AD-A129 026 MAGNA (MATERIALLY AND GEOMETRICALLY NONLINEAR ANALYSIS) 1/1
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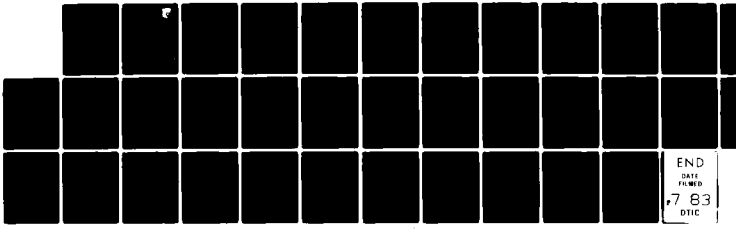

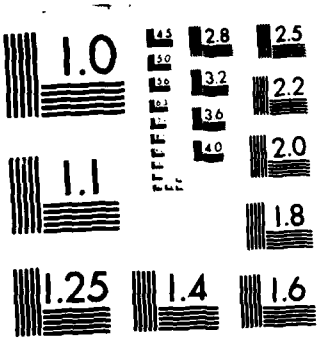

AFWAL-TR-82-3098, Part IV

(2)

MAGNA (Materially and Geometrically Nonlinear Analysis) Part IV - Quick Reference Manual

R. A. Brockman

University of Dayton Research Institute
300 College Park Avenue
Dayton, Ohio 45469

December 1982

Final Report, March 1980 - December 1982

Approved for public release; distribution unlimited

FLIGHT DYNAMICS LABORATORY
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This technical report has been reviewed and is approved for publication.

Robert E. McCarty

ROBERT E. McCARTY
Project Engineer

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Subsystems Development Group

FOR THE COMMANDER

SOLOMON R. METRES
Director
Vehicle Equipment Division

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The computer program contained in this technical report is theoretical and in no way affects any Air Force owned software programs.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Nonlinear Structural Analysis
Finite Element Analysis
Plasticity
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MAGNA
Aircraft Windshield

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This manual summarizes access and operating procedures for the MAGNA finite element analysis program and related pre- and postprocessing programs. Parallel descriptions are given for CDC, VAX, and CRAY versions of the programs where applicable. The overall organization of the system is also described, including possible data paths and data file types. The manual is intended to provide a broad summary of the MAGNA system,

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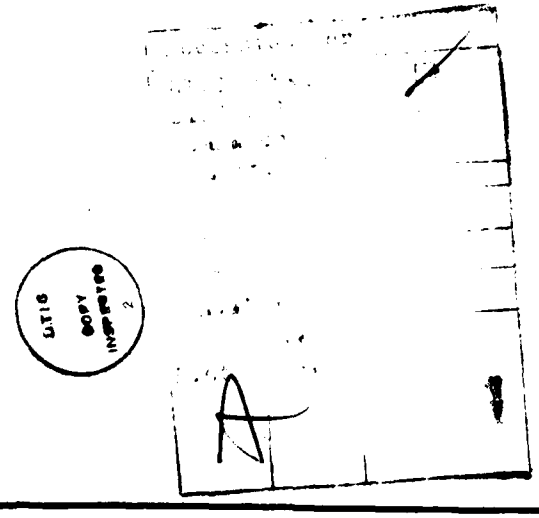
as well as a concise summary of the operating procedures described in other volumes of the program documentation.



FOREWORD

This report describes the finite element solution program MAGNA, developed at the University of Dayton Research Institute, Dayton, Ohio. Development of the program was performed between January, 1978 and December, 1982 by the Analtyical Mechanics Group (Dr. F. K. Bogner, Leader) within the Aerospace Mechanics Division (D. H. Whitford, Supervisor) of the Research Institute.

The work effort was accomplished under Project 2402, "Vehicle Equipment Technology," Task 240203, "Aerospace Vehicle Recovery and Escape Subsystems," Work Unit 24020332, "Computer Aided Design of Bird-Resistant Transparencies for USAF Aircraft."

The present report provides final documentation of the developments performed on Air Force Contract F33615-80-C-3403 between March, 1980 and December, 1982 for the Flight Dynamics Laboratory, Air Force Wright Aeronautical Laboratories, Wright-Patterson Air Force Base, Ohio. The project manager for this effort was Dr. Fred K. Bogner, and the Principal Investigator was Dr. Robert A. Brockman. Technical direction and support was provided by Mr. Robert E. McCarty (AFWAL/FIER) as the Air Force Project Engineer. The work described herein represents a continuation of previous developments performed in-house at the University of Dayton Research Institute, and on Air Force Contract F33615-76-C-3103.

The author wishes to express his appreciation for the contributions of several individuals and organizations whose efforts, support, and suggestions have resulted in significant improvements to the MAGNA program. Continuing support and many useful discussions have been provided by Dr. Fred K. Bogner; numerous improvements to both the program and its documentation have been suggested by Mr. Robert E. McCarty. The analytical development performed by Dr. H. C. Rhee and Dr. Mohan L. Soni, and the computer graphics support provided by Messrs. T. S. Bruner, C. S. King, M. P. Bouchard, M. J. Hecht, Ms. M. A. Dominic, and Ms. M. E. Wright also are gratefully acknowledged.

