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BEHAVIOR OF NOZZLES AND ACOUSTIC LINERS IN THREE-DIMENSIONAL ACOUSTIC FIELDS

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ΝΟΤΙΟΕ

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PROGRESS DURING REPORT PERIOD

A. Summary

Theoretical values of the admittances of various nozzles have been computed and compared with the corresponding experimental values. The existing data reduction scheme has been corrected and all available experimental data has been rechecked and corrected whenever necessary; the updated experimental admittance values are presented in this report. An analysis associated with the frequency sensitivity of experimental admittance values has been initiated. The Analog-To-Digital Data Reduction Program has become operational. Fourteen nozzle tests have been conducted during this report period.

B. Theoretical Studies

Theoretical values of the nozzle admittance have been computed based on the three dimensional nozzle admittance theory of Crocco.¹ The development of a computer program which employs this theory to predict nozzle admittances has been completed; this program was then used to predict the admittance values for all the nozzles tested to date. Before presenting the results, a brief description of the theory used in developing this computer program will now be given.

According to Crocco's theory¹, the admittance Y is given by the expression

$$Y = \frac{-Z}{q^2 Z + is}$$
(1)

where

$$Z = \frac{\text{axial dependence of the axial velocity perturbation}}{\text{axial dependence of the radial velocity perturbation}}$$

- q = nondimensionalized mean flow velocity
- s = nondimensionalized frequency

Once Z is known and q and s are specified, the admittance can be found from Eq. (1). The problem is to compute Z. Values of this parameter can be determined by numerically integrating the following complex, nonlinear equation (called the Riccati Equation):

$$\frac{dZ}{d\bar{Q}} = A(\Phi)Z - B(\Phi) - Z^2$$
 (2)

where the independent variable $\tilde{\Psi}$ is the steady state flow potential, and $A(\tilde{\Psi})$ and $B(\tilde{\Psi})$ are coefficients whose form depends upon s and the mean flow properties in the converging section of the nozzle. The major difficulty in integrating Eq. (2) is that Z can take on very large values whenever the radial velocity approaches zero. These large values can occur for the nozzles under investigation, and can cause numerical instabilities in the integration scheme. This problem is circumvented by transforming the dependent variable as follows:

$$T = \frac{1}{Z}$$
(3)

Thus, when Z becomes large T becomes small. Substituting for Z in Eq. (2) gives the following Riccati Equation for T:

$$\frac{dT}{d\Phi} = 1 - A(\Phi)T + B(\Phi)T^2$$
 (4)

In order to avoid numerical instabilities in the computer program which predicts theoretical admittance values, the following procedure is used. Starting at the nozzle throat, Eq. (2) is integrated until the magnitude of Z becomes larger than a specified value at a certain value of $\frac{1}{2}$; T is then found from Eq. (3) and Eq. (4) is integrated. Similarly, when |T| exceeds a certain value, Z is computed from Eq. (3) and the integration is carried out using Eq. (2). This process is repeated until Φ equals the value at the nozzle entrance. The admittance is then determined from Eq. (1) using the value of Z or T at that point.

When the theoretical admittance values were computed it was found that a discrepancy existed between the theoretical predictions and the experimental results. This discrepancy was traced to the improper interpretation of the incident and reflected waves in the theory used for the reduction of the experimental data. The discrepancy was corrected and all the experimental data that had been previously taken was rerun. While correcting the data reduction scheme, it was found that the equations presented in the last quarterly report remain unchanged with the exception of the expression for the real part of the admittance whose corrected form is given by Eq. (5). The corrected admittance data indicates that increasing the mean flow Mach number decreases the value of the real part of the admittance for three dimensional modes which is in agreement with nozzle admittance theory. Data presented in earlier reports shows the opposite trend. In addition, the signs of the corrected values of the imaginary parts of the nozzle admittance are the negative of the values reported earlier.

The comparisons of the experimental admittances with the corresponding theoretical predictions are presented in figures 1 through 24. Except for figures 3 and 7 the theory and experiment are in qualitative agreement. Before any conclusions, concerning the validity of the theory or the experimental data, are drawn, further analysis of these results will be performed. Included in this analysis will be the study of the accuracy of the frequency measurements and its effect upon the experimental results. The findings of this analysis will be reported in the next progress report.

Figures 3 and 7 show that the experimental values for the real part of the admittance approach large positive numbers whereas the theory predicts large negative values. This discrepancy could be due to the inability of the present data reduction scheme to

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determine the proper sign of \mathcal{Q} . This point may become clearer if one considers the following equations:

$$Y_{r} = \frac{S\sqrt{S^{2} - S_{mn}^{2}(1-\bar{m}^{2})} \tanh \pi \alpha \sec^{2} \pi \beta \overline{s}_{mn}^{2} M}{(S^{2} + S_{mn}^{2}M^{2}) (\tanh^{2} \pi \alpha + \tan^{2} \pi \beta)}$$
(5)

where

$$e^{-2\pi\alpha} = \left(\frac{\text{reflected wave amplitude}}{\text{incident wave amplitude}}\right)_{\text{nozzle entrance}}$$

$$\pi(1 + 2\beta) =$$
 phase change of the incident wave upon reflection

r_c = chamber radius

M = chamber Mach number

In order for the theoretical and experimental admittances, in Figs. 3 and 7, to agree α must take on negative values. However, the present data reduction scheme is not capable of determining the sign of α from the perturbation pressure amplitude measurements at various locations along the tube. The sign of α can, however, be determined from perturbation pressure phase measurements; as a matter of fact the phase measurements can be used to determine both the sign and magnitude of α .

A computer program using the Nonlinear Regression Technique for the computation of α , β , and the admittance from phase measurements taken at discrete points along the tube is in preparation. This program is currently undergoing preliminary checkouts and

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admittance values obtained from this program will be presented in the next report.

The checkout of the analog-to-digital data reduction program has been completed and the program is operational at this time. The principal motivation for the development of the A-to-D program was the desire to obtain accurate phase data, which is an important consideration for both the present nozzle testing program and the anticipated acoustic liner work. Other advantages associated with the use of the A-to-D program are: (1) the data reduction time is reduced by several orders of magnitude; (2) the frequency resolution is improved; and (3) the possibility of human errors affecting the data accuracy are virtually eliminated.

A brief description of the use of the A-to-D program follows. First, the analog data taken during the test must be digitized. This is accomplished by a 14 channel Analog-To-Digital Conversion System manufactured by the Radiation Corporation. This unit is made available, free-of-charge, to users of the Rich Electronic Computer Center, which is an integral part of Georgia Tech. The unit has been programmed to sample 25,000 samples/second. For ten channels of analog data (viz., two frequency channels and eight dynamic pressure transducer channels), this sample rate provides 2,500 samples/second/channel, which represents 0.4 milliseconds between samples on each channel. The maximum frequency recorded on the analog tape is 1,000 Hz; however, the maximum frequency of the Conversion System is restricted to 250 Hz at this sample rate for ten channels. Consequently, the analog tape recorder speed must be reduced by 4:1 during the playback into the A-to-D Conversion System. This selection of sample rate and maximum frequency insures that the signal with the shortest period (viz., the real-time frequency of 1,000 Hz) will be sampled 10 times during the period, which is considered to be an absolute minimum for good statistical confidence. The minimum frequency is not limited by the Conversion System but is limited by the available core size associated with the computer that is used to process the digitized

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data. In this case, the computer is a Univac 1108 that has a total available core of 60,000 words. This amount of core results in a minimum real-time frequency of 56 Hz, which implies that this period is sampled 179 times during one cycle by the Conversion System. The frequency limits can be summarized as follows:

Real-time; $56 \le f$, $Hz \le 1,000$

Reduced-time; $14 \le f$, $Hz \le 250$

The end product of the A-to-D conversion is a tape of digitized test data.

The digitized test data is then transferred to the Univac 1108 system where it is used to determine all needed information. The data reduction program is written in the Fortran V compiler and executed by the Univac 1108. After this program reads a block of digitized data, it proceeds to determine the frequency associated with that block of data. This is accomplished by checking for the zero-crossings of a reference (sinusoidal) frequency signal. Inasmuch as the frequency signal will not be digitized at the exact instant when the signal is identically zero, the instant when the signal crosses the zero line must be interpolated by using the last two positive values and the first two negative values. The use of an interpolation routine suggests that an error might be introduced. A checkout of the interpolation schemed showed that it produces a maximum error of 0.5 Hz, which represents a 0.05% error.

The frequency that has just been determined is the frequency of the driven oscillation at that instant of time during the test. Therefore, it represents the fundamental frequency for that block of digitized pressure data. For one period of the fundamental mode, the Fourier Series representation of the time-dependent signal is given by:

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where

p(t) : time-dependent pressure amplitude, psi

w : angular frequency, radians/sec

$$A = \frac{2}{T} \int_{0}^{T} p(t) \cos \omega t \, dt$$
$$B = \frac{2}{T} \int_{0}^{T} p(t) \sin \omega t \, dt$$

T : period of the fundamental mode, seconds

The program determines the Fourier Coefficients A and B for each of the pressure signals. The signal amplitude is determined from the expression:

Amplitude =
$$(A^2 + B^2)^{1/2}$$

and the phase is determined from the expression:

Phase =
$$\tan^{-1}(B/A)$$

Each test can be divided into 500 data reduction points. After the frequency, amplitude, and phase have been determined for the entire digital tape, this information is fed into a special subroutine that uses this data to compute the nozzle admittance and related data. An example of the data reduction results is presented in Appendix A.

