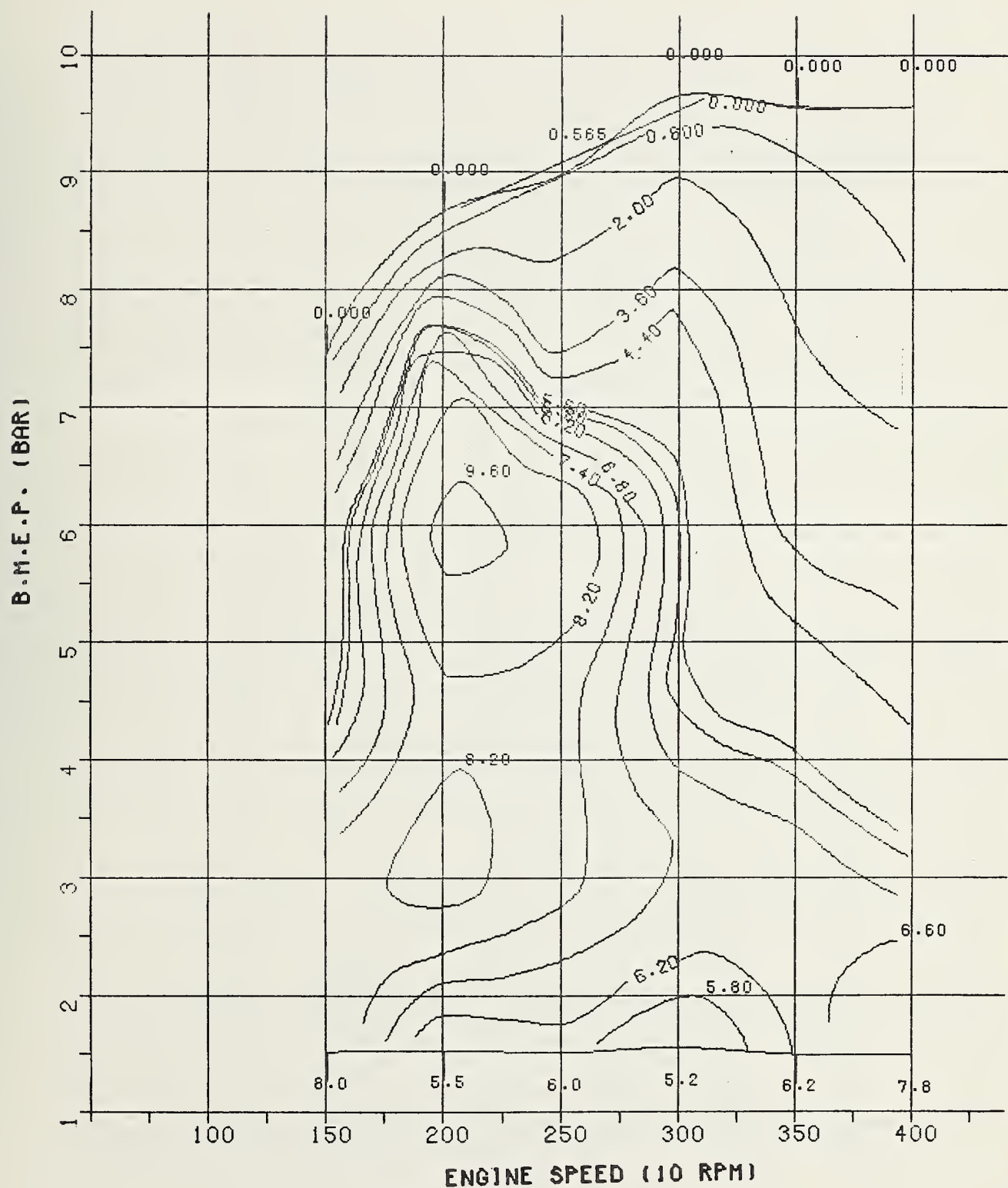
OIL TEMPERATURE (CELSIUS)  
70 HP TC DIESEL ENGINE WITH MODULATED E.G.R.



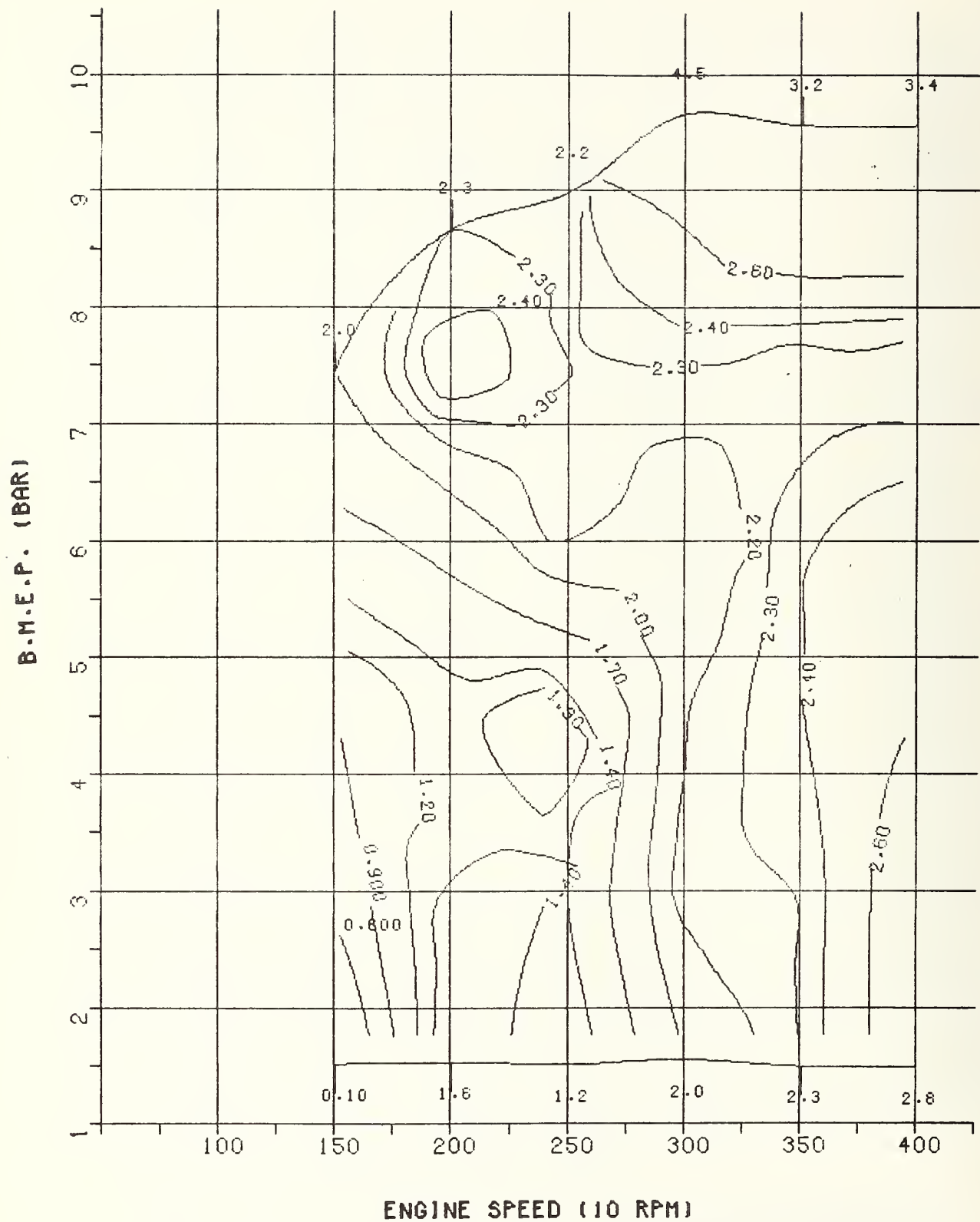
TURBOCHARGE PRESSURE (TORR)  
70 HP TC DIESEL ENGINE WITH MODULATED E.G.R.



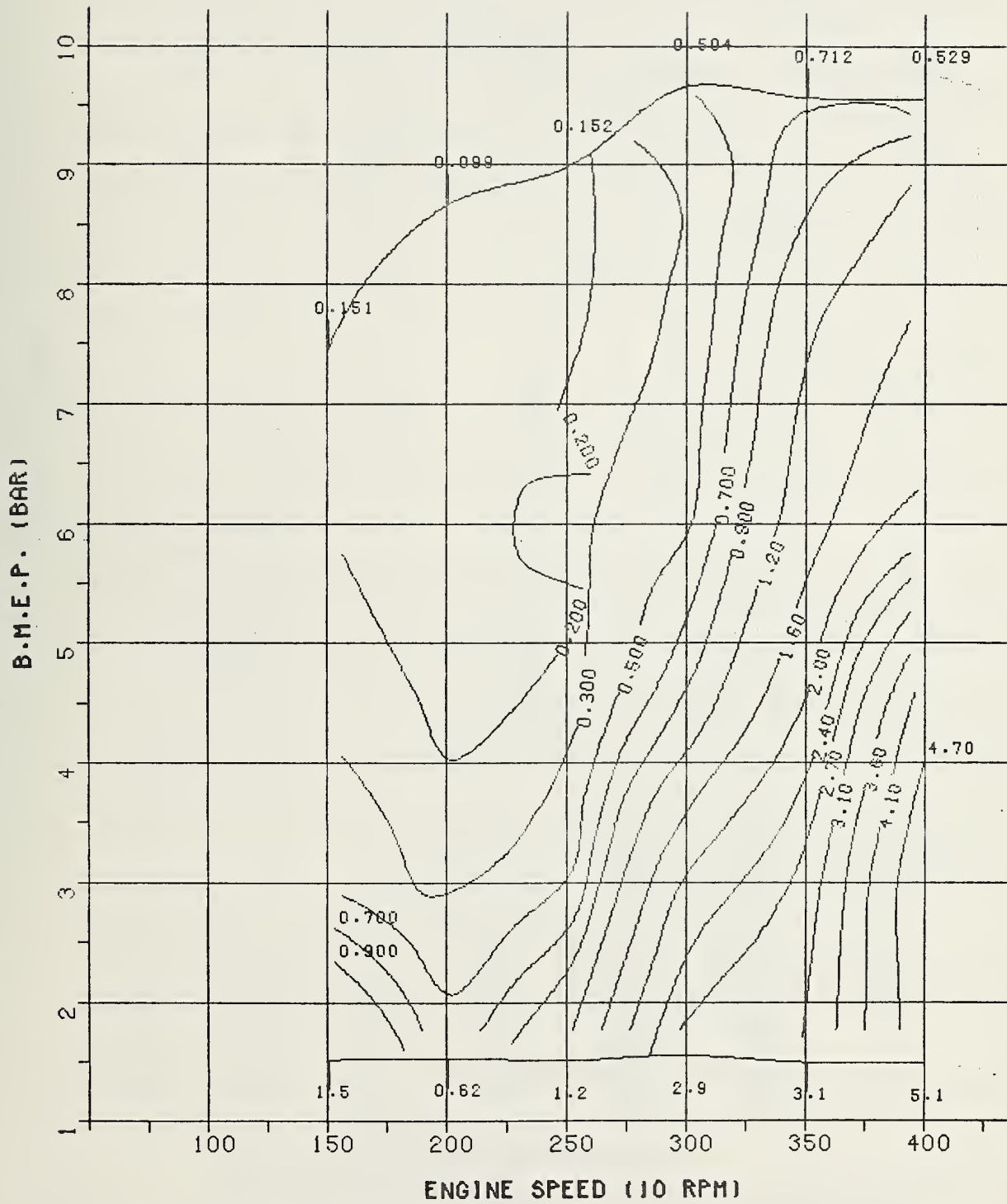
AIR TO FUEL RATIO  
70 HP TC DIESEL ENGINE WITH MODULATED E.G.R.



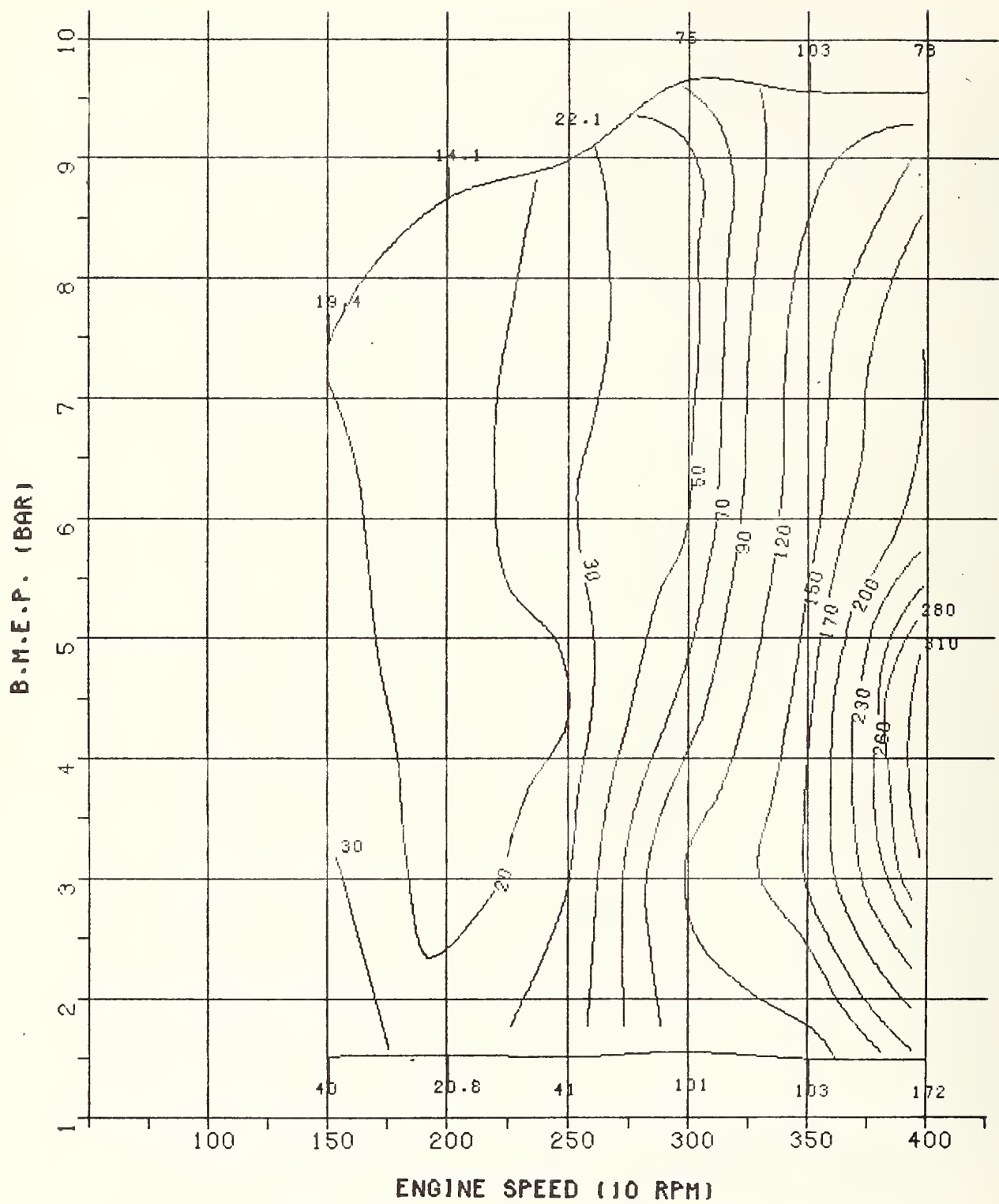
EFFECTIVE E.G.R. (%)  
 70 HP TC DIESEL ENGINE WITH MODULATED E.G.R.



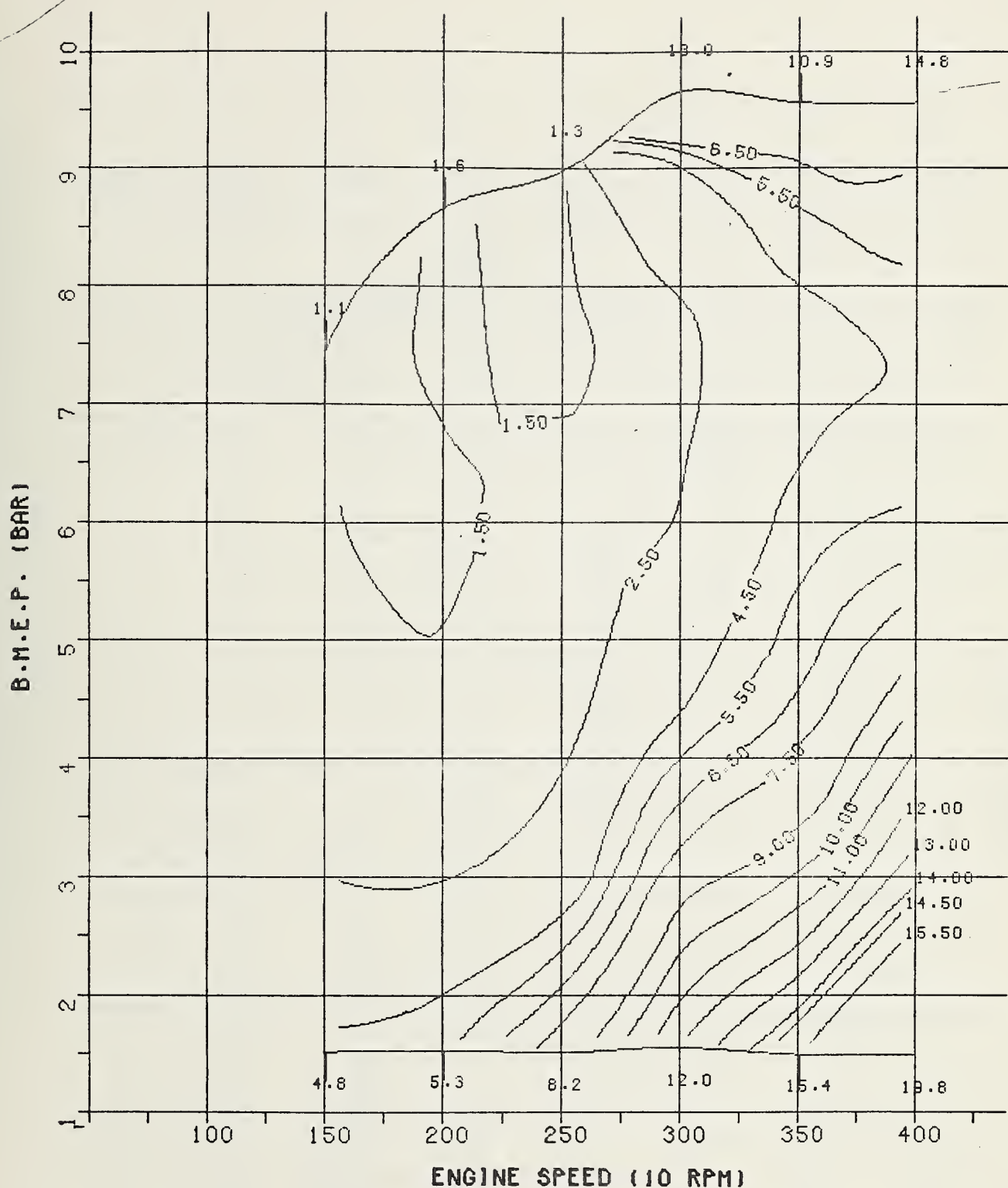
SMOKE (BOSCH NUMBER)  
70 HP TC DIESEL ENGINE WITH MODULATED E.G.R.



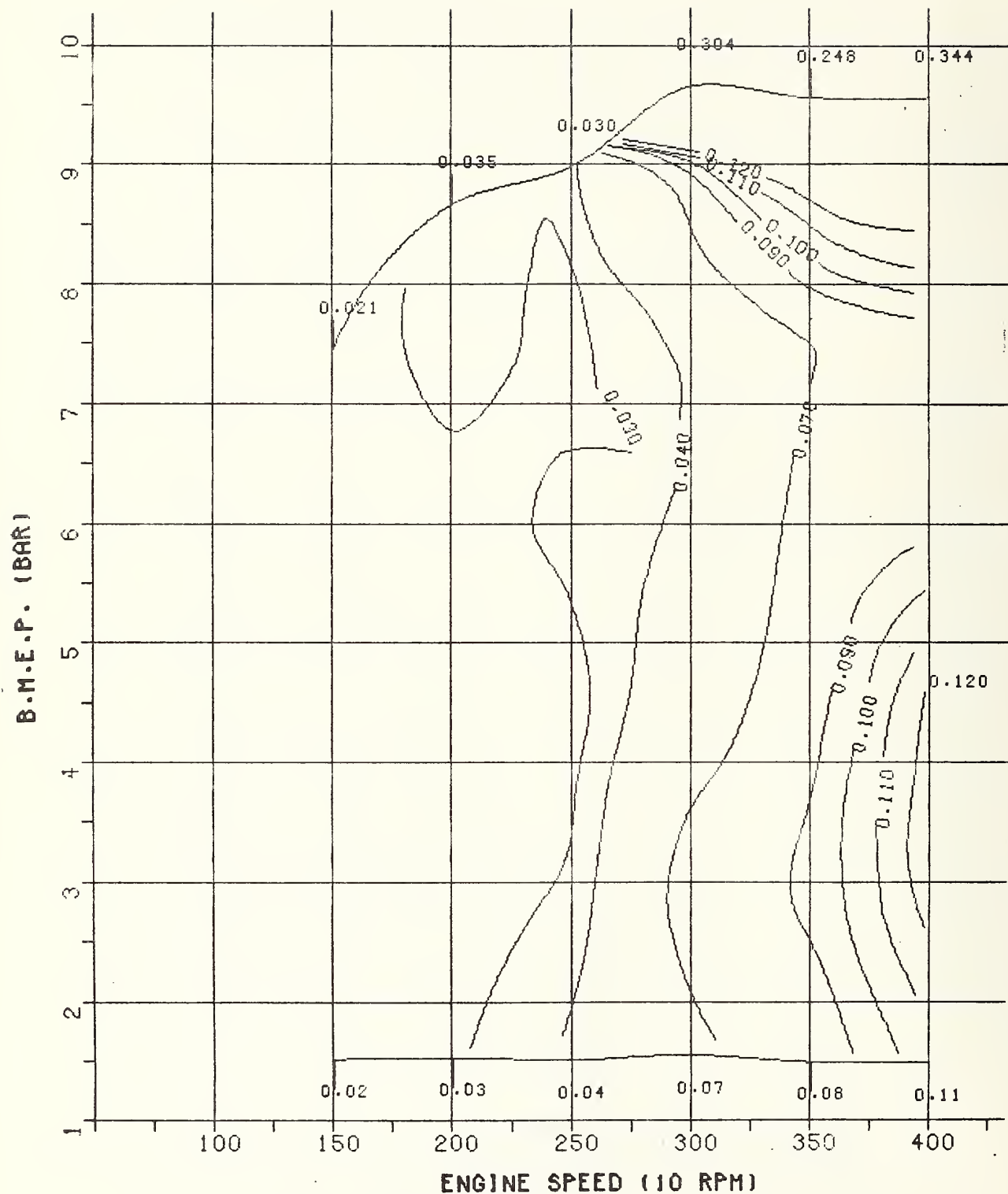
HC EMISSION (G/KWH)  
70 HP TC DIESEL ENGINE WITH MODULATED E.G.R.



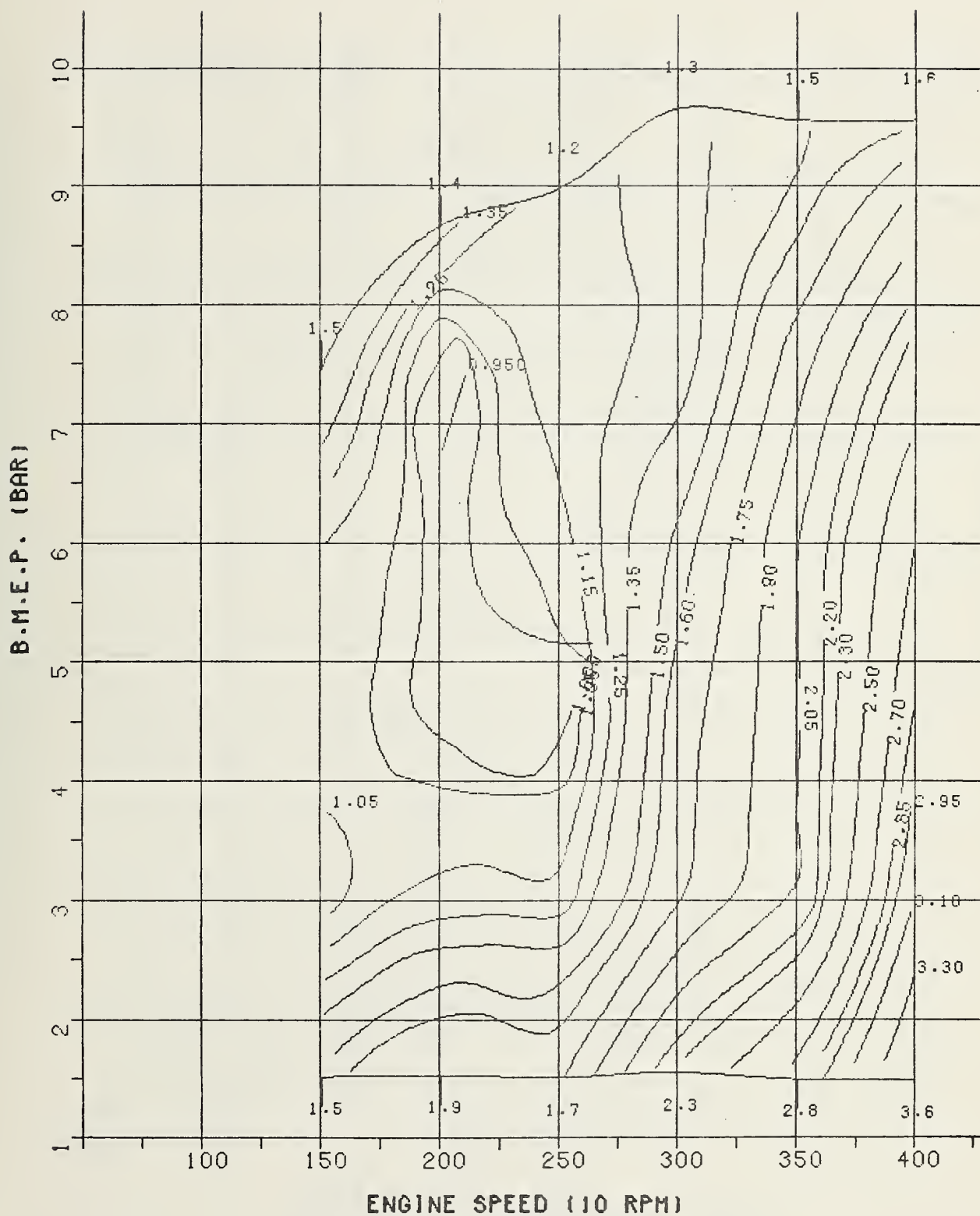
HC CONCENTRATION (PPM)  
70 HP TC DIESEL ENGINE WITH MODULATED E.G.R.



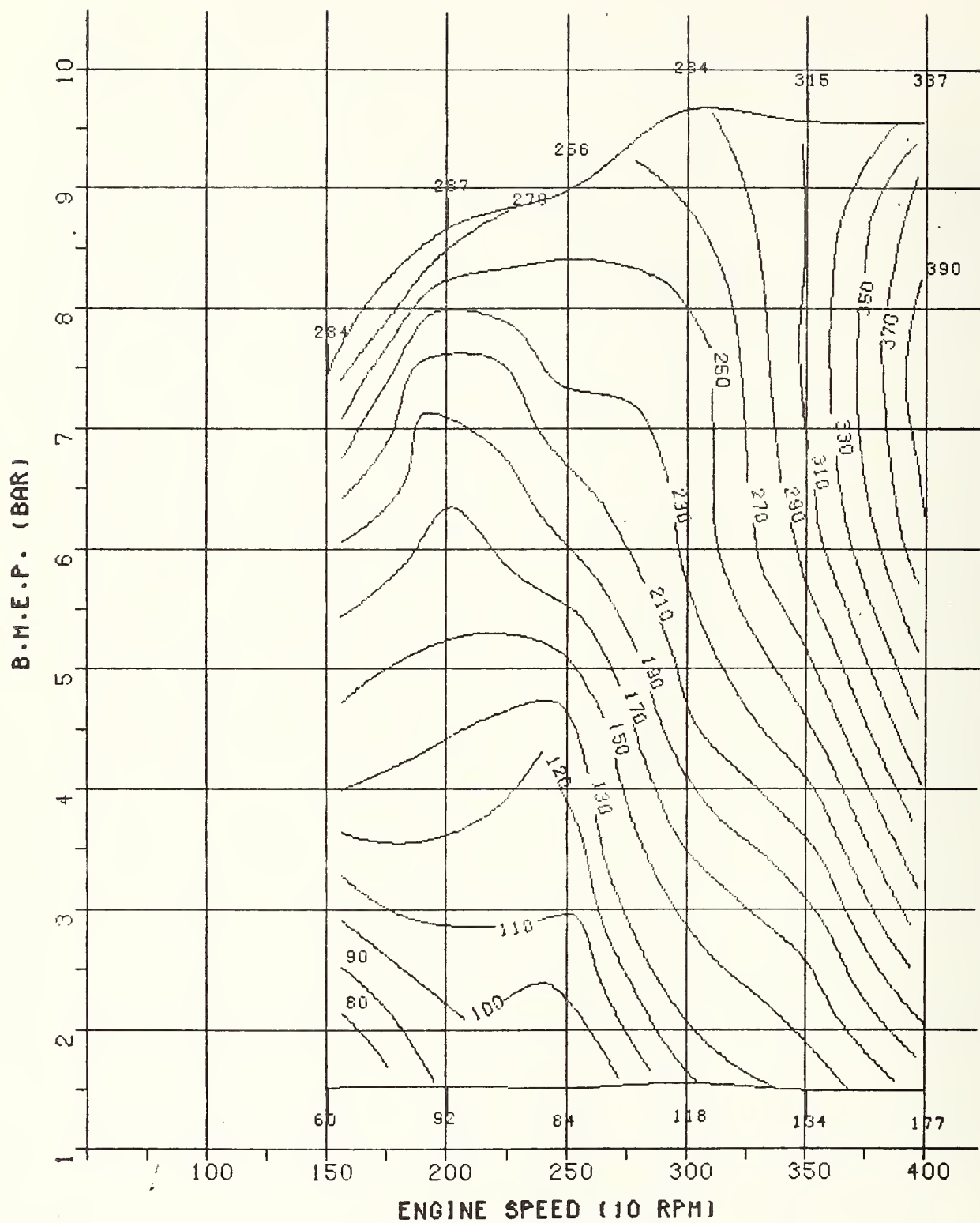
CO EMISSION (G/KWH)  
70 HP TC DIESEL ENGINE WITH MODULATED E.G.R.



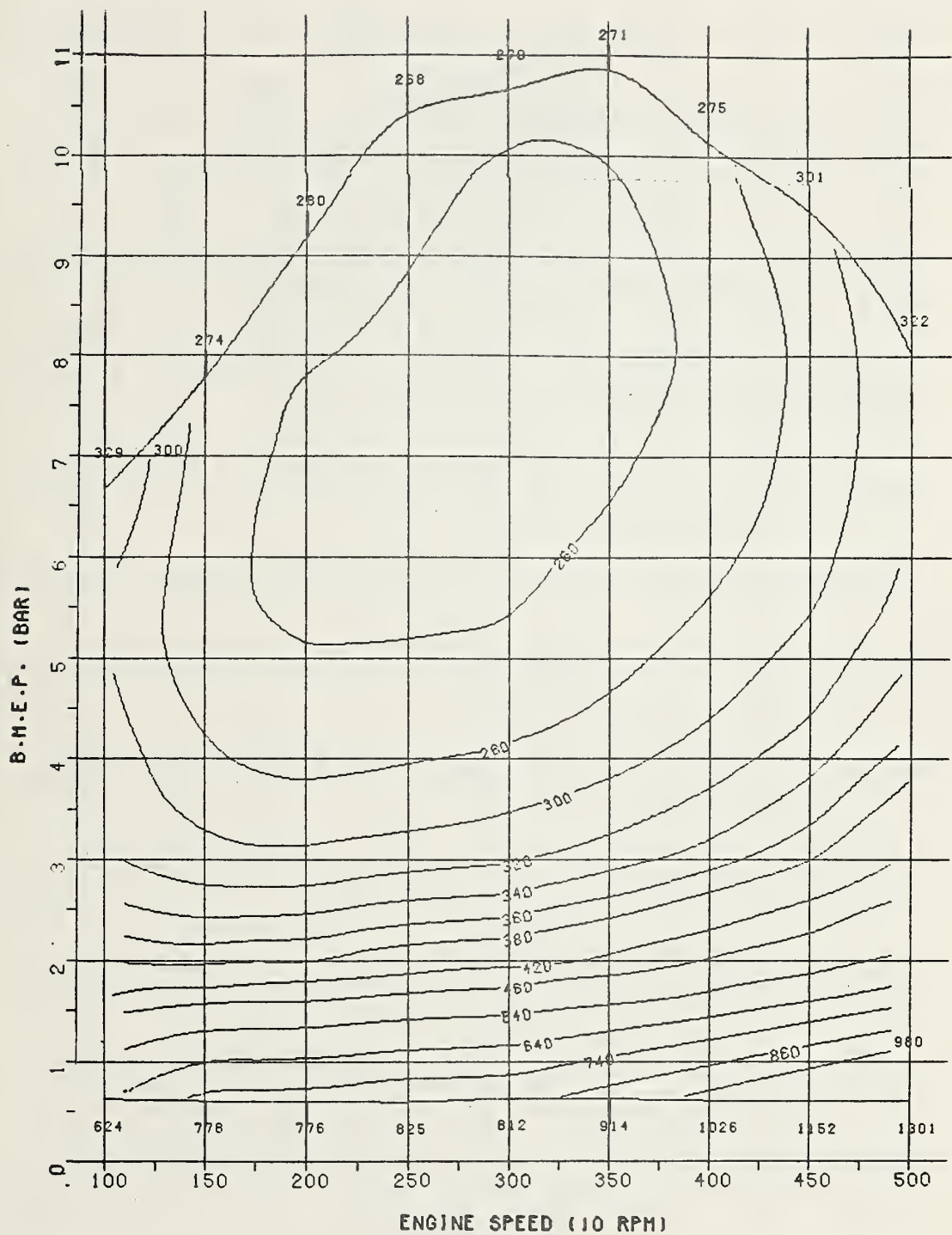
CO CONCENTRATION (%)  
70 HP TC DIESEL ENGINE WITH MODULATED E.G.R.



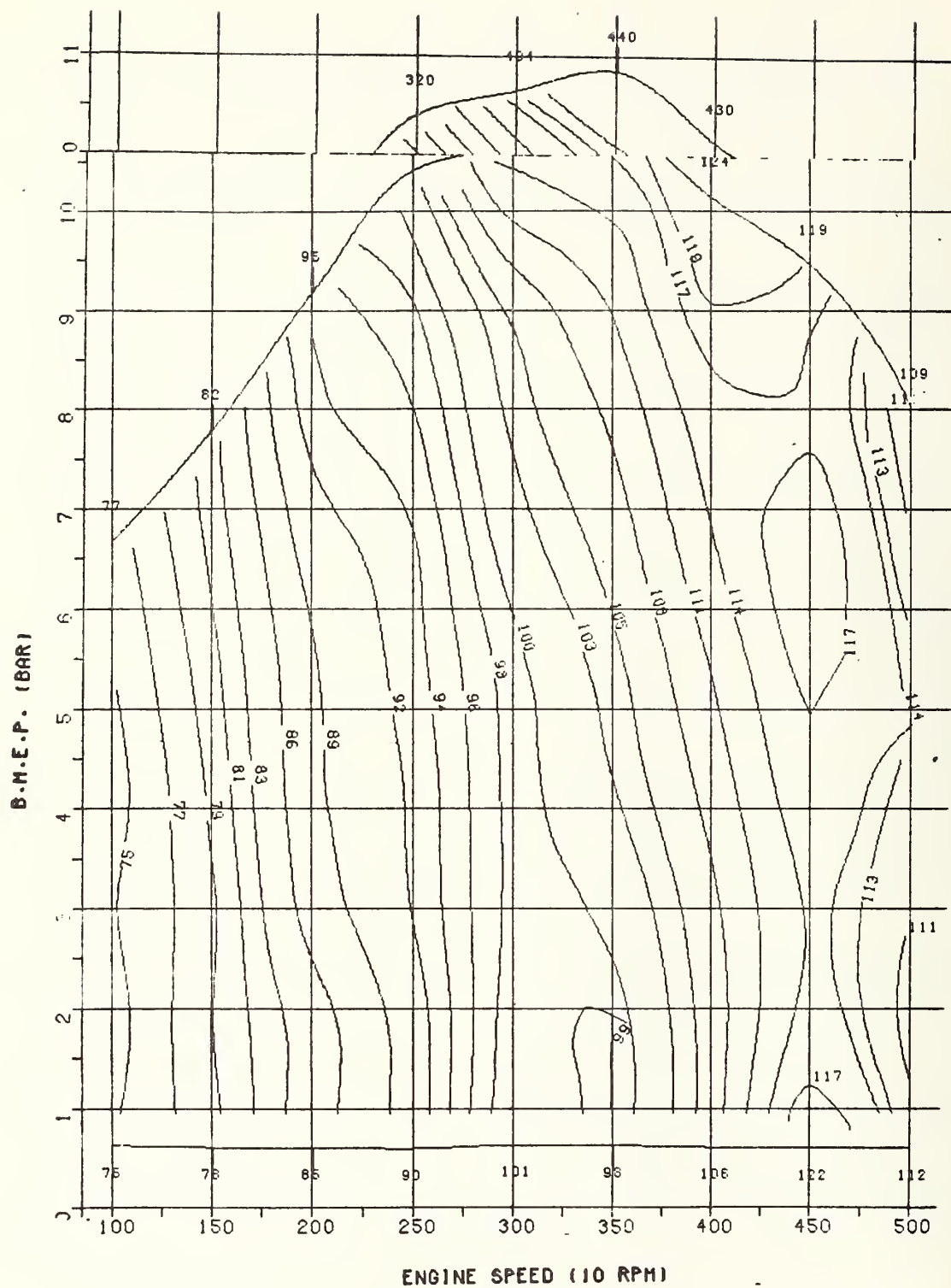
NO EMISSION (G/KWH)  
70 HP TC DIESEL ENGINE WITH MODULATED E.G.R.



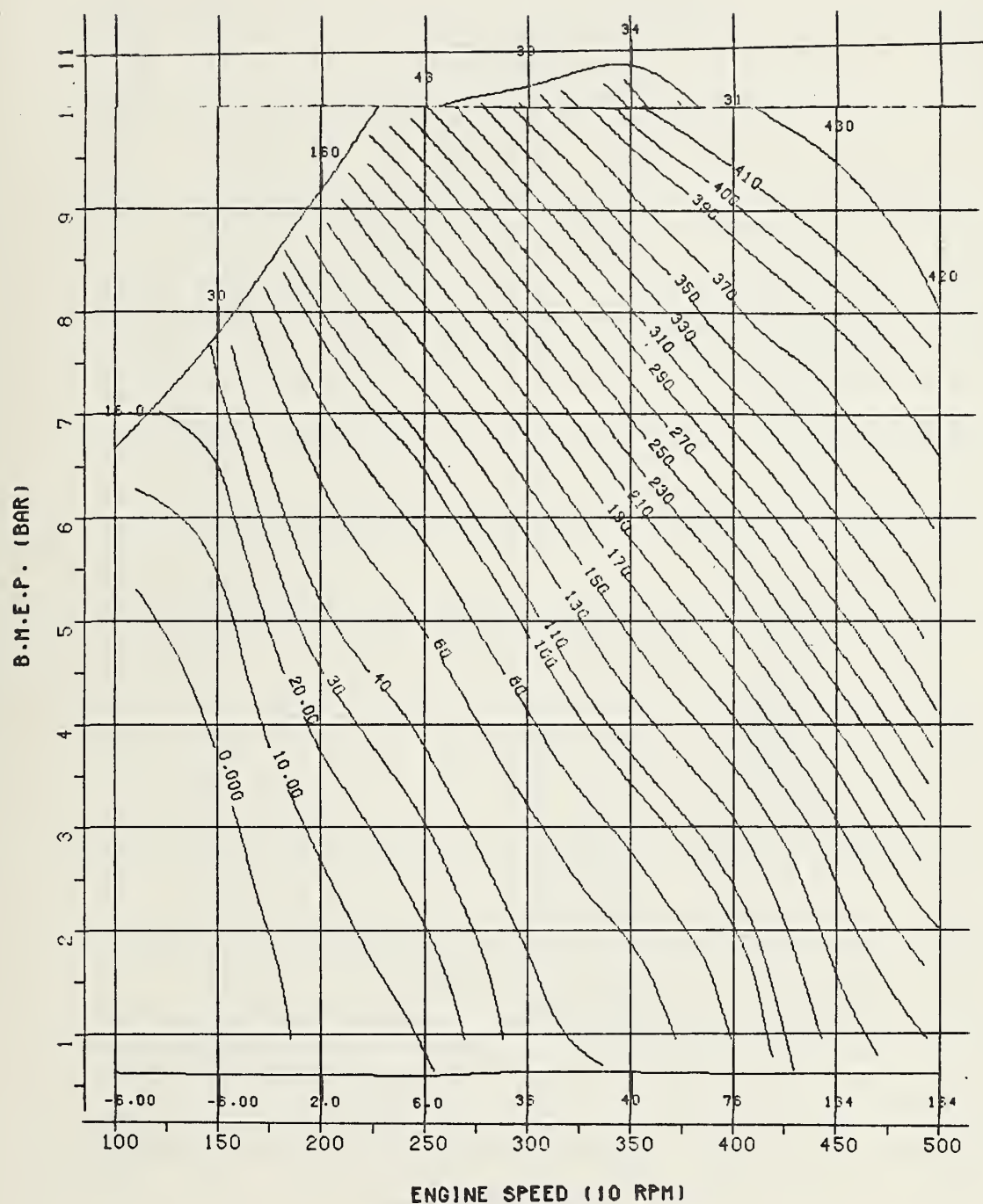
NO CONCENTRATION (PPM)  
70 HP TC DIESEL ENGINE WITH MODULATED E.G.R.



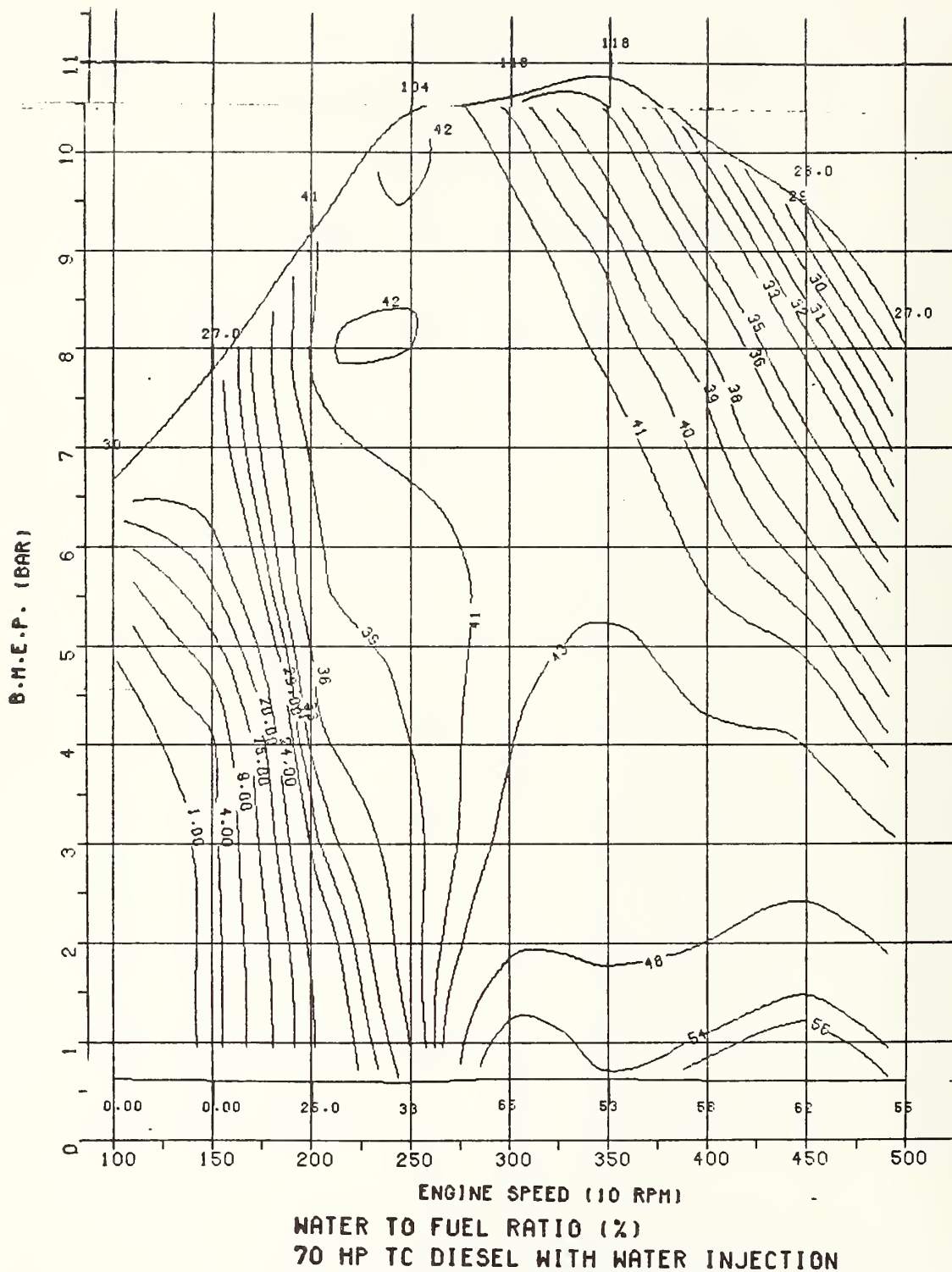
SPECIFIC FUEL CONSUMPTION (G/KWH)  
70 HP TC DIESEL WITH WATER INJECTION

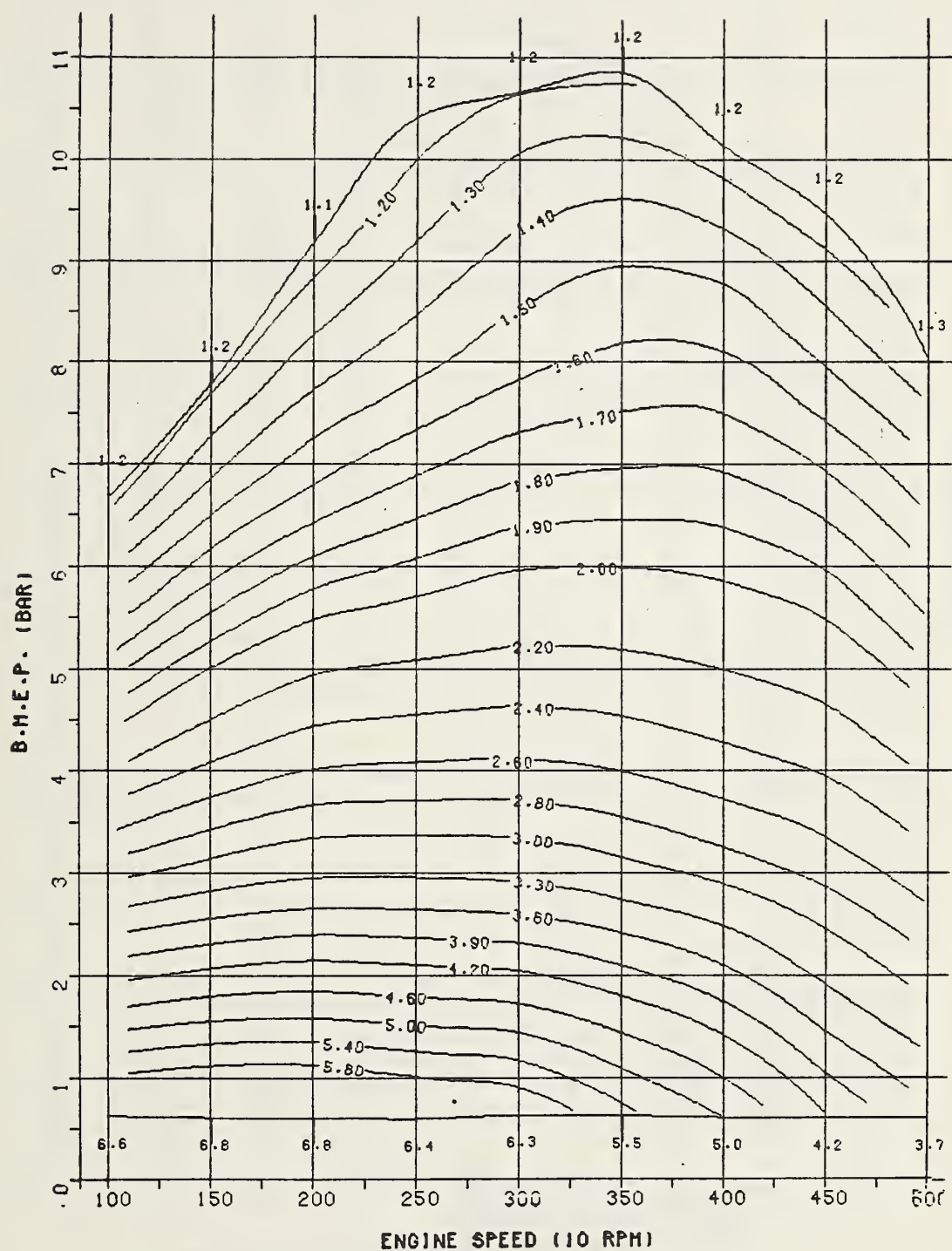


OIL TEMPERATURE (CELSIUS)  
70 HP TC DIESEL WITH WATER INJECTION

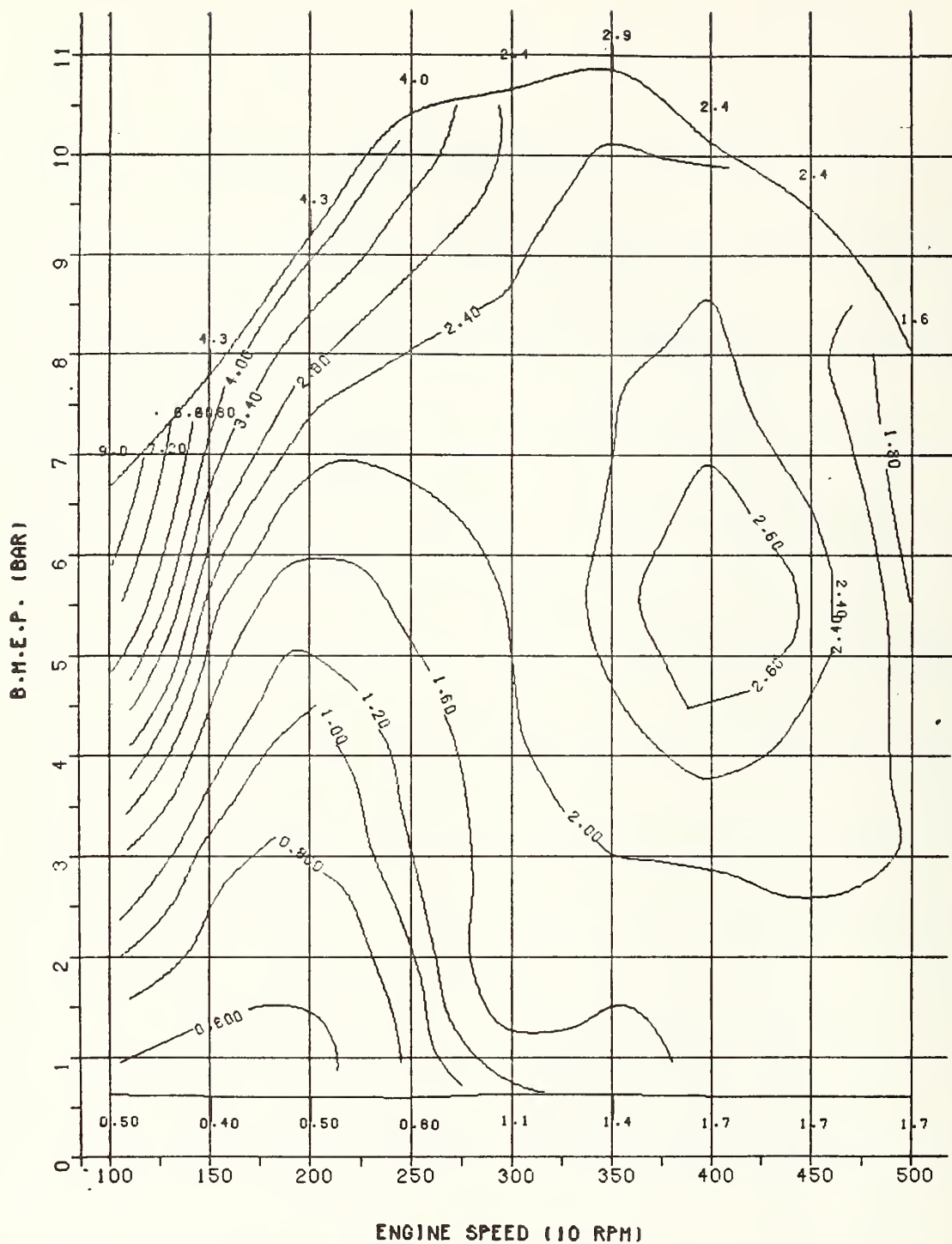


TURBOCHARGE PRESSURE (TORR)  
70 HP TC DIESEL WITH WATER INJECTION

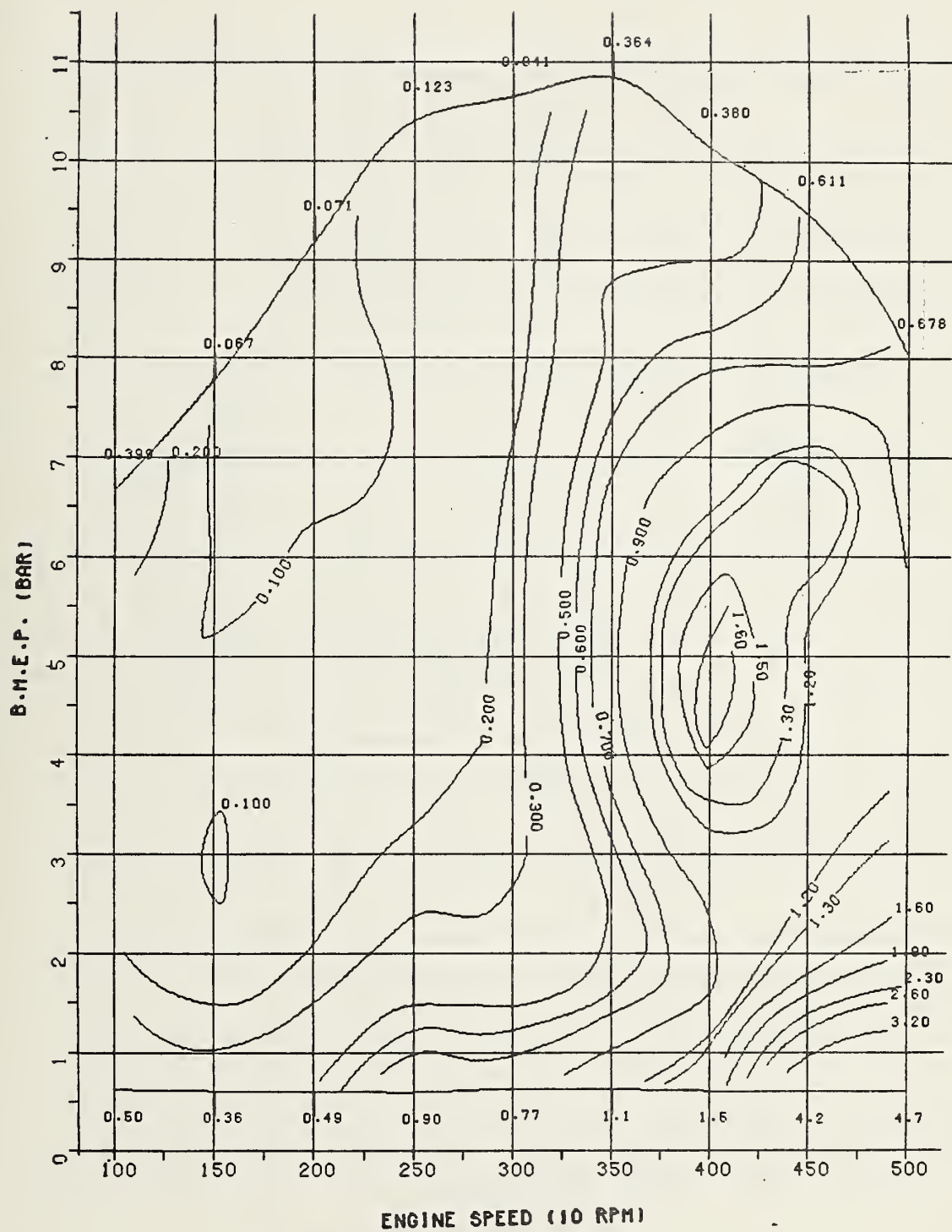




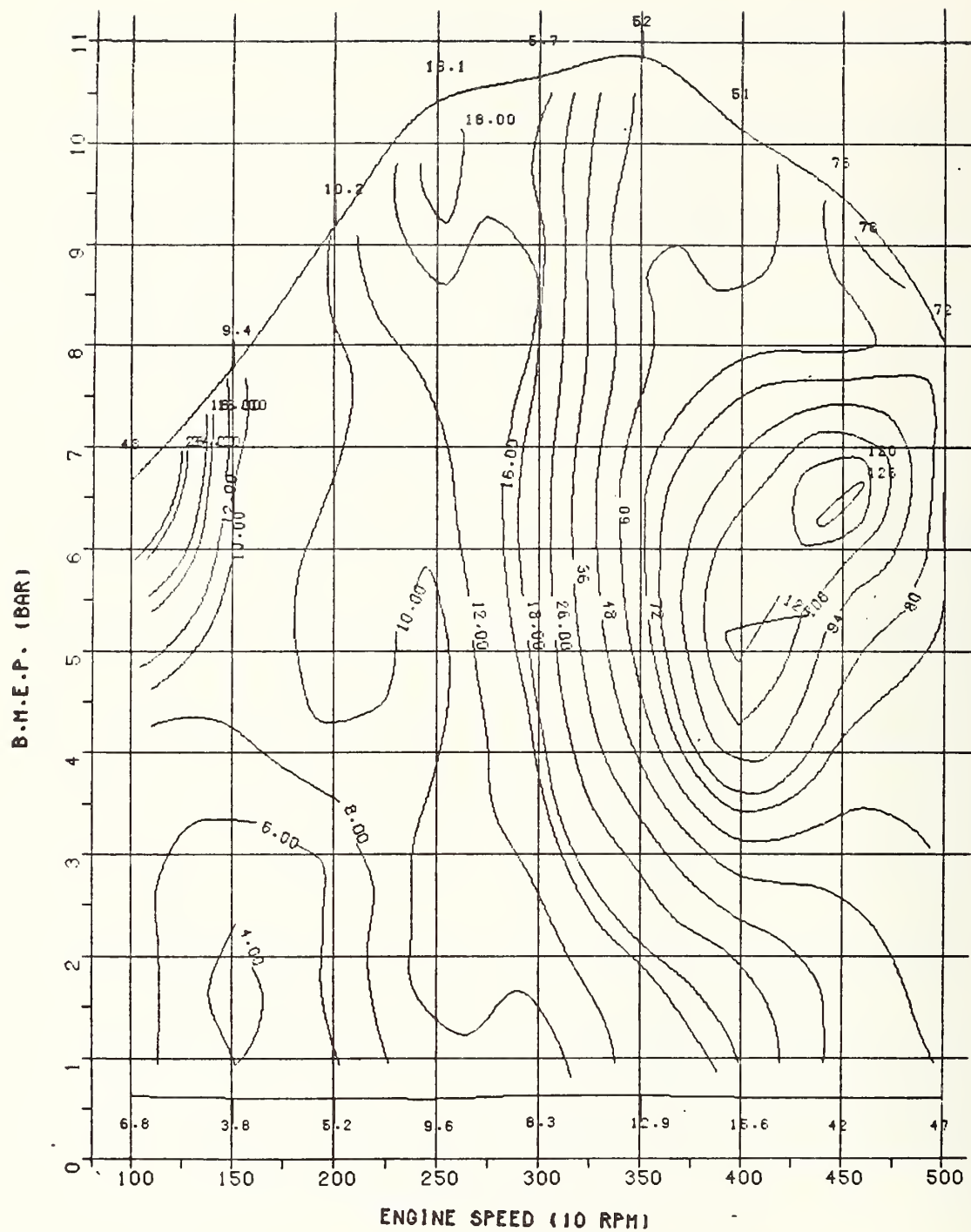
AIR TO FUEL RATIO  
70 HP TC DIESEL WITH WATER INJECTION



SMOKE (BOSCH NUMBER)  
70 HP TC DIESEL WITH WATER INJECTION

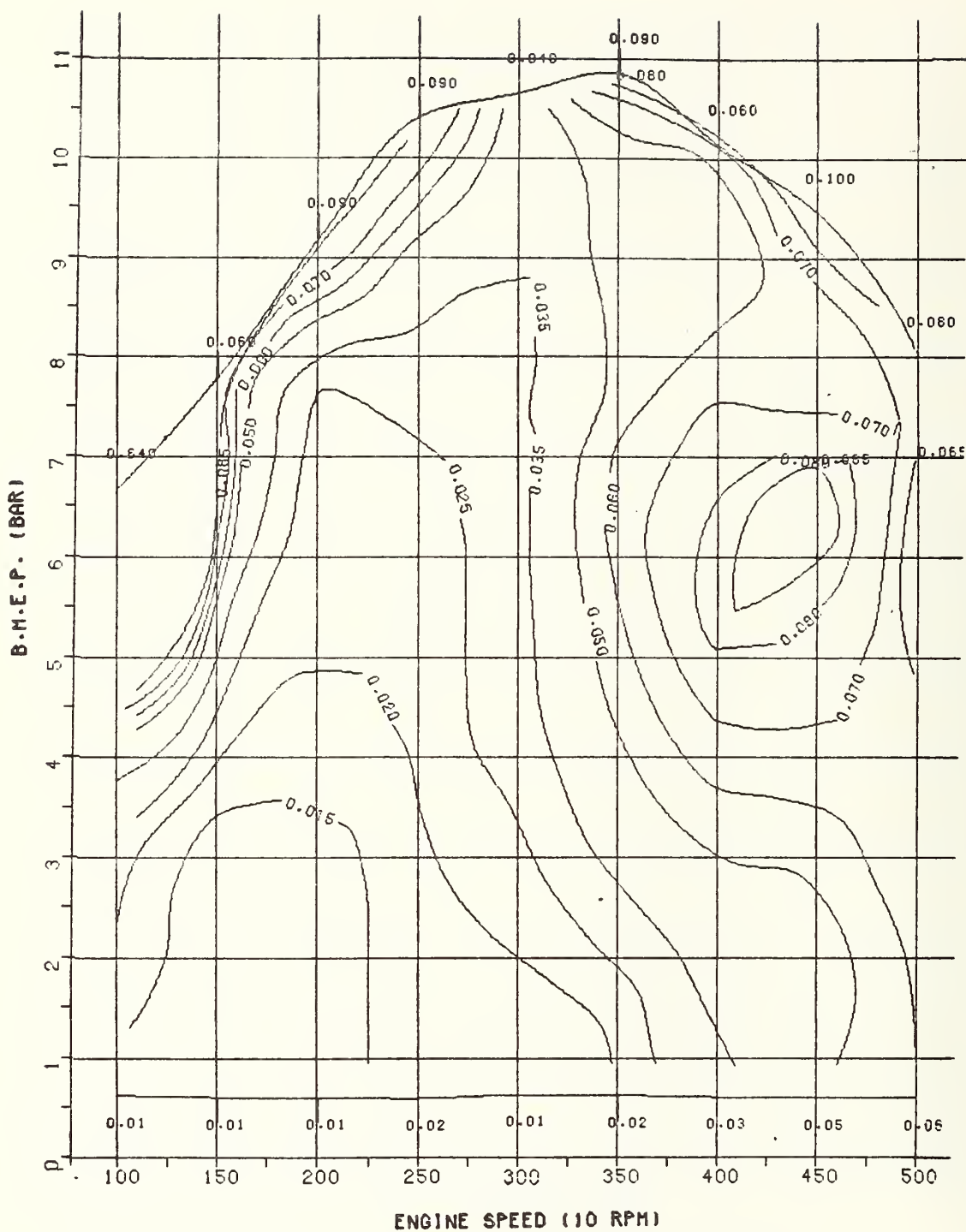


HC EMISSION (G/KWH)  
70 HP TC DIESEL WITH WATER INJECTION

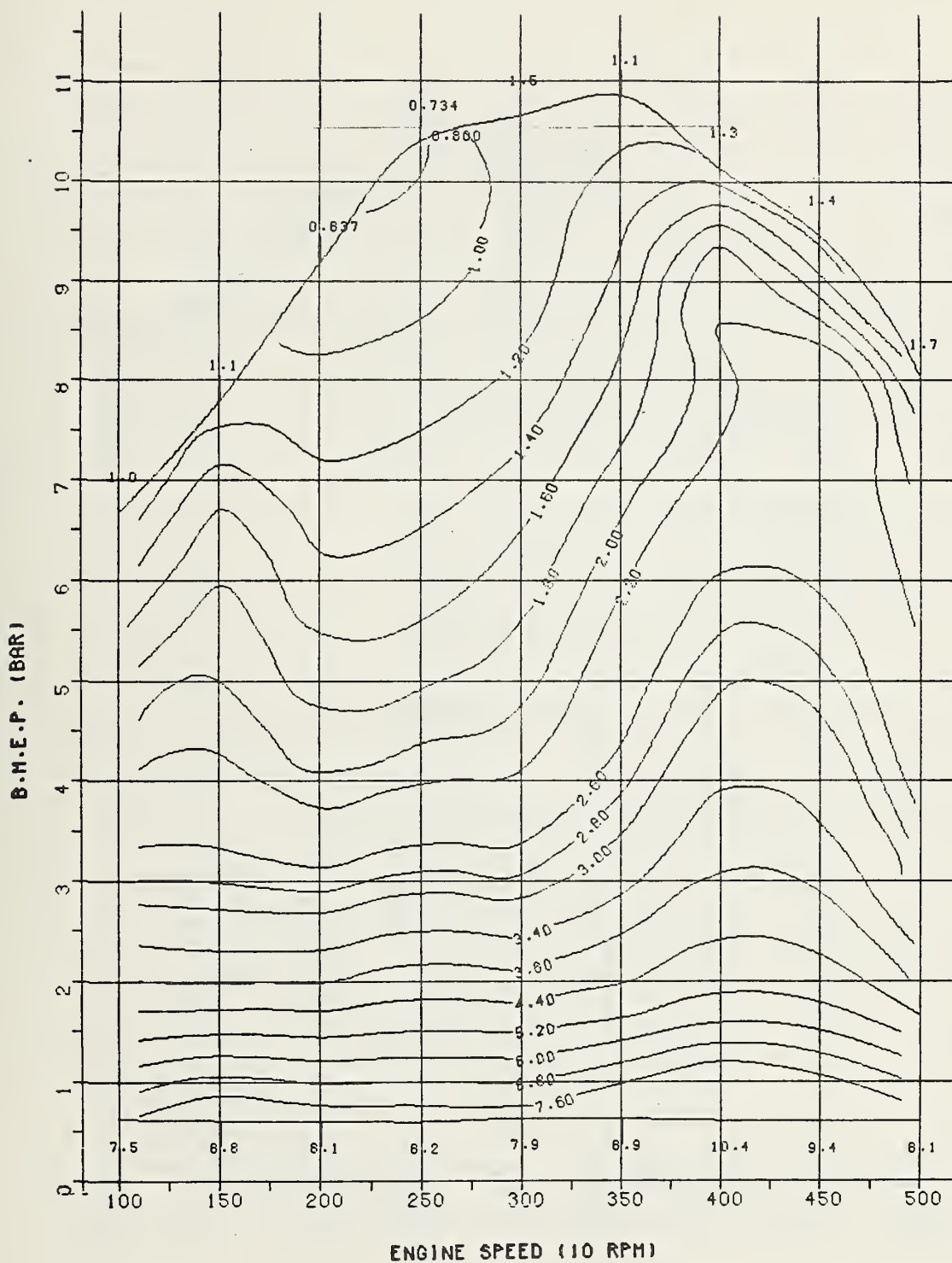


HC CONCENTRATION (PPM)  
70 HP TC DIESEL WITH WATER INJECTION

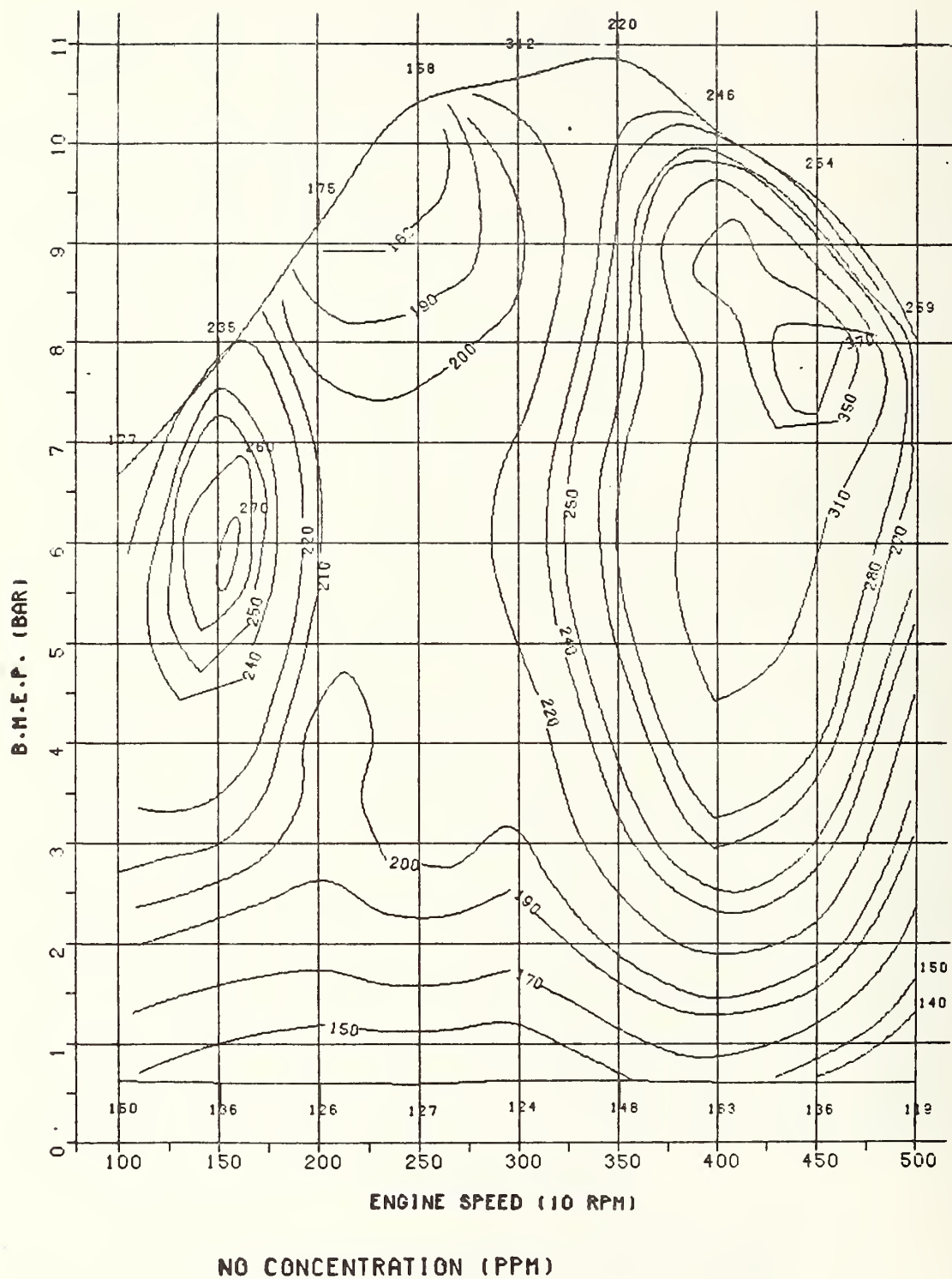




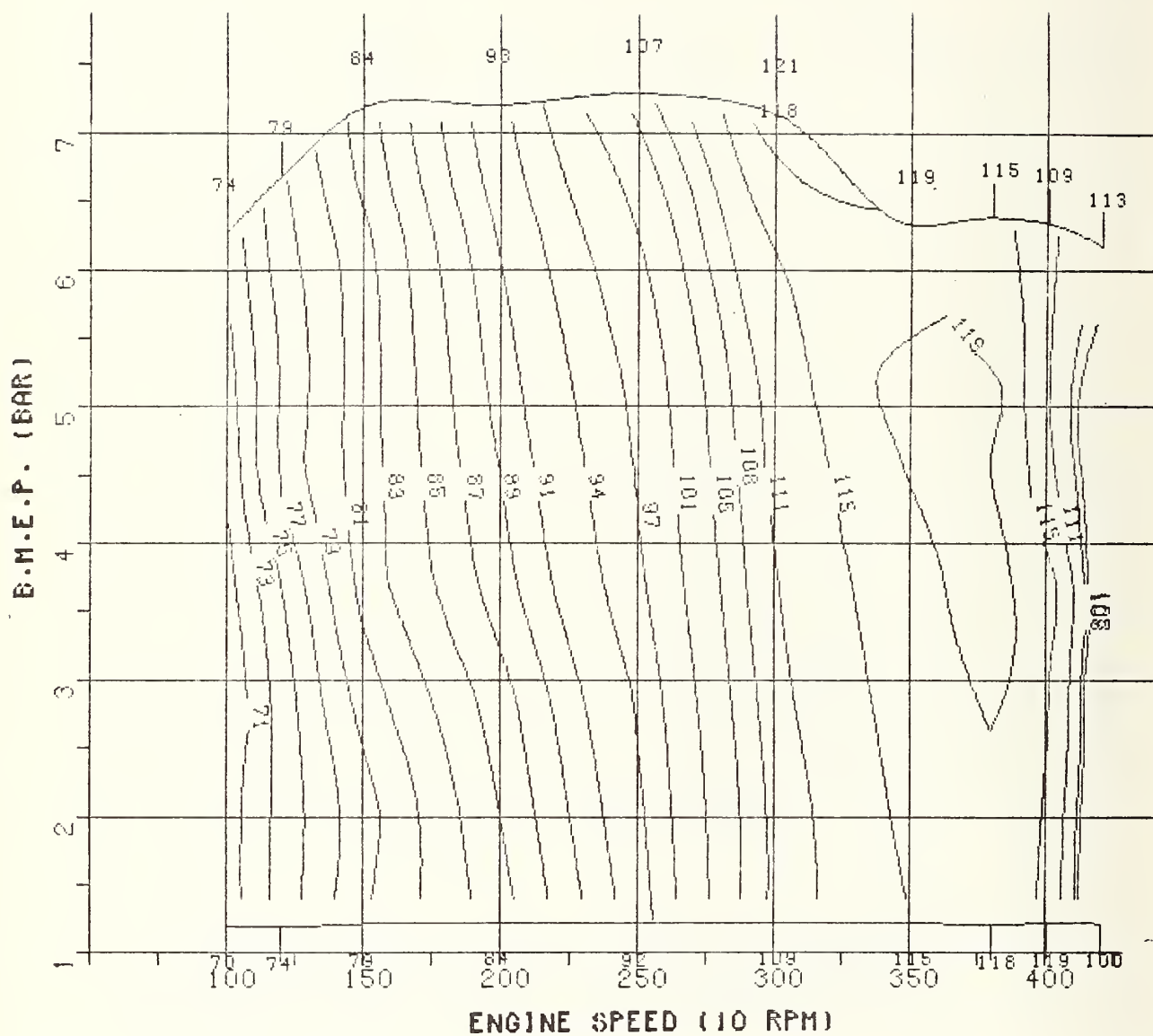
CO CONCENTRATION (%)  
70 HP TC DIESEL WITH WATER INJECTION



