AEROSPACE REPORT NO.
ATR-74(7343)-1, VOL. III

Systems Cost/Performance Analysis (Study 2.3) Final Report

Volume III: Programmer's Manual and User's Guide

DRA

Prepared by

ADVANCED MISSION ANALYSIS DIRECTORATE
Advanced Orbital Systems Division

27 September 1974

Prepared for

OFFICE OF MANNED SPACE FLIGHT
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, D.C. 20546

Contract No. NASW-2575

Systems Engineering Operations
THE AEROSPACE CORPORATION

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SYSTEMS COST/PERFORMANCE ANALYSIS
(STUDY 2.3) FINAL REPORT

Volume III: Programmer's Manual and User's Guide

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FOREWORD

This report documents The Aerospace Corporation effort on Study 2.3, Systems Cost/Performance Analysis, performed under NASA Contract NASW-2575 during Fiscal Year 1974. The effort was directed by Mr. B. H. Campbell. Mr. R. D. Kramer, Marshall Space Flight Center and Mr. R. R. Carley, NASA Headquarters were the NASA Study Directors for this study. Their efforts in providing technical direction throughout the duration of the study are greatly appreciated.

This volume is one of three volumes of the final report for Study 2.3. The three volumes are:

Volume I	Executive Summary
Volume II	Systems Cost/Performance Model
Appendix	Data Base
Volume III	Programmer's Manual and User's Guide

Volume I summarizes the overall report. It includes the relationship of this study to other NASA efforts, significant results, study limitations, and suggested additional effort.

Volume II provides a detailed description of the Systems Cost/Performance Model. It also includes the model checkout and the results for three payload test cases. The Data Base is provided in the Appendix to Volume II.

Volume III provides a detailed description of how the Systems Cost/Performance Computer Program is organized and operates. The program listing, detailed flow charts and user restrictions are included.

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ACKNOWLEDGMENTS

The Aerospace Corporation effort on Study 2.3 was supported by various Members of the Technical Staff (MTS). The contributions of the following MTS to the System Cost/Performance Computer Program are gratefully acknowledged:

R. M. Harris
R. F. Janz
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R. E. Rice
D. E. Sakaguchi
J. C. Thacker

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FIGURES

TABLES

1. INTRODUCTION

One of the objectives for FY 1974 Study 2.3 was to implement the Systems Cost/Performance Model as a digital computer program. The program would be used to perform initial program planning, cost/performance tradeoffs, and sensitivity analyses.

Contained herein is a discussion of the operating environment in which the program was written and checked; the program specifications such as discussions of logic and computational flow; the different subsystem models involved in the design of the spacecraft; and routines involved in the nondesign area such as costing and scheduling of the design. Preliminary results for the DSCS-II design are also included.

Section 2 of this volume covers the Operating Environment. This includes both hardware and software considerations for the IBM 370/155

Section 3 contains the Program Specifications. These include the computational flow, a discussion of the MACRO-MICRO concept, a detailed discussion of the COMMON structures used for communication the model, and the Hardware Selection procedure.

Section 4 covers the subroutines that select hardware from the data base. These include Stabilization and Control (Subroutine SANDC), Auxiliary Propulsion (Subroutine AP), Data Processing and Instrumentation (Subroutine DPI), Communications (Subroutine COMM), and Electrical Power (Subroutine EP). A discussion of the communication within with the main program is included along with the default parameters set in the DATA statements.

Section 5 covers the subroutines that do not select equipment but do size or calculate information that is pertinent to the design. Subroutines included are: FILTER, which filters out incompatible designs; INITIL, which initializes certain default numbers that are needed early in the model but are not computed until later in the model; READDB, which reads the data base for any one subsystem at a time; SAVE, which saves certain matrices to be used by later subroutines; VESIZE, the vehicle sizing routine that computes weights, lengths, and inertias for the design; STRUCT, that computes the data needed to size the structure; RELY, which computes the reliability for the spacecraft; THRML, which computes the thermal requirements for the spacecraft; COSTS, which calculates the various costs involved in building and integrating the entire spacecraft system; SKED, which computes the schedule for the spacecraft from initial design phase to the launch phase; and PRNT, which outputs the final design attributes.

Section 6 contains a discussion of the data base format and tape requirements. Also discussed is the PRESORT routine which allows one to presort the data base into a different order based on cost, weight, reliability, etc.

Section 7 summarizes the restrictions and limitations established within the program.

Section 8 contains a discussion of the actual sample case used to check the program. Also included is the input section including all default values and changes pertaining to the sample case. The results of the test case are discussed here also.

Sections 9 and 10 contain the source code listing and the detailed flow charts, respectively.

2. OPERATING ENVIRONMENT

Section 2 contains a description of the operating environment within which the program was coded and checked. Paragraph 2.1 summarizes the hardware involved and Paragraph 2.2 summarizes the software involved.

2.1 HARDWARE

2.1.1 Computer

IBM 370 - 155

2.1.2 Main Memory Utilization

270K Bytes - to compile

162K Bytes - to link edit

108K Bytes - to execute

2.1.3 Magnetic Tapes

Required only for presort (see Paragraph 6.2)

2.1.4 Card Punch

Not required

2.1.5 Plotter

Not required

2.1.6 Disk

Unit 1 - requires about five tracks on an IBM 3330 (cataloged space)

NOTE: A tape may be substituted.

2.2 SOFTWARE

2.2.1 Operating System

HASP-OS Release 21.7

2.2.2 Programming Language

FORTRAN

2.2.3 Type of Run

BATCH

2.2.4 Library Subroutines

SQRT
SIN
COS
TAN
ATAN
ARSIN
EXP
FLOAT
INT
ALOG

3. PROGRAM SPECIFICATIONS

Paragraph 3.1 contains a description of the over-all program flow and a discussion of the MACRO-MICRO concept. Paragraph 3.2 contains a discussion of the common structures. Paragraph 3.3 contains a discussion of the hardware selection procedure. Detailed discussions of all subroutines can be found in Sections 4 and 5.

3.1 COMPUTATIONAL FLOW CHART

In general, it can be said that the program has an outer loop on configurations and an inner loop on iterations. The inner loop on iterations includes the calling of all subsystem subroutines and for ITER = 0 the calling of the reliability subroutine. For ITER = 1 (second pass) reliability is bypassed. The structures, thermal, cost, and print subroutines are called once per outer loop on configurations. A general flowchart is shown in Figure 3-1.

3.1.1 MACRO-MICRO

A prerequisite to the understanding of the MACRO-MICRO concept is an understanding of "configuration". A set of rules for selecting equipments is associated with each subsystem. Which set of rules is to be used at any moment in time is determined by NCONF (configuration number) for that subsystem. For example, if NCONF(1) = 5, a star sensor will be selected by reference to the appropriate equations. However, if NCONF(1) = 1, a star sensor will never be selected. Thus, the configuration numbers determine a subset of the sets of equipments, and only this subset is considered for the configuration design.

A MACRO search is a method for testing all possible combinations of configuration numbers (one per subsystem) and determining within this subset of equipments and within the subset of selection procedures the first acceptable equipments for each. Some combinations of configurations

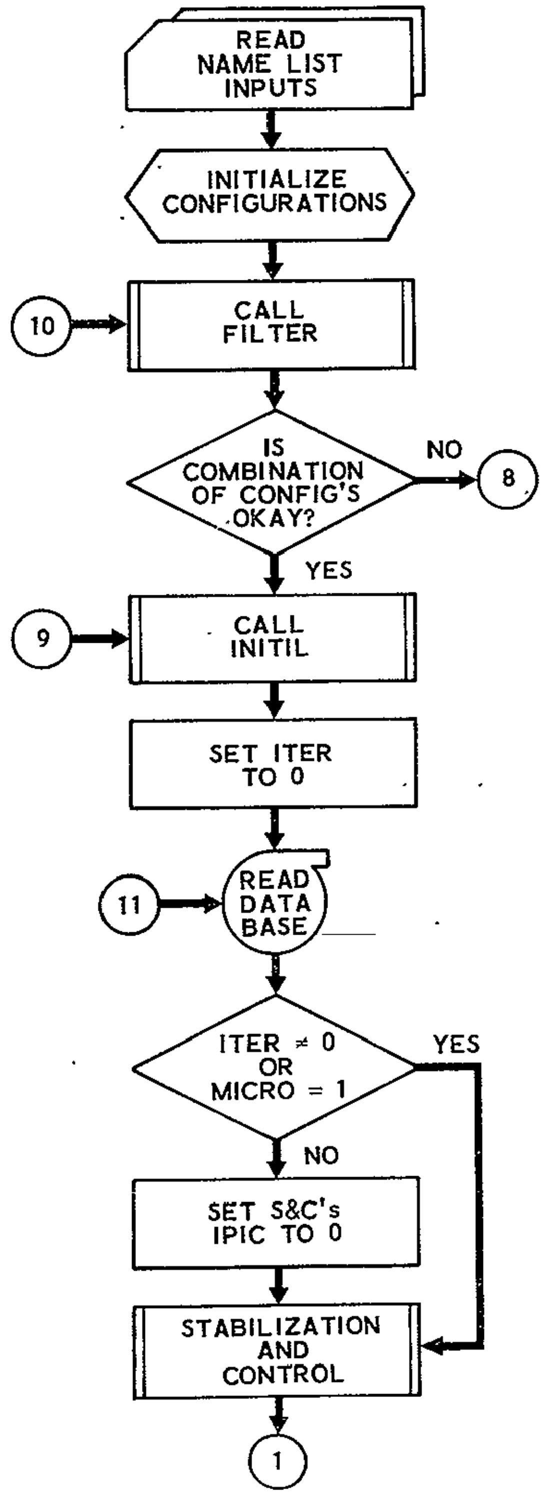

Figure 3-1. Hardware Selection Procedure in Kth Subsystem

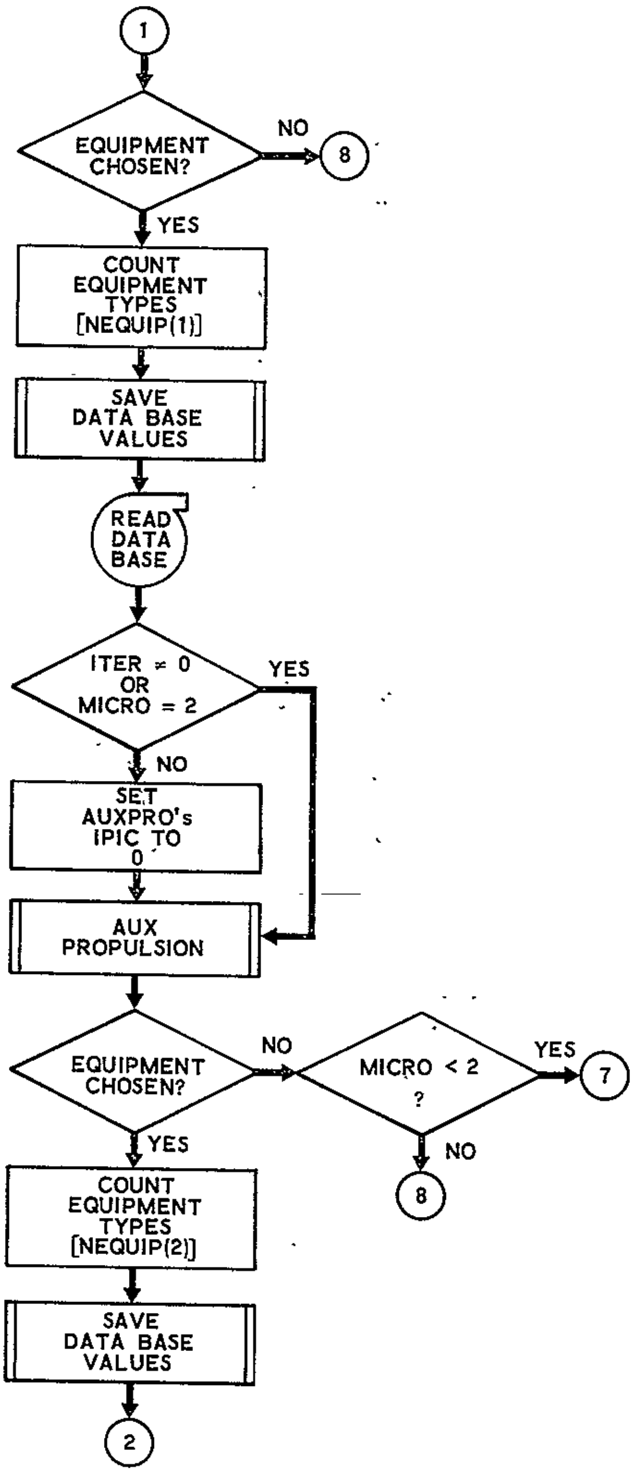

Figure 3-1. Hardware Selection Procedure in Kth Subsystem (Continued)

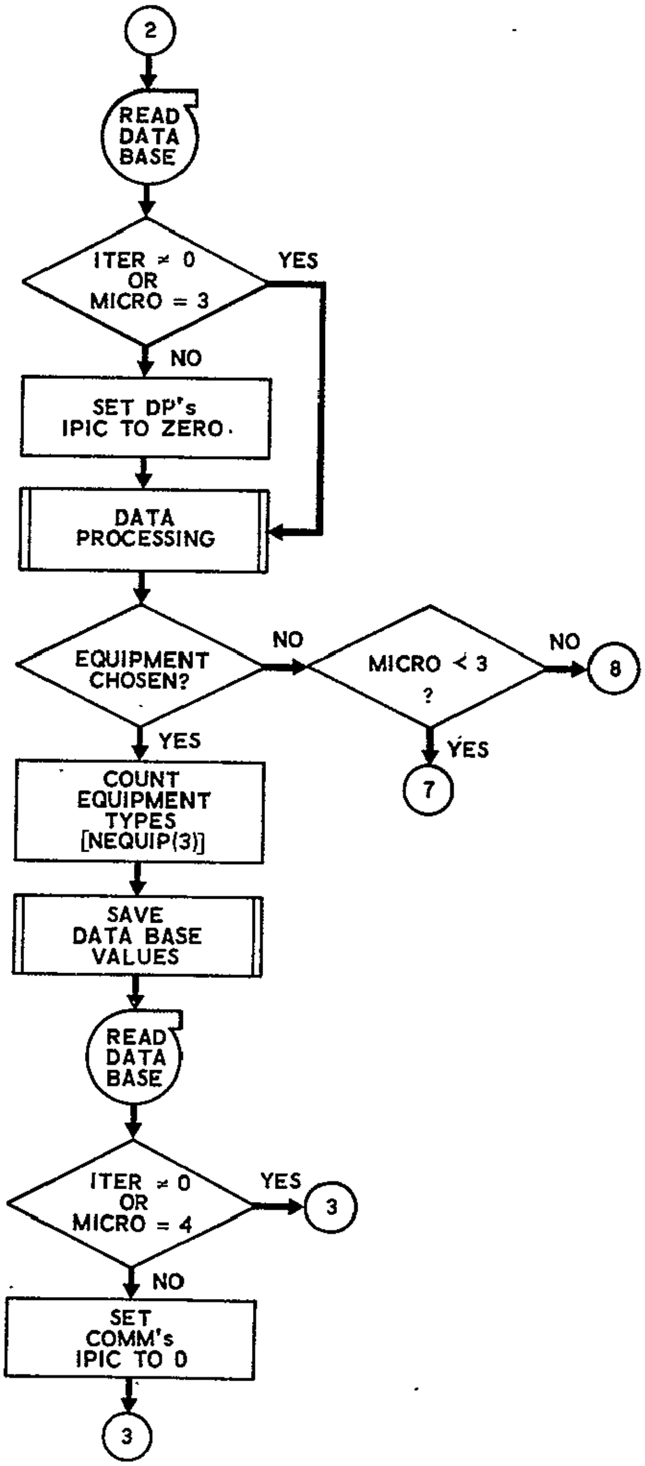

Figure 3-1. Hardware Selection Procedure in Kth Subsystem (Continued)

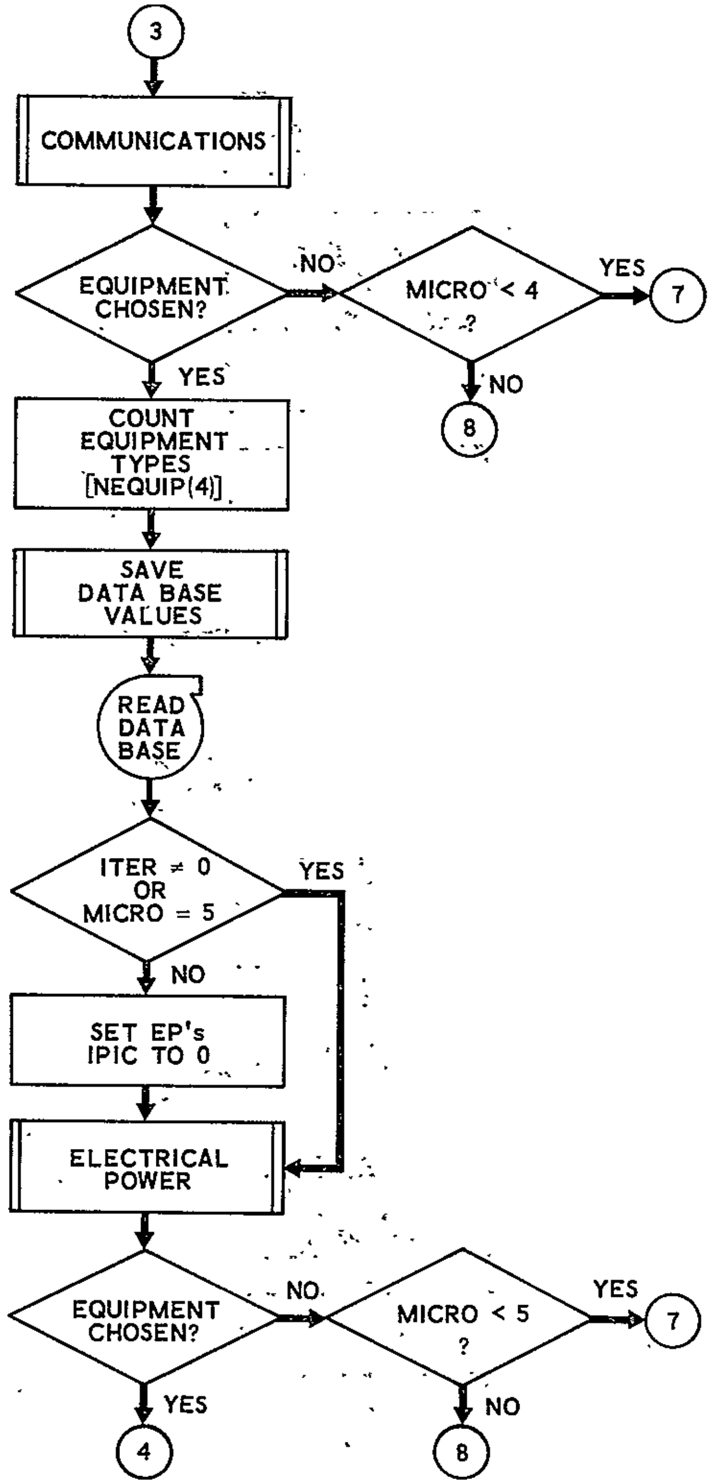

Figure 3-1. Hardware Selection Procedure in Kth Subsystem (Continued)

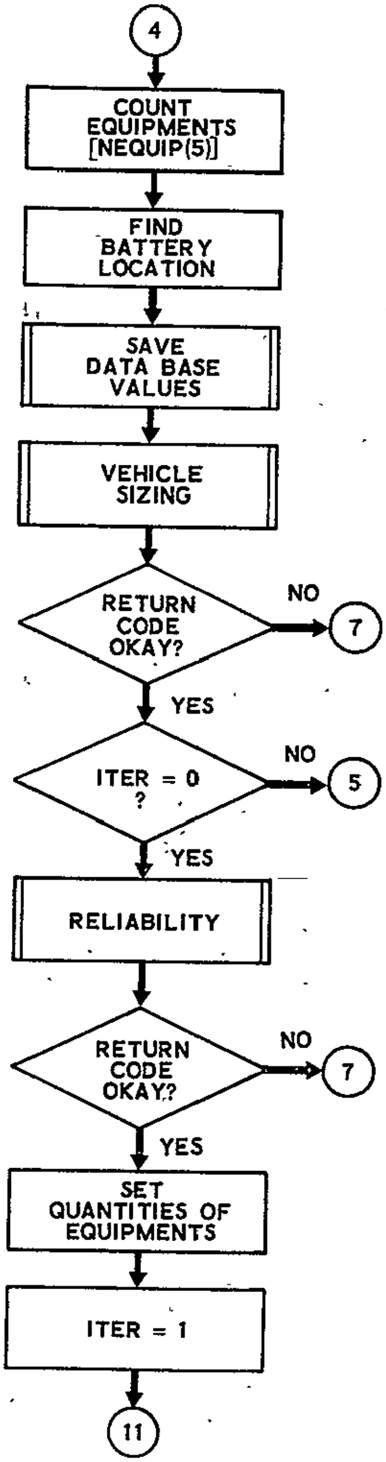

Figure 3-1. Hardware Selection Procedure in Kth Subsystem (Continued)

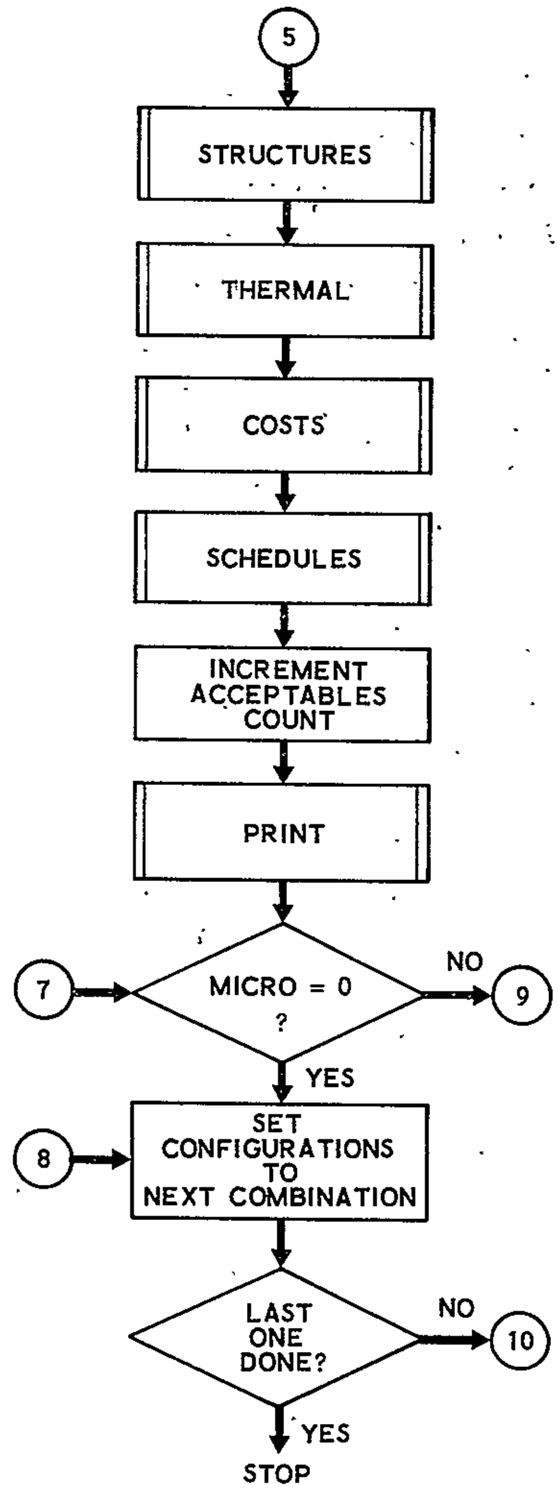

Figure 3-1. Hardware Selection Procedure in Kth Subsystem (Continued)

are never acceptable, and some are ruled out by mission requirements; but a MACRO search will, in general, produce many acceptable designs.

In a MICRO mode all configuration numbers except the one being "MICROed" are fixed. Care must be taken that these numbers are compatible. For example, VESIZE should not be set to configuration 2 when SANDC is set at 2; that is, a box shape for the equipment bay is incompatible with dual spin. Within the subsystem being "MICROed", all configurations are checked and all possible combinations of equipments within the subset determined by configuration are checked. Within a configuration then, it is essentially the stopping point which determines the difference between a MACRO and a MICRO. A MACRO selects the first acceptable equipment in each category. The MICRO selects all combinations of acceptable equipments.

3.2 COMMON REGIONS

The main COMMON regions consist of user COMMONs, DBCOM, BTWN, CHOSE, and PRTCOM.

The various user COMMONs (USER-1, USER-2, USER-3, etc.) are for storage of user specified values. These values are preset to default values by a block data routine but are overwritten by values specified in the namelist form by the user. For a complete description of the contents of the namelist variables in each user's COMMON see Paragraph 8.1. The COMMON and NAMELIST names with corresponding variables are as follows:

Named COMMON Block Name	NAMELIST Name	Subsystem
USER-1	USRSC	Stabilization and control
USER-2	USRAP	Auxiliary propulsion
USER-3	USRDP	Data processing and instrumentation
USER-4	USRCM	Communications
USER-5	USREP	Electrical power
USER-6	USRVS	Vehicle sizing
USER-7	USRTH	Thermal

Named COMMON Block Name	NAMELIST Name	Subsystem
USER-8	USRSK	Schedules
USER-9	USRST	Structures
USER-I	MODE	General
USER-R	USRRE	Reliability
USER-C	USRCS	Cost

DBCOM acts as storage for blocks of the data base. All data base values for one of the hardware selection subroutines (i.e., all 55 attributes associated with all equipments relevant to that subsystem) are read at one time. These values are stored in matrix DATAB (55, 90). In addition, the COMMON contains IDB(30) (see Paragraph 3.3) which is filled by the read routine. IDB(I) contains the last column number for the Ith equipment of the active subsystem.

The named COMMON block CHOSE contains values pertaining to equipment already chosen. ICHOSE(60) and NCHOSE(60) are concatenations of the separate ICHOSE(I) and NCHOSE(I) of each subsystem which selects hardware as discussed in Paragraph 3.3. COST(5, 60) is a matrix formed by selecting the following rows from the data base for each equipment selected:

Matrix	Row of DATAB	Description
COST (1, I)	46	Design engineering cost
COST (2, I)	47	Test and evaluation cost
COST (3, I)	48	Unit production cost
COST (4, I)	49	Reference quantity
COST (5, I)	50	Factor

SKD(7, 60) is a matrix formed by selecting the following rows from the data base for each equipment selected:

Matrix	Row of DATAB	Description
SKD (1, I)	46	Design engineering cost
SKD (2, I)	47	Test and evaluation cost
SKD (3, I)	51	Development constant
SKD (4, I)	52	Development variable
SKD (5, I)	53	Qualification constant
SKD (6, I)	54	Qualification variable
SKD (7, I)	55	State-of-the-art factor

REL(6, 60) is a matrix formed by selecting the following rows from the data base for each equipment selected:

Matrix	Row of DATAB	Description
REL (1, I)	23	Weight
REL (2, I)	41	Failure model
REL (3, I)	42	λ or μ
REL (4, I)	43	σ
REL (5, I)	44	q
REL (6, I)	45	Maximum redundancy

THM(4, 60) is a matrix formed by selecting the following rows from the data base for each equipment selected:

Matrix	Row of DATAB	Description
THM (1, I)	17	Maximum power
THM (2, I)	18	Minimum power
THM (3, I)	27	Maximum temperature
THM (4, I)	28	Minimum temperature

DPIA(11, 60) is a matrix formed by selecting the following rows from the data base for each equipment selected:

Matrix	Row of DATAB	Description
DPIA (1, I)	30	Number power commands
DPIA (2, I)	31	Number other commands
DPIA (3, I)	32	Number time tags
DPIA (4, I)	33	Number high rate analog points
DPIA (5, I)	34	Number high rate digital points
DPIA (6, I)	35	High sample rate
DPIA (7, I)	36	Word length
DPIA (8, I)	37	Number low rate analog points
DPIA (9, I)	38	Number low rate digital points
DPIA (10, I)	39	Low sample rate
DPIA (11, I)	40	Word length

These matrices are needed by the subroutines that have similar names. For example, COST is used by COSTS, REL is used by RELY, SKD is used by SKED, THM is used by THRML, and DPIA is used by DPI

PRTCOM is used to pass values to the print subroutine which are not needed (except for output) outside of a given routine. A description of the variables in this COMMON block is given below:

Name	From	Units	Description
ACCRCY	SANDC	deg	S&C accuracy
CISTAR	EP	amp-hr	Battery capacity
IREL	RELY	---	0 means single string 1 means dual string
MMDOLD	RELY	mo	Mean mission duration
TRUNC	RELY	mo	Reliability truncation time
ITRUNC	RELY	---	Index for reliability
DE	COST	$	Design engineering cost
TE	COST	$	Test and evaluation cost
TOOLR	COST	$	DDT&E tooling and test equipment cost
QCR	COST	$	DDT&E quality control cost

Name	From	Units	Description
SEIR	COST	$	DDT&E systems engineering and integration cost
PMR	COST	$	DDT&E program management cost
PE	COST	$	Unit engineering cost
PU	COST	$	Unit production cost
TOOLU	COST	$	Investment tooling and test equipment cost
QCP	COST	$	Investment quality control cost
SEIP	COST	$	Investment systems engineering and integration cost
PMP	COST	$	Investment program management cost
SATR	COST	$	DDT&E spacecraft cost
SATINV	COST	$	Spacecraft investment cost
MER	COST	$	DDT&E mission equipment cost
MEINV	COST	$	Mission equipment investment cost
PAYR	COST	$	DDT&E total payload cost
PAYINV	COST	$	Total payload investment cost
PAYQUL	COST	$	DDT&E qual. units cost
GSE	COST	$	DDT&E GSE
XLTOT	COST	$	Launch support operations cost
CTOT	COST	$	Flight operations cost
FEER	COST	$	DDT&E contractor fee
FEEINV	COST	$	Investment contractor fee
DDTE	COST	$	DDT&E program total
XVEST	COST	$	Investment program total
OPS	COST	$	Operations program total
SKTAU(1)	SKED	mo	Design and component development time
SKTAU(2)	SKED	mo	Component qualification time

Name	From	Units	Description
SKTAU(3)	SKED	mo	Subsystem development time
SKTAU(4)	SKED	mo	Subsystem qualification time
SKTAU(5)	SKED	mo	Subsystem development and flight readiness time
ROLD(60)	RELY	---	Reliability of each module
TTT	STRUCT	in.	Skin thickness
AN	STRUCT	---	Number of stringers
TS	STRUCT	in.	Stringer thickness
BS	STRUCT	in.	Stringer height
AM	STRUCT	---	Number of frames
TF	STRUCT	in.	Frame thickness
BF	STRUCT	in.	Frame height
TC	STRUCT	in.	End cover thickness forward
TA	STRUCT	in.	End cover thickness center
TB	STRUCT	in.	End cover thickness aft
TOTOPS	DPI	ips	Computer operations rate

Communication of all design variables between subsystems is accomplished via COMMON block BTWN. A description of all variables contained in BTWN is given below:

Name	From	To	Units	Description
WT	ALL	VS	lb	Accumulated equipment wt
VOL	ALL	VS	ft^3	Accumulated volume
DT	INITIL, VS	SANDC	ft	Dist. from c.g. to engine
D	INITIL, VS	SANDC	ft	Vehicle diameter
DX	INITIL, VS	SANDC	ft	Gas jet lever arm (roll, pitch, and yaw)
DY	INITIL, VS	SANDC	ft	
DZ	INITIL, VS	SANDC	ft	
XJ	INITIL, VS	SANDC	$slug\text{-}ft^2$	Vehicle inertia (roll, pitch, yaw)
YJ	INITIL, VS	SANDC	$slug\text{-}ft^2$	
ZJ	INITIL, VS	SANDC	$slug\text{-}ft^2$	

Name	From	To	Units	Description
RJ	INITIL, VS	SANDC	slug-ft^2	Rotor spin axis inertia
FF	SANDC	AUXPRO	lb	Attitude and control thrust
TI	SANDC	AUXPRO	lb-sec	Total impulse
PL	ALL	EP	watts	Average power
PLMIN	ALL	EP	watts	Minimum power
LMBDD	EP	RELY		Depth of discharge of battery capacity
AREA	EP	VS	ft^2	Solar array area
SATLG	VS	THERMAL	ft	Vehicle length
WATE	EP	VS, RELY	lb	Solar array weight
NC	EP	RELY		Number of cells
ACSWP	AUXPRO	VS	lb	Propellant weight
HARNWT	VS	COSTS	lb	Harness weight (wiring)
THCMWT	VS	COSTS	lb	Thermal control weight
CONVWT	SANDC & COMM	COSTS	lb	Converters weight
TNKWT	AUXPRO	COSTS	lb	Propellant feed systems weight
PASSTR	VS	COSTS	lb	Equivalent structures weight
SATTWT	VS	PRINT	lb	Vehicle weight.
TPRIM	REL	SANDC	mo	Mission length
IBTLOC	EP	THERMAL		Battery location (column No.)
RADA	THERMAL	PRINT	ft^2	Radiator area
RADAB	THERMAL	PRINT	ft^2	Battery radiator area
RAT	THERMAL	PRINT	ft^2	Total radiator area
HTRPWR	THERMAL	PRINT	Btu/hr	Heater power
HTRPRB	THERMAL	PRINT	Btu/hr	Battery heater power
HPT	THERMAL	PRINT	Btu/hr	Total heater power
HTPIPE	THERMAL	PRINT	Btu/hr	Heat pipe
VCHP	THERMAL	PRINT	Btu/hr	Variable conductance heat pipe
HTPT	THERMAL	PRINT	Btu/hr	Total heat pipe

Name	From	To	Units	Description
FC	SANDC	REL	hr^{-1}	APS thruster cycle rate
XNZERO	EP	RELY	rad/sec	Orbital mean motion
COMRT	COMM	DPI	ips	Command rate
ACSSN	SANDC	REL		Number of sensors
BITRAT	DPI	COMM	bps	Bit rate (mission equipment and housekeeping)

3.3 HARDWARE SELECTION PROCEDURE

This section describes the hardware selection procedure, the method of communication between the MAIN program and the hardware selection subroutines, and the general procedure used in systematically checking all hardware parameters until a component is found that meets the specifications. Discussions as to which hardware is selected can be found in the appropriate subsystem subroutine sections (see Section 4). There are five subroutines in which hardware is selected: SANDC (Stabilization and Control), AUXPRO (Auxiliary Propulsion), DPI (Data Processing and Instrumentation), COMM (Communications), and EP (Electrical Power). The procedures described in Table 3-1 and Figures 3-2 through 3-4 are applicable to all of these subroutines.

Table 3-1. Hardware Selection Procedure in Kth Subsystem

Calling Sequence

SUBROUTINE SSK (IPIC, IERR, ITER, NCONF, ICHOSE, NCHOSE)

Definition of Variable Names

1.	IPIC(NSIZE)	=	hardware index indicating data base column NSIZE = maximum number of equipments sized for any configuration
2.	IERR	=	message flag 0 means no message 1 means first message only 10 means second message only . . . 111 means first, second and third messages are applicable
3.	ITER	=	iteration flag (0 means first time through)
4.	NCONF(6)	=	system configuration indices
5.	ICHOSE(NEQUIP)*	=	I.D. of hardware chosen NEQUIP = maximum equipments (in general, more than one manufacturer per equipment) in any configuration
6.	NCHOSE(NEQUIP)	=	number of identical pieces of hardware required

Additional Variables Used in Selection Procedure

7.	DATAB(NR, NC)	=	data base for subsystem NR = total equipment attributes NC = total number of individual pieces of hardware
8.	IDB(NTOTL)*	=	last hardware column index for all equipment NTOTL = total number of equipments in data base for this subsystem (all configurations)

Assumptions in Example Routine Described Below

1. Two equipments require sizing in the first configuration.

---

* See Figure 3-2 for further explanation

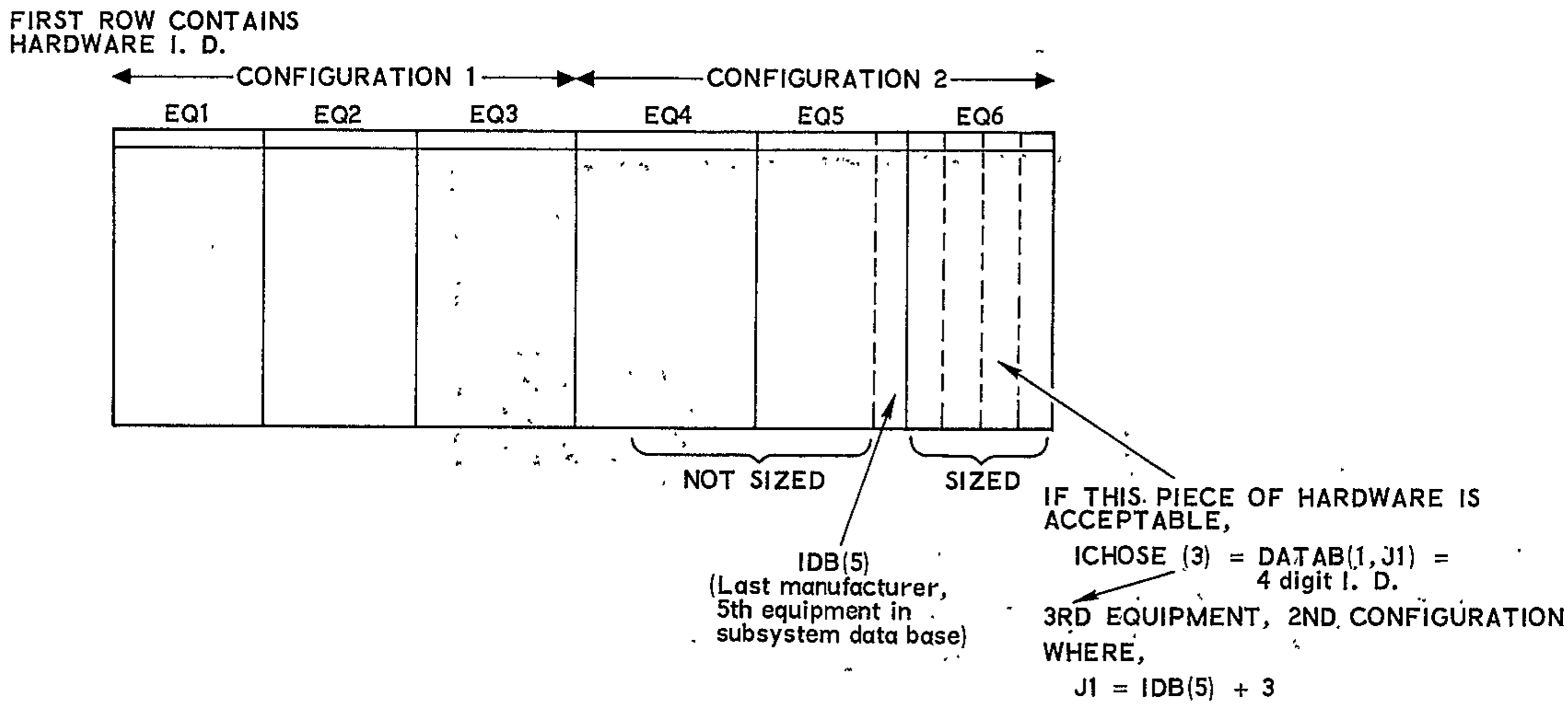

Figure 3-2. Explanation of Arrays: IDB and ICHOSE

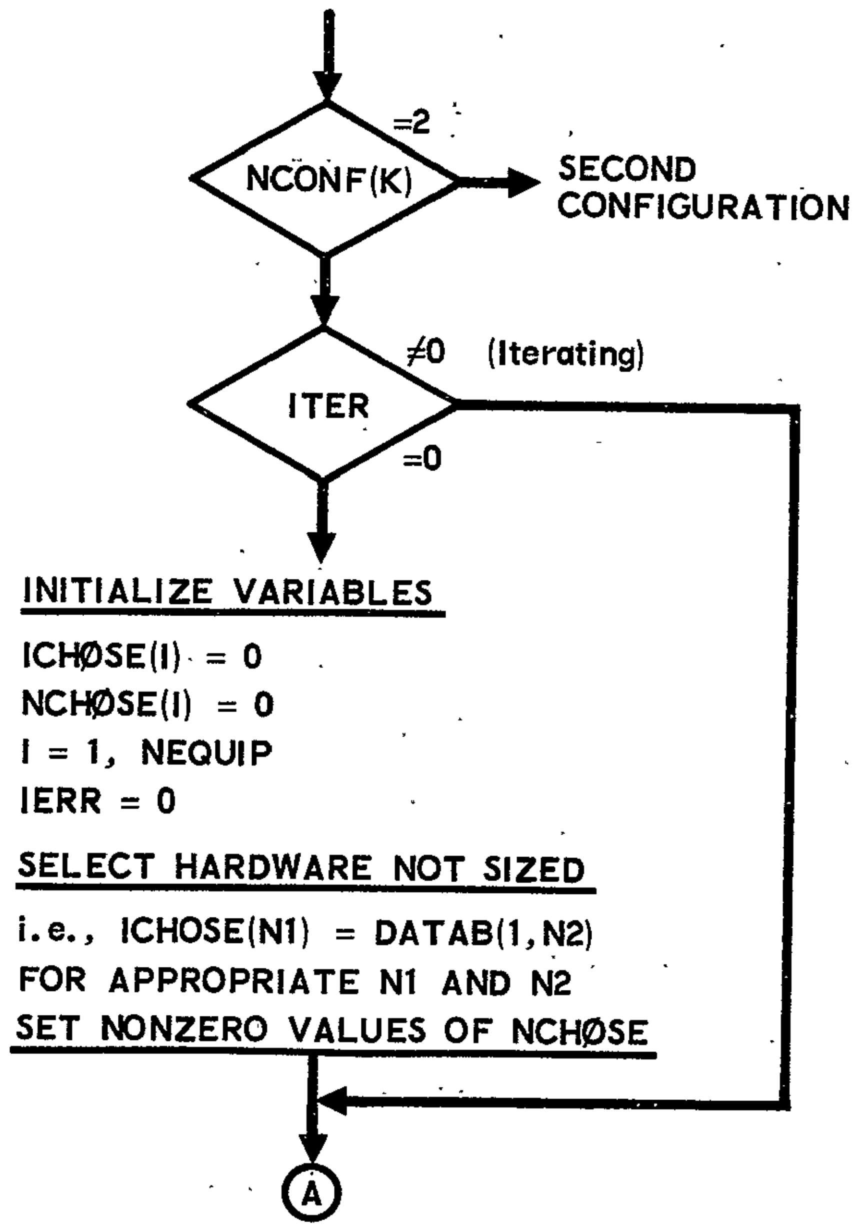

Figure 3-3. Hardware Selection Flow Chart

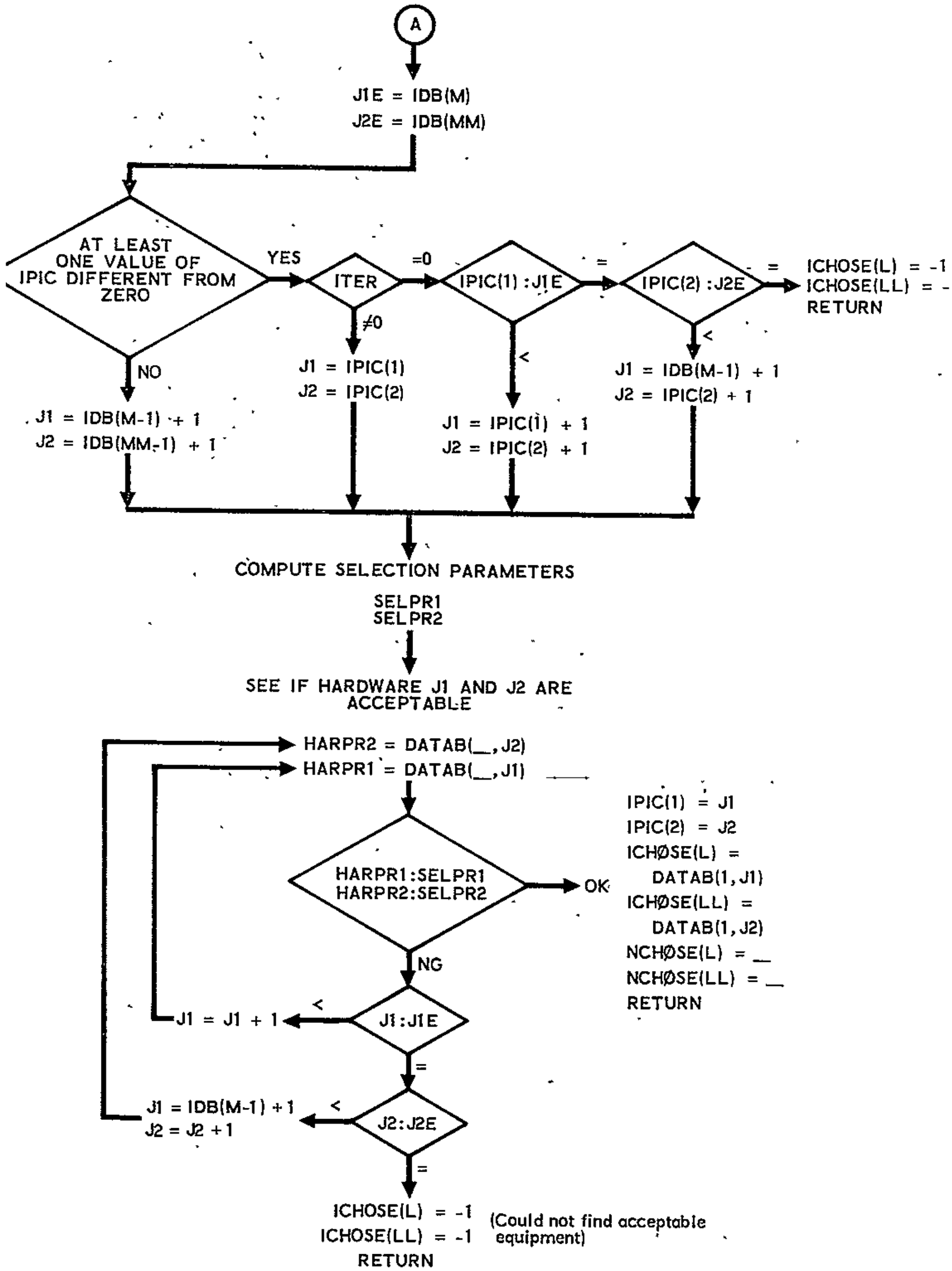

Figure 3-4. Main Program Logic

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4. SUBROUTINES WHICH SELECT HARDWARE

4.1 SUBROUTINE SANDC (IPIC, IERR, ITER, NCONF, ICHOSE, NCHOSE)

4.1.1 Purpose of Subroutine

The Stabilization and Control Subsystem stabilizes a spacecraft to a desired accuracy about a tracking line from a reference on the vehicle to an external reference. The external reference may be the local vertical of a planet, the sun, or a more distant star; an inertial reference; or the line of sight to a natural phenomenon like a gravity gradient or the lines of the earth's magnetic field. In many cases, a platform free to rotate with respect to the main structure of the vehicle must also be aligned with an external reference. The necessary accuracy of attitude stabilization depends, of course, on the mission of the vehicle.

The principal calculations, other than those necessary to select stabilization and control equipment, are contained in equations for thrust and total impulse. These are necessary for the correct sizing of equipment in auxiliary propulsion.

Those equipments which are selected on the basis of data base values, rather than merely by equipment type, vary widely from configuration to configuration. Sensor selection is based on factors such as deadband and pointing errors (with respect to various axes). The equations for sensor selection tend to be quite complicated and involve user input, numbers from other subsystems, and values from the data base for many of the selected equipments. As an example, star sensors are selected on the basis of type (mappers or trackers), rate error, pointing error, sensitivity, and compatibility with the selected gyro and control moment gyros (CMGs). CMGs are selected on the basis of momentum, gimbal rate, and torque. Reaction (or momentum) wheels are selected on the basis of the angular momentum required.

The five configurations and their equipments are as follows:

a. <u>Dual Spin</u>

1. Despin mechanical and electrical assembly
2. Valve driver assembly
3. Sun sensor
4. Nutation damper
5. Gimbal electronics
6. Control timing assembly
7. Gimbal drive assembly
8. Nonscanning earth sensor
9. Power converter

b. <u>Yaw Spin</u>

1. Sun sensor
2. ACS electronics
3. Rate gyro
4. Horizon sensor
5. Reaction wheel
6. Power converter
7. Valve driver

c. <u>Three-Axis Mass Expulsion</u>

1. Attitude reference electronics
2. Valve driver
3. Power converter
4. Rate integrating gyro
5. Scanning earth sensor

d. <u>Momentum Exchange</u>

1. Electronics processor
2. Valve driver
3. Horizon sensor or sun sensor
4. Control moment gyros
5. Rate integrating gyros
6. Star sensor

e. <u>Pitch Momentum Bias</u>

1. Valve driver
2. Electronic error processor
3. Horizon sensor
4. Momentum wheel

4.1.2 Communication with Main Program

The variables in the calling sequence are discussed in Paragraph 3.3.

User inputs are communicated by the COMMON areas USER-1 and USER-I. These are discussed in Paragraph 8.1 (see NAMELISTs USRSC and USRI). Variables are passed to and received from other subroutines through the COMMON area BTWN, which is discussed in Paragraph 3.2. The fourth COMMON area in this subroutine is DBCOM, which contains all necessary data base values and an indexing scheme to reference the values. DBCOM is also discussed in Paragraph 3.2.

4.1.3 Variables Specified in DATA Statements

Seven variables appear in DATA statements. Six of these (XMD, YMD, ZMD, XMD2, YMD2, and ZMD2) are approximations for external torques (ft-lb). The other, DI, is a minimum gas jet on-time in seconds.

4.1.4 Other Subroutines Called

None

4.2 SUBROUTINE AUXPRO (IPIC, IERR, ITER, NCONF, ICHOSE, NCHOSE)

4.2.1 Purpose of Subroutine

The auxiliary propulsion subroutine selects hardware which is required to provide attitude control forces and stationkeeping or maneuvering forces. Three configurations are considered in the subroutine. These configurations are characterized by the nature of the propellant under investigation: cold gas, monopropellant, bipropellant.

All thrusters, isolation valves, filters, regulators, and tanks are selected by comparing appropriate attributes listed in the data base with satellite performance requirements determined by the model. Thrusters are selected on the basis of thrust level, isolation valves on the basis of effective flow area, filters on the basis of flow impedance, regulators on the basis of effective flow area and pressure operating range, and tanks on the basis of volume and pressure.

The model does not include selection criteria for the fill and vent valves, fill and drain valves, or the relief valves. The first valves in the appropriate equipment slots in the data base are simply called up.

The sequence in which equipments are selected in each configuration are given below:

a. Cold Gas [NCONF(2) = 1]

1. Attitude and control thrusters
2. Translational thrusters
3. Pneumatic isolation valves
4. Pneumatic filters
5. Pneumatic regulator
6. Pneumatic tank
7. Fill and vent valve
8. Relief valve

b. Monopropellant [NCONF(2) = 2]

1. Attitude and control thrusters
2. Translational thrusters
3. Fuel circuit isolation valves
4. Fuel circuit filters
5. Pneumatic regulator
6. Pneumatic isolation valve
7. Fuel tank
8. Pneumatic tank
9. Fill and drain valve
10. Fill and vent valve
11. Relief valve

c. Bipropellant [NCONF(2) = 3]

1. Attitude and control thrusters
2. Translational thrusters
3. Fuel circuit isolation valves
4. Oxidizer circuit isolation valves
5. Fuel circuit filters
6. Oxidizer circuit filters
7. Pneumatic regulator
8. Pneumatic isolation valve
9. Fuel tank
10. Oxidizer tank
11. Pneumatic tank
12. Fill and vent valve
13. Fill and drain valves
14. Relief valve

Plumbing and connector weight in each configuration is estimated from the combined tank weight.

4.2.2 Communication with Main Program

The variables listed in the calling sequence are common to all subroutines which select hardware and are discussed in Paragraph 3.3.

In addition to the calling sequence, subroutine AUXPRO communicates with the main program via three COMMON blocks: USER-2, BTWN, and DBCOM. Variables coming through USER-2 are user inputs discussed in Paragraph 8.1 (see NAMELISTs USRAP and USRSC). The variables in BTWN and DBCOM are discussed in Paragraph 3.2.

4.2.3 Variables Specified in DATA Statements

DATA XMR/1.5/

XMR = mixing ratio for bipropellant configuration

4.2.4 Other Subrountines Called

None

4.3 SUBROUTINE DPI (IPIC, IERR, ITER, NCONF, ICHOSE, NCHOSE, NOWAT)

4.3.1 Purpose of Subroutine

The data processing and instrumentation subroutine selects hardware which is required for mission equipment data processing, command decoding, and monitoring purposes. Two configurations are considered in the subroutine: general purpose processing and special purpose processing. In the general purpose mode, a computer on board the satellite performs all data processing tasks unless there is a requirement for separate processing of telemetry data. In this case, a separate digital telemetry unit (DTU) is used to process the housekeeping data. In the special purpose mode, all processing is performed by DTUs. If the communications configuration involves uplink plus downlink, unified link-common antenna, or unified link-separate antennas, a single DTU performs all mission equipment and housekeeping data processing. If the communications configuration involves unified link-common antenna plus downlink, or unified link-separate antennas plus downlink, one DTU is used for mission equipment data processing and one DTU is used for housekeeping data processing.

The general purpose computer is selected on the basis of total required instructions (or operations) per second. The DTUs are not sized. The first DTUs in the appropriate equipment slot in the data base are simply called up.

The following quantities are computed in the sequence indicated:

a. Requirement for a digital multiplexer
b. Number of mainframe words
c. Word length
d. Bit rate
e. Number of words per subframe
f. Number of subframes

The above quantities are computed regardless of the configuration in subroutine DPI. Depending on the configuration, the following operations are performed in the sequence indicated:

a. <u>General Purpose Processing</u>
   1. If telemetry data is processed separately, select one DTU. Otherwise, compute telemetry operations per second.
   2. Compute attitude control, command, and total operations per second.
   3. Select general purpose computer.
b. <u>Special Purpose Processing</u>
   1. Depending on the communications configuration (as discussed previously), a DTU may or may not be selected for mission equipment data processing.
   2. Select DTU for housekeeping data processing.

4.3.2 Communication with Main Program

The variables listed in the calling sequence with the exception of NOWAT, are common to all subroutines which select hardware and are discussed in Paragraph 3.3. NOWAT is one greater than the number of entries in the ARRAY table. (see DPIA Matrix in Paragraph 3.2).

In addition to the calling sequence, subroutine DPI communicates with the main program via five COMMON blocks: CHOSE, DPITAB, BTWN, DBCOM, and USER-3. Variables coming through USER-3 are user inputs described in Paragraph 8.1 (see NAMELIST USRDP). The variables in BTWN, CHOSE, and DBCOM are discussed in Paragraph 3.2. The variables in DPITAB are listed below:

HRST	=	Sample rate - high (sec^{-1})
TLPTH	=	Number of analog and digital points - high rate
GRANH	=	Word length - high rate (bits)
XSRT	=	Sample rate - low (sec^{-1})
TLPTL	=	Number of analog and digital points - low rate
GRANL	=	Word length - low rate (bits)

4.3.3 Variables Specified in DATA Statements

DATA ACSRT, ACSOP, COMOP, OPREQ/10., 50., 6., 4./

where:

ACSRT	=	ACS rate (sec^{-1})
ACSOP	=	ACS operations
COMOP	=	Command operations
OPREQ	=	TLM operations required

4.3.4 Other Subroutines Called

4.3.4.1 Subroutine MIS (IPIC, IERR, ITER, NCONF, ICHOSE, NCHOSE)

The purpose of this subroutine is to select a DTU for mission equipment data processing. It is called from subroutine DPI in the special purpose processing configuration for the specific communications configurations discussed in Paragraph 4.3.1. The same six quantities (i.e., requirement for digital multiplexer, number of mainframe words, word length, bit rate, number of words per subframe, and number of subframes) which are computed in subroutine DPI for all equipment on board the satellite are computed for the mission equipment in subroutine MIS.

The variables listed in the calling sequence are discussed in Paragraph 3.3.

4.3.4.2 Subroutine ORDER (N, A, B, C, XM2, MEDIAN)

The purpose of this subroutine is to order array A from the highest to the lowest entry and determine the median entry in this array. The high rate telemetry points are ordered with respect to both sample rate and word length while the low rate telemetry points are ordered only with respect to sample rate. This information is used to determine mainframe sample rate and maximum word length.

This subroutine is called by both subroutines DPI and MIS. The variables in the calling sequence are defined as follows:

N	=	Number of entries in telemetry points table
A	=	One-dimensional array consisting of sample rates or word lengths
B	=	One-dimensional array consisting of number of analog and digital points
C	=	One-dimensional array consisting of sample rates or word lengths
XM2	=	Twice the median value of array A after it has been ordered
MEDIAN	=	Median entry in array A

4.4 SUBROUTINE COMM (IPIC, IERR, ITER, NCONF, ICHOSE, NCHOSE)

4.4.1 Purpose of Subroutine

The communication subroutine selects hardware for the satellite command and telemetry system. Five configurations are provided for in the subroutine. These are determined by the complexity of the data processor being used and the amount of data to be transmitted. The pieces of equipment which may be selected are: baseband assembly unit, transmitter antenna(s), transmitter(s), receiver antenna, receiver, diplexer, and signal conditioner. The pieces chosen and the number chosen are configuration dependent.

Each piece of equipment to be chosen is selected by comparing the attributes as computed from the user input, configuration number, and default parameter values, with the attributes for that piece of equipment in the data base.

There are pieces of equipment which have constraints placed on them for the selection process. For example, a given baseband assembly unit may be constrained for use with a given transmitter and no other. These constraints are built into the data base.

For the present, the antennas in the data base are limited to one of each type and the steerable parabolic antenna option is to be included in a later version.

The sequences in which equipment are selected in each configuration are given below:

a. Uplink Plus Downlink [NCONF(4) = 1]

1. Transmitter antenna
2. Transmitter
3. Receiver antenna
4. Receiver
5. Signal conditioner

b. Unified Link, Common Antenna [NCONF(4) = 2]

1. Baseband assembly unit
2. Antenna
3. Transmitter
4. Receiver
5. Signal conditioner
6. Diplexer

c. Unified Link, Separate Antennas [NCONF(4) = 3]

1. Baseband assembly unit
2. Transmitter antenna
3. Transmitter
4. Receiver antenna
5. Receiver
6. Signal conditioner

d. Unified Link, Common Antenna plus Downlink [NCONF(4) = 4]

1. Baseband assembly unit
2. Transmitter antenna (unified)
3. Transmitter antenna (nonunified)
4. Transmitter (unified)
5. Transmitter (nonunified)
6. Receiver
7. Signal conditioner
8. Diplexer

e. Unified Link, Separate Antennas plus Downlink [NCONF(5) = 5]

1. Baseband assembly unit
2. Transmitter antenna (unified)
3. Transmitter antenna (nonunified)
4. Transmitter (unified)
5. Transmitter (nonunified)
6. Receiver antenna
7. Receiver
8. Signal conditioner

4.4.2 Communication with Main Program

The variables listed in the calling sequence are common to all subroutines which select hardware and are discussed in Paragraph 3.3.

In addition to the calling sequence, Subroutine COMM communicates with the main program via three COMMON blocks: USER-4, BTWN, and DBCOM. Variables coming through USER-4 are user inputs discussed in Paragraph 8.1 (see NAMELIST USRCM). The variables in BTWN and DBCOM are discussed in Paragraph 3.2.

4.4.3 Variables Specified in DATA Statements

```
DATA SIGNOI/10.,10./, LMARG/6.,6./, SLANT/-1.E+10/,
     GTOT/-1.E+10/, GR/-1.E+10/, T/-1.E+10/, NF/-1.E+10/;
     TCLOSS/-0.,0./, POLOSS/0./, GAMMA/.1/, BETA/1.8/,
     GT/-1.E+10, -1.E+10/, MODX/0., 0./, ANTLOS/0./,
     COVER/0./
```

where:

SIGNOI(2) = Signal-to-noise ratios for transmitter(s) (dB)

LMARG(2)	=	Link margin(s) (dB)
SLANT	=	Slant range (nmi)
GTOT	=	Gain-to-temperature ratio
GR	=	Receiving antenna (downlink) gain (dB)
T	=	System noise temperature (^{o}K)
NF	=	Noise figure (dB)
TCLOSS(2)	=	Transmitter(s) circuit loss
POLOSS	=	Polarization loss
ANTLOS	=	Satellite antenna off-axis loss
GAMMA	=	PRN modulation index
BETA	=	Subcarrier modulation index
GT(2)	=	Antenna(s) gain (dB)
MODX(2)	=	Transmitter(s) modulation type
		MODX = 0 no equipment dependence MODX = 1 phase modulation MODX = 2 frequency modulation MODX = 3 amplitude modulation
COVER	=	Transmitter antenna coverage (in percent)

4.4.4 Other Subroutines Called

4.4.4.1 Subroutine BESS (X, BESJ, NMAX)

This subroutine uses a recursive procedure for evaluating tables of the Bessel function, $J_n(x)$.

The variables in the calling sequence are defined as follows:

X	=	floating point single precision argument
BESJ	=	one-dimensional array of values if $J_n(x)$
NMAX	=	one less than the number of values in BESJ array: i.e., BESJ $(n + 1) = J_n(x)$, $n = 0, \ldots,$ /NMAX/

4.4.4.2 Function RESET (K)

This subroutine, as the name implies, resets or initializes equipment indices in the data base.

4.5 SUBROUTINE EP (IPIC, IERR, ITER, NCONF, ICHOSE, NCHOSE)

4.5.1 Purpose of Subroutine

The electrical power subroutine selects hardware which is required to regulate the electrical power for the spacecraft and batteries to store the electrical power. Six configurations are considered in the subroutine. These configurations are characterized by the nature of the regulation and the configuration of the solar arrays.

All regulators, batteries and battery chargers are selected by comparing appropriate attributes listed in the data base with satellite performance determined by the model. Regulators are selected on the basis of their ability to regulate the power load, batteries on the basis of the capacity needed during the eclipse portion of orbit, and battery chargers on the basis of being able to use the excess power to store energy back into the battery.

The model does not include selection criteria for power control units, central control units, solar power distributor, and power distributors. The first equipments available in the data base are simply called up. The solar array area and weight are based primarily on the average power load required for the spacecraft.

The sequences in which equipments are selected in each configuration are given below:

a. Shunt Regulation - Paddle and Body Mounted Arrays [NCONF(5) = 1 or 2]

1. Shunt regulator
2. Battery
3. Battery charger
4. Power control unit

b. Shunt and Discharge Regulation - Paddle and Body Mounted Arrays [NCONF(5) = 3 or 4]

1. Discharge regulator
2. Shunt regulator
3. Battery
4. Battery charger
5. Central control unit

c. Series Load Regulation - Paddle and Body Mounted Arrays [NCONF(5) = 5 or 6]

1. Series load regulator
2. Battery
3. Battery charger
4. Power distributors
5. Solar power distributors.

4.5.2 Communication with Main Program

The variables listed in the calling sequence are common to all subroutines which select hardware and are discussed in Paragraph 3.3.

In addition to the calling sequence, subroutine EP communicates with the main program via four named COMMON blocks: USER-5, USER-I, BTWN, and DBCOM. Variables coming through USER-5 and USER-I are user inputs discussed in Paragraph 8.1 (see NAMELISTs USREP and USRI). The variables in BTWN and DBCOM are discussed in Paragraph 3.2.

4.5.3 Variables Specified in DATA Statements

```
DATA DELF/.03/, DELI/.02/, DELM/.01/, ETAI/.105/,
     ETAR/1.0/, K1/1.02/, K2/1.4/, LMBDP/.9/, SOL/1353/,
     VC/1.1/, PIE/3.1416/, CHMINT/2.0/
```

where:

DELF	=	Coverglass and coverglass adhesive transmissivity loss factor (dimensionless)
DELI	=	Array fabrication loss factor (dimensionless)
DELM	=	Miscellaneous loss factor (dimensionless)
ETAI	=	Solar cell efficiency at 28°C, AMO illumination (dimensionless)
ETAR	=	Power distribution loss factor (array to loads)
K1	=	Battery packing factor (dimensionless)
K2	=	Battery structure weight factor (dimensionless)
LMBDP	=	Solar array factor (dimensionless) (active surface area/actual surface area)
SOL	=	Average solar intensity (watts/meter^2)

VC	=	Minimum allowable cell voltage (V dc)
CHMINT	=	Minimum allowable charge time (hr)

4.5.4 Other Subroutines Called

None

5. SUBROUTINES WHICH DO NOT SELECT HARDWARE

5.1 SUBROUTINE FILTER (NCONF, ICODE)

5.1.1 Purpose of Subroutine

Some combinations of configurations are known to be unacceptable. These are filtered out without the necessity of calling any subsystems. As an example, configuration 1 in S&C and configuration 1 in EP are incompatible because 1 in S&C is a spinning vehicle and 1 in EP requires solar array paddles which cannot be used on a spinning vehicle. A complete description of these restrictions is presented in Section 7.

5.1.2 Communication with Main Program

NCONF is an array containing the number of each subsystem's configuration. ICODE is a return code of 0 for compatible configurations or -1 for unacceptable combinations of configurations.

FILTER also uses values from COMMONs USER-1, USER-3, USER-4, and USER-5, all of which are discussed in Paragraph 8.1.

5.1.3 Variables Specified in DATA Statements

None

5.1.4 Other Subroutines Called

None

5.2 SUBROUTINE INITIL (NCONF, IERRI)

5.2.1 Purpose of Subroutine

Some values are needed before they are calculated. For example, subroutine SANDC needs moments and lengths which are calculated 'downstream' in vehicle sizing. Approximations for such values are calculated here.

5.2.2 Communication with Main Program

NCONF is as previously discussed. IERRI is a flag set when the estimated satellite diameter exceeds the maximum allowable size.

INITIL also uses values from USER-1 and USER-I (both described in Paragraph 8.1) and places values in BTWN (discussed in Paragraph 3.2)

5.2.3 Variables Specified in DATA Statements

None

5.2.4 Other Subroutines Called

None

5.3 SUBROUTINE READDB (IENDDB)

5.3.1 Purpose of Subroutine

This subroutine reads all data base values for one subsystem at a time and calculates the numbers to fill the IDB array. Of major importance are the equipment numbers which exist as the first two digits of the four digit equipment identification numbers. These are counted by groups (all 1's, all 2's, all 3's, ...) and these counts exist as IDB(1), IDB(2), and so on. The routine returns when equipment for the next subsystem is encountered, i.e., when the equipment numbers begin to decrease.

5.3.2 Communication with Main Program

IENDDB is the last column in the data base for the active subsystem. This is needed for the SAVE routine. DBCOM is filled by this routine (see Paragraph 3.2).

5.3.3 Variables Specified in DATA Statements

DATA STORE/55*0./

STORE = variable used for temporary storage

5.3.4 Other Subroutines Called

None

5.4 SUBROUTINE SAVE (IIN, NIN, NOWAT, ITEST, IENDDB)

5.4.1 Purpose of Subroutine

The purpose of this subroutine is to build matrices needed by other subsystems. Specifically this routine concatenates separate ICHOSE and NCHOSE arrays (with zeros taken out) which contain the hardware I.D.'s of equipment selected for the five satellite subsystems and the number of each equipment type. It also saves the data required to fill the COST, REL THM, DPIA, and SKD arrays for their subroutines.

5.4.2 Communication with Main Program

IIN and NIN are ICHOSE and NCHOSE of the active subsystem (described in Paragraph 3.3). NOWAT is described in Paragraph 3.3. ITEST is the largest possible number of types of equipment chosen by a subsystem. The two COMMON areas (DBCOM, CHOSE) which are also used for communication with the main program are discussed in Paragraph 3.2.

5.4.3 Variables Specified in DATA Statements

None

5.4.4 Other Subroutines Called

None

5.5 SUBROUTINE VESIZE (IERR, NCONF, ICHOSE)

5.5.1 Purpose of Subroutine

The vehicle sizing subroutine determines the satellite structural weight, the total weight, the satellite volume, dimensions, center of gravity locations and the satellite inertial characteristics. Three configurations are considered in the subroutine. These configurations are characterized by the shape of the equipment bay: cylinder, box, sphere.

The following quantities are computed in the sequence indicated:

a. Equipment bay equipment weight and volume
b. Equipment bay length
c. Satellite length
d. Solar array dimensions
e. Equipment bay structural weight
f. Mission equipment bay structural weight
g. Mission equipment support weight
h. Total volume of mission equipment bay
i. Solar array boom and mechanism weight (paddles)
j. Total mission equipment and external equipment weight and volume
k. Harness weight
l. Structural thermal protection system weight
m. Satellite dry weight
n. Satellite gross weight
o. Satellite launch weight
p. Mission equipment and mission equipment bay structure CGs
q. Equipment bay structure CGs
r. External equipment CGs
s. Solar array CGs
t. Satellite CGs
u. Equipment bay structure and equipment bay equipment incremental inertia
v. External equipment incremental inertia
w. Solar array incremental inertia
x. Mission equipment bay incremental inertia
y. Total satellite inertia
z. Distance from satellite CG to main engine
$\underline{a}$. Gas jet lever arms on roll, pitch, and yaw axes

5.5.2 Communication with Main Program

All three variables listed in the calling sequence are discussed in Paragraph 3.3. (In this subroutine ICHOSE is a scalar which is set to - 1 when the current design is unacceptable.)

In addition to the calling sequence, subroutine VESIZE communicates with the main program via three COMMON blocks: USER-I, USER-6, and BTWN. Variables coming through USER-I and USER-6 are user inputs discussed in Paragraph 8.1 (see NAMELISTs USRI and USRVS). The variables in BTWN are discussed in Paragraph 3.2.

5.5.3 Variables Specified in DATA Statements

None

5.5.4 Other Subroutines Called

None

5.6 SUBROUTINE STRUCT (NCONF)

5.6.1 Purpose of Subroutine

The structures subroutine specifies the satellite loads environment and sizes the solar array extension supports, the equipment bay structure, the end covers and the midsection bulkhead if appropriate. One configuration is considered in the subroutine. This configuration is characterized by the type of equipment bay structure: semi-monocoque.

The following quantities are computed in the sequence indicated:

a. Solar array paddle applied load
b. Nominal radius and wall thickness of solar array extension supports
c. Loads applied to equipment bay structure
d. Equivalent axial load on semi-monocoque structure
e. Equivalent thickness of stiffened cylinder
f. Skin thickness of skin-stringer assembly

g. Stringer thickness, height, spacing, and efficiency

h. Number of stringers

i. Cylinder frame, radius of gyration, area, height, thickness and spacing

j. Number of frames

k. Forward and aft end cover thickness

l. Applied uniform load on midsection bulkhead

m. Midsection bulkhead thickness

If the equipment bay shape is a box instead of a cylinder, quantities comparable to those listed above in steps d - k are computed for the box shape.

5.6.2 Communication with Main Program

The variable in the calling sequence is discussed in Paragraph 3.3. In addition to the calling sequence, subroutine STRUCT communicates with the main program via three COMMON blocks: USER-6, USER-7, and BTWN. Variables coming through USER-6 and USER-7 are user inputs discussed in Paragraph 8.1 (see NAMELISTs USRVS and USRST). The variables in BTWN are discussed in Paragraph 3.2.

5.6.3 Variables Specified in DATA Statements

DATA E, XNU, RHO, SIGY, PI/1.E7, .33, .1, 3.E4, 3.1416/

where:

E	=	Young's modulus (psi)
XNU	=	Poisson's ratio
RHO	=	Weight density (lb/in^3)
SIGY	=	Yield stress (psi)

5.6.4 Other Subroutines Called

None

5.7 SUBROUTINE RELY (IRIN, IDS, NEQUIP)

5.7.1 Purpose of Subroutine

The reliability subroutine incrementally increases the level of redundancy in the spacecraft system until the system reliability, R(TRUNC), and the mean mission duration, MMD, specifications are met. The procedure is constrained by a maximum total satellite weight on cost and available equipment reserves. The subroutine operates to meet the system reliability specification prior to meeting the mean mission duration requirement.

The principle of operation is to add a redundancy to a single module, then calculate the new system reliability and the payoff, as defined by

$$\text{RHO} = \frac{\Delta \text{R(TRUNC)}}{\Delta \text{weight}}$$

This is repeated for each module where equipment reserves are available. The module offering the greatest payoff is selected, and the following three tests are applied:

a. Is RHO large enough? (The threshold is preselected.)

b. Is spacecraft weight or cost below the maximum allowed?

c. Is the R(TRUNC) still short of the requirement?

If these tests are passed, the subroutine begins the selection process again. This loop is retraced until one or more of the tests is failed. Failure of tests a or b results in termination of the design procedure. If a configuration is found which meets the system reliability requirement, then the above is repeated replacing R(TRUNC) with MMD. A final design is recognized as optimum subject to the imposed R(TRUNC), MMD, weight, and cost constraints.

The subroutine contains the additional feature in that subsystem reliabilities may be specified. The task of meeting subsystem requirements is performed prior to any total system considerations. The same logic as presented above is used for determining the appropriate subsystem redundancies.

5.7.2 Communication with Main Program

The variables listed in the calling sequence are: a return indicator, a double string design indicator, and a vector of the number of equipment types per subsystem, respectively.

Subroutine RELY additionally communicates with the main program through the COMMON blocks: USERR, USER-5, BTWN, and CHOSE. Variables in USERR and USER-5 are user inputs and are discussed in Paragraph 8.1 (see NAMELISTs USRRE and USREP). The variables in BTWN and CHOSE are discussed in Paragraph 3.2.

5.7.3 Variables Specified in DATA Statements

None

5.7.4 Other Subroutines Called

5.7.4.1 Subroutine RIMOD (J, DELH, ITRUNC, NT, IADD, IOPT

Subroutine RIMOD is called by subroutine RELY. Subroutine RIMOD computes the reliability function for a specified module with or without a redundancy added. Five different models are used, depending on the failure mode of an individual module. The calling parameters are:

J	=	Current module number
DELH	=	Time increment
ITRUNC	=	Number of time points
NT	=	Input option
IADD	=	Input option
IOPT	=	Input option

Parameters passed through COMMON block CHOSE are:

NCHOSE	=	Initial number of elements by module
SYSPAR	=	Matrix of model parameters (called DATAB in subroutine RELY)

Parameters passed through COMMON block DBCOM are:

R	=	Resultant reliability function
NR	=	Number of redundancies by module

5.7.4.2 Subroutine QSF (H, Y, Z, NDIM)

Subroutine QSF is called by subroutine RELY. Subroutine QSF computes a vector of integral values for a given equidistant table of function values. QSF is a member of the System/360 Scientific Subroutine Package. The calling parameters are:

H	=	Increment of argument values
Y	=	Input vector of function values
Z	=	Resulting vector of integral values
NDIM	=	Dimension of vectors Y and Z

No parameters are passed in common.

5.7.4.3 Subroutine GAM (X)

The function GAM is called by RIMOD. Function GAM computes the gamma function of its argument, X. GAM uses a polynomial approximation on the interval (1.0, 2.0).

5.7.4.4 Subroutine CERF (X)

The function CERF is called by RIMOD. Function CERF computes the error function for X in (0.0, 4.0) and the compliment of the error function for X in (4.0, ∞). A Chebyshev approximation is used in both cases.

5.8 SUBROUTINE THRML (IERR, NCONF)

5.8.1 Purpose of Subroutine

The thermal sizing subroutine determines the phase change material weight, insulation area, heater power, radiator area, and types of heat pipes to be used. Various configurations are considered in the subroutines dependent upon variables such as orbit, shape of vehicle, type of stabilization, power requirements, temperature limits, and battery temperatures. These variables are determined elsewhere in the model and passed to THRML via the common blocks.

The output quantities are computed in the following sequence:

a. Radiator area (RADA)
b. Heater power (HTRPWR)
c. Heat pipe (HTPIPE)
d. Battery radiator area (RADAB)
e. Battery heater power (HTRPRB)
f. Battery variable conductance heat pipe (VCHP)
g. Total radiator area (RAT)
h. Total heater power (HPT)
i. Total heat pipes (HTPT)

5.8.2 Communication with Main Program

Both variables listed in the calling sequence are discussed in Paragraph 3.3.

In addition to the calling sequence, subroutine THRML communicates with the main program via four COMMON blocks: USER-I, USER-7, CHOSE, and BTWN. Variables coming through USER-I and USER-7 are user inputs discussed in Paragraph 8.1 (see NAMELIST USRI and USRTH). The variables in BTWN and CHOSE are discussed in Paragraph 3.2.

5.8.3 Variables Specified in DATA Statements

```
DATA SIGMA/0.1714 E-08/, QS/442./, EMISS/60./,
     ALBDO/155./, CONST/1.5/, PIE/3.1416/
```

where:

SIGMA = Boltzmann constant in Btu/(hr-ft-deg R^4)
QS = Solar constant in Btu/(hr-ft^2)

EMISS	=	Earth emission in Btu/(hr-ft^2)
ALBDO	=	The Albedo in Btu/(hr-ft^2)
CONST	=	The K constant (dimensionless)

5.8.4 Other Subroutines Called

None

5.9 SUBROUTINE COSTS (NCONF, NEQUIP)

5.9.1 Purpose of Subroutine

The cost subroutine determines the cost of building and integrating a payload from the design engineering phase to the launch phase. Costs are broken down into the following categories (variable names are in parenthesis):

DDT&E (Nonrecurring)	Investment (Recurring)
Design engineering (DE)	Unit engineering (PE)
Test and evaluation (TE)	Unit production (PU)
Tooling and equipment (TOOLR)	Tooling and equipment (TOOLU)
Quality control (QCR)	Quality control (QCU)
Systems engineering and integration (SEIR)	Systems engineering and integration (SEIP)
Program management (PMR)	Program management (PMP)

Other costs which are computed are listed in the table below (variable names are written in where computed):

Cost Category	DDT&E	Investment	Operations
Spacecraft	SATR	SATINV	
Mission equipment	XMER	XMEINV	
Total payload	PAYR	PAYINV	
Quality Units	PAYQUL		
GSE	GSE		
Launch support			XLTOT

Cost Category	DDT&E	Investment	Operations
Flight operations			CTOT
Contractor fee	FEER	FEEINV	FEEOPS
Program total	DDTE	XVEST	OPS

5.9.2 Communication with Main Program

Both variables listed in the calling sequence are discussed in Paragraph 3.3.

In addition to the calling sequence, subroutine COSTS communicates with the main program via four COMMON blocks: USERC, BTWN, CHOSE, and PRTCOM. Variables coming through USERC are user inputs discussed in Paragraph 8.1 (see NAMELIST USRCS). The variables in BTWN, CHOSE, and PRTCOM are discussed in Paragraph 3.2.

5.9.3 Variables Specified in DATA Statements

DATA FR, FP, FT, FE, RE, RT, RP, BE, BT, BP, PI, SF

where:

FR(6)	=	Subsystem design engineering cost factor
FP(6)	=	Subsystem unit production cost factor
FE(6)	=	Subsystem unit engineering cost factor
FT(6)	=	Subsystem test evaluation cost factor
RE(6)	=	Design engineering CER constant
RT(6)	=	Test evaluation CER constant
RP(6)	=	Production CER constant
BE(6)	=	Design engineering CER exponent
BT(6)	=	Test evaluation CER exponent
BP(6)	=	Production CER exponent

The six values in each of the above arrays are associated with the following equipment or systems in the order indicated:

a. Solar array

b. Wiring harness

c. Thermal

d. Converters

e. Propellant feed systems

f. Structures

In addition:

PI	=	Price index (i.e., change of the value of the dollars)
SF	=	Optional factor (e.g., standardization factor)

5.9.4 Other Subroutines Called

None

5.10 SUBROUTINE SKED (NEQUIP, NCONF)

5.10.1 Purpose of Subroutine

The purpose of this subroutine is to calculate component development lead time, subsystem development, component qualification time, subsystem qualification lead time, test lead time, and a total time for each subsystem and for the mission equipment. The critical path is determined and the associated times are passed to the PRNT routine.

5.10.2 Communication with Main Program

Both variables in the calling sequence are discussed in Paragrap 3.3. Subroutine SKED also communicates with the main program via three COMMON areas: CHOSE, USER-8, and PRTCOM. Variables coming throu USER-8 are user inputs discussed in Paragraph 8.1 (see NAMELIST VSRSK) The variables in BTWN and PRTCOM are discussed in Paragraph 3.2.

5.10.3 Variables Specified in DATA Statements

DATA CONF, ICI

where:

CONF(22, 5)	=	Configuration dependent weighting factors
ICI(5)	=	Index with which the CONF array is addressed

5.10.4 Other Subroutines Called

None

5.11 SUBROUTINE PRNT (IERR, NEQUIP, NACCEP, NCONF)

5.11.1 Purpose of Subroutine

This subroutine prints all output determined by the model. A sample of the output may be found in Paragraph 8.3. The output consists of a glossary and acceptable design attributes for the specified mission.

5.11.2 Communication with Main Program

The variables IERR and NCONF listed in the calling sequence are discussed in Paragraph 3.3. NEQUIP is discussed in Paragraph 3.1. NACCEP is a counter maintained by MAIN and used only by PRNT. It is the acceptable design number identifying the particular run.

In addition to the calling sequence, subroutine PRNT communicates with the main program via four COMMON blocks: BTWN, PRTCOM, CHOSE, and DBCOM. The variables in these common areas are discussed in Paragraph 3.2.

5.11.3 Variables Specified in DATA Statements

None

5.11.4 Other Subroutines Called

None

6. DATA BASE

Paragraph 6.1 contains the discussion of the data base, the position of the attributes contained therein, and a description of the data base tape. Paragraph 6.2 discusses the PRESORT program which may reorder the data base as an input to the model.

6.1 FORMAT

The data base tape is a seven track, BCD tape, 800 bpi and blocked 84 characters per record. The format is illustrated in Figure 6-1.

Equipments in the data base are ordered by: (1) subsystems, (2) configuration within each subsystem, and (3) equipment types within each configuration [sized equipment(s) first, selected equipment(s) second]. Within equipment types, the equipment is ordered according to the prime technical performance parameter. (This ordering may be changed by the PRESORT routine discussed in Paragraph 6.2.) A list of the data base equipment in the order determined by these considerations is given below:

a. Stabilization and Control

1. Despin mechanical and electronics assembly
2. Valve driver assembly
3. Sun sensor with electronics
4. Nutation damper
5. Gimbal electronics assembly
6. Control timing assembly
7. Biaxial drive assembly
8. Nonscanning earth sensor
9. Sun sensor with electronics
10. Control electronics assembly
11. Rate gyro assembly
12. Horizon sensor
13. Reaction wheel
14. Power converter
15. Attitude reference electronics
16. Valve driver assembly
17. Rate integrating gyros

18. Horizon sensor (with electronics)
19. Electronics processing assembly
20. Single gimbal control moment gyro
21. Star sensor with electronics
22. Electronic error processor

b. Auxiliary Propulsion

1. Cold gas pneumatic thruster
2. Cold gas isolation valve
3. Cold gas filter
4. Cold gas pressure regulator
5. Cold gas pneumatic tank
6. Cold gas fill and vent valve
7. Cold gas relief valve
8. Monopropellant thruster
9. Monopropellant isolation valve
10. Monopropellant filter
11. Monopropellant spherical tank
12. Monopropellant fill valve
13. Bipropellant thruster
14. Bipropellant isolation valve
15. Bipropellant filter
16. Bipropellant tank
17. Bipropellant fill valve

c. Data Processing and Instrumentation

1. General purpose processor
2. Special purpose processor (digital telemetry unit)

d. Communications

1. Base band assembly unit
2. Antenna
3. Transmitters
4. Receiver
5. Signal conditioner
6. Diplexer
7. Converters (transmitter and receiver)

e. Electrical Power

1. Shunt regulator
2. Battery cells
3. Battery charger
4. Discharge regulator
5. Shunt regulator
6. Battery charger

7. Central control unit
8. Series load regulator
9. Battery charger
10. Solar power distributor
11. Power distributor
12. Power control unit

6.2 PRESORT

A small program exists to sort the data base prior to submitting a run for obtaining preliminary spacecraft designs. It will sort the data base according to weight, cost (data base row 46 or 48), or reliability. A single digit in Column 1 of a card (to be read on unit 5) determines the sort-variable: 1 = weight, 2 or 3 = cost (row 46 or 48), 4 = reliability. Input tape is expected on unit 8. Output tape is unit 9. Either disk or tape is acceptable for both input and output. Output should be input to the main run. If this presort capability is not used, the order of the data base is determined by technical performance as discussed in Paragraph 6.1.

Identification			
1	ID	E5.0	Card 1
2	CO	A2	
3	Type	3A6	
4			
5			
Technical Characteristics			
6	T. P. 1		
7	2		
8	3	5E10.0	
9	4		
10	5		
11	6		
12	7		
13	8		
14	9		
15	10	8E10.0	Card 2
Performance			
16	Ave Pow		
17	Max Pow		
18	Min Pow		
19	Nom Volt		
20	Max Volt		
21	Min Volt		
22	C or I	8E10.0	Card 3
23	Weight		
24	Volume		
25.	Rand Vib		
26	N-Rand		
27	Max Temp		
28	Min Temp		
29	Press		
CDPI Inputs		8E10.0	Card 4
30	No. Pow Cmd		
31	No. Other Cmd		
32	Time Tags		
33	No. Hi 'T' Ana		
34	No. Hi 'T' Dig		

Figure 6-1. Data Base Format (7 Cards/Equipment)

35 36 37 38 39 40 Safety 41 42 43	Samp Rate Granularity No. Lo 'T' Ana No. Lo 'T' Dig Samp Rate Granularity Fail Mod λ or μ σ	8E10.0	Card 5
44 45 Cost 46 47 48 49 50 Schedule 51	q Max Redund D. E. Cst T. E. Cst Unit Prod Ref Quant Factor Devel Const	8E10.0	Card 6
52 53 54 55	Devel Var Qual Const Qual Var State-Art	5E10.0	Card 7

Figure 6-1. Data Base Format (7 Cards/Equipment) (Continued)

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7. RESTRICTIONS AND/OR LIMITATIONS

The following tables detail both restrictions and limitations of the model. The first type of restriction is that of some configurations not being compatible with the user requirements. Both analyses and actual flight experience show that limitations exist for the utilization and performance of each of the Stabilization and Control configurations. These limitations are shown in Table 7-1. The second type of restriction is that of incompatibility between subsystems which is shown in Tables 7-2 through 7-8.

Table 7-1. Stabilization and Control Configuration Selection

Requirements	Dual Spin	Yaw Spin	Three-Axis Mass Expulsion	ME with CMGs	ME and Momentum Wheel
Payload yaw scan requirement	No	Yes	No	No	No
Orientation					
Inertial	Yes	No	Yes	Yes	Yes
Earth pointing	Yes	Yes	Yes	Yes	Yes
Sun pointing	Yes	No	Yes	Yes	Yes
Maneuverability requirements					
Powered flight control	Yes	Yes	Yes	Yes	Yes
Stationkeeping	Yes	Yes	Yes	Yes	Yes
Orbit correction control	Yes	Yes	Yes	Yes	Yes
Vehicle slewing	No	Yes	Yes	Yes	No
Altitude					
185-566 km (100-300 mi)	Yes	Yes	Yes	Yes	Yes
556-46,300 km (300-25,000 mi)	Yes	Yes	Yes	Yes	Yes
>46,300 km (25,000 mi)	Yes	Yes	Yes	Yes	Yes
Pointing accuracy					
35-170 mrad (2-10 deg)	Yes	Yes	Yes	Yes	Yes
3.5-35 mrad (0.2-2 deg)	Yes	Yes	Yes	Yes	Yes
0.17-3.5 mrad (0.01-0.2 deg)	Yes	No	No	Yes	No
<0.17 mrad (<0.01 deg)	No	No	No	Yes	No
Rate accuracy					
1.7-17 mrad/sec (0.1-1.0 deg/sec)	Yes	Yes	Yes	Yes	Yes
0.17-1.7 mrad/sec (0.01-0.1 deg/sec)	Yes	Yes	Yes	Yes	Yes
<0.17 mrad/sec (0.01 deg/sec)	No	No	No	Yes	No

Legend:

Yes - Configuration can be used

No - Configuration cannot be used

Table 7-2. Stabilization and Control Configuration Compatibility

Stabilization and Control Subsystem Configurations	Data Processing Subsystem	
	General Purpose Processors	Special Purpose Processors
Dual Spin	Yes	Yes
Yaw Spin	Yes	Yes
Three-Axis Mass Expulsion	Yes	Yes
Mass Expulsion with Control Moment Gyros	Yes	No
Mass Expulsion with Pitch Momentum Wheel	Yes	Yes

Legend:
Yes - Compatible
No - Incompatible

Table 7-3. Auxiliary Propulsion Configuration Selection

Input Requirements	Cold Gas	Monopropellant	Bipropellant
Thrust			
< 224 newtons (< 50 lb)	Yes	Yes	Yes
224-4450 newtons (50-1000 lb)	No	Yes	Yes
> 4450 newtons (> 1000 lb)	No	No	Yes
Total Impulse			
< 4.4×10^4 newton-sec (< 10^4 lb-sec)	Yes	No	No
$4.4 \times 10^4 - 2.2 \times 10^5$ newton-sec ($10^4 - 5 \times 10^4$ lb-sec)	Yes	Yes	No
$2.2 \times 10^5 - 8.9 \times 10^5$ newton-sec ($5 \times 10^4 - 2 \times 10^5$ lb-sec)	No	Yes	Yes
> 8.9×10^5 newton-sec (2×10^5 lb-sec)	No	No	Yes

Legend:

Yes - Acceptable

No - Unacceptable

Table 7-4. Data Processing Configuration Compatibility

Communication Configuration	General Purpose Processor	Special Purpose Processors	
		1 DTU	2 DTUs
Uplink, plus downlink	Yes (1 Data Rate Computed)	Yes	No
Unified link, common antenna	Yes (1 Data Rate Computed)	Yes	No
Unified link, separate antennas	Yes (1 Data Rate Computed)	Yes	No
Unified link, common antenna plus downlink	Yes (2 Data Rates Computed)	No	Yes
Unified link, separate antennas plus downlink	Yes (2 Data Rates Computed)	No	Yes

Legend:
- Yes - Compatible
- No - Incompatible

Table 7-5. Communication Configuration Selection

Configurations	Ranging Requirement	Separate Mission Link Requirement	Separate Antenna Requirement
Uplink plus downlink	No	No	Yes
Unified link, common antenna	Yes	No	No
Unified link, separate antennas	Yes	No	Yes
Unified link, common antenna plus downlink	Yes	Yes	No
Unified link, separate antennas plus downlink	Yes	Yes	Yes

Legend:

Yes - Acceptable

No - Unacceptable

Table 7-6. Electrical Power Configuration Compatibility

Configuration	Vehicle Orientation		Voltage Requirements	
	Spinning	Nonspinning	Unregulated	Regulated
Solar Arrays				
Body Mounted	Yes	Yes		
Oriented Paddles	No	Yes		
Voltage Regulation				
Shunt			Yes	No
Shunt and Discharge			Yes	Yes
Series			Yes	Yes

Legend:

Yes - Compatible

No - Incompatible

Table 7-7. Vehicle Shape Compatibility

S&C Configuration	Cylinder	Sphere	Box
Spinning	Yes	Yes	No
3-Axis	Yes	Yes	Yes

Legend:
Yes - Compatible
No - Incompatible

Table 7-8. Structural Configuration Compatibility

Structural Configuration	Vehicle Shape		
	Cylinder	Sphere	Box
Monocoque	Yes	No	Yes
Semi-Monocoque	Yes	No	Yes
Truss	Yes	Yes	Yes

Legend:
Yes - Compatible
No - Incompatible

8. SAMPLE TEST CASE

Paragraph 8.1 discusses the input variables to the model. Paragraph 8.2 discusses values that were used in the sample test case. Paragraph 8.3 contains the results of the sample test case.

8.1 USER INPUT VARIABLE LIST

Inputs to the model are listed in Table 8-1. NAMELIST names are shown in the parenthesis. All NAMELIST blocks must be in the order given. If the user wishes to use the default parameters, the variables need not be entered. However, NAMELIST control input must exist for each NAMELIST section. For example:

```
$ MODE
$ END
$ USRSC
$ END
  .
  .
  .
$ USRCS
$ END
```

8.2 INPUT VARIABLES FOR TEST CASE

Figure 8-1 lists the variables which were changed for the sample test case. Only those variables that are changed from the default need to be entered.

8.3 SAMPLE TEST CASE RESULTS

The test case corresponded to the DSCS-II satellite. This satellite provides for expanded communications service for worldwide military installations and the National Command Authority. The satellite is drumshaped. Two dish antennas on top of the spacecraft are deployed in orbit to provide narrow beam coverage. Conical horn earth coverage antennas are mounted on top of the spacecraft. An omnidirectional command and telemetry antenna is deployed beneath the main body. Communications equipment is mounted on a mechanically despun platform. Other subsystems are housed in the main body of the spacecraft. The test case results are presented in Figure 8-2.

Table 8-1. User Input List

FORTRAN Name	Default	Units	Description
General (MODE)			
MICRO	0		Set to 0 for macro, set to 1, 2, 3, 4 or 5 for micro. If 0, program operates in macro mode. If 1, 2, 3, 4, or 5, program performs micro search for SANDC, AUXPRO, DPI, COMM, or EP subsystem respectively. For micro search on a specific subsystem, user must restrict all other subsystems to one configuration each.
ISTRT1	1		First of all allowable five configurations to be designed for the SANDC subsystem. ISTRT1 and IEND1 effectively limit the number of SANDC configurations whose designs will be attempted. (Must be equal to IEND1 for micro search on another subsystem.)
IEND2	5		Last of the allowable five configurations to be designed for the SANDC subsystem.
ISTRT2 IEND2	1-3		As above for auxiliary propulsion
ISTRT3 IEND3	1-2		As above for data processing and instrumentation
ISTRT4 IEND4	1-5		As above for communications
ISTRT5 IEND5	1-6		As above for electrical power
ISTRT6 IEND6	1-3		As above for vehicle sizing
ISTRTR IENDR	0-1		As above for reliability
Stabilization and Control (USRSC)			
DPHI	.25	deg	Main engine alignment to thrust axis
FE	4.1	lb	Thrust (translational)
TSMALL	100.	sec	Main engine burn time
XNU	3.	---	Control system efficiency
PDOTO	1.	deg/sec	Maximum initial rate
TAUX TAUY TAUZ	62208000. 62208000. 62208000.	sec	Times that disturbance torques are in effect
T	24.	mo	Mission lifetime

Table 8-1. User Input List (Continued)

FORTRAN Name	Default	Units	Description
Stabilization and Control (USRSC) (Continued)			
PHIRX	.75		
PHIRY	.75	deg	Required accuracy on roll, pitch, and yaw axes
PHIRZ			
PDOTX	1.		
PDOTY	1.	deg/sec	Maximum maneuver rates
PDOTZ			
XN	1.		
YN	1.	---	Number of maneuver about roll, pitch, and yaw axes
ZN	1.		
PDOTRX	.012		
PDOTRY	.012	deg/sec	Required system rate accuracy
PDOTRZ	.012		
OMEGS	1.5708	rad/sec	Spin rate about yaw axis (applies only to yaw spin configuration)
OMEGR	60.	rpm	Spin rate of rotor (applies only to dual spin configuration)
PJ	75.	slug/ft^2	Platform spin axis inertia (applies only to dual spin configuration)
XNN	21.	days	Time between spin axis corrections (applies only to dual spin configuration)
K	1	---	0 if errors for spin axis relative to nadir; 1 if errors for payload relative to nadir (applies only to dual spin configuration)
MANV	1	---	1 = power flight control, 2 = station keeping, 3 = orbit correction control, 4 = vehicle slewing
IPAWAW	0	---	0 to 1 for payload yaw required (no or yes)
EP1	.0001	deg/sec	Maximum programmed pitchover rate (applies only to three-axis mass expulsion configuration)
AX	.05		
AY	.05	deg	Misalignment errors in mounting inertia measurement units (applies only to three-axis mass expulsion configuration)
AZ	.05		
EA	0.10	deg	Antenna misalignment (applies only to pitch momentum bias configuration)
EANT	0.1	rad	Antenna elevation (applies only to pitch momentum bias configuration)

Table 8-1. User Input List (Continued)

FORTRAN Name	Default	Units	Description
Stabilization and Control (USRSC) (Continued)			
ALPHA	12.0	deg	Thruster offset in roll-yaw plane (applies only to pitch momentum bias configuration)
TL	1.0	day	Time between unloading wheel momentum (applies only to CMG configuration)
TACCEL	20.0	sec	Acceleration time for maneuvering (applies only to CMG configuration)
XNNN	4.0	---	Number of single gimbaled gyros (applies only to CMG configuration)
THOLD	100000.	min	Time vehicle in inertial hold (applies only to CMG configuration)
PDOTAV	0.01	deg/sec	Average body rate for low orbit when high accuracy is required (applies only to CMG configuration)
PDTST	0.0667	deg/sec	Maximum rate at which star information is obtained (applies only to CMG configuration)
PHIFOV	40.0	deg	Maximum range of attitude freedom required to track specific stars (applies only to CMG configuration)
ISAT			Earth painting flag. Equivalent to ISATOR in Thermal (do not input)
Auxiliary Propulsion (USRAP)			
CLIFE	50,000.	cycles	Cycle (or pulse) life
BTRMX	1.024×10^6	bit/sec	Maximum bit rate
SLSFL	0.	---	Special command synchronization flag (0 means no synchronization required, 1 means synchronization required)
TPRFL	0.	---	Telemetry processing flag (0 means telemetry processed separately, 1 means otherwise)
OPSMS	0.	ops/sec	Number of mission operations
ARRAYN(11, 3)	0	---	Mission data for up to three (3) equipments: Power switching commands Other commands Time tagged commands High rate telemetry Number of analog points Number of digital points Sample rate (sec^{-1}) Word length (bits) Low rate telemetry Number of analog points Number of digital points Sample rate (sec^{-1}) Word length (bits)

Table 8-1. User Input List (Continued)

FORTRAN Name	Default	Units	Description
Auxiliary Propulsion (USRAP) (Continued)			
MISPD	0	---	Mission data processing flag (1 means processing required, 0 means no such processing required)
NMSEQ	0	---	Number of mission equipment (maximum of 3)
Communications (USRCM)			
IOPTCM(3)	0, 0, 0	---	IOPTCM(1) is ranging IOPTCM(2) is separate link IOPTCM(3) is separate antenna (0 or 1 for no or yes)
LSGLS	1	---	Link SGLS flag (0 = no, 1 = yes)
LUSB	0	---	Link USB flag (0 = no, 1 = yes)
FREQX(2)	2250., 2250	MHz	Frequency of downlink transmitters (Second number refers to separate downlink)
APOGEE	500.	nmi	Apogee (must be less than or equal to ALT)
NET	1	---	1 = NASA net, 0 = AFSCF net
NADIR	0	---	Nadir coverage flag (0 = no, 1 = yes)
FREQR	1800	MHz	Receiver frequency
COMRAT	1000.	baud	Receiver command rate
BWIDTH(2)	-1.E10, -1.E10	Hz	Bandwidth for transmitter (default values are flags that cause bandwidth to be computed as a function of bit rate)
Electrical Power (USREP)			
OPTEMP	15.	°C	Battery temperature
IVOLT	0	---	Flag: 0 = voltage need not be regulated 1 = voltage regulated
Vehicle Sizing (USRVS)			
EQPF	2.	---	Equipment packing factor
MB12SH	1	---	Mission equipment bay shape (1 means cylinder, 2 means box)
EQM1XL	40.	in.	No. 1 mission equipment bay length
EQM1YL	40.	in.	No. 1 mission equipment bay width
EQM1ZL	40.	in.	No. 1 mission equipment bay height
EQM2XL	40.	in.	No. 2 mission equipment bay length
EQM2YL	40.	in.	No. 2 mission equipment bay width
EQM2ZL	40.	in.	No. 2 mission equipment bay height

Table 8-1. User Input List (Continued)

FORTRAN Name	Default	Units	Description
Vehicle Sizing (USRVS) (Continued)			
ISBOFG	0	---	Solar array boom orientation (0 means not oriented, 1 means oriented)
NUMEEQ	0	---	Number of external equipments (maximum = 9)
EEQWT(9)	0	lb	External equipment weight
EEQVL(9)	0	ft^3	External equipment volume
EM1YCG	0	in.	Mission equipment CGs relative to equipment bay interface
EM1ZCG	0	in.	
EM2YCG	0	in.	
EM2ZCG	0	in.	
CGEEX(9)	2.	---	Location of external equipment (1 means front, 2 means center, 3 means aft end)
EELOC(9)	3.	---	Location of external equipment (1 means right, 2 means left, 3 means top, 4 means bottom)
XCGSA1	1.	---	Location of solar paddles (1 means front, 2 means center, 3 means aft end)
XCGSA3	1.	---	Location of body mounted solar array (1 means front, 2 means center, 3 means aft end)
Miscellaneous (USRI)			
EQM1WT	435.	lb	Mission equipment weight (must be zeroed out if there is no EQM2)
EQM2WT	435.	lb	Mission equipment weight (must be zeroed out if there is no EQM2)
DIAMAX	120.	in.	Maximum satellite diameter
ALT	500	nmi	Altitude
Thermal (USRTH)			
ISATOR	1	---	1 earth oriented, 2 sun oriented, 3 inertially oriented
ORBINC	28.5	---	Orbital inclination
Reliability (USRRE)			
KEOPT	1	---	Expense option indicator (1, expense is weight; otherwise expense is cost)
RFIXED	1.0	---	Initial system reliability (mission equipment reliability is set by an interval variable RFNL)

Table 8-1. User Input List (Continued)

FORTRAN Name	Default	Units	Description
Reliability (USRRE) (Continued)			
SYSLB	0.0	lb	Initial system weight (should include a estimate of all fixed, e.g., structural, weight)
SLBMX	50000.0	lb	Maximum system weight
ISPT	0	---	Single point failure requirements option (0 = not in effect, otherwise in effect)
ISUB	0	---	Subsystem requirements option (1 = at least one subsystem has a reliability spec, otherwise no reliability specs on subsystems)
SPEC1*	18.	mo	Mean mission duration system requirement
SPEC(1)**	.9	---	R(TRUNC)*** requirement for SANDC subsystem
SPEC(2)**	.9	---	R(TRUNC) requirement for AUXPRO subsystem
SPEC(3)**	.9	---	R(TRUNC) requirement for DPI subsystem
SPEC(4)**	.9	---	R(TRUNC) requirement for COMM subsystem
SPEC(5)**	.9	---	R(TRUNC) requirement for EP subsystem
SPEC(6)**	.6	---	R(TRUNC) requirement for system
Schedules (USRSK)			
SKDME(7, 3)	0	mo	Schedule data for up to three mission equipments: (1) Design engineering cost ($1000) (2) Test and evaluation cost ($1000) (3) Development lead time constant (mo) (4) Development lead time variable (mo) (5) Qualification lead time constant (mo) (6) Qualification lead time variable (mo) (7) State-of-art factor (dimensionless)
Structures (USRST)			
CA	10.	g	Axial acceleration
CE	5.	g	Lateral acceleration
Costs (USRCS)			
NFV	4		Number of flight vehicles
NQV	1		Number of qualification vehicles

*If SPEC 1 ≤ 0.1, MMD MODE is skipped in RELY
**If SPEC(K) ≤ 0.00001, R(TRUNC) MODE is skipped for subsystem K in RELY
***R(TRUNC) = reliability at the end of mission life

Table 8-1. User Input List (Continued)

FORTRAN Name	Default	Units	Description
Costs (USRCS) (Continued)			
XMER	0.	$	Mission equipment DDT&E cost
SMEU	0.	$	Mission equipment average unit cos
FEEPCT	0.07		Contractor's fee percentage
IMETYP	2		Mission equipment type (1 means communications, 2 means Earth Observatory)

```
&MODE
  MICRO=0,IEND6=1,ISTRT3=2,ISTRT2=2,IEND5=2,ISTRT4=2,ISTRT5=2,
&END
&USRSC
 FF=3.5,TSMALL=71.7,TAUX=1.578E10,TAUY=1.578E10,TAUZ=1.578E10,
 T=60.,PHIRX=.393,PHIRY=.393,PHIRZ=.393,OMEGS=.000001,
  OMEGR=58.,PJ=71.,
&END
&USRAP
&END
&USRDP
ARRAYN(1,1)=16.,ARRAYN(8,1)=68.,ARRAYN(9,1)=16.,ARRAYN(10,1)=.0075,
 ARRAYN(11,1)=8.,NMSFO=1,
&END
&USRCM
  IOPTCM(1)=1,IMSSEP=1,APOGEE=19322.9,NET=0,NADIR=1,
&END
&USRFP
&END
&USRVS
 EQM1XL=48.4,EQM1YL=108.2,EQM1ZL=108.2,EQM2XL=0.,EQM2YL=0.,EQM2ZL=0.,
XCGSA3=2.,
&END
&USRI
 EQM1WT=400.,EQM2WT=0.,DIAMAX=108.,ALT=19322.9,
&END
&USRTH
 ORBINC=0.,
&END
&USRPE
  SL3MX=2650.,ISPT=1,SPEC1=38.,SPEC(6)=.236,RFIXED=.6,
&END
&USRSK
&END
&USRST
&END
&USRCS
 NFV=6,NQV=1,XMFR=3.23E7,XMEU=3.34E6,FEEPCT=.07,IMETYP=1,
&END
```

Figure 8-1. Input Variables for Test Case

DEFINITIONS - -

CONFIGURATIONS (NCONF)

STABILIZATION AND CONTROL (NCONF(1))
NCONF(1)=1 IS DUAL SPIN
NCONF(1)=2 IS YAW SPIN
NCONF(1)=3 IS MASS EXPULSION
NCONF(1)=4 IS MASS EXPULSION W/ CMG-S
NCONF(1)=5 IS MASS EXPULSION W/ M.W.-S

DATA PROCESSING AND INSTRUMENTATION (NCONF(3))
NCONF(3)=1 IS GENERAL PURPOSE PROCESSOR
NCONF(3)=2 IS SPECIAL PURPOSE PROCESSOR

ELECTRICAL POWER (NCONF(5))
NCONF(5)=1 IS SHUNT REGULATION - PADDLE MTD.
NCONF(5)=2 IS SHUNT REGULATION - BODY MTD.
NCONF(5)=3 IS SHNT + DISCH.REG - PADDLE MTD.
NCONF(5)=4 IS SHNT + DISCH.REG. - BODY MTD.
NCONF(5)=5 IS SERIES LOAD REG. - PADDLE MTD.
NCONF(5)=6 IS SERIES LOAD REG. - BODY MTD.

