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Volume 5

USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK
Volume 5
MA-1A Power Unit, Gas Turbine Engine (Continental)

JUNE 1975

AEROSPACE MEDICAL RESEARCH LABORATORY
AEROSPACE MEDICAL DIVISION
Air Force Systems Command
Wright-Patterson Air Force Base, Ohio 45433

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FOR THE COMMANDER

HENNING E. VON GIERKE
Director
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The MA-1A Power Unit is a gas turbine driven air compressor for providing the sustained high mass flow necessary to operate pneumatic starters for aircraft jet engines and other pneumatically operated power equipment. This report provides measured and extrapolated data defining the bioacoustic environments produced by this unit operating outdoors on a concrete apron at normal rated/loaded conditions. Near-field data are reported for 37 locations

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in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 36 locations are normalized to standard meteorological conditions and extrapolated from 5-800 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. Refer to Volume 1 of this handbook, "USAF Bioenvironmental Noise Data Handbook, Vol 1: Organization, Content and Application," AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc.

PREFACE

This report was prepared by the Biodynamic Environment Branch, Aerospace Medical Research Laboratory, under Project/Task 723104, Measurement of Noise and Vibration Environments of Air Force Operations.

The author acknowledges the efforts of Mr. Robert T. England and Mr. Robert G. Powell who conducted the field measurements, and Mr. John N. Cole who established the data analysis requirements and assisted in the preparation of this report. Mr. Henry Mohlman and Mr. David Eilerman of the University of Dayton assisted in the mechanics of data processing, and Mrs. Norma Peachy and Mr. Mike Patterson prepared the graphics.

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INTRODUCTION

The MA-1A Power Unit is a gas turbine driven air compressor for providing the sustained high mass flow necessary to operate pneumatic starters for aircraft jet engines and other pneumatically operated power equipment. This unit is manufactured by the Continental Aviation and Engineering Corporation.

This volume provides measured and extrapolated data defining the bioacoustic environments produced by this unit. Such data are essential to evaluate ear protection requirements, limiting personnel exposure times, voice communication capabilities, and annoyance problems associated with operations of the MA-1A power unit.

This volume is one of a series published by the Aerospace Medical Research Laboratory (AMRL) under the same report number (AMRL-TR-75-50) as a multi-volume handbook that quantifies the noise environments produced at flight/ground crew locations and in surrounding communities by operations of Air Force aircraft and aerospace ground equipment. The far-field, community-type, noise data in the handbook describe the noise produced during *ground operations* of aircraft, aerospace ground equipment, and other ground-based equipment or facilities.

Volume 1 of this handbook discusses the objectives and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. Volume 2 provides a method and data for adjusting the handbook's far-field noise data, which are for standard meteorological conditions (15C temperature, 70% rel humidity, 0.760 meters Hg barometric pressure) to derive comparable data for other meteorological conditions. *Refer to Volumes 1 and 2* (references 1 and 2) for such information because it is not repeated in other handbook volumes.

A cumulative index lists those aerospace systems contained in the handbook, and identifies the specific volumes containing each type of environmental noise data available (i.e., inflight/flight crew and passenger noise, near-field/ground crew noise, far-field/community noise). Volume numbers are assigned sequentially as individual volumes are published, and is available upon request from AMRL/BBE, Wright-Patterson AFB, OH 45433. Organizations on the distribution list for the handbook will automatically receive a copy of the updated index as it is generated.

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NEAR-FIELD NOISE

MEASUREMENTS

A standard MA-1A power unit was operated outdoors on a concrete apron at normal rated conditions of 35,000 RPM, and loaded at 40 PSI and unloaded at 0 PSI with no significant sound-reflective surfaces present except the ground plane. Table 1 notes the surface meteorological conditions at the time of measurement.

Figure 1 identifies 72 noise measurement locations at a height of 1.5 meters above the concrete apron (nominal ear level of ground crew). The 0 degree reference direction passes through the tow bar. The 36 locations on the two inner circles are in the acoustic near-field of the source where the sound wave fronts generally do not spherically diverge and the source appears to be spatially distributed (i.e., not a point source). Consequently, these near-field data cannot be extrapolated to longer distances but do properly define the levels at locations close to the unit.

Near-field measurements were also made at ear level at the operator control panel. Table 1 lists the numeric-alphabetic designator used on the data pages in this report to identify the operator measurement location and test condition. The designator 1/A means operator location 1 and test condition A. Such a descriptor is essential in many handbook volumes that involve multiple combinations of locations/conditions. It is used in this report to maintain format consistency.

RESULTS

The measured data presented in Table 2 define the sound pressure levels (SPL) produced by the MA-1A unit at the 37 specified, near-field locations. This table includes the overall, 1/3 octave band, and octave band levels. From these data one can calculate the variety of measures in Table 3 which are widely used to assess the effects of noise on personnel and their performance.

For data at other intermediate near-field locations (i.e., for radial distances less than 5 meters) you can interpolate between the 72 measured data points. All near field data are for the meteorological conditions at the time of test but are valid for all typical airbase meteorology because of the short distances over which the sound is propagated.

TABLE 1

MEASUREMENT LOCATION AND TEST CONDITION
FOR OPERATOR NOISE MEASUREMENTS

MA-1A Power Unit, Gas Turbine Engine (Continental)
Eglin AFB, 9 Aug 1971
Serial # 283559DEG1351

Measurement Location	
1	Operator Control Panel
AGE Operation	
A	35,000 RPM Unloaded (0 PSI)
Meteorology	
Temperature	31 C
Bar Pressure	.761 M Hg
Rel Humidity	63%

FAR-FIELD NOISE

MEASUREMENTS

Noise measurements were also made on the same MA-1A unit under the same loaded test conditions at the outer circle locations on Figure 1. These 36 locations are in the acoustic far-field of the source where the sound wave fronts spherically diverge and the unit may be regarded as a point noise source. Under these far-field conditions, the measured data can be extrapolated to longer distances.

RESULTS

Table 4 lists the overall and 1/3 octave band SPL measured at the 36 far-field locations under the meteorological conditions at the time of test. These data were normalized to 10 meters distance and standard meteorological conditions (15C temperature, 70% rel humidity, 0.760 meter Hg barometric pressure) and used to derive the graphic data in Figure 2 which provides a compact summary of the far-field noise characteristics of the MA-1A power unit in a standard format.

These measured data were also used to derive sets of equal noise contours (Figures 3 through 9) describing seven different measures of noise as functions of angle and distance from the source for standard day meteorology. Note that Figure 8 contours identify limiting exposure times for personnel. Missing data points on any of the contours are the result of eliminating measured data which contained excessive influence of spurious background noise present at the time of measurement. In some cases contour levels at these missing data points were estimated and indicated with dashed lines.

Volume 2 of the handbook defines the influence of meteorology on far-field noise environments and provides, if required, the factors necessary to adjust the handbook standard meteorological day data.

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TABLE: 2 MEASURED SOUND PRESSURE LEVEL (DB)
1/3 OCTAVE BAND

IDENTIFICATION:
OMEGA 3-2
TEST 71-020-280
RUN 01
03 SEP 74
PAGE F1

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
NEAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

FREQ (HZ)	DISTANCE (M) -> / ANGLE (DEG) -->	2 / 0	2 / 20	2 / 40	2 / 60	2 / 80	2 / 100	2 / 120	2 / 140	2 / 160	2 / 180	2 / 200	2 / 220	2 / 240
25		78	81	78	78	77	77	76<	78	80	81	80	80	80
31.5		81	81	81	81	81	79	81	81	84	85	84	82	82
40		84	83	83	83	83	83	82	84	85	86	85	85	84
50		84	86	86	86	85	86	86	86	85	88	88	86	86
63		87	86	88	88	87	87	87	87	87	91	89	88	88
80		88	89	90	89	90	88	89	88	89	89	88	88	89
100		92	94	94	93	94	94	94	94	96	97	94	95	95
125		100	101	100	99	100	99	101	103	105	105	104	102	102
160		103	103	102	102	102	104	106	109	110	110	109	108	108
200		103	102	102	103	105	108	110	111	113	114	113	112	111
250		97	97	96	98	100	101	103	105	108	110	109	108	106
315		99	98	96	95	96	97	98	101	103	104	102	101	99
400		99	98	97	97	97	98	99	102	104	105	104	102	100
500		99	99	99	97	98	99	101	102	104	105	104	101	100
630		99	100	99	97	99	100	100	102	104	105	103	100	99
800		101	99	95	95	96	97	94	99	105	109	102	96	97
1000		99	96	93	94	95	93	94	99	105	109	104	97	95
1250		93	91	90	92	95	92	95	98	104	106	103	98	95
1600		90	88	88	88	89	89	93	98	98	101	97	95	92
2000		86	88	88	87	89	88	91	95	96	98	96	93	91
2500		86	90	88	87	87	88	89	94	93	94	93	92	90
3150		84	89	89	85	85	86	88	92	93	94	92	91	88
4000		88	91	91	87	87	88	89	94	94	95	93	92	90
5000		96	97	96	91	92	92	93	96	96	99	96	94	93
6300		89	95	96	91	91	93	93	99	99	101	98	96	93
8000		93	96	99	94	95	97	98	103	103	104	104	100	98
10000		97	101	102	97	98	100	101	104	105	107	106	102	100
OVERALL		111	111	111	110	111	112	114	116	118	120	118	116	115

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: 2 — MEASURED SOUND PRESSURE LEVEL (DB), 1/3 OCTAVE BAND

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
NEAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

IDENTIFICATION:
OMEGA 3.2
TEST 71-020-280
RUN 02
03 SEP 74
PAGE F2

FREQ (HZ)	DISTANCE (M) → / ANGLE (DEG) →	2 260	2 280	2 300	2 320	2 340	1 0	1 20	1 40	1 60	1 80	1 100	1 120	1 140
25		79	79	78	80	78	86	87	87	88	91	92	89	92
31.5		82	80	80	79	81	85	88	88	88	91	91	93	93
40		84	85	83	83	83	89	89	90	91	93	95	94	95
50		86	86	87	85	85	90	91	92	92	95	97	96	97
63		87	87	87	87	86	93	93	94	95	97	96	98	97
80		89	88	89	88	88	96	96	97	97	98	99	100	101
100		95	96	95	94	93	102	102	102	103	101	103	104	105
125		101	101	101	100	101	107	107	108	107	105	108	110	111
160		106	106	104	103	103	105	104	104	106	106	109	111	113
200		108	108	107	104	103	105	103	105	106	108	109	113	114
250		103	102	101	99	97	105	103	103	102	103	105	108	110
315		97	96	95	96	98	102	101	102	101	102	104	105	107
400		99	97	97	98	98	103	103	103	105	103	107	109	112
500		100	99	99	98	98	100	105	105	105	105	109	112	113
630		99	99	95	97	98	102	103	101	100	104	106	106	106
800		98	97	95	94	100	103	100	99	99	101	103	103	105
1000		97	95	95	94	95	102	98	97	98	102	103	101	109
1250		96	95	92	90	90	96	94	95	97	101	100	102	108
1600		90	89	89	88	88	90	92	94	93	96	97	101	104
2000		89	88	87	88	86	88	91	93	92	93	95	98	100
2500		88	86	86	88	87	88	89	92	91	92	94	96	100
3150		86	84	85	87	88	85	88	92	90	90	93	95	98
4000		89	86	87	89	90	87	92	95	92	91	94	95	99
5000		93	90	90	94	98	94	99	99	95	94	99	98	101
6300		92	88	88	90	89	89	95	98	95	94	99	100	103
8000		98	92	92	93	93	92	96	100	99	98	104	105	108
10000		100	96	96	97	98	97	100	104	102	102	106	108	110
OVERALL		113	112	111	110	111	114	114	115	115	116	118	120	122

LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: 2 MEASURED SOUND PRESSURE LEVEL (DB) 1/3 OCTAVE BAND

IDENTIFICATION:
OMEGA 3.2
TEST 71-020-280
RUN 03
03 SEP 74
PAGE F3

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL) NEAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%) LOADED (40 PSI)

FREQ (HZ) / DISTANCE (M) / ANGLE (DEG)	1 @ 160	1 @ 180	1 @ 200	1 @ 220	1 @ 240	1 @ 260	1 @ 280	1 @ 300	1 @ 320	1 @ 340	OPERATOR LOCATION TEST CONDITION 1/A
25	93	91	93	94	91	89	89	87	87	87	81
31.5	96	96	96	95	93	91	89	90	87	88	82
40	97	97	96	96	94	94	92	91	90	89	85
50	98	97	98	97	95	93	92	92	92	91	87
63	100	98	99	100	96	96	94	94	93	93	89
80	102	101	101	100	99	98	98	97	96	96	92
100	106	105	106	106	104	104	103	102	103	103	93
125	112	113	113	112	110	108	107	106	107	107	99
160	115	114	115	114	113	110	109	108	106	105	102
200	117	117	118	117	113	110	110	108	108	105	105
250	113	114	113	112	108	104	102	102	103	104	100
315	110	112	109	107	103	101	99	99	101	101	97
400	114	114	113	111	107	105	103	103	103	102	98
500	115	116	116	113	110	107	106	106	104	103	98
630	109	111	109	109	108	107	103	102	103	104	97
800	108	109	106	102	104	103	99	98	98	102	96
1000	114	116	113	109	101	103	100	99	98	99	95
1250	112	114	111	108	100	103	98	96	96	96	92
1600	107	108	106	104	99	97	94	94	94	91	88
2000	104	106	104	101	97	95	93	93	93	91	89
2500	101	102	100	99	95	95	92	93	94	91	91
3150	101	102	100	98	94	90	89	90	91	86	96
4000	102	102	101	97	94	92	91	92	94	89	99
5000	105	106	103	101	99	96	96	95	99	93	109
6300	106	108	105	103	99	95	92	93	94	89	92
8000	111	111	110	108	103	100	96	97	98	92	95
10000	113	114	112	110	105	102	102	102	103	96	103
OVERALL	125	125	125	123	120	116	116	115	115	114	113

LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: 2 — MEASURED SOUND PRESSURE LEVEL (DB), 1/3 OCTAVE BAND

NOISE SOURCE/SUBJECT: MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL) NEAR FIELD NOISE LEVELS

OPERATION: 35,000 RPM (100%) UNLOADED (0 PSI)

IDENTIFICATION: OMEGA 3.2 TEST 71-020-280 RUN 04 03 SEP 74 PAGE F4

FREQ (HZ) / DISTANCE (M) -> / ANGLE (DEG) -->	5 160	5 170	5 180	5 190	5 200	2 160	2 180	2 200
25	76<	71<	74<	75<	74<	80	80	82
31.5	78	74<	73<	76<	75<	82	84	84
40	79	77	78	78	79	84	85	84
50	80	80	80	81	81	87	87	86
63	83	82	82	84	84	88	88	89
80	85	85	86	84	85	89	90	89
100	88	89	88	89	91	95	96	95
125	94	95	94	95	95	104	103	104
160	95	96	95	95	95	108	108	109
200	96	97	97	96	96	114	114	113
250	96	96	97	96	97	108	109	109
315	98	97	98	98	98	103	102	102
400	100	100	101	100	101	104	105	104
500	101	103	101	103	104	105	107	106
630	97	98	97	98	97	105	105	103
800	97	97	100	99	96	105	108	102
1000	98	103	101	102	98	106	109	104
1250	97	98	98	96	97	105	107	104
1600	91	93	93	93	91	99	101	99
2000	88	89	88	90	89	96	97	96
2500	85	88	86	83	89	94	94	93
3150	86	88	86	87	86	95	94	91
4000	92	91	86	88	88	97	94	93
5000	93	93	88	90	90	97	95	94
6300	95	96	90	94	93	98	97	94
8000	101	102	95	100	99	103	101	99
10000	103	104	96	103	102	103	102	100
OVERALL	110	111	110	111	110	118	119	118

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: 2 — MEASURED SOUND PRESSURE LEVEL (DB) OCTAVE BAND

IDENTIFICATION:
OMEGA 3.2
TEST 71-020-280
RUN 01
03 SEP 74
PAGE J1

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
NEAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

FREQ (HZ)	DISTANCE (M) ->	2	2	2	2	2	2	2	2	2	2	2	2	2
	ANGLE (DEG) -->	0	20	40	60	80	100	120	140	160	180	200	220	240
31.5		86	87	86	86	86	85	85	86	88	89	88	88	87
63		91	92	93	93	93	92	92	91	92	94	93	92	93
125		105	105	104	104	104	105	107	110	111	111	110	109	109
250		105	104	104	105	106	109	111	112	114	116	115	114	112
500		104	104	103	102	103	104	105	107	109	109	108	106	104
1000		103	101	98	98	100	99	99	104	109	113	108	102	100
2000		92	93	93	92	93	93	96	100	101	103	100	98	96
4000		97	98	98	93	94	94	95	99	99	101	98	97	95
8000		98	103	104	99	100	102	103	107	108	109	108	104	103
OVERALL		111	111	111	110	111	112	114	116	118	120	118	116	115

TABLE: 2 MEASURED SOUND PRESSURE LEVEL (OB) OCTAVE BAND

NOISE SOURCE/SUBJECT: MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL) NEAR FIELD NOISE LEVELS

OPERATION: 35,000 RPM (100%) LOADED (40 PSI)

IDENTIFICATION: OMEGA 3.2 TEST 71-020-280 RUN 02 03 SEP 74 PAGE J2

FREQ (HZ)	DISTANCE (M) ->	2	2	2	2	2	1	1	1	1	1	1	1	1
	ANGLE (DEG) -->	260	280	300	320	340	0	20	40	60	80	100	120	140
31.5		87	87	85	86	86	92	93	93	94	96	98	97	98
63		92	92	93	91	91	99	99	99	100	102	102	103	104
125		107	108	106	105	105	110	109	110	110	109	112	114	116
250		109	109	108	106	105	109	107	108	108	110	111	114	116
500		104	103	102	102	103	106	108	108	103	109	112	114	116
1000		102	100	99	98	101	106	103	102	103	106	107	107	112
2000		94	92	92	93	92	93	95	97	96	98	100	104	107
4000		95	92	93	96	99	95	100	101	98	97	101	101	104
8000		102	98	98	99	99	98	102	106	104	104	108	110	113
OVERALL		113	112	111	110	111	114	114	115	115	116	118	120	122

TABLE: 2 — MEASURED SOUND PRESSURE LEVEL (DB) OCTAVE BAND	IDENTIFICATION:
NOISE SOURCE/SUBJECT: MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL) NEAR FIELD NOISE LEVELS	OPERATION: 35,000 RPM (100%) LOADED (40 PSI)	OMEGA 3.2 TEST 71-020-280 RUN 03 03 SEP 74 PAGE J3

FREQ (HZ) / DISTANCE (M) -> / ANGLE (DEG) -->	1 160	1 180	1 200	1 220	1 240	1 260	1 280	1 300	1 320	1 340	OPERATOR LOCATION TEST CONDITION 1/A
31.5	100	100	100	100	98	96	95	94	93	93	88
63	105	103	104	104	102	101	100	100	99	98	94
125	117	117	118	117	115	113	112	111	110	110	104
250	119	119	120	118	115	112	110	110	110	108	106
500	118	119	118	116	113	111	109	108	108	108	103
1000	116	119	115	111	106	108	104	102	102	104	99
2000	109	111	109	106	102	100	98	98	98	95	94
4000	108	108	106	103	101	98	98	98	101	95	109
8000	116	116	114	112	107	105	103	103	105	98	104
OVERALL	125	125	125	123	120	118	116	115	115	114	113

TABLE: 2 MEASURED SOUND PRESSURE LEVEL (DB) OCTAVE BAND

IDENTIFICATION:
OMEGA 3.2
TEST 71-020-280
RUN 04
03 SEP 74
PAGE J4

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
NEAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
UNLOADED (0 PSI)

FREQ (HZ) / DISTANCE (M) -> / ANGLE (DEG) -->	5 160	5 170	5 180	5 190	5 200	2 160	2 180	2 200
31.5	82	79	80	81	81	87	88	88
63	88	88	88	88	89	93	93	93
125	98	99	98	98	99	110	110	110
250	102	101	102	101	102	115	115	115
500	104	105	105	105	106	109	111	109
1000	102	105	105	104	102	110	113	108
2000	93	95	95	95	94	102	103	101
4000	96	96	91	93	93	101	99	98
8000	106	106	99	105	104	107	105	103
OVERALL	110	111	110	111	110	118	119	118

TABLE: MEASURES OF HUMAN NOISE EXPOSURE

3

IDENTIFICATION:

OMEGA 3.2
TEST 71-020-280
RUN 01

03 SEP 74

PAGE H1

NOISE SOURCE/SUBJECT:
HA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
NEAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

DISTANCE (M) ->	2	2	2	2	2	2	2	2	2	2	2	2	2
ANGLE (DEG) -->	0	20	40	60	80	100	120	140	160	180	200	220	240
HAZARD/PROTECTION													
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DBC) AT EAR													
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DBA) AT EAR													
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)													
NO PROTECTION													
OASLC	111	111	110	109	110	112	114	116	118	119	118	116	115
OASLA	107	107	107	105	106	106	108	111	113	116	113	110	108
T	9	9	9	13	11	11	8	4.5	3.2	P	3.2	5	8
MINIMUM QPL EAR MUFFS													
OASLA*	87	88	87	86	87	89	91	93	95	96	95	93	92
T	285	240	285	339	285	202	143	101	71	60	71	101	120
AMERICAN OPTICAL 1700 EAR MUFFS													
OASLA*	82	83	83	82	83	84	86	89	90	91	90	89	88
T	679	571	571	679	571	480	339	202	170	143	170	202	240
V-51R EAR PLUGS													
OASLA*	83	83	82	81	82	83	84	87	90	92	89	86	85
T	571	571	679	807	679	571	480	285	170	120	202	339	404
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS													
OASLA*	69	69	69	67	68	69	70	73	76	78	76	72	71
T	960	960	960	960	960	960	960	960	960	960	960	960	960
H-133 GROUND COMMUNICATION UNIT													
OASLA*	79	79	78	77	78	79	81	84	86	89	86	83	82
T	960	960	960	960	960	960	807	480	339	202	339	571	679
COMMUNICATION													
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)													
PSIL	100	99	98	97	98	99	100	104	106	108	105	102	100
ANNOYANCE													
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)													
TONE CORRECTION (C IN DB)													
PNLT	123	123	121	119	120	121	123	125	127	128	127	125	123
C	2	2	0	1	1	1	1	1	1	1	1	1	1

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.
P ADDITIONAL EAR PROTECTION REQUIRED.

TABLE: MEASURES OF HUMAN NOISE EXPOSURE

3

IDENTIFICATION:
OMEGA 3.2
TEST 71-020-260
RUN 02
03 SEP 74
PAGE H2

NOISE SOURCE/SUBJECT:
HA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
NEAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

DISTANCE (M) ->	2	2	2	2	2	1	1	1	1	1	1	1	1
ANGLE (DEG) -->	260	280	300	320	340	0	20	40	60	80	100	120	140
HAZARD/PROTECTION													
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DBC) AT EAR													
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DBA) AT EAR													
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)													
NO PROTECTION													
OASLC	113	112	111	110	110	114	114	114	114	115	117	120	122
OASLA	107	106	105	105	106	109	109	110	109	111	113	115	118
T	9	11	13	13	11	6	6	5	6	4.5	3.2	2.2	P
MINIMUM QPL EAR MUFFS													
OASLA*	90	90	88	87	87	91	91	92	92	92	95	97	99
T	170	170	240	285	285	143	143	120	120	120	71	50	36
AMERICAN OPTICAL 1700 EAR MUFFS													
OASLA*	86	85	84	83	82	87	86	87	87	87	90	92	94
T	339	404	480	571	679	285	339	285	285	285	170	120	85
V-51R EAR PLUGS													
OASLA*	84	83	82	81	82	86	86	86	86	87	90	91	94
T	480	571	679	807	679	339	339	339	339	285	170	143	85
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS													
OASLA*	70	69	68	67	68	72	72	72	72	73	76	77	80
T	960	960	960	960	960	960	960	960	960	960	960	960	960
H-133 GROUND COMMUNICATION UNIT													
OASLA*	81	80	78	78	78	82	81	82	82	83	85	87	90
T	807	960	960	960	960	679	807	679	679	571	404	285	170
COMMUNICATION													
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)													
PSIL	100	99	98	98	99	102	102	102	102	104	106	108	111
ANNOYANCE													
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)													
TONE CORRECTION (C IN DB)													
PNLT	122	121	120	121	124	123	125	125	123	124	127	130	132
C	1	1	1	2	3	2	2	1	0	1	0	1	2

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.
P ADDITIONAL EAR PROTECTION REQUIRED.

TABLE: MEASURES OF HUMAN NOISE EXPOSURE

3

IDENTIFICATION:
OMEGA 3.2
TEST 71-020-280
RUN 03
03 SEP 74
PAGE H3

NOISE SOURCE/SUBJECT:
HA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
NEAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

DISTANCE (M) ->	1	1	1	1	1	1	1	1	1	1	OPERATOR LOCATION
ANGLE (DEG) -->	160	180	200	220	240	260	280	300	320	340	TEST CONDITION
											1/A
HAZARD/PROTECTION											
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DBC) AT EAR											
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DBA) AT EAR											
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)											
NO PROTECTION											
OASLC	124	125	124	123	120	117	116	115	115	114	112
OASLA	121	122	120	118	114	113	110	110	110	109	111
T	P	P	P	P	2.7	3.2	5	5	5	6	4.5
MINIMUM QPL EAR MUFFS											
OASLA*	101	101	101	100	97	95	93	93	92	92	89
T	25	25	25	30	50	71	101	101	120	120	202
AMERICAN OPTICAL 1700 EAR MUFFS											
OASLA*	96	97	97	95	92	90	89	88	88	87	84
T	60	50	50	71	120	170	202	240	240	285	480
V-51R EAR PLUGS											
OASLA*	97	98	97	94	91	89	87	86	86	85	84
T	50	42	50	85	143	202	285	339	339	339	480
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS											
OASLA*	83	85	83	80	77	75	73	72	72	72	70
T	571	404	571	960	960	960	960	960	960	960	960
H-133 GROUND COMMUNICATION UNIT											
OASLA*	93	95	93	90	87	85	83	82	82	82	81
T	101	71	101	170	285	404	571	679	679	679	807
COMMUNICATION											
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)											
PSIL	115	116	114	111	107	106	103	103	103	103	98
ANNOYANCE											
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)											
TONE CORRECTION (C IN DB)											
PNLT	135	136	135	132	127	126	125	124	126	123	131
C	1	1	2	1	0	1	1	1	2	1	4

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.
P ADDITIONAL EAR PROTECTION REQUIRED.

