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REMOTE EQUIPMENT TECHNOLOGY

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1.0 ABSTRACT

An interactive graphics terminal and a desk-top computer were utilized to perform a Computer Aided Remote Maintenance simulation of a hypothetical equipment item. The equipment item included an electrical connection, hydraulic fitting, and a simple bolt pattern which were maintained by remote manipulators during the simulation. These remote maintenance operations demonstrated that the Computer Aided Remote Maintenance simulation technology could be extended to complex equipment items. As a result, these equipment items can be evaluated from the standpoint of remote operation and maintenance prior to purchase or installation in a remote processing or cell arrangement.

2.0 INTRODUCTION

Mixed oxide fuel fabrication operations are being developed and demonstrated at the laboratory and pilot scale level. The fabrication operations involved have been mechanized in some cases, but repair and maintenance operations are normally performed using contact (hands-on) techniques. Since the mixed oxide facilities anticipated for the future will be constructed in a remotely operated and maintained configuration, contact maintenance concepts will not be applicable.

The maintenance concepts proposed for remotely operated equipment involve preliminary repairs or equipment replacements inside the remote process area with manipulators or robots. All major repairs will be completed in a special glove box facility after decontamination and removal of the failed equipment item from the cell area. Since a limited experience base for these repair and maintenance operations exists, the equipment items required for fuel fabrication must be evaluated from the remote operating standpoint. Computer Aided Remote Maintenance (CARM) simulation technology will be used to demonstrate and evaluate various remote maintenance operations on an interactive graphics system. This simulation technology will be developed for use as a tool to select the most promising equipment items in each processing area for developmental evaluation and mockup testing.

3.0 SUMMARY AND CONCLUSIONS

CARM simulation technology was developed and demonstrated for a hypothetical test case which included an electrical connection, hydraulic fitting and a simple bolt pattern.

Simulation of the three maintenance operations in the hypothetical test case indicated that CARM simulation technology can be used for evaluation of equipment items prior to purchase and/or mockup testing.

Evaluation of the technology available in the interactive graphics area indicated that the requirements of CARM simulation for other than very simple equipment items exceeds the ability of current equipment as well as funding planned for this program.

4.0 DATA AND RESULTS

4.1 Program Requirements

Prior to the initiation of work effort on this program, the basic CARM simulation requirements were established through discussions with HEDL personnel. These requirements which are consistent with the Remote Materials Evaluation Facility currently under construction at Richland, Washington include:

- Initial demonstration of CARM simulation will involve a hypothetical operation which includes a simple bolt pattern, electrical connection and a hydraulic fitting.
- The simulation will be accomplished in a unit operation arrangement with visual and remote manipulator (Control Research Model 50) access from two sides. In addition, a manipulator (PAR System Corporation Model 3000) will be installed on the center line of the remote process area to provide access to the top of the equipment.

4.1 - Cont'd

- The maintenance operations for individual equipment items will be demonstrated for fully remote conditions. These operations are consistent with the suggested Secure Automated Facility (SAF) program Level III Criteria.

These requirements were integrated into the overall program plan.

4.2 Program Planning

Based on information and technical guidance received from government laboratories, General Electric research facilities and equipment vendors a five-year plan and estimated cost summary was prepared for the development of CARM simulation technology, see Appendix A. This plan involves the initial demonstration of CARM simulation for a simplified hypothetical test case followed by maintenance demonstration of equipment items in the ceramic, chemical, and rod assembly areas. The final CARM simulation will involve a basic processing unit operation including the associated material handling and measurement systems.

4.3 Technological Demonstration

The hypothetical test case which includes a simple bolt pattern, hydraulic fitting, and an electrical connection (see Figure 1) was used to demonstrate the basic concepts of CARM simulation. A dual approach was utilized to develop the necessary simulation technology. The first method involves the use of a computer code developed for time share which displays multi-polygon representations on a Ramtek 6000 color graphics terminal. These polygons were used to construct the hypothetical test case and associated equipment required to perform a CARM simulation demonstration. The second method involved the development of a special computer code for a Hewlett-Packard System 45 desk-top computer with graphics capabilities (HP 9845). This program allowed CARM simulation of the operations in the hypothetical test case with a wire frame representation. The individual frames of sequential action generated by both the Hewlett-Packard and Ramtek Systems were video taped for a short increment of time (~1 second). Replay of a video tape generated in this fashion resulted in an animated motion of the CARM simulation.

4.3.1 Multi-Polygon Simulation

A computer code, GRAPES, utilized at Lawrence Livermore Laboratory for multi-polygon graphics modeling was adapted for use on the General Electric Time Share System. The adapted GRAPES code was utilized to construct the hypothetical test case from different shaped polygons. The complexity of the color identity statements required by the Ramtek 6000 graphics terminal prevented the use of color surfaces for this modeling. As a result, the CARM simulation of the hypothetical test case was demonstrated in a black and white, wire frame model which utilized only the "finger" portions of the remote manipulators. Since this simulation was not as detailed as that being performed on the HP 9845 system, the basic CARM simulation work with the adapted GRAPES code was terminated. Definition of the basic software modifications necessary to perform solid modeling in color with the adapted GRAPES code was finalized.

4.3.2 HP 9845 Simulation

A special program was written for the HP 9845 system which performs the CARM simulation operations for the hypothetical test case. The main program as well as the driver programs for each CARM simulation are listed in Appendix B.

The remotely operated processing cell utilized during the CARM simulation of the hypothetical test case is shown in Figure 2. Enlarged views of the manipulators, impact wrench, and the equipment item are shown in Figures 3-5, respectively. Detailed representations of the hydraulic fitting, electrical connection, and a bolt are illustrated in Figures 6-8.

During the CARM simulation of the hypothetical test case selected frames from the animated video tape maintenance operations were reproduced to illustrate portions of each simulation sequence. The first reproduced frame shows the entire process cell and equipment item, see Figure 9. Early in the simulation sequence the shielding wall and window are removed and the process equipment

enlarged, see Figures 10-11, to provide a better view of the simulation sequence. Figure 12 shows the two manipulators engaging the hydraulic fitting while an enlarged view of the manipulator arms engaged with the hydraulic fitting is shown in Figure 13. The depression of the ring or collar which holds the hydraulic fitting together is shown in Figure 14 and the separated fitting is shown in Figure 15. Similar frames from the video tapes of the simulations are shown for the electrical connection, Figures 16-18, and the attachment bolt, Figures 19-21.

4.4 Program Evaluation

The demonstration of CARM simulation techniques for the hypothetical test case indicated that relatively simple maintenance operations required a complex computer code and a high technology graphics terminal. Computer codes which would allow one to simulate the hundreds of individual parts in a piece of processing equipment are not currently available. Estimates indicated that two to four manyears of development would be required to write and debug the necessary computer codes for this type of simulation. The development of these computer codes would require a dedicated main frame computer to perform all of the mathematical computations necessary to simulate a complex piece of equipment as well as provide for the movement of various parts, tools, and manipulators. A graphics terminal which could accept the complex simulation data for a piece of process equipment and display any changes in real time would also be required. Based on these requirements, the work effort proposed in the CARM simulation test plan exceeds both the current state-of-the-art and the funding level provided for this program.

5.0 Future Work

The CARM simulation technology developed during the program can be extended to complex process equipment items if an adequate graphics terminal and computer system are available. These simulations would allow one to screen various equipment items from the standpoint of operation and

5.0 - Cont'd

maintenance in a remote processing cell prior to purchase. In addition to the CARM simulation evaluation, the same data base can be used for optimum layout of entire equipment systems with respect to operation, maintenance, material handling, accountability, safety, and interfaces with other equipment items.

Figure 1. Hypothetical Test Case

Figure 2. CARM Simulation Process Cell

Figure 3. Manipulator Arms

Figure 4. Impact Wrench

Electrical Connection

Bolt

Hydraulic Fitting

Figure 5. Equipment Item

Figure 6. Electrical Connection

Figure 7. Hydraulic Fitting

Figure 8. Bolt

Figure 9. Process Cell For CARM Simulation
Of Hydraulic Fitting

Figure 10. Manipulator Arms and Equipment Item

Figure 11. Enlarged Manipulator Arms and Equipment Item

Figure 12. Manipulator Arms Engaging Hydraulic Fitting

Figure 14. Collar Of Hydraulic Fitting Depressed

Figure 15. Hydraulic Fitting Separated

Figure 16. Electrical Connection Engaged

Figure 17. Electrical Connection Under Rotation

Figure 18. Electrical Connection Separated

Figure 19. Bolt Engaged by Impact Wrench

Figure 20. Bolt Under Rotation

Figure 21. Bolt Separated

APPENDIX A

Test Plan for Computer Aided Remote Maintenance (CARM) Simulation

REVISED MARCH 1980

TEST PLAN FOR COMPUTER AIDED REMOTE MAINTENANCE (CARM) SIMULATION

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PREPARED UNDER DOE CONTRACT DE-AT03-76SF71031

WORK PACKAGE TASK SG016

ADVANCED REACTOR SYSTEMS DEPARTMENT
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OBJECTIVE

The objective of this test plan is to develop, test and demonstrate the technology for Computer Aided Remote Maintenance (CARM) simulation. The maintenance operations for selected fuel fabrication equipment items will be simulated on an interactive graphics system. This technology is to be used for demonstration of remote maintenance operations for process equipment items and unit operations.

DISCUSSION

Mixed oxide fuel fabrication operations are being developed and demonstrated at the laboratory and pilot scale level. The fabrication operations involved have been mechanized in some cases, but repair and maintenance operations are normally performed using contact (hands-on) techniques. Since the mixed oxide facilities anticipated for the future will be constructed in a remotely operated and maintained configuration, contact maintenance concepts will not be applicable.

The maintenance concepts proposed for remotely operated equipment involve repairs inside the remote process area with manipulators or robots. Since a limited experience base for these repair and maintenance operations exists, the equipment items required for fuel fabrication must be evaluated from the remote operating standpoint. The CARM simulation technology will be developed for use as a tool to select the most promising equipment items in each processing area for developmental evaluation and mockup testing.

The work completed in the Remote Equipment Technology area during the first part of fiscal year 1980 has involved the development of the requirements and preparation of a test plan for CARM simulation of fuel fabrication equipment with interactive graphics. The following basic requirements for the CARM simulation were established through discussions with HEDL personnel:

- o Initial demonstration of CARM simulation will involve a hypothetical operation which includes a simple bolt pattern, electrical connection and a hydraulic fitting.
- o The simulation will be accomplished in a unit operation arrangement with visual and remote manipulator (Control Research Model 50) access from two sides. In addition, a manipulator (PAR System Corporation Model 3000) will be installed on the center line of the remote process area to provide access to the top of the equipment.
- o The maintenance operations for individual equipment items will be demonstrated for fully remote conditions. These operations are consistent with the suggested Secure Automated Facility (SAF) program Level III Criteria.

These requirements have been integrated into the program action plan.

ACTION PLAN

The test plan for CARM simulation with an interactive graphics system detailed in this document establishes the key milestones, schedules and estimated costs required to develop this technology. The maintenance operations for the hypothetical test case, individual equipment items and a unit process operation will be simulated. Mockup testing will be utilized to verify the simulation results for a selected equipment item.

Task 1 - Initial Demonstration of CARM Technology

Milestone 1A

Review availability of current equipment and technology to perform CARM simulation of a hypothetical operation. Based on this review the software necessary to provide the equipment and simplified manipulator motions for CARM simulation will be developed. These software packages will be used to demonstrate the CARM simulation of the hypothetical operation (simple bolt pattern, electrical connection and a hydraulic fitting). After documentation, the results of this simulation will be reviewed to determine the equipment and software needs for the next phases of the program.

Milestone 1B

Mockup testing of the hypothetical operation with a manipulator will be used to verify the viability of the maintenance operations simulated in Milestone 1A.

Milestone 1C

A list of rating criteria will be developed for evaluating remote maintainability of equipment operations during CARM simulation. These criteria will be uniformly applied to each simulation during evaluation of various equipment items from the remote maintenance standpoint.

Task 2 - Demonstrate CARM Operational Steps

Milestone 2A

The envelopes of motion for the manipulators in a typical remote processing arrangement will be defined and the necessary software developed to graphically simulate these motions. These motions will be demonstrated by CARM simulation for selected portions of a simplified processing operation.

Milestone 2B

Based on the results of the simplified simulation, the criteria for evaluating the remote maintainability of selected equipment items will be reviewed and updated.

Task 3 - Demonstrate CARM Simulation for Key Equipment Items

Milestone 3A

A key ceramic equipment item will be selected for CARM simulation to demonstrate maintenance concepts for powder processing equipment. After incorporation of the selected ceramic equipment information with the graphics package developed during Task 2, the remote maintenance operations for the selected equipment item will be demonstrated by simulation. The results of the CARM simulation will be verified by mockup testing to demonstrate the viability of the simulation.