AUXILIARY PROPULSION (NCONF(2))
NCONF(2)=1 IS COLD GAS
NCONF(2)=2 IS MONOPROPELLANT
NCONF(2)=3 IS BIPROPELLANT

COMMUNICATIONS (NCONF(4))
NCONF(4)=1 IS SEPARATE UPLINK AND DOWNLINK
NCONF(4)=2 IS UNIFIED LINK-COMMON ANTENNA
NCONF(4)=3 IS UNIFIED LINK-SEPARATE ANTENNA
NCONF(4)=4 IS UNIFIED LINK-COMMON ANT + DOWNLINK
NCONF(4)=5 IS UNIFIED LINK-SEPARATE ANT + DOWNLINK

VEHICLE SIZING (NCONF(6))
NCONF(6)=1 IS CYLINDER
NCONF(6)=2 IS BOX
NCONF(6)=3 IS SPHERE

RELIABILITY
REDUNDANCY CONFIGURATION = 0 IS SINGLE STRING
REDUNDANCY CONFIGURATION = 1 IS DUAL STRING

MESSAGES (IERR)

STABILIZATION AND CONTROL
IERR = 0 MEANS NO MESSAGES
IERR = 1 MEANS MAX ALLOWABLE SYS. ERROR UNSAT.
IERR = 1X MEANS MAX RATE ERROR TOO SMALL
IERR = 1XX MEANS 3-AXIS WHEELS ACCEPTABLE
IERR = 1XXX MEANS DBL GIMB.CMGS ACCEPTABLE

DATA PROCESSING AND INSTRUMENTATION
IERR = 0 MEANS NO MESSAGES
IERR = 1 MEANS MUX REQUIRED
IERR = 10 WORD LENGTH GREATER THAN 256
IERR = 100 BIT RATE IS TOO LARGE
IERR = 1000 SPEC.COMD.SYNC.FLG NE 0
IERR = 10000 END OF DATA BASE SENSED

VEHICLE SIZING
IERR = 0 MEANS NO MESSAGES
IERR = 1 MEANS BODY MOUNTED SOLAR ARRAY LENGTH EXCEEDS EQUIPMENT BAY LENGTH

AUXILIARY PROPULSION
IERR = 0 MEANS NO MESSAGES
IERR = 1 MEANS CYCLE LIFE OF ATTITUDE AND CONTROL THRUSTERS IS TOO SHORT
IERR = 10 MEANS CYCLE LIFE OF TRANSLATIONAL THRUSTER IS TOO SHORT
IERR = 11 MEANS CYCLE LIVES OF BOTH THRUSTERS ARE TOO SHORT

THERMAL
IERR = 1XXXXXXXXX MEANS BATT RAD AREA IS SUPPLIED IN RADAB
IERR = X1XXXXXXXX MEANS OSR CONV. AND VARIABLE CONDUCTANCE HEAT PIPE INFO IS REQUIRED
IERR = XX1XXXXXXX MEANS PHASE CONTROL MASS IS SUPPLIED IN PCM
IERR = XXX1XXXXXX MEANS ISOTHERMALIZER IS REQUIRED
IERR = XXXX1XXXXX MEANS DIODE HEAT PIPE IS REQUIRED (2 REQUIRED)
IERR = XXXXX1XXXX MEANS CONV. HEAT PIPE IS REQUIRED
IERR = XXXXXX1XXX MEANS OSR RADIATOR IS REQUIRED
IERR = XXXXXXX1XX MEANS CONV. RADIATOR IS REQUIRED
IERR = XXXXXXXX1X MEANS HEATER POWER IS SUPPLIED IN HTRPWR
IERR = XXXXXXXXX1 MEANS RADIATOR AREA IS SUPPLIED IN RADA

Figure 8-2. Sample Test Case Results

```
SYSTEM DESCRIPTION - - DESIGN NUMBER    1
  STABILIZATION AND CONTROL
    CONFIGURATION IDENTIFIER        1
    EQUIPMENT CODE IDENTIFIER  101  202  302  401  501  601  701  801 1401
    EQUIPMENT QUANTITIES         1    2    3    2    3    3    2    3    3
    CALCULATED ACCURACY       0.7500E 00(DEG)
    IERR                              0
  AUXILIARY PROPULSION
    CONFIGURATION IDENTIFIER        2
    EQUIPMENT CODE IDENTIFIER  607  607  901 1001  499  201 1102  503  701 1201  601
    EQUIPMENT QUANTITIES        12    4    7    9    2    1    7    2    1    1    1
    TOTAL IMPULSE             0.1842E 05(LB-SEC)
    IERR                              0
  DATA PROCESSING AND INSTRUMENTATION
    CONFIGURATION IDENTIFIER        2
    EQUIPMENT CODE IDENTIFIER  201
    EQUIPMENT QUANTITIES         2
    COMPUTER OPERATIONS RATE  0.0      (IPS)
    IERR                              1
  COMMUNICATIONS
    CONFIGURATION IDENTIFIER        2
    EQUIPMENT CODE IDENTIFIER  101  201  301  401  502  601  701  702
    EQUIPMENT QUANTITIES         3    2    3    3    3    2    2    2
    ENGINEERING  DATA RATE       0.1000E 01(KBPS)
    MISSION EQUIPMENT DATA RATE  0.0        (KBPS)
  ELECTRICAL POWER
    CONFIGURATION IDENTIFIER        2
    EQUIPMENT CODE IDENTIFIER  101  205  301 1201
    EQUIPMENT QUANTITIES         2    6    6    2
    TOTAL AVERAGE POWER REQUIREMENT  0.1815E 03(WATTS)
    SOLAR ARRAY AREA                 0.7567E 02(FT**2)
    MINIMUM INSTALLED BATTERY CAP.   0.5897E 01(AMP-HR)
  THERMAL CONTROL
    RADIATOR AREA           0.4590E 01  (FT**2)  , BATTERY RADIATOR AREA        0.1132E 01   (FT**2)
                                                   TOTAL RADIATOR AREA          0.5722E 01   (FT**2)
    HEATER POWER            0.3066E 03 (BTU/HR)  , BATTERY HEATER POWER         0.1100E 03 (BTU/HR)
                                                   TOTAL HEATER POWER           0.4166E 03 (BTU/HR)
    HEAT PIPE               0.2808E 05 (BTU/HR)  , VARIABLE CONDUCTANCE H.P.    0.2723E 04 (BTU/HR)
                                                   TOTAL HEAT PIPE              0.3081E 05 (BTU/HR)
    IERR                  110001011
```

Figure 8-2. Sample Test Case Results (Continued)

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STRUCTURES
  SKIN THICKNESS   0.8350E-02(IN)
  STRINGER NO,THICKNESS,HT       420.,  0.1587E-01 (IN),       0.3112E 00 (IN)
  FRAME NO, THICKNESS, HT.         5.,  0.6300E-01 (IN),       0.6942E 00 (IN)
  END COVER THICKNESS -- FORWARD  0.2857E 00(IN),CENTER  0.0        (IN),AFT  0.2857E 00(IN)
VEHICLE SIZING
  CONFIGURATION IDENTIFIER      1
  LAUNCH WEIGHT, 0.1976E 04(LBS),                  LENGTH     0.8664E 02(IN) ,
         WIDTH    0.6197E 02(IN),                  HEIGHT     0.6197E 02 (IN),
  IXX    0.7811E 06 (LB-IN**2),       IYY    0.1365E 07 (LB-IN**2),       IZZ     0.1365E 07 (LB-IN**2)
  IERR                                  1
SAFETY,
  REDUNDANCY CONFIGURATION  0
  MEAN MISSION DURATION 0.3922E 02(MO),RELIABILITY 0.2464E 00,RELIABILITY TRUNCATION TIME 0.6083E 02(MO)
COST (ALL AMOUNTS ARE IN DOLLARS)
  DDT+E                                                     INVESTMENT(RECURRING)
    DESIGN ENGINEERING                        8050720.0     UNIT ENGINEERING                       2275250.0
    TEST AND EVALUATION                       5008816.0     UNIT PRODUCTION                        2661070.0
    TOOLING AND TEST EQUIPMENT                      0.0     TOOLING AND TEST EQUIPMENT                   0.0
    QUALITY CONTROL                            821994.9     QUALITY CONTROL                         406678.4
    SYSTEMS ENGINEERING AND INTEGRATION       3928610.0     SYSTEMS ENGINEERING AND INTEGRATION    1313515.0
    PROGRAM MANAGEMENT                        1629812.0     PROGRAM MANAGEMENT                      485518.8
  COST CATEGORY              DDT+E            INVESTMENT          OPERATIONS
    SPACECRAFT              19439936.         42852176.
    MISSION EQUIPMENT       32300000.         20040000.
    TOTAL PAYLOAD           51739936.         62892176.
    QUALIFICATION UNITS      7142031.
    G.S.E.                   2285763.
    LAUNCH SUPPORT                                                1653313.
    FLIGHT OPERATIONS                                              744860.
    CONTRACTOR FEE           2020739.          2999652.
    PROGRAM TOTAL           63188448.         65891824.           2566043.
SCHEDULE
  DESIGN AND COMPONENT DEVELOPMENT TIME             14.4(MONTHS)
  SUBSYSTEM DEVELOPMENT TIME                         9.4(MONTHS)
  COMPONENT QUALIFICATION TIME                      14.1(MONTHS)
  SUBSYSTEM QUALIFICATION TIME                       8.2(MONTHS)
  SYSTEM DEVELOPMENT AND FLIGHT READINESS TIME      42.3(MONTHS)
  SCHEDULE DURATION (TO LAUNCH)                     74.3(MONTHS)
```

Figure 8-2. Sample Test Case Results (Continued)

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9. SOURCE CODE LISTING

The following is a listing of the Systems Cost/Performance Computer Program.

```
COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                  SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
              C      THIS IS THE MAIN DRIVER                                     00000010
              C      IT SEQUENCES ALL SEGMENTS OF CODING,HANDLES I/O,SETS        00000020
              C      CONFIGURATIONS                                              00000030
ISN 0002           COMMON/USER1/DPHI,FE,TSMALL,XNU,PDOTO,TAUX,TAUY,TAUZ,T,       00000040
                  *PHIRX,PHIRY,PHIRZ,PDOTX,PDOTY,PDOTZ,XN,YN,ZN,PDOTRX,PDOTRY,   00000050
                  *PDOTRZ,OMEGS,OMEGR,PJ,XNN,K,MANV,IPAWAH,EP1,AX,AY,AZ,         00000060
                  *FA,EANT,ALPHA,TL,TACCFL,XNNN,THOLD,PDOTAV,PDOTST,PHIFOV,ISAT  00000061
ISN 0003           COMMON /USER2/TTHST,CLIFE                                     00000070
ISN 0004           COMMON /USER3/BTRMX,SCSFL,TPKFL,OPSMS,ARRAYN(11,3),NMSEQ      00000080
ISN 0005           COMMON /USER4/IOPTCM(3),IMSSEP,ISEQ,LSGLS,LUSB,FREQ(2),APOGEE, 00000090
                  * NET,NADIR,FRFQR,COMRAT,BWIDTH(2)                             00000100
ISN 0006           COMMON /USER5/IVOLT,OPTEMP                                    00000110
ISN 0007           COMMON /USER6/EQPF,MD1ZSH,EQM1XL,EQM1YL,EQM1ZL,EQM2XL,EQM2YL, 00000120
                  * EQM2ZL,ISBOFG,NUMEEQ,EEQWT(9),EEQVL(9),EM1YCG,EM1ZCG,EM2YCG, 00000130
                  * EM2ZCG,CGEEX(9),EELOC(9),XCGSA1,XCGSA3                       00000140
ISN 0008           COMMON /USER7/ISATOR,ORBINC                                   00000150
ISN 0009           COMMON /USER8/SKDMZ(7,3)                                      00000155
ISN 0010           COMMON /USER9/CA,CE                                           00000157
ISN 0011           COMMON /BTWN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,T1,PL,PLMIN, 00000160
                  * LMBOD,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,00000170
                  * SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,HTRPRB,            00000180
                  * HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),        00000190
                  * EQELG,SABOLG,SATWT                                           00000191
ISN 0012           COMMON /DBCOM/IDB(30),DATAB(55,90)                            00000200
ISN 0013           COMMON /USER1/EQM1WT,EQM2WT,DIAMAX,ALT                        00000210
ISN 0014           COMMON /USERR/KEOPT,SYSLB,RFIXED,SLBMX,ISPT,SPEC(6),SPEC1,ISUB 00000220
ISN 0015           COMMON /CHCSF/ICHOSE(60),NCHOSE(60),COST(5,60),REL(6,60),THM(4,60)00000230
                  *,DPIA(11,60),SKD(7,60)                                        00000240
ISN 0016           COMMON /USERC/NFV,NQV,XMER,XMEU,FEEPCT,IMETYP                 00000242
ISN 0017           COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMDOLD,TRUNC,ITRUNC,DE,TE,  00000245
                  * TOOLR,QCR,SEIR,PMR,PF,PU,IDOLU,QCP,SEIP,PMP,SATR,SATINV,MER, 00000246
                  * MEINV,PAYR,PAYINV,PAYQUL,GSE,XLTOT,CTOT,FEER,FEEINV,DDTE,XVEST, 00000247
                  * OPS,SKTAU(6),ROLD(60),TTT,AR,TS,BS,AM,TF,BF,TC,TA,TB,TOTOPS  00000248
ISN 0018           DIMENSION NCONF(6),NEQUIP(5),IERR(7),IPIC1(3),IPIC2(9),IPIC3(2), 00000250
                  * IPIC4(9),IPIC5(5),ICHOS1(9),ICHOS2(14),ICHOS3(2),ICHOS4(11), 00000260
                  *ICHOS5(5),NCHOS1(9),NCHOS2(14),NCHOS3(2),NCHOS4(11),NCHOS5(5) 00000270
ISN 0019           NAMELIST /MODE/MICRO,ISTRT1,IEND1,ISTRT2,IEND2,ISTRT3,IEND3,  00000280
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                 *ISTRT4,IEND4,ISTRT5,IEND5,ISTRT6,IEND6,ISTRTR,IENDR                    00000290
ISN 0020          NAMELIST/USRSC/DPHI,FE,TSMALL,XMU,PDOTO,TAUX,TAUY,TAUZ,T,              00000300
                 *PHIRX,PHIRY,PHIRZ,PDOTX,PDOTY,PDOTZ,XN,YN,ZN,PDOTRX,PDOTRY,            00000310
                 *PDOTRZ,OMEGS,OMEGR,PJ,XNN,K,MANV,IPAWAW,EPI,AX,AY,AZ,                  00000320
                 * EA,EANT,ALPHA,TL,TACCEL,XNNN,THOLD,PDOTAV,PDOTST,PHIFOV               00000322
ISN 0021          NAMELIST /USRAP/CLIFE                                                  00000330
ISN 0022          NAMELIST /USRDP/BTRMX,SCSFL,TPRFL,OPSMS,ARRAYN,MISPD,NMSEQ             00000340
ISN 0023          NAMELIST /USRCM/IOPTCM,IMSSEP,LSGLS,LUSB,FREQ,APOGEE,NET,NADIR,        00000350
                 * FREQR,COMRAT,BWIDTH                                                   00000360
ISN 0024          NAMELIST /USREP/IVOLT,OPTEMP                                           00000370
ISN 0025          NAMELIST /USRTH/ISATOR,ORBINC                                          00000380
ISN 0026          NAMELIST /USRRE/KEOPT,SYSLE,RFIXED,SLBMX,ISPT,SPEC,SPEC1,ISUB          00000390
ISN 0027          NAMELIST /USRCS/NFV,NQV,XMER,XMEU,FEEPCT,IMETYP                        00000392
ISN 0028          NAMELIST/USRVS/EQPF,MD12SH,EQM1XL,EQM1YL,EQM1ZL,EQM2XL,EQM2YL,         00000400
                 * EQM2ZL,ISBOFG,NUMEEQ,EEQWT,EEQVL,EM1YCG,EM1ZCG,EM2YCG,                00000410
                 * EM2ZCG,CGEEX,EELOC,XCGSA1,XCGSA3                                      00000420
ISN 0029          NAMELIST /USRSK/SKDME                                                  00000425
ISN 0030          NAMELIST /USRST/CA,CE                                                  00000427
ISN 0031          NAMELIST/USRI/EQM1WT,EQM2WT,DIAMAX,ALT                                 00000430
ISN 0032          DATA NEQUIP,NACCEP/2*0/                                                00000440
ISN 0033          DATA ISTRT1,IEND1,ISTRT2,IEND2,ISTRT3,IEND3,ISTRT4,IEND4,ISTRT5,       00000450
                 *IEND5,ISTRT6,IEND6,ISTRTR,IENDR/1,5,1,3,1,2,1,5,1,6,1,3,0,1/           00000460
ISN 0034          DATA ITEST1,ITEST2,ITEST3,ITEST4,ITEST5/9,14,2,11,5/                   00000470
ISN 0035          READ (5,MODE)                                                          00000480
ISN 0036          READ (5,USRSC)                                                         00000490
ISN 0037          READ (5,USRAP)                                                         00000500
ISN 0038          READ (5,USRDP)                                                         00000510
ISN 0039          READ (5,USRCM)                                                         00000520
ISN 0040          READ (5,USREP)                                                         00000530
ISN 0041          READ (5,USRVS)                                                         00000540
ISN 0042          READ (5,USRI)                                                          00000550
ISN 0043          READ (5,USRTH)                                                         00000560
ISN 0044          READ (5,USRRE)                                                         00000570
ISN 0045          READ (5,USRSK)                                                         00000575
ISN 0046          READ (5,USRST)                                                         00000577
ISN 0047          READ (5,USRCS)                                                         00000578
ISN 0048          TTHST=FE                                                               00000580
ISN 0049          ISEQ=ISATOR                                                            00000590
ISN 0050          IREL=ISTRTR                                                            00000600
```

```
ISN 0051         ISAT=ISATOR                                       00000601
ISN 0052       2 DO 1 I1=ISTRT1,IEND1                              00000610
ISN 0053         DO 1 I2=ISTRT2,IEND2                              00000620
ISN 0054         DO 1 I3=ISTRT3,IEND3                              00000630
ISN 0055         DO 1 I4=ISTRT4,IEND4                              00000640
ISN 0056         DO 1 I5=ISTRT5,IEND5                              00000650
ISN 0057         DO 1 I6=ISTRT6,IEND6                              00000660
ISN 0058         NCONF(1)=I1                                       00000670
ISN 0059         NCONF(2)=I2                                       00000680
ISN 0060         NCONF(3)=I3                                       00000690
ISN 0061         NCONF(6)=I6                                       00000700
ISN 0062         NCONF(5)=I5                                       00000710
ISN 0063         NCONF(4)=I4                                       00000720
ISN 0064         CALL FILTER(NCONF,ICODE)                          00000750
ISN 0065         IF (ICODE .LT.0) GO TO 1                          00000760
ISN 0067         IPIC1(1)=0                                        00000770
ISN 0068         IPIC1(2)=0                                        00000780
ISN 0069         IPIC1(3)=0                                        00000781
ISN 0070         DO 23 I=1,9                                       00000790
ISN 0071      23 IPIC2(I)=0                                        00000800
ISN 0072         IPIC3(1)=0                                        00000810
ISN 0073         IPIC3(2)=0                                        00000820
ISN 0074         DO 24 I=1,9                                       00000830
ISN 0075      24 IPIC4(I)=0                                        00000840
ISN 0076         DO 20 I=1,5                                       00000850
ISN 0077      20 IPIC5(I)=0                                        00000860
ISN 0078      11 CALL INITIL(NCONF,IERRI)                          00000870
ISN 0079         IF (IERRI .EQ. 1) GO TO 1                         00000880
ISN 0081         DO 10 ITR=1,2                                     00000890
ISN 0082         REWIND 1                                          00000900
ISN 0083         IENDDB=1                                          00000910
ISN 0084         ITER=ITR-1                                        00000920
ISN 0085         CALL READDB(IENDDB)                               00000930
ISN 0086         IF (ITER .NE. 0 .OR. MICRO .EQ. 1) GO TO 91       00000940
ISN 0088         IPIC1(1)=0                                        00000950
ISN 0089         IPIC1(2)=0                                        00000960
ISN 0090         IPIC1(3)=0                                        00000961
ISN 0091      91 CALL SANDC(IPIC1,IERR(1),ITER,NCONF,ICHOS1,NCHOS1) 00000970
ISN 0092         NEQUIP(1)=0                                       00001020
```

```
ISN 0093             DO 101 I=1,ITEST1                                              00001030
ISN 0094             IF (ICHOS1(I) .LT. 0 ) GO TO 1                                 00001050
ISN 0096             IF (ICHOS1(I) .GT. 0) NEQUIP(1)=NEQUIP(1)+1                    00001060
ISN 0098         101 CONTINUE                                                       00001070
ISN 0099             NOWAT=1                                                        00001080
ISN 0100             CALL SAVE(ICHOS1,NCHOS1,NOWAT,ITEST1,IENDDB)                   00001090
ISN 0101             CALL READDB(IENDDB)                                            00001100
ISN 0102             IF (ITER .NE. 0 .OR. MICRO .EQ. 2) GO TO 92                    00001110
ISN 0104             DO 28 I=1,9                                                    00001120
ISN 0105          28 IPIC2(9)=0                                                     00001130
ISN 0106          92 CALL AUXPRO(IPIC2,IERR(2),ITER,NCONF,ICHOS2,NCHOS2)            00001140
ISN 0107             NEQUIP(2)=0                                                    00001170
ISN 0108             DO 102 I=1,ITEST2                                              00001180
ISN 0109             IF (ICHOS2(I) .LT. 0 .AND. MICRO .LT. 2) GO TO 13              00001190
ISN 0111             IF (ICHOS2(I) .LT. 0 .AND. MICRO .EQ. 2) GO TO 1               00001200
ISN 0113             IF (ICHOS2(I) .GT. 0) NEQUIP(2)=NEQUIP(2)+1                    00001210
ISN 0115         102 CONTINUE                                                       00001220
ISN 0116             CALL SAVE(ICHOS2,NCHOS2,NOWAT,ITEST2,IENDDB)                   00001230
ISN 0117             CALL READDB(IENDDB)                                            00001240
ISN 0118             IF (ITER .NE. 0 .OR. MICRO .EQ. 3) GO TO 93                    00001250
ISN 0120             IPIC3(1)=0                                                     00001260
ISN 0121             IPIC3(2)=0                                                     00001270
ISN 0122          93 CALL DPI(IPIC3,IERR(3),ITER,NCONF,ICHOS3,NCHOS3,NOWAT)         00001280
ISN 0123             NEQUIP(3)=0                                                    00001310
ISN 0124             DO 103 I=1,ITEST3                                              00001320
ISN 0125             IF (ICHOS3(I) .LT. 0 .AND. MICRO .LT. 3) GO TO 13              00001330
ISN 0127             IF (ICHOS3(I) .LT. 0 .AND. MICRO .EQ. 3) GO TO 1               00001340
ISN 0129             IF (ICHOS3(I) .GT. 0) NEQUIP(3)=NEQUIP(3)+1                    00001350
ISN 0131         103 CONTINUE                                                       00001360
ISN 0132             CALL SAVE(ICHOS3,NCHOS3,NOWAT,ITEST3,IENDDB)                   00001370
ISN 0133             CALL READDB(IENDDB)                                            00001380
ISN 0134             IF (ITER.NE.0 .OR. MICRO.EQ.4) GO TO 94                        00001390
ISN 0136             DO 29 I=1,9                                                    00001400
ISN 0137          29 IPIC4(I)=0                                                     00001410
ISN 0138          94 CALL COMM(IPIC4,IERR(4),ITER,NCONF,ICHOS4,NCHOS4)              00001420
ISN 0139             NEQUIP(4)=0                                                    00001450
ISN 0140             DO 104 I=1,ITEST4                                              00001460
ISN 0141             IF (ICHOS4(I) .LT. 0 .AND. MICRO .LT. 4) GO TO 13              00001470
ISN 0143             IF (ICHOS4(I) .LT. 0 .AND. MICRO .EQ. 4) GO TO 1               00001480
```

```
ISN 0145          IF (ICHOS4(I) .GT. 0) NEQUIP(4)=NEQUIP(4)+1                   00001490
ISN 0147      104 CONTINUE                                                      00001500
ISN 0148          CALL SAVE(ICHOS4,NCHOS4,NOWAT,ITEST4,IENDDB)                  00001510
ISN 0149          CALL READDB(IENDDB)                                           00001520
ISN 0150          IF (ITER .NE. 0 .OR. MICRO .EQ. 5) GO TO 95                   00001530
ISN 0152          DO 21 I=1,5                                                   00001540
ISN 0153       21 IPIC5(I)=0                                                    00001550
ISN 0154       95 CALL EP(IPIC5,IERR(5),ITER,NCONF,ICHOS5,NCHOS5)               00001560
ISN 0155          NEQUIP(5)=0                                                   00001590
ISN 0156          DO 105 I=1,ITEST5                                             00001600
ISN 0157          IF (ICHOS5(I) .LT. 0 .AND. MICRO .LT. 5) GO TO 13             00001610
ISN 0159          IF (ICHOS5(I) .LT. 0 .AND. MICRO .EQ. 5) GO TO 1              00001620
ISN 0161          IF (ICHOS5(I) .GT. 0) NEQUIP(5)=NEQUIP(5)+1                   00001630
ISN 0163          IF (ICHOS5(I)/100 .EQ. 2) IBTLOC=NOWAT-1+I                    00001640
ISN 0165      105 CONTINUE                                                      00001650
ISN 0166          CALL SAVE(ICHOS5,NCHOS5,NOWAT,ITEST5,IENDDB)                  00001660
ISN 0167          CALL VESIZE(IERR(6),NCONF,ICHOS6)                             00001670
ISN 0168          IF (ICHOS6 .LT. 0) GO TO 13                                   00001680
ISN 0170          IF (ITER .GT. 0) GO TO 10                                     00001700
ISN 0172          CALL RELY(IRTN,IREL,NEQUIP)                                   00001720
ISN 0173          PRINT 3000,IRTN                                               00001721
ISN 0174     3000 FORMAT (5H IRTN,I10)                                          00001722
ISN 0175          IF (IRTN .LT. 0) GO TO 13                                     00001730
ISN 0177          IR1=1                                                         00001740
ISN 0178          IR2=NEQUIP(1)                                                 00001750
ISN 0179          DO 31 IR=1,IR2                                                00001760
ISN 0180       31 NCHOS1(IR)=NCHOSE(IR)                                         00001770
ISN 0181          IR1=IR2+1                                                     00001780
ISN 0182          IR2=NEQUIP(2)                                                 00001790
ISN 0183          DO 32 IR=1,IR2                                                00001800
ISN 0184          NCHOS2(IR)=NCHOSE(IR1)                                        00001810
ISN 0185       32 IR1=IR1+1                                                     00001820
ISN 0186          IR2=NEQUIP(3)                                                 00001830
ISN 0187          DO 33 IR=1,IR2                                                00001840
ISN 0188          NCHOS3(IR)=NCHOSE(IR1)                                        00001850
ISN 0189       33 IR1=IR1+1                                                     00001860
ISN 0190          IR2=NEQUIP(4)                                                 00001870
ISN 0191          DO 34 IR=1,IR2                                                00001880
ISN 0192          NCHOS4(IR)=NCHOSE(IR1)                                        00001890
```

```
ISN 0193        34 IR1=IR1+1                                              00001900
ISN 0194           IR2=NEQUIP(5)                                          00001910
ISN 0195           DO 35 IR=1,IR2                                         00001920
ISN 0196           NCHOS5(IR)=NCHOSF(IR1)                                 00001930
ISN 0197        35 IR1=IR1+1                                              00001940
ISN 0198        10 CONTINUE                                               00001950
ISN 0199           CALL STRUCT(NCONF)                                     00001955
ISN 0200           CALL THRML(IERR(7),NCONF)                              00001960
ISN 0201           NCHOSE(NOWAT)=0                                        00001980
ISN 0202           CALL COSTS(NCONF,NEQUIP)                               00001990
ISN 0203           CALL SKED(NEQUIP,NCONF)                                00001993
ISN 0204           NACCEP=NACCEP+1                                        00001995
ISN 0205           CALL PRNT(IERR,NEQUIP,NACCEP,NCONF)                    00002000
ISN 0206        13 IF (MICRO .GT. 0) GO TO 11                             00002010
ISN 0208           PRINT 9000,NCONF                                       00002011
ISN 0209           PRINT 9000,(ICHOSE(I),I=1,NOWAT)                       00002012
ISN 0210           PRINT 9000,(NCHOSE(I),I=1,NOWAT)                       00002013
ISN 0211      9000 FORMAT (10I10)                                         00002014
ISN 0212         1 CONTINUE                                               00002020
ISN 0213           IF (IREL .EQ. IENDR) GO TO 99                          00002030
ISN 0215           IREL=IENDR                                             00002040
ISN 0216           GO TO 2                                                00002050
ISN 0217        99 STOP                                                   00002060
ISN 0218           END                                                    00002070

*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*    SOURCE STATEMENTS =     217 ,PROGRAM SIZE =     5894

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                          81K BYTES OF CORE NOT USED
```

```
              COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                                SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
   ISN 0002                   SUBROUTINE FILTER(NCONF,ICODE)
                    C          FILTER CHECKS FOR COMPATIBLE COMBINATIONS OF CONFIGURATIONS
                    C          A MINUS 1 IS RETURNED FOR UNACCEPTABLE COMBINATIONS
                    C          NCONF IS ARRAY OF CONFIGURATIONS
                    C          ICODE IS CODE RETURNED
   ISN 0003                   DIMENSION NCONF(6)
   ISN 0004                   COMMON /USER1/DPHI,FE,TSMALL,XNU,PDOTO,TAUX,TAUY,TAUZ,T
                             * ,PHIRX,PHIRY,PHIRZ,PDOTX,PDOTY,PDOTZ,XN,YN,ZN,PDOTRX,PDOTRY,
                             *PDOTRZ,OMEGS,OMEGR,PJ,XNN,K,MANV,IPAYAW,EPI,AX,AY,AZ,
                             * EA,EANT,ALPHA,TL,TACCEL,XNNN,THOLD,PDOTAV,PDOTST,PHIFOV,ISAT
   ISN 0005                    COMMON /USER3/BTRMX,SCSFE,TPRFL,OPSMS,ARRAYN(11,3),NMSEQ
   ISN 0006                   COMMON /USER4/IOPTCM(3),IMSSEP,ISEQ,LSGLS,LUSB,FREQ(2),APOGEE,NET,
                             * NADIR,FREQR,COMRAT,BWIDTH(2)
   ISN 0007                   COMMON /USER5/IVOLT,OPTEMP
   ISN 0008                   ICODE=0
                    C          CHECK S AND C
   ISN 0009             10 IF (PDOTRX .LT. .01 .AND. NCONF(1) .EQ. 1) ICODE=-1
   ISN 0011                   IF (PDOTRX .LT. .01 .AND. NCONF(1) .EQ. 3) ICODE=-1
   ISN 0013                   IF (AMIN1(PHIRX,PHIRY,PHIRZ) .LT. .02 .AND. NCONF(1) .EQ. 2)
                             * ICODE=-1
                    C          MANEUVERABILITY IS MANV AND IS VALUES 1-4
   ISN 0015                   IF (MANV .EQ. 4 .AND. NCONF(1) .EQ. 1) ICODE=-1
                    C          PAYLOAD YAW IS 0 OR 1
   ISN 0017                   IF (IPAYAW .EQ. 1 .AND. NCONF(1) .NE. 2) ICODE=-1
   ISN 0019                   IF (NCONF(1) .EQ. 4 .AND. NCONF(3) .EQ. 2) ICODE=-1
                    C          IOPTCM(1) IS RANGING(1=YES),IOPTCM(2) IS SEPARATE LINK,AND
                    C          IOPTCM(3) IS SEPARATE ANTENNAS
   ISN 0021             40 IF (IOPTCM(1)+IOPTCM(2) .GT. 0 .AND. NCONF(4) .EQ. 1)ICODE=-1
   ISN 0023                   IF (IOPTCM(2)+IOPTCM(3) .GT. 0 .AND. NCONF(4) .EQ. 2)ICODE=-1
   ISN 0025                   IF (IOPTCM(2) .GT. 0 .AND. NCONF(4) .LE. 3)ICODE=-1
   ISN 0027                   IF (IOPTCM(3) .GT. 0 .AND. NCONF(4) .EQ. 4) ICODE=-1
   ISN 0029                   IF (NCONF(4) .LE. 3) GO TO 45
   ISN 0031                   DO 43 I=1,11
   ISN 0032                   DO 43 J=1,3
   ISN 0033                   IF (ARRAYN(I,J) .GT. 0) GO TO 45
   ISN 0035             43 CONTINUE
   ISN 0036                   ICODE=-1
```

```
 ISN 0037          45 CONTINUE
             C          IVOLT=1 MEANS VOLTAGE REGULATED
 ISN 0038          50 IF (IVOLT .EQ. 1 .AND. NCONF(5) .LE. 2) ICODE=-1
 ISN 0040             IF (NCONF(5) .EQ. 1 .AND. NCONF(1) .LT. 3) ICODE=-1
 ISN 0042             IF (NCONF(5) .EQ. 3 .AND. NCONF(1) .LT. 3) ICODE=-1
 ISN 0044             IF (NCONF(5) .EQ. 5 .AND. NCONF(1) .LT. 3) ICODE=-1
 ISN 0046          60 IF (NCONF(6) .EQ. 2 .AND. NCONF(1) .LT. 3)  ICODE=-1
 ISN 0048          99 RETURN
 ISN 0049             END

*OPTIONS IN EFFECT*       NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*       SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =       48 ,PROGRAM SIZE =       844

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                           117K BYTES OF CORE NOT USED
```

```
      COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                         SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
ISN 0002              SUBROUTINE READDB(IENDDB)
              C        THIS READS THE DATABASE FOR ONE SUBSYSTEM AT A TIME
              C        IDB IS SET AS THE DATABASE IS READ BY SCANNING EQUIP NUMBERS
ISN 0003              DIMENSION STORE(55)
ISN 0004              COMMON /DBCOM/IDB(30),DATAB(55,90)
ISN 0005              DATA STORE/55*0./
ISN 0006              IF (IENDDB .LE. 1) GO TO 2
ISN 0008              IF (STORE(1) .EQ. 0.) GO TO 2
ISN 0010              DO 1 J=1,55
ISN 0011            1 DATAB(J,1)=STORE(J)
ISN 0012              I=2
ISN 0013              IDOLD=STORE(1)/100.
ISN 0014              IIDB=1
ISN 0015              GO TO 3
ISN 0016            2 I=1
ISN 0017              IDOLD=0
ISN 0018              IIDB=1
ISN 0019            3 READ(1,100,END=90) (DATAB(J,I),J=1,55)
ISN 0020          100 FORMAT (F5.0,A2,3A6,5E10.0,/,5(8E10.0,/),5E10.0)
ISN 0021              IF (IDOLD .EQ. 0) IDOLD=DATAB(1,I)/100.
ISN 0023              ID=DATAB(1,I)/100.
              C        TEST FOR END OF SUBSYSTEM
ISN 0024              IF (ID .LT. IDOLD) GO TO 80
              C        TEST FOR NEW EQUIP TYPE
ISN 0026              IF (ID .EQ. IDOLD) GO TO 4
ISN 0028              IDB(IIDB)=I-1
ISN 0029              IIDB=IIDB+1
ISN 0030              IDOLD=ID
ISN 0031            4 I=I+1
ISN 0032              GO TO 3
              C        HERE WHEN SWITCHING SUBSYSTEMS
ISN 0033           80 DO 5 J=1,55
ISN 0034            5 STORE(J)=DATAB(J,I)
ISN 0035              IDB(IIDB)=I-1
ISN 0036              IENDDB=I-1
ISN 0037              RETURN
ISN 0038           90 DO 6 J=1,55
```

```
  ISN 0039          6 STORE(J)=0.                                   00000850
  ISN 0040            IDB(IIDB)=I-1                                 00000860
  ISN 0041            REWIND 1                                      00000870
  ISN 0042            IENDDB=I-1                                    00000880
  ISN 0043            RETURN                                        00000890
  ISN 0044            END                                           00000900

*OPTIONS IN EFFECT*     NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =      43 ,PROGRAM SIZE =      1042

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                        125K BYTES OF CORE NOT USED
```

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LEVEL 21.7 ( JAN 73 )                         OS/360  FORTRAN H

          COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                                    SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
    ISN 0002               SUBROUTINE SAVE(IIN,NIN,NOWAT,ITEST,IENDDB)                     00000910
                C           THIS SUBROUTINE SAVES ICHOSE,NCHOSE,AND ANY PORTIONS OF       00000920
                C           THE DATABASE REQUIRED BY LATER SUBSYSTEMS OR ROUTINES         00000930
    ISN 0003               DIMENSION IIN(15),NIN(15)                                       00000940
    ISN 0004               COMMON /DBCOM/IDB(30),DATAB(55,90)                              00000950
    ISN 0005               COMMON /CHOSE/ICHOSE(60),NCHOSE(60),COST(5,60),REL(6,60),THM(4,60)00000960
                          *,DPIA(11,60),SKD(7,60)                                          00000970
    ISN 0006               DO 1 I=1,ITEST                                                  00000980
    ISN 0007               IF (IIN(I) .LE. 0) GO TO 1                                      00000990
    ISN 0009               ICHOSE(NOWAT)=IIN(I)                                            00001000
    ISN 0010               NCHOSE(NOWAT)=NIN(I)                                            00001010
    ISN 0011               DO 3 J=1,IENDDB                                                 00001020
    ISN 0012               IF (DATAB(1,J) .NE. IIN(I)) GO TO 3                             00001030
    ISN 0014               DO 2 KKK=1,5                                                    00001040
    ISN 0015             2 COST(KKK,NOWAT)=DATAB(45+KKK,J)                                 00001050
    ISN 0016               REL(1,NOWAT)=DATAB(23,J)                                        00001060
    ISN 0017               DO 4 KKK=2,6                                                    00001070
    ISN 0018             4 REL(KKK,NOWAT)=DATAB(39+KKK,J)                                  00001080
    ISN 0019               DO 5 KKK=1,11                                                   00001090
    ISN 0020             5 DPIA(KKK,NOWAT)=DATAB(29+KKK,J)                                 00001100
    ISN 0021               THM(1,NOWAT)=DATAB(17,J)                                        00001110
    ISN 0022               THM(2,NOWAT)=DATAB(18,J)                                        00001120
    ISN 0023               THM(3,NOWAT)=DATAB(27,J)                                        00001130
    ISN 0024               THM(4,NOWAT)=DATAB(28,J)                                        00001140
    ISN 0025               SKD(1,NOWAT)=DATAB(46,J)                                        00001150
    ISN 0026               SKD(2,NOWAT)=DATAB(47,J)                                        00001160
    ISN 0027               DO 6 KKK=3,7                                                    00001170
    ISN 0028             6 SKD(KKK,NOWAT)=DATAB(48+KKK,J)                                  00001180
    ISN 0029             3 CONTINUE                                                        00001190
    ISN 0030               NOWAT=NOWAT+1                                                   00001200
    ISN 0031             1 CONTINUE                                                        00001210
    ISN 0032               RETURN                                                          00001220
    ISN 0033               END                                                             00001230

*OPTIONS IN EFFECT*     NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
```

```
*STATISTICS*     SOURCE STATEMENTS =      32 ,PROGRAM SIZE =     1076

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                                     121K BYTES OF CORE NOT USED
```

```
          COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                              SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
 ISN 0002               SUBROUTINE THRML (IERR,NCONF)                                    00001790
 ISN 0003               COMMON /BTWN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,T1,PL,PLMIN,    00001800
                       * LMBDD,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,00001810
                       * SATTWT,TPRIM,IPTLOC,RADA,RADAB,RAT,HTRPWR,HTRPRB,               00001820
                       * HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),           00001830
                       * FQBLG,SAEOLG,SATWT                                              00001831
 ISN 0004               COMMON /USER7/ISATOR,ORBINC                                      00001840
 ISN 0005               COMMON /USER1/EQM1WT,EQM2WT,DIAMAX,ALT                           00001850
 ISN 0006               COMMON /CHOSE/ICHOSE(60),NCHOSE(60),COST(5,60),REL(6,60),        00001860
                       * THRMDL(4,60),DP1A(11,60),SKD(7,60)                              00001870
 ISN 0007               DIMENSION NCONF(6)                                               00001880
 ISN 0008               REAL LNGTH                                                       00001890
 ISN 0009               DATA SIGMA/0.1714E-08/,QS/4.2.0/,EMISS/60.0/,ALBDO/155.0/,CONST/1.00001900
                       15/,PIE/3.1415926535/                                             00001910
                   C ****************************************************************00001920
                   C ****************************************************************00001930
                   C **   SUBROUTINE THRML USES A METHODOLOGY FOR SIZING THE THERMAL        **00001940
                   C **   CONTROL SUB-SYSTEM FOR A VARIETY OF SPACECRAFT. THIS METHODOLOGY**00001950
                   C **   DETERMINES SIZE AND PERFORMANCE OF THE THERMAL SUB-SYSTEM         **00001960
                   C ****************************************************************00001970
                   C ****************************************************************00001980
                   C **   A GLOSSARY OF VARIABLES FOLLOWS - -                               **00001990
                   C ****************************************************************00002000
                   C **                                                                    **00002010
                   C **       CODE IS AS FOLLOWS - -                                       **00002020
                   C **            U = USER INPUT, DB = DATA BASE, INT = INTERNAL          **00002030
                   C **            O = OUTPUT, I = INPUT FROM MAIN OR OTHER S/S            **00002040
                   C ****************************************************************00002050
                   C **       VAR. NAME      CODE        UNITS (DEFAULT)     DESCRIPTION  **00002060
                   C **                                                                    **00002070
                   C ****************************************************************00002080
                   C **                                                                    **00002090
                   C **       ALBDO       INT        155 BTU/(HR*FT**2)      ALBEDO       **00002100
                   C **                                                                    **00002110
                   C **       ALPHA       INT        0.30 (DIMENSIONLESS)    CONV.RAD.CONST.**00002120
                   C **                              0.08 (DIMENSIONLESS)    OSR. RAD.CONST.**00002130
                   C **                                                                    **00002140
```

```
C **      ALT         U                          N.MI.     ALTITUDE         **00002150
C **                                                                        **00002160
C **      BV          INT       1.1              VDC       MAX BATT.VOLT.   **00002170
C **                                                                        **00002180
C **      CA          INT       0.5              AMPS      BATT TRICKLE     **00002190
C **                                                                        **00002200
C **      CONST       INT       1.5                        K CONSTANT       **00002210
C **                                                                        **00002220
C **      EMISS       INT       60  BTU/(HR*FT**2)         EARTH EMISSION   **00002230
C **                                                                        **00002240
C **      EPSLON      INT       0.75 (DIMENSIONLESS)       CONV.RAD.CONST.**00002250
C **                            0.73 (DIMENSIONLESS)       OSR. RAD.CONST.**00002260
C **                                                                        **00002270
C **      ETAT        INT                            XMTR EFFICIENCY        **00002280
C **                                                                        **00002290
C **      HPT         O                     (BTU/HR) TOTAL HEATER POWER     **00002300
C **                                                                        **00002310
C **      HTPIPE      O                     (BTU/HR) HEAT DUE TO H.P.       **00002320
C **                                                                        **00002330
C **      HTPT        O                     (BTU/HR)TOTAL HEAT PIPE         **00002340
C **                                                                        **00002350
C **      HTRPRB      O                     (BTU/HR)BATT. HEATER POWER      **00002360
C **                                                                        **00002370
C **      HTRPWR      O                     (BTU/HR)OTHER HEATER POWER      **00002380
C **                                                                        **00002390
C **      I           INT                            INDEX                  **00002400
C **                                                                        **00002410
C **      IBTLOC      I                              BATTERY LOCATION       **00002420
C **                                                                        **00002430
C **      ICONF       INT                            TYPE OF CONFIG.        **00002440
C **      ISATOR      U         1      (DIMENSIONLESS)     EARTH ORIENTED   **00002450
C **                            2      (DIMENSIONLESS)     SUN   ORIENTED   **00002460
C **                            3      (DIMENSIONLESS)     INERTIALLY ORI.**00002470
C **                                                                        **00002480
C **      NC                                               NUMBER BATT CEL**00002490
C **                                                                        **00002500
C **      NCONF(1)    I                                    S+C MACRO INDEX**00002510
C **      NCONF(6)    I                                    VS  MACRO INDEX**00002520
C **                                                                        **00002530
```

```
C **     ORBINC    U                         DEGREES    ORBIT INCLINAT.**00002540
C **                                                                   **00002550
C **     PCM       0                    KG PHASE CHANGE MASS           **00002560
C **                                                                   **00002570
C **     PIE       INT               3.14159265 CONSTANT                 00002580
C **                                                                   **00002590
C **                                                                   **00002600
C **     PMAX      INT (DB)                   WATTS      PWR MAX        **00002610
C **                                                                   **00002620
C **     PMIN      INT (DB)                   WATTS      PWR MIN        **00002630
C **                                                                   **00002640
C **     QMAX      INT                     (BTU/HR)      MAX PWR DISSAP.**00002650
C **                                                                   **00002660
C **     QMAXB     INT                      (BTU/HR) BATT.POWER MAXIMUM **00002670
C **                                                                   **00002680
C **     QMIN      INT                     (BTU/HR)      MIN PWR DISSAP.**00002690
C **                                                                   **00002700
C **     QMINB     INT                      (BTU/HR) BATT.POWER MINIMUM **00002710
C **                                                                   **00002720
C **     QS        INT        442.0 BTU/(HR*FT**2)       SOLAR CONST.   **00002730
C **                                                                   **00002740
C **     RADA      0                         (FT**2)     RADIATOR AREA  **00002750
C **                                                                   **00002760
C **     RADAB     0                          FT**2 BATT.RAD.AREA       **00002770
C **                                                                   **00002780
C **     RAT       0                          FT**2 TOTAL RAD. AREA     **00002790
C **                                                                   **00002800
C **     SATLG     I  (VS)                   INCHES      SAT. LENGTH    **00002810
C **                                                                   **00002820
C **     SATRAD    I  (VS)                   INCHES      SAT. RADIUS    **00002830
C **                                                                   **00002840
C **     SIGMA     INT        0.1714E-8BTU/(HR*FT2*R4) BOLTZMANN CONST**00002850
C **                                                                   **00002860
C **     THRMDB    I                             THERMAL DATA BASE       00002870
C **                                                                   **00002880
C **     TMAX      INT (DB)                  DEGREES R  MAX TEMPERATURE**00002890
C **                                                                   **00002900
C **     TMAXB     INT                           BATT. MAX. TEMP.       **00002910
C **                                                                   **00002920
```

```
C **       TMIN       INT (DB)                      DEGREES R  MIN TEMPERATURE**
C **                                                                          **
C **       TMINB      INT                                BATT. MIN. TEMP.     **
C **                                                                          **
C **       VCHP       0                                  VAR.COND.HEAT PIPE   **
C **                                                                          **
C **                                                                          **
C **                                                                          **
C ****************************************************************************
C
C ****************************************************************************
C ****************************************************************************
C *                          2                                                 *
C *                                                                            *
C *                 O        D                                                 *
C *                 S     I  I                                                 *
C *                 R     S  O        C     R                                  *
C *                 +     O  D     O  O  H  A                                  *
C *                 V     T  E     S  N  E  D                                  *
C *                 C     H        R  V  A  I                                  *
C *                 H     E  H  H        T  A                                  *
C *                 E  P  R  E  E  R  R  E  T                                  *
C *                 A  C  M  A  A  A  A  R  O                                  *
C *                 T  M  A  T  T  D  D     R                                  *
C *              R        L        I  I  P                                     *
C *              A  P  M  I  P  P  A  A  O  A                                  *
C *              D  I  A  Z  I  I  T  T  W  R                                  *
C *              A  P  S  E  P  P  O  O  E  E                                  *
C *              B  E  S  R  E  E  R  R  R  A                                  *
C *                                                                            *
C *      IERR =  X  X  X  X  X  X  X  X  X  X                                  *
C *                                                                            *
C *          WHERE  0  MEANS NO SUCH REQUIREMENT, OR                           *
C *                 1  MEANS WE HAVE THIS REQUIREMENT                          *
C *                                                                            *
C *****************************************************************************
C *****************************************************************************
C *****************************************************************************
C *                                                                            *
```

```
                     C
                     C **      INITIALIZATION FOLLOWS - -
                     C
ISN 0010                   RADA=0.
ISN 0011                   RADAB=0.
ISN 0012                   RAT=0.0
ISN 0013                   HTRPWR=0.
ISN 0014                   HTRPRB=0.
ISN 0015                   HPT=0.
ISN 0016                   HTPIPE=0.
ISN 0017                   VCHP=0.
ISN 0018                   HTPT=0.
ISN 0019                   TMAX=1.E+20
ISN 0020                   TMIN=-1.E20
ISN 0021                   PMAX=0.
ISN 0022                   PMIN=0.0
ISN 0023                   ETAT=1.0
ISN 0024                   I=0
ISN 0025                   SATRAD=.5*D
ISN 0026             10    I=I+1
                     C
                     C         SEARCH FOR MIN(MAX TEMP) AND MAX(MIN TEMP), AND
                     C         ACCUMULATE THE POWER (EXCLUDING XMTRS AND BATTERIES)
                     C
ISN 0027                   IF (ICHOSE(I).LE.0) GO TO 50
                     C
ISN 0029                   IF (I.EQ.IBTLOC) GO TO 20
                     C
                     C
ISN 0031                   TMAX=AMIN1(TMAX,THRMDB(3,I))
ISN 0032                   TMIN=AMAX1(TMIN,THRMDB(4,I))
ISN 0033                   PMIN=THRMDB(2,I)+PMIN
ISN 0034                   PMAX=THRMDB(1,I)+PMAX
ISN 0035                   GO TO 10
                     C
                     C **  HERE IF WE HAVE THE BATTERY
                     C
ISN 0036             20    TMINB=THRMDB(4,I)+460.
ISN 0037                   TMAXB=THRMDB(3,I)+460.
```

```
 ISN 0038              GO TO 10
 ISN 0039           50 CONTINUE
 ISN 0040              QMIN=PMIN*3.41
 ISN 0041              IF(PMAX*.5 .GT. PMIN) PMAX=PMAX*.5
 ISN 0043              QMAX=PMAX*3.41
 ISN 0044              TMAX=TMAX+460.
 ISN 0045              TMIN=TMIN+460.
 ISN 0046              ICONF=NCONF(6)
              C
 ISN 0047              GO TO (60,70,80), ICONF
              C
              C **     SATELLITL LENGTH IN INCHES (MUST CONVERT TO CM)(FROM VS)     **
              C           (CYLINDER)
 ISN 0048     60       LNGTH=SATLG*2.54*0.75
 ISN 0049              GO TO 90
              C
              C        SATELLITE LENGTH IN INCHES (MUST CONVERT TO CM)(FROM VS)     **
              C           (BOX)
 ISN 0050     70       LNGTH=SATLG*2.54*0.75
 ISN 0051              GO TO 90
              C
              C        SATELLITE LENGTH IN INCHES (MUST CONVERT TO CM)(FROM VS)     **
              C           (SPHERE)
 ISN 0052     80       LNGTH=PIE*SATRAD*2.54
              C
              C
 ISN 0053     90       CONTINUE
 ISN 0054              IF (ALT.GT.19000.) GO TO 300
 ISN 0056              IF (ALT.LT.500.) GO TO 160
 ISN 0058              GO TO (130,100,100), ISATOR
 ISN 0059     100      ICONF=NCONF(1)
 ISN 0060              GO TO (120,120,110,110,110), ICONF
              C
              C **         ORBITS GT 500 BUT LT 19000 AND,                          **
              C **         SOLAR ORIENTED AND,                                      **
              C **         3-AXIS STABILIZED          (EQUATION 3.3.1.1)            **
              C
 ISN 0061     110      ALPHA=0.30
 ISN 0062              EPSLON=0.75
```

```
                C
                C    * DETERMINE RADIATOR AREA
                C
ISN 0063             RADA=QMAX/(SIGMA*EPSLON*TMAX**4-(EMISS*EPSLON))
                C
                C    * DETERMINE HEATER POWER
                C
ISN 0064             HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-(QMIN)-(EMISS*EPSLON))
                C
                C    * DETERMINE HEAT PIPE
                C
ISN 0065             HTPIPE=(QMAX*LNGTH)/3.41
ISN 0066             IERR=10111
ISN 0067             GO TO 380
                C
                C **        ORBITS GT 500 BUT LT 19000 AND,                              **
                C **        SOLAR ORIENTED AND,                                          **
                C **        SPIN STABILIZED           (EQUATION 3.3.1.2)                 **
                C
ISN 0068        120  ALPHA=0.3
ISN 0069             EPSLON=0.75
                C
                C    * DETERMINE RADIATOR AREA
                C
ISN 0070             RADA=QMAX/(SIGMA*EPSLON*TMAX**4-(EMISS*EPSLON))
                C
                C    * DETERMINE HEATER POWER
                C
ISN 0071             HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-(QMIN)-(EMISS*EPSLON))
                C
                C    * DETERMINE HEAT PIPE
                C
ISN 0072             HTPIPE=((QMAX*LNGTH)/3.41)
                C
ISN 0073             IERR=10111
ISN 0074             GO TO 380
                C
ISN 0075        130  ICONF=NCONF(1)
ISN 0076             GO TO (140,140,150,150,150), ICONF
```

```
                C                                                         
                C **     ORBITS GT 500 BUT LESS THAN 19000 AND,         **
                C **     EARTH ORIENTED AND,                            **
                C **     SPIN STABILIZED          (EQUATION 3.4.1.2)    **
                C                                                         
ISN 0077        140   ALPHA=0.08
ISN 0078              EPSLON=0.73
                C
                C   * DETERMINE RADIATOR AREA
                C
ISN 0079              RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(QS*ALPHA))
                C
                C   * DETERMINE HEATER POWER
                C
ISN 0080              HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-(QMIN))
                C
                C   * DETERMINE PCM
                C
ISN 0081              PCM=(0.26*ALPHA*QS*RADA*CONST)/40.
                C
                C   * DETERMINE HEAT PIPE
                C
ISN 0082              HTPIPE=(QMAX*LNGTH)/3.41
                C
ISN 0083              IERR=10011011
ISN 0084              GO TO 380
                C
                C **     ORBITS GT 500 BUT LESS THAN 19000 AND,         **
                C **     EARTH ORIENTED AND,                            **
                C **     3-AXIS STABILIZED        (EQUATION 3.4.1.1)    **
                C
ISN 0085        150   ALPHA=0.08
ISN 0086              EPSLON=0.73
                C
                C   * DETERMINE RADIATOR AREA
                C
ISN 0087              RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(QS*ALPHA))
                C
                C   * DETERMINE HEATER POWER
```

```
                 C
      ISN 0088         HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-(QMIN))
                 C
                 C   * DETERMINE PCM
                 C
      ISN 0089         PCM=(0.26*ALPHA*QS*RADA*CONST)/40.
                 C
                 C   * DETERMINE HEAT PIPE
                 C
      ISN 0090         HTPIPE=(QMAX*LNGTH)/3.41
                 C
      ISN 0091         IERR=10011011
      ISN 0092         GO TO 380
                 C
      ISN 0093   160   IF (ORBINC.GT.30.) GO TO 230
                 C
      ISN 0095         GO TO (170,200,200), ISATOR
                 C
      ISN 0096   170   ICONF=NCONF(I)
                 C
      ISN 0097         GO TO (180,180,190,190,190), ICONF
                 C
                 C **      ORBIT LT 500, ORBITAL INCLINATION LE 30 DEGREES AND,      **
                 C **      EARTH ORIENTED AND,                                       **
                 C **      SPIN STABILIZED          (EQUATION 2.1.2.2)               **
                 C
      ISN 0098   180   ALPHA=0.08
      ISN 0099         EPSLON=0.73
                 C
                 C   * DETERMINE RADIATOR AREA
                 C
      ISN 0100         RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(EMISS*EPSLON/PIE)-(QS+ALBDO)*AL
                      1PHA/PIE)
                 C
                 C   * DETERMINE HEATER POWER
                 C
      ISN 0101         HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-(QMIN)-((EMISS*EPSLON)/PI
                      1E))
                 C
```

```
ISN 0102             IERR=1011
ISN 0103             GO TO 380
                C
                C **      ORBIT LT 500, ORBITAL INCLINATION LE 30 DEGREES AND,
                C **      EARTH ORIENTED AND,
                C **      3-AXIS STABILIZED          (EQUATION 2.1.2.1)
                C
ISN 0104        190  ALPHA=0.08
ISN 0105             EPSLON=0.73
                C
                C   * DETERMINE RADIATOR AREA
                C
ISN 0106             RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(ALPHA*QS))
                C
                C    DETERMINE HEATER POWER
                C
ISN 0107             HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
                C
                C   * DETERMINE PCM MASS
                C
ISN 0108             PCM=(0.26*QS*RADA*ALPHA*CONST)/40.
                C
                C   * DETERMINE ISOTHERMALIZER HEAT PIPE
                C
ISN 0109             HTPIPE=(QMAX*LNGTH)/3.41
                C
ISN 0110             IERR=11011011
ISN 0111             GO TO 380
                C
                C
                C
ISN 0112        200  ICONF=NCONF(1)
                C
ISN 0113             GO TO (210,210,220,220,220), ICONF
                C
                C ** ORBIT LT 500, ORBITAL INCLINATION LE 30 DEGREES AND,
                C ** SUN ORIENTED AND,
                C ** SPIN STABILIZED                (EQUATION 2.1.1.2)
                C
```

```
ISN 0114    210   ALPHA=0.08
ISN 0115          EPSLON=0.73
            C
            C   * DETERMINE RADIATOR AREA
            C
ISN 0116          RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(EMISS*EPSLON)-(.5*ALBDO*ALPHA))
            C
            C   * DETERMINE HEATER POWER
            C
ISN 0117          HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
            C
            C   * DETERMINE HEAT PIPES
            C
ISN 0118          HTPIPE=(QMAX*LNGTH)/3.41
            C
ISN 0119          IERR=10011
ISN 0120          GO TO 380
            C
            C **  ORBIT LT 500, OBITAL INCLINATION LE 30 DEGREES AND,               **
            C **  SUN ORIENTED AND,                                                **
            C **  3-AXIS STABILIZED          (EQUATION 2.1.1.1)                    **
            C
ISN 0121    220   ALPHA=0.08
ISN 0122          EPSLON=0.73
            C
            C   * DETERMINE RADIATOR AREA
            C
ISN 0123          RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(EMISS*EPSLON)-(ALBDO*ALPHA))
            C
            C   * DETERMINE HEATER POWER
            C
ISN 0124          HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
            C
            C   * DETERMINE HEAT PIPES
            C
ISN 0125          HTPIPE=(QMAX*LNGTH)/3.41
            C
ISN 0126          IERR=10011
ISN 0127          GO TO 380
```

```
                  C
                  C
                  C      HERE IF ORBINC GT 30
                  C
                  C
ISN 0128          230    GO TO (240,270,270), ISATOR
                  C
ISN 0129          240    ICONF=NCONF(1)
                  C
ISN 0130                 GO TO (250,250,260,260,260), ICONF
                  C
                  C **   ORBIT LT 500, ORBITAL INCLINATION GT 30 DEGREES AND,          **
                  C **   EARTH ORIENTED AND,                                           **
                  C **   SPIN STABILIZED                (EQUATION 2.2.3.2)             **
                  C
ISN 0131          250    ALPHA=.08
ISN 0132                 EPSLON=.73
                  C
                  C    * DETERMINE RADIATOR AREA
                  C
ISN 0133                 RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(EMISS*EPSLON/PIE)-((QS+ALBDO)*A
                        1LPHA/PIE))
                  C
                  C    * DETERMINE HEATER POWER
                  C
ISN 0134                 HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN-(EMISS*EPSLON/PIE))
                  C
ISN 0135                 IERR=1011
ISN 0136                 GO TO 380
                  C
                  C **   ORBIT LT 500, ORBITAL INCLINATION GT 30 AND,                  **
                  C **   EARTH ORIENTED AND,                                           **
                  C **   3-AXIS STABILIZED              (EQUATION 2.2.3.1)             **
                  C
ISN 0137          260    ALPHA=.08
ISN 0138                 EPSLON=.73
                  C
                  C    * DETERMINE RADIATOR AREA
                  C
```

```
ISN 0139            RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(ALPHA*QS))
                C
                C    * DETERMINE HEATER POWER
                C
ISN 0140            HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
                C
                C    * DETERMINE PCM MASS
                C
ISN 0141            PCM=(0.26*QS*ALPHA*RADA*CONST)/40.
                C
                C     DETERMINE ISOTHERMALIZER HEAT PIPE
                C
ISN 0142            HTPIPE=(QMAX*LNGTH)/3.41
                C
ISN 0143            IERR=11011011
ISN 0144            GO TO 380
                C
                C
                C
ISN 0145        270 ICONF=NCONF(1)
ISN 0146            GO TO (280,280,290,290,290), ICONF
                C
                C ** ORBIT LT 500, ORBITAL INCLINATION GT 30 AND,                **
                C ** SUN ORIENTED AND,                                            **
                C ** SPIN STABILIZED                (EQUATION 2.2.2.2)            **
                C
ISN 0147        280 ALPHA=.08
ISN 0148            EPSLON=.73
                C
                C    * DETERMINE RADIATOR AREA
                C
ISN 0149            RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(EMISS*EPSLON)-(ALBDO*ALPHA))
                C
                C    * DETERMINE HEATER POWER
                C
ISN 0150            HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN-(EMISS*EPSLON))
                C
                C    * DETERMINE PCM MASS
                C
```

```
ISN 0151              PCM=(0.26*ALPHA*ALBDO*RADA*CONST)/40.
                C
                C   * DETERMINE HEAT PIPES
                C
ISN 0152              HTPIPE=(QMAX*LNGTH)/3.41
                C
ISN 0153              IERR=10011011
ISN 0154              GO TO 380
                C
                C **  ORBIT LT 500, ORBITAL INCLINATION GT 30 DEGREES
                C **  SUN ORIENTED AND,
                C **  3-AXIS STABILIZED            (EQUATION 2.2.2.1)
                C
ISN 0155        290   ALPHA=0.08
ISN 0156              EPSLON=0.73
                C
                C   * DETERMINE RADIATOR AREA
                C
ISN 0157              RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(EMISS*EPSLON)-(ALBDO*ALPHA))
                C
                C   * DETERMINE HEATER POWER
                C
ISN 0158              HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN-(EMISS*EPSLON))
                C
                C   * DETERMINE PCM MASS
                C
ISN 0159              PCM=(0.26*ALPHA*ALBDO*RADA*CONST)/40.
                C
                C   * DETERMINE HEAT PIPES
                C
ISN 0160              HTPIPE=(QMAX*LNGTH)/3.41
                C
ISN 0161              IERR=10011011
ISN 0162              GO TO 380
                C
                C     HERE IF ORBIT GT 19000
                C
ISN 0163        300   GO TO (340,310,310), ISATOR
                C
```

```
ISN 0164    310   ICONF=NCONF(1)
ISN 0165          GO TO (320,320,330,330,330), ICONF
            C
            C **  ORBIT GT 19000 AND
            C **  SOLAR INERTALLY ORIENTED AND,
            C **  SPIN STABILIZED                    (EQUATION 1.1.1.2)
            C
ISN 0166    320   ALPHA=0.30
ISN 0167          EPSLON=0.75
            C
            C   * DETERMINE RADIATOR AREA
            C
ISN 0168          RADA=QMAX/(SIGMA*EPSLON*TMAX**4)
            C
            C   * DETERMINE HEATER POWER
            C
ISN 0169          HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
            C
            C   * DETERMINE HEAT PIPES
            C
ISN 0170          HTPIPE=(QMAX*LNGTH)/3.41
            C
ISN 0171          IERR=10111
ISN 0172          GO TO 380
            C
            C **  ORBIT GT 19000 AND,
            C **  SOLAR INERTIALLY ORIENTED AND
            C **  3-AXIS STABILIZED                  (EQUATION 1.1.2)
            C
ISN 0173    330   ALPHA=0.30
ISN 0174          EPSLON=0.75
            C
            C   * DETERMINE RADIATOR AREA
            C
ISN 0175          RADA=(2.*QMAX)/(SIGMA*EPSLON*TMAX**4)
            C
            C   * DETERMINE HEATER POWER
            C
ISN 0176          HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4/2.)-QMIN)
```

```
                 C
                 C    * DETERMINE DIODE HEAT PIPE (2 REG-D)
                 C
 ISN 0177               HTPIPE=(QMAX*LNGTH)/3.41
                 C
 ISN 0178               IERR=110111
 ISN 0179               GO TO 380
                 C
                 C
                 C
 ISN 0180        340    ICONF=NCONF(1)
 ISN 0181               GO TO (350,360,370,370,360), ICONF
                 C
                 C **   ORBIT GT 19000 AND,                                  **
                 C **   EARTH ORIENTED AND,                                  **
                 C **   DUAL OR NORMAL SPIN STABILIZED(EQUATION 1.2.3)       **
                 C
 ISN 0182        350    ALPHA=0.30
 ISN 0183               EPSLON=0.75
                 C
                 C    * DETERMINE RADIATOR AREA
                 C
 ISN 0184               RADA=QMAX/(SIGMA*EPSLON*TMAX**4)
                 C
                 C    * DETERMINE HEATER POWER
                 C
 ISN 0185               HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
                 C
                 C    * DETERMINE HEAT PIPES
                 C
 ISN 0186               HTPIPE=(QMAX*LNGTH)/3.41
                 C
 ISN 0187               IERR=10111
 ISN 0188               GO TO 380
                 C
                 C **   ORBIT GT 19000 AND                                   **
                 C **   YAW SPIN STABILIZED          (EQUATION 1.2.2)        **
                 C
 ISN 0189        360    ALPHA=0.08
```

```
ISN 0190              EPSLON=0.73
                C
                C   * DETERMINE RADIATOR AREA
                C
ISN 0191              RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(QS*ALPHA/PIE))
                C
                C   * DETERMINE HEATER POWER
                C
ISN 0192              HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
                C
ISN 0193              IERR=1011
ISN 0194              GO TO 380
                C
                C **  ORBIT GT 19000 AND,
                C **  EARTH ORIENTED AND,                                         **
                C **  3-AXIS STABILIZED              (EQUATION 1.2.1)             **
                C                                                                 **
ISN 0195        370   ALPHA=0.30
ISN 0196              EPSLON=0.75
                C
                C   * DETERMINE RADIATOR AREA
                C
ISN 0197              RADA=(2.*QMAX)/(SIGMA*EPSLON*TMAX**4)
                C
                C   * DETERMINE HEATER POWER
                C
ISN 0198              HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4/2.)-QMIN)
                C
                C   * DETERMINE DIODE HEAT PIPE (2 REG-D)
                C
ISN 0199              HTPIPE=(QMAX*LNGTH)/3.41
                C
ISN 0200              IERR=110111
ISN 0201              GO TO 380
                C
                C ***      HERE WE WILL SIZE THE BATTERY THERMAL CONTROL NETWORK
                C ***
                C ***
                C
```

```
 ISN 0202      380    CA=.5
 ISN 0203             BV=1.5
 ISN 0204             ALPHA=0.08
 ISN 0205             EPSLON=0.73
 ISN 0206             QMAXB=NC*CA*BV*3.41
 ISN 0207             QMINB=0.
                C
                C   * DETERMINE RADIATOR AREA FOR BATTERY
                C
 ISN 0208             RADAB=QMAXB/((SIGMA*EPSLON*(TMAXB-30.)**4)-(QS*ALPHA))
                C
                C   * DETERMINE HEATER POWER FOR BATTERY
                C
                C
 ISN 0209             HTRPRB=1.25*(SIGMA*EPSLON*RADAB*(TMINB)**4-QMINB)
                C
                C   * DETERMINE VARIABLE CONDUCTANCE HEAT PIPE
                C
 ISN 0210             VCHP=QMAXB*LNGTH/3.41
 ISN 0211             IERR=IERR+1100000000
                C
                C
                C
 ISN 0212             RAT=RADA+RADAB
 ISN 0213             HPT=HTRPWR+HTRPRB
 ISN 0214             HTPT=HTPIPE+VCHP
                C
                C
 ISN 0215             RETURN
                C
 ISN 0216             END

*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =      215 ,PROGRAM SIZE =      3900

*STATISTICS*  NO  DIAGNOSTICS GENERATED
```

****** END OF COMPILATION ******   93K BYTES OF CORE NOT USED

```
        COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                          SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
ISN 0002             SUBROUTINE COMM (IPIC,IERR,ITER,MCONF,ICHOSE,NCHOSE)                      00008700
ISN 0003             INTEGER RESET,SEO,SSS,GRP                                                 00008710
ISN 0004             REAL LMARG,NF,MODLOS,IBER                                                 00008711
ISN 0005             DIMENSION IPIC(9),ICHOSE(11),NCHOSE(11),KPIC(9),MCONF(6),                 00008720
                    * KCHOSE(11)                                                               00008721
ISN 0006             DIMENSION SIGNOI(2),LMARG(2),TCLOSS(2),GT(2),MODX(2)                      00008730
ISN 0007             DIMENSION BER(14,3),IBER(14),BESSJ(2),LIMPIC(9)                           00008731
ISN 0008             COMMON /USER4/IOPTCM(3),IMSSEP,SEO,LSGLS,LUSB,FREQX(2),APOGEE,            00008740
                    * NET,NADIR,FREQR,COMRAT,BWIDTH(2)                                         00008750
ISN 0009             COMMON /BTWN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,             00008760
                    * LMBDD,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,00008770
                    * SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,HTRPRB,                        00008780
                    * HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),                    00008790
                    * EQBLG,SABOLG,SATWT                                                       00008791
ISN 0010             COMMON /DBCOM/IDB(30),DATAB(55,90)                                        00008800
ISN 0011             COMMON /USER1/EQM1WT,EQM2WT,DIAMAX,ALT                                    00008810
ISN 0012             EQUIVALENCE (J1,KPIC(1)), (J7,KPIC(6)), (J4,KPIC(7)), (J5,KPIC(8))00008820
                    1, (J6,KPIC(9))                                                            00008830
ISN 0013             INTEGER SEO,SSS,GRP                                                       00008840
ISN 0014             DATA      SIGNOI /10.,10./, LMARG   /6.,6./, SLANT /-1.E10/,              00008860
                    *          GTOT /-1.E10/, GR/-1.E10/, T/-1.E10/, NF /-1.E10/,              00008870
                    *          TCLOSS / 0.,0./, POLOSS /0./, GAMMA /.1/, BETA /1.8/,           00008880
                    *          GT /-1.E10,-1.E10/,  MODX /0,0/, ANTLOS /0./,                   00008890
                    *          COVER /0./,GRP /0/                                              00008900
               C BER IS BIT ERROR RATE DEGRADATION DUE TO HARDWARE                             00008910
               C IBER IS ARRAY OF DATA RATES                                                   00008920
ISN 0015             DATA IBER/.25,.50,1.0,2.0,4.0,8.0,16.,32.,64.,128.,256.,512.,768.,00008950
                    11024./                                                                    00008960
ISN 0016             DATA BER/8*4.4,4.6,5*5.5,8*2.4,2.4,2.5,4*3.3,10*4.0,3.9,                  00008970
                    13.3,3.4,4.1/                                                              00008980
ISN 0017             DATA IB1/6/,IB2/9/,IB3/11/,IA1/10/,IT1/11/,IT2/6/,IT3/12/,IT4/13/,00008990
                    1IT5/7/,IT6/14/,IT7/9/,IT8/8/,IT9/10/,IT10/15/,IR1/6/,IR2/10/,IR3/100009000
                    25/,IC1/7/,IC2/6/,IC3/12/,ID1/6/,ID2/11/                                   00009010
ISN 0018             IF (ITER .GT. 0) GO TO 3                                                  00009040
ISN 0020             DO 2 I=1,11                                                               00009050
ISN 0021           2 NCHOSE(I)=1                                                               00009060
ISN 0022           3 IF (ITER .EQ. 0 .AND. IPIC(4) .EQ. 0)IC=0                                 00009070
```

```
ISN 0024            NCONF = MCONF(4)
ISN 0025            DO 1 I=1,2
ISN 0026          1 BITRAT(I) = .001 * BITRAT(I)
ISN 0027            SSS=0
ISN 0028            IF (MCONF(1) .EQ. 1 .OR. MCONF(1) .EQ. 2) SSS=1
ISN 0030            INX=1
ISN 0031            IF (NCONF.EQ.4.OR.NCONF.EQ.5) INX=2
              C INITIALIZATION OF IPIC AND ICHOSE
ISN 0033            ICC=IC+1
ISN 0034            IF (ITER.NE.0) ICC=1
ISN 0036            DO 10 I=ICC,9
ISN 0037       10   KCHOSE(I)=0
ISN 0038            DO 20 I=1,9
ISN 0039            KPIC(I)=IPIC(I)
ISN 0040       20   IF (ITER.EQ.0.AND.IPIC(1).EQ.0) KPIC(I)=RESET(I)
ISN 0042            F1=0.
ISN 0043            IF (NCONF .EQ. 2 .OR. NCONF .EQ. 4)F1=1.
ISN 0045            IF (F1 .EQ. 0.) KPIC(9)=0
ISN 0047            IF (F1 .EQ. 1.) KPIC(6)=0
ISN 0049            IF (ITER.NE.0) IC=0
ISN 0051            IF (IC.NE.0) GO TO 700
ISN 0053            LIMPIC(1)=IDB(1)
ISN 0054            LIMPIC(2)=IDB(2)
ISN 0055            LIMPIC(3)=IDB(2)
ISN 0056            LIMPIC(4)=IDB(3)
ISN 0057            LIMPIC(5)=IDB(3)
ISN 0058            LIMPIC(6)=IDB(2)
ISN 0059            LIMPIC(7)=IDB(4)
ISN 0060            LIMPIC(8)=IDB(5)
ISN 0061            LIMPIC(9)=IDB(6)
ISN 0062            CALL BESS (BETA,BESSJ,I)
ISN 0063       30   CONTINUE
ISN 0064            IF (NCONF.GE.4.OR.BITRAT(2).EQ.0) GO TO 40
ISN 0066            BITRAT(1)=(BITRAT(1)+BITRAT(2))*1.3
ISN 0067       40   CONTINUE
ISN 0068            RATE1=IBER(1)
ISN 0069            RATE2=0
ISN 0070            DO 50 I=1,13
ISN 0071            IF (BITRAT(1).GT.IBER(I)) RATE1=IBER(I+1)
```

```
ISN 0073      50     IF (BITRAT(2).GT.IBER(I)) RATE2=IBER(I+1)
ISN 0075             BITRAT(1)=RATE1
ISN 0076             BITRAT(2)=RATE2
ISN 0077             IF (NCONF.EQ.1) GO TO 90
ISN 0079             IERR=1
ISN 0080             IF (LSGLS.EQ.0) GO TO 770
              C SGLS BBAU SELECTED ***********************************************
ISN 0082             IERR=0
ISN 0083             IC=1
              C ONE HOUSKEEPING BIT STREAM ONLY  (THIS SEMESTER)
              C 1 IS SGLS  2 IS USB
ISN 0084      60     IF (DATAB(IB1,J1).EQ.1) GO TO 70
ISN 0086             J1=J1+1
ISN 0087             IF (J1.GT.IDB(1)) GO TO 760
ISN 0089             GO TO 60
ISN 0090      70     IF (BITRAT(1).GT. 128.) GO TO 80
ISN 0092             IF (ABS(DATAB(IB2,J1)-1.024) .LT. .01) GO TO 690
ISN 0094             J1=J1+1
ISN 0095             IF (J1.GT.IDB(1)) GO TO 760
ISN 0097             GO TO 60
ISN 0098      80     IERR=2
ISN 0099             IF (BITRAT(1).NE.256) GO TO 770
ISN 0101             IERR=0
ISN 0102             IF (DATAB(IB2,J1).EQ.1.7) GO TO 690
ISN 0104             J1=J1+1
ISN 0105             IF (J1.GT.IDB(1)) GO TO 760
ISN 0107             GO TO 60
              C END OF BBAU SELECTION
ISN 0108      90     IC=2
ISN 0109             KXMTR=1
ISN 0110             GO TO 110
ISN 0111      100    IC=3
ISN 0112             KXMTR=2
ISN 0113      110    CONTINUE
              C
              C ANTENNA SELECTION ************************************************
ISN 0114             J2=KPIC(IC)
ISN 0115             IF (SEQ.EQ.0) GO TO 250
ISN 0117             IF (SSS.EQ.0) GO TO 160
```

```
ISN 0119              IF (ALT.GT.12000) GO TO 140
                C OMNI    (8 OMNI)
ISN 0121        120   IF (DATAB(IA1,J2).EQ.11) GO TO 130
ISN 0123              J2=J2+1
ISN 0124              IF (J2.GT.IDB(2)) GO TO 760
ISN 0126              GO TO 120
ISN 0127        130   IF (GT(KXMTR).NE.-1.E+10) GO TO 690
ISN 0129              GT(KXMTR)=-9.
ISN 0130              IF (COVER.EQ.0) GO TO 690
ISN 0132              GT(KXMTR)=-5.
ISN 0133              IF (COVER.EQ.55.) GT(KXMTR)=-13.
ISN 0135              GO TO 690
ISN 0136        140   IERR=30
ISN 0137              IF (ALT.GT.19323) GO TO 770
ISN 0139              IERR=0
ISN 0140              IF (GT(KXMTR).NE.-1.E+10) GO TO 150
ISN 0142              GT(KXMTR)=2.
                C BICONICAL    (A)
ISN 0143        150   IF (DATAB(IA1,J2).EQ.21) GO TO 690
ISN 0145              J2=J2+1
ISN 0146              IF (J2.GT.IDB(2)) GO TO 760
ISN 0148              GO TO 150
ISN 0149        160   IF (ALT.GT.7000) GO TO 210
ISN 0151              IF (NADIR.EQ.0) GO TO 190
ISN 0153        170   IF (GT(KXMTR).NE.-1.E+10) GO TO 180
ISN 0155              GT(KXMTR)=-1.
                C CONICAL SPIRAL (F2)
ISN 0156        180   IF (DATAB(IA1,J2).EQ.41) GO TO 690
ISN 0158              J2=J2+1
ISN 0159              IF (J2.GT.IDB(2)) GO TO 760
ISN 0161              GO TO 170
ISN 0162        190   IF (GRP.EQ.0) GO TO 170
ISN 0164              IF (GT(KXMTR).NE.-1.E+10) GO TO 200
ISN 0166              GT(KXMTR)=2.
                C MONOPOLE     (F1)
ISN 0167        200   IF (DATAB(IA1,J2).EQ.51) GO TO 690
ISN 0169              J2=J2+1
ISN 0170              IF (J2.GT.IDB(2)) GO TO 760
ISN 0172              GO TO 200
```

```
ISN 0173      210   IF (ALT.GT.12000.) GO TO 230
                    C
ISN 0175            IF (GT(KXMTR).NE.-1.E+10) GO TO 220
ISN 0177            GT(KXMTR)=10.
                    C HELIX  (F3)
ISN 0178      220   IF (DATAB(IA1,J2).EQ.31) GO TO 690
ISN 0180            J2=J2+1
ISN 0181            IF (J2.GT.IDB(2)) GO TO 760
ISN 0183            GO TO 220
ISN 0184      230   IERR=30
ISN 0185            IF (ALT.GT.19323) GO TO 770
ISN 0187            IERR=0
                    C
ISN 0188            IF (GT(KXMTR).NE.-1.E+10) GO TO 240
ISN 0190            GT(KXMTR)=15.
                    C PARABOLA  (B HIGH GAIN)
ISN 0191      240   IF (DATAB(IA1,J2).EQ.1) GO TO 690
ISN 0193            J2=J2+1
ISN 0194            IF (J2.GT.IDB(2)) GO TO 760
ISN 0196            GO TO 240
                    C
                    C STEERABLE PARABOLA OPTION WILL BE INCLUDED NEXT SEMESTER
ISN 0197      250   IF (ALT.LE.12000) GO TO 120
ISN 0199            IF (BITRAT(KXMTR).GT.10) GO TO 120
ISN 0201            GO TO 120
ISN 0202      260   KXMTR=1
ISN 0203            GO TO 280
ISN 0204      270   KXMTR=2
ISN 0205      280   CONTINUE
ISN 0206            LUNI=0
ISN 0207            IF (NCONF.GT.1.AND.KXMTR.EQ.1) LUNI=1
                    C
                    C SPACE LOSS
ISN 0209            IF (SLANT.EQ.-1.E+10) SLANT=SQRT(APOGEE*(APOGEE+6880))
ISN 0211            SLOSS=37.8+20*ALOG10(FREQX(KXMTR)*SLANT)
                    C
                    C G TO T
ISN 0212            IF (GTOT.NE.-1.E+10) GO TO 320
ISN 0214            IF (GR.NE.-1.E+10.AND.T.NE.-1.E+10) GO TO 310
```

```
ISN 0216          IF (NF.NE.-1.E+10.AND.GR.NE.-1.E+10) GO TO 300
             C NET.EQ.0 FOR AFSCF   NET.NE.0 FOR NASA
ISN 0218          IF (NET.EQ.0) GO TO 290
ISN 0220          GR=44
ISN 0221          T=170
ISN 0222          GO TO 310
ISN 0223     290  GR=47.5
ISN 0224          T=220
ISN 0225          GO TO 310
ISN 0226     300  T=(10.**(NF/10)-1)*290.
ISN 0227     310  GTOT=GR-10*ALOG10(T)
ISN 0228     320  CONTINUE
             C
             C TRANSMITTER CIRCUIT LOSS
ISN 0229          IF (TCLOSS(KXMTR).NE.0) GO TO 330
ISN 0231          TCLOSS(KXMTR)=1.0
ISN 0232          IF (LUNI.EQ.1.AND.(NCONF.EQ.2.OR.NCONF.EQ.4)) TCLOSS(KXMTR)=1.5
ISN 0234     330  CONTINUE
             C
             C MODULATION LOSS
ISN 0235          MODLOS=0
ISN 0236          IF (LUNI.EQ.0) GO TO 340
ISN 0238          IERR=10
ISN 0239          IF (LSGLS.EQ.0) GO TO 770
ISN 0241          IERR=0
             C BESSJ(2)=J1(BETA)  /  BESSJ(1)=J0(BETA)
ISN 0242          MODLOS=ABS(10*ALOG10(2*(BESSJ(2)*COS(GAMMA))**2))
ISN 0243     340  CONTINUE
             C HARDWARE DEGRDATION LOSS
ISN 0244          IF (LUNI.EQ.1) GO TO 360
ISN 0246          DO 350 I=1,14
ISN 0247     350  IF (BITRAT(KXMTR).EQ.IBER(I)) HDLOSS=BER(I,3)
ISN 0249          GO TO 380
ISN 0250     360  IERR=10
ISN 0251          IF (LSGLS.EQ.0) GO TO 770
ISN 0253          IERR=0
ISN 0254          IK=2
ISN 0255          IF (DATAB(IB2,J1).EQ.1.024) IK=1
ISN 0257          DO 370 I=1,14
```

```
ISN 0258      370   IF (BITRAT(I).EQ.IBER(I)) HDLOSS=BER(I,IK)
              C BANDWIDTH IN DB
ISN 0260      380   IF (BWIDTH(KXMTR).EQ.-1.E+10) BWIDTH(KXMTR)=BITRAT(KXMTR)*1000
ISN 0262            B=10*ALOG10(BWIDTH(KXMTR))
              C
              C CALCULATION OF ERP
ISN 0263            ERP=SIGNOI(KXMTR)+SLOSS+B-GTOT+LMARG(KXMTR)+TCLOSS(KXMTR)+POLOSS+A
                   1NTLOS+MODLOS+HDLOSS-228.6
ISN 0264            PW=10.**((ERP-GT(KXMTR))/10)
              C
              C TRANSMITTER SELECTION ***************************************************
ISN 0265            KNSTRA=0
ISN 0266            IC=KXMTR+3
ISN 0267            J3=KPIC(IC)
ISN 0268      390   IF (LUNI.EQ.0) GO TO 440
ISN 0270      400   IF (DATAB(IT1,J3).EQ.1) GO TO 410
ISN 0272            J3=J3+1
ISN 0273            IF (J3.GT.IDB(3)) GO TO 760
ISN 0275            GO TO 400
ISN 0276      410   IF (DATAB(IB3,J1).EQ.0) GO TO 420
ISN 0278            KNSTRA=1
ISN 0279            IF (DATAB(IB3,J1).EQ.DATAB(1,J3)) GO TO 460
ISN 0281            J3=J3+1
ISN 0282            IF (J3.GT.IDB(3)) GO TO 760
ISN 0284            GO TO 400
ISN 0285      420   IF (DATAB(IT2,J3).EQ.0) GO TO 430
ISN 0287            J3=J3+1
ISN 0288            IF (J3.GT.IDB(3)) GO TO 760
ISN 0290            GO TO 400
ISN 0291      430   IF (DATAB(IB2,J1).EQ.DATAB(IT3,J3).OR.DATAB(IB2,J1).EQ.DATAB(IT4,J
                   13)) GO TO 460
ISN 0293            J3=J3+1
ISN 0294            IF (J3.GT.IDB(3)) GO TO 760
ISN 0296            GO TO 400
ISN 0297      440   CONTINUE
              C NON UNIFIED TRANSMITTER
ISN 0298      450   CONTINUE
ISN 0299            IF (BITRAT(KXMTR)/1000.LE.DATAB(IT6,J3)) GO TO 460
ISN 0301            J3=J3+1
```

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ISN 0302              IF (J3.GT.IDB(3)) GO TO 760
ISN 0304              GO TO 450
ISN 0305      460     IF (LSGLS.EQ.0) GO TO 470
ISN 0307              IF (DATAB(IT5,J3).EQ.1) GO TO 470
ISN 0309              J3=J3+1
ISN 0310              IF (J3.GT.IDB(3)) GO TO 760
ISN 0312              GO TO 440
              C FREQUENCY,POWER,AND MODULATION COMPATIBILITY
ISN 0313      470     IF (FREQX(KXMTR).GE.DATAB(IT7,J3).AND.FREQX(KXMTR).LE.DATAB(IT8,J3
                     1)) GO TO 480
ISN 0315              J3=J3+1
ISN 0316              IF (J3.GT.IDB(3)) GO TO 760
ISN 0318              GO TO 390
ISN 0319      480     IF (PW.LE.DATAB(IT9,J3)) GO TO 490
ISN 0321              J3=J3+1
ISN 0322              IF (J3.GT.IDB(3)) GO TO 760
ISN 0324              GO TO 390
              C MODULATION  PHASE=1 ,FREQUENCY=2, AMPLITUDE=3
ISN 0325      490     IF (LSGLS.EQ.1) MODX(KXMTR)=1
ISN 0327              IF (MODX(KXMTR).EQ.0) GO TO 500
ISN 0329              IF (MODX(KXMTR).EQ.DATAB(IT10,J3)) GO TO 500
ISN 0331              J3=J3+1
ISN 0332              IF (J3.GT.IDB(3)) GO TO 760
ISN 0334              GO TO 390
ISN 0335      500     GO TO 690
ISN 0336        510 CONTINUE
              C
              C RECEIVING ANTENNA SELECTION ********************************************
ISN 0337              IC=6
ISN 0338              IF (FI .EQ. 1.) GO TO 690
ISN 0340              IF (SEQ.EQ.0) GO TO 520
ISN 0342              IF (SSS.EQ.0) GO TO 530
ISN 0344      520     IF (DATAB(IA1,J7).EQ.11) GO TO 690
ISN 0346              J7=J7+1
ISN 0347              IF (J7.GT.IDB(2)) GO TO 760
ISN 0349              GO TO 520
ISN 0350      530     IF (NADIR.EQ.0) GO TO 550
ISN 0352      540     IF (DATAB(IA1,J7).EQ.41) GO TO 690
ISN 0354              J7=J7+1
```

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ISN 0355            IF (J7.GT.IDB(2)) GO TO 760
ISN 0357            GO TO 540
ISN 0358      550   IF (GRP.EQ.0) GO TO 540
ISN 0360      560   IF (DATAB(IA1,J7).EQ.51) GO TO 690
ISN 0362            J7=J7+1
ISN 0363            IF (J7.GT.IDB(2)) GO TO 760
ISN 0365            GO TO 560
              C END RECEIVER ANTENNA SELECTION
              C RECEIVER SELECTION ************************************************
ISN 0366      570   IC=7
ISN 0367            IERR=10
ISN 0368            IF (LSGLS.EQ.0) GO TO 770
ISN 0370            IERR=0
ISN 0371      580   IF (DATAB(IR1,J4).EQ.1) GO TO 590
ISN 0373            J4=J4+1
ISN 0374            IF (J4.GT.IDB(4)) GO TO 760
ISN 0376            GO TO 580
ISN 0377      590   IF (DATAB(IR2,J4).GE.COMRAT) GO TO 650
ISN 0379            J4=J4+1
ISN 0380            IF (J4.GT.IDB(4)) GO TO 760
ISN 0382            GO TO 580
ISN 0383      600   IC=8
              C COMMAND SIGNAL CONDITIONER ****************************************
              C  RECEIVER CONSTRAINT TESTED.
ISN 0384      610   IF (DATAB(IR3,J4).EQ.0) GO TO 630
ISN 0386      620   IF (DATAB(IR3,J4).EQ.DATAB(1,J5)) GO TO 640
ISN 0388            J5=J5+1
ISN 0389            IF (J5.GT.IDB(5)) GO TO 760
ISN 0391            GO TO 620
ISN 0392      630   IF (DATAB(IC1,J5).EQ.0) GO TO 640
ISN 0394            J5=J5+1
ISN 0395            IF (J5.GT.IDB(5)) GO TO 760
ISN 0397            GO TO 630
              C LINK SGLS OR USB
ISN 0398      640   IERR=10
ISN 0399            IF (LSGLS.EQ.0) GO TO 770
ISN 0401            IERR=0
ISN 0402            IF (DATAB(IC2,J5).EQ.1) GO TO 650
ISN 0404            J5=J5+1
```

```
ISN 0405          IF (J5.GT.IDB(5)) GO TO 760
ISN 0407          GO TO 610
            C COMMAND RATE
ISN 0408    650   IF (DATAB(IC3,J5).GE.DATAB(IR2,J4)) GO TO 690
ISN 0410          J5=J5+1
ISN 0411          IF (J5.GT.IDB(J5)) GO TO 760
ISN 0413          GO TO 610
            C
            C DIPLEXER SELECTION ******************************************************
ISN 0414    660   IC=9
ISN 0415          IF (F1 .EQ. 0.) GO TO 690
            C LINK SGLS OR USB
ISN 0417          IERR=10
ISN 0418          IF (LSGLS.EQ.0) GO TO 770
ISN 0420          IERR=0
ISN 0421    670   IF (DATAB(ID1,J6).EQ.1) GO TO 680
ISN 0423          J6=J6+1
ISN 0424          IF (J6.GT.IDB(6)) GO TO 760
ISN 0426          GO TO 670
            C DIPLEXER POWER
ISN 0427    680   JT=KPIC(4)
ISN 0428          IF (DATAB(ID2,J6).GE.DATAB(IT9,JT)) GO TO 690
ISN 0430          J6=J6+1
ISN 0431          IF (J6.GT.IDB(6)) GO TO 760
ISN 0433          GO TO 670
            C
            C PROGRAM CONTROL AND BOOK KEEPING ***************************************
            C   J1-BASEBAND ASSEMBLY UNIT
            C   J2-TRANSMITTER ANTENNAS
            C   J3-TRANSMITTER
            C   J4-RECEIVER
            C   J5-SIGNAL CONDITIONER
            C   J6-DIPLEXER
            C   J7-RECEIVER ANTENNA
ISN 0434    690   IF (IC.EQ.2.OR.IC.EQ.3) KPIC(IC)=J2
ISN 0436          IF (IC.EQ.4.OR.IC.EQ.5) KPIC(IC)=J3
ISN 0438          KONT=0
ISN 0439          IN=KPIC(IC)
ISN 0440          IF (IN.NE.0) KCHOSE(IC)=DATAB(1,IN)
```

```
ISN 0442     700   CONTINUE
ISN 0443           IF (IC.EQ.9.AND.ITER.NE.0) GO TO 740
ISN 0445           IF (IC .EQ. 9 .AND. IPIC(4) .EQ. 0)GO TO 740
ISN 0447           IF (IC.EQ.9) GO TO 710
ISN 0449           IF (INX.EQ.1.AND.(IC.EQ.2.OR.IC.EQ.4)) IC=IC+1
ISN 0451           ICX=IC+1
ISN 0452           GO TO (30,90,100,260,270,510,570,600,660), ICX
ISN 0453     710   ICK=10-IC
ISN 0454           DO 730 I=ICK,9
ISN 0455           II=10-I
ISN 0456           IC=II-1
ISN 0457           IF (KCHOSE(II).EQ.0) GO TO 720
ISN 0459           IF (KPIC(II)+1.GT.LIMPIC(II)) GO TO 720
ISN 0461           KPIC(II)=KPIC(II)+1
ISN 0462           GO TO 740
ISN 0463       720 IF(KPIC(II) .EQ. 0) GO TO 725
ISN 0465           KPIC(II)=RESET(II)
ISN 0466       725 IF (II .EQ.1) KCHOSE(1)=-1
ISN 0468     730   CONTINUE
ISN 0469     740   DO 750 I=1,9
ISN 0470     750   IPIC(I)=KPIC(I)
ISN 0471           IF (KONT.EQ.1.AND.KCHOSE(1).NE.-1.) GO TO 700
ISN 0473           IF (ITER.NE.0) GO TO 752
ISN 0475           DO 751 I=1,9
ISN 0476           IF (KCHOSE(I).EQ.0) GO TO 751
ISN 0478           NCHOSE(I) = 1
ISN 0479       751 CONTINUE
ISN 0480       752 CONTINUE
             C
             C
ISN 0481           J=0
ISN 0482           DO 753 I=1,9
ISN 0483           IF (KCHOSE(I).EQ.0) GO TO 753
ISN 0485           J=J+1
ISN 0486           ICHOSE(J)=KCHOSE(I)
ISN 0487       753 CONTINUE
ISN 0488           ICONV=J+1
ISN 0489       754 IF (J.EQ.9) GO TO 755
ISN 0491           J=J+1
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```
ISN 0492            ICHOSE(J)=0                                                    00012970
ISN 0493            GO TO 754                                                      00012980
ISN 0494        755 CONTINUE                                                       00012990
ISN 0495            ICHOSE(ICONV)=0                                                00012991
ISN 0496            ICHOSE(ICONV+1)=0                                              00012992
ISN 0497            IDB6=IDB(6)                                                    00012993
ISN 0498            DO 780 I=1,9                                                   00012994
ISN 0499            DO 780 J=1,IDB6                                                00012995
ISN 0500            IF (DATAB(1,J) .NE. ICHOSE(I)) GO TO 780                       00012996
ISN 0502            IF (DATAB(22,J) .EQ. 0.) GO TO 780                             00012997
ISN 0504            IF (ICHOSE(ICONV) .EQ. DATAB(22,J) .OR. ICHOSE(ICONV+1) .EQ.   00012998
                   * DATAB(22,J)) GO TO 780                                        00012999
ISN 0506            IF (ICHOSE(ICONV) .NE. 0) GO TO 781                            00013000
ISN 0508            ICHOSE(ICONV)=DATAB(22,J)                                      00013001
ISN 0509            GO TO 780                                                      00013002
ISN 0510        781 ICHOSE(ICONV+1)=DATAB(22,J)                                    00013003
ISN 0511        780 CONTINUE                                                       00013004
ISN 0512                 IDB7=IDB(7)                                               00013010
ISN 0513             DO 757 I=1,11                                                 00013020
ISN 0514                 DO 756 J=1,IDB7                                           00013030
              C                                                                    00013040
ISN 0515                 IF (DATAB(1,J).NE. ICHOSE(I)) GO TO 756                   00013050
ISN 0517                 IF (I .GE. ICONV) CONVWT=CONVWT+DATAB(23,J)*NCHOSE(I)     00013055
ISN 0519                      WT = WT + DATAB(23,J)*NCHOSE(I)                      00013060
ISN 0520                      VOL = VOL + DATAB(24,J)*NCHOSE(I)                    00013070
ISN 0521                      PL = PL + DATAB(16,J)*NCHOSE(I)                      00013080
ISN 0522                      PLMIN = PLMIN + DATAB(18,J)*NCHOSE(I)                00013090
ISN 0523                      GO TO 757                                            00013100
              C                                                                    00013110
ISN 0524        756 CONTINUE                                                       00013120
              C                                                                    00013130
ISN 0525        757 CONTINUE                                                       00013140
ISN 0526            RETURN                                                         00013150
ISN 0527     760    CONTINUE                                                       00013160
ISN 0528            IF (IC.EQ.2.OR.IC.EQ.3) KPIC(IC)=J2                            00013170
ISN 0530            IF (IC.EQ.4.OR.IC.EQ.5) KPIC(IC)=J3                            00013180
ISN 0532            KONT=1                                                         00013190
ISN 0533            GO TO 710                                                      00013200
ISN 0534     770    CONTINUE                                                       00013210
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    ISN 0535          ICHOSE(I)=-1                                                            00013220
    ISN 0536          RETURN                                                                  00013230
    ISN 0537          END                                                                     00013240

*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =     536 ,PROGRAM SIZE =     7994

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                                          37K BYTES OF CORE NOT USED
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LEVEL 21.7 ( JAN 73 )                                       OS/360  FORTRAN H

              COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                                 SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
   ISN 0002              SUBROUTINE BESS (X,BESJ,NMAX)                                         00013250
   ISN 0003              DIMENSION BESJ(1), TJ(200)                                            00013260
   ISN 0004              EULER=0.577215664901533                                               00013270
   ISN 0005              PI=2.0/3.141592653589793                                              00013280
   ISN 0006              NU22=20                                                               00013290
   ISN 0007              IF (10.-X) 10,10,20                                                   00013300
   ISN 0008        10    HATN=(1.05)*X+25.                                                     00013310
   ISN 0009              GO TO 30                                                              00013320
   ISN 0010        20    HATN=35./(3.5-ALOG(X))                                                00013330
   ISN 0011        30    NU=HATN                                                               00013340
   ISN 0012              TJ(NU+2)=0.0                                                          00013350
   ISN 0013              TJ(NU+1)=0.000001                                                     00013360
   ISN 0014              DO 40 J=1,NU                                                          00013370
   ISN 0015              K=NU+1-J                                                              00013380
   ISN 0016              FK=K+K                                                                00013390
   ISN 0017        40    TJ(K)=FK*TJ(K+1)/X-TJ(K+2)                                            00013400
   ISN 0018              SUM=0.0                                                               00013410
   ISN 0019              DO 50 J=3,NU,2                                                        00013420
   ISN 0020        50    SUM=SUM+TJ(J)                                                         00013430
   ISN 0021              SUM=SUM+SUM                                                           00013440
   ISN 0022              TK=1./(TJ(1)+SUM)                                                     00013450
   ISN 0023              N=IABS(NMAX)+1                                                        00013460
   ISN 0024              DO 60 J=1,N                                                           00013470
   ISN 0025        60    BESJ(J)=TK*TJ(J)                                                      00013480
   ISN 0026              RETURN                                                                00013490
   ISN 0027              END                                                                   00013500

*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =       26 ,PROGRAM SIZE =      1604

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                                  121K BYTES OF CORE NOT USED
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LEVEL 21.7 ( JAN 73 )                                   OS/360  FORTRAN H

       COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                          SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
  ISN 0002            INTEGER FUNCTIONRESET(K)                                          00013510
  ISN 0003            COMMON /DBCOM/IDB(30),DATAB(55,90)                                00013520
  ISN 0004            IF (K.EQ.1) RESET=1                                               00013530
  ISN 0006            IF (K.EQ.2.OR.K.EQ.3.OR.K.EQ.6) RESET=IDB(1)+1                    00013540
  ISN 0008            IF (K.EQ.4.OR.K.EQ.5) RESET=IDB(2)+1                              00013550
  ISN 0010            IF (K.EQ.7.OR.K.EQ.8.OR.K.EQ.9) RESET=IDB(K-4)+1                  00013560
  ISN 0012            RETURN                                                            00013570
  ISN 0013            END                                                               00013580

*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*    SOURCE STATEMENTS =       12 ,PROGRAM SIZE =       378

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                                 125K BYTES OF CORE NOT USED
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      COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                        SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
ISN 0002          SUBROUTINE SKED(NEQUIP,NCONF)                                     00013590
ISN 0003          COMMON /USER8/SKOME(7,3)                                          00013600
ISN 0004          COMMON /CHOSE/ICHOSE(60),NCHOSE(60),COST(5,60),REL(6,60),        00013610
                 * THM(4,60),DPIA(11,60),DBSKED(7,60)                              00013620
ISN 0005          COMMON /PFTCOM/ACCRCY,CISTAR,IPCL,MMDLLD,TRUNC,ITRUNC,DE,TE,     00013630
                 * TOOLR,QCR,SEIR,PMR,PR,PU,TOOLU,QCP,SEIP,PMP,STAR,SATINV,MER,     00013631
                 * MEINV,PAYF,PAYINV,PAYOUL,CSL,XLTOT,CTOT,FEER,FEEINV,DDTE,XVEST,  00013632
                 * DPS,TSAVE(6),ROLD(60),IIII,AN,IS,BS,AM,TF,BF,IC,IA,IB,TOTOPS     00013633
ISN 0006          DIMENSION CONF(22,5),TSUB(6),ICI(5),NEQUIP(5),NCONF(6)           00013640
ISN 0007          DATA ICI/0,5,8,10,15/                                             00013645
ISN 0008          DATA CONF/1.,1.5,1.,2.,1.5,3*1.,2.,12*1.,2.,                      00013650
                 * 6.,9.,6.,12.,9.,5.,6.,6.,4.,6*2.,6*4.,2.,                        00013660
                 * 22*7.,22*7.E-7,5*.0001,3*.0002,13*.00007,.0002/                  00013670
ISN 0009          FK=4.5                                                            00013680
            C     CONF ROWS ARE   1 TO 5 FOR S AND C                                00013690
            C                     6 TO 8 FOR AUXPRO                                 00013700
            C                     9 TO 10 FOR DPI                                   00013710
            C                     11 TO 15 FOR COMM                                 00013720
            C                     16 TO 21 FOR EP                                   00013730
            C                     22 FOR M F                                        00013740
ISN 0010          DO 1 J=1,6                                                        00013750
ISN 0011        1 TSAVE(J)=0.                                                       00013760
ISN 0012          DO 4 IS=1,5                                                       00013770
ISN 0013          IF (IS .EQ. 1) ISTRT=1                                            00013780
ISN 0015          IF (IS .GT. 1) ISTRT=IEND+1                                       00013790
ISN 0017          IF (IS .EQ. 1) IEND=NEQUIP(1)                                     00013800
ISN 0019          IF (IS .GT. 1) IEND=IEND+NEQUIP(IS)                               00013810
ISN 0021          TSUB(1)=0.                                                        00013820
ISN 0022          TSUB(2)=0.                                                        00013830
ISN 0023          C=0.                                                              00013840
ISN 0024          NUM=0                                                             00013850
ISN 0025          DO 2  J=ISTRT,IEND                                                00013860
ISN 0026          TCD=DBSKED(3,J)+DBSKED(4,J)                                       00013870
ISN 0027          IF (TCD .GT. TSUB(1)) TSUB(1)=TCD                                 00013880
ISN 0029          TCQ=DBSKED(5,J)+DBSKED(6,J)                                       00013890
ISN 0030          IF (TCQ .GT. TSUB(2)) TSUB(2)=TCQ                                 00013900
ISN 0032          C=C+(1.335*DBSKED(1,J)+1.41*DBSKED(2,J))*1000.                    00013910
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ISN 0033          2 NUM=NUM+NCHOSE(J)                                          00013920
ISN 0034            XNUM=NUM                                                   00013930
ISN 0035            REDUN=XNUM/NEQUIP(IS)                                      00013940
ISN 0036            IC=ICI(IS)+NCONF(IS)                                       00013950
ISN 0037            R=REDUN**.125                                              00013960
ISN 0038            TSUB(3)=CONF(IC,2)+CONF(IC,5)*R*CONF(IC,1)*C**.6667        00013970
ISN 0039            TSUB(4)=CONF(IC,3)+CONF(IC,4)*R*C                          00013980
ISN 0040            TSDQ=TSUB(2)                                               00013990
ISN 0041            IF(TSUB(2) .LT. TSUB(3)+TSUB(4))TSDQ=TSUB(3)+TSUB(4)       00014000
ISN 0043            TSUB(5)=CONF(IC,1)*FK*TSUB(3)                              00014010
ISN 0044            TSUB(6)=TSUB(1)+TSDQ                                       00014015
ISN 0045            IF (TSUB(5) .LT. TSAVE(5)) TSUB(5)=TSAVE(5)                00014016
ISN 0047            IF (TSUB(5) .GE. TSAVE(5))TSAVE(5)=TSUB(5)                 00014017
ISN 0049            IF (TSUB(6) .LE. TSAVE(6)) GO TO 4                         00014020
ISN 0051            DO 3 J=1,6                                                 00014030
ISN 0052          3 TSAVE(J)=TSUB(J)                                           00014040
ISN 0053            ISSAVE=IS                                                  00014050
ISN 0054          4 CONTINUE                                                   00014060
            C        NOW DO MISSION EQUIP                                      00014070
ISN 0055            DO 5 J=1,3                                                 00014080
ISN 0056            DO 5 I=1,7                                                 00014090
ISN 0057            JJ=4-J                                                     00014100
ISN 0058            IF (SKDME(I,JJ) .GT. 0.) GO TO 6                           00014110
ISN 0060          5 CONTINUE                                                   00014120
ISN 0061            JJ=0                                                       00014130
ISN 0062          6 IF (JJ .EQ. 0) GO TO 20                                    00014140
ISN 0064            TSUB(1)=0.                                                 00014150
ISN 0065            TSUB(2)=0.                                                 00014160
ISN 0066            C=0.                                                       00014170
ISN 0067            DO 8 J=1,JJ                                                00014180
ISN 0068            TCD=SKDME(3,J)+SKDME(4,J)                                  00014190
ISN 0069            IF (TCD. GT. TSUB(1)) TSUB(1)=TCD                          00014200
ISN 0071            TCQ=SKDME(5,J)+SKDME(6,J)                                  00014210
ISN 0072            IF (TCQ .GT. TSUB(2)) TSUB(2)=TCQ                          00014220
ISN 0074          8 C=C+(1.335*SKDME(1,J)+1.41*SKDME(2,J))*1000.               00014230
ISN 0075            TSUB(3)=CONF(22,2)+CONF(22,5)*CONF(22,1)*C**.6667          00014240
ISN 0076            TSUB(4)=CONF(22,3)+CONF(22,4)*C                            00014250
ISN 0077            TSDQ=TSUB(2)                                               00014260
ISN 0078            IF (TSUB(2) .LT. TSUB(3)+TSUB(4))TSDQ=TSUB(3)+TSUB(4)      00014270
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ISN 0080              TSUB(5)=CONF(22,1)*FK*TSUB(3)                                 00014280
ISN 0081              TSUB(6)=TSUB(1)+TSDQ                                          00014285
ISN 0082              IF (TSUB(5) .LT. TSAVE(5)) TSUB(5)=TSAVE(5)                   00014286
ISN 0084              IF (TSUB(5) .GE. TSAVE(5))TSAVE(5)=TSUB(5)                    00014287
ISN 0086              IF (TSUB(6) .LT. TSAVE(6)) GO TO 20                           00014290
ISN 0088              DO 9 J=1,6                                                    00014300
ISN 0089            9 TSAVE(J)=TSUB(J)                                              00014310
ISN 0090           20 TSAVE(6)=TSAVE(6)+TSAVE(5)                                    00014320
ISN 0091              RETURN                                                        00014330
ISN 0092              END                                                           00014340

*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*    SOURCE STATEMENTS =      91 ,PROGRAM SIZE =      2202

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                              101K BYTES OF CORE NOT USED
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          COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                               SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
 ISN 0002                 SUBROUTINE INITIL(NCONF,IERR)
                C           THIS SUBROUTINE SETS APPROXIMATIONS FOR ALL VALUES IN ETWN
                C           WHICH ARE USED BEFORE THEY ARE CALCULATED
 ISN 0003                 DIMENSION NCONF(6)
 ISN 0004                 COMMON /USER1/DPHI,FE,TSMALL,XNU,PDOTO,TAUX,TAUY,TAUZ,T,
                         * PHIRX,PHIRY,PHIRZ,PDOTX,PDOTY,PDOTZ,XN,YN,ZN,PDOTRX,PDOTRY,
                         *PDOTRZ,OMEGS,OMEGR,PJ,XNN,K,MANV,IPAYAW,EP1,AX,AY,AZ,
                         *EA,FANT,ALPHA,TL,TACCEL,XNNN,THOLD,PDOTAV,PDOTST,PHIFOV,ISAT
 ISN 0005                 COMMON /USER1/ EQM1WT,EQM2WT,DIAMAX,ALT
 ISN 0006                 COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMDOLD,TRUNC,ITRUNC,DE,TE,
                         * TOOLR,QCR,SEIR,PMR,PE,PU,TOOLU,QCP,SEIP,PMP,SATR,SATINV,MER,
                         * MEINV,PAYR,PAYINV,PAYQUL,GSE,XLTOT,CTOT,FEER,FEEINV,DDTE,XVEST,
                         * OPS,SKTAU(6),ROLD(60),TTT,AN,TS,BS,AM,TF,BF,TC,TA,TB,TOTOPS
 ISN 0007                 COMMON /ETWN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,
                         * LMBDU,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,
                         * SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,HTRPRB,
                         * HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),
                         * EQBLG,SABOLG,SATWT
 ISN 0008                 IERR=0
 ISN 0009                 ACCRCY=AMIN1(PHIRX,PHIRY,PHIRZ)
 ISN 0010                 EQMWT=EQM1WT+EQM2WT
 ISN 0011                 SATWT=36.9*EQMWT**.672
 ISN 0012                 EQBVOL=.1*SATWT
 ISN 0013                 TPRIM=T
 ISN 0014                 N=NCONF(6)
 ISN 0015                 GO TO (20,10,30) ,N
                C           HERE IF A BOX
 ISN 0016              10 EQBLG=(EQBVOL* 3456.)**.333
 ISN 0017                 EQBDIA=EQBLG
 ISN 0018                 EQBSID=.707*EQBDIA
 ISN 0019                 IF (EQBDIA .LE. DIAMAX) GO TO 11
 ISN 0021                 EQBDIA=DIAMAX
 ISN 0022                 EQBSID=.707*EQBDIA
 ISN 0023                 EQBLG=(EQBVOL*1728.)/(EQBSID*EQBSID)
 ISN 0024              11 SATINX=(SATWT/6.)*EQBSID*EQBSID
 ISN 0025                 SATINY=(SATWT/12.)*(EQBSID*EQBSID+EQBLG*EQBLG)
 ISN 0026                 SATINZ=SATINY
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ISN 0027          GO TO 100                                          00000380
            C       HERE IF A CYLINDER                               00000390
ISN 0028       20 SATDAM=(EQBVOL*2201.)**.333                        00000400
ISN 0029          EQBLG=SATDAM                                       00000410
ISN 0030          IF (SATDAM .LE. DIAMAX) GO TO 21                   00000420
ISN 0032          SATDAM=DIAMAX                                      00000430
ISN 0033          EQBLG=EQBVOL*2201./(SATDAM*SATDAM)                 00000440
ISN 0034       21 SATINX=(SATWT*SATDAM*SATDAM/8.)                    00000450
ISN 0035          SATINY=(SATWT/12.)*(.75*SATDAM*SATDAM+EQBLG*EQBLG) 00000460
ISN 0036          SATINZ=SATINX                                      00000470
ISN 0037          GO TO 100                                          00000480
            C       HERE IF A SPHERE                                 00000490
ISN 0038       30 SATDAM=(EQBVOL*3300.9)**.333                       00000500
ISN 0039          SATINX=.1*SATWT*SATDAM*SATDAM                      00000510
ISN 0040          SATINY=SATINX                                      00000520
ISN 0041          SATINZ=SATINX                                      00000530
            C      IF SATDAM TOO BIG STOP PROGRAM                    00000540
ISN 0042          IF (SATDAM .GT. DIAMAX) IERR=1                     00000550
ISN 0044          IF (IERR .GT. 0) RETURN                            00000560
ISN 0046          GO TO 100                                          00000570
            C       SETS VALUES NEEDED BY S AND C                    00000580
ISN 0047      100 IF (NCONF(1) .NE. 1) GO TO 120                     00000590
ISN 0049          RJ=SATINX                                          00000600
ISN 0050          DX=.5*SATDAM/12.                                   00000605
ISN 0051          GO TO 200                                          00000610
ISN 0052      120 IF (NCONF(1) .NE. 2) GO TO 130                     00000620
ISN 0054          XJ=SATINX                                          00000630
ISN 0055          YJ=SATINY                                          00000640
ISN 0056          ZJ=SATINZ                                          00000650
ISN 0057          D=SATDAM                                           00000660
ISN 0058          DZ=.5*SATDAM                                       00000670
ISN 0059          IF (NCONF(6) .EQ. 2 ) GO TO 200                    00000680
ISN 0061          IF (NCONF(6) .EQ. 1) DT=.5*EQBLG                   00000690
ISN 0063          IF (NCONF(6) .EQ. 3) DT=.5*SATDAM                  00000700
ISN 0065          DX=DT                                              00000710
ISN 0066          DY=DT                                              00000720
ISN 0067          GO TO 200                                          00000730
ISN 0068      130 IF(NCONF(1) .GT. 5) GO TO 200                      00000740
ISN 0070          XJ=SATINX                                          00000750
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ISN 0071              YJ=SATINY                                   00000760
ISN 0072              ZJ=SATINZ                                   00000770
ISN 0073              D=SATDAM                                    00000780
ISN 0074              IF (NCONF(6).EQ. 2) D=EQBDIA                00000790
ISN 0076              DT=.5*EQBLG                                 00000800
ISN 0077              IF (NCONF(6) .EQ. 3) DT=.5*SATDAM           00000810
ISN 0079              DX=.5*SATDAM                                00000820
ISN 0080              IF (NCONF(6) .EQ. 2) DX=.5*EQBLG            00000830
ISN 0082              DY=DT                                       00000840
ISN 0083              DZ=DT                                       00000850
ISN 0084          200 CONTINUE                                    00000860
ISN 0085          300 COMRT=2000.                                 00000870
ISN 0086               RETURN                                     00000880
ISN 0087              END                                         00000890

*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =      86 ,PROGRAM SIZE =      1280

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                          109K BYTES OF CORE NOT USED
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          COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                        SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
 ISN 0002                BLOCK DATA
               C          SETS ALL DEFAULT VALUES
 ISN 0003                COMMON /USER1/DPHI,FL,TSMALL,XNU,PDOTO,TAUX,TAUY,TAUZ,T,
                        * PHIRX,PHIRY,PHIRZ,PDOTX,PDOTY,PDOTZ,XN,YN,ZN,PDOTRX,PDOTRY,
                        *PDOTRZ,OMEGS,OMEGR,PJ,XNN,K,MANV,IPAYAW,EPI,AX,AY,AZ,
                        *EA,EANT,ALPHA,TL,TACCEL,XNNN,THOLD,PDOTAV,PDOTST,PHIFOV,ISAT
 ISN 0004                COMMON /USER2/TTHST,CLIFF
 ISN 0005                COMMON /USER3/BTRMX,SCSFL,TPRFL,OPSMS,ARRAYN(11,3),NMSEQ
 ISN 0006                COMMON /USER4/IOPTCM(3),IMSSEP,ISEQ,LSGLS,LUSB,FREQ(2),APOGEE,NET,
                        * NADIR,FREQR,COMRAT,BWIDTH(2)
 ISN 0007                COMMON /USER5/IVOLT,OPTEMP
 ISN 0008                COMMON /USER6/EQPF,MB12ZH,EQM1XL,EQM1YL,EQM1ZL,EQM2XL,EQM2YL,
                        * EQM2ZL,ISBOFG,NUMEEQ,EEQWT(9),EEQVL(9),EM1YCG,EM1ZCG,EM2YCG,
                        * EM2ZCG,CCEEX(9),EELOC(9),XCGSA1,XCGSA3
 ISN 0009                 COMMON /USER7/ISATOR,ORBINC
 ISN 0010                 COMMON /USER8/SKDME(7,3)
 ISN 0011                COMMON /USERT/EQM1WT,EQM2WT,DIAMAX,ALT
 ISN 0012                 COMMON /USERR/KEOPT,SYSLB,RFIXED,SLBMX,ISPT,SPEC(6),SPEC1,ISUB
 ISN 0013                COMMON /USERC/MFV,NGV,XMER,XMEO,FEEPCT,IMETYP
 ISN 0014                DATA DPHI,FF,TSMALL,XNU,PDOTO,TAUX,TAUY,TAUZ,T/.25,4.1,100.,
                        * 3.,1.,3*62208000.,24./
 ISN 0015                COMMON /USER9/CA,CE
 ISN 0016                DATA PHIRX,PHIRY,PHIRZ,PDOTX,PDOTY,PDOTZ,XN,YN,ZN,PDOTRX,PDOTRY,
                        *PDOTRZ/3*.75,6*1.,3*.017/
 ISN 0017                DATA OMEGS,OMEGR,PJ,XNN,K,MANV,IPAYAW/1.5708,60.,75.,21.,1,1,0/
 ISN 0018                DATA EPI,AX,AY,AZ/.0001,3*.05/
 ISN 0019                DATA EA,EANT,ALPHA,TL,TACCEL,XNNN,THOLD,PDOTAV,PDOTST,PHIFOV
                        * /.1,.1,12.,1.,20.,4.,100000.,.01,.0667,40./
 ISN 0020                DATA CLIFF/50000./
 ISN 0021                DATA BTRMX,SCSFL,TPRFL,OPSMS,ARRAYN,NMSEQ/1024000.,36*0.,
                        * 0/
 ISN 0022                DATA IVOLT,OPTEMP/0,15./
 ISN 0023                DATA IOPTCM,IMSSEP,LSGLS,LUSB,FREQ,APOGEE,NET,NADIR,FREQR,COMRAT,
                        * BWIDTH/0,0,0,0,1,0,2*2250.,500.,0,0,1800.,1000.,2*-1.E10/
 ISN 0024                DATA EQPF,MB12ZH,EQM1XL,EQM1YL,EQM1ZL,EQM2XL,EQM2YL/2.,1,
                        * 5*40./
 ISN 0025                DATA EQM2ZL,ISBOFG,NUMEEQ,EEQWT,EEQVL,EM1YCG,EM1ZCG,EM2YCG
```