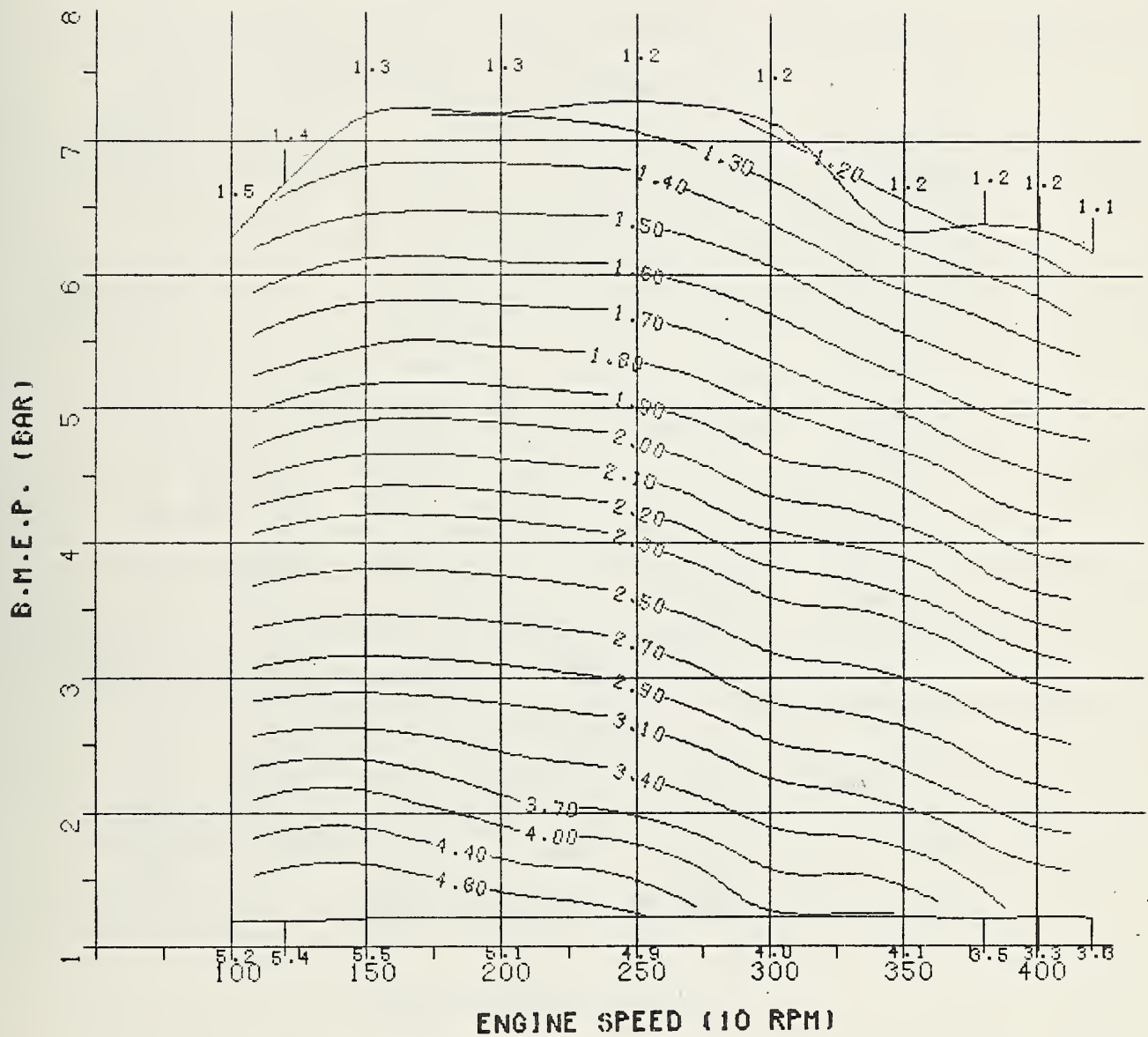
NO EMISSION (G/KWH)  
70 HP TC DIESEL WITH WATER INJECTION



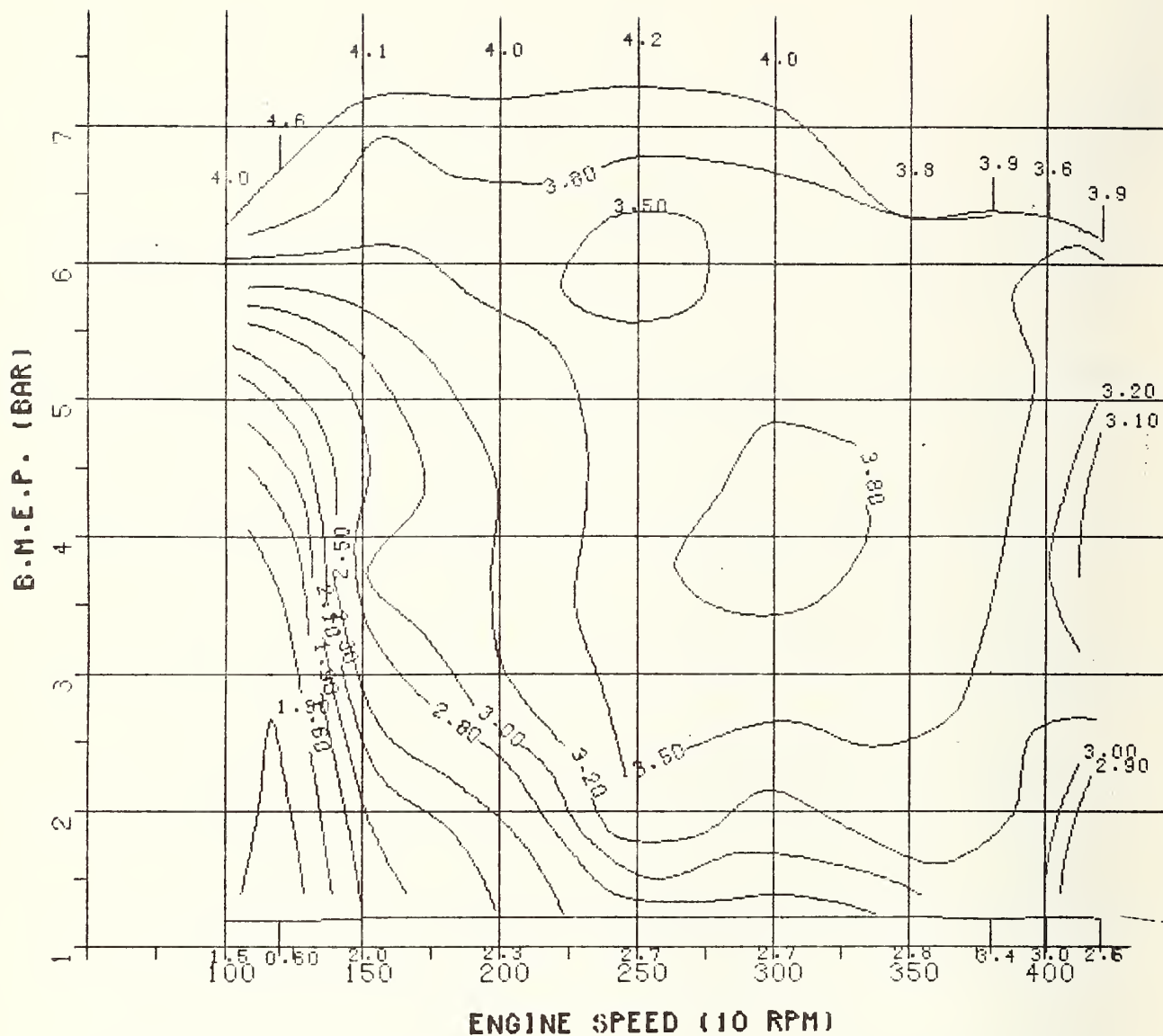




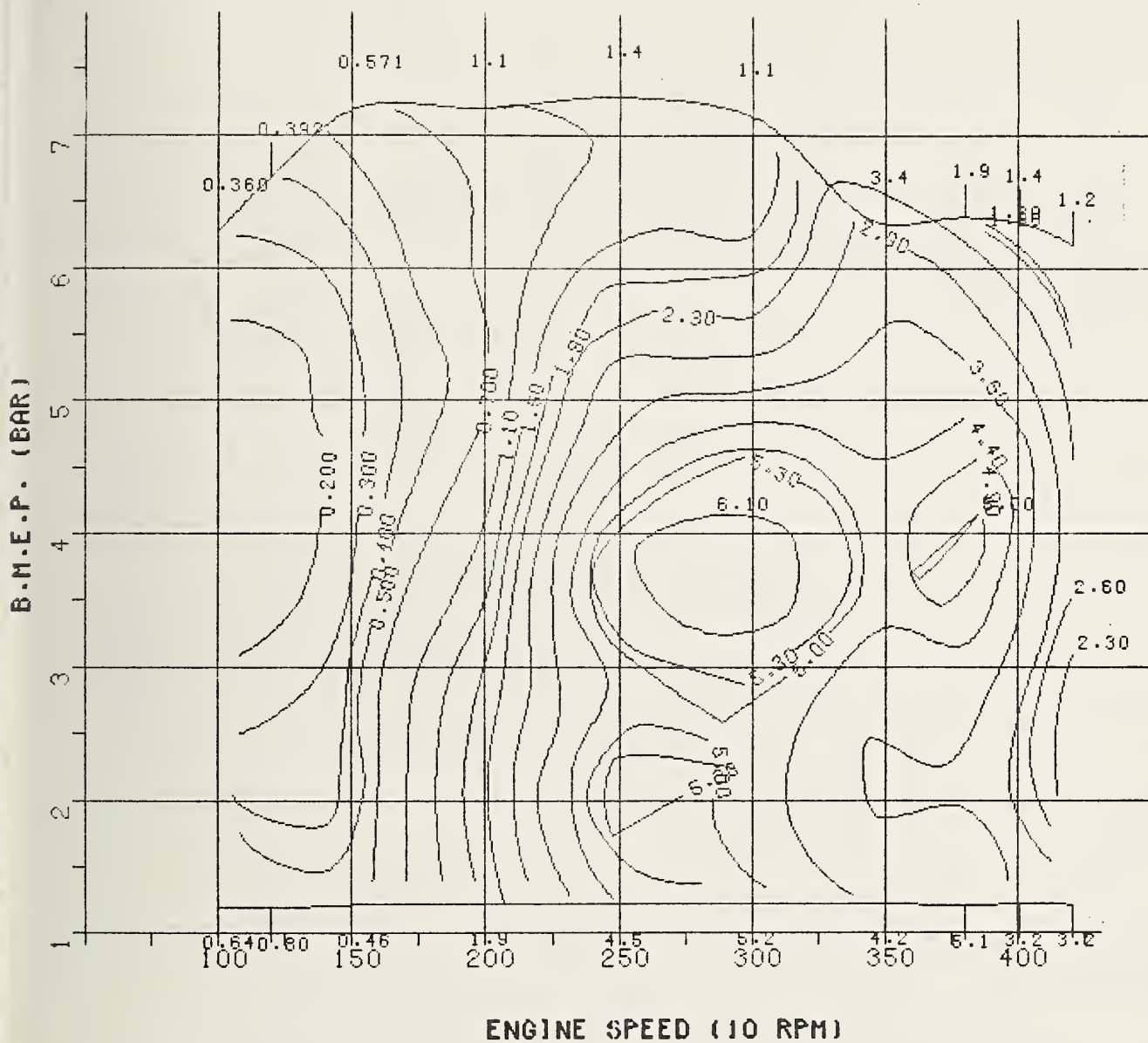
OIL TEMPERATURE (CELSIUS)  
5 CYLINDER 130 CID N.A. DIESEL ENGINE



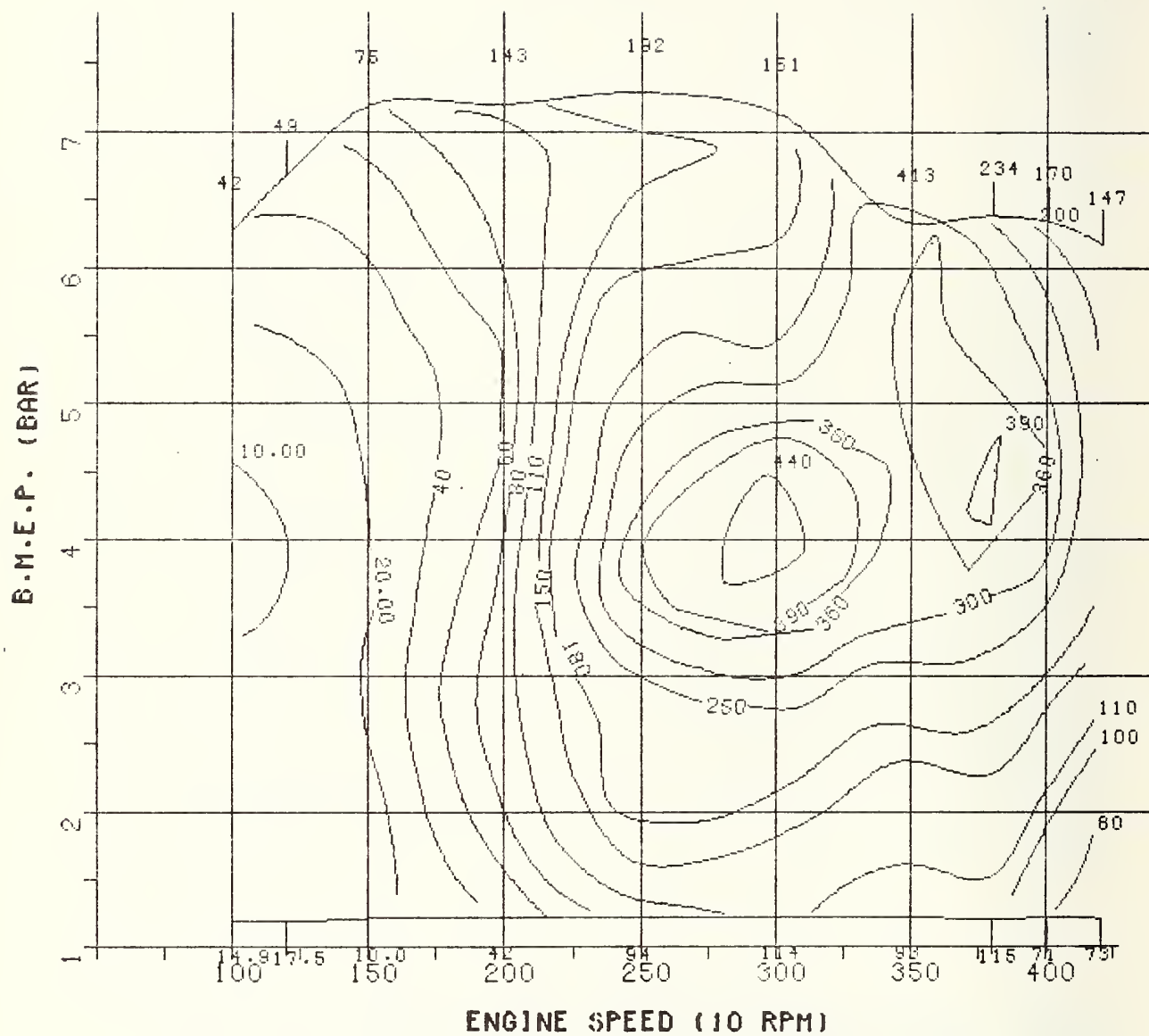
AIR TO FUEL RATIO  
5 CYLINDER 130 CID N.A. DIESEL ENGINE



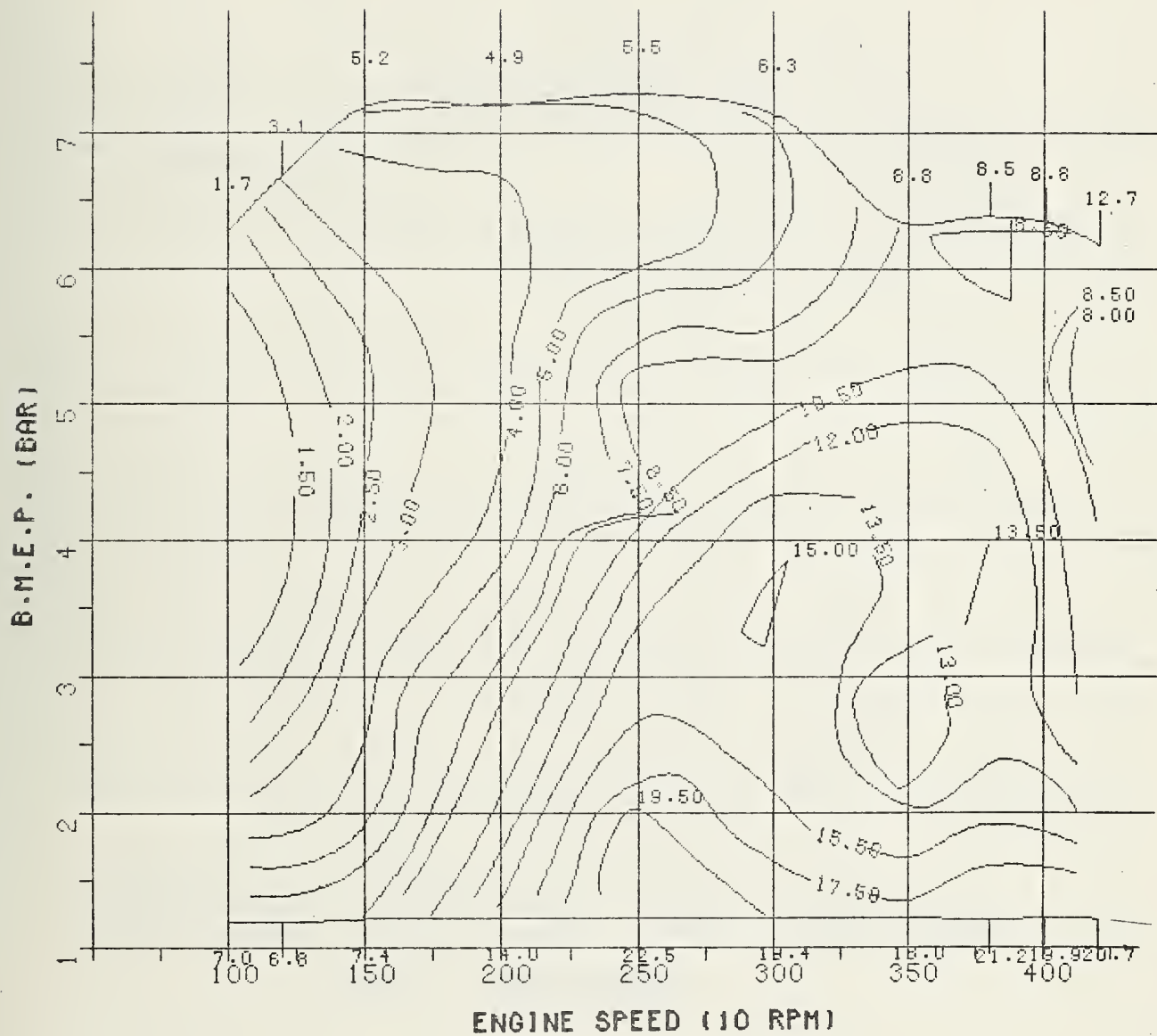
SMOKE (BOSCH NUMBER)  
5 CYLINDER 130 CID N.A. DIESEL ENGINE



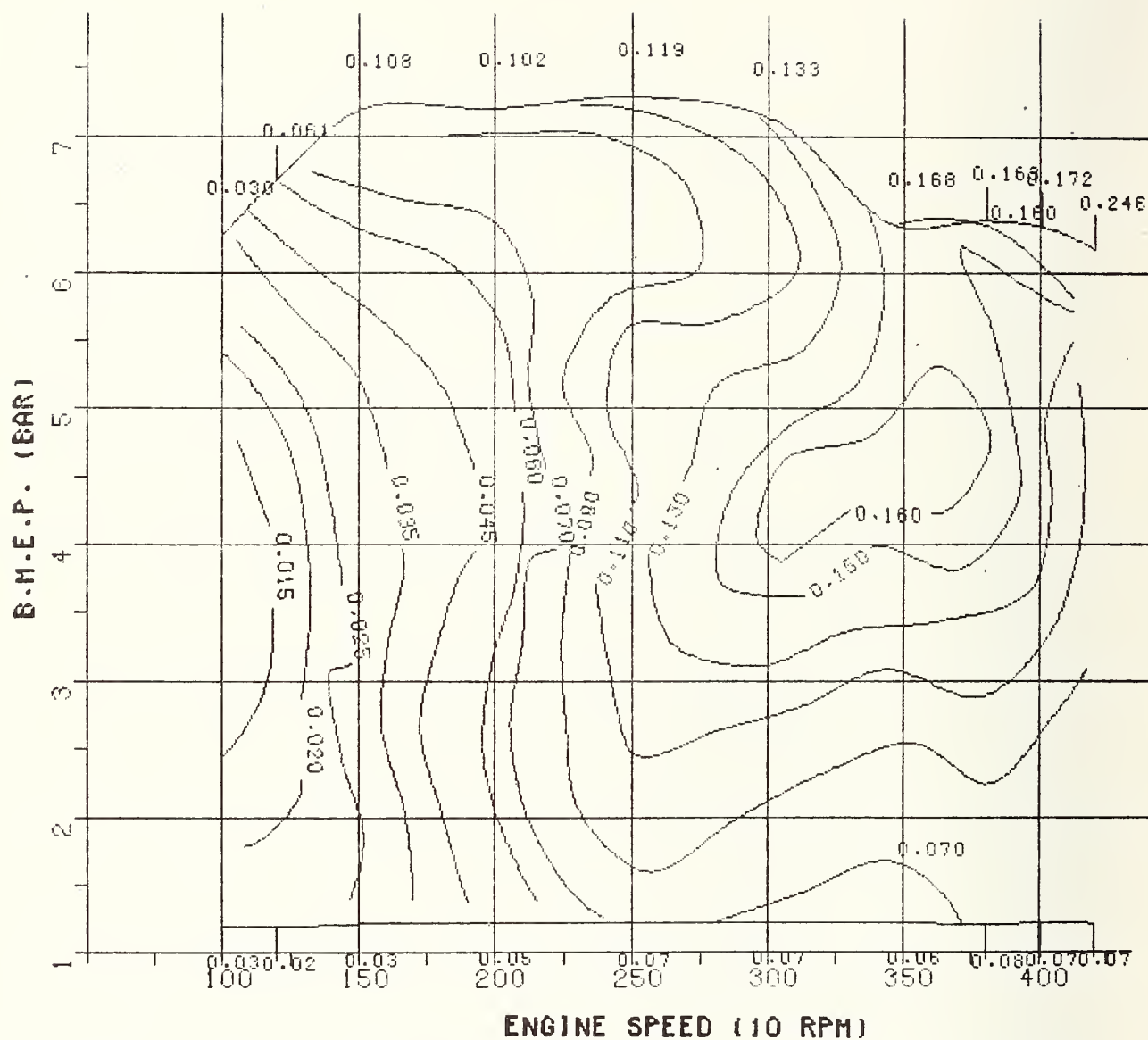
HC EMISSION (G/KWH)  
5 CYLINDER 130 CID N.A. DIESEL ENGINE



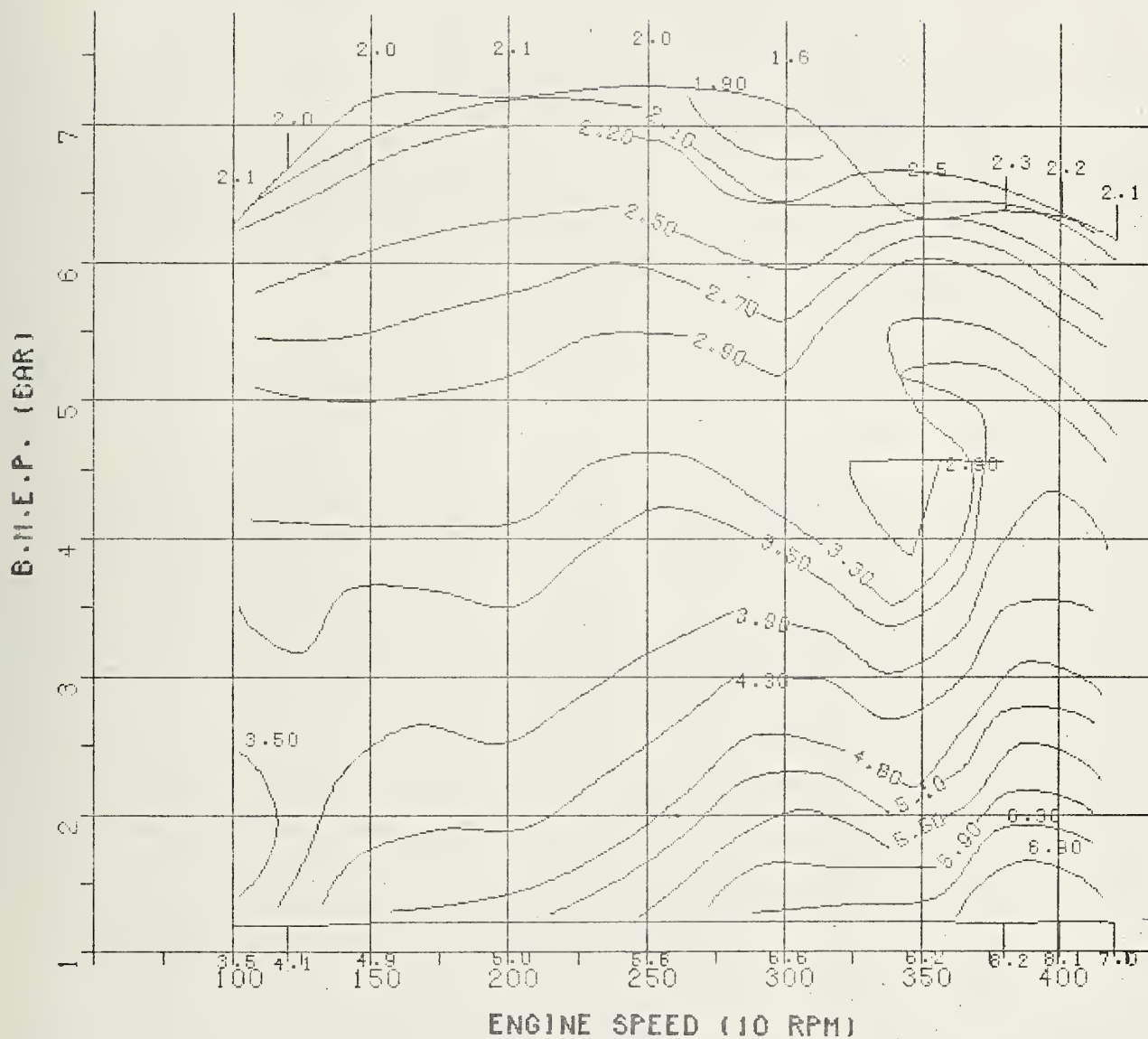
HC CONCENTRATION (PPM)  
5 CYLINDER 130 CID N.A. DIESEL ENGINE



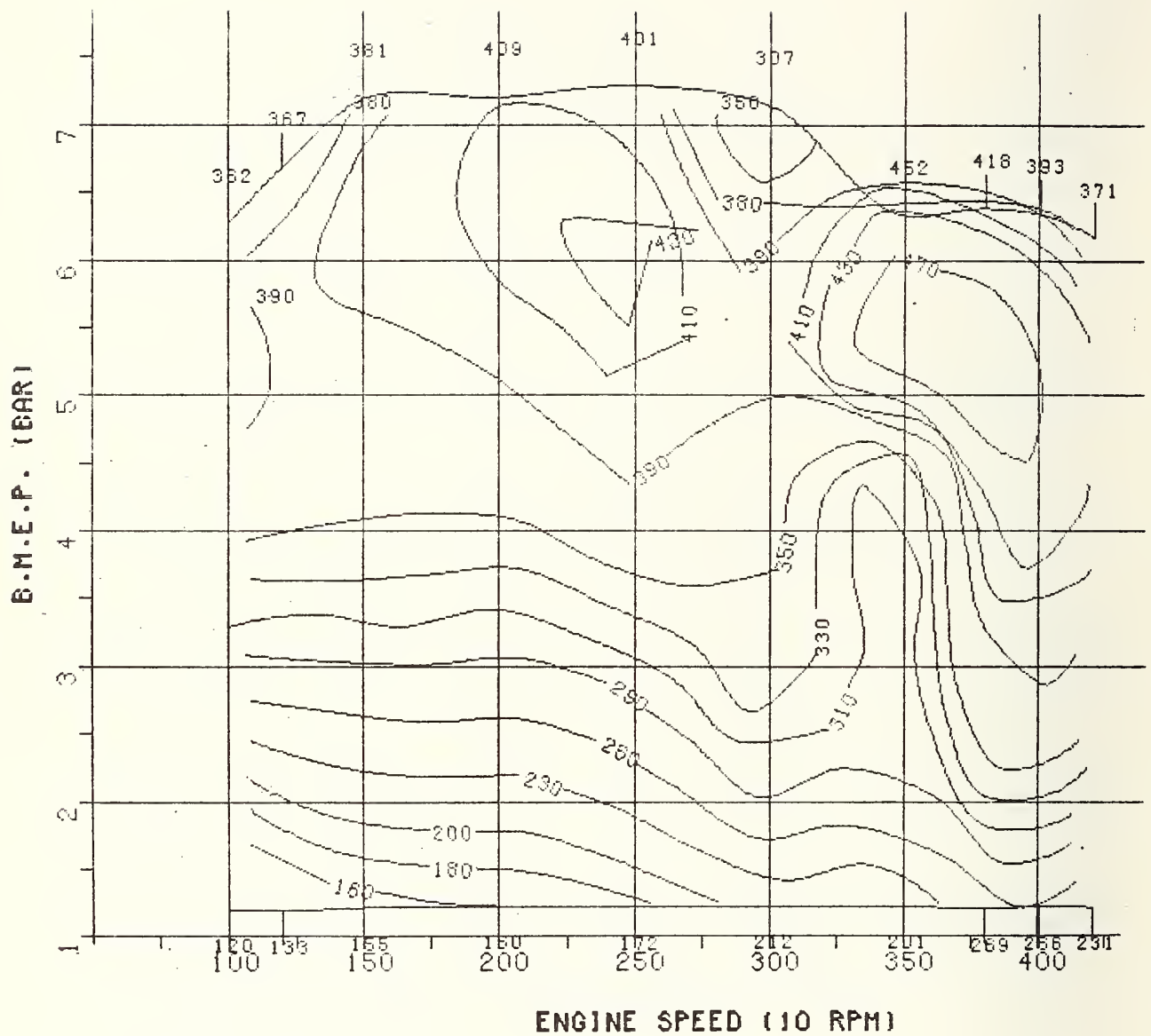
CO EMISSION (G/KWH)  
5 CYLINDER 130 CID N.A. DIESEL ENGINE



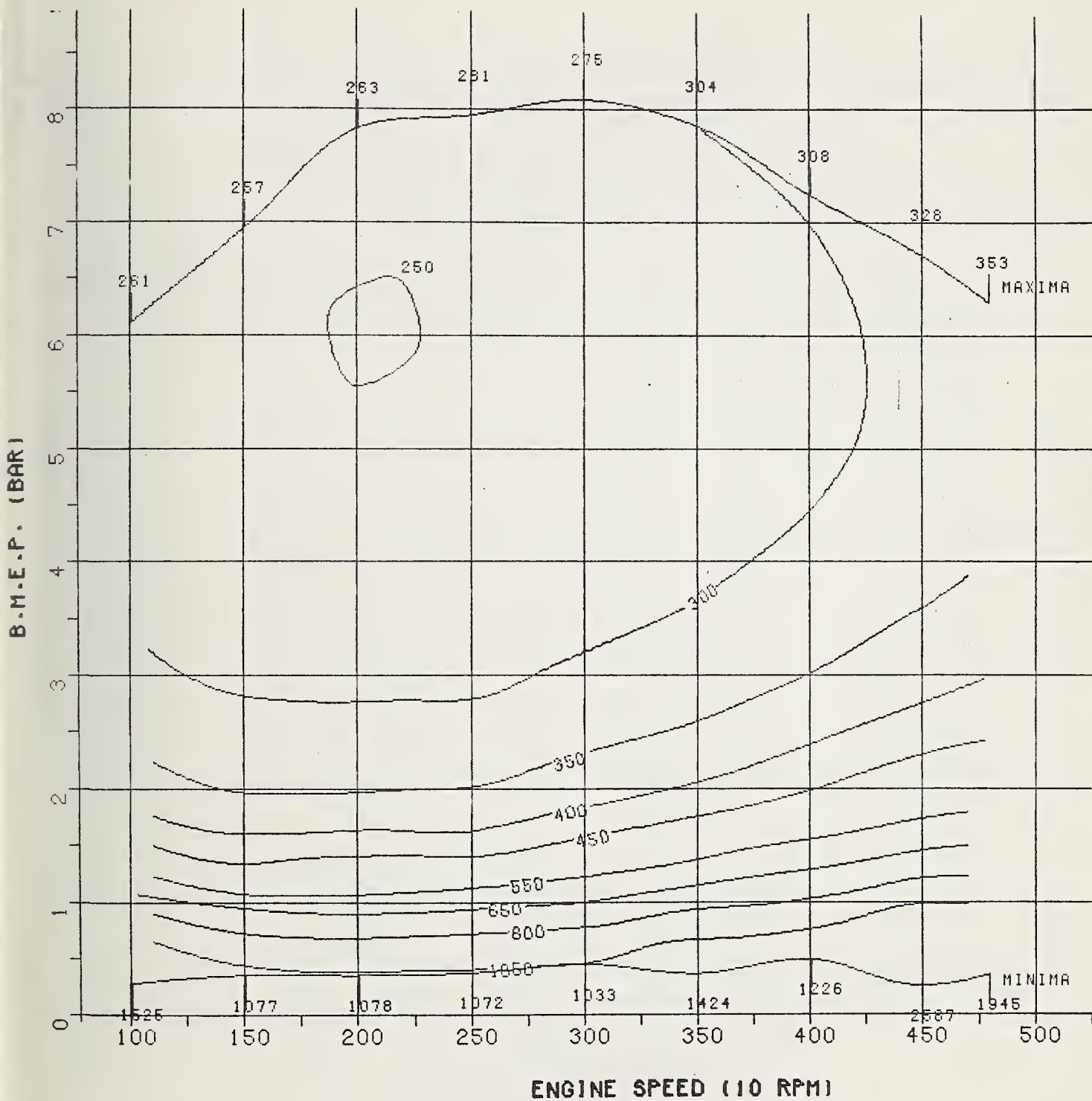
CO CONCENTRATION (%)  
5 CYLINDER 130 CID N.A. DIESEL ENGINE

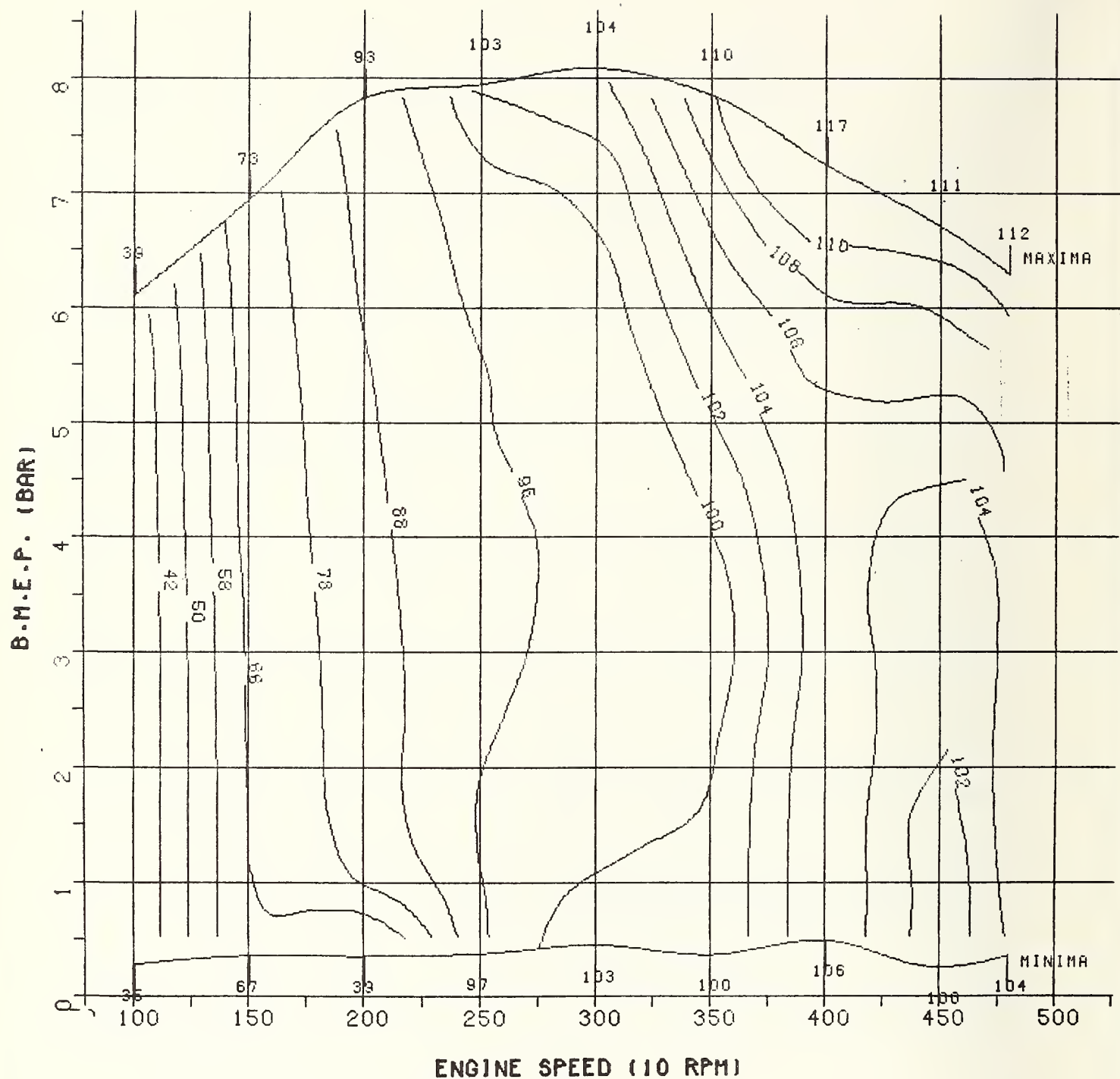


NO EMISSION (G/KWH)  
5 CYLINDER 130 CID N.A. DIESEL ENGINE

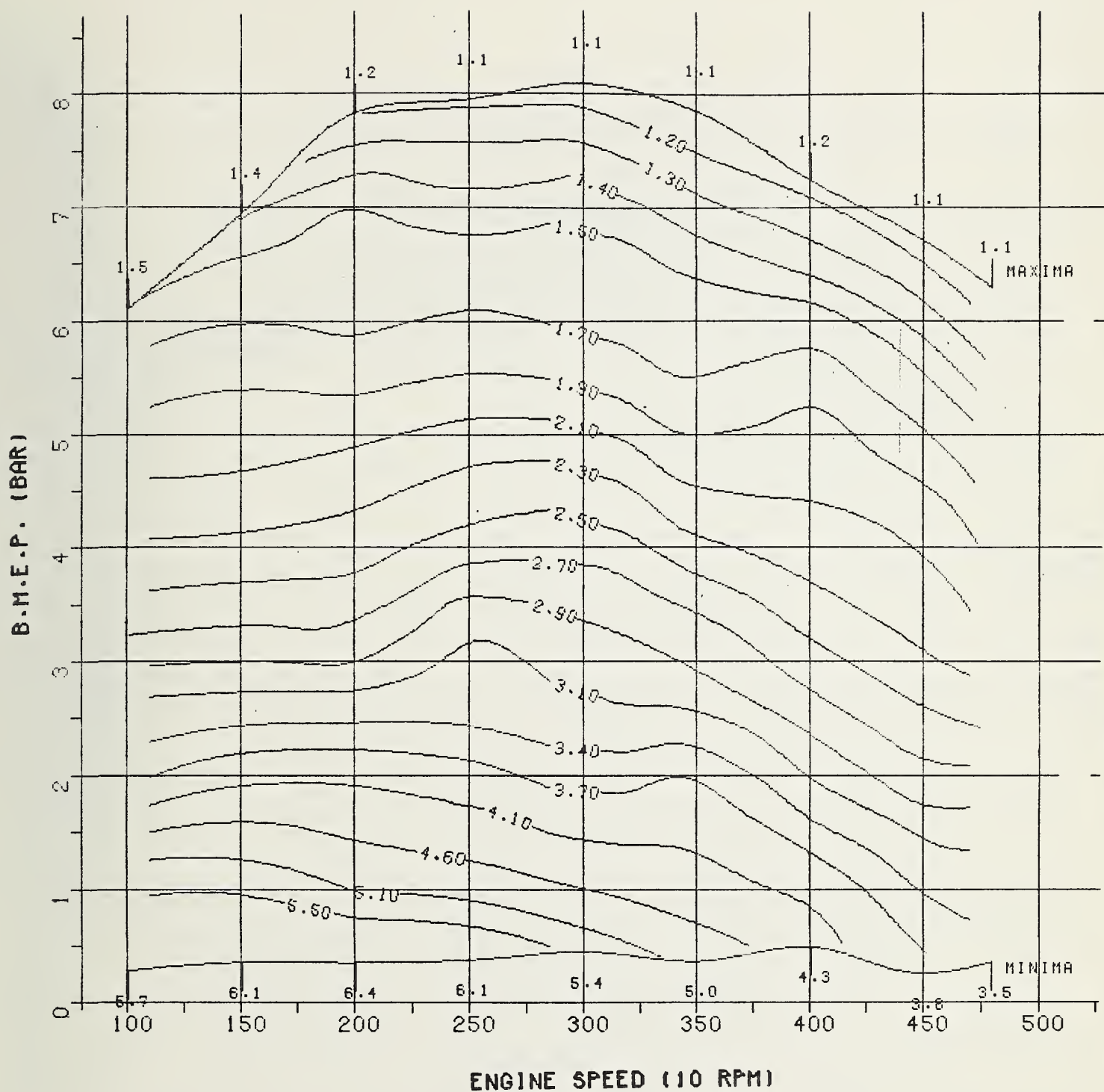


NO CONCENTRATION (PPM)  
5 CYLINDER 130 CID N.A. DIESEL ENGINE

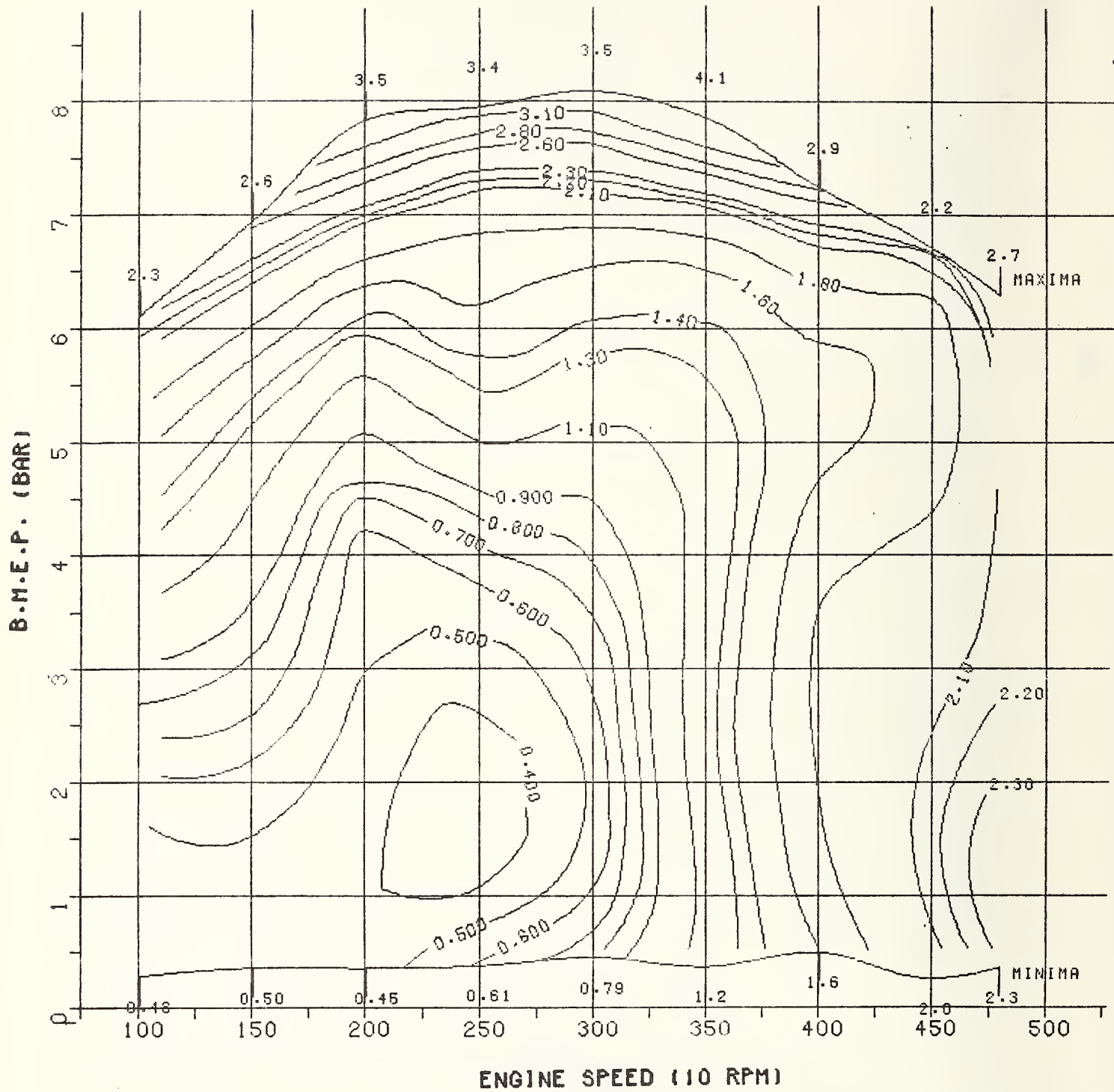




OIL TEMPERATURE (CELSIUS)  
6 CYLINDER 146 CID N.A. DIESEL ENGINE

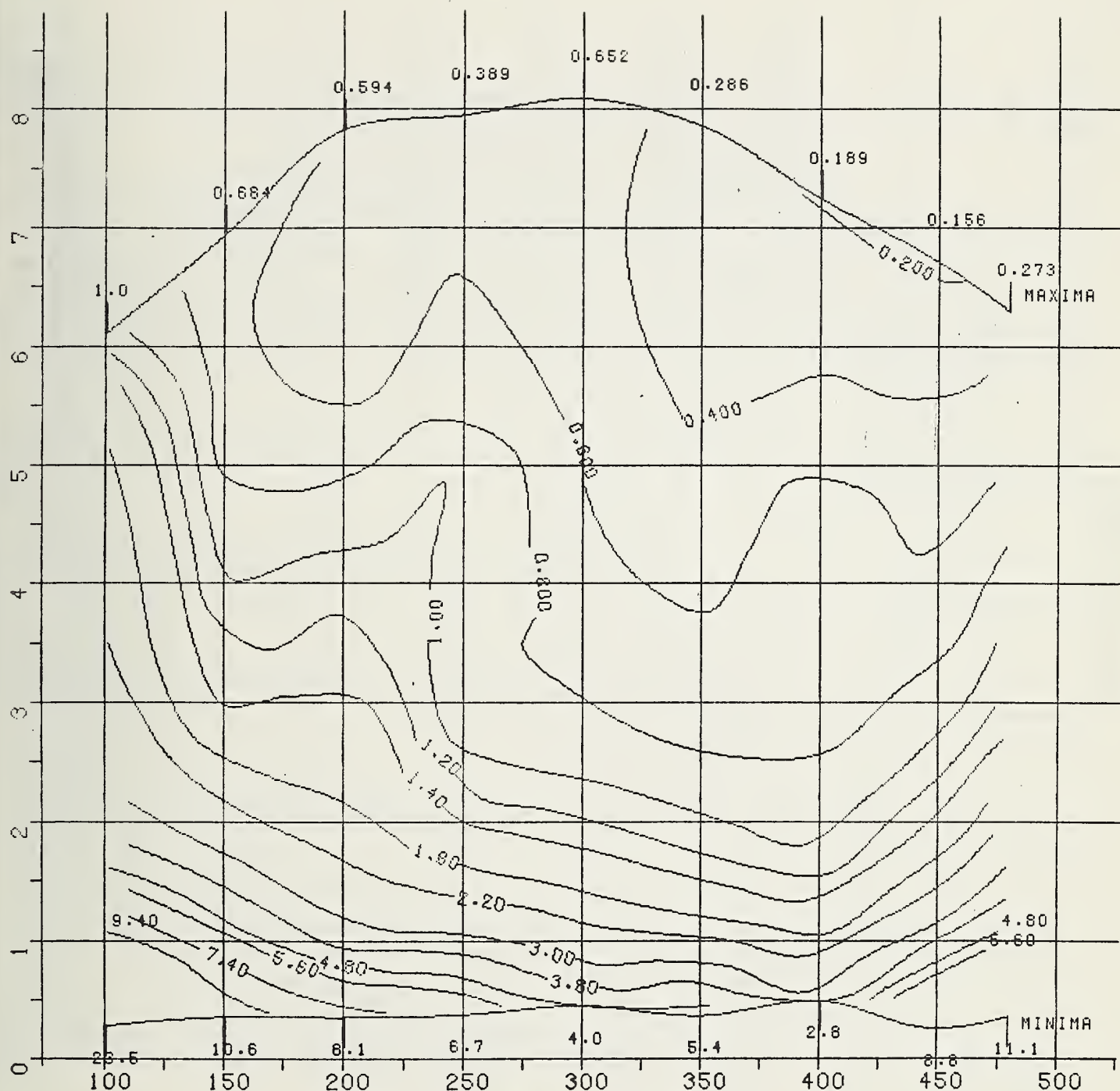


AIR TO FUEL RATIO  
6 CYLINDER 146 CID N.A. DIESEL ENGINE



SMOKE (BOSCH NUMBER)  
6 CYLINDER 146 CID N.A. DIESEL ENGINE

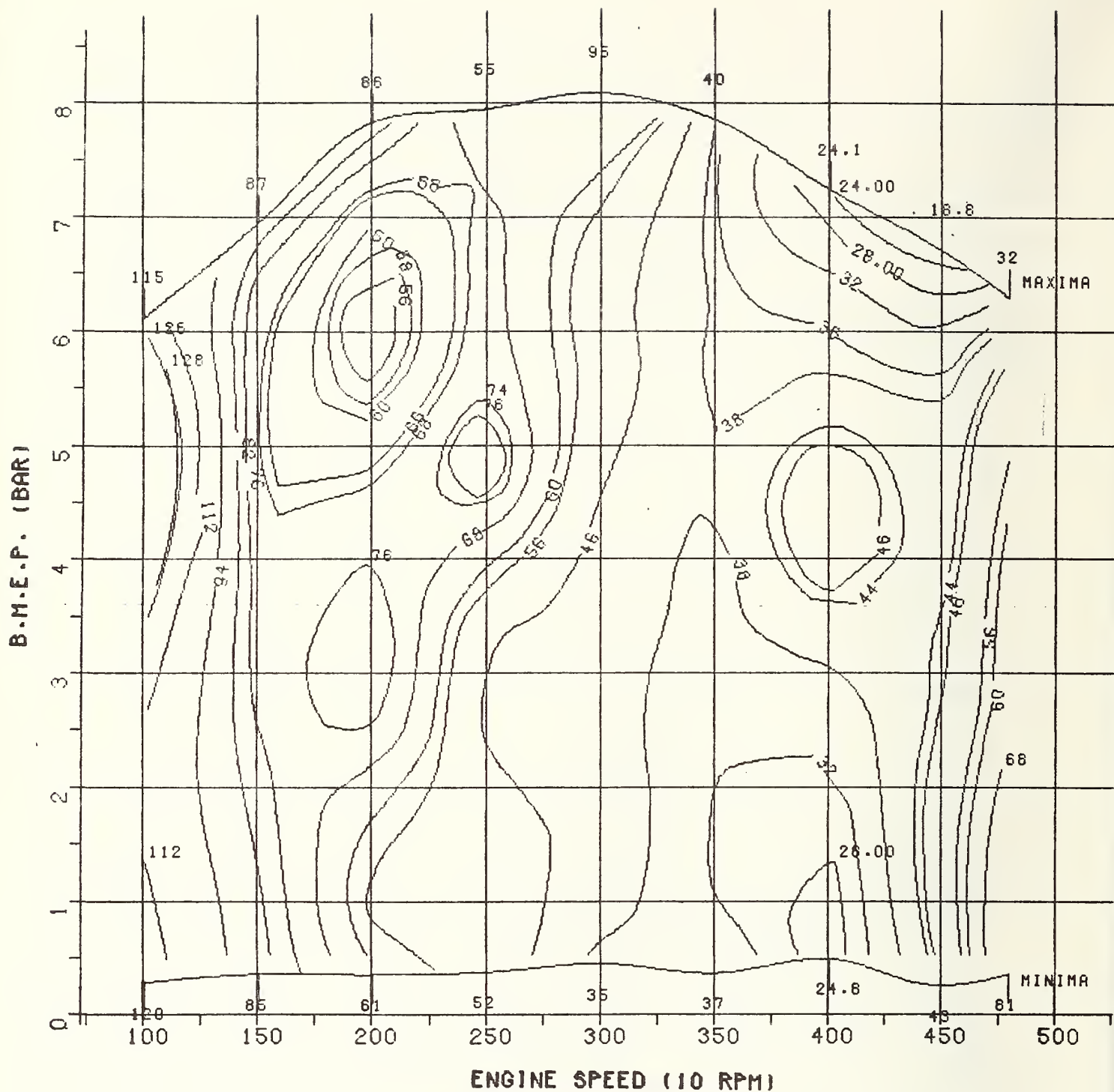
B.M.E.P. (BAR)



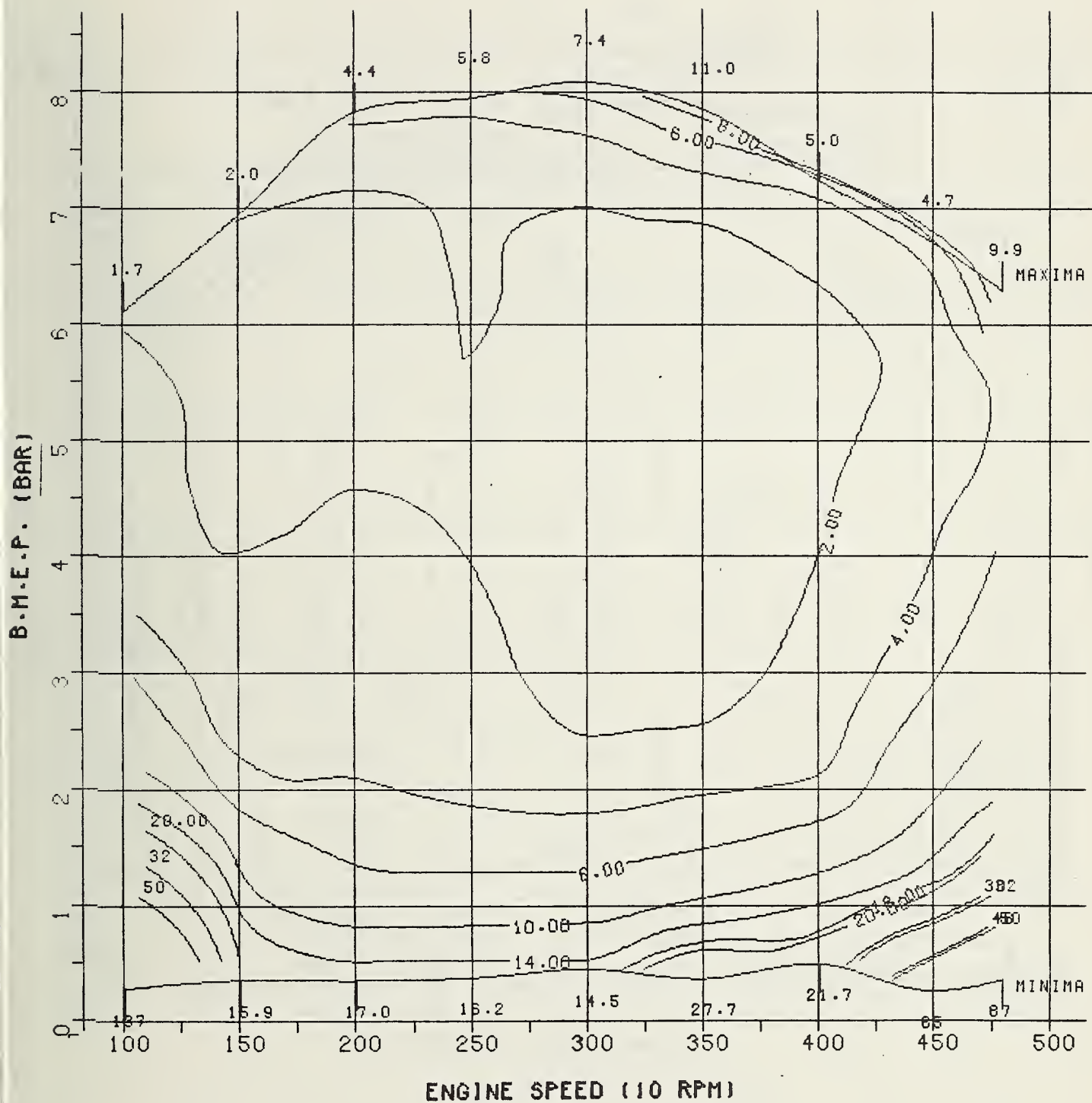
ENGINE SPEED (10 RPM)

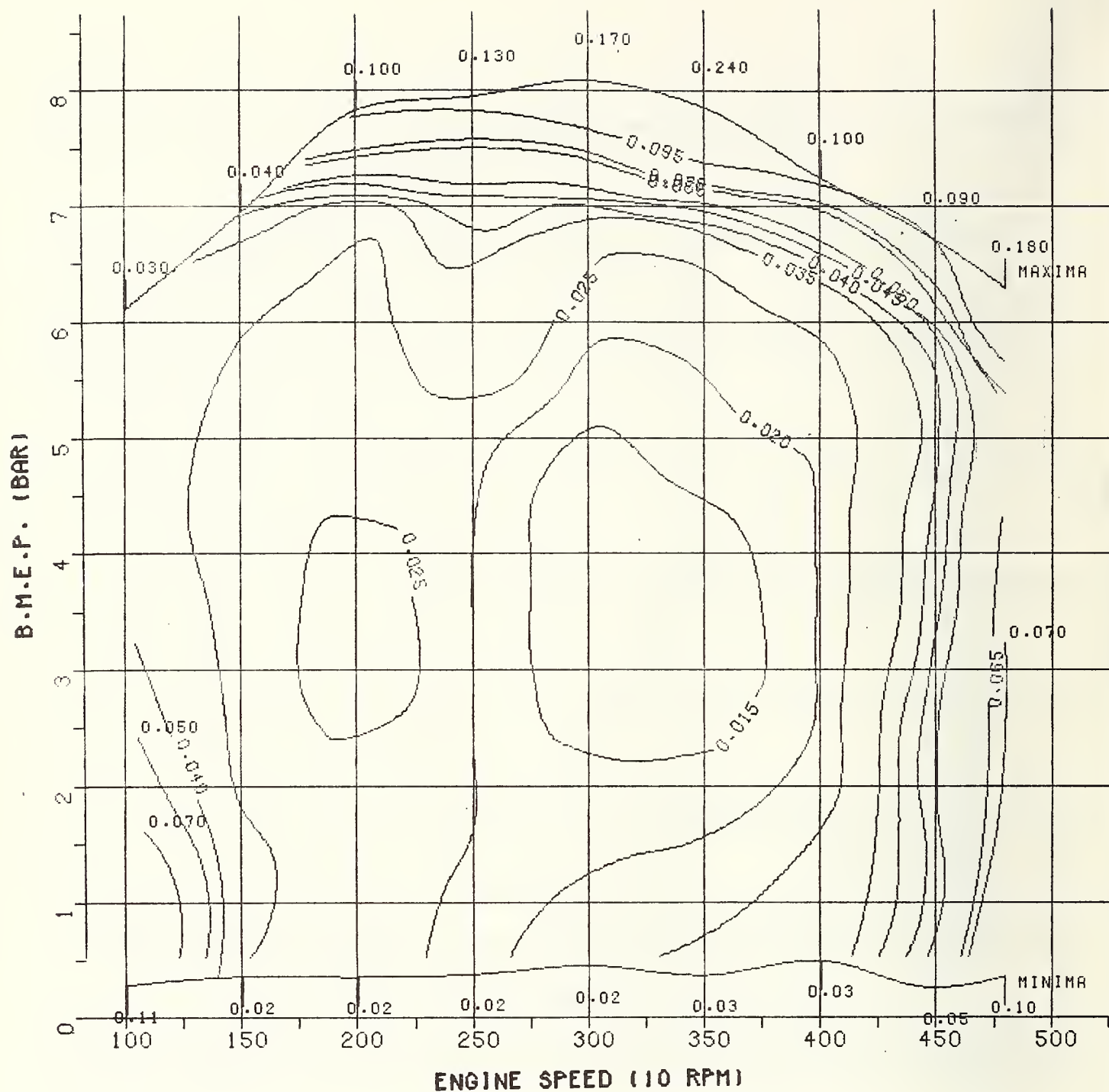
HC EMISSION (G/KWH)