Milestone 3B

A key chemical equipment item will be selected for CARM simulation to demonstrate maintenance concepts for equipment capable of handling liquids. The chemical processing equipment information will be incorporated with the graphics package utilized during demonstration of maintenance operations for the key ceramic equipment item. The combined graphics packages will be utilized to simulate remote maintenance operations for the selected chemical equipment item.

Milestone 3C

A key rod assembly equipment item will be selected for CARM simulation to demonstrate maintenance concepts for mechanical equipment items. The rod equipment item information will be combined with the graphics package utilized during the demonstration of maintenance operations in the ceramic and chemical equipment items. The combined graphics packages will be utilized to simulate remote maintenance operations in the selected rod assembly equipment item.

Milestone 3D

The remote maintenance operations of basic factory equipment items which are common to several processing areas will be simulated. The basic factory equipment items involved in the operations such as material transport, weighing, sampling, etc. will be identified by the functional analysis performed for the SAF Facility. The equipment items selected for CARM simulation will be incorporated into a graphics package and demonstration of the associated remote maintenance operations completed.

Task 4 - Demonstrate CARM Simulation for Unit Operations

Milestone 4

The graphics package utilized for individual equipment items will be modified to allow for CARM simulation of a complete unit operation. The equipment items for the selected unit operation will be incorporated into the graphics package and the remote maintenance operations of the equipment sequence will be demonstrated by graphics simulation.

The proposed program milestones, schedule, and estimated costs are shown in Attachments 1 and 2.

ATTACHMENT 1
PROPOSED CARM SIMULATION PROGRAM PLAN

TASK	MILESTONE	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985
Background	Prepare Test Plan	A ∇	B ∇				
	A. Establish Requirements (10/79 through 11/79)						
	B. Issue Plan (12/79 through 2/80)						
1	Demonstration CARM Technology		A ∇	B ∇	C ∇		
	A. Hypothetical Test Case (3/80 through 9/80)						
	B. Mockup Verification (10/80 through 2/81)						
	C. Rating Criteria (3/81 through 5/81)						
2	Demonstration CARM Operation			A ∇	B ∇		
	A. Operational Steps (12/80 through 10/81)						
	B. Review Rating Criteria (10/81 through 12/81)						
3	Demonstrate Key Equipment Item				A ∇	B ∇	C ∇
	A. Ceramic (7/81 through 10/82)						
	B. Chemical (6/82 through 6/83)						
	C. Rod (2/83 through 12/83)						
	D. Basic Factory (10/83 through 9/84)						
4	Demonstrate Unit Operation (4/83 through 9/85)						∇

ATTACHMENT 2
PROPOSED CARM SIMULATION COST SUMMARY

TASK	MILESTONE	FUNDING (K \$)						
		<u>FY 80</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>	<u>TOTAL</u>
Background	Prepare Test Plan							
	A. Establish Requirements	10						10
	B. Issue Plan	26						26
1	Demonstration CARM Technology							
	1A Hypothetical Test Case	64						64
	1B Mockup Verification		58					58
	1C Rating Criteria		20					20
2	Demonstration CARM Operation							
	2A Operational Steps		132	20				152
	2B Review Rating Criteria			10				10
3	Demonstrate Key Equipment Items							
	3A Ceramic		90	456				546
	3B Chemical			14	186			200
	3C Rod Assembly				75	96		171
	3D Basic Factory				39	254		293
4	Demonstrate Unit Operation					50	330	380
	TOTALS	100	300	500	300	400	330	1930

A6

APPENDIX B

CARM Simulation Programs for Hypothetical Test Case

B1

```

305 Start: 1
310 IF F=1 THEN GOSUB E
315 IF F=1 THEN 325
320 GOSUB G
325 FOR I=1 TO 4
330 FOR J=1 TO 4
335 Sm1(I,J)=0
340 Sm2(I,J)=0
345 Sm3(I,J)=0
350 Sm4(I,J)=0
355 Sm5(I,J)=0
360 IF I=J THEN Sm1(I,J)=1
365 IF I=J THEN Sm2(I,J)=1
370 IF I=J THEN Sm3(I,J)=1
375 IF I=J THEN Sm4(I,J)=1
380 IF I=J THEN Sm5(I,J)=1
385 NEXT J
390 NEXT I
395 FOR I=1 TO 5
400 FOR J=1 TO 3
405 Tc(J,I)=0
410 NEXT J
415 NEXT I
420 FOR U=1 TO 14
425 IF Ud(U)=U THEN 595
430 IF U=5 THEN 445
435 ASSIGN #1 TO F$(U):FS,1
440 READ #1,1;Nov,Noe,Nos
445 FOR I=1 TO Nov
450 IF F$(U)="T2" THEN 465
455 READ #1,I+1;V(1,I),V(2,I),V(3,I)
460 GOTO 470
465 V(1,I)=V(1,I)-.23
470 NEXT I
475 IF F$(U)="T2" THEN 585
480 IF (F$(U)="A1") AND (Sa1 > 0) THEN GOSUB A1
485 IF (F$(U)="A2") AND (Sa2 > 0) THEN GOSUB A1
490 IF (F$(U)="F1") AND (Sa1 > 0) THEN GOSUB A1
495 IF (F$(U)="F2") AND (Sa2 > 0) THEN GOSUB A1
500 IF (F$(U)="F1") AND (Sf1 > 0) THEN GOSUB Oc
505 IF (F$(U)="F2") AND (Sf2 > 0) THEN GOSUB Oc
510 FOR I=1 TO Noe
515 READ #1,I+Nov+1;Se(I),Ee(I)
520 NEXT I
525 IF Nos=0 THEN 585
530 Nts=0
535 FOR I=1 TO Nos
540 READ #1,I+Nov+Noe+1;S(I)
545 Nts=Nts+S(I)
550 NEXT I
555 FOR I=1 TO Nts
560 READ #1,I+Nov+Noe+Nos+1;Ts(I)
565 NEXT I
570 FOR I=1 TO Nos
575 READ #1,I+Nov+Noe+Nos+Nts+1;Ns(I)
580 NEXT I
585 Dp=0
590 GOSUB D
595 NEXT U
600 RETURN
605 G: 1
610 PLOTTER IS 13,"GRAPHICS"
615 GRAPHICS
620 SHOW -1,1,-1,1
625 LDIR 0
630 LONG 5

```

```

635 CSIZE 2.5
640 F=1
645 RETURN
650 E: 1
655 GCLEAR
660 RETURN
665 A1: 1
670 A1=Sa1
675 Wm=1
680 IF (F$(U)="A2") OR (F$(U)="F2") THEN A1=Sa2
685 IF (F$(U)="A1") OR (F$(U)="A2") THEN 695
690 IF (F$(U)="F1") OR (F$(U)="F2") THEN 715
695 FOR I=8 TO 14
700 V(2,I)=V(2,I)+A1
705 NEXT I
710 GOTO 780
715 FOR I=1 TO NoU
720 V(2,I)=V(2,I)+A1
725 NEXT I
730 IF F$(U)="F2" THEN Wm=2
735 Tc(1,Wm)=Sc(1,Wm)
740 Tc(1,Wm+3)=Sc(1,Wm+3)
745 Tc(2,Wm)=Sc(2,Wm)+A1
750 Tc(2,Wm+3)=Sc(2,Wm+3)+A1
755 Tc(3,Wm)=Sc(3,Wm)
760 Tc(3,Wm+3)=Sc(3,Wm+3)
765 Tc(1,3)=Sc(1,3)
770 Tc(2,3)=Sc(2,3)
775 Tc(3,3)=Sc(3,3)
780 RETURN
785 Oc: 1
790 F1=Sf1
795 IF F$(U)="F2" THEN F1=Sf2
800 V(1,1)=V(1,1)+F1
805 V(1,2)=V(1,2)+F1
810 V(1,5)=V(1,5)+F1
815 V(1,6)=V(1,6)+F1
820 FOR I=9 TO 14
825 V(1,I)=V(1,I)+F1
830 NEXT I
835 V(1,3)=V(1,3)-F1
840 V(1,4)=V(1,4)-F1
845 V(1,7)=V(1,7)-F1
850 V(1,8)=V(1,8)-F1
855 FOR I=15 TO 20
860 V(1,I)=V(1,I)-F1
865 NEXT I
870 IF (F1<Ssf) AND (Lk2'>0) THEN B11=1
875 ON Ck+1 GOTO 900,880,890
880 IF F1>Ssf THEN Lk=1
885 GOTO 895
890 IF F1>Ssf THEN Lk=2
895 IF F1<Ssf THEN Lk=0
900 Ssf=F1
905 RETURN
910 D: 1
915 FOR I=1 TO 4
920 FOR J=1 TO 4
925 M(I,J)=0
930 IF I=J THEN M(I,J)=1
935 NEXT J
940 NEXT I
945 IF (F$(U)="F1") OR (F$(U)="F2") THEN 955
950 GOTO 980
955 I=1
960 IF F$(U)="F2" THEN I=2

```

```

965 FOR J=1 TO 3
970 IF Ma(2,J,I)<>0 THEN GOSUB T
975 NEXT J
980 IF (F$(U)="A1") OR (F$(U)="A2") THEN 990
985 GOTO 1015
990 I=1
995 IF F$(U)="A2" THEN I=2
1000 FOR J=1 TO 3
1005 IF Ma(1,J,I)<>0 THEN GOSUB A
1010 NEXT J
1015 IF (F$(U)="F1") OR (F$(U)="F2") THEN 1025
1020 GOTO 1075
1025 IF F$(U)="F1" THEN 1035
1030 GOTO 1055
1035 MAT Dm=Sm1*M
1040 MAT M=Dm
1045 MAT Sm1=Dm
1050 GOTO 2180
1055 MAT Dm=Sm2*M
1060 MAT M=Dm
1065 MAT Sm2=Dm
1070 GOTO 2180
1075 IF F$(U)="I" THEN 1720
1080 IF F$(U)="H" THEN 1100
1085 IF F$(U)="E" THEN 1115
1090 IF (F$(U)="B") AND (B1 > 0) THEN 1420
1095 GOTO 2180
1100 IF (H1<>0) AND (H2 > 0) THEN GOSUB H1
1105 IF Hstp=1 THEN 1275
1110 GOTO 2180
1115 IF (E1<>0) AND (E2<>0) THEN GOSUB E1
1120 IF Estp=1 THEN 1130
1125 GOTO 2180
1130 X=-.59
1135 Y=-.35
1140 Z=-.75105
1145 It=4
1150 GOSUB Sm
1155 MAT Dm=Q+Sm4
1160 MAT Sm4=Dm
1165 V=-90
1170 It=3
1175 GOSUB Sm
1180 MAT Dm=Q+Sm4
1185 MAT Sm4=Dm
1190 ON E2 GOTO 1195,1210
1195 X=.83
1200 Y=.45513+Sa1
1205 GOTO 1220
1210 X=.6
1215 Y=.45513+Sa2
1220 Z=.50834
1225 It=4
1230 GOSUB Sm
1235 MAT Dm=Q+Sm4
1240 MAT Sm4=Dm
1245 ON E2 GOTO 1250,1260
1250 MAT Dm=Sm1*Sm4
1255 GOTO 1265
1260 MAT Dm=Sm2+Sm4
1265 MAT Sm4=Dm
1270 GOTO 2180
1275 X=-.815
1280 Y=-.33943
1285 Z=-.67708+.00542
1290 It=4