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                      */40.,2*0,21*0./
   ISN 0026            DATA EM2ZCG,CGEEX,EELOC,XCGSA1,XCGSA3 /0.,9*2.,9*5.,2*1./
   ISN 0027            DATA ISATOR,ORBINC/1,28.5/
   ISN 0028             DATA SKDMF/21*0./
   ISN 0029             DATA CA,CF/10.,5./
   ISN 0030            DATA EQM1WT,EQM2WT,DIAMAX,ALT/2*435.,120.,500./
   ISN 0031            DATA KEOPT,SYSLB,RFIXED,SLBMX,ISPT,SPEC,SPEC1,ISUB/1,0.,
                      * 1.,50000.,0,5*.9,.6,18.,0/
   ISN 0032            DATA NFV,NQV,XMER,XMEU,FEEPCT,IMETYP/4,1,0.,0.,.07,2/
   ISN 0033            END

*OPTIONS IN EFFECT*     NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*    SOURCE STATEMENTS =      32 ,PROGRAM SIZE =

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                          117K BYTES OF CORE NOT USED
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        COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                           SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
ISN 0002             SUBROUTINE COSTS (NCONF,NEQUIP)
               C ******************************************************************
               C **  THIS SUBROUTINE COLLECTS COSTS FOR CATALOG ITEMS AND CALCULATES **
               C **  COSTS FOR CER ITEMS AND STORES THEM FOR OUTPUTTING               **
               C ******************************************************************
               C
ISN 0003             COMMON /ETWN/  WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,
                    1               LMBDD,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,
                    2               TNKWT,PASSTR,SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,
                    3               HTRPWR,HTRPRB,HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,
                    4               ACSSN,BITRAT(2),EQBLG,SABOLG,SATWT
               C
ISN 0004             COMMON /CHOSE/ICHOSE(60),NCHOSE(60),COST(5,60),REL(6,60),THM(4,60)
                    1               ,DPIA(11,60)
ISN 0005             COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMDOLD,TRUNC,ITRUNC,DE,TE,TOOLR,
                    1               QCR,SEIR,PMR,PE,PU,TOOLU,QCU,SEIP,PMP,SATR,SATINV,
                    2               YMER,XMFINV,PAYR,PAYINV,PAYOUL,GSE,XLTOT,CTOT,FEER,
                    3               FEEINV,DDIE,XVEST,OPS,SKTAV(6),ROLD(60),T,AN,TS,BS,
                    4               AM,TF,EF,TC,TA,TB,TOTOPS
ISN 0006             COMMON /USERC/NFV,NQV,XMER,XMEU,FEEPCT,IMETYP
ISN 0007             DIMENSION      RE(6),RT(6),RP(6),BE(6),BT(6),BP(6),UPS(6),
                    1               X(6),FR(6),FP(6),FT(6),FE(6),NCONF(6),NEQUIP(5),
                    2               COMPR(60),COMPU(60),SUBE(7),SUBT(7),SUBR(7),
                    3               SUBUE(7),SUBUP(7),SUBU(7),COMP5E(60),COMP5P(60),
                    4               SUP5P(7),SUE5E(7)
               C
ISN 0008             DATA           FR          /6*1./,
                    1               FP          /6*1./,
                    2               FT          /6*1./,
                    3               FE          /6*1./,
                    4               RE          /6000.,105603.,40500.,53700.,21638.,
                    5                           108000./,
                    6               RT          /1300.,98719.,25600.,43100.,11762.,40200./
                    7,              RP          /2300.,5882.,3900.,23900.,67408.,32400./,
                    8               BE          /.4005,.3334,.4005,.8156,.585,.4005/,
                    9               BT          /.4005,.2869,.4005,.7137,.678,.4005/,
                    A               BP          /.3334,.6960,.3334,.6781,.5460,.3334/,
```

```
     B        PI        /1./,     SF        /1./
      SEIR = 0.
      QCR = 0.
      PMR = 0.
      SUMTDL = 0.
      TOOLR  = 0.
      SEIP = 0.
      QCU = 0.
      PMP = 0.
      SUMPF = 0.
      TOTSUM = 0.
      SATR = 0.
      SATINV = 0.
      MEINV = 0.
      PAYR = 0.
      PAYINV =C.
      PAYQUL = 0.
      GSE  = 0.
      XLTOT = 0.
      CTOT  = 0.
      FEER  = 0.
      FEEINV= 0.
      DDTF  = 0.
      XVEST = 0.
      OPS   = 0.
      DE = 0.
      TE = 0.
      PE = 0.
      PU = 0.
      SYSR=0.
      SYSU=0.
      Q5=0.
      P5P=0.
      P5E=0.
      DO 1 I=1,7
      SUB5P(I)=0.
      SUB5E(I)=0.
      SUBE(I)= 0.
      SUBT(I)= 0.
```

```
ISN 0047            SUBR(I)= 0.
ISN 0048            SUBUE(I)=0.
ISN 0049            SUBUP(I)=0.
ISN 0050          1 SUBU(I) =0.
ISN 0051            DO 2 I=1,60
ISN 0052            COMPU(I)=0.
ISN 0053          2 COMPR(I)=0.
ISN 0054            X(1) = WATE
ISN 0055            X(2) = HARNWT
ISN 0056            X(3) = THCMWT
ISN 0057            X(4) = CONVWT
ISN 0058            X(5) = TNKWT
ISN 0059            X(6) = PASSTR
                C
ISN 0060            I=1
                C
ISN 0061        100 IF (NCHOSE(I).EQ.0) GO TO 200
                C
                C
                C  ** COMPUTATIONS FOR CATALOG ITEMS
                C
                C
ISN 0063            C1= COST(1,I)
ISN 0064            Q =NQV +NFV
ISN 0065            QP = Q * NCHOSE(I)
ISN 0066            Q5=5.*NCHOSE(I)
ISN 0067            P5 = COST (3,I)
ISN 0068            QREF = COST(4,I)
ISN 0069            FQ = NCHOSE(I)/QREF
ISN 0070            IF (FQ.LT.1.) FQ = 1.
ISN 0072            FRE = 0.8875 + 0.1125*FQ
ISN 0073            FRT = 0.3    + 0.7*FQ
                C  ** COMPUTE DESIGN ENGINEERING COST, (DE OR COMPE)
ISN 0074            COST(1,I)=COST(1,I)*PI*FRE*1000.
                C  ** COMPUTE TEST AND EVALUATION COST, (TE OR COMPT)
ISN 0075            COST(2,I)=COST(2,I)*PI*FRT*1000.
                C  ** SUB-TOTAL ENGINEERING COSTS
ISN 0076            COMPR(I)= COST(1,I) + COST(2,I)
                C  ** COMPUTE COMPONENT AVERAGE UNIT PRODUCTION COST,(PU OR COMPUP)
```

```
ISN 0077          COST(3,I) = 1.277*P5*QP**.848*PI*1000./Q
             C  ** COMPUTE COMPONENT CUM AVG 5 UNIT PROD. COST
ISN 0078          COMP5P(I) = 200.* P5 * Q5**0.848 * PI * 1.277
             C  ** COMPUTE COMPONENT AVERAGE PRODUCTION ENGINEERING (PE.OR COMPUE)
ISN 0079          COST(4,I) = C1*(QP**.485-1.)*PI*FRE*1000./Q
             C  ** COMPUTE COMPONENT CUM AVG 5 PROD. ENG. COST
ISN 0080          COMP5E(I) = 200. * C1 * (Q5**0.485 - 1.0) * FRE * PI
ISN 0081          COMPU(I) = COST(3,I) + COST(4,I)
ISN 0082          I = I + 1
ISN 0083          GO TO 100
             C
             C
             C
             C
             C  ** COMPUTATIONS FOR SUBSYSTEM COSTS BASED ON COST ESTIMATING
             C  ** RELATIONSHIPS (C.E.R.-S)
ISN 0084      200 M = 0
ISN 0085          J = I + 5
ISN 0086          ISAVE = I
ISN 0087          PRINT 9993
ISN 0088     9993 FORMAT(//)
             C
ISN 0089          DO 300 K = 1,J
ISN 0090          M = M + 1
ISN 0091          GO TO (210,260,220,260,240,250),M
             C    SET SOLAR ARRAY FACTORS (FOR ALL EXCEPT DUAL SPIN)
ISN 0092      210 ICONF = NCONF(1)
ISN 0093          GO TO (260,215,215,215,215),ICONF
             C
ISN 0094      215 FR(M) = 3.
ISN 0095          FT(M) = 3.
ISN 0096          FP(M) = 4.67
ISN 0097          FE(M) = 4.67
ISN 0098          GO TO 270
             C
             C
             C    SET THERMAL FACTORS (FOR ALL EXCEPT DUAL SPIN)
ISN 0099      220 ICONF = NCONF(1)
ISN 0100          GO TO (260,225,225,225,225),ICONF
```

```
      C
ISN 0101   225 FR(M) = 3.
ISN 0102       FT(M) = 3.
ISN 0103       FP(M) = 4.67
ISN 0104       FE(M) = 4.67
ISN 0105       GO TO 270
      C
      C
      C        SET PROPELLANT FEED SYSTEMS FACTORS
ISN 0106   240 ICONF = NCONF(2)
ISN 0107       GO TO (260,241,245),ICONF
      C
ISN 0108   241 FR(M) = 2.37
ISN 0109       FT(M) = 1.
ISN 0110       FP(M) = 1.
ISN 0111       FE(M) = 2.37
ISN 0112       GO TO 270
      C
ISN 0113   245 FR(M) = .9954
ISN 0114       FT(M) = 1.0
ISN 0115       FP(M) = 1.0
ISN 0116       FE(M) = .9954
ISN 0117       GO TO 270
      C
      C
      C        SET STRUCTURES FACTORS (ALL EXCEPT DUAL SPIN)
ISN 0118   250 ICONF = NCONF(1)
ISN 0119       GO TO (260,255,255,255,255),ICONF
ISN 0120   255 FR(M) = 3.
ISN 0121       FT(M) = 3.
ISN 0122       FP(M) = 4.67
ISN 0123       FE(M) = 4.67
ISN 0124       GO TO 270
      C
      C
ISN 0125   260 FR(M) = 1.
ISN 0126       FP(M) = 1.
ISN 0127       FT(M) = 1.
ISN 0128       FE(M) = 1.
```

```
            C
ISN 0129     270 COMPER = RE(M)* X(M)**BE(M)
            C        DESIGN ENGINEERING COSTS (COMPE OR DE)
ISN 0130         COST(1,K) = COMPER * SF * PI * FR(M)
            C        TEST + EVALUATION COSTS  (COMPT OR TE)
ISN 0131         COST(2,K) = RT(M)*X(M)**BT(M)*SF*PI*FT(M)
            C        SUBTOTAL
ISN 0132         COMPR(K) = COST(1,K) + COST(2,K)
            C        UNIT PRODUCTION COST
ISN 0133         COST(3,K) = RP(M)*X(M)**BP(M)*SF*PI*Q**(-.152)*FP(M)*1.277
            C        UNIT ENGINEERING COSTS
ISN 0134         COST(4,K) =COMPER*(Q**.485-1.)*SF*PI*FE(M)/Q
            C   ** COMPUTE COMPONENTCUM AVG 5 UNIT PROD. COST
ISN 0135         COMP5P(K) = 0.783 * COST(3,K) * Q**0.152
            C   ** COMPUTE COMPONENT CUM AVG 5 PROD. ENG COST
ISN 0136         COMP5E(K) = 0.2365 * COST(4,K) * Q/(Q**0.485 - 1.0)
            C
            C        SUBTOTAL PRODUCTION
ISN 0137         COMPU(K) = COST(3,K) + COST(4,K)
            C
ISN 0138         GO TO (280,280,281,280,282,283),M
            C                                                   ** EP CER  SUB-TOTALING
ISN 0139     280 SUBE(5) = SUBE(5) + COST(1,K)
ISN 0140         SUBT(5) = SUBT(5) + COST(2,K)
ISN 0141         SUBR(5) = SUBR(5) + COMPR(K)
ISN 0142         SUBUE(5)= SUBUE(5)+ COST(3,K)
ISN 0143         SUBUP(5)= SUBUP(5)+ COST(4,K)
ISN 0144         SUBU(5) = SUBU (5)+ COMPU(K)
ISN 0145         SUB5E(5) = SUB5E(5) + COMP5E(K)
ISN 0146         SUB5P(5) = SUB5P(5) + COMP5P(K)
ISN 0147         GO TO 300
            C                                                   ** THERMAL CER SUB-TOTAL
ISN 0148     281 SUBE(7) = SUBE(7) + COST(1,K)
ISN 0149         SUBT(7) = SUBT(7) + COST(2,K)
ISN 0150         SUBR(7) = SUBR(7) + COMPR(K)
ISN 0151         SUBUE(7)= SUBUE(7)+ COST(3,K)
ISN 0152         SUBUP(7)= SUBUP(7)+ COST(4,K)
ISN 0153         SUBU(7) = SUBU(7) + COMPU(K)
ISN 0154         SUB5E(7) = SUB5E(7) + COMP5E(K)
```

```
ISN 0155              SUB5P(7) = SUB5P(7) + COMP5P(K)
ISN 0156              GO TO 300
                C                                             ** AUX PROP CER SUB-TOTAL
ISN 0157          282 SUBE(2) = SUBE(2) + COST(1,K)
ISN 0158              SUBT(2) = SUBT(2) + COST(2,K)
ISN 0159              SUBR(2) = SUBR(2) + COMPR(K)
ISN 0160              SUBUE(2)= SUBUE(2)+ COST(3,K)
ISN 0161              SUBUP(2)= SUBUP(2)+ COST(4,K)
ISN 0162              SUBU(2) = SUBU (2)+ COMPU(K)
ISN 0163              SUB5E(2) = SUB5E(2) + COMP5E(K)
ISN 0164              SUB5P(2) = SUB5P(2) + COMP5P(K)
ISN 0165              GO TO 300
                C                                             ** STRUCTURE CER SUB-TOTAL
ISN 0166          283 SUBE(6) = SUBE(6) + COST(1,K)
ISN 0167              SUBT(6) = SUBT(6) + COST(2,K)
ISN 0168              SUBR(6) = SUBR(6) + COMPR(K)
ISN 0169              SUBUE(6)= SUBUE(6)+ COST(3,K)
ISN 0170              SUBUP(6)= SUBUP(6)+ COST(4,K)
ISN 0171              SUBU(6) = SUBU(6) + COMPU(K)
ISN 0172              SUB5E(6) = SUB5E(6) + COMP5E(K)
ISN 0173              SUB5P(6) = SUB5P(6) + COMP5P(K)
                C
                C
ISN 0174          300 CONTINUE
                C
                C     SUM SUB-TOTALS BY SUBSYSTEMS OF CATALOG ITEMS
                C
ISN 0175              IJ = 1
ISN 0176              IK = 0
ISN 0177              DO 320 J=1,5
ISN 0178              IF (J.NE.1) IJ = IK + 1
ISN 0180              IK = IK + NEQUIP(J)
                C
ISN 0181              DO 310 I= IJ,IK
ISN 0182              SUBE (J) = SUBE (J) + COST(1,I)
ISN 0183              SUBT (J) = SUBT (J) + COST(2,I)
ISN 0184              SUBR (J) = SUBR (J) + COMPR(I)
ISN 0185              SUBUE(J) = SUBUE(J) + COST(3,I)
ISN 0186              SUBUP(J) = SUBUP(J) + COST(4,I)
```

```
ISN 0187              SUBU (J) = SUBU (J) + COMPU(I)
ISN 0188              SUB5E(J) = SUB5E(J) + COMP5E(I)
ISN 0189              SUB5P(J) = SUB5P(J) + COMP5P(I)
ISN 0190          310 CONTINUE
               C
ISN 0191          320 CONTINUE
               C
               C **   TOTAL COSTS FOR BASIC SPACECRAFT
               C
ISN 0192              DO 400 I = 1,7
ISN 0193              DE = DE + SUBE(I)
ISN 0194              TE = TE + SUBT(I)
ISN 0195              SYSR = SYSR + SUBR(I)
ISN 0196              PE = PE + SUBUE(I)
ISN 0197              PU = PU + SUBUP(I)
ISN 0198              SYSU = SYSU + SUBU(I)
ISN 0199              P5E = P5E + SUB5E(I)
ISN 0200              P5P = P5P + SUB5P(I)
ISN 0201          400 CONTINUE
               C
               C      COMPUTE TOOLING AND TEST EQUIPMENT
               C
ISN 0202              TOOLP = 0.
ISN 0203              TOOLU = 0.
ISN 0204              TOOL5 = 0.
               C
               C      COMPUTE QUALITY CONTROL
               C
ISN 0205              QCR = .015*DE + .14*TE
ISN 0206              QCU = .015*PE + .14*PU
ISN 0207              QC5 = 0.015*P5E  + 0.14*P5P
               C
               C      COMPUTE SYSTEMS ENGINEERING AND INTEGRATION
               C
ISN 0208              SEIR = .32*DE + .27*TE
ISN 0209              SEIP = .32*PE + .22*PU
ISN 0210              SEI5 = 0.32*P5E  +  0.22*P5P
               C
               C      COMPUTE PROGRAM MANAGEMENT
```

```
                C
ISN 0211              PMR = 0.19*DF   + 0.02*TE
ISN 0212              PMP  = 0.19*PE  + 0.02*PU
ISN 0213              PMS  = 0.19*P5E  +  0.02*P5P
                C
                C *** TOTAL SPACE CRAFT COSTS
                C
ISN 0214              SATR = SYSR + TOOLR + QCR + SEIR + PMR
ISN 0215              SATU  = SYSU + TOOLU + QCU + SEIP + PMP
                C
                C *** TOTAL PAYLOAD COSTS
                C
ISN 0216              SATINV =NFV * SATU
ISN 0217              XMEINV =NFV * XMEU
ISN 0218              PAYR    = SATR + XMER
ISN 0219              YMER = XMER
ISN 0220              PAYQUL =NQV * SATU
ISN 0221              PAYINV = SATINV + XMEINV
                C
                C     CUMULATIVE AVERAGE COST FOR FIVE(5) SPACECRAFT
                C
ISN 0222              SAT5 = P5E + P5P + TOOL5 + QC5 + SE15 + PM5
ISN 0223              SAT5 = 0.783*SATU*(Q)**0.152
                C
                C *** COMPUTE GROUND SUPPORT EQUIPMENT COST (DEVEL. AND PROD.)
                C
ISN 0224              IF (IMETYP.NE.1) GO TO 420
                C                                       ** SET FACTOR FOR COMSAT
ISN 0226          410 FGSE = 0.380
ISN 0227              GO TO 440
                C
ISN 0228          420 IF (NCONF(1).GE.2.AND.(NCONF(5).EQ.1.OR.NCONF(5).EQ.3.OR.NCONF(5).
                     1EQ.5)) GO TO 430
                C                                       ** SET FACTOR FOR GENERAL
ISN 0230              FGSF = 1.0
ISN 0231              GO TO 440
                C                                       ** SET FACTOR FOR GENERAL PADDLE
ISN 0232          430 FGSE = 2.156
                C
```

```
ISN 0233      440 GSE = 25.13*SATR**.738*FGSE
             C
             C *** COMPUTE LAUNCH COSTS
             C
ISN 0234            FL = 1.0
             C
ISN 0235            IF (NCONF(1).GE.2.AND.(NCONF(5).EQ.1.OR.NCONF(5).EQ.3
                   1                          .OR.NCONF(5).EQ.5)) FL = 2.411
             C
             C      COMPUTE UNIT LAUNCH COST
             C
ISN 0237            XLN = 1710.*SAT5**0.521 * FL
             C
             C *** COMPUTE TOTAL LAUNCH COSTS
             C
ISN 0238            XLTOT = NFV * XLN
             C
             C
             C
             C      COMPUTE OPERATIONS COST
             C
ISN 0239            FFO = 1.
             C
ISN 0240            IF (NCONF(1).GE.2.AND.(NCONF(5).EQ.1.OR.NCONF(5).EQ.3
                   1                          .OR.NCONF(5).EQ.5)) FFO = 4.6
             C
             C      COMPUTE UNIT FLIGHT OPERATIONS COST
             C
ISN 0242            CFO = 0.5937* (SATR+SAT5)**0.716 * FFO
             C
             C      COMPUTE TOTAL FLIGHT OPERATIONS COST
             C
ISN 0243            CTOT = NFV * CFO
             C
             C
             C      COMPUTE TOTALS
             C
             C                                          **TOTAL DDT+E COST
ISN 0244            FEER = FEEPCT * (SATR + PAYQUL + GSE)
```

```
 ISN 0245          DDTE = PAYR + PAYQUL + GSF + FEER
             C                                                 **TOTAL INVESTMENT COST
 ISN 0246          FEEINV = FEEPCT * SATINV
 ISN 0247          XVEST =  PAYINV + FEEINV
             C                                                 **TOTAL OPERATIONS COST
 ISN 0248          OPS = (XLTOT + CTOT)  *  (1.0 + FEEPCT)
             C
 ISN 0249          RETURN
             C
 ISN 0250          END

*OPTIONS IN EFFECT*     NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*   SOURCE STATEMENTS =    249 ,PROGRAM SIZE =    7080

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                                       77K BYTES OF CORE NOT USED
```

```
           COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                                SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
 ISN 0002              SUBROUTINE PRNT(IERR,NEQUIP,NACCEP,NCONF)                        00005320
                 C                                                                      00005330
                 C **  THIS IS THE OUTPUT SUBROUINE WHICH CONTROLS THE PRINTED        **00005340
                 C **  OUTPUT OF ANY ACCEPTABLE DESIGN                                **00005350
                 C **                                                                   00005360
 ISN 0003              COMMON /BTWN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,    00005370
                      1 LMBDD,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,00005380
                      2 SATTWT,TPRIM,IBTLOC,RADA,RADAE,RAT,HTRPWR,HTRPRB,HPT,HTPIPE,VCHP,00005390
                      3 HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),EQBLG,SAEQLG,SATWT          00005400
 ISN 0004              COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMDOLD,TRUNC,ITRUNC,     DE,TE, 00005410
                      1 TOOLR,QCR,SEIR,PMR,PE,PU,TOOLU,QCP,SEIP,PMP,SATR,SATINV,MER,    00005420
                      2 MEINV,PAYR,PAYINV,PAYQUL,GSE,XLTOT,CTOT,FEER,FEEINV,DDTE,XVEST, 00005430
                      3 OPS,      SKTAU(6),ROLD(60),T,AN,TS,BS,AM,TF,BF,TC,TA,TB,TOTOPS 00005440
 ISN 0005              COMMON /CHOSE/ICHOSE(60),NCHOSE(60),COST(5,60),REL (6,60),       00005450
                      1 THM(4,60),DPIA(11,60)                                           00005460
 ISN 0006              COMMON /DBCOM/IDB(30),DATAB(55,90)                               00005470
 ISN 0007              DIMENSION IERR(7),NEQUIP(5),NCONF(6)                             00005480
 ISN 0008              REAL MMDOLD                                                      00005490
 ISN 0009              MMDOLD=MMDOLD/720.                                               00005493
 ISN 0010              TRUNC=TRUNC/720.                                                 00005494
 ISN 0011              IF (NACCEP.GT.1) GO TO 100                                       00005500
 ISN 0013              PRINT 9000                                                       00005510
 ISN 0014         9000 FORMAT(1H1)                                                      00005520
 ISN 0015         9001 FORMAT(/,1X)                                                     00005530
 ISN 0016              PRINT 9002                                                       00005540
 ISN 0017         9002 FORMAT(38X,41H** NASA SYSTEMS COST/PERFORMANCE STUDY **)        00005550
 ISN 0018              PRINT 9001                                                       00005560
 ISN 0019              PRINT 9010                                                       00005570
 ISN 0020         9010 FORMAT (16H DEFINITIONS - -,/,25H   CONFIGURATIONS (NCONF),/,5X, 00005580
                      136HSTABILIZATION AND CONTROL (NCONF(1)),15X,31HAUXILIARY PROPULSIO00005590
                      2N (NCONF(2)),/,7X,23HNCONF(1)=1 IS DUAL SPIN,28X,22HNCONF(2)=1 IS 00005600
                      3COLD GAS,/,7X,22HNCONF(1)=2 IS YAW SPIN,29X,28HNCONF(2)=2 IS MONOP00005610
                      4ROPELLANT,/,7X,28HNCONF(1)=3 IS MASS EXPULSION,23X,26HNCONF(2)=3 I00005620
                      5S BIPROPELLANT,/,7X,37HNCONF(1)=4 IS MASS EXPULSION W/ CMG-S,12X,200005630
                      65HCOMMUNICATIONS (NCONF(4)),/,7X,38HNCONF(1)=5 IS MASS EXPULSION W00005640
                      7/ M.W.-S,13X,42HNCONF(4)=1 IS SEPARATE UPLINK AND DOWNLINK,/,5X,4600005650
                      8HDATA PROCESSING AND INSTRUMENTATION (NCONF(3)),7X,41HNCONF(4)=2 I00005660
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OF POOR QUALITY

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                9S UNIFIED LINK-COMMON ANTENNA,/,7X,39HNCONF(3)=1 IS GENERAL PURPOS00005670
                AE PROCESSOR,1.X,43HNCONF(4)=3 IS UNIFIED LINK-SEPARATE ANTENNA,/,700005680
                BX,39HNCONF(3)=2 IS SPECIAL PURPOSE PROCESSOR,12X,48HNCONF(4)=4 IS 00005690
                CUNIFIED LINK-COMMON ANT + DOWNLINK,/,5X,27HELECTRICAL POWER (NCONF00005700
                D(5)),26X,50HNCONF(4)=5 IS UNIFIED LINK-SEPARATE ANT + DOWNLINK,/,700005710
                EX,44HNCONF(5)=1 IS SHUNT REGULATION - PADDLE MTD.,5X,25HVEHICLE SI00005720
                FZING (NCONF(6)),/,7X,42HNCONF(5)=2 IS SHUNT REGULATION - BODY MTD.00005730
                G,9X,22HNCONF(6)=1 IS CYLINDER,/,7X,44HNCONF(5)=3 IS SHNT + DISCH.R00005740
                HEG - PADDLE MTD.,7X,17HNCONF(6)=2 IS BOX,/,7X,42HNCONF(5)=4 IS SHN00005750
                IT + DISCH.REG - BODY MTD.,9X,20HNCONF(6)=3 IS SPHERE)            00005760
ISN 0021         PRINT 9011                                                       00005770
ISN 0022   9011 FORMAT (7X,44HNCONF(5)=5 IS SERIES LOAD REG. - PADDLE MTD.,5X,11HR00005780
                1ELIABILITY,/,7X,42HNCONF(5)=6 IS SERIES LOAD REG. - BODY MTD.,9X,400005790
                25HREDUNDANCY CONFIGURATION = 0 IS SINGLE STRING,/,58X,43HREDUNDANC00005800
                3Y CONFIGURATION = 1 IS DUAL STRING)                              00005810
           C                                                                      00005820
ISN 0023         PRINT 9001                                                       00005830
           C                                                                      00005840
ISN 0024         PRINT 9012                                                       00005850
ISN 0025   9012 FORMAT (18H    MESSAGES (IERR),/,5X,25HSTABILIZATION AND CONTROL,2600005860
                1X,20HAUXILIARY PROPULSION,/,7X,29HIERR =     0 MEANS NO MESSAGES,2200005870
                2X,27HIERR =  0 MEANS NO MESSAGES,/,7X,49HIERR =      1 MEANS MAX ALL00005880
                3OWABLE SYS. ERROR UNSAT.,2X,50HIERR =  1 MEANS CYCLE LIFE OF ATTIT00005890
                4UDE AND CONTROL,/,7X,42HIERR =    1X MEANS MAX RATE ERROR TOO SMALL00005900
                5,25X,22HTHRUSTERS IS TOO SHORT,/,7X,42HIERR =   1XX MEANS 3-AXIS WH00005910
                6EELS ACCEPTABLE,9X,52HIERR = 10 MEANS CYCLE LIFE OF TRANSLATIONAL 00005920
                7THRUSTER,/,7X,42HIERR = 1XXX MEANS DBL GIMB.CMGS ACCEPTABLE,25X,1200005930
                8HIS TOO SHORT,/,5X,35HDATA PROCESSING AND INSTRUMENTATION,18X,49HI00005940
                9ERR = 11 MEANS CYCLE LIVES OF BOTH THRUSTERS ARE,/,7X,30HIERR =   00005950
                A  0 MEANS NO MESSAGES,37X,9HTOO SHORT,/,7X,31HIERR =      1 MEANS M00005960
                BUX REQUIRED,16X,7HTHERMAL,/,7X,41HIERR =     10 WORD LENGTH GREATER00005970
                C THAN 256,10X, 49HIERR = 1XXXXXXXXX MEANS BATT RAD AREA IS SUPPLIE00005980
                DD,/,7X,34HIERR =   100 BIT RATE IS TOO LARGE,35X,8HIN RADAB,/,7X,300005990
                E6HIERR =  1000 SPEC.COMD.SYNC.FLG NE 0,15X,  51HIERR = X1XXXXXXXX 00006000
                FMEANS OSR CONV. AND VARIABLE COND ,/,7X,36HIERR = 10000 END OF DAT00006010
                GA BASE SENSED,33X,34HUCTANCE HEAT PIPE INFO IS REQUIRED,/,5X,14HVE00006020
                HHICLE SIZING,39X,45HIERR = XX1XXXXXXX MEANS PHASE CONTROL MASS IS)00006030
           C                                                                      00006040
ISN 0026         PRINT 9013                                                       00006050
```

```
ISN 0027      9013 FORMAT (7X,26HIERR = 0 MEANS NO MESSAGES,43X,15HSUPPLIED IN PCM,/,
                   17X,46HIERR = 1 MEANS BODY MOUNTED SOLAR ARRAY LENGTH,5X,50HIERR =
                   2XXX1XXXXXX MEANS ISOTHERMALIZER IS REQUIRED,/,16X,28HEXCEEDS EQUIP
                   3MENT BAY LENGTH,14X,51HIERR = XXXX1XXXXX MEANS DIODE HEAT PIPE IS
                   4REQUIRED,/,76X,12H(2 REQUIRED),/,58X,51HIERR = XXXXX1XXXX MEANS CO
                   5NV. HEAT PIPE IS REQUIRED,/,58X,48HIERR = XXXXXX1XXX MEANS OSR RAD
                   6IATOR IS REQUIRED,/,58X,50HIERR = XXXXXXX1XX MEANS CONV. RADIATOR
                   7IS REQUIRED,/,58X,48HIERR = XXXXXXXX1X MEANS HEATER POWER IS SUPPL
                   8IED,/,76X,9HIN HTRPWR,/,58X,49HIERR = XXXXXXXXX1 MEANS RADIATOR AR
                   9EA IS SUPPLIED,/,76X,7HIN RADA)
              C
              C ***************************************************************************
              C
              C      BEGIN PRINTING OUTPUT STARTING WITH SANDC
              C ***************************************************************************
              C
ISN 0028       100 PRINT 9000
ISN 0029           PRINT 8000,NACCEP
ISN 0030      8000 FORMAT (38H SYSTEM DESCRIPTION - - DESIGN NUMBER ,I3)
ISN 0031           PRINT 8005,NCONF(1)
ISN 0032      8005 FORMAT(28H   STABILIZATION AND CONTROL,/,5X,24HCONFIGURATION IDENT
                   1IFIER, 6X,I1)
ISN 0033           IK = NEQUIP(1)
ISN 0034           PRINT 8010,(ICHOSE(I),I=1,IK)
ISN 0035      8010 FORMAT (30H       EQUIPMENT CODE IDENTIFIER,15(1X,I4))
ISN 0036           PRINT 8015,(NCHOSE(I),I=1,IK)
ISN 0037      8015 FORMAT(5X,20HEQUIPMENT QUANTITIES,5X,15(1X,I4))
ISN 0038           PRINT 8020,ACCRCY
ISN 0039      8020 FORMAT(5X,19HCALCULATED ACCURACY,6X,E11.4,5H(DEG))
ISN 0040           PRINT 8025,IERR(1)
ISN 0041      8025 FORMAT(5X,4HIERR,21X,I10)
ISN 0042           PRINT 8030,NCONF(2)
ISN 0043      8030 FORMAT (3X,20HAUXILIARY PROPULSION,/,5X,24HCONFIGURATION IDENTIFIE
                   1R, 6X,I1)
ISN 0044           IJ = IK + 1
ISN 0045           IK = IK + NEQUIP(2)
ISN 0046           PRINT 8010,(ICHOSE(I),I=IJ,IK)
ISN 0047           PRINT 8015,(NCHOSE(I),I=IJ,IK)
ISN 0048           PRINT 8045,TI
```

```
ISN 0049      8045 FORMAT(5X,13HTOTAL IMPULSE,12X,E11.4,8H(LB-SEC))
ISN 0050           PRINT 8025,IERR(2)
ISN 0051           PRINT 8055,NCONF(3)
ISN 0052      8055 FORMAT(3X,35HDATA PROCESSING AND INSTRUMENTATION,/,5X,24HCONFIGURA
                  1TION IDENTIFIER, 6X,I1)
ISN 0053           IJ = IK + 1
ISN 0054           IK = IK + NEQUIP(3)
ISN 0055           PRINT 8010,(ICHOSE(I),I=IJ,IK)
ISN 0056           PRINT 8015,(NCHOSE(I),I=IJ,IK)
ISN 0057           PRINT 8060,TLTOPS
ISN 0058      8060 FORMAT(5X,25HCOMPUTER OPERATIONS RATE ,E11.4,5H(IPS))
              C    PUT TOTAL STORAGE CAPACITY PRINT HERE LATER  - - - - - - -  * *
ISN 0059           PRINT 8025,IERR(3)
ISN 0060           PRINT 8070,NCONF(4)
ISN 0061      8070 FORMAT(3X,14HCOMMUNICATIONS,/,5X,24HCONFIGURATION IDENTIFIER, 6X,I
                  1I1)
ISN 0062           IJ = IK + 1
ISN 0063           IK = IK + NEQUIP(4)
ISN 0064           PRINT 8010,(ICHOSE(I),I=IJ,IK)
ISN 0065           PRINT 8015,(NCHOSE(I),I=IJ,IK)
ISN 0066           PRINT 8075,BITRAT(1)
ISN 0067      8075 FORMAT(5X,22HENGINEERING  DATA RATE,6X,E11.4,6H(KBPS))
ISN 0068           PRINT 8080,BITRAT(2)
ISN 0069      8080 FORMAT(5X,28HMISSION EQUIPMENT DATA RATE ,E11.4,6H(KBPS))
              C
ISN 0070           PRINT 8090,NCONF(5)
ISN 0071      8090 FORMAT(3X,16HELECTRICAL POWER,/,5X,24HCONFIGURATION IDENTIFIER, 6X
                  1,I1)
ISN 0072           IJ = IK + 1
ISN 0073           IK = IK + NEQUIP(5)
ISN 0074           PRINT 8010,(ICHOSE(I),I=IJ,IK)
ISN 0075           PRINT 8015,(NCHOSE(I),I=IJ,IK)
ISN 0076           PRINT 8100,PL
ISN 0077      8100 FORMAT(5X,32HTOTAL AVERAGE POWER REQUIREMENT ,E11.4,7H(WATTS))
ISN 0078           PRINT 8105,AREA
ISN 0079      8105 FORMAT(5X,16HSOLAR ARRAY AREA,16X,E11.4,7H(FT**2))
ISN 0080           PRINT 8110,CISTAR
ISN 0081      8110 FORMAT(5X,32HMINIMUM INSTALLED BATTERY CAP.  ,E11.4,8H(AMP-HR))
              C
```

```
ISN 0082       PRINT 8120
ISN 0083  8120 FORMAT(3X,15HTHERMAL CONTROL)
ISN 0084       PRINT 8125,RADA,RADAB,RAT
ISN 0085  8125 FORMAT(5X,13HRADIATOR AREA,9X,E11.4,3X,31H(FT**2)  , BATTERY RADIAT
              1OR AREA,8X,E11.4,3X,7H(FT**2),/,51X,19HTOTAL RADIATOR AREA,10X,
              2E11.4,3X,7H(FT**2))
ISN 0086       PRINT 8130,HTRPWR,HTRPRB,HPT
ISN 0087  8130 FORMAT(5X,12HHEATER POWER,10X,E11.4,33H (BTU/HR)   , BATTERY HEATER
              1 POWER,9X,E11.4,9H (BTU/HR),/,51X,18HTOTAL HEATER POWER,11X,E11.4,
              29H (BTU/HR))
ISN 0088       PRINT 8135,HTPIPE,VCHP,HTPT
ISN 0089  8135 FORMAT(5X,9HHEAT PIPE,13X,E11.4,38H (BTU/HR)   , VARIABLE CONDUCTAN
              1CE H.P.,4X,E11.4,9H (BTU/HR),/,51X,15HTOTAL HEAT PIPE,14X,E11.4,
              29H (BTU/HR))
ISN 0090       PRINT 8025,IERR(7)
          C
ISN 0091       PRINT 9000
ISN 0092       PRINT 8140,T
ISN 0093  8140 FORMAT(3X,10HSTRUCTURES,/,5X,15HSKIN THICKNESS ,E11.4,4H(IN))
ISN 0094       PRINT 8145,AN,TS,BS
ISN 0095  8145 FORMAT(5X,25HSTRINGER NO,THICKNESS,HT ,6X,F4.0,2H, ,E11.4,6H (IN),
              1,5X,E11.4,5H (IN))
ISN 0096       PRINT 8150,AM,TF,BF
ISN 0097  8150 FORMAT(5X,25HFRAME NO, THICKNESS, HT. ,6X,F4.0,2H, ,E11.4,6H (IN),
              1,5X,E11.4,5H (IN))
ISN 0098       PRINT 8155,TC,TB,TA
ISN 0099  8155 FORMAT(5X,30HEND COVER THICKNESS - FORWARD ,E11.4,12H(IN),CENTER ,
              1E11.4,9H(IN),AFT ,E11.4,4H(IN))
ISN 0100       PRINT 8160,NCONF(6),SATWT,SATLG,D,D
ISN 0101  8160 FORMAT(3X,14HVEHICLE SIZING,/,5X,24HCONFIGURATION IDENTIFIER, 6X,
              1I1,/,5X,14HLAUNCH WEIGHT,E11.4,6H(LBS),,14X,9HLENGTH    ,E11.4,
              26H(IN) ,,/,12X,7HWIDTH  ,E11.4,
              35H(IN),,13X,9HHEIGHT   ,E11.4,6H (IN),)
ISN 0102       PRINT 8165,XJ,YJ,ZJ
ISN 0103  8165 FORMAT(5X,6HIXX   ,E11.4,12H (LB-IN**2),,6X,6HIYY   ,E11.4,12H (LB
              1-IN**2),,6X,6HIZZ   ,E11.4,11H (LB-IN**2))
ISN 0104       PRINT 8025,IERR(6)
ISN 0105       PRINT 8170,IREL
ISN 0106  8170 FORMAT(3X,7HSAFETY,/,5X,25HREDUNDANCY CONFIGURATION ,I2)
```

```
ISN 0107           PRINT 8175,MMDOLD,ROLD(ITRUNC),TRUNC
ISN 0108      8175 FORMAT(5X,21HMEAN MISSION DURATION,E11.4,5H(MO),,11HRELIABILITY,
                  1E11.4,28H,RELIABILITY TRUNCATION TIME,E11.4,4H(MO))
ISN 0109           PRINT 8180
ISN 0110      8180 FORMAT(3X,33HCOST (ALL AMOUNTS ARE IN DOLLARS),/,5X,5HDDT+E,50X,
                  121HINVESTMENT(RECURRING))
ISN 0111           PRINT 8185,DE,PE
ISN 0112      8185 FORMAT(7X,18HDESIGN ENGINEERING,19X,F13.1,5X,16HUNIT ENGINEERING,
                  119X,F13.1)
ISN 0113           PRINT 8190,TE,PU
ISN 0114      8190 FORMAT(7X,19HTEST AND EVALUATION,18X,F13.1,5X,15HUNIT PRODUCTION,
                  120X,F13.1)
ISN 0115           PRINT 8195,TOOLR,TOOLU
ISN 0116      8195 FORMAT(7X,26HTOOLING AND TEST EQUIPMENT,11X,F13.1,5X,26HTOOLING AN
                  1D TEST EQUIPMENT,9X,F13.1)
ISN 0117           PRINT 8200,QCR,QCP
ISN 0118      8200 FORMAT(7X,15HQUALITY CONTROL,22X,F13.1,5X,15HQUALITY CONTROL,20X,
                  1F13.1)
ISN 0119           PRINT 8205,SEIR,SEIP
ISN 0120      8205 FORMAT(7X,35HSYSTEMS ENGINEERING AND INTEGRATION,2X,F13.1,5X,
                  135HSYSTEMS ENGINEERING AND INTEGRATION,F13.1)
ISN 0121           PRINT 8210,PMR,PMP
ISN 0122      8210 FORMAT(7X,18HPROGRAM MANAGEMENT,19X,F13.1,5X,18HPROGRAM MANAGEMENT
                  1,17X,F13.1)
ISN 0123           PRINT 8215
ISN 0124      8215 FORMAT(5X,13HCOST CATEGORY,12X,5HDDT+E,15X,10HINVESTMENT,10X,
                  110HOPERATIONS)
ISN 0125           PRINT 8220,SATR,SATINV
ISN 0126      8220 FORMAT(7X,10HSPACECRAFT,12X,F12.0,8X,F12.0)
ISN 0127           PRINT 8225,MER,MEINV
ISN 0128      8225 FORMAT(7X,17HMISSION EQUIPMENT,5X,F12.0,8X,F12.0)
ISN 0129           PRINT 8230,PAYR,PAYINV
ISN 0130      8230 FORMAT(7X,13HTOTAL PAYLOAD,9X,F12.0,8X,F12.0)
ISN 0131           PRINT 8235,PAYQUL
ISN 0132      8235 FORMAT(7X,19HQUALIFICATION UNITS,3X,F12.0)
ISN 0133           PRINT 8240,GSE
ISN 0134      8240 FORMAT(7X,6HG.S.E.,16X,F12.0)
ISN 0135           PRINT 8245,XLTOT
ISN 0136      8245 FORMAT(7X,14HLAUNCH SUPPORT,48X,F12.0)
```

```
ISN 0137            PRINT 8250,CTOT
ISN 0138       8250 FORMAT(7X,17HFLIGHT OPERATIONS,45X,F12.0)
ISN 0139            PRINT 8255,FEER,FEEINV
ISN 0140       8255 FORMAT(7X,14HCONTRACTOR FEE,8X,F12.0,8X,F12.0)
ISN 0141            PRINT 8260,DDTE,XVEST,OPS
ISN 0142       8260 FORMAT(7X,13HPROGRAM TOTAL,9X,F12.0,8X,F12.0,8X,F12.0)
ISN 0143            PRINT 8270
ISN 0144       8270 FORMAT(3X,8HSCHEDULE)
ISN 0145            PRINT 8280,SKTAU(1)
ISN 0146       8280 FORMAT(5X,37HDESIGN AND COMPONENT DEVELOPMENT TIME,8X,F5.1,8H(MONT
                   1HS))
ISN 0147            PRINT 8290,SKTAU(3)
ISN 0148       8290 FORMAT(5X,26HSUBSYSTEM DEVELOPMENT TIME,19X,F5.1,8H(MONTHS))
ISN 0149            PRINT 8300,SKTAU(2)
ISN 0150       8300 FORMAT(5X,28HCOMPONENT QUALIFICATION TIME,17X,F5.1,8H(MONTHS))
ISN 0151            PRINT 8310,SKTAU(4)
ISN 0152       8310 FORMAT(5X,28HSUBSYSTEM QUALIFICATION TIME,17X,F5.1,8H(MONTHS))
ISN 0153            PRINT 8320,SKTAU(5)
ISN 0154       8320 FORMAT(5X,45HSYSTEM DEVELOPMENT AND FLIGHT READINESS TIME ,F5.1,
                   18H(MONTHS))
ISN 0155            PRINT 8330,SKTAU(6)
ISN 0156       8330 FORMAT(5X,29HSCHEDULE DURATION (TO LAUNCH),16X,F5.1,8H(MONTHS))
              C
              C
              C
ISN 0157            RETURN
              C
ISN 0158            END

*OPTIONS IN EFFECT*     NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*    SOURCE STATEMENTS =     157 ,PROGRAM SIZE =     8978

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                              89K BYTES OF CORE NOT USED
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          COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                            SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
 ISN 0002              SUBROUTINE SANDC(IPIC,IERR,ITER,NCONF,ICHOSE,NCHOSE)
               C          ICHOSE(10) IS SELECTED EQUIP AS FOUR DIGIT EQUIP = -- MANF =
               C          NCONF IS CONFIGURATION NUMBER,ITER IS NUMBER OF THIS ITERATION
               C          IERR IS A MULTIPLE MESSAGE ERROR FLAG,IPIC IS THE LAST
               C          SET OF SUBSCRIPTS CHOSEN
               C          COMMON USER LISTS USER INPUT PARAMETERS
               C          COMMON BTWN LISTS NECESSARY COMMUNICATION BETWEEN SUBROUTINES
               C          COMMON CDATA HAS LAST SUBSCRIPT FOR EACH PIECE OF EQUIP,AND
               C          THE NECESSARY PIECE OF THE DATA BASE
 ISN 0003              DIMENSION  ICHOSE(9),IPIC(3),ES(6),C(5),DMA(2),G(3),F(9),NCHOSE(9)
 ISN 0004              DIMENSION NCONF(6)
 ISN 0005              COMMON /USER1/DPHI,FE,TSMALL,XNU,PDOTO,TAUX,TAUY,TAUZ,T,
                      *PHIRX,PHIRY,PHIRZ,PDOTX,PDOTY,PDOTZ,XN,YN,ZN,PDOTRX,PDOTRY,
                      *PDOTRZ,OMEGS,OMEGR,PJ,XNN,K,MANV,IPAYAW,EP1,AX,AY,AZ,
                      * EA,EANT,ALPHA,TL,TACCEL,XNNN,THOLD,PDOTAV,PDOTST,PHIFOV,ISAT
 ISN 0006              COMMON /BTWN/ WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,
                      * LMBOD,AKFA,SATLG,WATE,WC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,
                      * SATIWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,PTRPRB,
                      * HPT,HTPIPE,VCHP,HTPT,FC,XMZERO,COMPT,ACSSN,BIIRAT(2),
                      * FQBLG,SABOLG,SATWT
 ISN 0007              COMMON /DBCOM/IDB(30),DATAB(55,90)
 ISN 0008              COMMON /USER1/EQM1WT,EQM2WT,DIAMAX,ALT
 ISN 0009              DATA XMD,YMD,ZMD,DI,XMD2,YMD2,ZMD2/3*.0003,.03,3*.04/
 ISN 0010              ACSSN=2.
 ISN 0011              IF (NCONF(1) .EQ. 1) GO TO 10
 ISN 0013              DT=DT/12.
 ISN 0014              D=D/12.
 ISN 0015              DX=DX/12.
 ISN 0016              DY=DY/12.
 ISN 0017              DZ=DZ/12.
 ISN 0018              XJ=XJ/4636.8
 ISN 0019              YJ=YJ/4636.8
 ISN 0020              ZJ=ZJ/4636.8
 ISN 0021              RJ=1.
 ISN 0022              CONVWT=0.
 ISN 0023           10 RJ=RJ/4636.8
 ISN 0024              WT=0.
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```
ISN 0025            VOL=0.
ISN 0026            PL=0.
ISN 0027            PLMIN=0.
ISN 0028            IF (NCONF(1) .EQ. 2) GO TO 200
ISN 0030            IF (NCONF(1) .EQ. 3) GO TO 300
ISN 0032            IF (NCONF(1) .EQ. 4) GO TO 400
ISN 0034            IF (NCONF(1) .EQ. 5)  GO TO 500
              C      INITIALIZE FOR DUAL SPIN
ISN 0036            IERR=0
ISN 0037            DO 100 I=1,7
ISN 0038            II=IDB(I)
ISN 0039            IF (ITER .EQ. 0) NCHOSE(I)=1
ISN 0041            WT=WT+DATAB(23,II)*NCHOSE(I)
ISN 0042            VOL=VOL+DATAB(24,II)*NCHOSE(I)
ISN 0043            PL=PL+DATAB(16,II)*NCHOSE(I)
ISN 0044            PLMIN=PLMIN+DATAB(18,II)*NCHOSE(I)
ISN 0045        100 ICHOSE(I)=DATAB(1,II)
ISN 0046            IF (ITER .EQ. 0) NCHOSE(8) =1
ISN 0048            IF (ITER .EQ. 0) NCHOSE(9)=1
ISN 0050            IF (ITER .EQ. 0) NCHOSE(7)=2
ISN 0052            I14=IDB(13)+1
ISN 0053            ICHOSE(9)=DATAB(1,I14)
ISN 0054            II=IDB(6)
ISN 0055            CONVWT=DATAB(23,I14)*NCHOSE(9)
ISN 0056            WT=WT+DATAB(23,I14)*NCHOSE(9)
ISN 0057            VOL=VOL+DATAB(24,I14)*NCHOSE(9)
ISN 0058            PL=PL+DATAB(16,I14)*NCHOSE(9)
ISN 0059            PLMIN=PLMIN+DATAB(18,I14)*NCHOSE(9)
ISN 0060            IF (IPIC(1) .NE. 0) J1=IPIC(1)+1
ISN 0062            IF (ITER .GT. 0) J1=IPIC(1)
ISN 0064            IF (IPIC(1) .EQ. 0) J1=IDB(7) +1
ISN 0066            IF (J1 .GT. IDB(8) ) GO TO 118
ISN 0068            J1E=IDB(8)
              C      ES(6) CORRES EARTH SENSORS,C(5) CORRES CONTROL TIMING
              C      DMA(2) CORRES DESPIN MECH ASMB,G(3) CORRES GIMBAL,
              C      GH CORRES GIMBAL ANGLE
ISN 0069            IF (ITER .GT. 0) GO TO 112
ISN 0071        103 DO 104 I=1,6
ISN 0072        104 ES(I)=DATAB(I+5,J1)
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ISN 0073              II=IDB(1)
ISN 0074              DO 106 I=1,2
ISN 0075          106 DMA(I)=DATAB(I+6,II)
ISN 0076              II=IDB(6)
ISN 0077              DO 108 I=1,5
ISN 0078          108 C(I)=DATAB(I+5,II)
ISN 0079              II=IDB(7)
ISN 0080              DO 110 I=1,3
ISN 0081          110 G(I)=DATAB(I+5,II)
ISN 0082              II=IDB(5)
ISN 0083              GH=DATAB(6,II)
ISN 0084          112 XM1=.116*(320.*60.*XNN)/(21.*RJ*OMEGR)
ISN 0085              XM2=.03*(360.*60.*XNN)/(21.*RJ*OMEGR)
ISN 0086              XK2=SQRT((XNN*ES(2)/21.)**2+(XNN*ES(6)/21.)**2+(XNN*DMA(2)/21.)**2
                     *+XM2*XM2)
ISN 0087              XK1=SQRT((ES(1)/2.94)**2+(ES(3)/2.94)**2+C(4)**2+C(5)**2+
                     *(75.*DMA(1)/PJ)**2+(.75/PJ)**2)
ISN 0088              EZ=XM1+XK2
ISN 0089              IF (K.EQ.1) GO TO 114
ISN 0091              EY=SQRT(ES(4)**2+ES(5)**2)+XK1
ISN 0092              EX=EZ
ISN 0093              GO TO 116
ISN 0094          114 GT=G(1)*G(1)+G(2)*G(2)+G(3)*G(3)
ISN 0095              EY=SQRT(ES(4)**2+ES(5)**2)+SQRT(XK1**2+GT+C(1)**2+GH*GH)
ISN 0096              EX=SQRT(XM1**2+ES(4)**2)+SQRT(XK2**2+C(1)**2+C(2)**2+C(3)**2
                     *+GH*GH+GT)
ISN 0097          116 IF (EX .LE. PHIRX .AND. EY .LE. PHIRY .AND. EZ .LE. PHIRZ)
                     * GO TO 120
ISN 0099              J1=J1+1
ISN 0100              IF (J1 .LE. J1E) GO TO 103
                C     LAST ONE CHECKED AND NONE FOUND
ISN 0102          119 ICHOSE(8)=-1
ISN 0103              RETURN
                C     ACCEPTABLE DEVICE SELECTED
ISN 0104          120 IPIC(1)=J1
ISN 0105              IPIC(2)=0
ISN 0106              ICHOSE(8)=DATAB(1,J1)
ISN 0107              WT=WT+DATAB(23,J1)*NCHOSE(8)
ISN 0108              VOL=VOL+DATAB(24,J1)*NCHOSE(8)
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ISN 0109            PL=PL+DATAB(16,J1)*NCHOSE(8)
ISN 0110            PLMIN=PLMIN+DATAB(18,J1)*NCHOSE(8)
ISN 0111            TI=267.*TPRIM
ISN 0112            FF=2.5
ISN 0113            FC=14.1E-9*FF*DX*DI/(RJ*.4*PHIRX)
ISN 0114            RETURN
              C      YAW SPIN CONFIG
              C      INITIALIZE SKIPPING SOME IF ITERATING
ISN 0115        200 IERR=0
ISN 0116            TEMPIN=SATINX
ISN 0117            SATINX=SATINZ
ISN 0118            SATINZ=TEMPIN
ISN 0119            I1=IDB(8)+1
ISN 0120            ICHOSE(1)=DATAB(1,I1)
ISN 0121            I2=IDB(9)+1
ISN 0122            I3=IDB(10)+1
ISN 0123            ICHOSE(2)=DATAB(1,I2)
ISN 0124            ICHOSE(3)=DATAB(1,I3)
ISN 0125            I14=IDB(13)+1
ISN 0126            ICHOSE(6)=DATAB(1,I14)
ISN 0127            I7=IDB(2)
ISN 0128            ICHOSE(7)=DATAB(1,I7)
ISN 0129            IF (ITER .GT. 0) GO TO 203
ISN 0131            DO 202 I=1,9
ISN 0132        202 NCHOSE(I)=1
ISN 0133        203 WT=WT+NCHOSE(1)*DATAB(23,I1)+NCHOSE(2)*DATAB(23,I2)+NCHOSE(3)*
                   * DATAB(23,I3)+NCHOSE(6)*DATAB(23,I14)+NCHOSE(7)*DATAB(23,I7)
ISN 0134            CONVWT=DATAB(23,I14)*NCHOSE(6)
ISN 0135            VOL=VOL+NCHOSE(1)*DATAB(24,I1)+NCHOSE(2)*DATAB(24,I2)+NCHOSE(3)*
                   * DATAB(24,I3)+NCHOSE(6)*DATAB(24,I14)+NCHOSE(7)*DATAB(24,I7)
ISN 0136            PL=PL+NCHOSE(1)*DATAB(16,I1)+NCHOSE(2)*DATAB(16,I2)+NCHOSE(3)*
                   * DATAB(16,I3)+NCHOSE(6)*DATAB(16,I14)+NCHOSE(7)*DATAB(16,I7)
ISN 0137            PLMIN=PLMIN+NCHOSE(1)*DATAB(18,I1)+NCHOSE(2)*DATAB(18,I2)+
                   * NCHOSE(3)*DATAB(18,I3)+NCHOSE(6)*DATAB(18,I14)+NCHOSE(7)*
                   * DATAB(18,I7)
ISN 0138            ICHOSE(8)=0
ISN 0139            ICHOSE(9)=0
              C      IERR=1   MAX ALLOWABLE SYSTEM ERROR UNACCEPTABLE
ISN 0140            IF (PHIRX .LT. .125) IERR=1
```

```
ISN 0142              DB=PHIRX*.4                                                00001540
ISN 0143              IF (DB .LT. .05) DB=.05                                    00001550
               C       CALCULATE F VALUES                                        00001560
ISN 0145               F(1)=(DPHI*DT/57.3+.04*D)*FE/DY                           00001570
ISN 0146               F(2)=(DPHI*DT/57.3+.04*D)*FE/DZ                           00001580
ISN 0147               F(3)=2.*.04*D*DPHI/57.3*FE/DX                             00001590
ISN 0148               F(4)=XMD/DX                                               00001600
ISN 0149               F(5)=YMD/DY                                               00001610
ISN 0150               FMIN=AMAX1(F(1),F(2),F(3),F(4),F(5))                      00001620
ISN 0151              FMAX=(PDOTRX*XJ)/(2.*DI*DX)                                00001630
               C       IERR 1X   MAX RATE ERROR TOO SMALL                        00001640
ISN 0152              IF (FMAX .LT. 2.*FMIN) IERR=IERR+10                        00001650
ISN 0154              FF=2.*FMIN                                                 00001660
ISN 0155              IF (FMAX .LT. FF) FF=FMIN                                  00001670
ISN 0157              TDM=AMAX1(XMD,YMD)                                         00001680
ISN 0158              E=540.*TDM/(DX*FF)+.12-DB                                  00001690
ISN 0159              IF ( E .LT. 0.) E=0.                                       00001700
               C       SELECT EARTH SENSOR WITH PHIX)=PHIRX                      00001710
ISN 0161              IF (IPIC(1) .GT. 0) GO TO 204                              00001720
ISN 0163              J1=IDB(11)+1                                               00001730
ISN 0164              GO TO 206                                                  00001740
ISN 0165          204 J1=IPIC(1)                                                 00001750
ISN 0166          206 J1E=IDB(12)                                                00001760
ISN 0167              E1=DATAB(6,J1)                                             00001770
ISN 0168              II=IDB(10)                                                 00001780
ISN 0169              PHIX=SQRT(DATAB(7,J1)**2+DATAB(8,J1)**2)+DB+DATAB(11,II)+E 00001790
ISN 0170              IF (DATAB(6,J1) .GT. DB) GO TO 211                         00001800
ISN 0172              IF (PHIX .GT. PHIRX) GO TO 211                             00001810
ISN 0174              ICHOSE(4)=DATAB(1,J1)                                      00001820
ISN 0175              IPIC(1)=J1                                                 00001830
               C       EARTH SENSOR SET                                          00001840
ISN 0176              GO TO 212                                                  00001850
ISN 0177          211 J1=J1+1                                                    00001860
ISN 0178              IPIC(2)=0                                                  00001870
ISN 0179              IF (J1 .LE. J1E) GO TO 206                                 00001880
               C       MINUS ONE FLAG FOR NOT FOUND                              00001890
ISN 0181              ICHOSE(4)=-1                                               00001900
ISN 0182              ICHOSE(5)=0                                                00001910
ISN 0183              RETURN                                                     00001920
```

```
         C      HERE WHEN ACCEPTABLE EARTH SENSOR FOUND
ISN 0184    212 H=ZJ * OMEGS
         C      SELECT REACTION WHEEL WITH MOMENTUM GRTR THAN H
ISN 0185        J2=IPIC(2)
ISN 0186        IF (J2 .GE. IDB(13) .AND. ITER .EQ. 0) IPIC(2)=0
ISN 0188        IF (IPIC(2) .EQ. 0) J2=IDB(12)+1
ISN 0190        IF (ITER .EQ. 0 .AND. IPIC(2) .NE. 0) J2=J2+1
ISN 0192        J2E=IDB(13)
ISN 0193    214 H1=DATAB(6,J2)
ISN 0194        IF ( H1 .GT. H) GO TO 218
ISN 0196        J2=J2+1
ISN 0197        IF ( J2 .LE. J2E) GO TO 214
ISN 0199        IPIC(2)=0
ISN 0200        GO TO 211
         C      ACCEPTABLE COMBINATION FOUND
ISN 0201    218 ICHOSE(5)=DATAB(1,J2)
ISN 0202        IPIC(2)=J2
ISN 0203        WT=WT+DATAB(23,J2)*NCHOSE(5)+DATAB(23,J1)*NCHOSE(4)
ISN 0204        VOL=VOL+DATAB(24,J2)*NCHOSE(5)+DATAB(24,J1)*NCHOSE(4)
ISN 0205        PL=PL+DATAB(16,J2)*NCHOSE(5)+DATAB(16,J1)*NCHOSE(4)
ISN 0206        PLMIN=PLMIN+DATAB(18,J2)*NCHOSE(5)+DATAB(18,J1)*NCHOSE(4)
ISN 0207        XI=37000000.*TPRIM*DX*(FF*DI)**2/(XJ*.4*PHIRX)
               *+2./57.3*.04*D*DPHI*FE*TSMALL/DX
               *+XNU*XJ*PDOTO/(57.3*DX)
               *+2.*XJ*PDOTX*XN/(57.3*DX)
               *+XMD*TAUX/DX
ISN 0208        YI=37000000.*TPRIM*DY*(FF*DI)**2/(YJ*.4*PHIRY)
               *+(DPHI/57.3*DT+.04*D)*FE*TSMALL/DY
               *+XNU*YJ*PDOTO/(57.3*DY)
               *+2.*YJ*PDOTY*YN/(57.3*DY)
               *+YMD*TAUY/DY
ISN 0209        ZI=(DPHI/57.3*DT+.04*D)*FE*TSMALL/DZ
               *+XNU*ZJ*PDOTO/(57.3*DZ)
               *+2.*ZJ*PDOTZ*ZN/(57.3*DZ)
ISN 0210        TI=XI+YI+ZI
ISN 0211        FC=14.1E-9*FF*DX*DI/(XJ*.4*PHIRX)
ISN 0212        RETURN
         C       3-AXIS M CONFIG
         C        CHOSEN AS
```

```
                  C          ATTITUDE REF
                  C          VALVE
                  C          ASC
                  C          GYROS
                  C          EARTH SENSOR
                  C         INITIALIZE
ISN 0213              300 IERR=0
ISN 0214                  I1=IDB(14)+1
ISN 0215                  I2=IDB(15)+1
ISN 0216                  ICHOSE(1)=DATAB(1,I1)
ISN 0217                  ICHOSE(2)=DATAB(1,I2)
ISN 0218                  I14=IDB(13)+1
ISN 0219                  ICHOSE(3)=DATAB(1,I14)
ISN 0220                  IF (ITER .GT. 0) GO TO 303
ISN 0222                  DO 302 I=1,9
ISN 0223              302 NCHOSE(I)=1
ISN 0224              303 WT=WT+NCHOSE(1)*DATAB(23,I1)+NCHOSE(2)*DATAB(23,I2)+DATAB(24,I14)*
                        * NCHOSE(3)
ISN 0225                  CONVWT=DATAB(23,I1)*NCHOSE(1)
ISN 0226                  VOL=VOL+NCHOSE(1)*DATAB(24,I1)+NCHOSE(2)*DATAB(24,I2)+
                        * NCHOSE(3)*DATAB(24,I14)
ISN 0227                  PL=PL+NCHOSE(1)*DATAB(16,I1)+NCHOSE(2)*DATAB(16,I2)+NCHOSE(3)*
                        * DATAB(16,I14)
ISN 0228                  PLMIN=PLMIN+NCHOSE(1)*DATAB(18,I1)+NCHOSE(2)*DATAB(18,I2)+
                        * NCHOSE(3)*DATAB(18,I14)
ISN 0229                  DO 301 I=6,9
ISN 0230              301 ICHOSE(I)=0
ISN 0231                  OMEGO=1.1864*10.**8/(24.053*1000.*1000.+6076.*ALT)**1.5
                  C        CALCULATE F VALUES
ISN 0232                  F(1)=(DPHI*DT/57.3+.04*D)*FE/DY
ISN 0233                  F(2)=(DPHI*DT/57.3+.04*D)*FE/DZ
ISN 0234                  F(3)=2.*.04*D*DPHI/57.3*FE/DX
ISN 0235                  F(4)=XMD/DX
ISN 0236                  F(5)=YMD/DY
ISN 0237                  F(6)=ZMD/DZ
ISN 0238                  FMIN=AMAX1(F(1),F(2),F(3),F(4),F(5),F(6))
ISN 0239                  F(7)=PDOTRX*XJ/(DI*DX)
ISN 0240                  F(8)=PDOTRY*YJ/(DI*DY)
ISN 0241                  F(9)=PDOTRZ*ZJ/(DI*DZ)
```

```
ISN 0242          FMAX=AMAX1(F(7),F(8),F(9))
ISN 0243          IERR=0
            C      IERR 1X   MAX RATE ERROR TOO SMALL
ISN 0244          IF (FMAX .LT. 2.*FMIN) IERR=IERR+10
ISN 0246          FF=2.*FMIN
ISN 0247          IF (FMAX .LT. FF) FF=FMIN
ISN 0249          DBX=.4*PHIRX
ISN 0250          DBY=.4*PHIRY
ISN 0251          DBZ=.4*PHIRZ
ISN 0252          IF (DBX .LT. .05) DBX=.05
ISN 0254          IF (DBY .LT. .05) DBY=.05
ISN 0256          IF (DBZ .LT. .05) DBZ=.05
ISN 0258          DDBX=.1*DBX
ISN 0259          DDBY=.1*DBY
ISN 0260          DDBZ=.1*DBZ
ISN 0261          R1=.2*PDOTRX
ISN 0262          R2=.2*PDOTRY
ISN 0263          R3=.2*PDOTRZ
ISN 0264          R=AMAX1(R1,R2,R3)
            C      SELECT 3 GYROS
ISN 0265          IF (IPIC(1) .GT. 0) GO TO 304
ISN 0267          J1=IDB(16)+1
ISN 0268          GO TO 306
ISN 0269      304 J1=IPIC(1)
ISN 0270      306 J1E=IDB(17)
ISN 0271          GTEST=DATAB(6,J1)
ISN 0272          IF (GTEST .GT. R) GO TO 308
ISN 0274          ICHOSE(4)=DATAB(1,J1)
ISN 0275          IPIC(1)=J1
            C      GYRO SET
ISN 0276          I1=IDB(14)+1
ISN 0277          G1=DATAB(8,I1)/(DATAB(11,I1)+OMEGO)
ISN 0278          G2=(DATAB(8,I1)*DATAB(10,I1)-DATAB(7,I1)*(DATAB(11,I1)+OMEGO))
                * /(OMEGO*(DATAB(11,I1)+OMEGO))
ISN 0279          G3=DATAB(10,I1)/(OMEGO*(DATAB(11,I1)+OMEGO))
ISN 0280          GO TO 310
ISN 0281      308 J1=J1+1
ISN 0282          IPIC(2)=0
ISN 0283          IF (J1 .LE. J1E) GO TO 306
```

```
                    C      MINUS ONE FLAG FOR NOT FOUND
 ISN 0285                  ICHOSE(4)=-1
 ISN 0286                  ICHOSE(5)=0
 ISN 0287                  RETURN
                    C      SELECT EARTH SENSOR
 ISN 0288              310 J2=IPIC(2)
 ISN 0289                  IF(J2 .GE. IDB(18) .AND.  ITER .EQ. 0) IPIC(2)=0
 ISN 0291                  IF (IPIC(2) .EQ. 0) J2=IDB(17)+1
 ISN 0293                  IF (ITER .EQ. 0 .AND. IPIC(2) .NE. 0) J2=J2+1
 ISN 0295                  J2E=IDB(18)
 ISN 0296              314 PPHIN=DATAB(6,J2)*DATAB(6,J2)*DATAB(6,I1)/DATAB(13,J2)*
                         * ATAN(DATAB(13,J2)/DATAB(9,I1))
 ISN 0297                  POMEN=DATAB(6,J2)*DATAB(6,J2)/DATAB(13,J2)*.026
 ISN 0298                  E=SQRT(DATAB(7,J2)**2+DATAB(11,J2)**2)+SQRT(DATAB(9,J2)**2
                         * +DATAB(10,J2)**2)
 ISN 0299                  EY=DBY+SQRT(PPHIN+(DATAB(12,J2)*DATAB(6,I1)/DATAB(9,I1))**2
                         *+(E*DATAB(6,I1)/DATAB(9,I1))**2+AY*AY+(EP1/DATAB(9,I1))**2
                         *+DDBY*DDBY)
 ISN 0300                  EX=DBX+SQRT(POMEN+(DATAB(12,J2)*G1)**2+E*E*G1*G1+AX*AX+DDBX*DDBX)
 ISN 0301                  EZ=DBZ+SQRT((DATAB(7,J1)*OMEGO*G3)**2+(DATAB(6,J1)*G3)**2
                         * +DATAB(7,J1)**2+(DATAB(6,J1)/OMEGO)**2+AZ*AZ+(DATAB(12,J2)
                         * *G2)**2+DDBZ*DDBZ)
 ISN 0302                  IF (EX .LT. PHIRX .AND. EY .LT. PHIRY .AND. EZ .LT. PHIRZ)
                         * GO TO 318
 ISN 0304                  J2=J2+1
 ISN 0305                  IF ( J2 .LE. J2E) GO TO 314
 ISN 0307                  IPIC(2)=0
 ISN 0308                  GO TO 308
                    C      ACCEPTABLE COMBINATION FOUND
 ISN 0309              318 ICHOSE(5)=DATAB(1,J2)
 ISN 0310                  IPIC(2)=J2
 ISN 0311                  WT=WT+DATAB(23,J2)*NCHOSE(5)+DATAB(23,J1)*NCHOSE(4)
 ISN 0312                  VOL=VOL+DATAB(24,J2)*NCHOSE(5)+DATAB(24,J1)*NCHOSE(4)
 ISN 0313                  PL=PL+DATAB(16,J2)*NCHOSE(5)+DATAB(16,J1)*NCHOSE(4)
 ISN 0314                  PLMIN=PLMIN+DATAB(18,J2)*NCHOSE(5)+DATAB(18,J1)*NCHOSE(4)
 ISN 0315                  XI=37000000.*TPRIM*DX*(FF*D1)**2/(XJ*DBX)
                         *+2./57.3*.04*D*DPHI*FL*TSMALL/DX
                         *+XNU*XJ*PDOTO/(57.3*DX)
                         *+2.*XJ*PDOTX*XN/(57.3*DX)
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```
                        *+XMD*TAUX/DX
ISN 0316                 YI=37000000.*TPRIM*DY*(FF*DI)**2/(YJ*DBY)
                        *+(DPHI/57.3*DT+.04*D)*FE*TSMALL/DY
                        *+XNU*YJ*PDOTO/(57.3*DY)
                        *+2.*YJ*PDOTY*YN/(57.3*DY)
                        *+YMD*TAUY/DY
ISN 0317                 ZI=37000000.*TPRIM*DZ*(FF*DI)**2/(ZJ*DBZ)
                        *+(DPHI/57.3*DT+.04*D)*FE*TSMALL/DZ
                        *+XNU*ZJ*PDOTO/(57.3*DZ)
                        *+2.*ZJ*PDOTZ*ZN/(57.3*DZ)
                        * +ZMD*TAUZ/DZ
ISN 0318                 TI=XI+YI+ZI
ISN 0319                 FC=14.1E-9*FF*DX*DI/(XJ*.4*PHIRX)
ISN 0320                 RETURN
                  C       CONFIGURATION 4
ISN 0321            400  IERR=0
ISN 0322                 QJ1=XJ*PDOTX/57.3
ISN 0323                 QJ2=YJ*PDOTY/57.3
ISN 0324                 QJ3=ZJ*PDOTZ/57.3
ISN 0325                 HMAN=AMAX1(QJ1,QJ2,QJ3)
ISN 0326                 TMD=AMAX1(XMD2,YMD2,ZMD2)
ISN 0327                 HREQ=HMAN+86400.*TL*TMD
ISN 0328                 TREQ=HMAN/TACCEL+TMD
                  C       TEST IF ONLY 3-AXIS WHEELS OKAY
ISN 0329                 PDOTM=AMAX1(PDOTX,PDOTY,PDOTZ)
ISN 0330                 PDOTRM=AMIN1(PDOTRX,PDOTRY,PDOTRZ)
ISN 0331                 IF (TREQ/HREQ .GE. .02 .AND. .0000833*PDOTM .LT. PDOTRM) GO TO 403
ISN 0333                 DO 402 I=1,9
ISN 0334            402  ICHOSE(I)=-1
                  C       TEST IF 3-AXIS ACCEPTABLE
                  C       IERR    1XX MEANS 3-AXIS WHEELS ACCEPTABLE
ISN 0335            403  IF (TREQ/HREQ .LT. .1) IERR=100
                  C       IERR    1XXX MEANS DOUBLE GIMBAL CMG'S ACCEPTABLE
ISN 0337                 IF (TACCEL .LT. 20.) IERR=IERR+1000
ISN 0339                 HL=HMAN+TMD*TL
ISN 0340                 HS=AMIN1(QJ1,QJ2,QJ3)
ISN 0341                 HS=HS+TMD*TL
                  C       SET FIXED EQUIPMENT  ELECTRONICS PROCESSOR,VALVE DRIVER,
                  C       SENSOR(SUN OR HORIZON)
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```
ISN 0342          I1=IDB(18)+1
ISN 0343          I2=IDB(15)+1
ISN 0344          IF (ISAT .EQ. 1) I3=IDB(17)+1
ISN 0346          IF (ISAT .GT. 1) I3=IDB(8)+1
ISN 0348          ICHOSE(1)=DATAB(1,I1)
ISN 0349          ICHOSE(2)=DATAB(1,I2)
ISN 0350          ICHOSE(3)=DATAB(1,I3)
ISN 0351          ICHOSE(7)=0
ISN 0352          ICHOSE(8)=0
ISN 0353          ICHOSE(9)=0
ISN 0354          IF (ITER .GT. 0) GO TO 407
ISN 0356          DO 405 I=1,9
ISN 0357      405 NCHOSE(I)=1
ISN 0358      407 WT=WT+NCHOSE(1)*DATAB(23,I1)+NCHOSE(2)*DATAB(23,I2)+DATAB(23,I3)
                 **NCHOSE(3)
ISN 0359          VOL=VOL+NCHOSE(1)*DATAB(24,I1)+NCHOSE(2)*DATAB(24,I2)+DATAB(24,I3)
                 **NCHOSE(3)
ISN 0360          PL=PL+NCHOSE(1)*DATAB(16,I1)+NCHOSE(2)*DATAB(16,I2)+DATAB(16,I3)
                 **NCHOSE(3)
ISN 0361          PLMIN=PLMIN+NCHOSE(1)*DATAB(18,I1)+NCHOSE(2)*DATAB(18,I2)+
                 * DATAB(18,I3)*NCHOSE(3)
              C    SELECT CMG
ISN 0362          GAMMA=ATAN(HS*(XNNN-2.)/(HL*XNNN))
ISN 0363          H=HS/(XNNN*SIN(GAMMA))
ISN 0364          IF (IPIC(1) .GT. 0) J1=IPIC(1)
ISN 0366          IF (IPIC(1) .EQ. 0) J1=IDB(19)+1
              C    RETURNS HERE TO TEST NEW CMG
ISN 0368      410 IF (DATAB(6,J1) .LT. H) GO TO 414
ISN 0370          SDOTM=2.*H/(TACCEL*DATAB(6,J1))
ISN 0371          TMAX=DATAB(6,J1)*PDOTM/57.3
ISN 0372          IF (SDOTM .LE. DATAB(7,J1) .AND. TMAX .LE. DATAB(8,J1))GO TO 417
ISN 0374      414 J1=J1+1
ISN 0375          IF (J1 .LT. IDB(20)) GO TO 410
ISN 0377          ICHOSE(4)=-1
ISN 0378          ICHOSE(5)=0
ISN 0379          ICHOSE(6)=0
ISN 0380          RETURN
              C    CMG SELECTED
ISN 0381      417 ICHOSE(4)=DATAB(1,J1)
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```
ISN 0382          NCHOSE(4)=XNNN
ISN 0383          XKK=DATAB(7,J1)*PDOTM/57.3
ISN 0384          W=-32.+(.068+.29*XKK)*(DATAB(6,J1)+960.)
ISN 0385          P=(.0103+.0235*XKK)*(DATAB(6,J1)+1430.)
ISN 0386          V=7.45+(.00265-.0062*XKK)*(DATAB(6,J1)-1720.)
ISN 0387          DATAB(23,J1)=W
ISN 0388          DATAB(24,J1)=V
ISN 0389          DATAB(18,J1)=P
            C      GYRO NEXT
ISN 0390          IF (IPIC(2) .GT. 0) J2=IPIC(2)
ISN 0392          IF (IPIC(2) .EQ. 0) J2=IDB(16)+1
ISN 0394      420 ICHOSE(5)=DATAB(1,J2)
            C      SELECT STAR SENSOR
ISN 0395          PHIR=AMIN1(PHIRX,PHIRY,PHIRZ)
ISN 0396          TSMAX=.3*PHIR
ISN 0397          J3=IPIC(3)
ISN 0398          IF (J3 .GE. IDB(21) .AND. ITER .EQ. 0) IPIC(3)=0
ISN 0400          IF (IPIC(3) .EQ. 0) J3=IDB(20)+1
ISN 0402          IF (ITER .EQ. 0 .AND. IPIC(3) .NE. 0) J3=J3+1
ISN 0404      422 IF (DATAB(6,J3) .GT. 1. .AND. PDOTST .GT. 2.) GO TO 440
ISN 0406          IF (DATAB(6,J3) .EQ. 2. .AND. PHIFOV .GT. 30.) GO TO 440
ISN 0408          IF (DATAB(6,J3) .EQ. 1. .AND. PDOTAV .LE. .016) GO TO 440
ISN 0410          IF (DATAB(6,J3) .EQ. 1. .AND. THOLD .GT. TSMAX) GO TO 440
ISN 0412          IF (DATAB(6,J3) .GT. 1.) GO TO 424
ISN 0414          IF (DATAB(9,J3)*.451 .LT. 4.) GO TO 440
ISN 0416          XNM=ALOG10(-4.+.451*DATAB(9,J3))
ISN 0417          TSC=57.3/(XNM*DATAB(8,J3)*PDOTM)
ISN 0418          DPHIAV=PDOTM*TSC
ISN 0419          PHIEB=DATAB(6,J2)*TSC
ISN 0420          PHIESF=DATAB(7,J2)*DPHIAV
ISN 0421          PHIE=SQRT(DATAB(7,J3)**2+(.0000833*PDOTM)**2+PHIEB*PHIEB+
                 * PHIESF*PHIESF)
ISN 0422          GO TO 426
ISN 0423      424 PHIE=SQRT(DATAB(7,J3)**2+(.0000833*PDOTM)**2)
ISN 0424      426 IF (PHIE .LT. PHIR) GO TO 450
ISN 0426      440 J3=J3+1
ISN 0427          IF (J3 .LE. IDB(21)) GO TO 422
ISN 0429          IPIC(3)=0
ISN 0430          J2=J2+1
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ISN 0431            IF (J2 .LE. IDB(17)) GO TO 420
ISN 0433            IPIC(2)=0
ISN 0434            J2=IDB(16)+1
ISN 0435            GO TO 414
              C      ACCEPTABLE COMBINATION FOUND
ISN 0436        450 ICHOSE(6)=DATAB(1,J3)
ISN 0437            IPIC(1)=J1
ISN 0438            IPIC(2)=J2
ISN 0439            IPIC(3)=J3
ISN 0440            WT=WT+W*XNNN+NCHOSE(5)*DATAB(23,J2)+NCHOSE(6)*DATAB(23,J3)
ISN 0441            VOL=VOL+V*XNNN+NCHOSE(5)*DATAB(24,J2)+NCHOSE(6)*DATAB(24,J3)
ISN 0442            PL=PL+P*XNNN+NCHOSE(5)*DATAB(16,J2)+NCHOSE(6)*DATAB(16,J3)
ISN 0443            PLMIN=PLMIN+DATAB(18,J1)*XNNN+NCHOSE(5)*DATAB(18,J2)+NCHOSE(6)*
                   * DATAB(18,J3)
              C      NOW THRUST AND IMPULSE
ISN 0444            F(1)=(DPHI*DT/57.3+.04*D)*FE/DY
ISN 0445            F(2)=(DPHI*DT/57.3+.04*D)*FE/DZ
ISN 0446            F(3)=2./57.3*.04*D*DPHI*FE/DX
ISN 0447            FF=AMAX1(F(1),F(2),F(3))
ISN 0448            TI=(F(1)+F(2)+F(3))*DI
                   * +XNU*PDOTO/57.3*(XJ/DX+YJ/DY+ZJ/DZ)
                   * +TPRIM*2592000.*(XMD/DX+YMD/DY+ZMD/DZ)
ISN 0449            FC=FF*DX*DI/(XJ*.4*PHIRX)*14.1E-9
ISN 0450            RETURN
              C      CONFIGURATION 5
              C      SELECT FIXED EQUIPMENT
ISN 0451        500 I1=IDB(15)+1
ISN 0452            I2=IDB(21)+1
ISN 0453            ICHOSE(1)=DATAB(1,I1)
ISN 0454            ICHOSE(2)=DATAB(1,I2)
ISN 0455            OMEGO=1.1864*10.**8/(24.053*1000.*1000.+6076.*ALT)**1.5
ISN 0456            DO 502 I=5,9
ISN 0457        502 ICHOSE(I)=0
ISN 0458            IF (ITER .GT. 0) GO TO 505
ISN 0460            DO 504 I=1,9
ISN 0461        504 NCHOSE(I)=1
ISN 0462        505 WT=WT+NCHOSE(1)*DATAB(23,I1)+NCHOSE(2)*DATAB(23,I2)
ISN 0463            VOL=VOL+NCHOSE(1)*DATAB(24,I1)+NCHOSE(2)*DATAB(24,I2)
ISN 0464            PL=PL+NCHOSE(1)*DATAB(16,I1)+NCHOSE(2)*DATAB(16,I2)
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ISN 0465           PLMIN=PLMIN+NCHOSE(1)*DATAB(18,I1)+NCHOSE(2)*DATAB(18,I2)
ISN 0466           IERR=0
ISN 0467           EBEAM=AMIN1(PHIRX,PHIRY)
ISN 0468           DB=.4*EBEAM
ISN 0469           IF (DB .LT. .05) DB=.05
ISN 0471           EAR=EBEAM*EBEAM-EA*EA
ISN 0472           EHS=(EAR-(EANT*PHIRZ)**2)*.5
ISN 0473           IF (EHS .LT. 0.) EHS=0.
ISN 0475           EHS=SQRT(EHS)
ISN 0476           IF (IPIC(1) .GT. 0) J1=IPIC(1)
ISN 0478           IF (IPIC(1) .EQ. 0) J1=IDB(17)+1
ISN 0480       508 E=SQRT(DATAB(6,J1)**2+DATAB(7,J1)**2+DATAB(8,J1)**2+
                  * DATAB(11,J1)**2)+SQRT(DATAB(9,J1)**2+DATAB(10,J1)**2)
ISN 0481           IF (E .LT. EHS) GO TO 512
ISN 0483       510 J1=J1+1
ISN 0484           IF (J1 .LE. IDB(18)) GO TO 508
ISN 0486           ICHOSE(3)=-1
ISN 0487           ICHOSE(4)=0
ISN 0488           RETURN
ISN 0489       512 J2=IPIC(2)
ISN 0490           IF (J2 .GE. IDB(13) .AND. ITER .EQ. 0) IPIC(2)=0
ISN 0492           IF (IPIC(2) .EQ. 0) J2=IDB(12)+1
ISN 0494           IF (ITER .EQ. 0 .AND. IPIC(2) .GT. 0)J2=J2+1
ISN 0496       515 H=57.3*ZMD*ABS(EANT)/(OMEGO*SQRT(EAR-2.*E*E))
ISN 0497           IF (DATAB(6,J2) .GE. H) GO TO 520
ISN 0499           J2=J2+1
ISN 0500           IF (J2 .LE. IDB(13)) GO TO 515
ISN 0502           IPIC(2)=0
ISN 0503           GO TO 510
ISN 0504       520 ICHOSE(3)=DATAB(1,J1)
ISN 0505           ICHOSE(4)=DATAB(1,J2)
ISN 0506           IPIC(1)=J1
ISN 0507           IPIC(2)=J2
ISN 0508           IPIC(3)=0
ISN 0509           WT=WT+NCHOSE(3)*DATAB(23,J1)+NCHOSE(4)*DATAB(23,J2)
ISN 0510           VOL=VOL+NCHOSE(3)*DATAB(24,J1)+NCHOSE(4)*DATAB(24,J2)
ISN 0511           PL=PL+NCHOSE(3)*DATAB(16,J1)+NCHOSE(4)*DATAB(16,J2)
ISN 0512           PLMIN=PLMIN+NCHOSE(3)*DATAB(18,J1)+NCHOSE(4)*DATAB(18,J2)
ISN 0513           DX=.5*D*COS(ALPHA)
```

```
ISN 0514          FMAX=DB*DATAB(6,J2)*SQRT(XJ/ZJ)/(DI*DX)                         00005440
ISN 0515          DZ=.5*D*SIN(ALPHA)                                               00005450
ISN 0516          DY=.5*D                                                          00005460
ISN 0517          F(1)=(DPHI/57.3*DT+.04*D)*FE/DY                                  00005470
ISN 0518          F(2)=(DPHI/57.3*DT+.04*D)*FE/DZ                                  00005480
ISN 0519          F(3)=2./57.3*.04*D*DPHI*FE/DX                                    00005490
ISN 0520          FMIN=AMAX1(F(1),F(2),F(3))                                       00005500
ISN 0521          FF=2.*FMIN                                                       00005510
ISN 0522          IF (FF .LT. FMIN) FF=FMIN                                        00005520
ISN 0524          TI=(F(1)+F(2)+F(3))*DI+                                          00005530
                 * XNU*PDOT0/57.3*(XJ/DX+YJ/DY+ZJ/DZ)+                             00005540
                 * 37.E6*TPRIM*(FF*DI)**2*2.5*(DX/(XJ*PHIRX)+DY/(YJ*PHIRY))        00005550
                 * +XMD*TAUX/DX+YMD*TAUY/DY                                        00005560
ISN 0525          FC=14.1E-9*FF*DX*DI/(XJ*.4*PHIRX)                                00005570
ISN 0526          RETURN                                                           00005580
ISN 0527          END                                                              00005590

*OPTIONS IN EFFECT*     NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*    SOURCE STATEMENTS =      526 ,PROGRAM SIZE =    18234

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******
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          COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                             SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
  ISN 0002            SUBROUTINE STRUCT(NCONF)                                        00005600
  ISN 0003            DIMENSION NCONF(6)                                              00005610
  ISN 0004            COMMON/USER9/CA,CE                                              00005620
  ISN 0005            COMMON /BTWN/ WT,VOL,DT,SATDAM,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN00005621
                     *,LMBDD,AREA,SATLG,SOARWT,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASST00005622
                     *,SATTWT,TPRIM,IBILOC,RADA,RADAB,RAT,HTRPWR,PTRPRB,              00005623
                     * HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),          00005624
                     * EQBLG,SABOLG,SATWT                                             00005625
  ISN 0006            COMMON /USER6/EQPF,MB12SH,EQM1XL,EQM1YL,EQM1ZL,EQM2XL,EQM2YL,   00005626
                     * EQM2ZL,ISBOFG,NUMEEQ,EEQWT(9),EEQVL(9),EM1YCG,EM1ZCG,EM2YCG,   00005627
                     * EM2ZCG,CGEEX(9),EELOC(9),XCGSA1,XCGSA3                         00005628
  ISN 0007            COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMDOLD,TRUNC,ITRUNC,DE,TE,    00005629
                     * TOOLR,QCR,SEIR,PMR,PE,PU,TOOLU,QCP,SEIP,PMP,SATR,SATINV,MER,   00005630
                     * MEINV,PAYR,PAYINV,PAYUUL,USL,XLTOT,CTOT,FEER,FEEINV,DDTE,XVEST,00005631
                     * OPS,SKTAU(6),ROLD(60),T,AN,TS,BS,AM,TF,BF,TC,TA,TB,TOTOPS      00005632
  ISN 0008            DATA E,XNU,SIGY,PI/1.E7,.33,3.E4,3.1416/                        00005648
  ISN 0009            TB= 0.                                                          00005649
  ISN 0010            XXNU= 1. - XNU**2                                               00005650
  ISN 0011            ICHECK= 1                                                       00005660
  ISN 0012            IF((NCONF(5).EQ.1.OR.NCONF(5).EQ.3.OR.NCONF(5).EQ.5).AND.       00005670
                     *XCGSA1.EQ.2) ICHECK= 2                                          00005680
                C     ICHECK= 2 MEANS THAT SOLAR ARRAYS ARE PADDLES AND MOUNTED AT    00005700
                C     CENTER OF VEHICLE. ICHECK= 1 MEANS OTHERWISE.                   00005710
                C                                                                     00005720
  ISN 0014            XL= EQBLG                                                       00005730
  ISN 0015            IF(ICHECK.EQ.2) XL= .5*EQBLG                                    00005740
  ISN 0017            IF(NCONF(5).NE.1.AND.NCONF(5).NE.3.AND.NCONF(5).NE.5) GO TO 1   00005750
                C                                                                     00005760
                C     SOLAR ARRAYS ARE PADDLES                                        00005770
                C                                                                     00005780
                C     APPLIED LOAD (ONLY BENDING MOMENT)                              00005790
                C                                                                     00005800
                C     COMPUTE WEIGHT PER PADDLE (ASSUME 2 PADDLES)                    00005810
  ISN 0019            WE= .5*SOARWT                                                   00005820
                C                                                                     00005830
  ISN 0020            XMA= 1.25*SABOLG*WE*SQRT(CA*CA + CE*CE)                         00005840
                C                                                                     00005850
```