The data reduction program was checked out with and without a digitized tape data. The first checkout was without a digitized tape data. In this case, signals of known frequency, amplitude, and phase were generated using a sine function. These continuous signals were synthetically digitized in a manner similar to that used by the Conversion System when it digitizes the analog data. This data was processed by the program and the program results were compared to the input values. For both simple periodic signals and complex periodic signals (i.e., signals composed of a sum of a fundamental oscillation and its various harmonics), the error in amplitude and phase appeared as a "round-off" error, which represents an error of less than 0.2%. For a nonperiodic signal (i.e., two periodic signals whose frequencies are not related by an integer constant), the amplitude error was less than 5% and the phase error was approximately 5° for the case when the two signal amplitudes were equal. This case approximates conditions when the signal-to-noise ratios equal to one. These errors decreased rapidly as the signal-to-noise ratio approached 10:1.

The second checkout of the program involved the use of digitized data obtained from an actual test. A comparison of the program's results with the results obtained by the previous data reduction method disclosed that there was general agreement between the two methods. The concensus of opinion is that the new data reduction scheme is more accurate than the one used to date; furthermore, the new program is considerably more efficient.

C. Experimental Investigations

During this report period fourteen tests have been run. One test was conducted for checking the analog-to-digital data reduction program. All of the nozzles fabricated thus far were retested in order to include the entire frequency range for 1T modes (1.84 < s < 3.05) and most of the longitudinal frequency range (.1 < s < 1.84). The results of these tests are included in

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figures 1 through 24. In addition, two tests were run with a quasi-steady nozzle and two more with a nozzle whose half-angle is 45° and radius of curvature of 2.5 inches. The Mach number of the latter nozzle was increased to a value of .20. The data obtained in these tests is being reduced and it will be presented in the next progress report.

Other efforts have resulted in the improvement of the precision of the frequency measurements. This improvement allowed a significant increase in the number of data points taken per run.

EXPECTED PROGRESS DURING NEXT REPORT PERIOD

During the next quarter, two more microphones will be added to the data acquisition system. This addition will bring the number of pressure amplitudes sampled along the standing wave pattern to ten. This will improve the accuracy of the admittance values by providing more information about the wave structure.

The nozzle with a half-angle of 45° and radius of curvature of 2.5 inches will be tested at various Mach numbers starting at M = .24 and proceeding to M = .32. These series of tests will be conducted to determine whether there are any unexpected problems associated with testing at higher Mach numbers. Assuming that no major problems are encountered, the other nozzles will be tested and the experimental admittance values along with the corresponding theoretical predictions will be determined. These results will be compared in the next quarterly report.

REFERENCES

 Crocco, L., Sirignano, W. A., "Behavior of Supercritical Nozzles Under Three Dimensional Oscillatory Conditions," AGARDograph 117, 1967. 9



Figure 1. Comparison of the theory and experimental values of the real part of the admittance for the nozzle with a half-angle of 15 degrees, entrance Mach number of .08, and radii of curvature at the throat and entrance of 5.7 inches.





Figure 3. Comparison of the theory and experimental values of the real part of the admittance for a nozzle with a half-angle of 15 degrees.

entrance Mach number of .08, and radii of curvature at the throat and entrance of 5.7 inches.



Figure 4. Comparison of the theoretical and experimental values of the imaginary part of the admittance for a nozzle with a half-angle of 15 degrees, entrance Mach Number of .08, and radii of curvature at the throat and entrance of 5.7.



Figure 5. Comparison of the theoretical and experimental values of the real part of the admittance for a nozzle with a half-angle of 15 degrees entrance Mach number of .08 and radii of curvature at the entrance and throat of 2.5 inches.



Figure 6. Comparison of the theoretical and experimental values of the imaginary part of the admittance for a nozzle with a half-angle of 15 degrees, entrance Mach number of .08 and radii of curvature at the entrance and throat of 2.5 inches.



of .08, and radii of curvature at the throat and entrance of 2.5 inches.



8. Comparison of the theoretical and experimental values of the imaginary part of the admittance for a nozzle with a half-angle of 15 degrees, entrance Mach number of .C8, and radii of curvature at the throat and entrance of 2.5 inches.

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Figure 9. Comparison of the theoretical and experimental values of the real part of the admittance for a nozzle with a half-angle of 30 degrees, entrance Mach number of .08, and radii of curvature at the threat and entrance of 2.5 inches.



Figure 13. Comparison of the theoretical and experimental values of the imaginary part of the admittance for a nozzle with a half-angle of 30 degrees, entrance Mach number of .08, and radii of convature at the threat and entrance of 2.5 inches.



Figure 11. Comparison of the theoretical and experimental values of the real part of the admittance for a nozzle with a half-angle of 30 degrees, entrance Mach number of .08, and radii of curvature at the throat and entrance of 2.5 inches.



Figure 12. Comparison of the theoretical and experimental values of the imaginary part of the admittance for a nozzle with a half-angle of 30 degrees, an entrance Mach number of .08, and radii of curvature at the throat and entrance of 2.5 inches.



Figure 13. Comparison of the theoretical and experimental values of the real part of the admittance for a nozzle with a half-angle of 45 degrees, entrance Mach number of .08, and radii of curvature at the throat and entrance of 2.5 inches.



Figure 14. Comparison of the theoretical and experimental values of the imaginary part of the admittance for a nozzle with an entrance Mach number of .08, half-angle of 45 degrees, and radii of curvature at the throat and entrance of 2.5 inches.







Figure 16. Comparison of the theoretical and experimental values of the imaginary part of the admittance for a nozzle with an entrance Mach number of .0?, half-angle of 45 degrees, and radii of curvature at the throat and entrance of 2.5 inches.



Figure 17. Comparison of the theoretical and experimental values of the real part of the admittance for a nozzle with a half-angle of 30 degrees, entrance Mach number of .16, and radii of curvature at the intrance and throat of 5.7 inches.



Figure 18. Comparison of the theoretical and experimental values of the imaginary part of the admittance for a nozzle with a half-angle of 30 degrees, entrance Mach number of .16, and radii of curvature at the threat and entrance of 5.7 inches.



Figure 19. Comparison of the theoretical and experimental values of the real part of the admittance for a nozzle with a half-angle of 30 degrees, entrance Mach number of .16, and radii of curvature at the throat and entrance of 5.7 inch.s.





Figure 23. Comparison of the theoretical and experimental values of the imaginary part of the abittance for a nozzle with a half-angle of 30 degrees, entrance Mach number of .16, and radii of curvature at the threat and entrance of 5.7 inches.



Figure 21. Comparison of the theoretical and experimental values of the real part of the admittance for a nozzle with a half-angle of 45 degrees, entrance Mach number of .16, and radii of curvature at the threat and entrance of 2.5 inches.

Real Part of the Adrittance, Y_{r}



Figure 22. Comparison of the theoretical and experimental values of the imaginary part of the admittance for a mozzle with a half-angle of 45 degrees, entrance Mach number of .16, and radii of curvature at the throat and entrance of 2.5 inches.



Figure 23. Comparison of the theoretical and experimental values of the real part of the nozzle admittance of a nozzle with a half-angle of 45 degrees, entrance Mach number of .16, and radii of curvature at the throat and entrance of 2.5 inclus.



Figure 26. Comparison of the theoretical and experimental values of the imaginary part of the addittance for a nozzle with a half-angle of 45 degrees, entrance Mach number of .16, and radii of curvature at the throat and entrance of 2.5 inches.