Mr. Thomas W. Held performed the conversion of MAGNA to the VAX 11/780. Computer resources and assistance in adapting the program to the CRAY-1 computer were provided by United Information Services; special thanks are due Mr. Kent Griffith of UIS, wno developed the necessary direct access file utilities. Finally, the efforts of Mrs. Kathy Reineke in typing the manuscript of this manual are deeply appreciated.

This report (Parts I, II, III, and IV) supersedes AFWAL-TR-80-3152, AD A099454 dated January 1981; AFWAL-TR-80-3151, AD A099530 dated January 1981; AFWAL-TR-81-3180, AD A117544 dated February 1982; and AFWAL-TR-81-3181, AD A116541 dated February 1982.

TABLE OF CONTENTS

INTRODUCTION

This manual contains brief summaries of most of the programs which comprise the MAGNA system. It is intended to serve as a quick reference for operating the programs, and for managing the data files which are needed for typical preprocessing, analysis and postprocessing operations.

The contents of this manual include the following types of information:

(a) Flow-of-information diagrams, for determining possible sequences of operation;

(b) Tabulations of programs according to functions performed;

(c) Brief descriptions of each type of data file which might be used during the analysis cycle; and

(d) Capsule descriptions of all programs in the system, arranged alphabetically. These include information about the functions performed by each program, the types and names of data files read and written, and procedures for executing the program.

The operating procedures for each program typically include parameters which are installation-dependent, such as account or directory names. These are indicated by "****" in the listed procedures. For example, the VAX directory name in which MAGNA resides at the University of Dayton is [MAGNA.RAB]; the CDC installation at Wright-Patterson Air Force Base uses ID=BROCKMAN for all program files. Therefore, on these systems a command to access the CREATE program would become, for example,

```
RUN[MAGNA.RAB]CREATE              (UDRI,VAX)
```

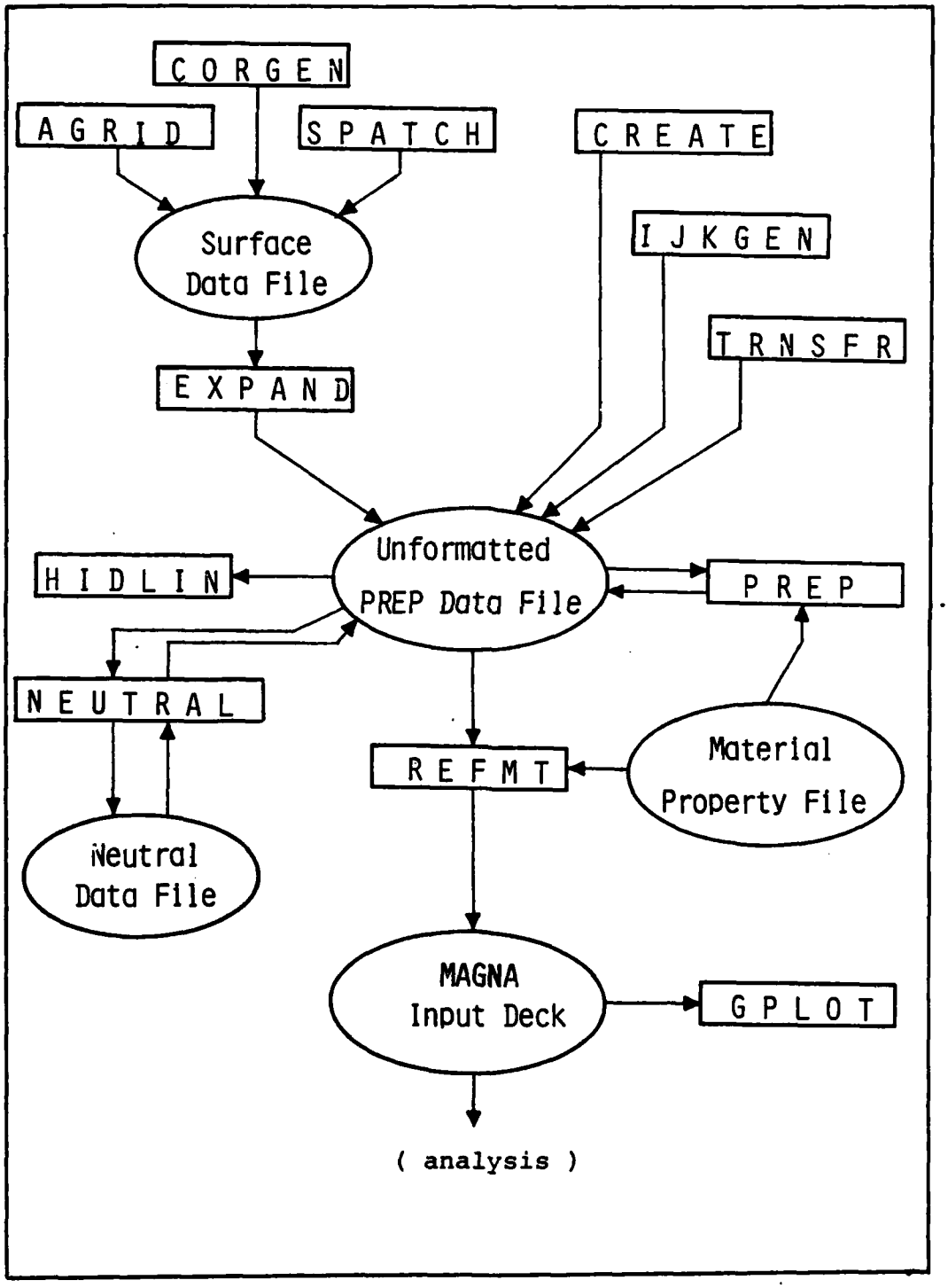
or

```
ATTACH,CREATE,ID=BROCKMAN         (WPAFB,CDC)
```