```

```

1295 GOSUB Sm
1300 MAT Dm=Q*Sm5
1305 MAT Sm5=Dm
1310 V=-30
1315 It=3
1320 GOSUB Sm
1325 MAT Dm=Q*Sm5
1330 MAT Sm5=Dm
1335 ON H2 GOTO 1340,1355
1340 X=.83
1345 Y=.45854+Sa1
1350 GOTO 1365
1355 X=.6
1360 Y=.45854+Sa2
1365 Z=.50384+.00542
1370 It=4
1375 GOSUB Sm
1380 MAT Dm=Q*Sm5
1385 MAT Sm5=Dm
1390 ON H2 GOTO 1395,1405
1395 MAT Dm=Sm1+Sm5
1400 GOTO 1410
1405 MAT Dm=Sm2+Sm5
1410 MAT Sm5=Dm
1415 GOTO 2180
1420 IF B1=.010417 THEN 1430
1425 GOTO 1500
1430 FOR L=1 TO 3
1435 D(L)=Sm1(L,4)
1440 FOR M=1 TO 3
1445 D(L)=D(L)+Sm1(L,M)+Tc(M,4)
1450 NEXT M
1455 NEXT L
1460 IF (D(1)>Cc(1,3)) AND (D(1)<Cc(2,3)) AND ((D(2)>Cc(3,3)) AND (D(2)<Cc(4,3))
) AND ((D(3)>Cc(5,3)-B1) AND (D(3)<Cc(6,3)-B1)) THEN Lk2=1
1465 FOR L=1 TO 3
1470 D(L)=Sm2(L,4)
1475 FOR M=1 TO 3
1480 D(L)=D(L)+Sm2(L,M)+Tc(M,5)
1485 NEXT M
1490 NEXT L
1495 IF (D(1)>Cc(1,3)) AND (D(1)<Cc(2,3)) AND ((D(2)>Cc(3,3)) AND (D(2)<Cc(4,3))
) AND ((D(3)>Cc(5,3)-B1) AND (D(3)<Cc(6,3)-B1)) THEN Lk2=2
1500 FOR I=13 TO 40
1505 V(3,I)=V(3,I)-B1
1510 NEXT I
1515 IF Lk2=3 THEN 1525
1520 GOTO 1535
1525 MAT M=Sm8
1530 GOTO 2180
1535 IF (Istp=1) AND (Lk2 = 0) THEN 1625
1540 X=-.914995
1545 Y=-.35
1550 Z=0
1555 It=4
1560 GOSUB Sm
1565 GOSUB Mm
1570 V=Su
1575 It=3
1580 GOSUB Sm
1585 GOSUB Mm
1590 X=.914995
1595 Y=.35
1600 Z=0
1605 It=4
1610 GOSUB Sm

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1615 GOSUB Mm
1620 GOTO 2180
1625 ON Lk2 GOTO 1630,1640
1630 X=-.0849995
1635 GOTO 1645
1640 X=-.3149995
1645 Y=.10506+R1
1650 Z=-(V(3,32)-.50834)
1655 It=4
1660 GOSUB Sm
1665 GOSUB Mm
1670 ON Lk2 GOTO 1675,1685
1675 MAT Dm=Sm1*M
1680 GOTO 1690
1685 MAT Dm=Sm2*M
1690 MAT M=Dm
1695 IF B1k=1 THEN 1705
1700 GOTO 2180
1705 MAT Sm8=M
1710 Lk2=3
1715 GOTO 2180
1720 IF Lk=0 THEN 2010
1725 X=-.83
1730 Y=-.520415
1735 Z=-1.02917
1740 It=4
1745 GOSUB Sm
1750 GOSUB Mm
1755 IF Lk1=1 THEN 1765
1760 GOTO 1830
1765 MAT Sm6=M
1770 IF Iea>=1800 THEN Iea=1800
1775 B1=Iea/1800*.010417
1780 IF Iea.360 THEN 1800
1785 V=-Iea
1790 Sv=V
1795 GOTO 1810
1800 V=-(Iea-INT(Iea/360)*360)
1805 Sv=V
1810 It=1
1815 GOSUB Sm
1820 MAT Dm=Q+Sm6
1825 MAT Sm6=Dm
1830 V=90
1835 It=2
1840 GOSUB Sm
1845 GOSUB Mm
1850 IF Lk1=1 THEN 1860
1855 GOTO 1870
1860 MAT Dm=Q+Sm6
1865 MAT Sm6=Dm
1870 ON Lk GOTO 1875,1890
1875 X=.83
1880 Y=.46583+Sa1
1885 GOTO 1900
1890 X=.6
1895 Y=.46583+Sa2
1900 Z=.5
1905 It=4
1910 GOSUB Sm
1915 GOSUB Mm
1920 IF Lk1=1 THEN 1930
1925 GOTO 1940
1930 MAT Dm=Q+Sm6
1935 MAT Sm6=Dm
1940 ON Lk GOTO 1945,1955

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1945 MAT Dm=Sm1*M
1950 GOTO 1960
1955 MAT Dm=Sm2*M
1960 MAT M=Dm
1965 MAT Sm7=M
1970 IF Lk1=1 THEN 1980
1975 GOTO 2005
1980 ON Lk GOTO 1985,1995
1985 MAT Dm=Sm1*Sm6
1990 GOTO 2000
1995 MAT Dm=Sm2*Sm6
2000 MAT Sm6=Dm
2005 ON Lk GOTO 2010,2055
2010 FOR L=1 TO 3
2015 D(L)=Sm1(L,4)
2020 FOR M=1 TO 3
2025 D(L)=D(L)+Sm1(L,M)*Tc(M,1)
2030 NEXT M
2035 NEXT L
2040 IF (D(1)>Cc(1,1)) AND (D(1)>Cc(2,1)) AND ((D(2)>Cc(3,1)) AND (D(2)>Cc(4,1))
) AND ((D(3)>Cc(5,1)) AND (D(3)>Cc(6,1))) THEN 2105
2045 Ck=0
2050 IF Lk<>0 THEN 2125
2055 FOR L=1 TO 3
2060 D(L)=Sm4(L,4)
2065 FOR M=1 TO 3
2070 D(L)=D(L)+Sm2(L,M)*Tc(M,2)
2075 NEXT M
2080 NEXT L
2085 IF (D(1)>Cc(1,1)) AND (D(1)>Cc(2,1)) AND ((D(2)>Cc(3,1)) AND (D(2)>Cc(4,1))
) AND ((D(3)>Cc(5,1)) AND (D(3)>Cc(6,1))) THEN 2115
2090 Ck=0
2095 IF Lk<>0 THEN 2125
2100 GOTO 2180
2105 Ck=1
2110 GOTO 2180
2115 Ck=2
2120 GOTO 2180
2125 FOR L=1 TO 3
2130 D(L)=Sm7(L,4)
2135 FOR M=1 TO 3
2140 D(L)=D(L)+Sm7(L,M)*Tc(M,3)
2145 NEXT M
2150 NEXT L
2155 Lk1=0
2160 IF (D(1)>Cc(1,2)) AND (D(1)>Cc(2,2)) AND ((D(2)>Cc(3,2)) AND (D(2)>Cc(4,2))
) AND ((D(3)>Cc(5,2)-B1) AND (D(3)>Cc(6,2)-B1)) THEN 2170
2165 GOTO 2180
2170 Lk1=1
2175 IF B1=.010417 THEN Istp=1
2180 GOSUB M4
2185 FOR I=1 TO 3
2190 GOSUB M123
2195 NEXT I
2200 GOSUB M5
2205 GOSUB S
2210 IF Dp<>0 THEN 2220
2215 GOSUB P
2220 RETURN
2225 H1:
2230 Hea=Hea+Ha
2235 IF Hea/0 THEN RETURN
2240 IF Hea>=.00542 THEN 2250
2245 GOTO 2260
2250 Hea=.00542
2255 Hs+ p=1

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```

2260 FOR I=25 TO 72
2265 V(3,I)=V(3,I)+Hea
2270 NEXT I
2275 RETURN
2280 E1: 1
2285 Tea=Tea+Ea
2290 IF (Tea<0) OR (Tea=0) THEN RETURN
2295 Ei=Tea/720+.00208
2300 IF Ei>=.00208 THEN 2310
2305 GOTO 2320
2310 Estp=1
2315 Ei=.00208
2320 FOR I=21 TO 96
2325 V(3,I)=V(3,I)+Ei
2330 NEXT I
2335 Est=1
2340 IF Tea\360 THEN 2355
2345 V=Tea
2350 GOTO 2360
2355 V=Tea-INT(Tea/360)*360
2360 It=4
2365 X=-.59
2370 Y=-.35
2375 Z=-.754175
2380 GOSUB Sm
2385 MAT Dm=Q+Sm3
2390 MAT Sm3=Dm
2395 It=3
2400 GOSUB Sm
2405 MAT Dm=Q+Sm3
2410 MAT Sm3=Dm
2415 It=4
2420 X=-X
2425 Y=-Y
2430 Z=-Z
2435 GOSUB Sm
2440 MAT Dm=Q+Sm3
2445 MAT Sm3=Dm
2450 RETURN
2455 A: 1
2460 ON I GOTO 2465,2475
2465 X=-.83
2470 GOTO 2480
2475 X=-.5
2480 Y=-1
2485 Z=-.5
2490 It=4
2495 GOSUB Sm
2500 GOSUB Mm
2505 V=Ma(1,J,I)
2510 It=J
2515 GOSUB Sm
2520 GOSUB Mm
2525 ON I GOTO 2530,2540
2530 X=.83
2535 GOTO 2545
2540 X=.6
2545 Y=1
2550 Z=.5
2555 It=4
2560 GOSUB Sm
2565 GOSUB Mm
2570 ON I GOTO 2575,2585
2575 MAT Sm1=M
2580 GOTO 2590
2585 MAT Sm2=M

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2590 RETURN
2595 T: 1
2600 ON I GOTO 2605,2615
2605 X=-.83
2610 GOTO 2620
2615 X=-.6
2620 Y=-V(2,2)
2625 Z=-.5
2630 It=4
2635 GOSUB Sm
2640 GOSUB Mm
2645 V=Ma(2,J,I)
2650 It=J
2655 GOSUB Sm
2660 GOSUB Mm
2665 ON I GOTO 2670,2680
2670 X=.83
2675 GOTO 2685
2680 X=.6
2685 Y=V(2,2)
2690 Z=.5
2695 It=4
2700 GOSUB Sm
2705 GOSUB Mm
2710 RETURN
2715 M123: 1
2720 V=Va(I)
2725 It=I
2730 GOSUB Sm
2735 GOSUB Mm
2740 IF Lk1=0 THEN 2755
2745 MAT Dm=Q+Sm6
2750 MAT Sm6=Dm
2755 RETURN
2760 M4: 1
2765 X=-X1
2770 Y=-Y1
2775 Z=-Z1
2780 It=4
2785 GOSUB Sm
2790 GOSUB Mm
2795 IF Lk1=0 THEN 2810
2800 MAT Dm=Q+Sm6
2805 MAT Sm6=Dm
2810 RETURN
2815 M5: 1
2820 It=5
2825 GOSUB Sm
2830 GOSUB Mm
2835 IF Lk1=0 THEN 2850
2840 MAT Dm=Q+Sm6
2845 MAT Sm6=Dm
2850 RETURN
2855 P: 1
2860 IF F$(U)="C" THEN Cs=0
2865 FOR I=1 TO Nos
2870 LINE TYPE 1
2875 IF Nos=0 THEN 2905
2880 IF (F$(U)="C") AND (Cs=0) THEN 2895
2885 IF E(I)=0 THEN 2925
2890 GOTO 2905
2895 LINE TYPE 3,1
2900 IF E(I)=1 THEN 2925
2905 I1=Se(I)
2910 I2=Ee(I)
2915 MOVE P*(I1),P*(I1)

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2920 PLOT P(I2),P(I2),-1
2925 NEXT I
2930 IF (F$(U)="C") AND (Cs=1) THEN 2955
2935 IF (F$(U)="C") AND (Cs=0) THEN 2945
2940 GOTO 2955
2945 Cs=1
2950 GOTO 2865
2955 RETURN
2960 Sm: 1
2965 MAT Q=ZER
2970 Q(4,4)=1
2975 Ct=COS(V)
2980 St=SIN(V)
2985 ON It GOTO 2995,3030,3065,3100,3140
2990 I P
2995 Q(1,1)=1
3000 Q(2,2)=Ct
3005 Q(3,2)=St
3010 Q(2,3)=-St
3015 Q(3,3)=Ct
3020 GOTO 3155
3025 I Y
3030 Q(1,1)=Ct
3035 Q(1,3)=St
3040 Q(2,2)=1
3045 Q(3,1)=-St
3050 Q(3,3)=Ct
3055 GOTO 3155
3060 I R
3065 Q(1,1)=Ct
3070 Q(1,2)=St
3075 Q(2,1)=-St
3080 Q(2,2)=Ct
3085 Q(3,3)=1
3090 GOTO 3155
3095 I T
3100 Q(1,1)=1
3105 Q(2,2)=1