APPENDIX A: OUTPUT OF ANALOG-TO-DIGITAL DATA REDUCTION PROGRAM

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EXAMPLE CASE, A-TO-D PRDB	RAM AEDPP.	TEST 321	4-51					AC	TE 120371	PAGE	·
FOURIER ANALYSIS RES	ULTS OF A-	TO-D DATA	. EXAMPLE	CASE, A-	TO-D PROG	RAM AEDPP	TEST B2	14-51		······	-
	HF-FREQ	HF- 8/9	HE-33/9	HF-19/9	4F-40/9	HF_FRED	HE-35/9	4F-24/9	HF_17/9	HF- 3/9	
FREQUENCY = 1000.0+ 42	RUN POINT	1									
AMPLITUDE, SPL(DS) =	• 99	160+90	160.00	150.00	160.00	.99	150.00	160.00	160.00	160.00	
PHASE, DEGREES =	•00	231.96	237.65	1/5,14	234.60	3.85	258,10	274.64	219.10	551.18	بمدسور مسنده
FREDUENCY = 609.1. HZ	RUN POINT	2				······································					
AMPLITUJE: SPL(JJ) = PHASE: JESREES =	1.00	124+28	124.05	100.00 68.75	100.00	1.00	126,26	12/.54	109.22	10.89	
$\frac{FREDUENCY}{AVENTANDE} = 616.7 \cdot HZ$	RUN POINT	3	131 62	100.00	100.00	1 00	128 95	121.00	100.00	124-09	and the second second
PHASE JEGREES =	.00	214.81	219.02	112,47	32.12	3.87	222.58	219.90	284.46	241.05	
		<u>ь</u> .									
$\frac{PREJUENCY = 025.07 Hz}{AMPLIJUJE, SPL(03) =}$	1.00	124.50	100.00	100.00	125.37	1.00	121.55	124.87	100.00	128.61	
PHASE + DEGREES =	•00	275.73	344.24	348,98	37.72	3.53	42.20	332.25	110.17	345.26	
FREQUENCY = 632.60 MZ	RUN POINT	5		/				•			
AMPLITUDE, SPL(D3) =	1.00	130.95	130.74	100.00	130.93	1.00	132.32	129.14	10.00	129.93	
PHAST + JESREES =	•00	169.99	10.55	54.70	44.43	3.51	45,90	351.11	124.77	211.54	
FREQUENCY = 640.7. HZ	RUN POINT	6									
AMPLITUJE, SPL(D3) = Phase, fabers =	1.00	127.65	126.52	100.00	126.43	1.00	126,40	100.00 89.34	127.51 1r5.09	129.33	
$\frac{FRESUEACY}{FRESUEACY} = 648.1 + HZ$	QUN POINT	7	133.30	131.75	127.71	1.01	133.67	131.75		125-91	
PHASE: JEGREES =	•00	152+39	148.13	122.13	146.09	3.58	168,95	145.98	148.77	145.01	
EDEOUENCY - 656 1. 47		8									
AMPLITUDE, SPL(D3) =	1.00	126.48	136.71	100.00	129.28	1.01	136.17	137.05	100.00	100.00	·
PHASE , JEGREES =	•00	313.62	155.64	145.80	140.76	3.78	172.20	163.44	147.18	61.74	
FREQUENCY = 663.5+ HZ	RUN POINT	9									
AMPLITUJE, SPL(DB) =	• 99	127.78	137.25	135.89	136.58	•99	139.04	136.57	134.75	132.11	
PHASE: DEGREES =	•00	335.97	194.30	215.74	194.43	4.10	208.94	215.60	2.30.04	331.71	
FREQUENCY = 671.5, HZ	RUN POINT	10		100 15							
AMPLITUDE, SPL(DB) = Phase, despers =	1.00	133.74	139.31	332.77	27.04	1.00	24,74	159,55 351.38	4.24	315.21	
$\frac{FREQUENCY}{FREQUENCY} = 678.9 HZ$	RUN POINT	11	165.06	163.36	162.99	1.00	165.66	164.15	163.20	157.02	
PHASE DEGREES =	.00	112.69	146.70	129,51	155.57	4.04	162.80	154.56	147.79	127.95	
	SHN POTNE	12									
$\frac{PREHOEVET = 007.17 HE}{AMPLITUDE, SPL(D3) =}$	1.00	170-14	165,44	171.65	156.13	1.00	164.52	157.45	171.00	167.93	
PHASE + DEGREES =	•00	339.97	23,78	358,56	47.53	4.17	42,59	23.63	15.31	355.25	
FREQUE ICY = 693.7. HZ	RUN POINT	13		•							
AMPLITUDE, SPL(D3) =	1.00	168.98	156.54	165.21	162.84	1.01	150.64	160.82	167.54	167.55	
PHASE / JEGKELS =	•00	142+51	7.01	103,74	22+14	2071	-0,74	70.4414	7099J	To 1403	