TABLE: MEASURES OF HUMAN NOISE EXPOSURE

3

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
NEAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
UNLOADED (0 PSI)

IDENTIFICATION:
OMEGA 3.2
TEST 71-020-280
RUN 04
03 SEP 74
PAGE H4

DISTANCE (M) ->	5	5	5	5	5	2	2	2
ANGLE (DEG) -->	160	170	180	190	200	160	180	200
HAZARD/PROTECTION								
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN OBC) AT EAR								
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN OBA) AT EAR								
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)								
NO PROTECTION								
OASLC	109	110	109	110	110	118	119	118
OASLA	108	109	107	108	108	114	115	112
T	8	6	9	8	8	2.7	2.2	3.8
MINIMUM QPL EAR MUFFS								
OASLA*	86	87	85	86	86	95	95	94
T	339	285	404	339	339	71	71	85
AMERICAN OPTICAL 1700 EAR MUFFS								
OASLA*	81	82	80	82	82	90	90	90
T	807	679	960	679	679	170	170	170
V-51R EAR PLUGS								
OASLA*	83	84	84	84	83	90	92	89
T	571	480	480	480	571	170	120	202
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS								
OASLA*	7?	71	70	71	69	76	78	75
T	960	960	960	960	960	960	960	960
H-133 GROUND COMMUNICATION UNIT								
OASLA*	79	81	79	80	79	87	88	86
T	960	807	960	960	960	285	240	339
COMMUNICATION								
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)								
PSIL	100	102	101	102	101	107	109	106
ANNOYANCE								
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)								
TONE CORRECTION (C IN DB)								
PNLT	121	123	118	122	122	128	128	126
C	0	2	0	1	2	1	1	1

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.

TABLE: 4

MEASURED SOUND PRESSURE LEVEL (DB)
1/3 OCTAVE BAND
DISTANCE = 5 METERS

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 2

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 31 C
BAR PRESS = .761 M HG
REL HUMID = 63 %

FREQ (HZ)	ANGLE (DEGREES) 0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
25	72<	72<	70<	71<	71<	70<	70<	70<	70<	72<	72<	71<	71<	74<	77	74<	73<	76<	75<
31.5	75<	76	75<	75<	75<	74<	73<	74<	73<	74<	76	76<	75<	74<	75<	74<	77	78	78
40	78	79	79	78	80	78	77	77	78	78	80	78	77	77	78	79	80	80	79
50	81	82	82	81	83	81	81	80	81	79	81	79	81	81	81	81	82	83	82
63	84	84	83	83	83	83	83	83	83	84	84	83	83	83	83	83	84	84	84
80	87	86	87	86	87	86	86	86	85	87	87	85	86	85	86	85	86	86	85
100	89	88	89	89	89	87	8"	87	88	89	88	87	88	88	88	87	88	88	88
125	90	88	89	87	89	89	90	91	92	93	93	92	93	92	93	93	94	94	94
160	88	86	87	87	89	90	91	92	91	92	90	89	92	93	94	95	96	96	95
200	90	90	89	88	87	86	86	86	86	86	88	90	93	94	95	96	96	96	95
250	93	92	91	90	89	89	89	88	88	87	88	89	91	93	93	95	95	96	97
315	95	94	93	91	90	90	90	90	89	90	91	93	95	96	96	97	97	98	98
400	96	96	94	95	96	94	93	92	93	93	93	95	96	97	99	100	101	101	103
500	94	93	94	97	97	93	94	93	93	93	94	97	97	99	101	103	104	104	105
630	95	95	91	92	91	87	86	87	87	88	88	89	90	91	93	96	98	99	99
800	93	94	92	92	89	87	88	88	89	89	89	89	90	91	92	95	98	100	101
1000	93	92	90	90	88	87	87	88	88	88	89	87	89	92	95	97	100	103	105
1250	88	89	86	88	86	87	88	88	87	86	86	87	90	92	94	96	98	99	99
1600	84	84	84	86	85	83	84	84	84	84	84	86	87	89	91	92	91	92	94
2000	82	83	81	84	83	82	82	83	82	82	82	84	84	86	89	89	89	90	92
2500	81	82	81	83	83	83	81	80	80	81	82	82	83	86	87	88	88	88	89
3150	80	81	83	85	83	80	80	80	80	80	80	82	82	85	86	88	86	87	88
4000	83	85	85	85	86	82	82	81	79	80	81	82	83	85	87	89	88	88	88
5000	88	93	89	91	89	87	88	87	82	83	85	86	86	88	89	91	90	90	89
6300	84	85	86	89	88	85	82	81	82	83	85	86	87	90	91	93	93	92	93
8000	87	89	89	92	91	89	86	85	87	88	90	91	92	95	96	98	97	97	97
10000	93	94	94	95	95	93	92	90	90	91	94	93	95	97	98	101	100	99	100
OVERALL	104	104	103	104	104	102	102	102	102	102	103	103	105	106	108	109	110	111	112

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: 4 — MEASURED SOUND PRESSURE LEVEL (DB)
1/3 OCTAVE BAND
DISTANCE = 5 METERS

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 31 C
BAR PRESS = .761 M HG
REL HUMID = 63 %

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 02
13 FEB 75
PAGE 2

FREQ (HZ)	ANGLE (DEGREES) 190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350
25	82	78	75<	80	76<	76<	80	74<	70<	71<	69<	71<	70<	71<	70<	70<	72<
31.5	81	76	77	77	77	76	77	75<	72<	74<	71<	74<	74<	74<	74<	75<	75<
40	80	79	79	80	79	78	79	78	77	77	76	77	77	77	78	78	78
50	80	82	82	82	80	80	81	80	79	79	80	80	80	81	81	80	81
63	84	84	84	84	84	82	84	82	82	81	82	81	82	83	82	82	84
80	85	84	85	85	85	84	85	84	85	85	85	85	86	85	85	86	87
100	88	89	89	88	88	88	88	87	88	87	88	87	87	87	88	87	89
125	96	95	94	94	93	93	93	92	92	93	91	92	89	88	89	89	89
160	98	97	96	96	93	93	92	92	92	93	93	92	91	90	89	88	87
200	97	96	95	94	94	92	91	89	89	89	90	90	90	90	89	89	89
250	95	95	94	94	94	91	91	89	88	87	87	87	87	88	89	90	92
315	97	97	96	95	96	94	94	92	91	90	89	90	90	90	90	92	94
400	99	100	98	97	95	95	93	92	92	91	90	90	92	94	93	93	95
500	103	103	101	101	99	97	95	93	93	93	93	94	94	95	95	95	92
630	99	97	95	93	91	90	91	91	90	89	88	88	88	89	89	90	93
800	98	96	92	91	89	88	90	89	89	88	87	86	85	87	89	91	92
1000	103	100	94	93	91	90	89	88	89	89	89	89	87	87	87	88	91
1250	96	95	94	93	92	90	88	86	88	88	86	87	86	87	86	87	87
1600	92	90	90	90	89	88	86	84	85	84	83	83	83	83	83	83	82
2000	89	90	88	89	88	86	85	83	83	83	82	83	83	83	82	82	82
2500	86	87	87	88	86	85	83	83	84	82	81	82	83	82	81	81	80
3150	85	88	88	86	84	84	85	83	82	81	80	81	81	82	83	82	81
4000	86	88	87	86	85	86	84	84	84	84	83	85	83	84	83	85	87
5000	89	90	87	88	86	86	85	85	84	85	85	89	87	88	87	91	95
6300	91	91	88	89	87	85	84	84	84	83	81	83	83	84	83	83	83
8000	96	96	93	94	91	90	88	88	88	86	84	86	86	87	87	86	86
10000	99	98	95	96	95	93	92	92	92	90	88	91	91	92	92	91	91
OVERALL	110	109	107	107	105	104	103	102	102	102	101	102	102	102	102	103	104

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

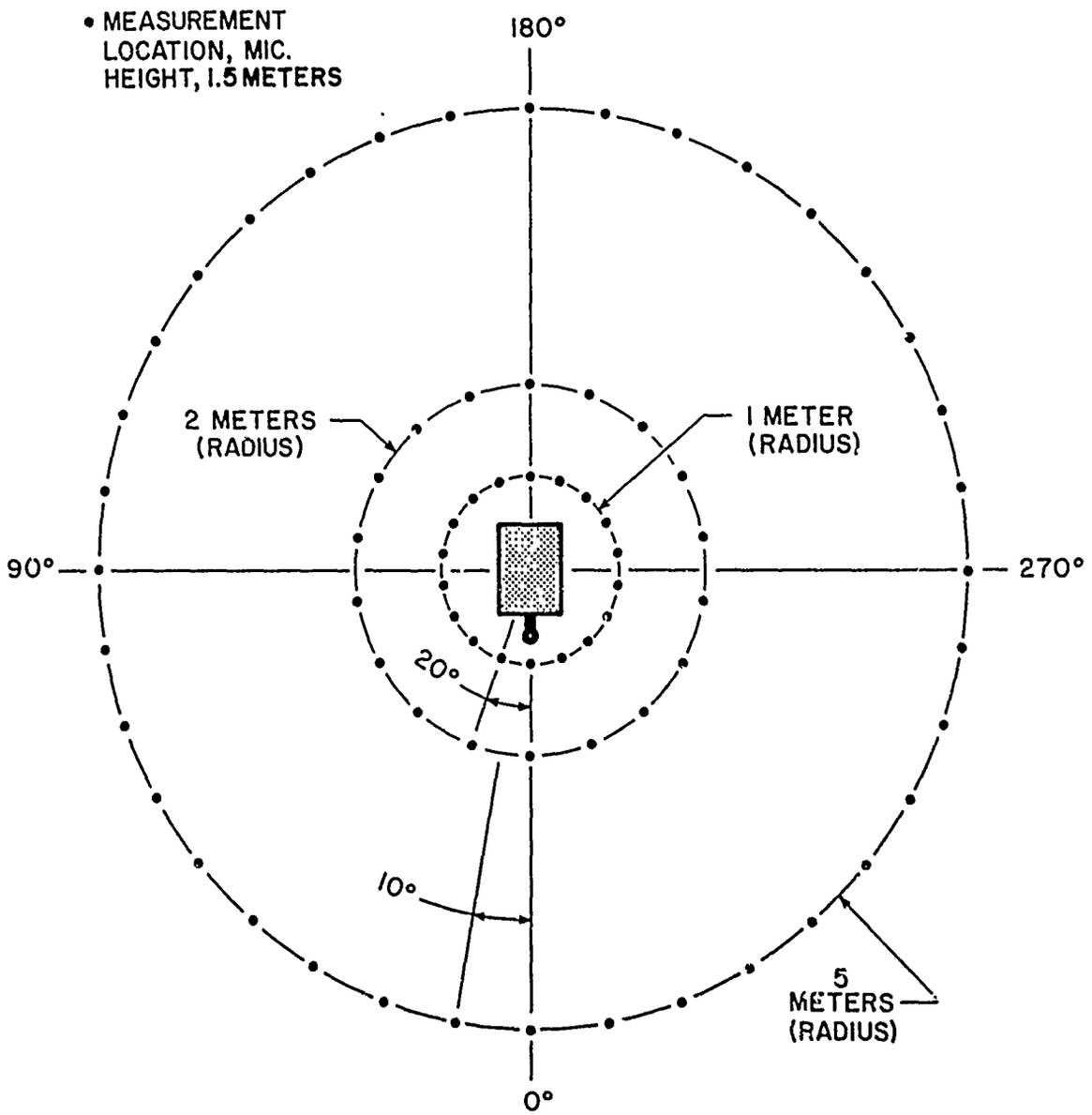


Figure 1. Measurement Locations

FIGURE: NORMALIZED FARFIELD NOISE LEVELS

2 DISTANCE = 10 METERS

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 4

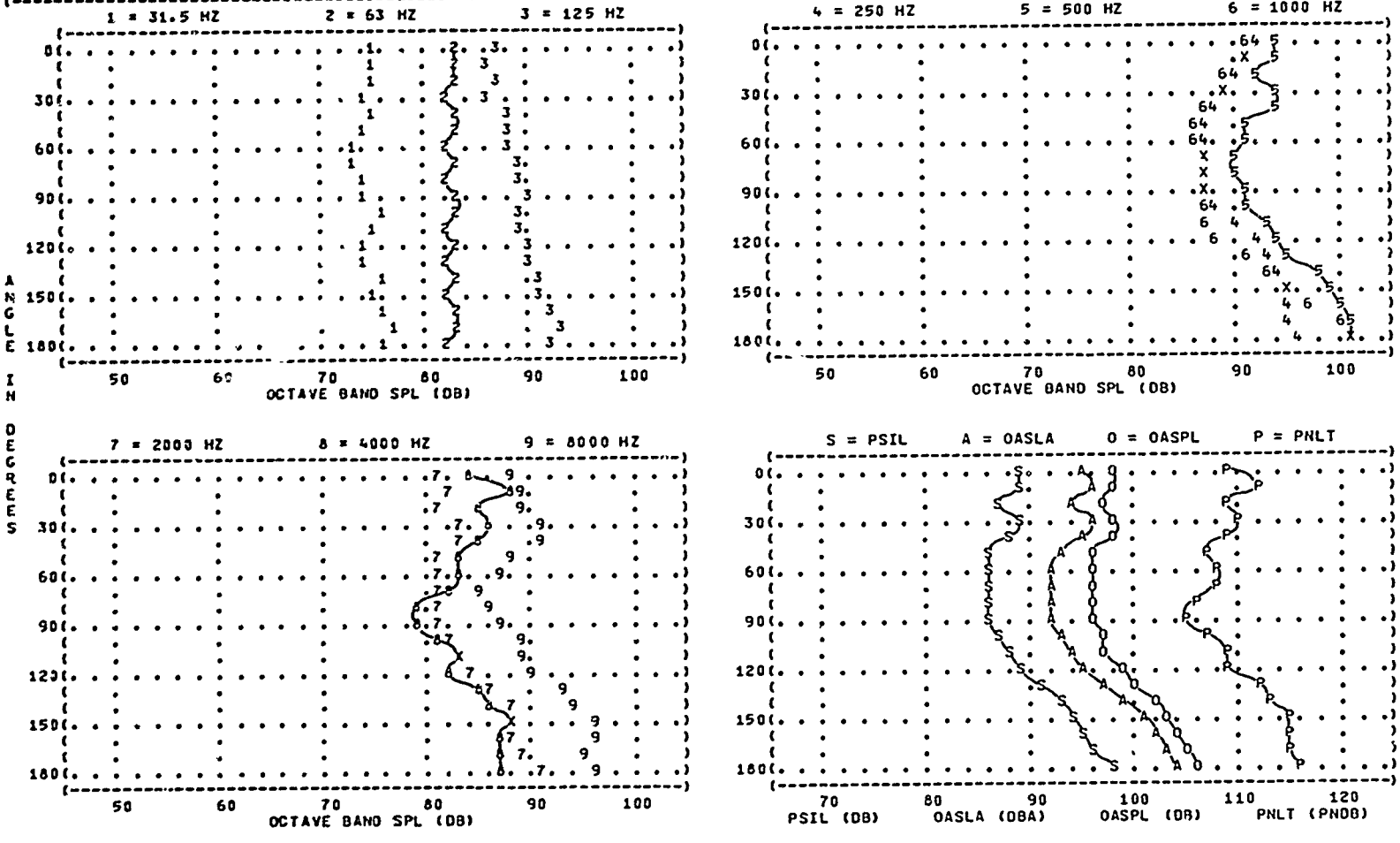


FIGURE: 2 NORMALIZED FARFIELD NOISE LEVELS

DISTANCE = 10 METERS

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-260
RUN 02
13 FEB 75
PAGE 4

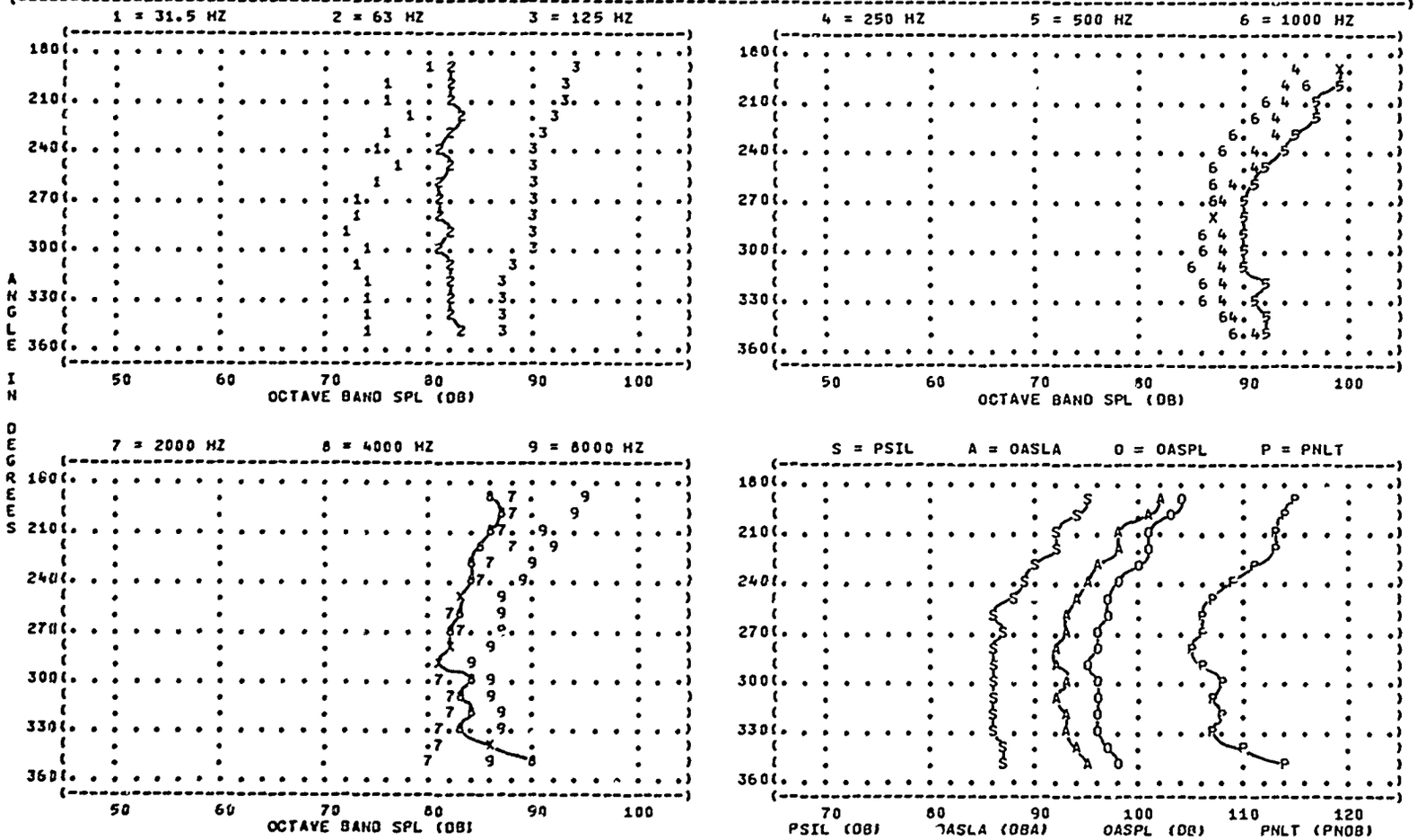


FIGURE: 3 OVERALL SOUND PRESSURE LEVEL (OASPL) EQUAL LEVEL CONTOURS (DB)

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 11

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

POINT	DB
A	55
B	60
C	65
D	70
E	75
F	80
G	85
H	90
I	95
J	100
K	105
L	110

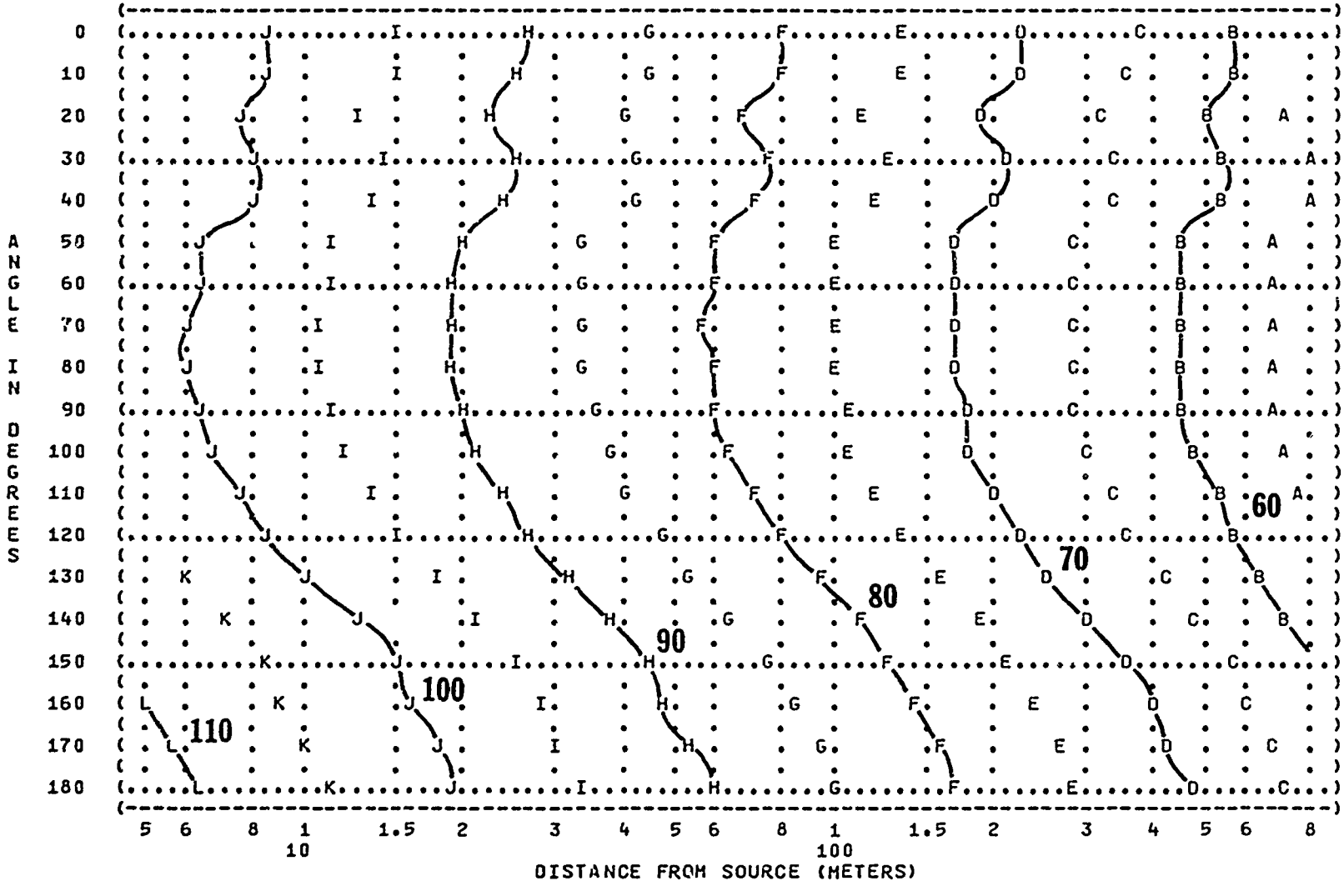


FIGURE: 3 OVERALL SOUND PRESSURE LEVEL (OASPL) EQUAL LEVEL CONTOURS (DB)