```
              C      NOMINAL TUBE RADIUS
              C
ISN 0021             R= (SABOLG**4*XMA/(PI**5*E))**.1428
              C
              C      TUBE WALL THICKNESS
              C
ISN 0022             TW=  2.*SQRT(XMA/(PI*E*R))
              C
              C      CHECK FOR APPLICABILITY OF EULER COLUMN STABILITY
              C
ISN 0023             FAC1= (PI*E**2*XMA/(8.*R*SABOLG**2))**.3333
ISN 0024             IF(SIGY-FAC1.GE.0.) GO TO 1
              C
              C      EULER COLUMN STABILITY NOT APPLICABLE
              C
ISN 0026             TW= (16.*SIGY*XMA/(PI*E**2))**.3333
ISN 0027             R= TW*E/(4.*SIGY)
              C
              C      SIZING OF EQUIPMENT BAY STRUCTURE
              C
ISN 0028           1 CONTINUE
              C
ISN 0029             P= CA*SATWT
              C
              C      BENDING MOMENT
              C
              C
ISN 0030             XM= .75*CE*EQBLG*SATWT
              C
ISN 0031             IF(ICHECK.EQ.1) XM= CE*EQBLG*SATWT
ISN 0033             IF(NCONF(6).NE.1) GO TO 3
              C
              C      EQUIVALENT AXIAL LOAD
              C
ISN 0035             RR= .5*SATDAM
ISN 0036             XN= P/(2.*PI*RR) + XM/(PI*RR*RR)
              C
              C      SIZING OF EQUIVALENT MONOCOQUE CYLINDER
              C
```

```
                C
 ISN 0037           TM= .672*(XXNU*XN*XL*XL/E)**.3333
 ISN 0038           FAC2= XL**2*SQRT(XXNU)/(RR*TM)
 ISN 0039           IF(FAC2.LE.31) GO TO 2
 ISN 0041           TM= 2.76*SQRT(SQRT(XXNU)*XN*RR/E)
 ISN 0042         2 CONTINUE
                C
                C   EQUIVALENT THICKNESS OF STIFFENED CYLINDER
                C
 ISN 0043           TBAR= .267*TM
                C
                C   SIZING OF SKIN-STRINGER ASSEMBLY
                C
 ISN 0044           T= .44*TBAR
 ISN 0045           TS= 1.9*T
 ISN 0046           BS= .64*TS*SQRT(E*TBAR/(XXNU*XN))
 ISN 0047           B= 1.49*BS
 ISN 0048           N= 1. + 2.*PI*RR/B
 ISN 0049           AN= N
 ISN 0050           B= 2.*PI*RR/AN
 ISN 0051           ALPHA= .745/XXNU**.25
                C
                C   SIZING OF CYLINDER FRAMES
                C
 ISN 0052           A= E*ALPHA**2*TBAR**2/XN
 ISN 0053           RHOF= .0564*(RR**2/A)*(XN*ALPHA**2/(E*A))**.25
 ISN 0054           AF= .000785*XN*RR**4/(E*RHOF**2*A)
 ISN 0055           BF= 3.464*RHOF
 ISN 0056           TF= AF/BF
 ISN 0057           M= 1. + XL/A
 ISN 0058           AM= M
 ISN 0059           A= XL/AM
                C
                C   SIZING OF END COVERS
                C
 ISN 0060           TC= .352*SQRT(CA*SATWT/SIGY)
 ISN 0061           TA= TC
 ISN 0062           XLD= RR
 ISN 0063           GO TO 4
```

```
              C
ISN 0064          3 CONTINUE
              C
ISN 0065            IF(NCONF(6).NE.2) RETURN
              C
ISN 0067            W= .707*SATDAM
              C
              C     EQUIVALENT AXIAL LOAD
              C
ISN 0068            XN= .25*P/W + .75*XM/W**2
              C
              C     SIZING OF EQUIVALENT MONOCOQUE BOX
              C
ISN 0069            IF(XL/W.LE..5) TM= 1.068*(XXNU*XN*XL*XL/E)**.3333
ISN 0071            IF(XL/W.GT..5) TM= .672*(XXNU*XN*W*W/E)**.3333
              C
              C     EQUIVALENT THICKNESS OF STIFFENED BOX
              C
ISN 0073            TBAR= .267*TM
              C
              C     SIZING OF SKIN STRINGER ASSEMBLY
              C
ISN 0074            T= .44*TBAR
ISN 0075            TS= 1.9*T
ISN 0076            BS= .64*TS*SQRT(E*TBAR/(XXNU*XN))
ISN 0077            B= 1.49*BS
ISN 0078            N= 1. + W/B
ISN 0079            N= 4*N
ISN 0080            AN= N
ISN 0081            B= W/AN
ISN 0082            ALPHA= .745/XXNU**.25
              C
              C     SIZING OF FRAMES
              C
ISN 0083            A= E*ALPHA**2*TBAR**2/XN
ISN 0084            RHOF= .405*(W**2/A)*(XN*ALPHA**2/(E*A))**.25
ISN 0085            AF= .041*XN*W**4/(E*RHOF**2*A)
ISN 0086            BF= 3.464*RHOF
ISN 0087            TF= AF/BF
```

```
ISN 0088          M= 1. + XL/A
ISN 0089          AM= M
ISN 0090          A= XL/AM
             C
             C    SIZING OF END COVERS
             C
ISN 0091          TC= .303*SQRT(CA*SATWT/SIGY)
ISN 0092          TA= TC
ISN 0093          XLD= .5*W
             C
ISN 0094        4 CONTINUE
ISN 0095          IF(ICHECK.EQ.1) GO TO 5
             C
             C    MID-SECTION BULKHEAD IS REQUIRED
             C
ISN 0097          WL= .455*CA*SATWT/XLD**2
ISN 0098          TB=.859*XLD*SQRT(WL/SIGY)
             C
ISN 0099        5 CONTINUE
             C
ISN 0100          RETURN
ISN 0101          END

*OPTIONS IN EFFECT*     NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =     100 ,PROGRAM SIZE =     2800

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                        109K BYTES OF CORE NOT USED
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          COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                                    SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
 ISN 0002              SUBROUTINE VESIZE(IERR,NCONF,ICHOSE)                                00000010
 ISN 0003              DIMENSION NCONF(6),EESID(9),EEYCG(9),EEZCG(9),EEINX(9),EEINY(9),    00000020
                      * EEINZ(9),EEXCG(9)                                                  00000030
 ISN 0004              COMMON /USER6/EQPF,MB12SH,EQM1XL,EQM1YL,EQM1ZL,EQM2XL,EQM2YL,       00000040
                      * EQM2ZL,ISBOFG,NUME G,EEQWT(9),EEQVL(9),EM1YCG,EM1ZCG,EM2YCG,       00000050
                      * EM2ZCG,CGEEX(9),EFLUC(9),XCGSA1,XCGSA3                             00000060
 ISN 0005              COMMON /USER1/EQM1WT,EQM2WT,DIAMAX,ALT                              00000070
 ISN 0006              COMMON /BTWN/STINWT,SATVOL,DT,SATDAM,DX,DY,DZ,SATINX,SATINY,        00000080
                      * SATINZ,RJ,FF,T1,PL,PLMIN,LMBDD,SOAREA,SATLG,SOARWT,NC,ACSWP,       00000090
                      * HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,SATTWT,TPRIM,IBTLOC,             00000100
                      * RADA,RADAB,RAT,HTRPWR,HTRPRB,HPT,HTPIPE,VCHP,HTPT,                 00000110
                      * FC,XNZERO,CUMRT,ACSSN,BITRAT(2),EQBLG,SABOLG,SATWT                 00000120
 ISN 0007              ISHAPE = NCONF(6)                                                   00000130
 ISN 0008              ISPIN = 0                                                           00000140
 ISN 0009              RLD=.617                                                            00000145
 ISN 0010              IF(NCONF(1).EQ.1.OR.NCONF(1).EQ.2) ISPIN = 1                        00000150
 ISN 0012              IECTYP = 1                                                          00000160
 ISN 0013              IF(NCONF(5).EQ.1.OR.NCONF(5).EQ.3.OR.NCONF(5).EQ.5) IEQTYP=2        00000170
                C      DETERMINE EQUIPMENT BAY EQUIPMENT WEIGHT AND VOLUME                 00000180
 ISN 0015              EQWT= 1.025*(STINWT+ACSWP)                                          00000190
 ISN 0016              EQVOL= 1.025*SATVOL                                                 00000200
 ISN 0017              THCMWT=EQWT-STINWT-ACSWP                                            00000210
                C      THE THERMAL CONTROL SUBSYSTEM IS ACCOUNTED FOR BY THE 1.025 FACTOR00000220
                C      NOTE THAT VOLUMES ARE IN FT**3                                      00000230
                C                                                                          00000240
                C      ACCOUNT FOR PACKING FACTOR                                          00000250
                C                                                                          00000260
 ISN 0018              EQBVOL= 1728.*EQVOL*EQPF                                            00000270
                C                                                                          00000280
                C      DETERMINE EQUIPMENT BAY LENGTH                                      00000290
                C                                                                          00000300
 ISN 0019              ICHOSE=0                                                            00000310
 ISN 0020              IF(ISHAPE-2)1,2,3                                                   00000320
 ISN 0021            1 SATDAM= (EQBVOL/(.785*RLD))**.333                                   00000330
 ISN 0022              EQBLG=RLD*SATDAM                                                    00000340
 ISN 0023              IF(SATDAM.LE.DIAMAX) GO TO 4                                        00000350
 ISN 0025              SATDAM= DIAMAX                                                      00000360
```

```
ISN 0026              EQBLG= EQBVOL/(.785*SATDAM**2)
ISN 0027              GO TO 4
ISN 0028            2 EQBLG= (2.*EQBVOL)**.333
ISN 0029              SATDAM= EQBLG
ISN 0030              IF(SATDAM.LE.DIAMAX) GO TO 4
ISN 0032              SATDAM= DIAMAX
ISN 0033              EQBLG= 2.*EQBVOL/SATDAM**2
ISN 0034              GO TO 4
ISN 0035            3 SATDAM= (EQBVOL/.524)**.333
ISN 0036              EQBLG= SATDAM
ISN 0037              IF(SATDAM.LE.DIAMAX) GO TO 4
ISN 0039              ICHOSE=-1
              C       THAT IS, THIS IS NOT AN ACCEPTABLE MACRO CONFIGURATION
ISN 0040              RETURN
ISN 0041            4 CONTINUE
              C
              C       DETERMINE SATELLITE LENGTH
              C
ISN 0042              SATLG = EQBLG + EQM1XL + EQM2XL
              C       DETERMINE SOLAR ARRAY DIMENSIONS
              C
ISN 0043              IERR=0
ISN 0044              SAAREA = 144.*SCAREA
ISN 0045              IF(IEQTYP.EQ.2) GO TO 54
ISN 0047              IF(ISHAPE-2) 51,52,53
ISN 0048           51 SA3XL= SAAREA/SATDAM
ISN 0049              IF(SA3XL.LE.EQBLG) GO TO 55
ISN 0051              IERR=IERR+1
ISN 0052              GO TO 55
ISN 0053           52 SA3XL= 1.414*SAAREA/SATDAM
ISN 0054              IF(SA3XL.LE.EQBLG) GO TO 55
ISN 0056              IERR=IERR+1
ISN 0057              GO TO 55
ISN 0058           53 SA3XL= SQRT(1.273*SAAREA)
ISN 0059              IF(SA3XL.LE.SATDAM) GO TO 55
ISN 0061              IERR=IERR+1
ISN 0062              GO TO 55
ISN 0063           54 SA1YL= .005208*SAAREA
ISN 0064              SA1XL= 96.
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```
ISN 0065          SA1ZL= 1.
ISN 0066          SA2YL= SA1YL
ISN 0067          SA2XL= SA1XL
ISN 0068          SA2ZL= SA1ZL
ISN 0069       55 CONTINUE
            C
            C     DETERMINE EQUIPMENT BAY STRUCTURAL WEIGHT
            C
ISN 0070          EQBSTR= .218*EQWT**.986*(EQBLG/SATDAM)**.263
ISN 0071          IF(IEQTYP.EQ.2) EQBSTR= .59*EQBSTR
ISN 0073          EQBWT= 1.1*EQWT + EQBSTR
            C
            C     DETERMINE MISSION EQUIPMENT BAY STRUCTURAL WEIGHT
            C
ISN 0074          IF(MB12SH.EQ.2) GO TO 5
ISN 0076          EQM1ST = .218*EQM1WT**.986*(EQM1XL/SATDAM)**.263
ISN 0077          EQM2ST = .218*EQM2WT**.986*(EQM2XL/SATDAM)**.263
ISN 0078          GO TO 14
ISN 0079        5 IFLAG= 1
ISN 0080          IF(EQM1YL.GT.EQM1XL) IFLAG= 2
ISN 0082          IF((IFLAG.EQ.1.AND.EQM1ZL.GT.EQM1XL).OR.(IFLAG.EQ.2.AND.EQM1ZL.GT.
                 * EQM1YL)) IFLAG= 3
ISN 0084          IF(IFLAG-2) 6,7,8
ISN 0085        6 EM1LNG= EQM1XL
ISN 0086          EM1DIA= SQRT(EQM1YL**2 + EQM1ZL**2)
ISN 0087          GO TO 9
ISN 0088        7 EM1LNG= EQM1YL
ISN 0089          EM1DIA= SQRT(EQM1XL**2 + EQM1ZL**2)
ISN 0090          GO TO 9
ISN 0091        8 EM1LNG= EQM1ZL
ISN 0092          EM1DIA= SQRT(EQM1XL**2 + EQM1YL**2)
ISN 0093        9 CONTINUE
ISN 0094          EQM1ST= .218*EQM1WT**.986*(EM1LNG/EM1DIA)**.263
ISN 0095          IFLAG= 1
ISN 0096          IF(EQM2YL.GT.EQM2XL) IFLAG= 2
ISN 0098          IF((IFLAG.EQ.1.AND.EQM2ZL.GT.EQM2XL).OR.(IFLAG.EQ.2.AND.EQM2ZL.GT.
                 * EQM2YL)) IFLAG= 3
ISN 0100          IF(IFLAG-2) 10,11,12
ISN 0101       10 EM2LNG= EQM2XL
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```
ISN 0102          EM2DIA= SQRT(EQM2YL**2 + EQM2ZL**2)
ISN 0103          GO TO 13
ISN 0104       11 EM2LNG= EQM2YL
ISN 0105          EM2DIA= SQRT(EQM2XL**2 + EQM2ZL**2)
ISN 0106          GO TO 13
ISN 0107       12 EM2LNG= EQM2ZL
ISN 0108          EM2DIA= SQRT(EQM2XL**2 + EQM2YL**2)
ISN 0109       13 CONTINUE
ISN 0110          EQM2ST= .218*EQM2WT**.986*(EM2LNG/EM2DIA)**.263
ISN 0111       14 CONTINUE
            C
            C     ACCOUNT FOR MISSION EQUIPMENT SUPPORTS
            C
ISN 0112          EQM1ST= EQM1ST + .1*EQM1WT
ISN 0113          EQM2ST= EQM2ST + .1*EQM2WT
            C
            C     DETERMINE MISSION EQUIPMENT BAY TOTAL VOLUME
            C
ISN 0114          IF(MB12SH.EQ.2) GO TO 150
ISN 0116          EQM1VL= .785*EQM1YL**2*EQM1XL
ISN 0117          EQM2VL= .785*EQM2YL**2*EQM2XL
ISN 0118          GO TO 151
ISN 0119      150 CONTINUE
ISN 0120          EQM1VL= EQM1XL*EQM1YL*EQM1ZL
ISN 0121          EQM2VL= EQM2XL*EQM2YL*EQM2ZL
ISN 0122      151 CONTINUE
ISN 0123          EQMVOL= EQM1VL + EQM2VL
            C
            C     DETERMINE SA1WT,SA2WT,SA3WT
            C
ISN 0124          SA3WT = SOARWT
ISN 0125          IF(IEQTYP.EQ.1) GO TO 152
ISN 0127          SA1WT = .5*SOARWT
ISN 0128          SA2WT = SA1WT
ISN 0129      152 CONTINUE
            C
            C     DETERMINE BOOM AND MECHANISM WEIGHT
            C
ISN 0130          SABOLG= 0.
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```
ISN 0131          SABOOM= 0.
ISN 0132          SADRIV= 0.
ISN 0133          IF(ISPIN.EQ.1) GO TO 23
ISN 0135          SABOLG= 24.
ISN 0136          SABOOM= 15.2
ISN 0137          IF(ISBOFG.EQ.0) GO TO 23
ISN 0139          SADRIV= .166*(SA1WT + SA2WT)
ISN 0140       23 CONTINUE
ISN 0141          SABMWT= SABOOM + SADRIV
            C
            C     CALCULATE HARNESS AND STRUCTURAL TPS WEIGHT
            C
            C
            C     FIRST NEED MISSION EQUIPMENT WEIGHT AND EXTERNAL EQUIPMENT WEIGHT
            C     AND VOLUME
            C
ISN 0142          EQMWT= EQM1WT+ EQM2WT
ISN 0143          EEQTWT= 0.
ISN 0144          EEQVOL= 0.
ISN 0145          IF(NUMEEQ.EQ.0) GO TO 232
ISN 0147          DO 231 I=1,NUMEEQ
ISN 0148          EEQTWT= EEQTWT + EEQWT(I)
ISN 0149          EEQVOL= EEQVOL + EEQVL(I)
ISN 0150      231 CONTINUE
ISN 0151      232 CONTINUE
            C
ISN 0152          HARNWT= .013*(STINWT+EEQTWT+
                 * EQMWT)**1.31*(EQBVOL + EQMVOL + EEQVOL)**.16/3.296
            C
            C     DETERMINE STRUCTURAL THERMAL PROTECTION SYSTEM WEIGHT
            C
ISN 0153          STTPS= .025*EQBSTR
            C
            C     DETERMINE SATELLITE DRY WEIGHT LESS AUXILIARY PROPULSION DRY
            C     WEIGHT
            C
            C     FIRST DETERMINE SOLAR ARRAY WEIGHT
            C
ISN 0154          SOARWT= 0.
```

```
ISN 0155          IF(IEQTYP.EQ.2) GO TO 233
ISN 0157          SOARWT= SA3WT
ISN 0158          GO TO 234
ISN 0159      233 SOARWT= SA1WT + SA2WT
ISN 0160      234 CONTINUE
            C
ISN 0161          PASSTR=EQBWT+EQM1ST+EQM2ST+SABOOM+SADRIV+STTPS
ISN 0162          SUBWT1= EQMWT + EQM1ST + EQM2ST + SOARWT + EEQTWT + SABMWT
ISN 0163          SUBWT2= SUBWT1 + EQWT - ACSWP + HARNWT + STTPS + EQBSTR
ISN 0164          CONTIN= .15*SUBWT2
ISN 0165          SUBWT= SUBWT2 + CONTIN
ISN 0166          DRYWT= SUBWT
            C
            C     DETERMINE SATELLITE GROSS WEIGHT
            C
ISN 0167          SATWT= DRYWT + ACSWP
            C
            C     DETERMINE ADAPTER WEIGHT
            C
ISN 0168          SATADP= .012*SATWT
            C
            C     DETERMINE SATELLITE LAUNCH WEIGHT
            C
ISN 0169          SATTWT= SATWT + SATADP
            C
            C     CENTER OF GRAVITY CALCULATIONS
            C
ISN 0170          EBXCG= 500. + .5*EQBLG
ISN 0171          EBYCG= 0.
ISN 0172          EBZCG= 0.
            C
            C     MISSION EQUIPMENT AND MISSION EQUIPMENT BAY STRUCTURE C.G.
            C
ISN 0173          EM1XCG= 500. + EQBLG + .5*EQM1XL
ISN 0174          EM2XCG= 500. - .5*EQM2XL
            C
            C     EQUIPMENT BAY STRUCTURE C.G.
            C
ISN 0175          STRXCG= 500. + .5*EQBLG
```

```
 ISN 0176           STRYCG= 0.
 ISN 0177           STRZCG= 0.
              C
              C     EXTERNAL EQUIPMENT C.G.
 ISN 0178           IF(NUMEEQ.EQ.0) GO TO 240
 ISN 0180           DO 239 I=1,NUMEEQ
 ISN 0181           EESID(I)= (1728.*EEQVL(I))**.333
 ISN 0182           IF(CGEEX(I)-2.) 235,236,237
 ISN 0183       235 EEXCG(I)= 500. + EQBLG
 ISN 0184           GO TO 238
 ISN 0185       236 EEXCG(I)= 500. + .5*EQBLG
 ISN 0186           GO TO 238
 ISN 0187       237 EEXCG(I)= 500.
 ISN 0188       238 CONTINUE
 ISN 0189           EEYCG(I)= 0.
 ISN 0190           EEZCG(I)= 0.
 ISN 0191           IF(EELOC(I).EQ.1.) EEYCG(I)= .5*(SATDAM + EESID(I))
 ISN 0193           IF(EELOC(I).EQ.2.) EEYCG(I)= -.5*(SATDAM + EESID(I))
 ISN 0195           IF(EELOC(I).EQ.3.) EEZCG(I)= -.5*(SATDAM + EESID(I))
 ISN 0197           IF(EELOC(I).EQ.4.) EEZCG(I)= .5*(SATDAM + EESID(I))
 ISN 0199       239 CONTINUE
 ISN 0200       240 CONTINUE
              C
              C     SOLAR ARRAY C.G.S
              C
 ISN 0201           IF(IEQTYP.EQ.2) GO TO 244
 ISN 0203           SA3YCG= 0.
 ISN 0204           SA3ZCG= 0.
 ISN 0205           IF(XCGSA3-2.) 241,242,243
 ISN 0206       241 SA3XCG= 500. + EQBLG
 ISN 0207           GO TO 249
 ISN 0208       242 SA3XCG= 500. + .5*EQBLG
 ISN 0209           GO TO 249
 ISN 0210       243 SA3XCG= 500.
 ISN 0211           GO TO 249
 ISN 0212       244 CONTINUE
 ISN 0213           IF(XCGSA1-2.) 245,246,247
 ISN 0214       245 SA1XCG= 500. + EQBLG
 ISN 0215           GO TO 248
```

```
ISN 0216      246 SA1XCG= 500. + .5*EQBLG
ISN 0217          GO TO 248
ISN 0218      247 SA1XCG= 500.
ISN 0219      248 CONTINUE
ISN 0220          SA2XCG= SA1XCG
ISN 0221          SA1YCG= 24. + .5*(SATDAM + SA1YL)
ISN 0222          SA2YCG= -SA1YCG
ISN 0223          SA1ZCG= 0.
ISN 0224          SA2ZCG= 0.
ISN 0225          SABXCG= SA1XCG
ISN 0226          SABYCG= 0.
ISN 0227          SABZCG= 0.
ISN 0228      249 CONTINUE
            C
            C     SATELLITE CENTER OF GRAVITY CALCULATIONS
            C
            C     FIRST DETERMINE CONTRIBUTION OF SOLAR ARRAYS
            C
ISN 0229          IF(IEQTYP.EQ.2) GO TO 250
ISN 0231          SAX= SA3WT*SA3XCG
ISN 0232          SAY= SA3WT*SA3YCG
ISN 0233          SAZ= SA3WT*SA3ZCG
ISN 0234          GO TO 251
ISN 0235      250 CONTINUE
ISN 0236          SAX= SA1WT*SA1XCG + SA2WT*SA2XCG + SABMWT*SABXCG
ISN 0237          SAY= SA1WT*SA1YCG + SA2WT*SA2YCG + SABMWT*SABYCG
ISN 0238          SAZ= SA1WT*SA1ZCG + SA2WT*SA2ZCG + SABMWT*SABZCG
ISN 0239      251 CONTINUE
            C
            C     NEXT DETERMINE CONTRIBUTION OF EXTERNAL EQUIPMENT
            C
ISN 0240          EEX=0.
ISN 0241          EEY=0.
ISN 0242          EEZ=0.
ISN 0243          IF(NUMEEQ.EQ.0) GO TO 253
ISN 0245          DO 252 I=1,NUMEEQ
ISN 0246          EEX= EEX + EEQWT(I)*EEXCG(I)
ISN 0247          EEY= EEY + EEQWT(I)*EEYCG(I)
ISN 0248          EEZ= EEZ + EEQWT(I)*EEZCG(I)
```

```
ISN 0249        252 CONTINUE
ISN 0250        253 CONTINUE
              C
ISN 0251            SATXCG= (EQBSTR*STRXCG + EQWT*EBXCG + (EQM1ST + EQM1WT)*EM1XCG +
                   1 (EQM2ST + EQM2WT)*EM2XCG + SAX +                    EEX +
                   2 (HARNWT + STTPS)*EBXCG)/(SATWT - CONTIN)
              C
ISN 0252            SATYCG= (EQBSTR*STRYCG + EQWT*EBYCG + (EQM1ST + EQM1WT)*EM1YCG +
                   1 (EQM2ST + EQM2WT)*EM2YCG + SAY +                    EEY +
                   2 (HARNWT + STTPS)*EBYCG)/(SATWT - CONTIN)
              C
ISN 0253            SATZCG= (EQBSTR*STRZCG + EQWT*EBZCG + (EQM1ST + EQM1WT)*EM1ZCG +
                   1 (EQM2ST + EQM2WT)*EM2ZCG + SAZ +                    EEZ +
                   2 (HARNWT + STTPS)*EBZCG)/(SATWT - CONTIN)
              C
              C     CALCULATE MOMENTS OF INERTIA
              C
              C     FIRST DETERMINE EQUIPMENT BAY STRUCTURE AND EQUIPMENT BAY
              C     EQUIPMENT INCREMENTAL INERTIA
              C
ISN 0254            SATRAD= .5*SATDAM
ISN 0255            IF(ISHAPE - 2)66,67,68
ISN 0256         66 STRINX= EQBSTR*SATRAD**2
ISN 0257            STRINY= .5*EQBSTR*(SATRAD**2 + .167*EQBLG**2)
ISN 0258            STRINZ= STRINY
ISN 0259            EQINX= .5*EQWT*SATRAD**2
ISN 0260            EQINY= .0833*EQWT*(3.*SATRAD**2 + EQBLG**2)
ISN 0261            EQINZ= EQINY
ISN 0262            GO TO 69
ISN 0263         67 EQBSID= .708*SATDAM
ISN 0264            STRINX= .333*EQBSTR*EQBSID**2
ISN 0265            STRINY= .0833*EQBSTR*(2.*EQBSID**2 + EQBLG**2)
ISN 0266            STRINZ= STRINY
ISN 0267            EQINX= .167*EQWT*EQBSID**2
ISN 0268            EQINY= .0833*EQWT*(EQBSID**2 + EQBLG**2)
ISN 0269            EQINZ= EQINY
ISN 0270            GO TO 69
ISN 0271         68 STRINX= .167*EQBSTR*SATDAM**2
ISN 0272            STRINY= STRINX
```

```
ISN 0273           STRINZ= STRINX                                                    00003490
ISN 0274           EQINX= .1*EQWT*SATDAM**2                                          00003500
ISN 0275           EQINY= EQINX                                                      00003510
ISN 0276           EQINZ= EQINX                                                      00003520
ISN 0277        69 CONTINUE                                                          00003530
ISN 0278           IF (NUMEEQ .EQ. 0) GO TO 71                                       00003535
             C                                                                       00003540
             C     EXTERNAL EQUIPMENT INCREMENTAL INERTIA (BOX SHAPE)                00003550
             C                                                                       00003560
ISN 0280           DO 70 I=1,NUMEEQ                                                  00003570
ISN 0281           EEINX(I)=  .167*EEQWT(I)*EESID(I)**2                              00003580
ISN 0282           EEINY(I)= EEINX(I)                                                00003590
ISN 0283           EEINZ(I)= EEINX(I)                                                00003600
ISN 0284        70 CONTINUE                                                          00003610
ISN 0285        71 CONTINUE                                                          00003615
             C                                                                       00003620
             C     SOLAR ARRAY INERTIAL CALCULATIONS                                 00003630
             C                                                                       00003640
ISN 0286           IF(IEQTYP.EQ.2) GO TO 37                                          00003650
ISN 0288           SA3INX= SA3WT*SATRAD**2                                           00003660
ISN 0289           SA3INY= .5*SA3WT*(SATRAD**2 + .167*SA3XL**2)                      00003670
ISN 0290           SA3INZ= SA3INY                                                    00003680
ISN 0291           GO TO 38                                                          00003690
ISN 0292        37 SA1INX= .0833*SA1WT*(SA1YL**2 + SA1ZL**2)                         00003700
ISN 0293           SA1INY= .0833*SA1WT*(SA1XL**2 + SA1ZL**2)                         00003710
ISN 0294           SA1INZ= .0833*SA1WT*(SA1XL**2 + SA1YL**2)                         00003720
ISN 0295           SA2INX= .0833*SA2WT*(SA2YL**2 + SA2ZL**2)                         00003730
ISN 0296           SA2INY= .0833*SA2WT*(SA2XL**2 + SA2ZL**2)                         00003740
ISN 0297           SA2INZ= .0833*SA2WT*(SA2XL**2 + SA2YL**2)                         00003750
ISN 0298        38 CONTINUE                                                          00003760
             C                                                                       00003770
             C     MISSION EQUIPMENT BAY INCREMENTAL INERTIA                         00003780
             C                                                                       00003790
ISN 0299           IF(MB12SH.EQ.2) GO TO 39                                          00003800
ISN 0301           EM1INX= .5*(EQM1ST + EQM1WT) * SATRAD**2                          00003810
ISN 0302           EM1INY= .0833*(EQM1ST + EQM1WT)*(3*SATRAD**2 + EQM1XL**2)         00003820
ISN 0303           EM1INZ= EM1INY                                                    00003830
ISN 0304           EM2INX= .5*(EQM2ST + EQM2WT)*SATRAD**2                            00003840
ISN 0305           EM2INY= .0833*(EQM2ST + EQM2WT)*(3*SATRAD**2 + EQM2XL**2)         00003850
```

```
ISN 0306          EM2INZ= EM2INY
ISN 0307          GO TO 40
ISN 0308       39 TEM1= .0833*(EQM1ST + EQM1WT)
ISN 0309          TEM2= .0833*(EQM2ST + EQM2WT)
ISN 0310          EM1INX= TEM1*(EQM1YL**2 + EQM1ZL**2)
ISN 0311          EM1INY= TEM1*(EQM1ZL**2 + EQM1XL**2)
ISN 0312          EM1INZ= TEM1*(EQM1YL**2 + EQM1XL**2)
ISN 0313          EM2INX= TEM2*(EQM2YL**2 + EQM2ZL**2)
ISN 0314          EM2INY= TEM2*(EQM2ZL**2 + EQM2XL**2)
ISN 0315          EM2INZ= TEM2*(EQM2YL**2 + EQM2XL**2)
ISN 0316       40 CONTINUE
            C
ISN 0317          EQM1TO= EQM1WT + EQM1ST
ISN 0318          EQM2TO= EQM2WT + EQM2ST
            C
            C     SATELLITE TOTAL INERTIA CALCULATIONS
            C
            C     FIRST DETERMINE CONTRIBUTION OF SOLAR ARRAYS
            C
ISN 0319          IF(IEQTYP.EQ.2) GO TO 41
ISN 0321          SA1X= SA3INX + SA3WT*((SATYCG-SA3YCG)**2 + (SATZCG-SA2ZCG)**2)
ISN 0322          SA1Y= SA3INY + SA3WT*((SATZCG-SA3ZCG)**2 + (SATXCG-SA3XCG)**2)
ISN 0323          SA1Z= SA3INZ + SA3WT*((SATYCG-SA3YCG)**2 + (SATXCG-SA3XCG)**2)
ISN 0324          GO TO 42
ISN 0325       41 CONTINUE
ISN 0326          SA1X= SA1INX + SA1WT*((SATYCG-SA1YCG)**2 + (SATZCG-SA1ZCG)**2) +
                 1 SA2INX + SA2WT*((SATYCG-SA2YCG)**2 + (SATZCG-SA2ZCG)**2)
                 2 + SABMWT*((SATYCG-SABYCG)**2 + (SATZCG-SABZCG)**2)
ISN 0327          SA1Y= SA1INY + SA1WT*((SATZCG-SA1ZCG)**2 + (SATXCG-SA1XCG)**2) +
                 1 SA2INY + SA2WT*((SATZCG-SA2ZCG)**2 + (SATXCG-SA2XCG)**2)
                 2 + SABMWT*((SATZCG-SABZCG)**2 + (SATXCG-SABXCG)**2)
ISN 0328          SA1Z= SA1INZ + SA1WT*((SATYCG-SA1YCG)**2 + (SATXCG-SA1XCG)**2) +
                 1 SA2INZ + SA2WT*((SATYCG-SA2YCG)**2 + (SATXCG-SA2XCG)**2)
                 2 + SABMWT*((SATYCG-SABYCG)**2 + (SATXCG-SABXCG)**2)
ISN 0329       42 CONTINUE
            C
            C     NEXT DETERMINE CONTRIBUTION OF EXTERNAL EQUIPMENT
            C
ISN 0330          EE1X= 0.
```

```
ISN 0331          EEIY= 0.
ISN 0332          EEIZ= 0.
ISN 0333          IF(NUMEEQ.EQ.0) GO TO 44
ISN 0335          DO 43 I=1,NUMEEQ
ISN 0336          EEIX= EEIX + EEINX(I) + EEQWT(I)*((SATYCG-EEYCG(I))**2 +
                 *  (SATZCG-EEZCG(I))**2)
ISN 0337          EEIY= EEIY + EEINY(I) + EEQWT(I)*((SATZCG-EEZCG(I))**2 +
                 *  (SATXCG-EEXCG(I))**2)
ISN 0338          EEIZ= EEIZ + EEINZ(I) + EEQWT(I)*((SATYCG-EEYCG(I))**2 +
                 *  (SATXCG-EEXCG(I))**2)
ISN 0339       43 CONTINUE
ISN 0340       44 CONTINUE
            C
ISN 0341          SATINX= STRINX + EQBSTR*((SATYCG-STRYCG)**2 + (SATZCG-STRZCG)**2)
                 1 + EM1INX + EQM1TO*((SATYCG-EM1YCG)**2 + (SATZCG-EM1ZCG)**2)
                 2 + EM2INX + EQM2TO*((SATYCG-EM2YCG)**2 + (SATZCG-EM2ZCG)**2)
                 3 + EQINX + EQWT*(SATYCG**2 + SATZCG**2) + SAIX + EEIX
            C
ISN 0342          SATINY= STRINY + EQBSTR*((SATZCG-STRZCG)**2 + (SATXCG-STRXCG)**2)
                 1 + EM1INY + EQM1TO*((SATZCG-EM1ZCG)**2 + (SATXCG-EM1XCG)**2)
                 2 + EM2INY + EQM2TO*((SATZCG-EM2ZCG)**2 + (SATXCG-EM2XCG)**2)
                 3 + EQINY + EQWT*(SATZCG**2 + (SATXCG-STRXCG)**2) + SAIY + EEIY
            C
ISN 0343          SATINZ= STRINZ + EQBSTR*((SATYCG-STRYCG)**2 + (SATXCG-STRXCG)**2)
                 1 + EM1INZ + EQM1TO*((SATYCG-EM1YCG)**2 + (SATXCG-EM1XCG)**2)
                 2 + EM2INZ + EQM2TO*((SATYCG-EM2YCG)**2 + (SATXCG-EM2XCG)**2)
                 3 + EQINZ + EQWT*(SATYCG**2 + (SATXCG-STRXCG)**2) + SAIZ + EEIZ
            C
            C     COMPUTE DISTANCE FROM C.G. TO MAIN ENGINE(DT), GAS JET LEVER ARMS
            C     ON ROLL, PITCH, AND YAW AXES, RESPECTIVELY, (DX,DY,DZ).  THE
            C     CONVERSION TO UNITS OF FT IS DONE IN SUBROUTINE SANDC
            C
ISN 0344          IF(ISHAPE-2) 45,46,46
ISN 0345       45 DT= SATXCG - 500.
ISN 0346          DX= .5*EQBLG
ISN 0347          DY= DX
ISN 0348          DZ= .5*SATDAM
ISN 0349          GO TO 47
ISN 0350       46 DT= SATXCG - 500.
```

ORIGINAL PAGE IS OF POOR QUALITY

```
ISN 0351            DX= .5*SATDAM                                    00004640
ISN 0352            DY= DX                                           00004650
ISN 0353            DZ=DX                                            00004659
ISN 0354            GO TO 47                                         00004660
ISN 0355         48 DT=.5*EQBLG                                      00004661
ISN 0356            DX=.5*EQBSID                                     00004662
ISN 0357            DY=DT                                            00004663
ISN 0358            DZ=DT                                            00004664
ISN 0359         47 RJ=SATINX                                        00004680
ISN 0360            RETURN                                           00004690
ISN 0361            END                                              00004700

*OPTIONS IN EFFECT*     NAME= MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =     360 ,PROGRAM SIZE =     6982

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******
                                                   65K BYTES OF CORE NOT USED
```

LEVEL 21.7 (JAN 73)   OS/360 FORTRAN H

```
        COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                         SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
ISN 0002          SUBROUTINE EP (IPIC,IERR,ITER,NCONF,ICHOSE,NCHOSE)              00004710
           C *******************************************************************00004720
           C *    SUBROUTINE EP - -                                             *00004730
           C *        WILL SELECT AND SIZE THE ELECTRICAL SUBSYSTEM WHICH WILL BE *00004740
           C *        THESE CONFIGURATIONS AS FOLLOWS - -                       *00004750
           C *                   NCONF (1) = 1   IS  DUAL SPIN                  *00004760
           C *                   NCONF (1) = 2   IS  YAW SPIN                   *00004770
           C *                   NCONF (1) = 3   IS  MASS EXPULSION             *00004780
           C *                   NCONF (1) = 4   IS  MASS EXPULSION(MOMENTUM BIAS) *00004790
           C *                   NCONF (1) = 5   IS  PITCH MOMENTUM BIAS         00004800
           C *                   NCONF (5) = 1   IS  SHUNT  -  PADDLE           *00004810
           C *                   NCONF (5) = 2   IS  SHUNT  -  BODY             *00004820
           C *                   NCONF (5) = 3   IS  S + D -   PADDLE           *00004830
           C *                   NCONF (5) = 4   IS  S + D -   BODY             *00004840
           C *                   NCONF (5) = 5   IS  SERIES    PADDLE           *00004850
           C *                   NCONF (5) = 6   IS  SERIES    BODY             *00004860
           C *                   NCONF (6) = 1   IS  CYLINDER                   *00004870
           C *                   NCONF (6) = 2   IS  BOX                        *00004880
           C *                   NCONF (6) = 3   IS  SPHERE                     *00004890
           C *******************************************************************00004900
           C *******************************************************************00004910
           C *        A LIST OF THE VARIABLES FOLLOWS - -                       *00004920
           C *                                                                  *00004930
           C *        VARIABLE  HOW USED  FROM     TO       DEFAULT   DESCRIPTION*00004940
           C *                                                                  *00004950
           C *        A         INT       EP       EP                 FT HE + HP *00004960
           C *        AI        INT       EPS      EPS            FT**2 ARRAY AREA*00004970
           C *        A32       INT       EP       EP                   A**(3/2) *00004980
           C *        ALT       I,INT     USER     EPR                MI ALTITUDE *00004990
           C *        AREA      O         EPS      VESIZE         FT**2 ARRAY AREA*00005000
           C *        CA        INT       EPS      EPS              A-H MIN REQ CP*00005010
           C *        CAPMAX    INT       DB       EPR              A-H MIN REQ CP*00005020
           C *        CCELL     INT       DB       EPS              A-H CAP SEL CL*00005030
           C *        CHMINT    INT       EPS      EPS      2.0     HRS MIN CHG TM*00005040
           C *        CI        INT       EPS      EPS              A-HMIN INST CP*00005050
           C *        CISTAR    INT       EPS      EPS              A-HCAP SEL CEL*00005060
           C *        CR        INT       EPS      EPS              W-HMIN REQ CAP*00005070
```

```
C *        DATAB     I,INT,O   MAIN      EPR,EPS                DATA BASE    *00005080
C *        DELF      INT       EPS       EPS        .03         XMIS LOSS    *00005090
C *        DELI      INT       EPS       EPS        .02         FAB LOSS     *00005100
C *        DELM      INT       EPS       EPS        .01         MISC LOSS    *00005110
C *        DELR      INT       EPS       EPS        .05 OR .5   RAD DEG FAC*00005120
C *        DELT      INT       EPS       EPS        TABLE       TEMP.CORR.   *00005130
C *        ETAC      INT       DB        EPR        1.0         EFF CHGR     *00005140
C *        ETAD      INT       DB        EPR,EPS    0.85        EFF DISCH    *00005150
C *        ETAL      INT       DB        EPR,EPS    0.65        EFF BATT     *00005160
C *        ETAI      INT       EPS       EPS        0.105       SOLAR CL EF*00005170
C *        ETALR     INT       DB        EPR        0.90        EFF LD REG *00005180
C *        ETAR      INT       EPR       EPR,EPS    1.0         PWR DIST LS*00005190
C *        FS        INT       EPS       EPS        -           SIZE FACT. *00005200
C *        FW        INT       EPS       EPS        -           WT FACTOR    *00005210
C *        HE        INT       EP        EP         20.902E6FT RAD EARTH *00005220
C *        HEDA      INT       EP        EP                      HE/A        *00005230
C *        HP        INT       EP        EP                   FT PERIGEE     *00005240
C *        I         INT       EP        EP                     INT INDEX    *00005250
C *        ICCU      INT       EPR       EPR                    CCU INDEX    *00005260
C *        ICELL     INT       EPS       EPS                    COL INDX CL*00005270
C *        ICELLE    INT       EPS       EPS                    END CELLS    *00005280
C *        ICH       INT       EPR       EPR                AMP CHG CURR     *00005290
C *        ICHGR     INT       EPR       EPR                    COL INDX CH*00005300
C *        ICHGRL    INT       EPS       EPS                    END CHGRS    *00005310
C *        ICHOSE    O         EPR,EPS   MAIN                   HDWR ID      *00005320
C *        ICONF     INT       EPR,EPS   EPR,EPS                VAR ON CONF*00005330
C *        IDR       I         MAIN      EPR,EPS                LAST HDWR    *00005340
C *        IDR       INT       EPR       EPR                    COL INDX DR*00005350
C *        IDRE      INT       EPR       EPR                    END DISCH    *00005360
C *        IERR      O         EPR       MAIN                   ERROR FLG    *00005370
C *        ILR       INT       EPR       EPR                    COL INDX LR*00005380
C *        ILRE      INT       EPR       EPR                    END LR       *00005390
C *        IPCU      INT       EPR       EPR                    PCU INDEX    *00005400
C *        IPCUE     INT       EPR       EPR                    END PCU      *00005410
C *        IPD       INT       EPR       EPR                    PD INDEX     *00005420
C *        IPDE      INT       EPR       EPR                    END PD       *00005430
C *        IPIC      I,O       EPR,EPS   MAIN                   HDWR INDEX *00005440
C *        ISPD      INT       EPR       EPR                    SPD INDEX    *00005450
C *        ISPDE     INT       EPR       EPR                    END SPD      *00005460
```

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C *     ISR1       INT        EPR        EPR                        SR1 INDEX    *00005470
C *     ISR1E      INT        EPR        EPR                        END SR1      *00005480
C *     ISR2       INT        EPR        EPR                        SR2 INDEX    *00005490
C *     ISR2E      INT        EPR        EPR                        END SR2      *00005500
C *     K1         INT        EPS        EPS          1.02          BATT PKG F   *00005510
C *     K2         INT        EPS        EPS          1.4           BAT ST WT F*00005520
C *     LMBDD      INT,O      EPR        EPR,REL      0.3           AV DP DISCH*00005530
C *     LMBDG      INT        EPS        EPS          -             ORINT FACT *00005540
C *     LMBDP      INT        EPS        EPS          0.9           SLR PKG FAC*00005550
C *     MU         INT        EP         EP           1.408E16      CONSTANT     *00005560
C *     N          INT        EP         EP                         EARTH RATE *00005570
C *     NB         INT        EPS        EPS          2             NO BATT      *00005580
C *     NC         INT        EPS        EPS                        NO SLR CELL*00005590
C *     NCCU       INT        EPR        EPR                        NO.CCU       *00005600
C *     NCH        INT        EPS        EPS          2             NO CHGRS     *00005610
C *     NCHOSE     O          EPR,EPS    MAIN                       NO. EQUIP. *00005620
C *     NCONF(1)   I,EPS,O    MAIN       EPS,MAIN                   SANDC MACRO*00005630
C *     NCONF(5)   I,EP ,O    MAIN       EP ,MAIN                   EP  MACRO  *00005640
C *     NCONF(6)   I,EPS,O    MAIN       EPS,MAIN                   VSIZE MACRO*00005650
C *     ND         INT        EPR        EPR                        NO DISCH RG*00005660
C *     NLR        INT        EPR        EPR                        NO LD REG    *00005670
C *     NPCU       INT        EPR        EPR                        NO.PCU       *00005680
C *     NPD        INT        EPR        EPR                        NO. PD       *00005690
C *     NSPD       INT        EPR        EPR                        NO. SPD      *00005700
C *     NSR        INT        EPR        EPR                        NO SHNT REG*00005710
C *     OPTEMP     I          USER       EP           15. DEG. C BAT TEMP.       *00005720
C *     PBOL       INT        EPR        EPR,EPS            WATTPWR B.O.L. *00005730
C *     PD         INT        EPR        EPR                WATTBAT PWR-REG*00005740
C *     PEXCES     INT        EPR        EPR,EPS            WATTPWD 2B DISP*00005750
C *     PIE        INT        EPS        EPS          3.14159       CONSTANT     *00005760
C *     PL         I          ALL S/S    EPR              WATT AV PWR LD     *00005770
C *     PLMIN      I          ALL S/S    EPR              WATT MIN PWR LD *00005780
C *     PLR        INT        EPR        EPR                WATTTOT PWR LRE*00005790
C *     PLRD       O          EPR        THERMAL            WATTPWR DISP LR*00005800
C *     PS         INT        EPR        EPR,EPS            WATTEOL SOL OUT*00005810
C *     RFD        INT        EPS        EPS                    TEMP DEG FC*00005820
C *     S          INT        EP         EP           USED IN CALC OF TE     *00005830
C *     SOL        INT        EPS        EPS          1353  W/M2AV SOL INT *00005840
C *     TE         INT        EPS        EPR                        ECPS TIME    *00005850
```

```
      C *       TEDTS       INT       EPS       EPS                    DARK/LITE  *00005860
      C *       VB          INT       EPS       EPS          FT**3UNIT BATVOL*00005870
      C *       VBM         INT       EPR       EPS           VDCMIN BAT VLT*00005880
      C *       VBT         INT       EPS       EPS          FT**3TOT BAT VOL*00005890
      C *       VC          INT       EPS       EPS     1.1   VDCMIN CELL U *00005900
      C *       VCELL       INT       DB        MAIN            M3VOL CELL   *00005910
      C *       VDB         INT       EPR       EPR           VDCAVE ALL VOL*00005920
      C *       VOL         0         MAIN                    FT**3 EP VOL   *00005930
      C *       WATE        INT,0     EPS       VESIZE          KG ARRAY WT  *00005940
      C *       WB          INT       EPS       EPS             KGUNIT BAT WT*00005950
      C *       WBT         INT       EPS       EPS             KGTOT BAT WT *00005960
      C *       WCELL       INT       DB        EPS             LB CELL WGT  *00005970
      C *       WT          0         MAIN                      LBS EP WT    *00005980
      C *                                                                    *00005990
      C ********************************************************************00006000
ISN 0003        COMMON /USER5/ IVOLT,OPTEMP                                   00006010
ISN 0004        COMMON /BTWN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,  00006020
               * LMBDD,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,00006030
               * SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,HTRPRB,             00006040
               * HPT,HTPIPE,VCHP,HTPT,FC,N,COMRT,ACSSN,BITRAT(2),              00006050
               * EQBLG,SABOLG,SATWT                                           00006051
ISN 0005        COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMDOLD,TRUNC,ITRUNC,DE,TE,  00006053
               * TOOLR,QCR,SEIR,PMR,PE,PU,TOOLU,QCP,SEIP,PMP,SATR,SATINV,MER,  00006054
               * MEINV,PAYR,PAYINV,PAUQUL,GSE,XLTOT,CTOT,FEER,FEEINV,DOTE,XVEST, 00006055
               * OPS,SKTAU(6),ROLD(60),TTT,AN,TS,BS,AM,TF,BF,TC,TA,TB,TOTOPS  00006056
ISN 0006        COMMON /USERI/EQM1WT,EQM2WT,DIAMAX,ALT                        00006060
ISN 0007        COMMON /DBCOM/ IDB(30),DATAB(55,90)                           00006070
ISN 0008        DIMENSION NCONF(10), IPIC(5), ICHOSE(5), NCHOSE(5)            00006080
ISN 0009        REAL MU,N,ICH,LMBDD,LMBDG,LMBDP,K1,K2                         00006090
ISN 0010        DATA DELF/.03/,DELI/.02/,DELM/.01/,ETAI/.105/,ETAR/1.0/,K1/1.02/,K00006100
               12/1.4/,LMBDP/.9/,SOL/1353./,VC/1.1/,PIE/3.1415926/            00006110
               *,CHMINT/2.0/
ISN 0011        LMBDD=.3                                                      00006120
      C **                                                                    00006130
      C         ** INITIALIZATION **                                          00006140
ISN 0012        IF (ITER.NE.0) GO TO 140                                      00006150
      C          MEAN RADIUS OF EARTH IN FEET                                 00006160
ISN 0014        HE=24.0530612E6                                               00006170
ISN 0015        MU=1.407645E16                                                00006180
                                                                              00006190
```

9-110

```
ISN 0016          HP=6076.*ALT
ISN 0017          A=HP+HE
ISN 0018          A32=A**1.5
ISN 0019          HEDA=HE/A
ISN 0020          S=1.02*ARSIN(HEDA)
ISN 0021          N=SQRT(MU)/A32
ISN 0022          TEDTS=S/(PIE-S)
ISN 0023          TE=2.*S/N
ISN 0024          RFD=.01*OPTEMP+1.0
ISN 0025          DO 10 I=1,5
ISN 0026    10    ICHOSE(I)=0
ISN 0027          IERR=0
            C *   LMBDD MUST GO TO REL
ISN 0028          NB=2
ISN 0029          DO 20 I=1,5
ISN 0030    20    NCHOSE(I)=0
ISN 0031          NLR=2
ISN 0032          WATE=0.0
ISN 0033          ARFA=0.0
            C
            C
            C
            C     **  SET UP DELTA-R AND DELTA-T (RADIATION DEGRADATION AND
            C                                 TEMPERATURE CORRECTION FACTORS)
ISN 0034          DELR=.05
ISN 0035          IF (ALT.GT.400.) DELR=.3
            C
            C
            C
ISN 0037          IF (ALT.GT.5000.) GO TO 80
ISN 0039          ICONF=NCONF(5)
ISN 0040          GO TO (30,50,30,50,30,50), ICONF
ISN 0041    30    ICONF=NCONF(1)
ISN 0042          GO TO (50,50,40,40,40), ICONF
            C
ISN 0043    40    DELT=.11
ISN 0044          GO TO 140
            C
            C
```

```
ISN 0045      50      ICONF=NCONF(1)
ISN 0046              GO TO (60,60,70,70,70), ICONF
                C
ISN 0047      60      DELT=.01
ISN 0048              GO TO 140
                C
ISN 0049      70      DELT=.04
ISN 0050              GO TO 140
                C
                C **  ALTITUDE IS GREATER THAN 5000 NAUTICAL MILES  **
                C
ISN 0051      80      ICONF=NCONF(5)
ISN 0052              GO TO (90,110,90,110,90,110), ICONF
                C
ISN 0053      90      ICONF=NCONF(1)
ISN 0054              GO TO (140,140,100,100,100), ICONF
                C
ISN 0055      100     DELT=.08
ISN 0056              GO TO 140
                C
ISN 0057      110     ICONF=NCONF(1)
ISN 0058              GO TO (120,120,130,130,130), ICONF
                C
ISN 0059      120     DELT=-.05
ISN 0060              GO TO 140
                C
ISN 0061      130     DELT=.02
                C
                C
                C ***********************************************************************
                C *   NOW WE WILL BE DOING THE EPR MACRO SELECTION (S,SANDD,SLR)
                C ***********************************************************************
                C
ISN 0062      140     ICONF=NCONF(5)
ISN 0063              GO TO (150,150,280,280,450,450), ICONF
                C
                C
                C     ** SHUNT REGULATION DESIGN **
                C
```

```
ISN 0064      150    ICONF=NCONF(5)
ISN 0065             ISR1E=IDB(1)
ISN 0066             ICELLE=IDB(2)
ISN 0067             ICHGRE=IDB(3)
ISN 0068             IPCUE=IDB(12)
              C
ISN 0069             IF (IPIC(1).NE.0) GO TO 160
ISN 0071             ISR1=1
ISN 0072             ICELL=IDB(1)+1
ISN 0073             ICHGR=IDB(2)+1
ISN 0074             IPCU=IDB(11)+1
ISN 0075             NPCU=1
ISN 0076             ETAE=0.65
ISN 0077             ETAC=1.0
ISN 0078             ETAD=1.0
ISN 0079             ETAR=1.0
ISN 0080             GO TO 210
              C
ISN 0081      160    IF (ITER.EQ.0) GO TO 170
ISN 0083             ISR1=IPIC(1)
ISN 0084             ICELL=IPIC(2)
ISN 0085             ICHGR=IPIC(3)
ISN 0086             GO TO 210
              C
ISN 0087      170    IF (ISR1.GE.ISR1E) GO TO 180
ISN 0089             ISR1=IPIC(1)+1
ISN 0090             ICELL=IPIC(2)
ISN 0091             ICHGR=IPIC(3)
ISN 0092             GO TO 210
              C
ISN 0093      180    IF (ICELL.GE.ICELLE) GO TO 190
ISN 0095             ISR1=1
ISN 0096             ICELL=IPIC(2)+1
ISN 0097             ICHGR=IPIC(3)
ISN 0098             GO TO 210
              C
ISN 0099      190    IF (ICHGR.GE.ICHGRE) GO TO 200
ISN 0101             ISR1=1
ISN 0102             ICELL=IDB(1)+1
```

```
ISN 0103            ICHGR=IPIC(3)+1
ISN 0104            GO TO 210
              C
ISN 0105      200   ICHOSE(1)=-1
ISN 0106            ICHOSE(2)=-1
ISN 0107            ICHOSE(3)=-1
ISN 0108            RETURN
              C
              C
              C **  COMPUTE SELECTION PARAMETERS FOR SHUNT REGULATION DESIGN - -
              C **  THIS IS FOR SHUNT REGULATOR,BATTERY AND BATTERY CHARGER - -
              C
              C
              C
              C **  DETERMINE NUMBER OF SHUNT REGULATORS REQUIRED
              C
ISN 0109      210   NSR=1
ISN 0110      220   CAPMAX=DATAB(6,ISR1)
              C     ** DETERMINE EXCESS ARRAY POWER FOR REGULATION
              C
ISN 0111            PS=(PL/ETAR)*(1.+TEDTS*(1./(ETAD*ETAC*ETAE)))
              C
ISN 0112            PBOL=PS/((1.-DELR)*(1.-DELF)*(1.-DELT)*(1-DELI)*(1-DELM))
              C
ISN 0113            PEXCES=PBOL-PLMIN
              C
ISN 0114            IF (PLMIN.GE.PEXCES) GO TO 230
ISN 0116            NSR=(PEXCES-PLMIN)/CAPMAX+.9
ISN 0117            IF (NSR.LE.0) NSR=1
ISN 0119      230   CONTINUE
              C
              C **  NOTE - - ADD SPECIAL EQUIPMENT (AS NECESSARY)
              C
              C
              C **  SET VOLTAGES FOR THIS DESIGN
              C
ISN 0120            VDB=27.
ISN 0121            VBM=25.
              C
```

```
              C **  BATTERY ALGORITHM
              C
              C         DETERMINE REQUIRED CAPACITIES
              C
ISN 0122              CR=(PL*TE/3600.)/(LMBDD*ETAD)
ISN 0123              CA=CR/VDB
              C
              C         DETERMINE MINIMUM INSTALLED CAPACITY
              C
ISN 0124              CI=CA*RFD
              C
              C **  DETERMINE NUMBER OF CELLS IN SERIES(TO BE SUPPLIED TO REL)
              C
ISN 0125              NC=VBM/VC
              C
              C     DETERMINE SELECTION PARAMETERS ON CELLS
ISN 0126              IF (ITER .GE. 1) NB=NCHOSE(2)
ISN 0128              CISTAR=CI/NB
              C
              C
              C *   DETERMINE CHARGE CURRENT RATING REQUIRED FOR THE BATTERY CHARGER  *
ISN 0129              CCELL=CISTAR
ISN 0130              ICH=CCELL/CHMINT
              C
              C
              C **
              C **  COMPARE THE HARDWARE PARAMETER TO THE SELECTION PARAMETER        **
              C **
ISN 0131              IF (DATAB(6,ISR1).GE.CAPMAX.AND.DATAB(6,ICELL).GE.CISTAR.AND.DATAB
                     1(6,ICHGR).GE.ICH) GO TO 270
              C
ISN 0133              IF (ISR1.GE.ISR1E) GO TO 240
ISN 0135              ISR1=ISR1+1
ISN 0136              GO TO 220
              C
ISN 0137      240     IF (ICELL.GE.ICELLE) GO TO 250
ISN 0139              ISR1=1
ISN 0140              ICELL=ICELL+1
ISN 0141              GO TO 220
```

```
                  C
ISN 0142     250    IF (ICHGR.GE.ICHGRE) GO TO 260
ISN 0144            ISR1=1
ISN 0145            ICELL=IDB(1)+1
ISN 0146            ICHGR=ICHGR+1
ISN 0147            GO TO 220
                  C
ISN 0148     260    ICHOSE(1)=-1
ISN 0149            ICHOSE(2)=-1
ISN 0150            ICHOSE(3)=-1
ISN 0151            RETURN
                  C
                  C
ISN 0152     270    VCELL=DATAB(24,ICELL)
ISN 0153            WCELL=DATAB(23,ICELL)
ISN 0154            ETAE=DATAB(7,ICELL)
                  C
ISN 0155            WB=NC*WCELL*K2
ISN 0156            VB=NC*VCELL*K1
                  C
ISN 0157            WBT=WB*NB
ISN 0158            VBT=VB*NB
                  C
ISN 0159            ETAC=DATAB(7,ICHGR)
ISN 0160            NCH=NB
                  C
                  C
ISN 0161            IF (NCHOSE(1) .GE. NSR) GO TO 271
ISN 0163            NCHOSE(1)=NSR
ISN 0164        271 IF (NCHOSE(2) .GE. NB) GO TO 272
ISN 0166            NCHOSE(2)=NB
ISN 0167        272 IF (NCHOSE(3) .GE. NCH) GO TO 273
ISN 0169            NCHOSE(3)=NCH
ISN 0170        273 IF (NCHOSE(4) .GE. NPCU) GO TO 274
ISN 0172            NCHOSE(4)=NPCU
ISN 0173        274 NCHOSE(5)=0
                  C
ISN 0174            ICHOSE(1)=DATAB(1,ISR1)
ISN 0175            ICHOSE(2)=DATAB(1,ICELL)
```

```
ISN 0176            ICHOSE(3)=DATAB(1,ICHGR)
ISN 0177            ICHOSE(4)=DATAB(1,IPCU)
ISN 0178            ICHOSE(5)=0
            C
ISN 0179            IPIC(1)=ISR1
ISN 0180            IPIC(2)=ICELL
ISN 0181            IPIC(3)=ICHGR
ISN 0182            IPIC(4)=IPCU
ISN 0183            IPIC(5)=0
            C
            C
ISN 0184            WT=NSR*DATAB(23,ISR1)+WBT+NCH*DATAB(23,ICHGR)+NPCU*DATAB(23,IPCU)
                   * +WT
            C
ISN 0185            VOL=NSR*DATAB(24,ISR1)+VBT+NCH*DATAB(24,ICHGR)+NPCU*DATAB(24,IPCU)
                   * +VOL
            C
ISN 0186            GO TO 590
            C
            C
            C       ** SHUNT AND DISCHARGE DESIGN **
            C
ISN 0187    280     ICONF=NCONF(5)
ISN 0188            IDRE=IDB(4)
ISN 0189            ISR2F=IDB(5)
ISN 0190            ICELLE=IDB(2)
ISN 0191            ICHGRE=IDB(6)
ISN 0192            NCCU=1
            C
ISN 0193            IF (IPIC(1).NE. 0) GO TO 290
ISN 0195            IDR=IDB(3)+1
ISN 0196            ISR2=IDB(4)+1
ISN 0197            ICELL=IDB(1)+1
ISN 0198            ICHGR=IDB(5)+1
ISN 0199            ICCU=IDB(6)+1
ISN 0200            ETAD=0.85
ISN 0201            ETAC=1.0
ISN 0202            ETAE=0.65
ISN 0203            ETAR=1.0
```

```
ISN 0204              GO TO 360
                C
ISN 0205        290   IF (ITER.EQ.0) GO TO 300
ISN 0207              IDR=IPIC(1)
ISN 0208              ISR2=IPIC(2)
ISN 0209              ICELL=IPIC(3)
ISN 0210              ICHGR=IPIC(4)
ISN 0211              ICCU=IPIC(5)
ISN 0212              GO TO 360
                C
ISN 0213        300   IF (IDR.GE.IDRE) GO TO 310
ISN 0215              IDR=IPIC(1)+1
ISN 0216              ISR2=IPIC(2)
ISN 0217              ICELL=IPIC(3)
ISN 0218              ICHGR=IPIC(4)
ISN 0219              ICCU=IPIC(5)
ISN 0220              GO TO 360
                C
ISN 0221        310   IF (ISR2.GE.ISR2E) GO TO 320
ISN 0223              IDR=IDB(3)+1
ISN 0224              ISR2=IPIC(2)+1
ISN 0225              ICELL=IPIC(3)
ISN 0226              ICHGR=IPIC(4)
ISN 0227              ICCU=IPIC(5)
ISN 0228              GO TO 360
                C
ISN 0229        320   IF (ICELL.GE.ICELLE) GO TO 330
ISN 0231              IDR=IDB(3)+1
ISN 0232              ISR2=IDB(4)+1
ISN 0233              ICELL=IPIC(3)+1
ISN 0234              ICHGR=IPIC(4)
ISN 0235              ICCU=IPIC(5)
ISN 0236              GO TO 360
                C
ISN 0237        330   IF (ICHGR.GE.ICHGRE) GO TO 340
ISN 0239              IDR=IDB(3)+1
ISN 0240              ISR2=IDB(4)+1
ISN 0241              ICELL=IDB(1)+1
ISN 0242              ICHGR=IPIC(4)+1
```

```
ISN 0243            ICCU=IPIC(5)
ISN 0244            GO TO 360
              C
ISN 0245      340   DO 350 I=1,5
ISN 0246      350   ICHOSE(I)=-1
ISN 0247            RETURN
              C
              C
              C **  COMPUTE SELECTION PARAMETERS FOR SHUNT AND DISCHARGE REGULATION -
              C **  THIS IS FOR DISCHARGE REGULATOR,SHUNT REGULATOR,BATTERY,BATTERY
              C **  CHARGER AND SIZING THE CENTRAL CONTROL UNIT - -
              C
              C **  DETERMINE NUMBER OF DISCHARGE REGULATORS REQUIRED
              C
ISN 0248      360   ND=NB
              C
              C     ** DETERMINE EXCESS ARRAY POWER FOR REGULATION
              C
ISN 0249            PS=(PL/ETAR)*(1.+TEDTS*(1./(ETAD*ETAC*ETAE)))
ISN 0250            PBOL=PS/((1.-DELR)*(1.-DELF)*(1.-DELT)*(1-DELI)*(1-DELM))
              C
ISN 0251            PEXCES=PBOL-PLMIN
              C
ISN 0252            IF (ITER .GE. 1 .AND. NCHOSE(1) .GE. ND) ND=NCHOSE(1)
ISN 0254            PD=PL/(ND*ETAD)
              C
              C **  DETERMINE NUMBER OF SHUNT REGULATORS REQUIRED
              C
ISN 0255      370   CAPMAX=DATAB(6,ISR2)
ISN 0256            NSR=1
ISN 0257            IF (PLMIN.GE.PEXCES) GO TO 380
ISN 0259            NSR=(PEXCES-PLMIN)/CAPMAX+.9
ISN 0260            IF (NSR.LE.0) NSR=1
ISN 0262      380   CONTINUE
              C
              C **  SET VOLTAGES FOR SHUNT AND DISCHARGE DESIGN
              C
ISN 0263            VDB=21.
ISN 0264            VBM=19.
```

```
                  C
                  C **  SET UP BATTERY SELECTION PARAMETER
                  C
                  C        DETERMINE REQUIRED CAPACITIES
                  C
ISN 0265                CR=(PL*TE/3600.)/(LMBDD*ETAD)
ISN 0266                CA=CR/VDB
                  C
                  C        DETERMINE MINIMUM INSTALLED CAPACITY
                  C
ISN 0267                CI=CA*RFD
                  C
                  C        DETERMINE NUMBER OF CELLS IN SERIES(TO BE SUPPLIED TO REL)
                  C
ISN 0268                NC=VBM/VC
                  C
                  C        CISTAR IS SELECTION PARAMETER ON CELLS
                  C
ISN 0269                IF (ITER .GE. 1) NB=NCHOSE(3)
ISN 0271                CISTAR=CI/NB
                  C
                  C **  CHARGER SELECTION
                  C
                  C *   DETERMINE CHARGE CURRENT RATING REQUIRED FOR THE BATTERY CHARGER *
                  C
ISN 0272                CCELL=CISTAR
ISN 0273                ICH=CCELL/CHMINT
                  C
                  C **
                  C **
                  C **  COMPARE THE HARDWARE PARAMETER TO THE SELECTION PARAMETER      **
                  C **
                  C **
                  C
ISN 0274                IF (DATAB(6,IDR).GE.PD.AND.DATAB(6,ISR2).GE.CAPMAX.AND.DATAB(6,ICE
                       1LL).GE.CISTAR.AND.DATAB(6,ICHGR).GE.ICH) GO TO 440
                  C
ISN 0276                IF (IDR.GE.IDRE) GO TO 390
ISN 0278                IDR=IDR+1
```

```
ISN 0279            GO TO 370
               C
ISN 0280       390  IF (ISR2.GE.ISR2E) GO TO 400
ISN 0282            IDR=IDB(3)+1
ISN 0283            ISR2=ISR2+1
ISN 0284            GO TO 370
               C
ISN 0285       400  IF (ICELL.GE.ICELLE) GO TO 410
ISN 0287            IDR=IDB(3)+1
ISN 0288            ISR2=IDB(4)+1
ISN 0289            ICELL=ICELL+1
ISN 0290            GO TO 370
               C
ISN 0291       410  IF (ICHGR.GE.ICHGRE) GO TO 420
ISN 0293            IDR=IDB(3)+1
ISN 0294            ISR2=IDB(4)+1
ISN 0295            ICELL=IDB(1)+1
ISN 0296            ICHGR=ICHGR+1
ISN 0297            GO TO 370
               C
ISN 0298       420  DO 430 I=1,5
ISN 0299       430  ICHOSE(I)=-1
ISN 0300            RETURN
               C
               C
ISN 0301       440  ETAD=DATAB(7,IDR)
ISN 0302            ETAE=DATAB(7,ICELL)
ISN 0303            ETAC=DATAB(7,ICHGR)
ISN 0304            VCELL=DATAB(24,ICELL)
ISN 0305            WCELL=DATAB(23,ICELL)
ISN 0306            WB=NC*WCELL*K2
ISN 0307            VB=NC*VCELL*K1
ISN 0308            WBT=WB*NB
ISN 0309            VBT=VB*NB
ISN 0310            NCH=NB
               C
ISN 0311            ICHOSE(1)=DATAB(1,IDR)
ISN 0312            ICHOSE(2)=DATAB(1,ISR2)
ISN 0313            ICHOSE(3)=DATAB(1,ICELL)
```

```
      ISN 0314              ICHOSE(4)=DATAB(1,ICHGR)
      ISN 0315              ICHOSE(5)=DATAB(1,ICCU)
                     C
      ISN 0316              IF (NCHOSE(1) .GE. ND) GO TO 451
      ISN 0318              NCHOSE(1)=ND
      ISN 0319          451 IF (NCHOSE(2) .GE. NSR) GO TO 452
      ISN 0321              NCHOSE(2)=NSR
      ISN 0322          452 IF (NCHOSE(3) .GE. NB) GO TO 453
      ISN 0324              NCHOSE(3)=NB
      ISN 0325          453 IF (NCHOSE(4) .GE. NCH) GO TO 454
      ISN 0327              NCHOSE(4)=NCH
      ISN 0328          454 IF (NCHOSE(5) .GE. NCCU) GO TO 455
      ISN 0330              NCHOSE(5)=NCCU
                     C **
      ISN 0331          455 IPIC(1)=IDR
      ISN 0332              IPIC(2)=ISR2
      ISN 0333              IPIC(3)=ICELL
      ISN 0334              IPIC(4)=ICHGR
      ISN 0335              IPIC(5)=ICCU
                     C
                     C
      ISN 0336              WT=ND*DATAB(23,IDR)+NSR*DATAB(23,ISR2)+WBT+NCH*DATAB(23,ICHGR)+
                           * NCCU*DATAB(23,ICCU)+WT
                     C
      ISN 0337              VOL=ND*DATAB(24,IDR)+NSR*DATAB(24,ISR2)+VBT+NSR*DATAB(24,ICHGR)+
                           * NCCU*DATAB(24,ICCU)+VOL
                     C
      ISN 0338              GO TO 590
                     C
                     C
                     C      ** SERIES LOAD REGULATION DESIGN
                     C
      ISN 0339       450    ICONF=NCONF(5)
      ISN 0340              ILRE=IDB(8)
      ISN 0341              ICELLE=IDB(2)
      ISN 0342              ICHGRE=IDB(9)
      ISN 0343              ISPDE=IDB(10)
      ISN 0344              IPDE=IDB(11)
                     C
```

```
ISN 0345          IF (IPIC(1).NE.0) GO TO 460                       00010880
ISN 0347          ILR=IDB(7)+1                                      00010890
ISN 0348          ICELL=IDB(1)+1                                    00010900
ISN 0349          ICHGR=IDB(8)+1                                    00010910
ISN 0350          ISPD=IDB(9)+1                                     00010920
ISN 0351          IPD=IDB(10)+1                                     00010930
ISN 0352          ETALR=0.9                                         00010940
ISN 0353          ETAE=0.65                                         00010950
ISN 0354          ETAC=1.0                                          00010960
ISN 0355          ETAD=1.0                                          00010970
ISN 0356          NSPD=1                                            00010980
ISN 0357          NPD=1                                             00010990
ISN 0358          GO TO 520                                         00011000
             C                                                      00011010
ISN 0359     460  IF (ITER.EQ.0) GO TO 470                          00011020
ISN 0361          ILR=IPIC(1)                                       00011030
ISN 0362          ICELL=IPIC(2)                                     00011040
ISN 0363          ICHGR=IPIC(3)                                     00011050
ISN 0364          ISPD=IPIC(4)                                      00011060
ISN 0365          IPD=IPIC(5)                                       00011070
ISN 0366          GO TO 520                                         00011080
             C                                                      00011090
ISN 0367     470  IF (ILR.GE.ILRE) GO TO 480                        00011100
ISN 0369          ILR=IPIC(1)+1                                     00011110
ISN 0370          ICELL=IPIC(2)                                     00011120
ISN 0371          ICHGR=IPIC(3)                                     00011130
ISN 0372          ISPD=IPIC(4)                                      00011140
ISN 0373          IPD=IPIC(5)                                       00011150
ISN 0374          GO TO 520                                         00011160
             C                                                      00011170
ISN 0375     480  IF (ICELL.GE.ICELLE) GO TO 490                    00011180
ISN 0377          ILR=IDB(7)+1                                      00011190
ISN 0378          ICELL=IPIC(2)+1                                   00011200
ISN 0379          ICHGR=IPIC(3)                                     00011210
ISN 0380          ISPD=IPIC(4)                                      00011220
ISN 0381          IPD=IPIC(5)                                       00011230
             C                                                      00011240
ISN 0382     490  IF (ICHGR.GE.ICHGRE) GO TO 500                    00011250
ISN 0384          ILR=IDB(7)+1                                      00011260
```

```
ISN 0385              ICELL=IDB(1)+1
ISN 0386              ICHGR=IPIC(3)+1
ISN 0387              ISPD=IPIC(4)
ISN 0388              IPD=IPIC(5)
             C
ISN 0389     500      DO 510 I=1,5
ISN 0390     510      ICHOSF(I)=-1
ISN 0391              RETURN
             C
             C
             C **     COMPUTE SELECTION PARAMETERS FOR SERIES LOAD REGULATION
             C **     THIS IS FOR THE LOAD REGULATOR,BATTERY,BATTERY CHARGER AND
             C **     SIZING THE SOLAR POWER DISTRIBUTOR AND POWER DISTRIBUTOR
             C
             C
             C           NLR IS THE NUMBER OF LOAD REGULATORS REQUIRED
ISN 0392     520      NLR=2
             C
             C        ** DETERMINE EXCESS ARRAY POWER FOR REGULATION
             C
ISN 0393              PS=(PL/ETAR)*(1.+TEDTS*(1./(ETAD*ETAC*ETAE)))
ISN 0394              PBOL=PS/((1.-DELR)*(1.-DELF)*(1.-DELT)*(1-DELI)*(1-DELM))
             C
ISN 0395              PEXCES=PBOL-PLMIN
             C
             C
             C           DETERMINE SELECTION PARAMETERS FOR LOAD REGULATORS
             C
ISN 0396              IF (ITER .GE. 1 .AND. NCHOSE(1) .GE. NLR) NLR=NCHOSE(1)
ISN 0398              PLR=PL/(ETALR*NLR)
             C
             C           SET VOLTAGES FOR THIS DESIGN
             C
ISN 0399              VDB=27.
ISN 0400              VBM=23.
             C
             C **     SET UP BATTERY SELECTION PARAMETERS
             C
             C           DETERMINE REQUIRED CAPACITIES
```

```
                C
  ISN 0401            CR=(PL*TE/3600.)/(LMBDD*ETAD)
  ISN 0402            CA=CR/VDB
                C
                C         DETERMINE MINIMUM INSTALLED CAPACITY
                C
  ISN 0403            CI=CA*RFD
                C
                C         DETERMINE NUMBER OF CELLS IN SERIES(TO BE SUPPLIED TO REL)
                C
  ISN 0404            NC=VBM/VC
                C
                C         CISTAR IS SELECTION PARAMETERS ON CELLS
                C
  ISN 0405            IF (ITER .GE. 1) NB=NCHOSE(2)
  ISN 0407            CISTAR=CI/NB
                C
                C **      CHARGER SELECTION PARAMETER
                C
                C *   DETERMINE CHARGE CURRENT RATING REQUIRED FOR THE BATTERY CHARGER *
                C
  ISN 0408            CCELL=CISTAR
  ISN 0409            ICH=CCELL/CHMINT
                C
                C **
                C **
                C **  COMPARE THE HARDWARE PARAMETER TO THE SELECTION PARAMETER      **
                C **
                C **
                C
  ISN 0410      530   IF (DATAB(6,ILR).GE.PLR.AND.DATAB(6,ICELL).GE.CISTAR.AND.DATAB(6,I
                     1CHGR).GE.ICH) GO TO 580
                C
                C
  ISN 0412            IF (ILR.GE.ILRE) GO TO 540
  ISN 0414            ILR=ILR+1
  ISN 0415            GO TO 530
                C
  ISN 0416      540   IF (ICELL.GE.ICELLE) GO TO 550
```

```
ISN 0418              ILR=IDB(7)+1
ISN 0419              ICELL=ICELL+1
ISN 0420              GO TO 530
          C
ISN 0421   550        IF (ICHGR.GE.ICHGRE) GO TO 560
ISN 0423              ILR=IDB(7)+1
ISN 0424              ICELL=IDB(1)+1
ISN 0425              ICHGR=ICHGR+1
ISN 0426              GO TO 530
          C
ISN 0427   560        DO 570 I=1,5
ISN 0428   570        ICHOSE(I)=-1
ISN 0429              RETURN
          C
          C
ISN 0430   580        ETALR=DATAB(7,ILR)
ISN 0431              ETAR=ETALR
ISN 0432              PLRD=PL*(1./ETALR-1.)
ISN 0433              ETAE=DATAB(7,ICELL)
ISN 0434              ETAC=DATAB(7,ICHGR)
ISN 0435              VCELL=DATAB(24,ICELL)
ISN 0436              WCELL=DATAB(23,ICELL)
ISN 0437              WB=NC*WCELL*K2
ISN 0438              VB=NC*VCELL*K1
ISN 0439              WBT=WB*NB
ISN 0440              VBT=VB*NB
ISN 0441              NCH=NB
          C
ISN 0442              ICHOSE(1)=DATAB(1,ILR)
ISN 0443              ICHOSE(2)=DATAB(1,ICELL)
ISN 0444              ICHOSE(3)=DATAB(1,ICHGR)
ISN 0445              ICHOSE(4)=DATAB(1,ISPD)
ISN 0446              ICHOSE(5)=DATAB(1,IPD)
          C
ISN 0447              IF (NCHOSE(1) .GE. NLR) GO TO 581
ISN 0449              NCHOSE(1)=NLR
ISN 0450      581     IF (NCHOSE(2) .GE. NB) GO TO 582
ISN 0452              NCHOSE(2)=NB
ISN 0453      582     IF (NCHOSE(3) .GE. NCH) GO TO 583
```

```
ISN 0455              NCHOSE(3)=NCH
ISN 0456          583 IF (NCHOSE(4) .GE. NSPD) GO TO 584
ISN 0458              NCHOSE(4)=NSPD
ISN 0459          584 IF (NCHOSE(5) .GE. NPD) GO TO 585
ISN 0461              NCHOSE(5)=NPD
               C
ISN 0462          585 IPIC(1)=ILR
ISN 0463              IPIC(2)=ICELL
ISN 0464              IPIC(3)=ICHGR
ISN 0465              IPIC(4)=ISPD
ISN 0466              IPIC(5)=IPD
               C
               C
               C
ISN 0467              WT=NLR*DATAB(23,ILR)+WBT+NCH*DATAB(23,ICHGR)+NSPD*DATAB(23,ISPD)+
                     * NPD*DATAB(23,IPD)+WT
               C
ISN 0468              VOL=NLR*DATAB(24,ILR)+VBT+NCH*DATAB(24,ICHGR)+NSPD*DATAB(24,ISPD)
                     * +NPD*DATAB(24,IPD)+VOL
               C
               C
               C      ** SOLAR ARRAY SIZING
               C
               C
ISN 0469       590    ICONF=NCONF(5)
ISN 0470              GO TO (600,610,600,610,600,610), ICONF
               C
               C      **  ORIENTED PADDLE SOLAR ARRAY (NON-SPINNING)
               C
ISN 0471       600    FW=7.3
ISN 0472              LMBDG=1.
ISN 0473              GO TO 670
               C
               C
               C
ISN 0474       610    ICONF=NCONF(6)
ISN 0475              GO TO (630,620,650), ICONF
               C
               C      **  BODY MOUNTED, BOX SHAPE, NON-SPINNING
```

```
                   C
      ISN 0476   620    FW=3.4
      ISN 0477          LMBDG=1.
      ISN 0478          GO TO 670
                   C
                   C
                   C
      ISN 0479   630    ICONF=NCONF(1)
      ISN 0480          IF (ICONF .GE. 3) GO TO 640
                   C
                   C    ** BODY MOUNTED CYLINDER SPINNING
                   C
      ISN 0482          FW=3.4
      ISN 0483          LMBDG=1./PIE
      ISN 0484          GO TO 670
                   C
                   C    ** BODY MOUNTED CYLINDER NON-SPINNING
                   C
      ISN 0485   640    FW=3.4
      ISN 0486          LMBDG=2./PIE
      ISN 0487          GO TO 670
                   C
                   C
                   C
      ISN 0488   650    ICONF=NCONF(1)
      ISN 0489          IF (ICONF .GE. 3) GO TO 660
                   C
                   C    ** BODY MOUNTED SPHERE  SPINNING
                   C
      ISN 0491          FW=3.4
      ISN 0492          LMBDG=.25
      ISN 0493          GO TO 670
                   C
                   C    ** BODY MOUNTED SPHERE NON-SPINNING
                   C
      ISN 0494   660    FW=3.4
      ISN 0495          LMBDG=.5
                   C
                   C        COMPUTE ENERGY BALANCE EQUATION
```

```
                C
 ISN 0496     670    PS=PL/ETAR*(1.+TEDTS*(1./(ETAD*ETAC*ETAE)))
                C
                C    COMPUTE SIZING FACTOR
                C
 ISN 0497            FS=LMBDG*LMBDP*((1.-DELR)*(1.-DELF)*(1.-DELT)*(1.-DEL1)*(1.-DELM))
                C
                C    COMPUTE ARRAY AREA
                C
 ISN 0498            A1=PS/(FS*SOL*ETAI)
                C
                C    COMPUTE ARRAY WEIGHT
                C
 ISN 0499            WATE=A1*FW
                C
                C    CONVERT TO ENGLISH FROM METRIC
                C
 ISN 0500            AREA=A1*10.76426265
 ISN 0501            WATE=WATE*2.20462
                C
 ISN 0502            RETURN
                C
 ISN 0503            END

*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =      502 ,PROGRAM SIZE =      8368

*STATISTICS*  NO DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                          57K BYTES OF CORE NOT USED
```

```
          COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                    SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
 ISN 0002              SUBROUTINE AUXPRO(IPIC,IERR,ITER,NCONF,ICHOSE,NCHOSE)
 ISN 0003              COMMON /USER2/TTHST,CLIFE
 ISN 0004              COMMON /BTWN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,ACTHST,TOTIMP,PL,
                      *PLMIN,LMBDD,AREA,SATLG,WATE,NC,ACSHP,HARNWT,THCMWT,CONVWT,TNKWT,
                      * PASSTF,SATTWT,TPRIM,IBTLOC,RADA,RADAB,KAT,HTRPWR,
                      * HTRPRB,HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),
                      * EQBLG,SABOLG,SATWT
 ISN 0005              COMMON /USER1/EQM1WT,EQM2WT,DIAMAX,ALT
 ISN 0006              COMMON /DBCOM/IDB(30),DATAB(55,90)
 ISN 0007              DIMENSION IPIC(9),NCONF(6),ICHOSE(14),NCHOSE(14),
                      * IACCPT(20)
 ISN 0008              DIMENSION N(14)
 ISN 0009              DATA XMR/1.5/
 ISN 0010              IF(NCONF(2).GT.1) GO TO 38
                 C
                 C     THIS IS COLD GAS CONFIGURATION
                 C
                 C     DETERMINE MAXIMUM THRUST FROM SANDC
                 C
 ISN 0012              FMAX= AMAX1(ACTHST,TTHST)
 ISN 0013              IF(FMAX.LT.50..AND.TOTIMP.LT.50000.) GO TO 1
                 C
                 C     THIS IS NOT AN ACCEPTABLE CONFIGURATION
                 C
 ISN 0015              ICHOSE(1)=-1
 ISN 0016              RETURN
                 C
 ISN 0017            1 CONTINUE
                 C
 ISN 0018              IF(ITER.NE.0) GO TO 3
                 C
                 C     INITIALIZE ICHOSE, NCHOSE, IERR AND SELECT HARDWARE NOT SIZED
                 C      I.E., THE FILL AND VENT VALVE AND RELIEF VALVE
 ISN 0020              DO 2 I=1,14
 ISN 0021              ICHOSE(I)= 0
 ISN 0022            2 NCHOSE(I)= 0
 ISN 0023              IERR= 0
```

```
ISN 0024              NCHOSE(1)=6
ISN 0025              NCHOSE(2)=2
ISN 0026              NCHOSE(3)=4
ISN 0027              NCHOSE(4)=9
ISN 0028              DO 299 I=5,8
ISN 0029          299 NCHOSE(I)=1
              C
ISN 0030              II= IDB(5) + 1
ISN 0031              JJ= IDB(6) + 1
ISN 0032              ICHOSE(7) = DATAB(1,II)
ISN 0033              ICHOSE(8) = DATAB(1,JJ)
              C
ISN 0034            3 CONTINUE
              C
              C
              C       THRUSTER SELECTION
              C
              C       FIRST CHECK TO SEE IF THERE IS AN ACCEPTABLE THRUSTER IN THE DATA
              C       BASE
              C
ISN 0035              J1E= IDB(1)
ISN 0036              J1= 1
ISN 0037           10 THRUST= DATAB(6,J1)
ISN 0038              IF(THRUST.GE.FMAX) GO TO 12
ISN 0040              IF(J1.EQ.J1E) GO TO 11
ISN 0042              J1= J1 + 1
ISN 0043              GO TO 10
              C
              C       NO ACCEPTABLE THRUSTERS
              C
ISN 0044           11 ICHOSE(1)= -1
ISN 0045              RETURN
              C
              C       AT LEAST ONE ACCEPTABLE THRUSTER
              C
ISN 0046           12 CONTINUE
              C
              C       SELECT PNEUMATIC ATTITUDE AND CONTROL THRUSTERS
              C
```

```
                  C      FIRST DETERMINE SET OF ALL THRUSTERS WHICH SATISFY THE INEQUALITY
                  C      THRUST GE ACTHST
                  C
  ISN 0047               I= 1
  ISN 0048               J1= 1
  ISN 0049            13 THRUST= DATAB(6,J1)
  ISN 0050               IF(THRUST.GE.ACTHST) GO TO 15
  ISN 0052            14 IF(J1.EQ.J1E) GO TO 16
  ISN 0054               J1= J1 + 1
  ISN 0055               GO TO 13
  ISN 0056            15 IACCPT(I)= J1
  ISN 0057               I= I + 1
  ISN 0058               GO TO 14
  ISN 0059            16 CONTINUE
  ISN 0060               IMAX= I - 1
                  C
                  C      CHOOSE THAT THRUSTER FROM THE ABOVE SET WHICH MINIMIZES THE
                  C      QUANTITY, ABS(THRUST - ACTHST)
                  C
  ISN 0061               I=1
  ISN 0062               J1= IACCPT(I)
  ISN 0063               THRUST= DATAB(6,J1)
  ISN 0064               DIFOLD= ABS(THRUST - ACTHST)
  ISN 0065            17 ICHOSE(I)= DATAB(1,J1)
  ISN 0066               JSAVE=J1
  ISN 0067               IF(I.EQ.IMAX) GO TO 20
  ISN 0069            18 I= I + 1
  ISN 0070               J1= IACCPT(I)
  ISN 0071               THRUST= DATAB(6,J1)
  ISN 0072               DIFNEW= ABS(THRUST - ACTHST)
  ISN 0073               IF(DIFNEW.LE.DIFOLD) GO TO 19
  ISN 0075               IF(I.LT.IMAX) GO TO 18
  ISN 0077               GO TO 20
  ISN 0078            19 DIFOLD= DIFNEW
  ISN 0079               GO TO 17
  ISN 0080            20 J1=JSAVE
                  C
                  C      SELECT PNEUMATIC TRANSLATIONAL THRUSTERS USING ABOVE PROCEDURE
                  C
```

```
ISN 0081          I= 1
ISN 0082          J2= 1
ISN 0083       21 THRUST= DATAB(6,J2)
ISN 0084          IF(THRUST.GE.TTHST) GO TO 23
ISN 0086       22 IF(J2.EQ.J1E) GO TO 24
ISN 0088          J2= J2 + 1
ISN 0089          GO TO 21
ISN 0090       23 IACCPT(I)= J2
ISN 0091          I= I + 1
ISN 0092          GO TO 22
ISN 0093       24 CONTINUE
ISN 0094          IMAX= I - 1
ISN 0095          I= 1
ISN 0096          J2= IACCPT(I)
ISN 0097          THRUST= DATAB(6,J2)
ISN 0098          DIFOLD= ABS(THRUST - TTHST)
ISN 0099       25 ICHOSE(2)= DATAB(1,J2)
ISN 0100          JSAVE=J2
ISN 0101          IF(I.EQ.IMAX) GO TO 28
ISN 0103       26 I= I + 1
ISN 0104          J2= IACCPT(I)
ISN 0105          THRUST= DATAB(6,J2)
ISN 0106          DIFNEW= ABS(THRUST - TTHST)
ISN 0107          IF(DIFNEW.LE.DIFOLD) GO TO 27
ISN 0109          IF(I.LT.IMAX) GO TO 26
ISN 0111          GO TO 28
ISN 0112       27 DIFOLD= DIFNEW
ISN 0113          GO TO 25
ISN 0114       28 J2=JSAVE
            C
            C     THRUSTERS HAVE BEEN SELECTED
            C
            C     SET NUMBER OF EACH TYPE OF THRUSTER
            C
            C
            C
            C     CHECK TO SEE IF CYCLE LIFE REQUIREMENT IS SATISFIED
            C
ISN 0115          IERR= 0
```

```
ISN 0116          IF(DATAB(7,J1).LT.CLIFE) IERR= 1
ISN 0118          IF(DATAB(7,J2).LT.CLIFE) IERR= IERR + 10
            C
            C     IERR= 1 IMPLIES THAT THE CYCLE LIFE OF THE ATTITUDE AND CONTROL
            C     THRUSTERS IS TOO SHORT. IERR= 10 IMPLIES THAT THE CYCLE LIFE OF
            C     THE TRANSLATIONAL THRUSTERS IS TOO SHORT. IERR= 11 IMPLIES THAT
            C     THE CYCLE LIVES OF BOTH THRUSTERS ARE TOO SHORT
            C
            C     PRELIMINARY CALCULATIONS FOR SELECTION OF PNEUMATIC ISOLATION
            C     VALVES AND FILTERS
            C
ISN 0120          PTI=DATAB(8,J1)
ISN 0121          RHO= 1.02E-7*PTI
ISN 0122          WDOTPR= (3.*ACTHST + 2.*TTHST)/65.
ISN 0123          CDAISO= WDOTPR/SQRT(200.*RHO/1.29E-3)
ISN 0124          RMAX= 200./WDOTPR**2
            C
            C     SET LAST EQUIPMENT INDICES
            C
ISN 0125          J3E= IDB(2)
ISN 0126          J4E= IDB(3)
ISN 0127          J5E= IDB(4)
ISN 0128          J6E= IDB(5)
            C     DETERMINE HARDWARE INDICES
ISN 0129          DO 30 I=1,9
ISN 0130          IF(IPIC(I).NE.0) GO TO 31
ISN 0132       30 CONTINUE
ISN 0133          GO TO 4
            C
ISN 0134       31 IF(ITER.NE.0) GO TO 5
ISN 0136          IF(IPIC(1).LT.J3E) GO TO 6
ISN 0138          IF(IPIC(2).LT.J4E) GO TO 7
ISN 0140          IF(IPIC(3).LT.J5E) GO TO 8
ISN 0142          IF(IPIC(4).LT.J6E) GO TO 9
            C
            C     NO ACCEPTABLE COMBINATIONS
            C
ISN 0144          ICHOSE(1)= -1
ISN 0145          RETURN
```

```
              C
ISN 0146            4 CONTINUE
              C
ISN 0147               J3= IDB(1) + 1
ISN 0148               J4= IDB(2) + 1
ISN 0149               J5= IDB(3) + 1
ISN 0150               J6= IDB(4) + 1
              C
ISN 0151               GO TO 1200
              C
ISN 0152            5 CONTINUE
ISN 0153               J3= IPIC(1)
ISN 0154               J4= IPIC(2)
ISN 0155               J5= IPIC(3)
ISN 0156               J6= IPIC(4)
ISN 0157               GO TO 1200
              C
ISN 0158            6 CONTINUE
ISN 0159               J3= IPIC(1) + 1
ISN 0160               J4= IPIC(2)
ISN 0161               J5= IPIC(3)
ISN 0162               J6= IPIC(4)
ISN 0163               GO TO 1200
              C
ISN 0164            7 CONTINUE
ISN 0165               J3= IDB(1) + 1
ISN 0166               J4= IPIC(2) + 1
ISN 0167               J5= IPIC(3)
ISN 0168               J6= IPIC(4)
ISN 0169               GO TO 1200
              C
ISN 0170            8 CONTINUE
ISN 0171               J3= IDB(1) + 1
ISN 0172               J4= IDB(2) + 1
ISN 0173               J5= IPIC(3) + 1
ISN 0174               J6= IPIC(4)
ISN 0175               GO TO 1200
              C
ISN 0176            9 CONTINUE
```

```
ISN 0177          J3= IDB(1) + 1
ISN 0178          J4= IDB(2) + 1
ISN 0179          J5= IDB(3) + 1
ISN 0180          J6= IPIC(4) + 1
            C
ISN 0181     1200 CONTINUE
            C
            C     THE HARDWARE INDICES ARE SET
            C
ISN 0182       32 IF(DATAB(7,J3).LT.CDAISO.OR.DATAB(7,J4).GT.RMAX) GO TO 33
            C
            C     ISOLATION VALVE AND FILTER ARE ACCEPTABLE
            C
ISN 0184          DELPIS = (1.29E-3/RHO)*(WDOTPR/DATAB(7,J3))**2
ISN 0185          DELPFI = DATAB(7,J4)*WDOTPR**2
ISN 0186          ICHOSE(3)= DATAB(1,J3)
ISN 0187          ICHOSE(4)= DATAB(1,J4)
            C
            C     PRELIMINARY CALCULATIONS FOR SELECTION OF REGULATOR AND TANK
            C
ISN 0188          PREG= PTI + 2.*DELPIS + DELPFI
ISN 0189          CDAREG= WDOTPR/SQRT(5600.*PREG/1.27E4)
ISN 0190          WPR= 1.1*TOTIMP/65.
ISN 0191          ACSWP= WPR
ISN 0192          VPRT= 3.4E3*WPR/28.
ISN 0193          IF(PREG.LT.DATAB(8,J5).OR.PREG.GT.DATAB(9,J5).OR.DATAB(7,J5).LT.
                 * CDAREG.OR.DATAB(6,J6).LT.VPRT) GO TO 33
            C
            C     REGULATOR AND TANK ARE ACCEPTABLE
ISN 0195          ICHOSE(5)= DATAB(1,J5)
ISN 0196          ICHOSE(6)= DATAB(1,J6)
ISN 0197          TNKWT= DATAB(23,J6)
            C
            C     SIZE PLUMBING AND CONNECTORS
            C
ISN 0198          PCWATE = .2*DATAB(23,J6)
            C
            C     STORE LAST INDICES ACCEPTABLE
            C
```

```
ISN 0199            IPIC(1)= J3
ISN 0200            IPIC(2)= J4
ISN 0201            IPIC(3)= J5
ISN 0202            IPIC(4)= J6
ISN 0203            N(7)= II
ISN 0204            N(8)= JJ
ISN 0205            N(1)= J1
ISN 0206            N(2)= J2
ISN 0207            N(3)= J3
ISN 0208            N(4)= J4
ISN 0209            N(5)= J5
ISN 0210            N(6)= J6
ISN 0211            DO 322 I=1,8
ISN 0212            J= N(I)
ISN 0213            WT= WT + NCHOSE(I)*DATAB(23,J)
ISN 0214            VOL= VOL + NCHOSE(I)*DATAB(24,J)
ISN 0215            PL= PL + NCHOSE(I)*DATAB(16,J)
ISN 0216            PLMIN= PLMIN + NCHOSE(I)*DATAB(18,J)
ISN 0217        322 CONTINUE
ISN 0218            WT= WT + ACSWP + PCWATE
ISN 0219            RETURN
              C
ISN 0220         33 CONTINUE
              C
              C     HARDWARE SELECTION NOT ACCEPTABLE - INCREMENT HARDWARE INDICES
              C
ISN 0221            IF(J3.LT.J3E) GO TO 34
ISN 0223            IF(J4.LT.J4E) GO TO 35
ISN 0225            IF(J5.LT.J5E) GO TO 36
ISN 0227            IF(J6.LT.J6E) GO TO 37
              C
              C     NO ACCEPTABLE HARDWARE COMBINATION
              C
ISN 0229            ICHOSE(1)= -1
ISN 0230            RETURN
              C
ISN 0231         34 J3= J3 + 1
ISN 0232            GO TO 32
ISN 0233         35 J3= IDB(1) + 1
```

```
ISN 0234              J4= J4 + 1                                          00017840
ISN 0235              GO TO 32                                            00017850
ISN 0236           36 J3= IDB(1) + 1                                      00017860
ISN 0237              J4= IDB(2) + 1                                      00017870
ISN 0238              J5= J5 + 1                                          00017880
ISN 0239              GO TO 32                                            00017890
ISN 0240           37 J3= IDB(1) + 1                                      00017900
ISN 0241              J4= IDB(2) + 1                                      00017910
ISN 0242              J5= IDB(3) + 1                                      00017920
ISN 0243              J6= J6 + 1                                          00017930
ISN 0244              GO TO 32                                            00017940
ISN 0245           38 CONTINUE                                            00017950
ISN 0246              IF(NCONF(2).EQ.3) GO TO 62                          00017960
              C                                                           00017970
              C                                                           00017980
              C       THIS IS MONOPROPELLANT CONFIGURATION                00017990
              C                                                           00018000
              C       DETERMINE MAXIMUM THRUST FROM SANDC                 00018010
              C                                                           00018020
ISN 0248              FMAX= AMAX1(ACTHST,TTHST)                           00018030
ISN 0249              IF(FMAX.LT.1000..AND.TOTIMP.LT.200000..AND.TOTIMP.GE.10000.) GO   00018040
                     * TO 39                                              00018050
              C                                                           00018060
              C       THIS IS NOT AN ACCEPTABLE CONFIGURATION             00018070
              C                                                           00018080
ISN 0251              ICHOSE(1)= -1                                       00018090
ISN 0252              RETURN                                              00018100
              C                                                           00018110
ISN 0253           39 CONTINUE                                            00018120
ISN 0254              VFTMAX=0.                                           00018125
ISN 0255              IF(ITER.NE.0) GO TO 42                              00018130
              C                                                           00018140
              C       INITIALIZE ICHOSE,NCHOSE,IERR AND SELECT HARDWARE NOT SIZED   00018150
              C        I.E., THE RELIEF VALVE,FILL AND VENT VALVE AND FILL AND DRAIN   00018160
              C        VALVE                                              00018170
              C                                                           00018180
ISN 0257              DO 40 I= 1,14                                       00018190
ISN 0258              ICHOSE(I)= 0                                        00018200
ISN 0259           40 NCHOSE(I)= 0                                        00018210
```

```
ISN 0260            IERR= 0
ISN 0261            NCHOSE(1)=6
ISN 0262            NCHOSE(2)=2
ISN 0263            NCHOSE(3)=4
ISN 0264            NCHOSE(4)=9
ISN 0265            DO 41 I=5,11
ISN 0266         41 NCHOSE(I)=1
               C
ISN 0267            II= IDB(5) + 1
ISN 0268            JJ= IDB(6) + 1
ISN 0269            KK= IDB(11) + 1
ISN 0270            ICHOSE(9) = DATAB(1,JJ)
ISN 0271            ICHOSE(10)= DATAB(1,KK)
ISN 0272            ICHOSE(11)= DATAB(1,II)
               C
ISN 0273         42 CONTINUE
               C
               C    THRUSTER SELECTION
               C
               C    FIRST CHECK TO SEE IF THERE IS AN ACCEPTABLE THRUSTER IN THE DATA
               C    BASE
               C
ISN 0274            J1E= IDB(8)
ISN 0275            J1 = IDB(7) + 1
ISN 0276        100 THRUST= DATAB(6,J1)
ISN 0277            IF(THRUST.GE.FMAX) GO TO 120
ISN 0279            IF(J1.EQ.J1E) GO TO 110
ISN 0281            J1= J1 + 1
ISN 0282            GO TO 100
               C
               C    NO ACCEPTABLE THRUSTERS
               C
ISN 0283        110 ICHOSE(1)= -1
ISN 0284            RETURN
               C
               C    AT LEAST ONE ACCEPTABLE THRUSTER
               C
ISN 0285        120 CONTINUE
               C
```

```
            C       SELECT PNEUMATIC ATTITUDE AND CONTROL THRUSTERS
            C
            C       FIRST DETERMINE SET OF ALL THRUSTERS WHICH SATISFY THE INEQUALITY
            C       THRUST GE ACTHST
            C
ISN 0286            I= 1
ISN 0287            J1 = IDB(7) + 1
ISN 0288        130 THRUST= DATAB(6,J1)
ISN 0289            IF(THRUST.GE.ACTHST) GO TO 150
ISN 0291        140 IF(J1.EQ.J1E) GO TO 160
ISN 0293            J1= J1 + 1
ISN 0294            GO TO 130
ISN 0295        150 IACCPT(I)= J1
ISN 0296            I= I + 1
ISN 0297            GO TO 140
ISN 0298        160 CONTINUE
ISN 0299            IMAX= I - 1
            C
            C       CHOOSE THAT THRUSTER FROM THE ABOVE SET WHICH MINIMIZES THE
            C       QUANTITY, ABS(THRUST - ACTHST)
            C
ISN 0300            I=1
ISN 0301            J1= IACCPT(I)
ISN 0302            THRUST= DATAB(6,J1)
ISN 0303            DIFOLD= ABS(THRUST - ACTHST)
ISN 0304        170 ICHOSE(1)= DATAB(1,J1)
ISN 0305            JSAVE=J1
ISN 0306            IF(I.EQ.IMAX) GO TO 200
ISN 0308        180 I= I + 1
ISN 0309            J1= IACCPT(I)
ISN 0310            THRUST= DATAB(6,J1)
ISN 0311            DIFNEW= ABS(THRUST - ACTHST)
ISN 0312            IF(DIFNEW.LE.DIFOLD) GO TO 190
ISN 0314            IF(I.LT.IMAX) GO TO 180
ISN 0316            GO TO 200
ISN 0317        190 DIFOLD= DIFNEW
ISN 0318            GO TO 170
ISN 0319        200 J1=JSAVE
```

```
            C       SELECT PNEUMATIC TRANSLATIONAL THRUSTERS USING ABOVE PROCEDURE
            C
ISN 0320            I= 1
ISN 0321            J2 = IDB(7) + 1
ISN 0322        210 THRUST= DATAB(6,J2)
ISN 0323            IF(THRUST.GE.TTHST) GO TO 230
ISN 0325        220 IF(J2.EQ.J1E) GO TO 240
ISN 0327            J2= J2 + 1
ISN 0328            GO TO 210
ISN 0329        230 IACCPT(I)= J2
ISN 0330            I= I + 1
ISN 0331            GO TO 220
ISN 0332        240 CONTINUE
ISN 0333            IMAX= I - 1
ISN 0334            I= 1
ISN 0335            J2= IACCPT(I)
ISN 0336            THRUST= DATAB(6,J2)
ISN 0337            DIFOLD= ABS(THRUST - TTHST)
ISN 0338        250 ICHOSE(2)= DATAB(1,J2)
ISN 0339            JSAVE=J2
ISN 0340            IF(I.EQ.IMAX) GO TO 280
ISN 0342        260 I= I + 1
ISN 0343            J2= IACCPT(I)
ISN 0344            THRUST= DATAB(6,J2)
ISN 0345            DIFNEW= ABS(THRUST - TTHST)
ISN 0346            IF(DIFNEW.LE.DIFOLD) GO TO 270
ISN 0348            IF(I.LT.IMAX) GO TO 260
ISN 0350            GO TO 280
ISN 0351        270 DIFOLD= DIFNEW
ISN 0352            GO TO 250
ISN 0353        280 J2=JSAVE
            C
            C       THRUSTERS HAVE BEEN SELECTED
            C
            C       SET NUMBER OF EACH TYPE OF THRUSTER
            C
            C
            C
            C       CHECK TO SEE IF CYCLE LIFE REQUIREMENT IS SATISFIED
```

```
                C
ISN 0354              IERR= 0
ISN 0355              IF(DATAB(7,J1).LT.CLIFE) IERR= 1
ISN 0357              IF(DATAB(7,J2).LT.CLIFE) IERR= IERR + 10
                C
                C     IERR= 1 IMPLIES THAT THE CYCLE LIFE OF THE ATTITUDE AND CONTROL
                C     THRUSTERS IS TOO SHORT. IERR= 10 IMPLIES THAT THE CYCLE LIFE OF
                C     THE TRANSLATIONAL THRUSTERS IS TOO SHORT. IERR= 11 IMPLIES THAT
                C     THE CYCLE LIVES OF BOTH THRUSTERS ARE TOO SHORT
                C
                C
                C     PRELIMINARY CALCULATIONS FOR SELECTION OF MONOPROPELLANT ISOLATION
                C     VALVES AND FILTERS
                C
ISN 0359              RHOF= .036
ISN 0360              WDOTF=(3.*ACTHST + 2.*TTHST)/200.
ISN 0361              IF (NCONF(1) .EQ. 1) WDOTF=TTHST/200.
ISN 0363              CDAISO= WDOTF/SQRT(50.*RHOF/1.29E-3)
ISN 0364              RMAX = 50./WDOTF**2
                C
                C
                C     SET LAST EQUIPMENT INDICES
                C
ISN 0365              J3E= IDB(9)
ISN 0366              J4E= IDB(10)
ISN 0367              J5E= IDB(4)
ISN 0368              J6E= IDB(2)
ISN 0369              J7E= IDB(11)
ISN 0370              J8E= IDB(5)
                C
                C     DETERMINE HARDWARE INDICES
                C
ISN 0371              DO 43 I=1,9
ISN 0372              IF(IPIC(I).NE.0) GO TO 44
ISN 0374           43 CONTINUE
ISN 0375              GO TO 45
ISN 0376           44 IF(ITER.NE.0) GO TO 46
ISN 0378              IF(IPIC(1).LT.J3E) GO TO 47
ISN 0380              IF(IPIC(2).LT.J4E) GO TO 48
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ISN 0382          IF(IPIC(3).LT.J5E) GO TO 49
ISN 0384          IF(IPIC(4).LT.J6E) GO TO 50
ISN 0386          IF(IPIC(5).LT.J7E) GO TO 51
ISN 0388          IF(IPIC(6).LT.J8E) GO TO 52
           C
           C      NO ACCEPTABLE COMBINATIONS
           C
ISN 0390          ICHOSE(1)= -1
ISN 0391          RETURN
           C
ISN 0392       45 CONTINUE
           C
ISN 0393          J3= IDB(8) + 1
ISN 0394          J4= IDB(9) + 1
ISN 0395          J5= IDB(3) + 1
ISN 0396          J6= IDB(1) + 1
ISN 0397          J7= IDB(10) + 1
ISN 0398          J8= IDB(4) + 1
ISN 0399          GO TO 53
           C
ISN 0400       46 CONTINUE
ISN 0401          J3= IPIC(1)
ISN 0402          J4= IPIC(2)
ISN 0403          J5= IPIC(3)
ISN 0404          J6= IPIC(4)
ISN 0405          J7= IPIC(5)
ISN 0406          J8= IPIC(6)
ISN 0407          GO TO 53
           C
ISN 0408       47 J3= IPIC(1) + 1
ISN 0409          J4= IPIC(2)
ISN 0410          J5= IPIC(3)
ISN 0411          J6= IPIC(4)
ISN 0412          J7= IPIC(5)
ISN 0413          J8= IPIC(6)
ISN 0414          GO TO 53
           C
ISN 0415       48 J3= IDB(8) + 1
ISN 0416          J4= IPIC(2) + 1
```

```
ISN 0417          J5= IPIC(3)
ISN 0418          J6= IPIC(4)
ISN 0419          J7= IPIC(5)
ISN 0420          J8= IPIC(6)
ISN 0421          GO TO 53
            C
ISN 0422       49 J3= IDB(8) + 1
ISN 0423          J4= IDB(9) + 1
ISN 0424          J5= IPIC(3)+ 1
ISN 0425          J6= IPIC(4)
ISN 0426          J7= IPIC(5)
ISN 0427          J8= IPIC(6)
ISN 0428          GO TO 53
            C
ISN 0429       50 J3= IDB(8) + 1
ISN 0430          J4= IDB(9) + 1
ISN 0431          J5= IDB(3) + 1
ISN 0432          J6= IPIC(4) + 1
ISN 0433          J7= IPIC(5)
ISN 0434          J8= IPIC(6)
ISN 0435          GO TO 53
            C
ISN 0436       51 J3= IDB(8) + 1
ISN 0437          J4= IDB(9) + 1
ISN 0438          J5= IDB(3) + 1
ISN 0439          J6= IDB(1) + 1
ISN 0440          J7= IPIC(5) + 1
ISN 0441          J8= IPIC(6)
ISN 0442          GO TO 53
            C
ISN 0443       52 J3= IDB(8) + 1
ISN 0444          J4= IDB(9) + 1
ISN 0445          J5= IDB(3) + 1
ISN 0446          J6= IDB(1) + 1
ISN 0447          J7= IDB(10) + 1
ISN 0448          J8= IPIC(6) + 1
            C
ISN 0449       53 CONTINUE
            C
```

```
          C     THE HARDWARE INDICES ARE SET
          C
ISN 0450     54 IF(DATAB(7,J3).LT.CDAISO.OR.DATAB(7,J4).GT.RMAX) GO TO 55
          C
          C     FUEL CIRCUIT ISOLATION VALVES AND FILTERS ARE ACCEPTABLE
          C
ISN 0452        DELPIS= (1.29E-3/RHOF)*(WDOTF/DATAB(7,J3))**2
ISN 0453        DELPFI= DATAB(7,J4)*WDOTF**2
ISN 0454        ICHOSE(3)= DATAB(1,J3)
ISN 0455        ICHOSE(4)= DATAB(1,J4)
ISN 0456        IPIC(1)= J3
ISN 0457        IPIC(2)= J4
          C
          C     PRELIMINARY CALCULATIONS FOR SELECTION OF PNEUMATIC REGULATOR
          C
ISN 0458        PTI= DATAB(8,J1)
ISN 0459        PFT= PTI + 2.*DELPIS + 2.*DELPFI
ISN 0460        PREG= PFT + 2.*DELPIS
ISN 0461        WDOTPR= 28.*1.02E-7*PREG*WDOTF/RHOF
ISN 0462        CDAREG= WDOTPR/SQRT(5600.*PREG/1.27E4)
          C
ISN 0463        IF(PREG.LT.DATAB(8,J5).OR.PREG.GT.DATAB(9,J5).OR.DATAB(7,J5).LT.
               * CDAREG) GO TO 55
          C
          C     REGULATOR IS ACCEPTABLE
          C
ISN 0465        ICHOSE(5)= DATAB(1,J5)
ISN 0466        IPIC(3)= J5
          C
          C     PRELIMINARY CALCULATIONS FOR SELECTION OF PNEUMATIC ISOLATION
          C     VALVE
          C
ISN 0467        RHOPR= 3000.*1.02E-7
ISN 0468        CDAISO= WDOTPR/SQRT(200.*RHOPR/1.29E-3)
ISN 0469        IF(DATAB(7,J6).LT.CDAISO) GO TO 55
          C
          C     PNEUMATIC ISOLATION VALVE IS ACCEPTABLE
          C
ISN 0471        ICHOSE(6)= DATAB(1,J6)
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ISN 0472              IPIC(4)= J6                                                      00020940
                C                                                                      00020950
                C     PRELIMINARY CALCULATIONS FOR SELECTION OF FUEL TANK AND PNEUMATIC 00020960
                C     TANK                                                             00020970
                C                                                                      00020980
ISN 0473              WF= 1.1*TOTIMP/200.                                              00020990
ISN 0474              VF= WF/.036                                                      00021010
ISN 0475              VFT= 1.1*VF                                                      00021020
ISN 0476              VPRT= PFT*VFT/(3000. - 2.*PFT)                                   00021030
ISN 0477              WPRT=.0085*VPRT                                                  00021032
ISN 0478              ACSWP=WF+WPRT                                                    00021034
ISN 0479              IF (J7 .EQ. IDB(10)+1) JSAVE=J7                                  00021040
                C     IF(DATAB(6,J7).LT.VFT.OR.DATAB(7,J7).LT.PFT.OR.DATAB(6,J8).LT.   00021050
                C    * VPRT) GO TO 55                                                  00021058
ISN 0481              IF (DATAB(6,J8) .LT. VPRT) GO TO 55                              00021059
ISN 0483              IF (J7 .EQ. J7E .AND. DATAB(7,J7) .LT. PFT) GO TO 555            00021060
ISN 0485              IF (DATAB(7,J7) .LT. PFT .OR. DATAB(6,J8) .LT. VPRT) GO TO 55    00021061
ISN 0487              IF (DATAB(6,J7) .GE. VFT) GO TO 550                              00021062
ISN 0489              IF (DATAB(6,J7) .GT. VFTMAX) J7SAVE=J7                           00021063
ISN 0491              IF (DATAB(6,J7) .GT. VFTMAX) VFTMAX=DATAB(6,J7)                  00021064
ISN 0493              IF (J7 .LT. J7F) GO TO 55                                        00021065
ISN 0495          555 NCHOSE(7)=VFT/DATAB(6,J7SAVE)+.5                                 00021067
ISN 0496              J7=J7SAVE                                                        00021068
ISN 0497          550 ICHOSE(7)=DATAB(1,J7)                                            00021069
                C     FUEL TANK AND PNEUMATIC TANK ARE ACCEPTABLE                      00021080
                C                                                                      00021090
                C     ICHOSE(7)= DATAB(1,J7)                                           00021100
ISN 0498              ICHOSE(8)= DATAB(1,J8)                                           00021110
ISN 0499              TNKWT= DATAB(23,J7)                                              00021120
                C                                                                      00021130
                C     SIZE PLUMBING AND CONNECTORS                                     00021140
                C                                                                      00021150
ISN 0500              PCWATE= .2*(DATAB(23,J7) + DATAB(23,J8))                         00021160
                C                                                                      00021170
ISN 0501              IPIC(5)= J7                                                      00021180
ISN 0502              IPIC(6)= J8                                                      00021190
ISN 0503              N(9)= JJ                                                         00021200
ISN 0504              N(10)= KK                                                        00021210
ISN 0505              N(11)= II                                                        00021220
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ISN 0506              N(1)= J1                                                           00021230
ISN 0507              N(2)= J2                                                           00021240
ISN 0508              N(3)= J3                                                           00021250
ISN 0509              N(4)= J4                                                           00021260
ISN 0510              N(5)= J5                                                           00021270
ISN 0511              N(6)= J6                                                           00021280
ISN 0512              N(7)= J7                                                           00021290
ISN 0513              N(8)= J8                                                           00021300
ISN 0514              DO 542 I=1,11                                                      00021310
ISN 0515              J= N(I)                                                            00021320
ISN 0516              WT= WT + NCHOSE(I)*DATAB(23,J)                                     00021330
ISN 0517              VOL= VOL + NCHOSE(I)*DATAB(24,J)                                   00021340
ISN 0518              PL= PL + NCHOSE(I)*DATAB(16,J)                                     00021350
ISN 0519              PLMIN= PLMIN + NCHOSE(I)*DATAB(18,J)                               00021360
ISN 0520          542 CONTINUE                                                           00021370
ISN 0521              WT= WT + ACSWP + PCWATE                                            00021380
ISN 0522              RETURN                                                             00021390
               C                                                                         00021400
ISN 0523           55 CONTINUE                                                           00021410
               C                                                                         00021420
               C      HARDWARE SELECTION NOT ACCEPTABLE - INCREMENT HARDWARE INDICES     00021430
               C                                                                         00021440
ISN 0524              IF(J3.LT.J3E) GO TO 56                                             00021450
ISN 0526              IF(J4.LT.J4E) GO TO 57                                             00021460
ISN 0528              IF(J5.LT.J5E) GO TO 58                                             00021470
ISN 0530              IF(J6.LT.J6E) GO TO 59                                             00021480
ISN 0532              IF(J7.LT.J7E) GO TO 60                                             00021490
ISN 0534              IF(J8.LT.J8E) GO TO 61                                             00021500
               C                                                                         00021510
               C      NO ACCEPTABLE HARDWARE                                             00021520
               C                                                                         00021530
ISN 0536              ICHOSE(1)= -1                                                      00021540
ISN 0537              RETURN                                                             00021550
               C                                                                         00021560
ISN 0538           56 J3= J3 + 1                                                         00021570
ISN 0539              GO TO 54                                                           00021580
ISN 0540           57 J3= IDB(8) + 1                                                     00021590
ISN 0541              J4= J4 + 1                                                         00021600
ISN 0542              GO TO 54                                                           00021610
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ISN 0543          58 J3= IDB(8) + 1                                    00021620
ISN 0544             J4= IDB(9) + 1                                    00021630
ISN 0545             J5= J5 + 1                                        00021640
ISN 0546             GO TO 54                                          00021650
ISN 0547          59 J3= IDB(8) + 1                                    00021660
ISN 0548             J4= IDB(9) + 1                                    00021670
ISN 0549             J5= IDB(3) + 1                                    00021680
ISN 0550             J6= J6 + 1                                        00021690
ISN 0551             GO TO 54                                          00021700
ISN 0552          60 J3= IDB(8) + 1                                    00021710
ISN 0553             J4= IDB(9) + 1                                    00021720
ISN 0554             J5= IDB(3) + 1                                    00021730
ISN 0555             J6= IDB(1) + 1                                    00021740
ISN 0556             J7= J7 + 1                                        00021750
ISN 0557             GO TO 54                                          00021760
ISN 0558          61 J3= IDB(8) + 1                                    00021770
ISN 0559             J4= IDB(9) + 1                                    00021780
ISN 0560             J5= IDB(3) + 1                                    00021790
ISN 0561             J6= IDB(1) + 1                                    00021800
ISN 0562             J7= IDB(10) + 1                                   00021810
ISN 0563             VFTMAX=0.                                         00021811
ISN 0564             J8= J8 + 1                                        00021820
ISN 0565             GO TO 54                                          00021830
               C                                                       00021840
ISN 0566          62 CONTINUE                                          00021850
               C                                                       00021860
               C     THIS IS BIPROPELLANT CONFIGURATION                00021870
               C                                                       00021880
ISN 0567             IF(TOTIMP.GE.50000.) GO TO 63                     00021890
               C                                                       00021900
               C     THIS IS NOT AN ACCEPTABLE CONFIGURATION           00021910
               C                                                       00021920
ISN 0569             ICHOSE(1)= -1                                     00021930
ISN 0570             RETURN                                            00021940
               C                                                       00021950
ISN 0571          63 CONTINUE                                          00021960
               C                                                       00021970
               C                                                       00021980
ISN 0572             IF(ITER.NE.0) GO TO 65                            00021990
```