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FOULTER AUALYSIS RESULTS OF A-TO-D DATA. 26AVPLE CASE, A-TO-D PROGRAM 4 EDPP, TEST R214-51 MPL-B201 MPL-D20 MPL		XAMPLE CASE: A-TO-D PROS	RAM LEDPP.	TEST 821	4-51					זפ	TE 120371	PAGE	2
HP-FRED HF-BY9		FOURIER ANALYSIS RES	ULTS OF A-	TO-D DATA	. EXAMPLE	E CASE, A-	TO-D PROG	RAM AEDPP	TEST B2	214-61			<u>.</u>
FREDUCUCY = 702.2, H2 RUM PDINT 14 FVEDUCUCY = 702.2, H2 RUM PDINT 14 AVPLITUDE: SPLCD1 = AVPLITUDE: SPLCD1 = FREDUCUCY = 702.4, H2 RUM PDINT 15 FREDUCUCY = 702.5, H2 RUM PDINT 15 FREDUCUCY = 717.1, H2 RUM PDINT 16 FREDUCUCY = 717.1, H2 RUM PDINT 16 FREDUCUCY = 717.1, H2 RUM PDINT 16 AVPLITUDE: SPLCD1 = PASS. JESSES = 00 346.07 210.44 23.43 221.65 4.32 226.06 214.33 PASS. JESSES = PASS. JESSE	_	· · · · · · · · · · · · · · · · · · ·	HF-FRED	HF- 8/9	HF-33/9	HF-19/9	HF-40/9	HE-FREQ	HF-35/9	HF-24/9	HF-17/9	HF- 3/9	
AVAPLID2: SR(20) I 1.00 165.09 164.50 155.70 164.38 1.00 155.71 144.33 122.65 165.37 PASS. DSSEES = .00 247.01 116.02 260.96 127.34 4.19 122.66 113.07 266.21 264.47 PASS. DSSEES = .00 344.07 210.49 23.43 221.65 4.32 228.06 214.03 255.1 5.35 FREDUC(Y = 717.1.4 2.00 344.07 210.49 23.43 221.65 4.32 228.06 214.03 255.1 5.35 FREDUC(Y = 717.1.4 2.00 93.40.07 210.49 23.43 221.65 4.33 330.49 317.99 297.78 112.47 AVAPLIDUE: 726.21 726.21 727.78 110.01 164.64 165.16 165.79 166.61 161.73 164.78 164.64 165.16 165.79 166.77 166.79 176.77 166.79 166.73 166.79 166.79 176.77 166.79 166.73 167.79 167.71 165.77 166.77 166.79		FREDUENCY = 702.2. HZ	RU'I POINT	14			·						
PHASE: DEARES = .00 247.01 114.03 266.96 127.34 4.16 132.66 113.67 266.21 264.29 PRESURE CT = 710.06 42 RUM PDINT 15 76.20 100.06 162.97 38 167.71 151.22 156.77 157.29 100.06 162.97 38 157.71 151.22 155.75 153.79 170.00 164.64 165.79 155.77 157.79 170.00 164.64 165.79 155.75 153.79 170.00 164.64 165.79 155.75 155.79 155.79 156.79 <t< td=""><td></td><td>AMPLITUDE: SPL(DJ) =</td><td>1.00</td><td>166.89</td><td>164.58</td><td>158.70</td><td>164.38</td><td>1.00</td><td>155.12</td><td>144.38</td><td>142.43</td><td>165.31</td><td></td></t<>		AMPLITUDE: SPL(DJ) =	1.00	166.89	164.58	158.70	164.38	1.00	155.12	144.38	142.43	165.31	
PRESUME (C) = 710.64 - 42 RUY PDIVT 15 167.77 167.70 167.70 167.71 151.24 167.71 157.24 PMASJ, JESAEZE = .00 344.07 210.44 23.43 221.65 4.32 228.06 214.63 255.51 5.35 PMASJ, JESAEZE = .00 344.07 210.44 23.43 221.65 4.32 228.06 214.63 255.51 5.35 PASJ, JESAEZE = .00 164.06 165.49 155.52 153.79 1.00 164.64 164.25 165.99 165.79 PASJELUZIC = 74.04 101.17 100.164.06 165.40 165.71 155.75 110.77 110.77 155.75 PASJELUZIC = 732.2.4 RUN POINT 19 100.161.09 153.80 164.63 155.91 1.60 160.10 166.72 162.20 165.75 PASJELUZICY = 732.2.4 RUN POINT 19 10.25 360.39 4.16 320.01 134.75 162.75 161.81 167.92 167.72 165.75 165.74 167.72 162.75 161.12 165.74 167.74		PHASE, DEGREES =	• O N:	247.01	114.03	268.96	127.34	4.19	132.66	113.87	286.21	264.29	
AVPCTIUDE, \$PTCDJ) = 499 165.77 167.29 100,40 23.43 221.65 4.32 228.68 214.43 25.51 5.35 PR551, 0550255 = .00 346.07 210.44 23.43 221.65 4.32 228.68 214.63 25.51 5.35 PR51, 0550255 = .00 165.49 155.52 153.79 11.66 164.64 161.26 145.26 145.26 145.79 173.77 PR52, 052655 = .00 314.60 286.70 321.48 4.13 350.49 317.79 173.77 PR52, 052655 = .00 161.69 16.3.11 162.03 148.04 1.64 165.12 155.74 PR52, 052652 = .00 161.69 153.81 162.03 158.91 1.00 100.00 165.32 162.29 165.63 PR52, 052652 = .00 163.49 153.81 163.63 158.91 1.00 100.00 166.32 162.29 165.73 PR52, 052625 = .00 153.64 129.77 110.25 160.71 167.75 161.41 167.92 167.7		FREQUENCY = 710.0+ 42	RUN POINT	15									
PH4Sj. DESKES = .00 344.07 210.44 23.43 221.65 4.32 228.08 214.43 25.51 5.35 PREDUC(Y = 717.1.42 QUI PDINT 16 165.40 155.52 153.79 1.00 164.64 164.25 145.79 166.20 PH4SL: JEARES = .00 39.40 286.70 321.98 4.13 330.99 317.99 207.78 112.47 FREDUC(Y = 725.0.42 NUP DINT 16 .00 161.40 21.01 584.10 234.95 4.56 39.72 24.19 185.73 165.74 PH4SL: DESKES = .00 161.49 153.78 164.45 158.79 1.00 166.22 165.73 PH4SL: DESKES = .00 289.56 129.77 110.25 326.91 1.30 159.79 186.73 PH4SL: DESKES = .00 289.56 129.77 10.25 326.91 1.61.61 167.72 165.73 PH4SL: DESKES = .00 289.56 147.70 165.75 165.71 162.75 161.81 162.90 PH4SL: DESKES = .00		AMPLITUDE, SPL(D) =	•99	165.77	167.29	100.00	162.97	.98	167.71	151.24	154.81	157.14	alla in reacher 2 4. Juin;
FRESURY T17.11. 42 RUY PDINT 16 AVP.LITUD: SPL(D3) = 1.00 164.00 165.52 153.79 1.00 164.26 165.29 AVP.LITUD: SPL(D3) = 1.00 93.14,00 286.70 321.88 4.13 330,99 317.97 293.78 124.97 PRESUPICY SPL.01 SPL.01 103 167.96 163.16 165.29 293.78 124.97 PRESUPICY SPL.01 SPL.01 103 167.96 163.16 165.29 293.72 24.19 155.54 PMASE JEGAZES .00 161.69 153.80 164.65 158.79 1.00 160.100.00 166.32 162.27 165.63 PMASE JEGAZES .00 269.56 129.77 110.25 326.39 4.06 320.01 134.59 129.99 289.42 PRESUPICY SPL.02.07 2 103 157.77 12.56 1.00 157.71 162.75 161.81 169.99 289.42 PRESUPICY SPL.02.07 2 103 157.72 158.55 159.71 <td></td> <td>PHAS: DEGREES =</td> <td>•00</td> <td>346.07</td> <td>210.84</td> <td>23.43</td> <td>221.65</td> <td>4.32</td> <td>228.08</td> <td>214.83</td> <td>25.51</td> <td>5.35</td> <td></td>		PHAS: DEGREES =	•00	346.07	210.84	23.43	221.65	4.32	228.08	214.83	25.51	5.35	
AVD_[110]2: SH (102): 1.00 160.10 160.10 160.20<		EREQUENCY = 717.1+ 47	RUN POINT	16									
PH452: J238252 = 1.00 93.90 314.06 286.70 321.96 4.13 330.89 317.99 269.78 112.87 PH452: J238255 = 1.00 161.69 21.01 356.10 234.95 4.64 160.12 156.74 155.73 165.53 PH452: J238255 = 1.00 161.69 21.01 356.10 234.95 4.56 39.72 24.19 18.66 141.24 PRESUENCY = 732.0.42 RUN POINT 19 19 153.88 164.63 158.91 1.00 100.00 166.32 162.29 165.03 PH452: J238252 = 1.00 269.66 129.77 110.25 326.39 4.66 320.01 134.59 199.99 289.42 PH452: J238252 = 1.00 269.66 129.77 110.25 326.39 4.66 320.01 134.59 199.99 289.42 PH452: J258252 = 1.00 257.77 161.70 155.71 162.75 161.41 169.94 44.94 248.62 242.19 44.94 PH452: J258252 = 1.00 29.04 67.07 223.05		AVP: (TIL)7. SPI (74) =	1.00	164.00	165.49	155.52	153.70	1.00-	154 64	164.25	145.99	165.29	
FREDUENCY = 725.0.42 GUN POINT 17 AVPLIUDE: SPELUD: 1.03 163.66 163.31 162.83 148.44 1.06 150.12 156.94 155.73 165.54 PH455: DEGREES = .00 161.69 21.01 358.10 234.95 4.56 39.72 24.19 18.66 181.24 PREDUENCY = 732.0.42 RUN POINT 18 .00 161.49 153.80 164.63 158.91 1.00 100.00 166.32 162.29 165.03 ANPLIUDE: SPELUD: 1.00 167.45 128.77 110.25 326.39 4.66 320.01 134.45 199.90 PA9.42 PREDUENCY = 740.5.42 RUN POINT 19 .00 165.71 162.75 161.81 169.90 ANPLIUDE: SPELUD: 1.00 157.71 161.87 159.50 1.50 155.71 162.75 161.81 169.90 ANPLIUD:: SPELUD: 1.00 157.71 161.87 159.55 155.96 1.02 155.71 167.75 ANPLIUD:: SPELUD: 1.03 157.71 161.87 158.75 167.72 167.75 PAASE: DE		PHASE JESREES =	.00	93.90	314.06	286.70	321.98	4.13	330,89	317.99	299.78	112.87	
PREJUGANT 2 / 22.07 42 (UV POINT 1/ APPLIUS: SP(2)1 = 1:03 163.96 163.31 162.83 148.44 APPLIUS: SP(2)2 = 1:03 163.49 21:01 355.10 234.95 4.56 39.72 24:19 15.63 155.73 PR455; JEGRESS =00 151.49 21:01 355.10 234.95 4.56 39.72 24:19 15.66 181.24 PREJUENCY = 732.0 H2 RUN POINT 18 PR455; JEGRESS =00 259.56 129.77 110.25 326.39 4.66 320.01 154.52 162.29 765.03 PR455; JEGRESS =00 259.56 129.77 110.25 326.39 4.66 320.01 154.52 162.29 765.03 PR455; JEGRESS =00 315.78 2.55 154.99 12.56 4.51 16.66 180.75 175.79 335.23 PR455; JEGRESS =00 315.78 2.56 154.99 12.56 4.51 165.74 162.75 161.81 167.92 167.94 PR455; JEGRESS =00 315.78 2.55 155.74 1.02 165.74 155.30 167.92 167.75 PR455; JEGRESS =00 29.04 67.07 223.08 79.25 4.74 84.94 245.62 242.19 44.45 PR455; JEGRES =00 29.04 157.07 125.07 1.02 165.74 155.30 167.92 167.75 PR455; JEGRES =00 29.04 67.07 223.08 79.25 4.74 84.94 245.62 242.19 44.45 PR455; JEGRES =00 129.04 152.27 160.34 163.24 158.76 157.19 335.53 129.67 PR455; JEGRES =00 129.04 152.2 307.72 168.08 3.91 171.98 335.67 326.63 129.67 PR455; JEGRES =00 129.04 152.75 161.32 162.31 156.73 199.66 7.77 354.93 125.78 PR455; JEGRES =00 129.04 152.75 161.32 167.97 156.48 1.00 168.50 150.26 159.16 1162.98 155.74 PR455; JEGRES =00 129.77 2168.08 3.91 171.98 335.67 326.33 129.67 PR455; JEGRES =00 129.72 168.34 160.35 336.29 195.95 4.38 199.66 7.77 354.93 155.74 PR455; JEGRES =00 125.27 256.49 52.90 271.98 4.38 199.66 7.79 354.93 155.74 PR455; JEGRES =00 125.27 256.49 52.90 271.98 4.71 276.67 91.65 71.60 33.157.12 PR455; JEGRES =00 135.104 159.76 150.74 150.74 150.74 150.74 150.75 150.712 PR455; JEGRES =00 155.74 150.74 150.74 150.74 150.74 150.75 150.712 PR455; JEGRES =00 155.74 150.74 24 PR455; JEGRES =00 155.74 150.74 25 PR455; JEGRES =00 155.79 157.64 159.76 150.74 150.74 150.75 150.713 150.75 150.70 173.88 331.13 PR455; JEGRES =00 135.04 350.39 154.86 185.94 1.00 154.00 1				• •			·						
Arreliuszisziszisziszisziszisziszisziszisziszis		FREQUENCY = 725.01 HZ	RUN POINT	1/	161 74		1 B II.			122 80			
FA2.02.02 + 7.732.0. HZ RUN POINT 18 AMPLITUDE: SPLIDE: SPLIDE		AMMELIUJIH SPELJJI - Dhashi nerofee =	1+03	161-60	203.31	358 10	140.44 234.9c	1.04	39 75	100+74	18-66	195+54	
FREQUENCY = 732.0. HZ RUV POINT 18 100 161.49 153.80 164.65 157.91 1.00 166.32 162.29 165.83 PHASE, JEGREES = .00 269.56 129.77 110.25 326.39 4.66 320.01 134.59 129.99 pA9.42 FRECUENCY = 740.6. HZ RUV POINT 19 -			•••	101+07	E 4 4 1 1	0000000	<u> </u>	*• 50	-/•'2	7.4017	10100	£	i-
AMPLIND: SPL(3) 1.00 161.49 153.80 164.53 162.29 165.73 PHAS: JEGRES = .00 269.56 129.77 110.25 326.39 4.06 320.01 134.59 129.90 280.42 FRE.UE:CY = 740.6.4 200.71 10.25 326.39 4.06 320.01 134.59 129.90 280.42 AMPLIUD: SPL(3) = 1.00 155.76 155.90 155.90 155.71 162.75 161.81 169.90 AMPLIUD: SPL(3) = 1.00 157.72 2.55 155.90 4.51 168.66 187.79 155.73 PHAS: JEGRES = .00 29.04 67.07 223.08 79.25 4.76 84.94 246.62 242.19 44.45 FAEJUE:CY = 756.2. HZ RUN POINT 21 10 29.04 67.07 23.08 79.25 4.76 84.94 246.62 242.19 44.45 FAEJUE:CY = 756.2. HZ RUN POINT 21 10 107.72 168.08 3.91 171.98 355.73 26.33 129.95 FAEJUE:CY = 756.2		FREQUENCY = 732.8 +2	RUN POINT	18									
PHR51: JISKISS = .00 259.56 129.77 110.45 326.39 4.06 340.01 134.59 129.97 289.92 FRECUE:CY = 740.6.4 Z RUM POINT 19		AMPLITUDE: SPL(D5) =	1.00	161.49	153.80	164.63	158.91	1.00	100.00	156.32	162.29	105.03	
FRELUE:CY = 740.6.4 RUN POINT 19 ArPLITUD::SPL(3) = 1.00 155.64 147.30 163.01 159.60 1.00 155.71 162.75 161.81 157.79 357.23 PHASE:JESKESE = .00 315.78 2.56 154.99 12.56 4.51 16.66 189.55 177.79 357.23 FRELUE:CY = 749.3.42 RUN POINT 20 .00 157.17 161.67 158.55 165.46 1.02 165.84 165.30 167.92 167.35 PHASE:JESES = .00 29.04 67.07 223.08 79.25 4.74 84.94 248.62 242.19 44.45 FRELUE:CY = 755.2.42 RUN POINT 21 .96 144.67 160.34 163.24 158.76 .95 162.74 154.71 163.26 167.92 167.35 PHASE:JESES = .00 129.41 152.77 307.72 168.08 3.91 171.98 355.57 326.33 129.67 FRELUE:CY = 764.2.7 AC RUN POINT 22 .96 132.57 161.32 162.31 156.31 .99 152.54 154.11 169.60<		PHASE JEGREES =	•00	259.56	129.77	110,25	376.39	4.06	320.01	154,59	123.90	244.45	