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 02
13 FEB 75
PAGE 11

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

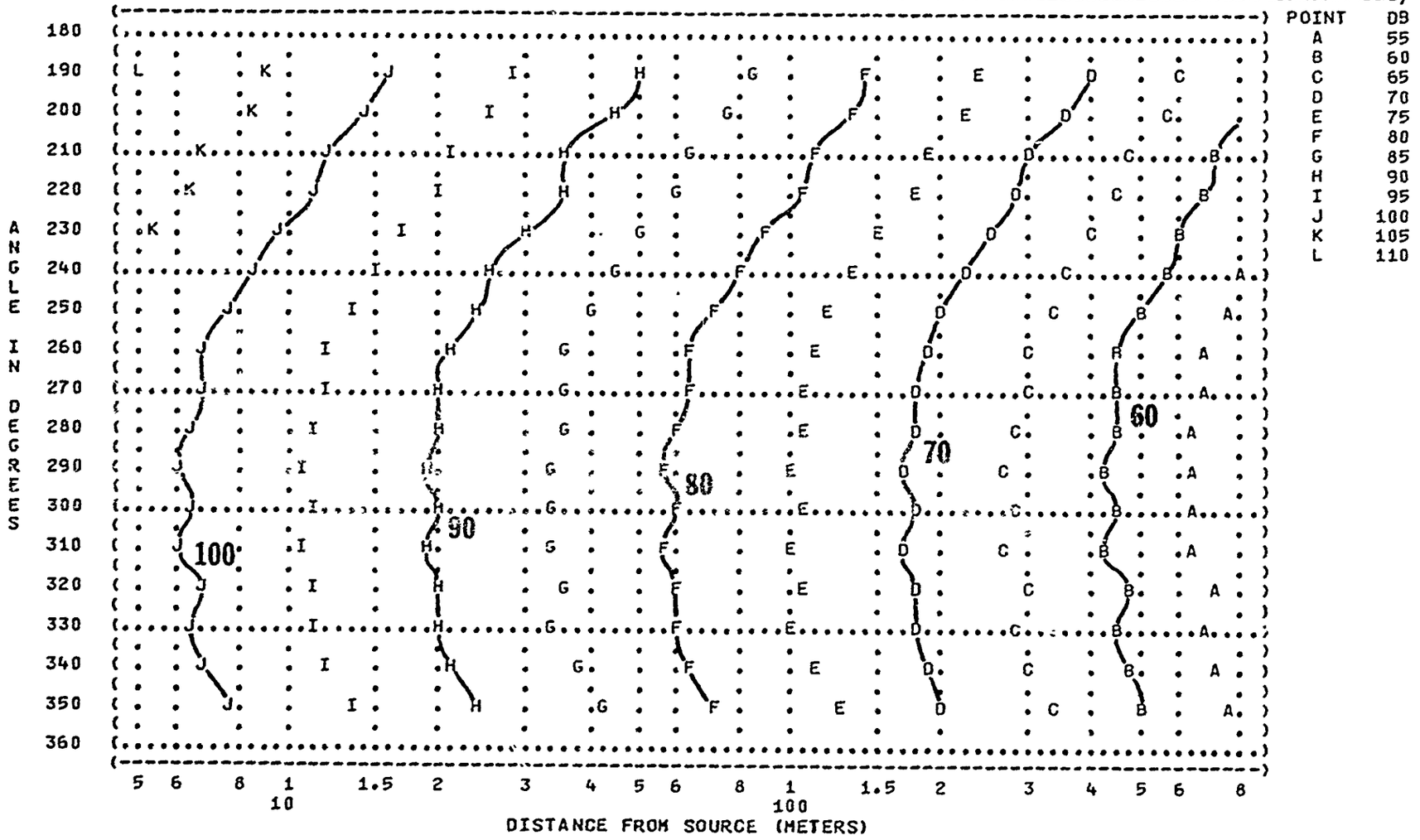


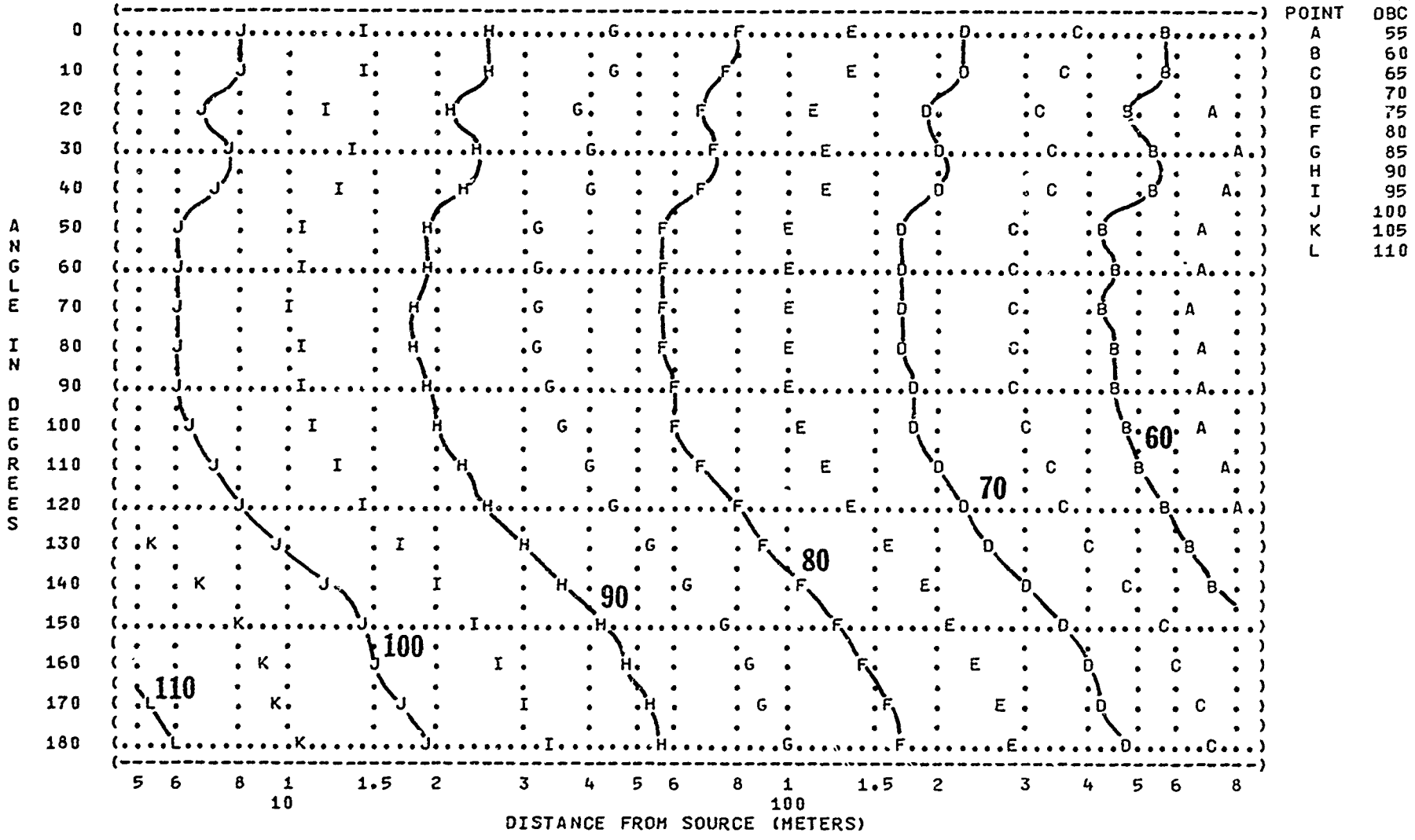
FIGURE: 4 C-WEIGHTED OVERALL SOUND LEVEL (OASLC) EQUAL LEVEL CONTOURS (OBC)

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 12

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %



POINT	OBC
A	55
B	60
C	65
D	70
E	75
F	80
G	85
H	90
I	95
J	100
K	105
L	110

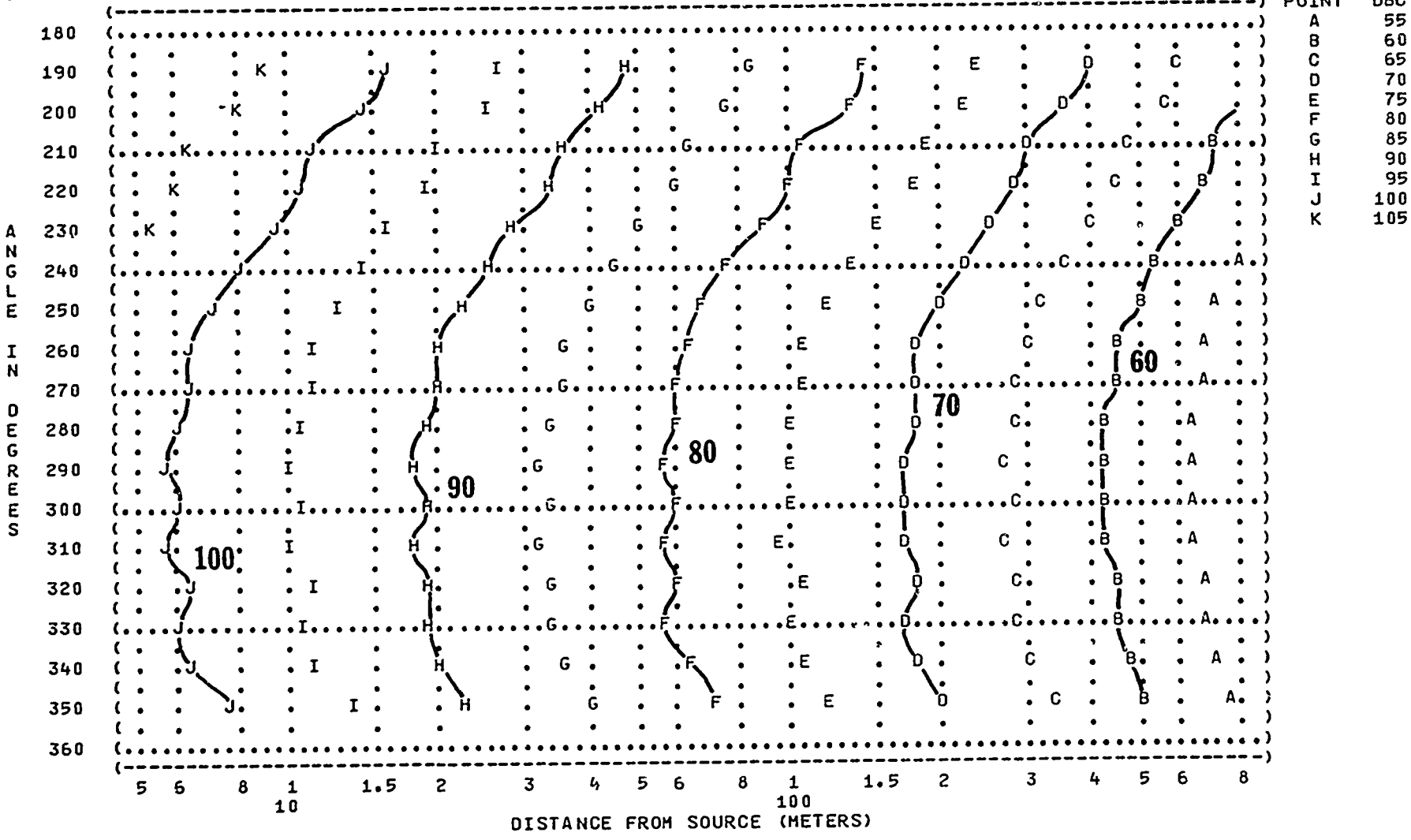
FIGURE: 4 C-WEIGHTED OVERALL SOUND LEVEL (OASLC) EQUAL LEVEL CONTOURS (DBC)

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 02
13 FEB 75
PAGE 12

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %



POINT	DBC
A	55
B	60
C	65
D	70
E	75
F	80
G	85
H	90
I	95
J	100
K	105

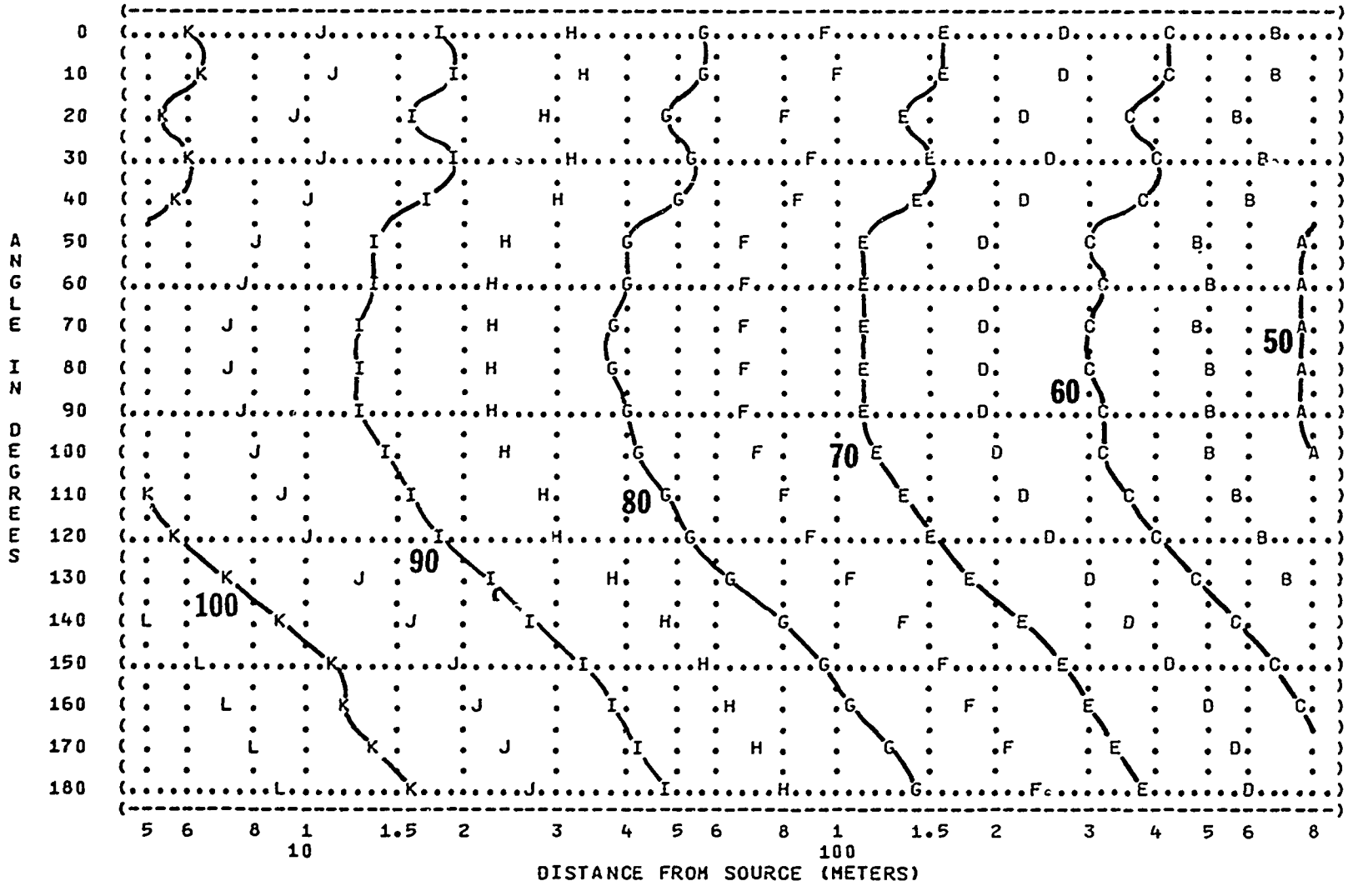
FIGURE 5: A-WEIGHTED OVERALL SOUND LEVEL (OASLA) EQUAL LEVEL CONTOURS (DBA)

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 13

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %



POINT	DBA
A	50
B	55
C	60
D	65
E	70
F	75
G	80
H	85
I	90
J	95
K	100
L	105

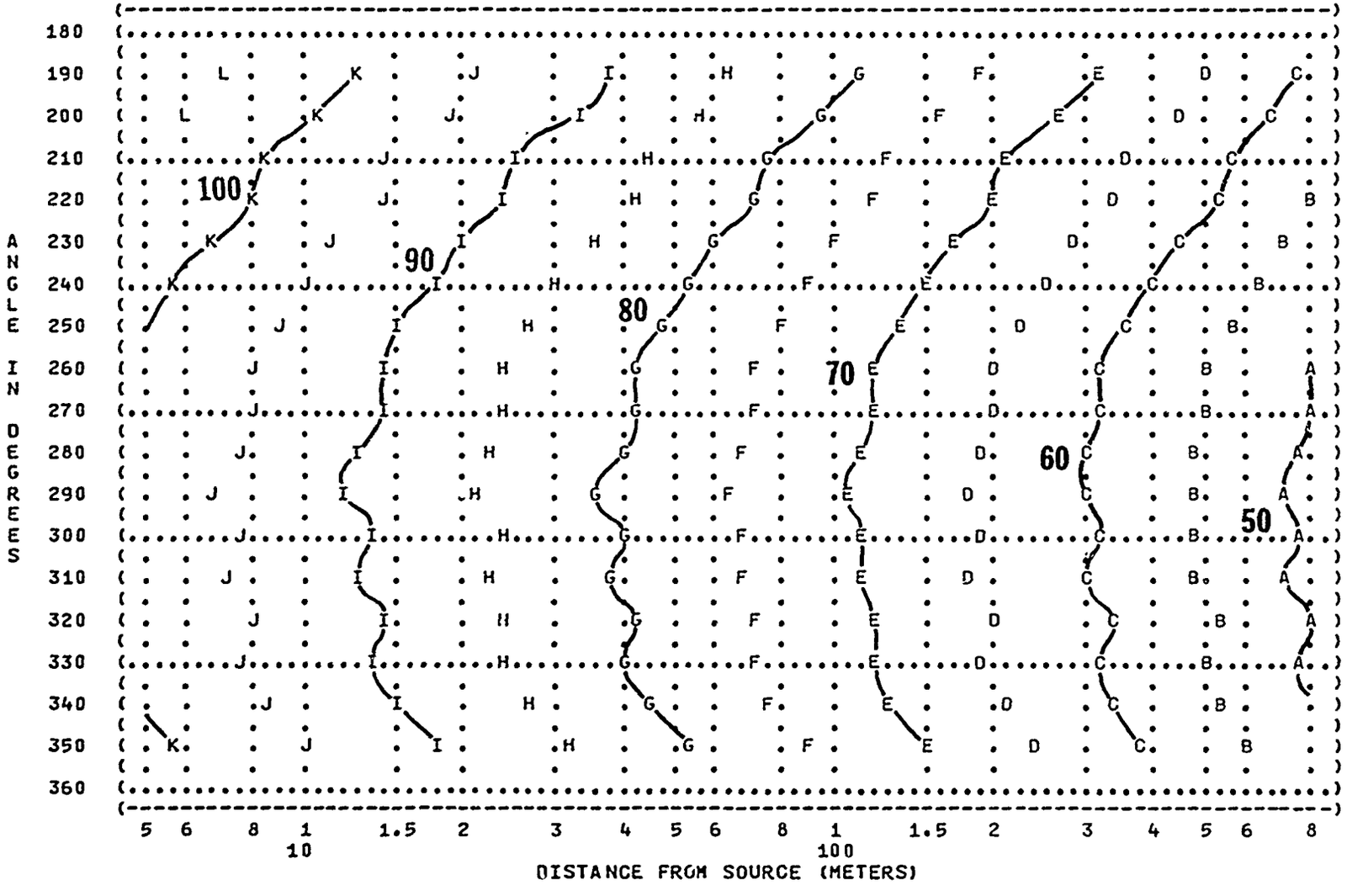
FIGURE: 5 A-WEIGHTED OVERALL SOUND LEVEL (OASLA) EQUAL LEVEL CONTOURS (DBA)

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 02
13 FEB 75
PAGE 13

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %



POINT	DBA
A	50
B	55
C	60
D	65
E	70
F	75
G	80
H	85
I	90
J	95
K	100
L	105

FIGURE: 6 PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT) EQUAL LEVEL CONTOURS (PNDB)

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 14

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

POINT	PNDB
A	60
B	65
C	70
D	75
E	80
F	85
G	90
H	95
I	100
J	105
K	110
L	115
M	120

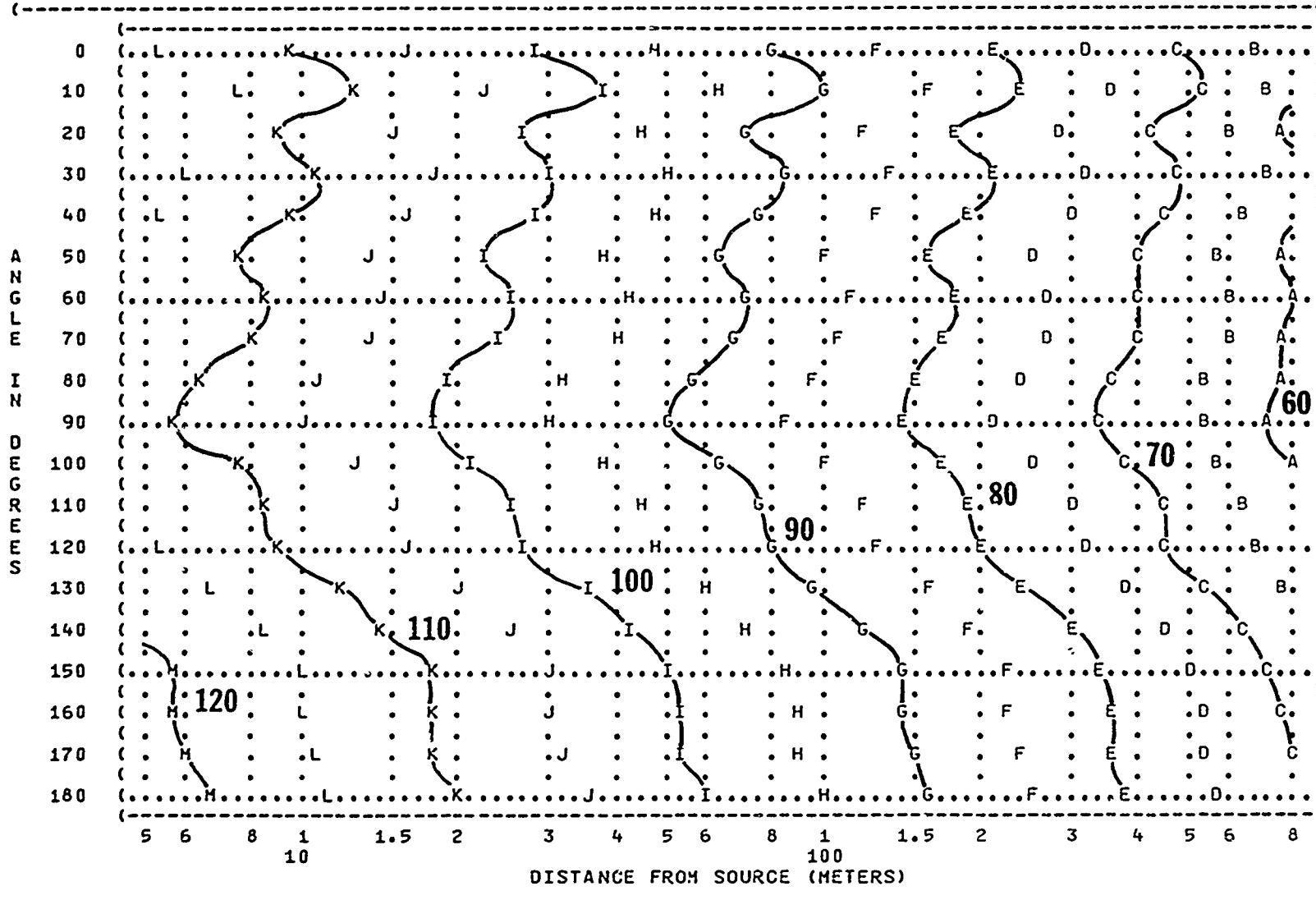


FIGURE 6: PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT) EQUAL LEVEL CONTOURS (PNDB)

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 02
13 FEB 75
PAGE 14

POINT	PNDB
A	60
B	65
C	70
D	75
E	80
F	85
G	90
H	95
I	100
J	105
K	110
L	115
M	120

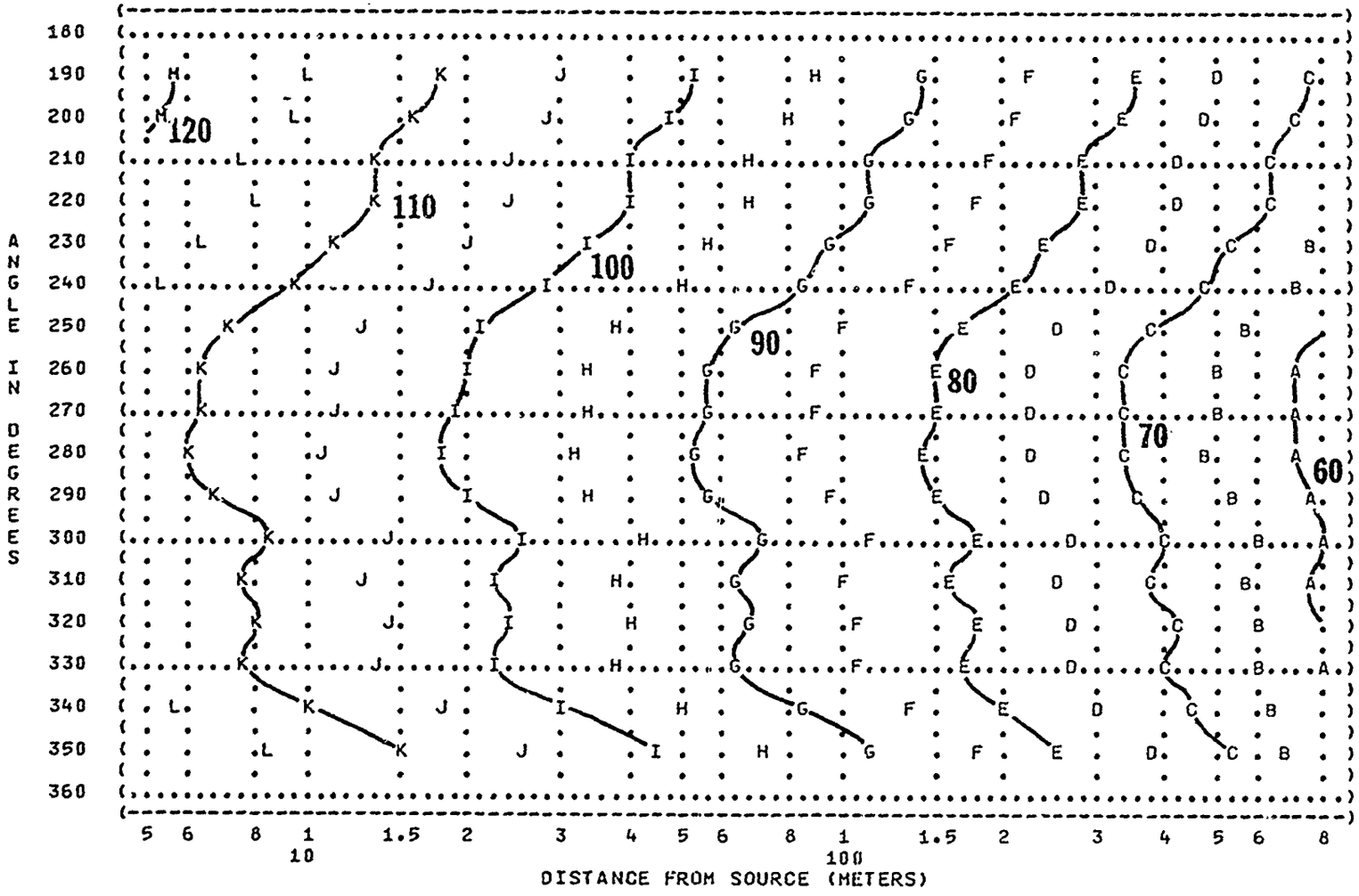


FIGURE: 7 PREFERRED SPEECH INTERFERENCE LEVEL (PSIL) EQUAL LEVEL CONTOURS (DB)