6 CYLINDER 146 CID N.A. DIESEL ENGINE

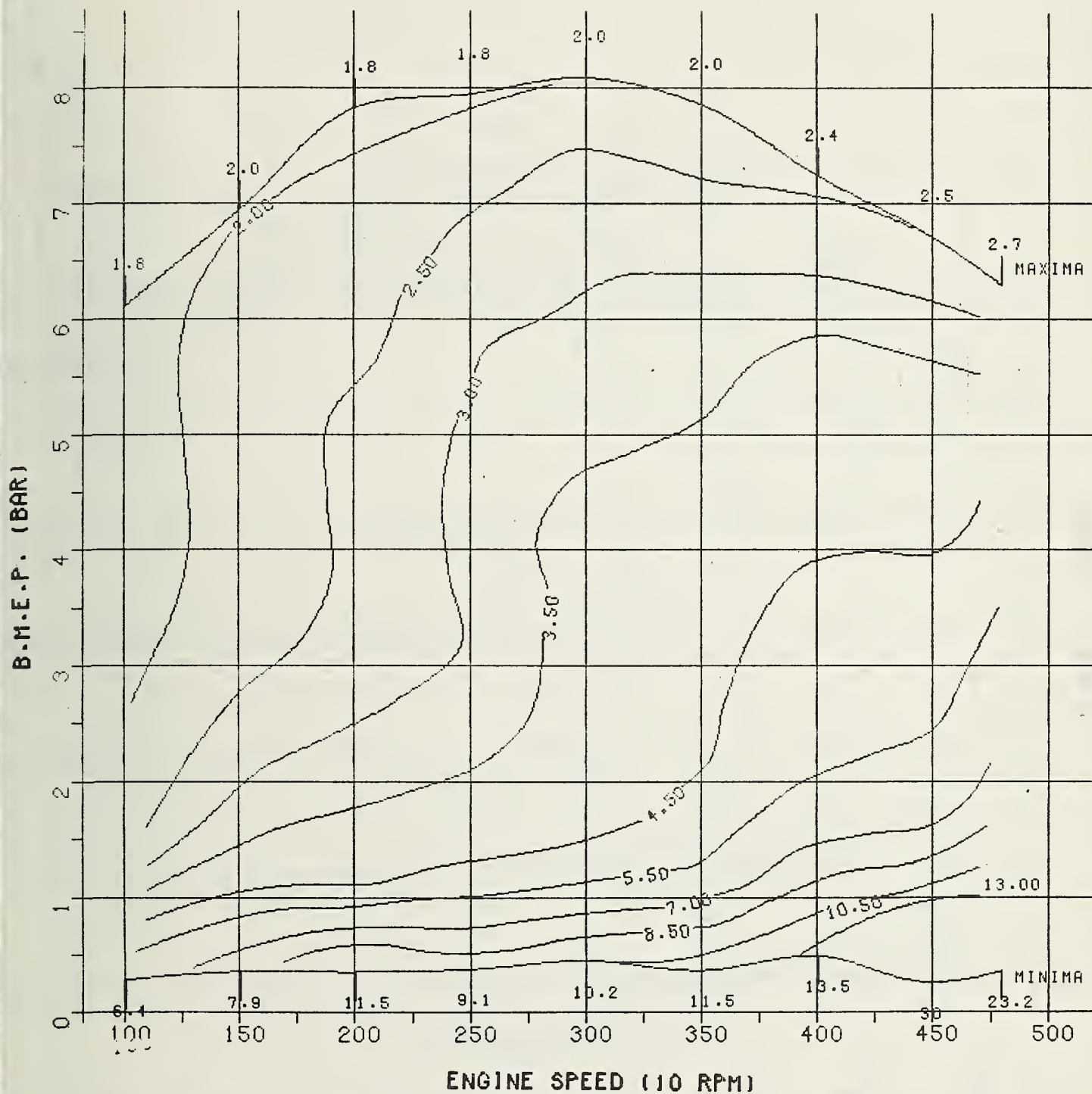


HC CONCENTRATION (PPM)  
6 CYLINDER 146 CID N.A. DIESEL ENGINE

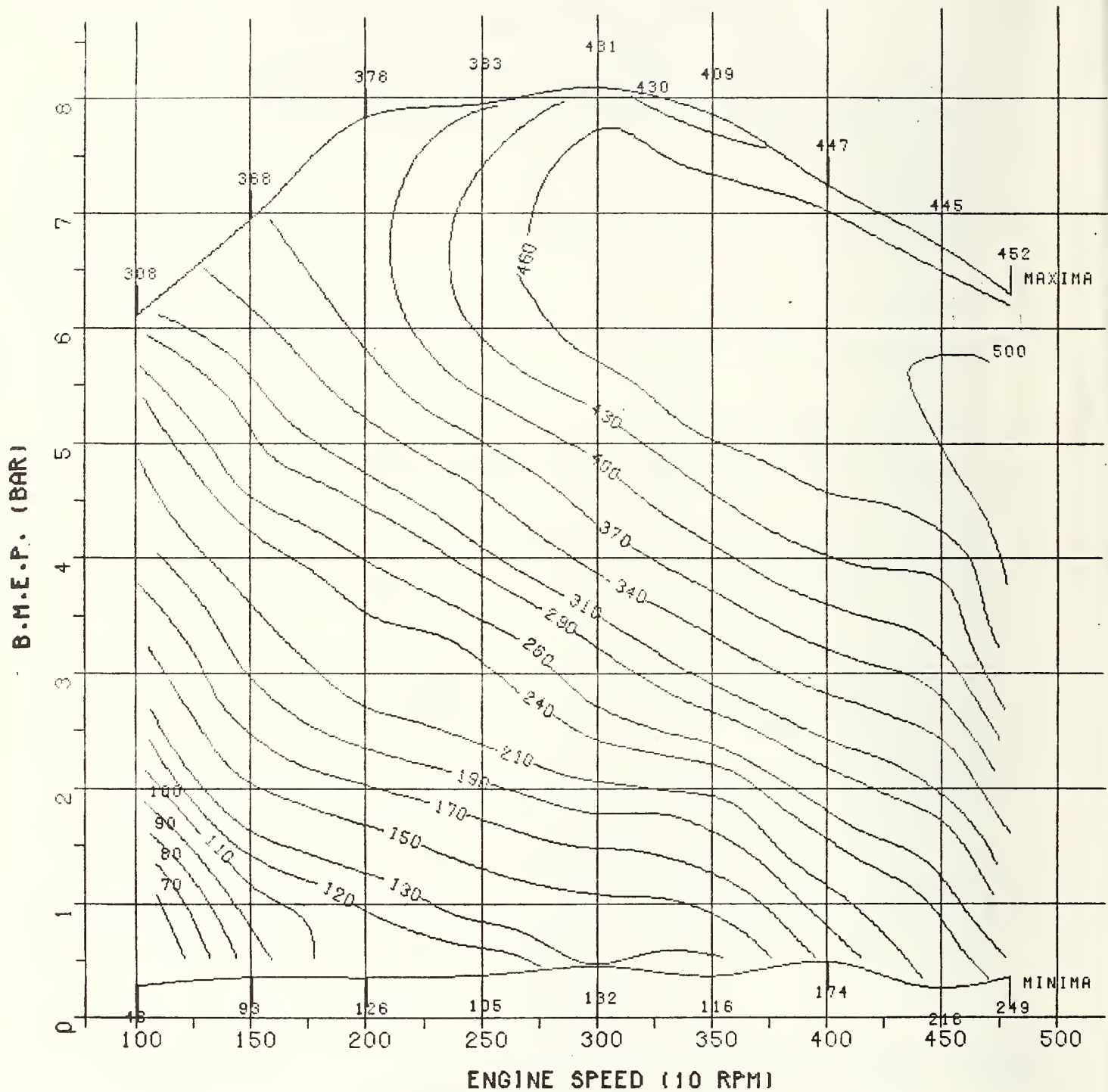


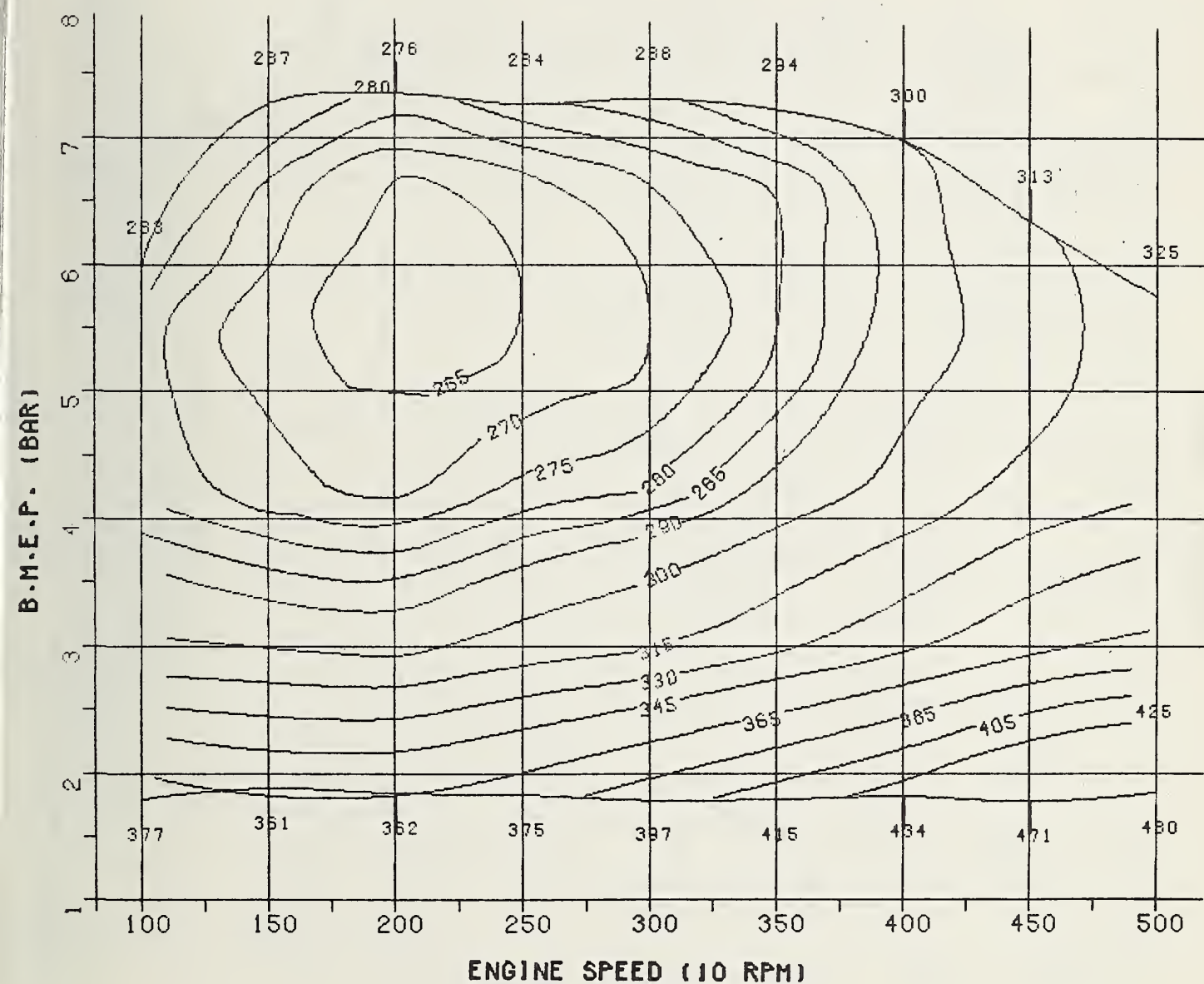


CO CONCENTRATION (%)  
6 CYLINDER 146 CID N.A. DIESEL ENGINE

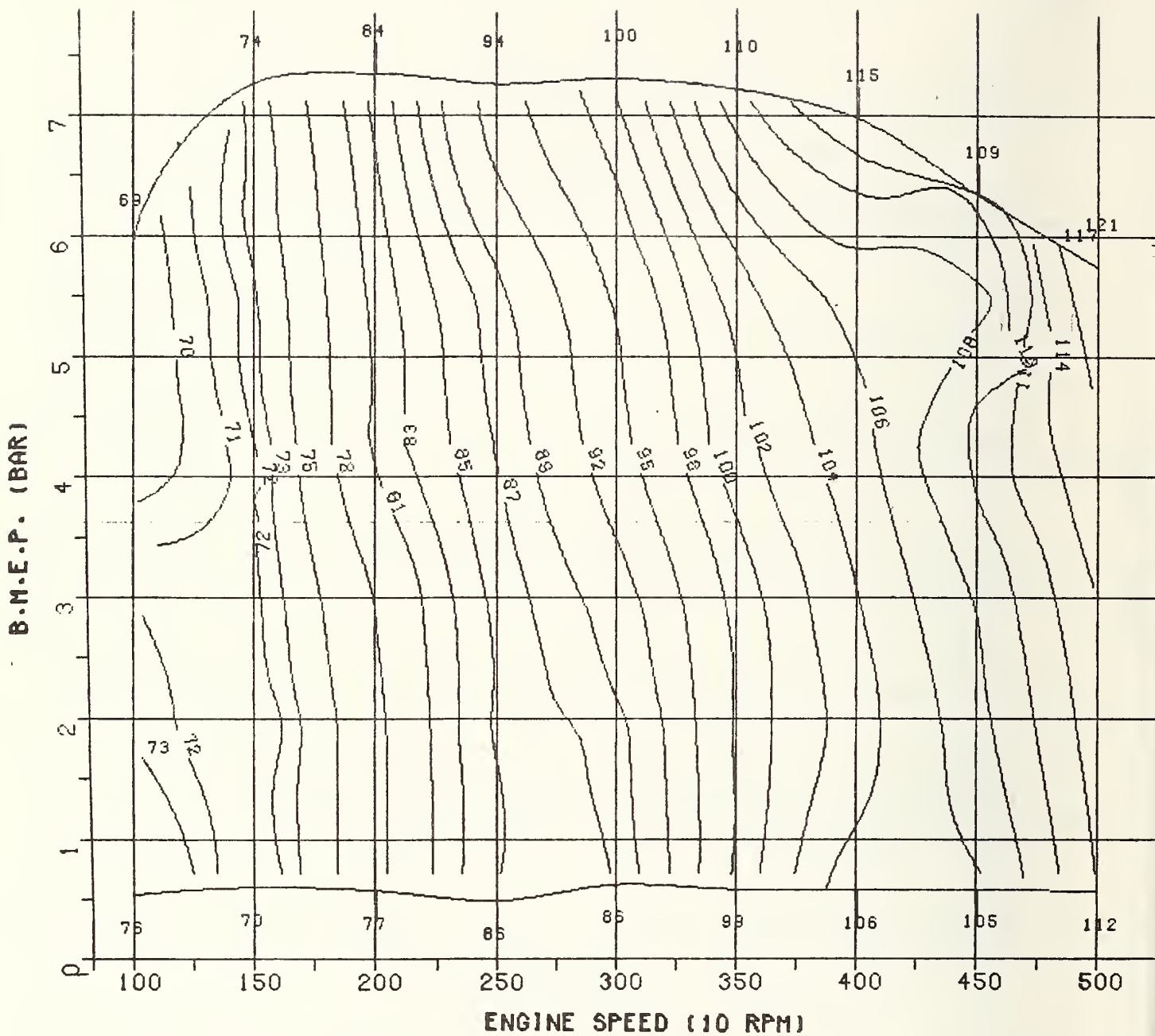


NO EMISSION (G/KWH)  
6 CYLINDER 146 CID N.A. DIESEL ENGINE



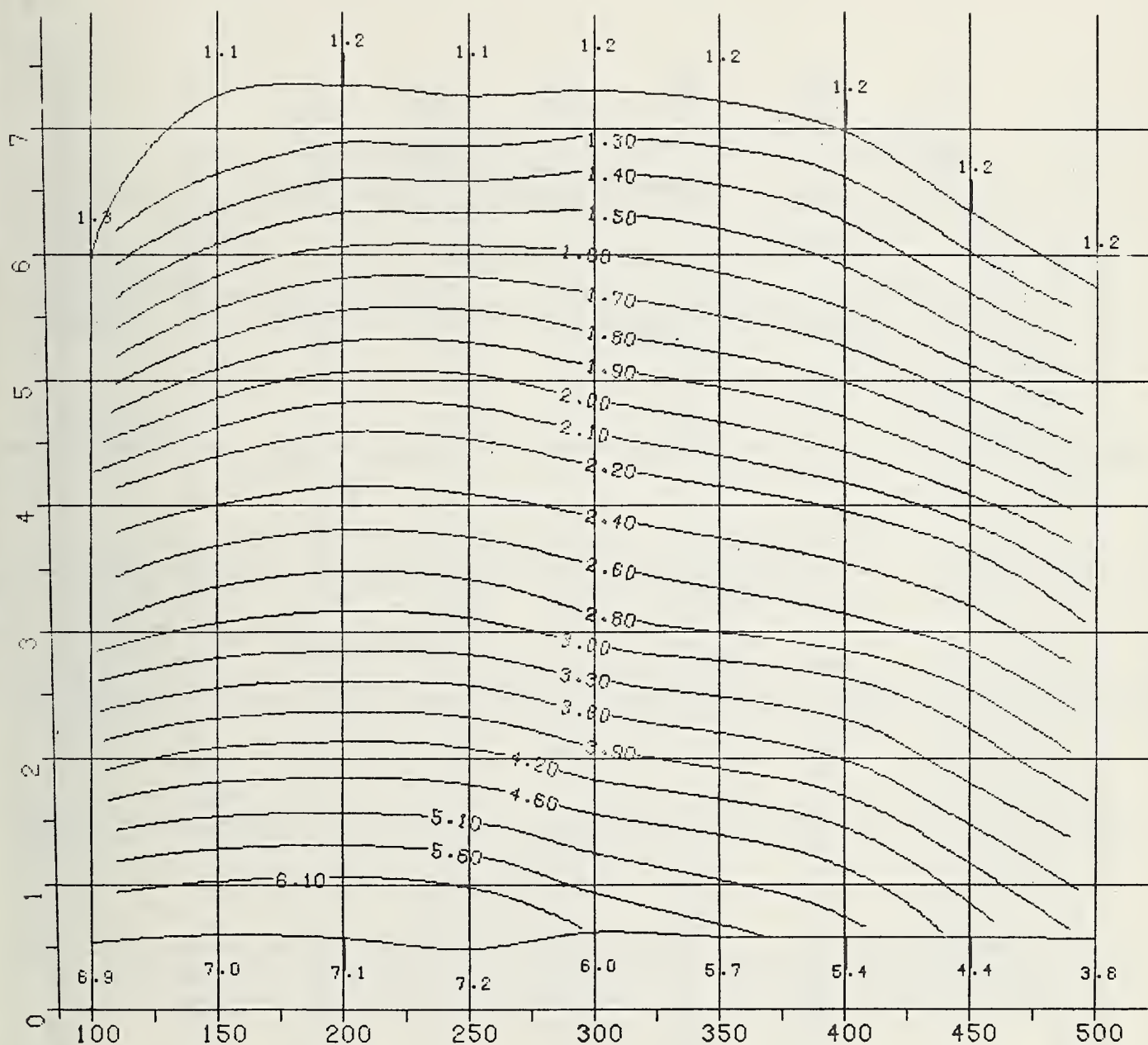


**SPECIFIC FUEL CONSUMPTION (G/KWH)  
50 HP DIESEL, FUEL 15275**



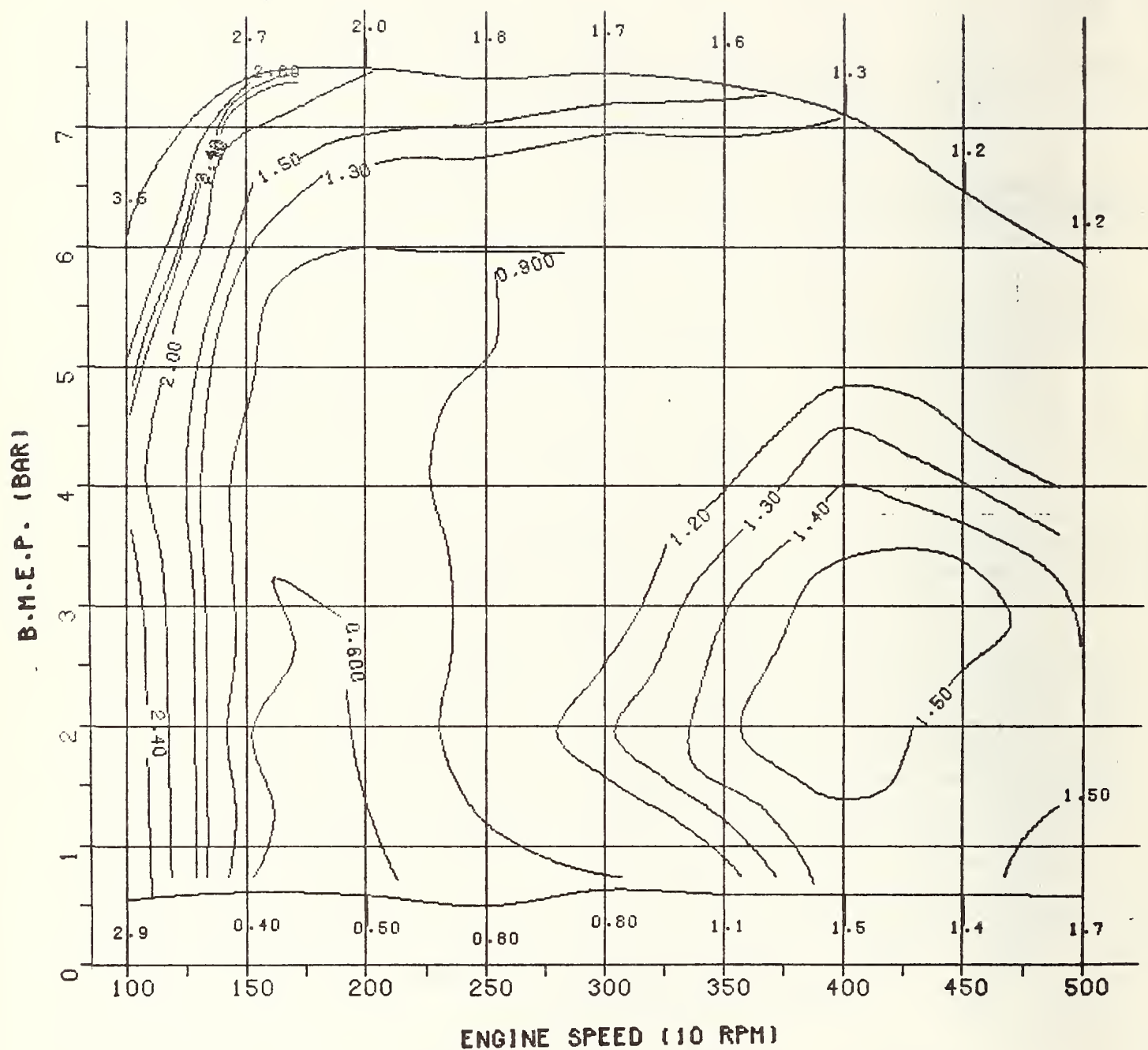
OIL TEMPERATURE (CELSIUS)  
50 HP DIESEL, FUEL 15275

B.M.E.P. (BAR)



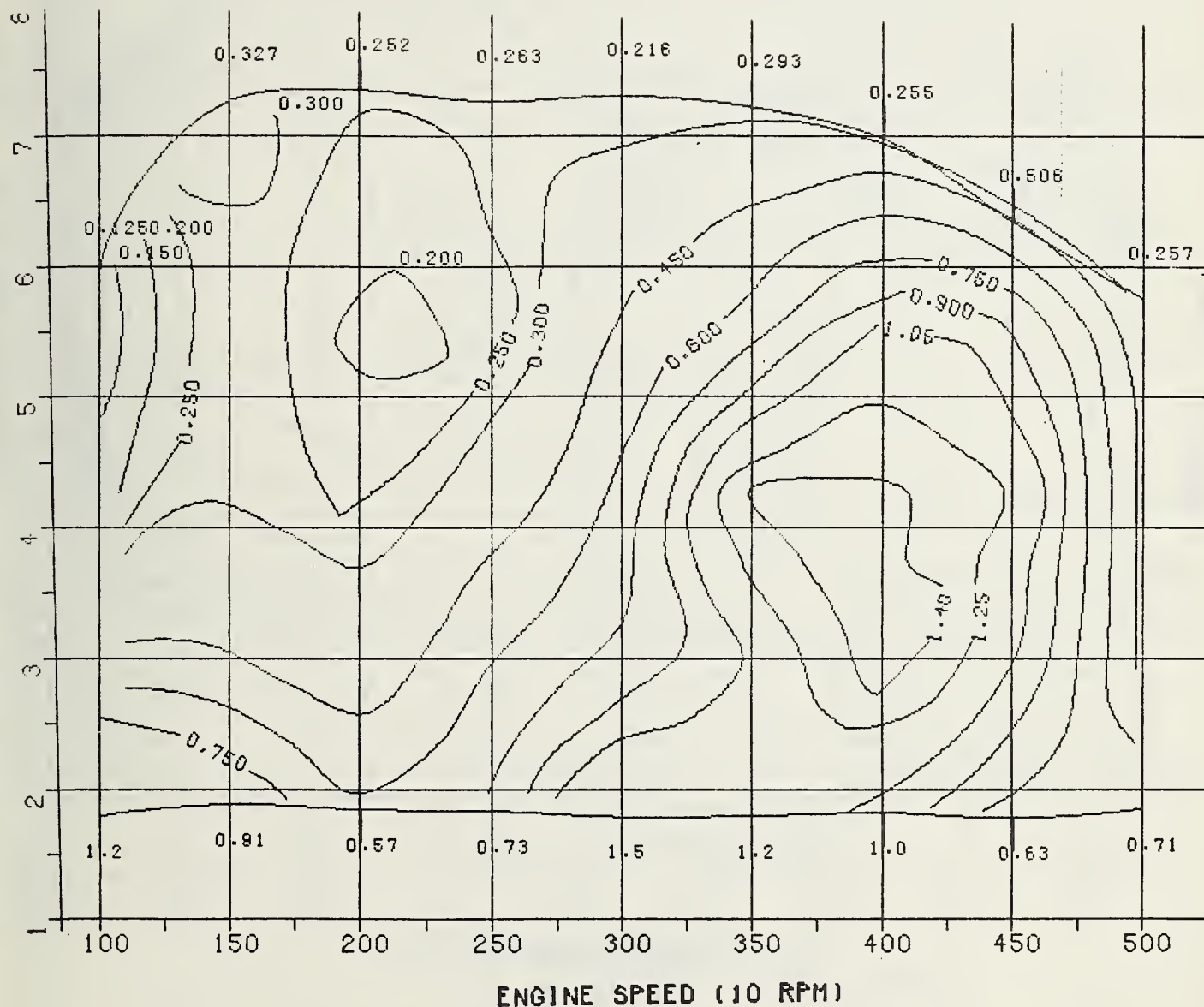
ENGINE SPEED (10 RPM)

AIR TO FUEL RATIO  
50 HP DIESEL, FUEL 15275

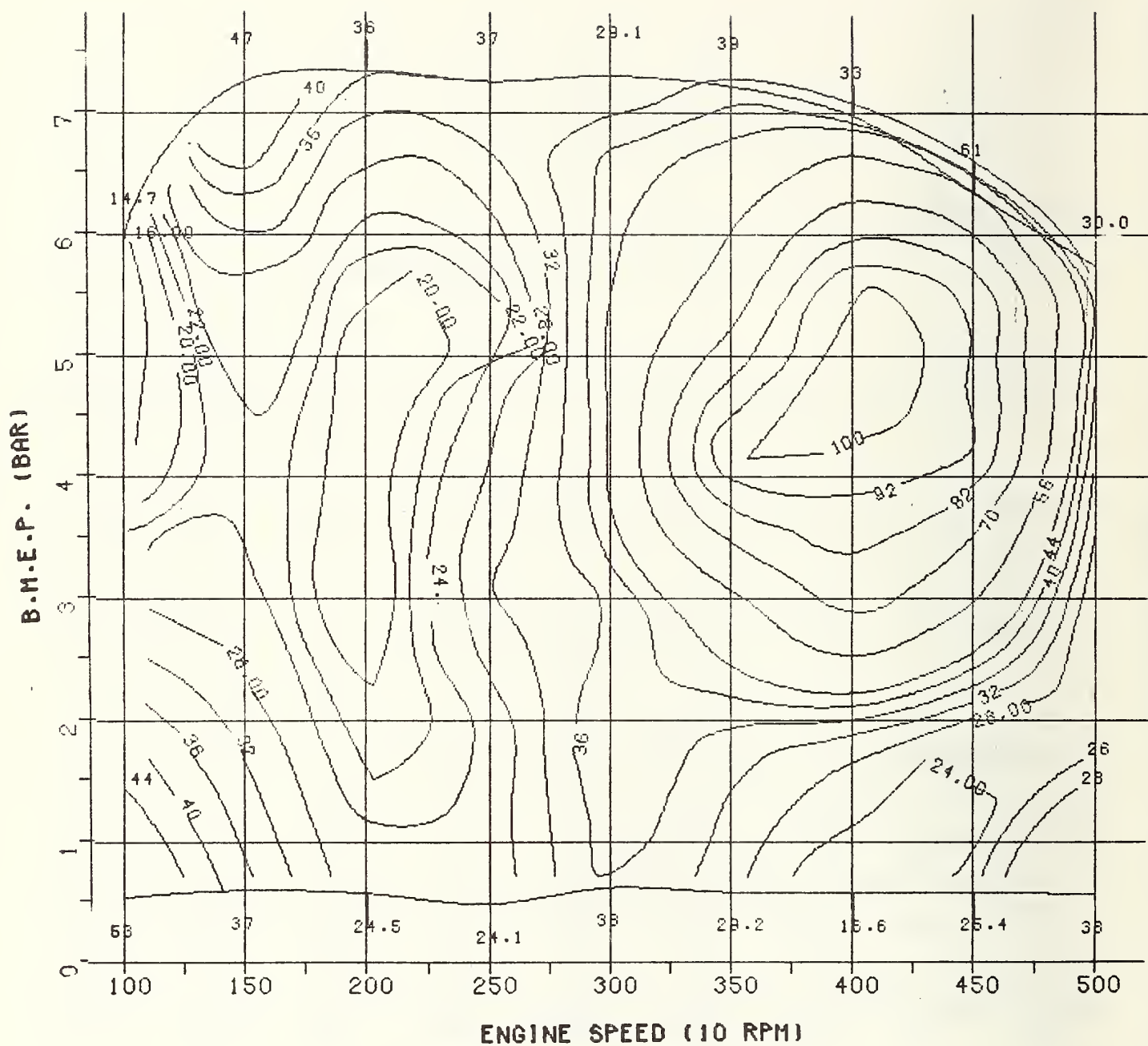


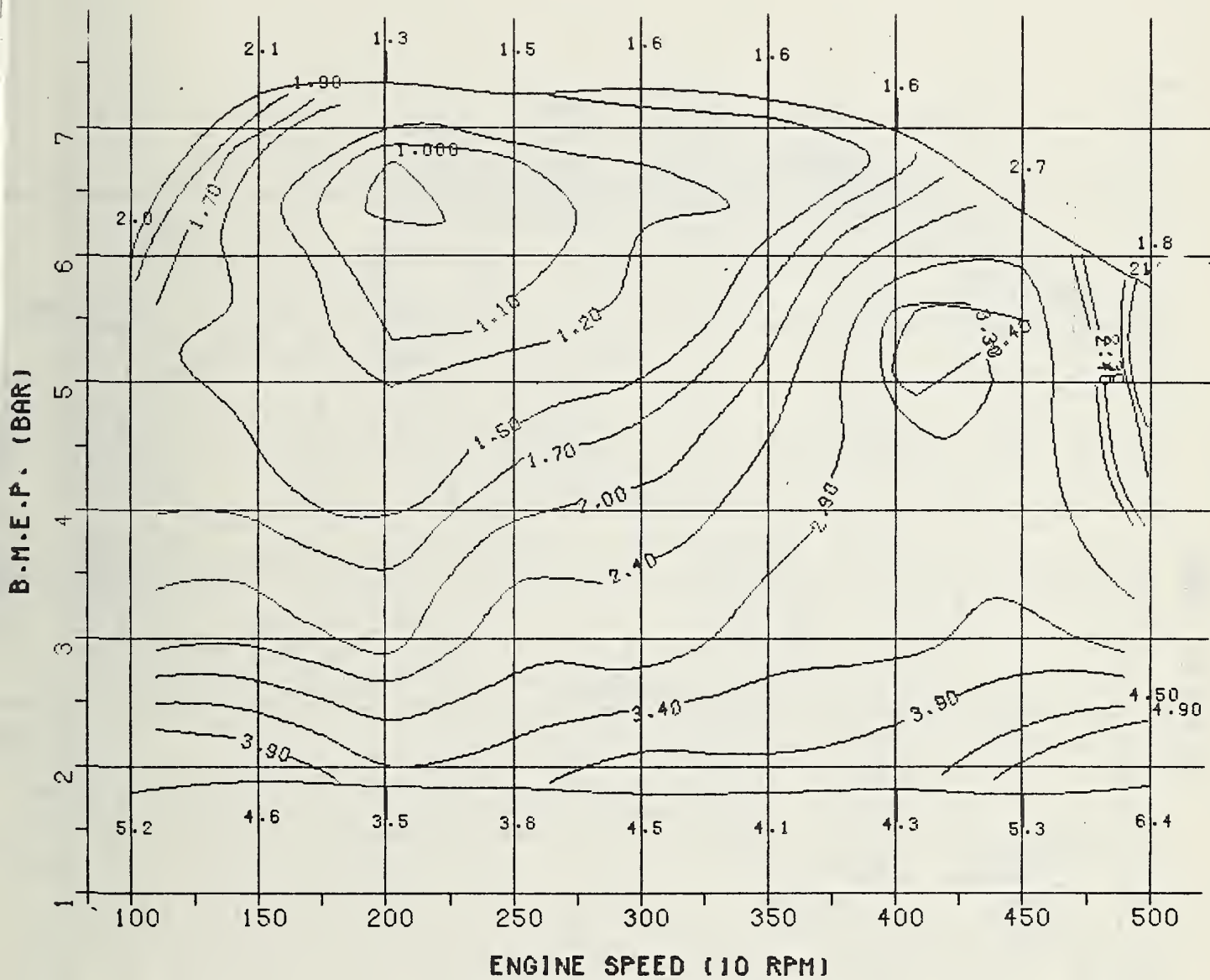
SMOKE (BOSCH NUMBER)  
50 HP DIESEL, FUEL 15275

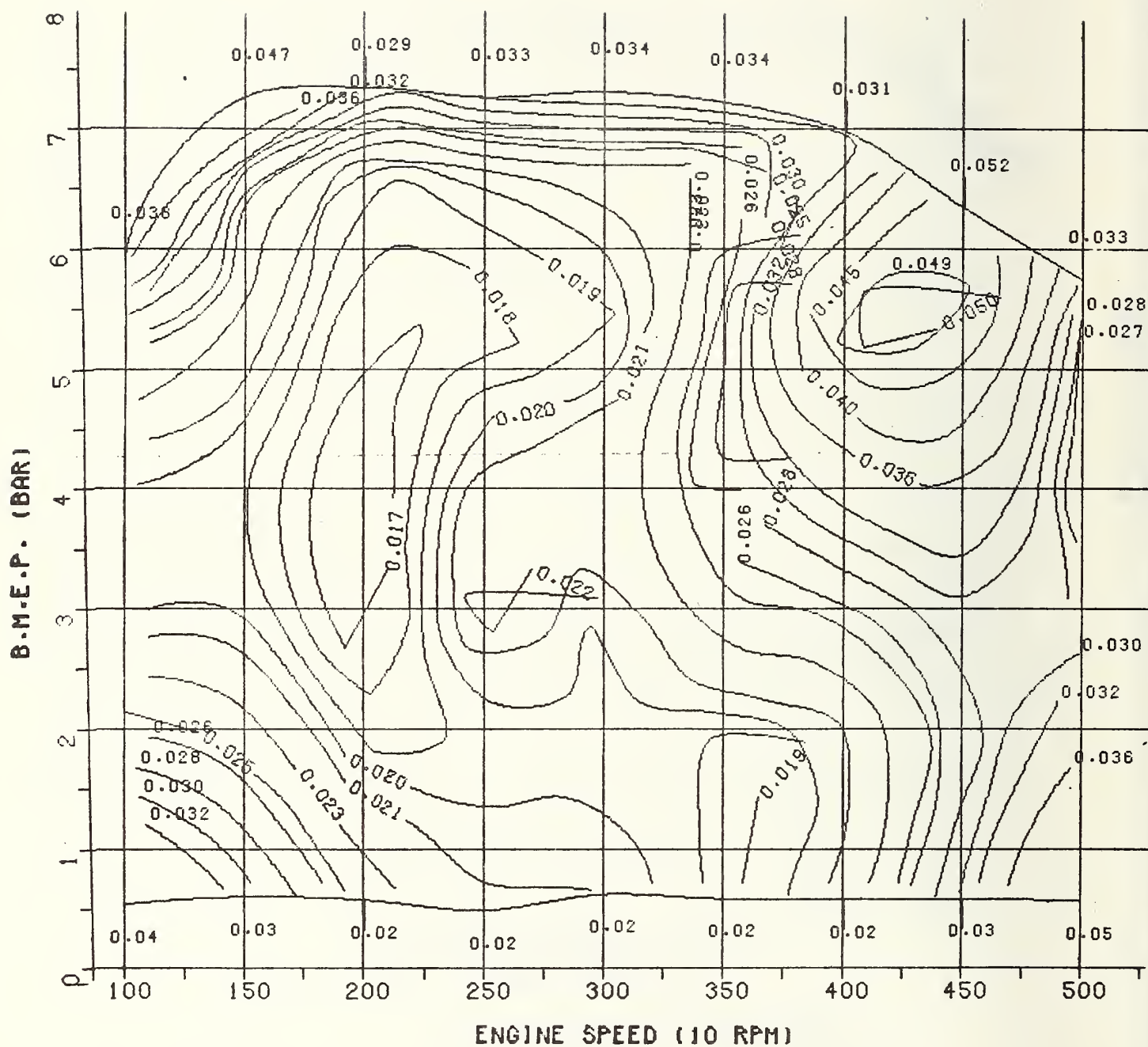
B.M.E.P. (BAR)



HC EMISSION (G/KWH)  
50 HP DIESEL, FUEL 15275

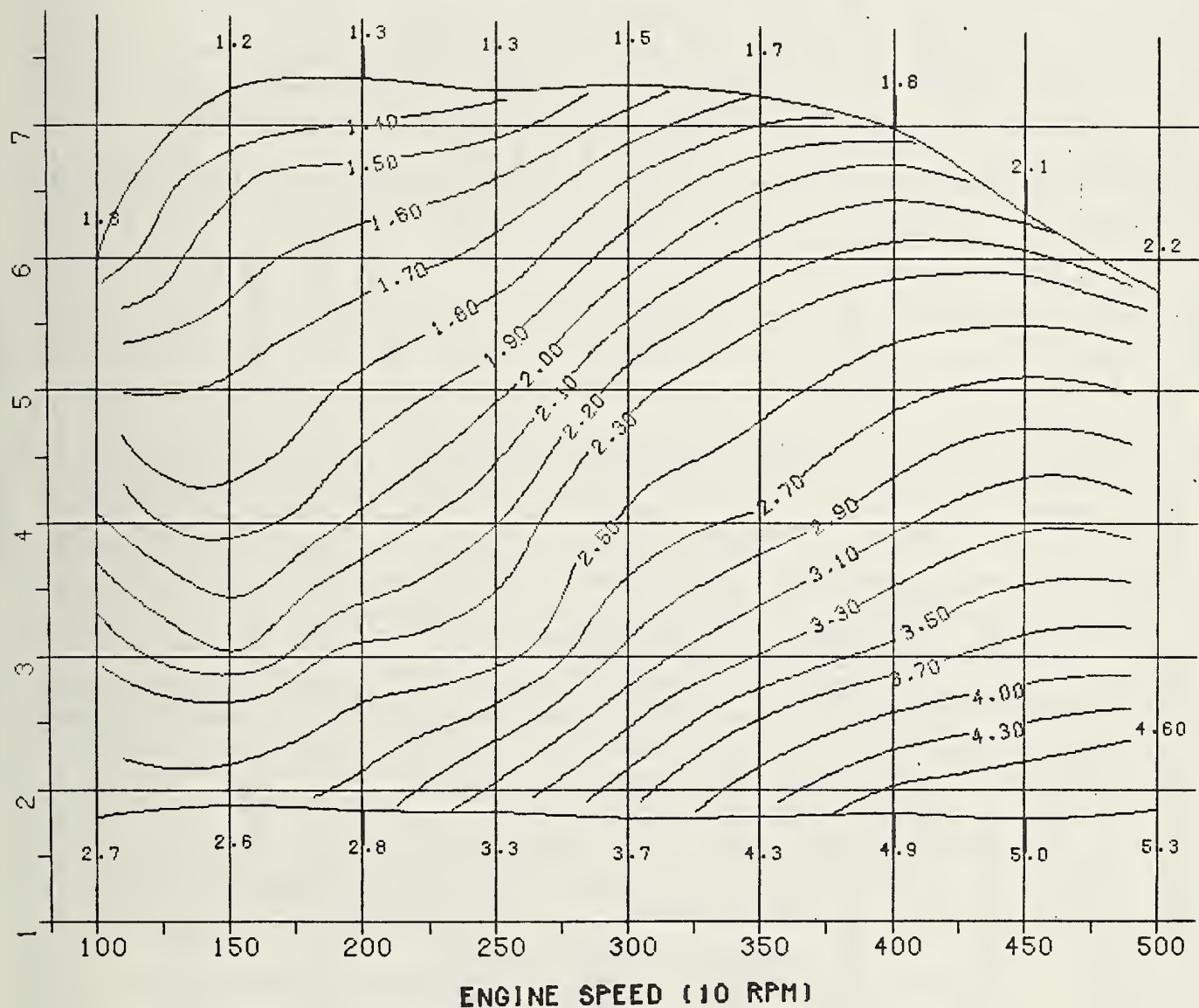




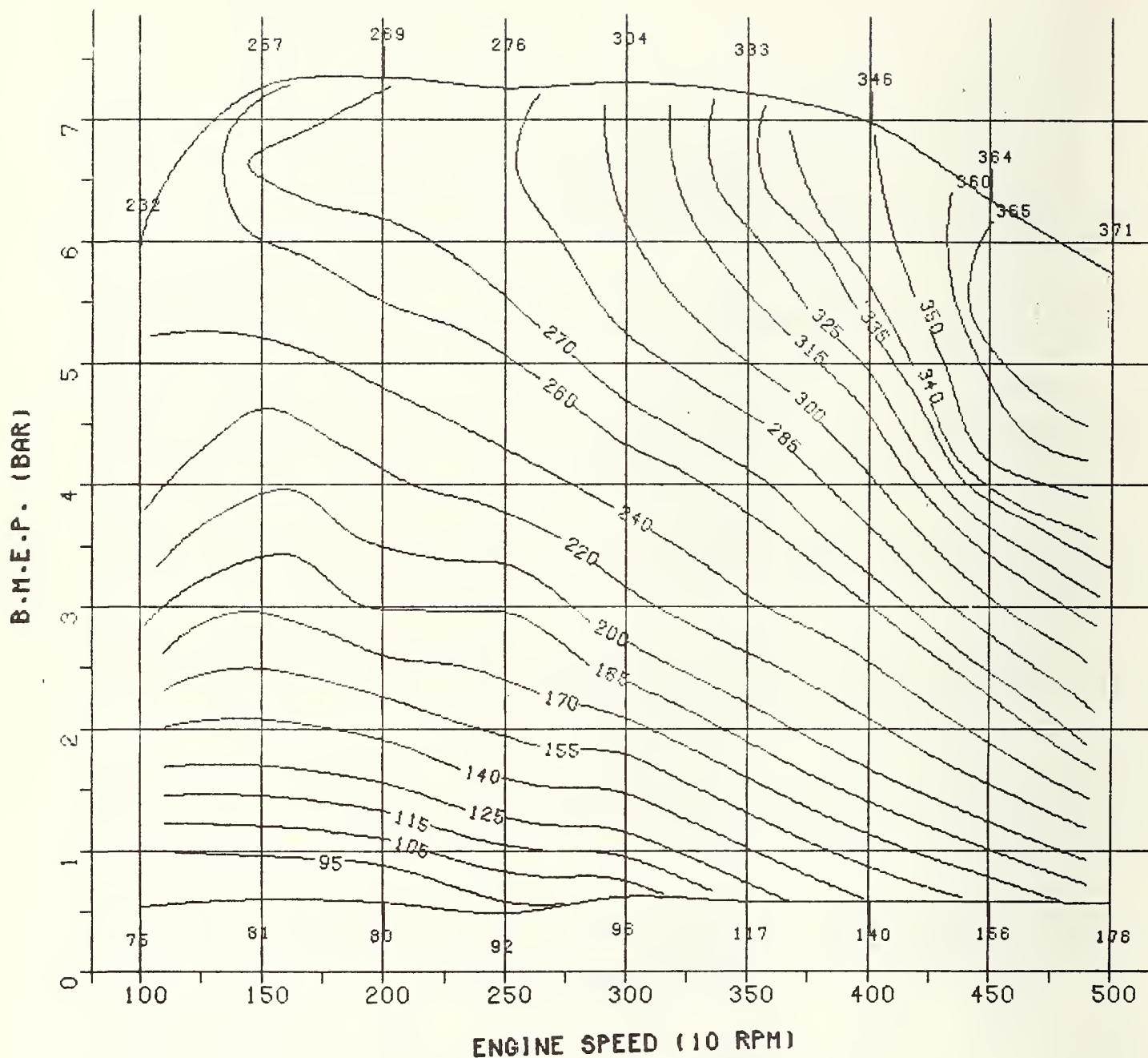


CO CONCENTRATION (%)  
50 HP DIESEL, FUEL 15275

B.M.E.P. (BAR)

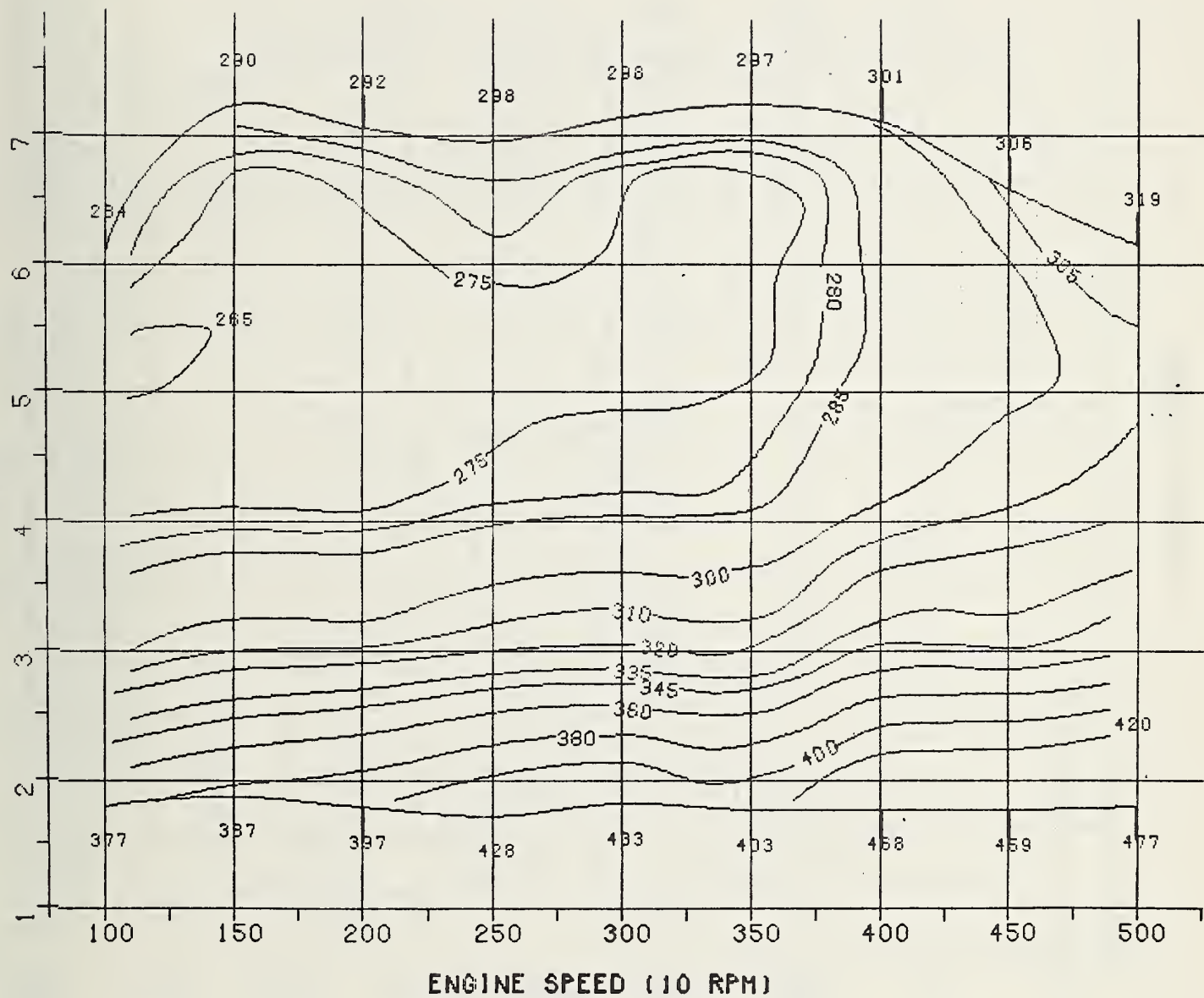


NO EMISSION (G/KWH)  
50 HP DIESEL, FUEL 15275

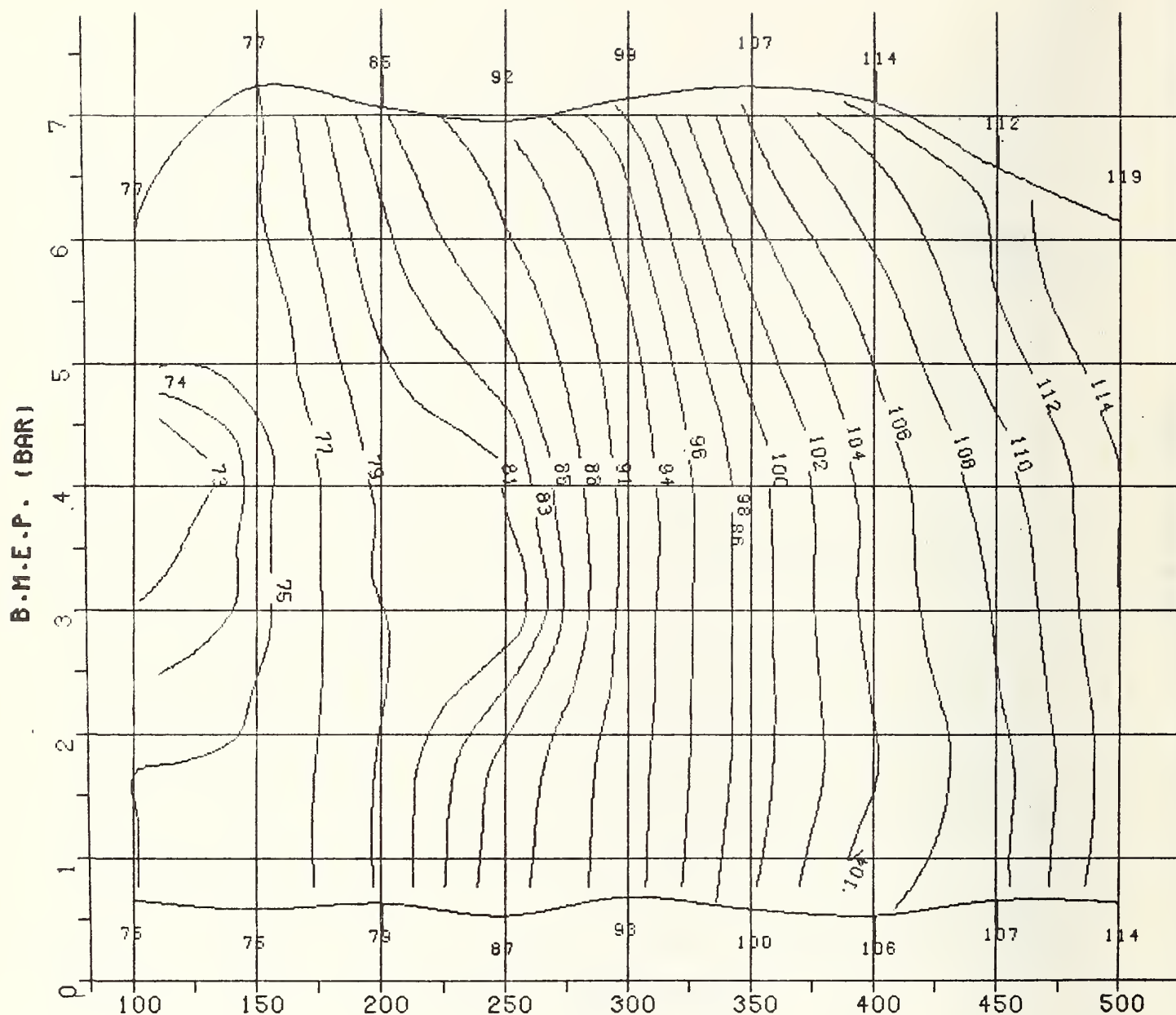


NO CONCENTRATION (PPM)  
50 HP DIESEL, FUEL 15275

B.M.E.P. (BAR)



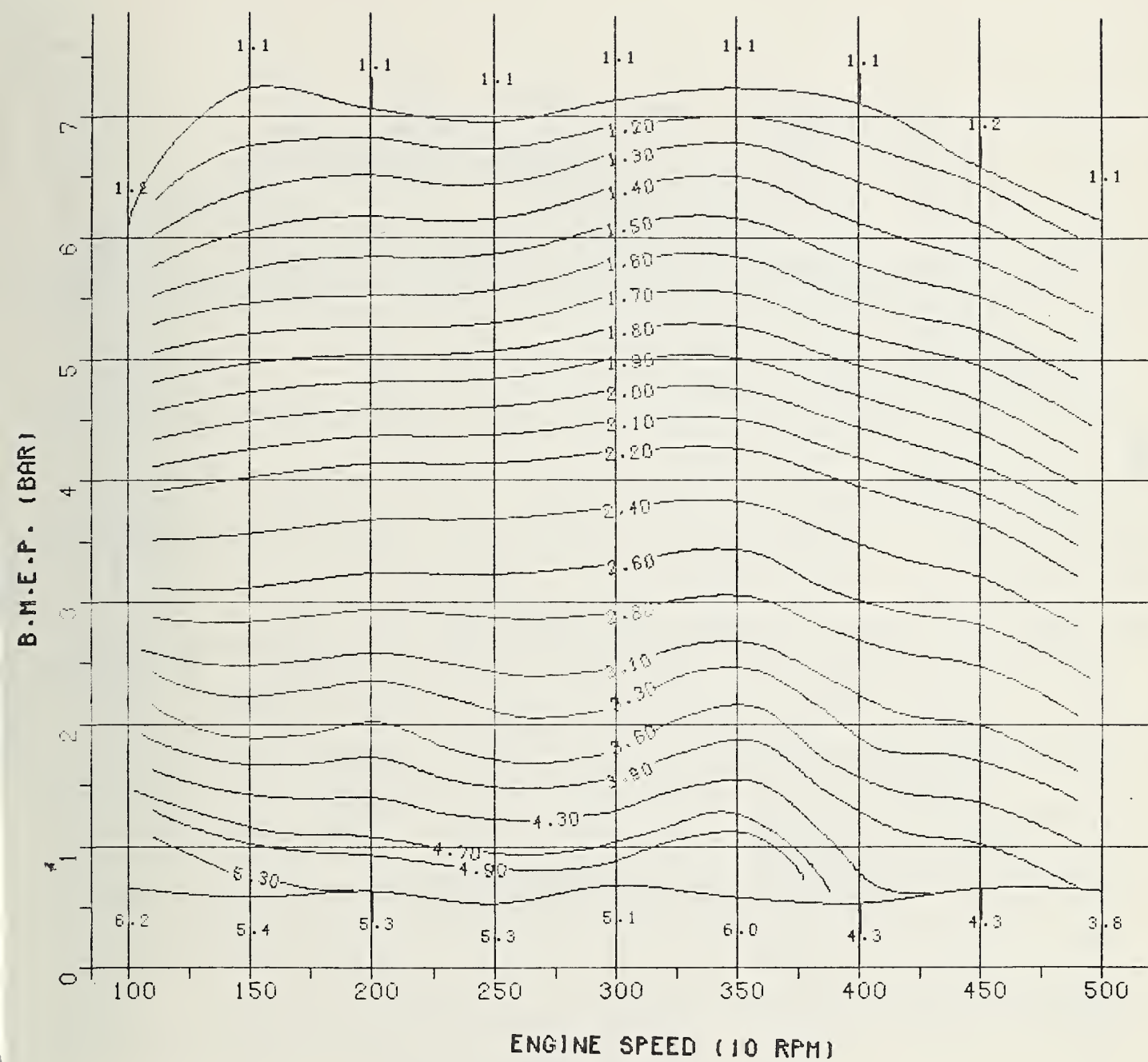
SPECIFIC FUEL CONSUMPTION (G/KWH)  
50 HP DIESEL, FUEL 16086

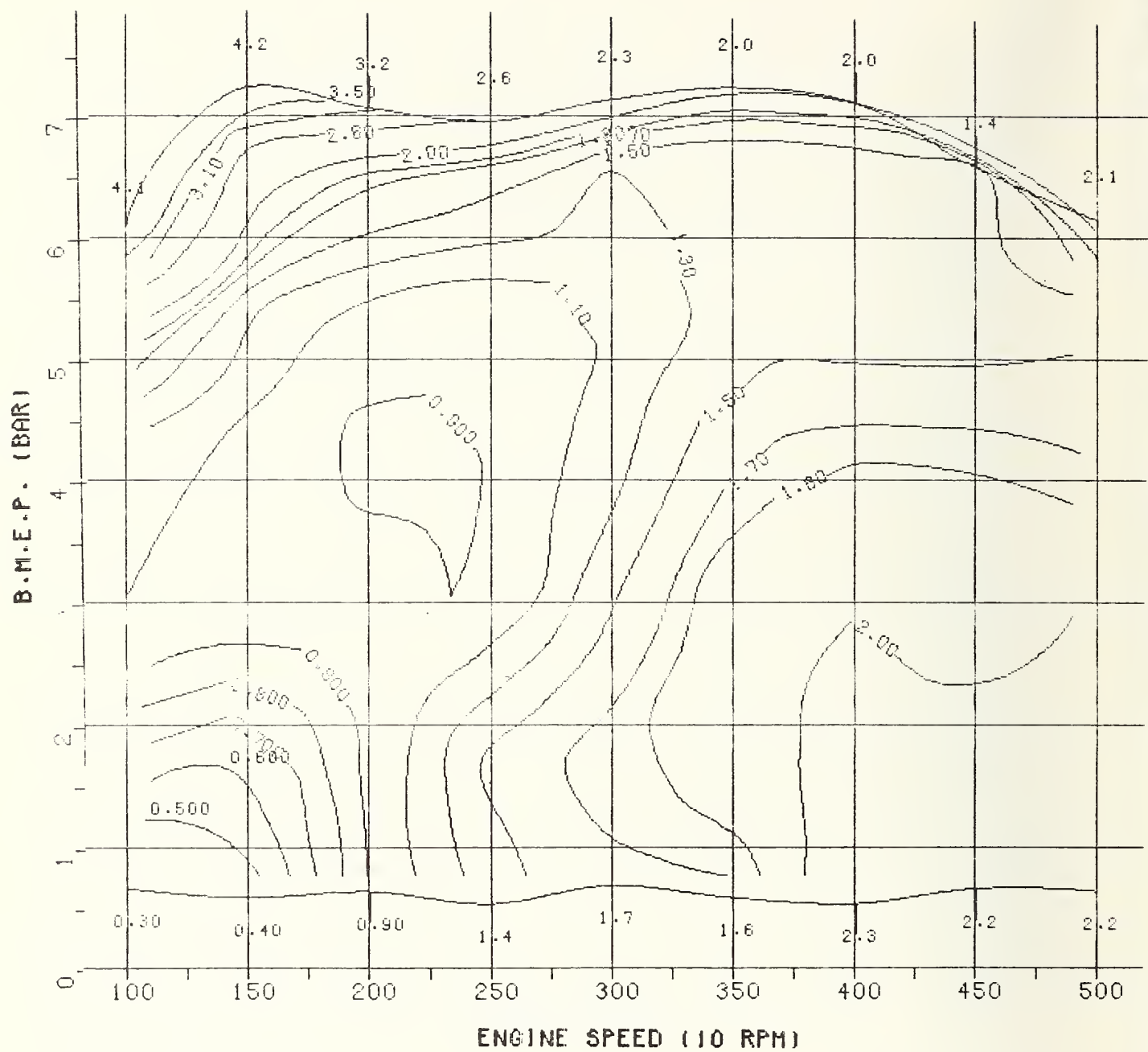


ENGINE SPEED (10 RPM)

OIL TEMPERATURE (CELSIUS)

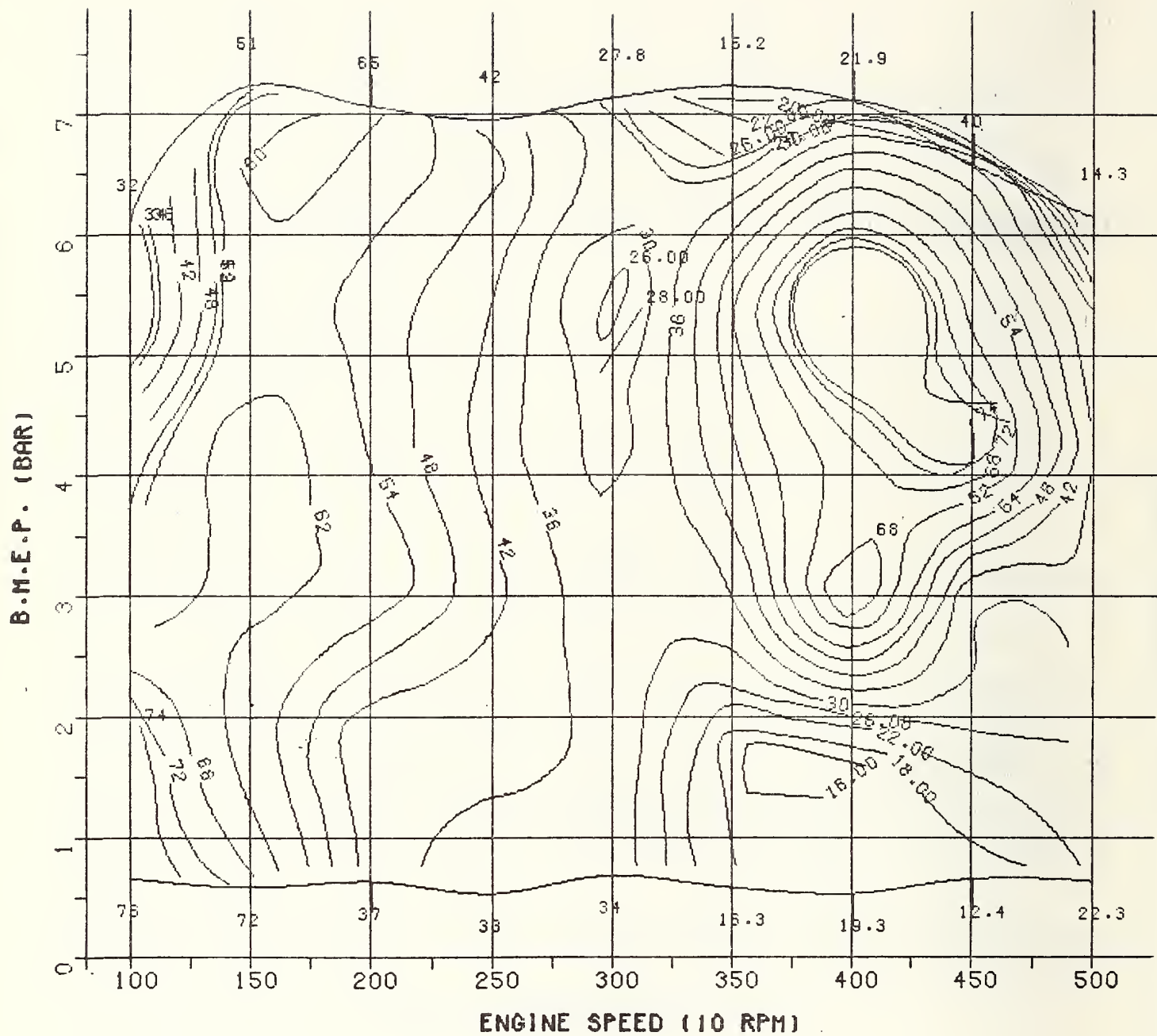
50 HP DIESEL, FUEL 16086





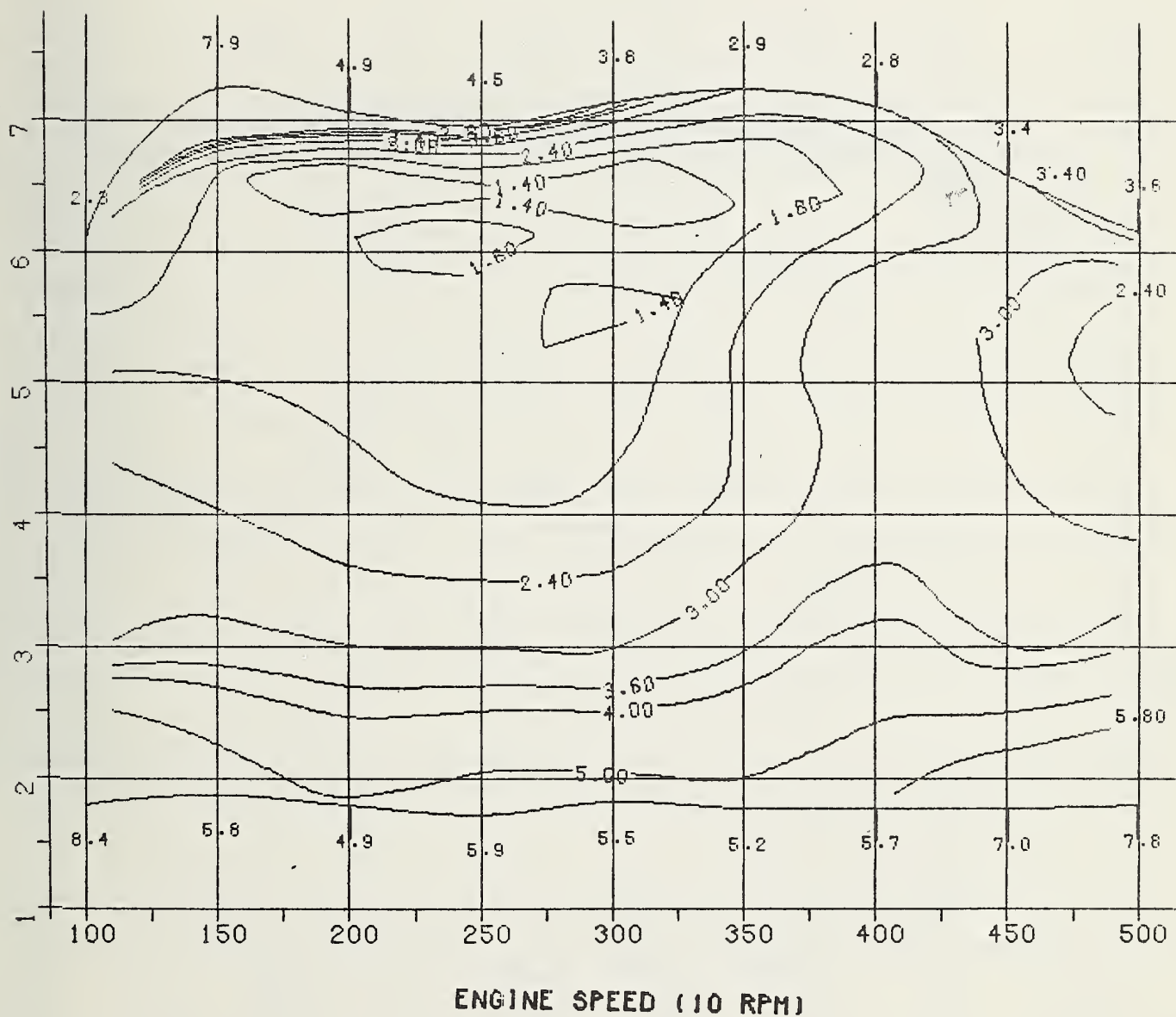
SMOKE (BOSCH NUMBER)  
50 HP DIESEL, FUEL 16086



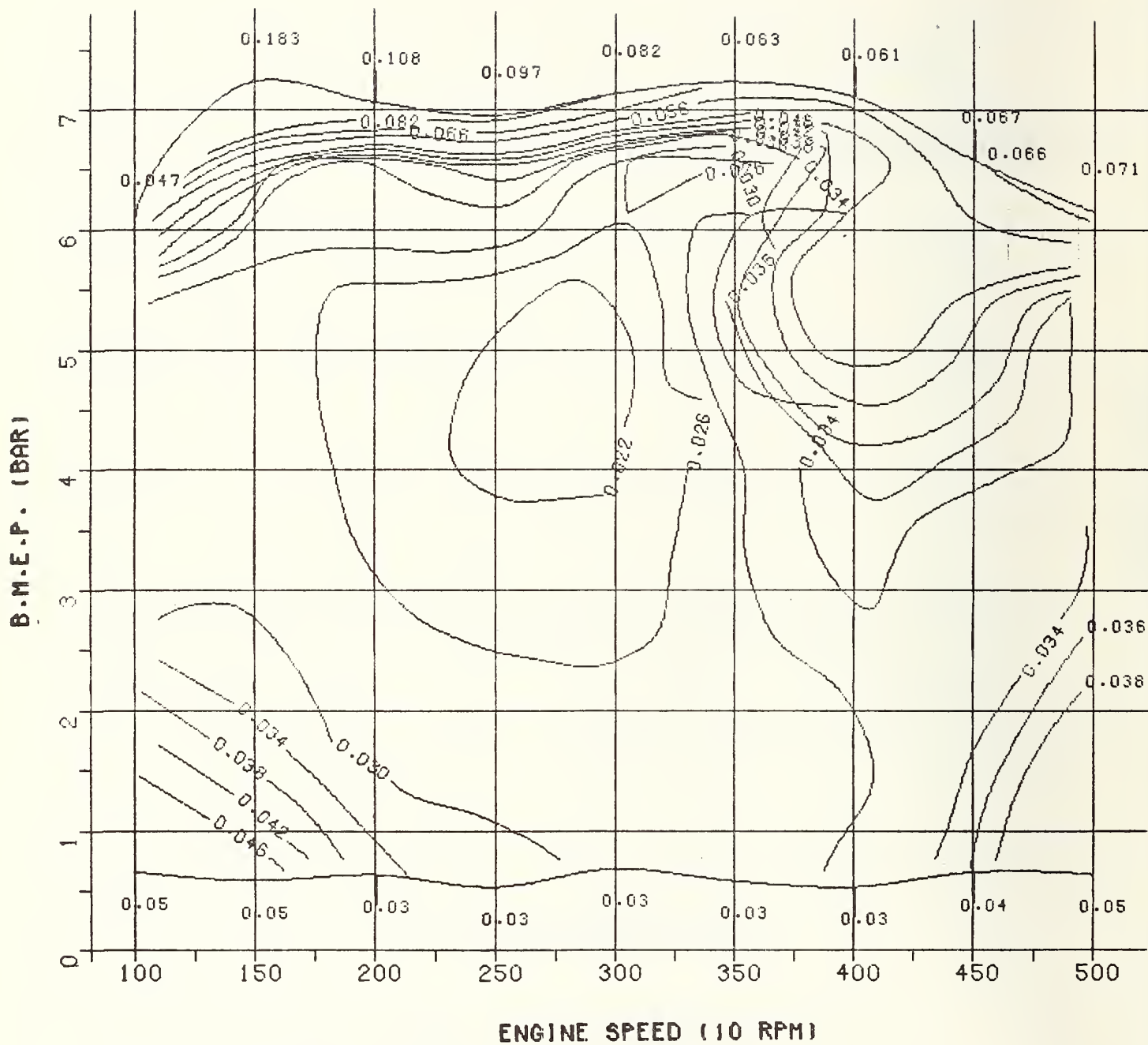


HC CONCENTRATION (PPM)  
50 HP DIESEL, FUEL 16086

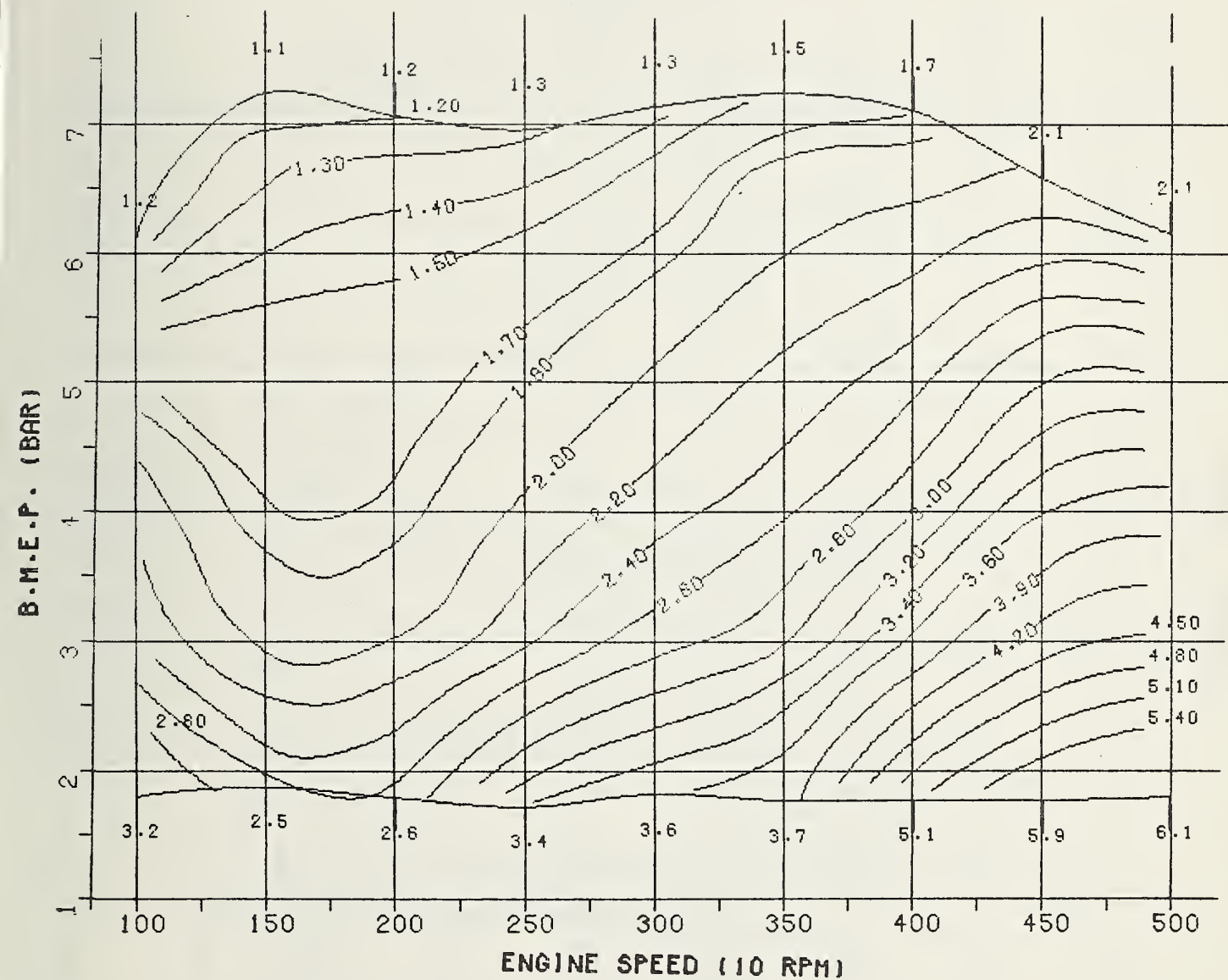
B.M.E.P. (BAR)



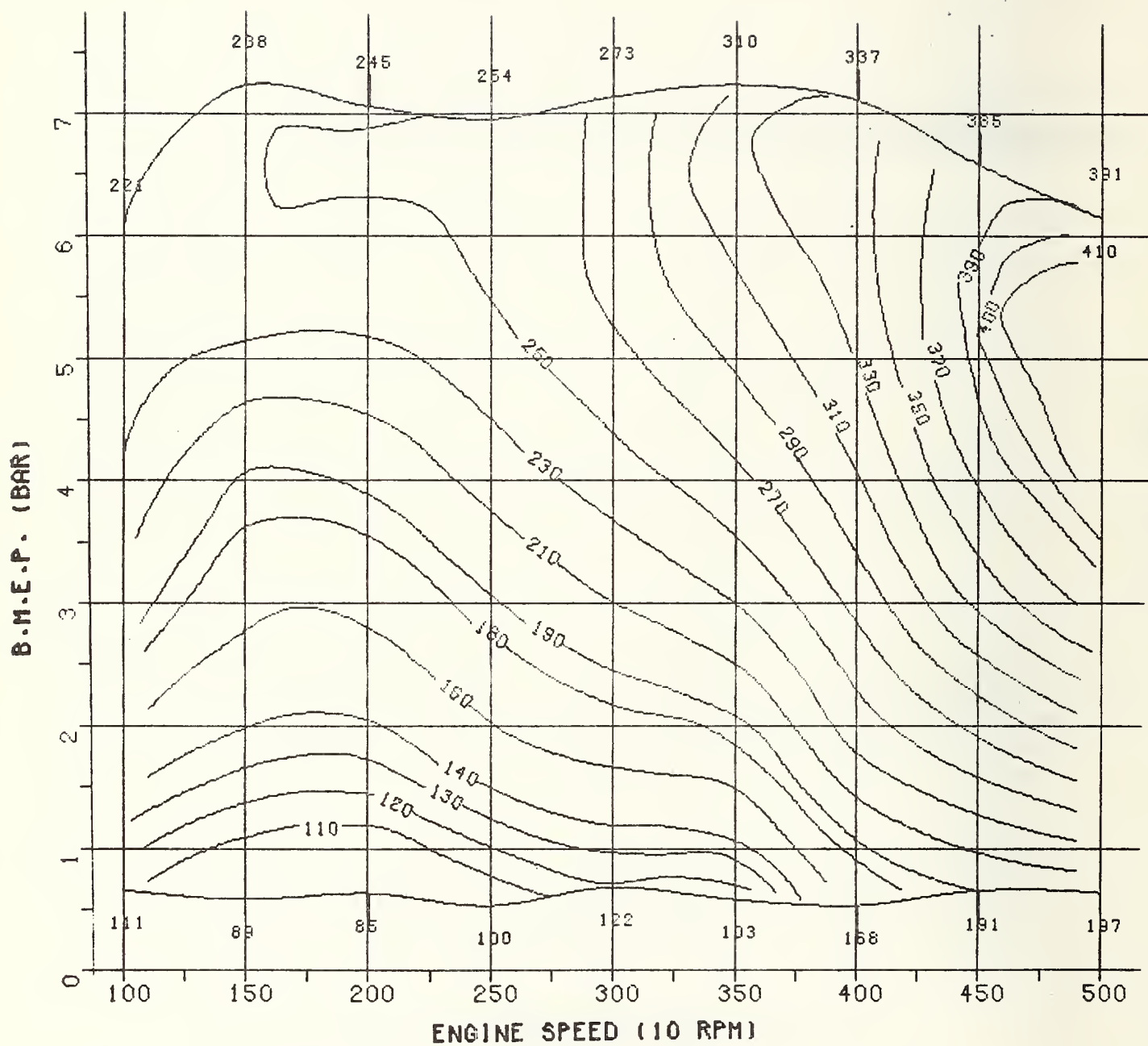
CO EMISSION (G/KWH)  
50 HP DIESEL, FUEL 16086