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                C
                C      INITIALIZE ICHOSE,NCHOSE,IERR AND SELECT HARDWARE NOT SIZED
                C       I.E., FILL AND DRAIN VALVES,FILL AND VENT VALVE AND RELIEF
                C       VALVE
                C
ISN 0574               DO 64 I=1,14
ISN 0575               ICHOSE(I)= 0
ISN 0576            64 NCHOSE(I)= 0
ISN 0577               IERR= 0
ISN 0578               NCHOSE(1)=6
ISN 0579               NCHOSE(2)=2
ISN 0580               NCHOSE(3)=3
ISN 0581               NCHOSE(4)=3
ISN 0582               NCHOSE(5)=4
ISN 0583               NCHOSE(6)=4
ISN 0584               DO 649 I=7,11
ISN 0585           649 NCHOSE(I)=1
ISN 0586               NCHOSE(12)=2
ISN 0587               NCHOSE(13)=1
ISN 0588               NCHOSE(14)=1
ISN 0589               II= IDB(5) + 1
ISN 0590               JJ= IDB(6) + 1
ISN 0591               KK= IDB(16) + 1
ISN 0592               ICHOSE(12)= DATAB(1,KK)
ISN 0593               ICHOSE(13)= DATAB(1,II)
ISN 0594               ICHOSE(14)= DATAB(1,JJ)
                C
ISN 0595            65 CONTINUE
                C
                C      THRUSTER SELECTION
                C
                C      FIRST CHECK TO SEE IF THERE IS AN ACCEPTABLE THRUSTER IN THE DATA
                C      BASE
                C
ISN 0596               FMAX=AMAX1(ACTHST,TTHST)
ISN 0597               J1F= IDB(13)
ISN 0598               J1 = IDB(12) + 1
ISN 0599           101 THRUST= DATAB(6,J1)
ISN 0600               IF(THRUST.GE.FMAX) GO TO 121
```

```
ISN 0602               IF(J1.EQ.J1E) GO TO 111
ISN 0604               J1= J1 + 1
ISN 0605               GO TO 101
                 C
                 C     NO ACCEPTABLE THRUSTERS
                 C
ISN 0606           111 ICHOSE(1)= -1
ISN 0607               RETURN
                 C
                 C     AT LEAST ONE ACCEPTABLE THRUSTER
                 C
ISN 0608           121 CONTINUE
                 C
                 C     SELECT PNEUMATIC ATTITUDE AND CONTROL THRUSTERS
                 C
                 C     FIRST DETERMINE SET OF ALL THRUSTERS WHICH SATISFY THE INEQUALITY
                 C     THRUST GE ACTHST
                 C
ISN 0609               I= 1
ISN 0610               J1 = IDB(12) + 1
ISN 0611           131 THRUST= DATAB(6,J1)
ISN 0612               IF(THRUST.GE.ACTHST) GO TO 151
ISN 0614           141 IF(J1.EQ.J1E) GO TO 161
ISN 0616               J1= J1 + 1
ISN 0617               GO TO 131
ISN 0618           151 IACCPT(I)= J1
ISN 0619               I= I + 1
ISN 0620               GO TO 141
ISN 0621           161 CONTINUE
ISN 0622               IMAX= I - 1
                 C
                 C     CHOOSE THAT THRUSTER FROM THE ABOVE SET WHICH MINIMIZES THE
                 C     QUANTITY, ABS(THRUST - ACTHST)
                 C
ISN 0623               I=1
ISN 0624               J1= IACCPT(I)
ISN 0625               THRUST= DATAB(6,J1)
ISN 0626               DIFOLD= ABS(THRUST - ACTHST)
ISN 0627           171 ICHOSE(1)= DATAB(1,J1)
```

```
ISN 0628          JSAVE=J1                                                    00022780
ISN 0629          IF(I.EQ.IMAX) GO TO 201                                     00022790
ISN 0631      181 I= I + 1                                                    00022800
ISN 0632          J1= IACCPT(I)                                               00022810
ISN 0633          THRUST= DATAB(6,J1)                                         00022820
ISN 0634          DIFNEW= ABS(THRUST - ACTHST)                                00022830
ISN 0635          IF(DIFNEW.LE.DIFOLD) GO TO 191                              00022840
ISN 0637          IF(I.LT.IMAX) GO TO 181                                     00022850
ISN 0639          GO TO 201                                                   00022860
ISN 0640      191 DIFOLD= DIFNEW                                              00022870
ISN 0641          GO TO 171                                                   00022880
ISN 0642      201 J1=JSAVE                                                    00022890
              C                                                               00022900
              C   SELECT PNEUMATIC TRANSLATIONAL THRUSTERS USING ABOVE PROCEDURE  00022910
              C                                                               00022920
ISN 0643          I= 1                                                        00022930
ISN 0644          J2 = IDB(12) + 1                                            00022940
ISN 0645      211 THRUST= DATAB(6,J2)                                         00022950
ISN 0646          IF(THRUST.GE.TTHST) GO TO 231                               00022960
ISN 0648      221 IF(J2.EQ.J1E) GO TO 241                                     00022970
ISN 0650          J2= J2 + 1                                                  00022980
ISN 0651          GO TO 211                                                   00022990
ISN 0652      231 IACCPT(I)= J2                                               00023000
ISN 0653          I= I + 1                                                    00023010
ISN 0654          GO TO 221                                                   00023020
ISN 0655      241 CONTINUE                                                    00023030
ISN 0656          IMAX= I - 1                                                 00023040
ISN 0657          I= 1                                                        00023050
ISN 0658          J2= IACCPT(1)                                               00023060
ISN 0659          THRUST= DATAB(6,J2)                                         00023070
ISN 0660          DIFOLD= ABS(THRUST - TTHST)                                 00023080
ISN 0661      251 ICHOSE(2)= DATAB(1,J2)                                      00023090
ISN 0662          JSAVE=J2                                                    00023100
ISN 0663          IF(I.EQ.IMAX) GO TO 281                                     00023110
ISN 0665      261 I= I + 1                                                    00023120
ISN 0666          J2= IACCPT(I)                                               00023130
ISN 0667          THRUST= DATAB(6,J2)                                         00023140
ISN 0668          DIFNEW= ABS(THRUST - TTHST)                                 00023150
ISN 0669          IF(DIFNEW.LE.DIFOLD) GO TO 271                              00023160
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ISN 0671          IF(I.LT.IMAX) GO TO 261
ISN 0673          GO TO 281
ISN 0674      271 DIFOLD= DIFNEW
ISN 0675          GO TO 251
ISN 0676      281 J2=JSAVE
            C
            C     THRUSTERS HAVE BEEN SELECTED
            C
            C     SET NUMBER OF EACH TYPE OF THRUSTER
            C
            C
            C
            C     CHECK TO SEE IF CYCLE LIFE REQUIREMENT IS SATISFIED
            C
ISN 0677          IERR= 0
ISN 0678          IF(DATAB(7,J1).LT.CLIFE) IERR= 1
ISN 0680          IF(DATAB(7,J2).LT.CLIFE) IERR= IERR + 10
            C
            C     IERR= 1 IMPLIES THAT THE CYCLE LIFE OF THE ATTITUDE AND CONTROL
            C     THRUSTERS IS TOO SHORT. IERR= 10 IMPLIES THAT THE CYCLE LIFE OF
            C     THE TRANSLATIONAL THRUSTERS IS TOO SHORT. IERR= 11 IMPLIES THAT
            C     THE CYCLE LIVES OF BOTH THRUSTERS ARE TOO SHORT
            C
            C     PRELIMINARY CALCULATIONS FOR SELECTION OF BIPROPELLANT ISOLATION
            C     VALVES AND FILTERS
            C
ISN 0682          RHOF= .032
ISN 0683          RHOO= .054
ISN 0684          WDOTF=(3.*ACTHST + 2.*TTHST)/(260.*(1.+XMR))
ISN 0685          WDOTO= WDOTF*XMR
ISN 0686          CDAISF= WDOTF/SQRT(50.*RHOF/1.29E-3)
ISN 0687          CDAISO= WDOTO/SQRT(50.*RHOO/1.29E-3)
ISN 0688          RMAXF= 50./WDOTF**2
ISN 0689          RMAXO= 50./WDOTO**2
            C
            C     SET LAST EQUIPMENT INDICES
            C
ISN 0690          J3E= IDB(14)
ISN 0691          J4E= IDB(14)
```

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      ISN 0692          J5E= IDB(15)                                          00023560
      ISN 0693          J6E= IDB(15)                                          00023570
      ISN 0694          J7E= IDB(4)                                           00023580
      ISN 0695          J8E= IDB(2)                                           00023590
      ISN 0696          J9E= IDB(16)                                          00023600
      ISN 0697          J10E= IDB(16)                                         00023610
      ISN 0698          J11E= IDB(5)                                          00023620
                  C                                                           00023630
                  C     DETERMINE HARDWARE INDICES                            00023640
                  C                                                           00023650
      ISN 0699          DO 66 I=1,9                                           00023660
      ISN 0700          IF(IPIC(I).NE.0) GO TO 67                             00023670
      ISN 0702       66 CONTINUE                                              00023680
      ISN 0703          GO TO 68                                              00023690
      ISN 0704       67 IF(ITER.NE.0) GO TO 69                                00023700
      ISN 0706          IF(IPIC(1).LT.J3E) GO TO 70                           00023710
      ISN 0708          IF(IPIC(2).LT.J4E) GO TO 71                           00023720
      ISN 0710          IF(IPIC(3).LT.J5E) GO TO 72                           00023730
      ISN 0712          IF(IPIC(4).LT.J6E) GO TO 73                           00023740
      ISN 0714          IF(IPIC(5).LT.J7E) GO TO 74                           00023750
      ISN 0716          IF(IPIC(6).LT.J8E) GO TO 75                           00023760
      ISN 0718          IF(IPIC(7).LT.J9E) GO TO 76                           00023770
      ISN 0720          IF(IPIC(8).LT.J10E) GO TO 77                          00023780
      ISN 0722          IF(IPIC(9).LT.J11E) GO TO 78                          00023790
                  C                                                           00023800
                  C     NO ACCEPTABLE COMBINATIONS                            00023810
                  C                                                           00023820
      ISN 0724          ICHOSE(1)= -1                                         00023830
      ISN 0725          RETURN                                                00023840
                  C                                                           00023850
      ISN 0726       68 J3= IDB(13) + 1                                       00023860
      ISN 0727          J4= IDB(13) + 1                                       00023870
      ISN 0728          J5= IDB(14) + 1                                       00023880
      ISN 0729          J6= IDB(14) + 1                                       00023890
      ISN 0730          J7= IDB(3) + 1                                        00023900
      ISN 0731          J8= IDB(1) + 1                                        00023910
      ISN 0732          J9= IDB(15) + 1                                       00023920
      ISN 0733          J10= IDB(15) + 1                                      00023930
      ISN 0734          J11= IDB(4) + 1                                       00023940
```

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ISN 0735            GO TO 79                                  00023950
              C                                               00023960
ISN 0736         69 CONTINUE                                  00023970
ISN 0737            J3= IPIC(1)                               00023980
ISN 0738            J4= IPIC(2)                               00023990
ISN 0739            J5= IPIC(3)                               00024000
ISN 0740            J6= IPIC(4)                               00024010
ISN 0741            J7= IPIC(5)                               00024020
ISN 0742            J8= IPIC(6)                               00024030
ISN 0743            J9= IPIC(7)                               00024040
ISN 0744            J10= IPIC(8)                              00024050
ISN 0745            J11= IPIC(9)                              00024060
ISN 0746            GO TO 79                                  00024070
              C                                               00024080
ISN 0747         70 J3= IPIC(1) + 1                           00024090
ISN 0748            J4= IPIC(2)                               00024100
ISN 0749            J5= IPIC(3)                               00024110
ISN 0750            J6= IPIC(4)                               00024120
ISN 0751            J7= IPIC(5)                               00024130
ISN 0752            J8= IPIC(6)                               00024140
ISN 0753            J9= IPIC(7)                               00024150
ISN 0754            J10= IPIC(8)                              00024160
ISN 0755            J11= IPIC(9)                              00024170
ISN 0756            GO TO 79                                  00024180
              C                                               00024190
ISN 0757         71 J3= IDB(13) + 1                           00024200
ISN 0758            J4= IPIC(2) + 1                           00024210
ISN 0759            J5= IPIC(3)                               00024220
ISN 0760            J6= IPIC(4)                               00024230
ISN 0761            J7= IPIC(5)                               00024240
ISN 0762            J8= IPIC(6)                               00024250
ISN 0763            J9= IPIC(7)                               00024260
ISN 0764            J10= IPIC(8)                              00024270
ISN 0765            J11= IPIC(9)                              00024280
ISN 0766            GO TO 79                                  00024290
              C                                               00024300
ISN 0767         72 J3= IDB(13) + 1                           00024310
ISN 0768            J4= IDB(13) + 1                           00024320
ISN 0769            J5= IPIC(3) + 1                           00024330
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ISN 0770          J6= IPIC(4)                                00024340
ISN 0771          J7= IPIC(5)                                00024350
ISN 0772          J8= IPIC(6)                                00024360
ISN 0773          J9= IPIC(7)                                00024370
ISN 0774          J10= IPIC(8)                               00024380
ISN 0775          J11= IPIC(9)                               00024390
ISN 0776          GO TO 79                                   00024400
            C                                                00024410
ISN 0777       73 CONTINUE                                   00024420
ISN 0778          J3= IDB(13) + 1                            00024430
ISN 0779          J4= IDB(13) + 1                            00024440
ISN 0780          J5= IDB(14) + 1                            00024450
ISN 0781          J6= IPIC(4) + 1                            00024460
ISN 0782          J7= IPIC(5)                                00024470
ISN 0783          J8= IPIC(6)                                00024480
ISN 0784          J9= IPIC(7)                                00024490
ISN 0785          J10= IPIC(8)                               00024500
ISN 0786          J11= IPIC(9)                               00024510
ISN 0787          GO TO 79                                   00024520
            C                                                00024530
ISN 0788       74 J3= IDB(13) + 1                            00024540
ISN 0789          J4= IDB(13) + 1                            00024550
ISN 0790          J5= IDB(14) + 1                            00024560
ISN 0791          J6= IDB(14) + 1                            00024570
ISN 0792          J7= IPIC(5) + 1                            00024580
ISN 0793          J8= IPIC(6)                                00024590
ISN 0794          J9= IPIC(7)                                00024600
ISN 0795          J10= IPIC(8)                               00024610
ISN 0796          J11= IPIC(9)                               00024620
ISN 0797          GO TO 79                                   00024630
            C                                                00024640
ISN 0798       75 CONTINUE                                   00024650
ISN 0799          J3= IDB(13) + 1                            00024660
ISN 0800          J4= IDB(13) + 1                            00024670
ISN 0801          J5= IDB(14) + 1                            00024680
ISN 0802          J6= IDB(14) + 1                            00024690
ISN 0803          J7= IDB(3) + 1                             00024700
ISN 0804          J8= IPIC(6) + 1                            00024710
ISN 0805          J9= IPIC(7)                                00024720
```

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ISN 0806          J10= IPIC(8)
ISN 0807          J11= IPIC(9)
ISN 0808          GO TO 79
            C
ISN 0809       76 CONTINUE
ISN 0810          J3= IDB(13) + 1
ISN 0811          J4= IDB(13) + 1
ISN 0812          J5= IDB(14) + 1
ISN 0813          J6= IDB(14) + 1
ISN 0814          J7= IDB(3) + 1
ISN 0815          J8= IDB(1) + 1
ISN 0816          J9= IPIC(7) + 1
ISN 0817          J10= IPIC(8)
ISN 0818          J11= IPIC(9)
ISN 0819          GO TO 79
            C
ISN 0820       77 CONTINUE
ISN 0821          J3= IDB(13) + 1
ISN 0822          J4= IDB(13) + 1
ISN 0823          J5= IDB(14) + 1
ISN 0824          J6= IDB(14) + 1
ISN 0825          J7= IDB(3) + 1
ISN 0826          J8= IDB(1) + 1
ISN 0827          J9= IDB(15) + 1
ISN 0828          J10= IPIC(8) + 1
ISN 0829          J11= IPIC(9)
ISN 0830          GO TO 79
            C
ISN 0831       78 CONTINUE
ISN 0832          J3= IDB(13) + 1
ISN 0833          J4= IDB(13) + 1
ISN 0834          J5= IDB(14) + 1
ISN 0835          J6= IDB(14) + 1
ISN 0836          J7= IDB(3) + 1
ISN 0837          J8= IDB(1) + 1
ISN 0838          J9= IDB(15) + 1
ISN 0839          J10= IDB(15) + 1
ISN 0840          J11= IPIC(9) + 1
            C
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```
ISN 0841          79 CONTINUE
              C
              C      THE HARDWARE INDICES ARE SET
              C
ISN 0842          80 IF(DATAB(7,J3).LT.CDAISF.OR.DATAB(7,J4).LT.CDAISO.OR.DATAB(7,J5).
                    * GT.RMAXF.OR.DATAB(7,J6).GT.RMAXO) GO TO 81
              C
              C      FUEL CIRCUIT AND OXIDIZER CIRCUIT ISOLATION VALVES AND FILTERS
              C      ARE ACCEPTABLE
              C
ISN 0844             DLPISF= (1.29E-3/RHOF)*(WDOTF/DATAB(7,J3))**2
ISN 0845             DLPISO= (1.29E-3/RHOO)*(WDOTO/DATAB(7,J4))**2
ISN 0846             DLPFIF= DATAB(7,J5)*WDOTF
ISN 0847             DLPFIO= DATAB(7,J6)*WDOTO
ISN 0848             ICHOSE(3)= DATAB(1,J3)
ISN 0849             ICHOSE(4)= DATAB(1,J4)
ISN 0850             ICHOSE(5)= DATAB(1,J5)
ISN 0851             ICHOSE(6)= DATAB(1,J6)
ISN 0852             IPIC(1)= J3
ISN 0853             IPIC(2)= J4
ISN 0854             IPIC(3)= J5
ISN 0855             IPIC(4)= J6
              C
              C      PRELIMINARY CALCULATIONS FOR SELECTION OF PNEUMATIC REGULATOR
              C
ISN 0856             PTI= DATAB(8,J1)
ISN 0857             PFT= PTI + 2.*DLPISF + 2.*DLPFIF
ISN 0858             POT= PTI + 2.*DLPISO + 2.*DLPFIO
ISN 0859             PREG= AMAX1(PFT,POT)
ISN 0860             WDOTPR= 1.05*1.02E-7*28.*PREG*(WDOTF/RHOF + WDOTO/RHOO)
ISN 0861             CDAREG= WDOTPR/SQRT(5600.*PREG/1.27E4)
              C
ISN 0862             IF(PREG.LT.DATAB(8,J7).OR.PREG.GT.DATAB(9,J7).OR.DATAB(7,J7).LT.
                    * CDAREG) GO TO 81
              C
              C      REGULATOR IS ACCEPTABLE
              C
ISN 0864             ICHOSE(7)= DATAB(1,J7)
ISN 0865             IPIC(5)= J7
```

```
                C
                C     PRELIMINARY CALCULATIONS FOR SELECTION OF PNEUMATIC ISOLATION
                C     VALVE
                C
  ISN 0866            RHOPR= 1.02E-7*3000.
  ISN 0867            CDAISO= WDOTPR/SQRT(200.*RHOPR/1.29E-3)
  ISN 0868            IF(DATAB(7,J8).LT.CDAISO) GO TO 81
                C
                C     PNEUMATIC ISOLATION VALVE IS ACCEPTABLE
                C
  ISN 0870            ICHOSE(8)= DATAB(1,J8)
  ISN 0871            IPIC(6)= J8
                C
                C     PRELIMINARY CALCULATIONS FOR SELECTION OF FUEL TANK,OXIDIZER
                C     TANK AND PNEUMATIC TANK
                C
  ISN 0872            WP= 1.1*TOTIMP/260.
  ISN 0873            WF= WP/(1. + XMR)
  ISN 0874            VF= WF/RHOF
  ISN 0875            VFT= 1.1*VF
  ISN 0876            WO= WF*XMR
  ISN 0877            ACSWP= WF + WO
  ISN 0878            VO= WO/RHOO
  ISN 0879            VOT= 1.1*VO
  ISN 0880            VPRT= PFT*(VFT + VOT)/(3000. - 2.*PFT)
                C
  ISN 0881            IF(DATAB(6,J9).LT.VFT.OR.DATAB(7,J9).LT.PFT.OR.DATAB(6,J10).LT.
                     * VOT.OR.DATAB(7,J10).LT.POT.OR.DATAB(6,J11).LT.VPRT) GO TO 81
                C
                C     FUEL TANK, OXIDIZER TANK AND PNEUMATIC TANK ARE ACCEPTABLE
                C
  ISN 0883            ICHOSE(9)= DATAB(1,J9)
  ISN 0884            ICHOSE(10)= DATAB(1,J10)
  ISN 0885            ICHOSE(11)= DATAB(1,J11)
  ISN 0886            TNKWT= DATAB(23,J9) + DATAB(23,J10)
                C
                C     SIZE PLUMBING AND CONNECTORS
                C
  ISN 0887            PCWATE= .2*(DATAB(23,J9) + DATAB(23,J10) + DATAB(23,J11))
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ISN 0888             IPIC(7)= J9                                          00025900
ISN 0889             IPIC(8)= J10                                         00025910
ISN 0890             IPIC(9)= J11                                         00025920
ISN 0891             N(12)= KK                                            00025930
ISN 0892             N(13)= II                                            00025940
ISN 0893             N(14)= JJ                                            00025950
ISN 0894             N(1)= J1                                             00025960
ISN 0895             N(2)= J2                                             00025970
ISN 0896             N(3)= J3                                             00025980
ISN 0897             N(4)= J4                                             00025990
ISN 0898             N(5)= J5                                             00026000
ISN 0899             N(6)= J6                                             00026010
ISN 0900             N(7)= J7                                             00026020
ISN 0901             N(8)= J8                                             00026030
ISN 0902             N(9)= J9                                             00026040
ISN 0903             N(10)= J10                                           00026050
ISN 0904             N(11)= J11                                           00026060
ISN 0905             DO 802 I=1,14                                        00026070
ISN 0906             J= N(I)                                              00026080
ISN 0907             WT= WT + NCHOSE(I)*DATAB(23,J)                       00026090
ISN 0908             VOL= VOL + NCHOSE(I)*DATAB(24,J)                     00026100
ISN 0909             PL= PL + NCHOSE(I)*DATAB(16,J)                       00026110
ISN 0910             PLMIN= PLMIN + NCHOSE(I)*DATAB(18,J)                 00026120
ISN 0911         802 CONTINUE                                             00026130
ISN 0912             WT= WT + ACSWP + PCWATE                              00026140
ISN 0913             RETURN                                               00026150
               C                                                          00026160
ISN 0914          81 CONTINUE                                             00026170
               C                                                          00026180
               C                                                          00026190
               C     HARDWARE SELECTION NOT ACCEPTABLE - INCREMENT HARDWARE INDICES   00026200
               C                                                          00026210
ISN 0915             IF(J3.LT.J3E) GO TO 82                               00026220
ISN 0917             IF(J4.LT.J4E) GO TO 83                               00026230
ISN 0919             IF(J5.LT.J5E) GO TO 84                               00026240
ISN 0921             IF(J6.LT.J6E) GO TO 85                               00026250
ISN 0923             IF(J7.LT.J7E) GO TO 86                               00026260
ISN 0925             IF(J8.LT.J8E) GO TO 87                               00026270
ISN 0927             IF(J9.LT.J9E) GO TO 88                               00026280
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ISN 0929             IF(J10.LT.J10E) GO TO 89
ISN 0931             IF(J11.LT.J11E) GO TO 90
              C
              C      NO ACCEPTABLE HARDWARE
              C
ISN 0933             ICHOSE(1)= -1
ISN 0934             RETURN
              C
ISN 0935          82 J3= J3 + 1
ISN 0936             GO TO 80
ISN 0937          83 J3= IDB(13) + 1
ISN 0938             J4= J4 + 1
ISN 0939             GO TO 80
ISN 0940          84 J3= IDB(13) + 1
ISN 0941             J4= IDB(13) + 1
ISN 0942             J5= J5 + 1
ISN 0943             GO TO 80
ISN 0944          85 J3= IDB(13) + 1
ISN 0945             J4= IDB(13) + 1
ISN 0946             J5= IDB(14) + 1
ISN 0947             J6= J6 + 1
ISN 0948             GO TO 80
ISN 0949          86 J3= IDB(13) + 1
ISN 0950             J4= IDB(13) + 1
ISN 0951             J5= IDB(14) + 1
ISN 0952             J6= IDB(14) + 1
ISN 0953             J7= J7 + 1
ISN 0954             GO TO 80
ISN 0955          87 J3= IDB(13) + 1
ISN 0956             J4= IDB(13) + 1
ISN 0957             J5= IDB(14) + 1
ISN 0958             J6= IDB(14) + 1
ISN 0959             J7= IDB(3) + 1
ISN 0960             J8= J8 + 1
ISN 0961             GO TO 80
ISN 0962          88 J3= IDB(13) + 1
ISN 0963             J4= IDB(13) + 1
ISN 0964             J5= IDB(14) + 1
ISN 0965             J6= IDB(14) + 1
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ISN 0966          J7= IDB(3) + 1
ISN 0967          J8= IDB(1) + 1
ISN 0968          J9= J9 + 1
ISN 0969          GO TO 80
ISN 0970       89 J3= IDB(13) + 1
ISN 0971          J4= IDB(13) + 1
ISN 0972          J5= IDB(14) + 1
ISN 0973          J6= IDB(14) + 1
ISN 0974          J7= IDB(3) + 1
ISN 0975          J8= IDB(1) + 1
ISN 0976          J9= IDB(15) + 1
ISN 0977          J10= J10 + 1
ISN 0978          GO TO 80
ISN 0979       90 J3= IDB(13) + 1
ISN 0980          J4= IDB(13) + 1
ISN 0981          J5= IDB(14) + 1
ISN 0982          J6= IDB(14) + 1
ISN 0983          J7= IDB(3) + 1
ISN 0984          J8= IDB(1) + 1
ISN 0985          J9= IDB(15) + 1
ISN 0986          J10= IDB(15) + 1
ISN 0987          J11= J11 + 1
ISN 0988          GO TO 80
            C
ISN 0989          END

*OPTIONS IN EFFECT*     NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*    SOURCE STATEMENTS =     988 ,PROGRAM SIZE =     12634

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******
```

```
LEVEL 21.7 ( JAN 73 )                                   OS/360  FORTRAN H

                COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                                  SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
    ISN 0002             FUNCTION GAM(X)                                                    00000010
    ISN 0003             IF (X.GT.1) GO TO 2                                                00000020
    ISN 0005             Z=X                                                                00000030
    ISN 0006           1 IF (Z.GT.0.) GO TO 3                                               00000040
    ISN 0008             Z=Z+1.                                                             00000050
    ISN 0009             GO TO 1                                                            00000060
    ISN 0010           2 Z=X-1.                                                             00000070
    ISN 0011           3 T1=Z+.5                                                            00000080
    ISN 0012             TZG=T1+5.                                                          00000090
    ISN 0013             T1=TZG**T1                                                         00000100
    ISN 0014             T1=EXP(-TZG)*T1*2.50662827465                                      00000110
    ISN 0015             GAMZ=T1*(1.+76.18009173/(Z+1.)-86.50532033/(Z+2.)+24.01409822/     00000120
                        6 (Z+3.)-1.231739516/(Z+4.)+.120858003E-2/(Z+5.)-.536382E-5/(Z+6.))00000130
    ISN 0016             IF (X.GT.1) GO TO 5                                                00000140
    ISN 0018           4 GAMZ=GAMZ/Z                                                        00000150
    ISN 0019             IF (Z.EQ.X) GO TO 5                                                00000160
    ISN 0021             Z=Z-1.                                                             00000170
    ISN 0022             GO TO 4                                                            00000180
    ISN 0023           5 GAM=GAMZ                                                           00000190
    ISN 0024             RETURN                                                             00000200
    ISN 0025             END                                                                00000210

*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =       24 ,PROGRAM SIZE =      602

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                                   125K BYTES OF CORE NOT USED
```

```
          COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                               SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
                  C      ..........................................................00000220
 ISN 0002                FUNCTION CERF(Y)                                            00000230
 ISN 0003                DIMENSION B(28),A(26),AA(17),BB(19)                         00000240
 ISN 0004                IF(Y.GT.4.0)GO TO 2                                         00000250
 ISN 0006                DATA AZERO   / 3.88730365/                                  00000260
 ISN 0007                DATA A(1)    /-1.38163142/                                  00000270
 ISN 0008                DATA A(2)    / .647316404/                                  00000280
 ISN 0009                DATA A(3)    /-.305931024/                                  00000290
 ISN 0010                DATA A(4)    /.1386797472/                                  00000300
 ISN 0011                DATA A(5)    /-.05924745/                                   00000310
 ISN 0012                DATA A(6)    /.023691751/                                   00000320
 ISN 0013                DATA A(7)    /-.00884736263/                                00000330
 ISN 0014                DATA A(8)    / .00308566171/                                00000340
 ISN 0015                DATA A(9)    /-.001006386351/                               00000350
 ISN 0016                DATA A(10)   /.000307546328843/                             00000360
 ISN 0017                DATA A(11)   /-.88261983E-04    /                           00000370
 ISN 0018                DATA A(12)   / .23845096E-04    /                           00000380
 ISN 0019                DATA A(13)   /-.60791002E-05    /                           00000390
 ISN 0020                DATA A(14)   / .146597217E-05    /                          00000400
 ISN 0021                DATA A(15)   /-.0335159[illegible]3E-05    /                00000410
 ISN 0022                DATA A(16)   / .007280579E-05    /                          00000420
 ISN 0023                DATA A(17)   /-.001505791E-05    /                          00000430
 ISN 0024                DATA A(18)   / .297094742E-08    /                          00000440
 ISN 0025                DATA A(19)   /-.560212739E-09    /                          00000450
 ISN 0026                DATA A(20)   / .101131623E-09    /                          00000460
 ISN 0027                DATA A(21)   /-.17506504E-10          /                     00000470
 ISN 0028                DATA A(22)   /.029103813E-10/                               00000480
 ISN 0029                DATA A(23)   /-.4653264E-12          /                      00000490
 ISN 0030                DATA A(24)   / .7164815E-13          /                      00000500
 ISN 0031                DATA A(25)   /-.1063749E-13          /                      00000510
 ISN 0032                DATA A(26)   / .152467E-14          /                       00000520
 ISN 0033                DATA B(27)   / .0                      /                    00000530
 ISN 0034                DATA B(28)   / .0                      /                    00000540
 ISN 0035                DATA AAZERO  / 1.970705272/                                 00000630
 ISN 0036                DATA AA(1)   /-.0243397402717775/                           00000640
 ISN 0037                DATA AA(2)   / .000297361692202 61/                         00000650
 ISN 0038                DATA AA(3)   /-.98035160E-05/                               00000660
```

```
ISN 0039          DATA AA(4)   / .04331334E-05   /                 00000670
ISN 0040          DATA AA(5)   /-.2362150E-07    /                 00000680
ISN 0041          DATA AA(6)   / .1515496E-08    /                 00000690
ISN 0042          DATA AA(7)   /-.11084939E-09   /                 00000700
ISN 0043          DATA AA(8)   / .90425901E-11 /                   00000710
ISN 0044          DATA AA(9)   /-.80947054E-12/                    00000720
ISN 0045          DATA AA(10)  / .7653856E-13/                     00000730
ISN 0046          DATA AA(11)  /-.617918E-14/                      00000740
ISN 0047          DATA AA(12)  / .90715E-15              /         00000750
ISN 0048          DATA AA(13)  /-.10646E-15              /         00000760
ISN 0049          DATA AA(14)  / .01315E-15              /         00000770
ISN 0050          DATA AA(15)  /-.00170E-15              /         00000780
ISN 0051          DATA AA(16)  / .00023E-15              /         00000790
ISN 0052          DATA AA(17)  /-.00003E-15              /         00000800
ISN 0053          DATA BB(18)  / .0                      /         00000810
ISN 0054          DATA BB(19)  / .0                      /         00000820
ISN 0055          X=Y/4.                                           00000821
ISN 0056          COEFF=4.*X*X-2.                                  00000822
ISN 0057          DO 1 I=1,26                                      00000823
ISN 0058          J=27-I                                           00000824
ISN 0059        1 B(J)=COEFF*B(J+1)-B(J+2)+A(J)                    00000825
ISN 0060          BZERO=COEFF*B(1)-B(2)+AZERO                      00000826
ISN 0061             CERF=X/2.*(BZERO-B(2))                        00000827
ISN 0062          RETURN                                           00000828
ISN 0063        2 X=4./Y                                           00000830
ISN 0064          COEFF=4.*X*X-2.                                  00000840
ISN 0065          DO 3 I=1,17                                      00000850
ISN 0066          J=18-I                                           00000860
ISN 0067        3 BB(J)=COEFF*BB(J+1)-BB(J+2)+AA(J)                00000870
ISN 0068          BBZERO=COEFF*BB(1)-BB(2)+AAZERO                  00000880
ISN 0069             CERF=(BBZERO-BB(2))/(2.*Y*EXP(Y*Y))*.5641895835477560  00000890
ISN 0070          RETURN                                           00000900
ISN 0071          END                                              00000910
```

```
*OPTIONS IN EFFECT*     NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*    SOURCE STATEMENTS =      70 ,PROGRAM SIZE =      1040
```

```
*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                                    121K BYTES OF CORE NOT USED
```

```
          COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                                    SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
                      C     ..................................................................00000920
 ISN 0002                   SUBROUTINE RELY (IRTN,IDS,NEQUIP)                                   00000930
 ISN 0003                   COMMON /BTWN/WT,VOL,DT,P,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,       00000940
                           * D,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSIR,     00000950
                           * SATTWT,TPRTM,IBTLOC,RADA,RADAE,RAT,HTRPWR,HTRPRB,                 00000960
                           * HPT,HTPIPE,VCHP,HTPT,FC,NZERO,COMRT,ACSSN,BITRAT(2),              00000970
                           * EQBLG,SABOLG,SATWT                                                00000971
 ISN 0004                   COMMON /USERR/KEOPT,SYSLB,RFIXED,SLBMX,ISPT,SPEC(6),CONS,ISUB       00000980
 ISN 0005                   COMMON /USERI/EQM1WT,EQM2WT,DIAMAX,ALT                              00000990
 ISN 0006                   COMMON /CHOSE/ICHOSE(60),NCHOSE(60),COSTM(5,60),DATAB(6,60),        00001000
                           * THM(4,60),DPIA(11,60),SKD(7,60)                                   00001010
 ISN 0007                   COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMDOLD,TRUNC,ITRUNP,DE,TE,        00001012
                           * TOOLR,QCR,SEIR,PMR,PE,PU,TOOLU,QCP,SEIP,PMP,SATR,SATINV,MER,      00001013
                           * METNV,PAYR,PAUINV,PAYQUL,GSE,XLTOT,CTOT,FEER,FEEINV,DDTE,XVEST,   00001014
                           * OPS,SKTAU(6),ROLD(60),TSRTT,AN,TS,DS,AM,TF,BF,TC,TA,TB,TOTOPS     00001015
 ISN 0008                   COMMON /USER5/IVOLT,TBI                                             00001020
 ISN 0009                   DIMENSION N(5),NEQUIP(5)                                            00001030
 ISN 0010                   COMMON /DBCOM/R(31),NR(60),R1(31,60),Z(31),RD(31),RDUM(31),SAVR(3100001040
                           *),SAVRNW(31),RNEW(31),NMX(60),SAVMX(60),COST(60),DUM(2563)         00001050
 ISN 0011                   REAL MMDOLD,MMDNEW,LAMS,NZERO                                       00001060
 ISN 0012                   INTEGER SAVMX,SAVNSR                                                00001070
                      C     ..................................................................00001080
                      C                                                                         00001090
                      C                                    INITIAL                              00001100
                      C        VARIABLES        SIZE       ORIGIN-       DEFN                   00001110
                      C                                    CHANGE                               00001120
                      C          NSMX            1         EXT-NC        MAX NUM SYSTEM REDUNDANCIES  00001130
                      C          NSR             1         EXT- C        CURRENT NUM OF SYSTEM  00001140
                      C                                                  REDUNDANCIES           00001150
                      C          IRTN            1         EXT-NC        RETURN INDICATOR       00001160
                      C          JMIN            1         EXT-NC        LOWER LIMIT ON MODULE NUM 00001170
                      C          JMAX            1         EXT-NC        UPPER LIMIT ON MODULE NUM 00001180
                      C          NR            N(NSS)      EXT- C        CURRENT NUM OF REDUNDANCIES IN00001190
                      C                                                  MODULE J               00001200
                      C          NMX           N(NSS)      EXT-NC        MAX NUM REDUNDANCIES IN MODULE00001210
                      C                                                  J                      00001220
                      C                                                  =1         R(TRUNC) MODE  00001230
```

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ORIGINAL PAGE IS
OF POOR QUALITY

```
C          NT              1        EXT-NC       LOOP AND OPTION PARAMETER
C          DELH            1        EXT-NC       TIME INCREMENT
C          ITRUNC          1        EXT-NC       NUM OF  TIME  POINTS
C          R             ITRUNC     INT          RELIABILITY FNC FOR MODULE J
C                                                =ITRUNC      MMD MODE
C          ROLD          ITRUNC     EXT- C       PREVIOUS VALUE OF SYSTEM
C                                                RELIABILITY
C          RNEW          ITRUNC     INT          SYSTEM RELIABILITY WITH WITH A
C                                                REDUNDANCY ADDED
C          RI            ITRUNC     EXT- C       SYSTEM RELIABILITY MATRIX
C                        *N(NSS)
C          COST          N(NSS)     EXT-NC       VALUE OF EXPENSE OPTION FOR
C                                                MODULE J
C          RHO             1        INT          DECISION PARAMETER(
C                                                  ABS(*NEW - *OLD)/EXPENSE
C          RHOTH           1        EXT-NC       LOWER BOUND FOR RHO
C          OLDRHO          1        INT          PREVIOUS VALUE OF RHO
C          MMDOLD          1        INT          PREVIOUS MMD VALUE
C          MMDNEW          1        INT          MMD VALUE WITH A REDUNDANCY
C                                                ADDED
C          JSAVE           1        INT          MODULE WITH LARGEST VALUE OF
C                                                RHO
C          SAVRNW        ITRUNC     INT          SYSTEM RELIABILITY FNC WITH A
C                                                REDUNDANCY IN MODULE JSAVE
C          SAVR          ITRUNC     INT          RELIABILITY FNC FOR MODULE
C                                                JSAVE WITH A REDUNDANCY ADDED
C          SAVMMD          1        INT          MMD WITH A REDUNDANCY ADDED IN
C                                                MODULE JSAVE
C          SYSLB           1        EXT- C       SYSTEM WEIGHT
C          SLBMX           1        EXT-NC       MAX SYSTEM WEIGHT
C          DATAB(I,J)    N(NSS)     EXT-NC       REDUNDANCY WEIGHT FOR MODULE J
C          IND             1        INT          LOOP INDEX
C          I               1        INT          INDEX
C          RFIXED          1        EXT-NC       INITIAL RELIABILITY
C
C       SUBROUTINES CALLED(
C                         QSF -  INTEGRATION BY SIMPSON'S RULE  (SSP)
C                         RIMOD- RELIABILITY MODELS CALCULATION
C
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
          C       .......................................................................
          C              *** PROGRAM INITIALIZATIONS   ***
          C
          C       .......................................................................
          C
ISN 0013          DO 110 I=1,60
ISN 0014    110   NR(I)=0
          C                         ***   USER INPUTS   ***
          C
          C       KEOPT(            EXPENSE OPTION INDICATOR
          C                                1            WEIGHT
          C                                OTHERWISE    COST
          C
          C       RFIXED(           INITIAL SYS RELIABILITY
          C
          C       SYSLB(            INITIAL WEIGHT (POUNDS)
          C
          C       SLBMX(            MAX SYS WEIGHT
          C
          C       TRUNC(            MISSION LENGTH (HRS)
          C
          C       ITRUNC(           NUM OF TIME POINTS
          C
          C       ISUB(             REQUIREMENTS OPTION
          C                                1            AT LEAST ONE SUB-SYS SPEC
          C                                OTHERWISE    NO SUB-SYS SPEC
          C
          C       ISPT(             SINGLE POINT FAILURE REQUIREMENTS OPTION
          C                                0            REQ NOT IN EFFECT
          C                                OTHERWISE REQ IN EFFECT
          C
          C       SPEC1(            MMD SYS REQUIREMENT (HRS)
          C
          C       SPEC(K)(          R(ITRUNC) SUB-SYS REQ  K=1,NSS
          C                                DEFAULT VALUE IS 0.0
          C
          C       SPEC(NSS+1)(      R(ITRUNC) SYS REQ   DEFAULT VALUE IS 0.0
          C
          C       N(K)(             CUMULATIVE NUM OF MODULES THRU SUB-SYS K
```

```
                   C                                                                              00002020
ISN 0015                RFNL=0.7                                                                   00002021
ISN 0016                TRUNC=TPRIM*730.                                                           00002030
ISN 0017                ALPHA=TRUNC/(-ALOG(RFNL))**.625)                                           00002031
ISN 0018                SPEC1=CONS*730.                                                            00002040
ISN 0019                ITRUNC=31                                                                  00002050
ISN 0020                SYSLB=SATTWT                                                               00002051
                   C                                                 SET NUM OF SUB SYS            00002060
ISN 0021                NSS=5                                                                      00002070
                   C                                                 ACCUMULATE N                  00002080
ISN 0022                N(1)=NEQUIP(1)                                                             00002081
ISN 0023                DO 100 I=2,NSS                                                             00002090
ISN 0024            100 N(I)=NEQUIP(I)+N(I-1)                                                      00002100
                   C                        ***   SIS IMPUTS   ***                                 00002110
                   C                                                                               00002120
                   C    ACSWP(           INITIAL EXPENDABLES WEIGHT   (POUNDS)               AP    00002130
                   C                                                                               00002140
                   C    EMU(             EXPENDABLES INITIAL MEAN LIFETIME   (HRS)           AP    00002150
                   C                                                                               00002160
                   C    ESIG(            EXPENDABLES INITIAL STD. DEV.   (HRS)               AP    00002170
                   C                                                                               00002180
                   C    MAXEXP(          MAX NUM OF EXPENDABLE INCREMENTS                    AP    00002190
                   C                                                                               00002200
                   C    NZERO(           ORBITAL MEAN MOTION   (RAD/HRS)                     AP    00002210
                   C                                                                               00002220
                   C    DC(              DUTY CYCLE                                       OTHER00002230
                   C                                                                               00002240
                   C    TB               BATTERY TEMP   (DEGREES KELVIN)                  OTHER00002250
                   C                                                                               00002260
                   C    D(               DEPTH OF DISCHARGE   (BETWEEN 0 AND 100)         OTHER00002270
                   C                                                                               00002280
                   C    NC(              TOTAL NUM OF CELLS   (ALL BATTERIES)             OTHER00002290
                   C                                                                               00002300
                   C    PARAMETERS NECESSARY TO COMPUTE THE CYCLES/HR FACTOR                 SEC   00002310
                   C                     NOW FIXED AT 4.0E-11, REF MODEL 5                         00002320
                   C                                                                               00002330
ISN 0025                EMU=TRUNC                                                                  00002340
ISN 0026                ESIG=TRUNC/6.                                                              00002350
ISN 0027                MAXEXP=20                                                                  00002360
```

```
ISN 0028              DC=.1                                                                 00002370
ISN 0029              TB=TBI+273.                                                           00002375
                C                                                                           00002380
                C                                                                           00002390
                C              ***   FIXEE CONSTANTS   ***                                  00002400
                C                                                                           00002410
                C                                                 SENSE/SWITCH FAILURE RATE 00002420
ISN 0030              LAMS=120.                                                             00002430
                C                                                 PAYOFF THRESHOLD, R(TRUNC) 00002440
ISN 0031              RHO1=0.00001                                                          00002450
                C                                                 PAYOFF THRESHOLD, MMD     00002460
ISN 0032              RHO2=0.1                                                              00002470
                C                                                 EXPENDABLES LIFE INCR.    00002480
ISN 0033              DELMU=2190.                                                           00002490
                C                                                 EXPENDABLES STD. DEV. INCR. 00002500
ISN 0034              DELSIG=365.                                                           00002510
                C                                                                           00002520
                C     ..............................................................        00002530
                C                                                                           00002540
                C              ***   SYS PARAM SPECIFICATION   ***                          00002550
                C                                                                           00002560
                C     ..............................................................        00002570
                C                                                 R-SHIFT NCHOSE AND COLUMNS OF 00002580
                C                                                 DATAB BY 1 BEGINNING WITH THE 00002590
                C                                                 THIRD SUB-SYS             00002600
ISN 0035              JMIN=N(2)+1                                                           00002610
ISN 0036              JMAX=N(NSS)                                                           00002620
                C                                                 INITIALIZE                00002630
ISN 0037              DO 130 I=1,6                                                          00002640
ISN 0038        130   Z(I)=DATAB(I,JMIN)                                                    00002650
ISN 0039              NZ=NCHOSE(JMIN)                                                       00002660
ISN 0040              DO 140 J=JMIN,JMAX                                                    00002670
                C                                                 SHIFT NCHOSE              00002680
ISN 0041              NY=NCHOSE(J+1)                                                        00002690
ISN 0042              NCHOSE(J+1)=NZ                                                        00002700
ISN 0043              NZ=NY                                                                 00002710
ISN 0044              DO 140 I=1,6                                                          00002720
                C                                                 SHIFT DATAB               00002730
ISN 0045              R(I)=DATAB(I,J+1)                                                     00002740
```

```
ISN 0046          DATAB(I,J+1)=Z(I)                                             00002750
ISN 0047          Z(I)=R(I)                                                     00002760
ISN 0048     140  CONTINUE                                                      00002770
             C                                       INSERT EXPENDABLES PARAMETERS 00002780
ISN 0049          DATAB(1,JMIN)=3.*(ACSWP+TNKWT)                                00002790
ISN 0050          DATAB(2,JMIN)=4.                                              00002800
ISN 0051          DATAB(3,JMIN)=EMU                                             00002810
ISN 0052          DATAB(4,JMIN)=ESIG                                            00002820
ISN 0053          DATAB(5,JMIN)=DELMU                                           00002830
ISN 0054          DATAB(6,JMIN)=DELSIG                                          00002840
             C                                       SET MAX NUM OF REDUNDANT ELE. 00002860
ISN 0055          NMX(JMIN)=MAXEXP                                              00002870
ISN 0056          SAVMX(JMIN)=NMX(JMIN)                                         00002880
             C                                       RESET N(K)                 00002890
ISN 0057          DO 150 K=2,NSS                                                00002900
ISN 0058     150  N(K)=N(K)+1                                                   00002910
ISN 0059          JMAX=JMAX+1                                                   00002920
             C                                       SWEEP DATAB AND COMPUTE MODEL 00002930
             C                                       PARAMETERS                 00002940
ISN 0060          DO 160 J=1,JMAX                                               00002950
ISN 0061          MODL=INT(DATAB(2,J)+.1)                                       00002960
             C                                       CK FOR MODEL TYPE 4        00002970
ISN 0062          IF (MODL.EQ.4) GO TO 160                                      00002980
             C                                       MAX NUM OF REDUNDANCIES    00003010
ISN 0064          NMX(J)=DATAB(6,J)+.1                                          00003020
ISN 0065          NMX(J)=NMX(J)-NCHOSE(J)                                       00003030
ISN 0066          SAVMX(J)=NMX(J)                                               00003040
ISN 0067          GO TO (151,152,153,160,155), MODL                             00003050
             C                                       MODEL 1                    00003060
ISN 0068     151  DATAB(4,J)=LAMS*1.0E-09                                       00003070
ISN 0069          DATAB(3,J)=DATAB(3,J)*1.0E-09                                 00003080
ISN 0070          DATAB(6,J)=DC                                                 00003090
ISN 0071          GO TO 160                                                     00003100
             C                                       MODEL 2                    00003110
ISN 0072     152  DATAB(3,J)=DATAB(3,J)*1.0E-09                                 00003120
ISN 0073          DATAB(4,J)=DATAB(4,J)*1.0E-09                                 00003130
ISN 0074          GO TO 160                                                     00003140
             C                                       MODEL 3                    00003150
ISN 0075     153  DATAB(6,J)=NC/NCHOSE(J)                                       00003160
```

```
ISN 0076            TWOPI=6.2831853
ISN 0077              DATAB(5,J)=NZERO*3600./TWOPI
ISN 0078              DATAB(4,J)=EXP(-138.10332 + 0.95927099*TB - 0.18704227*D - 0.0016
                    1717786*TB*TB - 0.0019619976*D*D + 0.0011242688*TB*D)
ISN 0079              DATAB(3,J)=EXP(-11.380958 + 0.23896921*TB - 0.54986583*D - 0.0005
                    10646174*TB*TB + 0.01930773?*D*D - 0.0002374105*D**3)
ISN 0080            GO TO 160
              C                                       MODEL 5
ISN 0081        155   DATAB(6,J)=DC
ISN 0082              DATAB(3,J)=DATAB(3,J)*FC
ISN 0083              DATAB(4,J)=LAMS*1.0E-09
ISN 0084      160   CONTINUE
              C                                       TIME STEP INCR.
ISN 0085            DELH=TRUNC/FLOAT(ITRUNC-1)
              C                                       CALCULATE RELIABILITY MATRIX
ISN 0086            LIM=N(NSS)
ISN 0087            DO 180 J=1,LIM
ISN 0088            IADD=0
ISN 0089            CALL RIMOD(J,DELH,ITRUNC,ITRUNC,IADD,0)
ISN 0090            DO 170 I=1,ITRUNC
ISN 0091      170   RI(I,J)=R(I)
ISN 0092      180   CONTINUE
              C                                       SET EXPENSE OPTION
ISN 0093            IF (KEOPT.NE.1) GO TO 195
ISN 0095            DO 190 J=1,LIM
ISN 0096      190   COST(J)=DATAB(1,J)
ISN 0097            GO TO 200
              C                                       COMPUTE COST
ISN 0098        195 DO 196 J=1,LIM
ISN 0099        196 COST(J)=COSTM(1,J)+COSTM(2,J)+COSTM(3,J)
              C
              C     ..........................................................
              C
              C                 ***   MAIN PROGRAM   ***
              C
              C     ..........................................................
              C
              C     R(TRUNC) MODL
ISN 0100      200   LIM=NSS+1
```

```
              C                                             R(TRUC) MODE FOR EACH SUB-SYS 00003550
              C                                             WITH A USER SPEC.             00003560
              C                                             FOR K=LIM SUB-SYS IS TOTAL SYS00003570
 ISN 0101                SAVNSR=0                                                         00003580
 ISN 0102                JMAX=0                                                           00003590
 ISN 0103                DO 270 K=1,LIM                                                   00003600
              C                                             CK FOR ANY SUB-SYS  USER SPEC.00003610
              C                                              ISUB=2     NO SUB-SYS SPECS. 00003620
              C                                              ISUB=1     AT LEAST ONE      00003630
              C                                                         SUB-SYS SPEC.     00003640
 ISN 0104                IF (ISUB .NE. 1 .AND. K .NE. LIM) GO TO 270                      00003650
              C                                             SET NUM OF SUB-SYSTEM RED TO 000003660
 ISN 0106                NSR=0                                                            00003670
              C                                             SELECT JMIN AND JMAX          00003680
 ISN 0107                IF (K.NE.LIM) GO TO 210                                          00003690
 ISN 0109                JMIN=1                                                           00003700
 ISN 0110                JMAX=N(NSS)                                                      00003710
 ISN 0111                NSR=SAVNSR                                                       00003720
 ISN 0112                GO TO 220                                                        00003730
 ISN 0113     210        JMIN=JMAX+1                                                      00003740
 ISN 0114                JMAX=N(K)                                                        00003750
              C                                             CALCULATE MAX NUM SYS RED.    00003760
 ISN 0115     220        NSMX=0                                                           00003770
 ISN 0116                DO 230 L=JMIN,JMAX                                               00003780
 ISN 0117     230        NSMX=NSMX+SAVMX(L)                                               00003790
              C                                             CK FOR SUB-SYS USER SPEC      00003800
 ISN 0118                IF (SPEC(K).LE.RHO1) GO TO 269                                   00003810
              C                                                                           00003811
              C                                             SET PARAMETERS FOR REDAP ENTRY00003812
 ISN 0120                RHOTH=RHO1                                                       00003813
 ISN 0121                NT=1                                                             00003814
 ISN 0122                IRTN=1                                                           00003815
              C                                             CALCULATE INITIAL SUB-SYS     00003820
              C                                             RELIABILITY                   00003830
 ISN 0123      250       ROLD(ITRUNC)=RFIXED*RFNL                                         00003840
 ISN 0124                DO 240 J=JMIN,JMAX                                               00003850
 ISN 0125     240        ROLD(ITRUNC)=ROLD(ITRUNC)*RI(ITRUNC,J)                           00003860
              C                                             CK RELIABILITY AGAINST SPEC.  00003920
              C                                             ENTER  REDAP                  00003930
```

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```
              C
ISN 0126               OLDRHO=-1.0
ISN 0127               IF (ROLD(ITRUNC).LT.SPEC(K)) GO TO 390
              C
              C                                         UPDATE NMX FOR  K .LT. LIM
ISN 0129               IF (K.EQ.LIM) GO TO 269
ISN 0131               DO 260 J=JMIN,JMAX
ISN 0132      260      NMX(J)=NR(J)
ISN 0133        269    SAVNSR=SAVNSR+NSR
ISN 0134        270    CONTINUE
              C
              C
              C                                         LIST OF EXIT PARAM AND VALUES(
              C                                         EXIT R(TRUNC) MODE
              C                                             JMIN=1
              C                                             JMAX=N(NSS)
              C                                             NSR= NUM SYS RED
              C                                             NSMX= MAX NUM SYS RED
              C                                         NOW ENTER MMD DETERMINATION
              C                                         RESET NMX TO TRUE LIMITS
ISN 0135               DO 280 J=1,JMAX
ISN 0136      280      NMX(J)=SAVMX(J)
              C
              C 200    ENTRY  TO  MMD DETERMINATION
              C
              C
              C                                         CK FOR SINGLE POINT FAILURE
              C                                         REQUIREMENT(
              C                                             ISPT=0         NO REQ.
              C                                                 =1            REQ.
ISN 0137               IF (ISPT.EQ.0) GO TO 300
              C
              C                                         SINGLE POINT FAILURE REQ. IN
                                                        EFFECT
ISN 0139               DO 290 J=1,JMAX
ISN 0140               IF ((NMX(J).LE.0).OR.(NR(J).GT.0)) GO TO 290
ISN 0142               MODL=DATAB(2,J)+.1
ISN 0143               L=1
ISN 0144               IF(MODL.EQ.5) L=NCHOSE(J)
ISN 0146               NSR=NSR+L
ISN 0147               NR(J)=NR(J)+L
ISN 0148               IADD=0
```

```
ISN 0149            CALL RIMOD(J,DELH,ITRUNC,ITRUNC,IADD,0)                        00004266
ISN 0150            DO 285 I=1,ITRUNC                                              00004267
ISN 0151        285 RI(I,J)=R(I)                                                   00004268
ISN 0152       290  CONTINUE                                                       00004280
               C                                  INITIALIZATION OF PARAMETERS     00004281
               C                                  BEFORE ENTRY TO THE REDUNDANCY00004282
               C                                  ALLOCATION PROCEDURE             00004283
ISN 0153        300 RHOTH=RHO2                                                     00004284
ISN 0154            NT=ITRUNC                                                      00004285
ISN 0155            IRTN=2                                                         00004286
               C                                  COMPUTE INITIAL RELIABILITY      00004290
               C                                  FNC FOR SINGLE AND DOUBLE        00004300
               C                                  STRING SYSTEMS                   00004310
ISN 0156       330  DO 320 I=1,ITRUNC                                              00004320
ISN 0157            ROLD(I)=RI(I,1)*EXP(-((DELH*FLOAT(I-1))/ALPHA)**1.6)           00004330
ISN 0158            DO 310 J=2,JMAX                                                00004340
ISN 0159       310  ROLD(I)=ROLD(I)*RI(I,J)                                        00004350
ISN 0160            RD(I)=1.-(1.-ROLD(I))**2                                       00004360
ISN 0161       320  CONTINUE                                                       00004370
               C                                  COMPUTE INITIAL MMD VALUE        00004380
ISN 0162            CALL QSF (DELH,ROLD,Z,ITRUNC)                                  00004390
ISN 0163            MMDOLD=RFIXED*Z(ITRUNC)                                        00004400
ISN 0164            CALL QSF (DELH,RD,Z,ITRUNC)                                    00004410
ISN 0165            DSMMD=RFIXED*Z(ITRUNC)                                         00004420
               C                                                                   00004490
               C                                  CK MMDOLD AGAINST USER SPECI     00004500
               C                                  GO TO  REDAP                     00004510
               C                                  ALSO RETURN POINT FOR REDAP      00004520
ISN 0166            OLDRHO=-1.0                                                    00004530
ISN 0167            IF(IDS.EQ.0) GO TO 350                                         00004540
ISN 0169            IF(DSMMD.LT.SPECI) GO TO 390                                   00004550
ISN 0171            GO TO 351                                                      00004560
ISN 0172       350  IF (MMDOLD.LT.SPECI) GO TO 390                                 00004570
ISN 0174        351 IRTN=0                                                         00004580
               C                                  COMPRESS NCHOSE AND ADD RED.     00004590
ISN 0175       360  JMIN=N(2)-1                                                    00004600
ISN 0176            DO 370 J=1,JMIN                                                00004610
ISN 0177       370  NCHOSE(J)=NCHOSE(J)+NR(J)                                      00004620
ISN 0178            JMIN=N(2)                                                      00004630
```

```
ISN 0179               JMAX=N(NSS)
ISN 0180               DO 380 J=JMIN,JMAX
ISN 0181       380     NCHOSE(J)=NCHOSE(J+1)+NR(J+1)
               C                                          EXPENDABLES INFO RETURN
ISN 0182               IPRIM=IPRIM+FLOAT(3*NR(JMIN))
ISN 0183               ITRUNP=ITRUNC
ISN 0184               RETURN
               C       ..................................................................
               C
               C           ***   MAIN REDUNDANCY ALLOCATION PROCEDURE   ***
               C                              (REDAP)
               C
               C       ..................................................................
               C                                          IF MAX NUM RED EXCEEDED, RETRN
               C                                          OTHERWISE CONTINUE PROCEDURE
               C
ISN 0185       390     IF (NSR.GE.NSMX) GO TO (490,510), IRTN
               C
               C                                          SELECT MODULE TO ADD A RED, IF
               C                                          J.GE.JMAX GO TO SYS UPDATE
               C                                          PROCEDURE.
ISN 0187               DO 440 J=JMIN,JMAX,1
ISN 0188               IF (NR(J).GE.NMX(J)) GO TO 440
ISN 0190               MODL=DATAB(2,J)+.1
ISN 0191               IF ((MODL.EQ.3).AND.(NR(J+1).GE.NMX(J+1))) GO TO 440
               C                                          ADD A RED TO MODULE AND
               C                                          COMPUTE THE RELIABILITY FNC
ISN 0193               IADD=1
ISN 0194               CALL RIMOD(J,DELH,ITRUNC,NT,IADD,1)
               C                                          CALCULATE NEW SYS RELIABILITY
ISN 0195               DO 400 IND=1,NT
ISN 0196               I=ITRUNC+1-IND
ISN 0197               RNEW(I)=ROLD(I)*R(I)/RI(I,J)
ISN 0198       400     CONTINUE
               C                                          CK FOR R(TRUNC) OR MMD
               C                                          COMPUTATIONAL MODE
ISN 0199               IF (NT.NE.1) GO TO 410
               C                                          R(ITRUNC) MODE
ISN 0201               I=ITRUNC
```

```
ISN 0202              RHO=(ABS(RNEW(I)-ROLD(I)))/COST(J)
ISN 0203              GO TO 420
            C                                                  MMD MODE
ISN 0204    410       CALL QSF (DFLH,RNEW,Z,ITRUNC)
ISN 0205              MMDNEW=Z(ITRUNC)*RFIXED
ISN 0206              RHO=(ABS(MMDNEW-MMDOLD))/COST(J)
            C                                                  SELECTION, DECISION SEQUENCE
            C
ISN 0207    420       IF (RHO.LT.OLDRHO) GO TO 440
            C                                                  RHO.LT.OLDRHO( SAVE CURRENT
            C                                                  RELIABILITY DATA, MODULE NUM,
            C                                                  AND VALUE OF RHO.
ISN 0209              JSAVE=J
ISN 0210              OLDRHO=RHO
ISN 0211              DO 430 IND=1,NT
ISN 0212              I=ITRUNC+1-IND
ISN 0213              SAVR(I)=R(I)
ISN 0214    430       CONTINUE
ISN 0215              IF (NT.NE.I) SAVMMD=MMDNEW
ISN 0217    440       CONTINUE
ISN 0218              IF (OLDRHO.LT.RHOTH) GO TO (530,540), IRTN
            C
            C                    ***    END REDAP    ***
            C
            C         ..............................................................
            C
            C          ***   SYSTEM RELIABILITY UPDATE PROCEDURE   ***
            C                               (SYRUP)
            C
            C
ISN 0220              MODL=DATAB(2,JSAVE)+.1
ISN 0221              L=1
ISN 0222              IF (MODL.EQ.5) L=NCHOSE(JSAVE)
ISN 0224              NSR=NSR+L
ISN 0225              NR(JSAVE)=NR(JSAVE)+L
ISN 0226              IF(MODL.NE.4) GO TO 449
ISN 0228              SYSLB=SYSLB+DATAB(1,JSAVE)/(TPRIM+FLOAT(3*NR(JSAVE)))
ISN 0229              GO TO 450
ISN 0230        449   SYSLB=SYSLB+DATAB(1,JSAVE)*FLOAT(L)
```

```
ISN 0231              IF (MODL.NE.3) GO TO 450
ISN 0233              NSR=NSR+1                                                              00005420
ISN 0234              NR(JSAVE+1)=NR(JSAVE+1)+1                                              00005430
ISN 0235              SYSLB=SYSLB+DATAB(1,JSAVE+1)                                           00005440
ISN 0236              IADD=0                                                                 00005450
ISN 0237              CALL RIMOD(JSAVE+1,DELH,ITRUNC,ITRUNC,IADD,0)                          00005457
ISN 0238              DO 452 I=1,ITRUNC                                                      00005458
ISN 0239          452 RI(I,JSAVE+1)=R(I)                                                     00005459
ISN 0240          450 IF (NT .NE. 1) GO TO 455                                               00005460
ISN 0242              IADD=0                                                                 00005461
ISN 0243              CALL RIMOD(JSAVE,DELH,ITRUNC,ITRUNC,IADD,0)                            00005462
ISN 0244              DO 451 I=1,ITRUNC                                                      00005463
ISN 0245          451 SAVR(I)=R(I)                                                           00005464
ISN 0246      455     DO 460 I=1,ITRUNC                                                      00005465
ISN 0247              RI(I,JSAVE)=SAVR(I)                                                    00005470
ISN 0248      460     CONTINUE                                                               00005480
ISN 0249              IF (NT .NE. 1) GO TO 480                                               00005500
ISN 0251              MMDOLD=SAVMMD                                                          00005510
ISN 0252              IF(IOS.EQ.0) GO TO 480                                                 00005520
ISN 0254              DO 470 IND=1,ITRUNC                                                    00005530
ISN 0255              RD(IND)=1.-(1.-ROLD(IND))**2                                           00005540
ISN 0256      470     CONTINUE                                                               00005550
ISN 0257              CALL QSF (DELH,RD,Z,ITRUNC)                                            00005560
ISN 0258              DSMMD=RFIXED*Z(ITRUNC)                                                 00005570
              C                                                                              00005580
              C                                       EXIT IF SYS WEIGHT EXCEEDED.           00005590
ISN 0259      480     IF (SYSLE.GE.SLEMX) GO TO (500,520), IRTN                              00005600
              C                                                                              00005610
              C                                       BRANCH TO START ANOTHER PASS           00005620
              C                                       THRU REDAP(                            00005630
              C                                         MODE          NT       STMT NUM00005640
              C                                       R(ITRUNC)        1            250      00005650
              C                                         MMD          ITRUNC         330      00005660
ISN 0261              IF (NT.NE.1) GO TO 330                                                 00005670
ISN 0263              GO TO 250                                                              00005680
              C                                                                              00005690
              C                     ***    END SYRUP    ***                                  00005700
              C                                                                              00005710
              C       ..........................................................00005720
              C                                                                              00005730
```

```
                   C              ***   PROGRAM RETURNS   ***                        00005740
                   C                                                                 00005750
                   C                                                                 00005760
   ISN 0264      490     IRTN=-1                                                     00005770
   ISN 0265              GO TO 360                                                   00005780
   ISN 0266      500     IRTN=-2                                                     00005790
   ISN 0267              GO TO 360                                                   00005800
   ISN 0268      510     IRTN=-3                                                     00005810
   ISN 0269              GO TO 360                                                   00005820
   ISN 0270      520     IRTN=-4                                                     00005830
   ISN 0271              GO TO 360                                                   00005840
   ISN 0272      530     IRTN=-5                                                     00005850
   ISN 0273              GO TO 360                                                   00005860
   ISN 0274      540     IRTN=-6                                                     00005870
   ISN 0275              GO TO 360                                                   00005880
                   C                                                                 00005890
   ISN 0276              END                                                         00005900

*OPTIONS IN EFFECT*     NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =     275 ,PROGRAM SIZE =     5734

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                                73K BYTES OF CORE NOT USED
```

```
              COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                                 SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
                   C     ***************************************************************
  ISN 0002               SUBROUTINE RIMOD(J,DELH,ITRUNC,NT,IADD,IOPT)
  ISN 0003               COMMON /CHOSE/ICHOSE(60),NCHOSE(60),COSTM(5,60),SYSPAR(6,60),
                        * THM(4,60),DPIA(11,60),SKD(7,60)
  ISN 0004               COMMON /DBCOM/R(31),NR(60),R1(31,60),W(31),RD(31),RDUM(31),SAVR(31
                        *),SAVRNW(31),RNEW(31),NMX(60),SAVMX(60),COST(60),DUM(2563)
  ISN 0005               COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMDOLD,TRUNC,ITRUNP,DE,TE,
                        * TOOLR,QCR,SEIR,PMR,PE,PU,TOOLU,QCP,SEIP,PMP,SATR,SATINV,MER,
                        * MEINV,PAYR,PAUINV,PAYQUL,GSE,XLTOT,CTOT,FEER,FEEINV,DDTE,XVEST,
                        * OPS,SKTAU(6),ROLD(60),TSRTI,AN,TS,DS,AM,TF,BF,TC,TA,TB,TOTOPS
  ISN 0006               REAL LAM,LAMBAR,LAMS
                   C
                   C     ***************************************************************
                   C
                   C        SUBROUTINE RIMOD
                   C
                   C        PURPOSE
                   C           TO COMPUTE THE RELIABILITY FUNCTION FOR MODULE J AFTER
                   C           REDUNDANCIES ARE ADDED TO THE MODULE.
                   C
                   C        USAGE
                   C           CALL RIMOD(R,NR,J,DELH,ITRUNC,NT,IADD,IOPT)
                   C
                   C        DESCRIPTION OF PARAMETERS
                   C           J       -INPUT MODULE NUM
                   C           DELH    -DELTA TIME, THE TIME INCREMENT
                   C           ITRUNC  -THE NUM OF TIME POINTS
                   C           NT      -INPUT OPTION PARAMETER
                   C           IADD    -INPUT OPTION PARAMETER
                   C           IOPT    -INPUT OPTION PARAMETER
                   C
                   C        REMARKS
                   C           OPTION PARAMETER   VALUE      ACTION
                   C                  NT            1        ONLY COMPUTE RELIABILITY AT
                   C                                         TRUNCATION TIME. RETURN VALUE IN
                   C                                         R(ITRUNC).
                   C                              ITRUNC     COMPUTE RELIABILITY AT EACH TIME
```

```
C                                                   RETURN VALUES IN R.
C               IADD             0                  ADD NO REDUNDANCIES BEFORE COM-
C                                                   PUTING THE RELIABILITY FUNCTION.
C                                1                  ADD REDUNDANCIES BEFORE COMPUT-
C                                                   ING THE RELIABILITY FUNCTION.
C               IOPT             0                  UNCOUPLE MODELS 1 AND 3.
C
C                              OTHER                COUPLE MODELS 1 AND 3.
C
C       GLOBAL VARIABLES PASSED THOUGH COMMON
C          R       -THE RESULTING RELIABILITY FUNCTION
C          NR      -INPUT VECTOR OF THE NUM OF REDUNDANCIES BY MODULE
C          NCHOS   -INITIAL NUM OF ELEMENTS IN MODULES
C          SYSPAR  -MATRIX OF MODEL PARAMETERS
C                   SYSPAR(2,J)= MODEL ID FOR J-TH MODULE
C                   FOR FURTHER DESCRIPTION SEE COMMENTS PRECEEDING THE
C                   PARTICULAR MODEL OF INTEREST.
C
C       SUBROUTINES AND SUBPROGRAMS REQUIRED
C          FORTRAN SYS FNCS  EXP, FLOAT, INT, SQRT
C          EXTERNAL FNCS  GAM=GAMMA FNC, CERF=ERROR FNC
C          SUBROUTINES  NONE
C
C     ..........................................................................
C
ISN 0007      ROOT2=SQRT(2.0)
ISN 0008      MOD=INT(SYSPAR(2,J)+.1)
ISN 0009      GO TO (10,90,120,160,10), MOD
C     ..........................................................................
C     MODELS 1 AND 5
C
C        VARIABLES     SIZE     ORIGIN       DEFN
C
C          LAMS          1        INT        SENSE/SWITCH FAILURE RATE
C           LAM          1        INT        FAILURE RATE
C            Q           1        INT        DORMANCY FACTOR
C           DC           1        INT        MODULE DUTY CYCLE
C           MI           1        INT        NUM OF STANDBY ELEMENTS
C           NI           1        INT        NUM OF ACTIVE ELEMENTS
```

```
              C         SYSPAR        I,J       GLOBAL        MODEL PARAMETERS FOR J-TH      00006630
              C                                              MODULE                          00006640
              C                                              I=3   VALUE OF LAM              00006650
              C                                              I=4   VALUE OF LAMS             00006660
              C                                              I=5   VALUE OF Q                00006670
              C                                              I=6   VALUE OF DC               00006680
              C                                                                              00006690
              C     ...........................................................................00006700
ISN 0010      10     LAM=SYSPAR(3,J)                                                          00006710
ISN 0011             LAMS=SYSPAR(4,J)                                                         00006720
ISN 0012             Q=SYSPAR(5,J)                                                            00006730
ISN 0013             DC=SYSPAR(6,J)                                                           00006740
ISN 0014             NREQ=NCHOSE(J)                                                           00006750
ISN 0015             NRED=NR(J)                                                               00006751
              C                                                                              00006752
              C                                              CK MODEL TYPE                   00006760
ISN 0016             IF (MOD .EQ. 1) GO TO 15                                                 00006770
ISN 0018             NREQ=1                                                                   00006771
ISN 0019             NRED=NRED/NCHOSE(J)                                                      00006772
ISN 0020             LAM=LAM*FLOAT(NCHOSE(J))                                                 00006773
              C                                                                              00006780
              C                                              CK INCR MODE(  IQ=I ACTIVE      00006790
ISN 0021          15 IQ=INT(Q+.1)                                   OTHERWISE STDBY00006790
ISN 0022             IF (IQ.NE.1) GO TO 20                                                    00006800
              C                                                                              00006810
              C                                              INCR IN ACTIVE MODE             00006820
ISN 0024             NI=NREQ+NRED+IADD                                                        00006820
ISN 0025             MI=0                                                                     00006830
ISN 0026             GO TO 30                                                                 00006840
              C                                                                              00006850
              C                                              INCR IN STANDBY MODE            00006860
ISN 0027      20     NI=NREQ                                                                  00006860
ISN 0028             MI=NRED+IADD                                                             00006870
              C                                                                              00006880
              C                                              CALCULATION OF MODEL CONSTANTS00006890
ISN 0029      30     IF (MI.NE.0) Q=Q+LAMS/LAM                                                00006890
ISN 0031             QBAR=Q/(DC+(1.-DC)*Q)                                                    00006900
ISN 0032             LAMBAR=LAM*(DC+(1.-DC)*Q)                                                00006910
              C                                                                              00006920
              C               ****  COMPUTATION OF RELIABILITIES  ****                       00006930
              C                                                                              00006940
              C                                                                              00006950
              C                                              INITIALIZATIONS                 00006960
```

```
ISN 0033            LIM=NREQ
ISN 0034            LIM2=LIM-1
ISN 0035            DO 80 IND=1,NT
              C                                         DO FOR EACH TIME POINT, IN
              C                                         DESCENDING ORDER, NT TO 1
ISN 0036            I=ITRUNC+1-IND
ISN 0037            TIME=DELH*FLOAT(I-1)
              C                                           SUMO ACCUMULATES RELIABILITY
ISN 0038            SUM0=1.0
              C                                         EXPONENTIAL CONSTANT
              C
ISN 0039            EC1=EXP(-LAMBAR*TIME*FLOAT(NI))
              C
              C                                         CALCULATE PROBABILITIES, IN
              C                                         DESCENDING ORDER, LIM-1 TO 0.
ISN 0040            DO 70 IND2=1,LIM
ISN 0041            K=LIM-IND2
ISN 0042            SUM2=0.0
ISN 0043            SUM1=0.0
              C                                         COMPUTE FIRST SUMMATION
ISN 0044            KLIM=K+1
ISN 0045            NILIM=NI+1
ISN 0046            DO 40 INDD=KLIM,NILIM
ISN 0047            IND3=INDD-1
ISN 0048            ARG1=1.+FLOAT(IND3-K)
ISN 0049            ARG2=FLOAT(NI-IND3)
ISN 0050            ARG3=1.+ARG2/QBAR
ISN 0051            BK=GAM(ARG1)*GAM(ARG2+1.)*GAM(ARG3+FLOAT(MI))/GAM(ARG3)
ISN 0052            IF ((IND3-2*(IND3/2)).EQ.1) BK=-BK
ISN 0054            Z=EXP(-LAMBAR*TIME*FLOAT(IND3))
ISN 0055      40    SUM1=SUM1+Z/BK
              C                                         COMPUTE SECOND SUMMATION
ISN 0056            IF (MI.EQ.0) GO TO 60
ISN 0058            DO 50 IND3=1,MI
ISN 0059            ARG1=FLOAT(IND3)
ISN 0060            ARG2=1.+FLOAT(MI-IND3)
ISN 0061            ARG3=1.+ARG1*QBAR
ISN 0062            CJ=GAM(ARG1+1.)*GAM(ARG2)*GAM(ARG3+FLOAT(NI-K))/GAM(ARG3)
ISN 0063            ICK=NI+IND3
```

```
ISN 0064            IF ((ICK-2*(ICK/2)).EQ.1) CJ=-CJ
ISN 0066            Z=EXP(-Q*LAM*TIME*ARG1)
ISN 0067      50    SUM2=SUM2+Z/CJ
              C
              C
              C                                                CALCULATION OF PROBABILITY(
              C                                                   PR(K)=A(K)*SUMS
ISN 0068      60    SUM2=SUM1+EC1*SUM2
ISN 0069            ARG1=FLOAT(NI)
ISN 0070            ARG2=1.+FLOAT(K)
ISN 0071            ARG3=1.+ARG1/UBAR
ISN 0072            AK=GAM(ARG1+1.)*GAM(ARG3+FLOAT(MI))/(GAM(ARG2)*GAM(ARG3))
ISN 0073            IF ((K-2*(K/2)).EQ.1) AK=-AK
              C
              C
              C                                                ACCUMULATE  RELIABILITY
ISN 0075            SUMO=SUMO-AK*SUM2
ISN 0076      70    CONTINUE
              C
              C                                                CK COUPLING OPTION
              C                                                ASSIGN RELIABILITY AND INCR
              C                                                TIME
ISN 0077            IF (MOD.EQ.3) SUMO=SUMO*R(I)
ISN 0079      80    R(I)=SUMO
              C                                                CK COUPLING OPTION
ISN 0080            IF (MOD.EQ.3) J=J-1
ISN 0082            RETURN
              C
              C     ..................................................................
              C
              C     MODEL2(
              C         VARIABLES     SIZE     ORIGIN          DEFN
              C
              C           FMU          SC       LOCAL          MEAN UNIT LIFE
              C           FSIG         SC       LOCAL          STD. DEV.
              C          SYSPAR        I,J      GLOBAL         MODEL PARAMETERS FOR J-TH
              C                                                MODULE
              C                                                I=3   VALUE OF FMU
              C                                                I=4   VALUE OF FSIG
```

```
                C           NI          SC        LOCAL       TOTAL NUM OF ELEMENTS
                C
                C     *******************************************************************
                C
ISN 0083        90    FMU=SYSPAR(3,J)
ISN 0084              FSIG=SYSPAR(4,J)
                C                                             INCR REDUND.
ISN 0085              LIM=NR(J)+IADD
ISN 0086              NI=LIM+NCHOSE(J)
ISN 0087              LIM2=LIM-1
                C
                C                                             COMPUTE NEW RELIABILITIES
                C
ISN 0088              DO 110 I=1,NT
ISN 0089              K=ITRUNC+1-I
ISN 0090              Z=((DELH*(K-1))-FMU)/(ROOT2*FSIG)
ISN 0091              AN=CLRF(ABS(Z))
ISN 0092              IF (ABS(Z).GT.4.0) AN=1.-AN
ISN 0094              AN=0.5*(1.-AN)
ISN 0095              IF (Z.LT.0.0) AN=1.-AN
                C
                C
                C                                             COMPUTATION OF CUMULATIVE
                C                                             BINOMIAL PROBABILITIES
ISN 0097              Z=AN
ISN 0098              AN=AN**NI
ISN 0099              SUM=AN
ISN 0100              IF (LIM.EQ.0) GO TO 110
ISN 0102              Z=(1.-Z)/Z
ISN 0103              LLLIM=LIM2+1
ISN 0104              DO 100 LLL=1,LLLIM
ISN 0105              L=LLL-1
ISN 0106              AN=AN*(FLOAT(NI-L)/FLOAT(L+1))*Z
ISN 0107        100   SUM=SUM+AN
ISN 0108        110   R(K)=SUM
ISN 0109              RETURN
                C
                C     *******************************************************************
                C
                C     MODEL3(
```


ORIGINAL PAGE IS
OF POOR QUALITY

```
      C          VARIABLES      SIZE     ORIGIN        DEFN
      C
      C             AB           SC       LOCAL        BATTERY CELL CONSTANT
      C             BB           SC       LOCAL        BATTERY CELL CONSTANT
      C             BCYC         SC       LOCAL        CYCLE RATE OF BATTERY
      C             NI           SC       LOCAL        TOTAL NUM OF BATTERIES
      C             NC           SC       LOCAL        NUM OF CELLS IN BATTERY
      C             SYSPAR       I,J      GLOBAL       MODEL PARAMETERS FOR J-TH
      C                                                MODULE
      C                                                I=3   VALUE OF AB
      C                                                I=4   VALUE OF BB
      C                                                I=5   VALUE OF BCYC
      C                                                I=6   VALUE OF NC
      C
      C     ......................................................................
      C
ISN 0110  120    AB=SYSPAR(3,J)
ISN 0111         BB=SYSPAR(4,J)
ISN 0112         BCYC=SYSPAR(5,J)
ISN 0113         NC=SYSPAR(6,J)+.1
      C                                           INCR REDUND.
ISN 0114         LIM=NR(J)+IADD
ISN 0115         NI=LIM+NCHOSE(J)
ISN 0116         LIM2=LIM-1
ISN 0117         LIM3=NC/2
ISN 0118         NC=NC+LIM3
      C                                           COMPUTE NEW RELIABILITIES
      C
ISN 0119         DO 140 I=1,NT
ISN 0120         K=ITRUNC+1-I
ISN 0121         Z=(DELH*(K-1)-43800.)/(8760.*ROOT2)
ISN 0122         AN=CERF(ABS(Z))
ISN 0123         IF (ABS(Z).GT.4.0) AN=1.-AN
ISN 0125         AN=0.5*(1.-AN)
ISN 0126         IF (Z.LT.0.0) AN=1.-AN
ISN 0128         Z=EXP(-((BCYC*(DELH*(K-1)))/AB)**BB)
ISN 0129         LLLIM=LIM3
ISN 0130         AA=Z**NC
ISN 0131         SUM=AA
```

```
ISN 0132              Z=(1.-Z)/Z
ISN 0133              DO 125 LLL=1,LLLIM                                                   00008434
ISN 0134              L=LLL-1                                                              00008435
ISN 0135              AA=AA*(FLOAT(NC-L)/FLOAT(L+1))*Z                                     00008436
ISN 0136          125 SUM=SUM+AA                                                           00008437
ISN 0137              Z=SUM*AN                                                             00008438
              C                                                                            00008439
              C                                                                            00008440
              C                              COMPUTATION OF CUMULATIVE                     00008450
                                             BINOMIAL PROBABILITIES                        00008460
ISN 0138              AN=Z**NI                                                             00008470
ISN 0139              SUM=AN                                                               00008480
ISN 0140              IF (LIM.EQ.0) GO TO 140                                              00008490
ISN 0142              Z=(1.-Z)/Z                                                           00008500
ISN 0143              LLLIM=LIM2+1                                                         00008509
ISN 0144              DO 130 LLL=1,LLLIM                                                   00008510
ISN 0145              L=LLL-1                                                              00008511
ISN 0146              AN=AN*(FLOAT(NI-L)/FLOAT(L+1))*Z                                     00008520
ISN 0147          130 SUM=SUM+AN                                                           00008530
ISN 0148          140 R(K)=SUM                                                             00008540
              C                              CK COUPLING OPTION                            00008550
ISN 0149              IF (IOPT.EQ.0) GO TO 150                                             00008560
ISN 0151              J=J+1                                                                00008570
ISN 0152              GO TO 10                                                             00008580
ISN 0153          150 RETURN                                                               00008590
              C                                                                            00008600
              C       ******************************************************************  00008610
              C                                                                            00008620
              C       MODEL4(                                                              00008630
              C          VARIABLES     SIZE     ORIGIN       DEFN                          00008640
              C                                                                            00008650
              C              FMU        SC       LOCAL       MEAN EXPENABLE DEPLETION TIME 00008660
              C              FSIG       SC       LOCAL       STD. DEV. OF DEPLETION TIME   00008670
              C            SYSPAR       I,J      GLOBAL      MODEL PARAMETERS FOR J-TH     00008680
              C                                              MODULE                        00008690
              C                                              I=3   INITIAL VALUE OF MU     00008700
              C                                              I=4   INITIAL VALUE OF SIG    00008710
              C                                              I=5   INCR. VALUF OF MU       00008720
              C                                              I=6   INCR. VALUE OF SIG      00008730
                                                                                           00008740
```

```
                  C
                  C        ..............................................................
                  C
                  C                                            INCR REDUND.
                  C
   ISN 0154   160     Z=FLOAT(NR(J)+IADD)
   ISN 0155           FMU=SYSPAR(3,J)+Z*SYSPAR(5,J)
   ISN 0156           FSIG=SQRT((SYSPAR(4,J)**2)+Z*(SYSPAR(6,J)**2))
                  C
                  C
                  C                                            COMPUTE NEW RELIABILITIES
                  C
   ISN 0157           DO 170 I=1,NT
   ISN 0158           K=ITRUNC+I-I
   ISN 0159           Z=((DELH*(K-1))-FMU)/(ROOT2*FSIG)
   ISN 0160           R(K)=CERF(ABS(Z))
   ISN 0161           IF (ABS(Z).GT.4.0) R(K)=1.0-R(K)
   ISN 0163           R(K)=0.5*(1.-R(K))
   ISN 0164           IF (Z.LT.0.0) R(K)=1.-R(K)
   ISN 0166   170     CONTINUE
   ISN 0167           RETURN
   ISN 0168           END
*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =      167 ,PROGRAM SIZE =      4534