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 15

POINT	DB
A	45
B	50
C	55
D	60
E	65
F	70
G	75
H	80
I	85
J	90
K	95
L	100

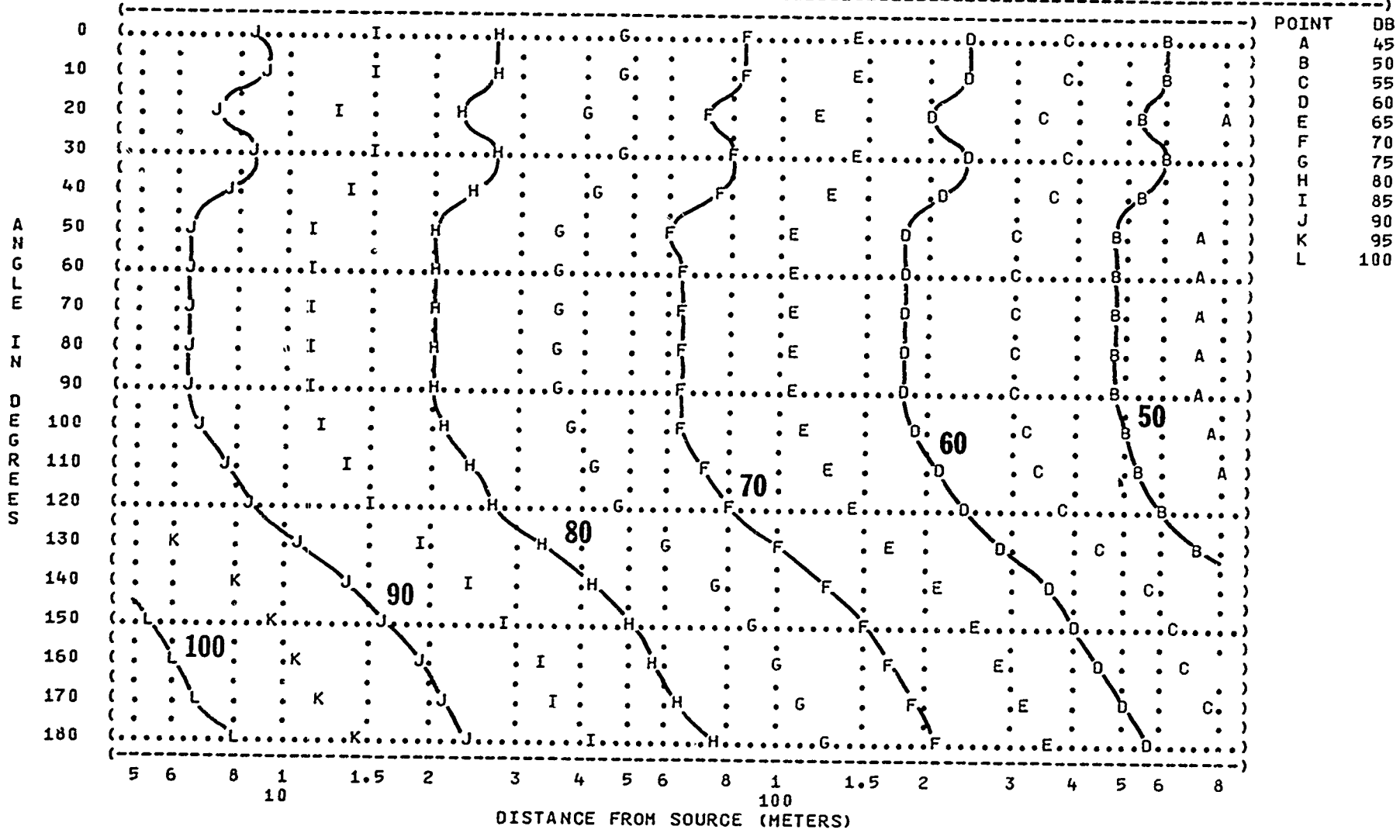


FIGURE: 7 PREFERRED SPEECH INTERFERENCE LEVEL (PSIL) EQUAL LEVEL CONTOURS (DB)

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 02
13 FEB 75
PAGE 15

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

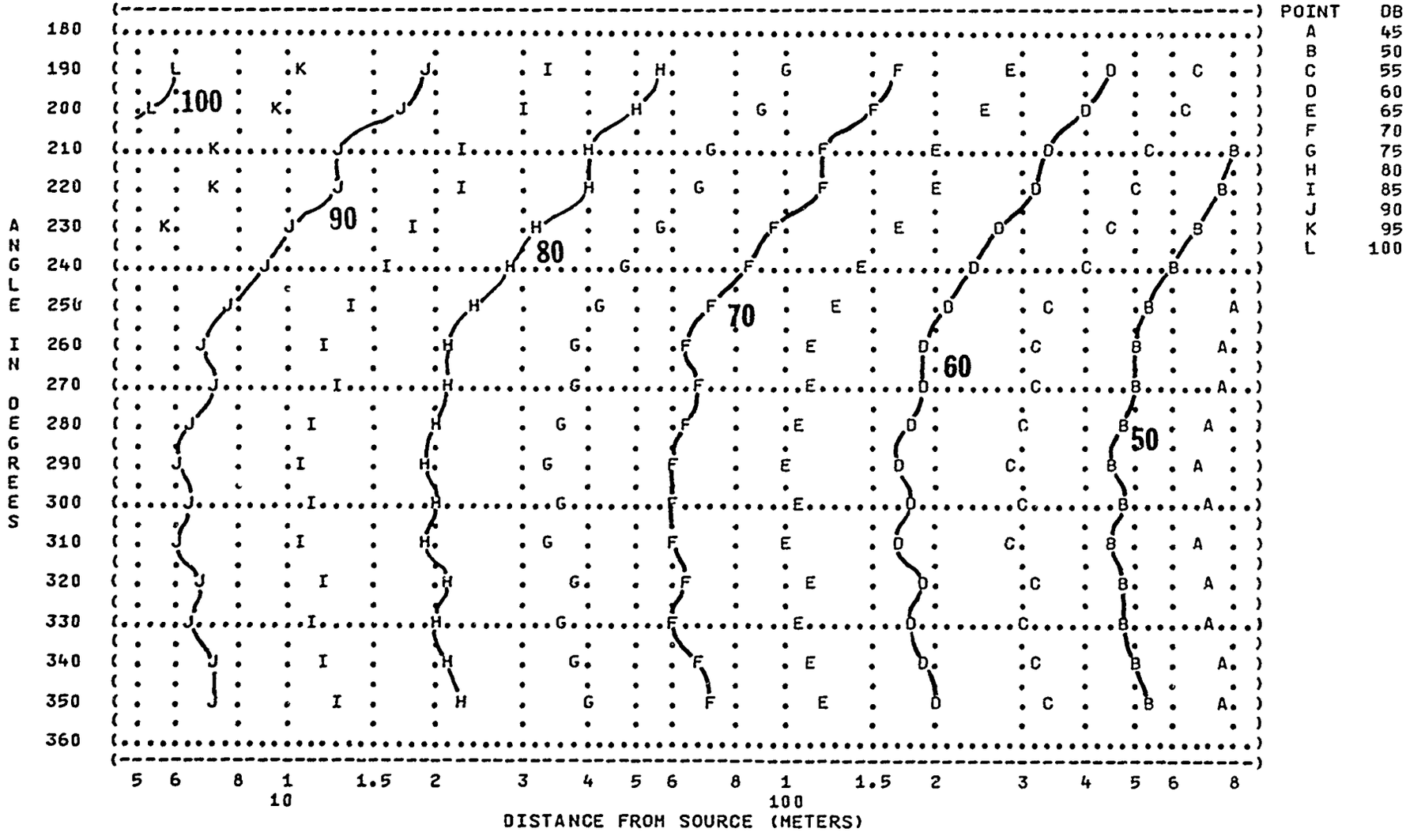


FIGURE: 8

MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)
EQUAL TIME CONTOURS (MINUTES)
NO PROTECTION

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 5

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

POINT	MIN
A	960
B	480
C	240
D	120
E	60
F	30
G	15
H	8

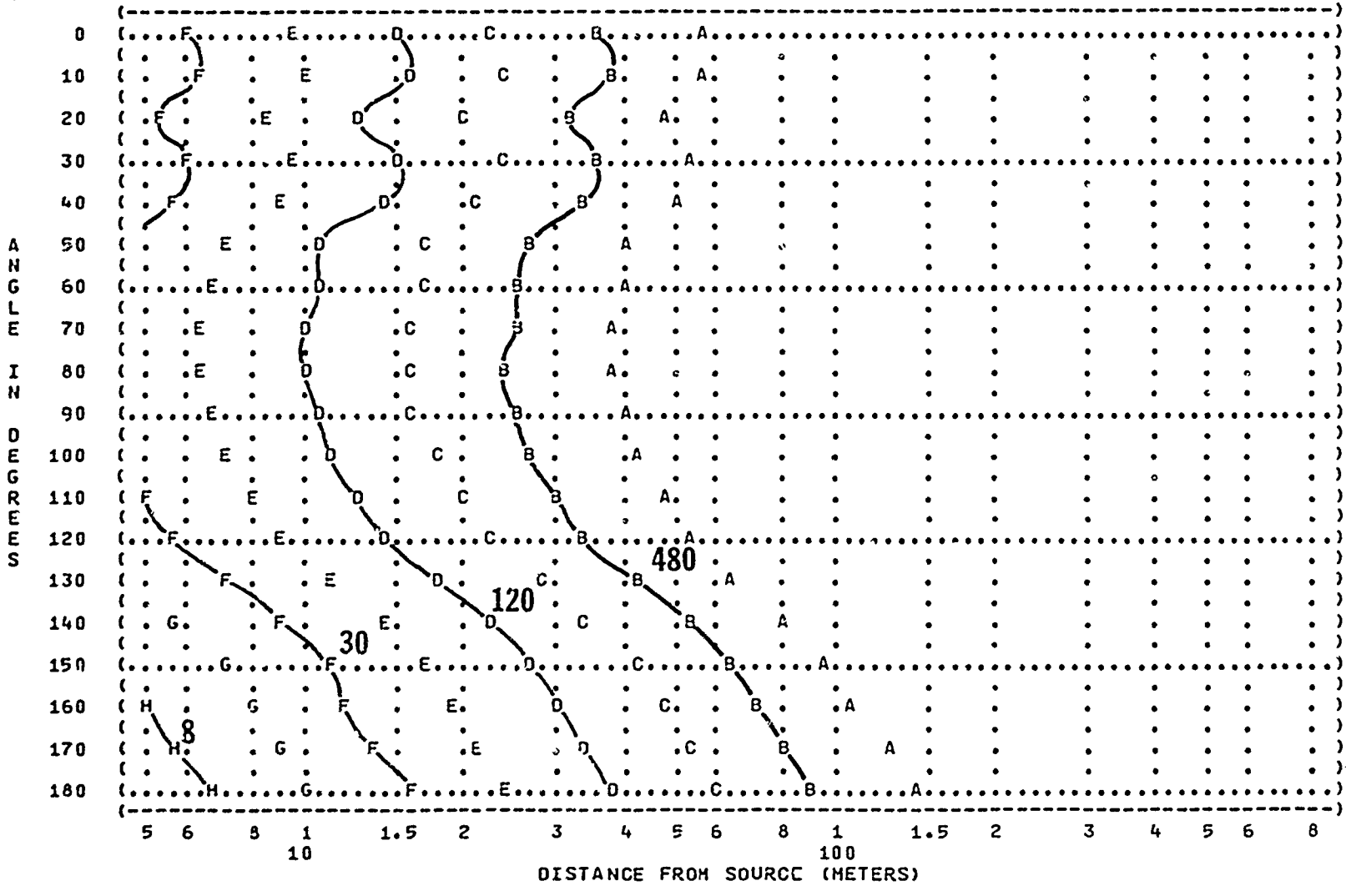


FIGURE: 8

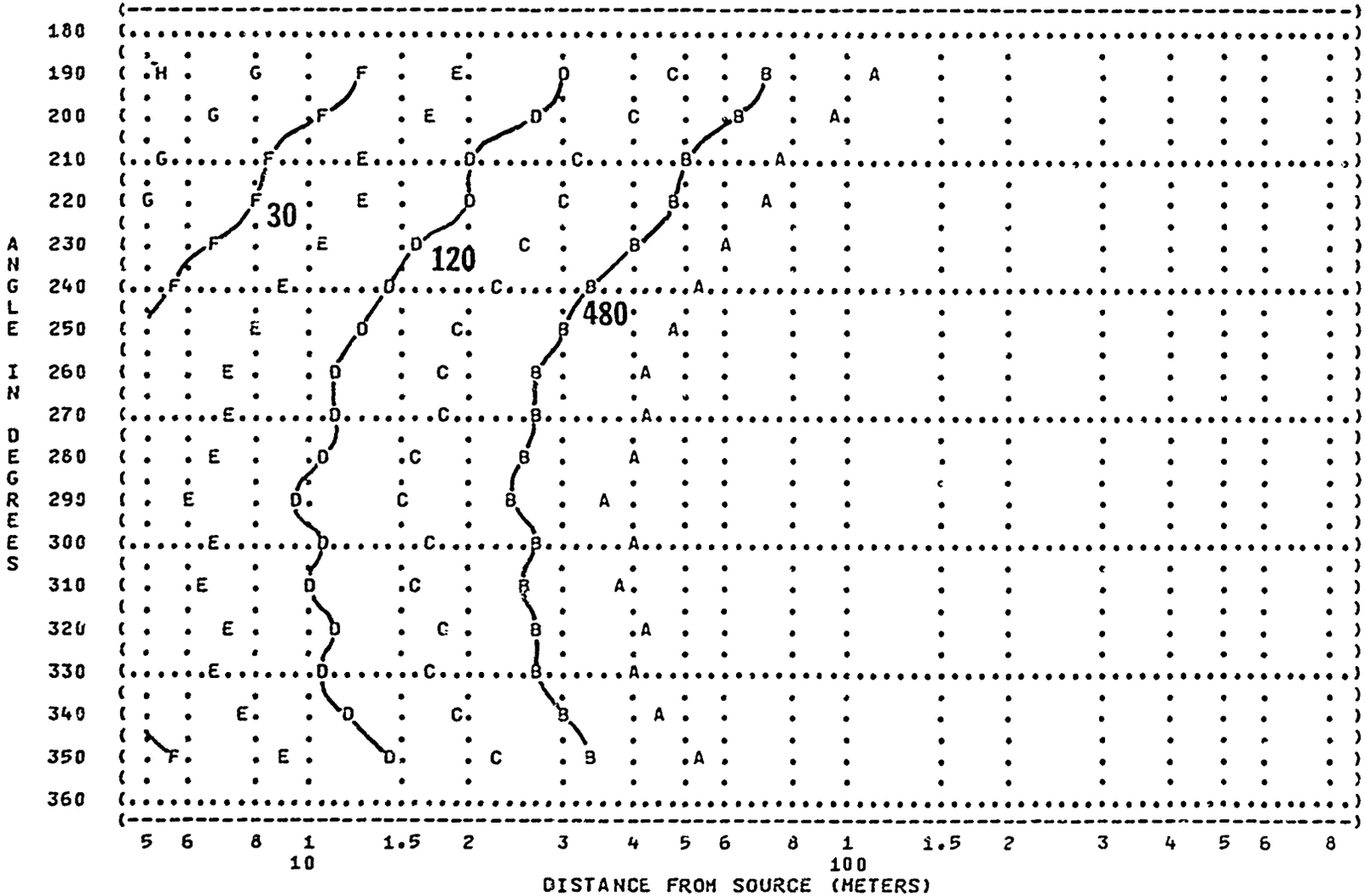
MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)
EQUAL TIME CONTOURS (MINUTES)
NO PROTECTION

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 02
13 FEB 75
PAGE 5

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %



POINT	MIN
A	960
B	480
C	240
D	120
E	60
F	30
G	15
H	8

FIGURE: 8

MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)
EQUAL TIME CONTOURS (MINUTES)
MINIMUM QPL EAR MUFFS

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 6

POINT	MIN
A	960
B	480

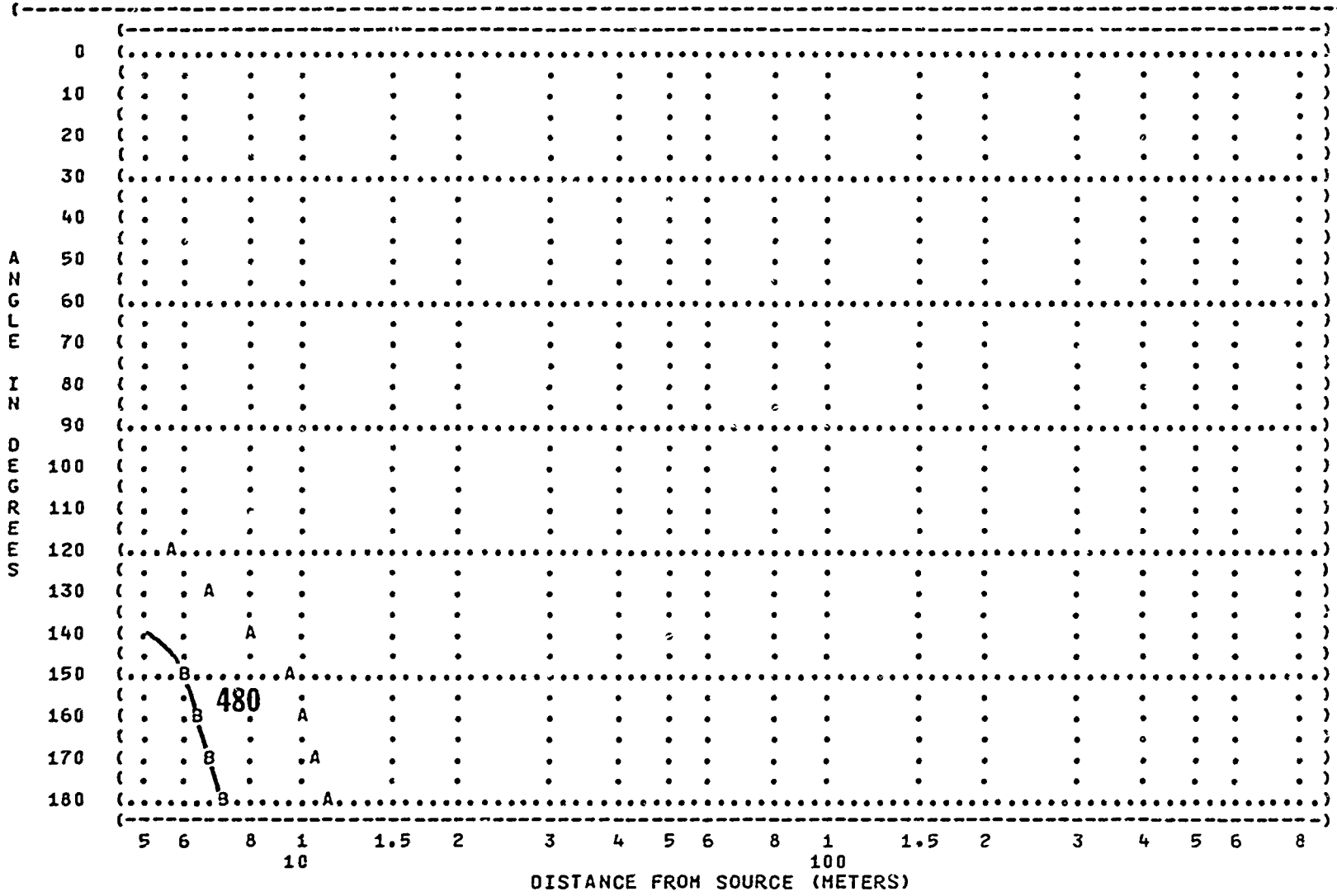


FIGURE: 8

MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)
EQUAL TIME CONTOURS (MINUTES)
MINIMUM QPL EAR MUFFS

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 02
13 FEB 75
PAGE 6

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

POINT	MIN
A	960
B	480

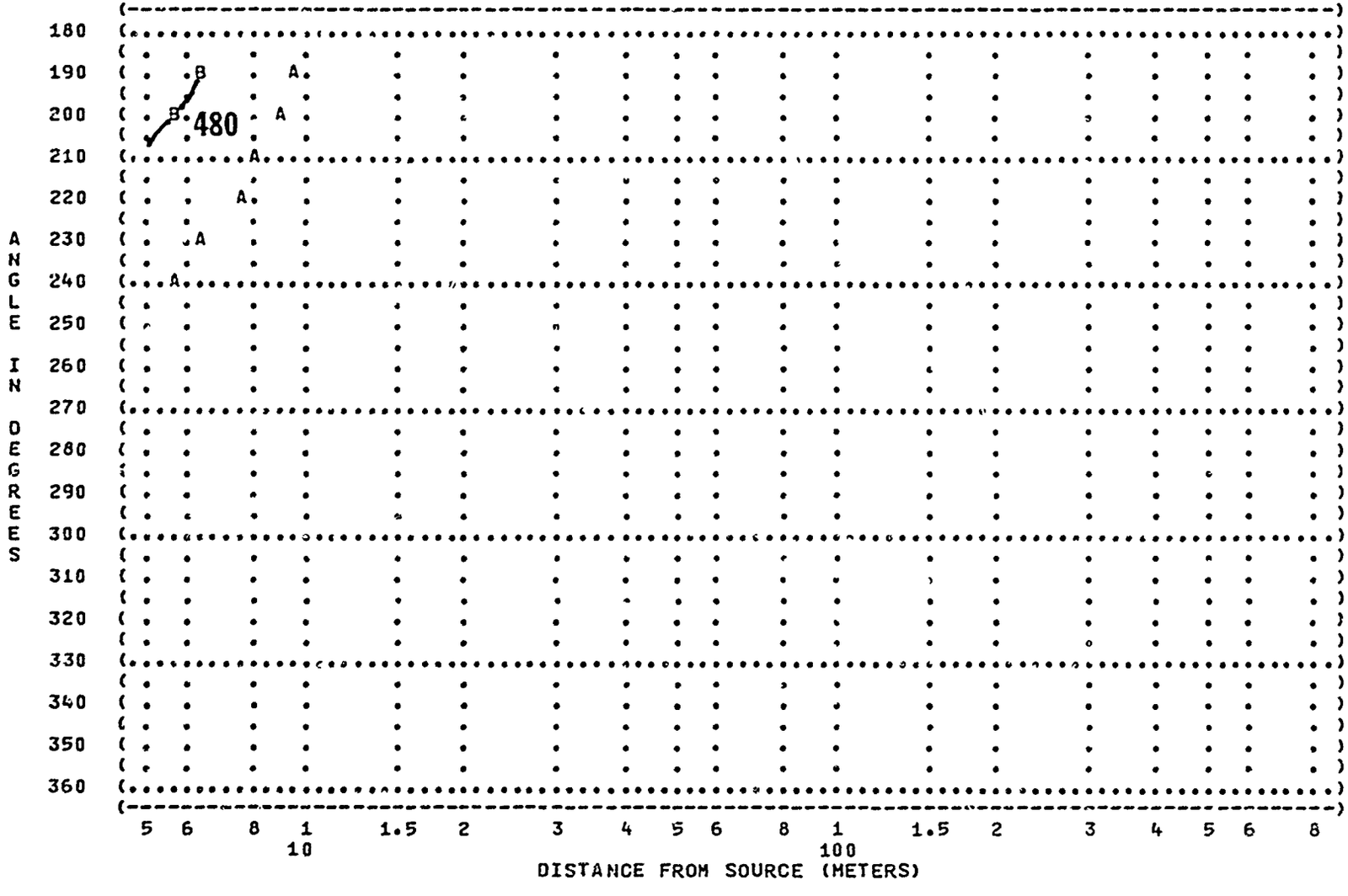


FIGURE 8: MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)
EQUAL TIME CONTOURS (MINUTES)
AMERICAN OPTICAL 1700 EAR MUFFS