3110 Q(3,3)=1
3115 Q(1,4)=X
3120 Q(2,4)=Y
3125 Q(3,4)=Z
3130 GOTO 3155
3135 I S
3140 Q(1,1)=Sc
3145 Q(2,2)=Sc
3150 Q(3,3)=Sc
3155 RETURN
3160 Mn: 1
3165 MAT Dn=Q*M
3170 MAT M=Dn
3175 RETURN
3180 S: 1
3185 IF Nos=0 THEN 3220
3190 FOR K=1 TO Nos
3195 Ps(K)=1
3200 NEXT K
3205 FOR K=1 TO Noe
3210 E(K)=0
3215 NEXT K
3220 GOSUB Tv
3225 IF Nos=0 THEN 6165
3230 Is=1
3235 FOR I=1 TO Nos
3240 K=S(I)
3245 Ie=Is+K-1

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3250 GOSUB Tn
3255 I1=Ts(I1)
3260 I2=Se(I1)
3265 En(1)=-Tu(1,I2)
3270 En(2)=-Tu(2,I2)
3275 En(3)=-Tu(3,I2)-E
3280 Dot=En(1)*Sn(I,1)+En(2)*Sn(I,2)+En(3)*Sn(I,3)
3285 IF Dot<=0 THEN Ps(I)=0
3290 IF Dot<=0 THEN 3315
3295 FOR L=Is TO Ie
3300 M=Ts(L)
3305 E(M)=1
3310 NEXT L
3315 Is=Ie+1
3320 NEXT I
3325 IF F$(U)="W" THEN 3385
3330 IF (F$(U)="F1") OR (F$(U)="F2") THEN 3670
3335 IF F$(U)="I" THEN 3670
3340 IF F$(U)="M" THEN 3670
3345 IF F$(U)="E" THEN 3355
3350 GOTO 3370
3355 Est=0
3360 IF Sc>2 THEN 3670
3365 GOTO 6165
3370 IF (Sc>2) AND (F$(U)="H") THEN 3670
3375 IF (Sc>4) AND (F$(U)="B") THEN 3670
3380 GOTO 6165
3385 IF Ps(1)=1 THEN 3400
3390 IF Ps(3)=1 THEN 3415
3395 GOTO 6165
3400 Ix=1
3405 Rt=1
3410 GOTO 3425
3415 Ix=3
3420 Rt=2
3425 I1=0
3430 FOR I=1 TO Ix
3435 I1=I1+S(I)
3440 NEXT I
3445 I2=I1
3450 I1=I1-S(I)+1
3455 FOR I=1 TO Noe
3460 IF E(I)=0 THEN 3660
3465 FOR K=I1 TO I2
3470 IF Ts(K)=I THEN 3660
3475 NEXT K
3480 ON Rt GOTO 3485,3520
3485 S=1
3490 N=Se(I)
3495 GOSUB V1
3500 S=2
3505 N=Ee(I)
3510 GOSUB V1
3515 GOTO 3550
3520 S=1
3525 N=Ee(I)
3530 GOSUB V1
3535 S=2
3540 N=Se(I)
3545 GOSUB V1
3550 FOR J=I1 TO I2
3555 N=J
3560 S=1
3565 GOSUB V2
3570 S=2
3575 GOSUB V2

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3580 ON Rt GOTO 3615,3585
3585 D1=X1
3590 D2=Y1
3595 X1=X2
3600 Y1=Y2
3605 X2=D1
3610 Y2=D2
3615 S=1
3620 GOSUB Ds
3625 IF (Is=0) AND (Ie=1) OP (Is=1) AND (Ie=0) THEN 3650
3630 IF (Is=1) AND (Ie=1) THEN 3650
3635 IF (Is=-1) AND (Ie=-1) THEN 3655
3640 IF (Is=-1) AND (Ie=1) OP (Is=1) AND (Ie=-1) THEN GOSUB Is
3645 GOTO 3655
3650 E(I)=0
3655 NEXT J
3660 NEXT I
3665 GOTO 6165
3670 IF F$(U)="M" THEN 3705
3675 IF F$(U)="I" THEN 3705
3680 IF F$(U)="E" THEN 3705
3685 IF F$(U)="H" THEN 3705
3690 IF F$(U)="B" THEN 3705
3695 ASSIGN #2 TO "CF:F8,1"
3700 GOTO 3710
3705 ASSIGN #2 TO "C"&F$(U)&"":F8,1"
3710 READ #2,1;Sp
3715 READ #2,2;0
3720 FOR I=1 TO Sp
3725 READ #2,2+I;P(I)
3730 NEXT I
3735 FOR I=1 TO 0
3740 READ #2,2+Sp+I;Np(I)
3745 NEXT I
3750 FOR I=1 TO Nos
3755 READ #2,2+Sp+0+I;Op(I)
3760 NEXT I
3765 I2=0
3770 FOR I=1 TO 0
3775 I2=I2+Np(I)
3780 I1=I2-Np(I)+1
3785 O(I,1)=I1
3790 O(I,2)=I2
3795 FOR J=I1 TO I2
3800 I4=0
3805 FOR K=1 TO Op(J)
3810 I4=I4+S(K)
3815 NEXT K
3820 I3=I4-S(K-1)+1
3825 F(Op(J),1)=I3
3830 F(Op(J),2)=I4
3835 NEXT J
3840 NEXT I
3845 FOR I=1 TO Sp
3850 N=F(P(I),1)
3855 S=1
3860 GOSUB Vt
3865 A=S*(P(I),1)
3870 B=S*(P(I),2)
3875 C=S*(P(I),3)
3880 D=-A*X1-B*Y1-C*Z1
3885 Es=(-E*C+D)/SQRT(A*A+B*B+C*C)
3890 IF (Es>L1) AND (Es<U1) THEN Es=0
3895 Es=SGN(Es)
3900 FOR K=1 TO 0
3905 Cs=0

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3910 FOR L=0(k,1) TO 0(k,2)
3915 IF P(I)=Op(L) THEN 4000
3920 IF Pa(Op(L))=0 THEN 4000
3925 FOR J=F(Op(L),1) TO F(Op(L),2)
3930 N=J
3935 S=1
3940 GOSUB Vt
3945 S=2
3950 GOSUB Vt
3955 GOSUB Sn
3960 IF (Is=1) AND (Ie=-1) OR (Is=-1) AND (Ie=1) THEN 4025
3965 IF Cs<>0 THEN 3995
3970 IF (Is<>0) OR (Ie<>0) THEN 3980
3975 GOTO 3995
3980 IF Is<>0 THEN Ss=Is
3985 IF Ie<>0 THEN Ss=Ie
3990 Cs=1
3995 NEXT J
4000 NEXT L
4005 IF Es=0 THEN 4035
4010 IF Ss=Es THEN Sp(I,k)=1
4015 IF Ss<>Es THEN Sp(I,k)=0
4020 GOTO 4045
4025 Sp(I,k)=2
4030 GOTO 4045
4035 IF Ss=1 THEN Sp(I,k)=3
4040 IF Ss>1 THEN Sp(I,k)=-3
4045 NEXT K
4050 NEXT I
4055 FOR I=1 TO 0
4060 FOR K=1 TO 0
4065 So(I,K)=0
4070 NEXT K
4075 NEXT I
4080 FOR I1=1 TO 0-1
4085 FOR I2=I1+1 TO 0
4090 J=0
4095 FOR I=1 TO Sp
4100 IF Sp(I,I1)=Sp(I,I2) THEN 4195
4105 IF (Sp(I,I1)=3) AND (Sp(I,I2)=-3) OR (Sp(I,I1)=-3) AND (Sp(I,I2)=3) THEN 41
80
4110 IF (Sp(I,I1)=0) AND (Sp(I,I2)=1) THEN 4125
4115 IF (Sp(I,I1)=1) AND (Sp(I,I2)=0) THEN 4140
4120 GOTO 4195
4125 IF J=1 THEN 4160
4130 I3=-1
4135 GOTO 4150
4140 IF J=1 THEN 4170
4145 I3=1
4150 J=1
4155 GOTO 4195
4160 I4=-1
4165 GOTO 4175
4170 I4=1
4175 IF I3=I4 THEN 4195
4180 So(I1,I2)=0
4185 So(I2,I1)=0
4190 GOTO 4210
4195 NEXT I
4200 So(I1,I2)=I3
4205 So(I2,I1)=-I3
4210 NEXT I2
4215 NEXT I1
4220 FOR I=1 TO Nt:
4225 Ce(I)=1
4230 NEXT I

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4235 FOR I=1 TO Nos
4240 FOR K=F(I,1) TO F(I,2)
4245 IF Ps(I)=0 THEN 4255
4250 GOTO 4260
4255 Ce(K)=0
4260 NEXT K
4265 NEXT I
4270 FOR I=1 TO 0
4275 FOR J=O(I,1) TO O(I,2)
4280 FOR K=F(Op(J),1) TO F(Op(J),2)
4285 IF Ce(K)=0 THEN 4295
4290 GOTO 4320
4295 FOR I1=O(I,1) TO O(I,2)
4300 FOR I2=F(Op(I1),1) TO F(Op(I1),2)
4305 IF (Ts(I2)=Ts(K)) AND (Ce(I2)=1) THEN Ce(I2)=2
4310 NEXT I2
4315 NEXT I1
4320 NEXT K
4325 NEXT J
4330 NEXT I
4335 FOR I=1 TO 0
4340 FOR K=1 TO 3 STEP 2
4345 W(I,K)=1E99
4350 NEXT K
4355 FOR K=2 TO 4 STEP 2
4360 W(I,K)=-1E99
4365 NEXT K
4370 NEXT I
4375 FOR I=1 TO 0
4380 FOR J=O(I,1) TO O(I,2)
4385 FOR K=F(Op(J),1) TO F(Op(J),2)
4390 IF E(Ts(K))=0 THEN 4460
4395 N=K
4400 S=1
4405 GOSUB V2
4410 S=2
4415 GOSUB V2
4420 IF W(I,1)>X1 THEN W(I,1)=X1
4425 IF W(I,1)>X2 THEN W(I,1)=X2
4430 IF W(I,2)>X1 THEN W(I,2)=X1
4435 IF W(I,2)>X2 THEN W(I,2)=X2
4440 IF W(I,3)>Y1 THEN W(I,3)=Y1
4445 IF W(I,3)>Y2 THEN W(I,3)=Y2
4450 IF W(I,4)>Y1 THEN W(I,4)=Y1
4455 IF W(I,4)>Y2 THEN W(I,4)=Y2
4460 NEXT K
4465 NEXT J
4470 NEXT I
4475 FOR I=1 TO 0
4480 N=I
4485 S=1
4490 GOSUB Eo
4495 FOR J=1 TO C1
4500 Iv=0
4505 FOR I1=1 TO 0
4510 Cs(I1)=0
4515 NEXT I1
4520 S=1
4525 N=Se(L1(J))
4530 GOSUB V1
4535 S=2
4540 N=Ee(L1(J))
4545 GOSUB V1
4550 FOR L=1 TO 0
4555 IF L=I THEN 5920
4560 IF So(I,L)=-1 THEN 4570

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4565 GOTO 5920
4570 IF (S<>W(L,1)) AND (E<>W(L,2)) AND (S<>W(L,3)) AND (E<>W(L,4)) THEN 4690
4575 I3=3
4580 I4=4
4585 FOR I1=1 TO 2
4590 I3=I3-1
4595 I4=I4-1
4600 FOR I2=I3 TO I4
4605 IF (W(I,I1)>W(L,1)) AND (W(I,I1)<W(L,2)) AND (W(I,I1+I2)>W(L,3)) AND (W(I,I1+I2)<W(L,4)) THEN 4700
4610 NEXT I2
4615 NEXT I1
4620 I3=3
4625 I4=4
4630 FOR I1=1 TO 2
4635 I3=I3-1
4640 I4=I4-1
4645 FOR I2=I3 TO I4
4650 IF (W(L,I1)>W(I,1)) AND (W(L,I1)<W(I,2)) AND (W(L,I1+I2)>W(I,3)) AND (W(L,I1+I2)<W(I,4)) THEN 4700
4655 NEXT I2
4660 NEXT I1
4665 IF (W(L,1)>W(I,1)) AND (W(L,2)<W(I,2)) AND (W(L,3)>W(I,3)) AND (W(L,4)<W(I,4)) THEN 4700
4670 IF (W(L,3)>W(I,3)) AND (W(L,4)<W(I,4)) AND (W(L,1)<W(I,1)) AND (W(L,2)>W(I,2)) THEN 4700
4675 IF (W(I,1)>W(L,1)) AND (W(I,2)<W(L,2)) AND (W(I,3)>W(L,3)) AND (W(I,4)<W(L,4)) THEN 4700
4680 IF (W(I,3)>W(L,3)) AND (W(I,4)<W(L,4)) AND (W(I,1)<W(L,1)) AND (W(I,2)>W(L,2)) THEN 4700
4685 GOTO 5920
4690 Ic=1
4695 GOTO 4705
4700 Ic=0