A YPL (10):: 5: (13):= 1:30 155: 64 147: 30 155: 01 150: 155: 71 162: 75 161. 61 173: 79 335: 73 PHASE, DISREES = .00 315: 78 2:56 154: 99 12:56 4:51 16.66 100: 35: 71 167: 92 167: 95 FREDUEYCY = 749.33 AZ RUN POINT 20 .00 29: 04 67: 07 223: 08 79: 25 4:74 84: 94 248: 62 242: 19 44: 45 FREDUEYCY = 756: 2: 4Z RUN POINT 21 .00 29: 04 67: 07 223: 08 79: 25 4: 74 84: 94 248: 62 242: 19 44: 45 FREDUEYCY = 756: 2: 4Z RUN POINT 21 .00 129: 41 152: 72 307: 72 168: 08 3: 91 171: 98 335: 57 326: 33 129: 67 FREDUEYCY = 764: 2: 4Z RUN POINT 22 .00 169: 46 160: 33 165: 15 .99 162: 54 154: 11 162: 94 160: 00 160: 00 160: 00 160: 00 160: 00 160: 00 160: 00 160: 00 160: 00 160: 00 160: 00 160: 00<		FREGUENCY = 740.6+ HZ	RUN POINT	19									
PHASE, DESREES = .00 315.78 2.55 154.99 12.56 4.51 16.66 10n.55 173.79 335.23 FREDUENCY = 749.3, 42 RUN POINT 20 AMPLITUDE, SPL(SJ) = 1.03 157.17 161.67 158.55 165.46 1.02 195.84 156.30 167.92 167.36 PHASE, DESREES = .00 29.04 67.07 223.08 79.25 4.74 84.94 248.62 242.19 44.45 FREDUENCY = 755.2. HZ RUN POINT 21 167.75 167.76 167.77 168.08 3.91 171.98 335.73 26.6.33 129.47 AMPCITUDE: SPL(SJ) = .94 144.67 160.34 163.24 158.96 .95 162.34 154.11 162.94 160.433 126.77 AMPCITUDE: SPL(SJ) = .94 132.57 161.32 162.31 156.31 .99 162.54 154.11 162.94 160.06 160.40 169.40 169.40 169.40 169.40 169.40 169.40 169.40 169.40 169.40 156.		AMPLITUDE: SPL(D3) =	1.00	155.64	147.30	163.01	159.50	1.00	155,71	162.75	161.81	162.91	
FREQUENCY = 749.3, 42 RUN POINT 20 AMPLITUDE: SPUCUT 1.03 157.17 161.67 158.55 165.46 1.02 165.30 167.92 167.55 PHASE; JESREES = .00 229.00 79.25 4.74 84.94 244.62 242.19 44.45 FREQUE:CY = 756.2.42 RUN POINT 21 .00 129.41 152.72 307.72 168.08 3.91 171.98 335.57 326.33 129.67 FREQUE:CY = 764.2.42 RUN POINT 22 .00 129.41 152.72 307.72 168.08 3.91 171.98 335.57 326.33 129.67 FREQUE:CY = 764.2.42 RUN POINT 22 .00 129.41 152.72 307.72 168.08 3.91 171.98 335.57 326.33 129.67 FREQUE:CY = 764.2.4 RUN POINT 22 .00 159.48 180.35 336.29 195.95 4.38 199.66 7.79 354.93 155.84 FREQUE:CY = 771.3.4 RUN POINT 23 .00 25.27 256.49 52.90 271.98 4.71 276.67		PHASE + DEGREES =	•00	315.78	2.55	154,99	12.56	4.51	16,86	189.35	173.79	335.23	·····
ANPLLITUJE, SPL(J2) = 1.03 157.17 161.67 159.55 165.46 1.02 165.84 165.30 167.92 167.56 PHA52, JEGREES = .00 29.04 67.07 223.08 79.25 4.74 84.94 248.62 242.19 44.45 FREDUE.CY = 756.2, HZ RUM POINT 21 .00 129.41 152.72 307.72 168.08 3.91 171.98 335.57 326.33 129.67 PHA52, JEGREES = .00 129.41 152.72 307.72 168.08 3.91 171.98 335.57 326.33 129.67 FREDUE.CY = 764.2, HZ RUN POINT 22 .00 152.71 161.32 162.31 156.31 .99 152.54 154.11 162.94 160.00 AMPLITUDE, SPL(J3) = .98 132.57 161.32 162.31 156.31 .99 152.54 154.11 162.94 160.00 FREDUE.CY = 771.3, HZ RUN POINT 23 .62 .62 .67 .79 354.93 155.78 PHASE, JEGREES = .00 155.17 168.59 157.37		FREQUENCY = 749.30 HZ	RUN POINT	20			•						
PHASE, JEGREES = .00 29.04 67.07 223.08 79.25 4.74 84.94 248.62 242.19 44.45 FREDUE:CY = 755.2. HZ RUN POINT 21 .94 144.67 160.34 153.24 158.96 .95 162.46 159.10 143.26 160.93 PHASE, JEGREES = .00 124.1 152.72 307.72 168.08 3.91 171.98 335.57 326.33 129.67 FREJUE:CY = 764.2. HZ RUN POINT 22 .00 153.84 180.35 336.29 195.95 4.38 199.66 7.79 354.93 155.64 PHASE, JEGREES = .00 155.84 180.35 336.29 195.95 4.38 199.66 7.79 354.93 155.64 FREJUE:CY = 771.3. HZ RUN POINT 23 .00 25.27 256.49 52.90 271.98 4.71 276.67 91.85 71.84 233.22 FREJUE:CY = 781.1. HZ RUN POINT 24 .00 155.73 156.48 100.00 158.35 139.75 160.83 156.22 FREJUE:CY = 781.1. HZ RUN POINT 24 .00		AMPLITUDE, SPL(DB) =	1.03	157.17	161.87	158,55	165.46	1.02	165.84	155.30	167.92	167.55	
FREDUELCY = 755.2. HZ RUN POINT 21 AMPLITUDE, SPL(D3) =		PHASE JEGREES =	•00	29.04	67.07	223.08	79.25	4.74	84,94	245.62	242.19	44.45	
LNP_ITUDE: SP(10) = .94 144.67 160.34 163.24 158.96 .95 162.46 158.10 143.26 160.93 PHASE: DEGREES = .00 129.41 152.72 307.72 168.08 3.91 171.98 335.57 326.33 129.67 FREIDENCY = 764.2: HZ RUN POINT 22		FREQUENCY = $756.2 \cdot HZ$	RUN POINT	21									
PHASE, DEGREES = .00 129.41 152.72 307.72 168.08 3.91 171.98 335.57 326.33 129.67 FRESUENCY = 764.2, HZ RUN POINT 22 .00 152.57 161.32 162.31 156.31 .99 162.54 154.11 162.94 160.00 PHASE, DEGREES = .00 153.88 180.35 336.29 195.95 4.38 199.66 7.79 354.93 155.84 FRESUE, CY = 771.3, HZ RUN POINT 23 .00 151.17 168.59 167.97 156.48 1.00 168.50 150.26 169.35 165.12 PHASE, DEGREES = .00 25.27 256.49 52.90 271.98 4.71 276.67 91.85 156.12 PHASE, DEGREES = .00 25.27 256.49 52.90 271.98 4.71 276.67 91.85 156.22 PHASE, DEGREES = .00 150.16 159.85 158.43 100.00 1.00 158.35 139.08 160.83 155.22 PHASE, DEGREES = .00 105.23 335.38 130.55 110.83 4.54 357.19 <td>•</td> <td>ANPLITUDE, SPL(D3) =</td> <td>. 94</td> <td>144.67</td> <td>160.34</td> <td>163.24</td> <td>158.96</td> <td>.95</td> <td>162.46</td> <td>155,10</td> <td>163.26</td> <td>167.93</td> <td></td>	•	ANPLITUDE, SPL(D3) =	. 94	144.67	160.34	163.24	158.96	.95	162.46	155,10	163.26	167.93	
FRELUE:CY = 764.2, HZ RUN POINT 22 ARPLITUDE, SPL(DB) =		PHASE DEGREES =	•00	129.41	152.72	307.72	168.08	3,91	171.98	335.57	326.33	129.67	
AMPLITUDE: SPL(JB) = .98 132.67 161.32 162.31 156.31 .99 162.54 154.11 162.94 160.00 PHASE: DEGREES = .00 169.AA 180.35 336.29 195.95 4.38 199.66 7.79 354.93 155.84 FREDUE: CY = 771.3, HZ RUN POINT 23 AMPLITUDE: SPL(DB) = 1.00 151.17 168.59 167.37 156.48 1.00 168.60 150.26 169.35 166.12 PHASE: DEGREES = .00 25.27 256.49 52.90 271.98 4.71 276.67 91.85 71.84 233.22 FREDUE: CY = 781.1, HZ RUN POINT 24 AMPLITUDE: SPL(DB) = 1.00 150.16 159.85 158.43 100.00 1.00 158.35 139.05 160.83 155.22 PHASE: DEGREES = .00 105.23 335.34 130.55 110.83 4.54 357.19 330.61 149.97 314.62 FREDUE: CY = 767.6, HZ RUN POINT 25 100 154.10 143.90 159.55 153.80 <td></td> <td>FREAUFILICY = 764-2+ H7</td> <td>RUN POINT</td> <td>22</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>•</td> <td></td> <td></td>		FREAUFILICY = 764-2+ H7	RUN POINT	22							•		
PHASE, DEGREES = .00 168.A8 180.35 336.29 195.95 4.38 199.66 7.79 354.93 155.84 FREDUE.CY = 771.3, HZ RUN POINT 23 AMPLITUDE: SPL(JE) = 1.00 151.17 168.59 167.37 156.48 1.00 158.60 150.26 169.35 165.12 PHASE, DEGREES = .00 25.27 256.49 52.90 271.98 4.71 276.67 91.85 71.84 233.22 FREDUE.CY = 781.1, HZ RUN POINT 24		AMPLITUJE, SPL(JB) =	•98	132.57	161.32	162.31	156.31	.99	162.54	154.11	162.94	160.00	
FRE:UE.CY = 771.3, HZ RUN POINT 23 AMPLITUDE, SPL(DB) = 1.00 151.17 168.59 167.37 156.48 1.00 151.26 169.35 165.12 PHASE, DEGREES = .00 25.27 256.49 52.90 271.98 4.71 276.67 91.85 71.84 233.22 FREDUE.CY = 781.1, HZ RUN POINT 24 .00 150.16 159.85 158.43 100.00 1.00 158.35 139.03 160.83 155.22 PHASE, DEGREES = .00 105.23 335.39 130.55 110.83 4.54 357.19 330.61 149.97 314.62 FREDUE.CY = 767.6, HZ RUN POINT 25 .00 152.09 157.64 155.85 147.96 1.00 154.10 149.97 314.62 FREDUE.CY = 767.6, HZ RUN POINT 25 .00 153.04 356.39 154.86 185.94 5.22 19.77 356.30 173.88 331.13 FREDUE.CY = 794.4, HZ RUN POINT 26 .00 160.40 162.23 158.91 159.99 1.00 154.90 154.85 161.12 164.29 167.13 PHASE, DEGREES = .0		PHASE , DEGREES =	•00	159.88	180.35	336.29	195.95	4.38	199.66	7.79	354.93	155.84	
AMPLITUDE: SPL(3) = 1.00 151.17 168.59 167.97 156.48 1.00 168.60 150.26 169.35 165.12 PHASE, DEGREES = .00 25.27 256.49 52.90 271.98 4.71 276.67 91.85 71.84 233.22 FREDUE: CY = 781.1, HZ RUN POINT 24		EREINE CY = 771 3+ 47	DIN DOINT	23									
PHASE, JESREES = .00 25.27 256.49 52.90 271.98 4.71 276.67 91.85 71.84 233.22 FREDUE: CY = 781.1: HZ RUN POINT 24 AMPLITUDE: SPL(D3) = 1.00 150.16 159.85 158.43 100.00 1.00 158.35 139.05 160.83 155.22 PHASE, DESREES = .00 105.23 335.38 130.55 110.83 4.54 357.19 330.61 149.97 314.62 FREDUE: CY = 767.6: HZ RUN POINT 25 .00 157.64 155.85 147.96 1.00 154.10 149.90 159.55 153.80 PHASE, DESREES = .00 133.04 358.39 154.86 185.94 5.22 19.77 356.30 173.88 331.13 FREDUE: CY = 794.4: HZ RUN POINT 26		AMPLITUST SPICAL	1.00	-151.17	168.59	167.97	156.48	1.00	168.60	150.26	159-35	165.12	
FREDUE: CY = 781.1: HZ RUN POINT 24 AMPLITUDE: SPL(DB) = 1.00 150.16 159.85 158.43 100.00 1.00 158.35 139.05 160.83 155.22 PHASE: DEGREES =		PHASE JEGREES =	.00	25.27	256.49	52.90	271.98	4.71	276.67	91.85	71.84	233.22	
PREJUE (CT = 781.1) HZ RUN POINT 24 AMPLITUDE, SPL(D3) = 1.00 150.16 159.85 158.43 100.00 1.00 158.35 139.05 160.83 155.22 PHASE, DEGREES = .00 105.23 335.38 130.55 110.83 4.54 357.19 330.61 149.97 314.62 FREDUE (CY = 767.6) HZ RUN POINT 25 .00 152.09 157.84 155.85 147.96 1.00 154.10 149.90 159.55 153.80 AMPLITUDE, SPL(D3) = 1.00 152.09 157.84 155.85 147.96 1.00 154.10 149.90 159.55 153.80 PHASE, DEGREES = .00 133.04 358.39 154.86 185.94 5.22 19.77 356.30 173.88 331.13 FREDUE (CY = 794.40 HZ RUN POINT 26 .00 160.40 162.23 158.91 159.99 1.00 154.05 161.12 164.29 167.13 PHASE, DEGREES = .00 160.40 162.23 158.91 159.99 1.00 154.05 161.12 164.29 167.13 PHASE, DEGREES = .00													
AMPLITUDE, SPLUDE, SPLUDE, I 100, 159, 100, 100, 100, 100, 100, 100, 100, 10		$\frac{PREJUENEY}{APBETER} = \frac{781.1}{APBETER}$	RUN POINT	24	160 00								
FRESE IOU IOU <thiou< th=""> IOU <thiou< th=""> IOU <thiou< th=""> <thio< td=""><td></td><td>NARELIUJEN SPELUSI -</td><td>1.00</td><td>105.93</td><td>107.00</td><td>130 55</td><td>110.81</td><td>1.54</td><td>357 10</td><td>330-61</td><td>149-97</td><td>314.60</td><td></td></thio<></thiou<></thiou<></thiou<>		NARELIUJEN SPELUSI -	1.00	105.93	107.00	130 55	110.81	1.54	357 10	330-61	149-97	314.60	
FREQUE CY = 767.6, HZ RUN POINT 25 AMPLITUDE, SPL(D3) = 1.00 152.09 157.84 155.85 147.96 1.00 149.90 159.55 153.80 PHASE, DEGREES = .00 133.04 358.39 154.86 185.94 5.22 19.77 356.30 173.88 331.13 FREQUE CY = 794.4, HZ RUN POINT 26 AMPLITUDE, SPL(D3) = 1.00 160.40 162.23 158.91 159.99 1.00 154.05 161.12 164.29 167.13 PHASE, DEGREES = .00 168.49 42.55 201.07 237.97 5.21 67.06 44.59 219.78 21.42 Reproduced from		FRADIT JISKIIS -	•00	103+23	333437	200,00	TIANO	7604	001419	000+01	A4 / 4 / 1		
AMPLITUDE, $SPL(D3) =$ 1.00 152.09 157.84 155.85 147.96 1.00 154.10 148.90 159.55 158.80 PHASE, DEGREES = .00 133.04 358.39 154.86 185.94 5.22 19.77 356.30 173.88 331.13 FREDUE, CY = 794.4, HZ RUN POINT 26 AMPLITUDE, SPL(D3) = 1.00 160.40 162.23 158.91 159.99 1.00 154.05 161.12 164.29 167.13 PHASE, DEGREES = .00 168.49 42.55 201.07 237.97 5.21 67.06 44.59 21.42		FREQUE CY = 767.6. HZ	RUN POINT	2.5					·····				<u></u>
PHASE, DEGREES = .00 133.04 358.39 154.86 185.94 5.22 19.77 356.30 173.88 331.13 FREDUE, CY = 794.44 HZ RUN POINT 26 AMPLITUDE, SPL(D3) = 1.00 160.40 162.23 158.91 159.99 1.00 154.05 161.12 164.29 167.13 PHASE, DEGREES = .00 168.49 42.55 201.07 237.97 5.21 67.06 44.59 21.42 Reproduced from		AMPLITUDE, SPL(D3) =	1.00	152.09	157.84	155,85	147.96	1.00	154-10	145 90	159.55	153.80	
FREDUE CY = 794.4, HZ RUN POINT 26 AMPLITUDE, SPL(JJ) = 1.00 160.40 162.23 159.99 1.00 154.05 161.12 164.29 167.13 PHASE, DEGREES = .00 168.49 42.55 201.07 237.97 5.21 67.06 44.59 219.78 21.42		PHASE DEGREES =	•00	133.04	358.39	154,86	185.94	5,22	19,77	556.30	173.88	331.13	
AMPLITUDE, SPL(J3) = 1.00 160.40 162.23 158.91 159.99 1.00 154.95 161.12 164.29 16^1.13 PHASE, DESREES = .00 168.49 42.55 201.07 237.97 5.21 67.06 44.59 219.78 21.42 Reproduced from		FREDUE CY = 794.4+ HZ	RUN POINT	2 5									
PHASE, DEGREES = .00 168.49 42.55 201.07 237.97 5.21 67.06 44.59 219.78 21.42		AMPLITUDE, SPL(Da) =	1.00	160.40	162.23	158,91	159.99	1.00	154.05	161.12	144.53	157.13	
Reproduced from		PHASE, DEGREES =	.00	168.49	42.55	201.07	237.97	5.21	67.06	44.59	219.78	21.42	
		Reprodu	ced from			•		÷.					
best available copy.		best ava	ilable copy.						•	•		•	