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 7

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

POINT	MIN
A	960

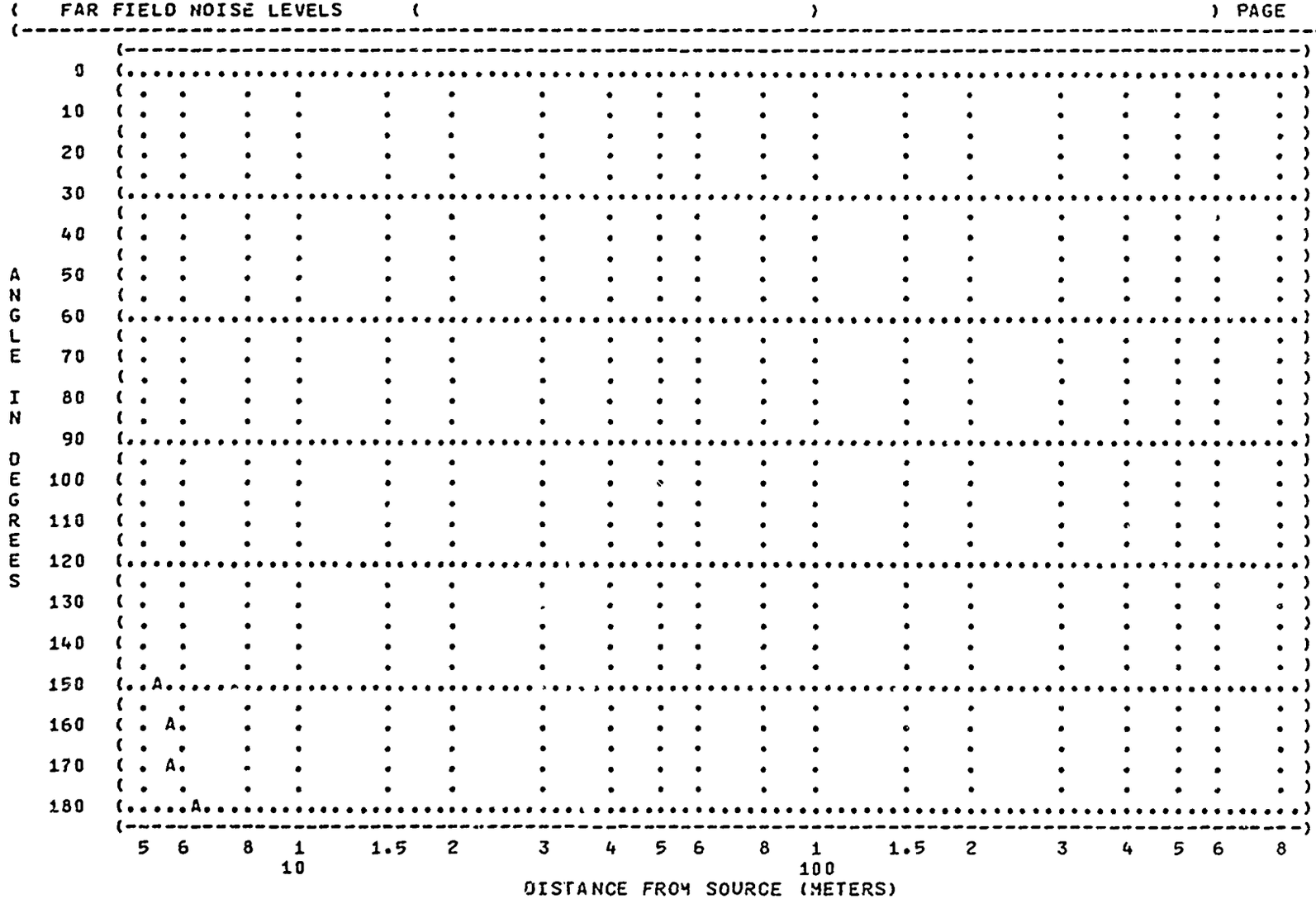


FIGURE 8 MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)
EQUAL TIME CONTOURS (MINUTES)
AMERICAN OPTICAL 1700 EAR MUFFS

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 02
13 FEB 75
PAGE 7

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

POINT MIN
A 960

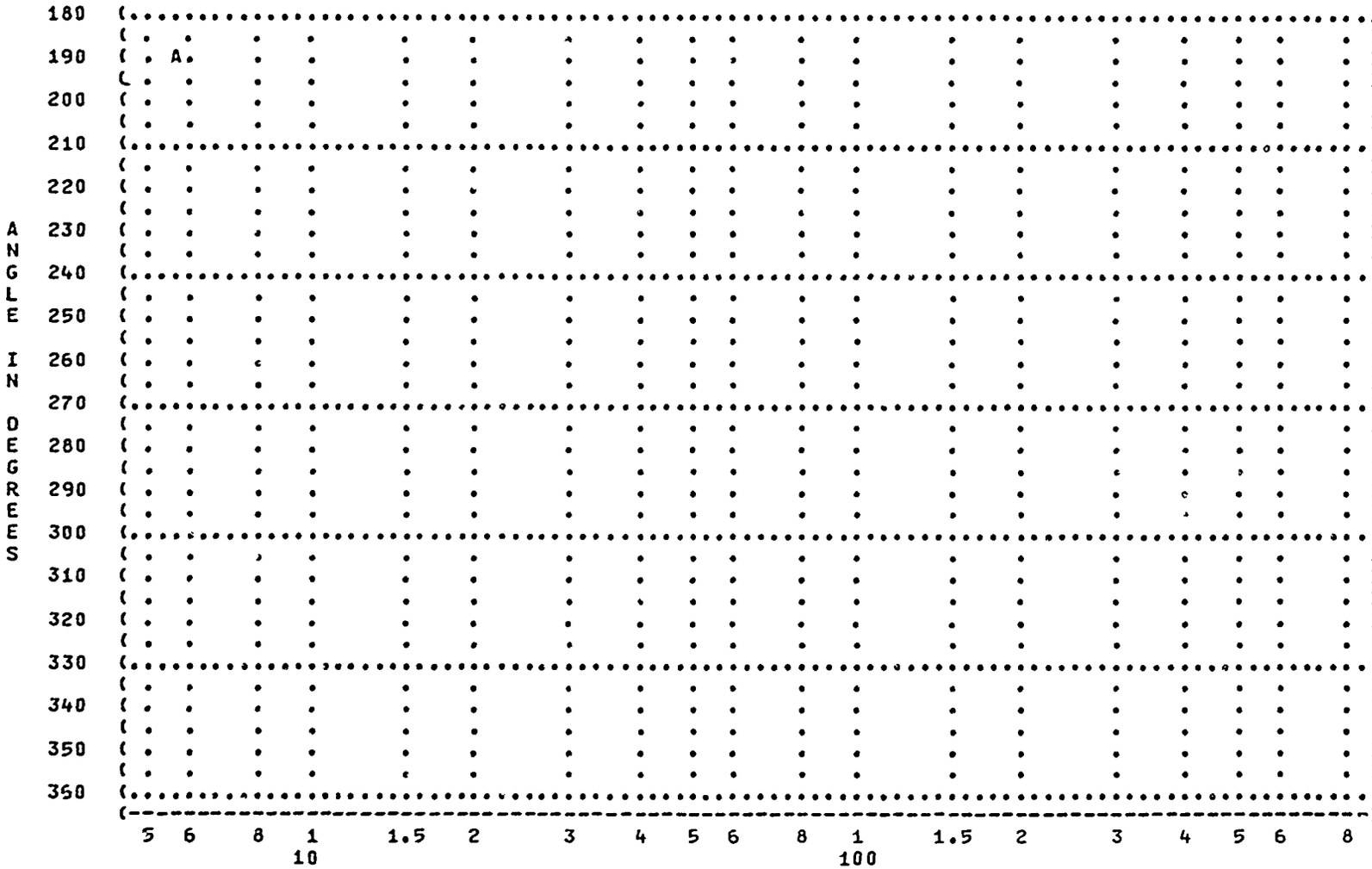


FIGURE: 8

MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)
EQUAL TIME CONTOURS (MINUTES)
V-51R EAR PLUGS

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 8

POINT	MIN
A	960
B	480

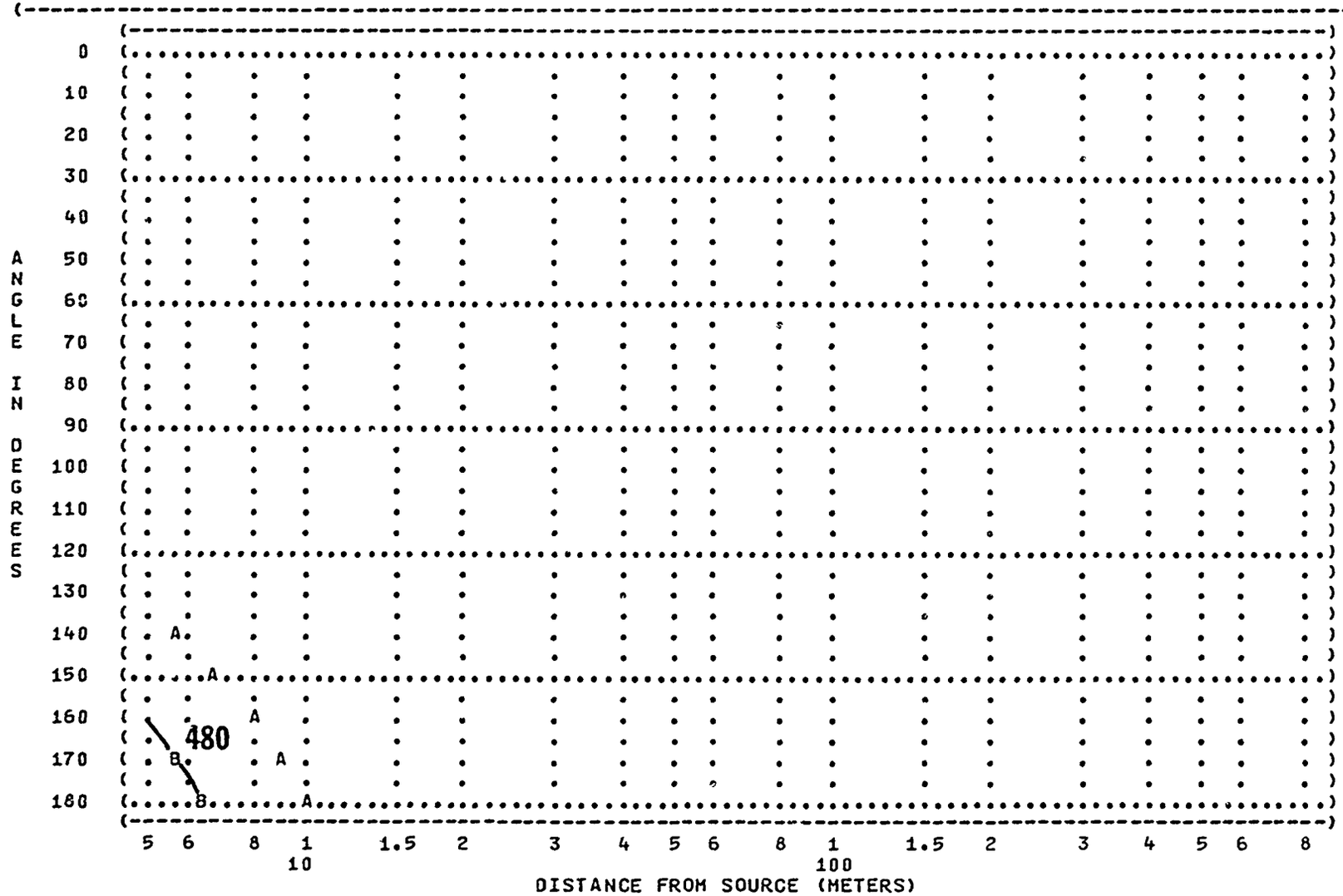


FIGURE 8 MAXIMUM PERMISSIBLE TIME ...

EQUAL TIME CONTOURS (MINUTES)
V-51R EAR PLUGS

OMEGA 1.3
TEST 71-020-280
RUN 02
13 FEB 75
PAGE 8

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

POINT	MIN
A	960
B	480

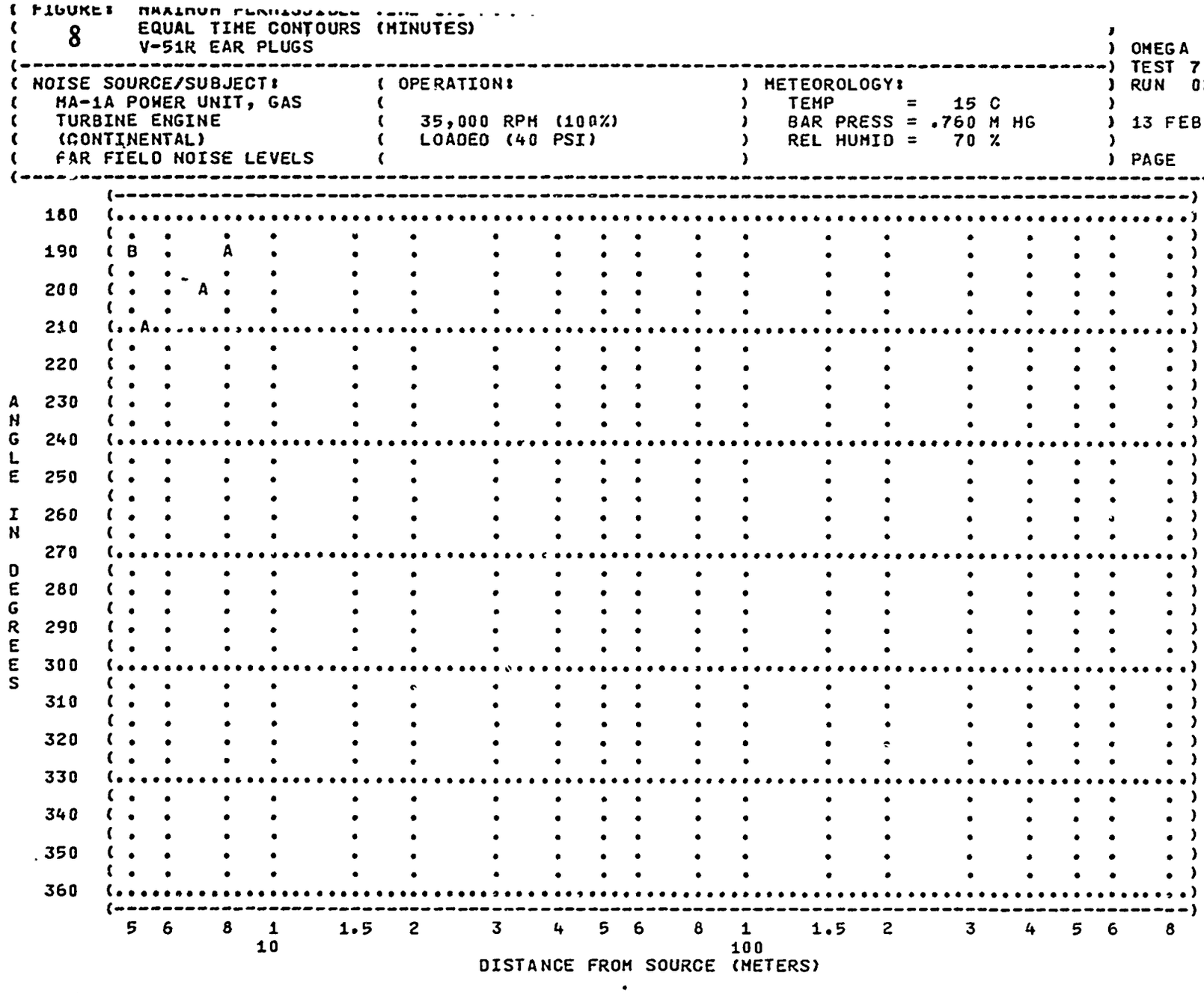


FIGURE: 8

MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)
EQUAL TIME CONTOURS (MINUTES)
COMFIT TRIPLE FLANGE EAR PLUGS

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
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POINT	MIN
A	960
B	480
C	240

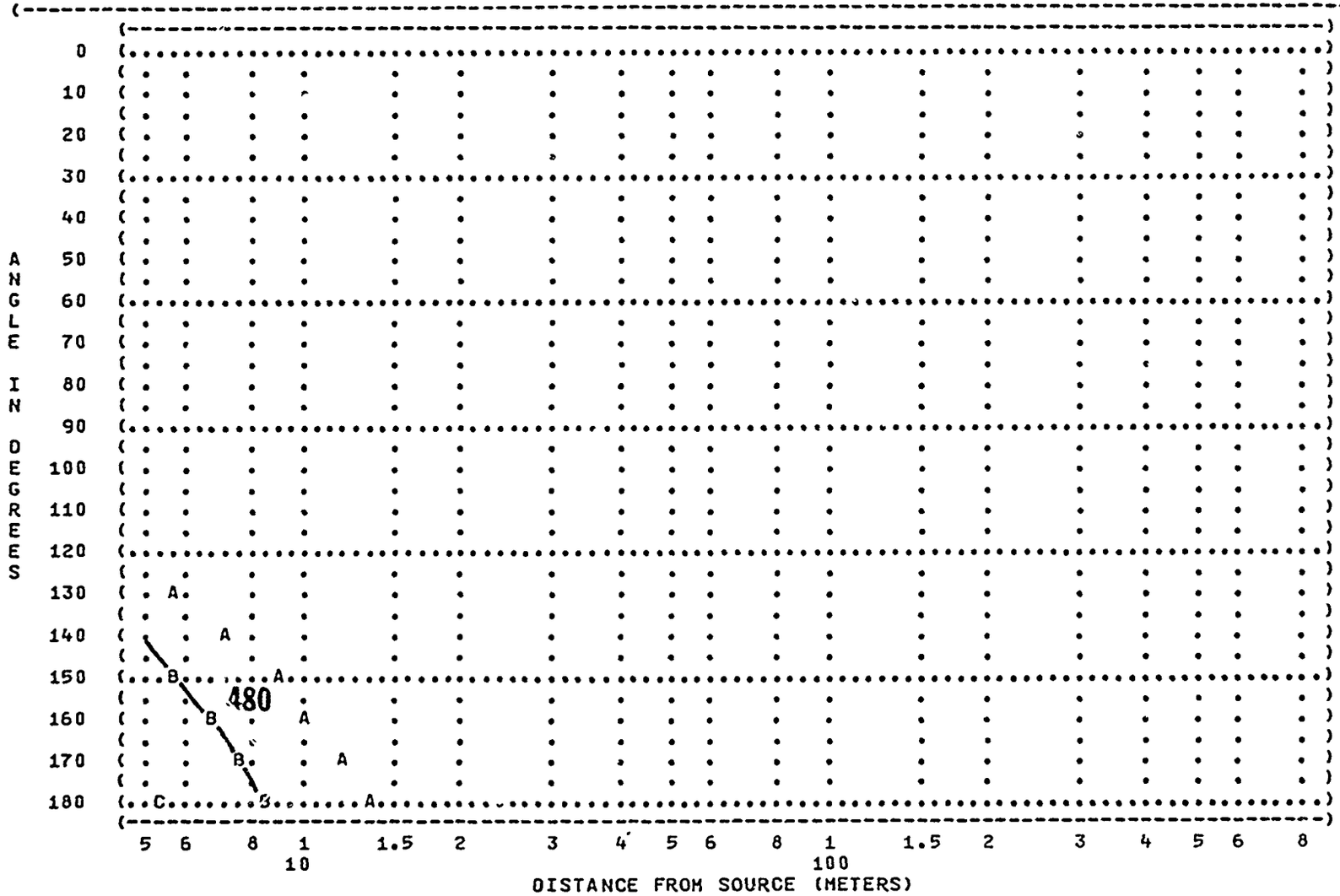


FIGURE: 8

MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)
EQUAL TIME CONTOURS (MINUTES)
COMFIT TRIPLE FLANGE EAR PLUGS

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 02
13 FEB 75
PAGE 9

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

POINT	MIN
A	960
B	480

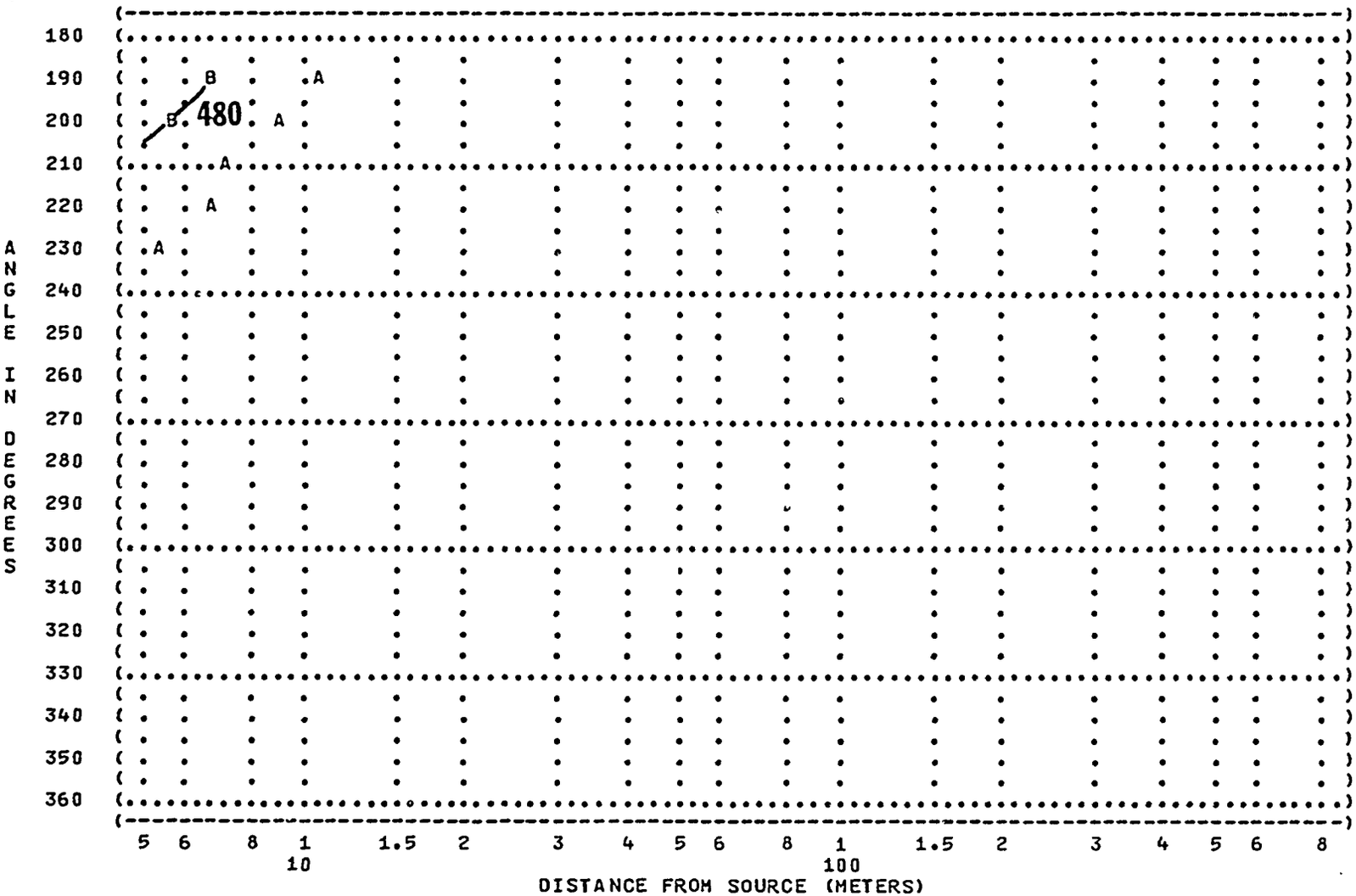


FIGURE 8: MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)
EQUAL TIME CONTOURS (MINUTES)
H-133 GROUND COMMUNICATION UNIT

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 10

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

POINT	MIN
A	960

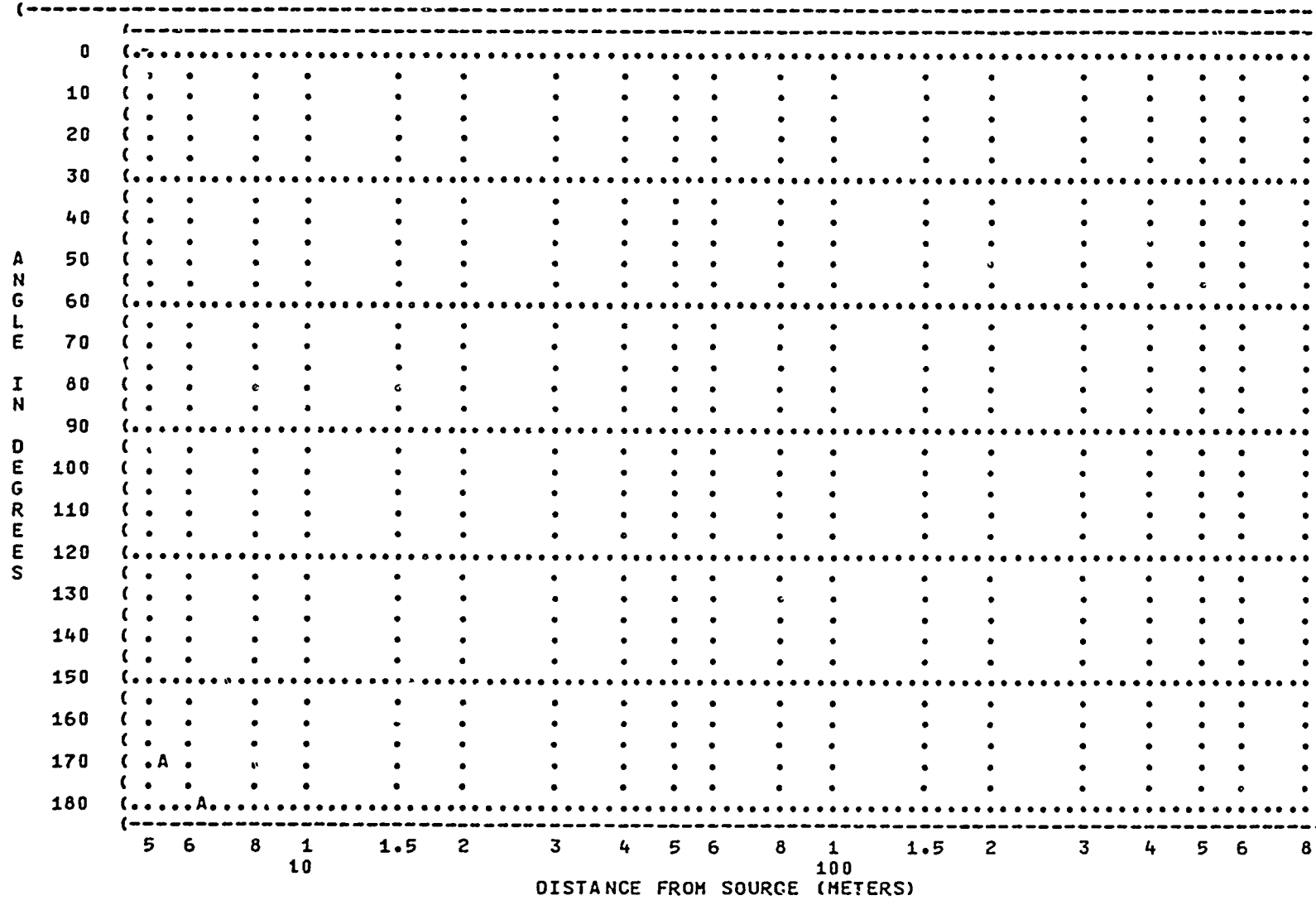


FIGURE 8	MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73) EQUAL TIME CONTOURS (MINUTES)	IDENTIFICATION:
NOISE SOURCE/SUBJECT: MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL) FAR FIELD NOISE LEVELS	OPERATION: 35,000 RPM (100%) LOADED (40 PSI)	METEOROLOGY: TEMP = 15 C BAR PRESS = .760 M HG REL HUMID = 70 %	OMEGA 1.3 TEST 71-020-280 RUN 02 13 FEB 75 PAGE 10