4705 IF L=Sa+1 THEN 4725
4710 N=L
4715 S=2
4720 GOSUB Eo
4725 Sa+1=L
4730 Ix=0
4735 Ctb=0
4740 FOR I1=1 TO C2
4745 I2=I1+1
4750 IF I1=C2 THEN I2=1
4755 S=1
4760 N=I1
4765 GOSUB V3
4770 S=2
4775 N=I2
4780 GOSUB V3
4785 GOSUB Tab
4790 IF Dn=0 THEN 5105
4795 IF (Ta>L1) AND (Ta+1+U1) AND (Tb<L1) AND (Tb+1+U1) THEN 4805
4800 GOTO 5765
4805 IF (Ta>L1) AND (Ta+U1) THEN Ta=0
4810 IF (Ta>1+L1) AND (Ta+1+U1) THEN Ta=1
4815 IF (Tb>L1) AND (Tb+U1) THEN Tb=0
4820 IF (Tb>1+L1) AND (Tb+1+U1) THEN Tb=1
4825 S=1
4830 GOSUB Ds
4835 IF Ta=0 THEN 4860
4840 IF Ta=1 THEN 4850
4845 GOTO 4975
4850 Cs=1
4855 GOTO 4865
4860 Cs=2

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4865 FOR I3=1 TO C2
4870 I4=I3+1
4875 IF I3=C2 THEN I4=1
4880 S=1
4885 N=I3
4890 GOSUB V3
4895 S=2
4900 N=I4
4905 GOSUB V3
4910 ON Cs GOTO 4915,4925
4915 S=2
4920 GOTO 4930
4925 S=3
4930 GOSUB Ds
4935 ON Cs GOTO 4940,4955
4940 IF Is=0 THEN 4965
4945 IF Is<>Rt THEN 5765
4950 GOTO 4965
4955 IF Is=0 THEN 4965
4960 IF Is<>Rt THEN 5765
4965 NEXT I3
4970 Cs(L)=1
4975 IF Ta=0 THEN 5765
4980 IF Ta=1 THEN 5765
4985 IF ((Tb=0) OR (Tb=1)) AND (C+b=1) THEN 5040
4990 IF (Tb=0) OR (Tb=1) THEN 5000
4995 GOTO 5065
5000 C+b=1
5005 ON Tb+1 GOTO 5010,5025
5010 Sp=X1
5015 Spy=Y1
5020 GOTO 5765
5025 Sp=X2
5030 Spy=Y2
5035 GOTO 5765
5040 ON Tb+1 GOTO 5045,5055
5045 IF (X1=Sp) AND (Y1=Spy) THEN 5065
5050 GOTO 5765
5055 IF (X2=Sp) AND (Y2=Spy) THEN 5065
5060 GOTO 5765
5065 Ix=Ix+1
5070 Iv=Iv+1
5075 Iv(Iv,1)=(Ex-Sx)+Ta+Sx
5080 Iv(Iv,2)=(Ey-Sy)+Ta+Sy
5085 Tb(Ix,1)=Is
5090 Tb(Ix,2)=Ie
5095 Tb(Ix,3)=Iv
5100 GOTO 5765
5105 IF X1=X2 THEN 5135
5110 D1=Sx
5115 D2=Ex
5120 D3=X1
5125 D4=X2
5130 GOTO 5155
5135 D1=Sy
5140 D2=Ey
5145 D3=Y1
5150 D4=Y2
5155 Ss=1
5160 Cs=1
5165 IF D4<D3 THEN Ss=2
5170 IF D2<D1 THEN Cs=2
5175 S=2
5180 GOSUB Ds
5185 IF Is=0 THEN 5195
5190 GOTO 5765

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5195 IF (D1=D3) AND (D2=D4) OR (D2=D3) AND (D1=D4) THEN 5760
5200 IF (D1=D3) OR (D1=D4) OR (D2=D3) OR (D2=D4) THEN 5580
5205 ON S$ GOTO 5210,5235
5210 ON C$ GOTO 5215,5225
5215 IF (D1>D3) AND (D2<D4) THEN 5760
5220 GOTO 5255
5225 IF (D2>D3) AND (D1<D4) THEN 5760
5230 GOTO 5255
5235 ON C$ GOTO 5240,5250
5240 IF (D1>D4) AND (D2<D3) THEN 5760
5245 GOTO 5255
5250 IF (D2>D4) AND (D1<D3) THEN 5760
5255 ON S$ GOTO 5260,5285
5260 ON C$ GOTO 5265,5275
5265 IF (D1<D3) AND (D2>D4) THEN 5505
5270 GOTO 5305
5275 IF (D2<D3) AND (D1>D4) THEN 5505
5280 GOTO 5305
5285 ON C$ GOTO 5290,5300
5290 IF (D1<D4) AND (D2>D3) THEN 5505
5295 GOTO 5305
5300 IF (D2<D4) AND (D1>D3) THEN 5505
5305 Dr=1
5310 ON S$ GOTO 5315,5340
5315 ON C$ GOTO 5320,5330
5320 IF D2>D4 THEN Dr=2
5325 GOTO 5360
5330 IF D1>D4 THEN Dr=2
5335 GOTO 5360
5340 ON C$ GOTO 5345,5355
5345 IF D2>D3 THEN Dr=2
5350 GOTO 5360
5355 IF D1>D3 THEN Dr=2
5360 ON S$ GOTO 5365,5420
5365 ON C$ GOTO 5370,5395
5370 ON Dr GOTO 5375,5385
5375 IF D2<D3 THEN 5765
5380 GOTO 5470
5385 IF D1>D4 THEN 5765
5390 GOTO 5470
5395 ON Dr GOTO 5400,5410
5400 IF D1<D3 THEN 5765
5405 GOTO 5470
5410 IF D2>D4 THEN 5765
5415 GOTO 5470
5420 ON C$ GOTO 5425,5450
5425 ON Dr GOTO 5430,5440
5430 IF D2<D4 THEN 5765
5435 GOTO 5470
5440 IF D1>D3 THEN 5765
5445 GOTO 5470
5450 ON Dr GOTO 5455,5465
5455 IF D1<D4 THEN 5765
5460 GOTO 5470
5465 IF D2>D3 THEN 5765
5470 ON S$ GOTO 5475,5490
5475 ON C$ GOTO 5480,5485
5480 ON Dr GOTO 5670,5685
5485 ON Dr GOTO 5700,5720
5490 ON C$ GOTO 5495,5500
5495 ON Dr GOTO 5720,5700
5500 ON Dr GOTO 5685,5670
5505 IF (S$=2) AND (C$=1) OR (S$=1) AND (C$=2) THEN 5545
5510 Iv=Iv+1
5515 GOSUB I-1
5520 Iv(Iv,3)=1

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5525 Iv=Iv+1
5530 GOSUB Iv2
5535 Iv(Iv,3)=-1
5540 GOTO 5765
5545 Iv=Iv+1
5550 GOSUB Iv2
5555 Iv(Iv,3)=1
5560 Iv=Iv+1
5565 GOSUB Iv1
5570 Iv(Iv,3)=-1
5575 GOTO 5765
5580 ON Ss GOTO 5585,5630
5585 ON Cs GOTO 5590,5610
5590 IF (D1=D4) OR (D2=D3) THEN 5765
5595 IF (D1=D3) AND (D2=D4) OR (D2=D4) AND (D1=D3) THEN 5760
5600 IF D1=D3 THEN 5720
5605 GOTO 5670
5610 IF (D1=D3) OR (D2=D4) THEN 5765
5615 IF (D2=D3) AND (D1=D4) OR (D1=D4) AND (D2=D3) THEN 5760
5620 IF D2=D3 THEN 5685
5625 GOTO 5700
5630 ON Cs GOTO 5635,5655
5635 IF (D1=D3) OR (D2=D4) THEN 5765
5640 IF (D1=D4) AND (D2=D3) OR (D2=D3) AND (D1=D4) THEN 5760
5645 IF D1=D4 THEN 5700
5650 GOTO 5685
5655 IF (D1=D4) OR (D2=D3) THEN 5765
5660 IF (D2=D4) AND (D1=D3) OR (D1=D3) AND (D2=D1) THEN 5760
5665 IF D1=D3 THEN 5720
5670 Iv=Iv+1
5675 Iv(Iv,3)=1
5680 GOTO 5740
5685 Iv=Iv+1
5690 Iv(Iv,3)=1
5695 GOTO 5750
5700 Cs(L)=1
5705 Iv=Iv+1
5710 Iv(Iv,3)=-1
5715 GOTO 5740
5720 Cs(L)=1
5725 Iv=Iv+1
5730 Iv(Iv,3)=-1
5735 GOTO 5750
5740 GOSUB Iv1
5745 GOTO 5765
5750 GOSUB Iv2
5755 GOTO 5765
5760 Cs(L)=1
5765 NEXT I1
5770 IF (Ix=0) AND (Ic=1) THEN 5850
5775 IF Ix=1 THEN 5790
5780 IF Ix>1 THEN 5825
5785 GOTO 5920
5790 I1=Tb(Ix,3)
5795 IF Tb(Ix,1)=Rt THEN 5810
5800 Iv(I1,3)=1
5805 GOTO 5920
5810 Cs(L)=1
5815 Iv(I1,3)=-1
5820 GOTO 5920
5825 FOR I1=1 TO Ix
5830 IF Tb(I1,1)=Rt THEN Iv(Tb(I1,3),3)=-1
5835 IF Tb(I1,1)<>Rt THEN Iv(Tb(I1,3),3)=1
5840 NEXT I1
5845 GOTO 5920
5850 FOR I3=1 TO C2

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5855 I4=I3+1
5860 IF I3=C2 THEN I4=1
5865 S=1
5870 N=I3
5875 GOSUB V3
5880 S=2
5885 N=I4
5890 GOSUB V3
5895 S=1
5900 GOSUB Ds
5905 IF (Is<>Rt) OR (Is<>Rt) THEN 5920
5910 NEXT I3
5915 Cs(L)=1
5920 NEXT L
5925 I1=0
5930 FOR I2=1 TO 0
5935 I1=I1+Cs(I2)
5940 NEXT I2
5945 Is=I1
5950 IF Iv=0 THEN 6135
5955 Ss=1
5960 Cs=1
5965 IF S>Ex THEN 5995
5970 IF Sx=Ex THEN 5985
5975 Cs=2
5980 GOTO 5995
5985 Ss=2
5990 IF Sy>Ev THEN 5975
5995 IF Iv=1 THEN 6065
6000 FOR I2=1 TO Iv-1
6005 FOR I1=1 TO Iv-1
6010 ON Cs GOTO 6015,6025
6015 IF Iv(I1,Ss)<Iv(I1+1,Ss) THEN 6075
6020 GOTO 6030
6025 IF Iv(I1,Ss)>Iv(I1+1,Ss) THEN 6075
6030 D1=Iv(I1,1)
6035 D2=Iv(I1,2)
6040 D3=Iv(I1,3)
6045 Iv(I1,1)=Iv(I1+1,1)
6050 Iv(I1,2)=Iv(I1+1,2)
6055 Iv(I1,3)=Iv(I1+1,3)
6060 Iv(I1+1,1)=D1
6065 Iv(I1+1,2)=D2
6070 Iv(I1+1,3)=D3
6075 NEXT I1
6080 NEXT I2
6085 MOVE Sx,Sy
6090 FOR I1=1 TO Iv
6095 IF Is>0 THEN 6105
6100 PLOT Iv(I1,1),Iv(I1,2),-1
6105 Is=Is+Iv(I1,3)
6110 MOVE Iv(I1,1),Iv(I1,2)
6115 NEXT I1
6120 IF Is>0 THEN 6150
6125 PLOT Ex,Ey,-1
6130 GOTO 6150
6135 IF Is>0 THEN 6150
6140 MOVE Sx,Sy
6145 PLOT Ex,Ey,-1
6150 NEXT J
6155 NEXT I
6160 Dp=1
6165 RETURN
6170 T0: I
6175 IF (F$(U)="H") AND (Hstp=1) THEN 6190
6180 IF (Est=1) AND (F$(U)="E") THEN 6205

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6185 GOTO 6235
6190 MAT Dm=M+Sm5
6195 MAT Sm5=Dm
6200 GOTO 6235
6205 MAT Dm=M*Sm3
6210 MAT Sm3=Dm
6215 IF Estp=1 THEN 6225
6220 GOTO 6235
6225 MAT Dm=M*Sm4
6230 MAT Sm4=Dm
6235 FOR K=1 TO Nov
6240 FOR L=1 TO 3
6245 D(L)=M(L,4)
6250 IF F$(U)="E" THEN 6270
6255 IF F$(U)="H" THEN 6285
6260 IF F$(U)="I" THEN 6295
6265 GOTO 6305
6270 IF (Est=1) AND (K=33) AND (K=34) THEN D(L)=Sm3(L,4)