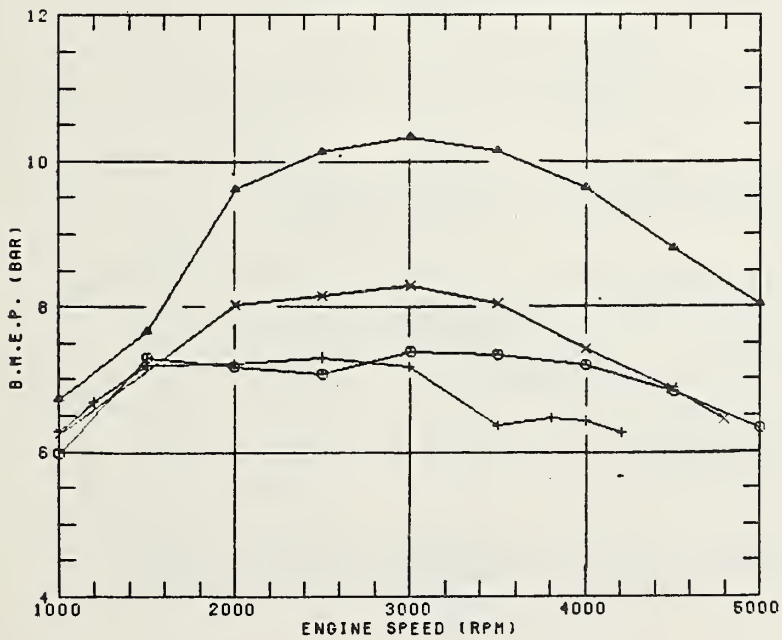
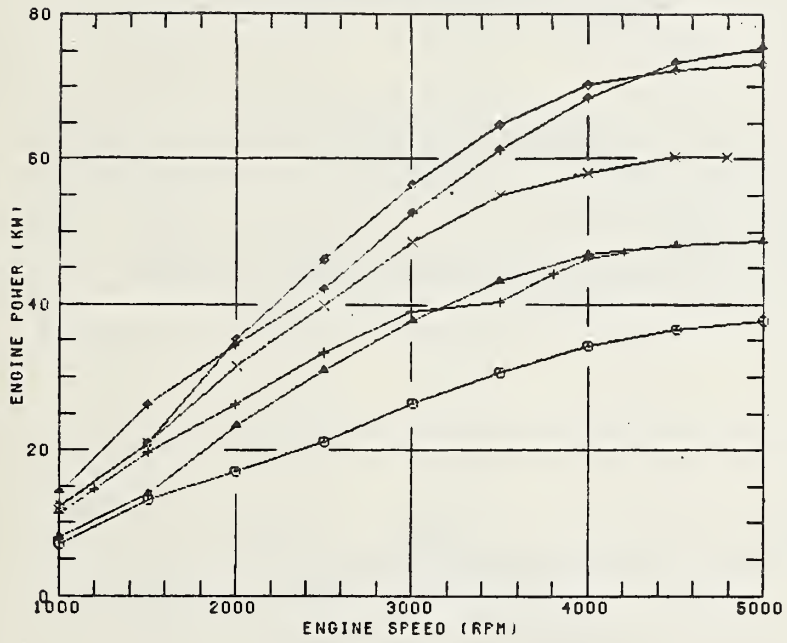
CO CONCENTRATION (%)  
50 HP DIESEL, FUEL 16086



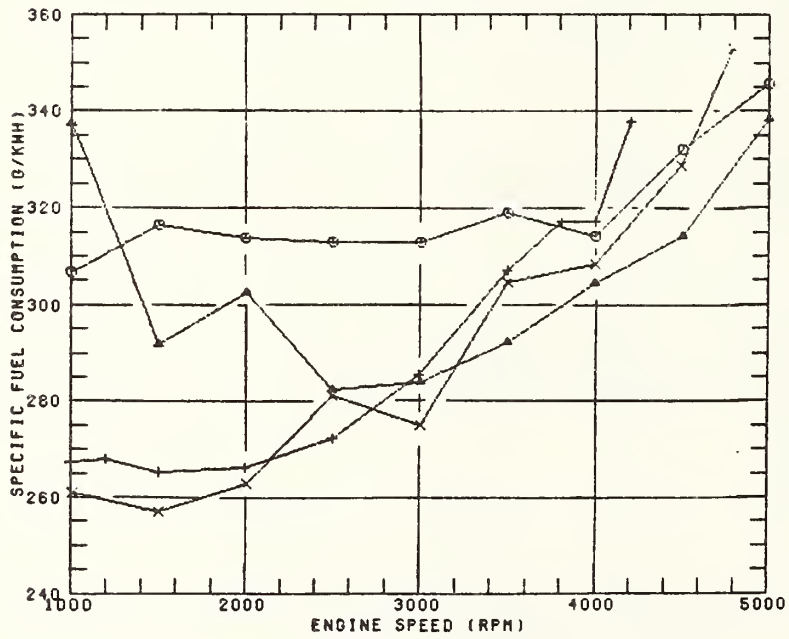
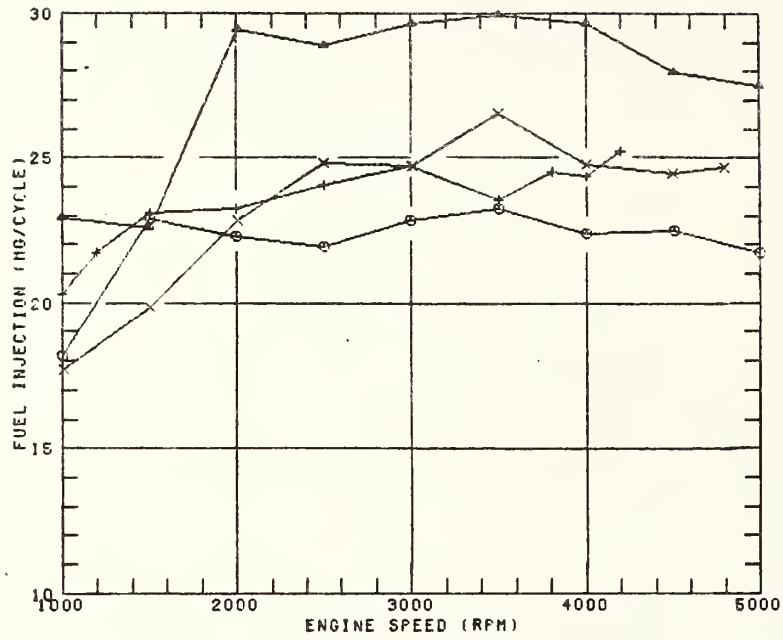
NO EMISSION (G/KWH)  
50 HP DIESEL, FUEL 16086

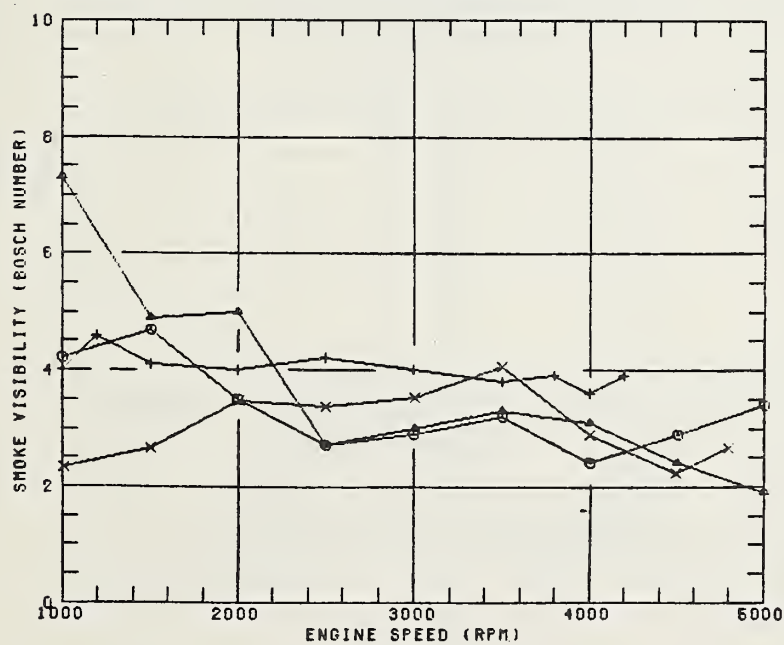
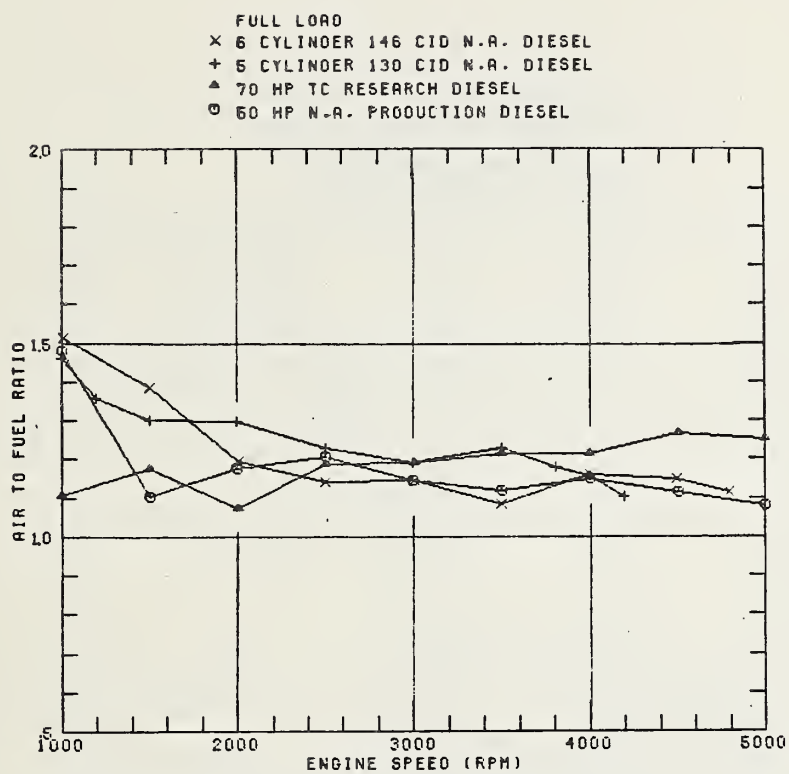


FULL LOAD  
 + PROJECTED 8 CYLINDER N.A. DIESEL  
 ◊ PROJECTED 6 CYLINDER TC DIESEL  
 × 6 CYLINDER 146 CID N.A. DIESEL  
 + 6 CYLINDER 130 CID N.A. DIESEL  
 ▲ 70 HP TC RESEARCH DIESEL  
 ○ 50 HP N.A. PRODUCTION DIESEL

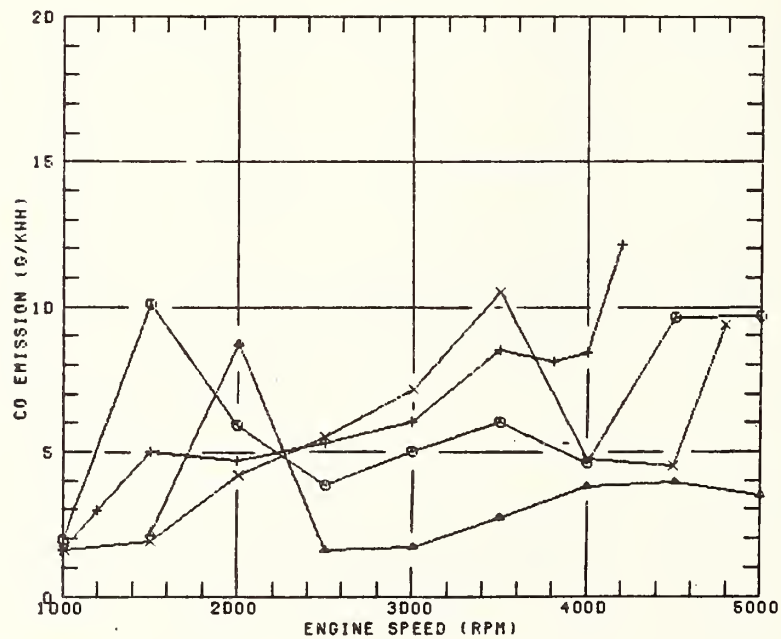
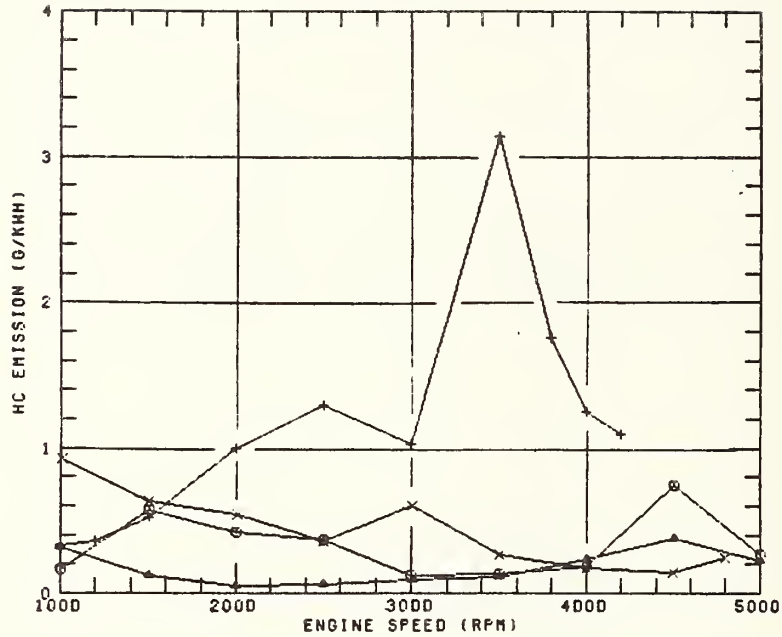


FULL LOAD  
 X 6 CYLINDER 146 CID N.A. DIESEL  
 + 5 CYLINDER 130 CID N.A. DIESEL  
 ▲ 70 HP TC RESEARCH DIESEL  
 ○ 50 HP N.A. PRODUCTION DIESEL



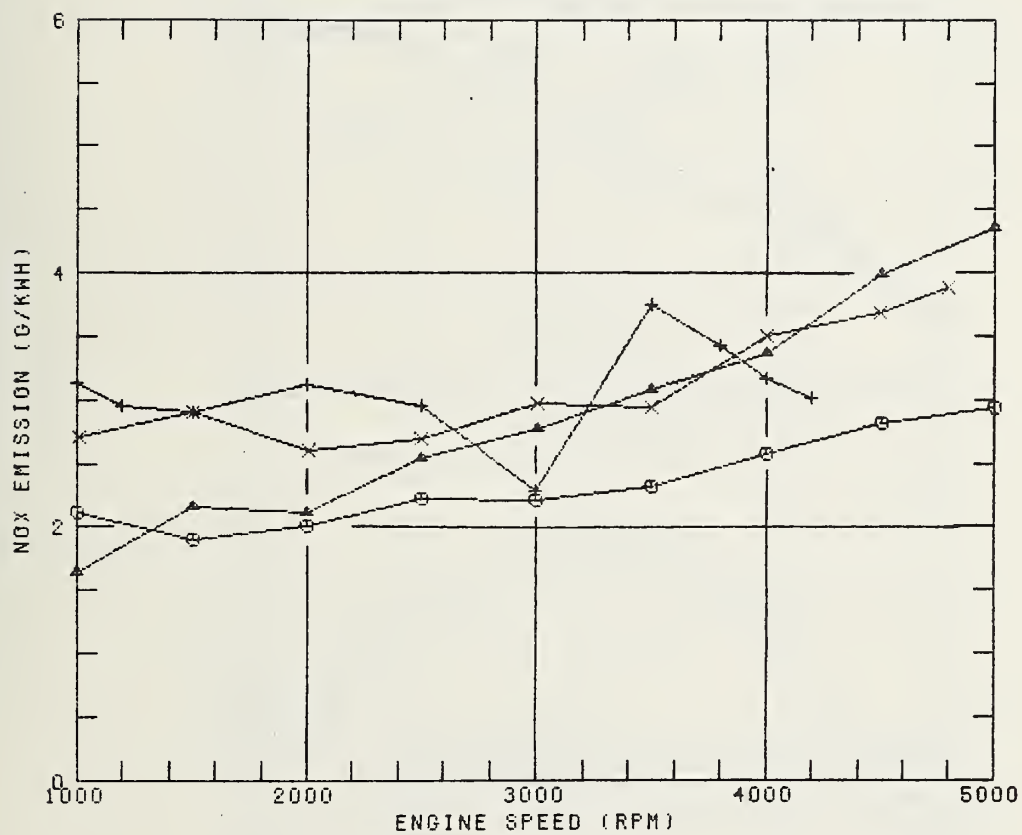


FULL LOAD  
 X 6 CYLINDER 146 CID N.A. DIESEL  
 + 5 CYLINDER 130 CID N.A. DIESEL  
 ▲ 70 HP TC RESEARCH DIESEL  
 ● 60 HP N.A. PRODUCTION DIESEL

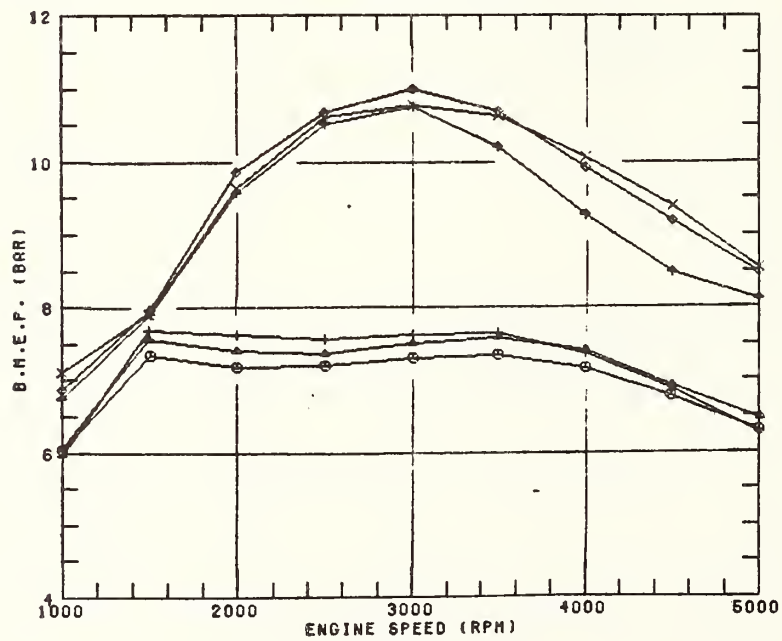
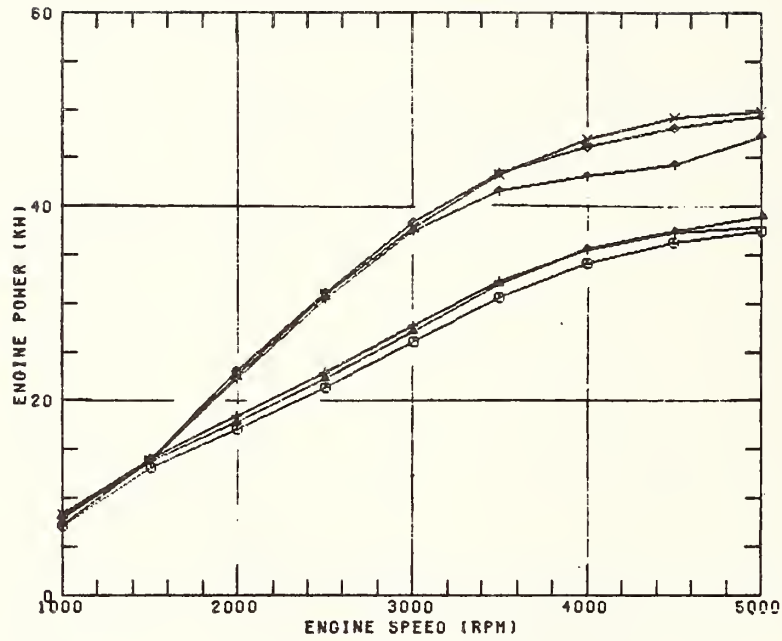


FULL LOAD

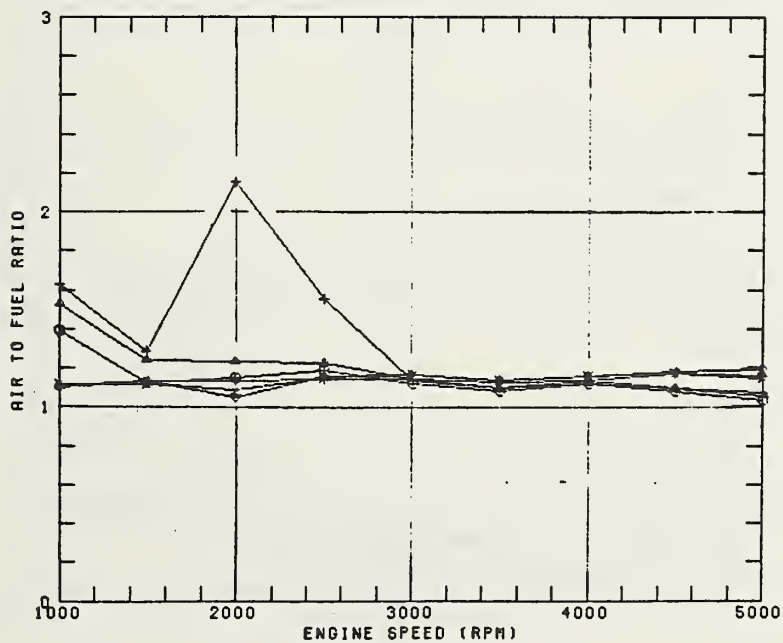
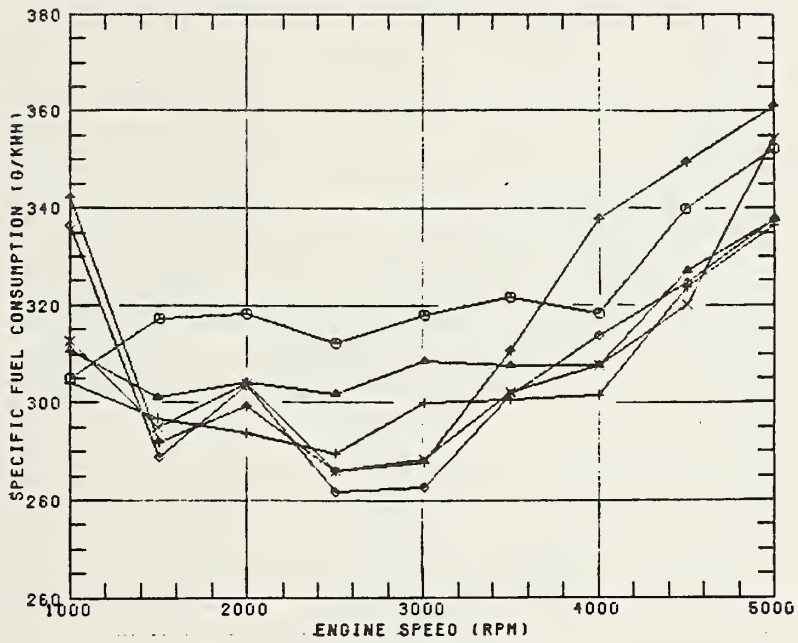
- × 6 CYLINDER 146 CID N.A. DIESEL
- + 5 CYLINDER 130 CID N.A. DIESEL
- ▲ 70 HP TC RESEARCH DIESEL
- ⊙ 50 HP N.A. PRODUCTION DIESEL



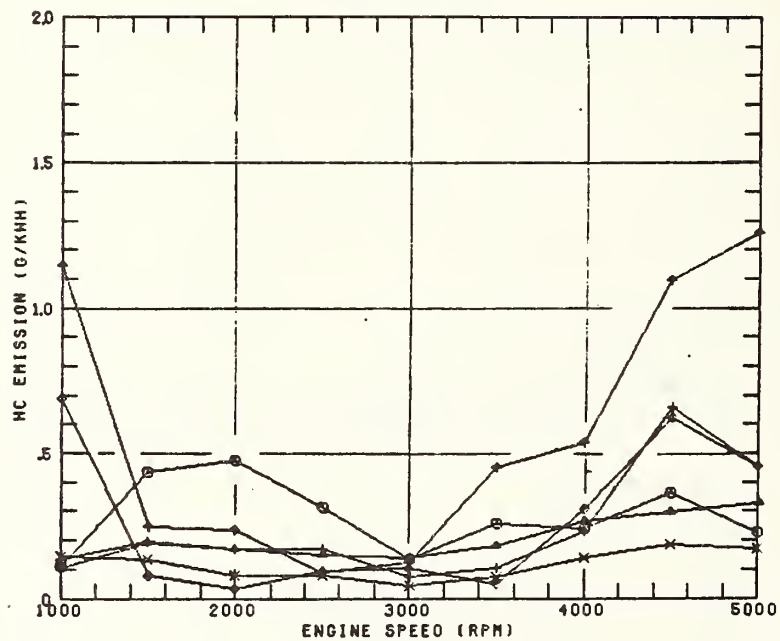
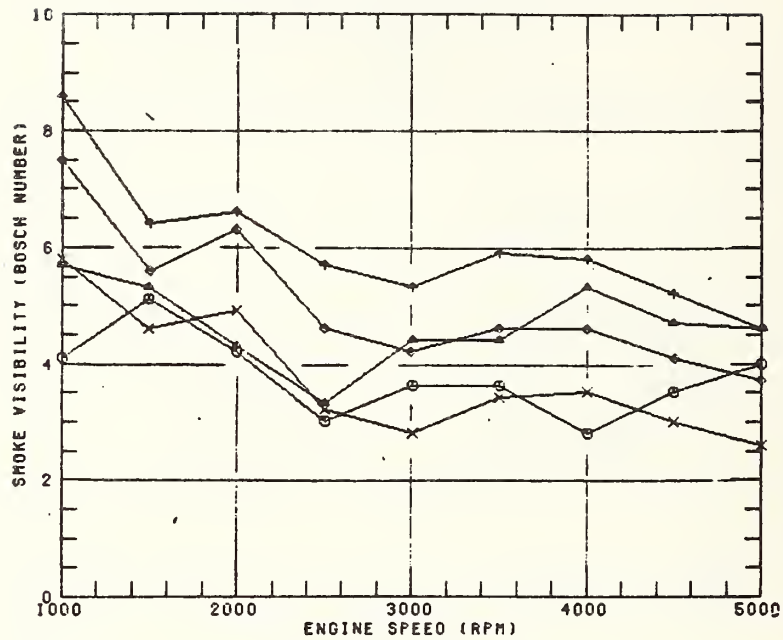
FULL LOAD INJECTION TIMING  
 150 HP N.A. DIESEL 70 HP TC DIESEL  
 + 2 DEG. BEFORE TDC + 2 DEG. BEFORE TDC  
 ▲ 0 DEGREE ◆ 0 DEGREE  
 ○ 3 DEG. AFTER TDC × 3 DEG. AFTER TDC



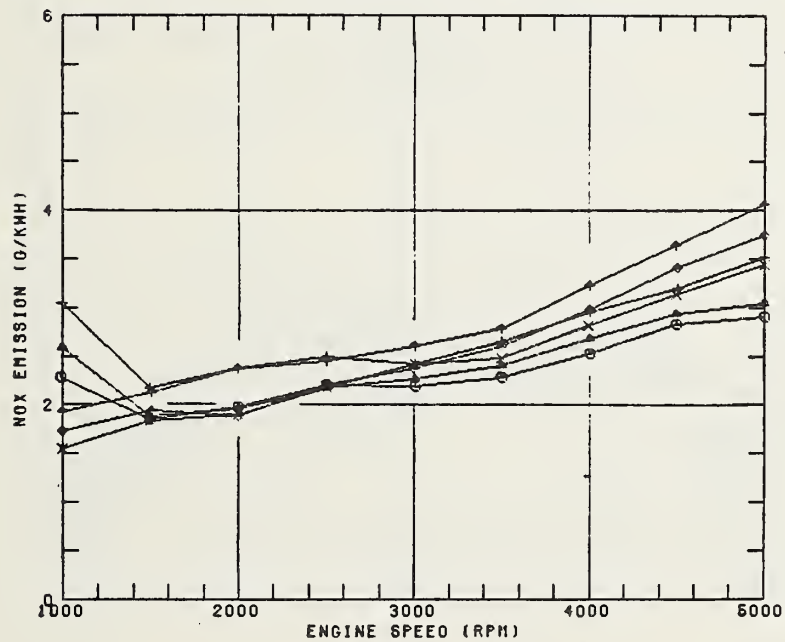
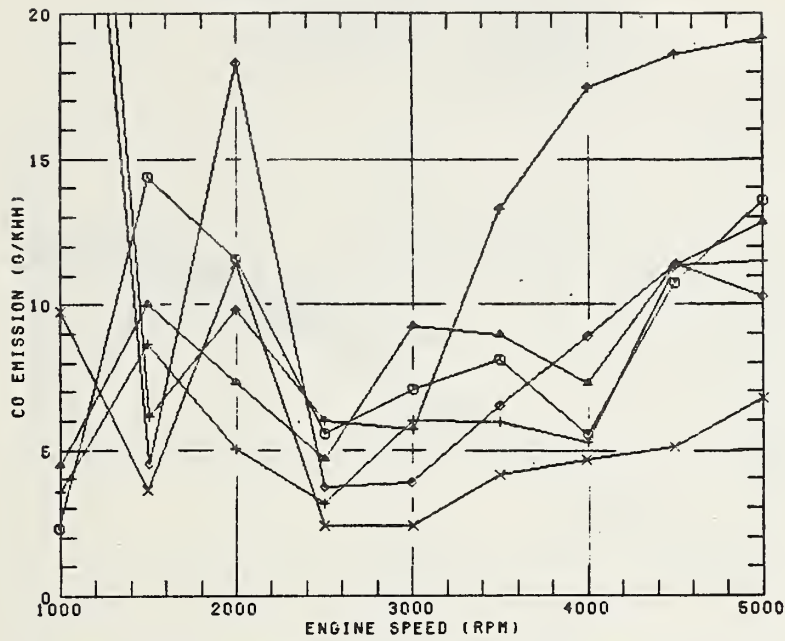
FULL LOAD INJECTION TIMING  
 150 HP N.A. DIESEL 70 HP TC DIESEL  
 + 2 DEG. BEFORE TDC + 2 DEG. BEFORE TDC  
 △ 0 DEGREE ◆ 0 DEGREE  
 ○ 3 DEG. AFTER TDC × 3 DEG. AFTER TDC



FULL LOAD INJECTION TIMING  
 50 HP N.A. DIESEL 70 HP TC DIESEL  
 + 2 DEG. BEFORE TDC + 2 DEG. BEFORE TDC  
 ▲ 0 DEGREE ● 0 DEGREE  
 ○ 3 DEG. AFTER TDC × 3 DEG. AFTER TDC

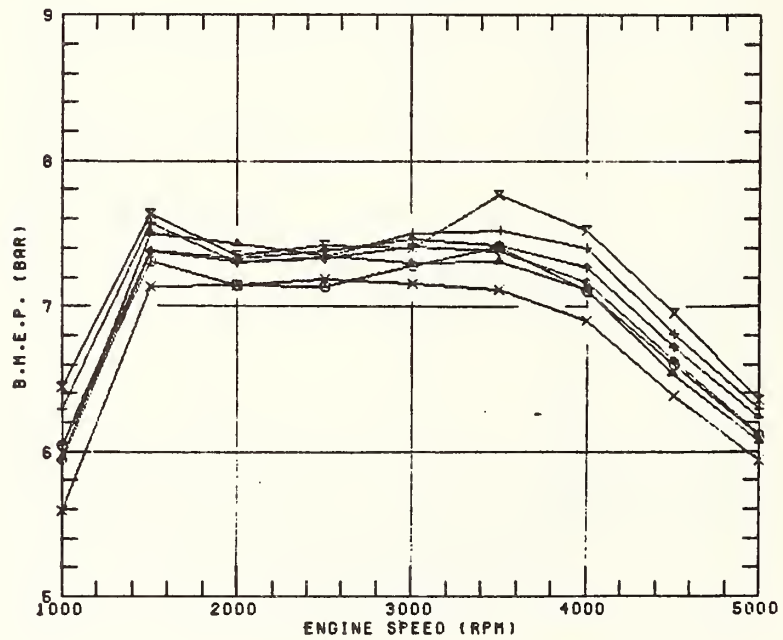
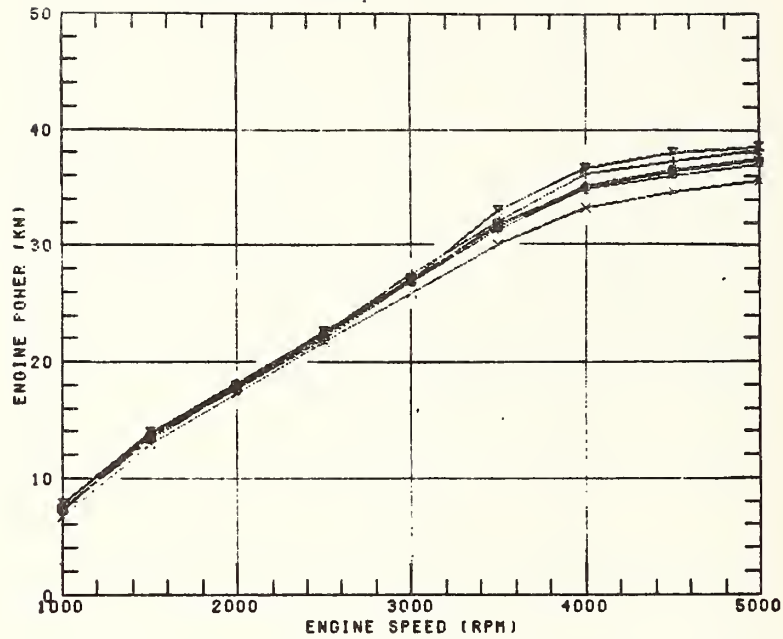


FULL LOAD INJECTION TIMING  
 50 HP N.A. DIESEL 70 HP TC DIESEL  
 + 2 DEG. BEFORE TDC + 2 DEG. BEFORE TDC  
 ▲ 0 DEGREE ◊ 0 DEGREE  
 ○ 3 DEG. AFTER TDC × 3 DEG. AFTER TDC



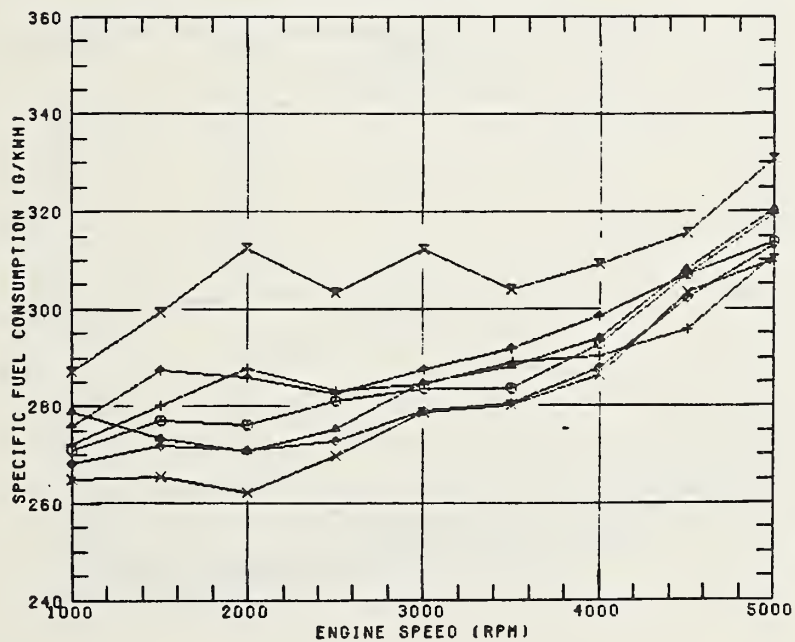
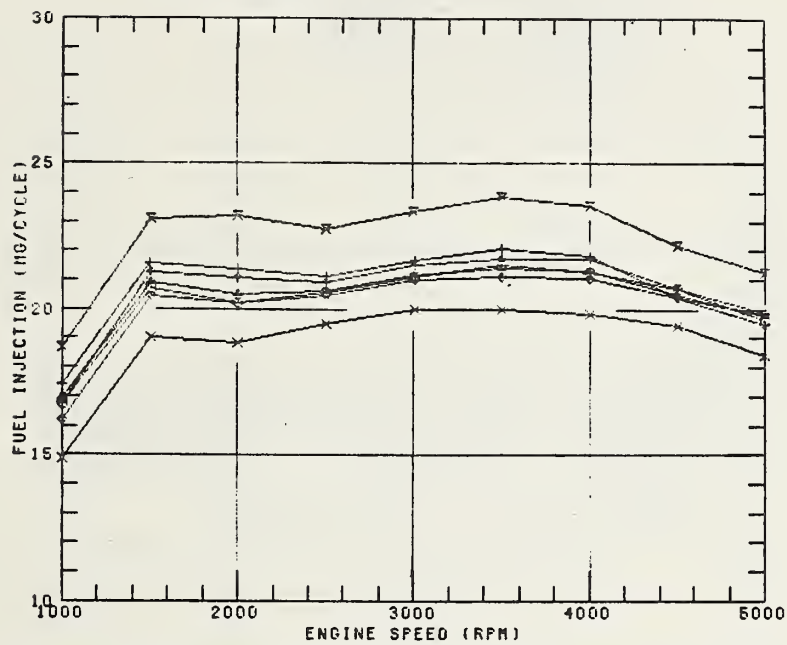
FULL LOAD: FUEL NUMBER/FUEL DENSITY

○ 323/0.841      ◇ 16140/0.834  
 ▲ 16275/0.840    ♣ 16160/0.843  
 + 16066/0.825    ✕ 16164/0.869  
 X 16120/0.817



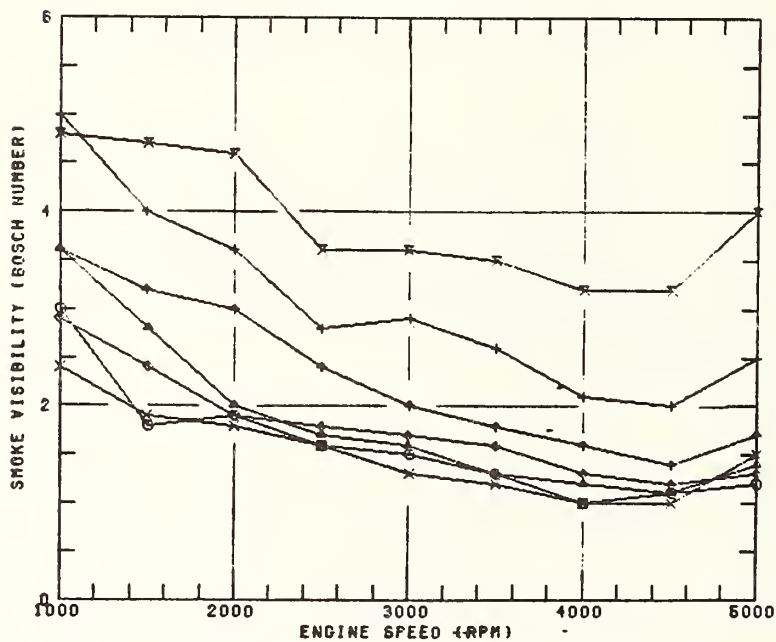
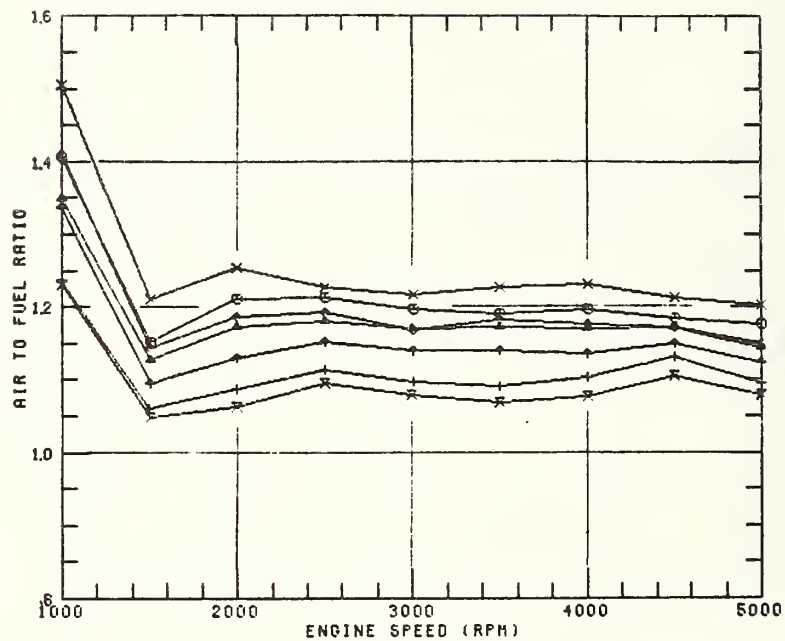
FULL LOAD: FUEL NUMBER/FUEL DENSITY

|               |               |
|---------------|---------------|
| ○ 323/0.841   | ◇ 16140/0.834 |
| △ 15275/0.840 | ◆ 16160/0.843 |
| + 16086/0.825 | × 16164/0.869 |
| × 16120/0.817 |               |



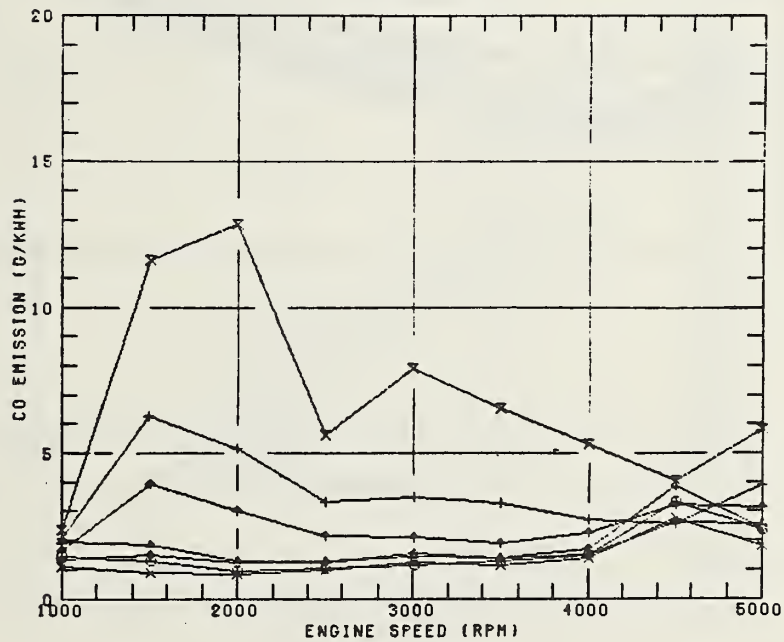
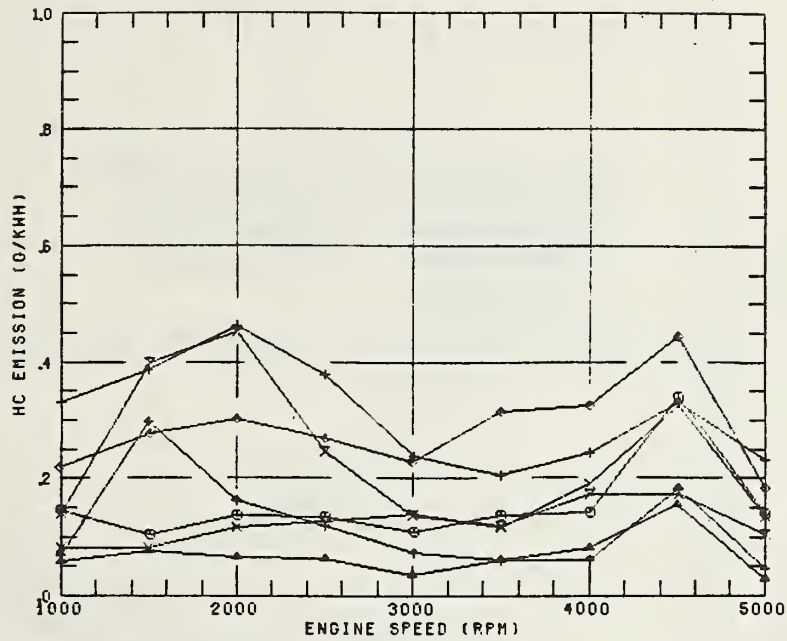
FULL LOAD: FUEL NUMBER/FUEL DENSITY

|               |               |
|---------------|---------------|
| ○ 323/0.841   | ◇ 16140/0.834 |
| △ 16275/0.840 | ◆ 16160/0.843 |
| + 16086/0.825 | ✕ 16164/0.869 |
| × 16120/0.817 |               |



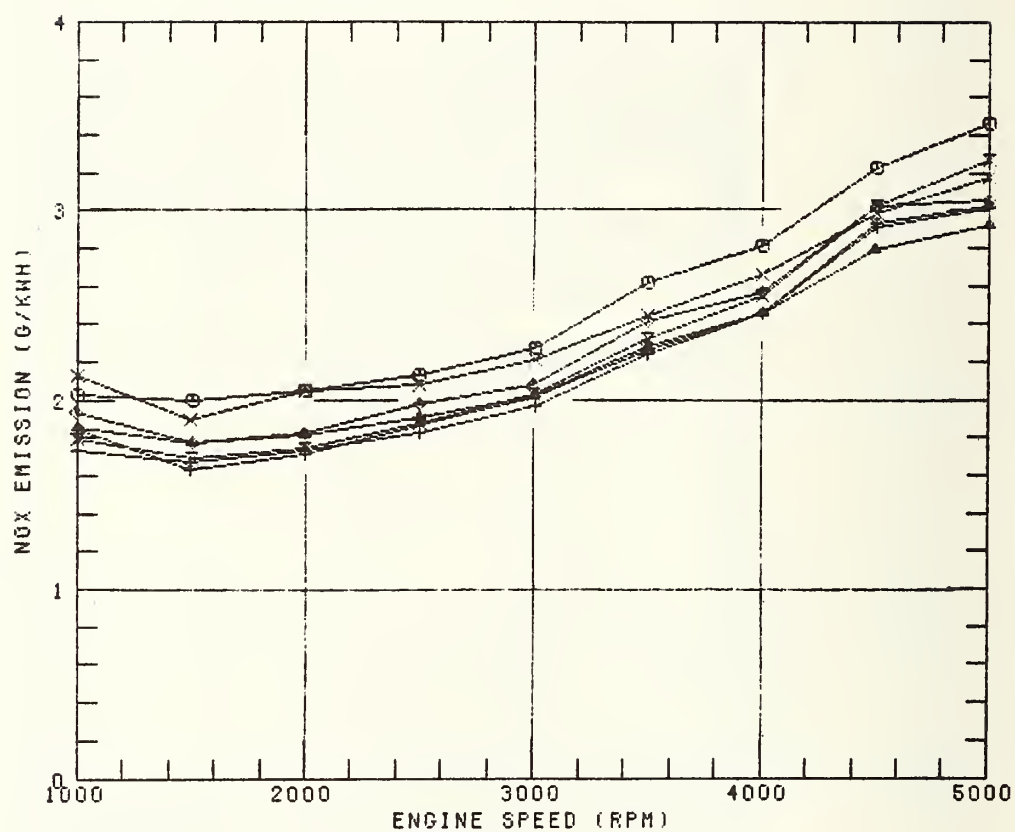
FULL LOAD: FUEL NUMBER/FUEL DENSITY

|               |               |
|---------------|---------------|
| ○ 323/0.841   | ◇ 16140/0.834 |
| △ 15275/0.840 | ◆ 16160/0.843 |
| + 16086/0.825 | × 16164/0.869 |
| × 16120/0.817 |               |



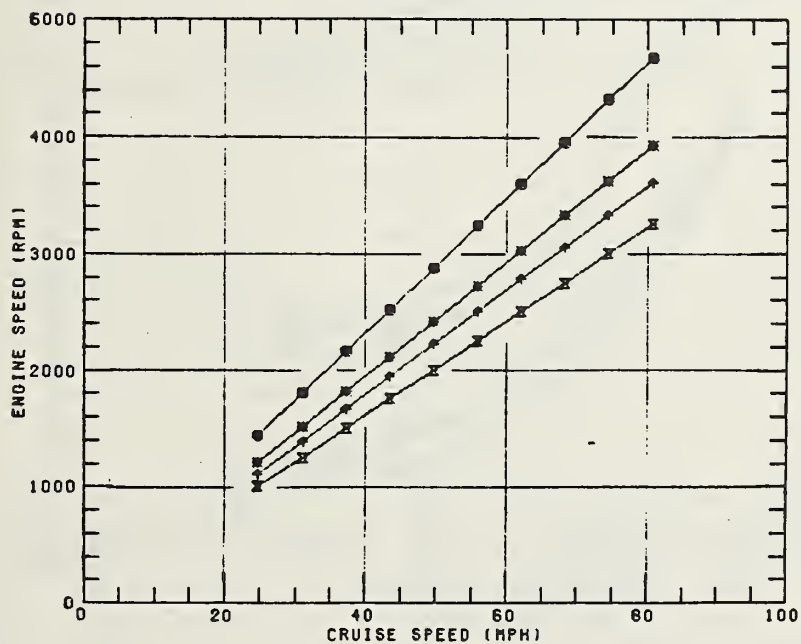
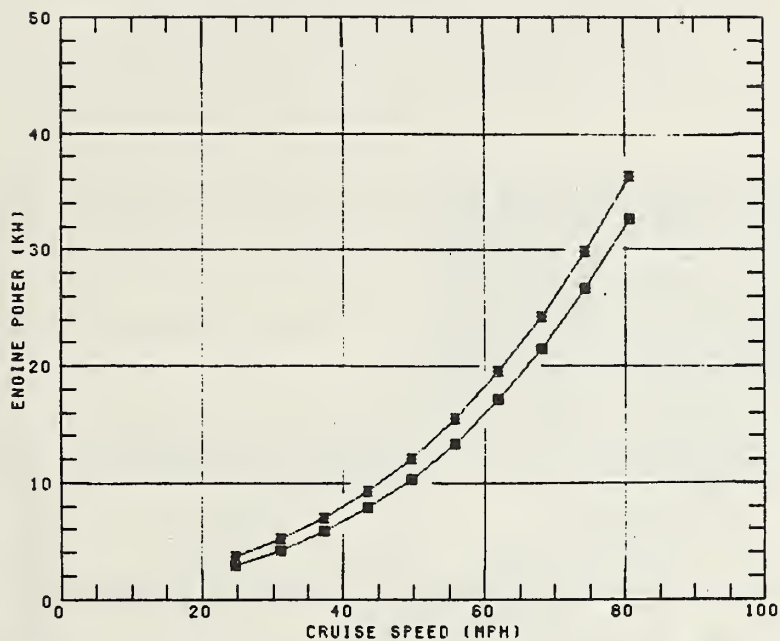
FULL LOAD: FUEL NUMBER/FUEL DENSITY

|               |               |
|---------------|---------------|
| ○ 323/0.841   | ◇ 16140/0.834 |
| △ 15275/0.840 | ♣ 16160/0.843 |
| + 16086/0.626 | × 16164/0.869 |
| × 16120/0.817 |               |

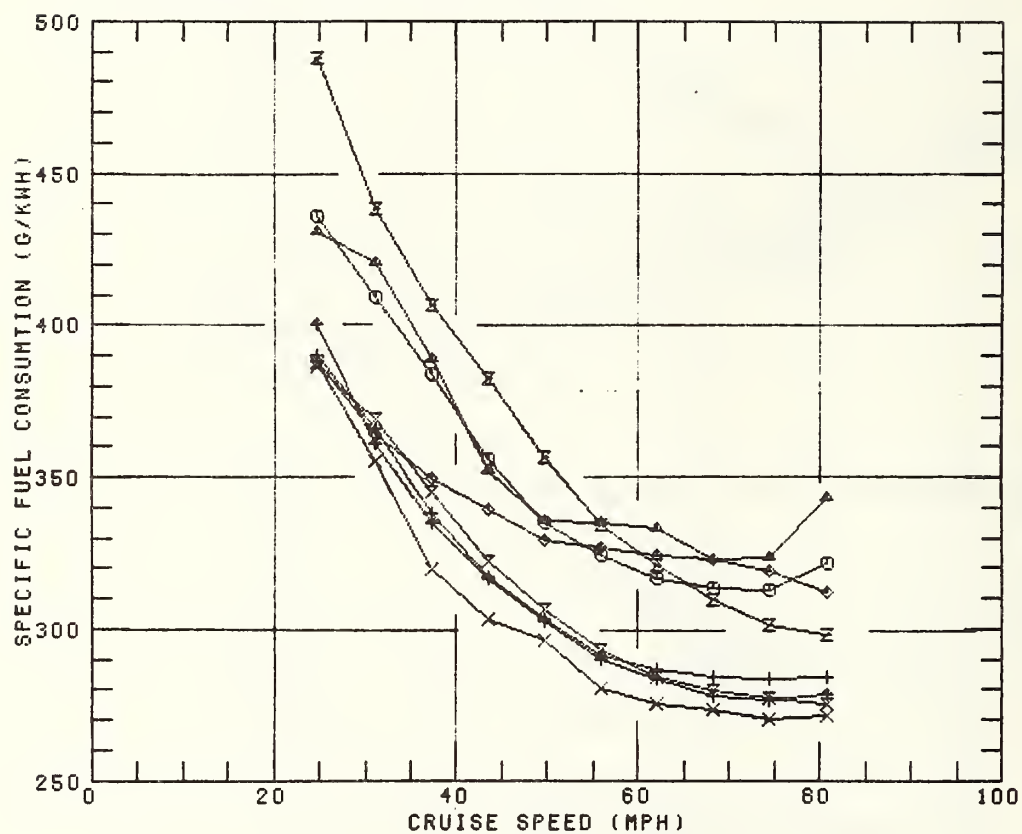


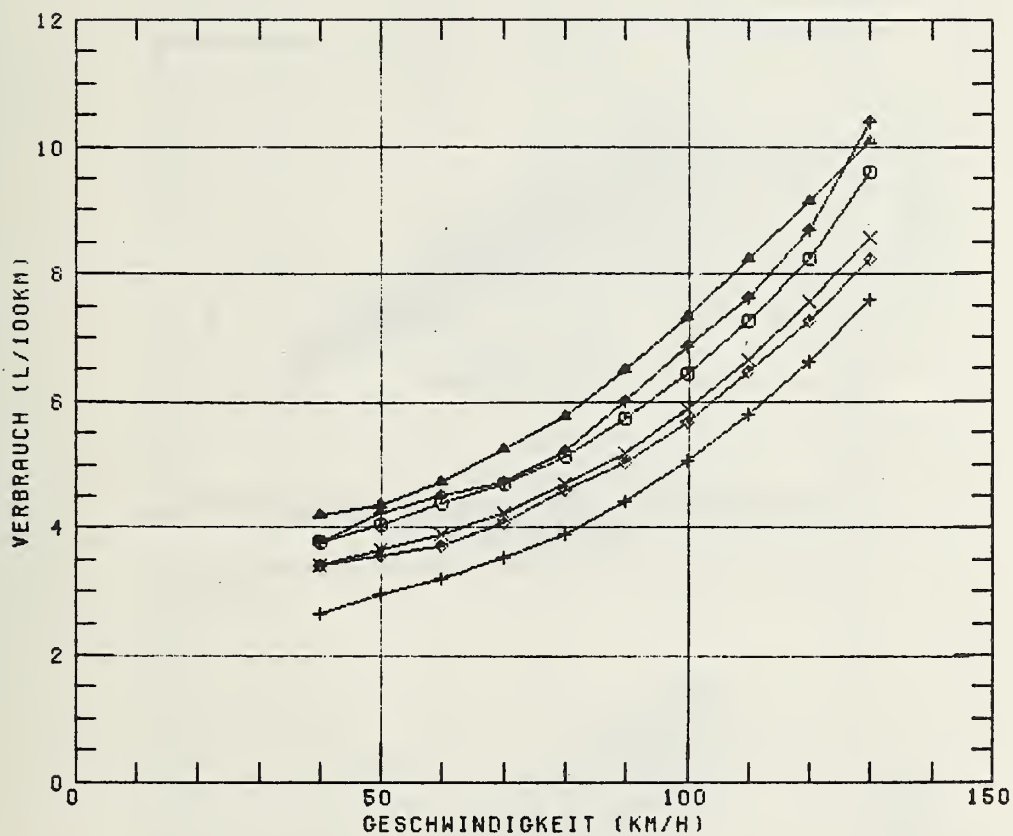
ROAD LOAD CURVES

| 2250 LB VEHICLE     | 3000 LB VEHICLE           |
|---------------------|---------------------------|
| × 70 HP TC E.G.R    | ⌘ 8 CYLINDER 180 CID N.A. |
| + 70 HP TC DIESEL   | × 6 CYLINDER 146 CID TC   |
| ▲ 50 HP N.A. E.G.R. | ◆ 6 CYLINDER 146 CID N.A. |
| ○ 60 HP N.A. DIESEL | ◇ 5 CYLINDER 130 CID N.A. |



|   |            |      |      |      |      |
|---|------------|------|------|------|------|
| Z | 77400SCHD1 | 1362 | 1.75 | 0.80 | 40.0 |
| X | 77400SCHL1 | 1362 | 1.75 | 0.80 | 40.0 |
| + | 31904DRSZ6 | 1362 | 1.75 | 0.80 | 36.0 |
| ◇ | 72000SCHF1 | 1362 | 1.75 | 0.80 | 33.1 |
| X | 77400SCHAB | 1020 | 1.75 | 0.77 | 33.1 |
| + | 77400SCHL1 | 1020 | 1.75 | 0.77 | 33.1 |
| △ | 77400SCHAA | 1020 | 1.75 | 0.77 | 27.8 |
| ○ | 77400SCHD1 | 1020 | 1.75 | 0.77 | 27.8 |

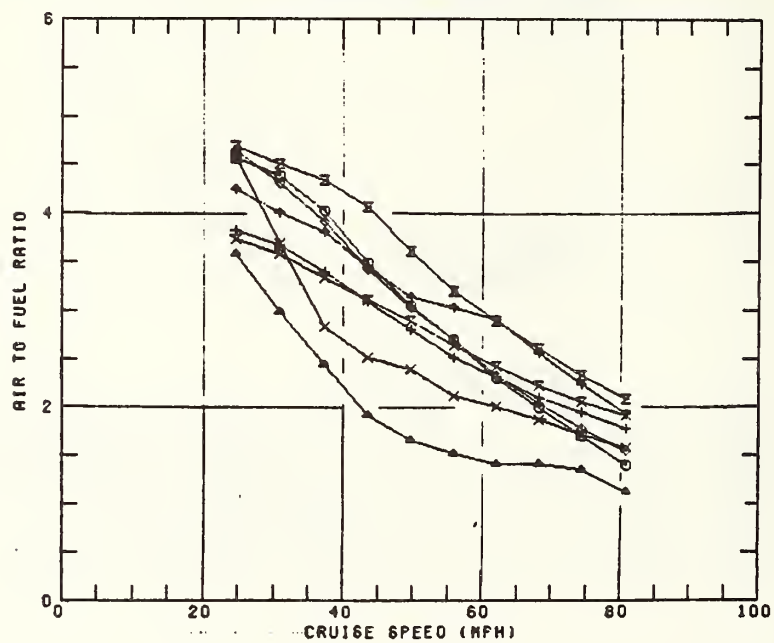
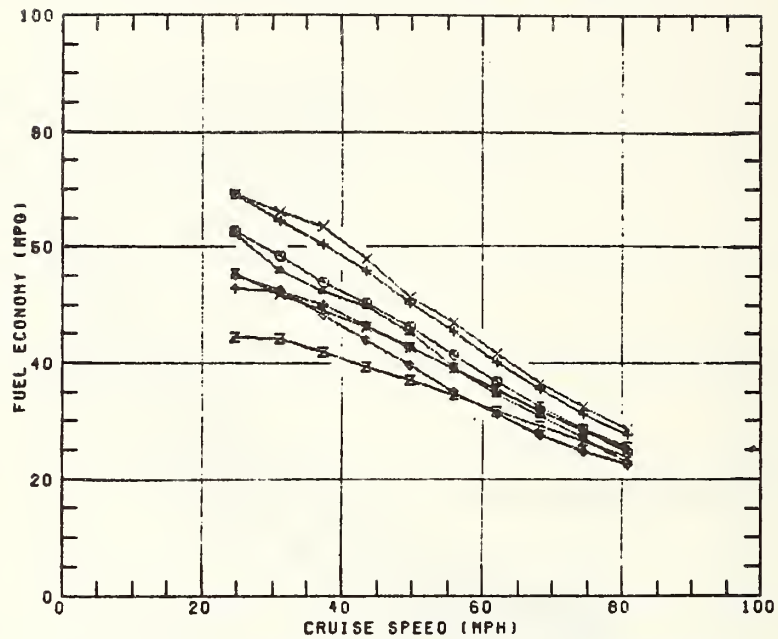




|   |             |      |      |      | ROAD LOAD                                     |
|---|-------------|------|------|------|-----------------------------------------------|
| + | 77400SCHAR2 | 1020 | 1.75 | 0.77 | 27.8 50 HP N.A. PRODUCTION DIESEL WITH E.G.R. |
| ◇ | 77400SCHR2  | 1020 | 1.75 | 0.77 | 33.1 70 HP TC RESEARCH DIESEL WITH E.G.R.     |
| + | 77400SCHL1  | 1020 | 1.75 | 0.77 | 33.1 70 HP TC RESEARCH DIESEL 5 SPEED TRANSM. |
| × | 77400SCHL1  | 1020 | 1.25 | 0.77 | 42.9 70 HP TC RESEARCH DIESEL                 |
| ▲ | 72000SCHF1  | 1250 | 1.75 | 0.77 | 33.1 5 CYLINDER 130 CID N.A. DIESEL           |
| ○ | 77400SCHD1  | 1020 | 1.75 | 0.77 | 27.8 60 HP N.A. PRODUCTION DIESEL             |

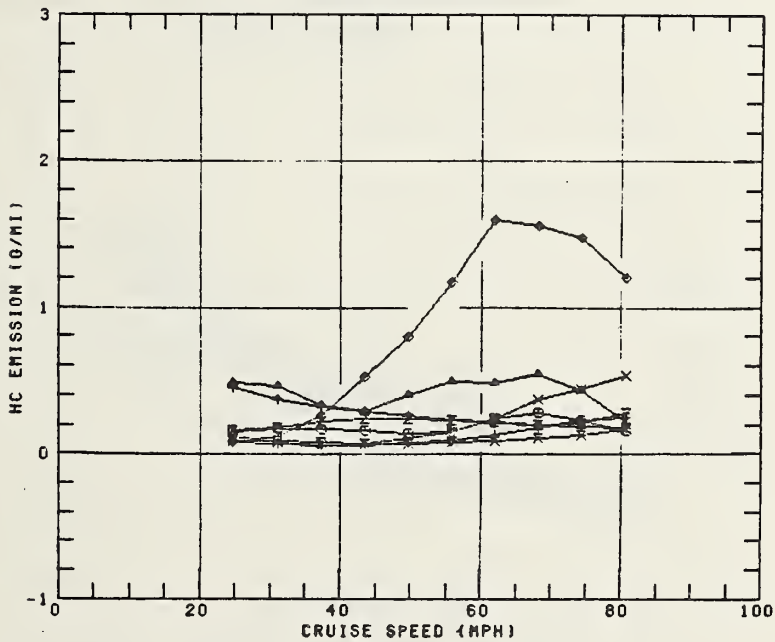
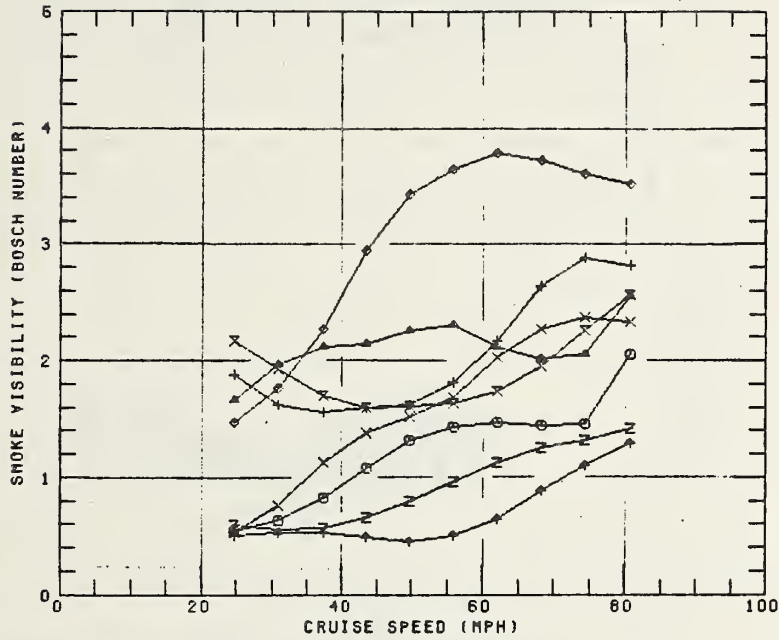
# ROAD LOAD CURVES

|                 |                   |                 |                         |
|-----------------|-------------------|-----------------|-------------------------|
| 2260 LB VEHICLE |                   | 3000 LB VEHICLE |                         |
| x               | 70 HP TC E.G.R.   | z               | 6 CYLINDER 180 CID N.A. |
| +               | 70 HP TC DIESEL   | x               | 6 CYLINDER 146 CID TC   |
| ▲               | 50 HP N.A. E.G.R. | ◆               | 6 CYLINDER 146 CID N.A. |
| ○               | 50 HP N.A. DIESEL | ◆               | 6 CYLINDER 130 CID N.A. |



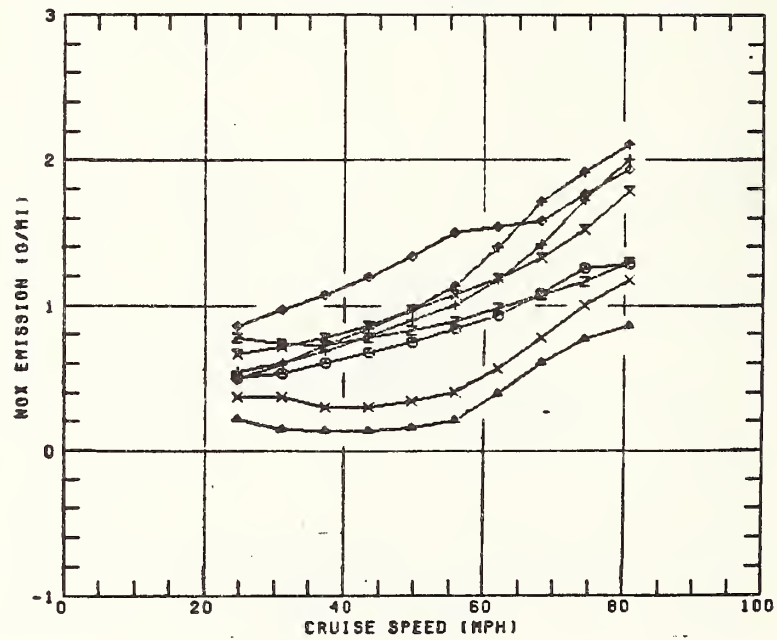
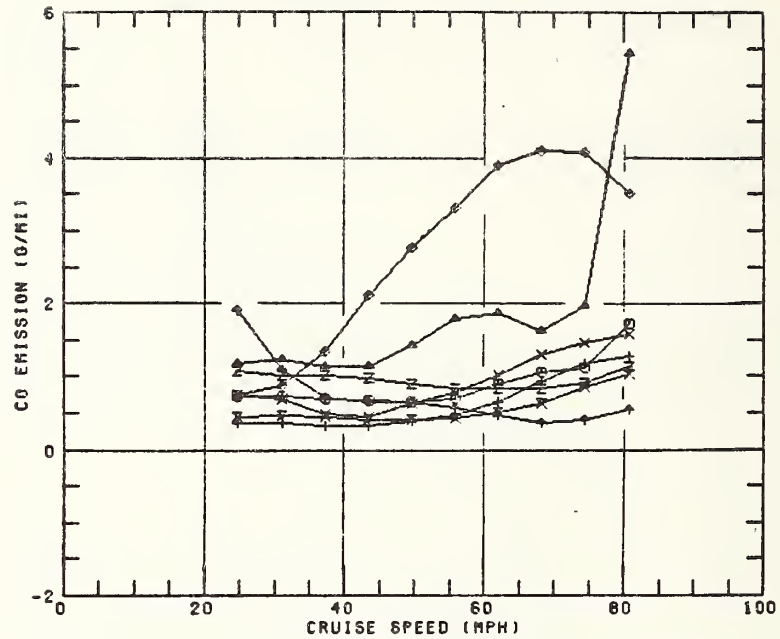
# ROAD LOAD CURVES

| 2250 LB VEHICLE |                   | 3000 LB VEHICLE |                         |
|-----------------|-------------------|-----------------|-------------------------|
| ×               | 70 HP TC E.G.R.   | z               | 8 CYLINDER 180 CID N.A. |
| +               | 70 HP TC DIESEL   | x               | 6 CYLINDER 146 CID TC   |
| ▲               | 50 HP N.A. E.G.R. | +               | 6 CYLINDER 146 CID N.A. |
| ○               | 50 HP N.A. DIESEL | ◆               | 5 CYLINDER 130 CID N.A. |



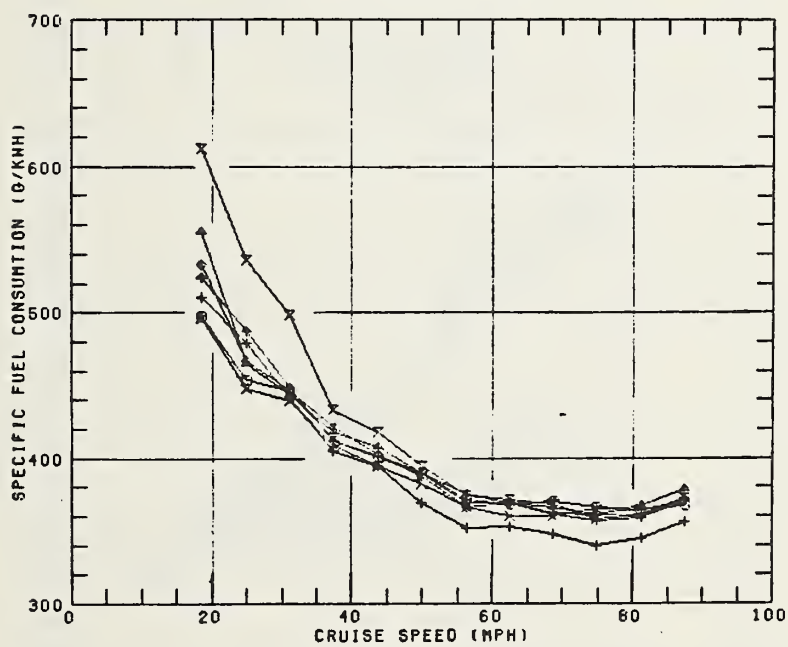
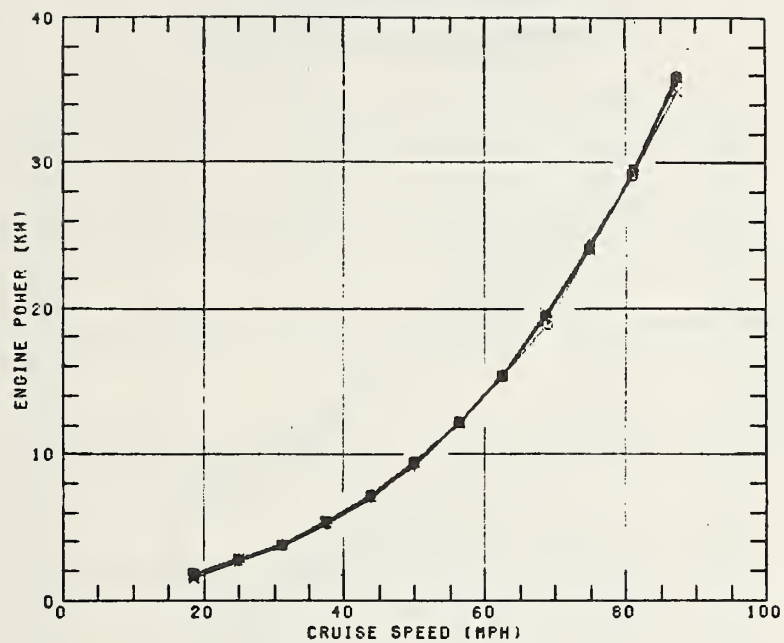
# ROAD LOAD CURVES

| 2250 LB VEHICLE |                   | 3000 LB VEHICLE |                         |
|-----------------|-------------------|-----------------|-------------------------|
| x               | 70 HP TC E.O.R    | z               | 8 CYLINDER 180 CID N.A. |
| +               | 70 HP TC DIESEL   | z               | 8 CYLINDER 146 CID TC   |
| ▲               | 50 HP N.A. E.O.R. | ◆               | 6 CYLINDER 146 CID N.A. |
| ○               | 50 HP N.A. DIESEL | ◆               | 5 CYLINDER 130 CID N.A. |