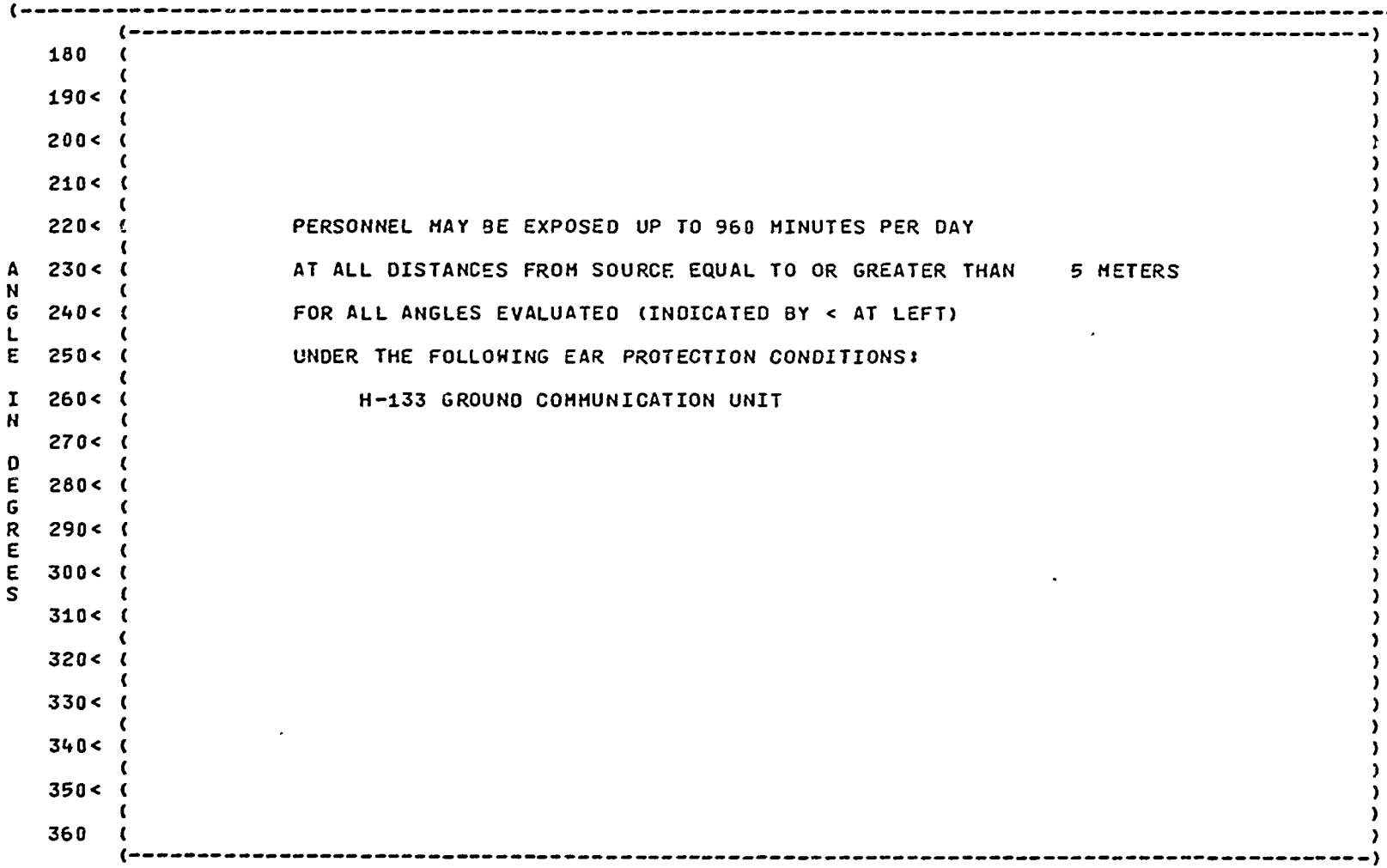


FIGURE: 9

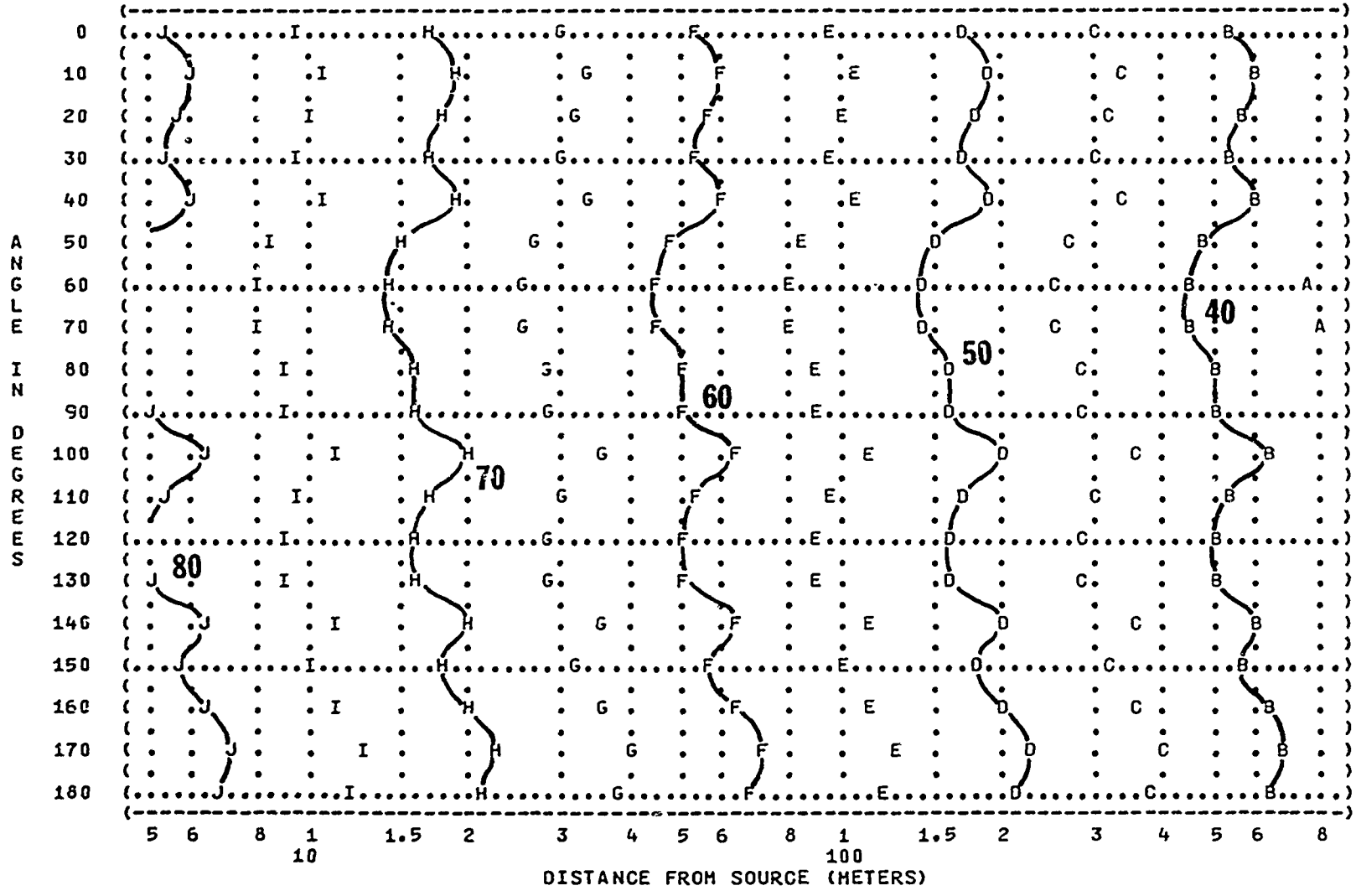
SOUND PRESSURE LEVEL (SPL)
EQUAL LEVEL CONTOURS (DB)
31.5 HZ OCTAVE BAND

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
PAGE 16



POINT	DB
A	35
B	40
C	45
D	50
E	55
F	60
G	65
H	70
I	75
J	80

FIGURE: 9

SOUND PRESSURE LEVEL (SPL)
EQUAL LEVEL CONTOURS (DB)
31.5 HZ OCTAVE BAND

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 02
13 FEB 75
PAGE 16

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

POINT	DB
A	35
B	40
C	45
D	50
E	55
F	60
G	65
H	70
I	75
J	80
K	85

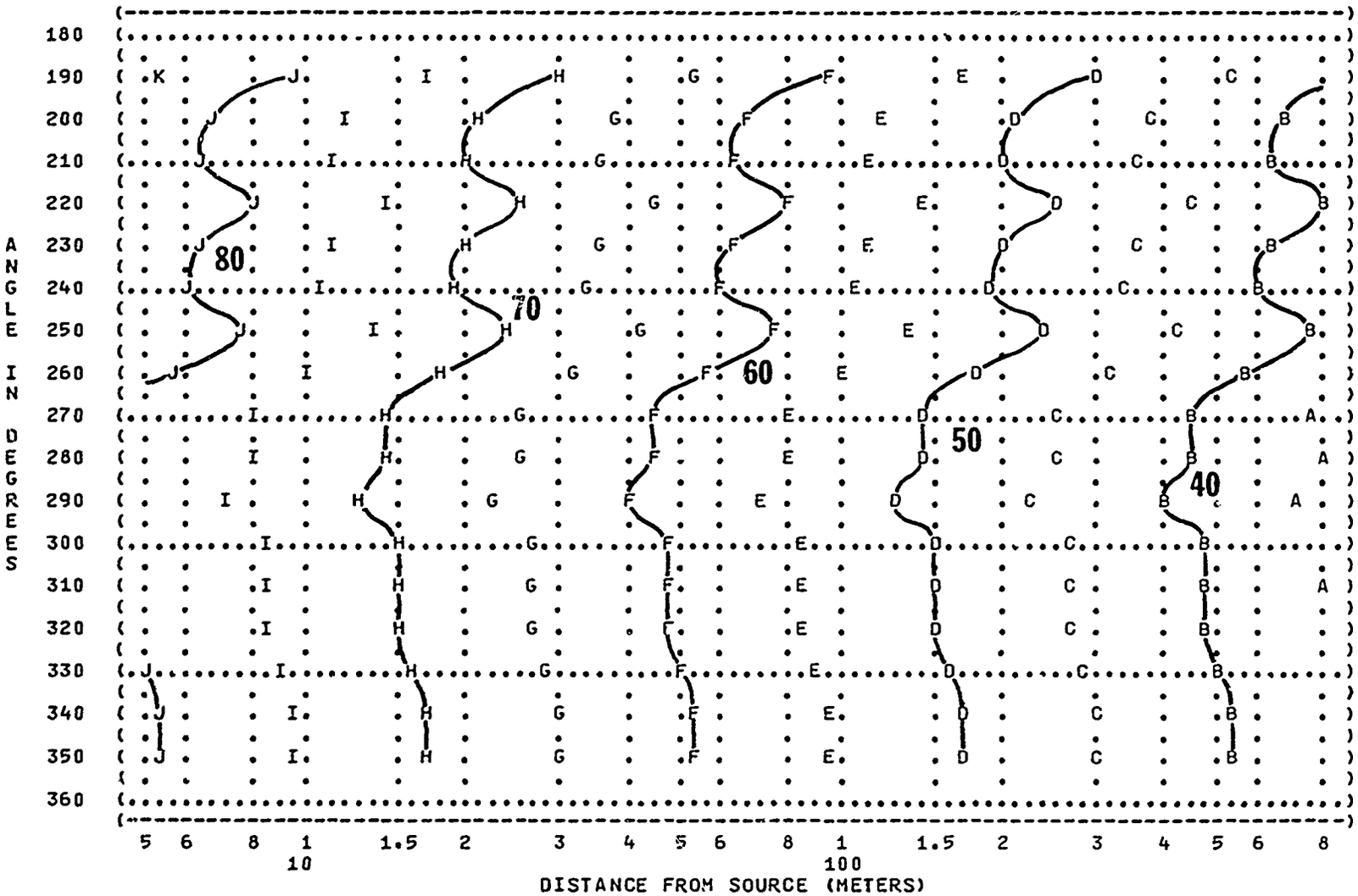


FIGURE 9: SOUND PRESSURE LEVEL (SPL) EQUAL LEVEL CONTOURS (DB) 63 HZ OCTAVE BAND

IDENTIFICATION: OMEGA 1.3 TEST 71-020-280 RUN 01 13 FEB 75 PAGE 17

NOISE SOURCE/SUBJECT: MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL) FAR FIELD NOISE LEVELS

OPERATION: 35,000 RPM (100%) LOADED (40 PSI)

METEOROLOGY: TEMP = 15 C BAR PRESS = .760 M HG REL HUMID = 70 %

POINT	DB
A	40
B	45
C	50
D	55
E	60
F	65
G	70
H	75
I	80
J	85

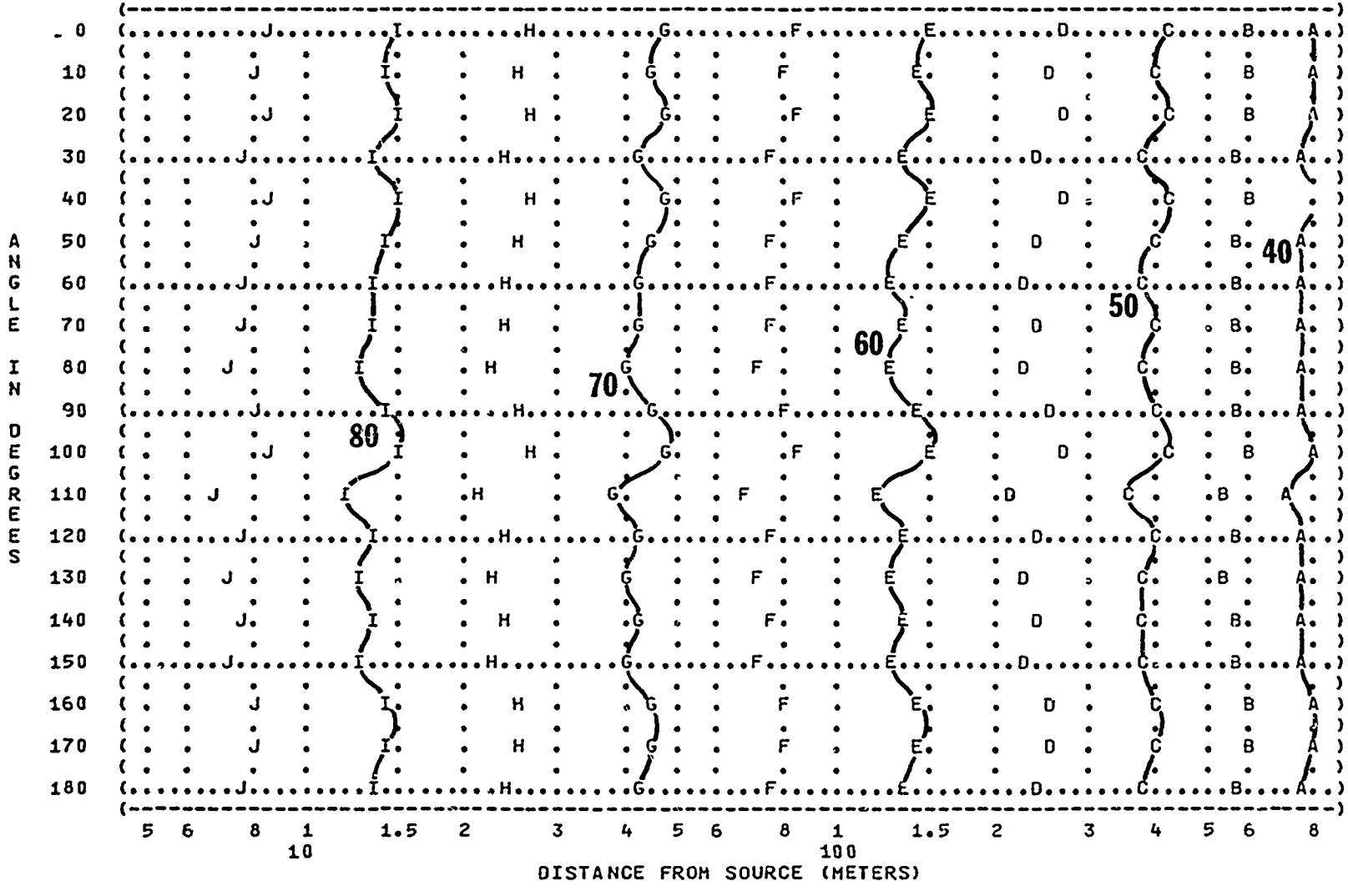


FIGURE: 9 SOUND PRESSURE LEVEL (SPL) EQUAL LEVEL CONTOURS (DB) 63 HZ OCTAVE BAND

NOISE SOURCE/SUBJECT: MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL) FAR FIELD NOISE LEVELS

OPERATION: 35,000 RPM (100%) LOADED (40 PSI)

METEOROLOGY: TEMP = 15 C BAR PRESS = .760 M HG REL HUMID = 70 %

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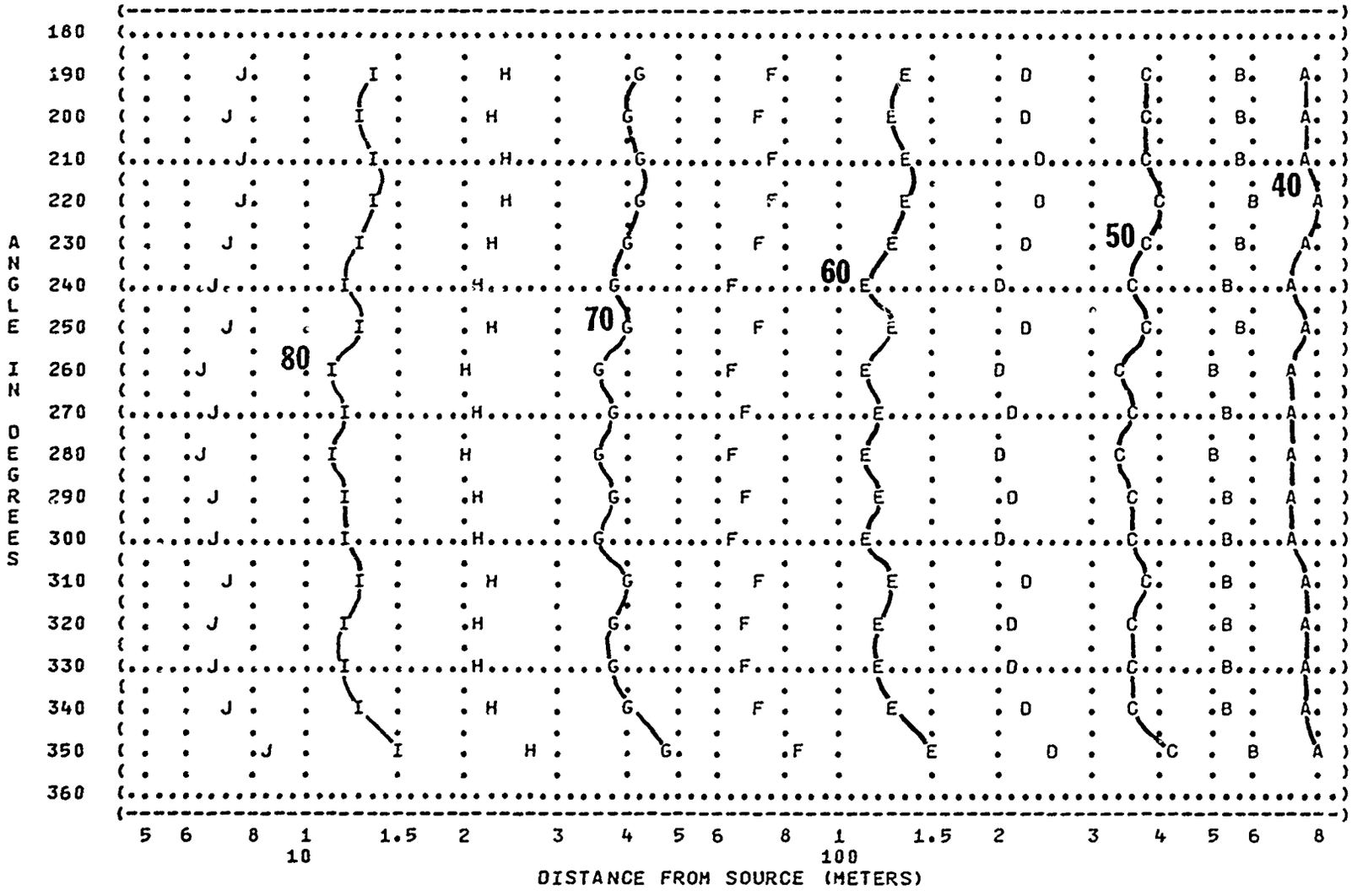

FIGURE: 9

SOUND PRESSURE LEVEL (SPL)
EQUAL LEVEL CONTOURS (DB)
125 HZ OCTAVE BAND

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

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POINT	DB
A	40
B	45
C	50
D	55
E	60
F	65
G	70
H	75
I	80
J	85
K	90
L	95

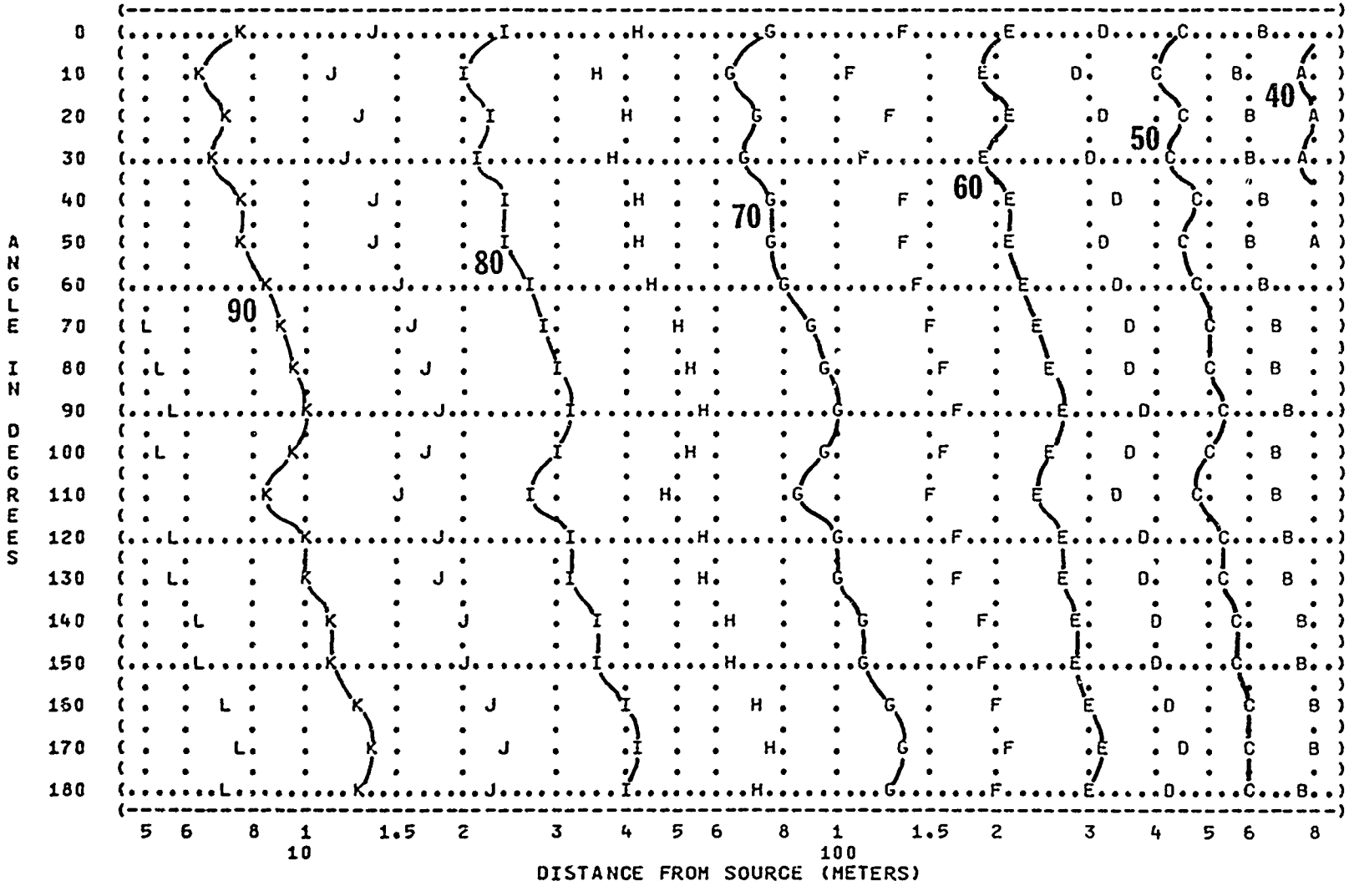

FIGURE 9: SOUND PRESSURE LEVEL (SPL) EQUAL LEVEL CONTOURS (DB) 250 HZ OCTAVE BAND

IDENTIFICATION:
OMEGA 1.3
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RUN 01
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NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