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******
                                                                  93K BYTES OF CORE NOT USED
```

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        COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                          SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
  ISN 0002                SUBROUTINE QSF(H,Y,Z,NDIM)
                    C
                    C     ..................................................................
                    C
                    C        SUBROUTINE QSF
                    C
                    C        PURPOSE
                    C           TO COMPUTE THE VECTOR OF INTEGRAL VALUES FOR A GIVEN
                    C           EQUIDISTANT TABLE OF FUNCTION VALUES.
                    C
                    C        USAGE
                    C           CALL QSF (H,Y,Z,NDIM)
                    C
                    C        DESCRIPTION OF PARAMETERS
                    C           H      - THE INCREMENT OF ARGUMENT VALUES.
                    C           Y      - THE INPUT VECTOR OF FUNCTION VALUES.
                    C           Z      - THE RESULTING VECTOR OF INTEGRAL VALUES. Z MAY BE
                    C                    IDENTICAL WITH Y.
                    C           NDIM   - THE DIMENSION OF VECTORS Y AND Z.
                    C
                    C        REMARKS
                    C           NO ACTION IN CASE NDIM LESS THAN 3.
                    C
                    C        SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
                    C           NONE
                    C
                    C        METHOD
                    C           BEGINNING WITH Z(1)=0, EVALUATION OF VECTOR Z IS DONE BY
                    C           MEANS OF SIMPSONS RULE TOGETHER WITH NEWTONS 3/8 RULE OR A
                    C           COMBINATION OF THESE TWO RULES. TRUNCATION ERROR IS OF
                    C           ORDER H**5 (I.E. FOURTH ORDER METHOD). ONLY IN CASE NDIM=3
                    C           TRUNCATION ERROR OF Z(2) IS OF ORDER H**4.
                    C           FOR REFERENCE, SEE
                    C           (1) F.B.HILDEBRAND, INTRODUCTION TO NUMERICAL ANALYSIS,
                    C               MCGRAW-HILL, NEW YORK/TORONTO/LONDON, 1956, PP.71-76.
                    C           (2) R.ZURMUEHL, PRAKTISCHE MATHEMATIK FUER INGENIEURE UND
                    C               PHYSIKER, SPRINGER, BERLIN/GOETTINGEN/HEIDELBERG, 1963,
```

```
               C          PP.214-221.
               C
               C    .............................................................
               C
               C
               C
ISN 0003              DIMENSION Y(1),Z(1)
               C
ISN 0004              HT=.3333333*H
ISN 0005              IF(NDIM-5)7,8,1
               C
               C      NDIM IS GREATER THAN 5. PREPARATIONS OF INTEGRATION LOOP
ISN 0006            1 SUM1=Y(2)+Y(2)
ISN 0007              SUM1=SUM1+SUM1
ISN 0008              SUM1=HT*(Y(1)+SUM1+Y(3))
ISN 0009              AUX1=Y(4)+Y(4)
ISN 0010              AUX1=AUX1+AUX1
ISN 0011              AUX1=SUM1+HT*(Y(3)+AUX1+Y(5))
ISN 0012              AUX2=HT*(Y(1)+3.875*(Y(2)+Y(5))+2.625*(Y(3)+Y(4))+Y(6))
ISN 0013              SUM2=Y(5)+Y(5)
ISN 0014              SUM2=SUM2+SUM2
ISN 0015              SUM2=AUX2-HT*(Y(4)+SUM2+Y(6))
ISN 0016              Z(1)=0.
ISN 0017              AUX=Y(3)+Y(3)
ISN 0018              AUX=AUX+AUX
ISN 0019              Z(2)=SUM2-HT*(Y(2)+AUX+Y(4))
ISN 0020              Z(3)=SUM1
ISN 0021              Z(4)=SUM2
ISN 0022              IF(NDIM-6)5,5,2
               C
               C      INTEGRATION LOOP
ISN 0023            2 DO 4 I=7,NDIM,2
ISN 0024              SUM1=AUX1
ISN 0025              SUM2=AUX2
ISN 0026              AUX1=Y(I-1)+Y(I-1)
ISN 0027              AUX1=AUX1+AUX1
ISN 0028              AUX1=SUM1+HT*(Y(I-2)+AUX1+Y(I))
ISN 0029              Z(I-2)=SUM1
ISN 0030              IF(I-NDIM)3,6,6
```

```
ISN 0031        3 AUX2=Y(I)+Y(I)
ISN 0032          AUX2=AUX2+AUX2
ISN 0033          AUX2=SUM2+HT*(Y(I-1)+AUX2+Y(I+1))
ISN 0034        4 Z(I-1)=SUM2
ISN 0035        5 Z(NDIM-1)=AUX1
ISN 0036          Z(NDIM)=AUX2
ISN 0037          RETURN
ISN 0038        6 Z(NDIM-1)=SUM2
ISN 0039          Z(NDIM)=AUX1
ISN 0040          RETURN
           C      END OF INTEGRATION LOOP
           C
ISN 0041        7 IF(NDIM-3)12,11,8
           C
           C      NDIM IS EQUAL TO 4 OR 5
ISN 0042        8 SUM2=1.125*HT*(Y(1)+Y(2)+Y(2)+Y(2)+Y(3)+Y(3)+Y(3)+Y(4))
ISN 0043          SUM1=Y(2)+Y(2)
ISN 0044          SUM1=SUM1+SUM1
ISN 0045          SUM1=HT*(Y(1)+SUM1+Y(3))
ISN 0046          Z(1)=0.
ISN 0047          AUX1=Y(3)+Y(3)
ISN 0048          AUX1=AUX1+AUX1
ISN 0049          Z(2)=SUM2-HT*(Y(2)+AUX1+Y(4))
ISN 0050          IF(NDIM-5)10,9,9
ISN 0051        9 AUX1=Y(4)+Y(4)
ISN 0052          AUX1=AUX1+AUX1
ISN 0053          Z(5)=SUM1+HT*(Y(3)+AUX1+Y(5))
ISN 0054       10 Z(3)=SUM1
ISN 0055          Z(4)=SUM2
ISN 0056          RETURN
           C
           C      NDIM IS EQUAL TO 3
ISN 0057       11 SUM1=HT*(1.25*Y(1)+Y(2)+Y(2)-.25*Y(3))
ISN 0058          SUM2=Y(2)+Y(2)
ISN 0059          SUM2=SUM2+SUM2
ISN 0060          Z(3)=HT*(Y(1)+SUM2+Y(3))
ISN 0061          Z(1)=0.
ISN 0062          Z(2)=SUM1
ISN 0063       12 RETURN
```

```
    ISN 0064            END
                                                                 00010100
*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
*STATISTICS*    SOURCE STATEMENTS =      63 ,PROGRAM SIZE =     1234
*STATISTICS*  NO  DIAGNOSTICS GENERATED
****** END OF COMPILATION ******                          117K BYTES OF CORE NOT USED
```

```
          COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
  ISN 0002            SUBROUTINE DPI (IPIC,IERR,ITER,NCONF,ICHOSE,NCHOSE,NOWAT)              00010110
  ISN 0003            DIMENSION IPIC(2), ICHOSE(2), NCONF(6), NCHOSE(2)                      00010120
  ISN 0004            COMMON /USER3/BTRMX,SCSFL,TPRFL,OPSMS,ARRAYN(11,3),NMSEQ               00010121
  ISN 0005            COMMON /BTHN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,          00010130
                     * LMBDD,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,00010131
                     * SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,HTRPRB,                 00010132
                     * HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),             00010133
                     * EOBLG,SAPOLG,SATWT                                                00010134
  ISN 0006            COMMON /DBCOM/IDB(30),DATAB(55,90)                                     00010150
  ISN 0007            COMMON /CHOSE/ICHOSG(60),NCHOSG(60),COST(5,60),REL(6,60),              00010151
                     * THM(4,60),ARRAY(11,60),SKD(7,60)                                  00010152
  ISN 0008            COMMON /DPITAB/ HSRT(60),TLPTH(60),GRANH(60),XSRT(60),TLPTL(60),GR00010160
                     1ANL(60)                                                            00010170
  ISN 0009            COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMOOLD,TRUNC,ITRUNP,DE,TE,           00010171
                     * TOOLR,QCR,SEIR,PMR,PE,PU,TOOLU,QCP,SEIP,PMP,SATR,SATINV,MER,      00010172
                     * MEINV,PAYR,PAUINV,PAYQUL,GSF,XLTOT,CTOT,FEER,FEEINV,DDTE,XVEST,   00010173
                     * OPS,SKTAU(6),ROLD(60),TSRT1,AN,TS,DS,AM,TF,BF,TC,TA,TB,TOTOPS     00010174
  ISN 0010            DATA ACSRT,ACSOP,COMOP,OPREQ/10.,50.,6.,4./                            00010181
              C        INPUTS  FOR DATA PROCESSING SUBSYSTEMS - DPI                          00010190
              C                                                                              00010200
              C   INPUT   CDPI    T D SOURCE  UNITS  DESCRIPTION                             00010210
              C   VAR.    IN.                                                                00010220
              C                                                                              00010230
              C   GRANH   36      R Y ALL S/S        GRANULARITY HIGH RATE TABLE             00010240
              C   HSRT    35      R Y ALL S/S SPS    SAMPLE RATE HIGH TABLE                  00010250
              C   TLPTH   34+35   R Y ALL S/S        NO OF ANOL AND DIG POINTS HIGH          00010260
              C   GRANL   40      R Y ALL S/S        GRANULARITY LOW RATE TABLE              00010270
              C   XSRT    39      R Y ALL S/S SPS    SAMPLE RATE LOW TABLE                   00010280
              C   TLPTL   37+38   R Y ALL S/S        NO OF ANOL AND DIG POINTS LOW           00010290
              C   SCSFL           R     U            SPECIAL COMMAND SYNC FLAG               00010300
              C   TOTCM   30TO32  R   DB             TOTAL NO OF COMMANDS                    00010310
              C   COMTY           R   MACRO          NCONF(3) - SPEC OR GEN COMPUTER FLAG00010320
              C   TTCPL   32      R                  TIME TAG COMMAND FLAG                   00010330
              C   TPRFL           R   U              TELEM PROCESS FLAG                      00010340
              C   ACSSN           R   SC             SUM OF ACS  SENSOR                      00010350
              C   COMRT           R   COMM           COMMAND RATE                            00010360
              C   OPSMS           R   U      SEC-1   MISSION OPS                             00010370
```

```
              C  MISPD          I    U              MISSION DATA PROC. FLAG                 00010380
              C                                                                             00010390
              C          ERROR FLAGS                                                        00010400
              C          IERR = 1     MUX IS REQUIRED                                       00010410
              C          IERR = 10    WORD LENGTH GREATER THAN 256                          00010420
              C          IERR = 100   BIT RATE IS TOO LARGE                                 00010430
              C          IERR = 1000 SPECIAL COMMAND SYNC FLAG IS NOT EQUAL TO ZERO         00010440
              C          IERR = 10000  J1 .GE. J1E                                          00010450
              C                                                                             00010460
ISN 0011               IERR=0                                                               00010470
ISN 0012               ICHOSE(1)=0                                                          00010471
ISN 0013               ICHOSE(2)=0                                                          00010472
ISN 0014               IF (ITER .EQ. 0) NCHOSE(1)=1                                         00010473
ISN 0016               IF (ITER .EQ. 0) NCHOSE(2)=1                                         00010474
ISN 0018               BITRAT(2)=0.                                                         00010476
ISN 0019               IERR1=0                                                              00010480
ISN 0020               IERR2=0                                                              00010490
ISN 0021               IERR3=0                                                              00010500
ISN 0022               IERR4=0                                                              00010510
ISN 0023               IERR5=0                                                              00010520
ISN 0024               NEWFL=0                                                              00010530
ISN 0025               IF (NCONF(3) .EQ. 2 .AND. NCONF(4) .GT. 3)                           00010560
                      * CALL MIS(IPIC,IERR,ITER,NCONF,ICHOSE,NCHOSE)                        00010561
ISN 0027               IF (NCONF(3) .EQ. 2 .AND. NCONF(4) .GT. 3) GO TO 110                 00010580
ISN 0029               NEWFL=1                                                              00010590
ISN 0030       110     CONTINUE                                                             00010600
ISN 0031               ANULH=0.                                                             00010610
ISN 0032               ANOLL=0.                                                             00010620
ISN 0033               MUX=0                                                                00010630
              C           COMPUTE TABLES                                                    00010640
ISN 0034               TOTCM=0                                                              00010650
ISN 0035               TTCFL=0                                                              00010660
ISN 0036               NTABH=0                                                              00010670
ISN 0037               NTABL=0                                                              00010680
              C      ************  WE NEED NTAB   **********************************        00010690
ISN 0038               NTAB= NOWAT - 1                                                      00010700
              C      *****************************************************************      00010710
ISN 0039               K= -1                                                                00010720
ISN 0040               DO 170 I=1,NTAB                                                      00010730
```

```
ISN 0041          TOTCM=(ARRAY(K+2,I)+ARRAY(K+3,I)+ARRAY(K+4,I))*NCHOSG(I)+TOTCM
ISN 0042          TTCFL=TTCFL+ARRAY(K+4,I)*NCHOSG(I)
ISN 0043          IF (ARRAY(K+7,I).EQ.0.) GO TO 150
ISN 0045          NTABH=NTABH+1
ISN 0046          HSRT(NTABH)=ARRAY(K+7,I)
ISN 0047          GRANH(NTABH)=ARRAY(K+8,I)
ISN 0048          TLPTH(NTABH)=(ARRAY(K+5,I)+ARRAY(K+6,I))*NCHOSG(I)
ISN 0049    150   IF (ARRAY(K+6,I).NE.0.) MUX=1
ISN 0051          IF (ARRAY(K+11,I).EQ.0.) GO TO 160
ISN 0053          NTABL=NTABL+1
ISN 0054          XSRT(NTABL)=ARRAY(K+11,I)
ISN 0055          GRANL(NTABL)=ARRAY(K+12,I)
ISN 0056          TLPTL(NTABL)=(ARRAY(K+9,I)+ARRAY(K+10,I))*NCHOSG(I)
ISN 0057    160   IF (ARRAY(K+10,I).NE.0.) MUX=1
ISN 0059          ANOLH=ANOLH+ARRAY(K+5,I)*NCHOSG(I)
ISN 0060    170   ANOLL=ANOLL+ARRAY(K+9,I)*NCHOSG(I)
ISN 0061          IF (NEWFL.EQ.0) GO TO 240
            C   ***********  WE NEED NTABN  ********************************
ISN 0063          NTABN= NMSEQ
            C   ************************************************************
ISN 0064          K=-1
ISN 0065          DO 230 I=1,NTABN
ISN 0066          TOTCM=TOTCM+ARRAYN(K+2,I)+ARRAYN(K+3,I)+ARRAYN(K+4,I)
ISN 0067          TTCFL=TTCFL+ARRAYN(K+4,I)
ISN 0068          IF (ARRAYN(K+7,I).EQ.0.) GO TO 210
ISN 0070          NTABH=NTABH+1
ISN 0071          HSRT(NTABH)=ARRAYN(K+7,I)
ISN 0072          GRANH(NTABH)=ARRAYN(K+8,I)
ISN 0073          TLPTH(NTABH)=ARRAYN(K+5,I)+ARRAYN(K+6,I)
ISN 0074    210   IF (ARRAYN(K+6,I).NE.0.) MUX=1
ISN 0076          IF (ARRAYN(K+11,I).EQ.0.) GO TO 220
ISN 0078          NTABL=NTABL+1
ISN 0079          XSRT(NTABL)=ARRAYN(K+11,I)
ISN 0080          GRANL(NTABL)=ARRAYN(K+12,I)
ISN 0081          TLPTL(NTABL)=ARRAYN(K+9,I)+ARRAYN(K+10,I)
ISN 0082    220   IF (ARRAYN(K+10,I).NE.0.) MUX=1
ISN 0084          ANOLH=ANOLH+ARRAYN(K+5,I)
ISN 0085    230   ANOLL=ANOLL+ARRAYN(K+9,I)
ISN 0086    240   CONTINUE
```

```
             C           ANOLH--NO OF ANOL PTS  IN HIGH  TAB
             C           ANOLL -NO OF ANOL PTS  IN LOW   TAB
ISN 0087                IF (MUX.NE.0) IERR1=1
ISN 0089                IERR=IERR+IERR1
             C          COUNT NUMBER OF POINTS OF ALL TABLES
ISN 0090                SUMTLP=0.
ISN 0091                JL=0
ISN 0092                BTRFL=0
ISN 0093                IF (BTRMX.NE.1.024E6) BTRFL=1
             C           ORDER TELEM POINTS BY SAMPLE RATE - HIGH
ISN 0095                IF (NTABH.EQ.1) GO TO 280
ISN 0097       250      CONTINUE
ISN 0098                CALL ORDER (NTABH,HSRT,TLPTH,GRANH,XM2,MEDIAN)
ISN 0099                JL=JL+1
ISN 0100                IF (JL.EQ.2) GO TO 280
ISN 0102                DO 270 I=1,MEDIAN
ISN 0103       260      IF (HSRT(I).LE.XM2) GO TO 270
ISN 0105                HSRT(I)=HSRT(I)/2.
ISN 0106                TLPTH(I)=2.*TLPTH(I)
ISN 0107                GO TO 260
ISN 0108       270      CONTINUE
ISN 0109                GO TO 250
ISN 0110       280      SSR=HSRT(1)
             C           SSR = MAIN FRAME RATE
ISN 0111                JL=0
ISN 0112                IF (NTABH.EQ.1) GO TO 320
ISN 0114       290      CONTINUE
ISN 0115                CALL ORDER (NTABH,GRANH,TLPTH,HSRT,XM2,MEDIAN)
ISN 0116                JL=JL+1
ISN 0117                IF (JL.EQ.2) GO TO 320
ISN 0119                DO 310 I=1,MEDIAN
ISN 0120       300      IF (GRANH(I).LE.XM2) GO TO 310
ISN 0122                GRANH(I)=GRANH(I)/2.
ISN 0123                TLPTH(I)=2.*TLPTH(I)
ISN 0124                GO TO 300
ISN 0125       310      CONTINUE
ISN 0126                GO TO 290
ISN 0127       320      SUMWH=0
ISN 0128                DO 330 I=1,NTABH
```

```
ISN 0129    330    SUMWH=SUMWH+TLPTH(I)                                        00011520
             C     SUMWH = NUMBER OF WORDS                                     00011530
ISN 0130           SUMWH=SUMWH*1.2                                             00011540
ISN 0131           IF (SUMWH.LE.256.) GO TO 340                                00011550
ISN 0133           ICHOSE(1)=-1                                                00011560
ISN 0134           IERR2=10                                                    00011570
ISN 0135           IERR=IERR+IERR2                                             00011580
ISN 0136           RETURN                                                      00011590
ISN 0137    340    POWER=16.                                                   00011600
ISN 0138           DO 350 NN=5,8                                               00011610
ISN 0139           N=NN                                                        00011620
ISN 0140           POWER=POWER*2.                                              00011630
ISN 0141           IF (POWER.GE.SUMWH) GO TO 360                               00011640
ISN 0143    350    CONTINUE                                                    00011650
ISN 0144    360    TLMWD=POWER                                                 00011660
             C         MAIN FRAME LENGTH    - TLMWD                            00011670
             C         WDLMAX = WORD LENGTH TO MAX REQUIRED LENGTH             00011680
ISN 0145           WDLMAX=N                                                    00011690
ISN 0146           BIRATE=WDLMAX*TLMWD*SSR                                     00011700
ISN 0147           DO 370 MM=1,18                                              00011710
ISN 0148           N=MM-1                                                      00011720
ISN 0149           TT=2.**N*7.8125                                             00011730
ISN 0150           IF (TT.GE.BIRATE) GO TO 380                                 00011740
ISN 0152    370    CONTINUE                                                    00011750
ISN 0153           ICHOSE(1)=-1                                                00011760
ISN 0154           IERR3=100                                                   00011770
ISN 0155           IERR=IERR+IERR3                                             00011780
             C         IERR = 100    BIT RATE TOO LARGE                        00011790
ISN 0156           RETURN                                                      00011800
ISN 0157    380    BIRATE=TT                                                   00011810
ISN 0158           BITRAT(1)=BIRATE                                            00011815
ISN 0159           JL=0                                                        00011820
             C     ORDER LOW SAMPLE RATE                                       00011830
ISN 0160           IF (NTABL.EQ.1) GO TO 420                                   00011840
ISN 0162    390    CONTINUE                                                    00011850
ISN 0163           CALL ORDER (NTABL,XSR1,TLPTL,GRANL,XM2,MEDIAN)              00011860
ISN 0164           JL=JL+1                                                     00011870
ISN 0165           IF (JL.EQ.2) GO TO 420                                      00011880
ISN 0167           DO 410 I=1,MEDIAN                                           00011890
```

```
ISN 0168   400   IF (XSRT(I).LE.XM2) GO TO 410
ISN 0170         XSRT(I)=XSRT(I)/2.
ISN 0171         TLPTL(I)=TLPTL(I)*2.
ISN 0172         GO TO 400
ISN 0173   410   CONTINUE
ISN 0174         GO TO 390
ISN 0175   420   SFR=XSRT(I)
           C          SFR = HIGHEST RATE IN LOW RATE TABLE
ISN 0176         SFL=SSR/SFR
           C     SFL  SUB FRAME LENGTH
ISN 0177         N=5
ISN 0178         IF (SFL.LE.2.**N) GO TO 440
ISN 0180         N=7
ISN 0181         IF (SFL.GE.2.**N) GO TO 440
ISN 0183         DO 430 N=5,7
ISN 0184         NP1=N+1
ISN 0185         IF (SFL.GE.2.**N.AND.SFL.LE.2.**NP1) GO TO 440
ISN 0187   430   CONTINUE
ISN 0188   440   SFL=2.**N
ISN 0189         SUMWL=0.
ISN 0190         DO 450 I=1,NTABL
ISN 0191   450   SUMWL=SUMWL+TLPTL(I)
ISN 0192         SUMWL=SUMWL*1.2
ISN 0193         NSUBFR=SUMWL/SFL+1
           C     (1) BIT RATE                       TT
           C     (2) WORD LENGTH                    WDLMAX
           C     (3) NUMBER OF M/F WORDS            TLMWD
           C     (4) NUMBER OF SUBFRAMES            NSUBFR
           C     (5) NUMBER OF WORDS PER S/F        SFL
           C     (6) NEED FOR DIGITAL MUX           MUX
           C
           C          SPECIAL COMMAND SYNC FLAG
ISN 0194         IF (SCSFL.NE.0.) IERR4=1000
ISN 0196         IERR=IERR+IERR4
ISN 0197         TOTCM=TOTCM*1.5
ISN 0198         DO 460 NN=1,100
ISN 0199         N=NN
ISN 0200         IF (TOTCM.LE.2.**N) GO TO 470
ISN 0202   460   CONTINUE
```

```
ISN 0203   470   TOTCM=2.**N                                       00012290
ISN 0204         COWDLN=N                                          00012300
ISN 0205         M=NCONF(3)                                        00012310
ISN 0206         GO TO (480,500), M                                00012320
ISN 0207   480   TLMOPS=0                                          00012330
ISN 0208         IF (TPRFL.NE.0.) TLMOPS=TT*OPREQ/WDLMAX           00012340
ISN 0210         IF (TPRFL.NE.0.) GO TO 490                        00012350
ISN 0212         J1=IDB(1)+1                                       00012360
ISN 0213         IPIC(2)=J1                                        00012370
ISN 0214         ICHOSE(2)=DATAB(1,J1)                             00012380
ISN 0215         IF(ITER.EQ.0) NCHOSE(2)= 1                        00012390
ISN 0217         WT= WT + NCHOSE(2)*DATAB(23,J1)                   00012400
ISN 0218         VOL= VOL + NCHOSE(2)*DATAB(24,J1)                 00012410
ISN 0219         PL= PL + NCHOSE(2)*DATAB(16,J1)                   00012420
ISN 0220         PLMIN= PLMIN + NCHOSE(2)*DATAB(18,J1)             00012430
ISN 0221   490   CONTINUE                                          00012440
ISN 0222         ACSOPS=ACSSN*ACSRT*ACSOP                          00012450
ISN 0223         CMDOPS=COMRT*COMOP                                00012460
ISN 0224         TOTOPS=TLMOPS+ACSOPS+CMDOPS+OPSMS                 00012470
ISN 0225         TOTOPS=TOTOPS*1.2*1.5                             00012480
ISN 0226   500   IF (ITER.NE.0) GO TO 510                          00012490
ISN 0228         IERR=0                                            00012500
ISN 0229         NEQUIP=2                                          00012510
ISN 0230         ICHOSE(1)=0                                       00012520
ISN 0231   510   L=1                                               00012530
ISN 0232         J1E=IDB(M)                                        00012540
ISN 0233         IF (IPIC(L).NE.0) GO TO 520                       00012550
ISN 0235         J1=1                                              00012560
ISN 0236         IF (M.NE.1) J1=IDB(M-1)+1                         00012570
ISN 0238         GO TO 540                                         00012580
ISN 0239   520   IF (ITER.EQ.0) GO TO 530                          00012590
ISN 0241         J1=IPIC(L)                                        00012600
ISN 0242         GO TO 540                                         00012610
ISN 0243   530   IF (J1.GE.J1E) GO TO 570                          00012620
ISN 0245         J1=IPIC(L)+1                                      00012630
ISN 0246   540   HARPAR=DATAB(6,J1)*1000.                          00012640
ISN 0247         GO TO (560,550), M                                00012650
ISN 0248   550   IPIC(L)=J1                                        00012660
ISN 0249         ICHOSE(L)=DATAB(1,J1)                             00012670
```

```
      ISN 0250             IF(ITER.EQ.0) NCHOSE(L)=1
      ISN 0252             WT= WT + NCHOSE(L)*DATAB(23,J1)
      ISN 0253             VOL= VOL + NCHOSE(L)*DATAB(24,J1)
      ISN 0254             PL= PL + NCHOSE(L)*DATAB(16,J1)
      ISN 0255             PLMIN= PLMIN + NCHOSE(L)*DATAB(18,J1)
      ISN 0256             RETURN
      ISN 0257      560    HARPAR=DATAB(6,J1)*1000.
      ISN 0258             IF (TOTOPS.LE.HARPAR) GO TO 550
      ISN 0260             IF (J1.GE.J1E) GO TO 570
      ISN 0262             J1=J1+1
      ISN 0263             GO TO 560
      ISN 0264      570    IERR5=10000
      ISN 0265             IERR=IERR+IERR5
      ISN 0266             ICHOSE(L)=-1
      ISN 0267             RETURN
      ISN 0268             END

*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =      267 ,PROGRAM SIZE =      5146

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                                    81K BYTES OF CORE NOT USED
```

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```
          COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                             SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
  ISN 0002                SUBROUTINE ORDER (N,A,B,C,XM2,MEDIAN)
                   C      ORDERS ARRAYS AND GETS MEDIAN VALUES
  ISN 0003                DIMENSION A(1), B(1), C(1)
  ISN 0004                MEDIAN=N/2
  ISN 0005                KK=MEDIAN*2
  ISN 0006                KKK=2
  ISN 0007                IF (KK.NE.N) KKK=1
                   C      KKK = 1 , ODD NUMBER OF POINTS
  ISN 0009                DO 20 I=1,N
  ISN 0010                IF (A(I).EQ.0.) GO TO 20
  ISN 0012                XLG=A(I)
  ISN 0013                JJ=I
  ISN 0014                DO 10 J=I,N
  ISN 0015                IF (XLG.GE.A(J)) GO TO 10
  ISN 0017                XLG=A(J)
  ISN 0018                JJ=J
  ISN 0019         10     CONTINUE
  ISN 0020                IF (I.EQ.JJ) GO TO 20
  ISN 0022                AS=A(I)
  ISN 0023                BS=B(I)
  ISN 0024                CS=C(I)
  ISN 0025                A(I)=A(JJ)
  ISN 0026                B(I)=B(JJ)
  ISN 0027                C(I)=C(JJ)
  ISN 0028                A(JJ)=AS
  ISN 0029                B(JJ)=BS
  ISN 0030                C(JJ)=CS
  ISN 0031         20     CONTINUE
  ISN 0032                GO TO (30,40), KKK
  ISN 0033         30     XM2=A(MEDIAN)*2.
  ISN 0034                RETURN
  ISN 0035         40     XM2=A(MEDIAN)+A(MEDIAN+1)
  ISN 0036                RETURN
  ISN 0037                END

*OPTIONS IN EFFECT*      NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*      SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
```

```
*STATISTICS*     SOURCE STATEMENTS =       36 ,PROGRAM SIZE =       824

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                                        125K BYTES OF CORE NOT USED
```

```
COMPILER OPTIONS - NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,
                          SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF
ISN 0002         SUBROUTINE MIS (IPIC,IERR,ITER,NCONF,ICHOSE,NCHOSE)            00013180
ISN 0003         DIMENSION IPIC(2), ICHOSE(2), NCONF(6), NCHOSE(2)              00013190
ISN 0004         COMMON /USER3/BTRMX,SCSFL,TPRFL,OPSMS,ARRAYN(11,3),NMSEQ       00013191
ISN 0005         COMMON /BTWN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,  00013192
                * LMBOD,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,00013193
                * SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,HTRPRB,             00013194
                * HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),         00013195
                * EQLLG,SABOLG,SATWT                                            00013196
ISN 0006         COMMON /DBCOM/IDB(30),DATAB(55,90)                             00013200
ISN 0007         COMMON /CHOSE/ICHOSG(60),NCHOSG(60),COST(5,60),REL(6,60),      00013210
                * THM(4,60),ARRAY(11,60),SKD(7,60)                              00013220
ISN 0008         COMMON /MISTAB/ HSRT(60),TLPTH(60),GRANH(60),XSRT(60),TLPTL(60),GR00013230
                1ANL(60)                                                        00013240
           C          INPUTS  FOR DATA PROCESSING SUBSYSTEMS - MIS              00013260
           C                                                                    00013270
           C  INPUT  CDPI    T D SOURCE  UNITS  DESCRIPTION                      00013280
           C  VAR.   IN.                                                        00013290
           C                                                                    00013300
           C  GRANH  36      R Y ALL S/S        GRANULARITY HIGH RATE TABLE      00013310
           C  HSRT   35      R Y ALL S/S SPS    SAMPLE RATE HIGH TABLE           00013320
           C  TLPTH  34+35   R Y ALL S/S        NO OF ANOL AND DIG POINTS HIGH   00013330
           C  GRANL  40      R Y ALL S/S        GRANULARITY LOW RATE TABLE       00013340
           C  XSRT   39      R Y ALL S/S SPS    SAMPLE RATE LOW TABLE            00013350
           C  TLPTL  37+38   R Y ALL S/S        NO OF ANOL AND DIG POINTS LOW    00013360
           C  SCSFL          R    U             SPECIAL COMMAND SYNC FLAG        00013370
           C  TOTCM  30TO32  R    DB            TOTAL NO OF COMMANDS             00013380
           C  COMTY          R    MACRO         NCONF(3) - SPEC OR GEN COMPUTER FLAG00013390
           C  TTCPL  32      R                  TIME TAG COMMAND FLAG            00013400
           C  TPRFL          R    U             TELEM PROCESS FLAG               00013410
           C  ACSSN          R    SC            SUM OF ACS  SENSOR               00013420
           C  COMRT          R    COMM          COMMAND RATE                     00013430
           C  OPSMS          R    U       SEC-1 MISSION OPS                      00013440
           C  MISPD          I    U             MISSION DATA PROC. FLAG          00013450
           C                                                                    00013460
           C          ERROR FLAGS                                               00013470
           C          IERR = 1    MUX IS REQUIRED                               00013480
           C          IERR = 10   WORD LENGTH GREATER THAN 256                  00013490
```

```
                C         IERR = 100  BIT RATE IS TOO LARGE
                C         IERR = 1000 SPECIAL COMMAND SYNC FLAG IS NOT EQUAL TO ZERO
                C         IERR = 10000  J1 .GE. J1E
                C
ISN 0009                IERR=0
ISN 0010                IERR1=0
ISN 0011                IERR2=0
ISN 0012                IERR3=0
ISN 0013                IERR4=0
ISN 0014                IERR5=0
ISN 0015                ANOLH=0.
ISN 0016                ANOLL=0.
ISN 0017                MUX=0
                C         COMPUTE TABLES
ISN 0018                TOTCM=0
ISN 0019                TTCFL=0
ISN 0020                NTABH=0
ISN 0021                NTABL=0
                C    ***********  WE NEED NTABN  ***********************************
ISN 0022                NTABN= NMSEQ
                C    ***************************************************************
ISN 0023                K= -I
ISN 0024                DO 60 I=1,NTABN
ISN 0025                TOTCM=TOTCM+ARRAYN(K+2,I)+ARRAYN(K+3,I)+ARRAYN(K+4,I)
ISN 0026                TTCFL=TTCFL+ARRAYN(K+4,I)
ISN 0027                IF (ARRAYN(K+7,I).EQ.0.) GO TO 40
ISN 0029                NTABH=NTABH+1
ISN 0030                HSRT(NTABH)=ARRAYN(K+7,I)
ISN 0031                GRANH(NTABH)=ARRAYN(K+8,I)
ISN 0032                TLPTH(NTABH)=ARRAYN(K+5,I)+ARRAYN(K+6,I)
ISN 0033        40      IF (ARRAYN(K+6,I).NE.0.) MUX=1
ISN 0035                IF (ARRAYN(K+11,I).EQ.0.) GO TO 50
ISN 0037                NTABL=NTABL+1
ISN 0038                XSRT(NTABL)=ARRAYN(K+11,I)
ISN 0039                GRANL(NTABL)=ARRAYN(K+12,I)
ISN 0040                TLPTL(NTABL)=ARRAYN(K+9,I)+ARRAYN(K+10,I)
ISN 0041        50      IF (ARRAYN(K+10,I).NE.0.) MUX=1
ISN 0043                ANOLH=ANOLH+ARRAYN(K+5,I)
ISN 0044        60      ANOLL=ANOLL+ARRAYN(K+9,I)
```

```
                C        ANOLH--NO OF ANOL PTS IN HIGH  TAB
                C        ANOLL -NO OF ANOL PTS IN LOW   TAB
ISN 0045                 IF (MUX.NE.0) IERR1=1
ISN 0047                 IERR=IERR+IERR1
                C        COUNT NUMBER OF POINTS OF ALL TABLES
ISN 0048                 SUMTLP=0.
ISN 0049                 JL=0
ISN 0050                 BTRFL=0
ISN 0051                 IF (BTRMX.NE.1.024E6) BTRFL=1
                C           ORDER TELEM POINTS BY SAMPLE RATE - HIGH
ISN 0053                 IF (NTABH.EQ.1) GO TO 100
ISN 0055        70       CONTINUE
ISN 0056                 CALL ORDER (NTABH,HSRT,TLPTH,GRANH,XM2,MEDIAN)
ISN 0057                 JL=JL+1
ISN 0058                 IF (JL.EQ.2) GO TO 100
ISN 0060                 DO 90 I=1,MEDIAN
ISN 0061        80       IF (HSRT(I).LE.XM2) GO TO 90
ISN 0063                 HSRT(I)=HSRT(I)/2.
ISN 0064                 TLPTH(I)=2.*TLPTH(I)
ISN 0065                 GO TO 80
ISN 0066        90       CONTINUE
ISN 0067                 GO TO 70
ISN 0068        100      SSR=HSRT(1)
                C           SSR = MAIN FRAME RATE
ISN 0069                 IF (NTABH.EQ.1) GO TO 140
ISN 0071                 JL=0
ISN 0072        110      CONTINUE
ISN 0073                 CALL ORDER (NTABH,GRANH,TLPTH,HSRT,XM2,MEDIAN)
ISN 0074                 JL=JL+1
ISN 0075                 IF (JL.EQ.2) GO TO 140
ISN 0077                 DO 130 I=1,MEDIAN
ISN 0078        120      IF (GRANH(I).LE.XM2) GO TO 130
ISN 0080                 GRANH(I)=GRANH(I)/2.
ISN 0081                 TLPTH(I)=2.*TLPTH(I)
ISN 0082                 GO TO 120
ISN 0083        130      CONTINUE
ISN 0084                 GO TO 110
ISN 0085        140      SUMWH=0
ISN 0086                 DO 150 I=1,NTABH
```

```
ISN 0087     150   SUMWH=SUMWH+TLPTH(I)                                           00014280
             C     SUMWH = NUMBER OF WORDS                                        00014290
ISN 0088           SUMWH=SUMWH*1.2                                                00014300
ISN 0089           IF (SUMWH.LE.256.) GO TO 160                                   00014310
ISN 0091           ICHOSE(1)=-1                                                   00014320
ISN 0092           IERR2=10                                                       00014330
ISN 0093           IERR=IERR+IERR2                                                00014340
ISN 0094           RETURN                                                         00014350
ISN 0095     160   POWER=16.                                                      00014360
ISN 0096           DO 170 NN=5,8                                                  00014370
ISN 0097           N=NN                                                           00014380
ISN 0098           POWER=POWER*2.                                                 00014390
ISN 0099           IF (POWER.GE.SUMWH) GO TO 180                                  00014400
ISN 0101     170   CONTINUE                                                       00014410
ISN 0102     180   TLMWD=POWER                                                    00014420
             C         MAIN FRAME LENGTH   - TLMWD                                00014430
             C         WDLMAX = WORD LENGTH TO MAX REQUIRED LENGTH                00014440
ISN 0103           WDLMAX=N                                                       00014450
ISN 0104           BIRATE=WDLMAX*TLMWD*SSR                                        00014460
ISN 0105           DO 190 MM=1,18                                                 00014470
ISN 0106           N=MM-1                                                         00014480
ISN 0107           TT=2.**N*7.8125                                                00014490
ISN 0108           IF (TT.GE.BIRATE) GO TO 200                                    00014500
ISN 0110     190   CONTINUE                                                       00014510
ISN 0111           ICHOSE(1)=-1                                                   00014520
ISN 0112           IERR3=100                                                      00014530
ISN 0113           IERR=IERR+IERR3                                                00014540
             C         IERR = 100   BIT RATE TOO LARGE                            00014550
ISN 0114           RETURN                                                         00014560
ISN 0115     200   BIRATE=TT                                                      00014570
ISN 0116           BITRAT(2)=BIRATE                                               00014575
ISN 0117           IF (NTABL.EQ.1) GO TO 240                                      00014580
ISN 0119           JL=0                                                           00014590
             C     ORDER LOW SAMPLE RATE                                          00014600
ISN 0120     210   CONTINUE                                                       00014610
ISN 0121           CALL ORDER (NTABL,XSRT,TLPTL,GRANL,XM2,MEDIAN)                 00014620
ISN 0122           JL=JL+1                                                        00014630
ISN 0123           IF (JL.EQ.2) GO TO 240                                         00014640
ISN 0125           DO 230 I=1,MEDIAN                                              00014650
```

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```
ISN 0126      220    IF (XSRT(I).LE.XM2) GO TO 230
ISN 0128             XSRT(I)=XSRT(1)/2.
ISN 0129             TLPTL(I)=TLPTL(1)*2.
ISN 0130             GO TO 220
ISN 0131      230    CONTINUE
ISN 0132             GO TO 210
ISN 0133      240    SFR=XSRT(I)
              C          SFR = HIGHEST RATE IN LOW RATE TABLE
ISN 0134             SFL=SSR/SFR
              C      SFL  SUB FRAME LENGTH
ISN 0135             N=5
ISN 0136             IF (SFL.LE.2.**N) GO TO 260
ISN 0138             N=7
ISN 0139             IF (SFL.GE.2.**N) GO TO 260
ISN 0141             DO 250 N=5,7
ISN 0142             NP1=N+1
ISN 0143             IF (SFL.GE.2.**N.AND.SFL.LE.2.**NP1) GO TO 260
ISN 0145      250    CONTINUE
ISN 0146      260    SFL=2.**N
ISN 0147             SUMWL=0.
ISN 0148             DO 270 I=1,NTABL
ISN 0149      270    SUMWL=SUMWL+TLPTL(I)
ISN 0150             SUMWL=SUMWL*1.2
ISN 0151             NSUBFR=SUMWL/SFL+1
              C      (1) BIT RATE                     TT
              C      (2) WORD LENGTH                  WDLMAX
              C      (3) NUMBER OF M/F WORDS          TLMWD
              C      (4) NUMBER OF SUBFRAMES          NSUBFR
              C      (5) NUMBER OF WORDS PER S/F      SFL
              C      (6) NEED FOR DIGITAL MUX         MUX
              C
ISN 0152             J1=IDB(1)+1
ISN 0153             IPIC(2)=J1
ISN 0154             ICHOSE(2)=DATAB(I,J1)
ISN 0155             IF(ITER.EQ.0) NCHOSE(2)=1
ISN 0157             WT= WT + NCHOSE(2)*DATAB(23,J1)
ISN 0158             VOL= VOL + NCHOSE(2)*DATAB(24,J1)
ISN 0159             PL= PL + NCHOSE(2)*DATAB(16,J1)
ISN 0160             PLMIN= PLMIN + NCHOSE(2)*DATAB(18,J1)
```

```
   ISN 0161          RETURN                                                    00015050
   ISN 0162          END                                                       00015060

*OPTIONS IN EFFECT*     NAME=  MAIN,OPT=01,LINECNT=41,SIZE=0000K,

*OPTIONS IN EFFECT*     SOURCE,EBCDIC,NOLIST,NODECK,LOAD,NOMAP,NOEDIT,ID,NOXREF

*STATISTICS*     SOURCE STATEMENTS =      161 ,PROGRAM SIZE =     2900

*STATISTICS*  NO  DIAGNOSTICS GENERATED

****** END OF COMPILATION ******                                  101K BYTES OF CORE NOT USED

*STATISTICS*  NO  DIAGNOSTICS THIS STEP
```

10. DETAILED FLOW CHARTS

The following are detailed flow charts of the entire model.

```
*DECK NASA
C        THIS IS THE MAIN DRIVER
C        IT SEQUENCES ALL SEGMENTS OF CODING.HANDLES I/O.SETS
C        CONFIGURATIONS
```

```
COMMON/USER1/DPHI.FE.TSMALL.XNU.PDDTO.TAUX.TAUY.TAUZ.T.
PHIRX.PHIRY.PHIRZ.PDDTX.PDDTY.PDDTZ.XN.YN.ZN.PDDTRX.PDDTRY.
PDDTRZ.OMEGS.OMEGR.PJ.XNN.K.MANV.IPAWAW.EP1.AX.AY.AZ.
EA.EANT.ALPHA.TL.TACCEL.XNNN.THOLD.PDDTAV.PDDTST.PHIFOV.ISAT
```

```
COMMON /USER2/TTHST.CLIFE
COMMON /USER3/BTRMX.SCSFL.TPRFL.OPSMS.ARRAYN(11.3).NMSEQ
```

```
COMMON /USER4/IOPTCM(3).IMSSEP.ISEQ.LSOLS.LUSB.FREQ(2).APOGEE.
 NET.NADIR.FREQR.COMRAT.BWIDTH(2)
```

```
COMMON /USER5/IVOLT.OPTEMP
```

```
COMMON /USER6/EQPF.MD12SH.EQM1XL.EQM1YL.EQM1ZL.EQM2XL.EQM2YL.
 EQM2ZL.ISBOFG.NUMEEQ.EEQWT(9).EEQVL(9).EM1YCG.EM1ZCG.EM2YCG.
 EM2ZCG.COEEX(9).EELOC(9).XCOSA1.XCOSA3
```

```
COMMON /USER7/ISATOR.ORBINC
COMMON /USER8/SKOME(7.3)
COMMON /USER9/CA.CE
```

```
COMMON /BTWN/WT.VOL.DT.D.DX.DY.DZ.XJ.YJ.ZJ.RJ.FF.TI.PL.PLMIN.
 LMBDD.AREA.SATLG.WATE.NC.ACSWP.HARNWT.THCMWT.CONVWT.TNKWT.PASSTR.
 SATTWT.TPRIM.IBTLOC.RADA.RADAB.RAT.HTRPWR.HTRPRD.
 HPT.HTPIPE.VCHP.HTPT.FC.XNZERO.COMRT.ACSSW.BITRAT(2).
 EQBLG.SABDLG.SATWT
```

```
COMMON /DBCOM/IDB(30).DATAB(55.90)
COMMON /USERI/EQM1WT.EQM2WT.DIAMAX.ALT
COMMON /USERR/KEOPT.SYSLB.RFIXED.SLBMX.ISPT.SPEC(6).SPEC1.ISUB
```

```
COMMON /CHOSE/ICHOSE(60).NCHOSE(60).COST(5.60).REL(6.60).THM(4.60)
.DPIA(11.60).SKD(7.60)
```

```
COMMON /USERC/NFV.NQV.XMER.XMEU.FEEPCT.IMETYP
```

```
COMMON /PRTCOM/ACCRCY.CISTAR.IREL.MMODLD.TRUNC.ITRUNC.DE.TE.
 TOOLR.QCR.SEIR.PMR.PE.PU.TOOLU.QCP.SEIP.PMP.SATR.SATINV.MER.
 MEINV.PAYR.PAYINV.PAYQUL.GSE.XLTOT.CTOT.FEER.FEEINV.DDTE.XVEST.
 OPS.SKTAU(6).ROLD(60).TTT.AN.TS.BS.AM.TF.BF.TC.TA.TB.TOTOPS
```

```
DIMENSION NCONF(6).NEQUIP(5).IERR(7).IPIC1(3).IPIC2(9).IPIC3(2).
 IPIC4(9).IPIC5(5).ICHOS1(9).ICHOS2(14).ICHOS3(2).ICHOS4(11).
ICHOS5(5).NCHOS1(9).NCHOS2(14).NCHOS3(2).NCHOS4(11).NCHOS5(5)
```

```
NAMELIST /MODE/MICRO.ISTRT1.IEND1.ISTRT2.IEND2.ISTRT3.IEND3.
 ISTRT4.IEND4.ISTRT5.IEND5.ISTRT6.IEND6.ISTRTR.IENDR
```

CONT. ON PG 2

002

```
NAMELIST/USRSC/DPHI.FE.TSMALL.XNU.PDOTO.TAUX.TAUY.TAUZ.T.
PHIRX.PHIRY.PHIRZ.PDOTX.PDOTY.PDOTZ.XN.YN.ZN.PDOTRX.PDOTRY.
PDOTRZ.OMEGS.OMEGA.PJ.XNN.K.MANV.IPAWAW.EPI.AX.AY.AZ.
 EA.EANT.ALPHA.TL.TACCEL.XNNN.THOLD.PDOTAV.PDOTST.PHIFOV

NAMELIST /USRAP/CLIFE
NAMELIST /USRDP/BTRMX.SCSFL.TPRFL.OPSMS.ARRAYN.MISPD.NMSEQ

NAMELIST /USRCM/IOPTCM.IMSSEP.LSOLS.LUSB.FREQ.APOGEE.NET.NADIR.
 FREQR.COMRAT.BWIDTH

NAMELIST /USREP/IVOLT.OPTEMP
NAMELIST /USRTH/ISATOR.ORBINC
NAMELIST /USRRE/KEOPT.SYSLB.RFIXED.SLBMX.ISPT.SPEC.SPEC1.ISUB
NAMELIST /USRCS/NFV.NOV.XMER.XMEU.FEEPCT.IMETYP

NAMELIST/USRVS/EQPF.MD12SH.EQM1XL.EQM1YL.EQM1ZL.EQM2XL.EQM2YL.
 EQM2ZL.ISBOFG.NUMEEQ.EEQWT.EEQVL.EM1YCG.EM1ZCG.EM2YCG.
 EM2ZCG.CGEEX.EELOC.XCOSA1.XCOSA3

NAMELIST /USRSK/SKOME
NAMELIST /USRST/CA.CE
NAMELIST/USRI/EQM1WT.EQM2WT.DIAMAX.ALT
DATA NEQUIP.NACCEP/6*0/

DATA ISTRT1.IEND1.ISTRT2.IEND2.ISTRT3.IEND3.ISTRT4.IEND4.ISTRT5.
IEND5.ISTRT6.IEND6.ISTRTR.IENDR/1.5.1.3.1.2.1.5.1.6.1.3.0.1/

DATA ITEST1.ITEST2.ITEST3.ITEST4.ITEST5/9.14.2.11.5/
READ (5.MODE)
READ (5.USRSC)
READ (5.USRAP)
READ (5.USRDP)
READ (5.USRCM)
READ (5.USREP)
READ (5.USRVS)

READ (5.USRI)
READ (5.USRTH)
READ (5.USRRE)
READ (5.USRSK)
READ (5.USRST)
READ (5.USRCS)
TTHST=FE
ISEQ=ISATOR

IREL=ISTRTR
ISAT=ISATOR

A1 15

2
DO 1 I1=ISTRT1.IEND1
```

CONT. ON PG 3

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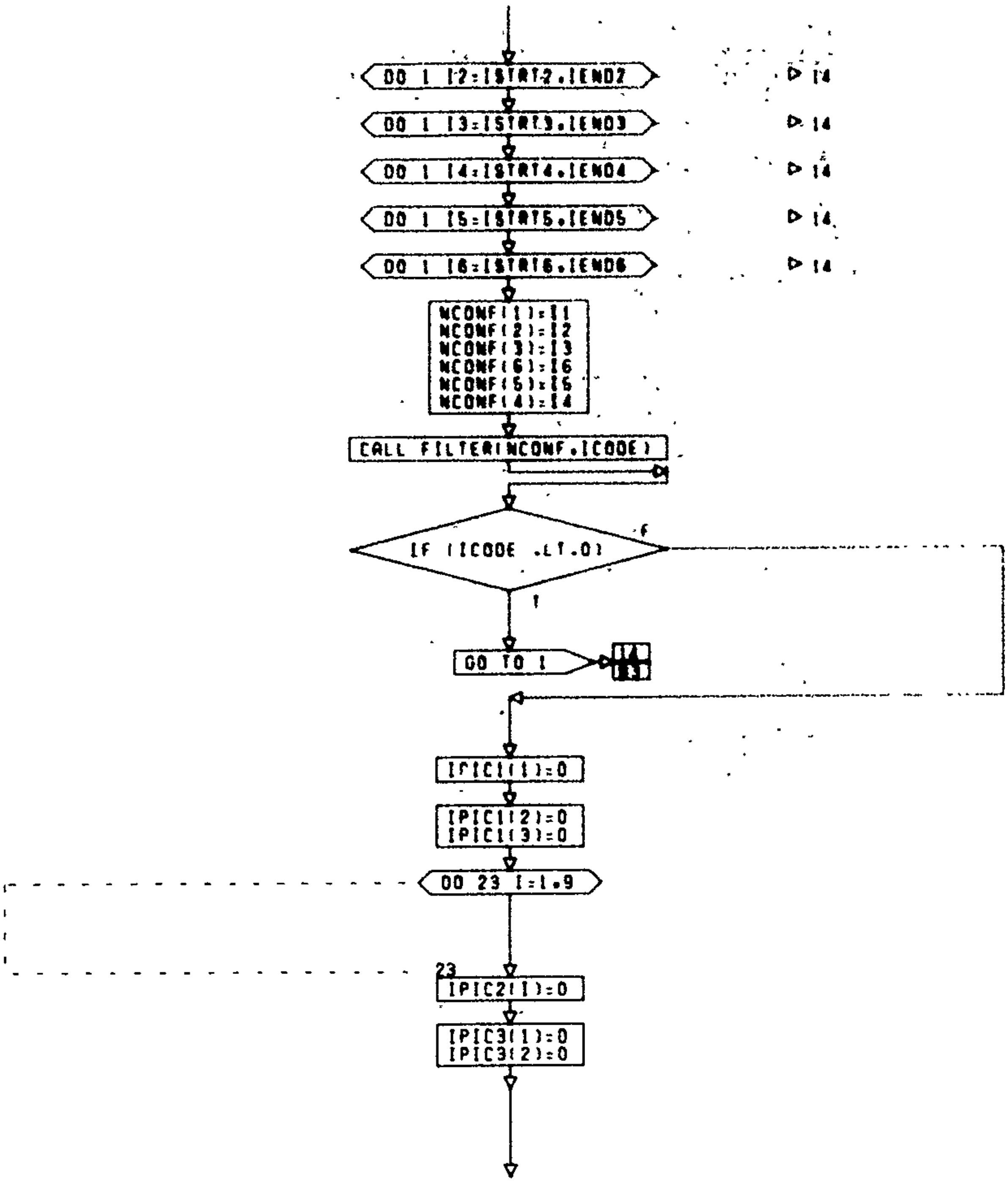
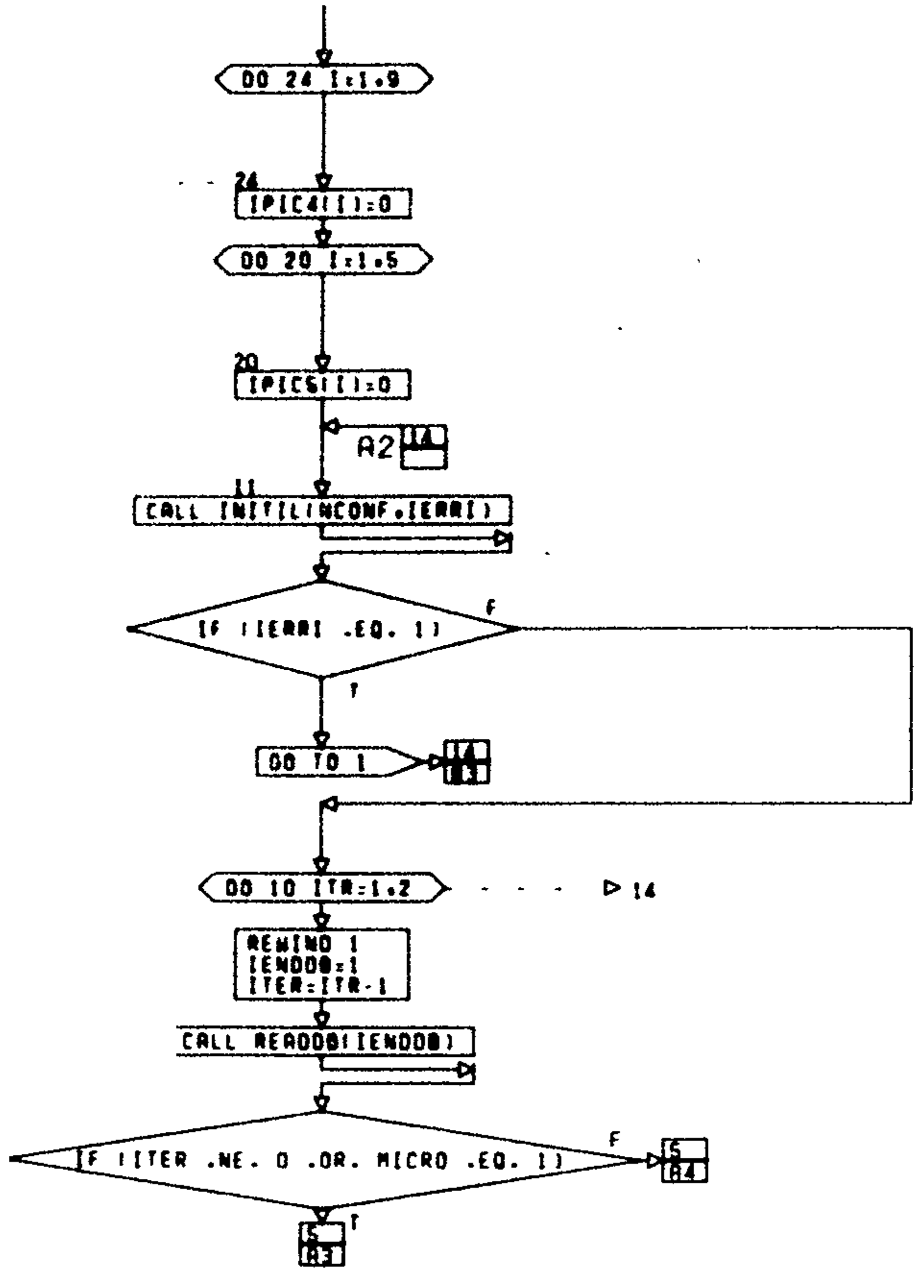
OF POOR QUALITY



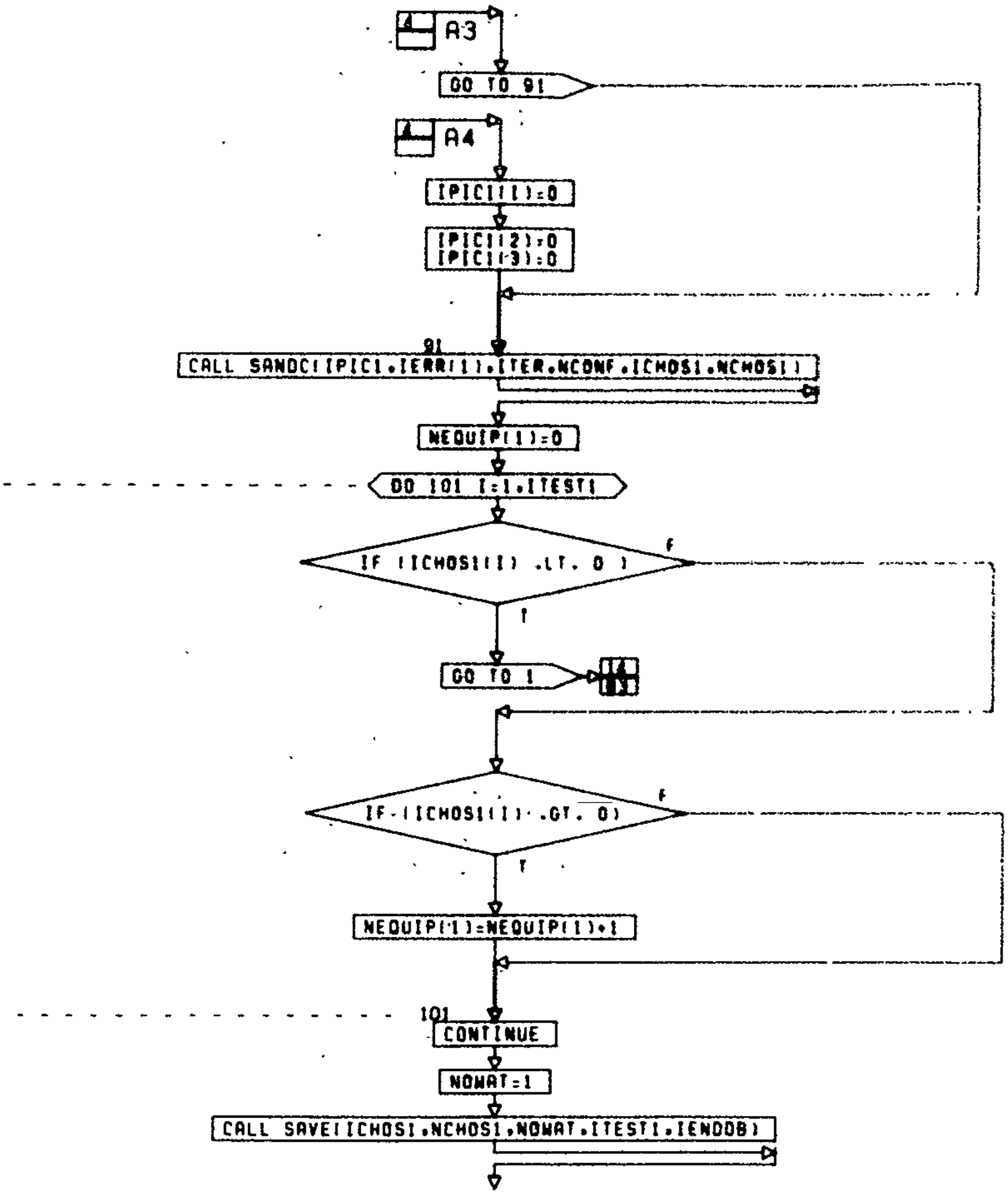
CONT. ON PG 4

PG 3 OF 15

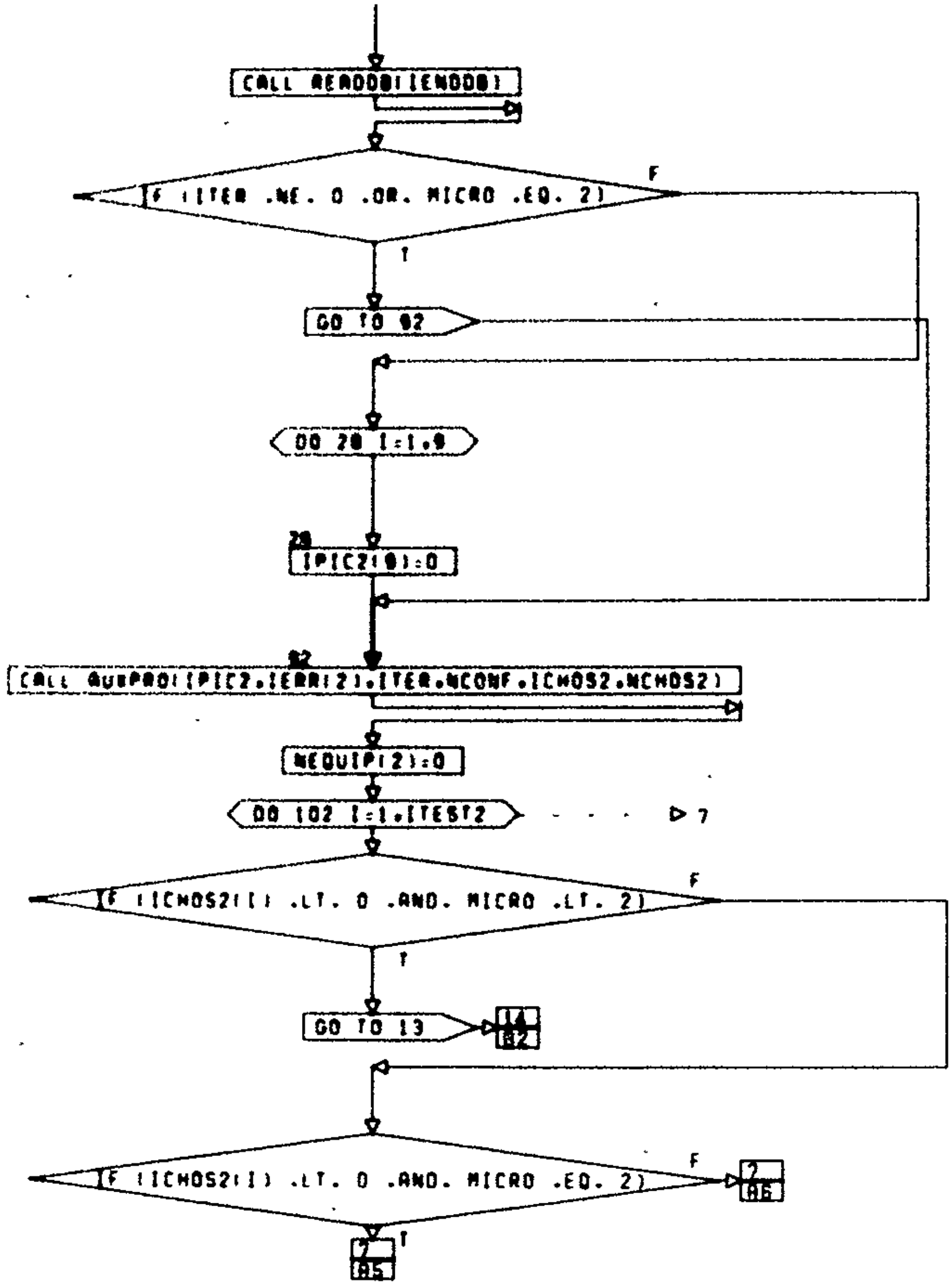
003


DO 24 I=1,9
24
IPIC4(I)=0
DO 20 I=1,5
20
IPIC5(I)=0
A2
1A
11
CALL INITIL(NCONF,IERR)
IF (IERR .EQ. 1)
F
T
GO TO 1
1A
B3
DO 10 ITR=1,2
14
REWIND 1
IENDDB=1
ITER=ITR-1
CALL READDB(IENDDB)
IF (ITER .NE. 0 .OR. MICRO .EQ. 1)
F
T
5
B4
5
B3

CONT. ON PG 5

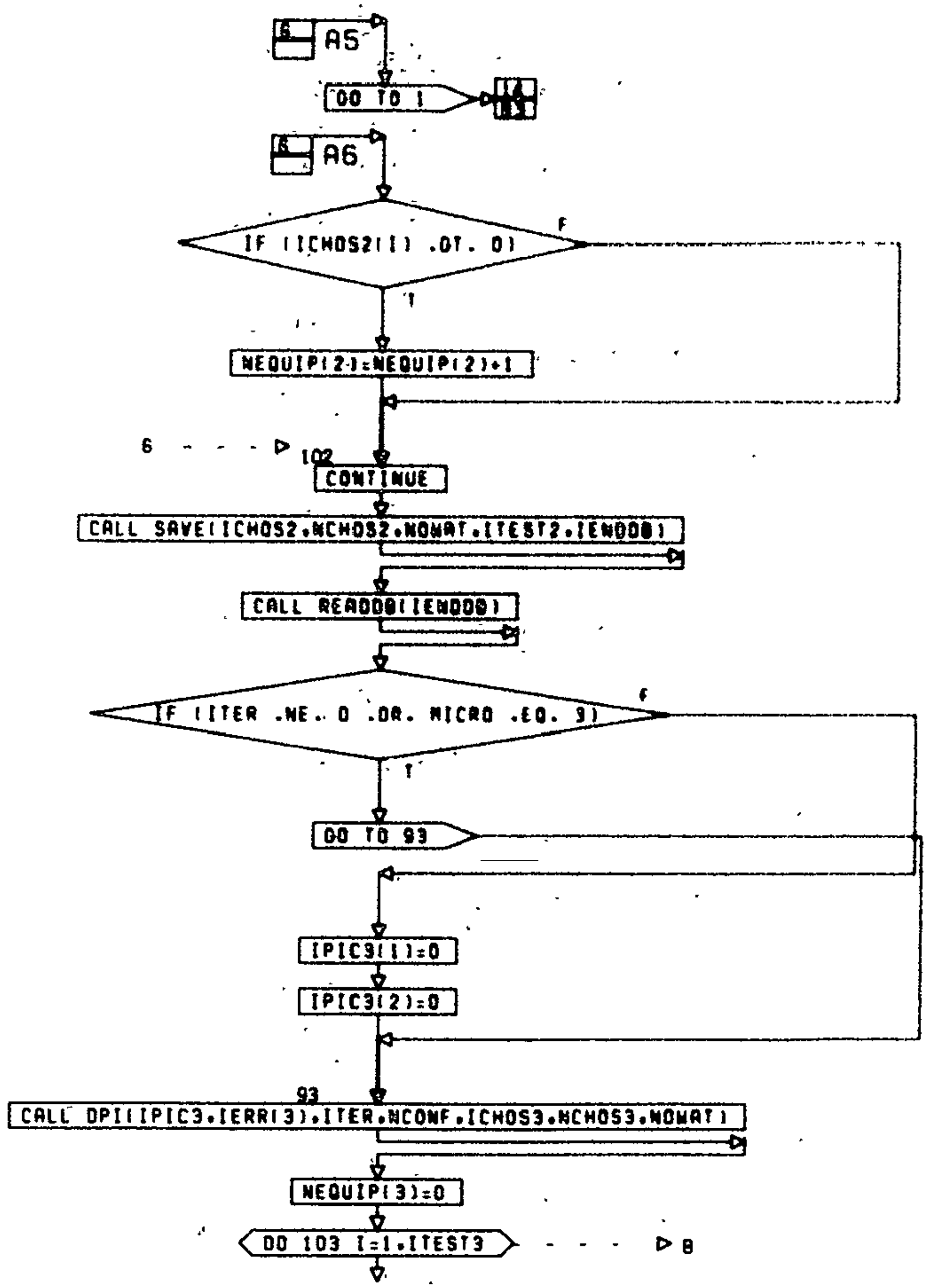

A3
GO TO 91
A4
IPIC(1):0
IPIC(2):0
IPIC(3):0
91
CALL SANDC(IPIC,IERR(1),ITER,NCONF,ICHOS1,NCHOS1)
NEQUIP(1)=0
DO 101 I=1,ITEST1
IF (ICHOS1(I) .LT. 0)
F
T
GO TO 1
IF (ICHOS1(I) .GT. 0)
F
T
NEQUIP(1)=NEQUIP(1)+1
101
CONTINUE
NOWAT=1
CALL SAVE(ICHOS1,NCHOS1,NOWAT,ITEST1,IENDOB)

CONT. ON PG 6

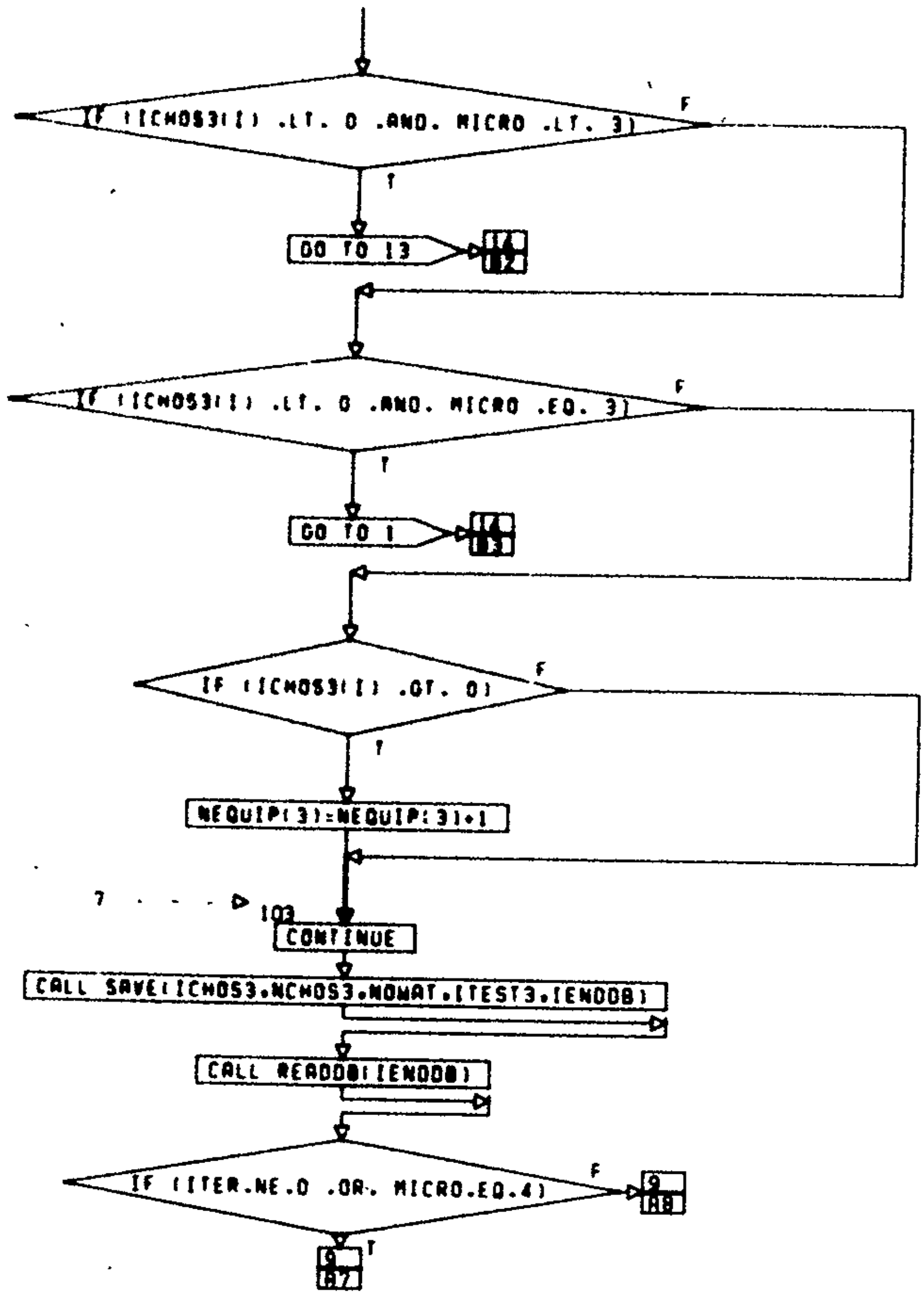


CALL READOB(IENDOB)
IF (ITER .NE. 0 .OR. MICRO .EQ. 2)
F
T
GO TO 92
DO 20 I=1,9
20
IPIC2(I)=0
92
CALL AUXPRO(IPIC2,IERR(2),ITER,NCONF,ICHOS2,NCHOS2)
NEQUIP(2)=0
DO 102 I=1,ITEST2
7
IF (ICHOS2(I) .LT. 0 .AND. MICRO .LT. 2)
F
T
GO TO 13
14
B2
IF (ICHOS2(I) .LT. 0 .AND. MICRO .EQ. 2)
F
7
A6
T
7
A5

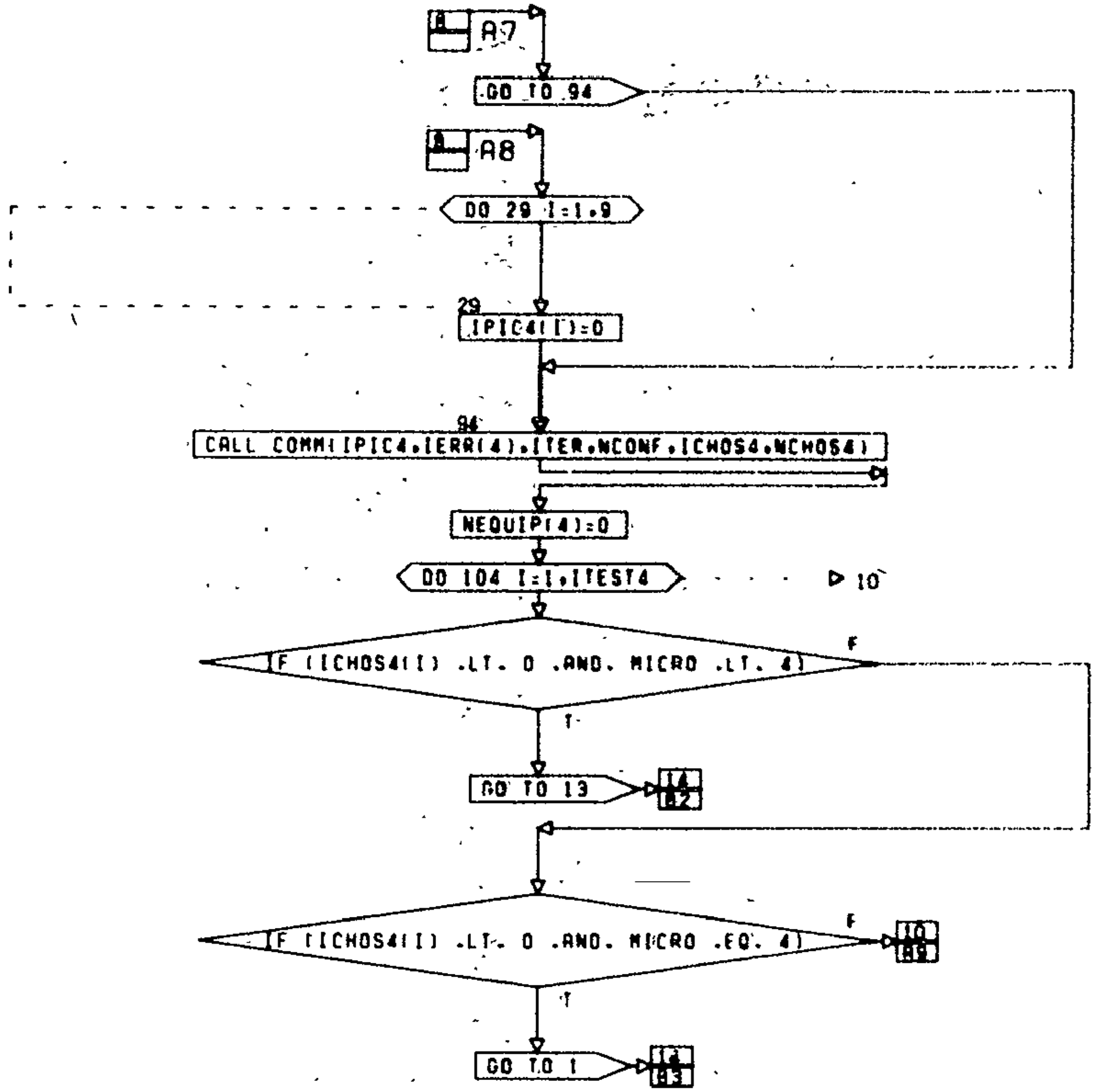
CONT. ON PG 7


6
A5
GO TO 1
6
A6
IF (ICHOS2(I) .GT. 0)
F
T
NEQUIP(2)=NEQUIP(2)+1
6
102
CONTINUE
CALL SAVE(ICHOS2,NCHOS2,NOWAT,ITEST2,IENDDB)
CALL READDB(IENDDB)
IF (ITER .NE. 0 .OR. MICRO .EQ. 9)
F
T
GO TO 93
IPIC3(1)=0
IPIC3(2)=0
93
CALL DPI(IPIC3,IERR(3),ITER,NCONF,ICHOS3,NCHOS3,NOWAT)
NEQUIP(3)=0
DO 103 I=1,ITEST3
8

CONT. ON PG 8

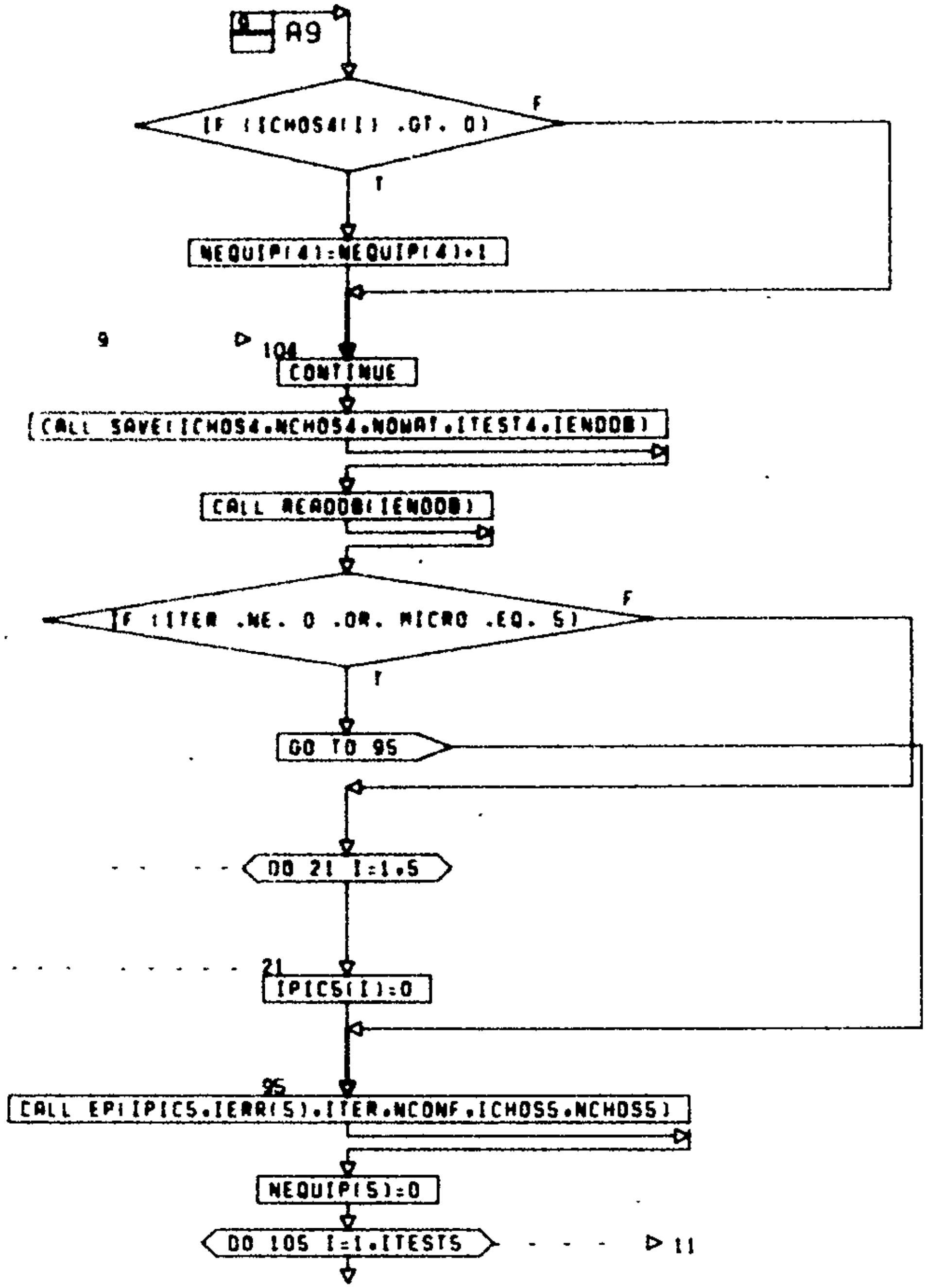

IF (ICHOS3(I) .LT. 0 .AND. MICRO .LT. 3)
F
T
GO TO 13
14
B2
IF (ICHOS3(I) .LT. 0 .AND. MICRO .EQ. 3)
F
T
GO TO 1
14
B3
IF (ICHOS3(I) .GT. 0)
F
T
NEQUIP(3)=NEQUIP(3)+1
7
103
CONTINUE
CALL SAVE(ICHOS3,NCHOS3,NOWAT,ITEST3,IENDDB)
CALL READDB(IENDDB)
IF (ITER.NE.0 .OR. MICRO.EQ.4)
F
9
A8
T
9
A7

CONT. ON PG 9

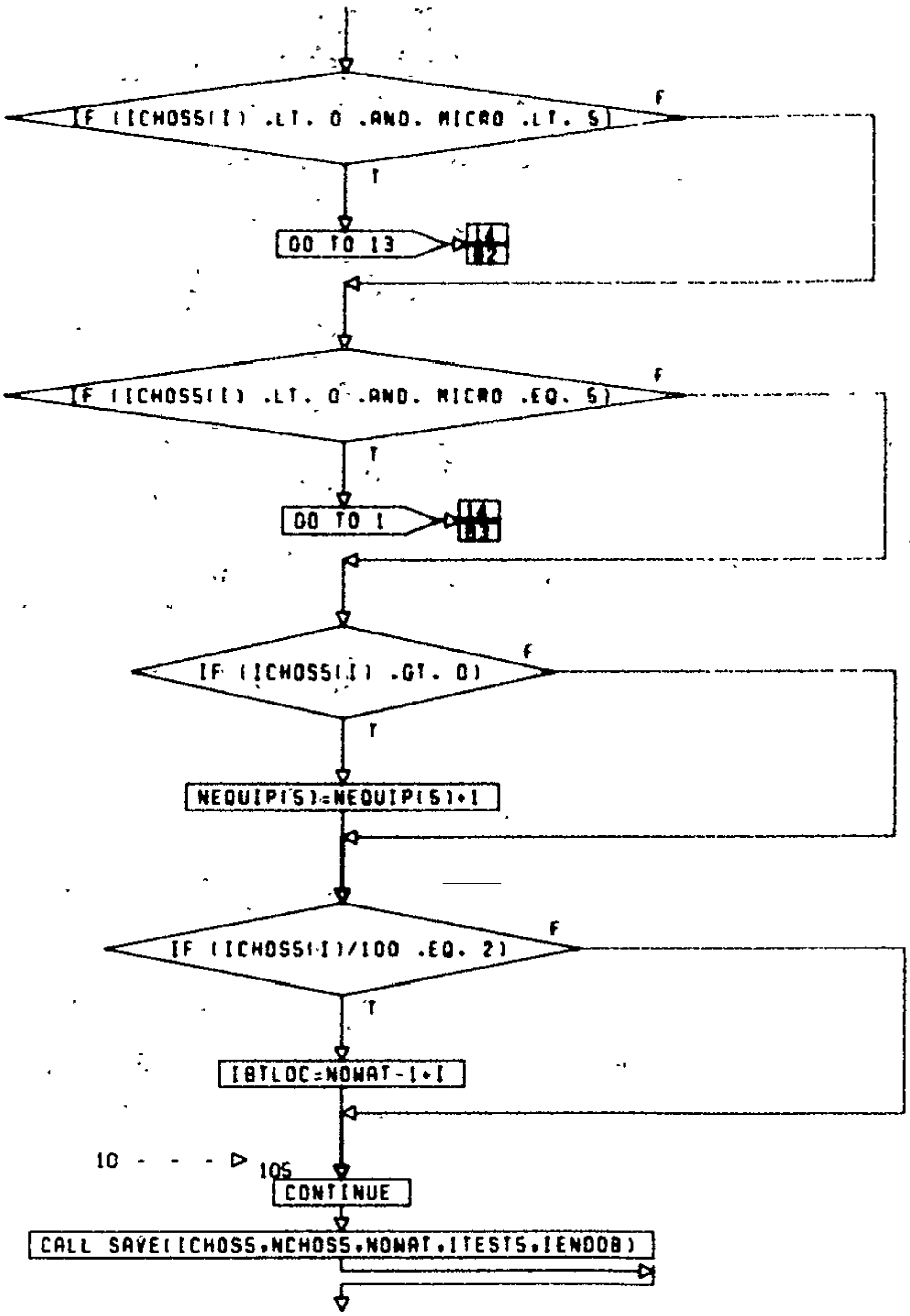


CONT. ON PG 10

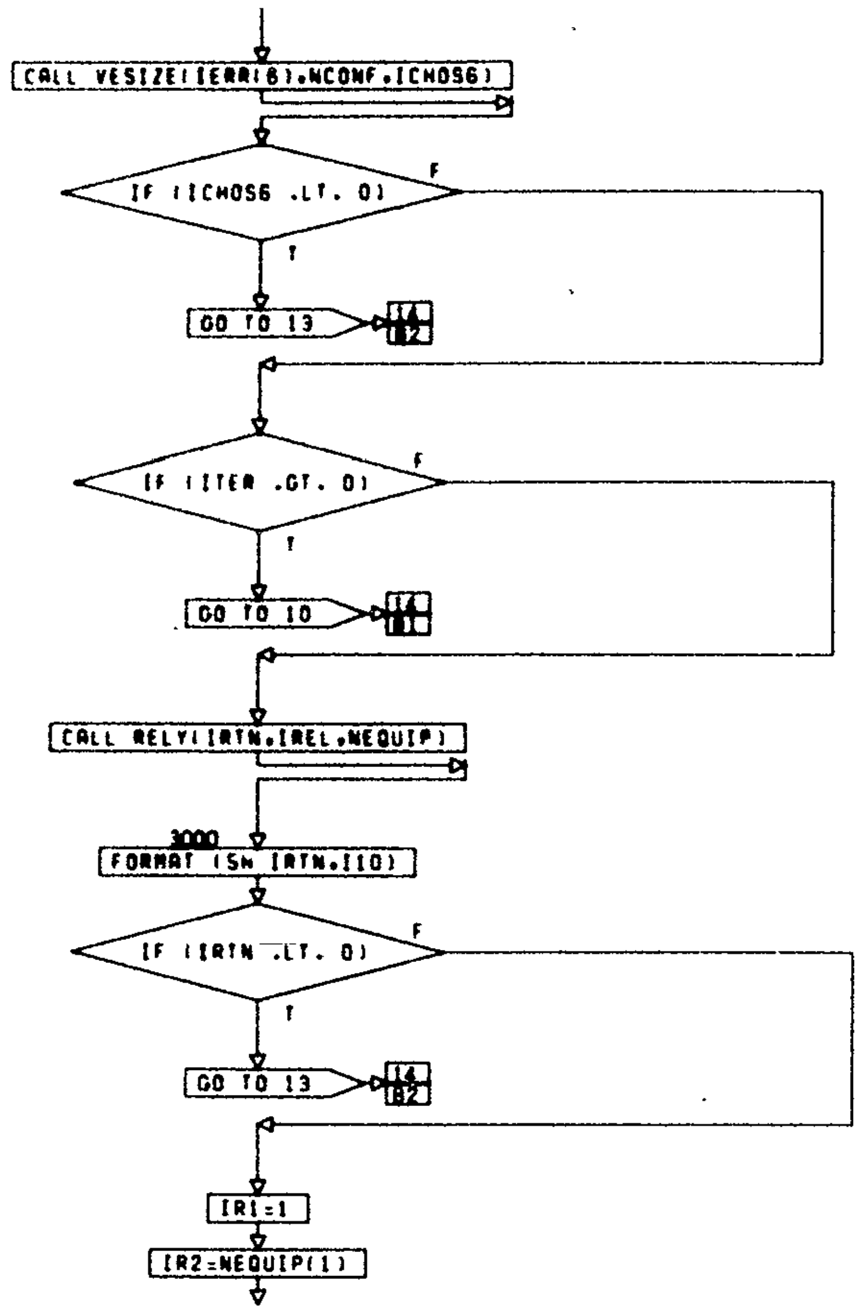
006


9
A9
IF (ICHOS4(I) .GT. 0)
F
T
NEQUIP(4)=NEQUIP(4)+1
9
104
CONTINUE
CALL SAVE(ICHOS4,NCHOS4,NOWAT,ITEST4,IENDDB)
CALL READDB(IENDDB)
IF (ITER .NE. 0 .OR. MICRO .EQ. 5)
F
T
GO TO 95
DO 21 I=1,5
21
IPICS(I)=0
95
CALL EP(IPICS,IERR(5),ITER,NCONF,ICHOS5,NCHOS5)
NEQUIP(5)=0
DO 105 I=1,ITESTS
11

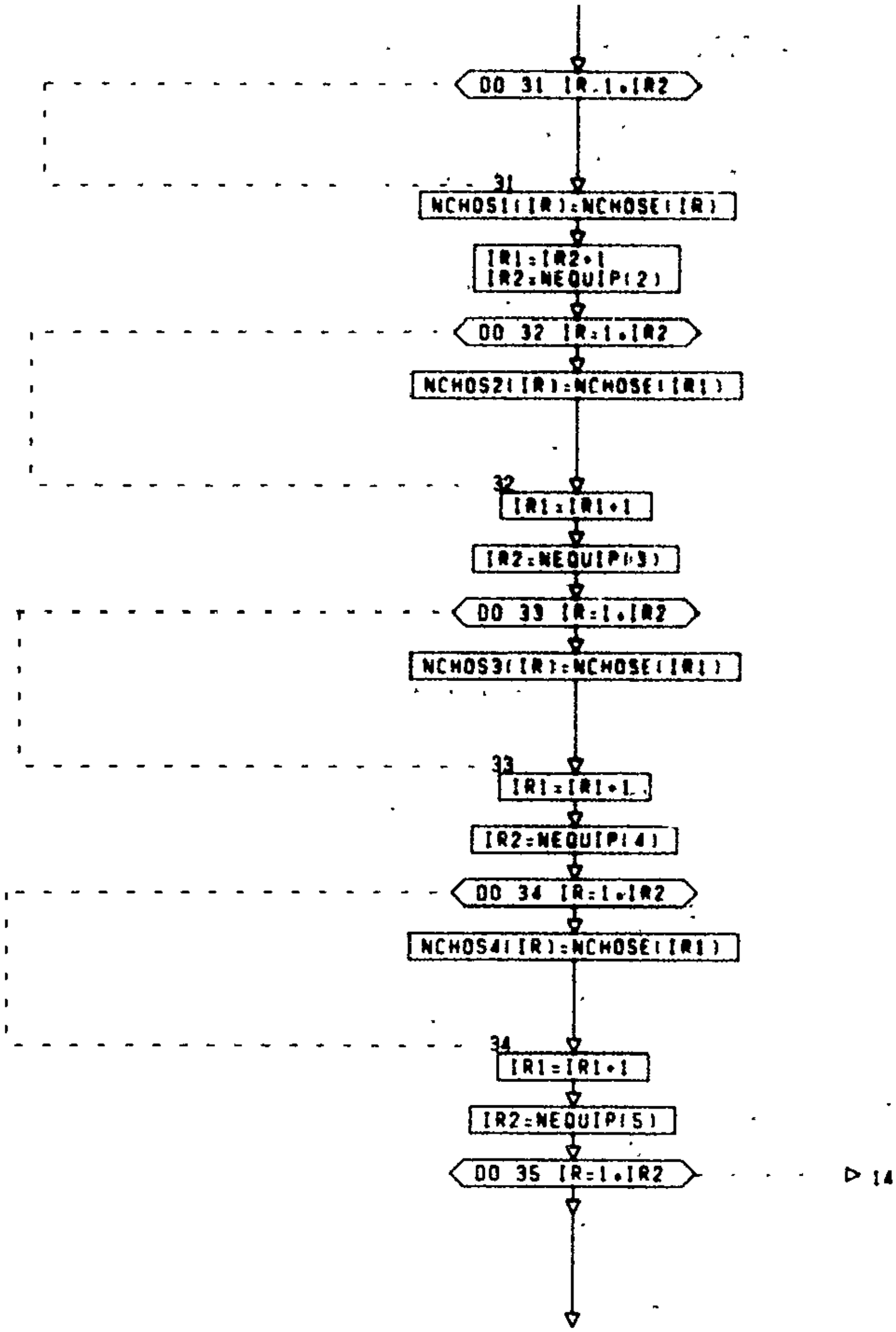
CONT. ON PG 11


IF (ICHOSS(I) .LT. 0 .AND. MICRO .LT. 5)
F
T
GO TO 13
14
12
IF (ICHOSS(I) .LT. 0 .AND. MICRO .EQ. 5)
F
T
GO TO 1
14
12
IF (ICHOSS(I) .GT. 0)
F
T
NEQUIP(5)=NEQUIP(5)+1
IF (ICHOSS(I)/100 .EQ. 2)
F
T
IBTLOC=NOWAT-1+I
10
105
CONTINUE
CALL SAVE(ICHOSS,NCHOSS,NOWAT,ITESTS,IENDOB)

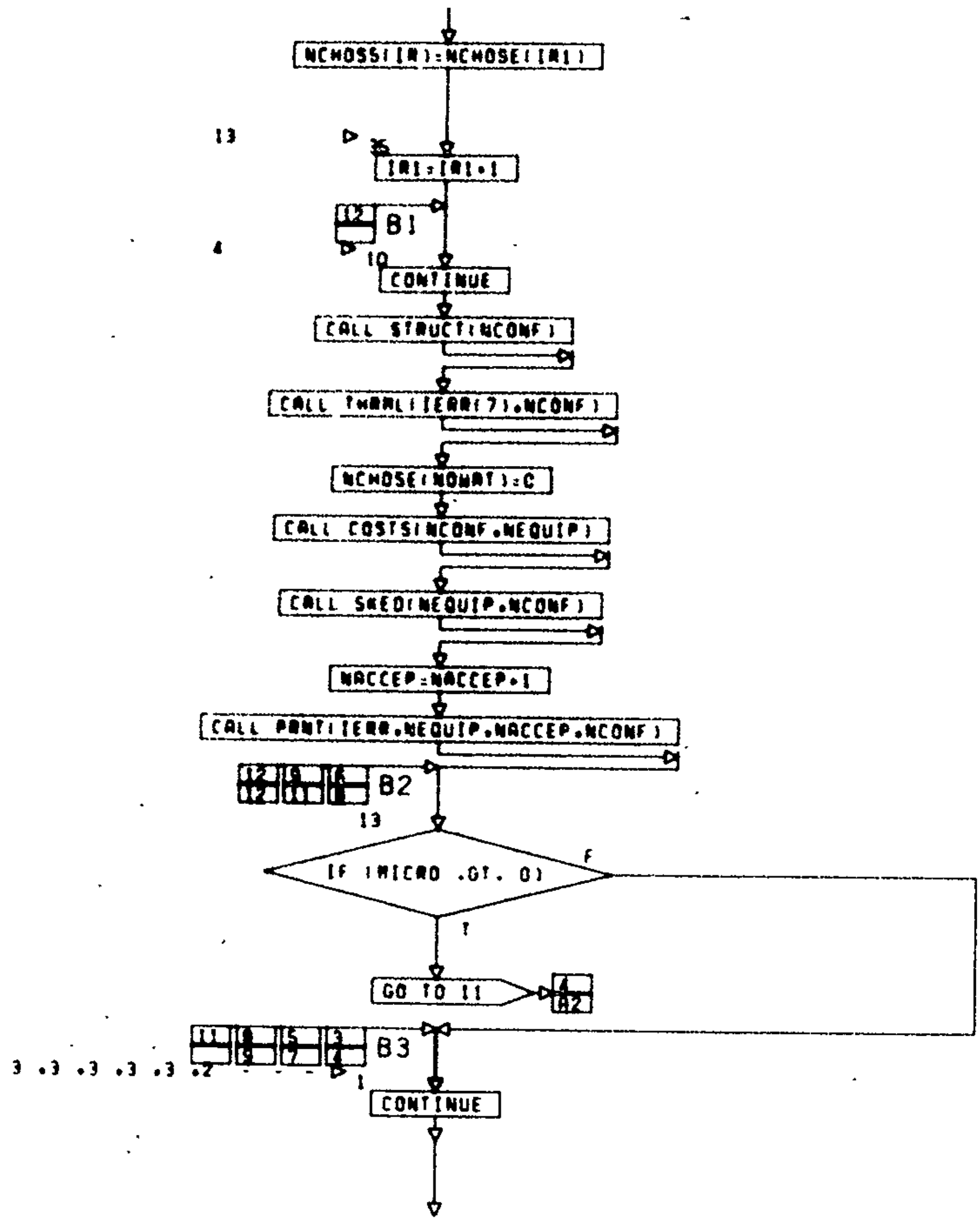
CONT. ON PG 12


CALL VESIZE(IERR(6),NCONF,ICHOS6)
IF (ICHOS6 .LT. 0)
F
T
GO TO 13
14
B2
IF (ITER .GT. 0)
F
T
GO TO 10
14
B1
CALL RELY(IRTN,IREL,NEQUIP)
3000
FORMAT (5H IRTN,I10)
IF (IRTN .LT. 0)
F
T
GO TO 13
14
B2
IR1=1
IR2=NEQUIP(1)

CONT. ON PG 13

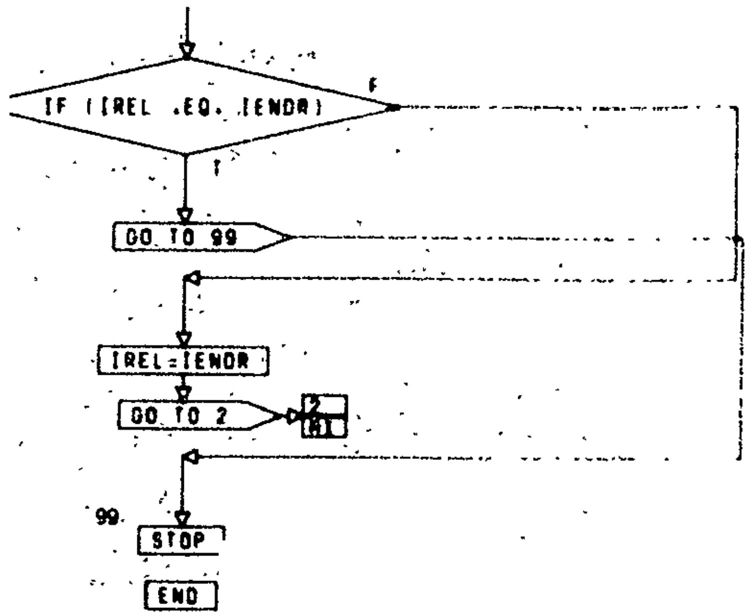

DO 31 IR=1,IR2
31
NCHOS1(IR)=NCHOSE(IR)
IR1=IR2+1
IR2=NEQUIP(2)
DO 32 IR=1,IR2
NCHOS2(IR)=NCHOSE(IR1)
32
IR1=IR1+1
IR2=NEQUIP(3)
DO 33 IR=1,IR2
NCHOS3(IR)=NCHOSE(IR1)
33
IR1=IR1+1
IR2=NEQUIP(4)
DO 34 IR=1,IR2
NCHOS4(IR)=NCHOSE(IR1)
34
IR1=IR1+1
IR2=NEQUIP(5)
DO 35 IR=1,IR2
14

CONT. ON PG 14



NCHOSS(IR)=NCHOSE(IR1)
13
35
IR1=IR1+1
12
B1
4
10
CONTINUE
CALL STRUCT(NCONF)
CALL THRML(IERR(7),NCONF)
NCHOSE(NOWAT)=C
CALL COSTS(NCONF,NEQUIP)
CALL SKED(NEQUIP,NCONF)
NACCEP=NACCEP+1
CALL PRNT(IERR,NEQUIP,NACCEP,NCONF)
B2
13
IF (MICRO .GT. 0)
F
T
GO TO 11
4
B2
B3
3 .3 .3 .3 .3 .2
1
CONTINUE

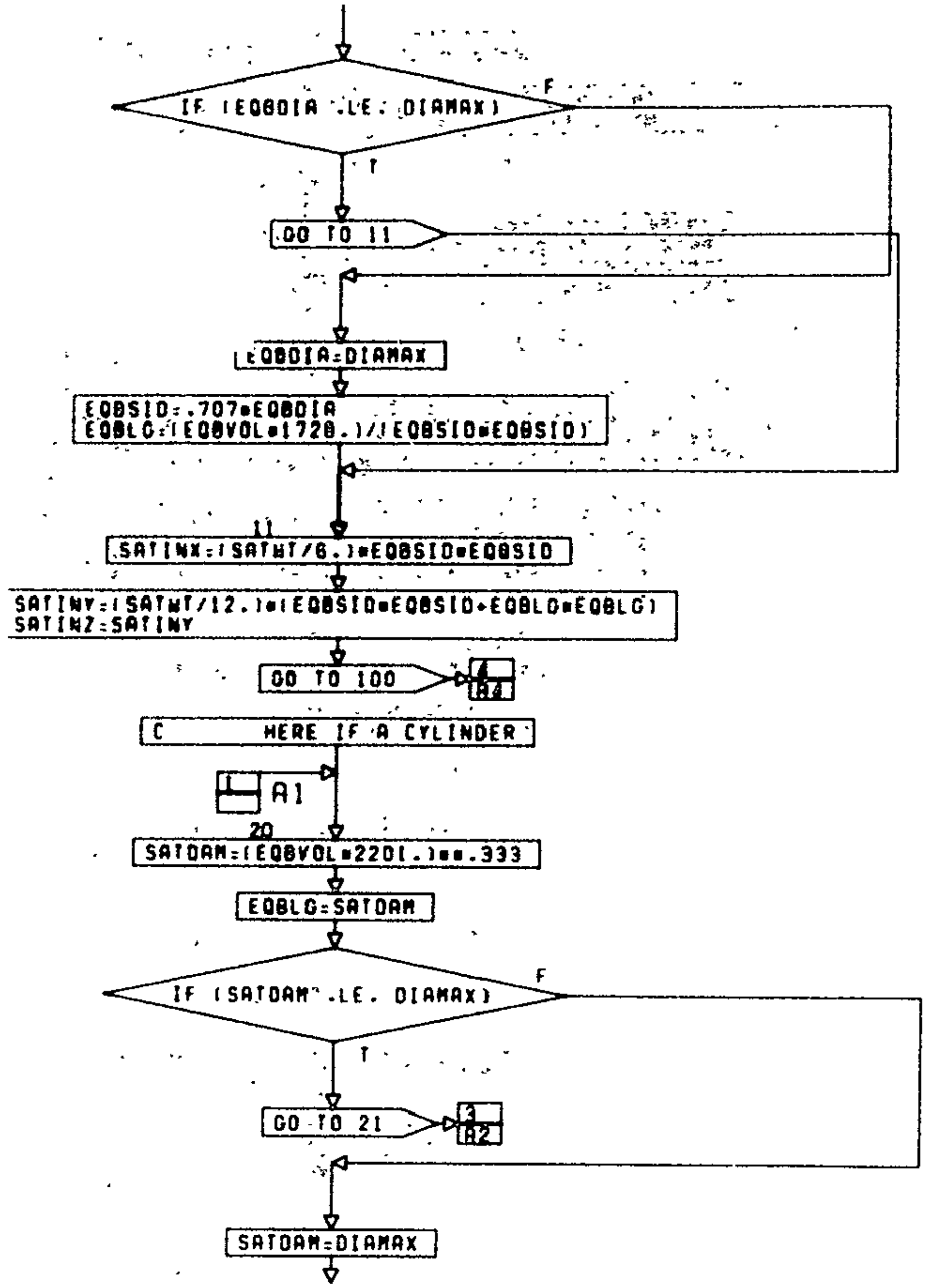
CONT. ON PG 15



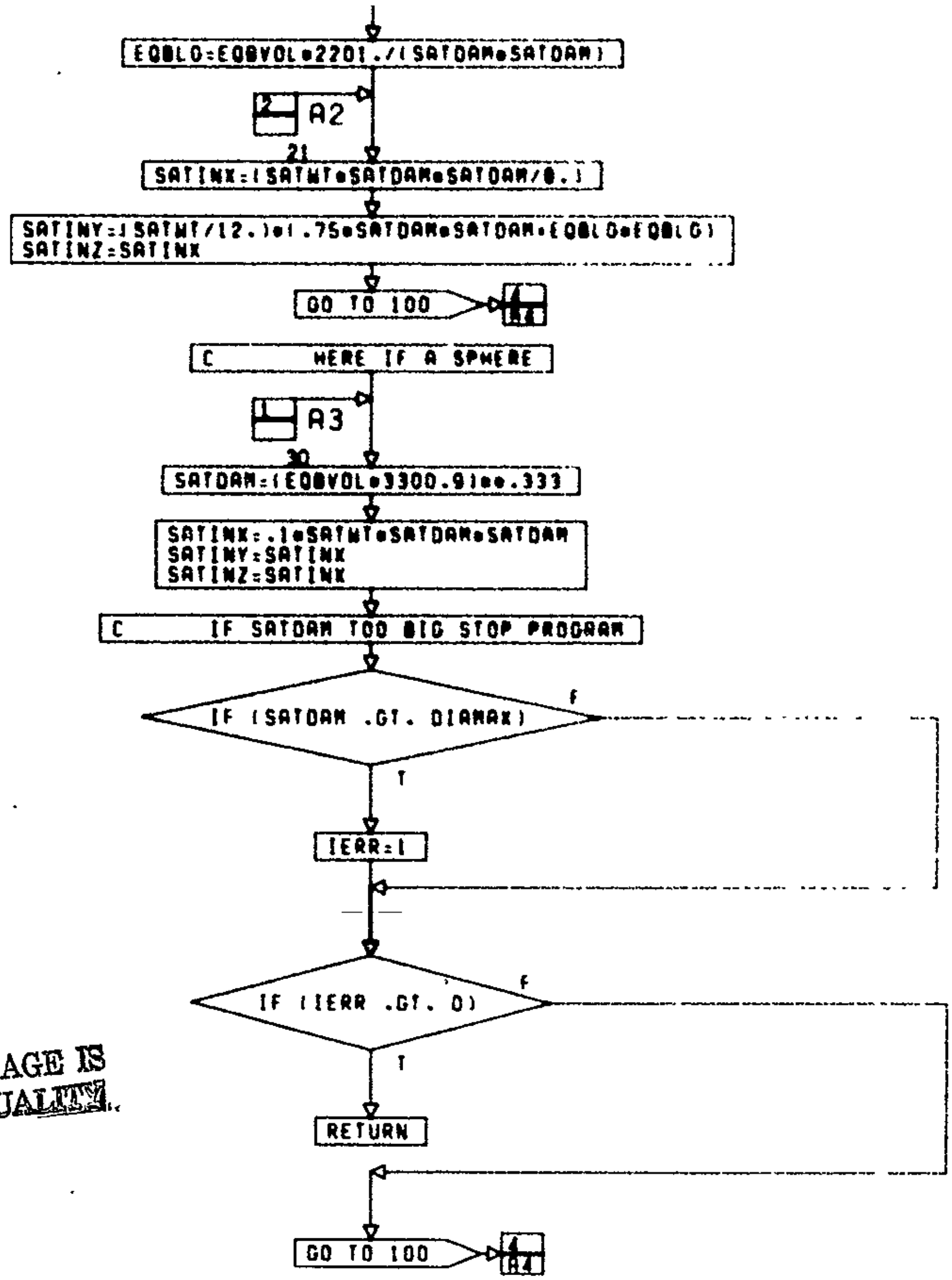
PG 15 FINAL

```
SUBROUTINE INITIL(NCONF,IERR)

C        THIS SUBROUTINE SETS APPROXIMATIONS FOR ALL VALUES IN BTWN
C        WHICH ARE USED BEFORE THEY ARE CALCULATED

DIMENSION NCONF(6)

COMMON /USERI/DPHI,FE,TSMALL,XNU,PDOTO,TAUX,TAUY,TAUZ,T,
 PHIRX,PHIRY,PHIRZ,PDOTX,PDOTY,PDOTZ,XN,YN,ZN,PDOTRX,PDOTRY,
PDOTRZ,OMEDS,OMEDR,PJ,XNN,K,MANV,IPAYAW,EPI,AX,AY,AZ,
EA,EANT,ALPHA,TL,TACCEL,XNNN,THOLD,PDOTAV,PDOTST,PHIFOV,ISAT

COMMON /USERI/ EQMIWT,EQM2WT,DIAMAX,ALT

COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMDOLD,TRUNC,ITRUNC,OE,TE,
 TOOLR,OCR,SEIR,PMR,PE,PU,TOOLU,OCP,SEIP,PMP,SATR,SATINV,MER,
 MEINV,PAYR,PAYINV,PAYQUL,GSE,XLTOT,CTOT,FEER,FEEINV,ODTE,XVEST,
 OPS,SKTAU(6),ROLD(60),TTT,AN,TS,BS,AM,TF,BF,TC,TA,TB,TOTOPS

COMMON /BTWN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,
 LMBOD,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,
 SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,HTRPRB,
 HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),
 EQBLG,SABOLG,SATWT

IERR=0
ACCRCY=AMIN1(PHIRX,PHIRY,PHIRZ)
EQMWT=EQMIWT+EQM2WT
SATWT=36.9*EQMWT**.672
EQBVOL=.1*SATWT
TPRIM=T
N=NCONF(6)

GO TO (20,10,30) ,N

2      3
A1     A3

C        HERE IF A BOX

10
EQBLG=(EQBVOL* 3456.)**.333

EQBDIA=EQBLG
EQBSID=.707*EQBDIA
```

CONT. ON PG 2

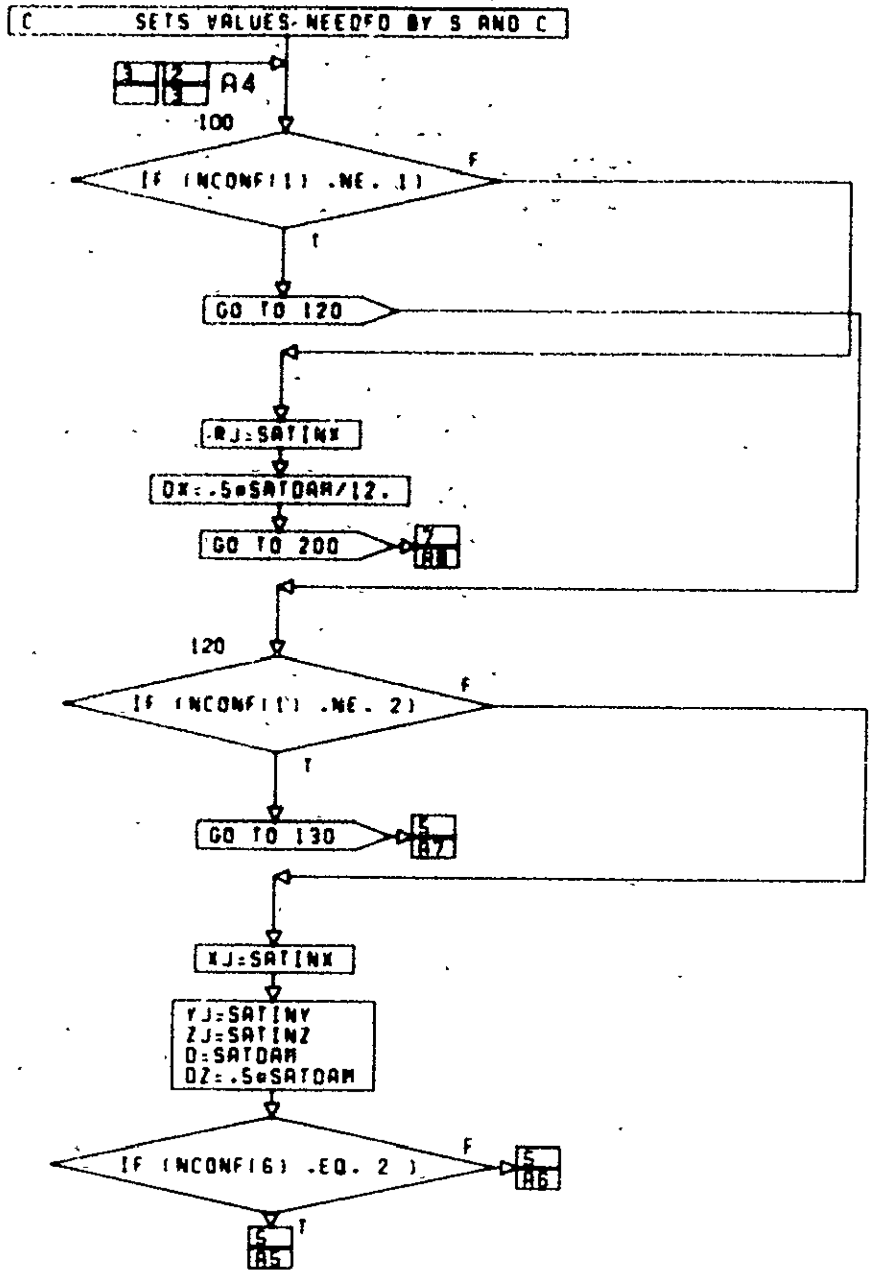

IF (EQBDIA .LE. DIAMAX)
F
T
GO TO 11
EQBDIA=DIAMAX
EQBSID=.707*EQBDIA
EQBLG=(EQBVOL*1728.)/(EQBSID*EQBSID)
11
SATINX=(SATWT/6.)*EQBSID*EQBSID
SATINY=(SATWT/12.)*(EQBSID*EQBSID+EQBLG*EQBLG)
SATINZ=SATINY
GO TO 100
4
A4
C HERE IF A CYLINDER
1
A1
20
SATDAM=(EQBVOL*2201.)**.333
EQBLG=SATDAM
IF (SATDAM .LE. DIAMAX)
F
T
GO TO 21
3
A2
SATDAM=DIAMAX