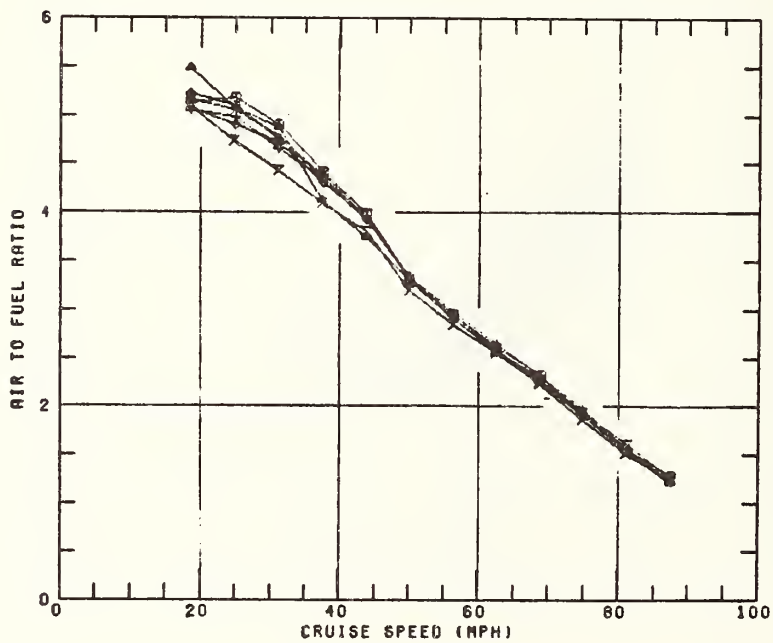
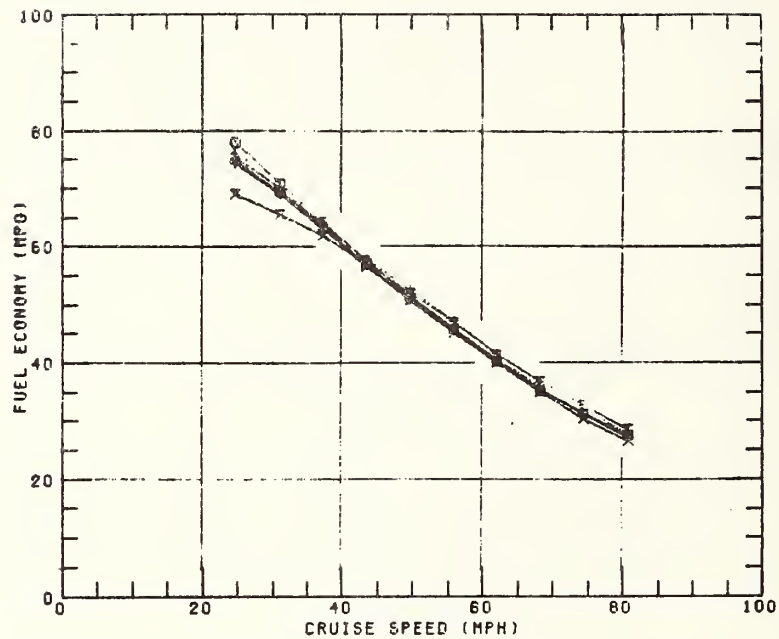
ROAD LOAD: FUEL NUMBER/FUEL DENSITY

|               |               |
|---------------|---------------|
| ○ 323/0.841   | ◇ 16140/0.834 |
| △ 15275/0.840 | † 16160/0.843 |
| + 16086/0.825 | × 16164/0.869 |
| × 16120/0.817 |               |



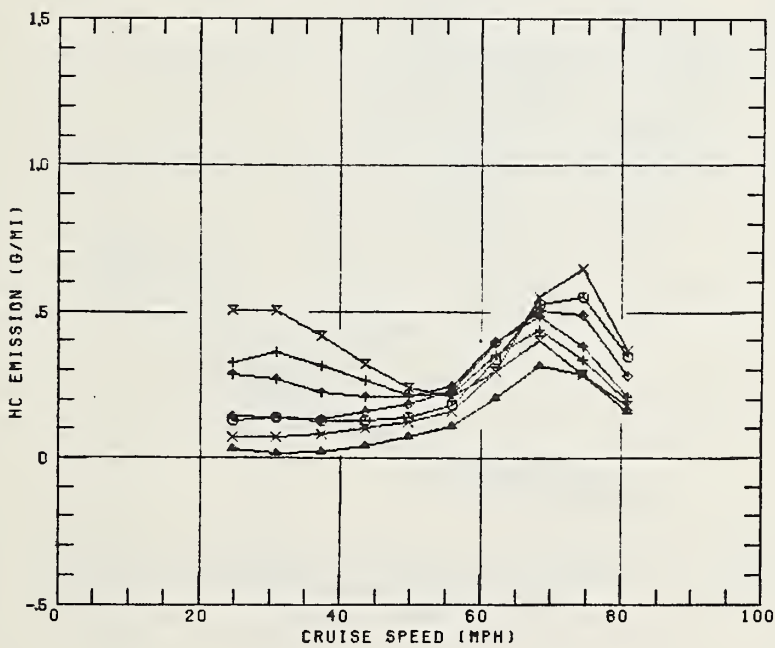
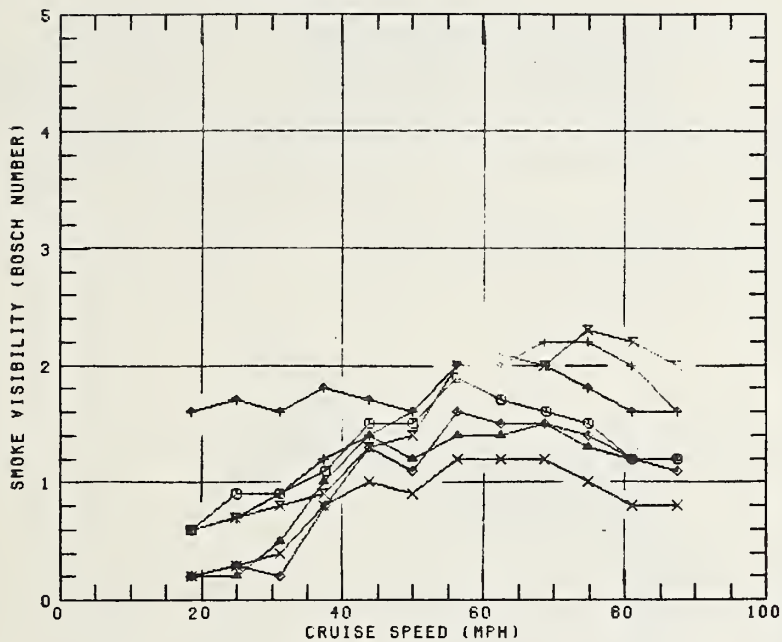
ROAD LOG: FUEL NUMBER/FUEL DENSITY

|               |               |
|---------------|---------------|
| ○ 323/0.841   | ◇ 16140/0.834 |
| △ 15275/0.840 | ✦ 16160/0.843 |
| + 15086/0.825 | ✕ 16164/0.859 |
| × 16120/0.817 |               |



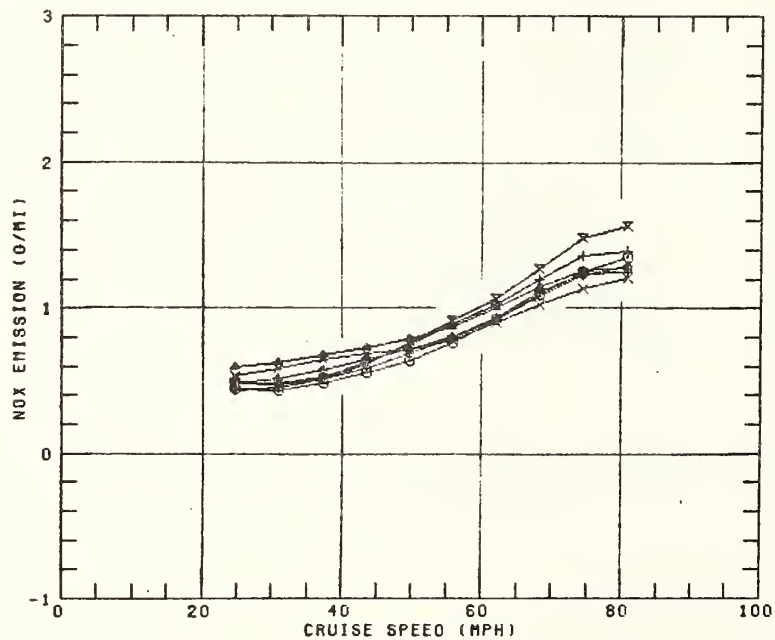
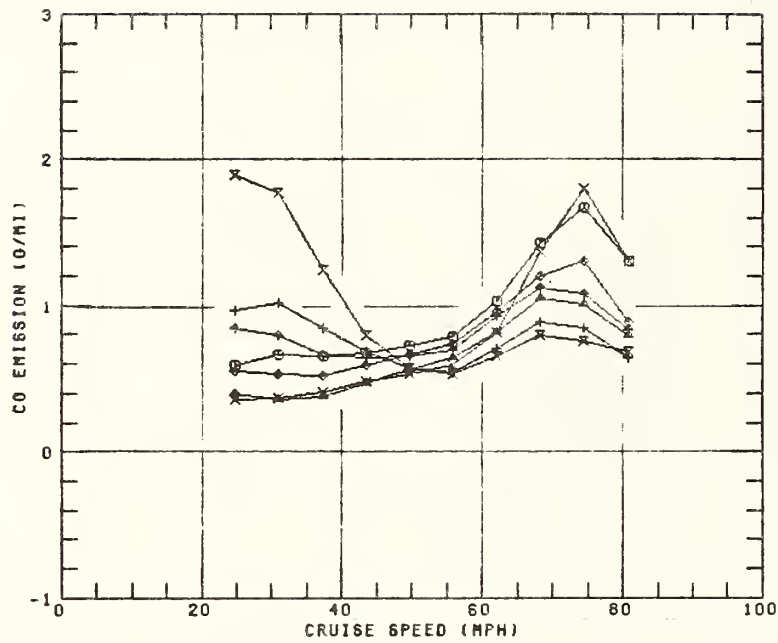
ROAD LOAD: FUEL NUMBER/FUEL DENSITY

○ 323/0.841      ◇ 16140/0.834  
 ▲ 15275/0.840    ◆ 16160/0.843  
 + 16086/0.825    × 16164/0.869  
 × 16120/0.817



ROAD LOAD: FUEL NUMBER/FUEL DENSITY

|               |               |
|---------------|---------------|
| ○ 323/0.841   | ● 16140/0.834 |
| △ 16275/0.840 | ▲ 16160/0.843 |
| + 16066/0.825 | × 16164/0.869 |
| × 16120/0.817 |               |



50 HP N.A. 90 CID

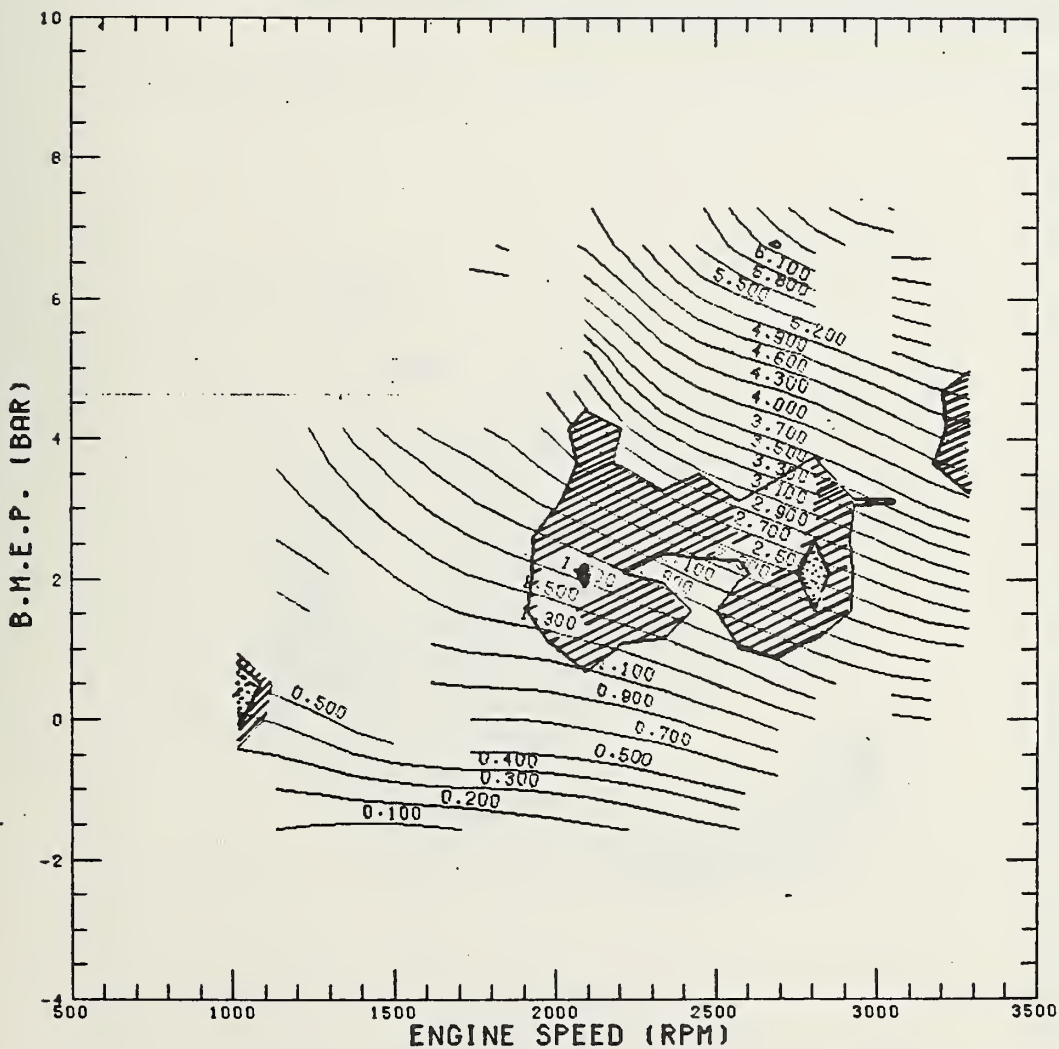
## FUEL CONSUMPTION (KG/H)

1372.0 SEC US-CITY TEST DATE 07/10/76 13.47.33

TEST RESULT 615.04 G/ 7.45 MI = 38.60 MPG

SHADED REGIONS 310.43 71.67 M

VEHICLE .1020 KG MASS. 0.80 SQM CWxF. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. 90 CID

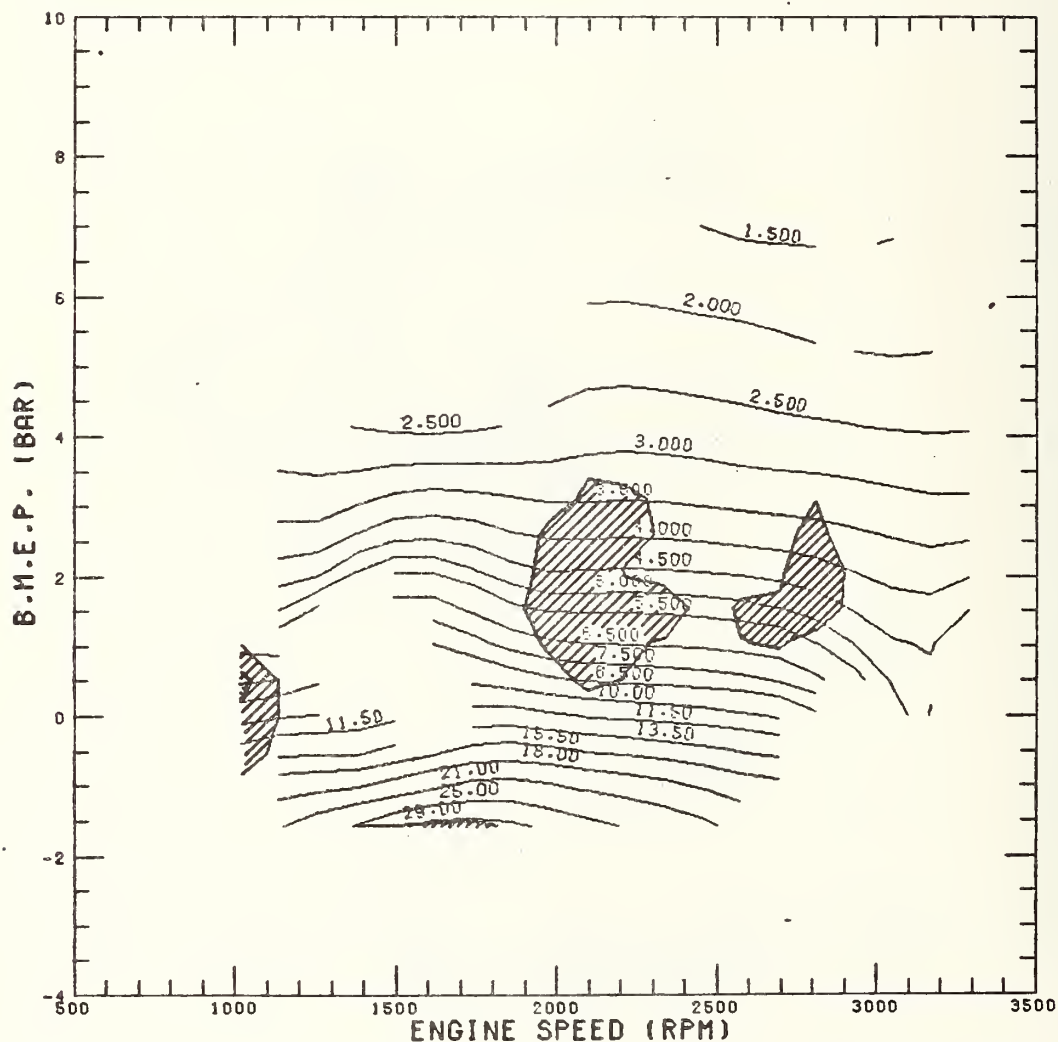
AIR TO FUEL RATIO

1372.0 SEC US-CITY TEST DATE 07/10/76 13.47.33

TEST RESULT 1372.25 S/ 7.45 MI = 19.54 MPH

SHADED REGIONS 682.87 194.37 M

VEHICLE 1020 KG MASS. 0.80 SQM CWF. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. 90 CID

HC - EMISSION (G/H)

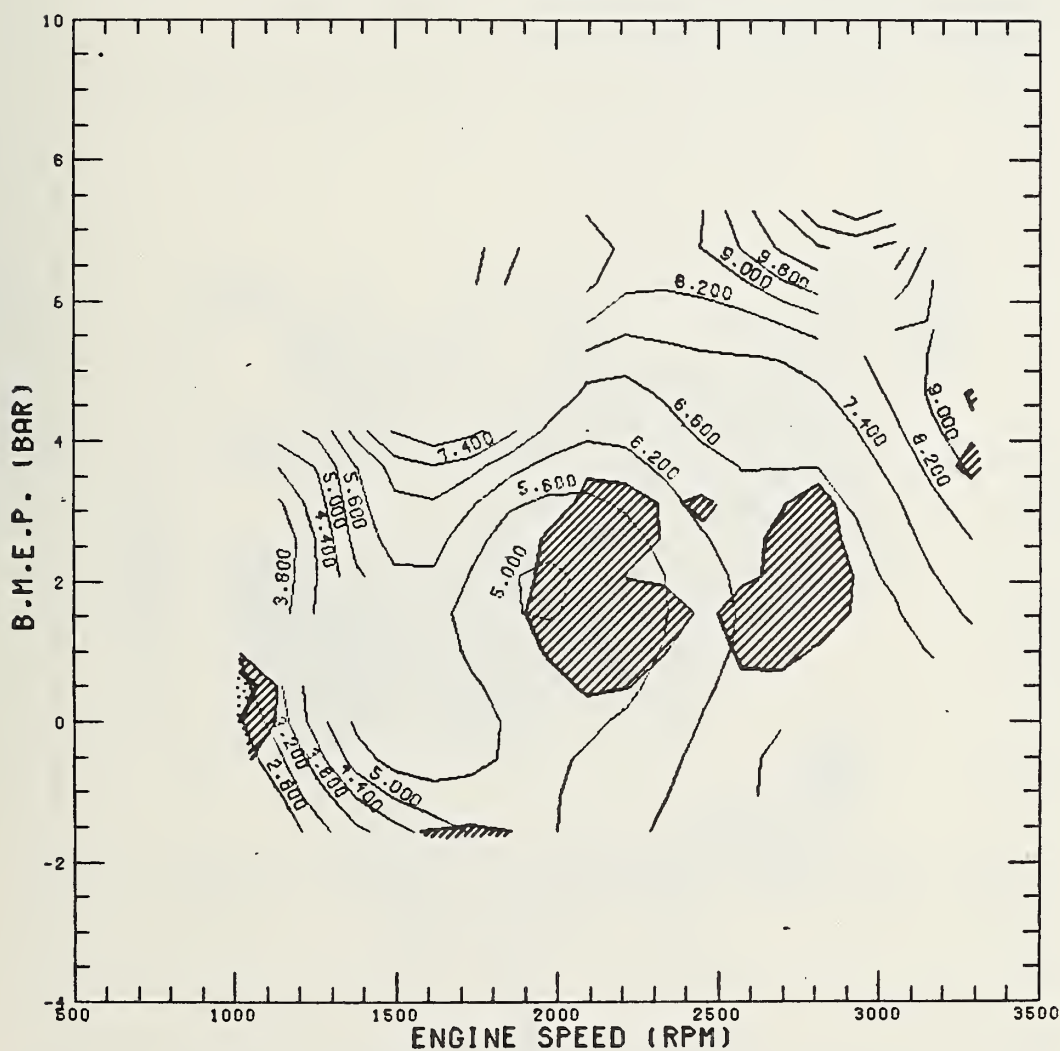
1372.0 SEC US-CITY TEST DATE 07/10/76 13.47.33

TEST RESULT 1.86 G/ 7.45 MI = 0.25 G/MI

SHADED REGIONS 0.94 0.14 G

VEHICLE 1020 KG MASS, 0.80 SQM CM\*F, 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. 90 CID

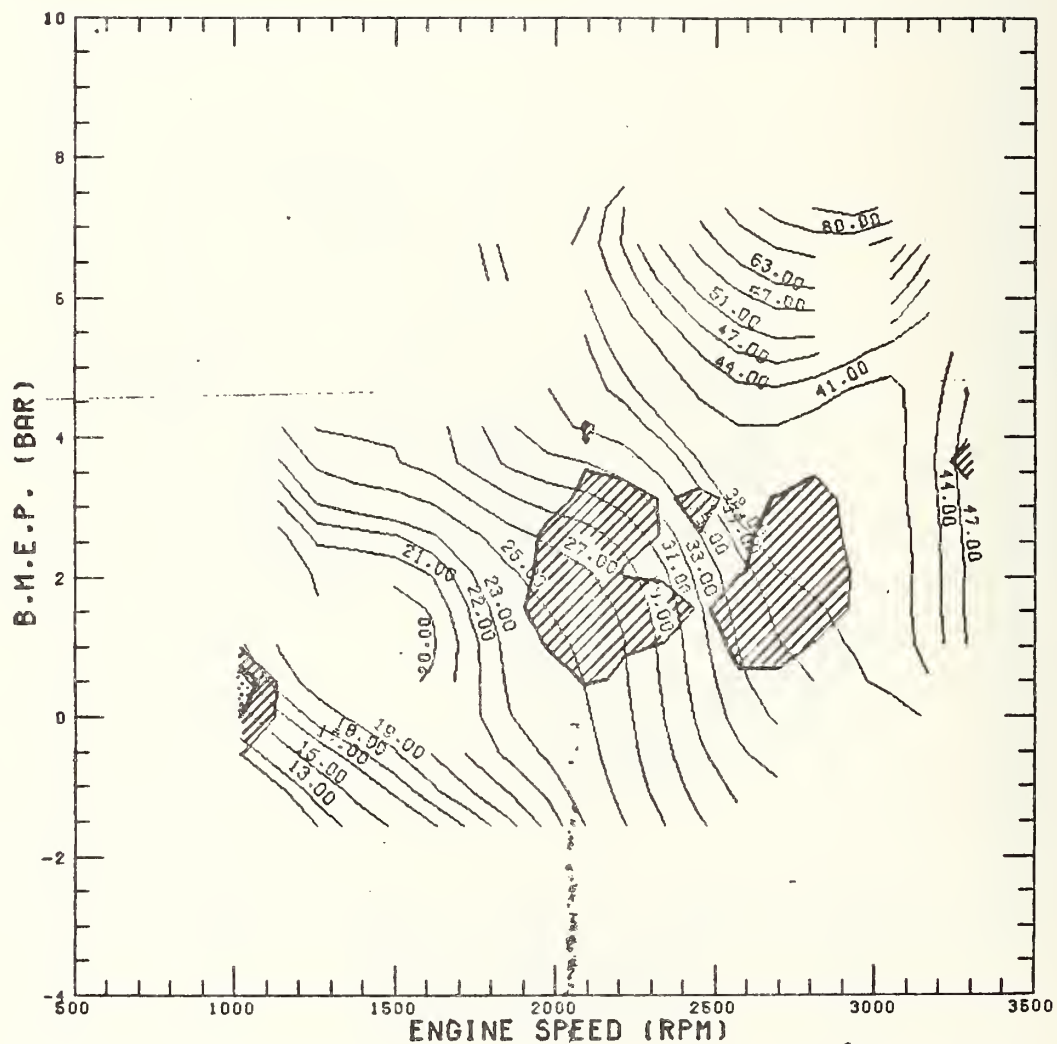
CO - EMISSION (G/H)

1372.0 SEC US-CITY TEST DATE 07/10/76 13.47.33

TEST RESULT 9.77 G/ 7.45 MI = 1.31 G/MI

SHADED REGIONS 4.84 1.30 G

VEHICLE 1020 KO MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. 90 CID

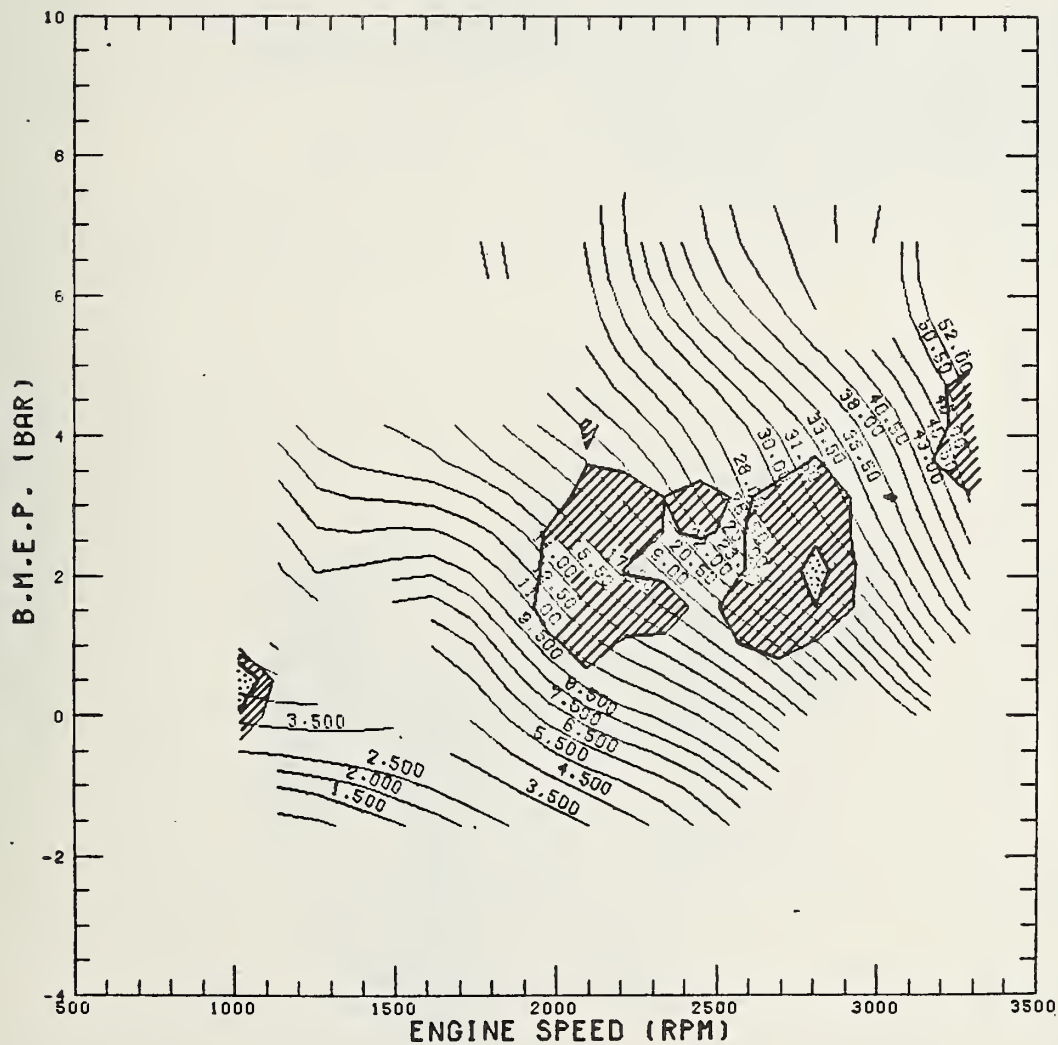
NOX - EMISSION (G/H)

1372.0 SEC US-CITY TEST DATE 07/10/76 13.47.33

TEST RESULT 5.58 G/ 7.45 MI = 0.75 G/MI

SHADED REGIONS 2.82 0.60 G

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. 90 CID

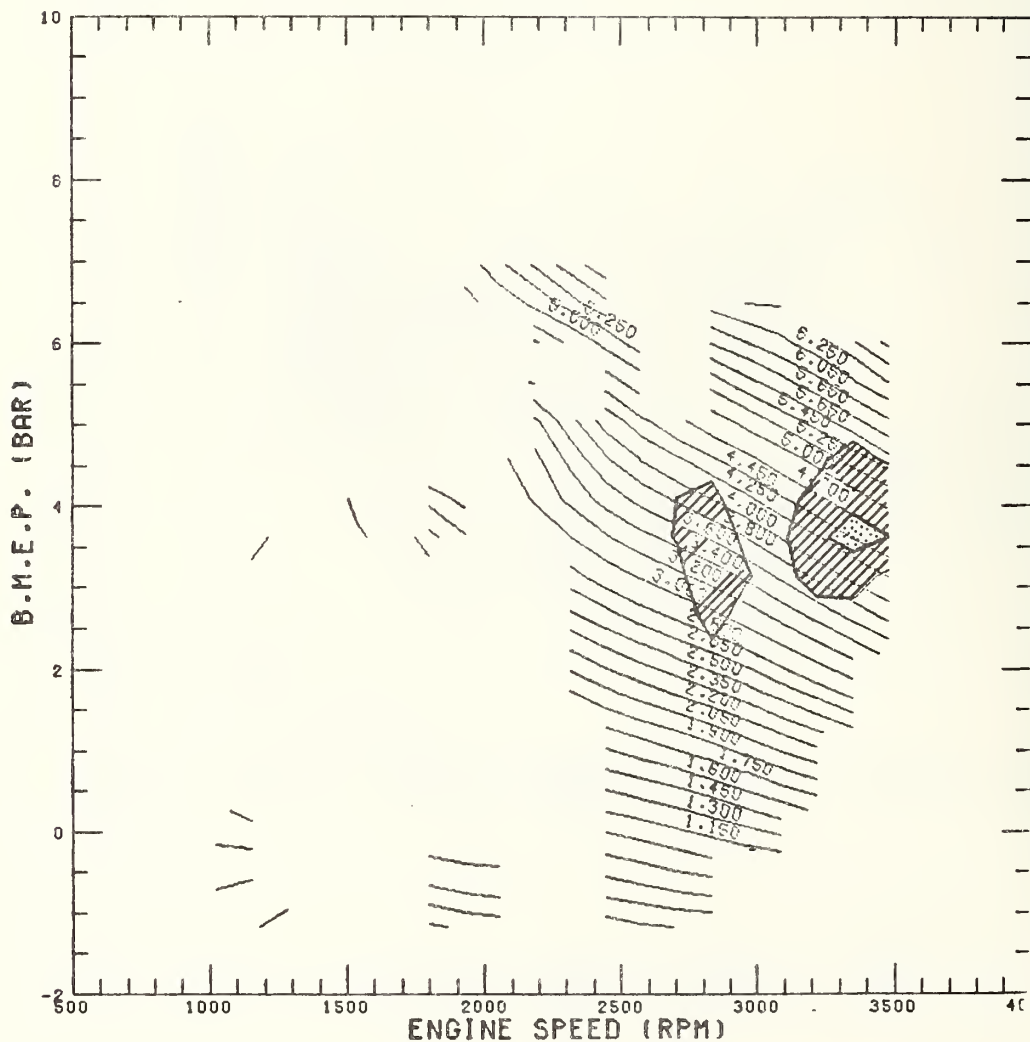
## FUEL CONSUMPTION (KG/H)

764.0 SEC HIGHWAY TEST DATE 07/10/76 14-30-52

TEST RESULT 772.33 G/ 10.25 MI = 42.30 MPG

SHADED REGIONS 397.16 83.86 M

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. 90 CID

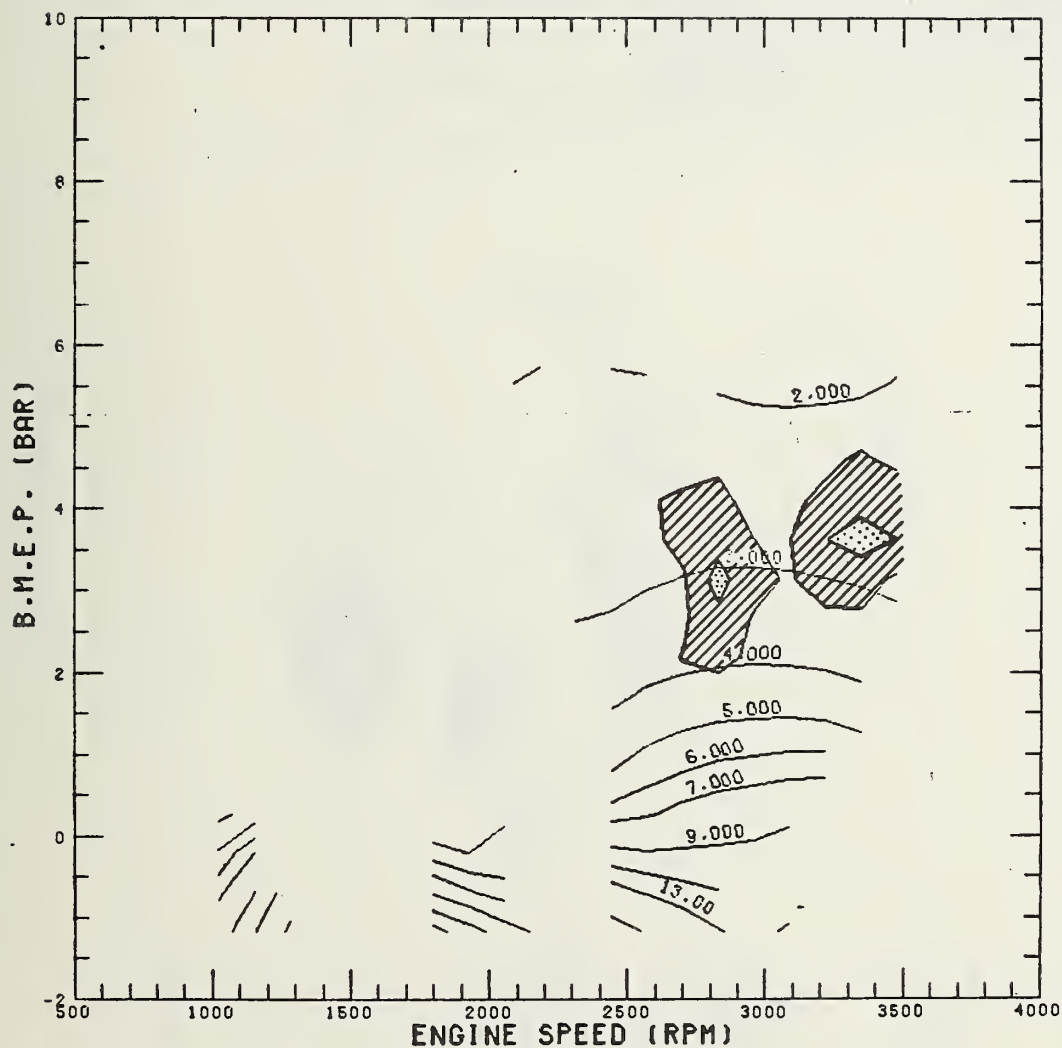
AIR TO FUEL RATIO

764.0 SEC HIGHWAY TEST DATE 07/10/76 14.30.52

TEST RESULT 764.25 S/ 10.25 MI = 48.28 MPH

SHADED REGIONS 386.25 73.62 M

VEHICLE 1020 KG MASS. 0.80 SQM CW=F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. 90 CID

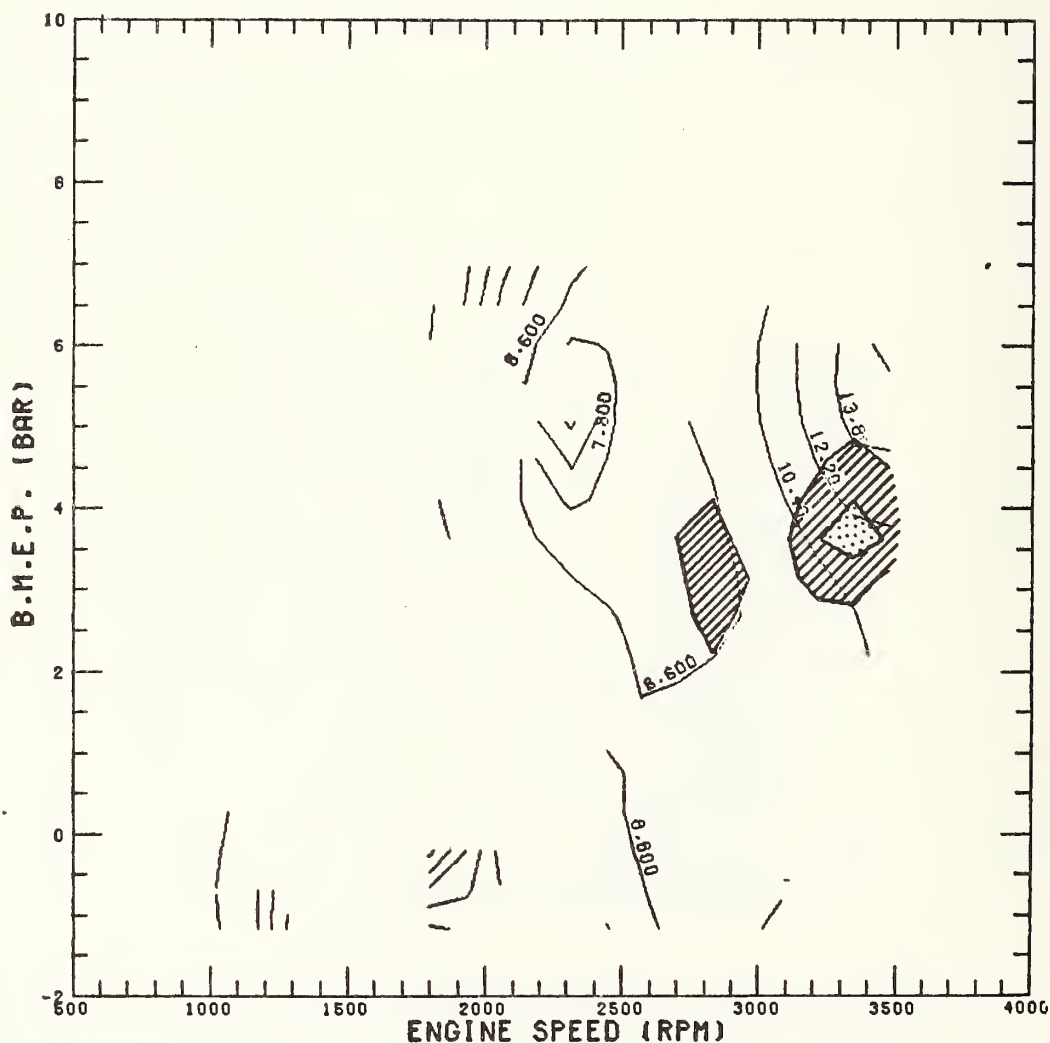
HC - EMISSION (G/H)

764.0 SEC HIGHWAY TEST DATE 07/10/76 14.30.52

TEST RESULT 1.96 G/ 10.25 MI = 0.19 G/MI

SHADED REGIONS 0.99 0.21 G

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. 90 CID

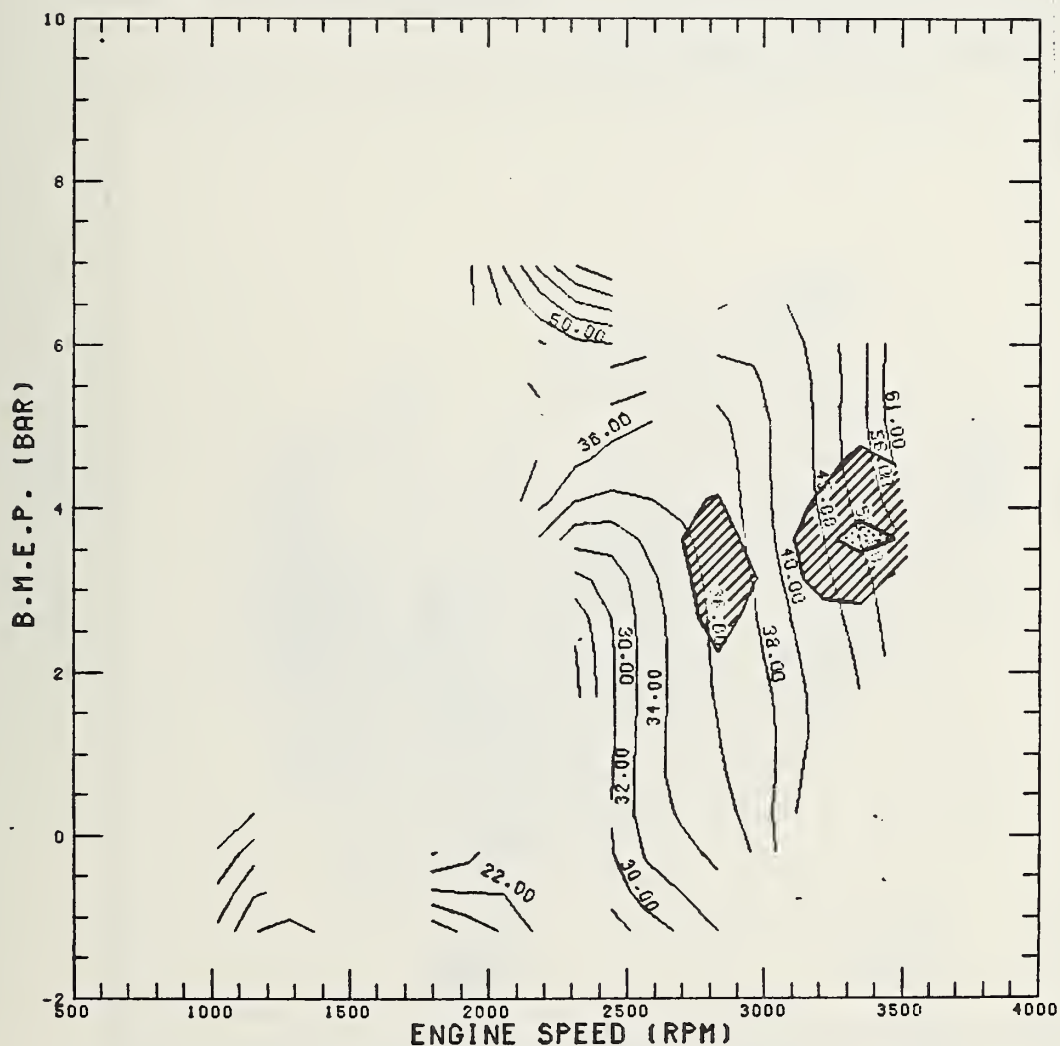
CO - EMISSION (G/H)

764.0 SEC HIGHWAY TEST DATE 07/10/76 14.30.52

TEST RESULT 8.22 G/ 10.25 MI = 0.80 G/MI

SHADED REGIONS 4.02 0.93 G

VEHICLE 1020 KG MASS. 0.80 SQM CW=F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. 90 CID

NOX - EMISSION (G/H)

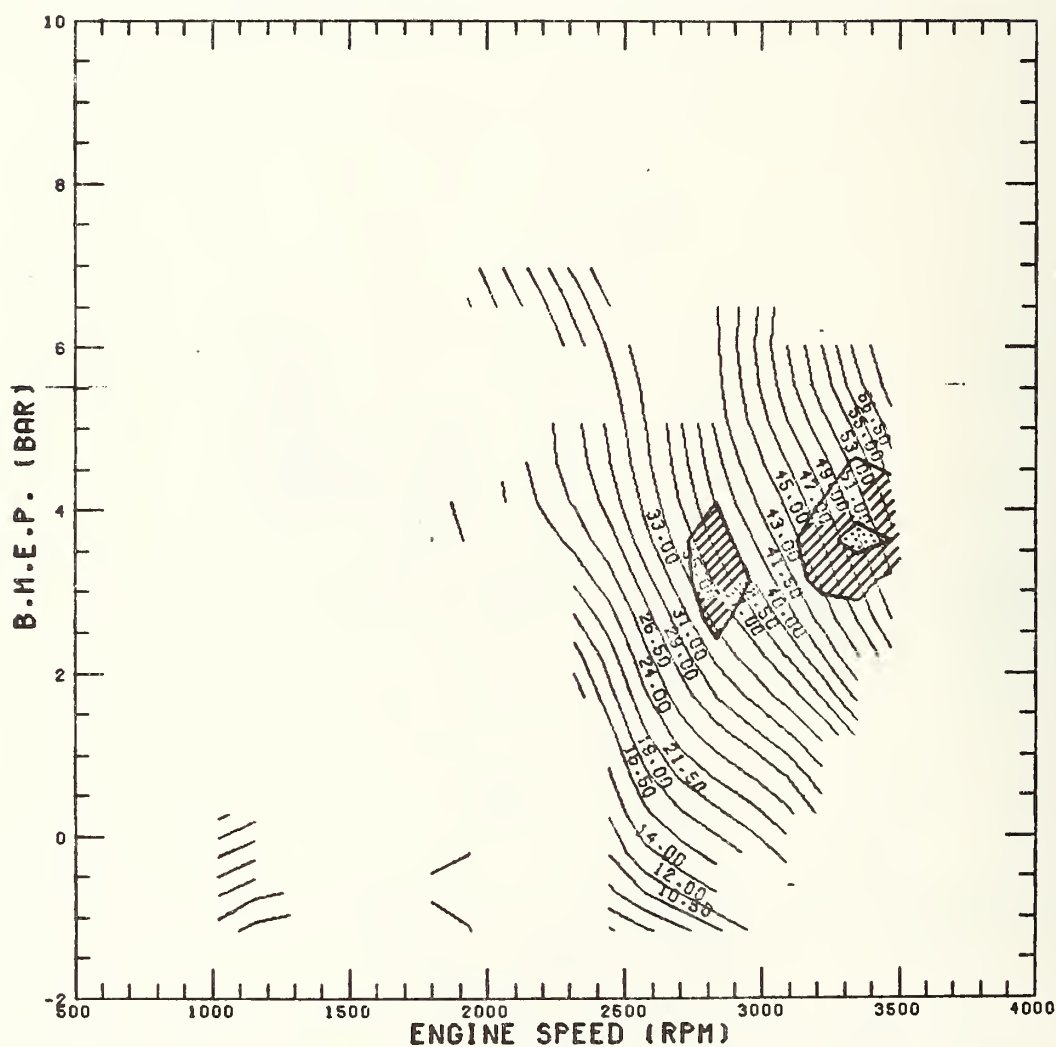
764.0 SEC HIGHWAY TEST DATE 07/10/76 14.30.52

TEST RESULT 7.97 G/ 10.25 MI = 0.78 G/MI

SHADED REGIONS 3.99 0.52 G

VEHICLE 1020 KG MASS. 0.80 SQM CWF. 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. E.G.R.

## FUEL CONSUMPTION (KG/H)

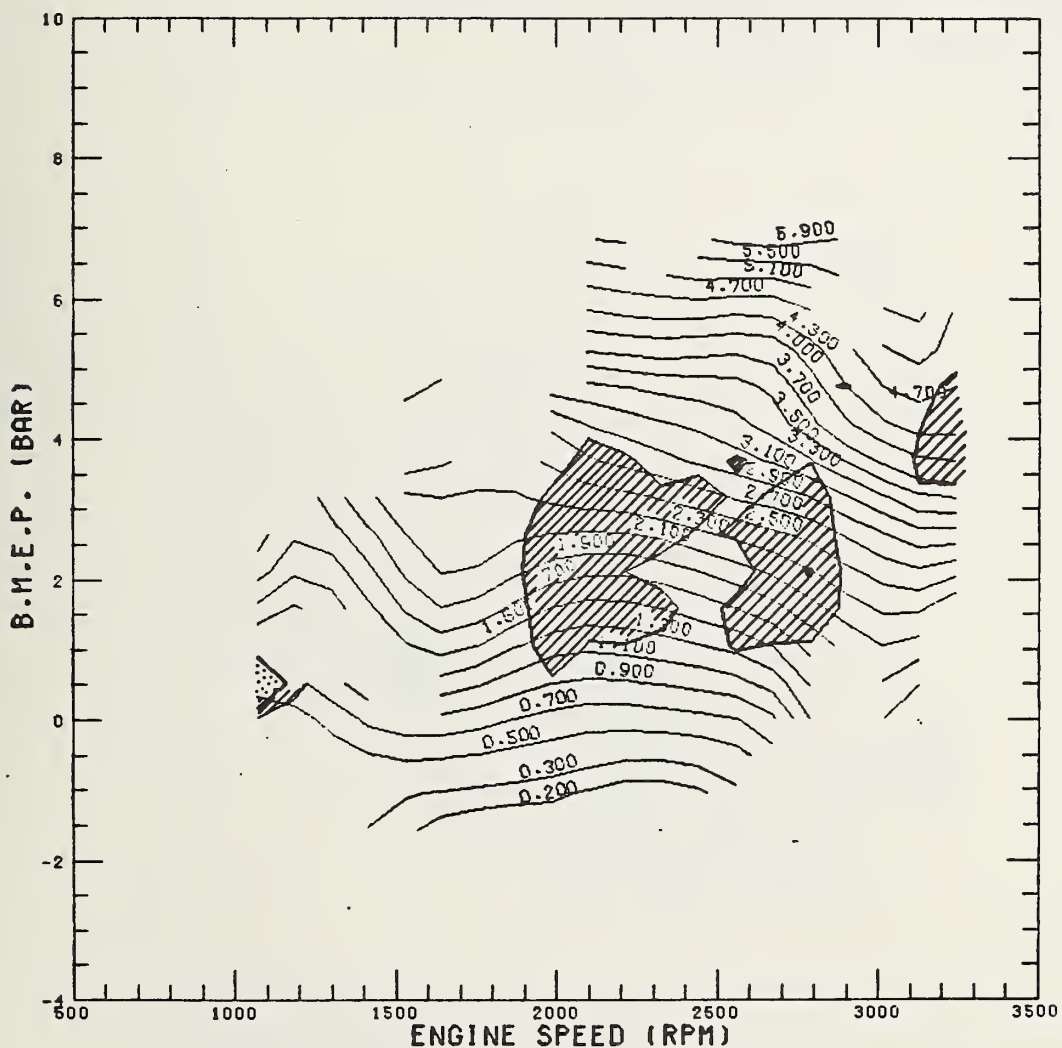
1372.0 SEC US-CITY TEST DATE 11/08/77 14.21.28

TEST RESULT 562.51 G/ 7.45 MI = 41.45 MPG

SHADED REGIONS 282.20 47.57 M

VEHICLE 1020 KG MASS, 0.80 SQM CW\*F, 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 3

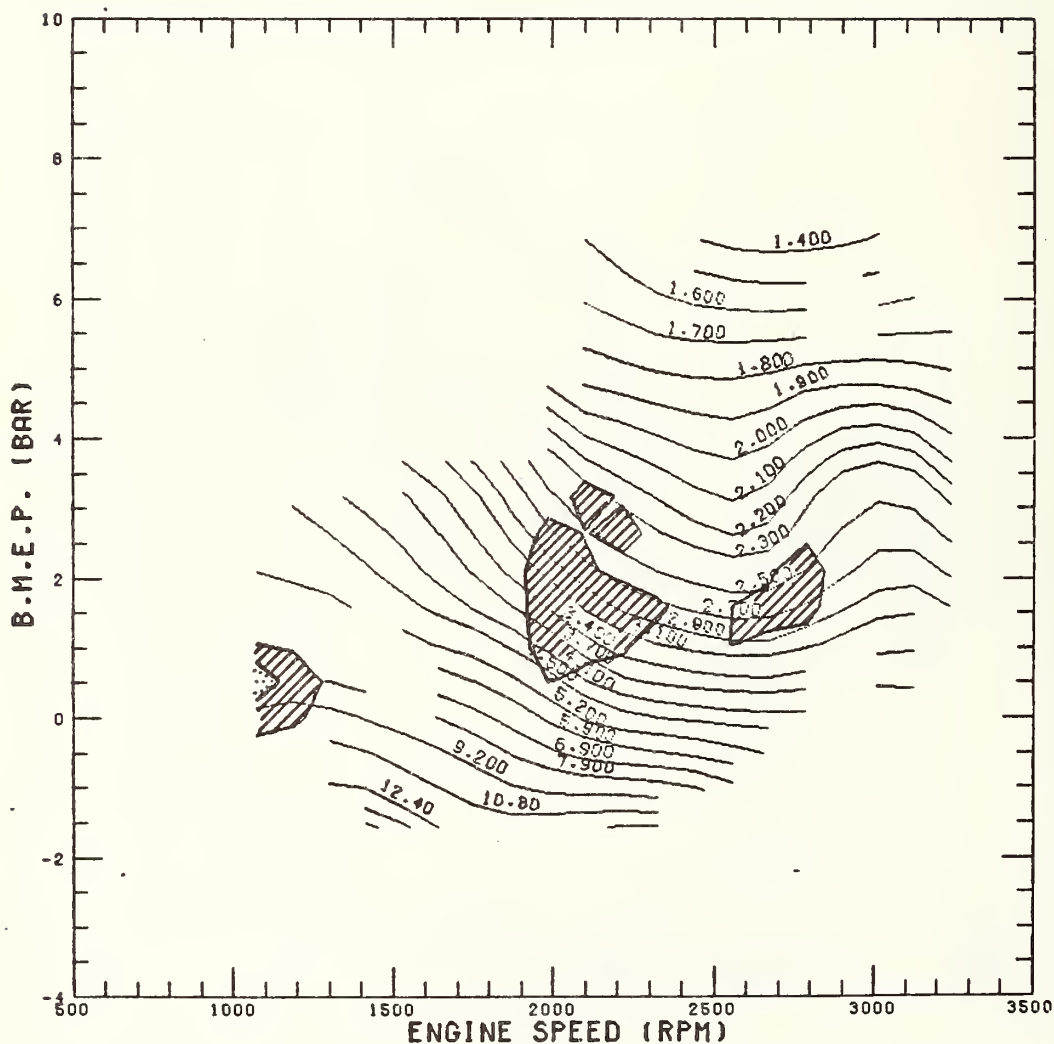


# AIR TO FUEL RATIO

TEST RESULT 1372.25 S/ 7.45 MI = 19.54 MPH

SHADED REGIONS 678.62 276.00 M

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. E.G.R.

HC - EMISSION (G/H)

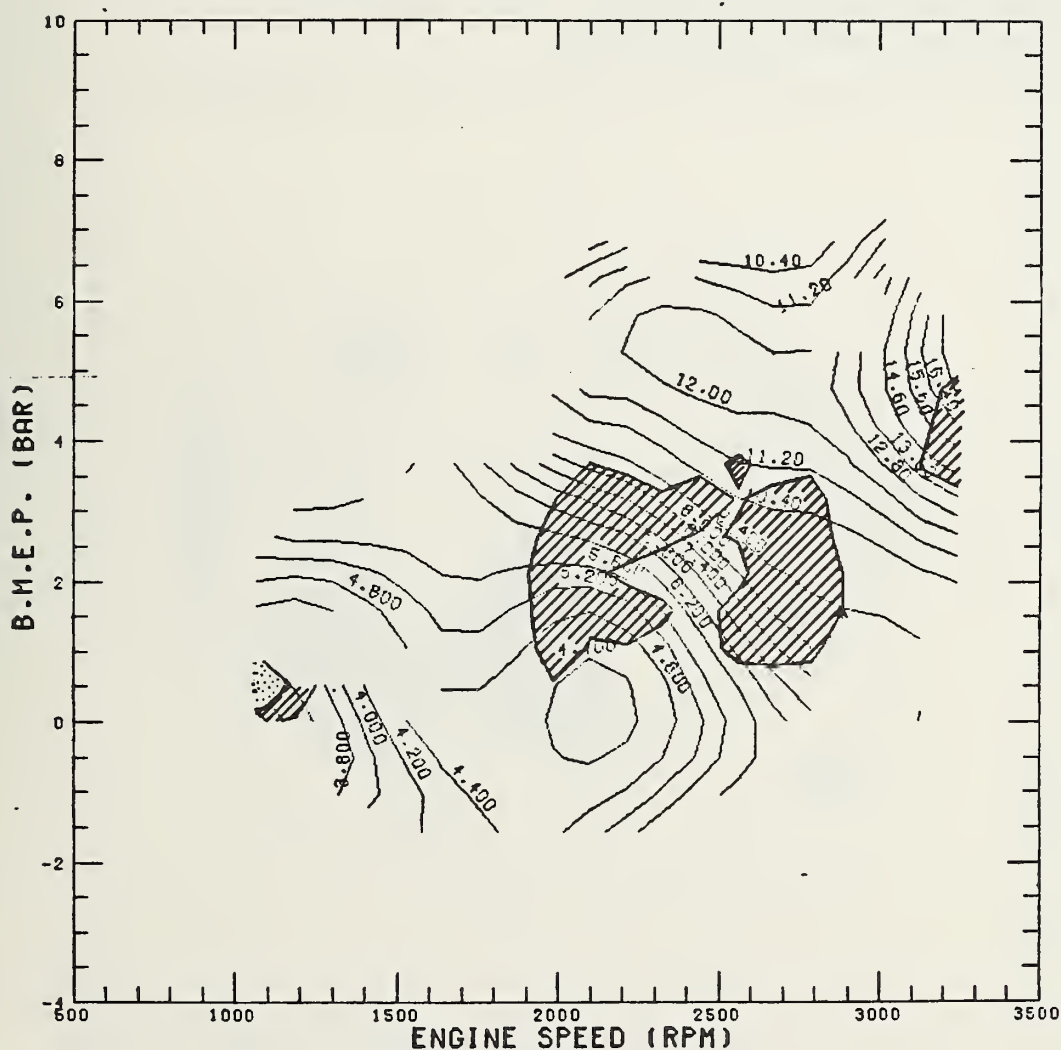
1372.0 SEC US-CITY TEST DATE 11/08/77 14.21.28

TEST RESULT 2.29 G/ 7.45 MI = 0.31 G/MI

SHADED REGIONS 1.15 0.22 G

VEHICLE 1020 KG MASS, 0.80 SQM CW\*F, 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. E.G.R.

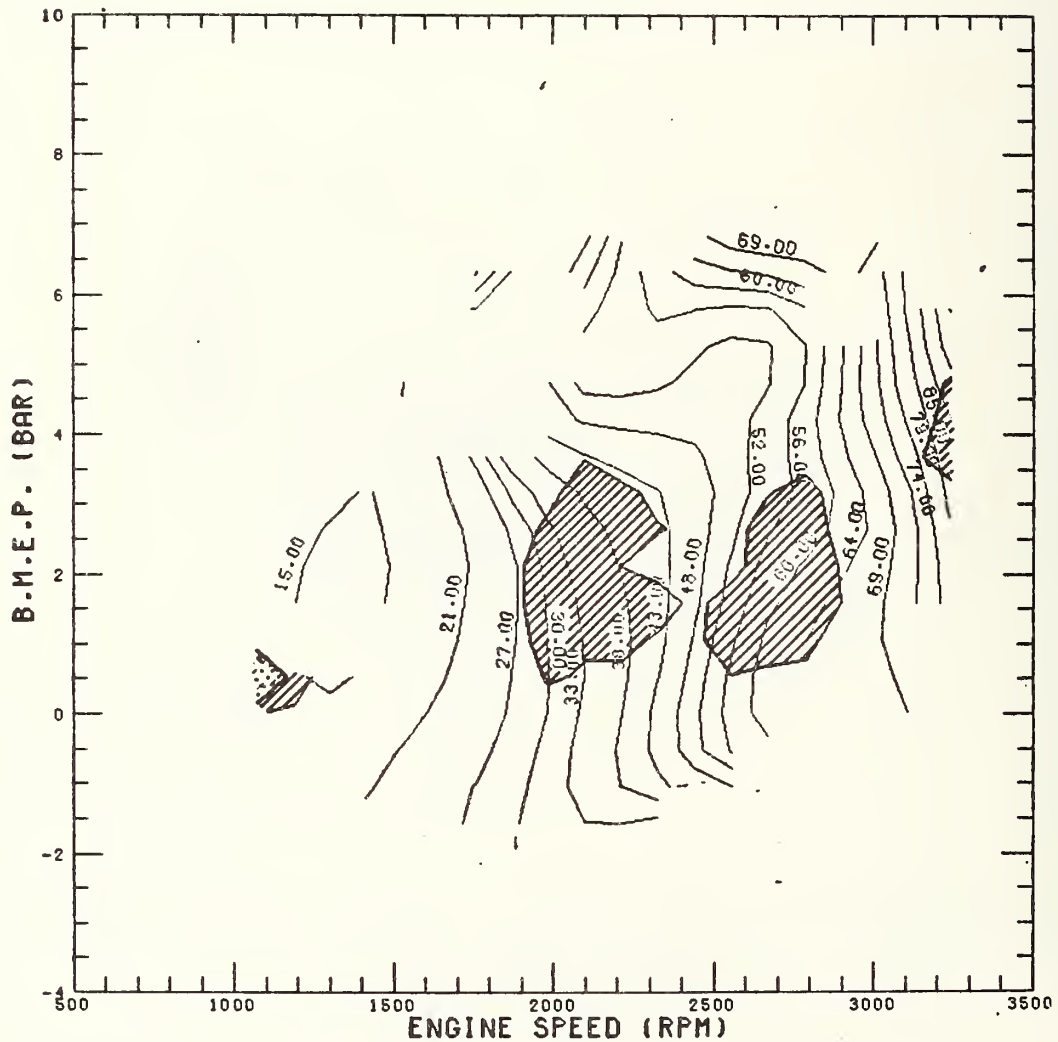
CO - EMISSION (G/H)

1372.0 SEC US-CITY TEST DATE 11/08/77 14.21.28

TEST RESULT 13.76 G/ 7.45 MI = 1.85 G/MI

SHADED REGIONS 6.91 1.19 G

VEHICLE 1020 KG MASS, 0.80 SQM CW=F, 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. E.G.R.

NOX - EMISSION (G/H)

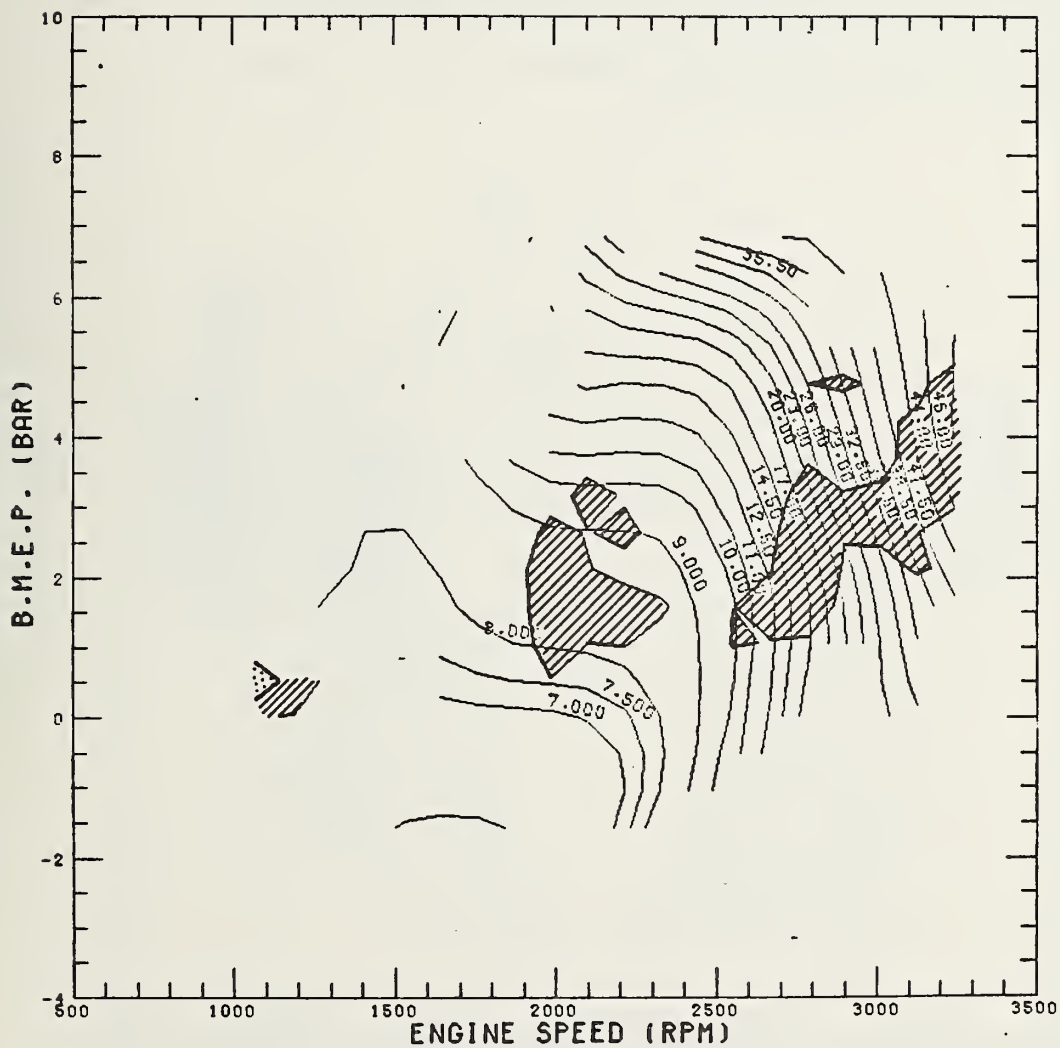
1372.0 SEC US-CITY TEST DATE 11/08/77 14.21.28

TEST RESULT 4.15 G/ 7.45 MI = 0.56 G/MI

SHADED REGIONS 2.06 0.50 G

VEHICLE 1020 KG MASS. 0.80 SQM CW=F. 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. E.G.R.

## FUEL CONSUMPTION (KG/H)

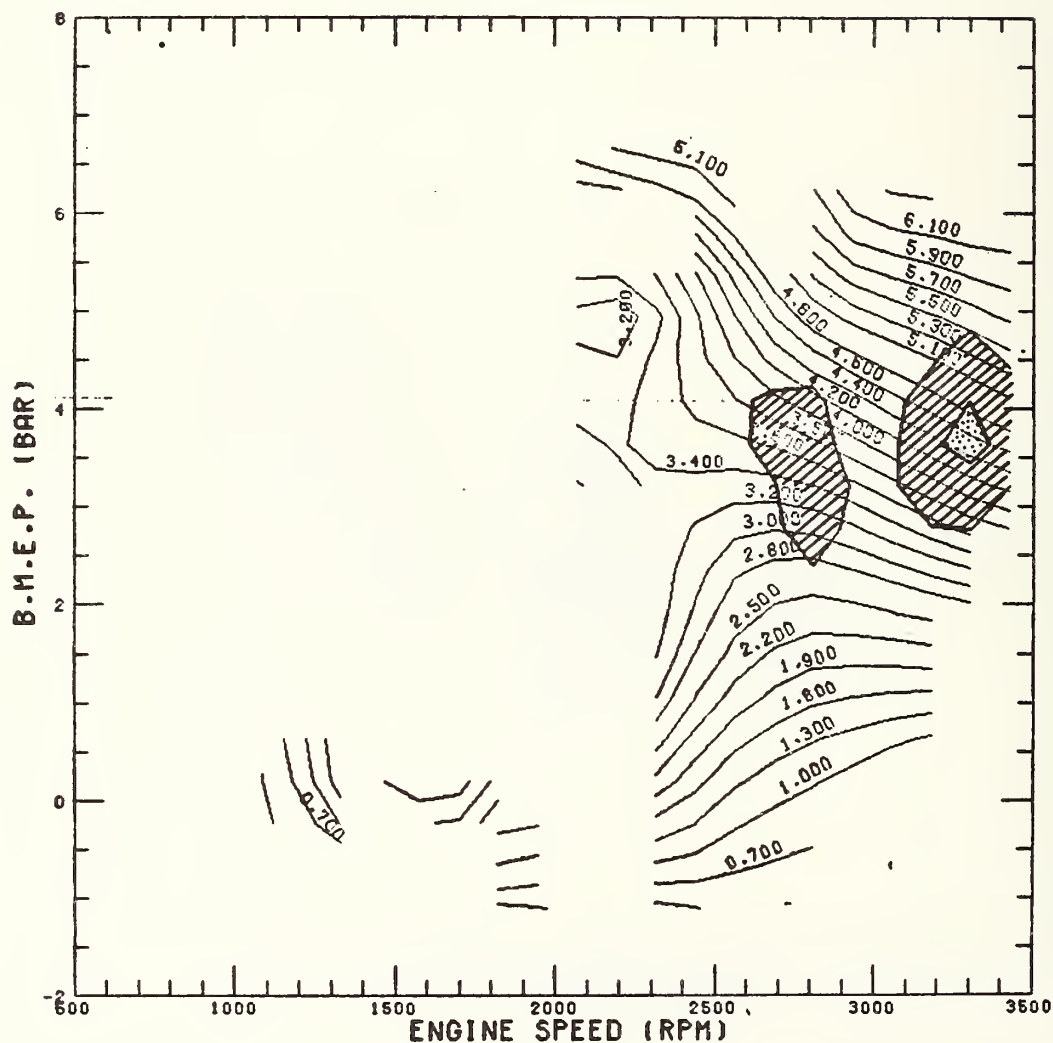
764.0 SEC HIGHWAY TEST DATE 11/08/77 14.50.33

TEST RESULT 765.71 G/ 10.25 MI = 41.90 MPG

SHADED REGIONS 384.92 50.38 M

VEHICLE 1020 KG MASS, 0.80 SQM CW\*F, 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. E.G.R.