POINT	DB
A	45
B	50
C	55
D	60
E	65
F	70
G	75
H	80
I	85
J	90
K	95
L	100

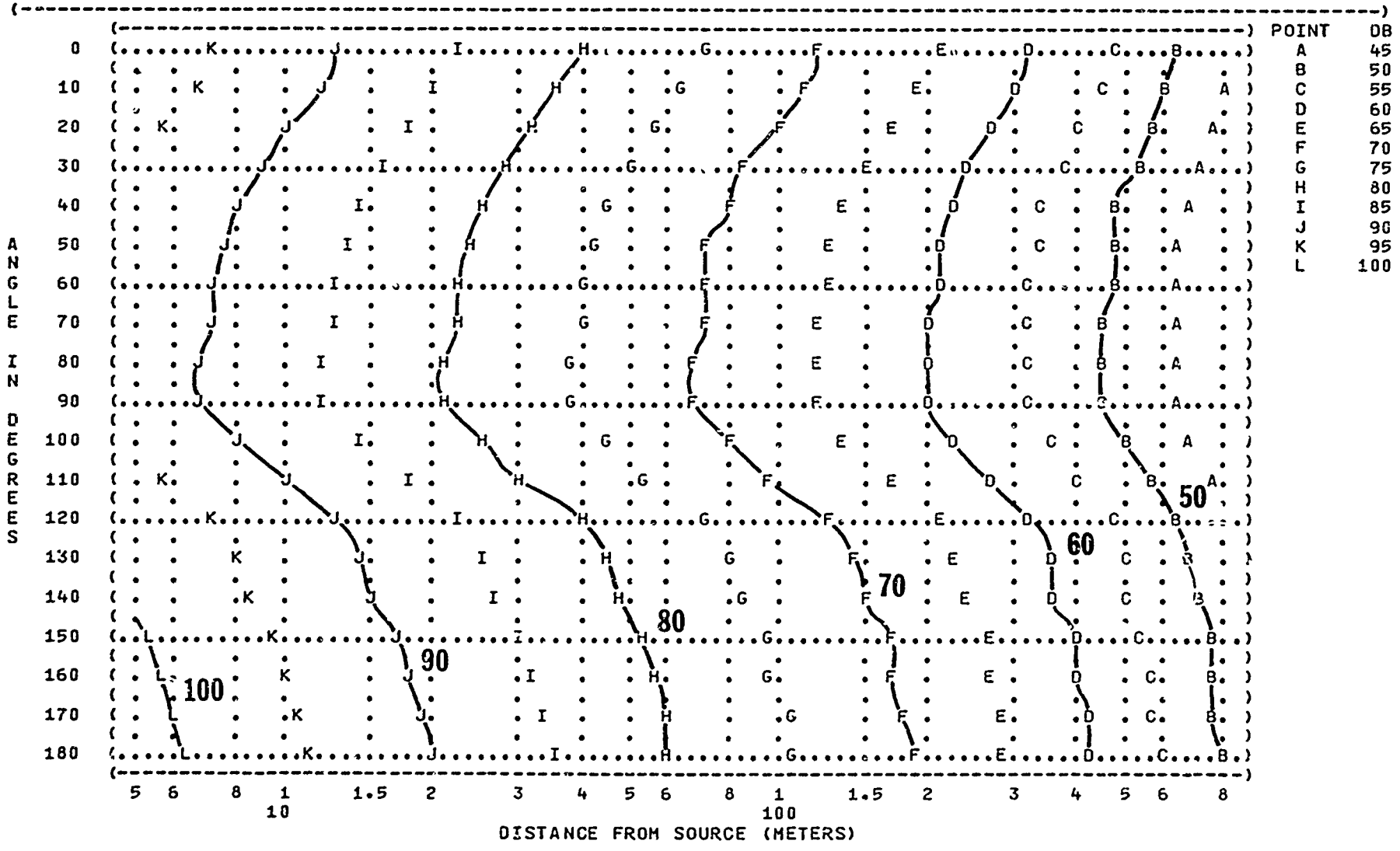

FIGURE: 9

SOUND PRESSURE LEVEL (SPL)
EQUAL LEVEL CONTOURS (DB)
250 HZ OCTAVE BAND

IDENTIFICATION:

OMEGA 1.3
TEST 71-020-280
RUN 02
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NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

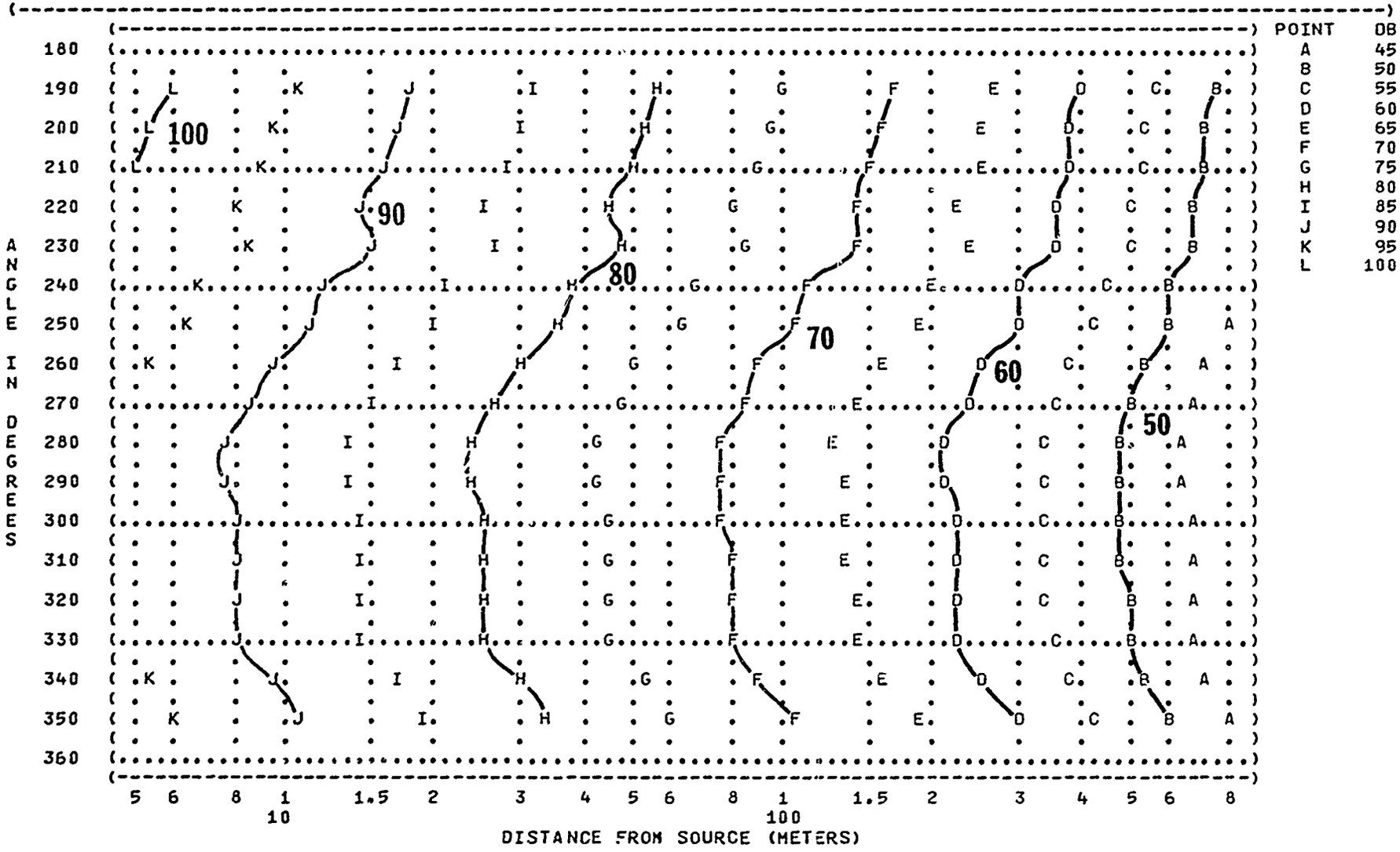
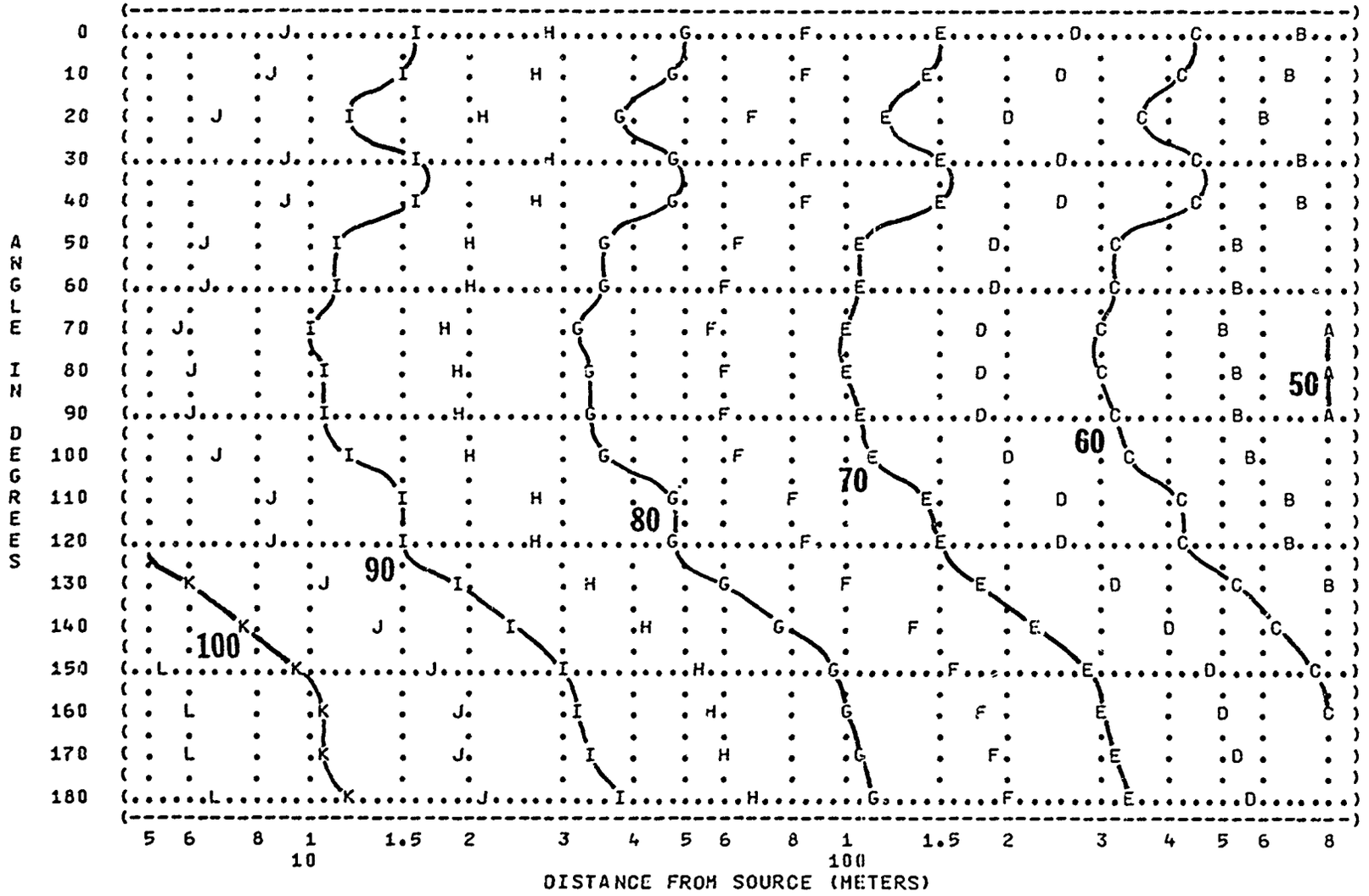


FIGURE:	SOUND PRESSURE LEVEL (SPL) EQUAL LEVEL CONTOURS (DB) 500 HZ OCTAVE BAND	IDENTIFICATION:
9		OMEGA 1.3
		TEST 71-020-280

NOISE SOURCE/SUBJECT:	OPERATION:	METEOROLOGY:	
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL) FAR FIELD NOISE LEVELS	35,000 RPM (100%) LOADED (40 PSI)	TEMP = 15 C BAR PRESS = .760 M HG REL HUMID = 70 %	RUN 01 13 FEB 75 PAGE 20



POINT	DB
A	50
B	55
C	60
D	65
E	70
F	75
G	80
H	85
I	90
J	95
K	100
L	105

FIGURE 9: SOUND PRESSURE LEVEL (SPL) EQUAL LEVEL CONTOURS (DB) 500 HZ OCTAVE BAND

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NOISE SOURCE/SUBJECT: MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL) FAR FIELD NOISE LEVELS

OPERATION: 35,000 RPM (100%) LOADED (40 PSI)

METEOROLOGY: TEMP = 15 C BAR PRESS = .760 M HG REL HUMID = 70 %

POINT	DB
A	50
B	55
C	60
D	65
E	70
F	75
G	80
H	85
I	90
J	95
K	100
L	105

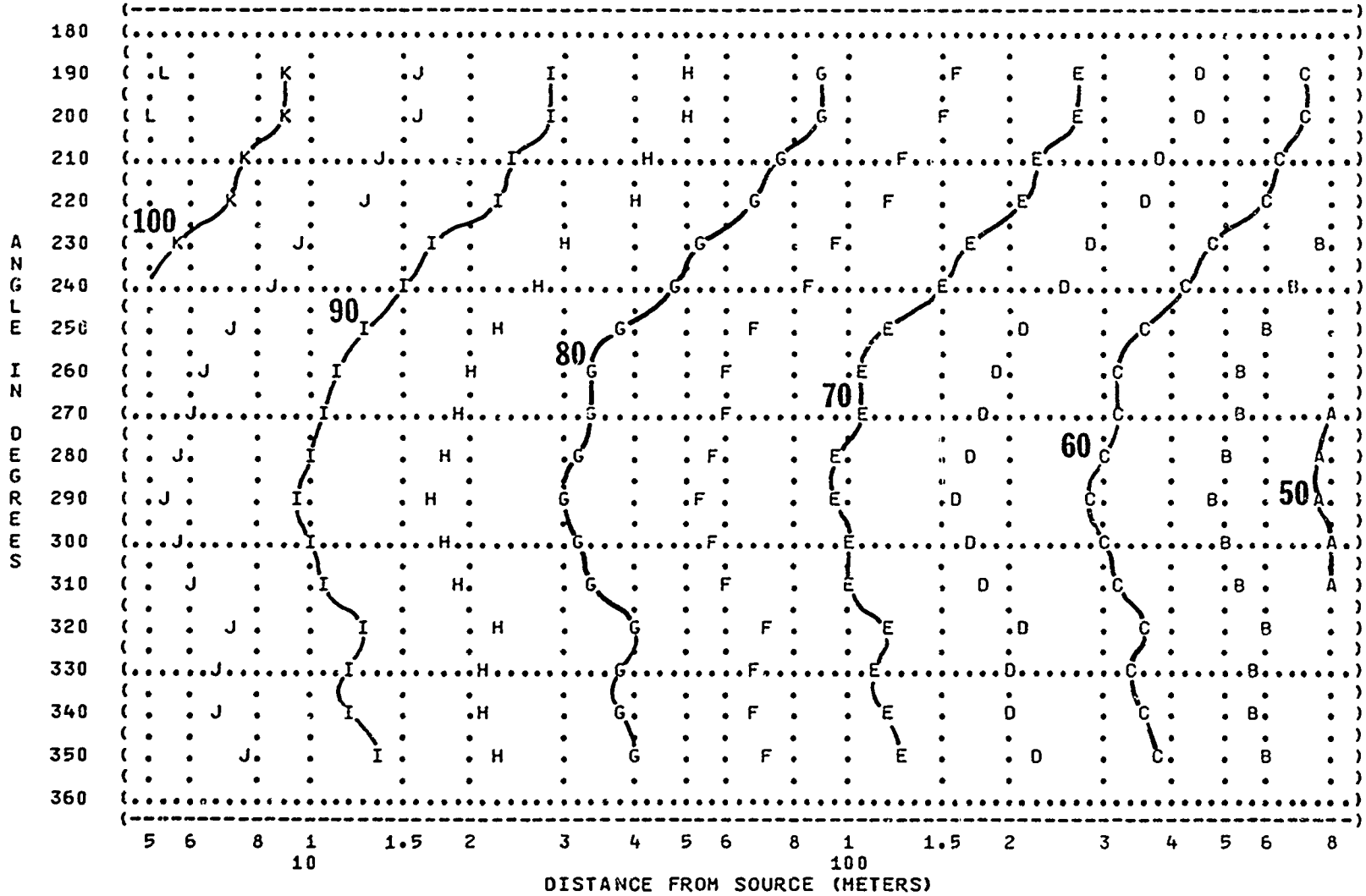

FIGURE 9: SOUND PRESSURE LEVEL (SPL) EQUAL LEVEL CONTOURS (DB) 1000 HZ OCTAVE BAND

IDENTIFICATION: OMEGA 1.3 TEST 71-020-280 RUN 01 13 FEB 75 PAGE 21

NOISE SOURCE/SUBJECT: MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL) FAR FIELD NOISE LEVELS

OPERATION: 35,000 RPM (100%) LOADED (40 PSI)

METEOROLOGY: TEMP = 15 C BAR PRESS = .760 M HG REL HUMID = 70 %

POINT	DB
A	45
B	50
C	55
D	60
E	65
F	70
G	75
H	80
I	85
J	90
K	95
L	100
M	105

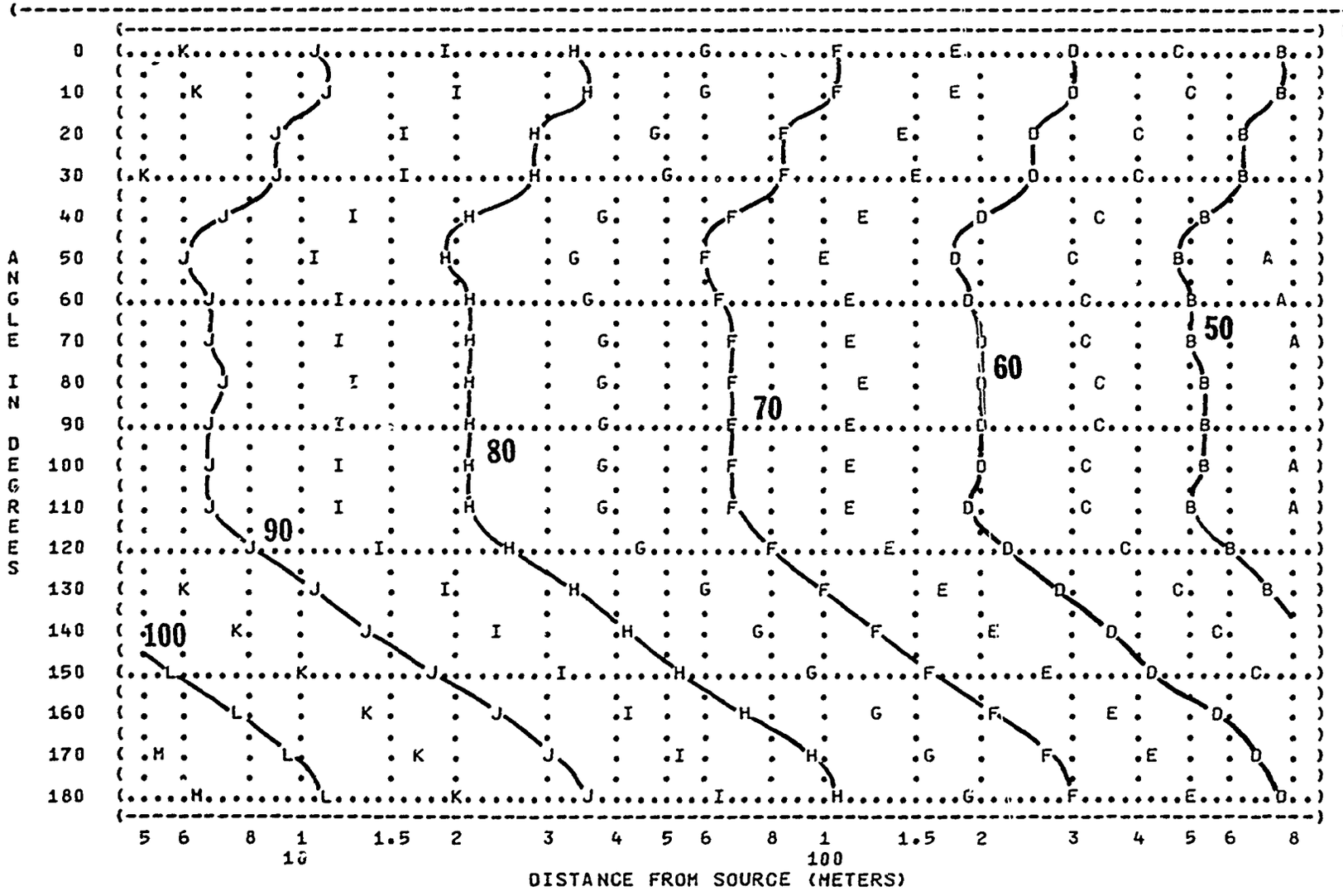

FIGURE 9: SOUND PRESSURE LEVEL (SPL) EQUAL LEVEL CONTOURS (DB) 1000 HZ OCTAVE BAND

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 02
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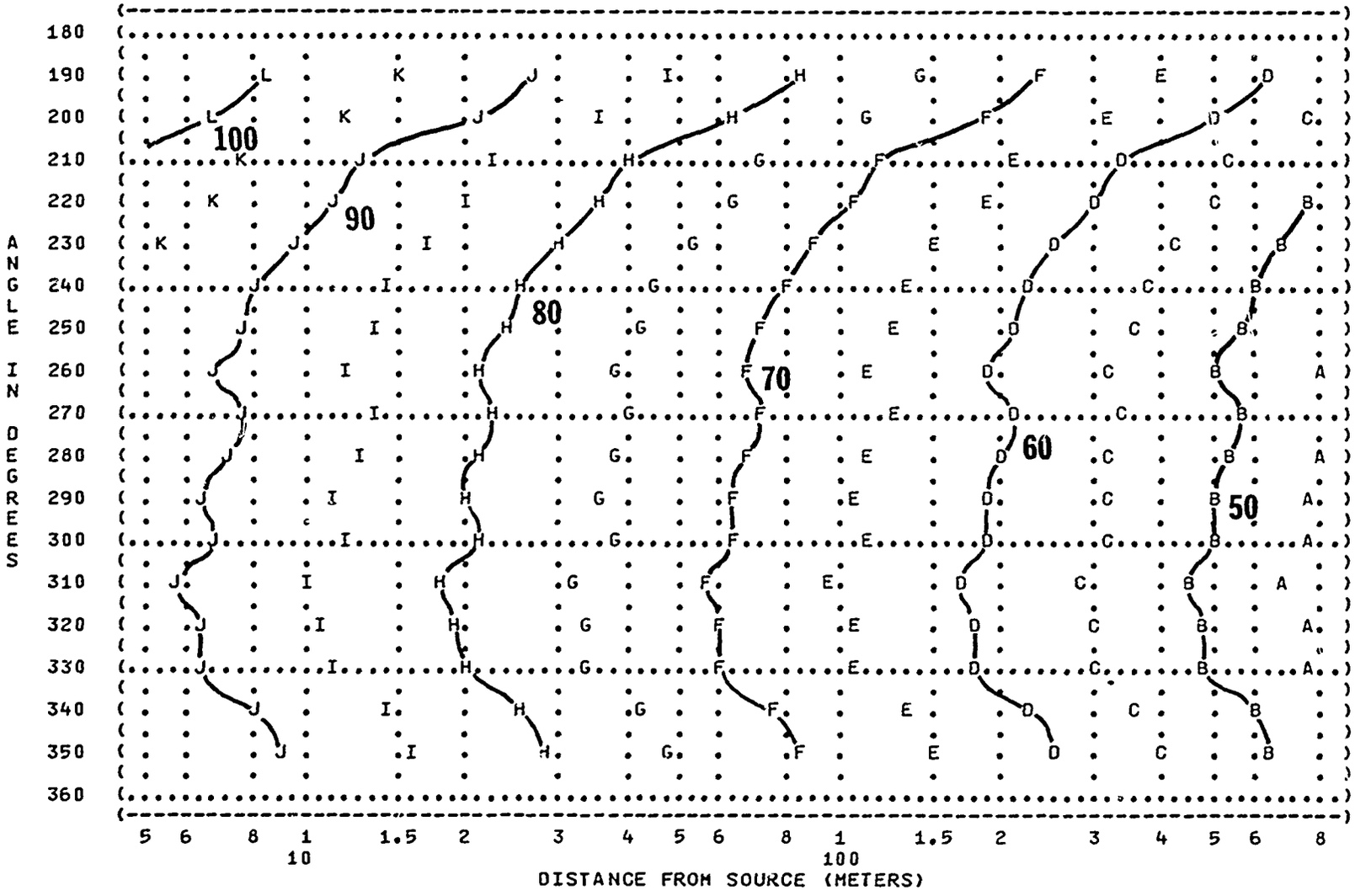
NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL) FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %



POINT	DB
A	45
B	50
C	55
D	60
E	65
F	70
G	75
H	80
I	85
J	90
K	95
L	100

FIGURE 9: SOUND PRESSURE LEVEL (SPL) EQUAL LEVEL CONTOURS (DB) 2000 HZ OCTAVE BAND

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

IDENTIFICATION:
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POINT	DB
A	40
B	45
C	50
D	55
E	60
F	65
G	70
H	75
I	80
J	85
K	90
L	95

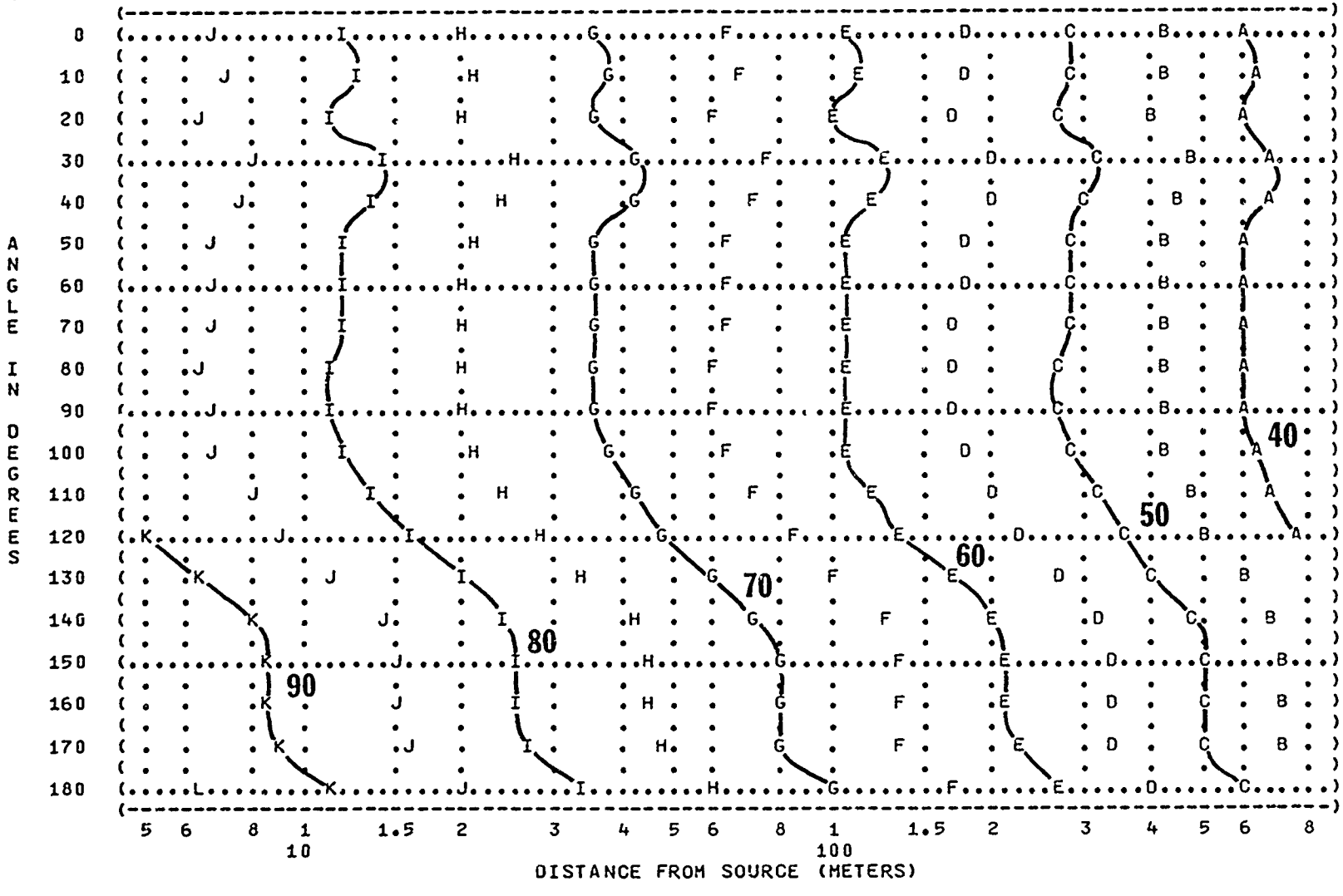

FIGURE: 9

SOUND PRESSURE LEVEL (SPL)
EQUAL LEVEL CONTOURS (DB)
2000 HZ OCTAVE BAND

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

IDENTIFICATION:
OMEGA 1.3
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13 FEB 75
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POINT	DB
A	35
B	40
C	45
D	50
E	55
F	60
G	65
H	70
I	75
J	80
K	85
L	90

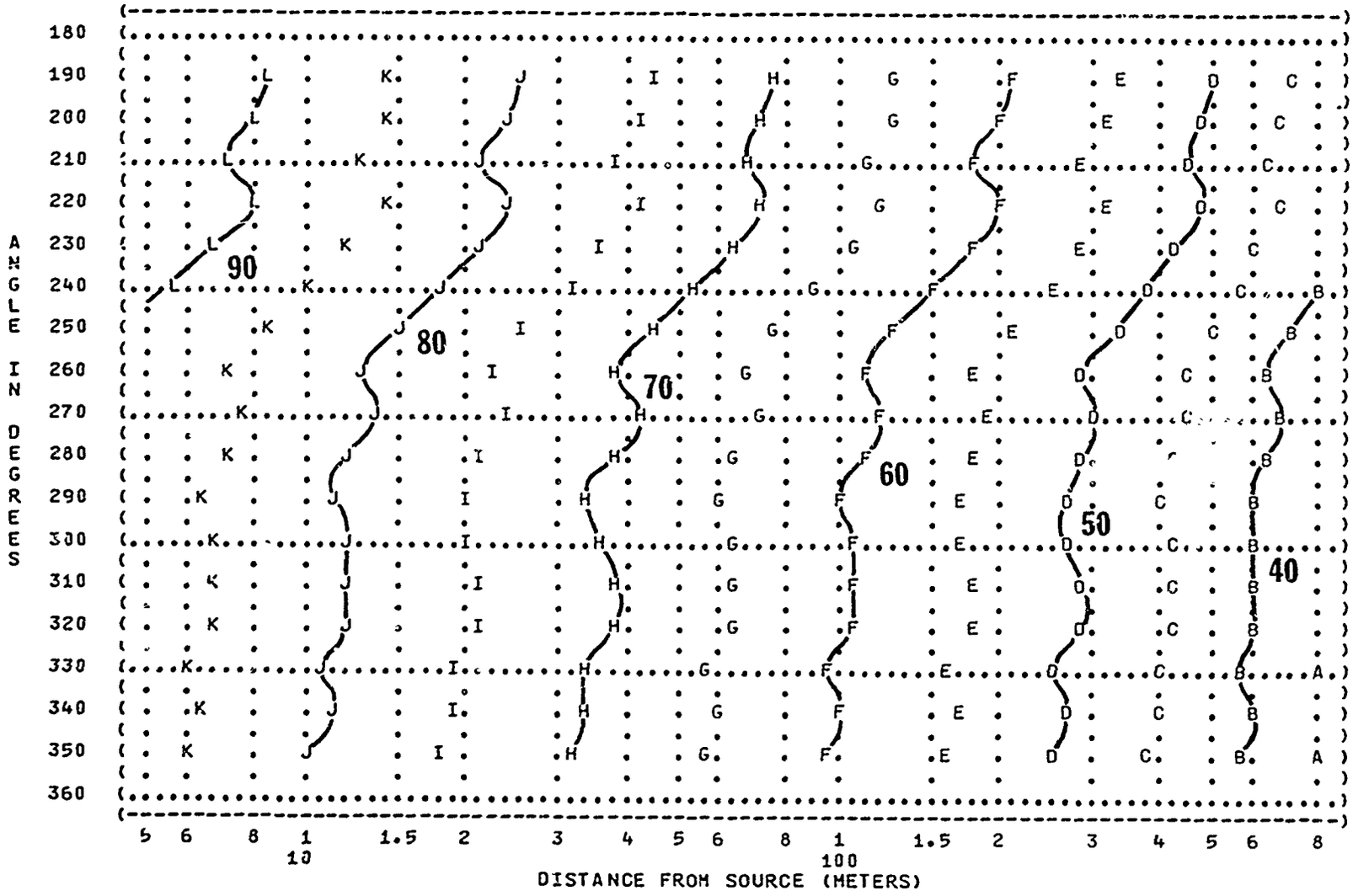

FIGURE 9: SOUND PRESSURE LEVEL (SPL) EQUAL LEVEL CONTOURS (DB) 4000 HZ OCTAVE BAND

IDENTIFICATION: OMEGA 1.3 TEST 71-020-280 RUN 01 13 FEB 75 PAGE 23

NOISE SOURCE/SUBJECT: MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL) FAR FIELD NOISE LEVELS

OPERATION: 35,000 RPM (100%) LOADED (40 PSI)

METEOROLOGY: TEMP = 15 C BAR PRESS = .760 M HG REL HUMID = 70 %

POINT	DB
A	35
B	40
C	45
D	50
E	55
F	60
G	65
H	70
I	75
J	80
K	85
L	90

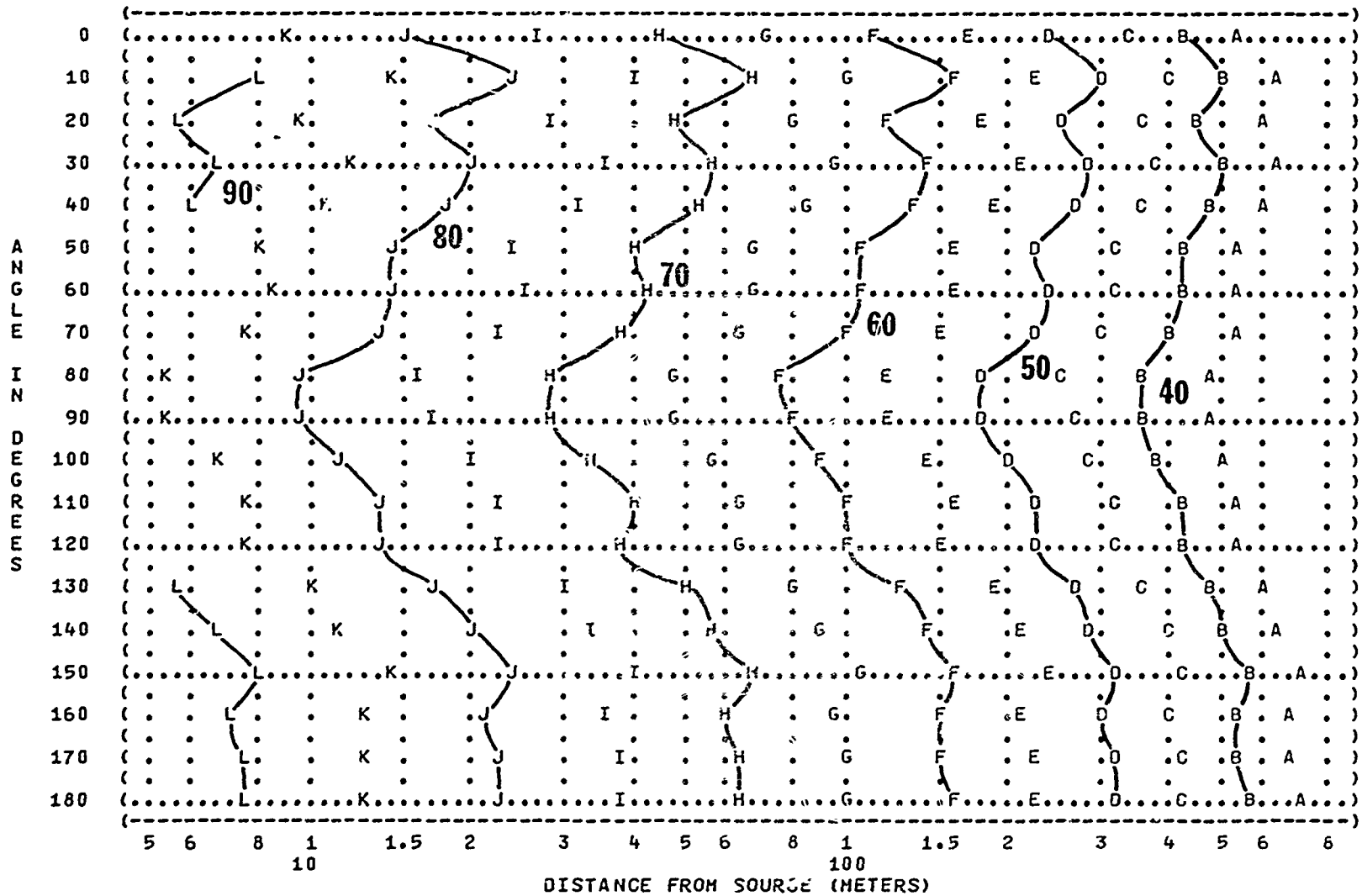

FIGURE: 9 — SOUND PRESSURE LEVEL (SPL) EQUAL LEVEL CONTOURS (DB) 4000 HZ OCTAVE BAND

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

IDENTIFICATION:
OMEGA 1.3
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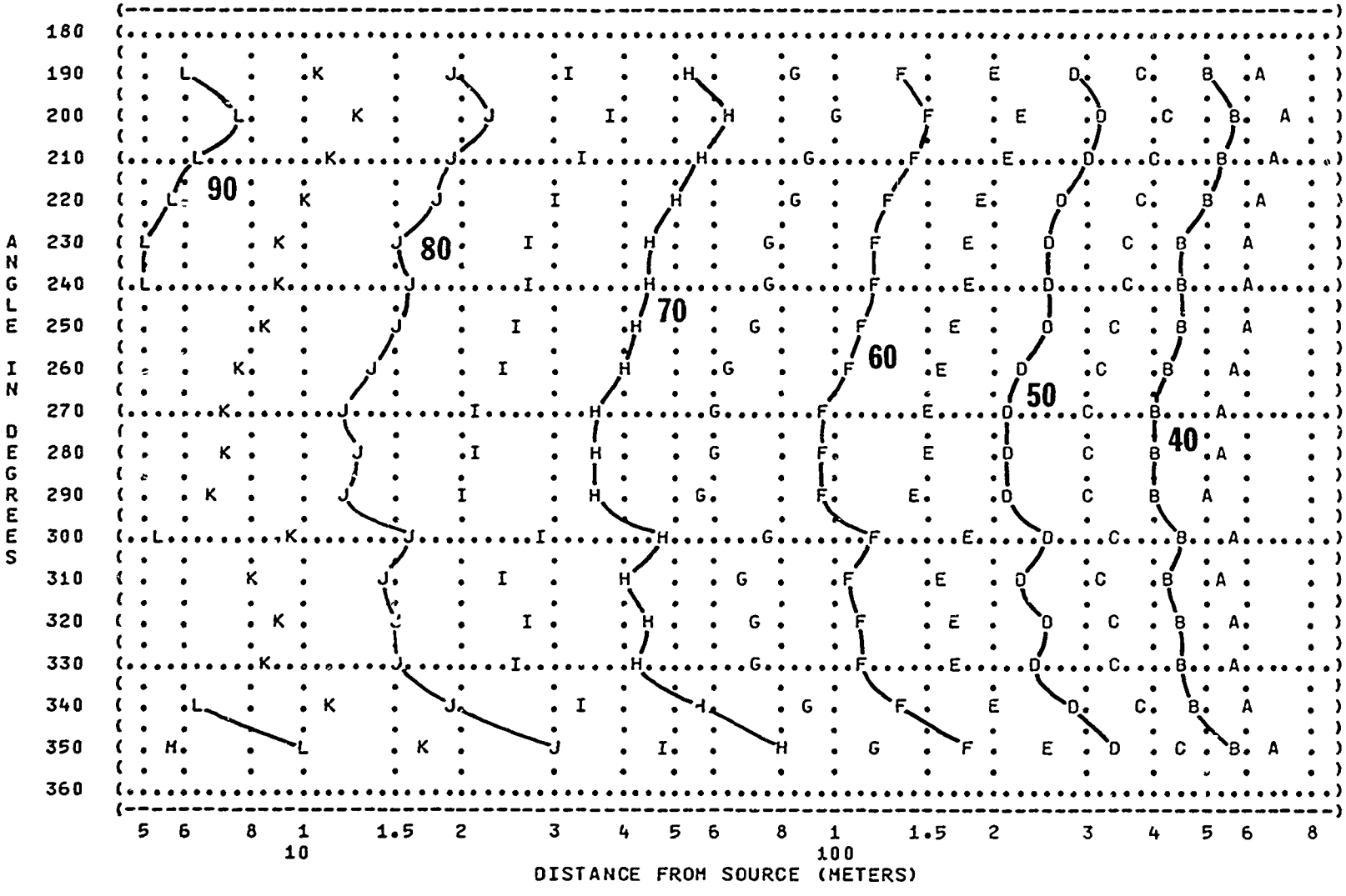

POINT	DB
A	35
B	40
C	45
D	50
E	55
F	60
G	65
H	70
I	75
J	80
K	85
L	90
M	95

FIGURE: 9

SOUND PRESSURE LEVEL (SPL)
EQUAL LEVEL CONTOURS (DB)
8000 HZ OCTAVE BAND

IDENTIFICATION:
OMEGA 1.3
TEST 71-020-280
RUN 01
13 FEB 75
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NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS
TURBINE ENGINE
(CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

POINT	DB
A	35
B	40
C	45
D	50
E	55
F	60
G	65
H	70
I	75
J	80
K	85
L	90
M	95
N	100

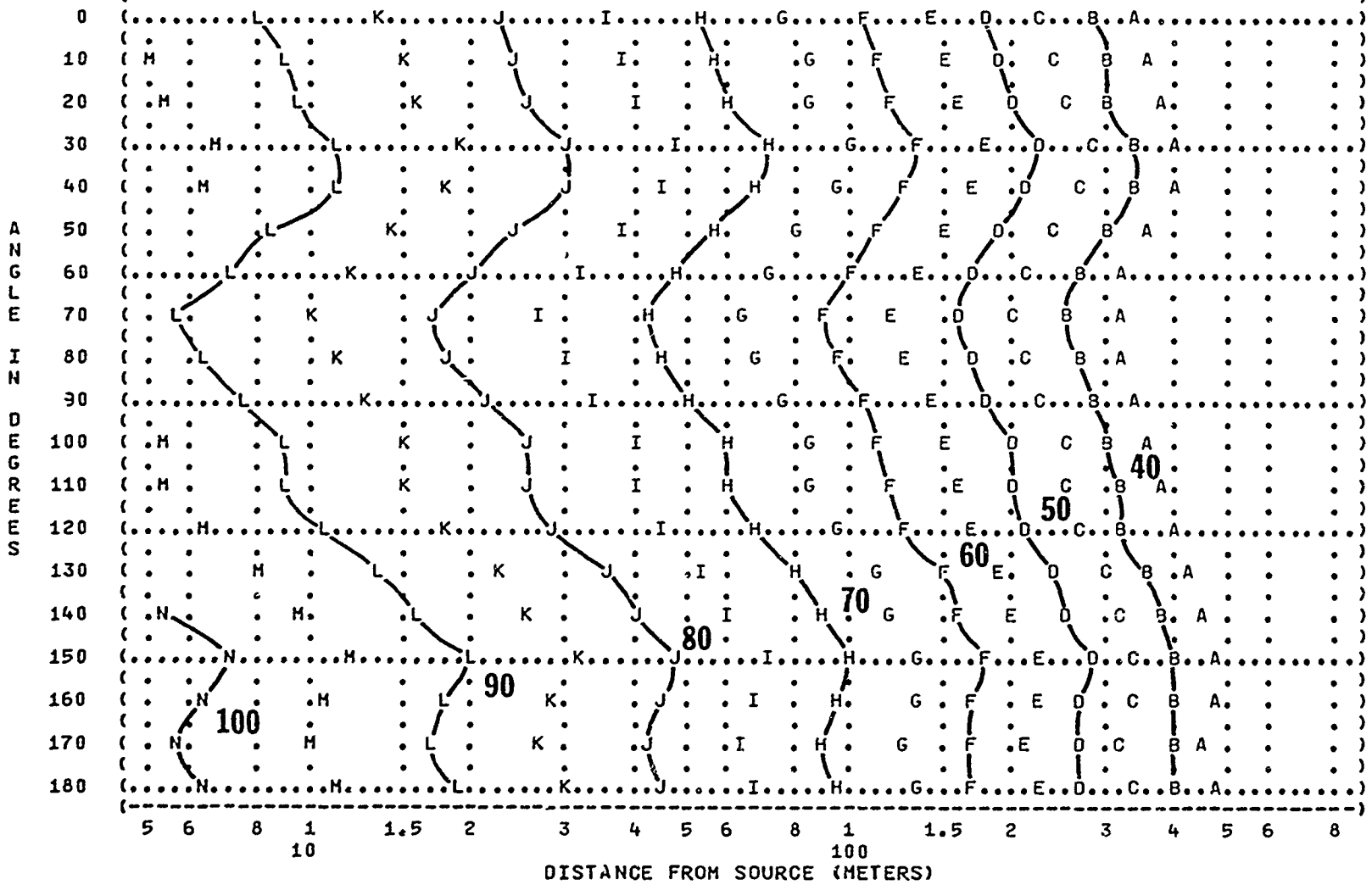

FIGURE 9: SOUND PRESSURE LEVEL (SPL) EQUAL LEVEL CONTOURS (DB) 8000 HZ OCTAVE BAND

NOISE SOURCE/SUBJECT:
MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)
FAR FIELD NOISE LEVELS

OPERATION:
35,000 RPM (100%)
LOADED (40 PSI)

METEOROLOGY:
TEMP = 15 C
BAR PRESS = .760 M HG
REL HUMID = 70 %

IDENTIFICATION:
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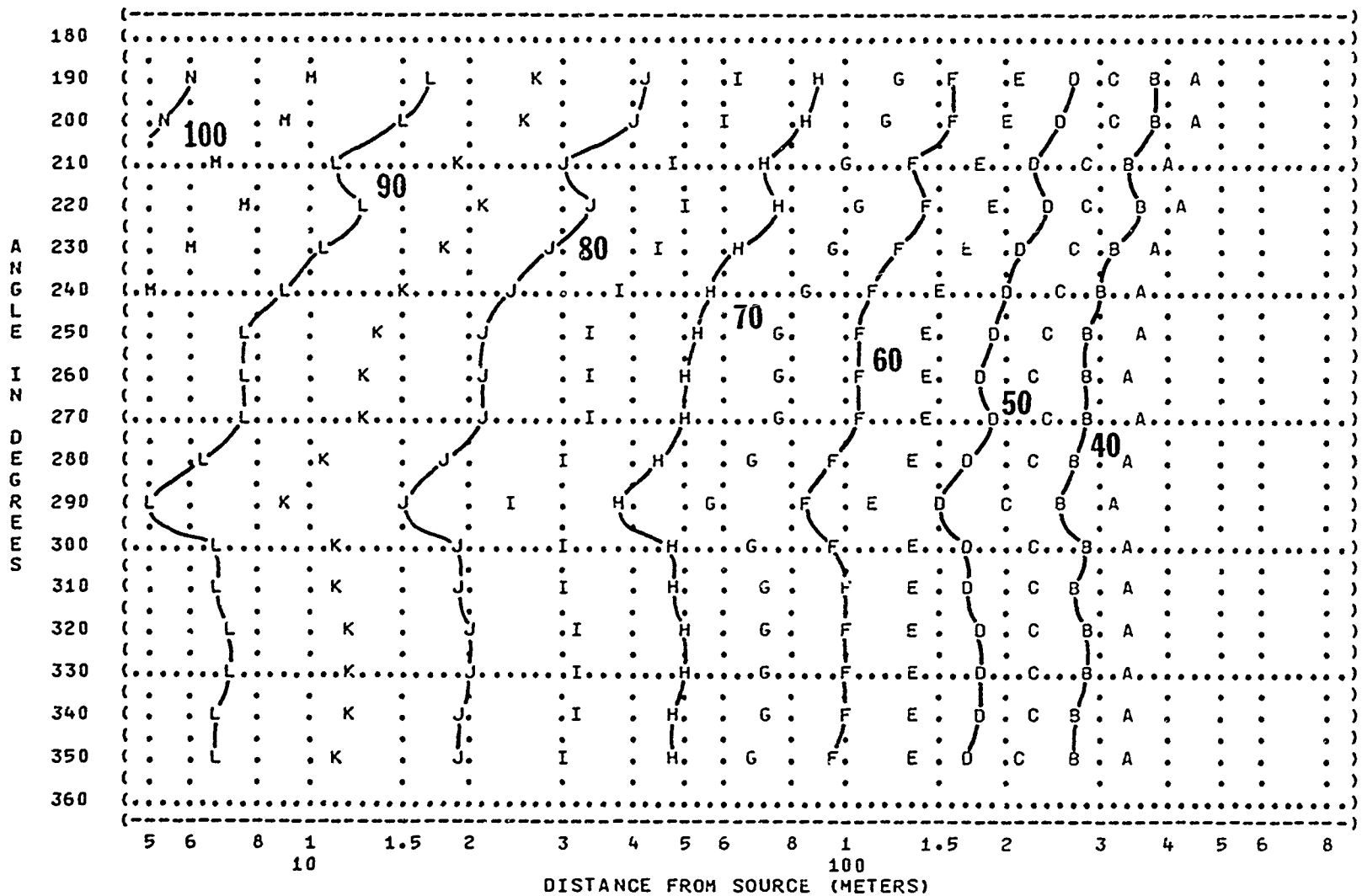
RUN 02
13 FEB 75
PAGE 24



POINT	DB
A	35
B	40
C	45
D	50
E	55
F	60
G	65
H	70
I	75
J	80
K	85
L	90
M	95
N	100