CONT. ON PG 3



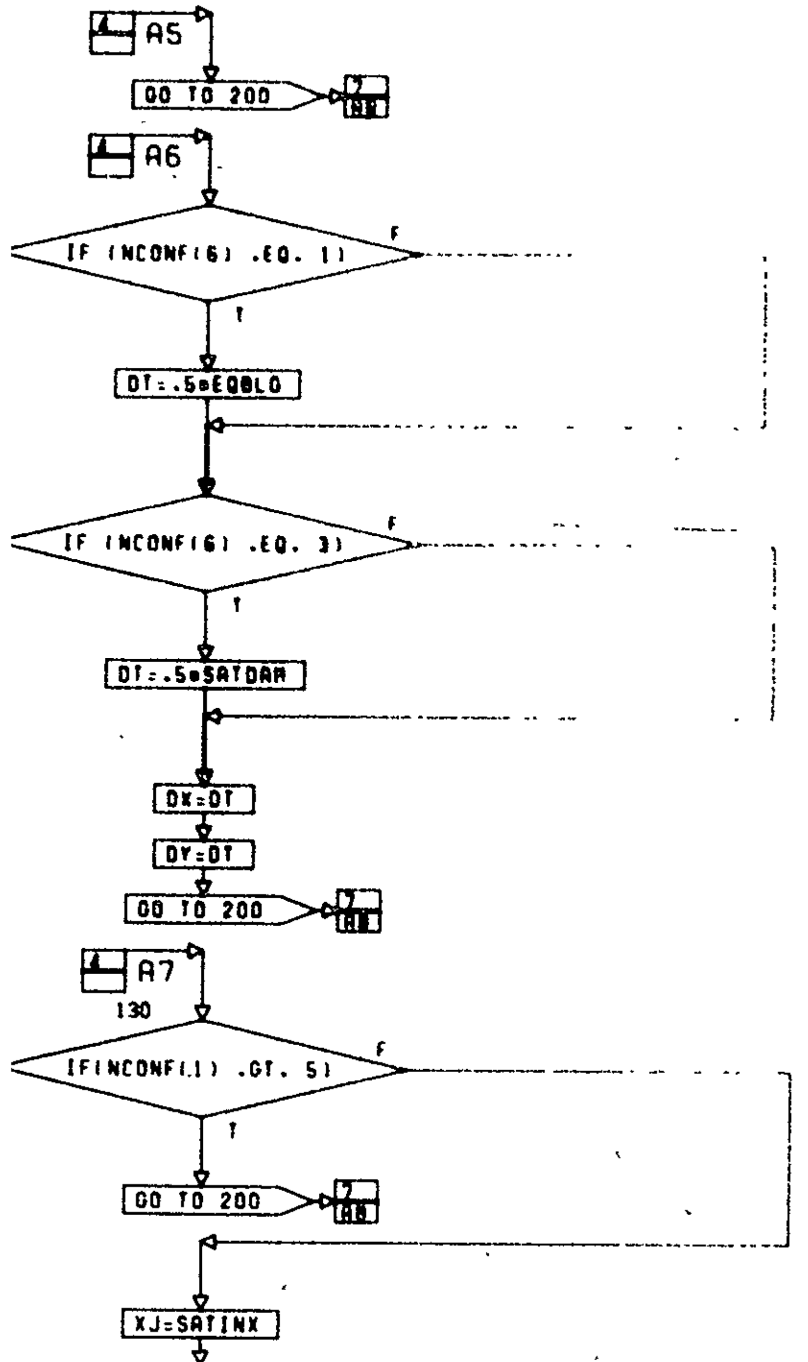
CONT. ON PG 4

812



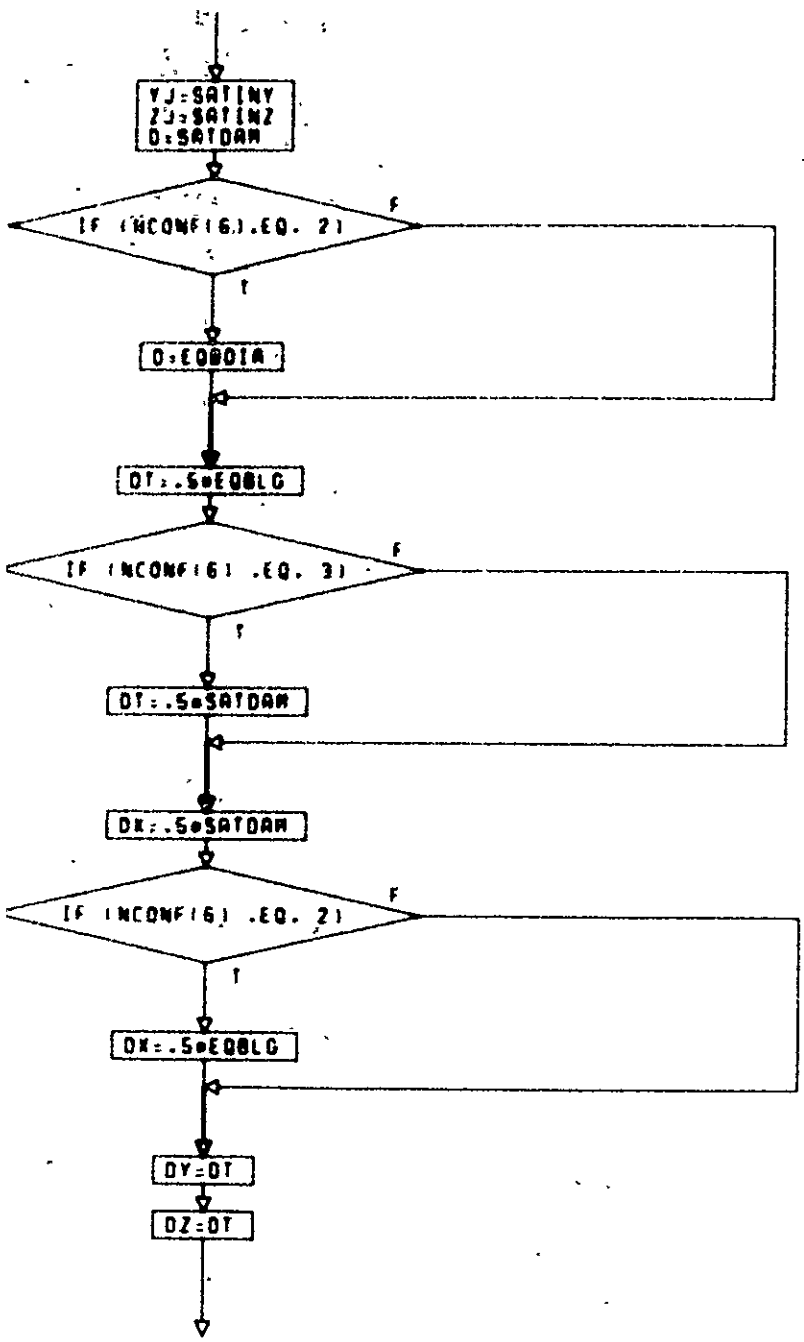
C SETS VALUES NEEDED BY S AND C
3
2
3
A4
100
IF (NCONF(1) .NE. 1)
F
T
GO TO 120
RJ=SATINX
DX=.5*SATDAM/12.
GO TO 200
7
A1
120
IF (NCONF(1) .NE. 2)
F
T
GO TO 130
5
A7
XJ=SATINX
YJ=SATINY
ZJ=SATINZ
D=SATDAM
DZ=.5*SATDAM
IF (NCONF(6) .EQ. 2)
F
5
A6
T
5
A5

CONT. ON PG 5

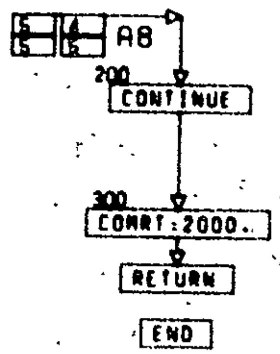


CONT. ON PG 6

012


YJ=SATINY
ZJ=SATINZ
D=SATDAM
IF (NCONF(6).EQ. 2)
F
T
D=EQBDIA
DT=.5*EQBLG
IF (NCONF(6) .EQ. 3)
F
T
DT=.5*SATDAM
DX=.5*SATDAM
IF (NCONF(6) .EQ. 2)
F
T
DX=.5*EQBLG
DY=DT
DZ=DT

CONT. ON PG 7



PG 7 FINAL

814

```
BLOCK DATA

C          SETS ALL DEFAULT VALUES

COMMON /USER1/DPHI.FE.TSMALL.XNU.PDOTO.TAUX.TAUY.TAUZ.T.
 PHIRX.PHIRY.PHIRZ.PDOTX.PDOTY.PDOTZ.XN.YN.ZN.PDOTRX.PDOTRY.
PDOTRZ.OMEGS.OMEGR.PJ.XNN.K.MANV.IPAYAW.EP1.AX.AY.AZ.
EA.EANT.ALPHA.TL.TACCEL.XNNN.THOLD.PDOTAV.PDOTST.PHIFOV.ISAT

COMMON /USER2/TTHST.CLIFE
COMMON /USER3/BTRMX.SCSFL.TPRFL.OPSMS.ARRAYN(11.3).NMSEQ

COMMON /USER4/IOPTCM(3).IMSSEP.ISEQ.LSOLS.LUSB.FREQ(2).APOGEE.NET.
 NADIR.FREQR.COMRAT.BWIDTH(2)

COMMON /USER5/IVOLT.OPTEMP

COMMON /USER6/EQPF.MB12ZH.EQM1XL.EQM1YL.EQM1ZL.EQM2XL.EQM2YL.
 EQM2ZL.ISBOFO.NUMEEQ.EEQWT(9).EEQVL(9).EM1YCG.EM1ZCG.EM2YCG.
 EM2ZCG.COEEX(9).EELOC(9).XCGSA1.XCGSA3

COMMON /USER7/ISATOR.ORBINC
COMMON /USER8/SKOME(7.3)
COMMON /USERI/EQM1WT.EQM2WT.DIAMAX.ALT
COMMON /USERR/KEOPT.SYSLB.RFIXED.SLBMX.ISPT.SPEC(6).SPECI.ISUB
COMMON /USERC/NFV.NOV.XMER.XMEU.FEEPCT.IMETYP

DATA DPHI.FE.TSMALL.XNU.PDOTO.TAUX.TAUY.TAUZ.T/.25.4.1.100..
 3..1..3*62208000..24./

COMMON /USER9/CA.CE

DATA PHIRX.PHIRY.PHIRZ.PDOTX.PDOTY.PDOTZ.XN.YN.ZN.PDOTRX.PDOTRY.
PDOTRZ/3*.75.6*1..3*.012/

DATA OMEGS.OMEGR.PJ.XNN.K.MANV.IPAYAW/1.5708.60..75..21..1.1.0/
DATA EP1.AX.AY.AZ/.0001.3*.05/

DATA EA.EANT.ALPHA.TL.TACCEL.XNNN.THOLD.PDOTAV.PDOTST.PHIFOV
 /..1..1.12..1..20..4..100000...01..0667.40./

DATA CLIFE/50000./

DATA BTRMX.SCSFL.TPRFL.OPSMS.ARRAYN.NMSEQ/1024000..36*0..
 0/

DATA IVOLT.OPTEMP/0.15./

DATA IOPTCM.IMSSEP.LSGLS.LUSB.FREQ.APOGEE.NET.NADIR.FREQR.COMRAT.
 BWIDTH/0.0.0.0.1.0.2*2250..500..0.0.1800..1000..2*-1.E10/
```

CONT. ON PG 2

```
DATA EQPF,NB12ZM,EQM1XL,EQM1YL,EQM1ZL,EQM2XL,EQM2YL/2.,1.,
 5*40./

DATA EQM2ZL,ISBOFG,NUMEEQ,EEQWT,EEQVL,EM1YCG,EM1ZCG,EM2YCG
/40.,2*0,21*0./

DATA EM2ZCG,COEEX,EELOC,XCOSA1,XCOSA3 /0.,9*2.,9*3.,2*1./
DATA ISATOR,ORBINC/1,28.6/
DATA SKONE/21*0./
DATA CA,CE/10.,5./
DATA EQM1WT,EQM2WT,DIAMAX,ALT/2*435.,120.,500./

DATA KEOPT,SYSLB,RFIXED,SLBMX,ISPT,SPEC,SPEC1,ISUB/1,0.,
 1.,50000.,0,5*.9,.6,10.,0/

DATA NFV,NOV,XNER,XNEU,FEEPCT,INETYP/4,1,0.,0.,.07,2/

END
```

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PG 2 FINAL

```
SUBROUTINE COSTS (NCONF,NEQUIP)
```

```
C ******************************************************************
C **   THIS SUBROUTINE COLLECTS COSTS FOR CATALOG ITEMS AND CALCULATES **
C **   COSTS FOR CER ITEMS AND STORES THEM FOR OUTPUTTING             **
C ******************************************************************
```

```
COMMON /BTWN/ WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,
              LMBOD,AREA,SATLO,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,
              TNKWT,PASSTR,SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,
              HTRPWR,HTRPRB,HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,
              ACSSN,BITRAT(2),EQBLO,SABOLO,SATWT
```

```
COMMON /CHOSE/ICHOSE(60),NCHOSE(60),COST(5,60),REL(6,60),TMM(4,60)
              ,DPIA(11,60)
```

```
COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMDOLD,TRUNC,ITRUNC,DE,TE,TOOLR,
               QCR,SEIR,PMR,PE,PU,TOOLU,QCU,SEIP,PMP,SATR,SATINV,
               YMER,XMEINV,PAYR,PAYINV,PAYOUL,DSE,XLTOT,CTOT,FEER,
               FEEINV,DDTE,XVEST,OPS,SKTAV(6),ROLD(60),T,AN,TS,BS,
               AM,TF,BF,TC,TA,TB,TOTOPS
```

```
COMMON /USERC/NFV,NQV,XMER,XMEU,FEEPCT,IMETYP
```

```
DIMENSION      RE(6),RT(6),RP(6),BE(6),BT(6),BP(6),UPS(6),
               X(6),FR(6),FP(6),FT(6),FE(6),NCONF(5),NEQUIP(5),
               COMPR(60),COMPU(60),SUBE(7),SUBT(7),SUBR(7),
               SUBUE(7),SUBUP(7),SUBU(7),COMPSE(60),COMPSP(60),
               SUBSP(7),SUBSE(7)
```

```
DATA           FR        /6*1./,
               FP        /6*1./,
               FT        /6*1./,
               FE        /6*1./,
               RE        /6000.,105603.,40500.,53700.,21638.,
                         108000./,
               RT        /1300.,98719.,25600.,43100.,11762.,40200./
,              RP        /2300.,5882.,3900.,23900.,67408.,32400./,
```

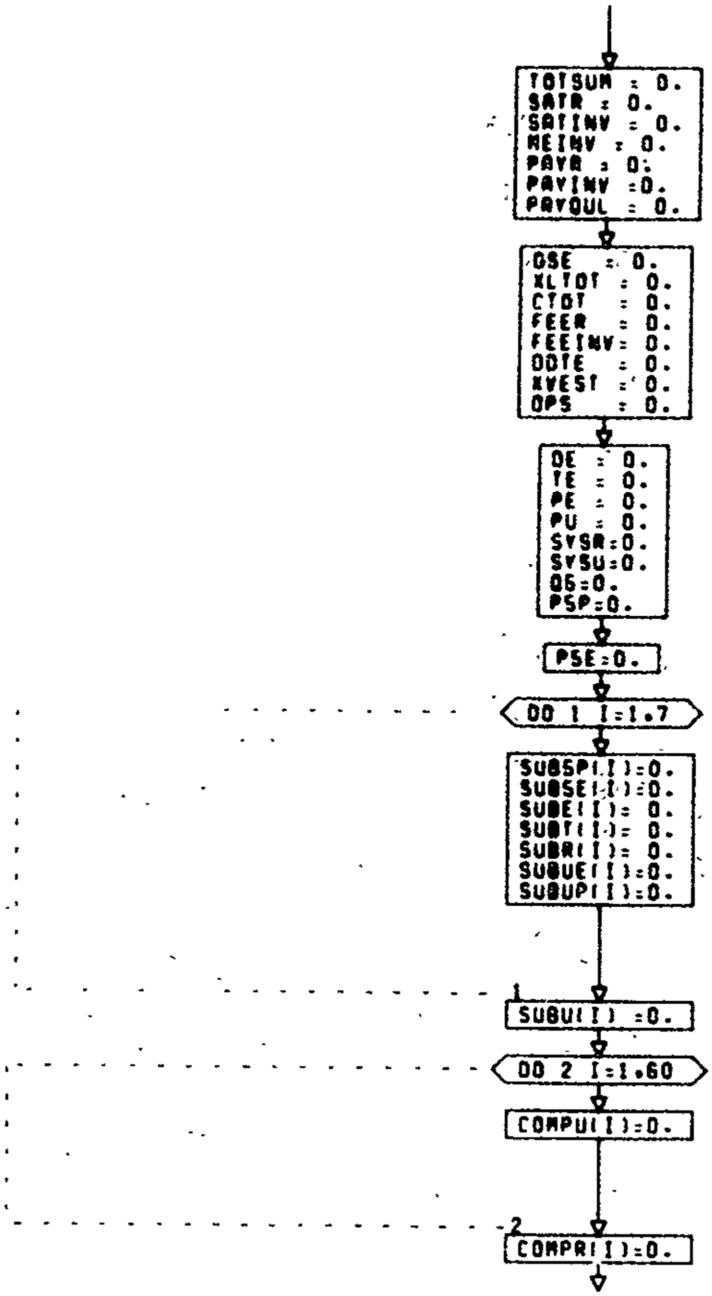
```
               BE        /.4005,.3334,.4005,.8156,.585,.4005/,
               BT        /.4005,.2869,.4005,.7137,.678,.4005/,
               BP        /.3334,.6960,.3334,.6781,.5460,.3334/,
               PI        /1./,      SF        /1./
```

```
SEIR = 0.
QCR = 0.
PMR = 0.
SUMTOE = 0.
TOOLR  = 0.
SEIP = 0.
QCU = 0.
PMP = 0.
```

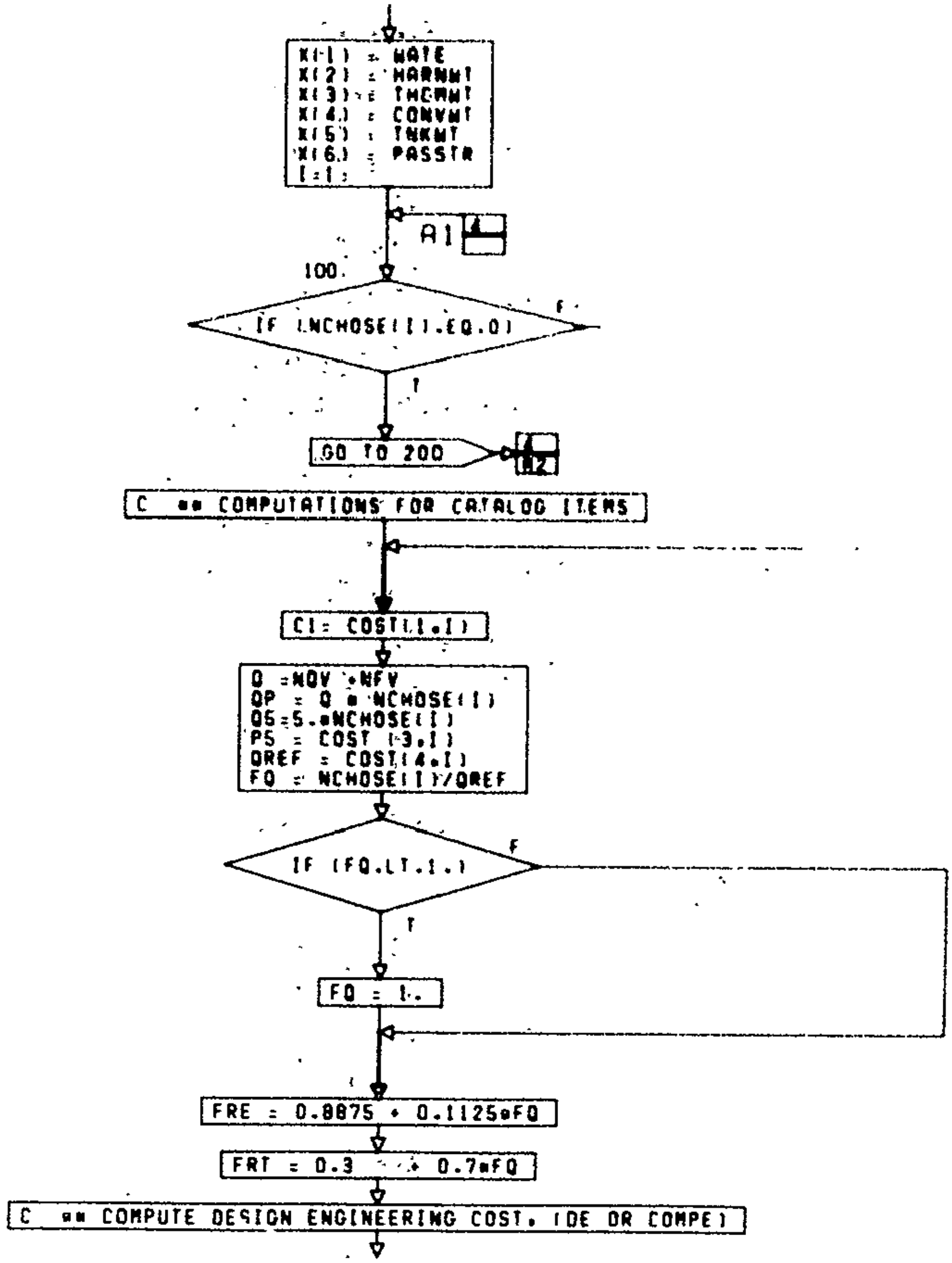
```
SUMPE = 0.
```

CONT. ON PG 2

818

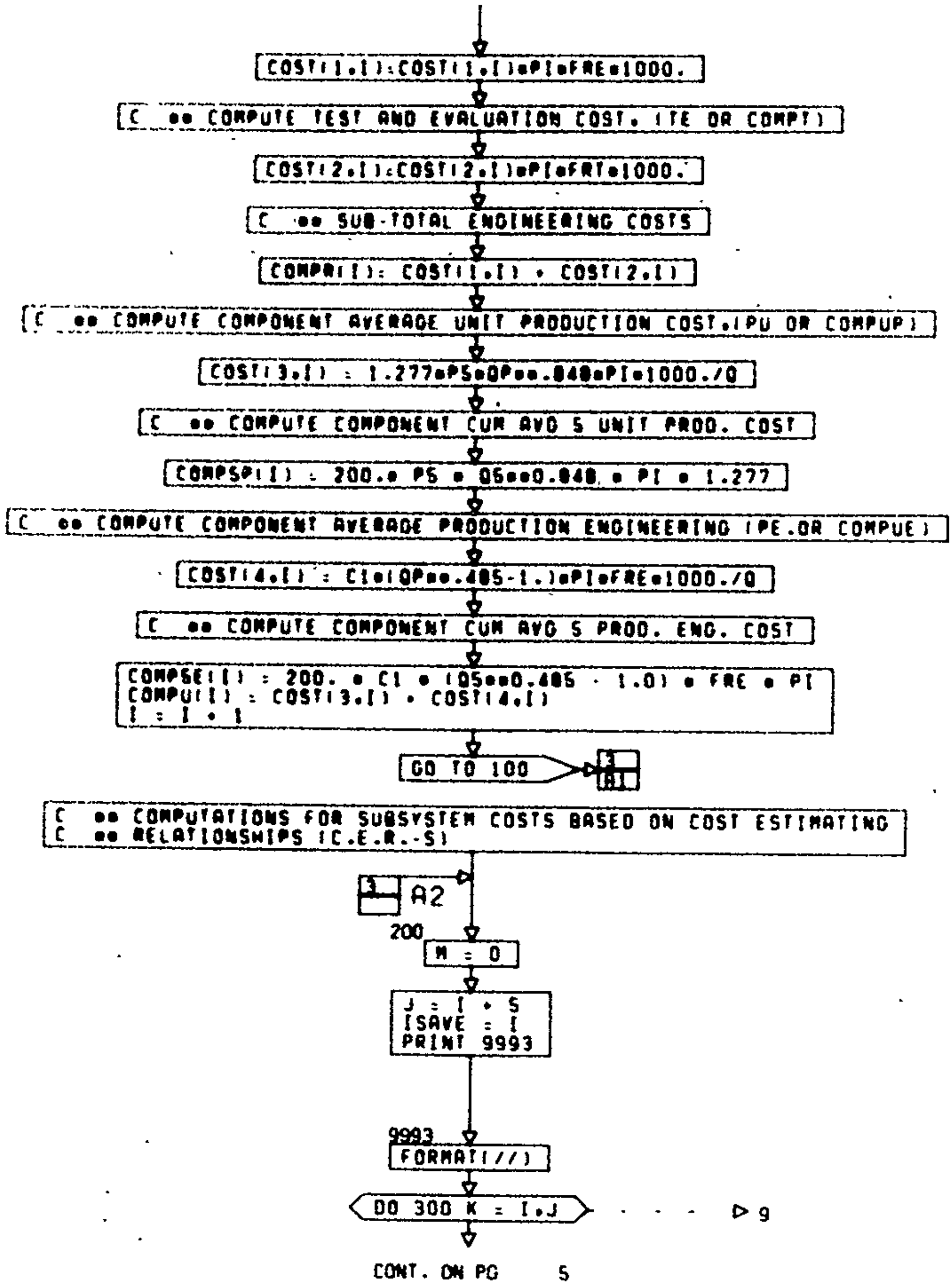

TOTSUM = 0.
SATR = 0.
SATINV = 0.
MEINV = 0.
PAYR = 0.
PAYINV =0.
PAYQUL = 0.
DSE = 0.
XLTOT = 0.
CTOT = 0.
FEER = 0.
FEEINV= 0.
DDTE = 0.
XVEST = 0.
DPS = 0.
DE = 0.
TE = 0.
PE = 0.
PU = 0.
SYSR=0.
SYSU=0.
DS=0.
PSP=0.
PSE=0.
DO 1 I=1,7
SUBSP(I)=0.
SUBSE(I)=0.
SUBE(I)= 0.
SUBT(I)= 0.
SUBR(I)= 0.
SUBUE(I)=0.
SUBUP(I)=0.
1
SUBU(I) =0.
DO 2 I=1,60
COMPU(I)=0.
2
COMPR(I)=0.

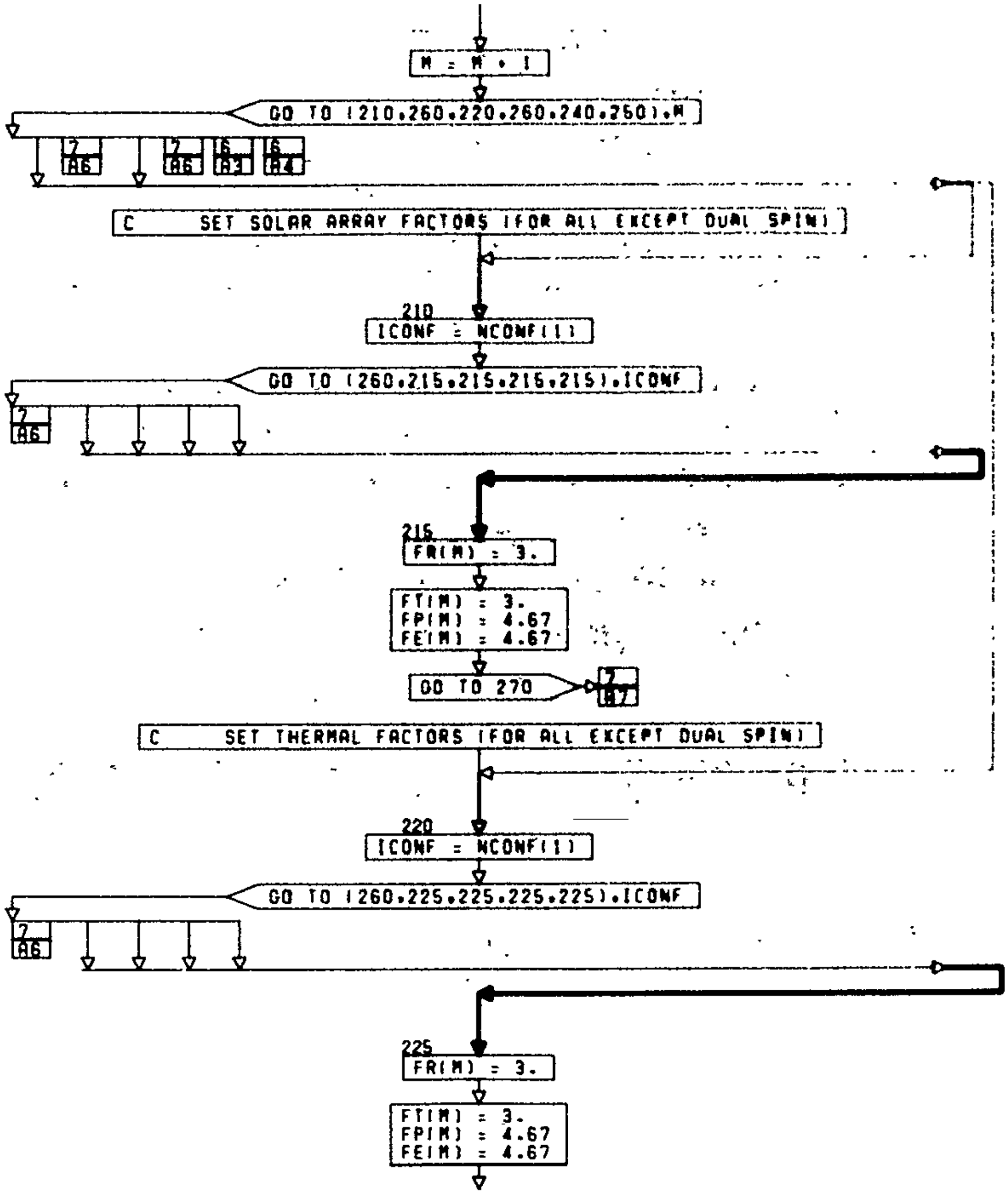
CONT. ON PG 3



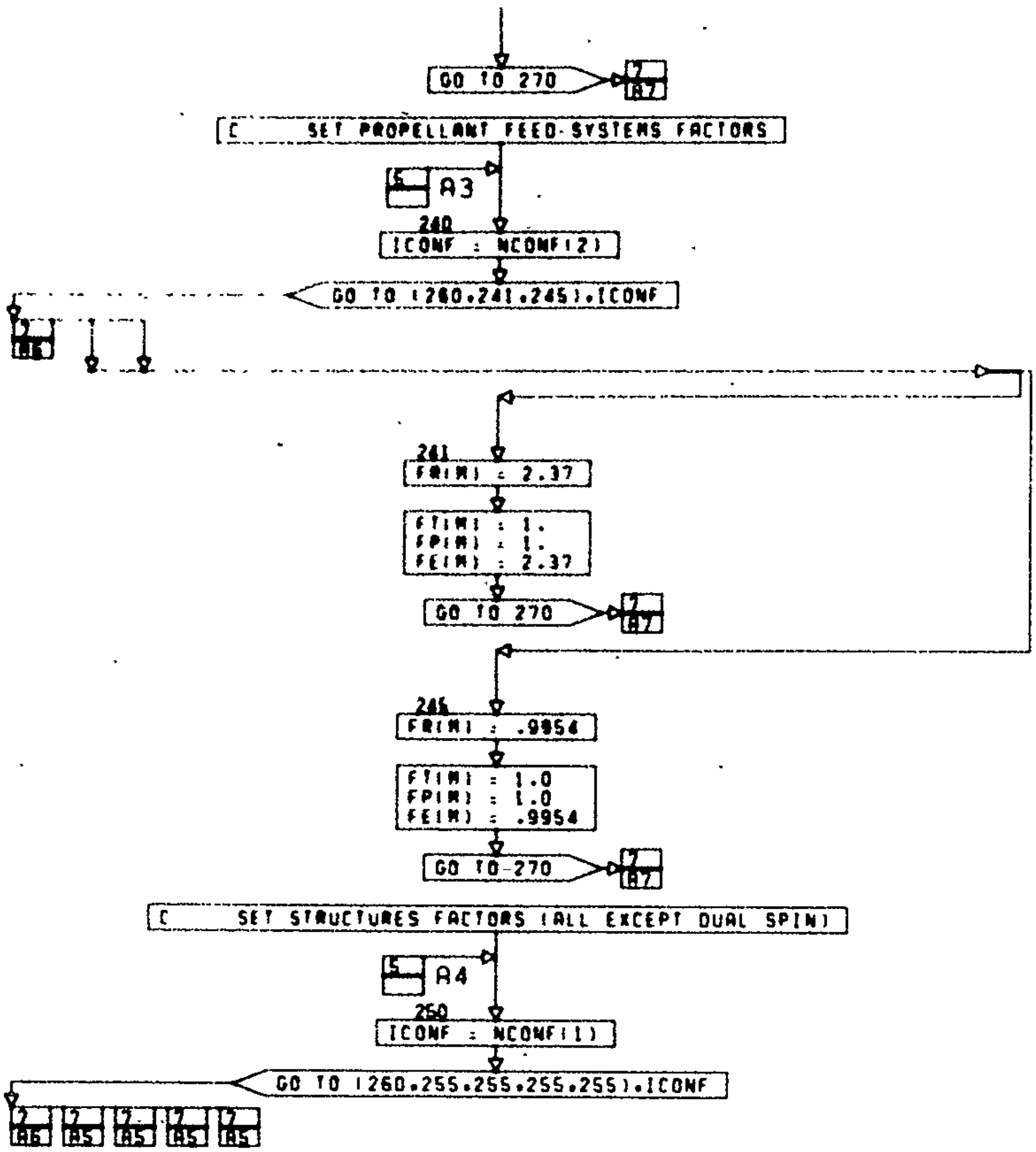
CONT. ON PG 4

019

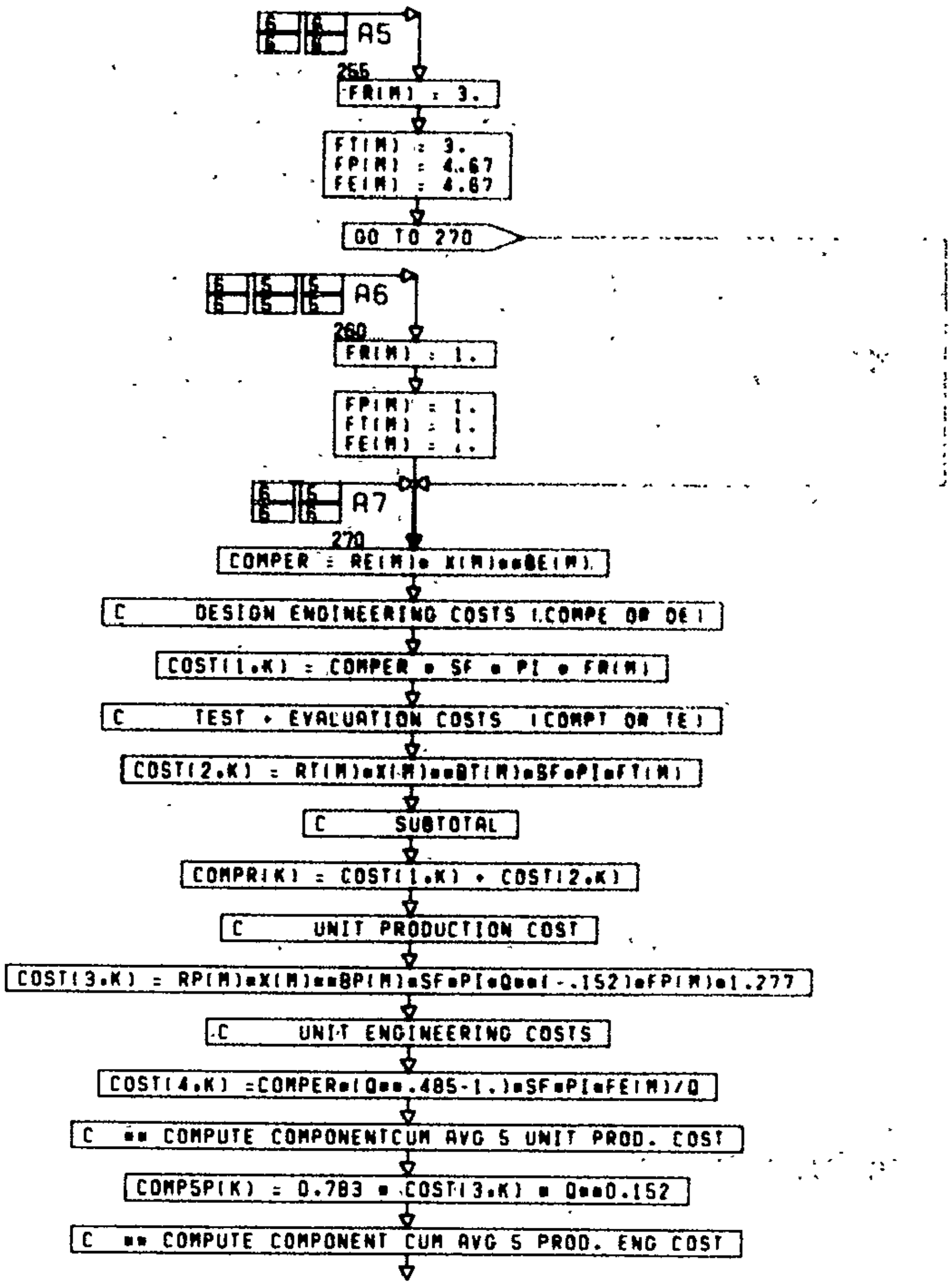

COST(1,I)=COST(1,I)*PI*FRE*1000.
C ** COMPUTE TEST AND EVALUATION COST. (TE OR COMPT)
COST(2,I)=COST(2,I)*PI*FRT*1000.
C ** SUB-TOTAL ENGINEERING COSTS
COMPR(I)= COST(1,I) + COST(2,I)
C ** COMPUTE COMPONENT AVERAGE UNIT PRODUCTION COST.(PU OR COMPUP)
COST(3,I) = 1.277*PS*QP**.848*PI*1000./Q
C ** COMPUTE COMPONENT CUM AVG 5 UNIT PROD. COST
COMPSP(I) = 200.* PS * Q5**0.848 * PI * 1.277
C ** COMPUTE COMPONENT AVERAGE PRODUCTION ENGINEERING (PE.OR COMPUE)
COST(4,I) = CI*(QP**.485-1.)*PI*FRE*1000./Q
C ** COMPUTE COMPONENT CUM AVG 5 PROD. ENG. COST
COMPSE(I) = 200. * CI * (Q5**0.485 - 1.0) * FRE * PI
COMPU(I) = COST(3,I) + COST(4,I)
I = I + 1
GO TO 100
3
B1
C ** COMPUTATIONS FOR SUBSYSTEM COSTS BASED ON COST ESTIMATING
C ** RELATIONSHIPS (C.E.R.-S)
3
A2
200
M = 0
J = I + 5
ISAVE = I
PRINT 9993
9993
FORMAT(//)
DO 300 K = I,J
9
CONT. ON PG 5


M = M + 1
GO TO (210,260,220,260,240,260),M
7 A6
7 A6
6 A3
6 A4
C SET SOLAR ARRAY FACTORS (FOR ALL EXCEPT DUAL SPIN)
210
ICONF = NCONF(1)
GO TO (260,215,215,215,215),ICONF
7 A6
215
FR(M) = 3.
FT(M) = 3.
FP(M) = 4.67
FE(M) = 4.67
GO TO 270
7 B7
C SET THERMAL FACTORS (FOR ALL EXCEPT DUAL SPIN)
220
ICONF = NCONF(1)
GO TO (260,225,225,225,225),ICONF
7 A6
225
FR(M) = 3.
FT(M) = 3.
FP(M) = 4.67
FE(M) = 4.67

CONT. ON PG 6

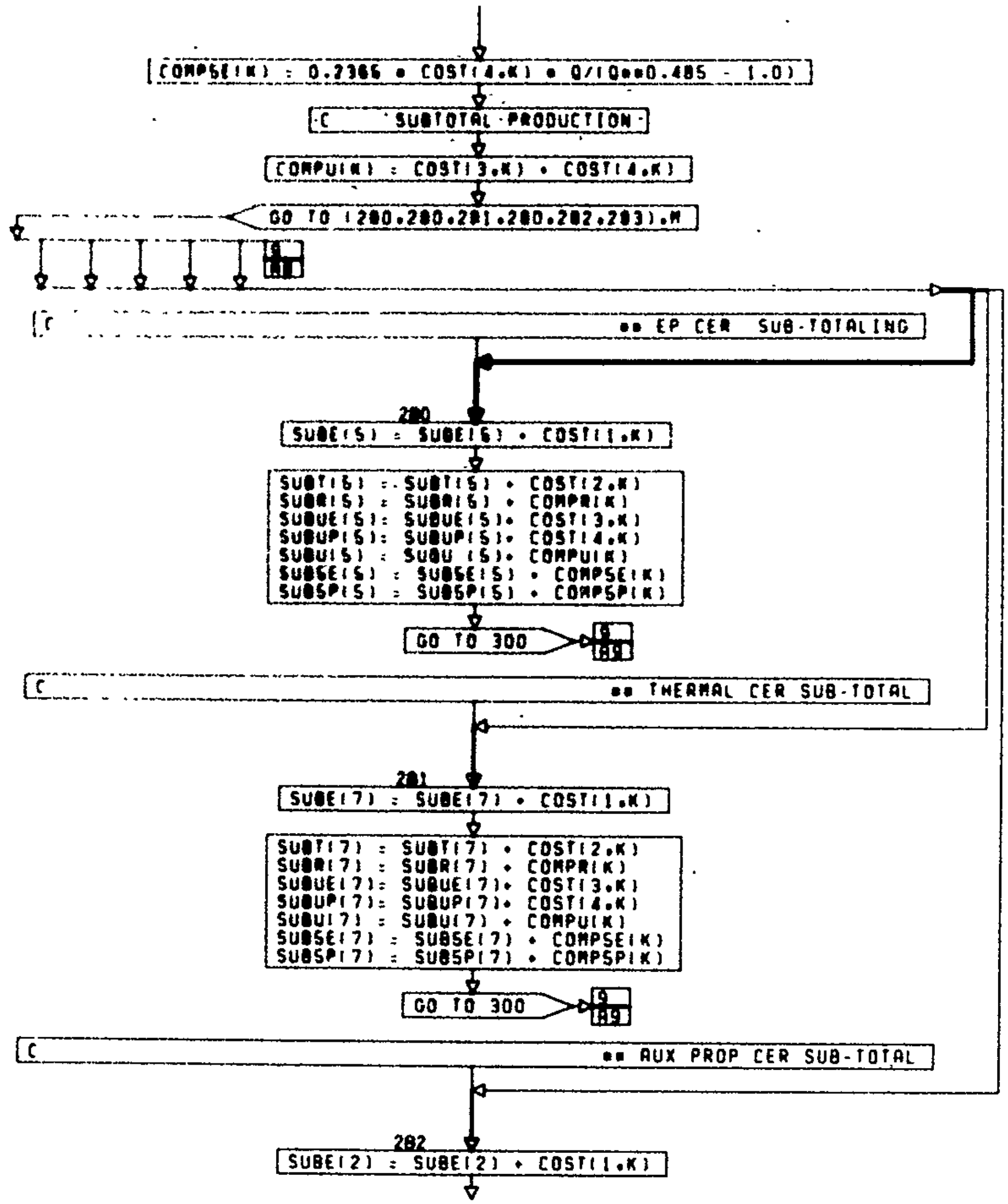

GO TO 270
7
A7
C SET PROPELLANT FEED-SYSTEMS FACTORS
5
A3
240
ICONF = NCONF(2)
GO TO (260,241,245),ICONF
7
A6
241
FR(M) = 2.37
FT(M) = 1.
FP(M) = 1.
FE(M) = 2.37
GO TO 270
7
A7
245
FR(M) = .9954
FT(M) = 1.0
FP(M) = 1.0
FE(M) = .9954
GO TO 270
7
A7
C SET STRUCTURES FACTORS (ALL EXCEPT DUAL SPIN)
5
A4
250
ICONF = NCONF(1)
GO TO (260,255,255,255,255),ICONF
7
A6
7
A5
7
A5
7
A5
7
A5

CONT. ON PG 7

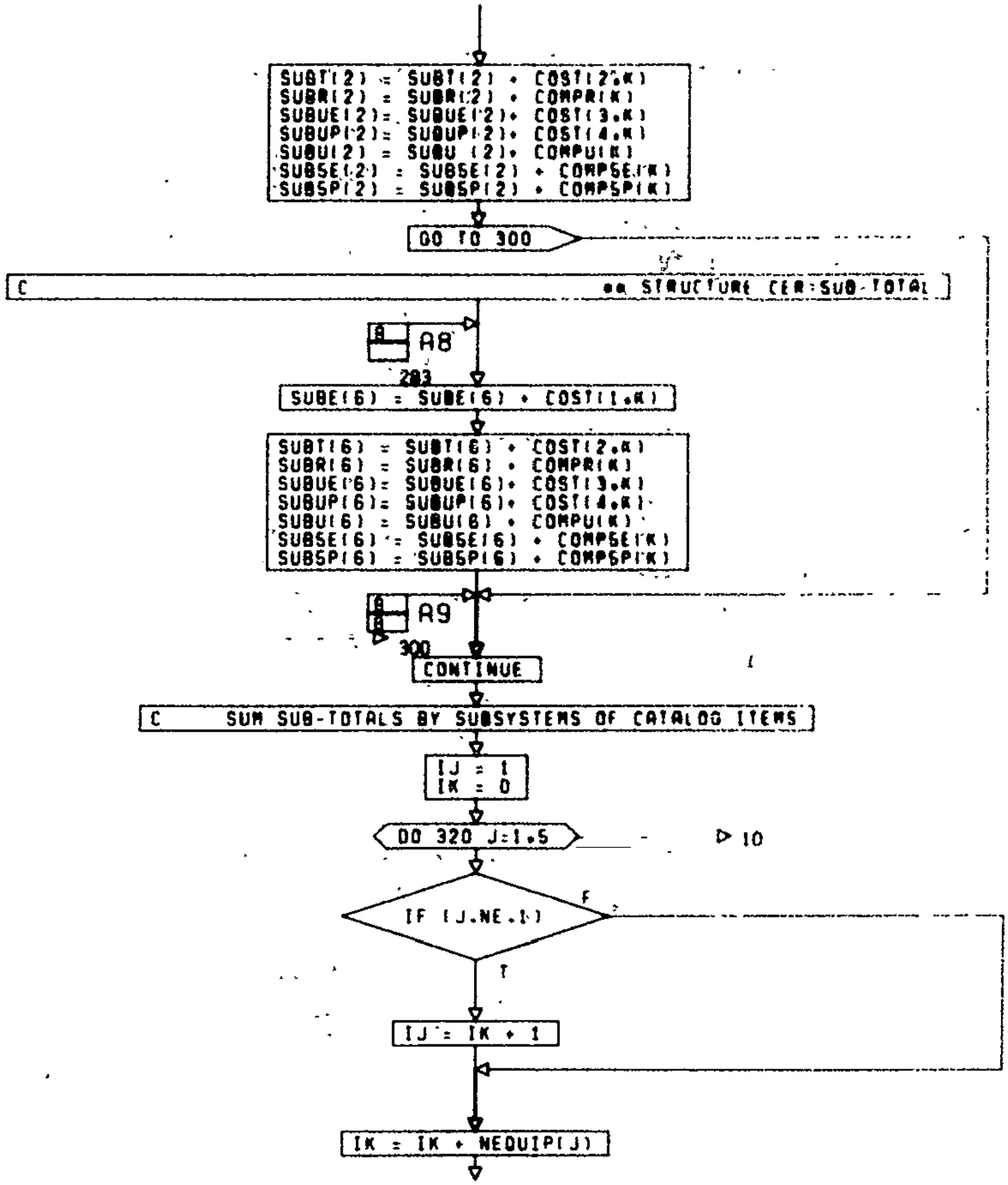


CONT. ON PG 8

821


COMPSE(K) = 0.2366 * COST(4,K) * Q/(Q**0.485 - 1.0)
C SUBTOTAL PRODUCTION
COMPU(K) = COST(3,K) + COST(4,K)
GO TO (280,280,281,280,282,283),M
9
A8
C ** EP CER SUB-TOTALING
280
SUBE(5) = SUBE(5) + COST(1,K)
SUBT(5) = SUBT(5) + COST(2,K)
SUBR(5) = SUBR(5) + COMPR(K)
SUBUE(5)= SUBUE(5)+ COST(3,K)
SUBUP(5)= SUBUP(5)+ COST(4,K)
SUBU(5) = SUBU (5)+ COMPU(K)
SUBSE(5) = SUBSE(5) + COMPSE(K)
SUBSP(5) = SUBSP(5) + COMPSP(K)
GO TO 300
9
A9
C ** THERMAL CER SUB-TOTAL
281
SUBE(7) = SUBE(7) + COST(1,K)
SUBT(7) = SUBT(7) + COST(2,K)
SUBR(7) = SUBR(7) + COMPR(K)
SUBUE(7)= SUBUE(7)+ COST(3,K)
SUBUP(7)= SUBUP(7)+ COST(4,K)
SUBU(7) = SUBU(7) + COMPU(K)
SUBSE(7) = SUBSE(7) + COMPSE(K)
SUBSP(7) = SUBSP(7) + COMPSP(K)
GO TO 300
9
A9
C ** AUX PROP CER SUB-TOTAL
282
SUBE(2) = SUBE(2) + COST(1,K)

CONT. ON PG 9

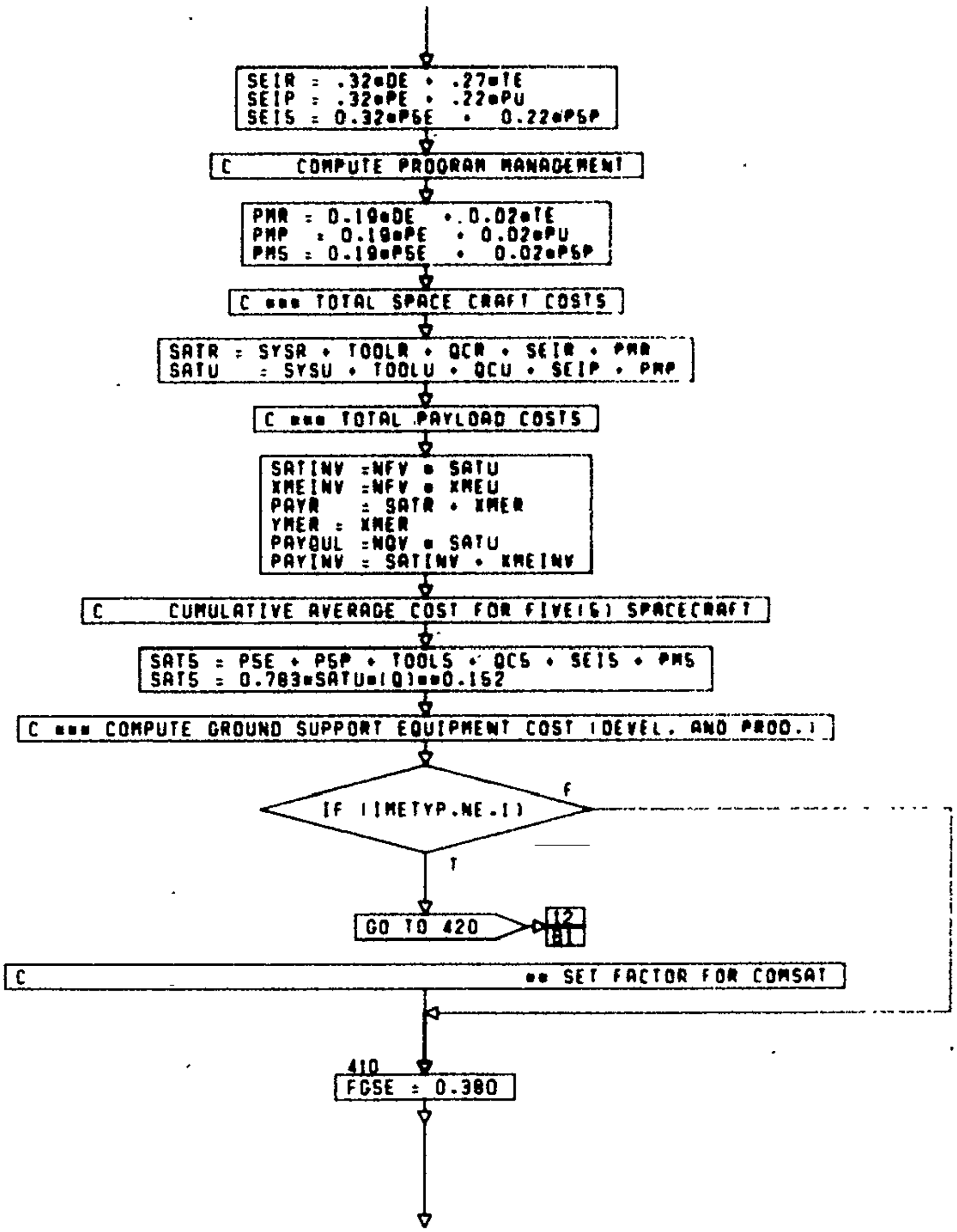


CONT. ON PG 10

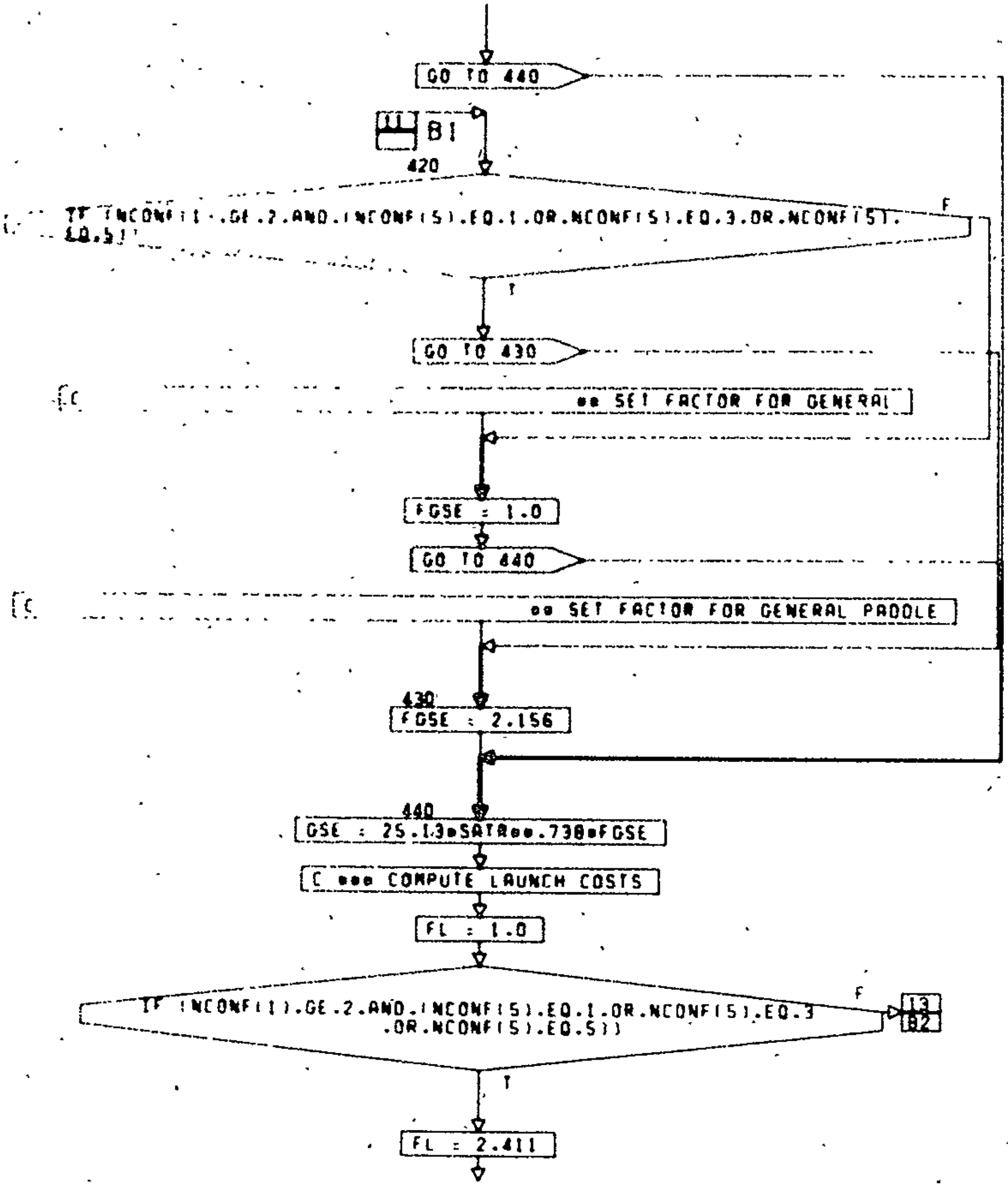
022

```
DO 310 I = IJ,IK

SUBE (J)  = SUBE (J)  + COST(1,I)
SUBT (J)  = SUBT (J)  + COST(2,I)
SUBR (J)  = SUBR (J)  + COMPR(I)
SUBUE(J)  = SUBUE(J)  + COST(3,I)
SUBUP(J)  = SUBUP(J)  + COST(4,I)
SUBU (J)  = SUBU (J)  + COMPU(I)
SUBSE(J)  = SUBSE(J)  + COMPSE(I)
SUBSP(J)  = SUBSP(J)  + COMPSP(I)

310 CONTINUE

320 CONTINUE

C **  TOTAL COSTS FOR BASIC SPACECRAFT

DO 400 I = 1,7

DE  = DE  + SUBE(I)
TE  = TE  + SUBT(I)
SYSR = SYSR + SUBR(I)
PE  = PE  + SUBUE(I)
PU  = PU  + SUBUP(I)
SYSU = SYSU + SUBU(I)
PSE = PSE + SUBSE(I)
PSP = PSP + SUBSP(I)

400 CONTINUE

C     COMPUTE TOOLING AND TEST EQUIPMENT

TOOLR = 0.
TOOLU = 0.
TOOLS = 0.

C     COMPUTE QUALITY CONTROL

QCR = .015*DE + .14*TE
QCU = .015*PE + .14*PU
QCS = 0.015*PSE  + 0.14*PSP

C     COMPUTE SYSTEMS ENGINEERING AND INTEGRATION
```

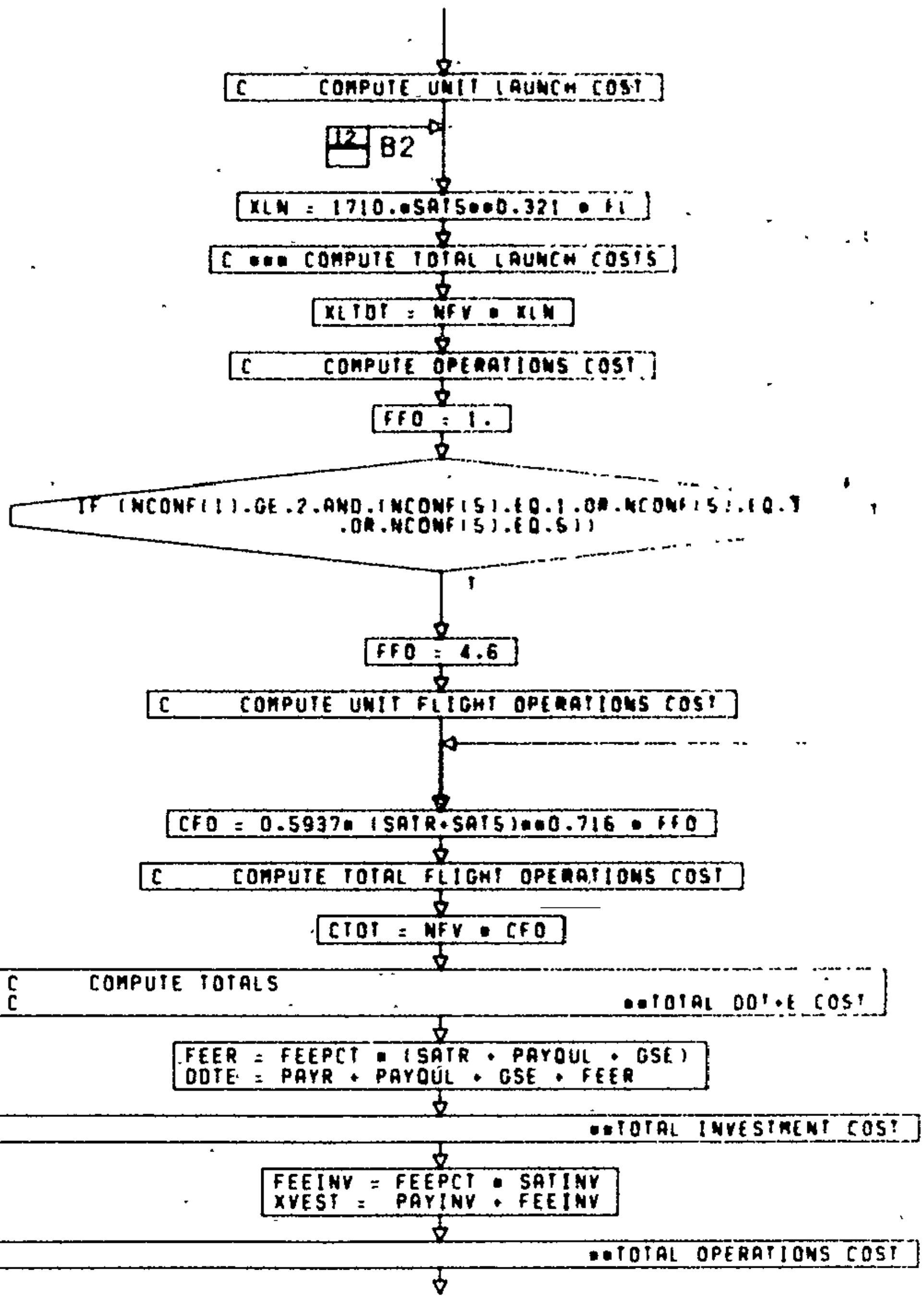
CONT. ON PG 11


SEIR = .32*DE + .27*TE
SEIP = .32*PE + .22*PU
SEIS = 0.32*P5E + 0.22*P5P
C COMPUTE PROGRAM MANAGEMENT
PMR = 0.19*DE + 0.02*TE
PMP = 0.19*PE + 0.02*PU
PMS = 0.19*P5E + 0.02*P5P
C *** TOTAL SPACE CRAFT COSTS
SATR = SYSR + TOOLR + QCR + SEIR + PMR
SATU = SYSU + TOOLU + QCU + SEIP + PMP
C *** TOTAL PAYLOAD COSTS
SATINV =NFV * SATU
XMEINV =NFV * XMEU
PAYR = SATR + XMER
YMER = XMER
PAYQUL =NQV * SATU
PAYINV = SATINV + XMEINV
C CUMULATIVE AVERAGE COST FOR FIVE(5) SPACECRAFT
SAT5 = P5E + P5P + TOOL5 + QC5 + SEI5 + PM5
SAT5 = 0.783*SATU*(Q)**0.152
C *** COMPUTE GROUND SUPPORT EQUIPMENT COST (DEVEL. AND PROD.)
IF (IMETYP.NE.1)
F
T
GO TO 420
12
B1
C ** SET FACTOR FOR COMSAT
410
FGSE = 0.380

CONT. ON PG 12


GO TO 440
11
B1
420
IF (NCONF(1).GE.2.AND.(NCONF(5).EQ.1.OR.NCONF(5).EQ.3.OR.NCONF(5).
EQ.5))
F
T
GO TO 430
C ** SET FACTOR FOR GENERAL
FGSE = 1.0
GO TO 440
C ** SET FACTOR FOR GENERAL PADDLE
430
FGSE = 2.156
440
GSE = 25.13*SATR**.738*FGSE
C *** COMPUTE LAUNCH COSTS
FL = 1.0
IF (NCONF(1).GE.2.AND.(NCONF(5).EQ.1.OR.NCONF(5).EQ.3
.OR.NCONF(5).EQ.5))
F
13
B2
T
FL = 2.411

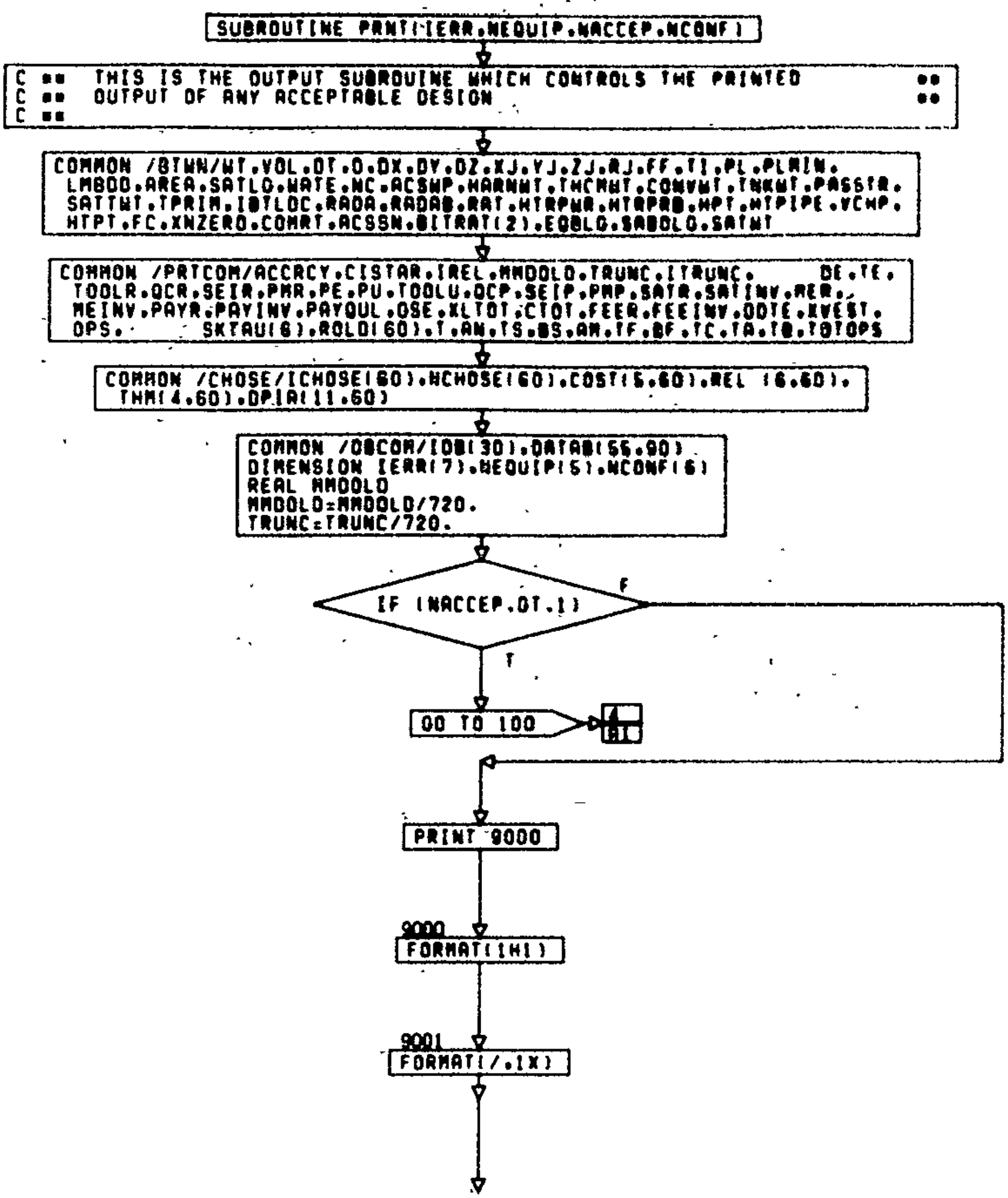
CONT. ON PG 13


C COMPUTE UNIT LAUNCH COST
12 B2
XLN = 1710.*SATS**0.321 * FL
C *** COMPUTE TOTAL LAUNCH COSTS
XLTOT = NFV * XLN
C COMPUTE OPERATIONS COST
FFO = 1.
IF (NCONF(1).GE.2.AND.(NCONF(5).EQ.1.OR.NCONF(5).EQ.3
.OR.NCONF(5).EQ.6))
T
FFO = 4.6
C COMPUTE UNIT FLIGHT OPERATIONS COST
CFO = 0.5937* (SATR+SAT5)**0.716 * FFO
C COMPUTE TOTAL FLIGHT OPERATIONS COST
CTOT = NFV * CFO
C COMPUTE TOTALS
C **TOTAL DDT+E COST
FEER = FEEPCT * (SATR + PAYQUL + GSE)
DDTE = PAYR + PAYQUL + GSE + FEER
C **TOTAL INVESTMENT COST
FEEINV = FEEPCT * SATINV
XVEST = PAYINV + FEEINV
C **TOTAL OPERATIONS COST

CONT. ON PG 14

```
OPS : (XLTOT + CTOT) * (1.0 + FEEPCT)

RETURN

END
```

PG 14 FINAL



CONT. ON PG 2

026

```
PRINT 9002

9002
FORMAT(30X,41H** NASA SYSTEMS COST/PERFORMANCE STUDY **)

PRINT 9001
PRINT 9010

9010
FORMAT (16H DEFINITIONS - -,/,25H   CONFIGURATIONS (NCONF),/,5X,
36HSTABILIZATION AND CONTROL (NCONF(1)),15X,31HAUXILIARY PROPULSIO
N (NCONF(2)),/,7X,23HNCONF(1)=1 IS DUAL SPIN,28X,22HNCONF(2)=1 IS
COLD GAS,/,7X,22HNCONF(1)=2 IS YAW SPIN,29X,28HNCONF(2)=2 IS MONOP
ROPELLANT,/,7X,28HNCONF(1)=3 IS MASS EXPULSION,23X,26HNCONF(2)=3 I
S BIPROPELLANT,/,7X,37HNCONF(1)=4 IS MASS EXPULSION W/ CMG-S,12X,2
5HCOMMUNICATIONS (NCONF(4)),/,7X,38HNCONF(1)=5 IS MASS EXPULSION W
/ R.W.-S,13X,42HNCONF(4)=1 IS SEPARATE UPLINK AND DOWNLINK,/,5X,46

HDATA PROCESSING AND INSTRUMENTATION (NCONF(3)),7X,41HNCONF(4)=2 I
S UNIFIED LINK-COMMON ANTENNA,/,7X,39HNCONF(3)=1 IS GENERAL PURPOS
E PROCESSOR,12X,43HNCONF(4)=3 IS UNIFIED LINK-SEPARATE ANTENNA,/,7
X,39HNCONF(3)=2 IS SPECIAL PURPOSE PROCESSOR,12X,48HNCONF(4)=4 IS
UNIFIED LINK-COMMON ANT + DOWNLINK,/,5X,27HELECTRICAL POWER (NCONF
(5)),26X,50HNCONF(4)=5 IS UNIFIED LINK-SEPARATE ANT + DOWNLINK,/,7
X,44HNCONF(5)=1 IS SHUNT REGULATION - PADDLE MTD.,5X,25HVEHICLE SI
ZING (NCONF(6)),/,7X,42HNCONF(5)=2 IS SHUNT REGULATION - BODY MTD.

,9X,22HNCONF(6)=1 IS CYLINDER,/,7X,44HNCONF(5)=3 IS SHNT + DISCH.R
EG - PADDLE MTD.,7X,17HNCONF(6)=2 IS BOX,/,7X,42HNCONF(5)=4 IS SHN
T + DISCH.REG - BODY MTD.,9X,20HNCONF(6)=3 IS SPHERE)

PRINT 9011

9011
FORMAT (7X,44HNCONF(5)=5 IS SERIES LOAD REG. - PADDLE MTD.,5X,11HR
ELIABILITY,/,7X,42HNCONF(5)=6 IS SERIES LOAD REG. - BODY MTD.,9X,4
5HREDUNDANCY CONFIGURATION = 0 IS SINGLE STRING,/,58X,43HREDUNDANC
Y CONFIGURATION = 1 IS DUAL STRING)
```

CONT. ON PG 3

```
PRINT 9001
PRINT 9012
```

```
9012
FORMAT (18H   MESSAGES (IERR)./.5X.25HSTABILIZATION AND CONTROL.26
X.20HAUXILIARY PROPULSION./.7X.28HIERR =     0 MEANS NO MESSAGES.22
X.27HIERR =  0 MEANS NO MESSAGES./.7X.49HIERR =     1 MEANS MAX ALL
OWABLE SYS. ERROR UNSAT..2X.60HIERR =  1 MEANS CYCLE LIFE OF ATTIT
UDE AND CONTROL./.7X.42HIERR =    1X MEANS MAX RATE ERROR TOO SMALL
.25X.22HTHRUSTERS IS TOO SHORT./.7X.42HIERR =  1XX MEANS 3-AXIS WH
EELS ACCEPTABLE.9X.52HIERR = 10 MEANS CYCLE LIFE OF TRANSLATIONAL
THRUSTER./.7X.42HIERR = 1XXX MEANS DBL GIMB.CMGS ACCEPTABLE.25X.12
```

```
HIS TOO SHORT./.5X.35HDATA PROCESSING AND INSTRUMENTATION.10X.49HI
ERR = 11 MEANS CYCLE LIVES OF BOTH THRUSTERS ARE./.7X.30HIERR =
 0 MEANS NO MESSAGES.37X.9HTOO SHORT./.7X.31HIERR =     1 MEANS M
UX REQUIRED.18X.7HTHERMAL./.7X.41HIERR =     10 WORD LENGTH GREATER
 THAN 256.10X. 49HIERR = 1XXXXXXXXX MEANS BATT RAD AREA IS SUPPLIE
D./.7X.34HIERR =    100 BIT RATE IS TOO LARGE.35X.8HIN RADAB./.7X.3
6HIERR =  1000 SPEC.COMD.SYNC.FLG NE 0.15X.  51HIERR = X1XXXXXXXX
MEANS OSR CONV. AND VARIABLE COND ./.7X.36HIERR = 10000 END OF DAT
```

```
A BASE SENSED.33X.34HUCTANCE HEAT PIPE INFO IS REQUIRED./.5X.14HVE
HICLE SIZING.39X.45HIERR = XX1XXXXXXX MEANS PHASE CONTROL MASS IS)
```

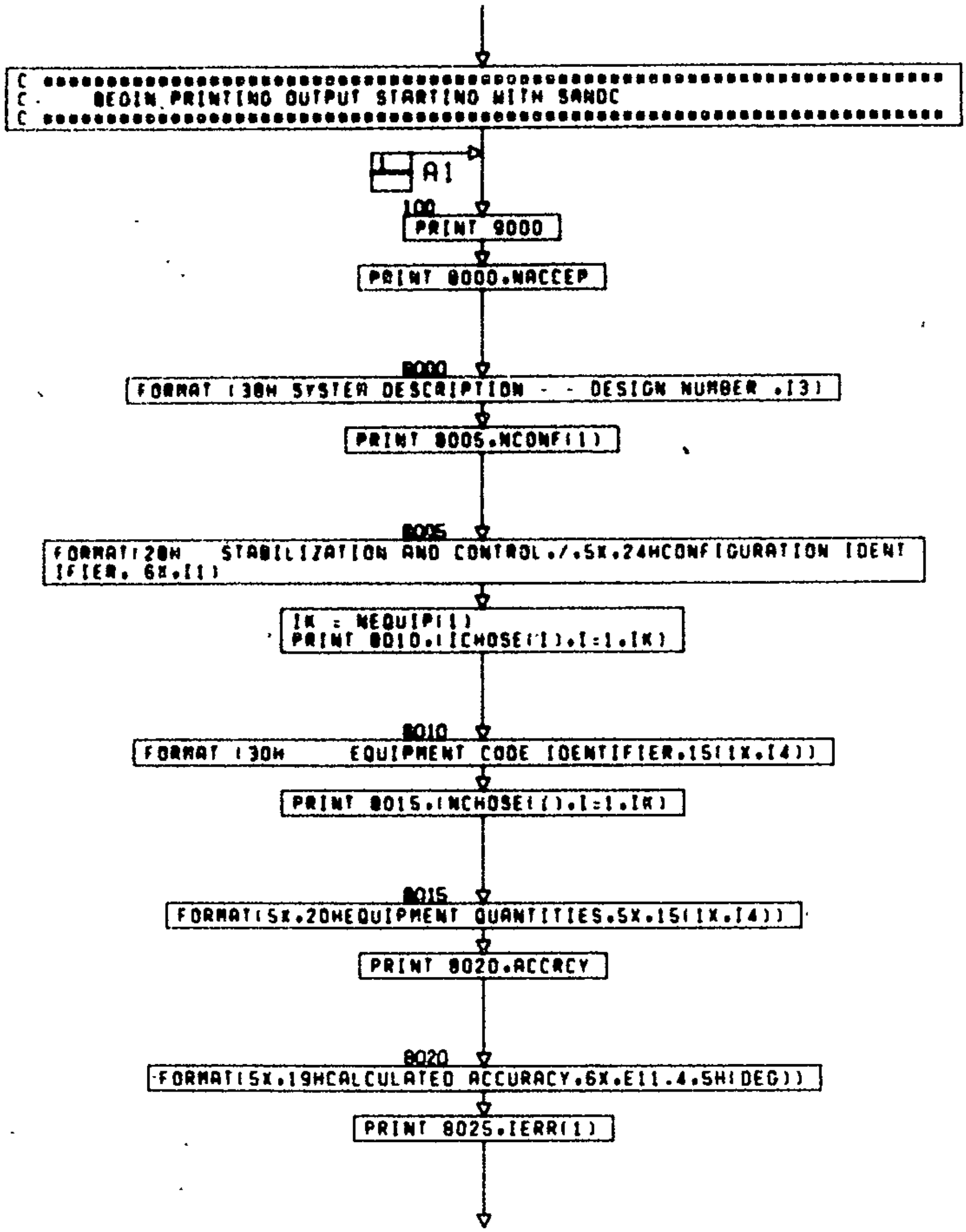
```
PRINT 9013
```

```
9013
FORMAT (7X.26HIERR = 0 MEANS NO MESSAGES.43X.15HSUPPLIED IN PCM./.
7X.46HIERR = 1 MEANS BODY MOUNTED SOLAR ARRAY LENGTH.5X.50HIERR =
XXX1XXXXXX MEANS ISOTHERMALIZER IS REQUIRED./.16X.28HEXCEEDS EQUIP
MENT BAY LENGTH.14X.51HIERR = XXXX1XXXXX MEANS DIODE HEAT PIPE IS
REQUIRED./.76X.12H(2 REQUIRED)./.58X.51HIERR = XXXXX1XXXX MEANS CO
NV. HEAT PIPE IS REQUIRED./.58X.48HIERR = XXXXXX1XXX MEANS OSR RAD
IATOR IS REQUIRED./.58X.50HIERR = XXXXXXX1XX MEANS CONV. RADIATOR
IS REQUIRED./.58X.48HIERR = XXXXXXXX1X MEANS HEATER POWER IS SUPPL
```

```
IED./.76X.9HIN HTRPWR./.58X.49HIERR = XXXXXXXXX1 MEANS RADIATOR AR
EA IS SUPPLIED./.76X.7HIN RADA)
```

CONT. ON PG 4

027

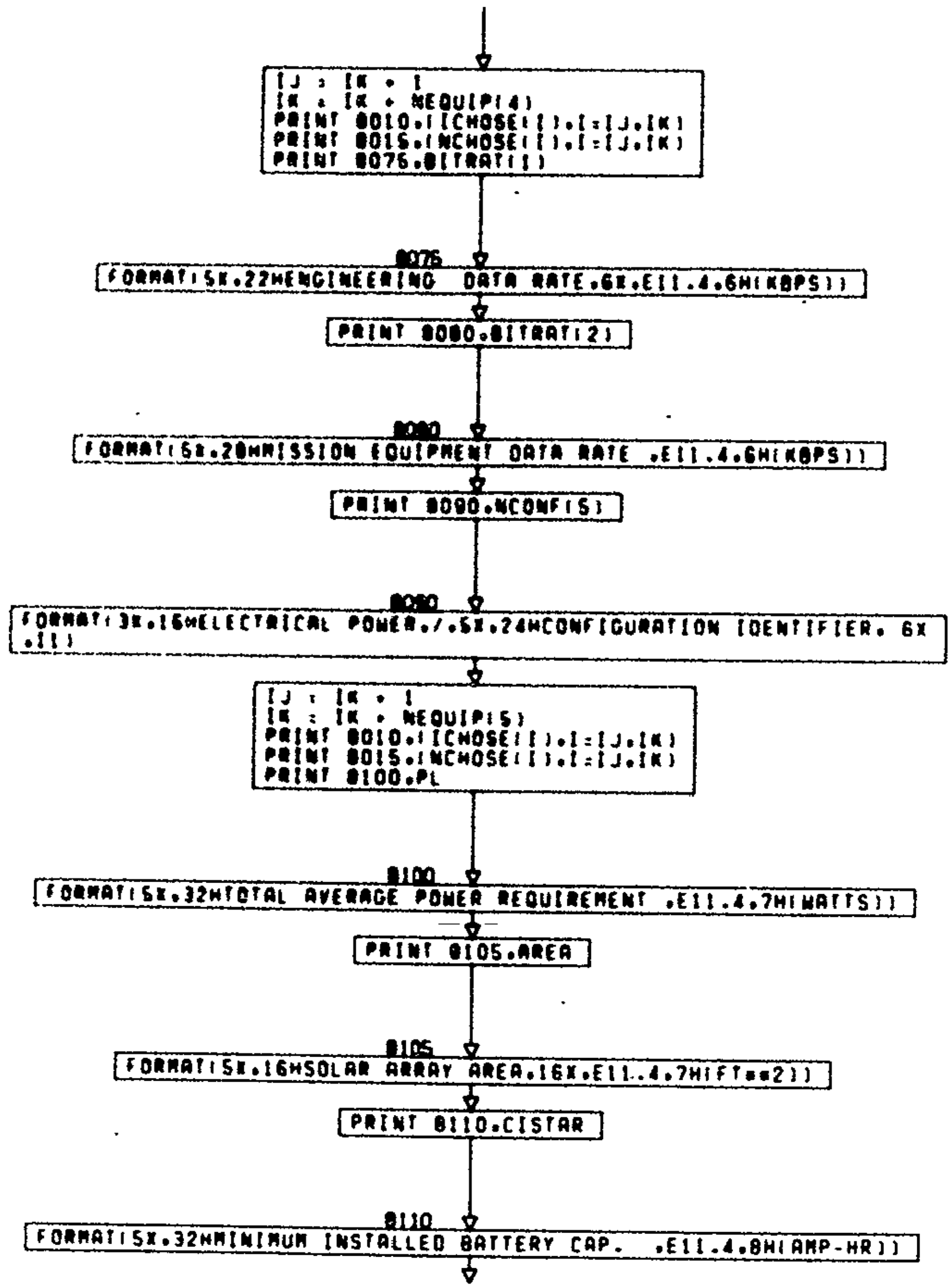

C **
C   BEGIN PRINTING OUTPUT STARTING WITH SANDC
C **
A1
100
PRINT 9000
PRINT 8000,NACCEP
8000
FORMAT (30H SYSTEM DESCRIPTION - - DESIGN NUMBER ,I3)
PRINT 8005,NCONF(1)
8005
FORMAT(20H   STABILIZATION AND CONTROL,/,5X,24HCONFIGURATION IDENT IFIER, 6X,I1)
IK = NEQUIP(1)
PRINT 8010,(ICHOSE(I),I=1,IK)
8010
FORMAT (30H   EQUIPMENT CODE IDENTIFIER,15(1X,I4))
PRINT 8015,(NCHOSE(I),I=1,IK)
8015
FORMAT(5X,20HEQUIPMENT QUANTITIES,5X,15(1X,I4))
PRINT 8020,ACCRCY
8020
FORMAT(5X,19HCALCULATED ACCURACY,6X,E11.4,5H DEG))
PRINT 8025,IERR(1)

CONT. ON PG 5

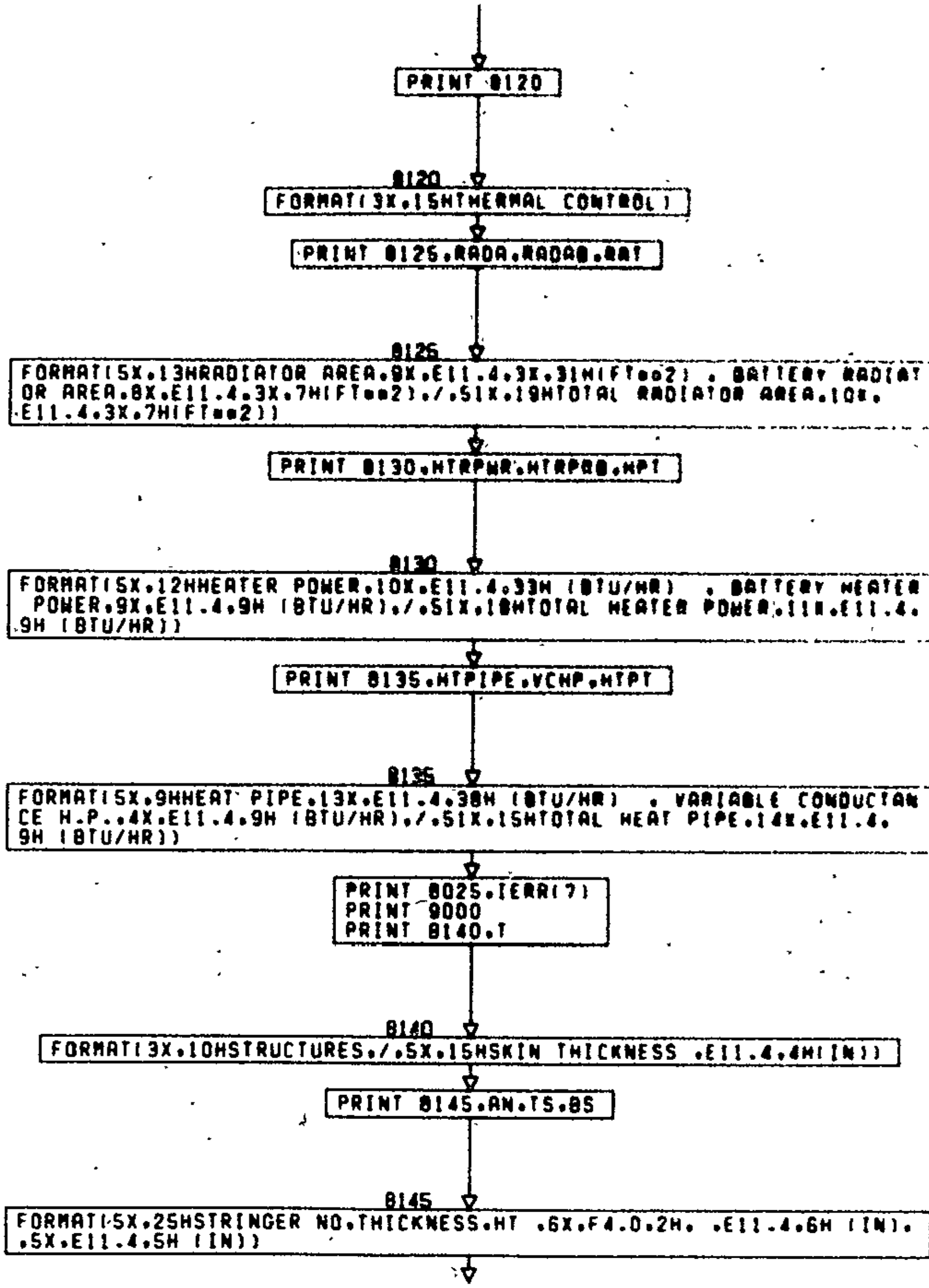
```
8025
FORMAT(5X,4HIERR,21X,I10)

PRINT 8030,NCONF(2)

8030
FORMAT (3X,20HAUXILIARY PROPULSION,/,5X,24HCONFIGURATION IDENTIFIE
R, 6X,I1)

IJ = IK + 1
IK = IK + NEQUIP(2)
PRINT 8010,(ICHOSE(I),I=IJ,IK)
PRINT 8015,(NCHOSE(I),I=IJ,IK)
PRINT 8045,TI

8045
FORMAT(5X,13HTOTAL IMPULSE,12X,E11.4,8H(LB-SEC))

PRINT 8025,IERR(2)
PRINT 8055,NCONF(3)

8055
FORMAT(3X,35HDATA PROCESSING AND INSTRUMENTATION,/,5X,24HCONFIGURA
TION IDENTIFIER, 6X,I1)

IJ = IK + 1
IK = IK + NEQUIP(3)
PRINT 8010,(ICHOSE(I),I=IJ,IK)
PRINT 8015,(NCHOSE(I),I=IJ,IK)
PRINT 8060,TOTOPS

8060
FORMAT(5X,25HCOMPUTER OPERATIONS RATE ,E11.4,5H(IPS))

C      PUT TOTAL STORAGE CAPACITY PRINT HERE LATER

PRINT 8025,IERR(3)
PRINT 8070,NCONF(4)

8070
FORMAT(3X,14HCOMMUNICATIONS,/,5X,24HCONFIGURATION IDENTIFIER, 6X,I
1)
```

CONT. ON PG 6

420


IJ : IK + 1
IK : IK + NEQUIP(4)
PRINT 8010,(ICHOSE(I),I=IJ,IK)
PRINT 8015,(NCHOSE(I),I=IJ,IK)
PRINT 8075,BITRAT(1)
8075
FORMAT(5X,22HENGINEERING DATA RATE,6X,E11.4,6H(KBPS))
PRINT 8080,BITRAT(2)
8080
FORMAT(5X,28HMISSION EQUIPMENT DATA RATE ,E11.4,6H(KBPS))
PRINT 8090,NCONF(5)
8090
FORMAT(3X,16HELECTRICAL POWER,/,5X,24HCONFIGURATION IDENTIFIER, 6X
,I1)
IJ : IK + 1
IK : IK + NEQUIP(5)
PRINT 8010,(ICHOSE(I),I=IJ,IK)
PRINT 8015,(NCHOSE(I),I=IJ,IK)
PRINT 8100,PL
8100
FORMAT(5X,32HTOTAL AVERAGE POWER REQUIREMENT ,E11.4,7H(WATTS))
PRINT 8105,AREA
8105
FORMAT(5X,16HSOLAR ARRAY AREA,16X,E11.4,7H(FT**2))
PRINT 8110,CISTAR
8110
FORMAT(5X,32HMINIMUM INSTALLED BATTERY CAP. ,E11.4,8H(AMP-HR))

CONT. ON PG 7

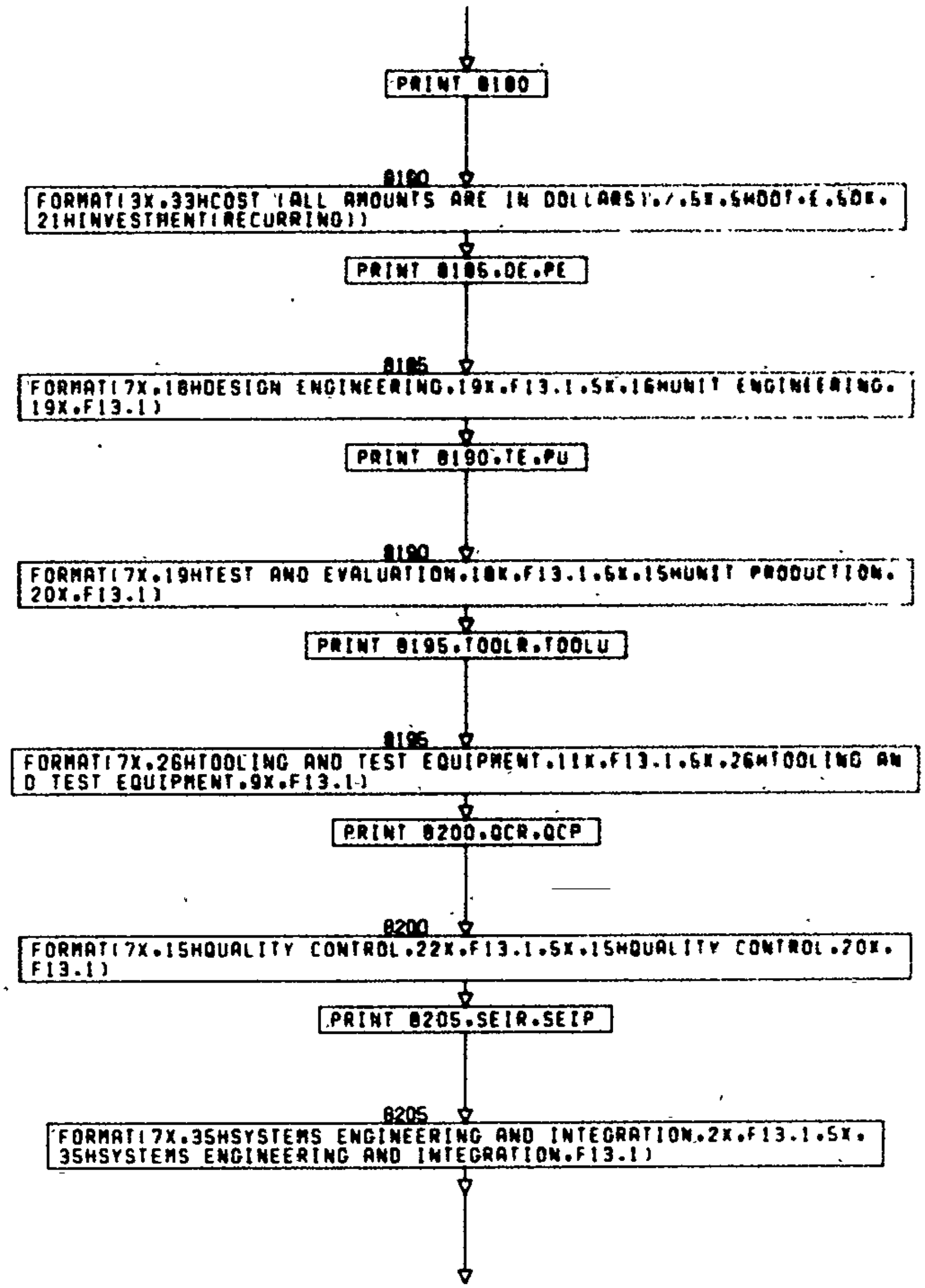


CONT. ON PG 8

829

```
PRINT 8160,AM,TF,BF

8160
FORMAT(6X,25HFRAME NO. THICKNESS, HT. ,6X,F4.0,2H. ,E11.4,6H (IN),
,5X,E11.4,6H (IN))

PRINT 8155,TC,TB,TA

8155
FORMAT(5X,30HEND COVER THICKNESS - FORWARD ,E11.4,12H(IN),CENTER ,
E11.4,8H(IN),AFT ,E11.4,4H(IN))

PRINT 8160,NCONF(6),SATWT,SATLG,D,D

8160
FORMAT(3X,14HVEHICLE SIZING,/,5X,24HCONFIGURATION IDENTIFIER, 6X,
I1,/,5X,14HLAUNCH WEIGHT,E11.4,6H(LBS),,14X,9HLENGTH     ,E11.4,
6H(IN),,/,12X,7HWIDTH   ,E11.4,
5H(IN),,15X,8HHEIGHT    ,E11.4,6H (IN),)

PRINT 8165,XJ,YJ,ZJ

8165
FORMAT(5X,6HIXX   ,E11.4,12H (LB-IN**2),,6X,6HIYY   ,E11.4,12H (LB
-IN**2),,6X,6HIZZ   ,E11.4,11H (LB-IN**2))

PRINT 8025,IERR(6)
PRINT 8170,IREL

8170
FORMAT(3X,7HSAFETY,/,5X,25HREDUNDANCY CONFIGURATION ,I2)

PRINT 8175,MMDOLD,ROLD(ITRUNC),TRUNC

8175
FORMAT(5X,21HMEAN MISSION DURATION,E11.4,5H(MO),,11HRELIABILITY,
E11.4,28H,RELIABILITY TRUNCATION TIME,E11.4,4H(MO))
```

CONT. ON PG 9


PRINT 8180
8180
FORMAT(3X,33HCOST (ALL AMOUNTS ARE IN DOLLARS),/,5X,5HDDT-E,60X,
21HINVESTMENT(RECURRING))
PRINT 8185,DE,PE
8185
FORMAT(7X,18HDESIGN ENGINEERING,19X,F13.1,5X,16HUNIT ENGINEERING,
19X,F13.1)
PRINT 8190,TE,PU
8190
FORMAT(7X,19HTEST AND EVALUATION,18X,F13.1,6X,15HUNIT PRODUCTION,
20X,F13.1)
PRINT 8195,TOOLR,TOOLU
8195
FORMAT(7X,26HTOOLING AND TEST EQUIPMENT,11X,F13.1,6X,26HTOOLING AN
D TEST EQUIPMENT,9X,F13.1)
PRINT 8200,QCR,QCP
8200
FORMAT(7X,15HQUALITY CONTROL,22X,F13.1,5X,15HQUALITY CONTROL,20X,
F13.1)
PRINT 8205,SEIR,SEIP
8205
FORMAT(7X,35HSYSTEMS ENGINEERING AND INTEGRATION,2X,F13.1,5X,
35HSYSTEMS ENGINEERING AND INTEGRATION,F13.1)

CONT. ON PG 10

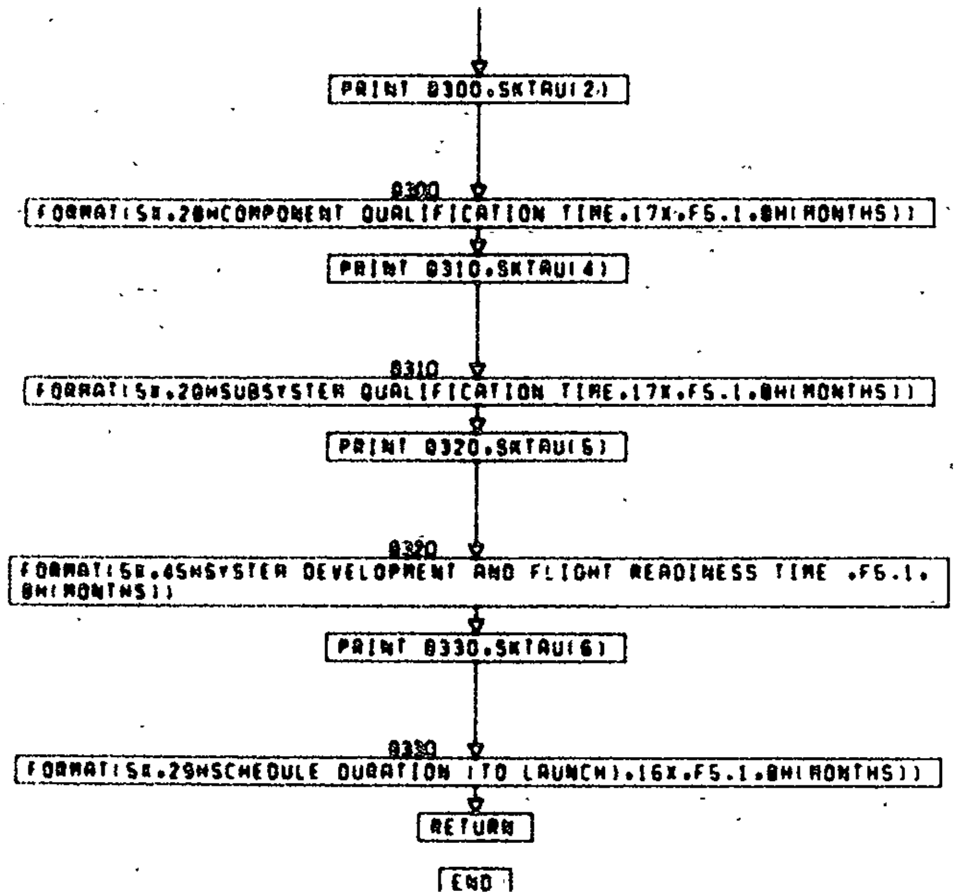
```
PRINT 8210,PMR,PMP

8210
FORMAT(7X,18HPROGRAM MANAGEMENT,19X,F13.1,6X,18HPROGRAM MANAGEMENT
,17X,F13.1)

PRINT 8215

8215
FORMAT(5X,13HCOST CATEGORY,12X,5HDDT+E,15X,10HINVESTMENT,10X,
10HOPERATIONS)

PRINT 8220,SATR,SATINV

8220
FORMAT(7X,10HSPACECRAFT,12X,F12.0,8X,F12.0)

PRINT 8225,MER,MEINV

8225
FORMAT(7X,17HMISSION EQUIPMENT,5X,F12.0,8X,F12.0)

PRINT 8230,PAYR,PAYINV

8230
FORMAT(7X,13HTOTAL PAYLOAD,9X,F12.0,8X,F12.0)

PRINT 8235,PAYQUL

8235
FORMAT(7X,19HQUALIFICATION UNITS,3X,F12.0)

PRINT 8240,GSE

8240
FORMAT(7X,6HG.S.E.,16X,F12.0)
```

CONT. ON PG 11

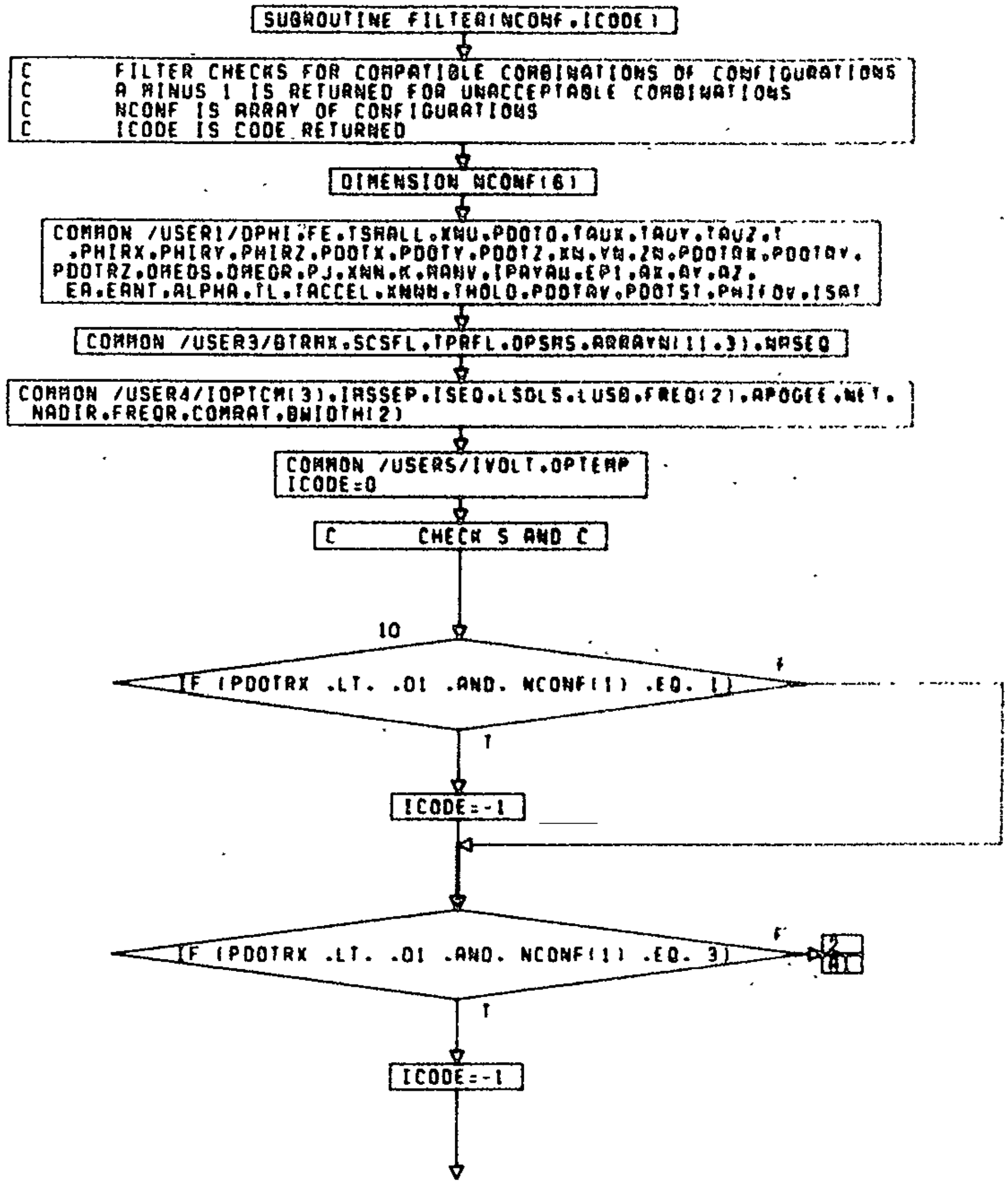
```
PRINT 8245,XLTOT

8245
FORMAT(7X,14HLAUNCH SUPPORT,48X,F12.0)

PRINT 8250,CTOT

8250
FORMAT(7X,17HFLIGHT OPERATIONS,45X,F12.0)

PRINT 8255,FEER,FEEINV

8255
FORMAT(7X,14HCONTRACTOR FEE,8X,F12.0,8X,F12.0)

PRINT 8260,DDTE,XVEST,OPS

8260
FORMAT(7X,13HPROGRAM TOTAL,9X,F12.0,8X,F12.0,8X,F12.0)

PRINT 8270

8270
FORMAT(3X,8HSCHEDULE)

PRINT 8280,SKTAU(1)

8280
FORMAT(5X,37HDESIGN AND COMPONENT DEVELOPMENT TIME,8X,F5.1,8H(MONT
HS))

PRINT 8290,SKTAU(3)

8290
FORMAT(5X,26HSUBSYSTEM DEVELOPMENT TIME,19X,F5.1,8H(MONTHS))
```