AIR TO FUEL RATIO

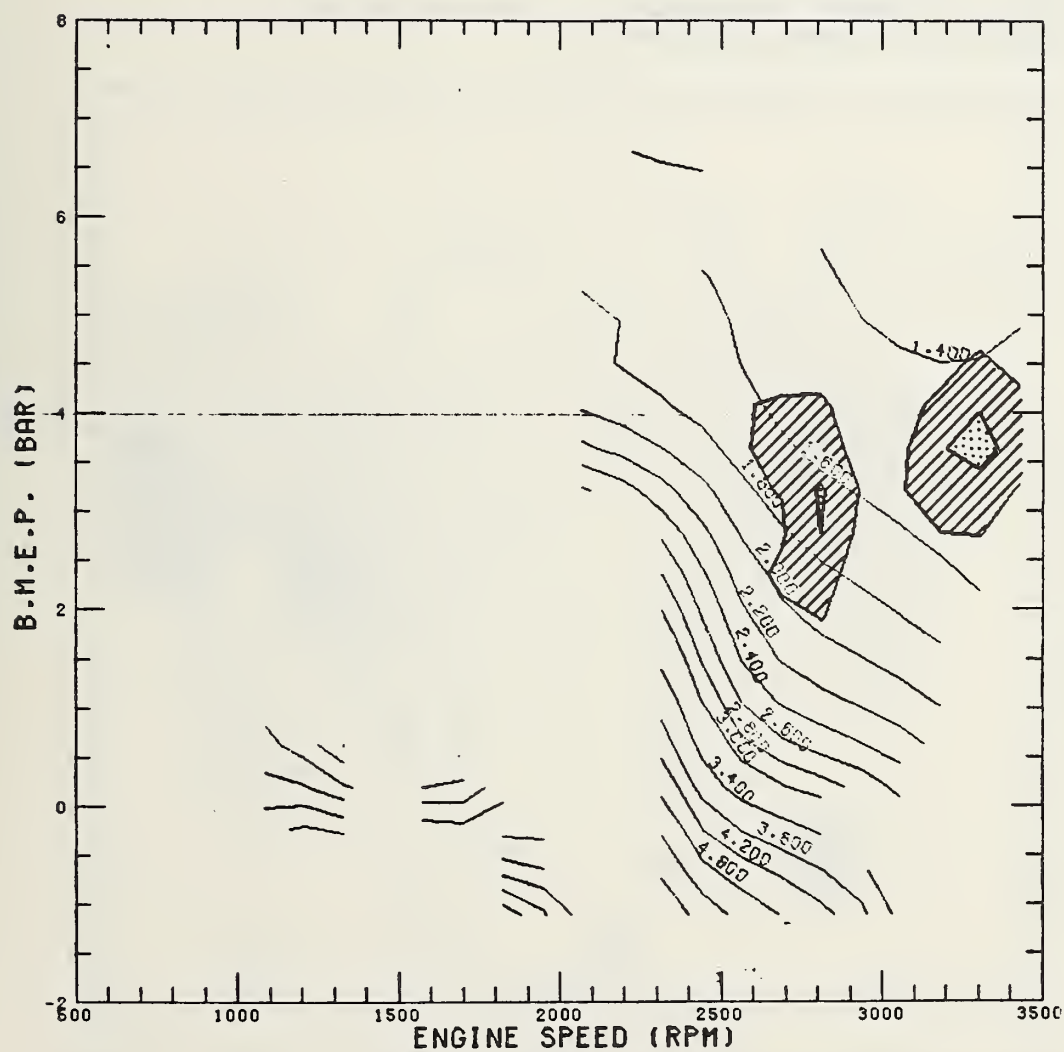
764.0 SEC HIGHWAY TEST DATE 11/08/77 14.50.33

TEST RESULT 764.25 S/ 10.25 MI = 48.28 MPH

SHADED REGIONS 384.62 99.37 M

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. E.G.R.

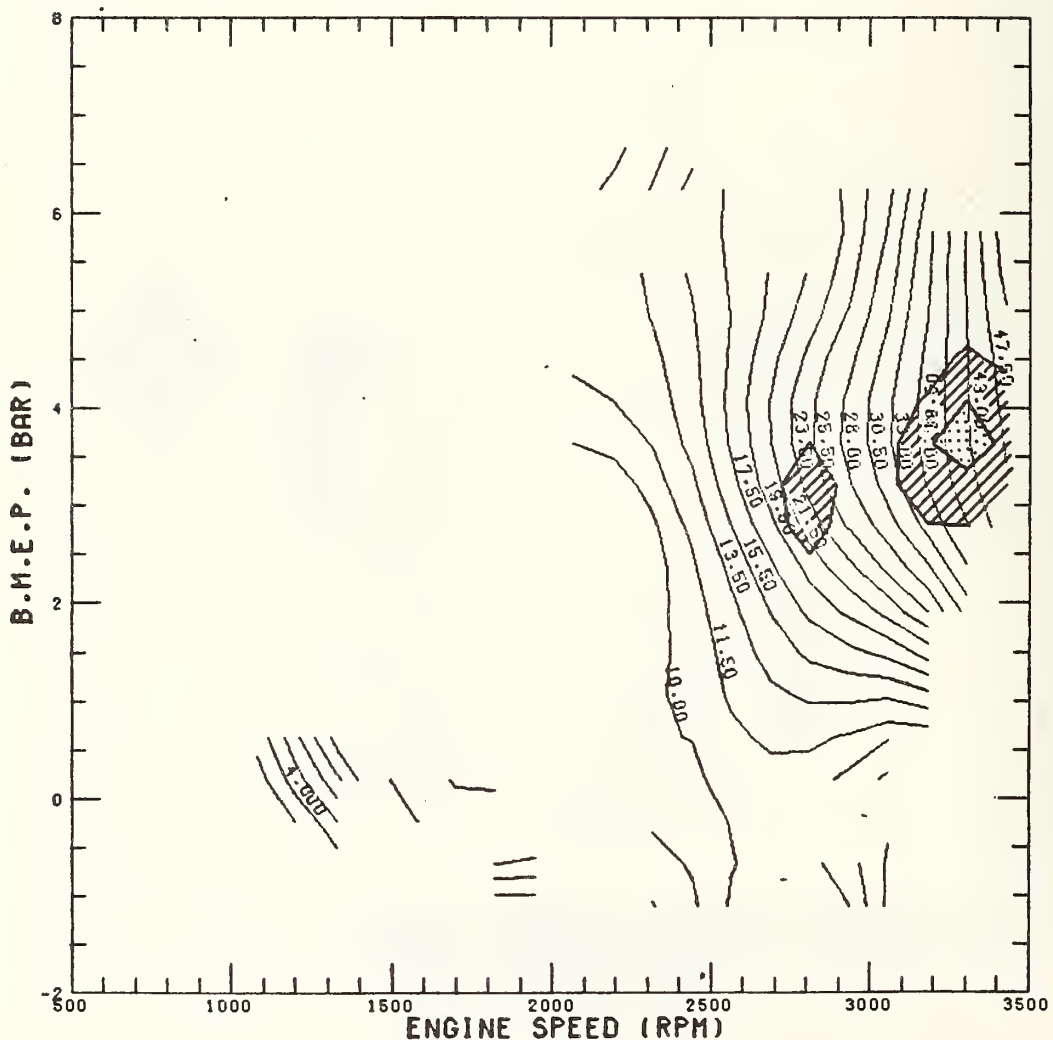
HC - EMISSION (G/H)

764.0 SEC HIGHWAY TEST DATE 11/08/77 14.50.33

TEST RESULT 5.86 G/ 10.25 MI = 0.57 G/MI

SHADED REGIONS 2.84 0.49 G

VEHICLE 1020 KG MASS. 0.80 SQM CWF. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. E.G.R.

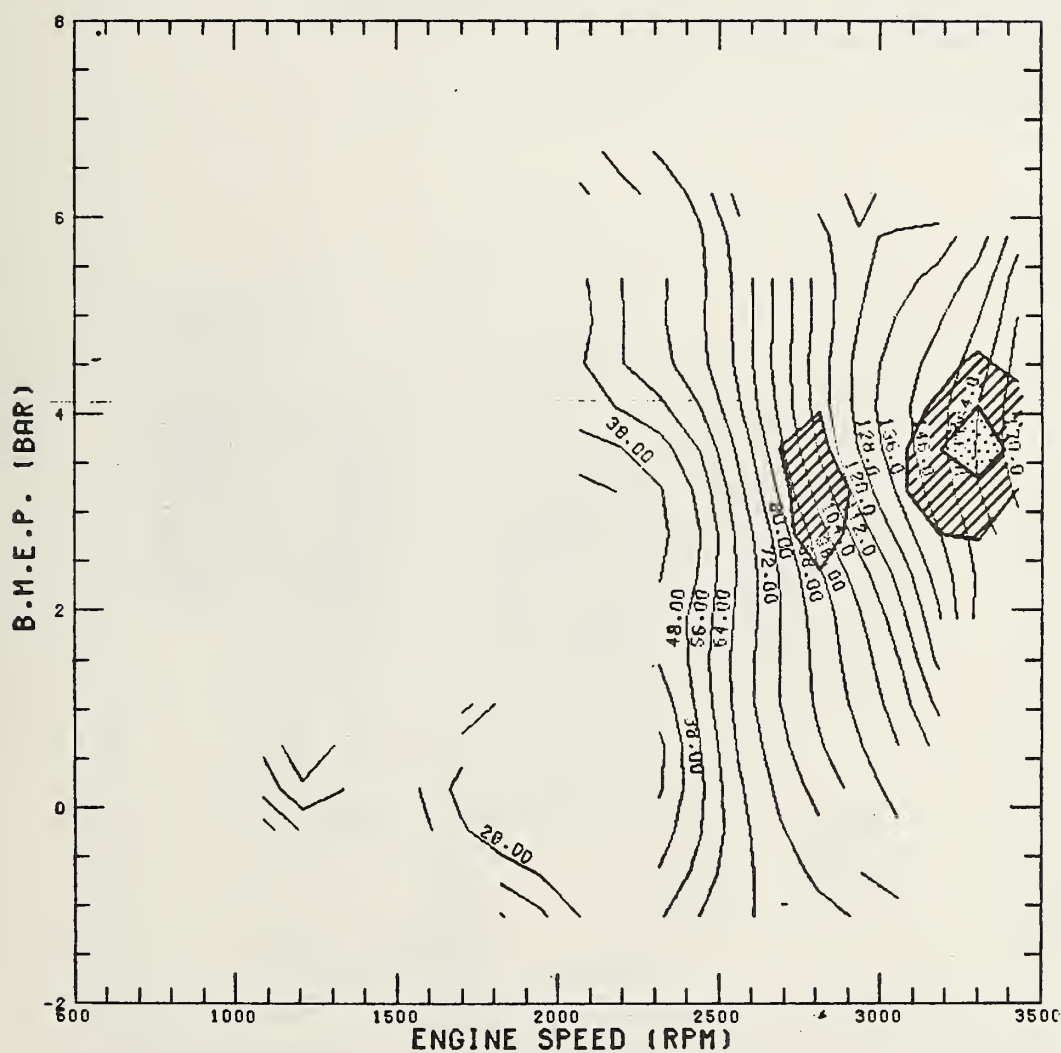
CO - EMISSION (G/H)

764.0 SEC HIGHWAY TEST DATE 11/08/77 14.50.33

TEST RESULT 25.24 G/ 10.25 MI = 2.46 G/MI

SHADED REGIONS 12.52 1.89 G

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



50 HP N.A. E.G.R.

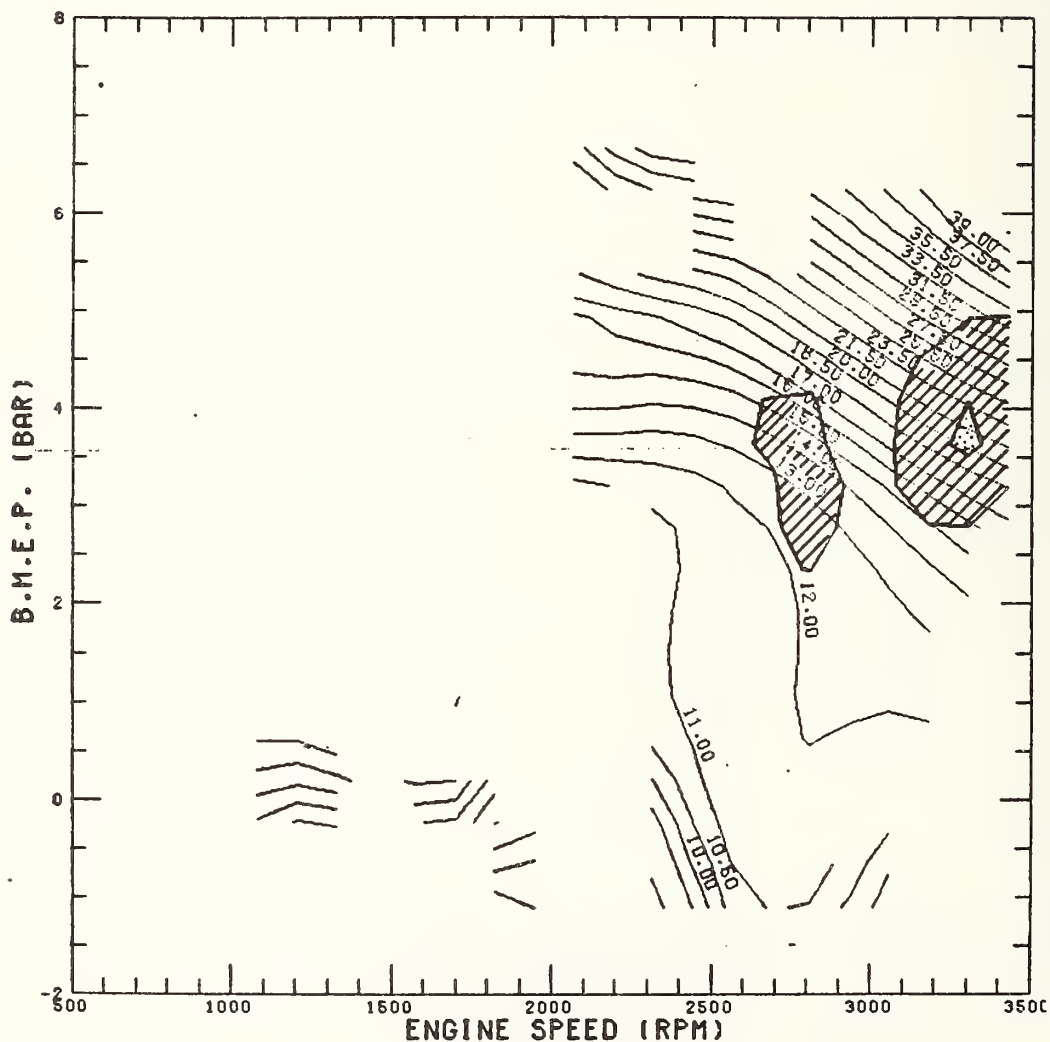
NOX - EMISSION (G/H)

764.0 SEC HIGHWAY TEST DATE 11/08/77 14.50.33

TEST RESULT 3.53 G/ 10.25 MI = 0.34 G/MI

SHADED REGIONS 1.76 0.39 G

VEHICLE 1020 KG MASS. 0.80 SQM CW=F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 3



70 HP TC 90 CID

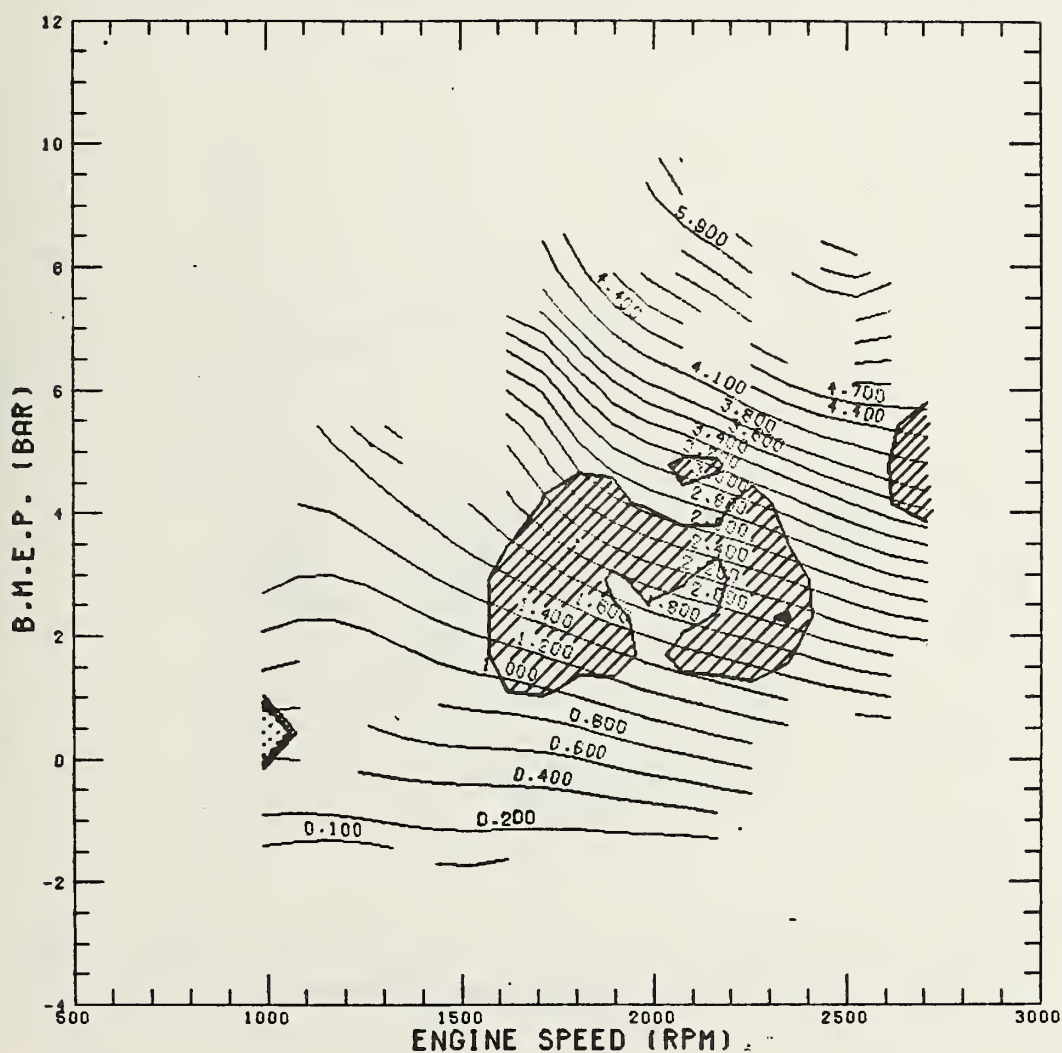
## FUEL CONSUMPTION (KG/H)

1372.0 SEC US-CITY TEST DATE 10/11/76 11.34.59

TEST RESULT 529.61 G/ 7.45 MI = 43.92 MPG

SHADED REGIONS 267.07 60.38 M

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC 90 CID

## AIR TO FUEL RATIO

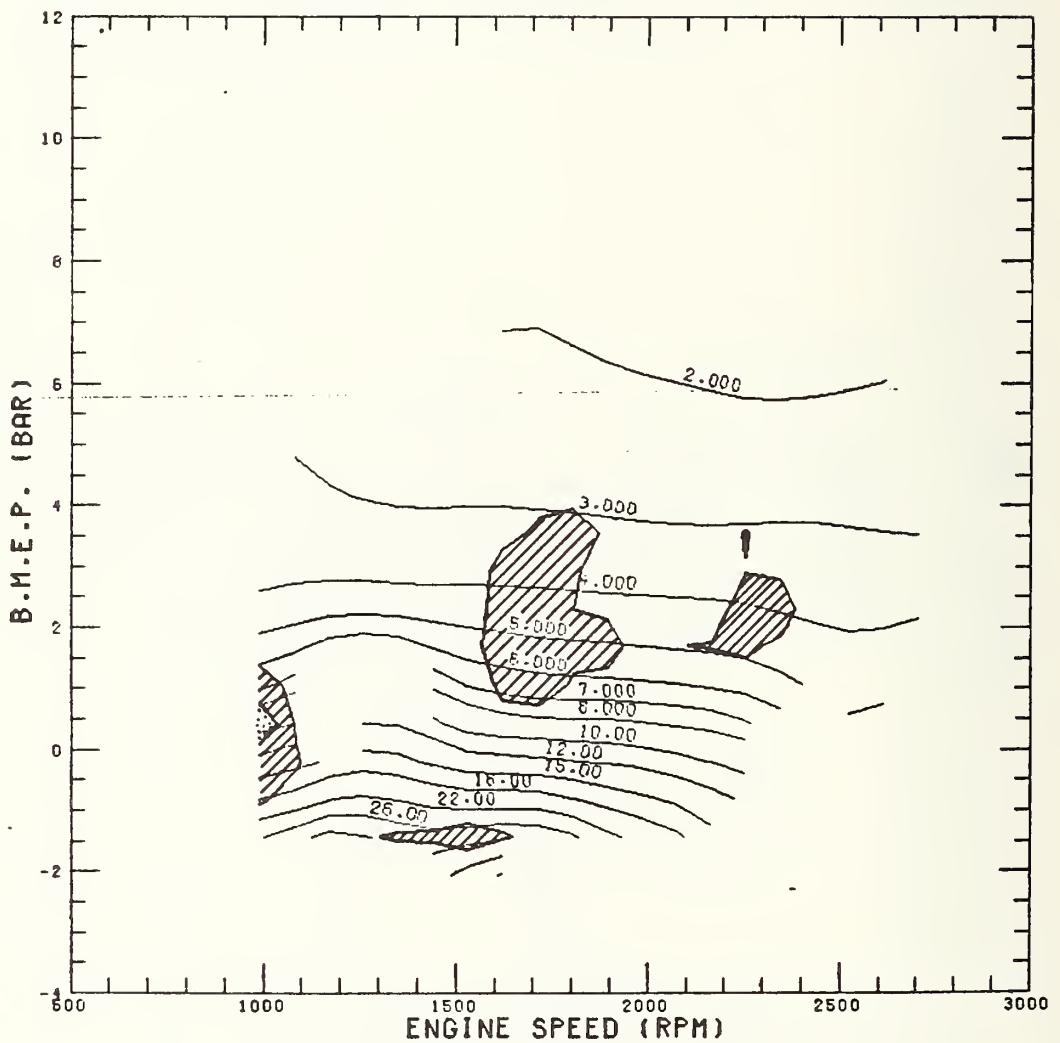
1372.0 SEC US-CITY TEST DATE 10/11/76 11.34.59

TEST RESULT 1372.25 S/ 7.45 MI = 19.54 MPH

SHADED REGIONS 679.50 281.75 M

VEHICLE 1020 KG MASS. 0.60 SQM CW\*F. 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 6



70 HP TC 90 CID

HC - EMISSION (G/H)

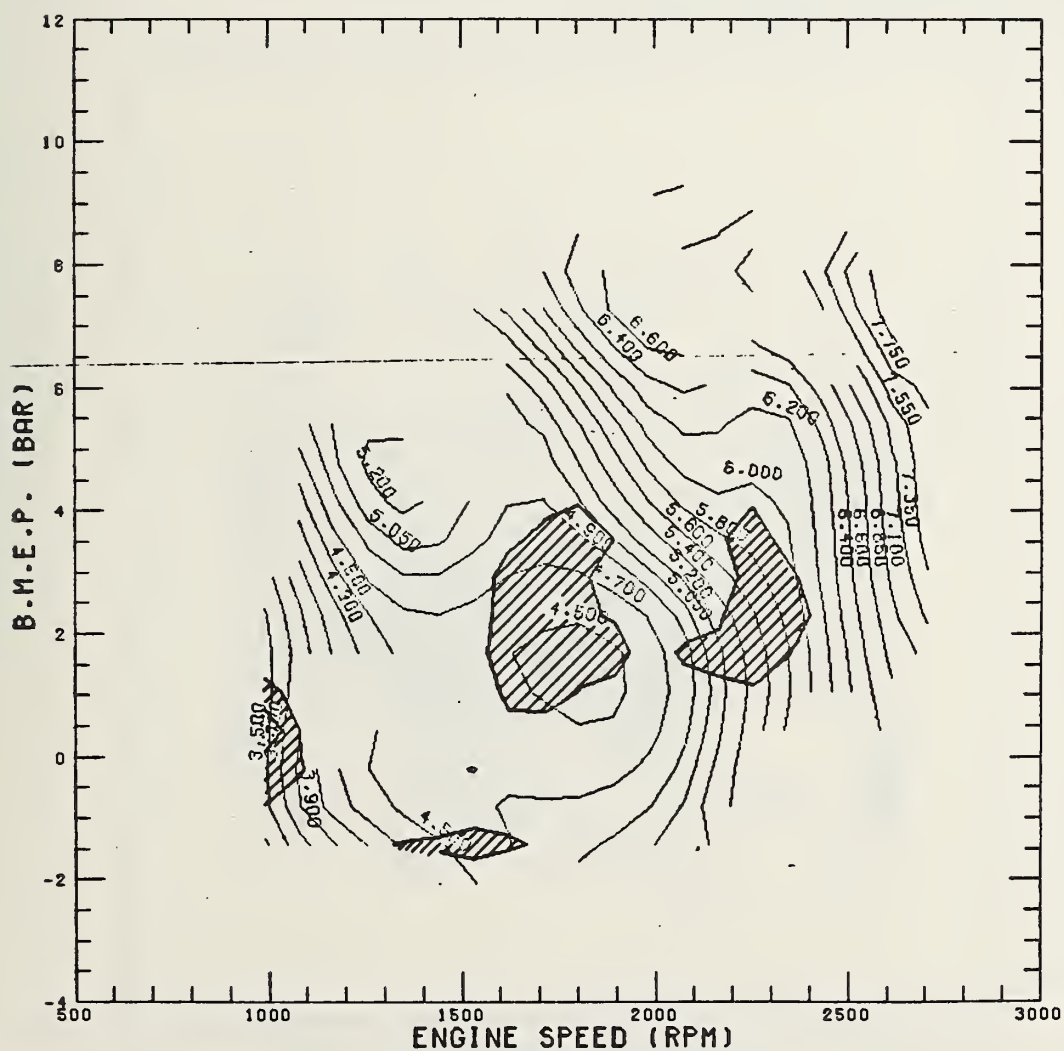
1372.0 SEC US-CITY TEST DATE 10/11/76 11.34.59

TEST RESULT 1.70 G/ 7.45 MI = 0.23 G/MI

SHADED REGIONS 0.84 0.28 G

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC 90 CID

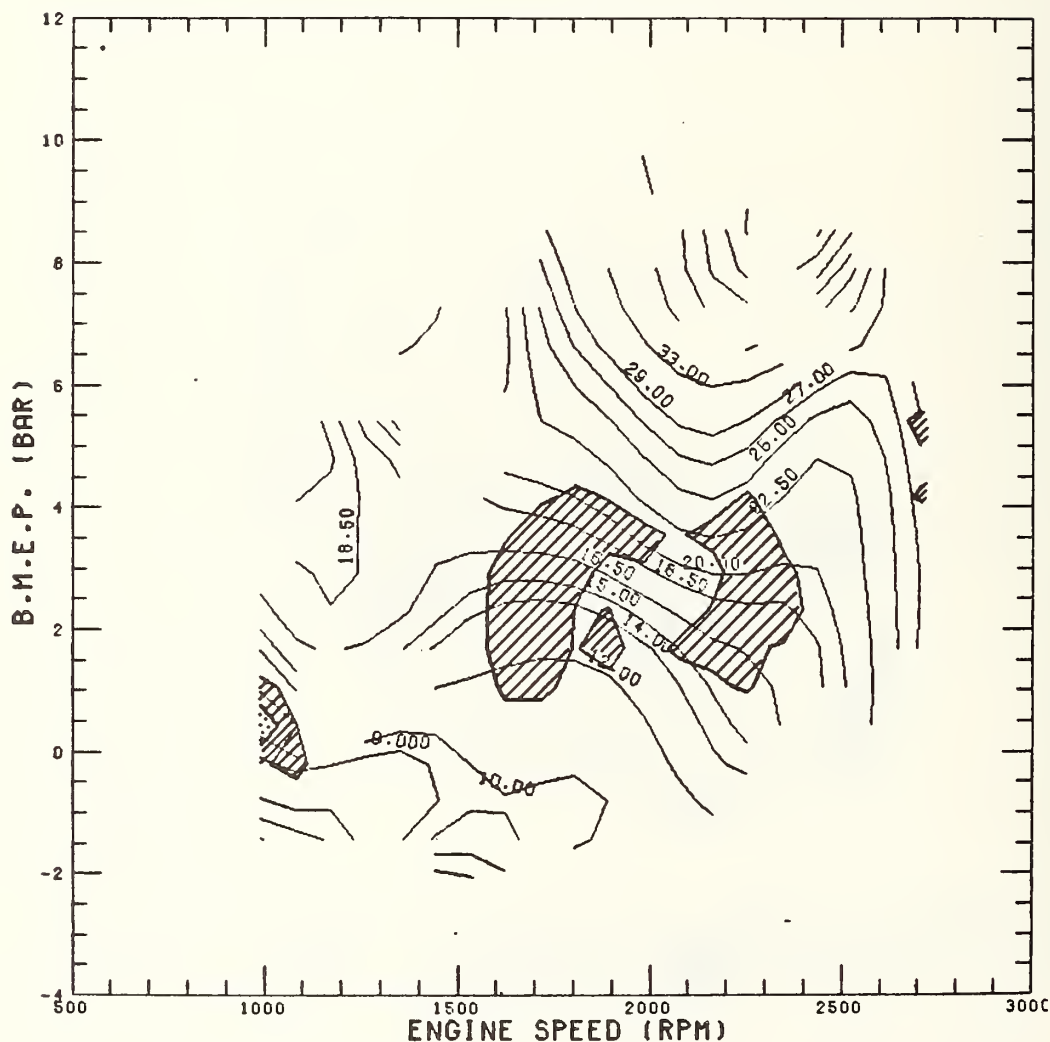
CO - EMISSION (G/H)

1372.0 SEC US-CITY TEST DATE 10/11/76. 11.34.59

TEST RESULT 5.39 G/ 7.45 MI = 0.72 G/MI

SHADED REGIONS 2.68 0.93 G

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC 90 CID

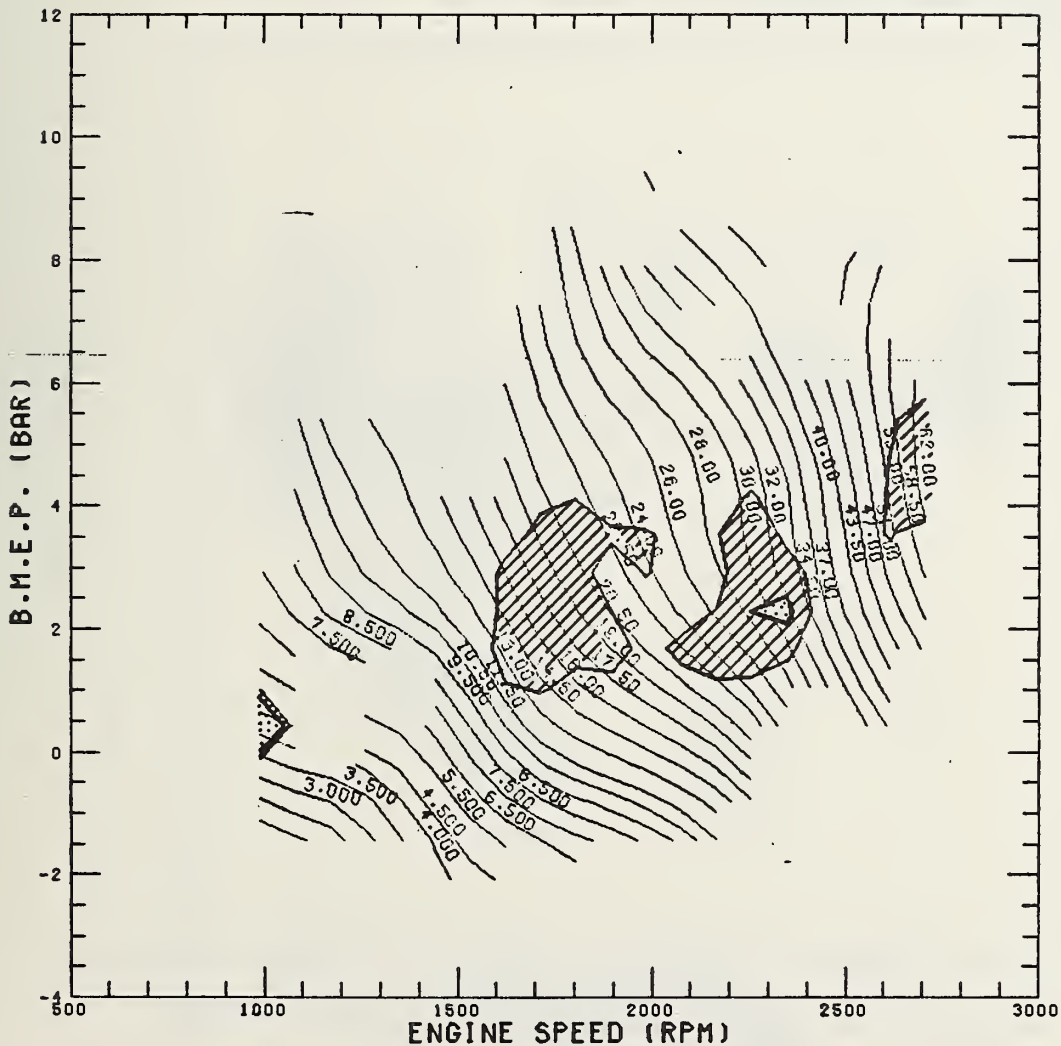
NOX - EMISSION (G/H)

1372.0 SEC US-CITY TEST DATE 10/11/76 11.34.59

TEST RESULT 6.00 G/ 7.45 MI = 0.80 G/MI

SHADED REGIONS 2.96 0.61 G

VEHICLE 1020 KG MASS. 0.80 SQM CW=F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC 90 CID

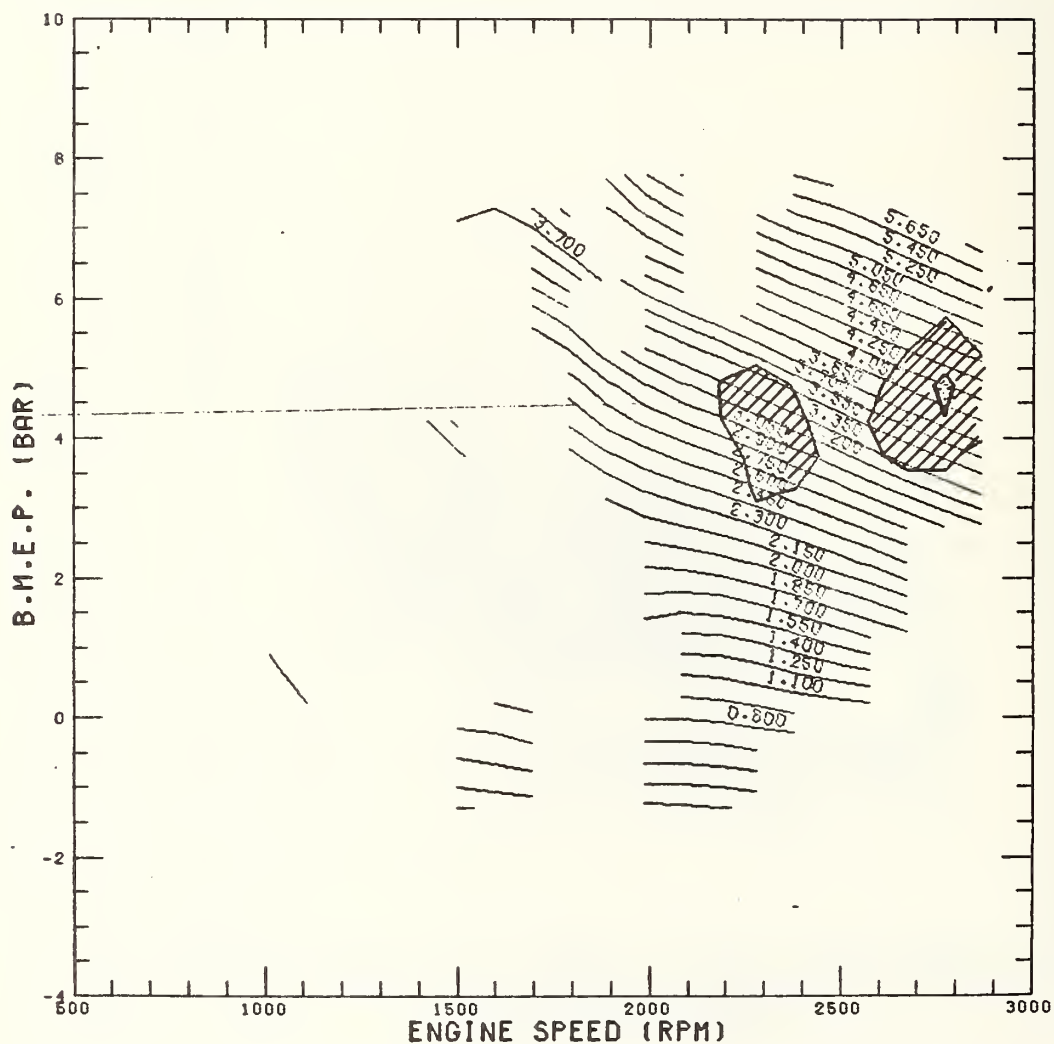
## FUEL CONSUMPTION (KG/H)

764.0 SEC HIGHWAY TEST DATE 10/11/76 13.03.54

TEST RESULT 688.17 G/ 10.25 MI = 46.51 MPG

SHADED REGIONS 336.02 72.69 M

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC 90 CID

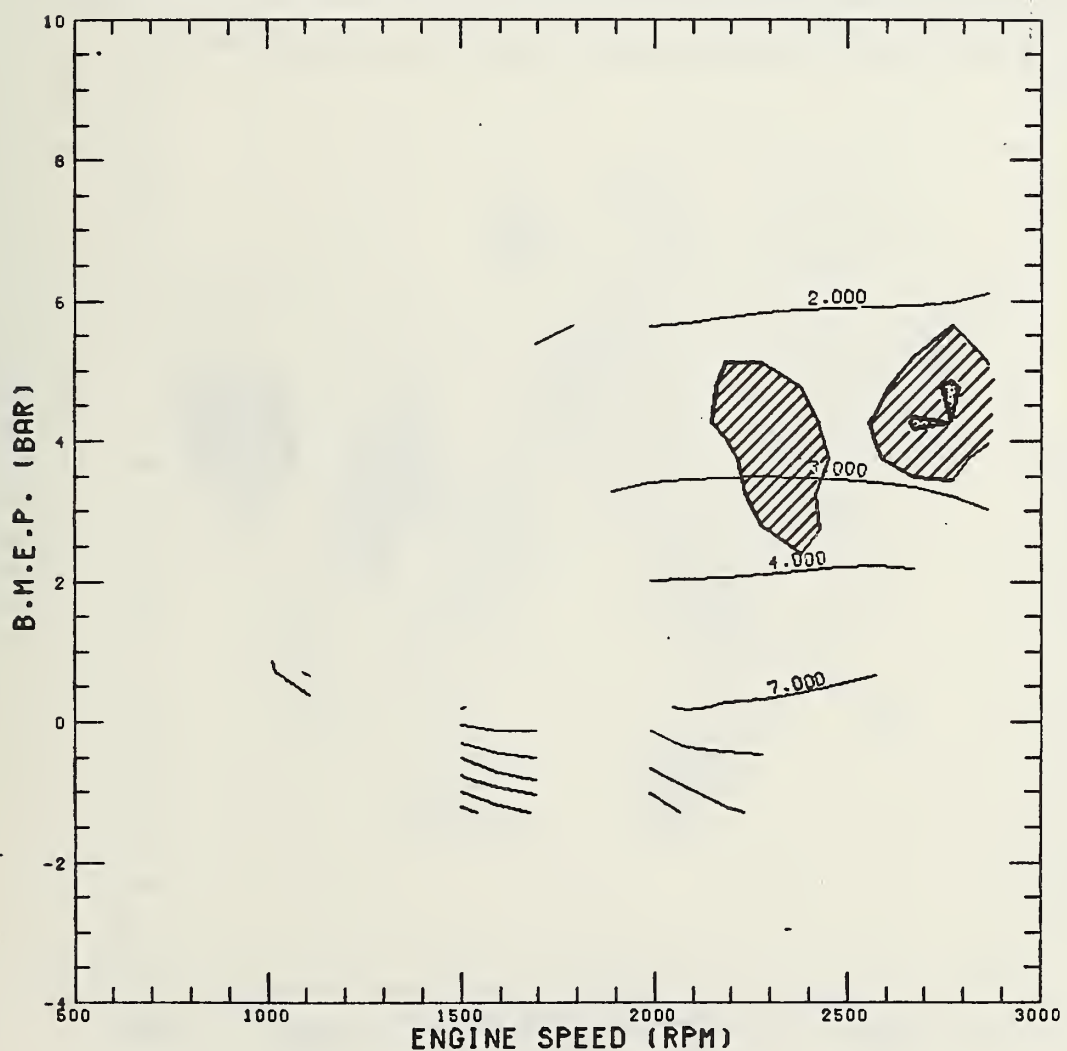
## AIR TO FUEL RATIO

764.0 SEC HIGHWAY TEST DATE 10/11/76 .13.03.54

TEST RESULT 764.25 S/ 10.25 MI = 48.28 MPH

SHADED REGIONS 377.37 95.25 M

VEHICLE 1020 KG MASS. 0.80 SQM CWF. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC 90 CID

## HC - EMISSION (G/H)

764.0 SEC HIGHWAY TEST DATE 10/11/76 13.03.54

TEST RESULT 0.83 G/ 10.25 MI = 0.08 G/MI

SHADED REGIONS 0.43 0.05 G

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC 90 CID

CO - EMISSION (G/H)

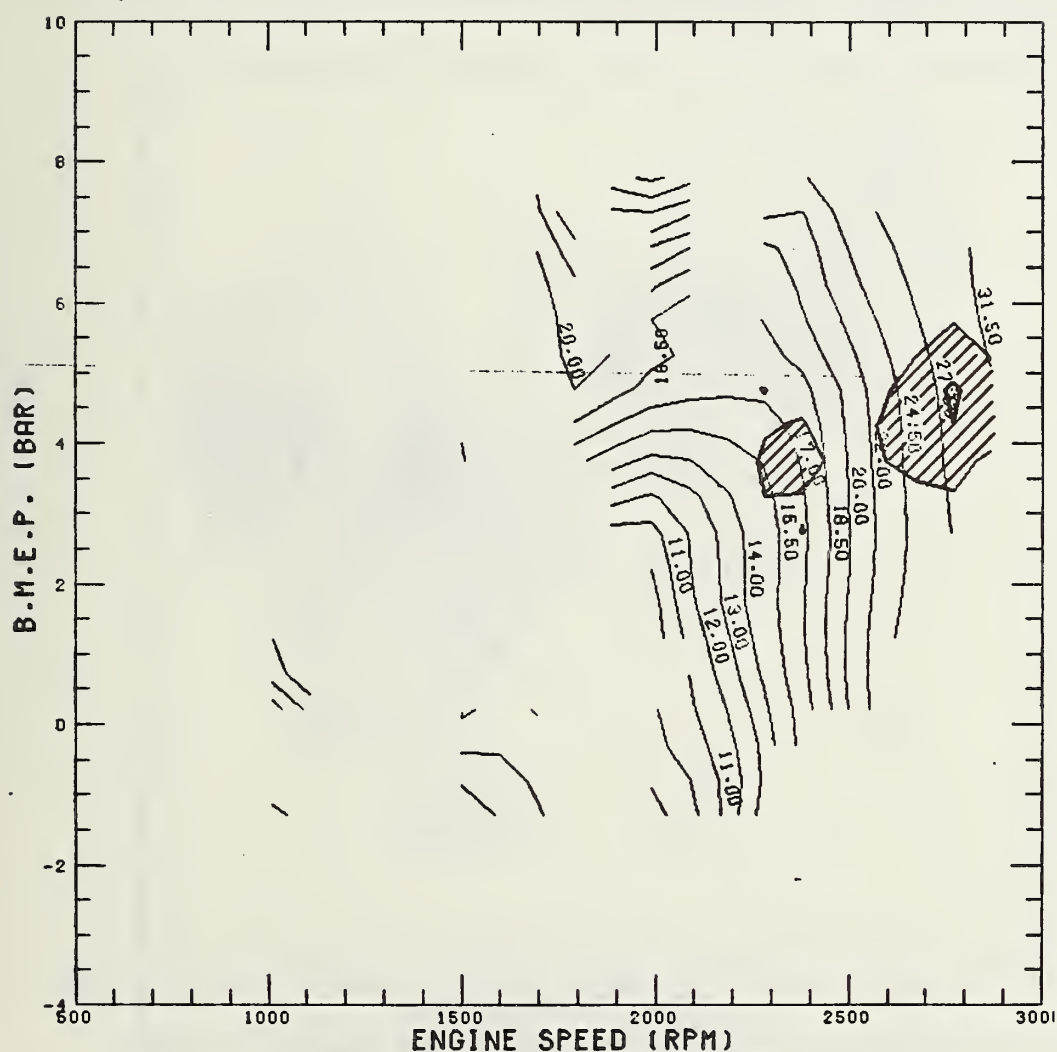
764.0 SEC HIGHWAY TEST DATE 10/11/76 13.03.54

TEST RESULT 4.16 G/ 10.25 MI = 0.41 G/MI

SHADED REGIONS 2.02 0.50 G

VEHICLE 1020 KG MASS. 0.80 SQM CH#F. 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC 90 CID

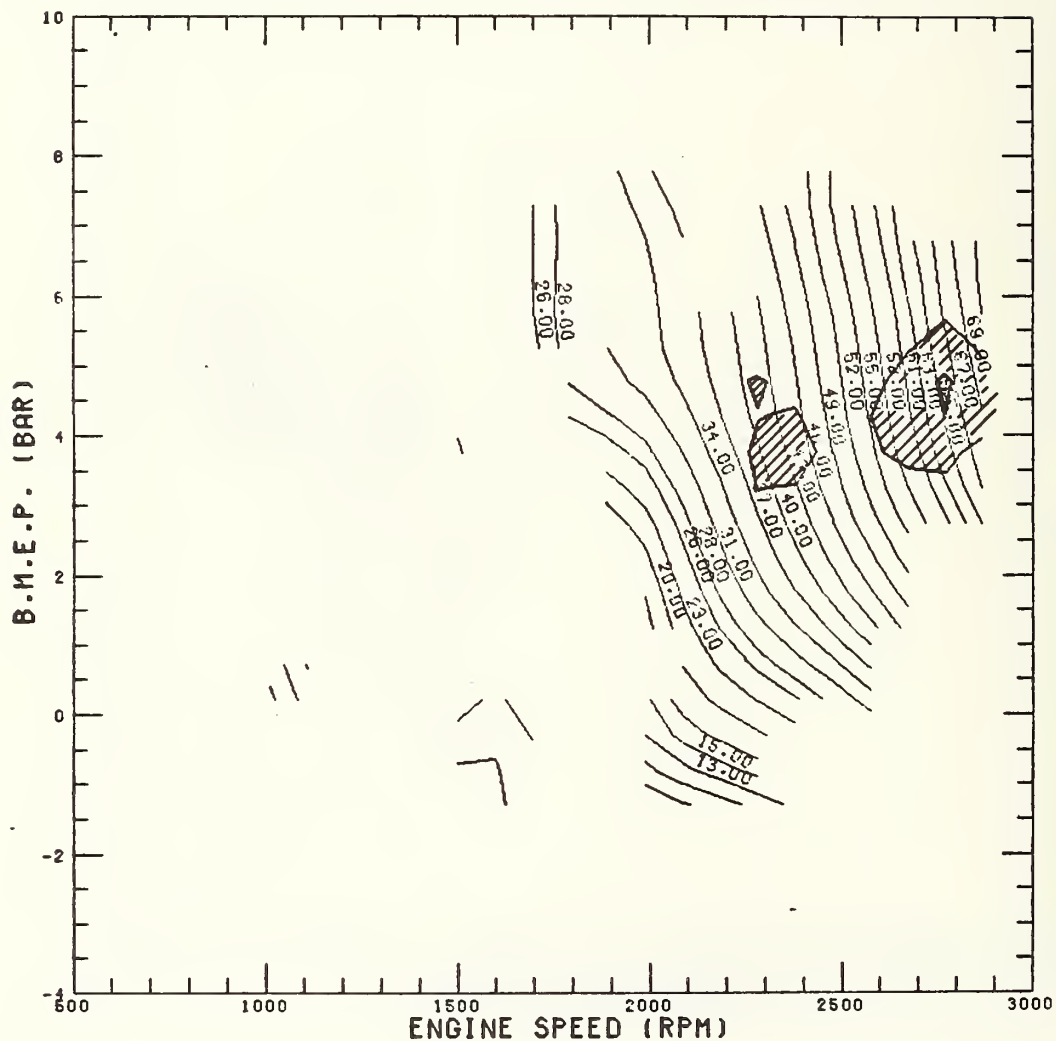
## NOX - EMISSION (G/H)

764.0 SEC HIGHWAY TEST DATE 10/11/76 13.03.54

TEST RESULT 9.49 G/ 10.25 MI = 0.93 G/MI

SHADED REGIONS 4.70 0.62 G

VEHICLE 1020 KG MASS, 0.80 SQM CWF, 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC E.G.R.

## FUEL CONSUMPTION (KG/H)

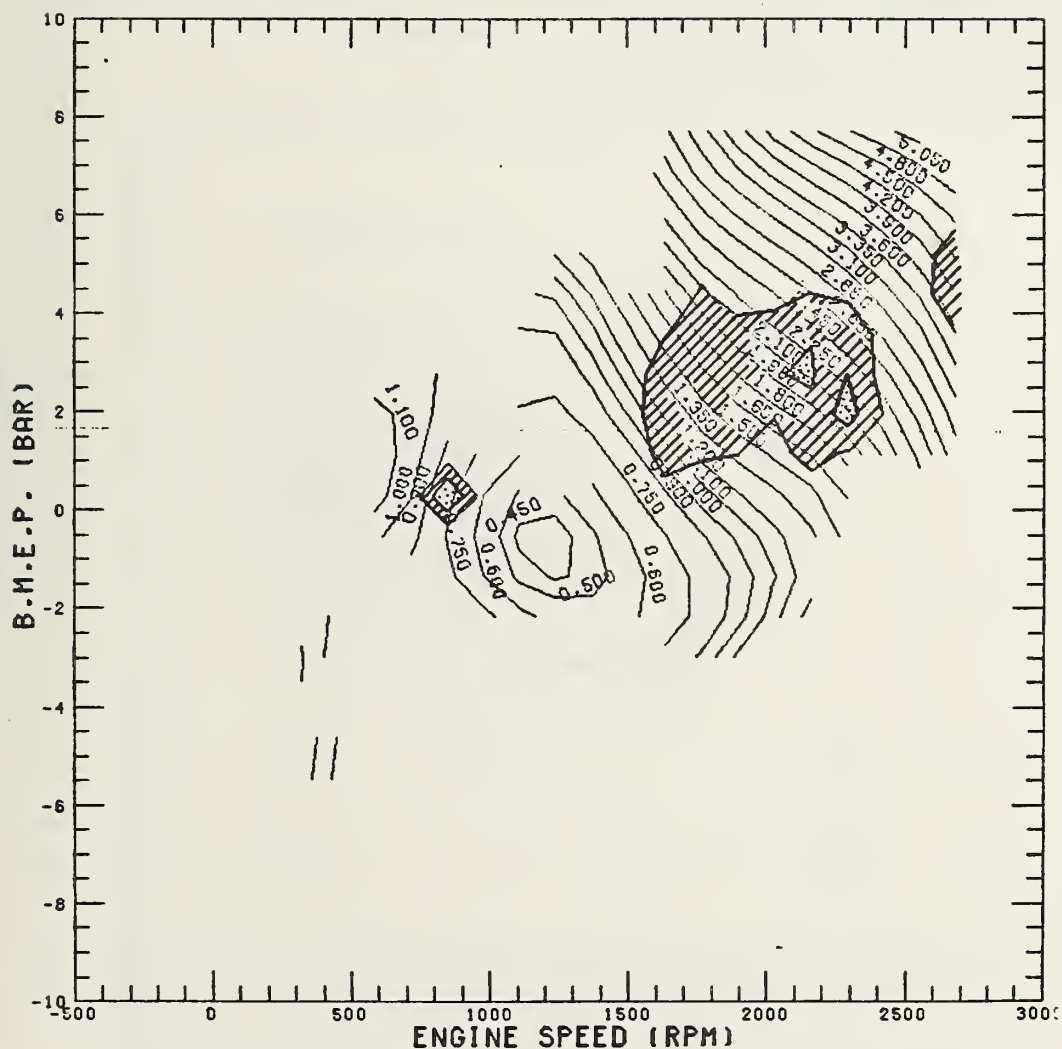
1372.0 SEC US-CITY TEST DATE 18/05/77 11.01.27

TEST RESULT 525.92 G/ 7.45 MI = 44.34 MPG

SHADED REGIONS 259.34 56.28 M

VEHICLE 1020 KG MASS. 0.80 SQM CM<sup>2</sup>F. 1.75 % ROLLING DRAG

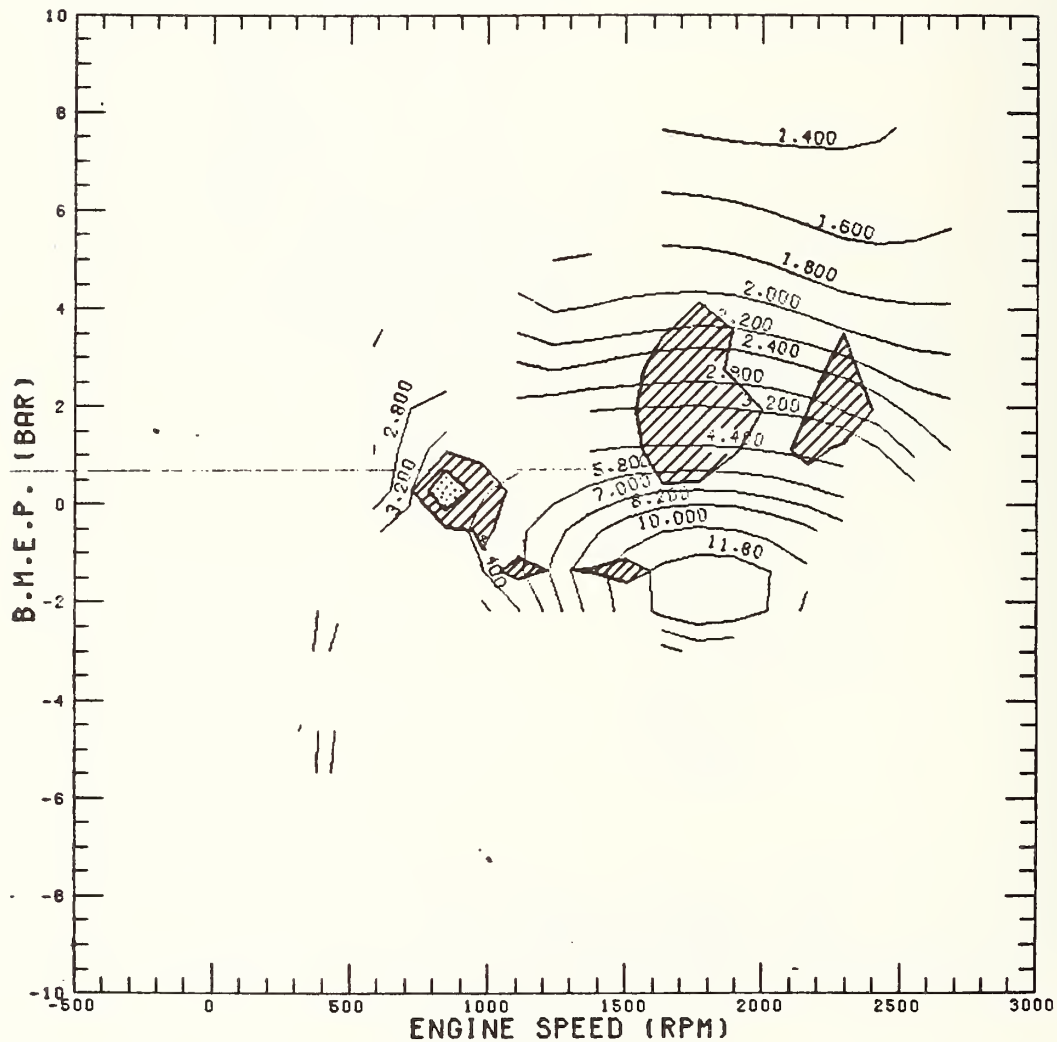
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



# AIR TO FUEL RATIO

TEST RESULT 1372.25 S/ 7.45 MI = 19.54 MPH

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC E.G.R.

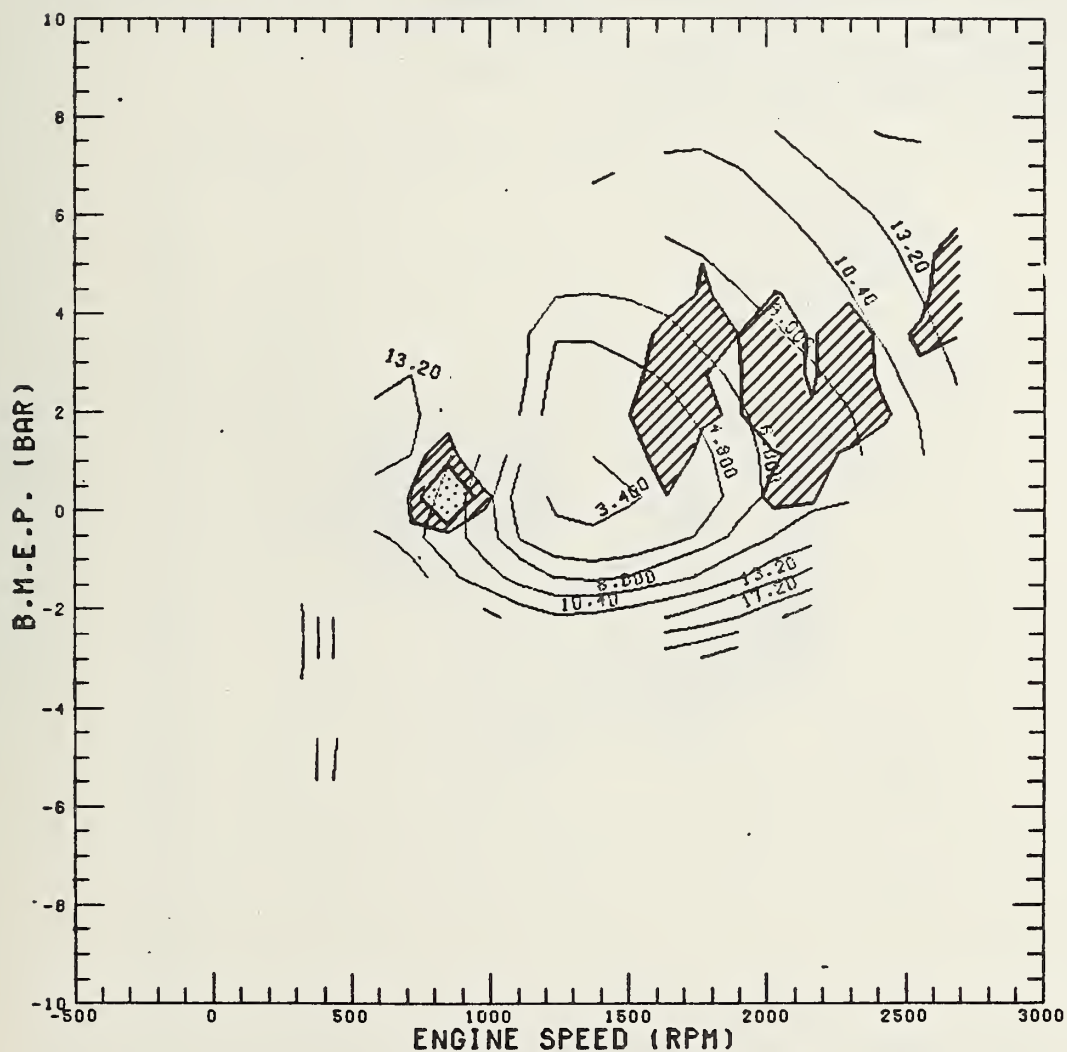
HC - EMISSION (G/H)

1372.0 SEC US-CITY TEST DATE 18/05/77 11-01-27

TEST RESULT 2.21 G/ 7.45 MI = 0.30 G/MI .

SHADED REGIONS 1.11 0.17 G

VEHICLE 1020 KG MASS. 0.80 SOM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 6



70 HP TC E.G.R.

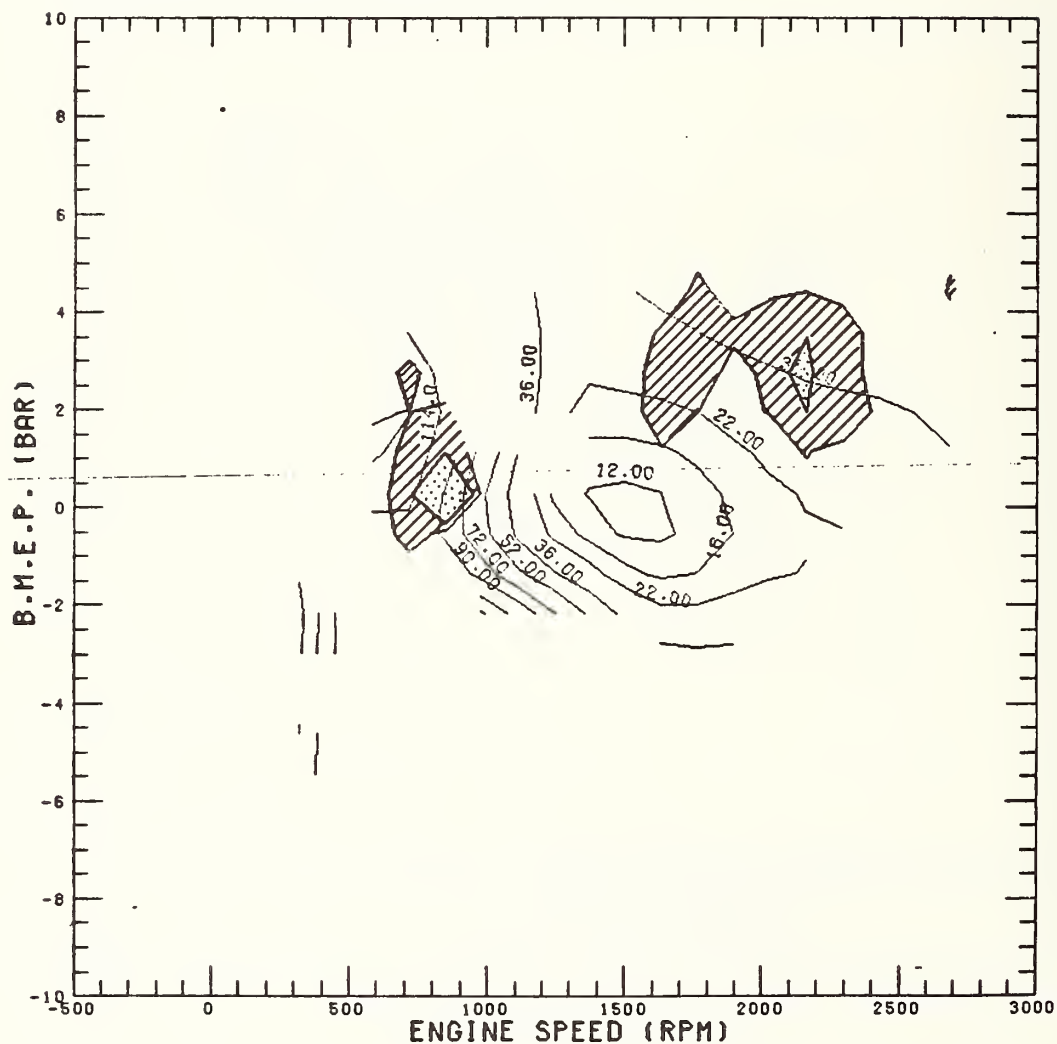
CO - EMISSION (G/H)

1372.0 SEC US-CITY TEST DATE 18/05/77 11.01.27

TEST RESULT 10.49 G/ 7.45 MI = 1.41 G/MI

SHADED REGIONS 5.12 0.90 G

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC E.G.R.

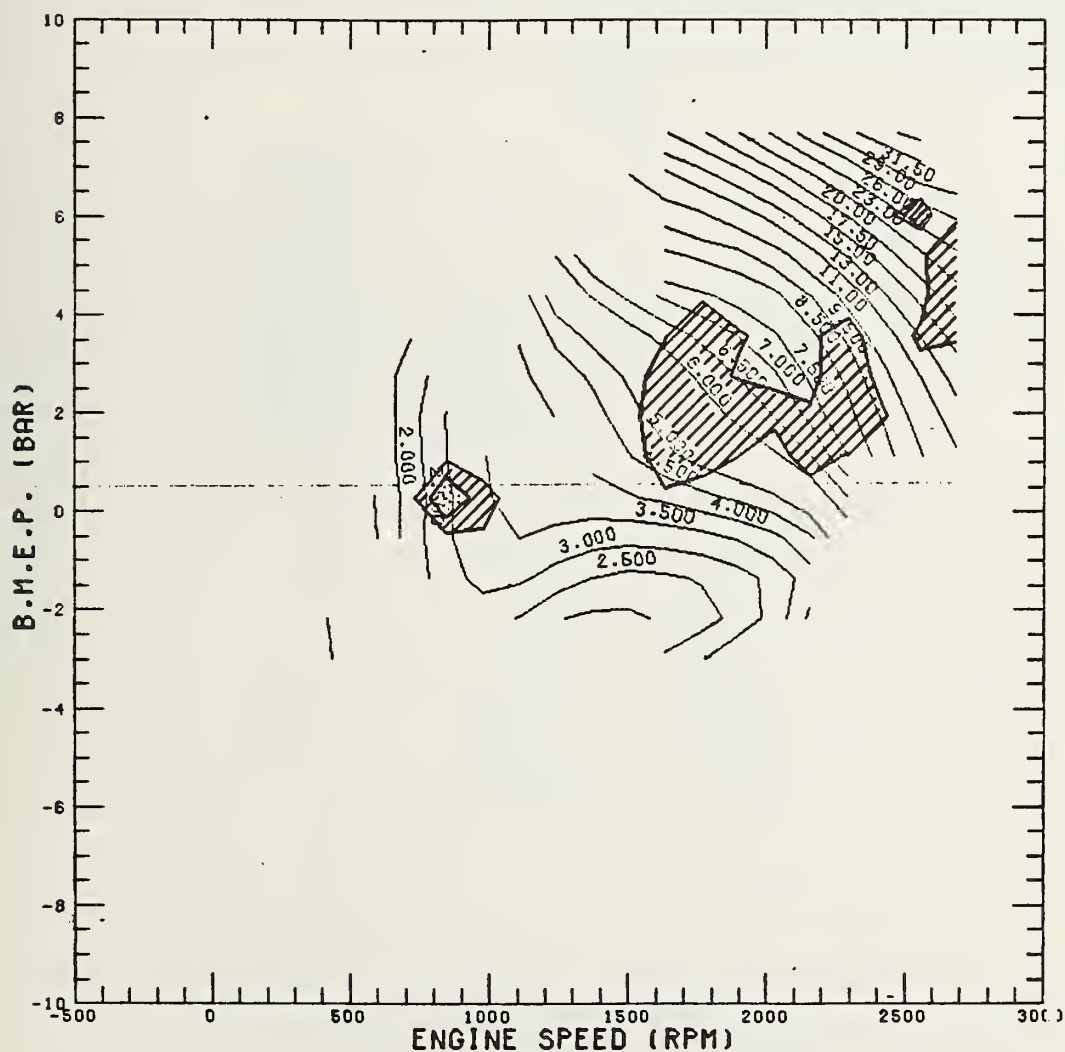
## NOX - EMISSION (G/H)

1372.0 SEC US-CITY TEST DATE 18/05/77 11.01.27

TEST RESULT 2.40 G/ 7.45 MI = 0.32 G/MI

SHADED REGIONS 1.19 0.25 G

VEHICLE 1020 KG MASS. 0.80 SOM CW=F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC E.G.R.

## FUEL CONSUMPTION (KG/H)

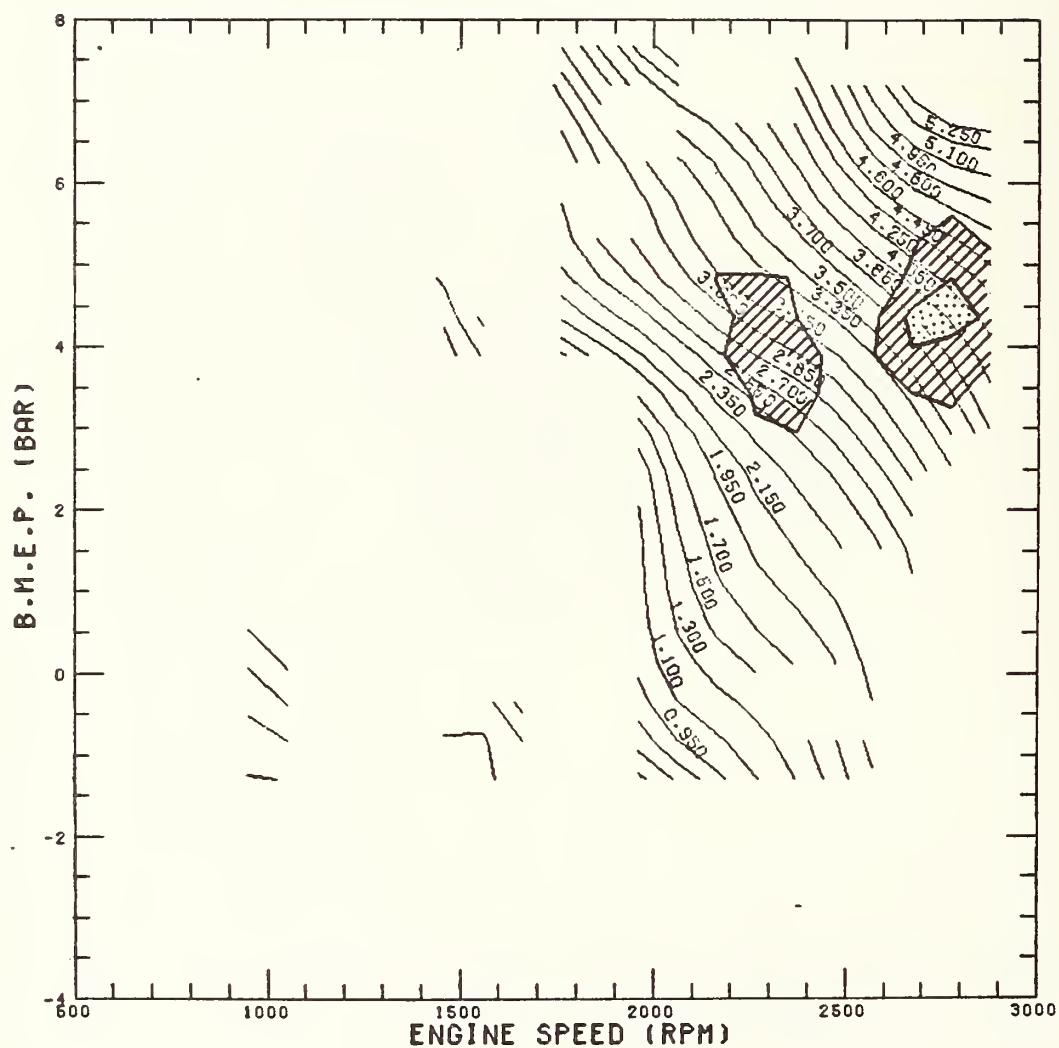
764.0 SEC HIGHWAY TEST DATE 18/05/77 14.21.38

TEST RESULT 671.84 G/ 10.25 MI = 47.76 MPG

SHADED REGIONS 337.47 93.14 M

VEHICLE 1020 KG MASS. 0.80 SQM CW=F. 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC E.G.R.

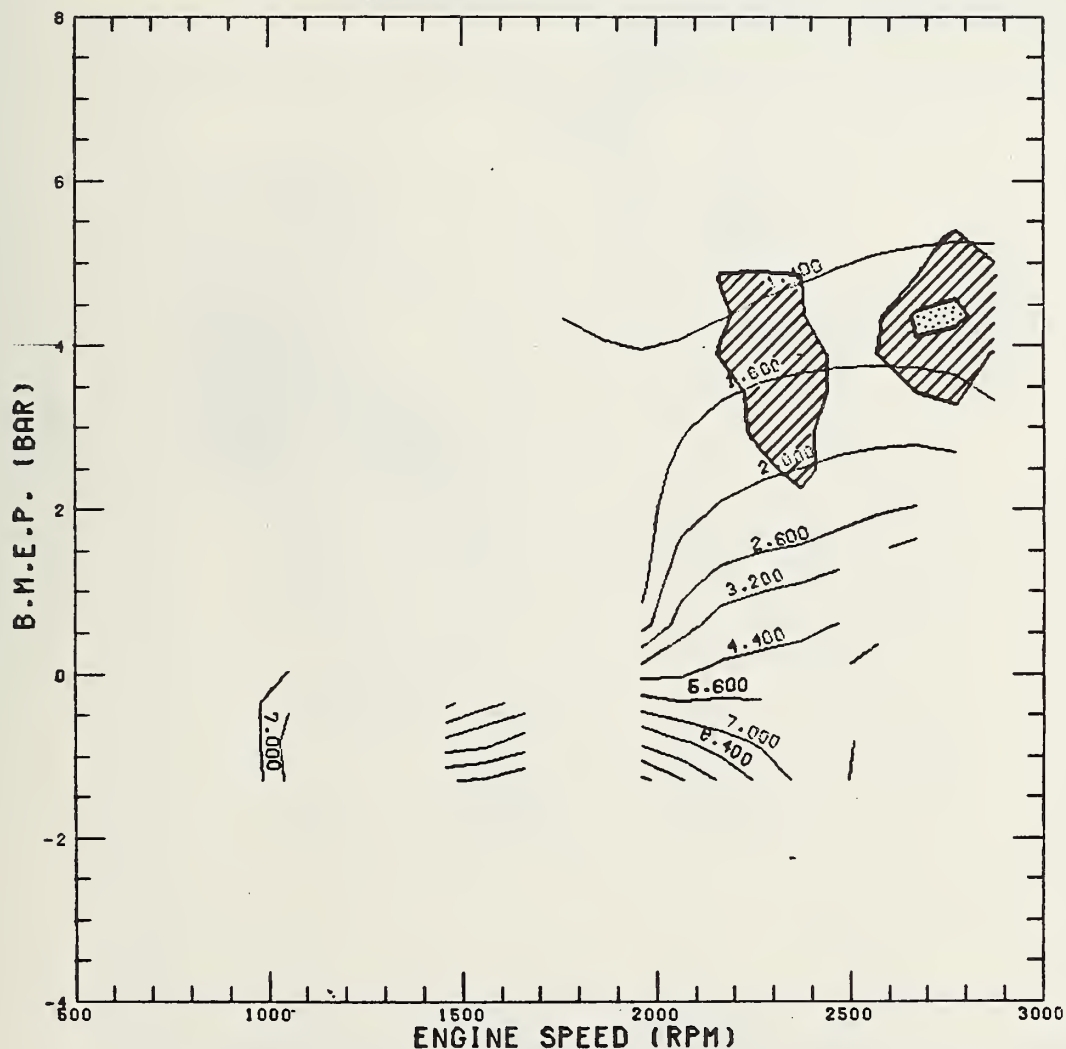
## AIR TO FUEL RATIO

764.0 SEC HIGHWAY TEST DATE 18/05/77 14.21.38

TEST RESULT 764.25 S/ 10.25 MI = 48.28 MPH

SHADED REGIONS 391.75 88.87 M

VEHICLE 1020 KG MASS. 0.80 SQM CH\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC E.G.R.