ANPLE CASEN A-IU-J PRUG	AAA AEDIFI	1231 324	4-01						12 120011		
FOURIER ANALYSIS RES	ULTS OF A-	TO-D DATA	EXAMPLE	CASE, A-	TO-D PROG	RAN AEDPP	• TEST 82	14-61		·	
	HF-FREO	HF- 8/9	HF-33/9	HF-19/9	HF-40/9	HF_FRED	HF-35/9	HF-24/9	HF-17/9	HF- 3/9	······································
FREDUENCY = 802.3+ HZ	RUN POINT	27							_		
AMPLITUJE, SPL(D3) =	1.00	155.91	153.10	143.02	157.03	1.00	132.48	153.35	157.58	153.65	
PHASE JEGREES =	•00	280.97	158.65	322.62	349.04	5,00	211.32	153.33	333.14	130.55	unge alland (AT. Aufle
FREDUENCY = 810.3. 42	RUN POINT	28	•			•					
MPLITUJE, SPL(D3) =	1.00	153.96	139.97	135.82	153.91	1.00	145.66	155.71	150.97	147.39	an a
PHASE DEGREES =	•00	305+79	185.16	53,53	9.97	5,18	9.24	172.78	358.81	120.44	
FREDUENCY = 617.0+ HZ	RUN POINT	29									
AMPLITUDE, SPL(DJ) =	•96	156.23	142.27	142.73	156.50	•95	154,31	158.95	150.61	150.01	Allow the balances with a program.
PHASE DEGREES =	•00	316.90	12.08	132,90	28.98	4.72	32.39	191.58	16.84	173.99	
FREDUENCY = 825.9+ HZ	RUN POINT	30 .									
AMPLITUDE, SPL(DB) =	1.00	165.46	158.44	156.94	162.79	1.00	154.80	166.61	150.47	122.22	
PHASE)EGREES =	•00	68.84	114.93	266.91	136.93	4.72	138,08	304.65	137.53	289.89	
FREQUENCY = 834.57 HZ	RUN POINT	31	1								
AMPLITUDE, SPL(DB) =	1.00	155.78	152.29	149,50	150.45	1.00	155.85	155.79	121.20	142.20	
PHASE = DEGREES =	•00	113-12	167.51	320.02	191.14	5.01	189.75	350.73	101.82	324.55	··
FREDUENCY = 840.5+ HZ	RUN POINT	32									
WPLITUDE, SPL(Da) =	1.00	154.42	152.61	152.54	143.94	1.00	155.09	153.51	141.04	135.43	
PHASE > DEGREES =	• 00	125.33	178,52	\$25,50	205.05	5.01	200.89	3.10	330.09	29.17	
FREQUENCY = 849.5+ HZ	RUN POINT	33									
AMPLITUDE, SPL(D3) =	1.02	159-43	158.88	157.57	139.39	1.01	159.79	158.29	152.02	131.95	
2HAS11 JIGREIS =	•00	145.37	195.77	352.17	509.01	4.75	210.00	24.52	14.52	(7, 4)	
FREQUENCY = 555.9+ HZ	RUN POINT	34			,	•					
AMPLITUSE, SPL(DB) =	• 97	163.06	162.25	161.33	140.38	.98	152.00	160.40	156.86	142.65	
HASE JESKELS =	•00	275+48	328.64	120.04	139.08	5.33	320.85	105.00	130.01	2/3+1/	
FREQUENCY = 663.3. HZ	RUN POINT	35									
MPLITUDE, SPL(D3) =	•99	153.45	152,54	153,13	143.47	1.00	150,04	148.54	150.62	134.13	
PHASE JESREES =	•00	\$95+35	351.60	143,43	186.54	5.05	15,55	102+11	104033	31.1.4.5	
FREQUE :: CY = 872.6+ HZ	RUN POINT	36									
MPLITUDE, SPL(DB) =	1.00	152.16	151.35	152.32	143.86	1.00	147.97	145.3/	150.45	139.02	
HASE JESREES =	•00	511+94	1.55	147,51	199.51	4 ,/4	£0,45	1/8+9/	190.00	323.13	
FREQUENCY = 880.6+ HZ	RUN POINT	37									
AMPLITUDE: SPL(DB) =	1.00	157.07	154.24	157,24	152.34	1.00	146.73	143.10	150.22	140.94	
HASE JESREES =	•00	527+110	22.05	170.15	209.98	5.17	54,12	207.90	191.05	201013	
FREDUENCY = 888.0+ HZ	RUN POINT	38									
MPLITUDE, SPL(D3) =	1.00	162.20	157.24	161,48	158.03	1.00	144.51	139.15	160.81	151.65	
PHASE DEGREES =	• 00	100+64	152,75	302.68	343.25	2.05	200.11	34.44	372.09	123+00	
FREQUENCY = 894.9+ HZ	RUN POINT	39									
$MPL(TU)=, SPL(D_3) =$	1.01	147-54	143.34	151,72	146.86	1.00	131,33	100.00	151.75	140.72	
HASE JESKEES =	•00	112+01	104.32	521,50	0.02	5+34	362.14	TAR*23	371012	194463	