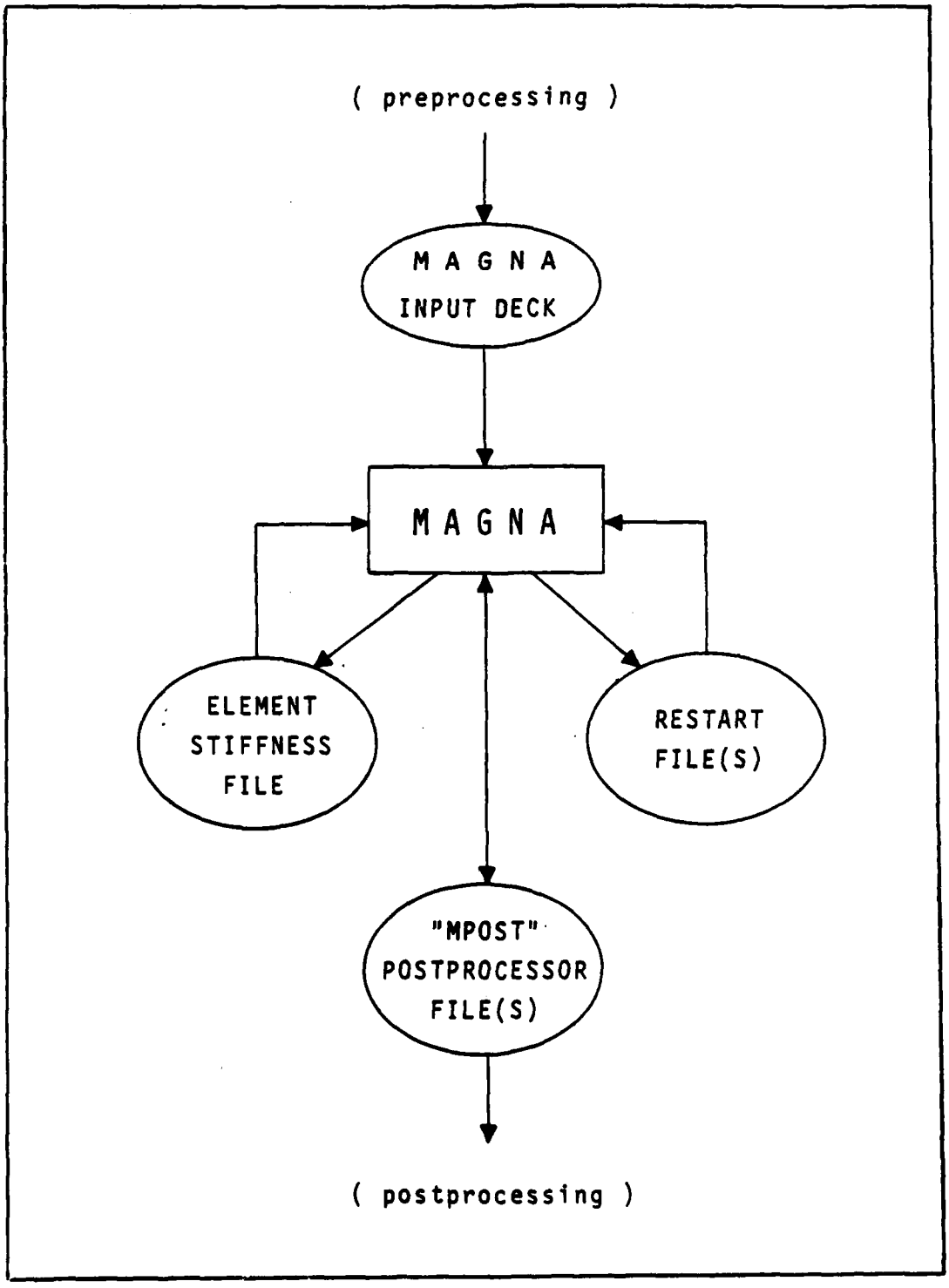
On the VAX-11/780 minicomputer, most of the programs described may be accessed through a general control procedure, by entering

```
@[MAGNA.RAB]CONTROL
```