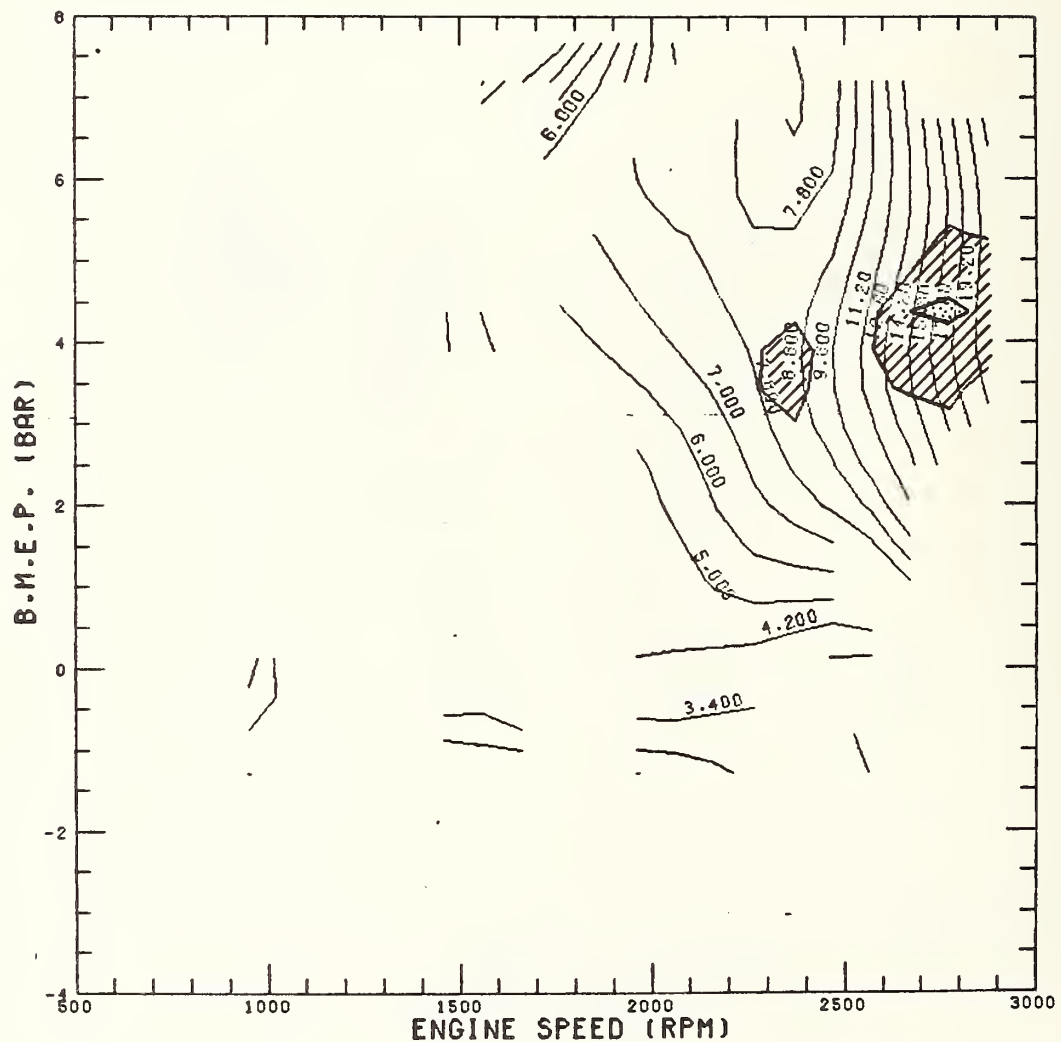
## HC - EMISSION (G/H)

764.0 SEC HIGHWAY TEST DATE 18/05/77 14.21.38

TEST RESULT 2.24 G/ 10.25 MI = 0.22 G/MI

SHADED REGIONS 1.12 0.15 G

VEHICLE 1020 KG MASS, 0.80 SQM CW\*F, 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC E.G.R.

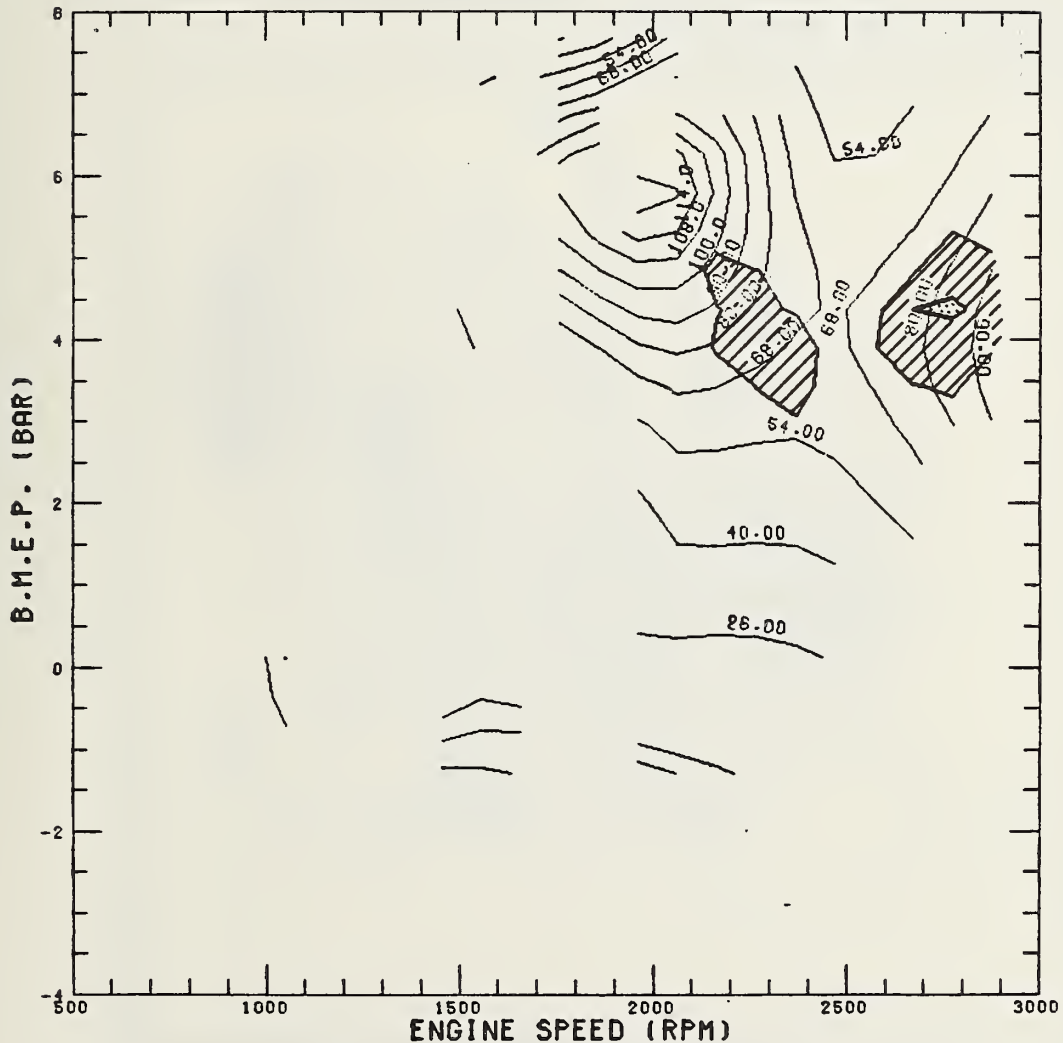
CO - EMISSION (G/H)

764.0 SEC HIGHWAY TEST DATE 18/05/77 14.21.38

TEST RESULT 14.22 G/ 10.25 MI = 1.39 G/MI

SHADED REGIONS 7.18 1.46 G

VEHICLE 1020 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



70 HP TC E.G.R.

NOX - EMISSION (G/H)

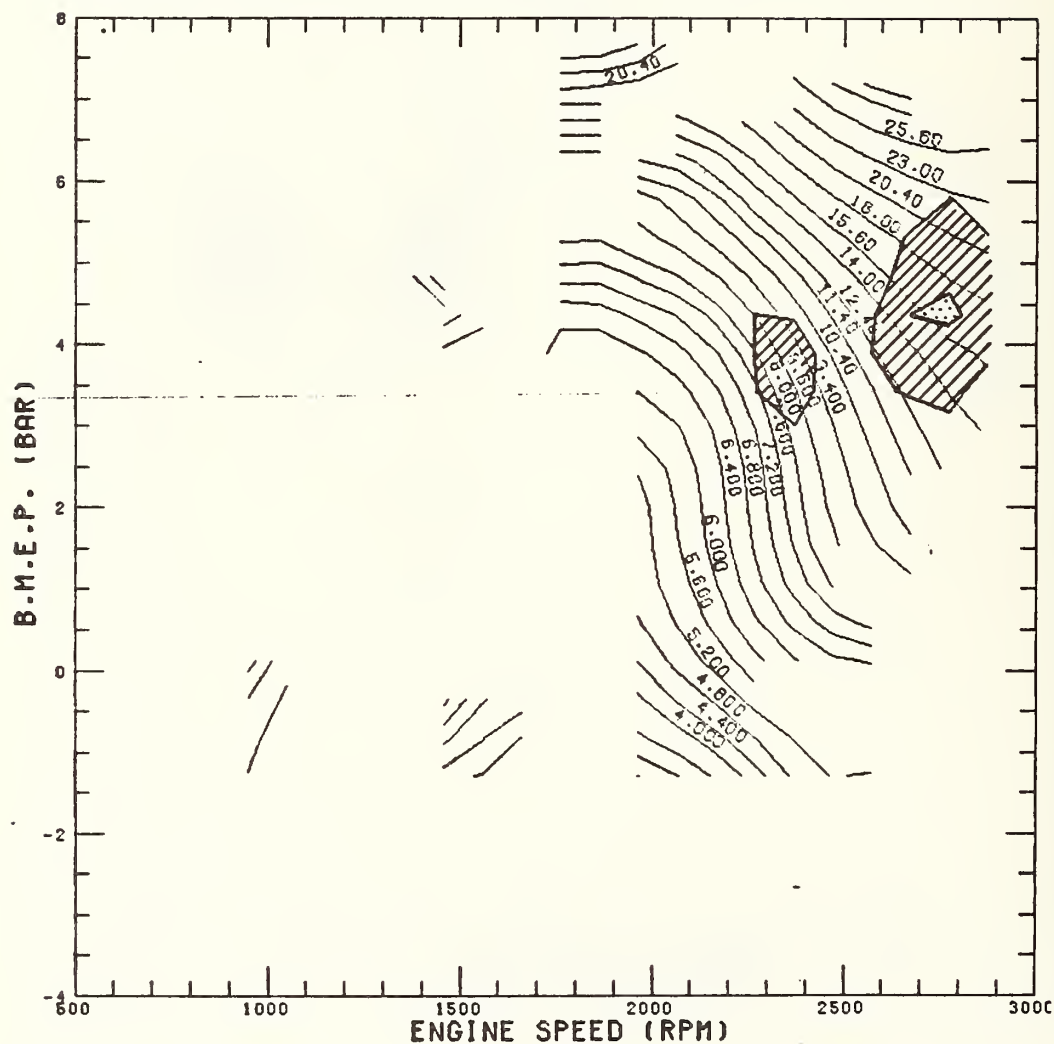
764.0 SEC HIGHWAY TEST DATE 18/05/77 14.21.38

TEST RESULT 2.49 G/ 10.25 MI = 0.24 G/MI

SHADED REGIONS 1.23 0.15 G

VEHICLE 1020 KO MASS. 0.80 SQM CW=F. 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 8



5 CYL. N.A. 130 CID

## FUEL CONSUMPTION (KG/H)

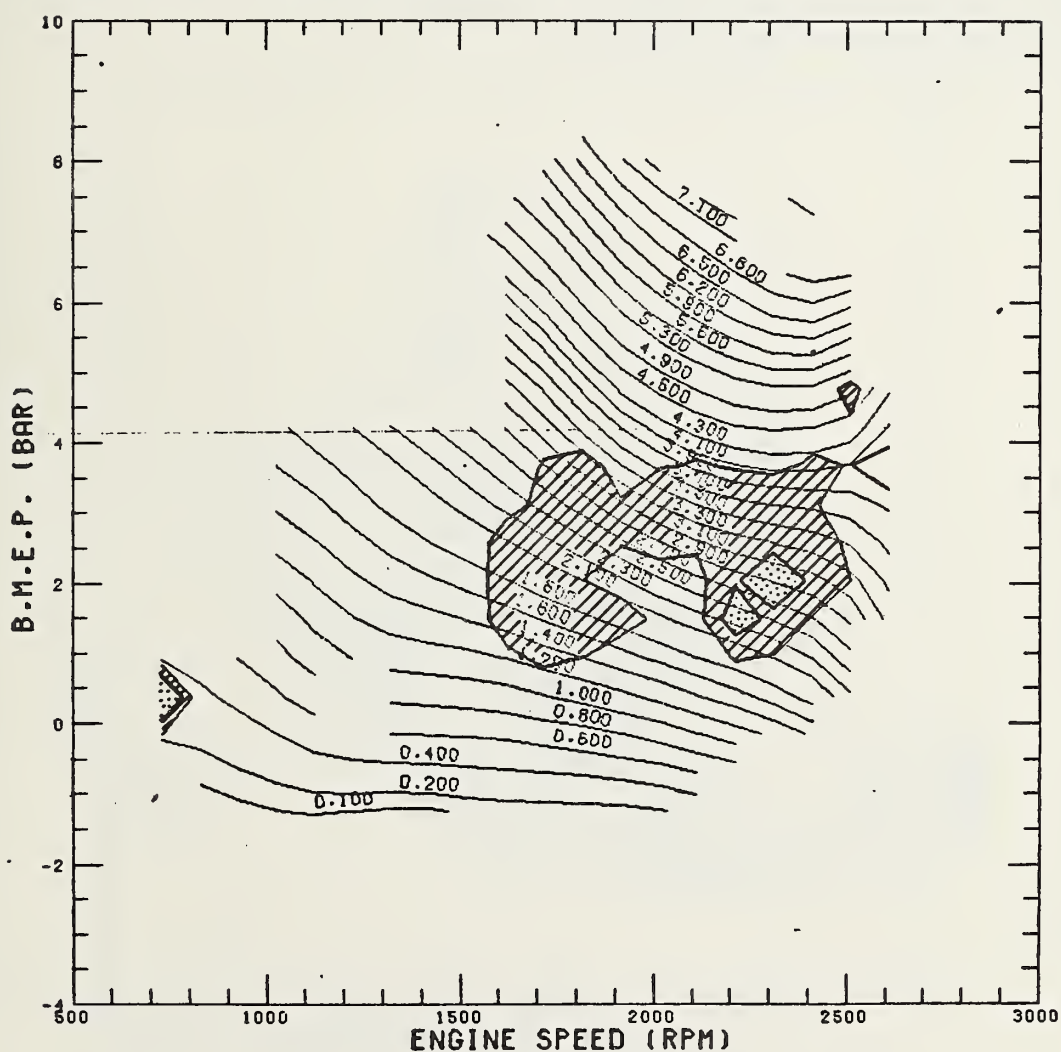
1372.0 SEC US-CITY TEST DATE 15/09/76 15.27.40

TEST RESULT 670.11 G/ 7.45 MI = 35.05 MPG

SHADED REGIONS 337.91 56.98 M

VEHICLE 1362 KG MASS, 0.80 SQM CW\*F, 1.75 % ROLLING DRAG

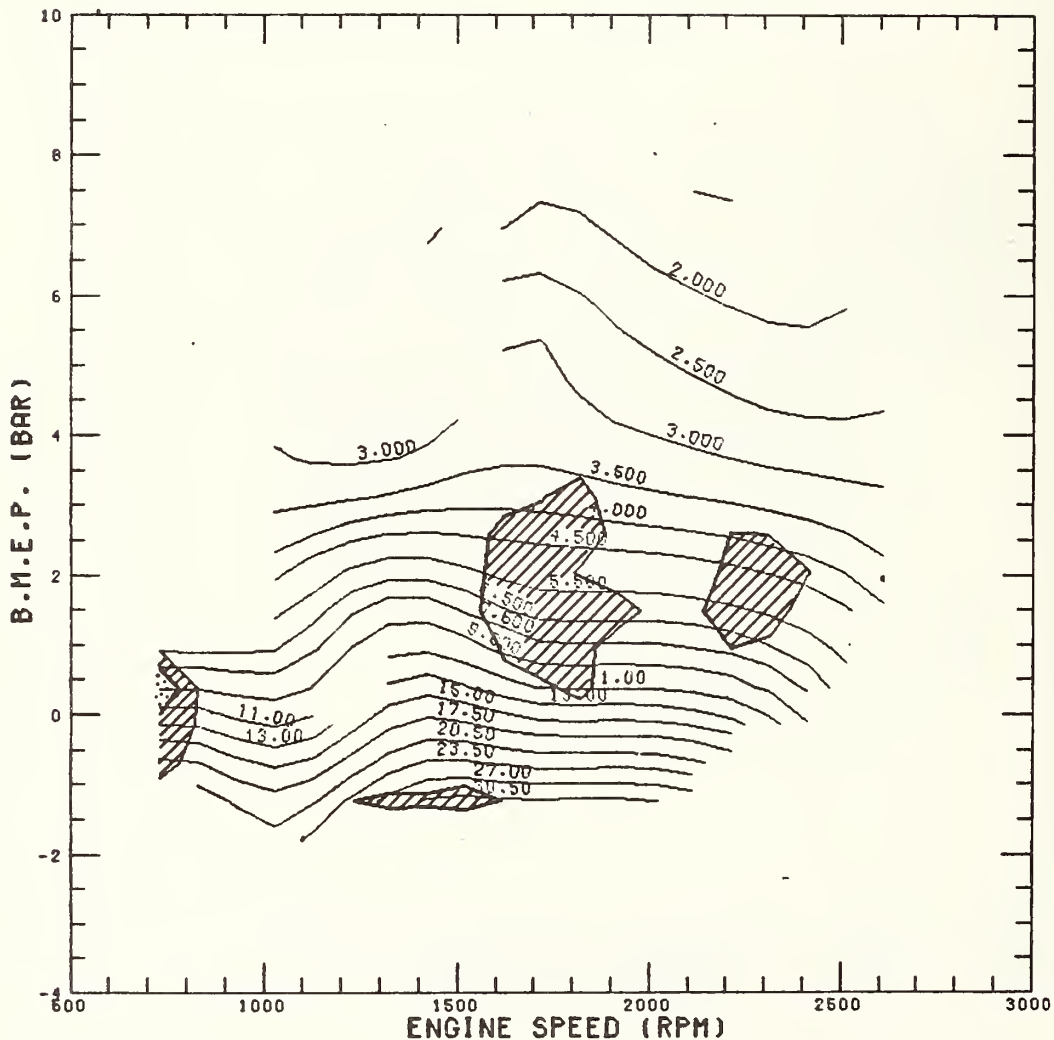
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



# AIR TO FUEL RATIO

TEST RESULT 1372.25 S/ 7.45 MI = 19.54 MPH

VEHICLE 1362 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



5 CYL. N.A. 130 CID

HC - EMISSION (G/H)

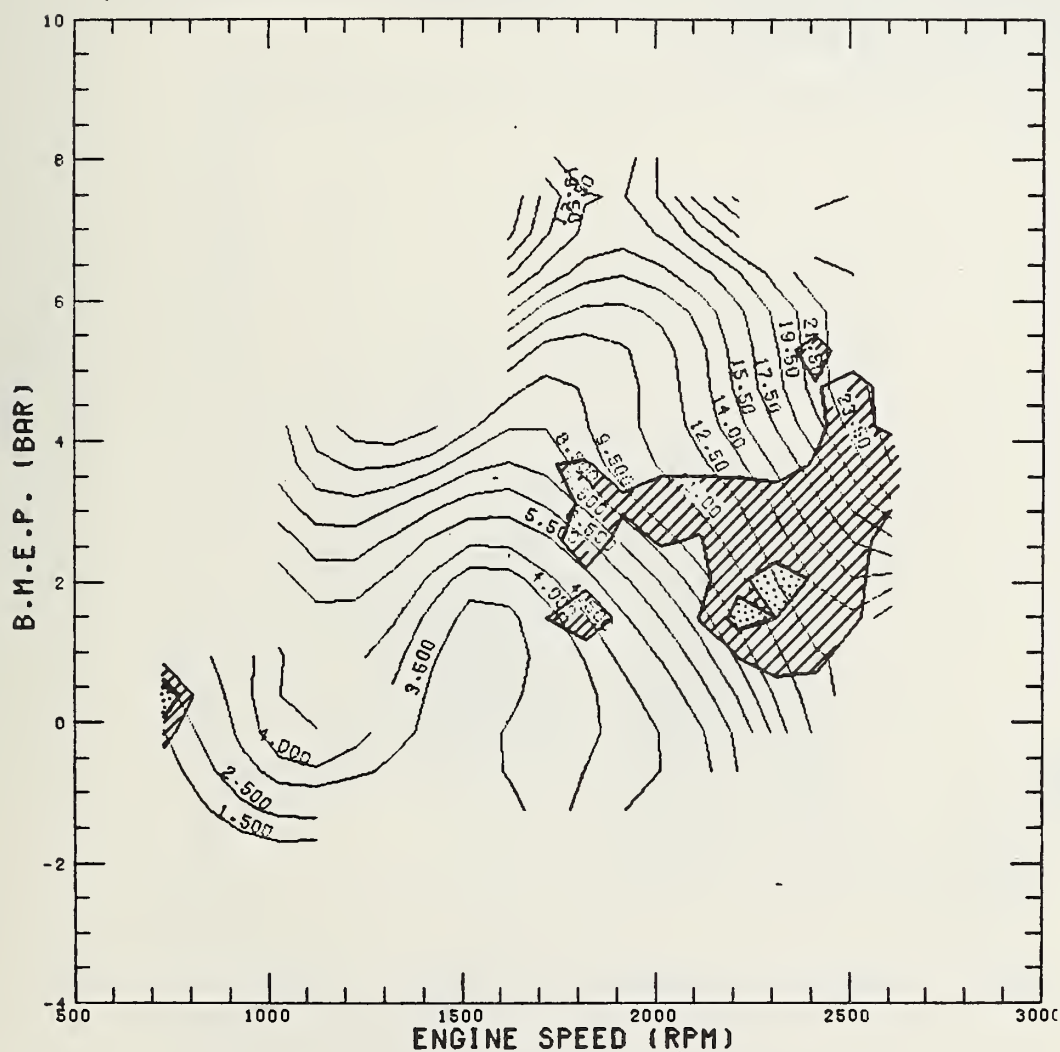
1372.0 SEC US-CITY TEST DATE 15/09/76 15.27.40

TEST RESULT 2.35 G/ 7.45 MI = 0.32 G/MI

SHADED REGIONS 1.19 0.23 G

VEHICLE 1362 KG MASS. 0.80 SQM CWF. 1.75 % ROLLING DRAG

TRANSMISSION AXLE/GEAR COMBINATION NO. 8



5 CYL. N.A. 130 CID

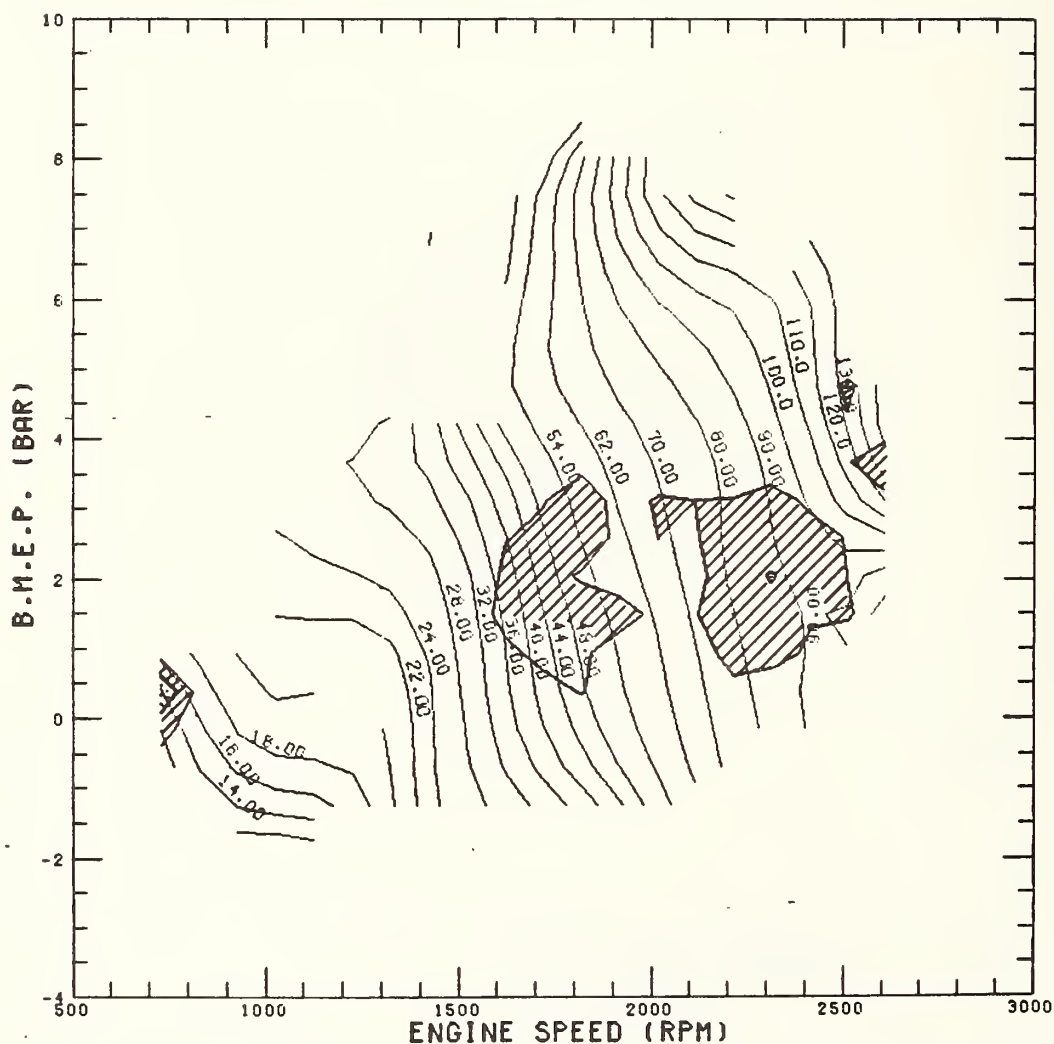
CO - EMISSION (G/H)

1372.0 SEC US-CITY TEST DATE 15/09/76 15.27.40

TEST RESULT 17.44 G/ 7.45 MI = 2.34 G/MI

SHADED REGIONS 8.61 2.03 G

VEHICLE 1362 KG MASS, 0.80 SQM CW\*F, 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



5 CYL. N.A. 130 CID

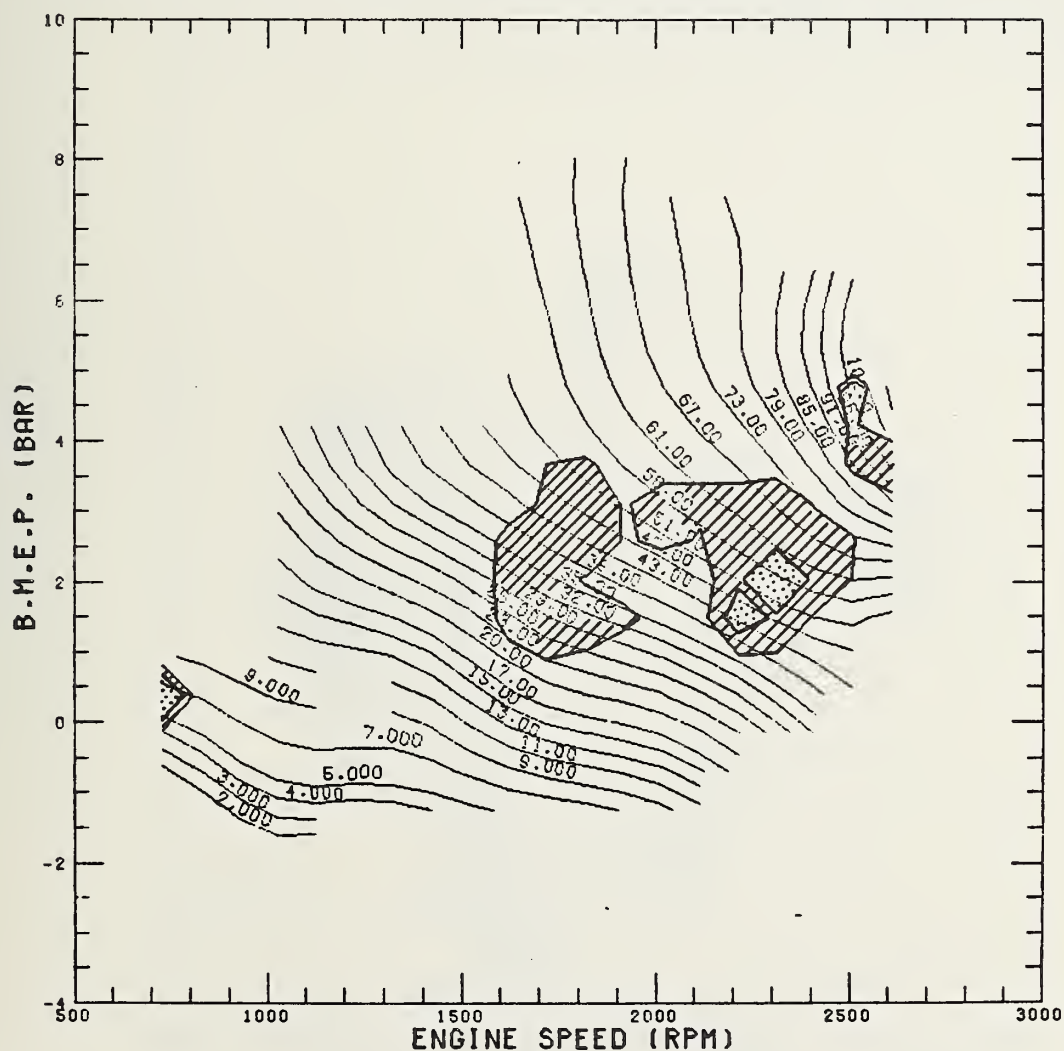
# NOX - EMISSION (G/H)

1372.0 SEC US-CITY TEST DATE 15/09/76 15.27.40

TEST RESULT 11.13 G/ 7.45 MI = 1.49 G/MI

SHADED REGIONS 5.56 1.10 G

VEHICLE 1362 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



5 CYL. N.A. 130 CID

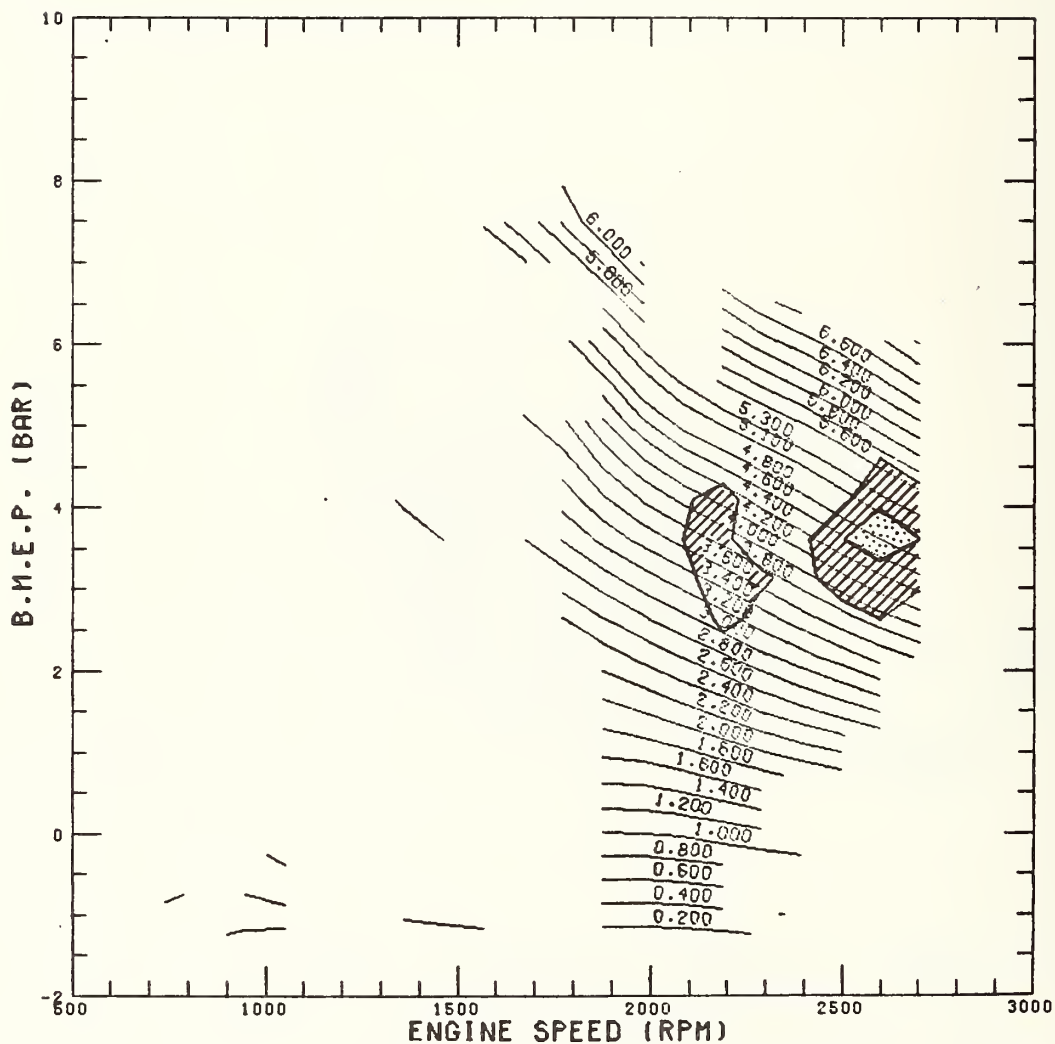
## FUEL CONSUMPTION (KG/H)

764.0 SEC HIGHWAY TEST DATE 15/09/76 15.49.37

TEST RESULT 810.15 G/ 10.25 MI = 39.89 MPG

SHADED REGIONS 409.52 93.46 M

VEHICLE 1362 KG MASS, 0.80 SQM CW\*F, 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



5 CYL. N.A. 130 CID

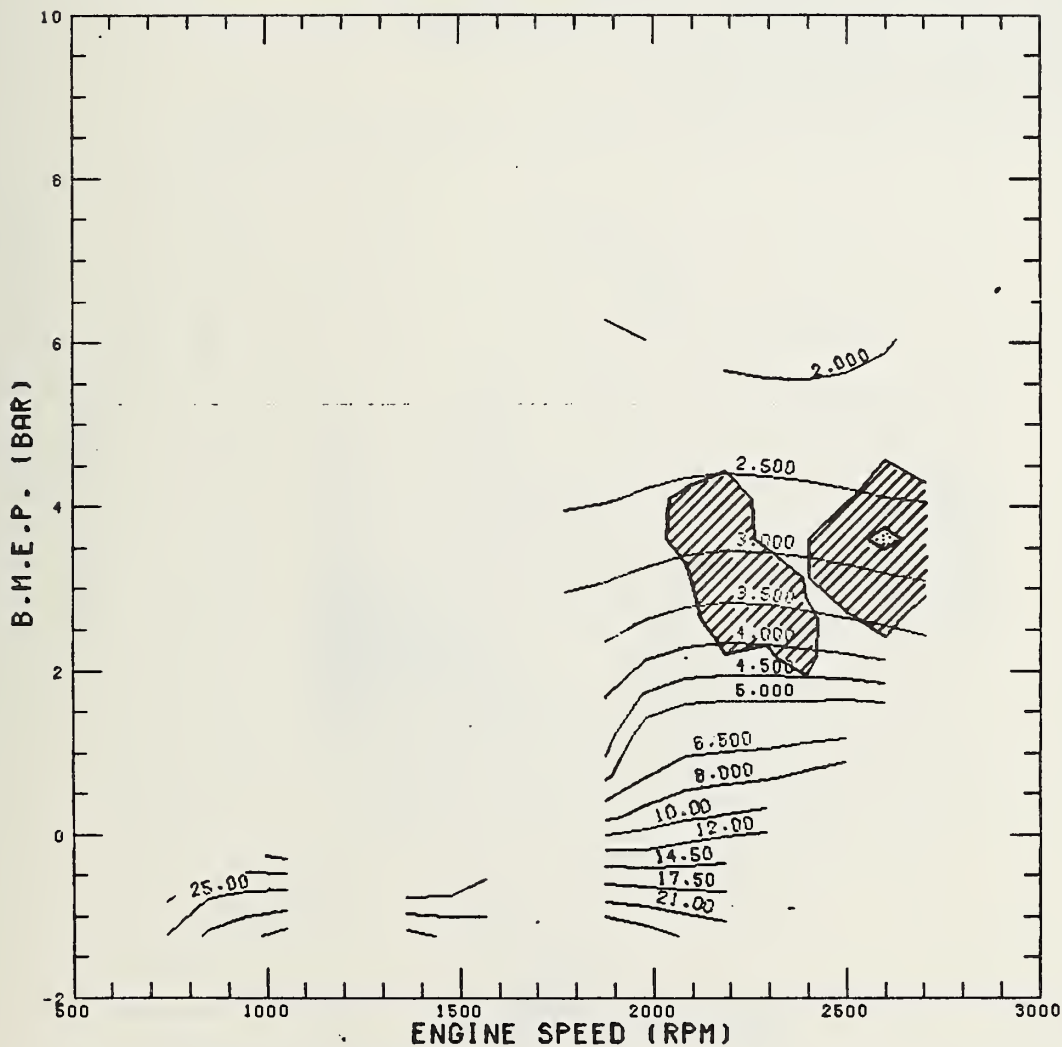
## AIR TO FUEL RATIO

764.0 SEC HIGHWAY TEST DATE 15/09/76 15.49.37

TEST RESULT 764.25 S/ 10.25 MI = 48.28 MPH

SHADED REGIONS 389.37 78.25 M

VEHICLE 1362 KG MASS, 0.80 SQM CW\*F, 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



5 CYL. N.A. 130 CID

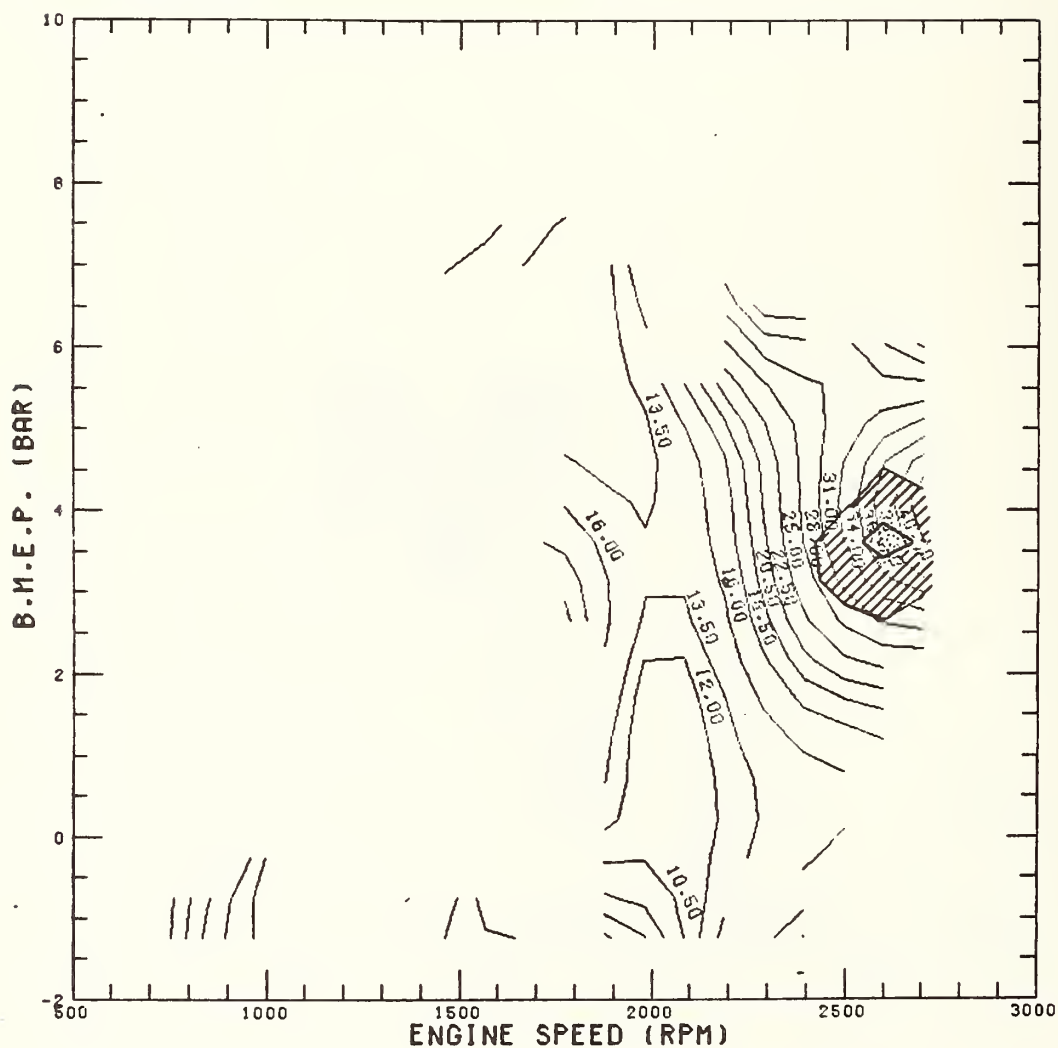
HC - EMISSION (G/H)

764.0 SEC HIGHWAY TEST DATE 15/09/76 15.49.37

TEST RESULT 4.90 G/ 10.25 MI = 0.48 G/MI

SHADED REGIONS 2.45 0.53 G

VEHICLE 1362 KG MASS, 0.80 SQM CW\*F, 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



5 CYL. N.A. 130 CID

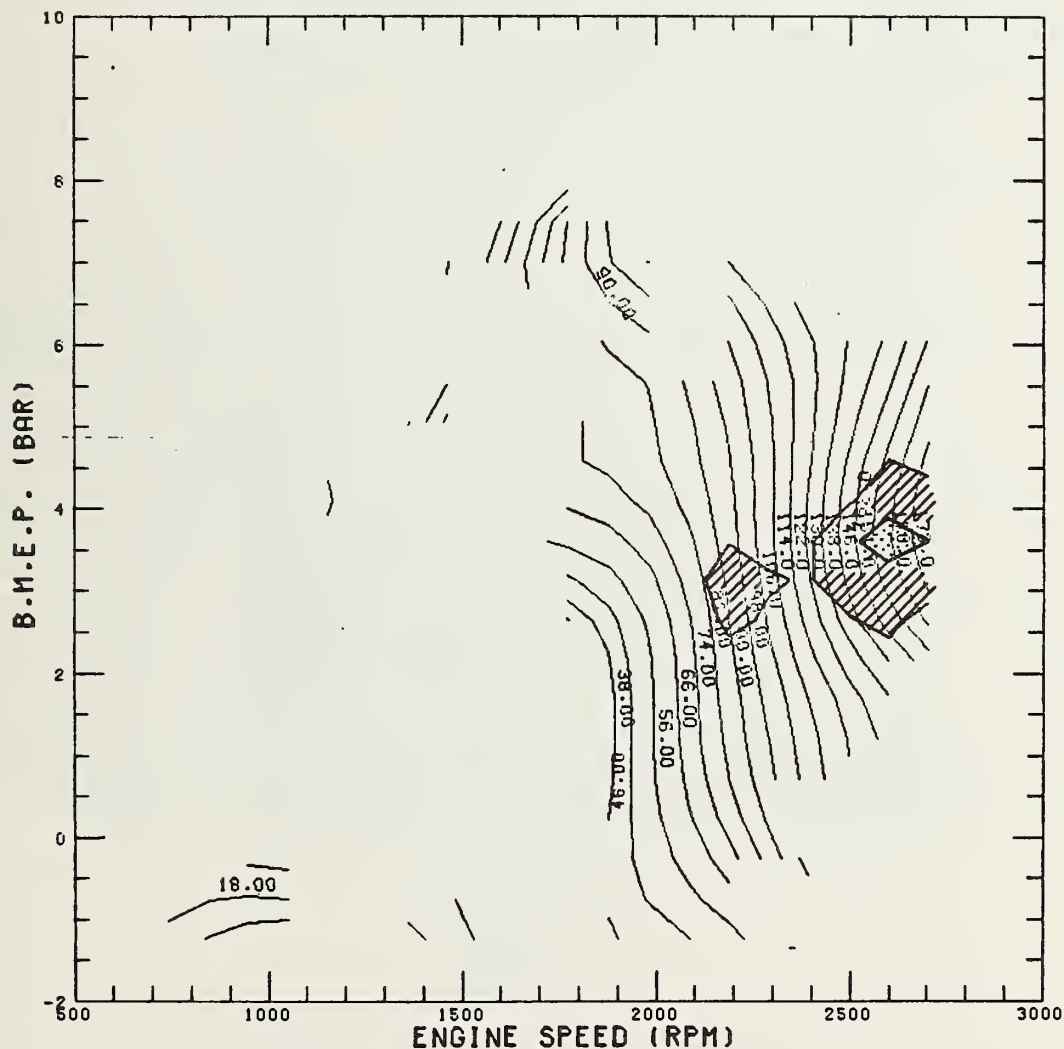
CO - EMISSION (G/H)

764.0 SEC HIGHWAY TEST DATE 15/09/76 15.49.37

TEST RESULT 23.43 G/ 10.25 MI = 2.29 G/MI

SHADED REGIONS 11.70 2.10 G

VEHICLE 1362 KG MASS. 0.80 SQM CW\*F. 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8



5 CYL. N.A. 130 CID

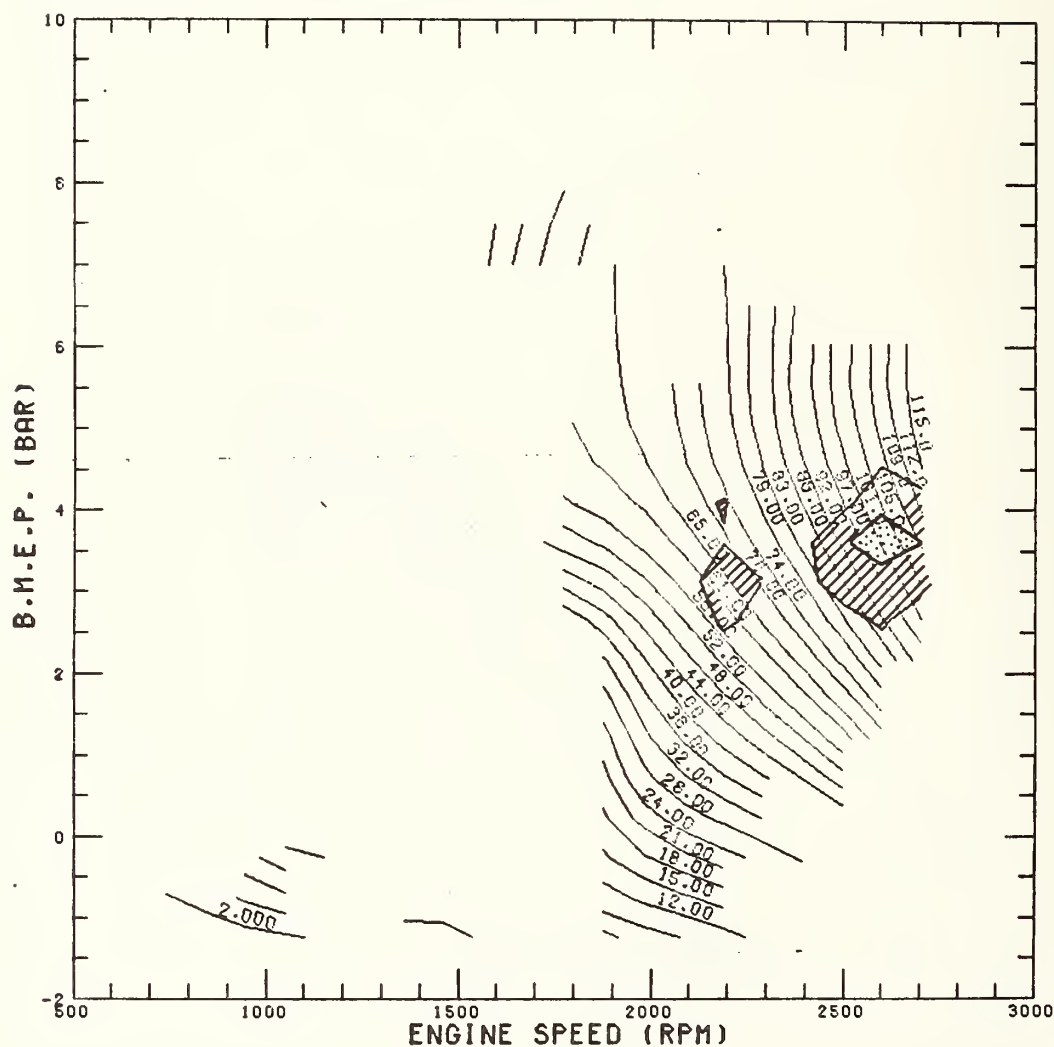
NOX - EMISSION (G/H)

764.0 SEC HIGHWAY TEST DATE 15/09/76 15.49.37

TEST RESULT 14.72 G/ 10.25 MI = 1.44 G/MI

SHADED REGIONS 7.09 1.20 G

VEHICLE 1362 KG MASS, 0.80 SQM CW\*F, 1.75 % ROLLING DRAG  
TRANSMISSION AXLE/GEAR COMBINATION NO. 8

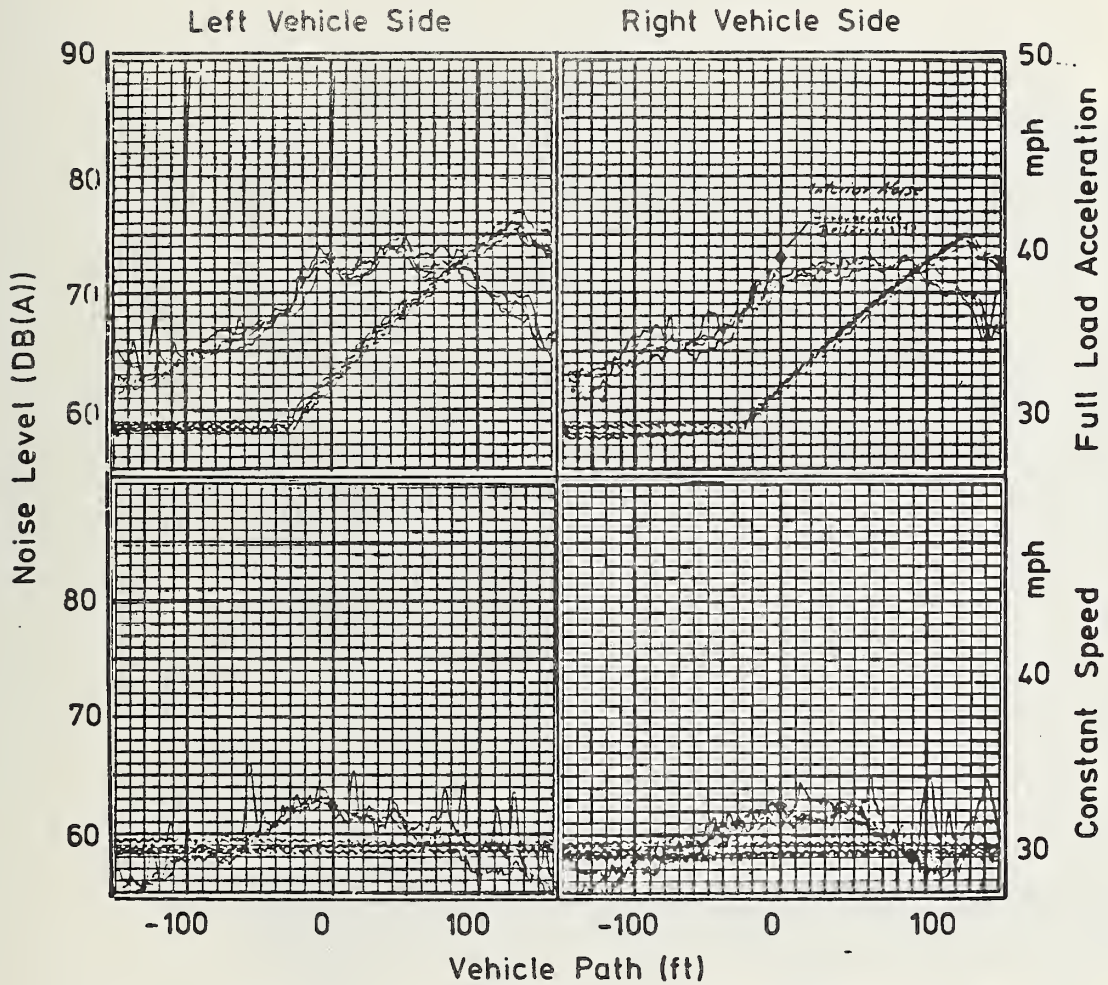


# NOISE EMISSION

GOLF D NO. 1 WITH 50 HP PRODUCTION DIESEL

Idle Noise 79 dB(A) exterior

58 dB(A) interior

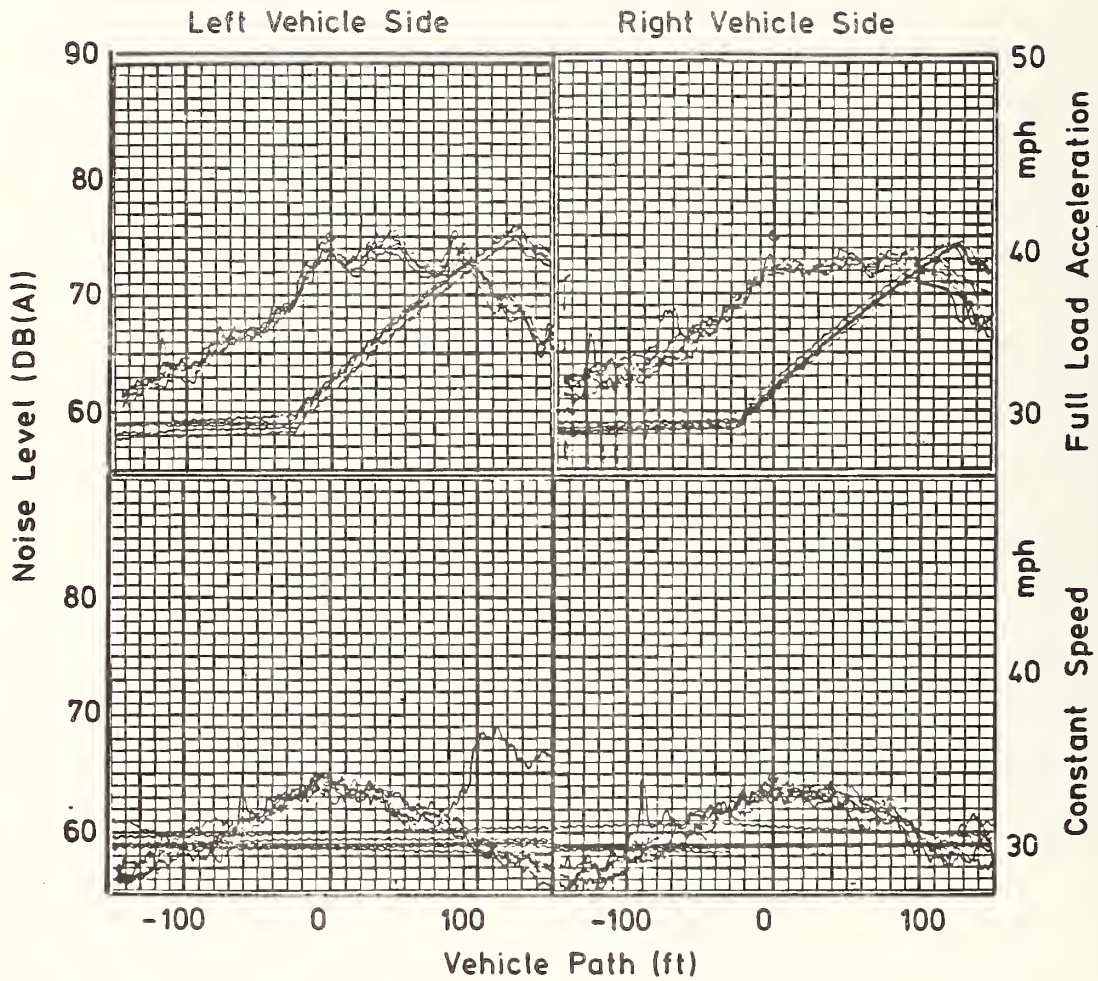


# NOISE EMISSION

GOLF D NO. 2 WITH 50 HP PRODUCTION DIESEL

Idle Noise 79 dB(A) exterior

56 dB(A) interior



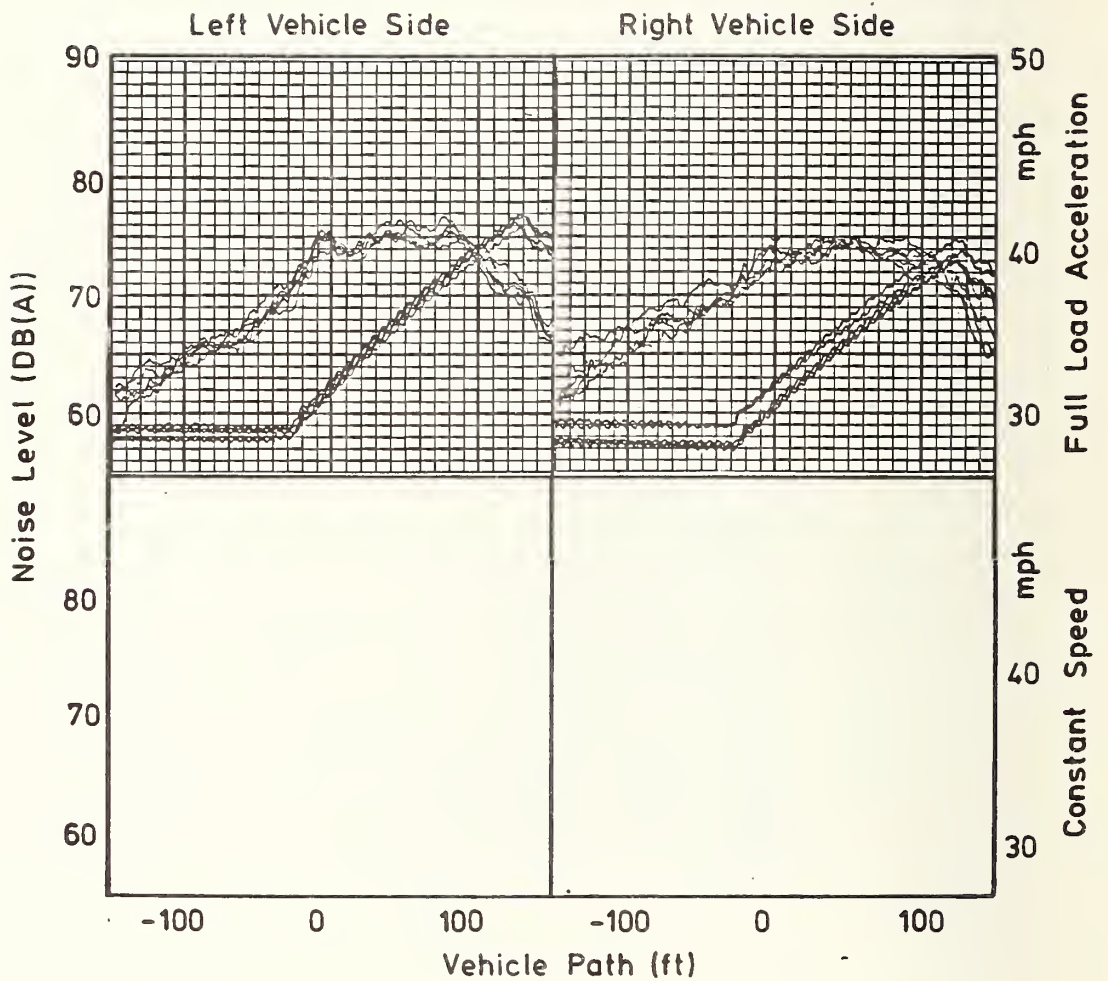


## NOISE EMISSION

GOLF D NO. 4 WITH 50 HP PRODUCTION DIESEL

Idle Noise 80 dB(A) exterior

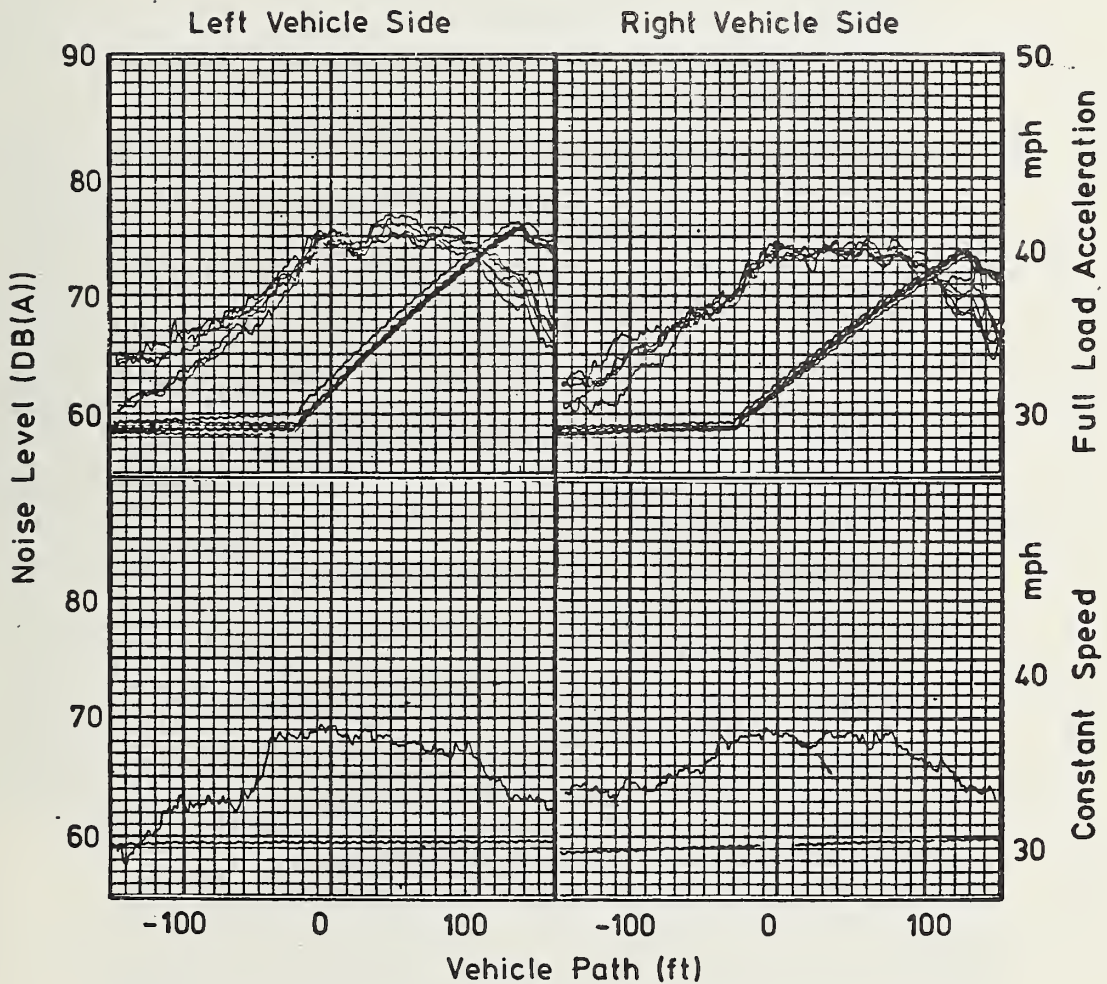
54.5 dB(A) interior



## NOISE EMISSION

GOLF D NO. 5 WITH 50 HP PRODUCTION DIESEL  
wet surface

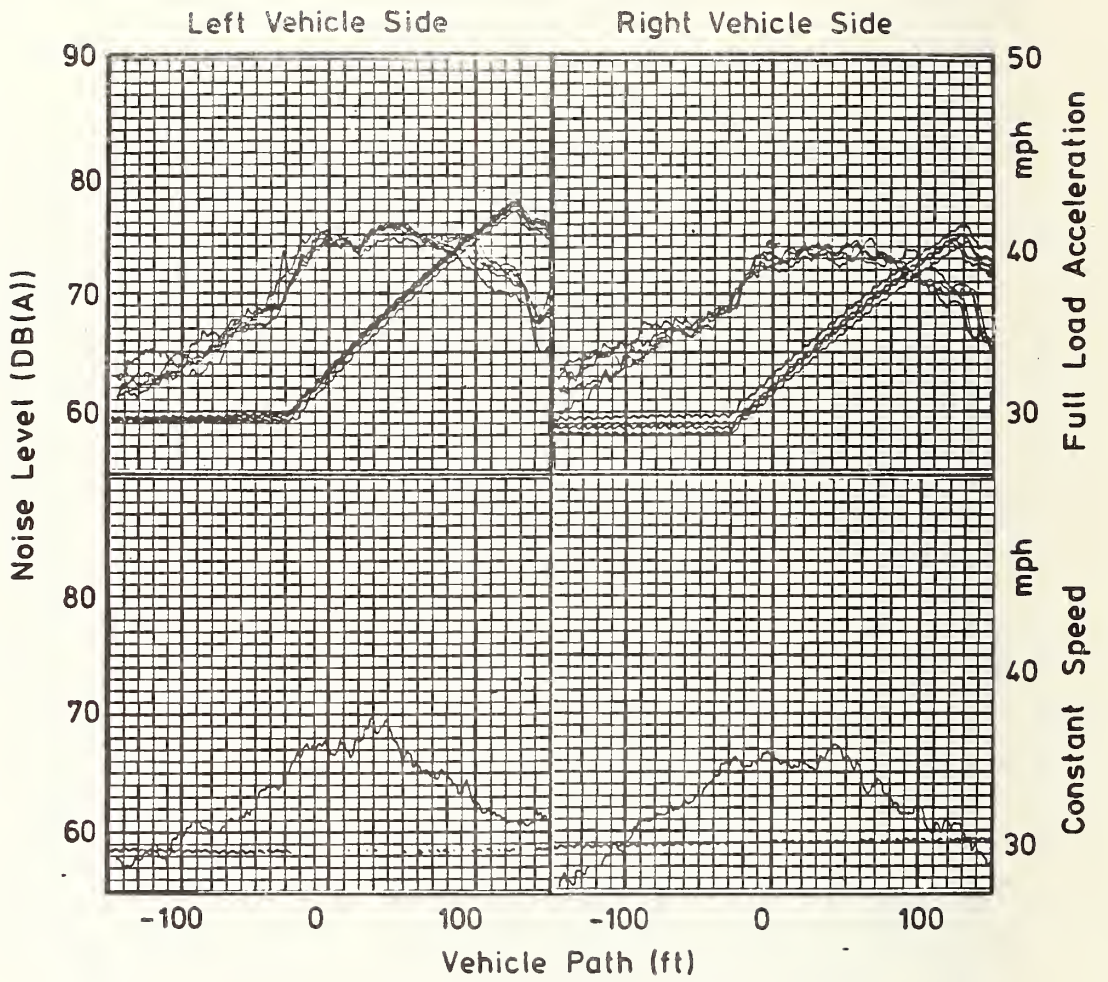
Idle Noise 81 dB(A) exterior  
56 dB(A) interior