AMPLE CASE: A-TO-D PROG	RAM NEOPPI	TEST B21	4-61					AC	TE 120371	PAGE	4
FOURIER ANALYSIS RES	ULTS OF A-	TO-D DATA	. EXAMPLE	CASE, A-	TO-D PROG	RAY AEDPP	• TEST B2	14-51			<u> </u>
•	HF-FREQ	HF- 8/9	HE-33/9	HF-19/9	4F-40/9	HF_FRED	HF-35/9	HF-24/9	HF-17/9	HE- 3/9	
FREQUENCY = 902.5+ HZ	RUN POINT	40									
WARTIANS - 25F(DB) =	1.00	149.12	135.34	148,52	145.45	1.01	139.34	133.70	149.94	143.00	
PHASE, DEGREES =	•00	126.25	182,56	331.29	24.99	5.42	31.89	191.61	356.18	146.66	
FREDUENCY = 910.6+ HZ	RUN POINT	41									
MPLITUDE, SPL(D) =	1.00	150.30	124.97	149.20	147.11	1.00	146.48	145.45	151.85	146,53	and the second secon
PHASE + DEGREES =	•00	139.34	322.86	340.02	30.15	5.44	32,56	197,59	1.24	144.91	
FREQUENCY = 918.4+ HZ	RUN POINT	42									
WPLITUDE, SPL(Dy) =	1.00	161.79	150.82	160.21	155.73	1.00	160.11	158.66	163.22	157.15	
PHASE DEGREES =	•00	219.19	78.83	63.84	110.87	5.32	110,54	271.72	84.67	236.62	
FREQUENCY = 925.3+ HZ	RUN POINT	43 .								•	
MPLITUJE: SPL(JS) =	1.01	149.57	144.79	145.42	139.42	1.02	149.72	147.37	150.57	145.17	
PHASE JEGREES = .	.00	293.80	155.11	148.26	205.18	5.10	186,15	349.19	171.93	322.5R	
FREDUENCY = 933.5+ HZ	RUN POINT	44									
MPLITUDE, SPL(D3) =	•99	141.86	141.08	138.57	128.39	.97	144.47	140.37	104.43	140.74	
PHASE JEGREES =	.00	319.28	176.93	148.64	202.15	5,95	198.99	353.4A	169.60	339.43	
FREDUENCY = 940.5+ HZ	RUN POINT	45									
MPLITUJE, SPL(24) =		142.10	145.35	136.85	100.00	.98	147.26	145.25		192.51	
HASE DEGREES =	.00	307.39	172.58	189,55	218.52	5,81	199,69	2.97	190.17	330.74	
FREQUENCY = 948.1+ HZ	RUN POINT	46		,				·			
NPLITUE SPL (JA) =	. 99	147.96	151.80	137.21	140.47		152.58	152.61	151725	150.35	
HASE + DEGREES =	• 00	329.72	198.08	172.20	31.40	5,84	224.96	34.39	203.70	349.27	
ERECUENCY = 955.0+ HZ	PHN POINT	47									
MPLITUDE, SPL(Da) =	1.00	143.95	148.37	100.00	142.74		146.44				
HASE DEGREES =	.00	111.24	344.70	289.09	173.55	5.31	13.60	161.93	327.65	132.33	
FREQUENCY = 964.0, 47	RUN POINT	48									,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
MPLITUS, SPL(D3) =	1.00	137.40	138.17	100.00	135.78	1.00	133.10		-137.65	143.17	
HASE DEGREES =	.00	112.95	343.26	99.66	160.56	6.17	35,63	174.29	345.97	136.05	
FREDUENCY = 970.3+ 47	RUN POINT	49									
MPL(IJZ) = SPL(JA) =	1.01	135.51	133.49	100.00	137.13	1.01	128.61	138-43	139.50	141.13	
HASE DEGREES =	.00	138.95	350.04	222.83	176.14	6.01	56,50	195.25	332.44	129.97	
ERFOUENCY = 977.7. 47	RUN POINT	50									
MPLITUS, SPL(D3) =	1.00	122.87	143.37	135.27	138-81	1.01	136.35	135-67	130.34	142.91	
HASE, DEGREES =	•00	197.21	20.54	141.02	200.57	6.15	62.90	171.73	345.67	140.55	
FREDUENCY = 986.1+ 47	RUN POINT	51									
WPL1105: SPL(23) =		140.59	149.42	149.10	149.77	.97	133.92	150.46	135.54	153.27	
HASE JESREES =	.00	175.03	71.94	209.03	266.90	6.00	136.78	249.51	80.87	208.49	