6275 IF (Estp=1) AND (K=85) THEN D(L)=Sm4(L,4)
6280 GOTO 6305
6285 IF (F$(U)="H") AND (Hstp=1) AND (K=60) THEN D(L)=Sm5(L,4)
6290 GOTO 6305
6295 IF (F$(U)="I") AND (LK1=1) AND (K=1) AND (K=16) THEN D(L)=Sm6(L,4)
6300 IF (F$(U)="I") AND (LK1=1) AND (K=29) THEN D(L)=Sm6(L,4)
6305 FOR M=1 TO 3
6310 IF F$(U)="E" THEN 6330
6315 IF F$(U)="H" THEN 6345
6320 IF F$(U)="I" THEN 6355
6325 GOTO 6365
6330 IF (Est=1) AND (K=33) AND (K=34) THEN 6375
6335 IF (Estp=1) AND (K=85) THEN 6385
6340 GOTO 6365
6345 IF (F$(U)="H") AND (Hstp=1) AND (K=60) THEN 6395
6350 GOTO 6365
6355 IF (F$(U)="I") AND (LK1=1) AND (K=1) AND (K=16) THEN 6405
6360 IF (F$(U)="I") AND (LK1=1) AND (K=29) THEN 6405
6365 D(L)=D(L)+M(L,M)*V(M,K)
6370 GOTO 6410
6375 D(L)=D(L)+Sm3(L,M)+V(M,K)
6380 GOTO 6410
6385 D(L)=D(L)+Sm4(L,M)+V(M,K)
6390 GOTO 6410
6395 D(L)=D(L)+Sm5(L,M)+V(M,K)
6400 GOTO 6410
6405 D(L)=D(L)+Sm6(L,M)+V(M,K)
6410 NEXT M
6415 NEXT L
6420 FOR L=1 TO 3
6425 Tv(L,K)=D(L)
6430 NEXT L
6435 NEXT K
6440 FOR K=1 TO Nov
6445 Zp=Tv(3,K)+E
6450 Px(K)=E*Tv(1,K)/Zp
6455 Py(K)=E*Tv(2,K)/Zp
6460 NEXT K
6465 RETURN
6470 Tn: 1
6475 FOR L=1 TO 3
6480 D(L)=0
6485 FOR M=1 TO 3
6490 IF F$(U)="E" THEN 6505
6495 IF F$(U)="I" THEN 6515
6500 GOTO 6520
6505 IF (Est=1) AND (I=22) AND (I=43) THEN 6530
6510 GOTO 6520

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6515 IF (F$(U)="I") AND (Lk1=1) AND (I=2) AND (I<9) THEN 6540
6520 D(L)=D(L)+M*L,M)+N(M,Ns(I))
6525 GOTO 6545
6530 D(L)=D(L)+Sm3(L,M)+N(M,Ns(I))
6535 GOTO 6545
6540 D(L)=D(L)+Sm6(L,M)+N(M,Ns(I))
6545 NEXT M
6550 NEXT L
6555 FOR L=1 TO 3
6560 Sn(I,L)=D(L)
6565 NEXT L
6570 RETURN
6575 Ds: !
6580 Dn=SQR((Y2-Y1)^2+(X1-X2)^2)
6585 ON S GOTO 6590,6590,6605
6590 Sd=(Y1-Y2)*Sx/Dn+(X2-X1)*Sy/Dn+(X1+Y2-.12*Y1)/Dn
6595 IF (Sd>L1) AND (Sd<U1) THEN Sd=0
6600 Is=SGN(Sd)
6605 ON S GOTO 6610,6625,6610
6610 Ed=(Y1-Y2)+E/Dn+(Y2-X1)+Eu/Dn+(X1+Y2-.12*(1-Dn
6615 IF (Ed>L1) AND (Ed<U1) THEN Ed=0
6620 Ie=SGN(Ed)
6625 RETURN
6630 Is: !
6635 GOSUB Tab
6640 IF Dn=0 THEN RETURN
6645 D1=(Ex-Sx)*Ta+Sx
6650 D2=(Ey-Sy)*Ta+Sy
6655 IF Ie=1 THEN 6680
6660 ON Rt GOTO 6665,6685
6665 Px(Se(I))=D1
6670 Py(Se(I))=D2
6675 GOTO 6695
6680 ON Rt GOTO 6685,6665
6685 Px(Ee(I))=D1
6690 Py(Ee(I))=D2
6695 RETURN
6700 Tab: !
6705 Dn=-((Ex-Sx)*(Y2-Y1)+Eu-Sy)*(X2-X1)
6710 IF (Dn>L1) AND (Dn<U1) THEN Dn=0
6715 IF Dn=0 THEN RETURN
6720 Ta=-((X1-Sx)*(Y2-Y1)+(Y1-Sy)*(X2-X1))/Dn
6725 Tb=((Ex-Sx)*(Y1-Sy)-Eu-Sy*(X1-Sx))/Dn
6730 RETURN
6735 Sn: !
6740 Sd=A*X1+B*Y1+C*Z1+D
6745 IF (Sd>L1) AND (Sd<U1) THEN Sd=0
6750 Is=SGN(Sd)
6755 Ed=A*X2+B*Y2+C*Z2+D
6760 IF (Ed>L1) AND (Ed<U1) THEN Ed=0
6765 Ie=SGN(Ed)
6770 RETURN
6775 Vt: !
6780 ON S GOTO 6785,6805
6785 X1=Tv(1,Se(Ts(N)))
6790 Y1=Tv(2,Se(Ts(N)))
6795 Z1=Tv(3,Se(Ts(N)))
6800 GOTO 6820
6805 X2=Tv(1,Ee(Ts(N)))
6810 Y2=Tv(2,Ee(Ts(N)))
6815 Z2=Tv(3,Ee(Ts(N)))
6820 RETURN
6825 V1: !
6830 ON S GOTO 6835,6850
6835 Sx=Px(N)
6840 Sy=Py(N)

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6845 GOTO 6860
6850 Ex=Px(N)
6855 Ey=Py(N)
6860 RETURN
6865 V2: 1
6870 ON S GOTO 6875,6890
6875 X1=Px(Se(Ts(N)))
6880 Y1=Py(Se(Ts(N)))
6885 GOTO 6900
6890 X2=Px(Ee(Ts(N)))
6895 Y2=Py(Ee(Ts(N)))
6900 RETURN
6905 V3: 1
6910 ON S GOTO 6915,6930
6915 X1=Px(L2(N))
6920 Y1=Py(L2(N))
6925 GOTO 6940
6930 X2=Px(L2(N))
6935 Y2=Py(L2(N))
6940 RETURN
6945 Eo: 1
6950 Cs=0
6955 FOR I2=0(N,1) TO 0(N,2)
6960 IF Ps(Op(I2))=0 THEN 7045
6965 FOR I3=F(Op(I2),1) TO F(Op(I2),2)
6970 ON S GOTO 6985,6975
6975 IF Ce(I3)=1 THEN 7040
6980 GOTO 7015
6985 IF Cs=0 THEN 7015
6990 Ss=0
6995 FOR I4=1 TO Cs
7000 IF Ts(I3)=L1(I4) THEN Ss=1
7005 NEXT I4
7010 IF Ss=1 THEN 7040
7015 Cs=Cs+1
7020 ON S GOTO 7025,7035
7025 L1(Cs)=Ts(I3)
7030 GOTO 7040
7035 S1(Cs)=Ts(I3)
7040 NEXT I3
7045 NEXT I2
7050 ON S GOTO 7055,7065
7055 C1=Cs
7060 GOTO 7245
7065 C2=Cs
7070 Ss=Se(S1(1))
7075 Cs=Ee(S1(1))
7080 L2(1)=Ss
7085 S1(1)=0
7090 FOR I1=2 TO C2
7095 FOR I2=1 TO C2
7100 IF S1(I2)=0 THEN 7145
7105 IF Se(S1(I2))=Cs THEN 7115
7110 GOTO 7125
7115 I3=Ee(S1(I2))
7120 GOTO 7150
7125 IF Ee(S1(I2))=Cs THEN 7135
7130 GOTO 7145
7135 I3=Se(S1(I2))
7140 GOTO 7150
7145 NEXT I2
7150 L2(I1)=Cs
7155 Cs=I3
7160 S1(I2)=0
7165 NEXT I1
7170 D1=Sx

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7175 D2=Sy
7180 Sx=(W(L,1)+W(L,2))/2
7185 Sy=(W(L,3)+W(L,4))/2
7190 S=1
7195 N=1
7200 GOSUB V3
7205 S=2
7210 N=2
7215 GOSUB V3
7220 S=2
7225 GOSUB D3
7230 Rt=Is
7235 Sx=D1
7240 Sy=D2
7245 RETURN
7250 Iv1: !
7255 Iv(Iv,1)=X1
7260 Iv(Iv,2)=Y1
7265 RETURN
7270 Iv2: !
7275 Iv(Iv,1)=X2
7280 Iv(Iv,2)=Y2
7285 RETURN
7290 End: ! End.
7295 IF F=1 THEN EXIT GRAPHICS
7300 DISP "Program Stop"
7305 STOP
7310 END

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10  REM HYDRAULIC FITTING *****
20  GOSUB Start
30  FOR Sw=1 TO 10
40  BEEP
50  WAIT 3000
60  NEXT Sw
70  Ud(1)=1
80  Ud(2)=2
90  Ud(3)=3
100 GOSUB Start
110 BEEP
120 WAIT 3000
130 FOR Sw=1 TO 8
140 Sc=Sc+1/8
150 GOSUB Start
160 BEEP
170 WAIT 3000
180 NEXT Sw
190 Sf1=-.00833
200 GOSUB Start
210 BEEP
220 WAIT 3000
230 FOR Sw=1 TO 10
240 Ma(1,1,1)=Ma(1,1,1)-14.95/10
250 Ma(1,3,1)=Ma(1,3,1)-1.55/10
260 Ma(2,1,1)=Ma(2,1,1)+13.168/10
270 Ma(2,2,1)=Ma(2,2,1)+7/10
280 Ma(2,3,1)=Ma(2,3,1)+32.054/10
290 Sa1=Sa1-.15017/10
300 GOSUB Start
310 BEEP
320 WAIT 3000
330 NEXT Sw
340 Sf1=-.00417
350 GOSUB Start
360 BEEP
370 WAIT 3000
380 Sf2=-.00833
390 GOSUB Start
400 BEEP
410 WAIT 3000
420 FOR Sw=1 TO 10
430 Ma(1,1,2)=Ma(1,1,2)-19.93905/10
440 Ma(1,2,2)=Ma(1,2,2)+40.79102/10
450 Ma(2,1,2)=Ma(2,1,2)-40.79102/10
460 Ma(2,2,2)=Ma(2,2,2)-19.93905/10
470 Ma(2,3,2)=Ma(2,3,2)-89.3/10
480 Sa2=Sa2-.22205/10
490 GOSUB Start
500 BEEP
510 WAIT 3000
520 NEXT Sw
530 Sf2=-.00521
540 GOSUB Start
550 BEEP
560 WAIT 3000
570 FOR Sw=1 TO 8
580 Sc=Sc-1/8
590 GOSUB Start
600 BEEP
610 WAIT 3000
620 NEXT Sw
630 FOR Su=1 TO 20
640 Xi=Xi+.1/20
650 Yi=Yi-.26057/20
660 Zi=Zi+.13333/20

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670 Va(1)=Va(1)+60/20
680 Va(2)=Va(2)-60/20
690 GOSUB Start
700 BEEP
710 WAIT 3000
720 NEXT Sw
730 FOR Sw=1.125 TO 15 STEP .125
740 Sc=Sw
750 GOSUB Start
760 BEEP
770 WAIT 3000
780 NEXT Sw
790 FOR Sw=15.25 TO 25 STEP .25
800 Sc=Sw
810 GOSUB Start
820 BEEP
830 WAIT 3000
840 NEXT Sw
850 H1=1
860 H2=1
870 FOR Sw=1 TO 5
880 Ma(2,1,2)=Ma(2,1,2)-1
890 Ha=.00542/5
900 GOSUB Start
910 BEEP
920 WAIT 3000
930 NEXT Sw
940 FOR Sw=.125 TO 5 STEP .125
950 Sc=Sc-1
960 GOSUB Start
970 BEEP
980 WAIT 3000
990 NEXT Sw
1000 FOR Sw=1 TO 8
1010 Ma(1,1,1)=Ma(1,1,1)+1.6/8
1020 Sa1=Sa1+.01607/8
1030 GOSUB Start
1040 BEEP
1050 WAIT 3000
1060 NEXT Sw
1070 FOR Sw=1 TO 8
1080 Ma(1,1,1)=Ma(1,1,1)-1.6/8
1090 Sa1=Sa1-.01607/8
1100 IF Sw=2 THEN Hstp=0
1110 IF Sw=8 THEN Ha=.005419
1120 IF Sw=8 THEN Ha=0
1130 GOSUB Start
1140 BEEP
1150 WAIT 3000
1160 NEXT Sw
1170 FOR Sw=1 TO 5
1180 Ma(2,1,2)=Ma(2,1,2)+1
1190 Ha=-.005419/5
1200 GOSUB Start