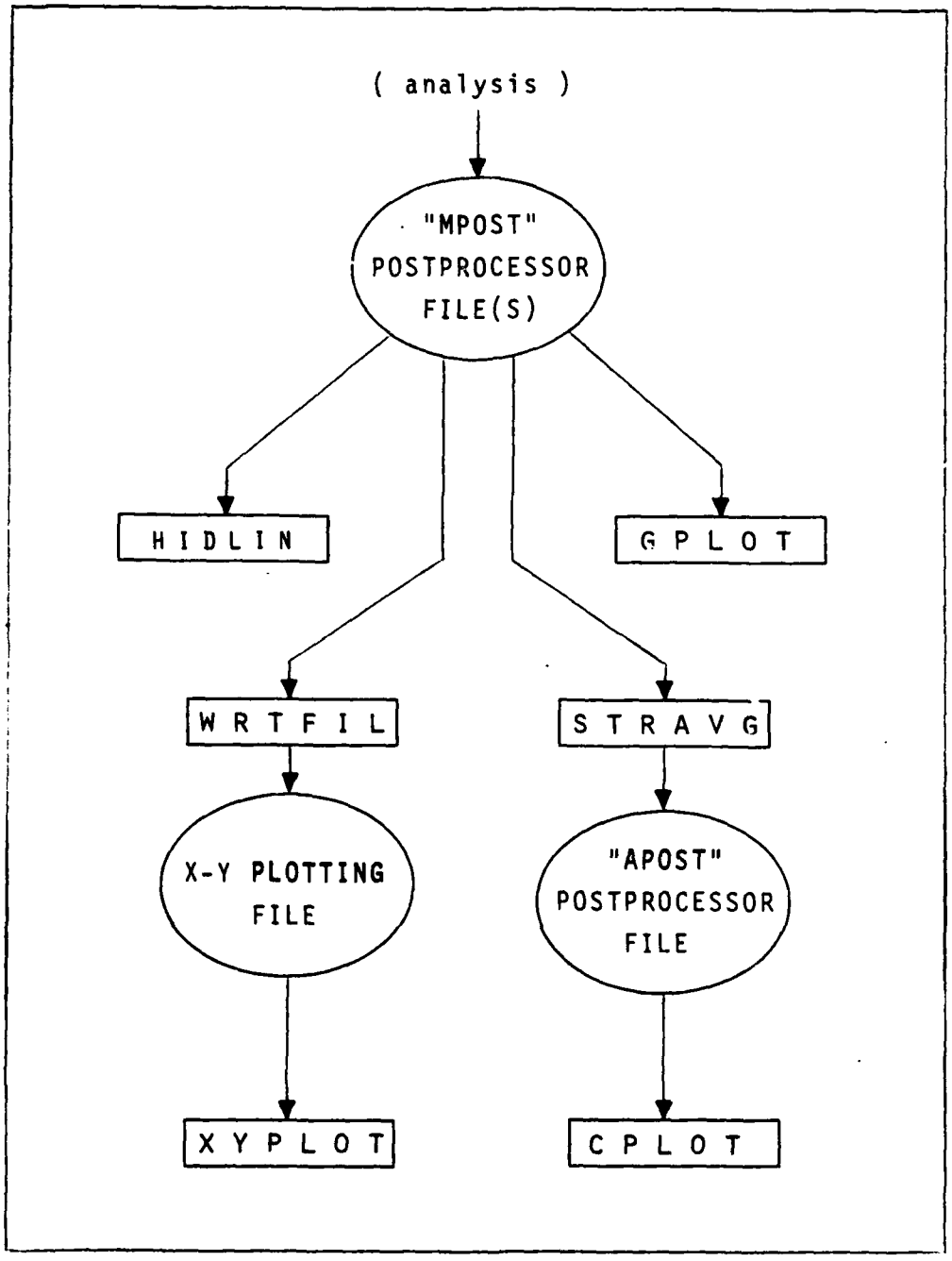
P R E P R O C E S S I N G



ANALYSIS


(preprocessing)
M A G N A
INPUT DECK
M A G N A
ELEMENT
STIFFNESS
FILE
RESTART
FILE(S)
"MPOST"
POSTPROCESSOR
FILE(S)
(postprocessing)

POSTPROCESSING



MAGNA ANALYSIS SYSTEM

PREPROCESSING

CORGEN	:	Input of lofting surface data via file or digitizing tablet.
CREATE	:	Direct input and editing of coarse mesh geometry.
IJKGEN	:	Mesh generation on analytically-defined surfaces.
TRNSFR	:	Conversion of MAGNA input to preprocessor format.
AGRID	:	Surface fitting for arbitrary point data.
SPATCH	:	Translation of surface patch data into preprocessor format.
EXPAND	:	Expansion of surface mesh data to three-dimensional form
PREP	:	Model refinement, merging, plotting, properties definition, etc.
REFMT	:	Generate a MAGNA input deck from preprocessor data.
GPLOT	:	Geometry plotting from MAGNA input deck
HIDLIN	:	Geometry plotting with hidden line removal.
NEUTRAL	:	Translate model data between preprocessor and neutral file formats.