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EXAMPLE CASE, A-TO-D PROGRAM AEDPP, TEST 8214-61

DATE 120371

PARE

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EXAMPLE CASE, A-TO-D PROGRAM AEDPP, TEST B214-61

RU1 FRED S PRHS 2 3 4 5 - 6 8-ATTONS JETA RE(Y/YS) IM(Y/YS) Y5 1 ZH TI'ICA ALPHA .3392 -.1 15 .0948 •1555 .241 • 3 •1 673.9 1.8485 •1133 .0396 -.2 -•2 • 0 •4 -.3 11 -.2 -.2 .2 -.3 .3050 +1556 .0 .0 .2 637.1 1.8715 +1285 .1515 .2071 .210 •5 12 -,7 75 .3037 1465 -,3 .0 -.2 - 3 . 4 .0755 .5 .0 693.7 1.3902 .0000 .2113 .410 13 .0 • 4 35 • 1 .2473 .0953 .2864 +1565 .265 -.4 -.3 • 0 • 1 7,2.2 1.9142 •(121 •1 14 20 .2458 -1564 -,1 .0 .4 -.1 -11 -.1 .2:99 .0719 •193 •0 15 710.0 1.9352 • 0')00 -.1 35 .2 .0 .0 .0 .2 717.1 1.9561 · n274 .3185 .1121 .2100 .1564 +134 -.2 -.1 --1 16 75 .259 •2 .3 -.2 -.3 .1526 .1713 -1563 -.3 •I •2 +11594 .3571 725.0 1.9782 17 -.0 20 • 1 -.0 . 0 -. 0 732.3 1.9999 ·C246 .3964 .1014 .1325 .1563 .035 • 1 • 0 • 1 18 -6 35 -,1 -.6 **"**n - 2 -.5 • 3 .0 .4149 .065n .1143 .1552 .390 740.6 2.0213 •0000 19 .5 15 -.9 . 1939 .479 .0 .3 • 3 .0000 .4330 .0544 .1562 -.5 .4 -.1 749.3 2.0461 2) •3 35 -.1 -.7 .4 .0 -.1 -5 -.3 .4671 • 383 21 756.2 2.0055 •0000 .0633 .0474 •1562 -.7 25 .7 .4 -.5 .0427 .459 •2 • 1 -.0 764.2 2.0875 +0000 .4714 .0619 .1561 -.1 22 35 .0944 .273 • 0 • 1 -.0 .4 -.2 .4927 .0112 .1561 .0 -.5 •2 7/1.3 2.1092 +1519 25 .7 -1.5 35 -.5 -3.4 .4A72 .0592 .n2n5 2.274 4.6 • 3 • 11 -.2 751.1 2.1353 +0000 .1560 2+ 35 -2.3 1.4 -1.7 -. 0259 .1560 1.439 1.9 -.0 .9 • 0 -.3 • (453 -. 4839 .1319 757.6 2.1535 25 35 -.7 .6 -.7 -.0 .4 • 9 -.1 -.0782 +1560 +537 •5 25 794.4 2.1724 +0359 -.4530 .1183 35 -.3 - 6 -1.1 -. 41:45 .0551 -. 0962 -1559 632 1.0 - 3 -.3 •0 -.1 27 802.3 2.1945 •0000 •4 35 .6 -1.9 .4 -1.0 -.4384 . 1944 -.1090 .1559 1.072 1.6 -.1 .0 23 314.3 2.2171 • 1217 15 •5 .5 .1072 -.1310 .1559 •639 • 3 -1.1 • 5 • 0 • 1 -. 8 -.4275 27 817.5 2.233. •0283 35 .3 .5 -1.1 -.2059 .1558 .753 1.1 -1.0 -.2 .0 .4 825.0 2.259 •0303 -,3004 .115n 3.1 15 **=**,u =:) -.3 -.3921 .1558 .489 1.1 - 4 -.3 .0 • 2 .051A -.2000 834.3 2.2:142 •0000 31 35 -.6 -.0 -.4 • 5 • 0 +1558 -.2 .0 .1037 -.27:5 .426 .7 32 840.5 2.3014 •(232) -.3541 35 . S .2 -- 7 .0818 -.3354 .1557 •291 -.5 -.2 .0 • 3 -.3402 •0 549.5 2.3263 .6123 35 -. 9 35 .2 .1 -.6 .0 • 0 .1229 -.3423 +1557 .303 • 5 -.2 855.9 2.3447 •6290 -.3379 34 15 -.5 .6 .6 -.1 .1092 -.4513 •1557 •439 -.0 -.7 •1 .0 ·2198 -.2935 35 863.3 2.3554 35 - 4 .0 .6 -+1 +3 .1756 -- 4028 .1555 .333 -.4 -.1 • 0 872.6 2.3914 • : ÷ 57 -.3167 35 35 .3 -.3 •5 -.3 •n -.2833 .164n -.5118 1556 -285 -.2 -.0 .0 586.5 2.4130 •0355 37 35 -1.3 -.4 1.0 -.8 .0 2.2 -.7 -.2981 .0456 -.4815 +1556 1.140 .0 33 838.0 2.4345 •0000 ---70 --8 .9 .0 -. 2 **.** (r 1.4 .0449 -.5109 1555 -915 -1.3 •0000 -.2906 39 894.3 2.4535 35 -.1 .5 1.5 -1.7 -.2679 -.5972 .1555 .905 -.1 -.3 .0 .0441 .0 4) 912.5 2.4753 ·0000 35 -.4 .3 •? 1.5 .6433 -.6599 •1555 . 500 -.1 -.2 -1.0 .0 914.6 2.4973 •0000 -.2538 41 .? .4 .4 35 -.2 -.3 - . 4 .0 .0426 -.6912 .1554 •314 -.0 42 918.4 2.5199 •0000 -.2481 35 -.9 •5 .2 -1 -.2139 .0419 -.8658 •1554 +617 1.0 -.9 .0 • 0 925.3 2.5391 •0000 43 • 0 -2.3 1.1 .7 35 .3 .6 -.7742 .1554 -.3 -.2160 .3845 1.051 -.1 44 933.6 2.5624 •0570 35 -.5 -.3 -.6 .6 .0 1.2 .0406 -1.0964 •1554 •634 -.5 • 1 -.1511 940.5 2.5820 •0000 45 - , 5 -•5 1.1 -.2 35 -.2 .0 • 3 •0000 -.1603 .0390 -1.2834 1553 •520 -.3 45 948.1 2.6033 2.0 • 4 הכ -.5 .1 -.2596 -.5 .0 -.0779 1.1035 •1553 1.059 -1.3 • 0 955.0 2.6254 •2251 47 1.7 1.2 -.5 20 -1.3 .0 -.7 +1553 1.067 - 4 .0 .0960 +1392 .8983 1.0130 4:5 954.0 2.6480 -2.2 20 3.1 '4 ° n' -.3 -2.7 .0 .0 -2.2 1.7295 .1553 2.657 970.3 2.6655 .0005 ·1260 .0404 49 5.9 -4.9 1.2 1.0 35 3.775 -5.5 2.7 -.5 .0 .0375 -2.6523 1552 -.0853 5÷ 977.7 2.6363 •0000 -.2 -1.5 -1 35 -1.0 1.056 2.1 -5 .0 • ∩ .8531 -2.3480 .1552 936.1 2.710) •0267 -.0973 51 • 0 -.2 •5 -.1 -.3 -.0 •1 •1 Reproduced from best available copy.

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EXAMPLE CASE, A-TO-D PROGRAM AEDPP, TEST B214-61	D4TE 120371	PAGE 6
NORMAL EXIT. EXECUTION TIME: 28933 MILLISECONDS.		1
<u>PFIN</u>	·····	
RUNID: 0158 R_F. ND: 51216617 NAME: SMILH-A-J		
1-0188*NS3: PLEASE ANSWER 3 TO ALL TAPE ERRORS	•	
1		
11M2: 00:00:28.9+6 IN: 27 OUT: 0 PAGES: 8		
INITIATION TIME: 10:08:46-DEC 3,1971		** <u>}</u>
TERMINATION TIME: 10:13:15-DEC 3,1971		an a
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