# NOISE EMISSION

GOLF D NO. 6 WITH 50 HP PRODUCTION DIESEL  
wet surface

Idle Noise 81 dB(A) exterior  
55 dB(A) interior

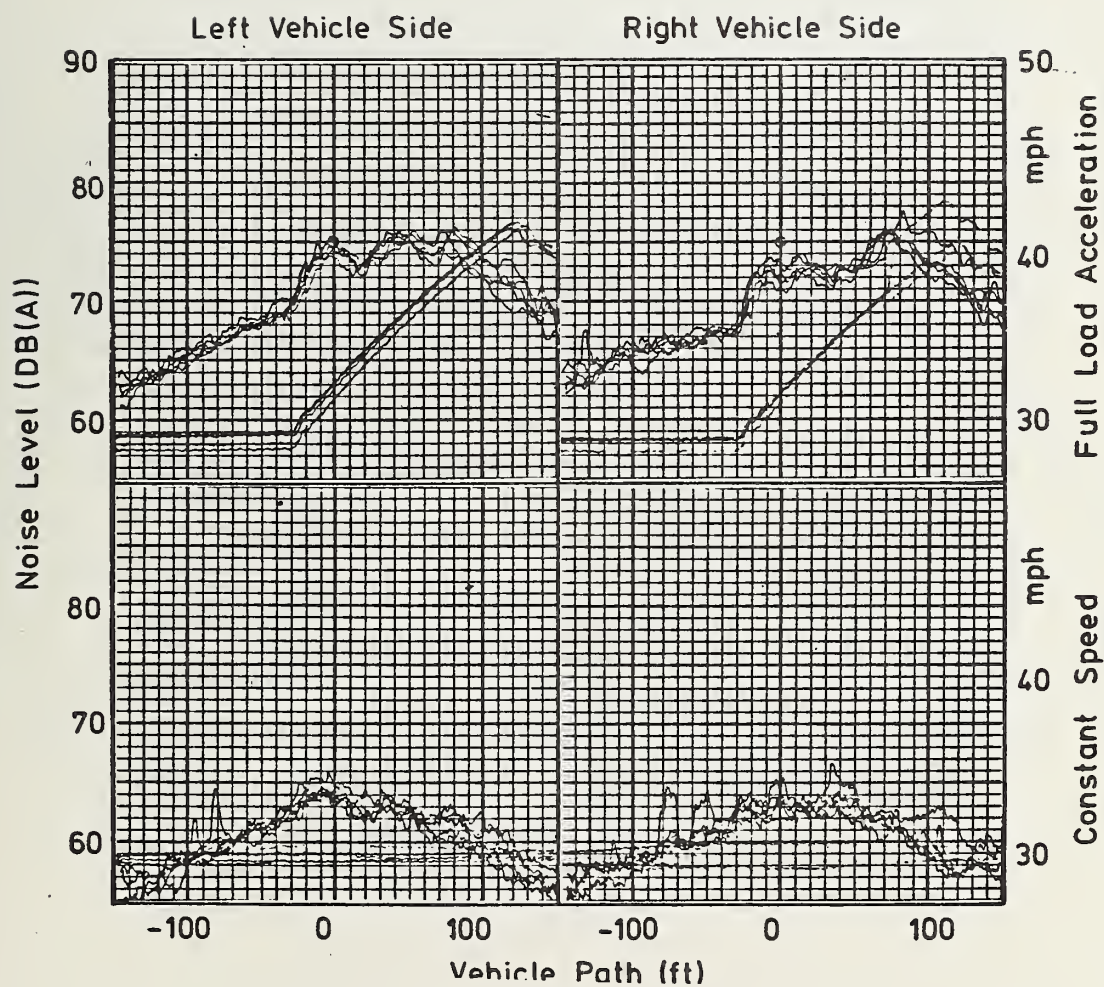


## NOISE EMISSION

GOLF LD NO. 1 WITH 50 HP PRODUCTION DIESEL

Idle Noise 79.5 dB(A) exterior

54 dB(A) interior

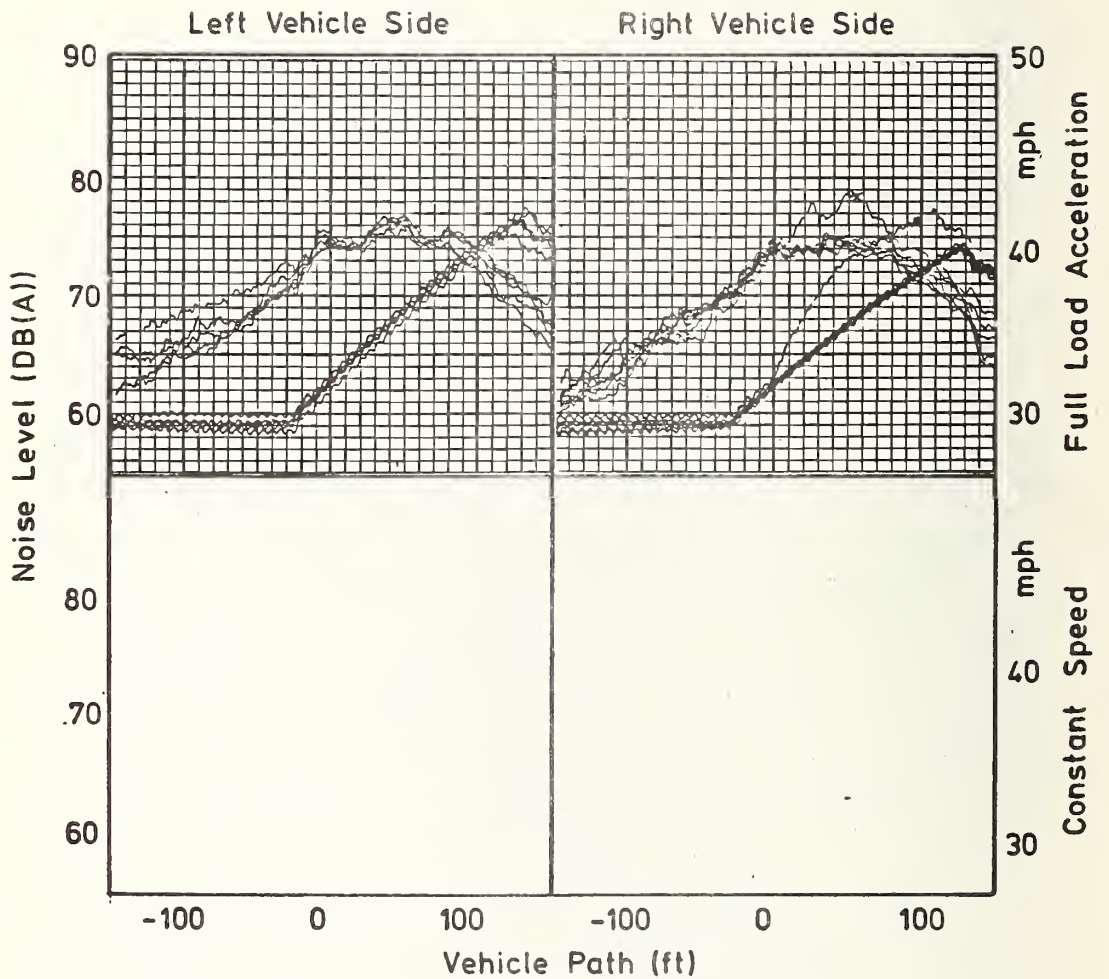


# NOISE EMISSION

GOLF LD NO. 2 WITH 50 HP PRODUCTION DIESEL

Idle Noise 81 dB(A) exterior

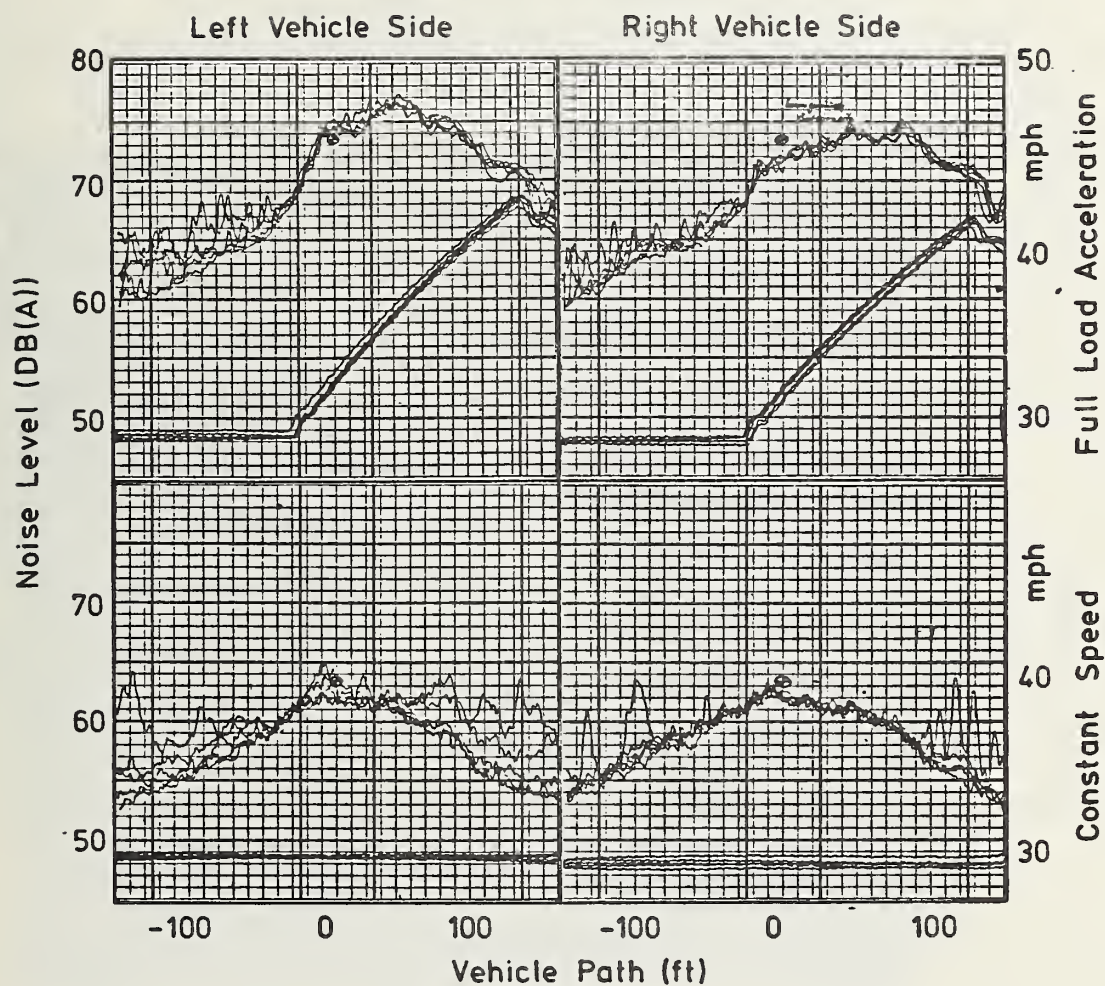
53.5 dB(A) interior



# NOISE EMISSION

GOLF GLD NO. 1 WITH 50 HP PRODUCTION DIESEL

Idle Noise 78.5 dB(A) exterior

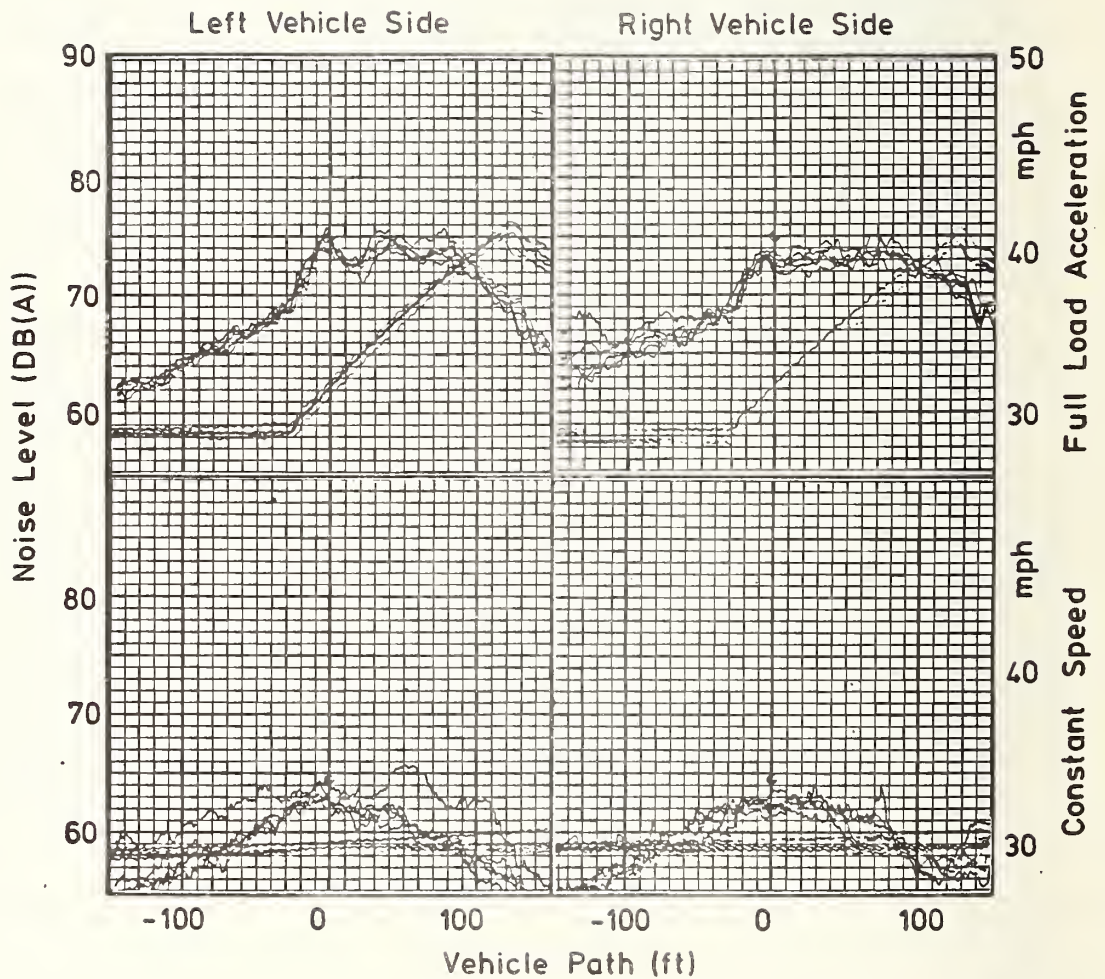


# NOISE EMISSION

GOLF GLD NO. 2 WITH 50 HP PRODUCTION DIESEL

Idle Noise 83 dB(A) exterior

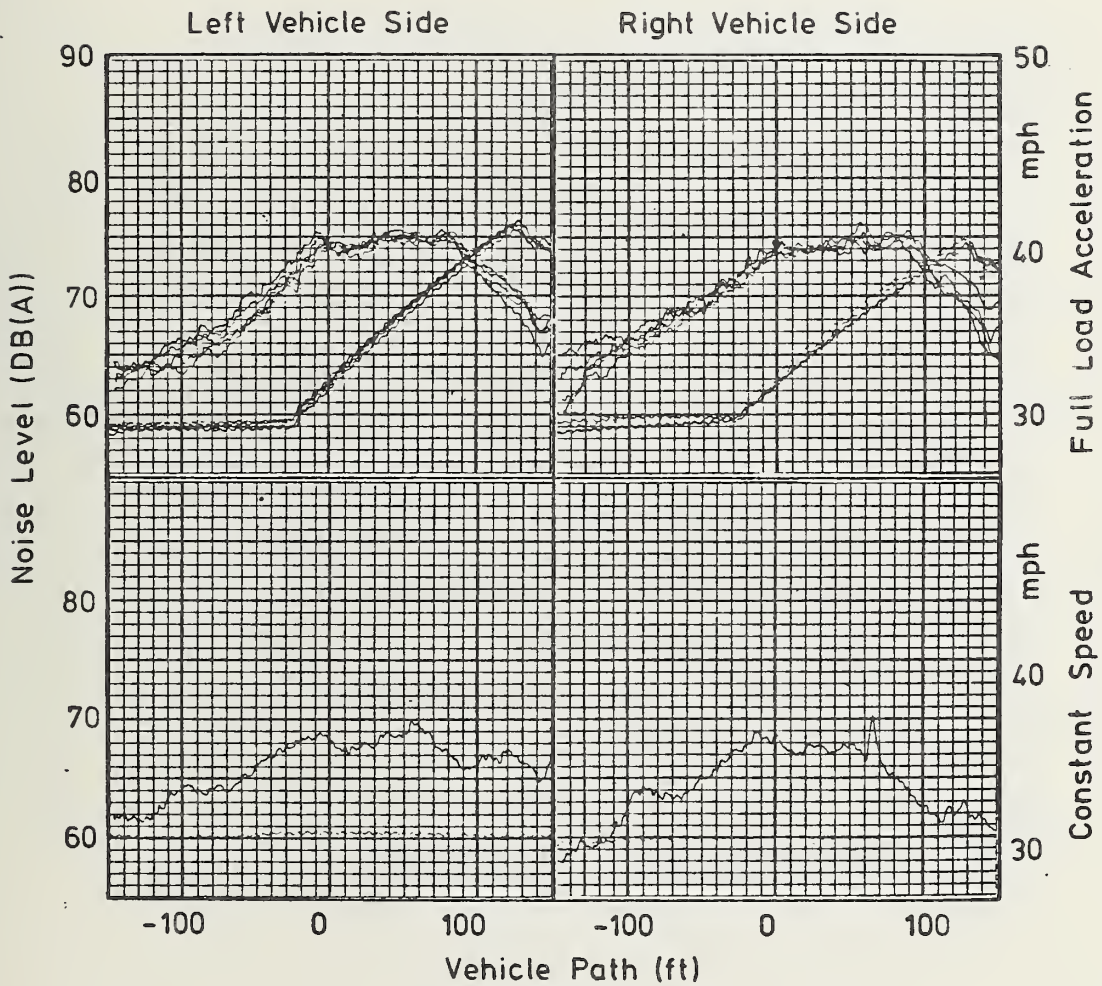
55.5 dB(A) interior



# NOISE EMISSION

GOLF GLD NO. 3 WITH 50 HP PRODUCTION DIESEL  
on wet surface.

Idle Noise 80 dB(A) exterior  
54 dB(A) interior

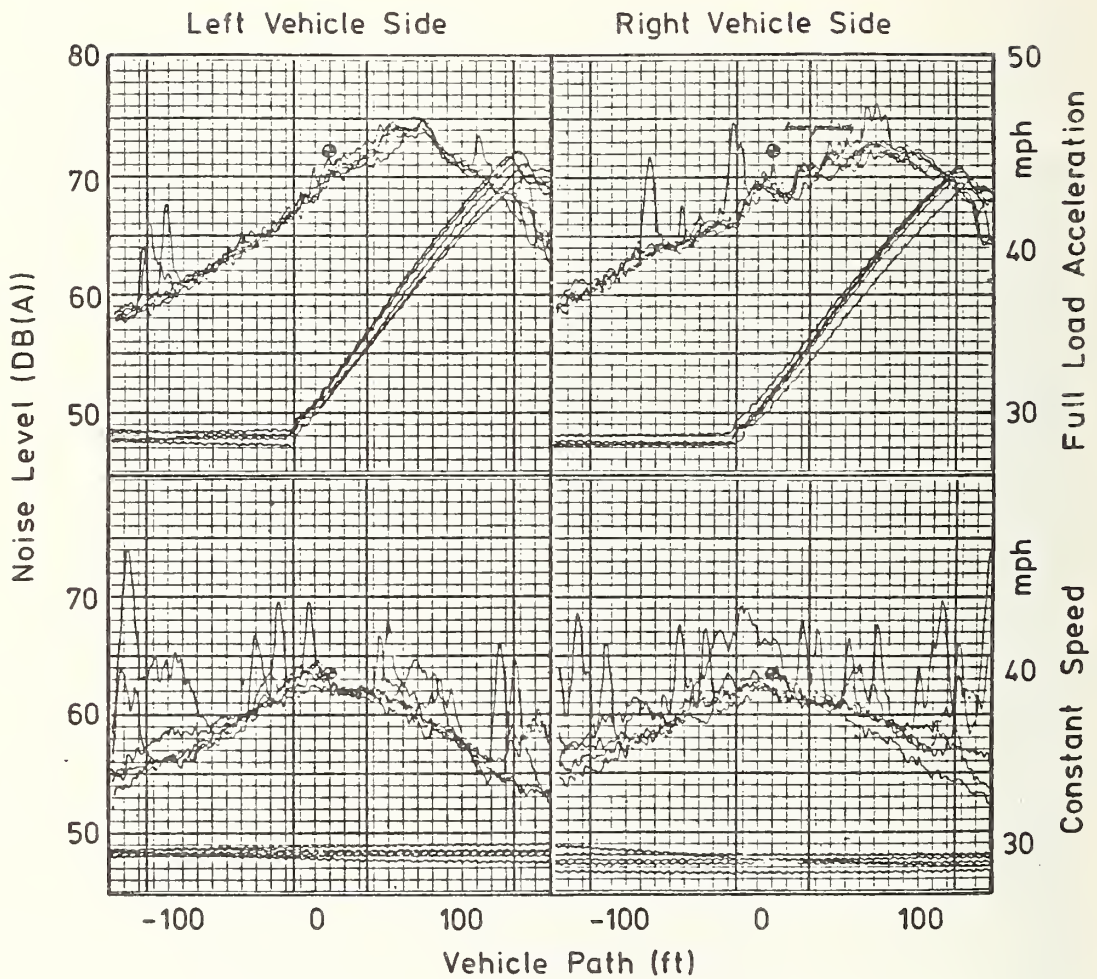


# NOISE EMISSION

GOLF LD WITH 70 HP TURBOCHARGED DIESEL

Gunfire background

Idle Noise 79.5 dB(A) exterior

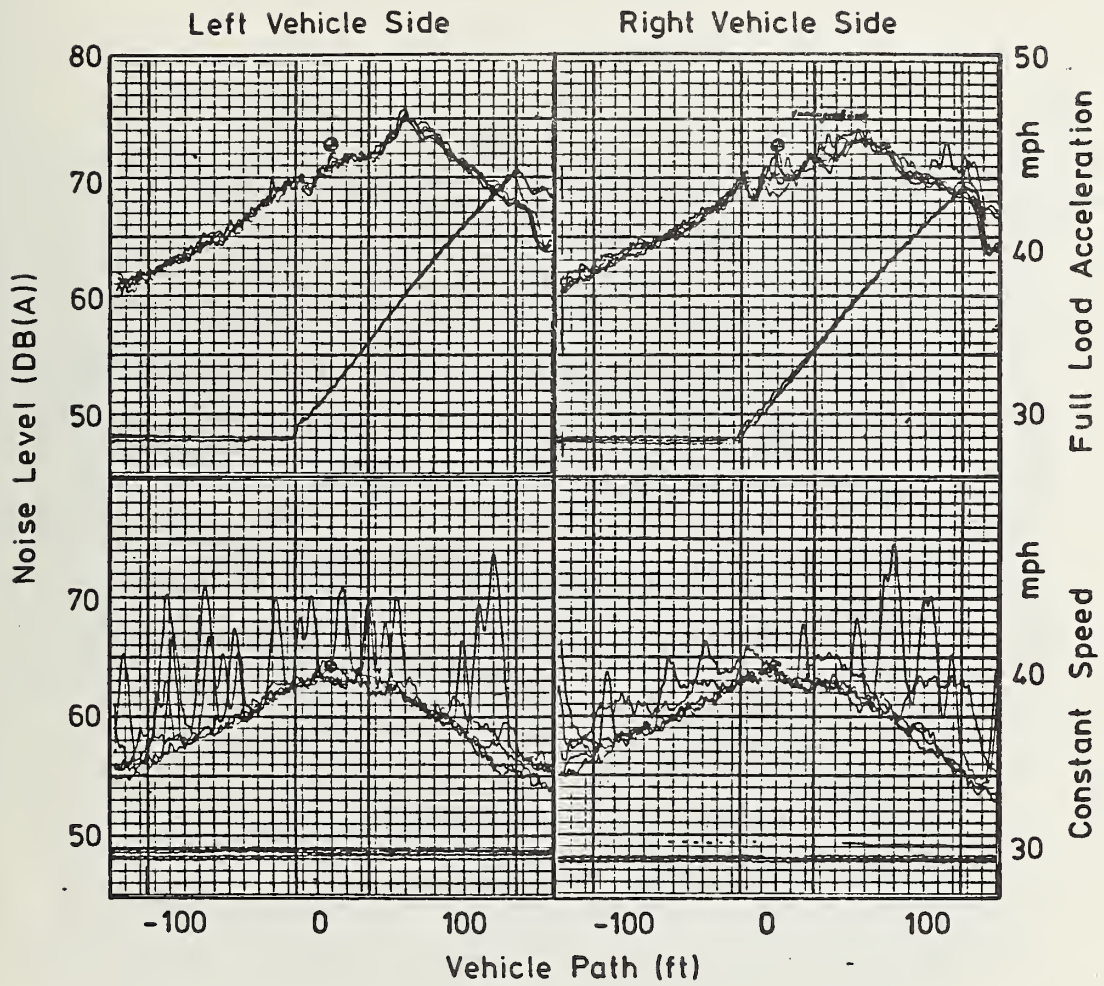


# NOISE EMISSION

GOLF GLD WITH 70 HP TURBOCHARGED DIESEL

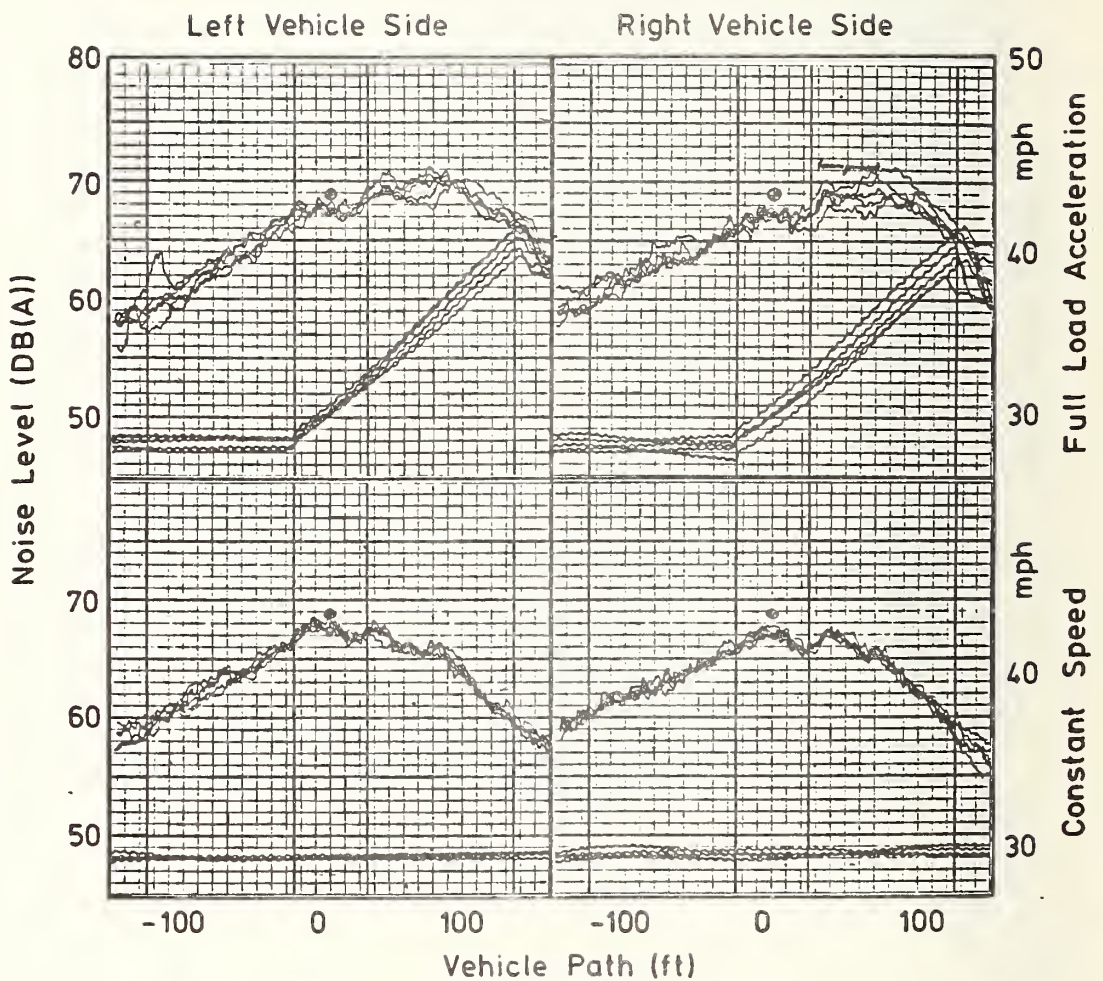
Gunfire background

Idle Noise 79.5 dB(A) exterior



## NOISE EMISSION

RABBIT D WITH 70 HP TURBOCHARGED DIESEL  
30 mph cruise in 2 nd. gear.

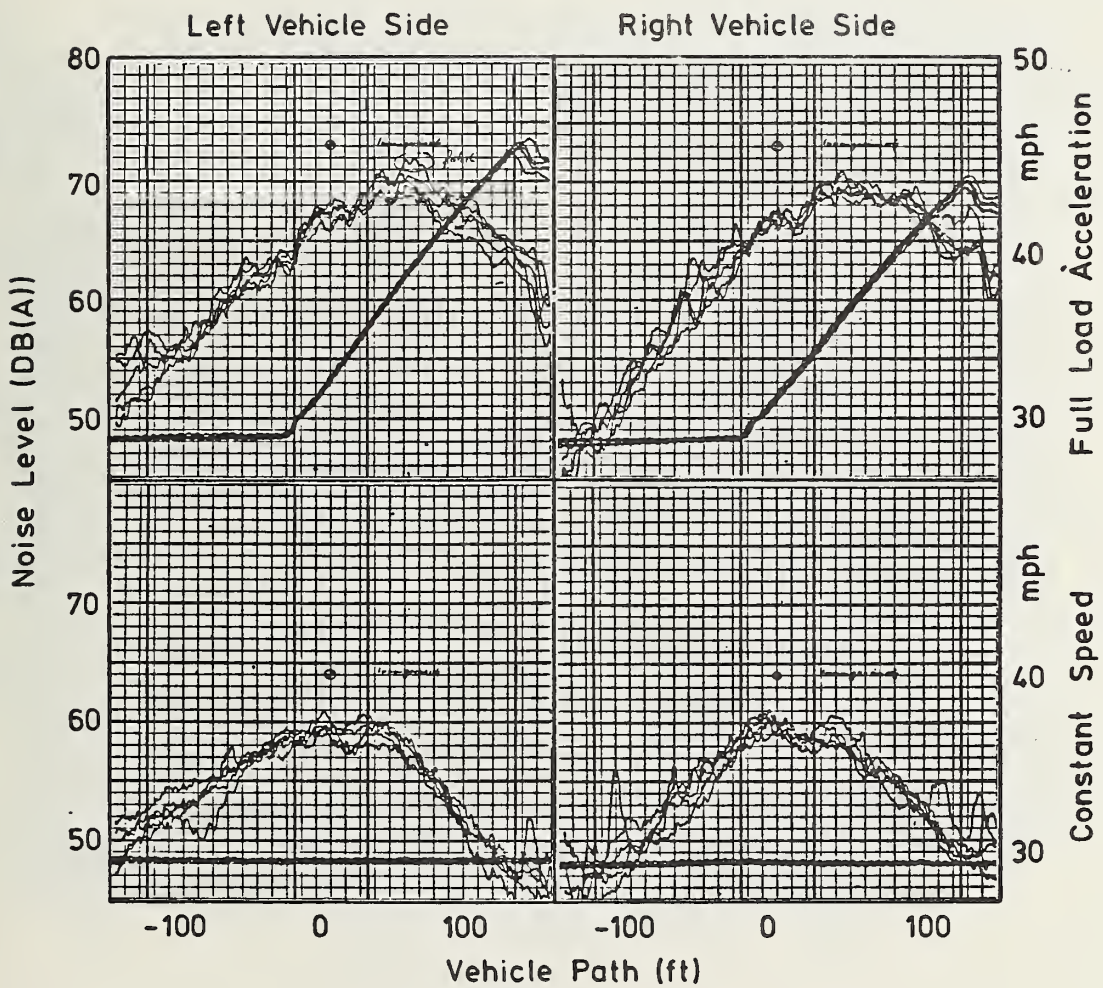


# NOISE EMISSION

IRVW WITH 70 HP TURBOCHARGED DIESEL

Idle Noise 74 dB(A) exterior

56 dB(A) interior

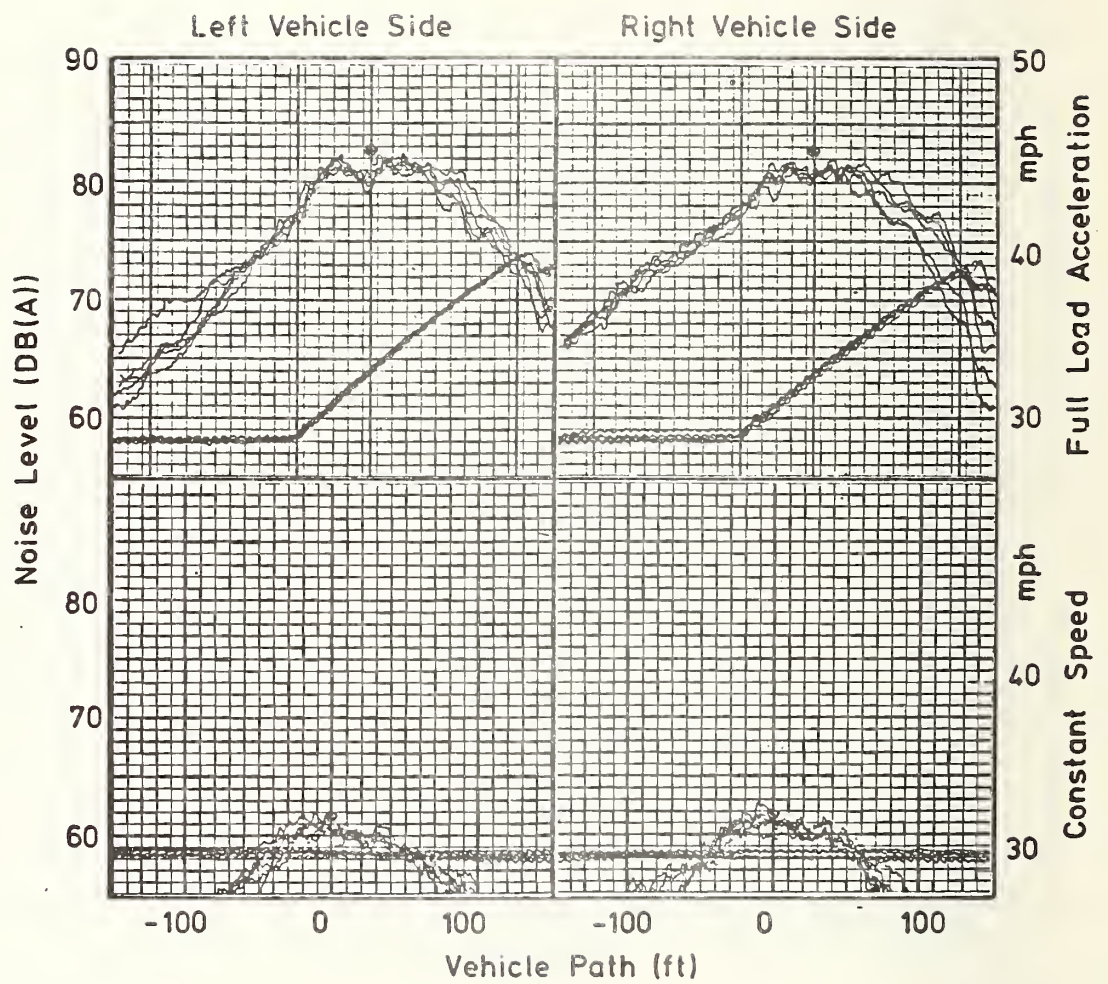


## NOISE EMISSION

GOLF GLD WITH 50 HP N.A. E.G.R. DIESEL

Idle Noise 73 dB(A) exterior

51 dB(A) interior

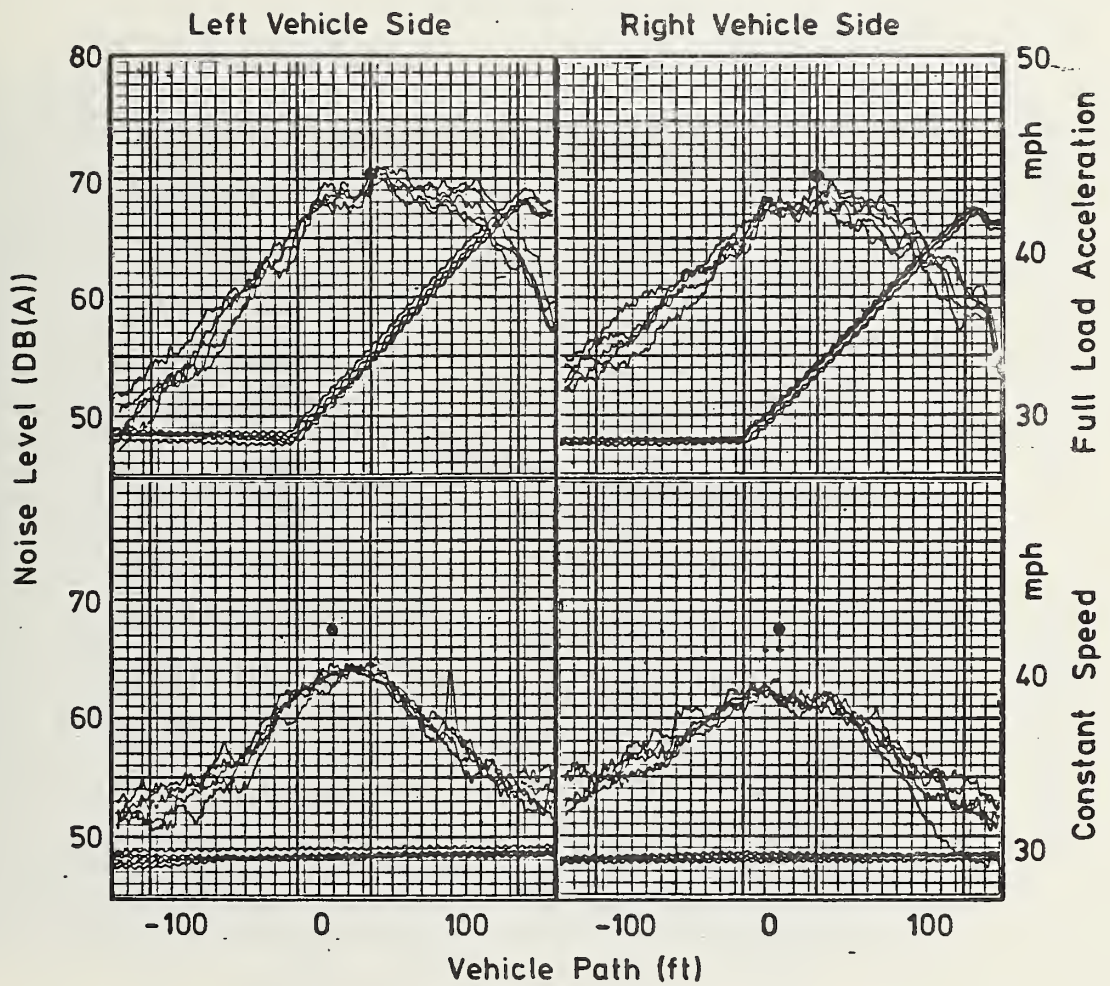


# NOISE EMISSION

GOLF GLD WITH 70 HP TC E.G.R. DIESEL

Idle Noise 76 dB(A) exterior

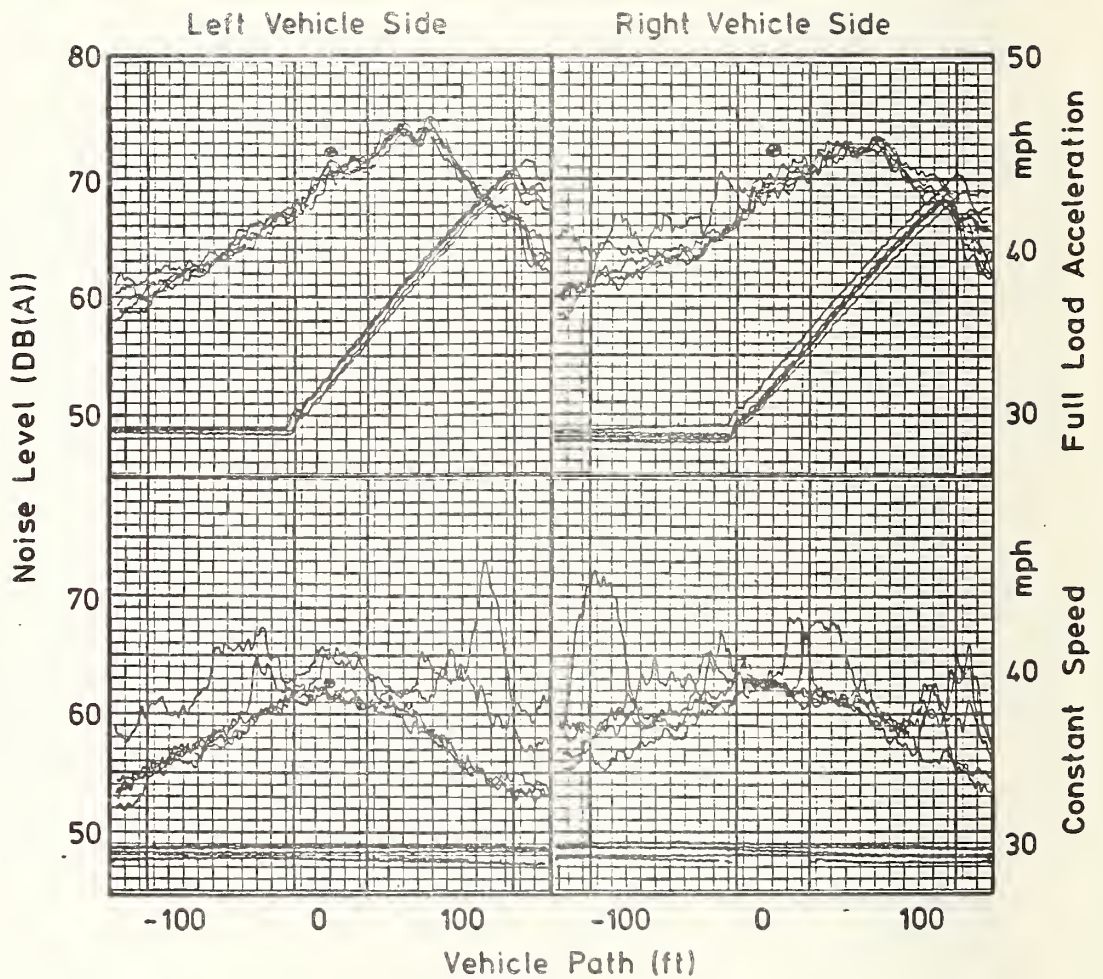
54 dB(A) interior



# NOISE EMISSION

GOLF GLD WITH 70 HP TC H<sub>2</sub>O DIESEL

Idle Noise 81 dB(A) exterior

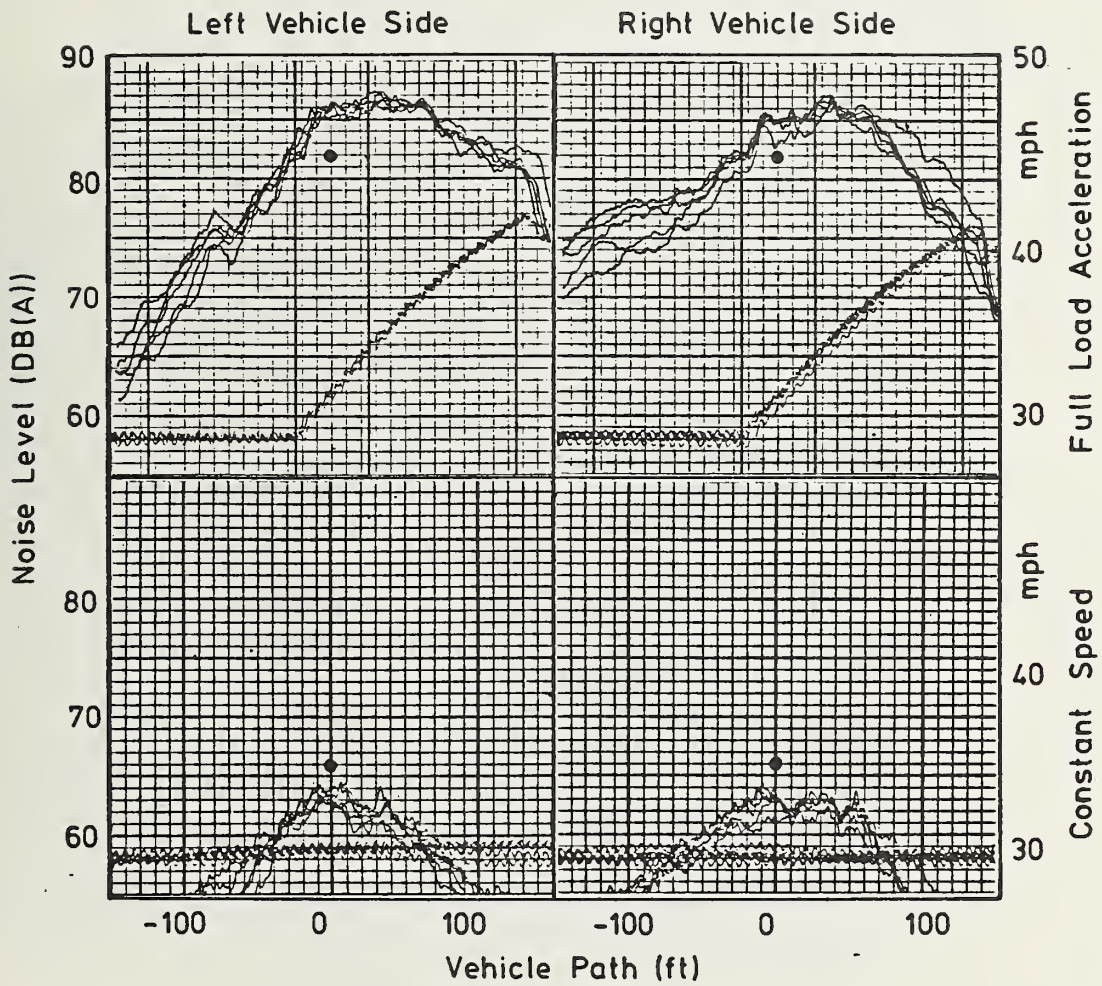


# NOISE EMISSION

AUDI 100 WITH 5 CYLINDER N.A. DIESEL

Idle Noise 75 dB(A) exterior

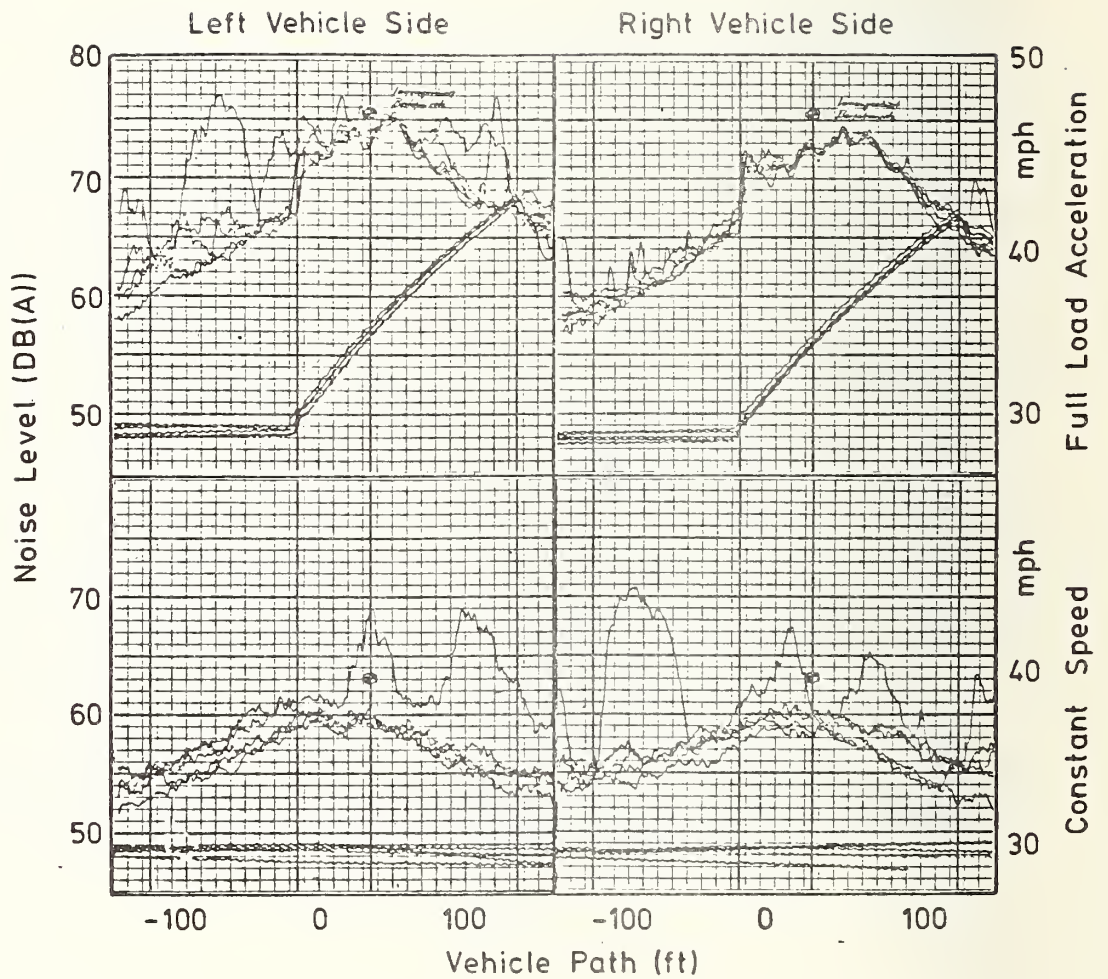
55.5 dB(A) interior



# NOISE EMISSION

GOLF WITH 50 HP GASOLINE ENGINE

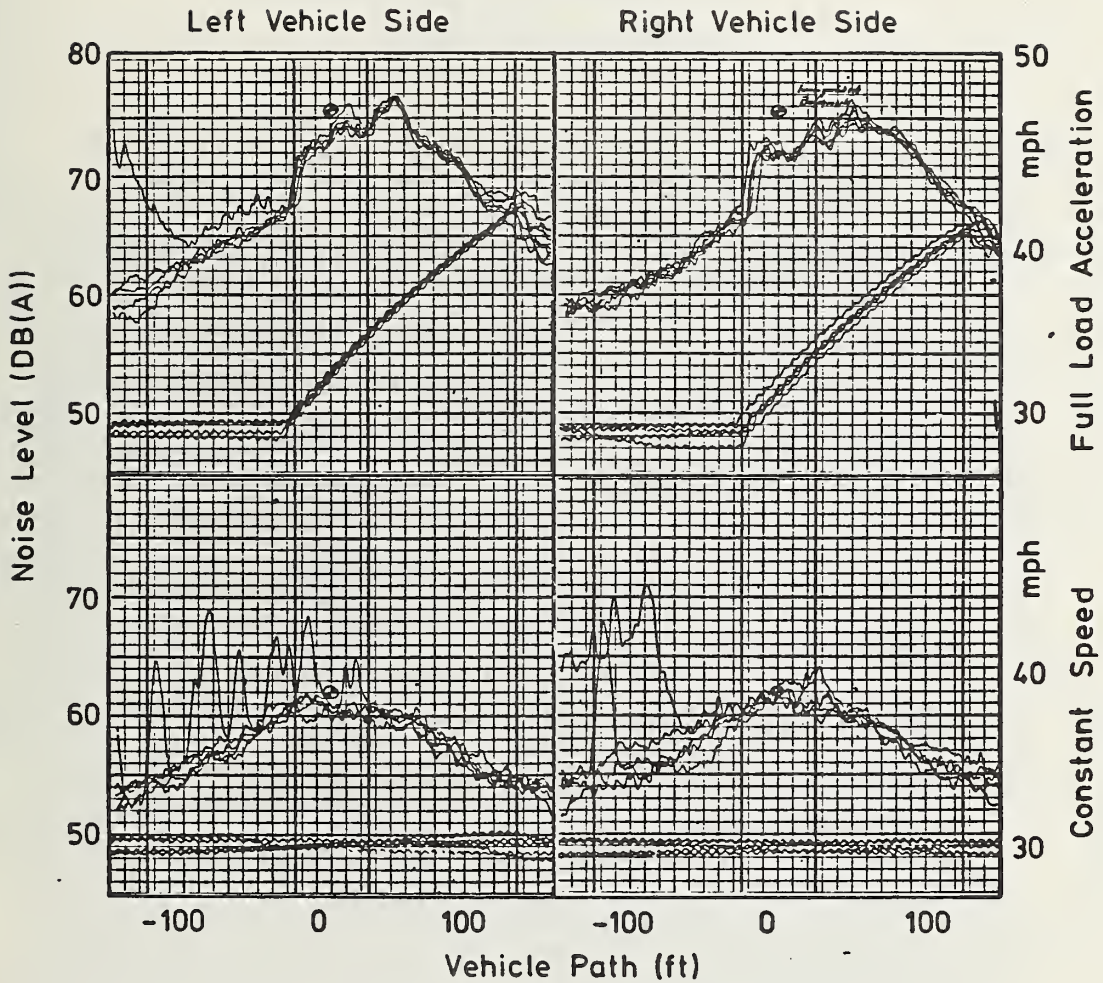
Idle Noise 74 dB(A) exterior



# NOISE EMISSION

GOLF L WITH 50 HP GASOLINE ENGINE

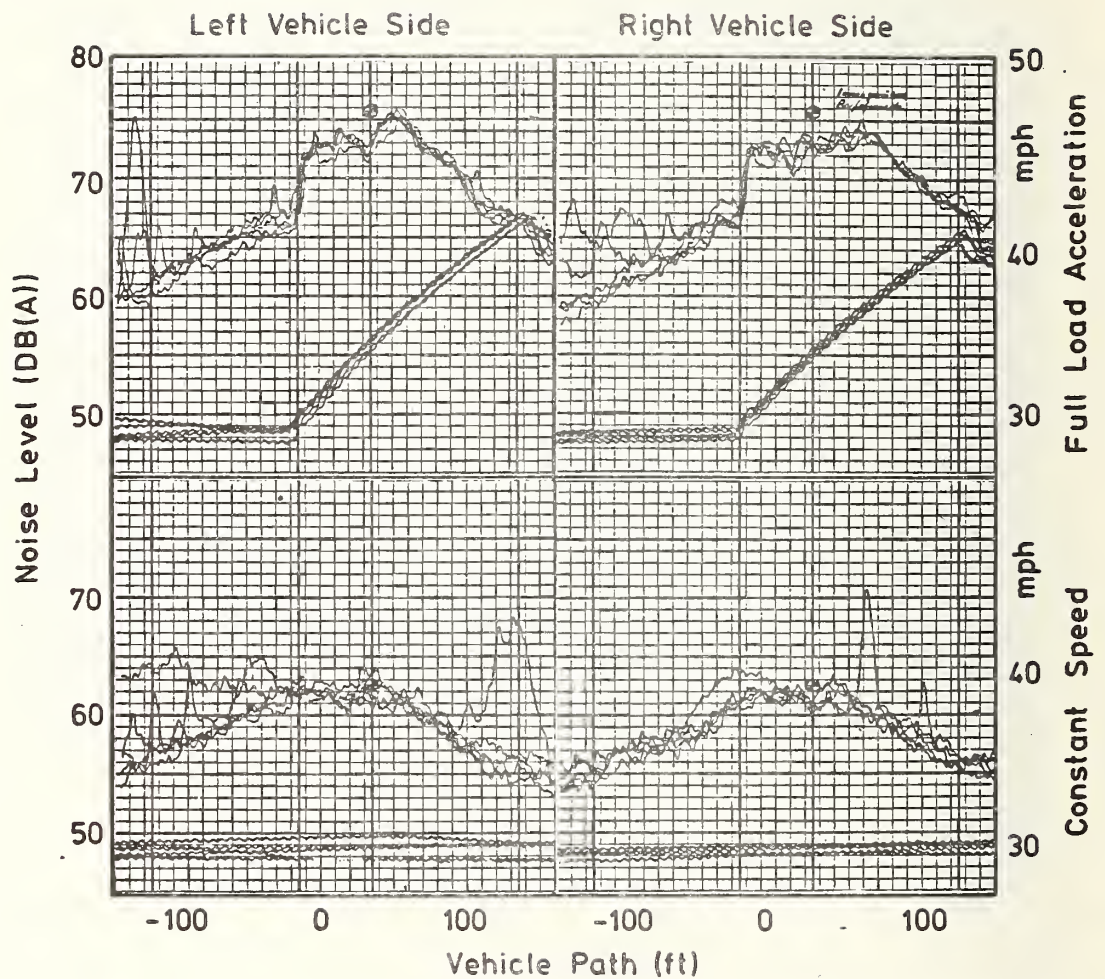
Idle Noise 71 dB(A) exterior



# NOISE EMISSION

GOLF GL NO. 1 WITH 50 HP GASOLINE ENGINE

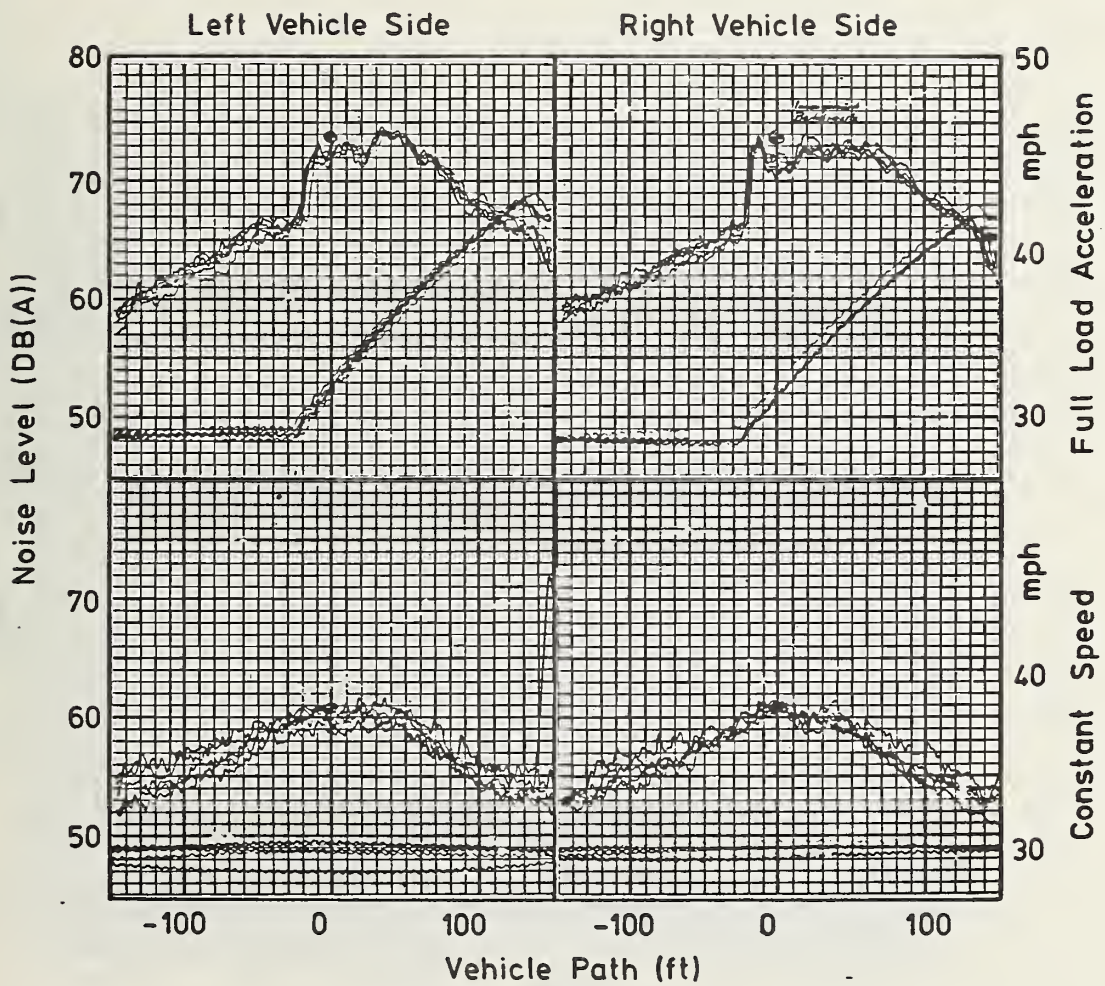
Idle Noise 76 dB(A) exterior



# NOISE EMISSION

GOLF GL NO. 2 WITH 50 HP GASOLINE ENGINE

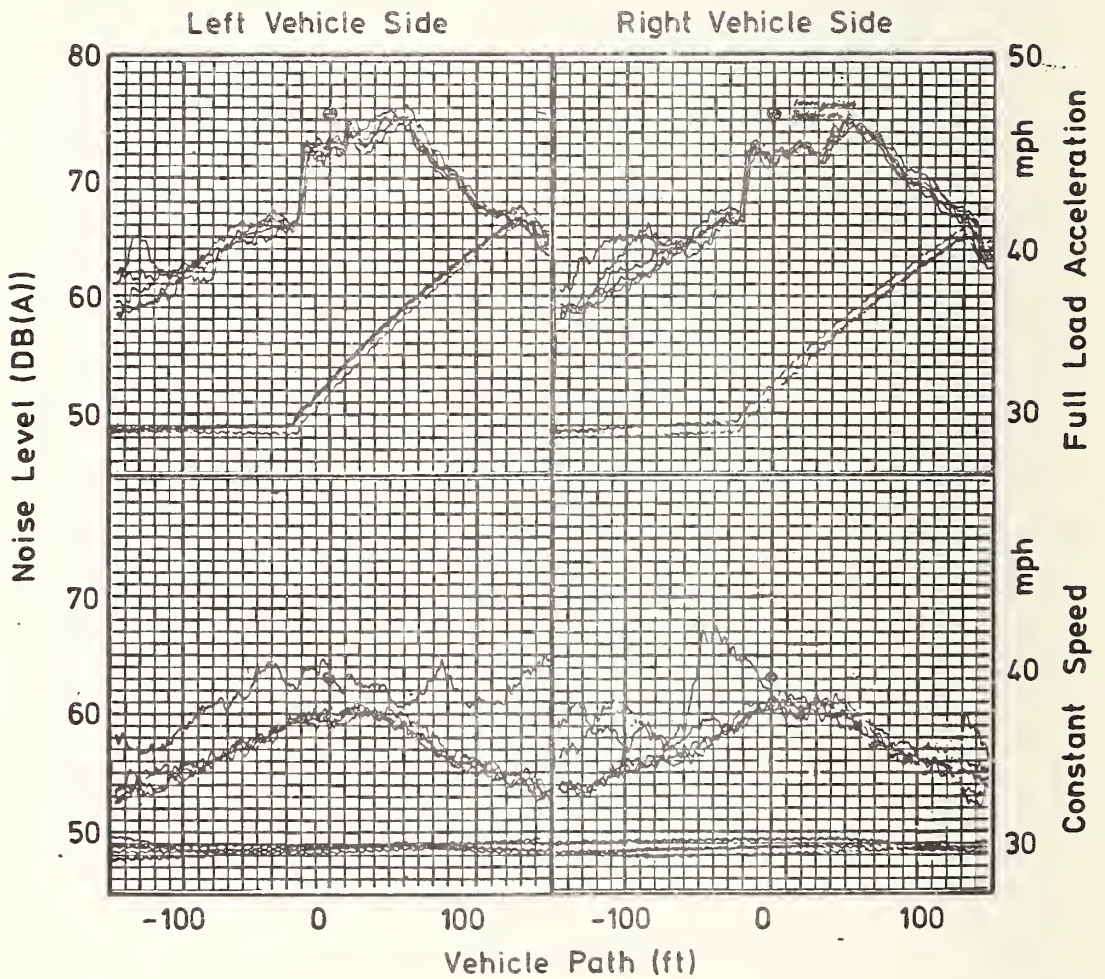
Idle Noise 75 dB(A) exterior



# NOISE EMISSION

GOLF GL NO. 3 WITH 50 HP GASOLINE ENGINE

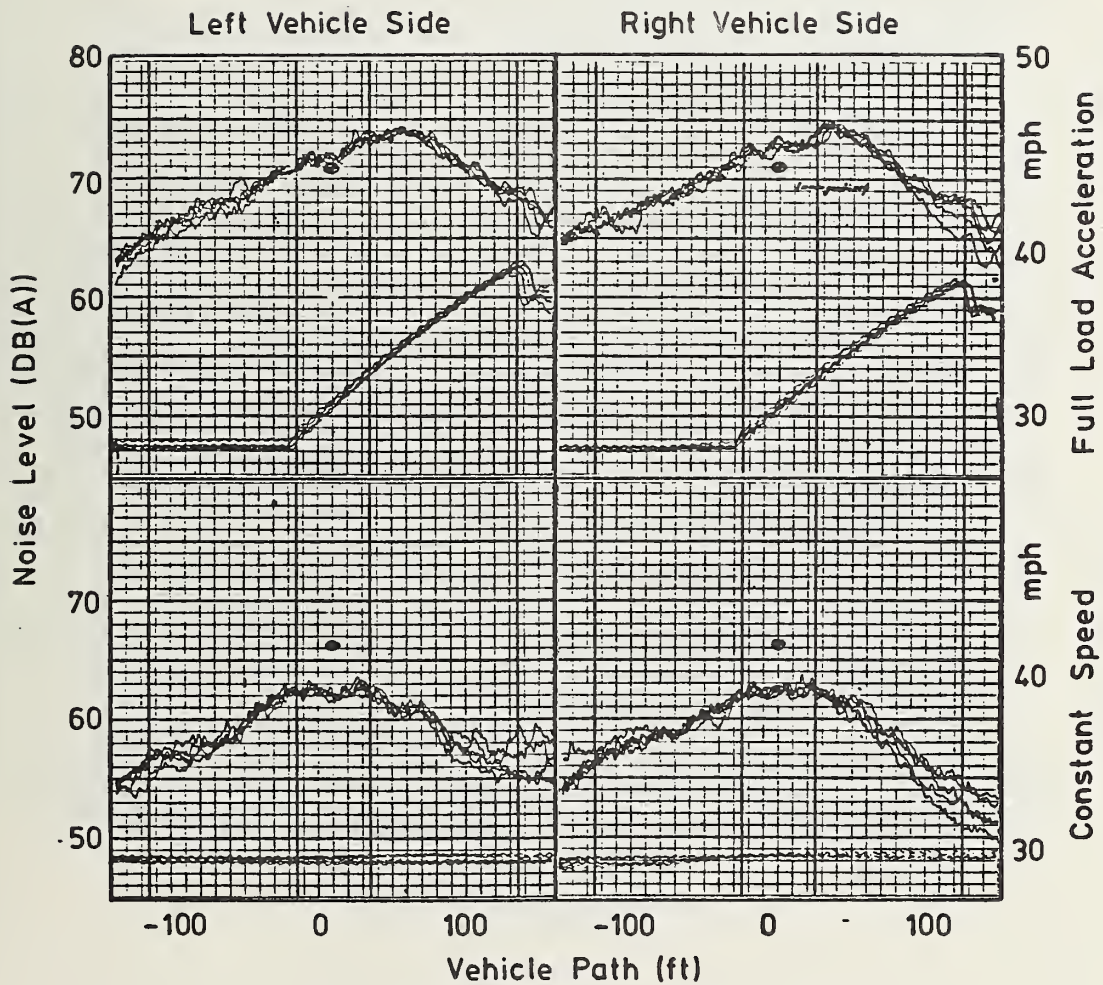
Idle Noise 75 dB(A) exterior



# NOISE EMISSION

OPEL D WITH 60 HP PRODUCTION DIESEL

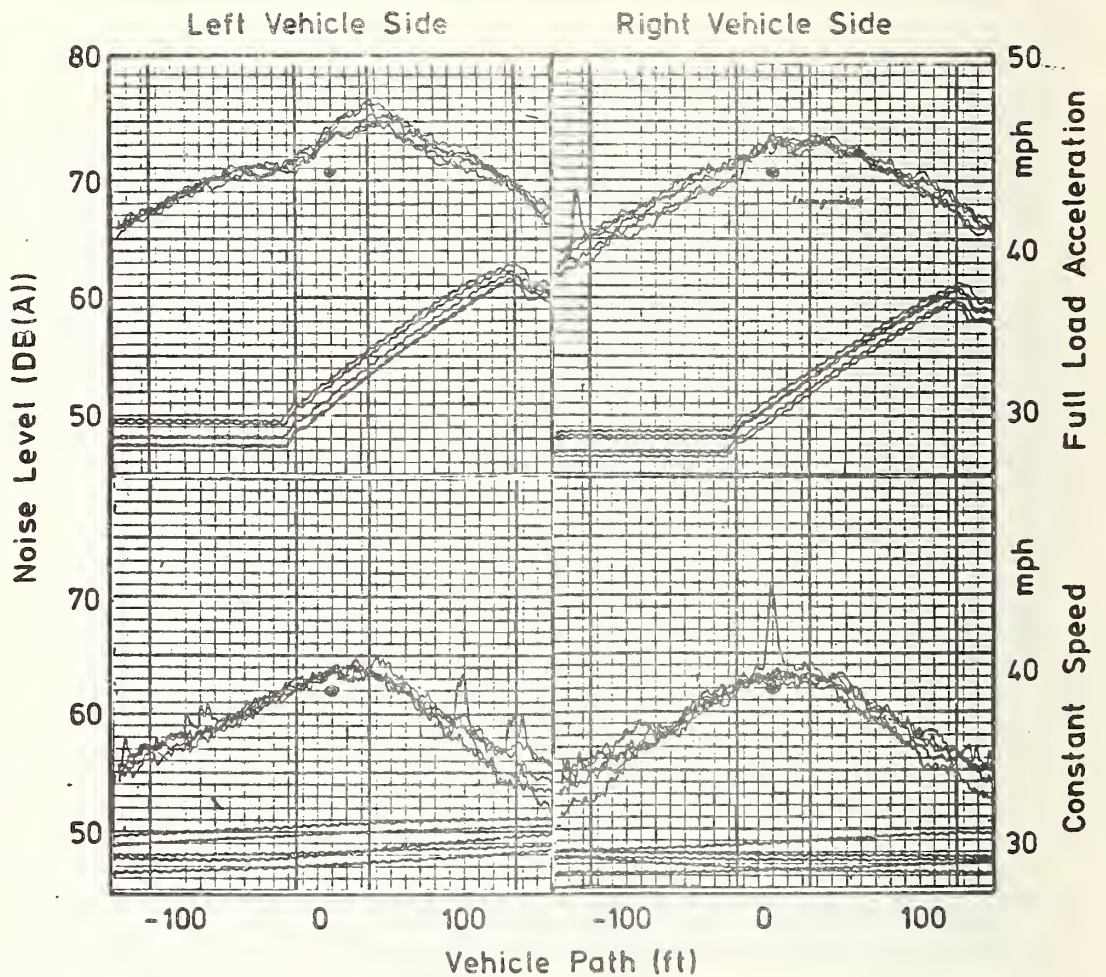
Idle Noise 83 dB(A) exterior



# NOISE EMISSION

PEUGEOT 504 WITH 65 HP PRODUCTION DIESEL

Idle Noise 80 dB(A) exterior

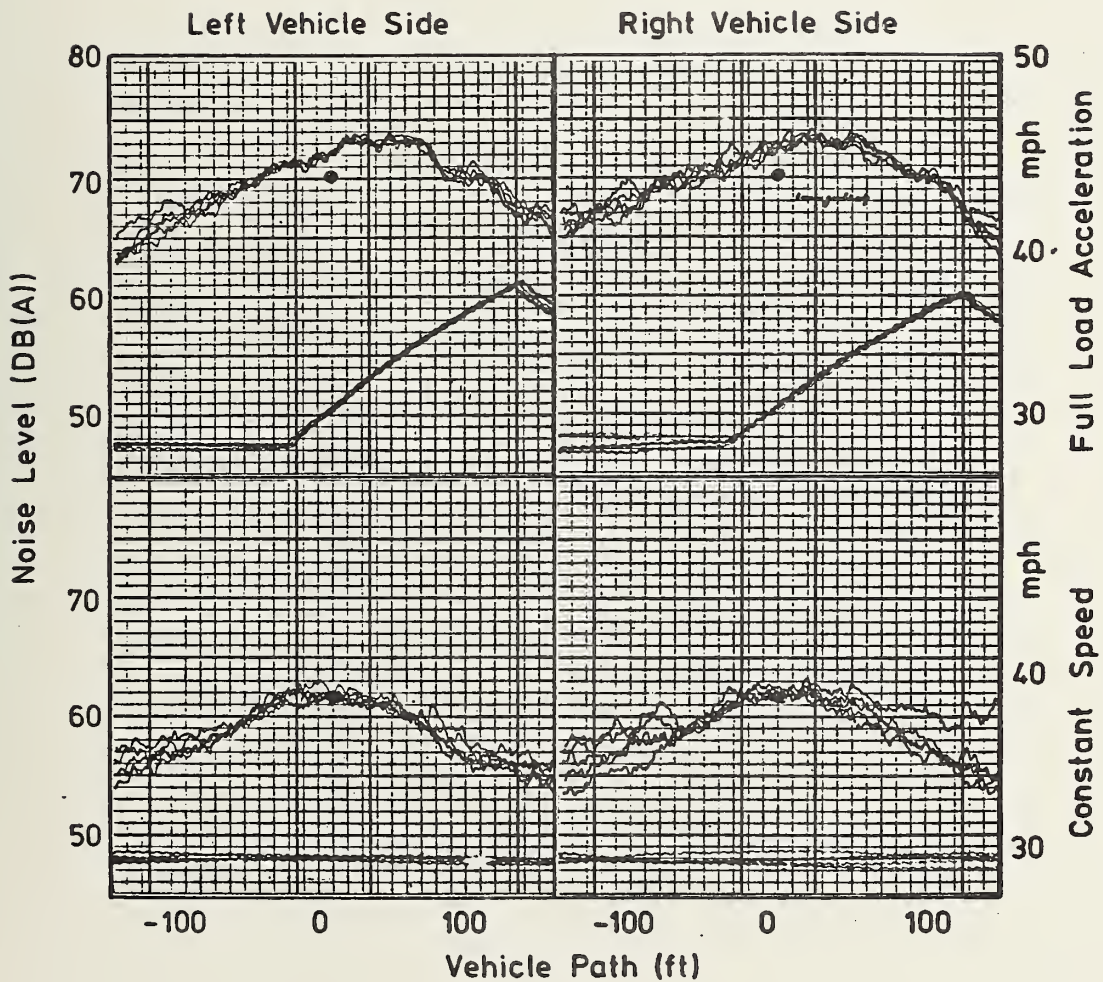


# NOISE EMISSION

MERCEDES 300 D WITH 80 HP PRODUCTION DIESEL

Automatic Transmission

Idle Noise 81 dB(A) exterior





APPENDIX B  
REPORT OF NEW TECHNOLOGY



The work performed under this contract, while leading to no new inventions has provided a detailed characterization of the engines studied with emphasis on fuel economy, emissions and driveability.



HE 18.5 .A34 no. DOT- TSC  
NHTSA-79-62 I-III v.3  
Wiedemann, B.

Data base for light-weight  
automotive diesel power

**Form DOT F 1720.2 (8-70)**  
FORMERLY FORM DOT F 1700.11.1



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