ANALYSIS

MAGNA	:	Linear or nonlinear, static or dynamic finite element analysis.

POSTPROCESSING

STRAVG	:	Stress extrapolation and smoothing.
CPLOT	:	Contour and relief plotting.
GPLOT	:	Deformed geometry plotting.
WRTFIL	:	Write x-y plotting file.
WTFILA	:	Write x-y plotting file.
XYPLOT	:	Variable-versus-variable plotting
HIDLIN	:	Deformed geometry plotting with hidden line removal.
MPOSTMERGE	:	Combine MPOST postprocessor files.
APOSTMERGE	:	Combine APOST postprocessor files.
XYPMERGE	:	Combine x-y plotting files.

MAGNA FILE TYPES

FILE TYPE		CHARACTERISTICS	OUTPUT FROM	INPUT TO
1	MAGNA Input Deck	Formatted Sequential	REFMT	GPLOT, MAGNA, TRNSFR
2	Unformatted PREP Data File	Unformatted Sequential	CREATE, IJKGEN, PREP, TRNSFR, EXPAND, NEUTRAL	PREP, REFMT, NEUTRAL, HIDLIN
3	MPOST Postprocessing	Formatted Sequential	MAGNA, MPOSTMERGE	GPLOT, MAGNA, STRAVG, WRTFIL, HIDLIN, MPOSTMERGE
4	APOST Postprocessing	Formatted Sequential	STRAVG, APOSTMERGE	CPLOT, WTFILA, APOSTMERGE
5	X-Y Plotting File	Formatted Sequential	WRTFIL, WTFILA, XYPMERGE	XYPLOT, XYPMERGE
6	MAGNA Restart File	Unformatted Sequential	MAGNA	MAGNA
7	MAGNA Element Stiffness File	Unformatted Sequential	MAGNA	MAGNA (Frequency Solution with Prestress Only)
8	Material Properties File	Formatted Sequential	-	PREP, REFMT
9	Neutral Archive Data File	Formatted Sequential	NEUTRAL	NEUTRAL
10	Surface Data File	Unformatted Sequential	AGRID, CORGEN, SPATCH	EXPAND

AGRID

Program Name : Arbitrary GRID Input

Machine Versions : CDC

Operating Mode : Interactive

Function(s) - AGRID accepts as input an array of arbitrarily-spaced points lying on a smooth surface. A curvature minimization procedure is used to define a smooth surface passing through the data points. Output is in the form of a suitable mesh of finite elements, suitable for input to EXPAND.

Input File(s) : INGEOM File (see Preprocessor Manual)

CDC - INGEOM

Output File(s) : Surface Data File

CDC - SURFAC

Access : CDC - ATTACH,INGEOM,filename.
ATTACH,P,PREPROCESSORPROC,ID=****,MR=1.
BEGIN,AGRID,P.

APOSTMERGE

Program Name : APOST File MERGE Utility

Machine Versions : CDC

Function(s) - Combines up to ten APOST files into a single file with increment data sorted in ascending order.

Input File(s) : APOST Postprocessing File(s)

CDC - APOST1,APOST2,...,APOST1Ø

Output File(s) : APOST Postprocessing File

CDC - MAPOST

Access : CDC - ATTACH,APOST1,filename.

: : :

ATTACH,APOSTn,filename.
ATTACH,MERGLGO,APOSTMERGE,ID=****,MR=1.
MERGLGO.

CORGEN

Program Name : COoRdinate GENerator

Machine Versions : CDC

Operating Mode : Interactive

Function(s) - Accepts lofting-type geometry data from the keyboard, digitizer, and/or disk files, and generates a regular surface mesh suitable for input to EXPAND.

Input File(s) : Geometry Files (see Preprocessor Manual)

CDC - TAPE1Ø,TAPE11,...,TAPE2Ø

Output File(s) : Surface Data File

CDC - TAPE1Ø

Access : CDC - ATTACH,TAPExx,filename.
ATTACH,P,PREPROCESSORPROC,ID=****,MR=1.
BEGIN,CORGEN,P.

CPLOT

Program Name : Contour/relief PLOTter

Machine Versions: CDC, VAX

Operating Mode : Interactive

Function(s) - Generates contour and/or relief plots of stresses, strains or displacements superimposed on the gometry of a finite element model. Contour ranges and intervals, and the line density of relief plots, are user-controlled. Several labelling options are provided. Undeformed and/or deformed geometry may be used for plotting.

Input File(s) : APOST Postprocessing File

CDC - TAPE99

VAX - (filename given as input)

Output File(s) : (None)

Access : CDC - ATTACH,TAPE99,filename.
ATTACH,P,PLOTPROC,ID=****,MR=1.
BEGIN,CPLOT2,P.

VAX - RUN [****]CPLOT

CREATE

Program Name : CREATE

Machine Versions: CDC, VAX

Operating Mode : Interactive

Function(s) - Process direct keyboard input of coarse-grid finite element geometry data in two or three dimensions. Data editing and consistency checks are also included.