1210 BEEP
1220 WAIT 3000
1230 NEXT Sw
1240 FOR Sw=19.875 TO 1 STEP -.125
1250 Sc=Sw
1260 IF Sw=5 THEN Ud(12)=0
1270 GOSUB Start
1280 BEEP
1290 WAIT 3000
1300 NEXT Sw
1310 GOSUB Start
1320 FOR Sw=1 TO 5

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1330 BEEP
1340 WAIT 3000
1350 NEXT Sw
1360 REM ELECTRICAL FITTING *****
1370 GOSUB Start
1380 FOR Sw=1 TO 5
1390 BEEP
1400 WAIT 3000
1410 NEXT Sw
1420 Sf2=-.00833
1430 GOSUB Start
1440 BEEP
1450 WAIT 3000
1460 FOR Sw=1 TO 10
1470 Ma(1,1,2)=Ma(1,1,2)+19.93905/10
1480 Ma(1,2,2)=Ma(1,2,2)-40.79102/10
1490 Ma(2,1,2)=Ma(2,1,2)+40.79102/10
1500 Ma(2,2,2)=Ma(2,2,2)+19.93905/10
1510 Ma(2,3,2)=Ma(2,3,2)+89.3/10
1520 Sa2=Sa2+.22205/10
1530 GOSUB Start
1540 BEEP
1550 WAIT 3000
1560 NEXT Sw
1570 FOR Sw=1 TO 10
1580 Ma(1,1,2)=Ma(1,1,2)-23.84342003/10
1590 Ma(1,2,2)=Ma(1,2,2)-11.94488695/10
1600 Ma(2,1,2)=Ma(2,1,2)+23.84342003+1.5/10
1610 Ma(2,2,2)=Ma(2,2,2)-11.94488695-3.15/10
1620 Ma(2,3,2)=Ma(2,3,2)-45.6/10
1630 Sa2=Sa2-.18111124/10
1640 GOSUB Start
1650 BEEP
1660 WAIT 300
1670 NEXT Sw
1680 Sf2=-.00635
1690 GOSUB Start
1700 BEEP
1710 WAIT 3000
1720 Sf1=-.00833
1730 GOSUB Start
1740 BEEP
1750 WAIT 3000
1760 FOR Sw=1 TO 10
1770 Ma(1,1,1)=Ma(1,1,1)+14.95/10
1780 Ma(1,3,1)=Ma(1,3,1)+1.55/10
1790 Ma(2,1,1)=Ma(2,1,1)-13.168/10
1800 Ma(2,2,1)=Ma(2,2,1)-7/10
1810 Ma(2,3,1)=Ma(2,3,1)-32.054/10
1820 Sa1=Sa1+.15017/10
1830 GOSUB Start
1840 BEEP
1850 WAIT 3000
1860 NEXT Sw
1870 FOR Sw=1 TO 10
1880 Ma(1,1,1)=Ma(1,1,1)-24.67525527/10
1890 Ma(1,2,1)=Ma(1,2,1)-35.90591907/10
1900 Ma(2,1,1)=Ma(2,1,1)-35.90591907/10
1910 Ma(2,2,1)=Ma(2,2,1)+24.67525527/10
1920 Ma(2,3,1)=Ma(2,3,1)+90/10
1930 Sa1=Sa1-.23531105/10
1940 GOSUB Start
1950 BEEP
1960 WAIT 3000
1970 NEXT Sw
1980 Sf1=-.003125

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1990 GOSUB Start
2000 BEEP
2010 WAIT 3000
2020 FOR Sw=1 TO 10
2030 X1=X1-.225/10
2040 Y1=Y1+.01557/10
2050 Z1=Z1+.09167/10
2060 GOSUB Start
2070 BEEP
2080 WAIT 3000
2090 NEXT Sw
2100 FOR Sw=1.125 TO 15 STEP .125
2110 Sc=Sw
2120 GOSUB Start
2130 BEEP
2140 WAIT 3000
2150 NEXT Sw
2160 E1=2
2170 E2=1
2180 FOR Sw=1 TO 5
2190 READ Sma(1,Sw),Sma(2,Sw),Sma(3,Sw)
2200 NEXT Sw
2210 DATA 11.94488695,23.84342003,.16111124
2220 DATA 9.89231161,23.98098733,.17309321
2230 DATA 7.51989332,24.06100661,.16701462
2240 DATA 4.91701180,24.09013358,.16316710
2250 DATA 2.18922337,24.07448333,.16173998
2260 FOR Sw=1 TO 5
2270 READ Sub(1,Sw),Sub(2,Sw),Sub(3,Sw)
2280 NEXT Sw
2290 DATA 2.18922337,24.07448333,.16173998
2300 DATA 4.91640390,24.09276687,.16318032
2310 DATA 7.51804615,24.06621710,.16704089
2320 DATA 9.88869734,23.98668603,.17313225
2330 DATA 11.93912120,23.85350123,.16116267
2340 FOR Sw=1 TO 5
2350 READ Swc(1,Sw),Swc(2,Sw),Swc(3,Sw)
2360 NEXT Sw
2370 DATA 2.2578E-7,-2.3487E-7,3.75E-8
2380 DATA 2.3150E-7,-2.4461E-7,3.50E-8
2390 DATA 2.3800E-7,-2.5327E-7,3.10E-8
2400 DATA 2.4180E-7,-2.5999E-7,3.00E-8
2410 DATA 2.4465E-7,-2.6450E-7,2.90E-8
2420 FOR Sw=1 TO 5
2430 READ Swd(1,Sw),Swd(2,Sw),Swd(3,Sw)
2440 NEXT Sw
2450 DATA 2.4470E-7,-2.6458E-7,2.8200E-8
2460 DATA 2.4185E-7,-2.6081E-7,2.9200E-8
2470 DATA 2.3787E-7,-2.5278E-7,3.2000E-8
2480 DATA 2.3203E-7,-2.4361E-7,3.4500E-8
2490 DATA 2.2510E-7,-2.3407E-7,3.8000E-8
2500 FOR Sw=1 TO 5
2510 READ Sum(1,Sw),Sum(2,Sw),Sum(3,Sw)
2520 NEXT Sw
2530 DATA .99951730,1.00042281,1.00028394
2540 DATA .99951291,1.00042804,1.00030077
2550 DATA .99950884,1.00043309,1.00031469
2560 DATA .99950566,1.00043721,1.00032407
2570 DATA .99950377,1.00043982,1.00032770
2580 FOR Sw=1 TO 5
2590 READ Swn(1,Sw),Swn(2,Sw),Swn(3,Sw)
2600 NEXT Sw
2610 DATA .99950377,1.00043982,1.00032770
2620 DATA .99950572,1.00043715,1.00032408
2630 DATA .99950896,1.00043296,1.00031470
2640 DATA .99951308,1.00042785,1.00030080

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2650 DATA .99951753,1.00042257,1.00028397
2660 FOR Sw=1 TO 16
2670 FOR Sw1=1 TO 5
2680 Ma(1,1,2)=-Swa(2,Sw1)
2690 Ma(1,2,2)=-Swa(1,Sw1)
2700 Sa2=-Swa(3,Sw1)
2710 Ma(2,1,2)=Swa(2,Sw1)
2720 Ma(2,2,2)=-Swa(1,Sw1)
2730 ON Sw1 GOTO 2740,2790,2840,2880,2920
2740 Ma(2,1,2)=Ma(2,1,2)+1.5
2750 Ma(2,2,2)=Ma(2,2,2)+3.15
2760 Ma(2,3,2)=-45.6
2770 Sf2=-.00635
2780 GOTO 2940
2790 Ea=11.25
2800 Ma(2,1,2)=Ma(2,1,2)+1.125
2810 Ma(2,2,2)=Ma(2,2,2)+4
2820 Ma(2,3,2)=-34.45
2830 GOTO 2940
2840 Ma(2,1,2)=Ma(2,1,2)+.75
2850 Ma(2,2,2)=Ma(2,2,2)+4.1
2860 Ma(2,3,2)=-23.3
2870 GOTO 2940
2880 Ma(2,1,2)=Ma(2,1,2)+.375
2890 Ma(2,2,2)=Ma(2,2,2)+4.1
2900 Ma(2,3,2)=-12.15
2910 GOTO 2940
2920 Ma(2,2,2)=Ma(2,2,2)+4.1
2930 Ma(2,3,2)=-1
2940 GOSUB Start
2950 BEEP
2960 WAIT 3000
2970 BEEP
2980 WAIT 3000
2990 NEXT Sw1
3000 Ea=0
3010 FOR Sw1=1 TO 5
3020 Swa(1,Sw1)=Swa(1,Sw1)+Swm(1,Sw1)
3030 Swm(1,Sw1)=Swm(1,Sw1)+Swa(1,Sw1)
3040 Swa(2,Sw1)=Swa(2,Sw1)*Swm(2,Sw1)
3050 Swm(2,Sw1)=Swm(2,Sw1)+Swa(2,Sw1)
3060 Swa(3,Sw1)=Swa(3,Sw1)+Swm(3,Sw1)
3070 Swm(3,Sw1)=Swm(3,Sw1)+Swa(3,Sw1)
3080 NEXT Sw1
3090 IF Sw=16 THEN 3570
3100 Sf2=-.00726
3110 GOSUB Start
3120 BEEP
3130 WAIT 3000
3140 BEEP
3150 WAIT 3000
3160 FOR Sw1=1 TO 5
3170 Ma(1,1,2)=-Swb(2,1)
3180 Ma(1,2,2)=-Swb(1,Sw1)
3190 Sa2=-Swb(3,Sw1)
3200 Ma(2,1,2)=Swb(2,Sw1)
3210 Ma(2,2,2)=-Swb(1,Sw1)
3220 ON Sw1 GOTO 3230,3270,3310,3350,3390
3230 Ma(2,2,2)=Ma(2,2,2)+4.1
3240 Ma(2,3,2)=-1
3250 Sf2=-.00833
3260 GOTO 3430
3270 Ma(2,1,2)=Ma(2,1,2)+.375
3280 Ma(2,2,2)=Ma(2,2,2)+4.1
3290 Ma(2,3,2)=-12.15
3300 GOTO 3430

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3310 Ma(2,1,2)=Ma(2,1,2)+.75
3320 Ma(2,2,2)=Ma(2,2,2)+4.1
3330 Ma(2,3,2)=-23.3
3340 GOTO 3430
3350 Ma(2,1,2)=Ma(2,1,2)+1.125
3360 Ma(2,2,2)=Ma(2,2,2)+4
3370 Ma(2,3,2)=-34.45
3380 GOTO 3430
3390 Ma(2,1,2)=Ma(2,1,2)+1.5
3400 Ma(2,2,2)=Ma(2,2,2)+3.15
3410 Ma(2,3,2)=-45.6
3420 Sf2=-.00726
3430 GOSUB Start
3440 BEEP
3450 WAIT 3000
3460 BEEP
3470 WAIT 3000
3480 NEXT Sw1
3490 FOR Sw1=1 TO 5
3500 Swb(1,Sw1)=Swb(1,Sw1)*Swn(1,Sw1)
3510 Swn(1,Sw1)=3wn(1,Sw1)+Swd(1,Sw1)
3520 Swb(2,Sw1)=Swb(2,Sw1)*Swn(2,Sw1)
3530 Swn(2,Sw1)=Swn(2,Sw1)+Swd(2,Sw1)
3540 Swb(3,Sw1)=Swb(3,Sw1)*Swn(3,Sw1)
3550 Swn(3,Sw1)=Swn(3,Sw1)+Swd(3,Sw1)
3560 NEXT Sw1
3570 NEXT Sw
3580 FOR Sw=1 TO 20
3590 Ma(2,1,1)=Ma(2,1,1)+1
3600 GOSUB Start
3610 BEEP
3620 WAIT 3000
3630 NEXT Sw
3640 FOR Sw=1 TO 20
3650 Ma(2,1,1)=Ma(2,1,1)-1
3660 GOSUB Start
3670 BEEP
3680 WAIT 3000
3690 NEXT Sw
3700 Ma(1,1,2)=-24.24794307
3710 Ma(1,2,2)=-4.88080150
3720 Sa2=-.16396258
3730 Ma(2,1,2)=24.24794307+.375
3740 Ma(2,2,2)=-4.88080150+4.1
3750 Ma(2,3,2)=-12.15
3760 Estp=0
3770 Ea=-11.25
3780 GOSUB Start
3790 BEEP
3800 WAIT 3000
3810 BEEP
3820 WAIT 3000
3830 Ma(1,1,2)=-24.21714637
3840 Ma(1,2,2)=-7.46486796
3850 Sa2=-.16780527
3860 Ma(2,1,2)=24.21714637+.75
3870 Ma(2,2,2)=-7.46486796+4.1
3880 Ma(2,3,2)=-23.3
3890 GOSUB Start
3900 BEEP
3910 WAIT 3000
3920 BEEP
3930 WAIT 3000
3940 Ma(1,1,2)=-24.13480224
3950 Ma(1,2,2)=-9.82051961
3960 Sa2=-.17387641