Input File (s) : PREP data file (optional)
CDC - UNFMTO

Output File (s) : PREP data file

CDC - UNFMT

VAX - UNFMT.DAT

Access : CDC - REQUEST,UNFMT,*PF.
ATTACH,P,PREPROCESSORPROC,ID=****,MR=1.
BEGIN,CREATE,P.
CATALOG,UNFMT,filename.

VAX - RUN[****]CREATE

EXPAND

Program Name : EXPAND Surface Data

Machine Versions : CDC

Operating Mode : Interactive or Batch

Function(s) - Generates three-dimensional finite element data from a surface geometry file containing coordinate and thickness data.

Input File(s) : Surface Data File

CDC - TAPE1Ø

Output File(s) : PREP Data File

CDC - TAPE11

Access : CDC - ATTACH,TAPE1Ø,filename.
ATTACH,P,PREPROCESSORPROC,ID=****,MR=1.
BEGIN,EXPAND,P.

GPLOT

Program Name : Geometry PLOTter

Machine Versions: CDC, VAX

Operating Mode : Interactive

Function(s) - Produces mesh geometry plots of a finite element model in both undeformed and deformed states. Numerous options are included for specifying viewing parameters, labelling nodes or elements, and scaling displacements.

Input File(s) : MAGNA Input data deck, or
MPOST Postprocessing File.

CDC - TAPE5

VAX - (filename entered as input)

Output File(s) : (None)

Access : CDC - ATTACH,TAPE5,filename.
ATTACH,P,PLOTPROC,ID=****,MR=1.
BEGIN,GPLOT,P. (Tektronix 4014)
or
BEGIN,GPLOT,P,HP. (H-P 7221)

VAX - RUN [****]GPLOT

HIDLIN

Program Name : Geometry Plotting with HIDden LINe Removal

Machine Versions: CDC

Operating Mode : Interactive

Function(s) - Performs mesh plotting of model data stored in the form of a preprocessor (PREP) data file or an MPOST postprocessor file. Hidden lines are removed from the plot using either of two algorithms.

Input File(s) : PREP Data File, or
MPOST Postprocessing File

CDC - TAPE1Ø

Output File(s) : (None)

Access : CDC - ATTACH,TAPE1Ø,filename.
ATTACH,P,PLOTPROC,ID=****,MR=1.
BEGIN,HIDLIN,P.

IJKGEN

Program Name : I-J-K mesh GENerator

Machine Versions: CDC, VAX

Operating Mode : Interactive

Function(s) - Generate a mesh of nodes and (3-D solid) finite elements for general analytically-defined shapes. Mesh points are located as functions of a system of integer indices (I,J,K).

Input File(s) : (None)

Output File(s) : PREP data file.

CDC - UNFMT

VAX - UNFMT.DAT

User Subroutines:

1. SURFAC (I,J,K,ALPHA,BETA,ZETA)- Define curvilinear coordinates as functions of indices I,J,K. Built-in options provided for uniform and graded meshes.

2. CRDTRN (ALPHA,BETA,ZETA,X,Y,Z)- Define transformation between curvilinear and rectangular coordinates. Built-in options for rectangular, cylindrical or spherical coordinates.

Access : CDC - REQUEST,UNFMT,*PF.
ATTACH,P, PREPROCESSORPROC,ID=****,MR=1.
BEGIN,IJKGEN,P.
CATALOG,UNFMT,filename.

VAX - RUN [****]IJKGEN

MAGNA

Program Name : Materially And Geometrically Nonlinear Analysis

Machine Versions: CDC, CRAY, VAX

Operating Mode : Non-Interactive

Function(s) - MAGNA performs linear and nonlinear static and dynamic solutions for structural finite element models. Large deflections, finite rotations, plasticity, contact and deformation-dependent loading may be considered. Analysis restart, user-supplied subroutines and numerous other special features are supported.

Input File(s) : 1. Standard MAGNA input deck

CDC - TAPE5
CRAY - FTØ5
VAX - FORØØ5.DAT

2. MAGNA restart file (optional)

CDC - TAPE23
CRAY - FT23
VAX - (filename supplied as input)

3. MAGNA element stiffness file (optional)

CDC - STIFF
CRAY - FT12
VAX - MAGNEM.DAT

4. MPOST postprocessing file (optional)

CDC - TAPE23
CRAY - FT23
VAX - FORØ97.DAT

Output File(s) : 1. Printer output (input data echo, messages, analysis results, time summary

CDC - OUTPUT
CRAY - $OUT
VAX - SYS$OUTPUT

2. MAGNA restart file (optional)

CDC - NRSTAP
CRAY - FT98
VAX - (filename supplied as input)

3. MPOST postprocessing file

CDC - MPOST
CRAY - FT99
VAX - MAGNPO.DAT

4. MAGNA element stiffness file

CDC - STIFF
CRAY - FT12
VAX - MAGNEM.DAT

User Subroutines : (Many - refer to user's manual)

Access : CDC - SET,R1=MFL.
ATTACH,TAPE5,filename.
: : :
ATTACH,P,MAGNAJCL,ID=****,MR=1.
BEGIN,XMAGNA,P,kywd1,kywd2,R1+B.

CRAY - GET,FT05=filename.
GET,IOLIB=RBIOLIB,ID=****.
GET,MAGNA,ID=****.
LDR,DN=MAGNA,LIB=IOLIB.

VAX - @[****]SETUP
SUBMIT MBATCH.COM

MPOSTMERGE

Program Name : MPOST File MERGE Utility

Machine Versions: CDC

Operating Mode : Interactive or Batch

Function(s) - Combines up to ten MPOST files into a single file with increment data sorted in ascending order.

Input File(s) : MPOST Postprocessing File(s)

CDC - MPOST1,MPOST2,...,MPOST1Ø

Output File(s) : MPOST Postprocessing File

CDC - MERMPO

Access : CDC - ATTACH,MPOST1,filename.

⋮ ⋮ ⋮

ATTACH,MPOSTn,filename.
ATTACH,MERGLGO,MPOSTMERGE,ID=****,MR=1.
MERGLGO.

NEUTRAL

Program Name : NEUTRAL File Translator

Machine Versions: CDC, VAX

Operating Mode : Interactive

Function(s) - Converts PREP data files to formatted form for archival or remote-job-entry, or translates the formatted data back into the PREP data file format.

Input File(s) : PREP Data File, or
Neutral (archive) data file

CDC - UNFMT or FMTDAT
VAX - (filename given as input)

Output File(s) : Neutral (archive data file, or
PREP Data File

CDC - FMTDAT or UNFMT
VAX - (filename given as input)

Access : CDC - ATTACH,UNFMT,filename.
(or)
ATTACH,FMTDAT,filename.
ATTACH,P,PREPROCESSORPROC,ID=****,MR=1.
BEGIN,NEUTRAL,P.

VAX - RUN[****]NEUTRAL

PREP

Program Name : PREProcessor

Machine Versions: CDC, VAX

Operating Mode : Interactive

Function(s) - Performs a variety of preprocessing operations on models stored in unformatted neutral data files. Options include:

BOUNDS - assign constraint conditions;
CONTACT - flag elements for contact analysis;
COPY - duplicate model file;
CREATE - begin editing of new model;
DELETE - erase model file;
EDIT - perform editing of existing data file;
FILL - generate midside nodes;
HELP - print options description(s);
LIST - list contents of model file;
LOAD - assign loads or pressures;
MASK - delete midside or other nodes;
MERGE - combine two models;
NAME - name a model file;
PLOT - perform geometry plotting;
PRINT - print model data;
PROPS - assign physical properties;
REFINE - subdivide selected elements;
REFLECT - reflect a model file;
RENUMBER - reorder node points;
ROTATE - rotate model in space;
SHELL - select shell element;
SIFT - remove unused node points;
STOP - terminate execution;
TIME - display elapsed CPU time;
TOLERANCE- define distance tolerance for nodal equivalency;
TRANSLATE- move model in space;
TIDY - merge and renumber coincident nodes

Input File(s) : 1. PREP data file(s)

CDC - TAPE1Ø,TAPE11,...,TAPE22

VAX - (up to 13 model files; file names are defined as input)

2. Material Properties Library

CDC - MATLIB (access transparent to user)

VAX - (access transparent to user)

Output File(s) : PREP data file(s)

CDC - TAPE1Ø,TAPE11,...,TAPE22

VAX - (up to 13 model files; file names are defined as input)

Access : CDC - ATTACH,TAPExx,filename.
ATTACH,P,PREPROCESSORPROC,ID=****,MR=1.
BEGIN,PREP,P.
REWIND,TAPEyy.
REQUEST,TEMP,*PF.
COPYBF,TAPEyy,TEMP.
CATALOG,TEMP,filename.

VAX - RUN[****]PREP

REFMT

Program Name : REForMaT

Machine Versions: CDC, VAX

Operating Mode : Interactive

Function(s) - Translate analysis data from unformatted neutral file to standard MAGNA input deck. Request additional data (options, solution parameters) as required, to complete the input data. The function of REFMT is inverse to that of TRNSFER.

Input File(s) : 1. PREP data file

CDC - UNFMT

VAX - (filename defined as input)

2. Material Property Library (optional)

CDC - MATLIB

VAX - (access transparent to user)

Output File(s) : Standard MAGNA input data deck

CDC - FDATA

VAX - (filename defined as input)

Access : CDC - REQUEST,FDATA,*PF.
ATTACH,UNFMT,filename.
ATTACH,P,PREPROCESSORPROC,ID=*****,MR=1.
BEGIN,REFMT,P.
CATALOG,FDATA,filename.

VAX - RUN [****]REFMT

SPATCH

Program Name : Surface PATCH Data Translator

Machine Versions: CDC

Operating Mode : Interactive or Batch

Function(s) - Evaluates bicubic surface patch data at selected locations to generate a surface data file suitable for input to EXPAND. User-written subroutines are required to access the surface patch database.