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3970 Ma(2,1,2)=24.13480224+1.125
3980 Ma(2,2,2)=-9.82051961+4
3990 Ma(2,3,2)=-34.45
4000 GOSUB Start
4010 BEEP
4020 WAIT 3000
4030 BEEP
4040 WAIT 3000
4050 Ma(1,1,2)=-23.99449545
4060 Ma(1,2,2)=-11.85897289
4070 Sa2=-.18188486
4080 Ma(2,1,2)=23.99449545+1.5
4090 Ma(2,2,2)=-11.85897289+3.15
4100 Ma(2,3,2)=-45.6
4110 GOSUB Start
4120 BEEP
4130 WAIT 3000
4140 BEEP
4150 WAIT 3000
4160 Ea=0
4170 FOR Sw=14.875 TO 1 STEP -.125
4180 Sc=Sw
4190 GOSUB Start
4200 BEEP
4210 WAIT 3000
4220 NEXT Sw
4230 FOR Sw=1 TO 20
4240 Xi=Xi+.125/20
4250 Yi=Yi+.245/20
4260 Zi=Zi-.225/20
4270 Va(1)=Va(1)-60/20
4280 Va(2)=Va(2)+60/20
4290 GOSUB Start
4300 BEEP
4310 WAIT 3000
4320 NEXT Sw
4330 E1=0
4340 E2=0
4350 Tea=0
4360 Sf1=-.00833
4370 GOSUB Start
4380 BEEP
4390 WAIT 3000
4400 FOR Sw=1 TO 10
4410 Ma(1,1,1)=Ma(1,1,1)+24.67525527/10
4420 Ma(1,2,1)=Ma(1,2,1)+35.90591907/10
4430 Ma(2,1,1)=Ma(2,1,1)+35.90591907/10
4440 Ma(2,2,1)=Ma(2,2,1)-24.67525527/10
4450 Ma(2,3,1)=Ma(2,3,1)-90/10
4460 Sa2=Sa2+.23531105/10
4470 GOSUB Start
4480 BEEP
4490 WAIT 3000
4500 NEXT Sw
4510 Sf1=0
4520 GOSUB Start
4530 BEEP
4540 WAIT 3000
4550 Sf2=-.00833
4560 GOSUB Start
4570 BEEP
4580 WAIT 3000
4590 FOR Sw=1 TO 10
4600 Ma(1,1,2)=Ma(1,1,2)+23.99449545/10
4610 Ma(1,2,2)=Ma(1,2,2)+11.85897289/10
4620 Ma(2,1,2)=Ma(2,1,2)-(23.99449545+1.5)/10

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4630 Ma(2,2,2)=Ma(2,2,2)+(11.85897289-3.15) 10
4640 Ma(2,3,2)=Ma(2,3,2)+45.6 10
4650 Sa2=Sa2+.18188486
4660 GOSUB Start
4670 BEEP
4680 WAIT 3000
4690 NEXT Sw
4700 Sf2=0
4710 GOSUB Start
4720 BEEP
4730 WAIT 3000
4740 Ud(1)=0
4750 Ud(2)=0
4760 Ud(3)=0
4770 GOSUB Start
4780 FOR Sw=1 TO 5
4790 BEEP
4800 WAIT 3000
4810 NEXT Sw
4820 REM BOLT *****
4830 GOSUB Start
4840 FOR Sw=1 TO 5
4850 BEEP
4860 WAIT 3000
4870 NEXT Sw
4880 Ud(1)=1
4890 Ud(3)=3
4900 GOSUB Start
4910 BEEP
4920 WAIT 3000
4930 Sf1=-.00833
4940 GOSUB Start
4950 BEEP
4960 WAIT 3000
4970 FOR Sw=1 TO 10
4980 Ma(1,1,1)=Ma(1,1,1)-90 10
4990 Ma(1,2,1)=Ma(1,2,1)-38.76949913 10
5000 Ma(1,3,1)=Ma(1,3,1)-90 10
5010 Ma(2,3,1)=Ma(2,3,1)+51.23050082 10
5020 Sa1=Sa1-.19870899/10
5030 GOSUB Start
5040 BEEP
5050 WAIT 3000
5060 NEXT Sw
5070 Sf1=-.00417
5080 GOSUB Start
5090 BEEP
5100 WAIT 3000
5110 FOR Sw=1 TO 10
5120 Ma(1,1,1)=Ma(1,1,1)+90 10
5130 Ma(1,2,1)=Ma(1,2,1)+38.76949913 10
5140 Ma(1,3,1)=Ma(1,3,1)+90 10
5150 Ma(2,3,1)=Ma(2,3,1)-51.23050082 10
5160 Sa1=Sa1+.19870899/10
5170 GOSUB Start
5180 BEEP
5190 WAIT 3000
5200 NEXT Sw
5210 Ud(2)=2
5220 Sf2=-.00833
5230 GOSUB Start
5240 BEEP
5250 WAIT 3000
5260 FOR Sw=1 TO 10
5270 Ma(1,1,2)=Ma(1,1,2)-32.73133505 10
5280 Ma(1,2,2)=Ma(1,2,2)+46.91273106 10

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5290 Ma(2,1,2)=Ma(2,1,2)+57.72691646/10
5300 Ma(2,2,2)=Ma(2,2,2)-41.67312045/10
5310 Ma(2,3,2)=Ma(2,3,2)+30.85893505/10
5320 Sa2=Sa2-.16514635/10
5330 GOSUB Start
5340 BEEP
5350 WAIT 3000
5360 NEXT Sw
5370 FOR Sw=1 TO 10
5380 Ma(1,1,1)=Ma(1,1,1)-25.11699154/10
5390 Ma(1,2,1)=Ma(1,2,1)+17.67937646/10
5400 Ma(2,1,1)=Ma(2,1,1)+26.42698154/10
5410 Ma(2,3,1)=Ma(2,3,1)+7.53968823/10
5420 Sa1=Sa1-.17791855/10
5430 GOSUB Start
5440 BEEP
5450 WAIT 3000
5460 NEXT Sw
5470 FOR Sw=1 TO 10
5480 Va(1)=Va(1)+30/10
5490 Va(2)=Va(2)+45/10
5500 Va(3)=Va(3)-10/10
5510 Xi=Xi+.1999995/10
5520 Yi=Yi-.25/10
5530 Zi=Zi+.21667/10
5540 GOSUB Start
5550 BEEP
5560 WAIT 3000
5570 NEXT Sw
5580 FOR Sw=1 TO 15 STEP .125
5590 Sc=Sw
5600 GOSUB Start
5610 BEEP
5620 WAIT 3000
5630 NEXT Sw
5640 FOR Sw=1 TO 15
5650 Iea=Iea+120
5660 Ma(1,1,1)=Ma(1,1,1)+.80074441/15
5670 Ma(1,2,1)=Ma(1,2,1)+.67138319/15
5680 Ma(2,1,1)=Ma(2,1,1)-.78574441/15
5690 Ma(2,2,1)=Ma(2,2,1)-.67138319/15
5700 Ma(2,3,1)=Ma(2,3,1)+.135691595/15
5710 Sa1=Sa1+.00415289/15
5720 GOSUB Start
5730 BEEP
5740 WAIT 3000
5750 NEXT Sw
5760 FOR Sw=1 TO 5
5770 Ma(1,1,1)=Ma(1,1,1)+7/5
5780 Ma(2,1,1)=Ma(2,1,1)-7/5
5790 Sa1=Sa1+.03630401/5
5800 GOSUB Start
5810 BEEP
5820 WAIT 3000
5830 NEXT Sw
5840 FOR Sw=1 TO 5
5850 Ma(1,1,2)=Ma(1,1,2)-2.81886171/5
5860 Ma(1,2,2)=Ma(1,2,2)+2.19206294/5
5870 Ma(2,1,2)=Ma(2,1,2)-8.62212256/5
5880 Ma(2,2,2)=Ma(2,2,2)+4.37232369/5
5890 Ma(2,3,2)=Ma(2,3,2)+3.69186171/5
5900 Sa2=Sa2-.0734339/5
5910 GOSUB Start
5920 BEEP
5930 WAIT 3000
5940 NEXT Sw

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5950 Sf2=-.00625
5960 GOSUB Start
5970 BEEP
5980 WAIT 3000
5990 Sf2=-.00417
6000 GOSUB Start
6010 BEEP
6020 WAIT 3000
6030 FOR Sw=1 TO 5
6040 Ma(1,1,2)=Ma(1,1,2)+2.81866171/5
6050 Ma(1,2,2)=Ma(1,2,2)-2.19206284/5
6060 Ma(2,1,2)=Ma(2,1,2)+8.62212256/5
6070 Ma(2,2,2)=Ma(2,2,2)-4.37232369/5
6080 Ma(2,3,2)=Ma(2,3,2)-3.69186171/5
6090 Sa2=Sa2+.0734339/5
6100 GOSUB Start
6110 BEEP
6120 WAIT 3000
6130 NEXT Sw
6140 FOR Sw=1 TO 2
6150 Ma(1,1,2)=Ma(1,1,2)+1.5/2
6160 GOSUB Start
6170 BEEP
6180 WAIT 3000
6190 NEXT Sw
6200 Sf2=-.00625
6210 GOSUB Start
6220 BEEP
6230 WAIT 3000
6240 Sf2=-.00933
6250 GOSUB Start
6260 BEEP
6270 WAIT 3000
6280 FOR Sw=1 TO 2
6290 Ma(1,1,2)=Ma(1,1,2)-1.5/2
6300 GOSUB Start
6310 BEEP
6320 WAIT 3000
6330 NEXT Sw
6340 FOR Sw=15 TO 1 STEP -.125
6350 Sc=Sw
6360 GOSUB Start
6370 BEEP
6380 WAIT 3000
6390 NEXT Sw
6400 FOR Sw=1 TO 10
6410 Va(1)=Va(1)-30/10
6420 Va(2)=Va(2)-45/10
6430 Va(3)=Va(3)+10/10
6440 X1=X1-.1999995/10
6450 Y1=Y1+.25/10
6460 Z1=Z1-.21667
6470 GOSUB Start
6480 BEEP
6490 WAIT 3000
6500 NEXT Sw
6510 FOR Sw=1 TO 10
6520 Ma(1,1,1)=Ma(1,1,1)+17.31623713/10
6530 Ma(1,2,1)=Ma(1,2,1)-18.35075965/10
6540 Ma(2,1,1)=Ma(2,1,1)-19.14123713/10
6550 Ma(2,2,1)=Ma(2,2,1)+16.60075965/10
6560 Ma(2,3,1)=Ma(2,3,1)-7.67537983/10
6570 Sa1=Sa1+.13746165/10
6580 GOSUB Start
6590 BEEP
6600 WAIT 3000

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6610 NEXT Sw
6620 FOR Sw=1 TO 10
6630 Ma(1,1,2)=Ma(1,1,2)+32.73193505/10
6640 Ma(1,2,2)=Ma(1,2,2)-46.91273106/10
6650 Ma(2,1,2)=Ma(2,1,2)-57.72691646/10
6660 Ma(2,2,2)=Ma(2,2,2)+41.67312045/10
6670 Ma(2,3,2)=Ma(2,3,2)-30.85893505/10
6680 Sa2=Sa2+.16514635/10
6690 GOSUB Start
6700 BEEP
6710 WAIT 3000
6720 NEXT Sw
6730 Sf2=0
6740 Ud(2)=0
6750 GOSUB Start
6760 BEEP
6770 WAIT 3000
6780 FOR Sw=1 TO 10
6790 Ma(1,1,1)=Ma(1,1,1)-90/10
6800 Ma(1,2,1)=Ma(1,2,1)-38.76949918/10
6810 Ma(1,3,1)=Ma(1,3,1)-90/10
6820 Ma(2,3,1)=Ma(2,3,1)+51.23050082/10
6830 Sa1=Sa1-.19870899/10
6840 GOSUB Start
6850 BEEP
6860 WAIT 3000
6870 NEXT Sw
6880 Sf1=-.00833
6890 GOSUB Start
6900 BEEP
6910 WAIT 3000
6920 FOR Sw=1 TO 10
6930 Ma(1,1,1)=Ma(1,1,1)+90/10
6940 Ma(1,2,1)=Ma(1,2,1)+38.76949918/10
6950 Ma(1,3,1)=Ma(1,3,1)+90/10
6960 Ma(2,3,1)=Ma(2,3,1)-51.23050082/10
6970 Sa1=Sa1+.19870899/10
6980 GOSUB Start
6990 BEEP
7000 WAIT 3000
7010 Ud(1)=0
7020 Ud(3)=0
7030 GOSUB Start
7040 FOR Sw=1 TO 10
7050 BEEP
7060 WAIT 3000
7070 NEXT Sw
7080 GOTO End

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