Input File(s) : Surface Patch Data (user-defined format)

CDC - TAPE5Ø

Output File(s) : Surface Data File

CDC - SURFAC

User Subroutines: UOPEN,UCLOSE,UPATCH

Access : CDC - ATTACH,TAPE5Ø,filename.
ATTACH,P,PREPROCESSORPROC,ID=****,MR=1.
BEGIN,SPATCH,P.

STRAVG

Program Name : STRess AVeraGe

Machine Versions: CDC, CRAY, VAX

Operating Mode : Non-Interactive

Function(s) - 1. Sort analysis results by element types and material property codes;

2. Extrapolate stress/strain data to node points; and

3. Perform smoothing of nodal values to define stress and strain values which are continuous from element to element.

Input File(s) : 1. MPOST Processing File

CDC - MPOST

CRAY - FT99

VAX - MAGNPO.DAT

Output File(s) : 1. Printed Output (nodal stress and strain values)

2. APOST Postprocessing File

CDC - APOST

CRAY - FT98

VAX - APOST.DAT

Access : CDC - REQUEST,APOST,*PF.
ATTACH,MPOST,filename.
ATTACH,STRAVG,ID=****,MR=1.
BEGIN,STRAVG,STRAVG.
CATALOG,APOST,filename.

CRAY - GET,FT99=mpostfilename.
GET,IOLIB=RBIOLIB,ID=****.
GET,STRAVG,ID=****.
LDR,DN=STRAVG,LIB=IOLIB.
PUT,FT98=apostfilename.

VAX - RUN [****]STRAVG

TRNSFR

Program Name : data TRaNSFeR

Machine Versions: CDC, VAX

Operating Mode : Interactive

Function(s) - Translate geometry data from MAGNA input deck format to unformatted neutral data file. TRNSFR performs an inverse function to program REFMT.

Input File(s) : Standard MAGNA input data deck

CDC - FMTDAT

VAX - (filename given as input)

Output File(s) : PREP data file

CDC - UNFMT

VAX - (filename given as input)

Access : CDC - REQUEST,UNFMT,*PF.
ATTACH,FMTDAT,filename
ATTACH,P,PREPROCESSORPROC,ID=****,MR=1.
BEGIN,TRNSFR,P.
CATALOG,UNFMT,filename

VAX - RUN [****]TRNSFR

WRTFIL

Program Name : WRiTe x-y plot FILe

Machine Versions: CDC, VAX

Operating Mode : Interactive

Function(s) - Collects plotting data (displacements, strains or stresses, versus time) from a postprocessor file for x-y plotting in XYPLOT.

Input File(s) : MPOST Processor File

CDC - TAPE99

VAX - (filename defined as input)

Output File(s) : X-Y Plotting File

CDC - XYSCRØ

VAX - XYSCRØ.DAT

Access : CDC - ATTACH,TAPE99,filename.
ATTACH,P,PLOTPROC,ID=****,MR=1.
REQUEST,XYSCRØ,*PF.
BEGIN,WRTFIL,P.
CATALOG,XYSCRØ,filename.

VAX - RUN [****]WRTFIL

WTFILA

Program Name : WriTe X-Y Plot FILe (Apost version)

Machine Versions: CDC, VAX

Operating Mode : Interactive

Function(s) - Prepares nodal results, as output by STRAVG, for x-y plotting. Any of the following may be plotted: displacements, strains, stresses, unit extensions, time value, and increment number.

Input File(s) : APOST Postprocessing File

CDC - APOST
VAX - (filename given as input)

Output File(s) : X-Y Plotting File

CDC - XYSCRØ
VAX - XYSCRØ.DAT

Access : CDC - ATTACH,APOST,filename.
ATTACH,P,PLOTPROC,ID=****,MR=1.
BEGIN,WTFILA,P.

VAX - RUN[****]WTFILA

XYPMERGE

Program Name : X-Y Plot File MERGE Utility

Machine Versions: CDC

Operating Mode : Interactive or Batch

Function(s) Combines up to five X-Y plotting files into a single file with data points sorted in ascending order. The number of data sets on each file must be the same.

Input File(s) : X-Y Plotting Files

CDC - XYDAT1,XYDAT2,...,XYDAT5

Output File(s) : X-Y Plotting File

CDC - XYMERGE

Access : CDC - ATTACH,XYDAT1,filename.

```
        :     :     :
ATTACH,XYDATn,filename.
ATTACH,MERGLGO,XYPMERGE,ID=****,MR=1.
MERGLGO.
```

XYPLOT

Program Name : X vs. Y PLOTter

Machine Versions: CDC, VAX

Operating Mode : Interactive

Function(s) - Generate labelled plots of one variable (displacement, strain, stress) versus another, from either file or keyboard input. Plotting files for XYPLOT are generated using WRTFIL.

Input File(s) : X-Y Plotting File (optional)

CDC - XYSCRØ

VAX - XYSCRØ.DAT

Output File(s) : (None)

Access : CDC - ATTACH,XYSCRØ,filename.
ATTACH,P,PLOTPROC,ID=****,MR=1.
BEGIN,XYPLOT,P.

VAX - RUN [****]XYPLOT

*USGPO: 1983-659-062-904