CONT. ON PG 12

031

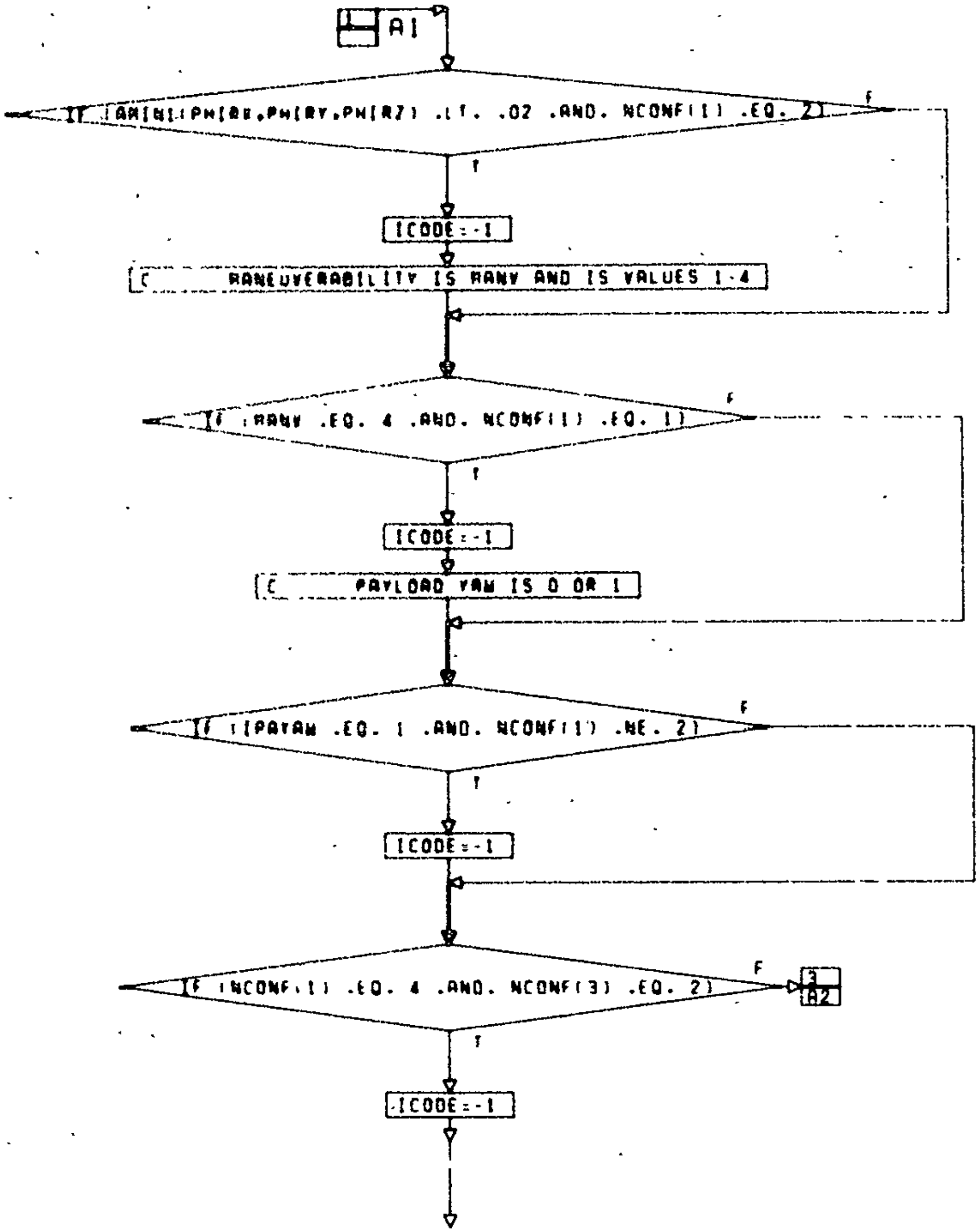

PRINT 8300,SKTAU(2)
8300
FORMAT(5X,28HCOMPONENT QUALIFICATION TIME,17X,F5.1,8H(MONTHS))
PRINT 8310,SKTAU(4)
8310
FORMAT(5X,28HSUBSYSTEM QUALIFICATION TIME,17X,F5.1,8H(MONTHS))
PRINT 8320,SKTAU(5)
8320
FORMAT(5X,45HSYSTEM DEVELOPMENT AND FLIGHT READINESS TIME ,F5.1,
8H(MONTHS))
PRINT 8330,SKTAU(6)
8330
FORMAT(5X,29HSCHEDULE DURATION (TO LAUNCH),16X,F5.1,8H(MONTHS))
RETURN
END

PG 12 FINAL

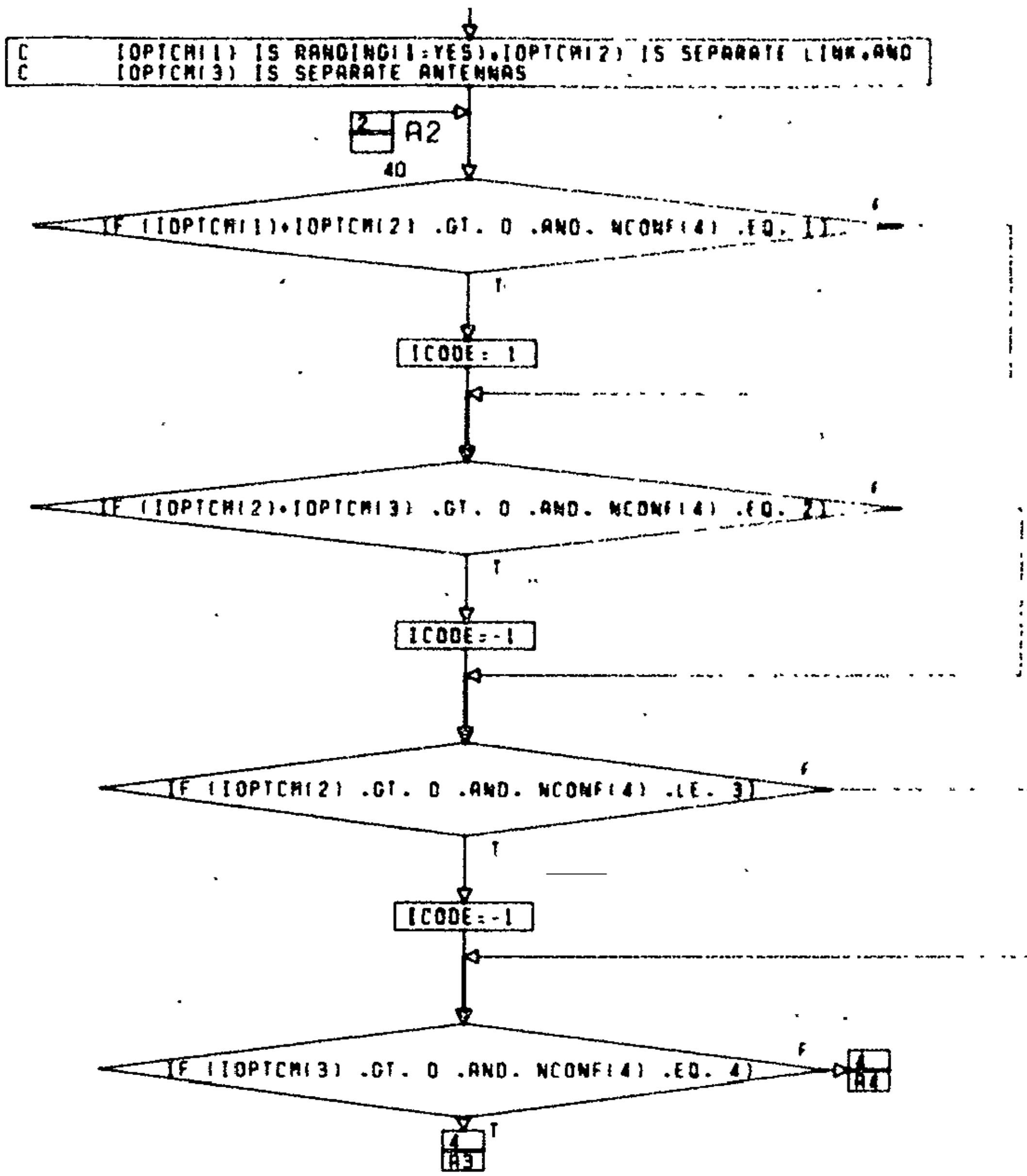


CONT. ON PG 2

033

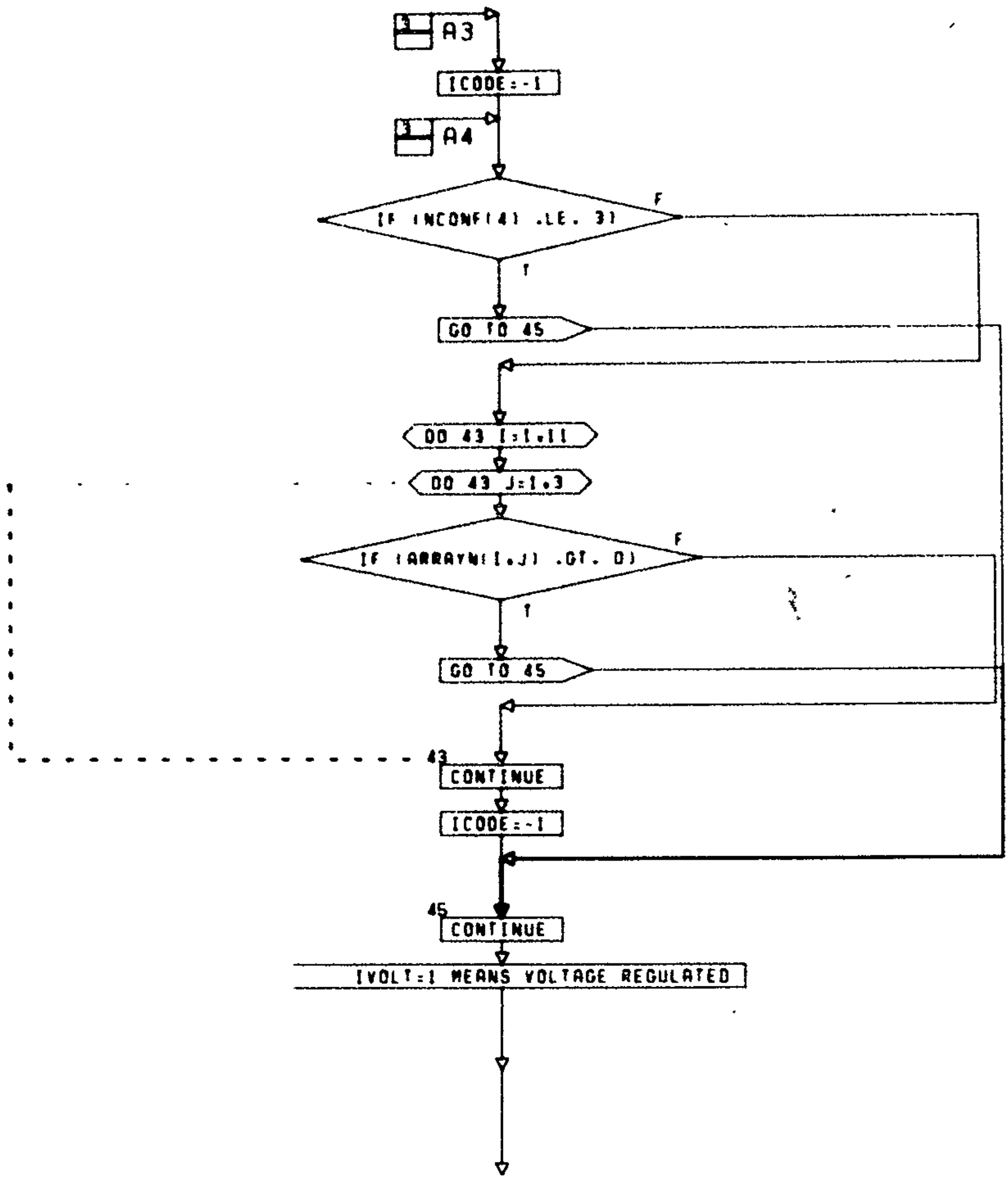

A1
IF (AMIN1(PH(RX),PH(RY),PH(RZ)) .LT. .02 .AND. NCONF(1) .EQ. 2)
F
T
ICODE=-1
C MANEUVERABILITY IS MANV AND IS VALUES 1-4
IF (MANV .EQ. 4 .AND. NCONF(1) .EQ. 1)
F
T
ICODE=-1
C PAYLOAD YAW IS 0 OR 1
IF ((PAYAW .EQ. 1 .AND. NCONF(1) .NE. 2)
F
T
ICODE=-1
IF (NCONF(1) .EQ. 4 .AND. NCONF(3) .EQ. 2)
F
3
A2
T
ICODE=-1

CONT. ON PG 3

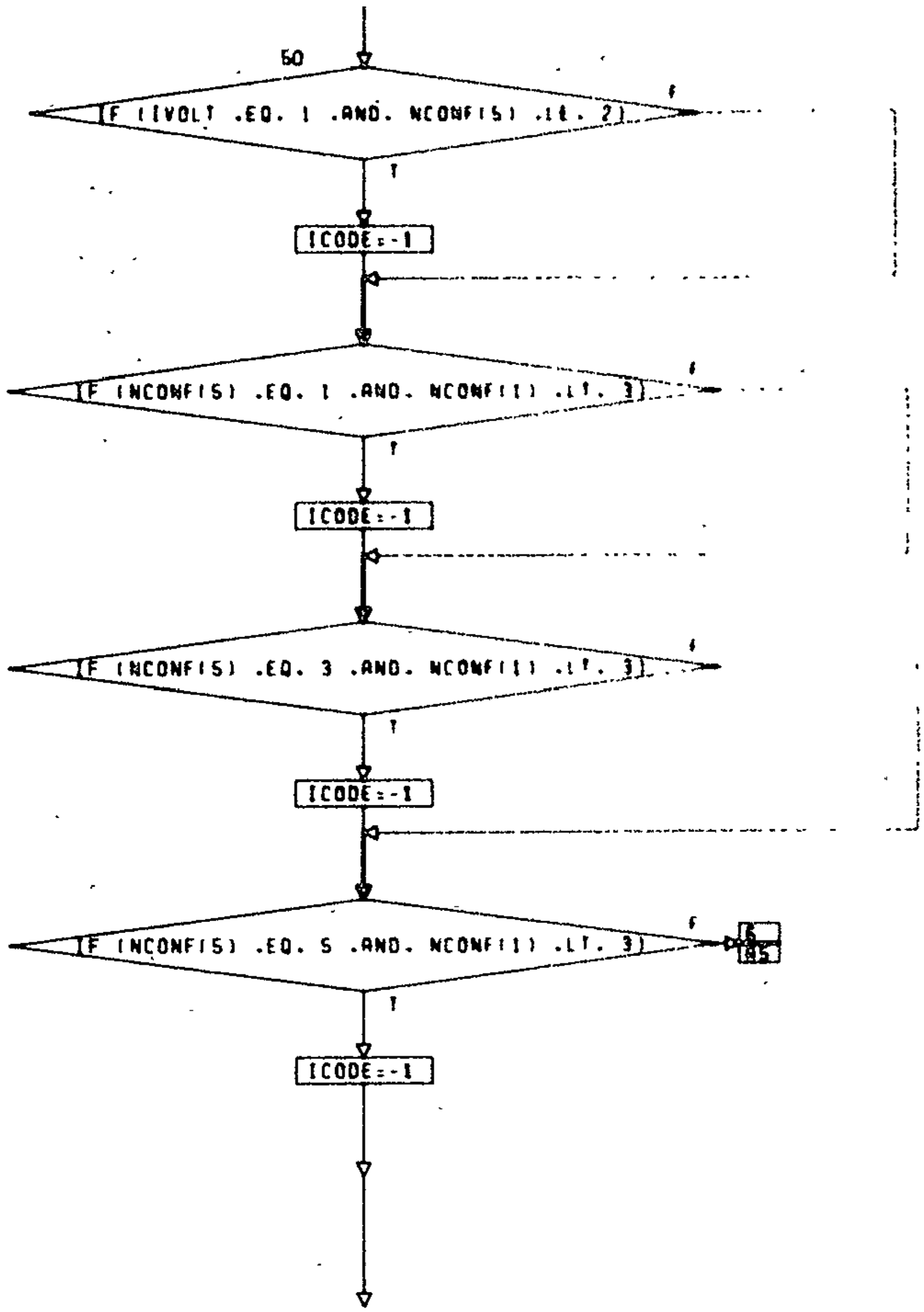


CONT. ON PG 4

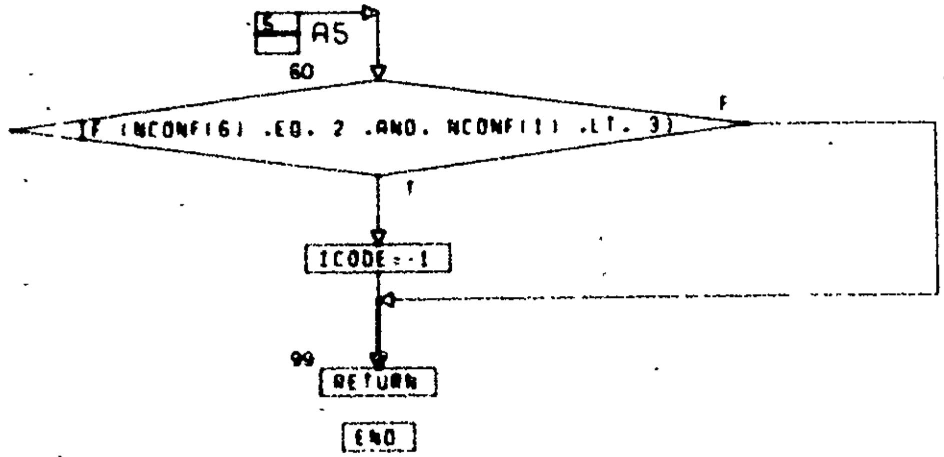
034


A3
ICODE:-1
A4
IF (NCONF(4) .LE. 3)
F
T
GO TO 45
DO 43 I:1,11
DO 43 J:1,3
IF (ARRAYN(I,J) .GT. 0)
F
T
GO TO 45
43
CONTINUE
ICODE:-1
45
CONTINUE
IVOLT:1 MEANS VOLTAGE REGULATED

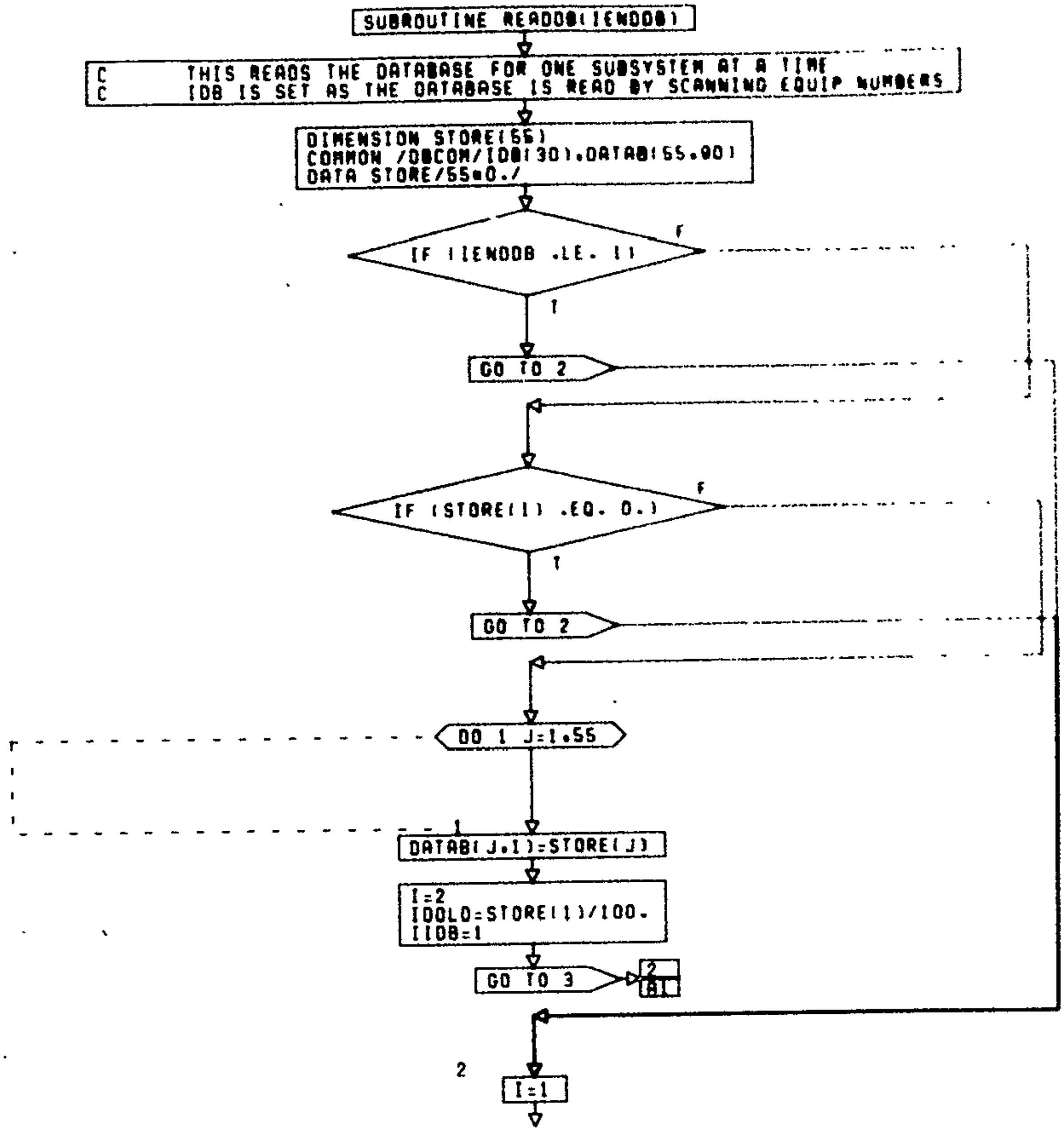
CONT. ON PG 5


50
IF (IVOLT .EQ. 1 .AND. NCONF(5) .LE. 2)
F
T
ICODE=-1
IF (NCONF(5) .EQ. 1 .AND. NCONF(1) .LT. 3)
F
T
ICODE=-1
IF (NCONF(5) .EQ. 3 .AND. NCONF(1) .LT. 3)
F
T
ICODE=-1
IF (NCONF(5) .EQ. 5 .AND. NCONF(1) .LT. 3)
F
6
85
T
ICODE=-1

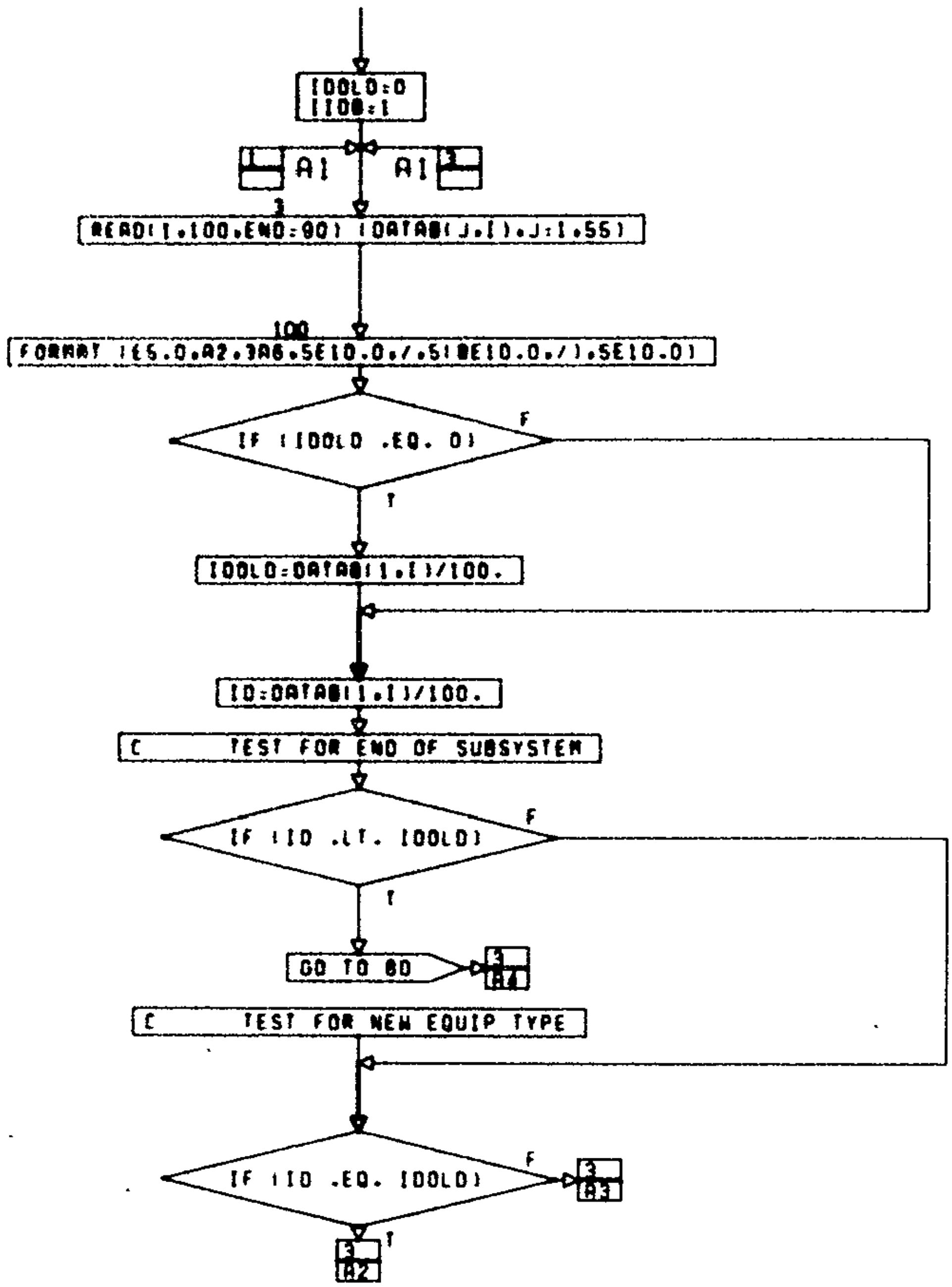
CONT. ON PG. 6



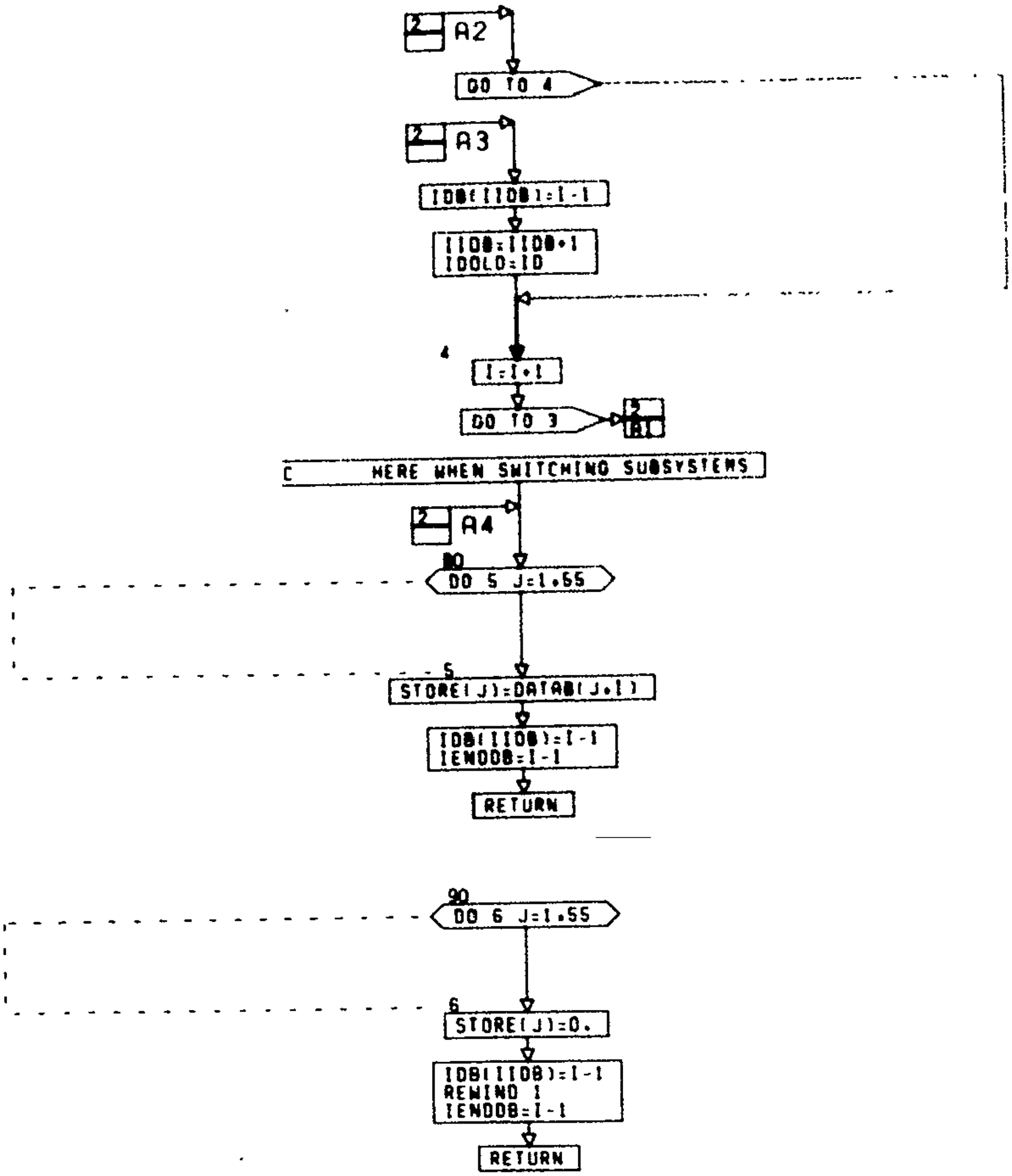
PG 6 FINAL


SUBROUTINE READDB(IENDDB)
C THIS READS THE DATABASE FOR ONE SUBSYSTEM AT A TIME
C IDB IS SET AS THE DATABASE IS READ BY SCANNING EQUIP NUMBERS
DIMENSION STORE(55)
COMMON /DBCOM/IDB(30),DATAB(55,90)
DATA STORE/55*0./
IF (IENDDB .LE. 1)
F
T
GO TO 2
IF (STORE(1) .EQ. 0.)
F
T
GO TO 2
DO 1 J=1,55
1
DATAB(J,I)=STORE(J)
I=2
IDOLD=STORE(1)/100.
IIDB=1
GO TO 3
2
B1
2
I=1

CONT. ON PG 2


IDOLD=0
IIDD=1
1 A1
A1 3
3
READ(I,100,END=90) (DATAB(J,I),J=1,55)
100
FORMAT (F5.0,A2,3A6,5E10.0,/,5(8E10.0,/),5E10.0)
IF (IDOLD .EQ. 0)
F
T
IDOLD=DATAB(1,I)/100.
ID=DATAB(1,I)/100.
C TEST FOR END OF SUBSYSTEM
IF (ID .LT. IDOLD)
F
T
GO TO 80
3
A4
C TEST FOR NEW EQUIP TYPE
IF (ID .EQ. IDOLD)
F
3
A3
T
3
A2

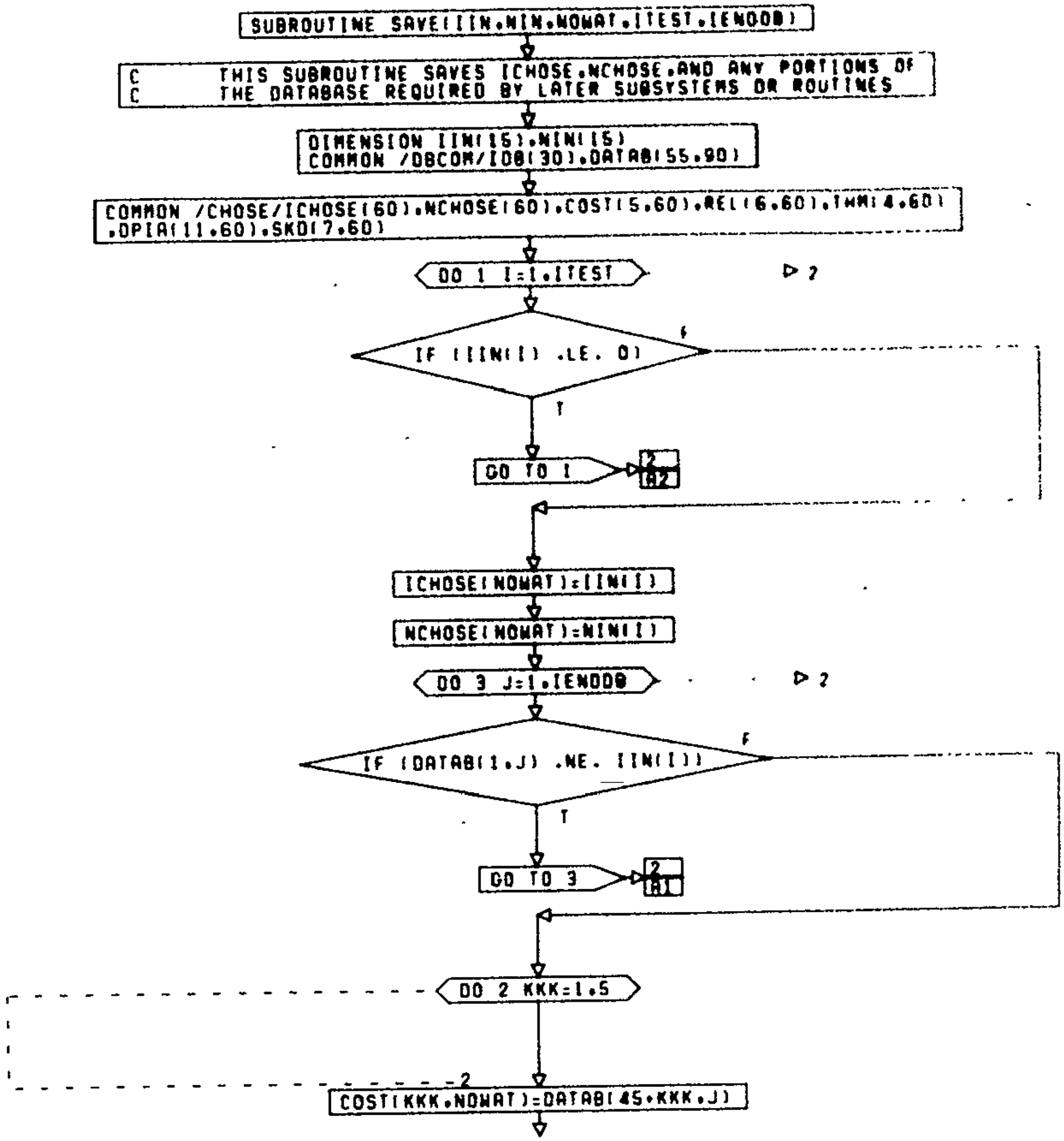
CONT. ON PG 3


2 A2
DO TO 4
2 A3
IDB(IIDB):I-1
IIDB=IIDB+1
IDOLD=ID
4
I=I+1
DO TO 3
2 A1
C HERE WHEN SWITCHING SUBSYSTEMS
2 A4
80
DO 5 J=1,65
5
STORE(J)=DATAB(J,I)
IDB(IIDB)=I-1
IENDDB=I-1
RETURN
90
DO 6 J=1,55
6
STORE(J)=0.
IDB(IIDB)=I-1
REWIND 1
IENDDB=I-1
RETURN

CONT. ON PG 4

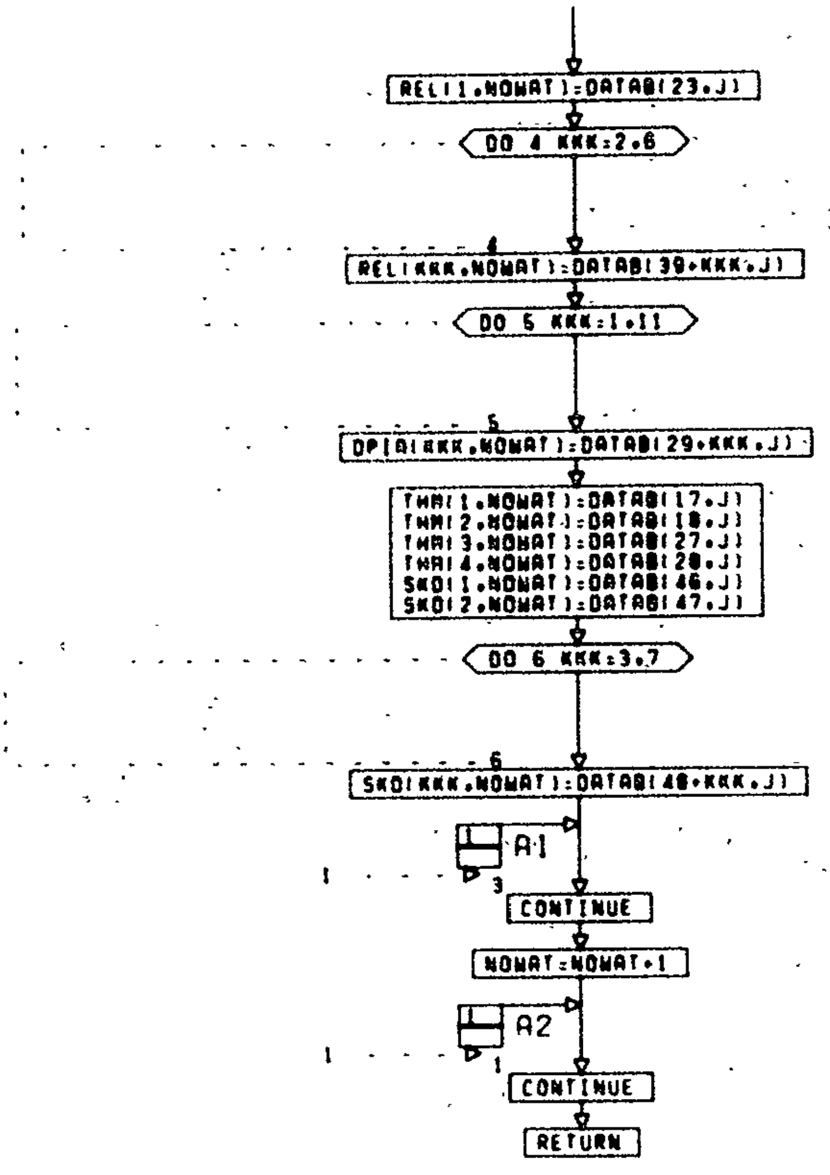
[END]

PG 4 FINAL



CONT. ON PG 2

040


RELI(1,NOWAT):DATAB(23,J)
DO 4 KKK:2,6
4
RELI(KKK,NOWAT):DATAB(39+KKK,J)
DO 5 KKK:1,11
5
DP(A(KKK,NOWAT):DATAB(29+KKK,J)
THA(1,NOWAT):DATAB(17,J)
THA(2,NOWAT):DATAB(18,J)
THA(3,NOWAT):DATAB(27,J)
THA(4,NOWAT):DATAB(28,J)
SKO(1,NOWAT):DATAB(46,J)
SKO(2,NOWAT):DATAB(47,J)
DO 6 KKK:3,7
6
SKO(KKK,NOWAT):DATAB(48+KKK,J)
A1
3
CONTINUE
NOWAT:NOWAT+1
A2
1
CONTINUE
RETURN

PG 2 FINAL

```
SUBROUTINE THRML (IERR,NCONF)

COMMON /BTWN/WT,VOL,DT,D,DX,DY,DZ,KJ,YJ,ZJ,RJ,FF,FI,PL,PLMIN,
 LMBDD,AREA,SATLO,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,INRWT,PASSTR,
 SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,HTRPRB,
 HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),
 EDBLO,SABOLG,SATWT

COMMON /USER7/ISATOR,ORBINC
COMMON /USERI/EQMIWT,EQM2WT,DIAMAX,ALT

COMMON /CHOSE/ICHOSE(60),NCHOSE(60),COST(5,60),REL(6,60),
 THRMDB(4,60),DPIA(11,60),SKD(7,60)

DIMENSION NCONF(6)
REAL LNGTH

DATA SIGMA/0.1714E-08/,QS/442.0/,EMISS/60.0/,ALBDO/155.0/,CONST/1.
5/,PIE/3.1415926536/

C ***************************************************************
C ***************************************************************
C **  SUBROUTINE THRML USES A METHODOLOGY FOR SIZING THE THERMAL  **
C **  CONTROL SUB-SYSTEM FOR A VARIETY OF SPACECRAFT. THIS METHODOLOGY**
C **  DETERMINES SIZE AND PERFORMANCE OF THE THERMAL SUB-SYSTEM   **
C ***************************************************************
C ***************************************************************
C **  A GLOSSARY OF VARIABLES FOLLOWS - -                         **

C ***************************************************************
C **                                                              **
C **       CODE IS AS FOLLOWS - -                                 **
C **             U = USER INPUT, DB = DATA BASE, INT = INTERNAL   **
C **             O = OUTPUT, I = INPUT FROM MAIN OR OTHER S/S     **
C ***************************************************************
C **       VAR. NAME      CODE      UNITS (DEFAULT)     DESCRIPTION  **
C **                                                              **

C ***************************************************************
C **                                                              **
C **       ALBDO        INT       155 BTU/(HR*FT**2)    ALBEDO     **
C **                                                              **
C **       ALPHA        INT       0.30 (DIMENSIONLESS)  CONV.RAD.CONST.**
C **                              0.08 (DIMENSIONLESS)  OSR. RAD.CONST.**
C **                                                              **
C **       ALT          U                   N.MI.       ALTITUDE   **

C **                                                              **
C **       BV           INT       1.1           VDC     MAX BATT.VOLT. **
C **                                                              **
C **       CA           INT       0.5           AMPS    BATT TRICKLE **
C **                                                              **
C **       CONST        INT       1.5                   K CONSTANT **
C **                                                              **
C **       EMISS        INT       60  BTU/(HR*FT**2)    EARTH EMISSION **
```

CONT. ON PG 2

642

```
C **                                                                        **
C **      EPSLON     INT        0.75 (DIMENSIONLESS)     CONV.RAD.CONST.**
C **                            0.73 (DIMENSIONLESS)     OSR. RAD.CONST.**
C **                                                                        **
C **      ETAT       INT                                XMTR EFFICIENCY     **
C **                                                                        **
C **      HPT        O                        (BTU/HR) TOTAL HEATER POWER **
C **                                                                        **

C **      HTPIPE     O                        (BTU/HR) HEAT DUE TO H.P.   **
C **                                                                        **
C **      HTPT       O                        (BTU/HR)TOTAL HEAT PIPE      **
C **                                                                        **
C **      HTRPRB     O                        (BTU/HR)BATT. HEATER POWER   **
C **                                                                        **
C **      HTRPHR     O                        (BTU/HR)OTHER HEATER POWER   **
C **                                                                        **

C **      I          INT                                INDEX               **
C **                                                                        **
C **      IBTLOC     I                                  BATTERY LOCATION    **
C **                                                                        **
C **      ICONF      INT                                TYPE OF CONFIG.     **
C **      ISATOR     U            1     (DIMENSIONLESS)     EARTH ORIENTED **
C **                              2     (DIMENSIONLESS)     SUN   ORIENTED **
C **                              3     (DIMENSIONLESS)     INERTIALLY ORI.**

C **                                                                        **
C **      NC                                            NUMBER BATT CEL**
C **                                                                        **
C **      NCONF(1)   I                                  S+C MACRO INDEX**
C **      NCONF(6)   I                                  VS  MACRO INDEX**
C **                                                                        **
C **      ORBINC     U                        DEGREES   ORBIT INCLINAT.**
C **                                                                        **

C **      PCM        O                            KG PHASE CHANGE MASS  **
C **                                                                        **
C **      PIE        INT              3.14159265 CONSTANT                   **
C **                                                                        **
C **      PMAX       INT (DB)               WATTS       PWR MAX             **
C **                                                                        **
C **      PMIN       INT (DB)               WATTS       PWR MIN             **

C **                                                                        **
C **      QMAX       INT                  (BTU/HR)        MAX PWR DISSAP.**
C **                                                                        **
C **      QMAXB      INT                  (BTU/HR) BATT.POWER MAXIMUM **
C **                                                                        **
C **      QMIN       INT                  (BTU/HR)        MIN PWR DISSAP.**
C **                                                                        **
C **      QMINB      INT                  (BTU/HR) BATT.POWER MINIMUM **

C **                                                                        **
C **      QS         INT        442.0 BTU/(HR*FT**2)      SOLAR CONST.   **
```

CONT. ON PG 3

```
C **                                                                     **
C **      RADA        D                        (FT**2)    RADIATOR AREA  **
C **                                                                     **
C **      RADAB       D                        FT**2 BATT.RAD.AREA       **
C **                                                                     **
C **      RAT         D                        FT**2 TOTAL RAD. AREA     **
```

```
C **                                                                     **
C **      SATLG       I  (VS)                  INCHES     SAT. LENGTH    **
C **                                                                     **
C **      SATRAD      I  (VS)                  INCHES     SAT. RADIUS    **
C **                                                                     **
C **      SIGMA       INT       0.1714E-8BTU/(HR*FT2*R4) BOLTZMANN CONST**
C **                                                                     **
C **      THRMDB      I                               THERMAL DATA BASE
```

```
C **                                                                     **
C **      TMAX        INT (DB)                 DEGREES R  MAX TEMPERATURE**
C **                                                                     **
C **      TMAXB       INT                             BATT. MAX. TEMP.   **
C **                                                                     **
C **      TMIN        INT (DB)                 DEGREES R  MIN TEMPERATURE**
C **                                                                     **
C **      TMINB       INT                             BATT. MIN. TEMP.   **
```

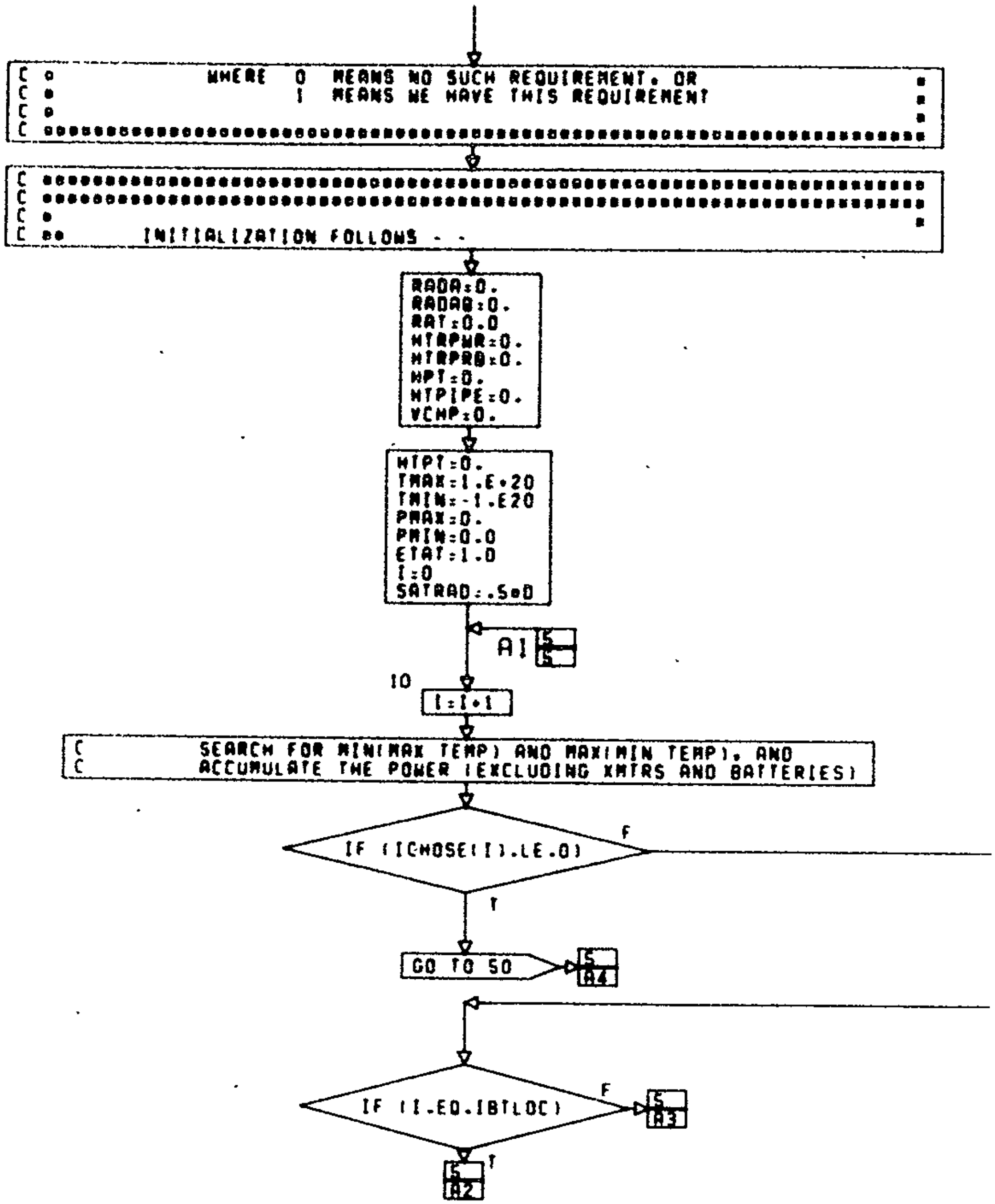
```
C **                                                                     **
C **      VCHP        D                               VAR.COND.HEAT PIPE **
C **                                                                     **
C **                                                                     **
C **                                                                     **
C ***********************************************************************
C ***********************************************************************
C ***********************************************************************
```

```
C *                                   2                                 *
C *                                                                     *
C *                       O           D                                 *
C *                       S       I   I                                 *
C *                       R       S   O           C       R             *
C *                       +       O   D       O   O   H   A             *
C *                       V       T   E       S   N   E   D             *
C *                       C       H           R   V   A   I             *
```

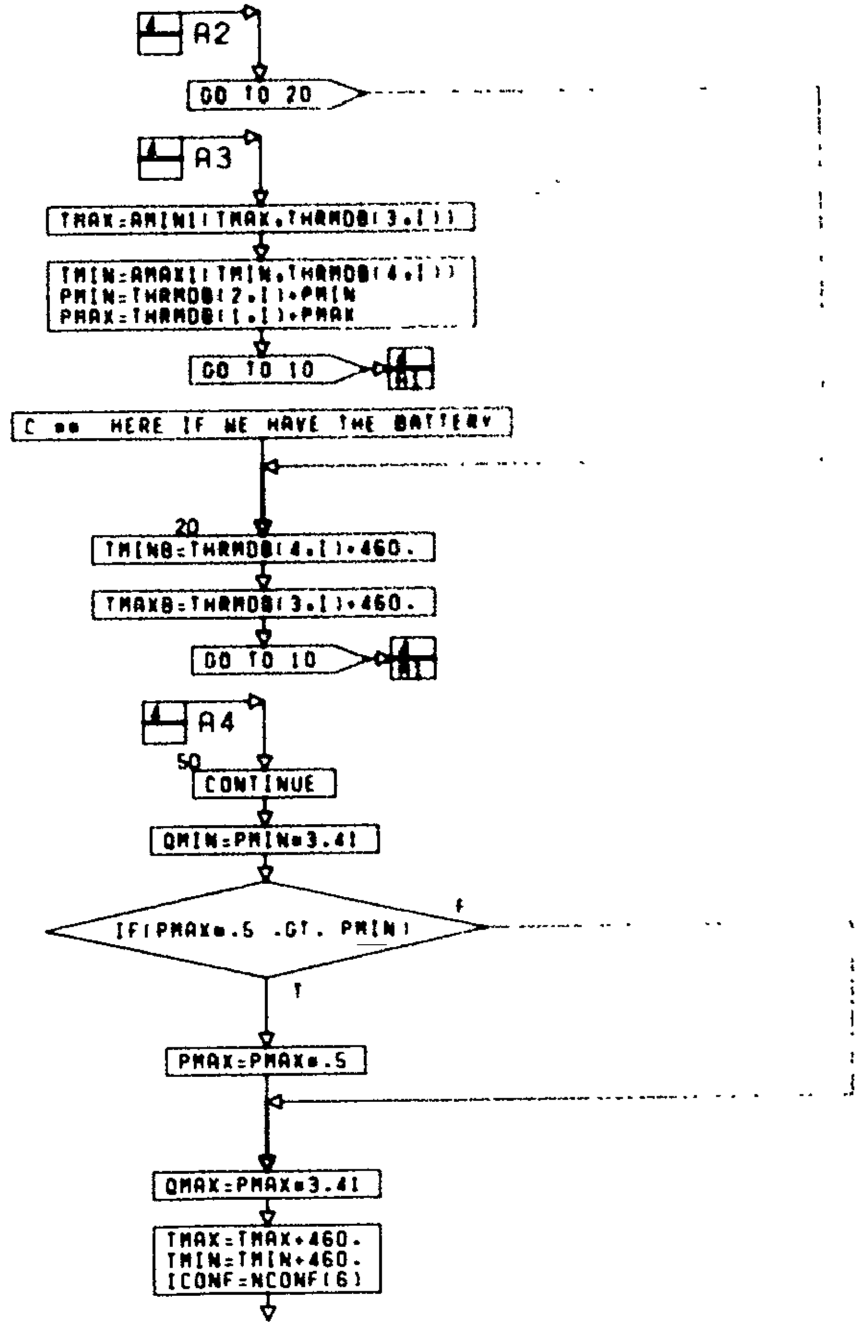
```
C *                       H       E   H   H           T   A             *
C *                       E   P   R   E   E   R   R   E   T             *
C *                       A   C   M   A   A   A   A   R   O             *
C *                       T   M   A   T   T   D   D       R             *
C *                   R           L           I   I   P                 *
C *                   A   P   M   I   P   P   A   A   O   A             *
C *                   D   I   A   Z   I   I   T   T   W   R             *
C *                   A   P   S   E   P   P   O   O   E   E             *
```

```
C *                   B   E   S   R   E   E   R   R   R   A             *
C *                                                                     *
C *       IERR    =   X   X   X   X   X   X   X   X   X   X             *
C *                                                                     *
```

CONT. ON PG 4

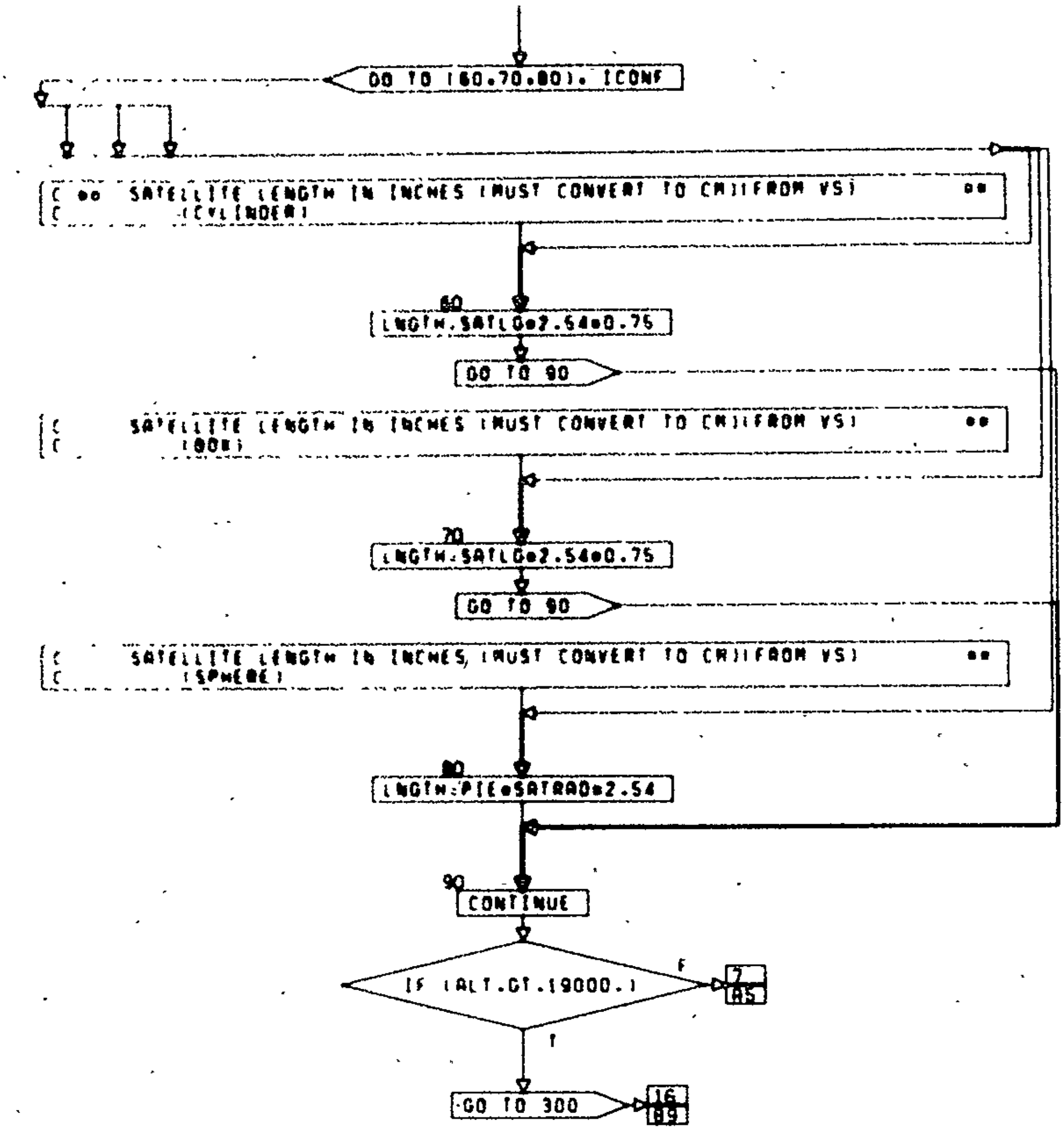

C * WHERE 0 MEANS NO SUCH REQUIREMENT, OR
C * 1 MEANS WE HAVE THIS REQUIREMENT
C *
C **
C **
C **
C *
C ** INITIALIZATION FOLLOWS - -
RADA=0.
RADAB=0.
RAT=0.0
HTRPWR=0.
HTRPRB=0.
HPT=0.
HTPIPE=0.
VCHP=0.
HTPT=0.
TMAX=1.E+20
TMIN=-1.E20
PMAX=0.
PMIN=0.0
ETAT=1.0
I=0
SATRAD=.5*D
A1 5 5
10
I=I+1
C SEARCH FOR MIN(MAX TEMP) AND MAX(MIN TEMP), AND
C ACCUMULATE THE POWER (EXCLUDING XMTRS AND BATTERIES)
IF (ICHOSE(I).LE.0)
F
T
GO TO 50
5 A4
IF (I.EQ.IBTLOC)
F
5 A3
T
5 A2

CONT. ON PG 5

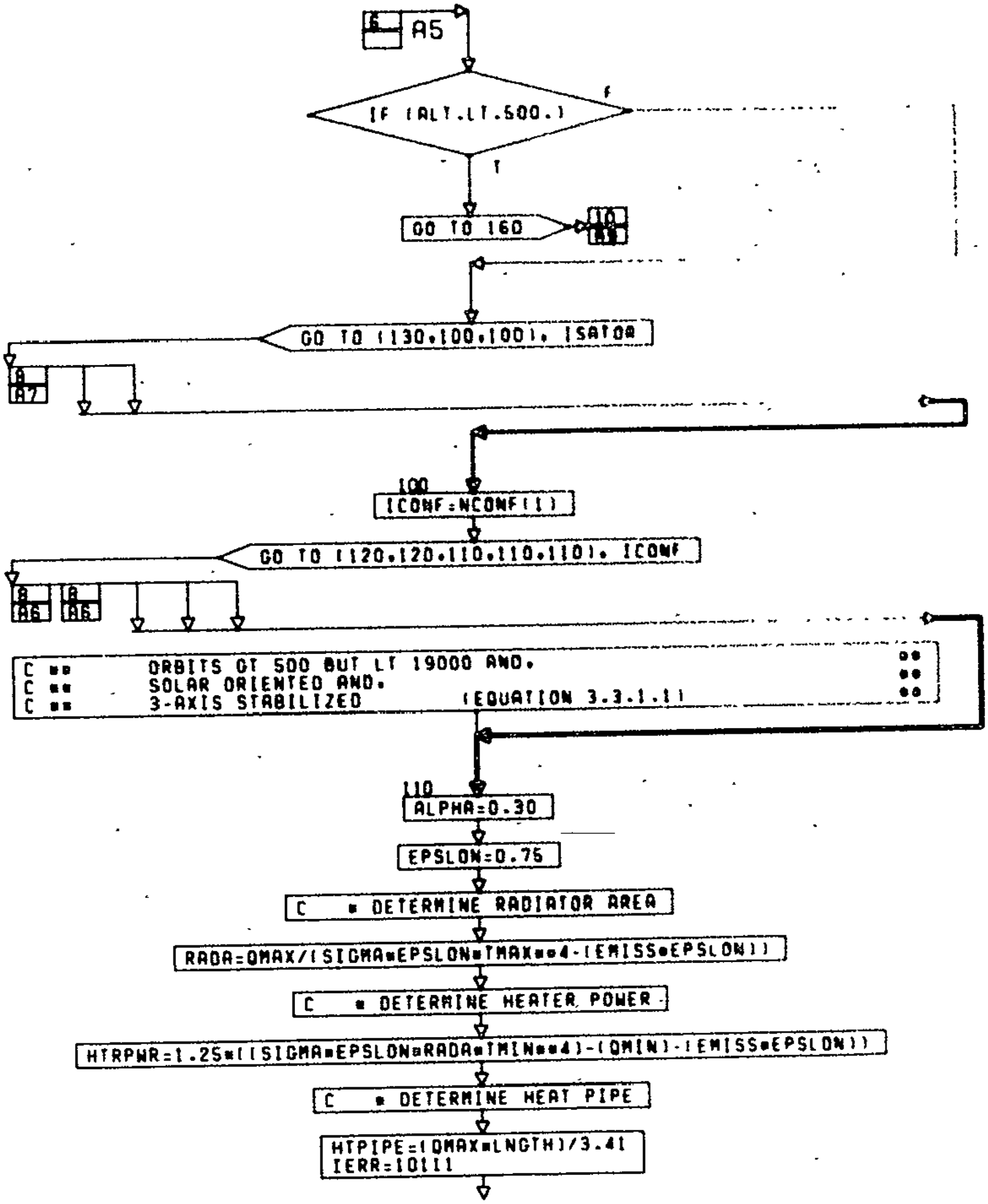


CONT. ON PG 6

044

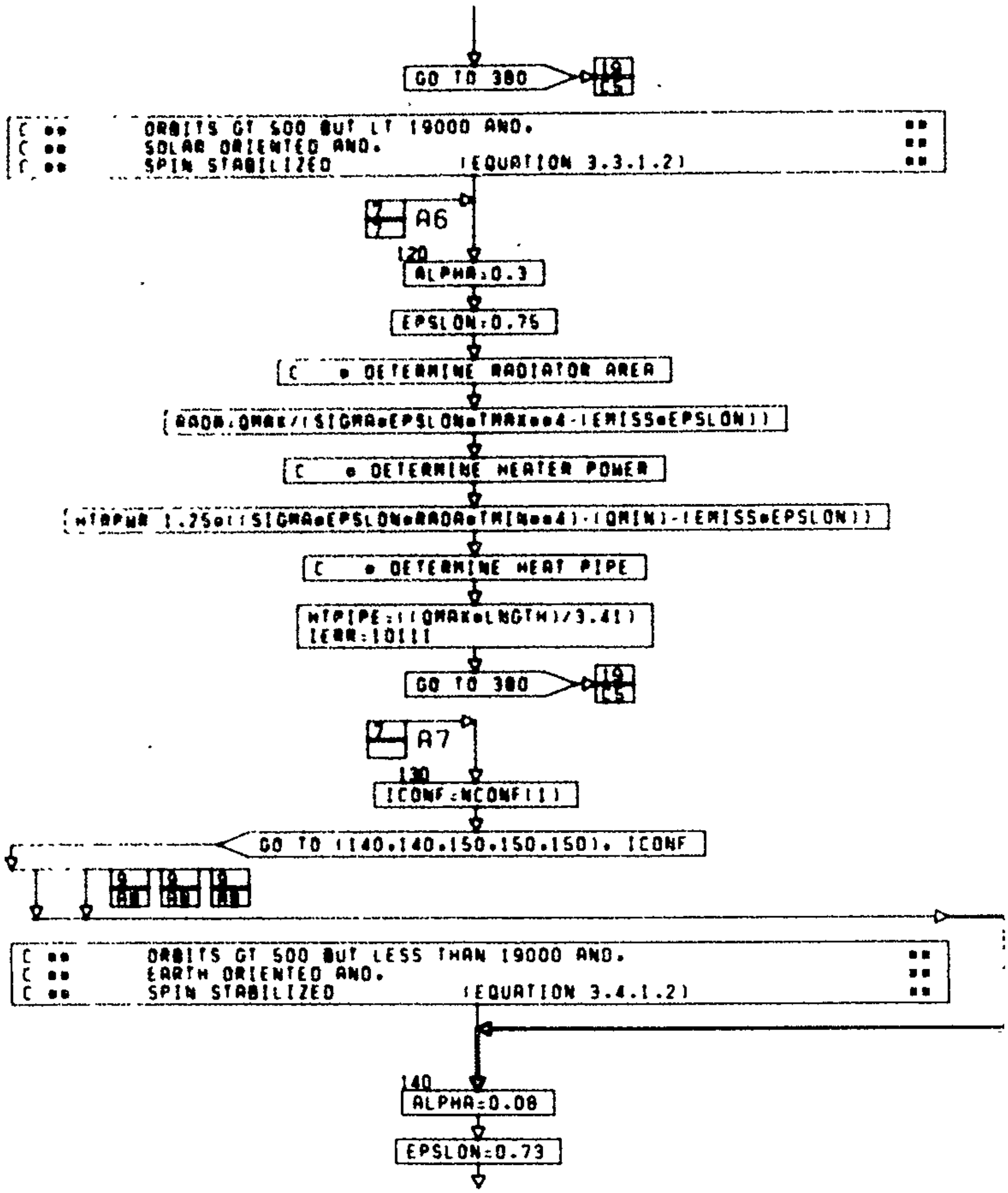

GO TO (60,70,80), ICONF
C ** SATELLITE LENGTH IN INCHES (MUST CONVERT TO CM)(FROM VS) **
C (CYLINDER)
60
LNGTH=SATLG*2.54*0.75
GO TO 90
C SATELLITE LENGTH IN INCHES (MUST CONVERT TO CM)(FROM VS) **
C (BOX)
70
LNGTH=SATLG*2.54*0.75
GO TO 90
C SATELLITE LENGTH IN INCHES (MUST CONVERT TO CM)(FROM VS) **
C (SPHERE)
80
LNGTH=PIE*SATRAD*2.54
90
CONTINUE
IF (ALT.GT.19000.)
F
7
A5
T
GO TO 300
16
B9

CONT. ON PG 7

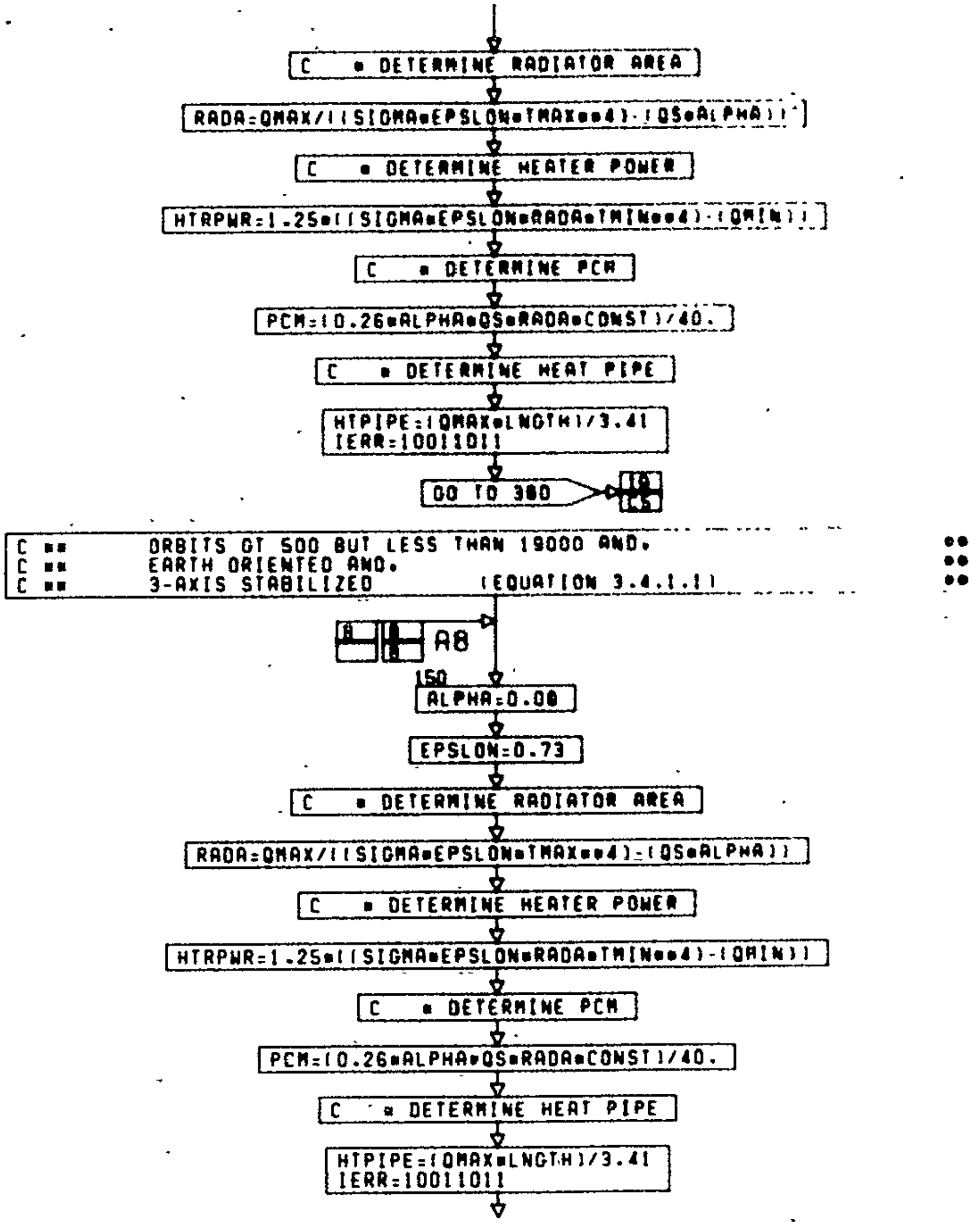


CONT. ON PG 8

045

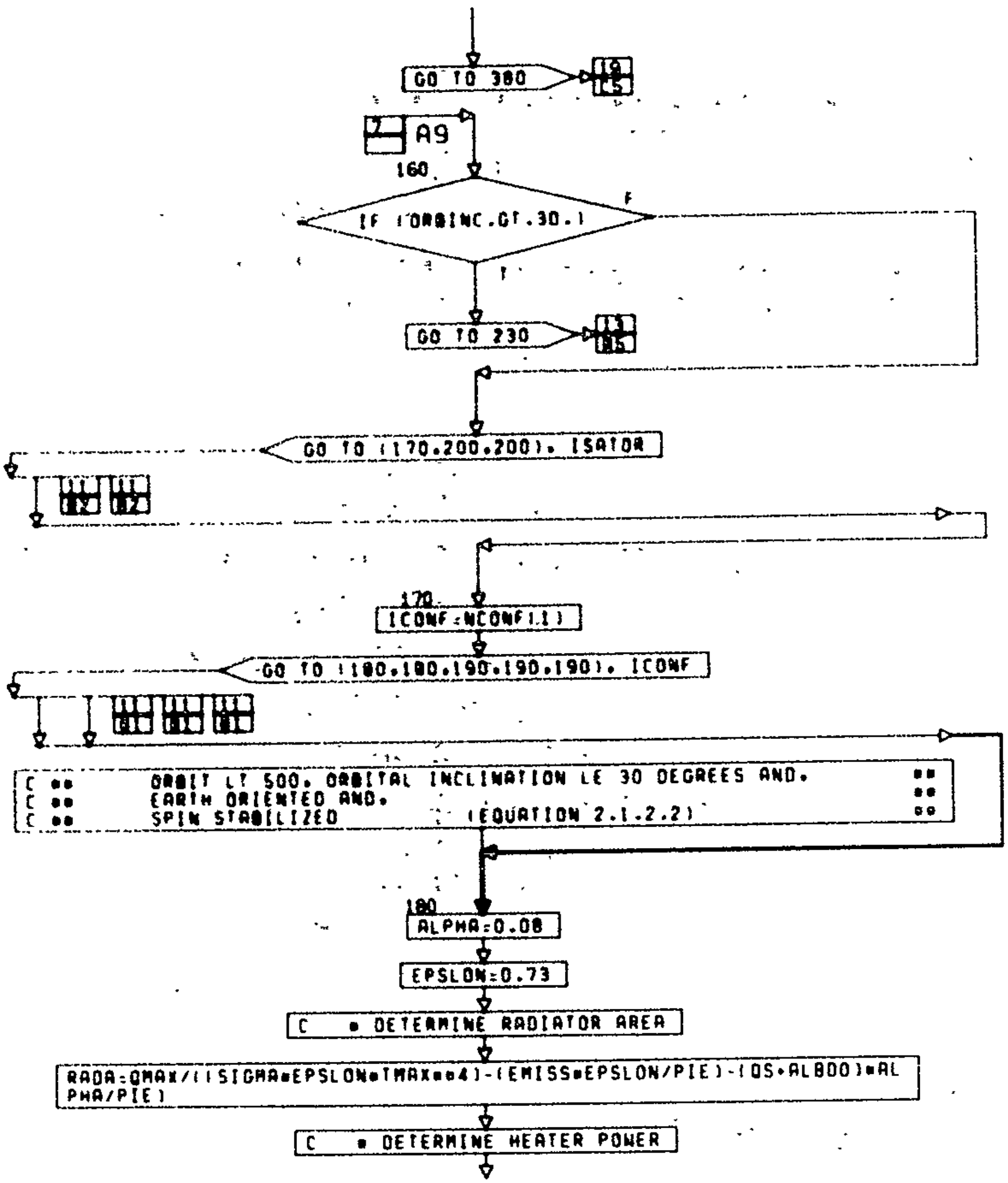

GO TO 380
19
C5
C ** ORBITS GT 500 BUT LT 19000 AND, **
C ** SOLAR ORIENTED AND, **
C ** SPIN STABILIZED (EQUATION 3.3.1.2) **
7
7
A6
120
ALPHA=0.3
EPSLON=0.75
C * DETERMINE RADIATOR AREA
RADR=QMAX/(SIGMA*EPSLON*TMAX**4-(EMISS*EPSLON))
C * DETERMINE HEATER POWER
HTRPWR=1.25*((SIGMA*EPSLON*RADR*TMIN**4)-(QMIN)-(EMISS*EPSLON))
C * DETERMINE HEAT PIPE
WTPIPE=((QMAX*LNGTH)/3.41)
IERR=10111
GO TO 380
19
C5
7
A7
130
ICONF=NCONF(1)
GO TO (140,140,150,150,150), ICONF
9
A11
9
A11
9
A11
C ** ORBITS GT 500 BUT LESS THAN 19000 AND, **
C ** EARTH ORIENTED AND, **
C ** SPIN STABILIZED (EQUATION 3.4.1.2) **
140
ALPHA=0.08
EPSLON=0.73

CONT. ON PG 9

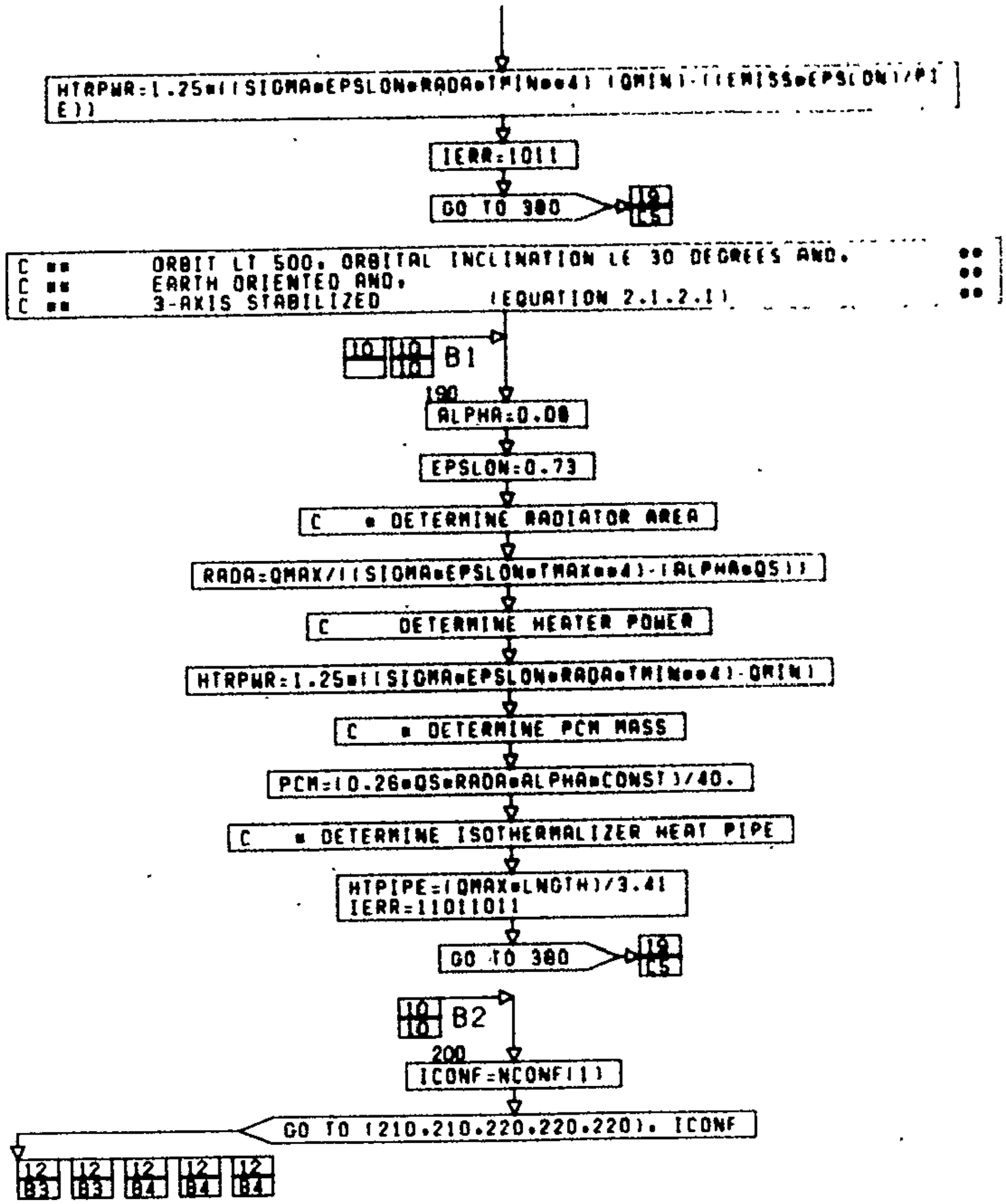


CONT. ON PG 10

046


GO TO 380
19 C5
7 A9
160
IF (ORBINC.GT.30.)
F
T
GO TO 230
13 B5
GO TO (170,200,200), ISATOR
11 B2
11 B2
170
ICONF=NCONF(1,1)
GO TO (180,180,190,190,190), ICONF
11 B1
11 B1
11 B1
C ** ORBIT LT 500, ORBITAL INCLINATION LE 30 DEGREES AND, **
C ** EARTH ORIENTED AND, **
C ** SPIN STABILIZED (EQUATION 2.1.2.2) **
180
ALPHA=0.08
EPSLON=0.73
C * DETERMINE RADIATOR AREA
RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(EMISS*EPSLON/PIE)-(QS+ALBDO)*AL
PHA/PIE)
C * DETERMINE HEATER POWER

CONT. ON PG 11

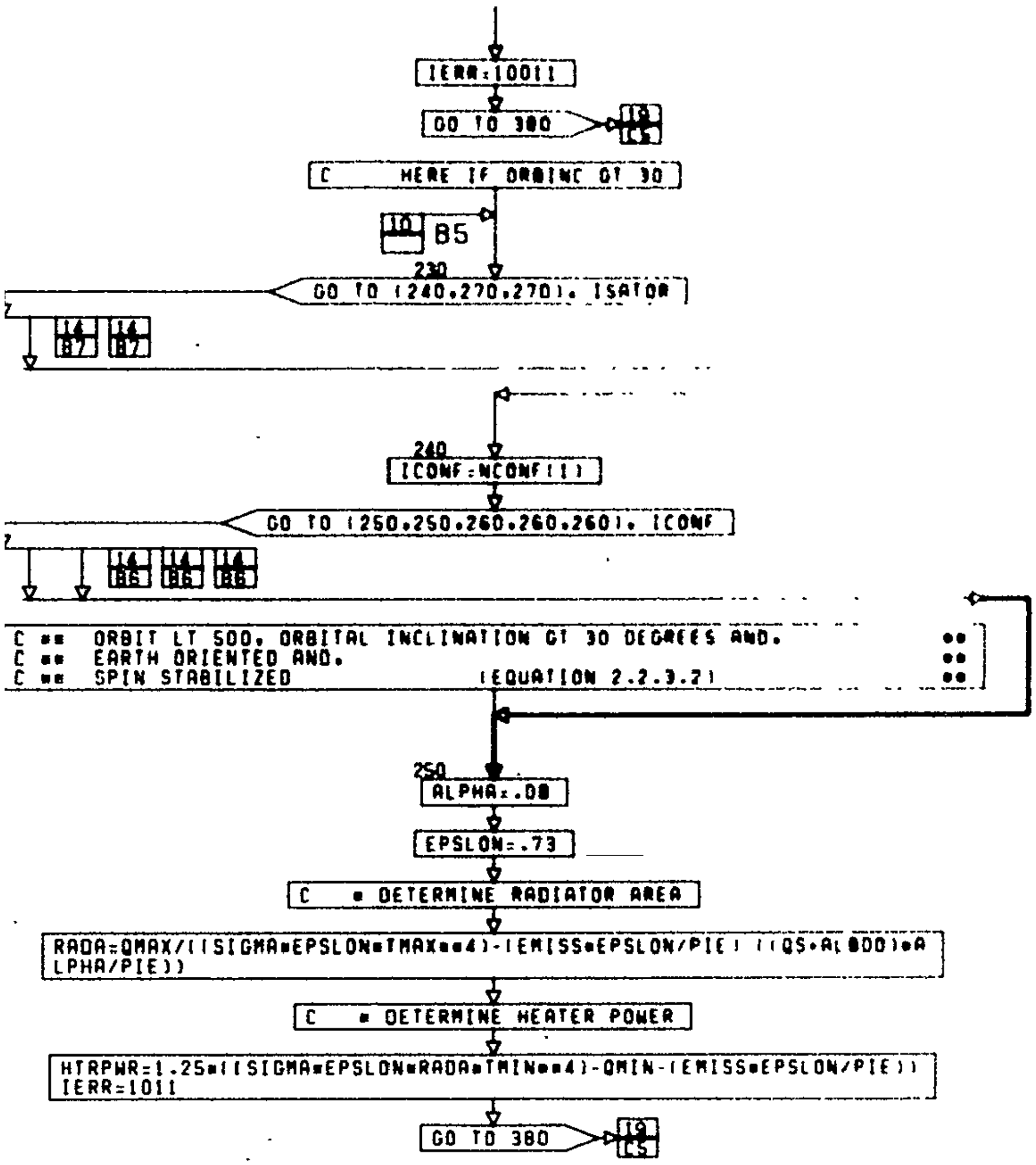


CONT. ON PG 12

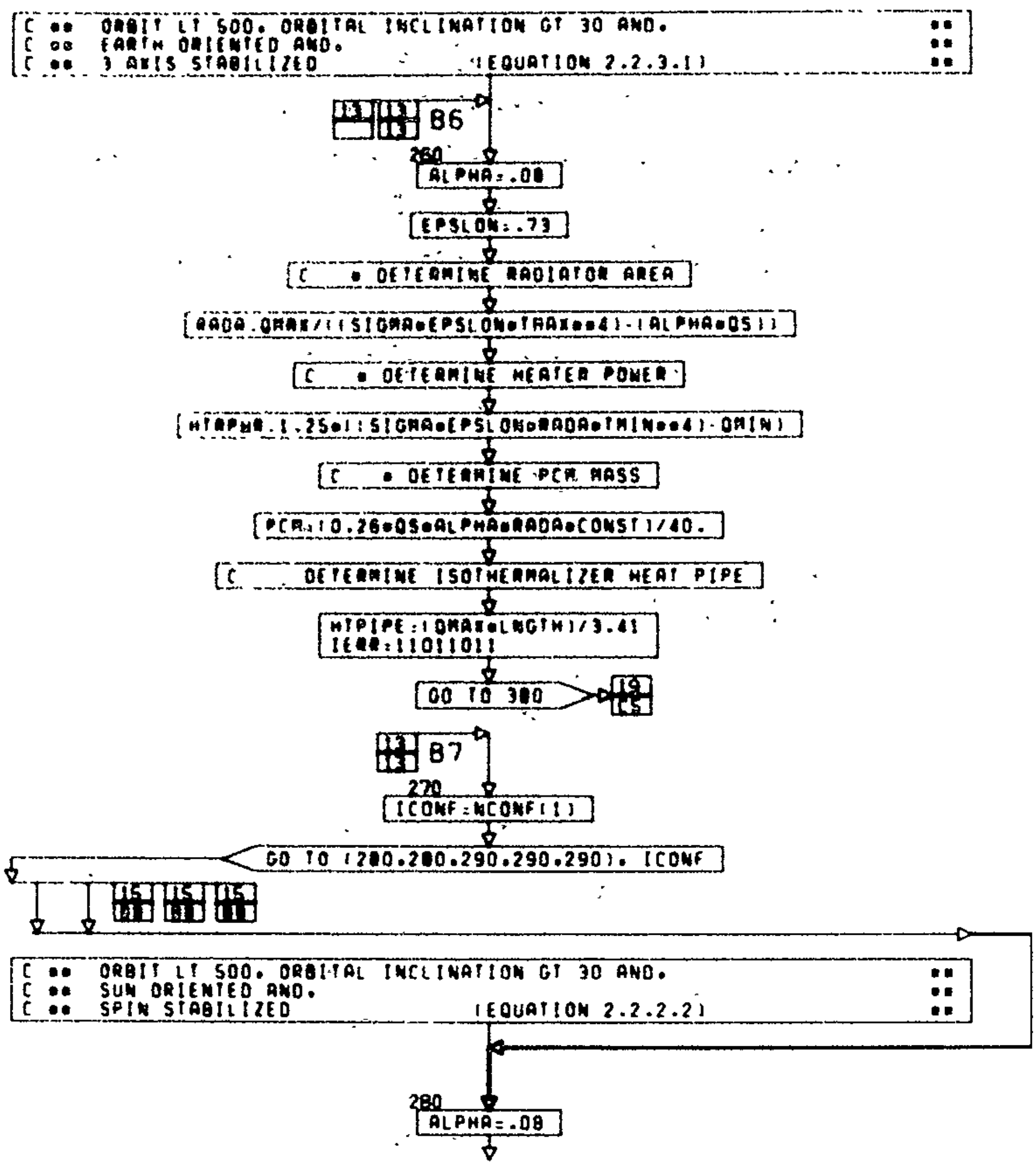
847

```
C **  ORBIT LT 500, ORBITAL INCLINATION LE 30 DEGREES AND.           **
C **  SUN ORIENTED AND.                                               **
C **  SPIN STABILIZED                    (EQUATION 2.1.1.2)           **

B3
210
ALPHA=0.08
EPSLON=0.73
C     * DETERMINE RADIATOR AREA
RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(EMISS*EPSLON)-(.5*ALBDO*ALPHA))
C     * DETERMINE HEATER POWER
HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
C     * DETERMINE HEAT PIPES
HTPIPE=(QMAX*LNGTH)/3.41
IERR=1001)
GO TO 380                                  19
                                           C5

C **  ORBIT LT 500, OBITAL INCLINATION LE 30 DEGREES AND.            **
C **  SUN ORIENTED AND.                                               **
C **  3 AXIS STABILIZED                  (EQUATION 2.1.1.1)           **

B4
220
ALPHA=0.08
EPSLON=0.73
C     * DETERMINE RADIATOR AREA
RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(EMISS*EPSLON)-(ALBDO*ALPHA))
C     * DETERMINE HEATER POWER
HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
C     * DETERMINE HEAT PIPES
HTPIPE=(QMAX*LNGTH)/3.41
```

CONT. ON PG 13

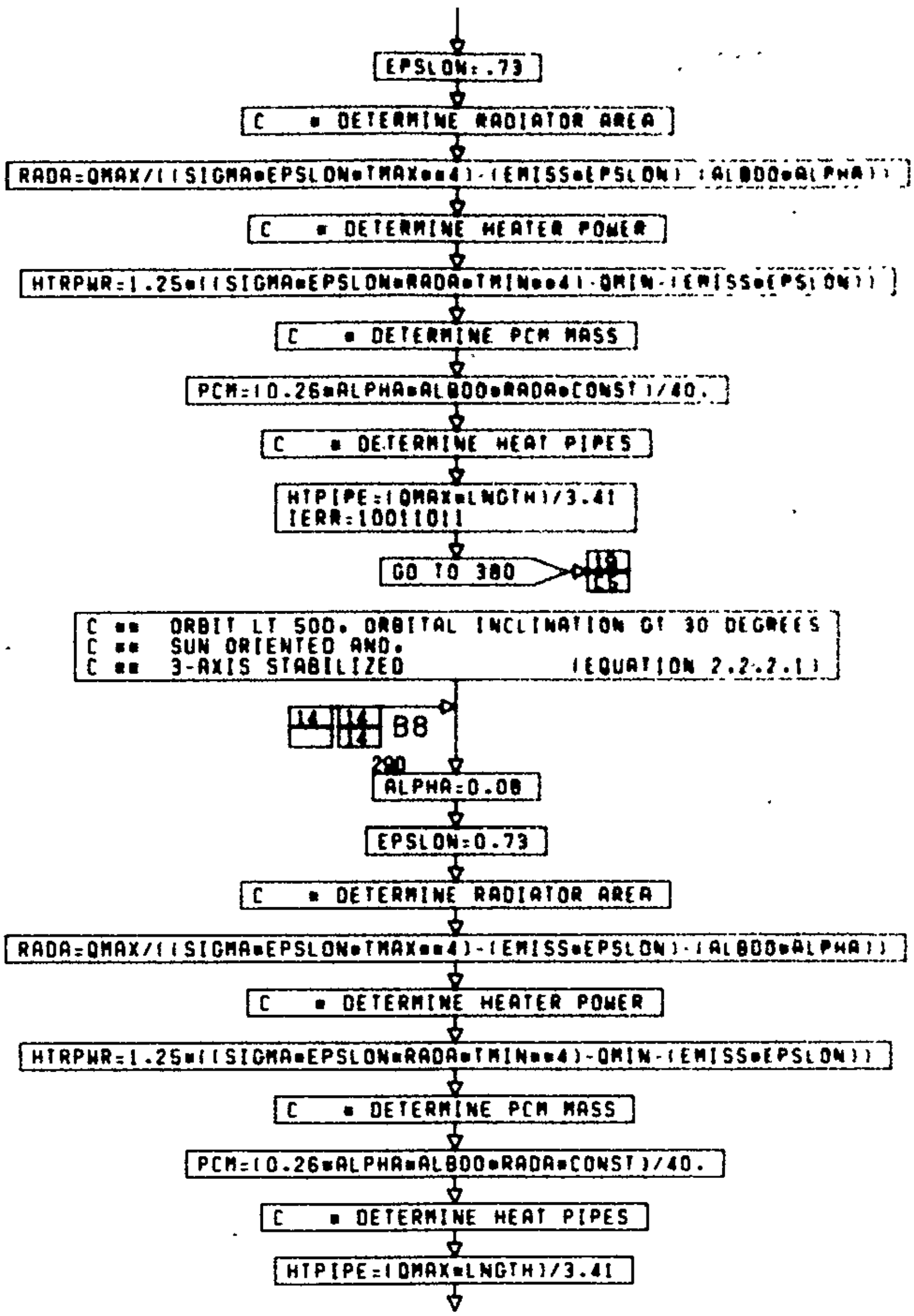

IERR=10011
GO TO 380
19 C5
C HERE IF ORBINC GT 30
10 B5
230
GO TO (240,270,270), ISATOR
14 B7
14 B7
240
ICONF=NCONF(1)
GO TO (250,250,260,260,260), ICONF
14 B6
14 B6
14 B6
C ** ORBIT LT 500, ORBITAL INCLINATION GT 30 DEGREES AND. **
C ** EARTH ORIENTED AND. **
C ** SPIN STABILIZED (EQUATION 2.2.3.7) **
250
ALPHA=.08
EPSLON=.73
C * DETERMINE RADIATOR AREA
RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(EMISS*EPSLON/PIE) ((QS*A(800)*A
LPHA/PIE))
C * DETERMINE HEATER POWER
HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN-(EMISS*EPSLON/PIE))
IERR=1011
GO TO 380
19 C5

CONT. ON PG 14



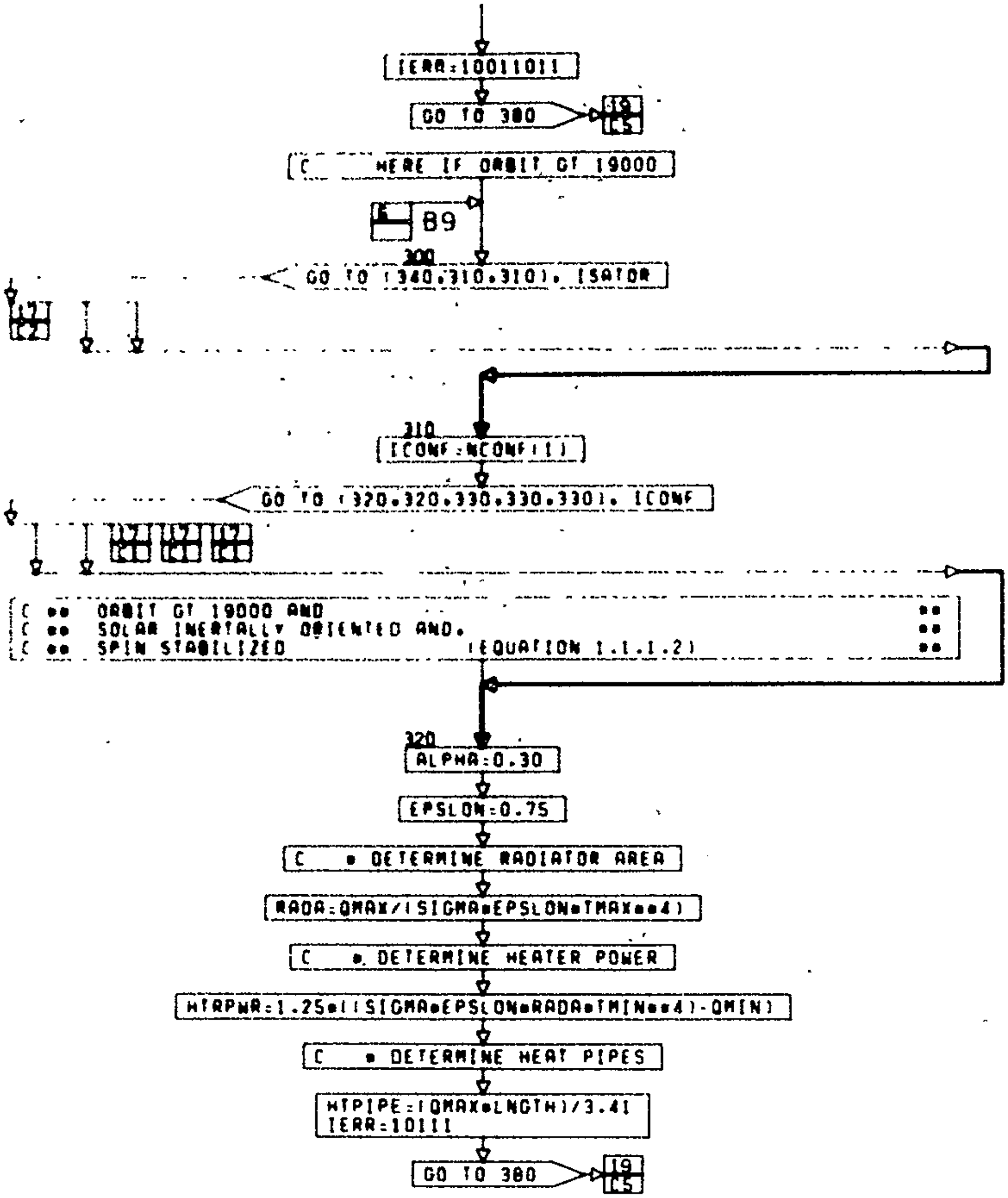
C ** ORBIT LT 500, ORBITAL INCLINATION GT 30 AND. **
C ** EARTH ORIENTED AND. **
C ** 3 AXIS STABILIZED (EQUATION 2.2.3.1) **
B6
260
ALPHA=.08
EPSLON=.73
C * DETERMINE RADIATOR AREA
RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(ALPHA*QS))
C * DETERMINE HEATER POWER
HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
C * DETERMINE PCM MASS
PCM=(0.26*QS*ALPHA*RADA*CONST)/40.
C DETERMINE ISOTHERMALIZER HEAT PIPE
HTPIPE=(QMAX*LNGTH)/3.41
IERR=11011011
GO TO 380
19
B7
270
ICONF=NCONF(1)
GO TO (280,280,290,290,290), ICONF
15
15
15
C ** ORBIT LT 500, ORBITAL INCLINATION GT 30 AND. **
C ** SUN ORIENTED AND. **
C ** SPIN STABILIZED (EQUATION 2.2.2.2) **
280
ALPHA=.08

CONT. ON PG 15

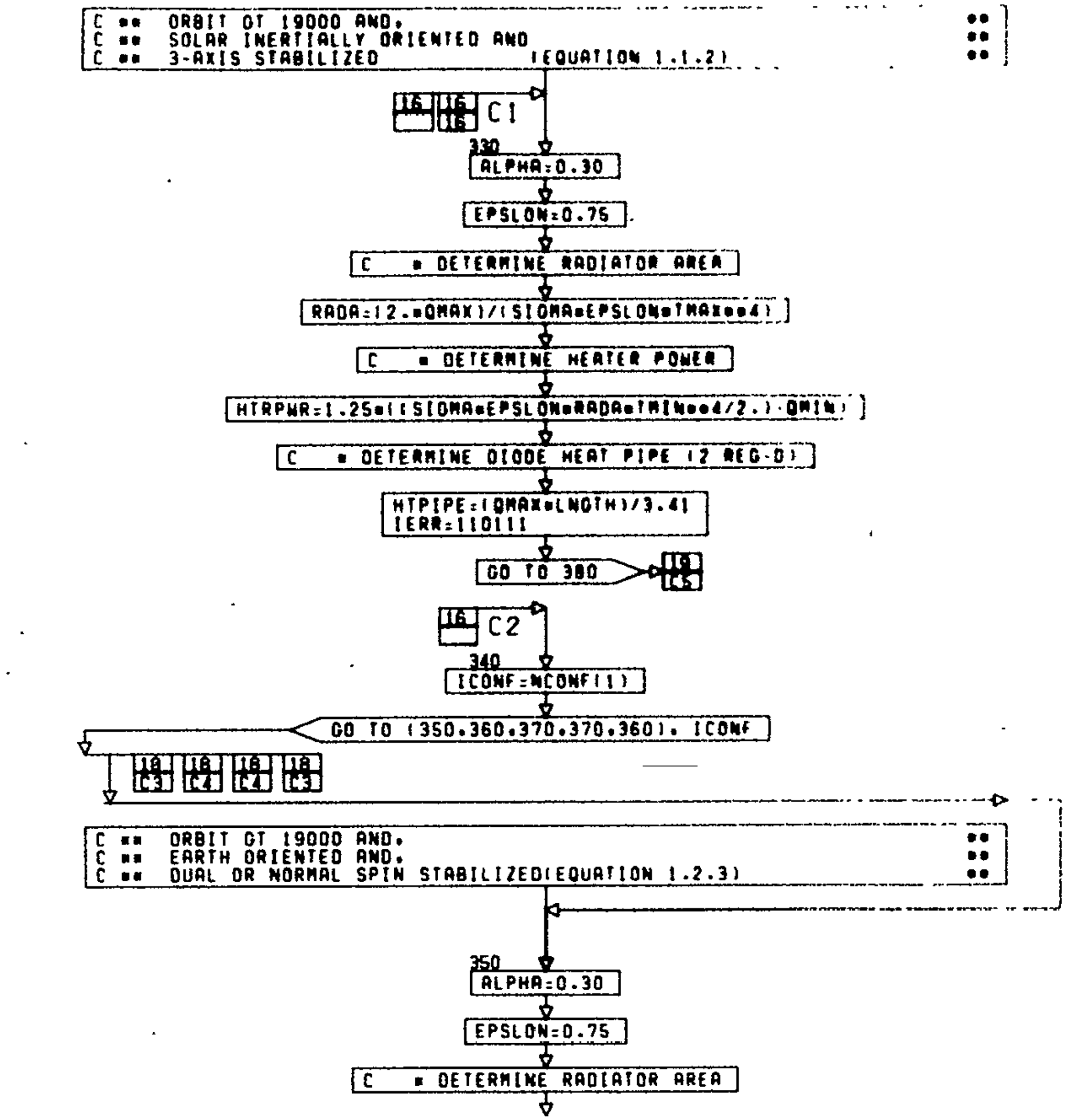


CONT. ON PG 16

049


IERR=10011011
GO TO 380
19
C5
C HERE IF ORBIT GT 19000
B9
300
GO TO (340,310,310), ISATOR
310
ICONF=NCONF(1)
GO TO (320,320,330,330,330), ICONF
C ** ORBIT GT 19000 AND **
C ** SOLAR INERTIALLY ORIENTED AND, **
C ** SPIN STABILIZED (EQUATION 1.1.1.2) **
320
ALPHA=0.30
EPSLON=0.75
C * DETERMINE RADIATOR AREA
RADA=QMAX/(SIGMA*EPSLON*TMAX**4)
C * DETERMINE HEATER POWER
HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
C * DETERMINE HEAT PIPES
HTPIPE=(QMAX*LNGTH)/3.41
IERR=10111
GO TO 380
19
C5

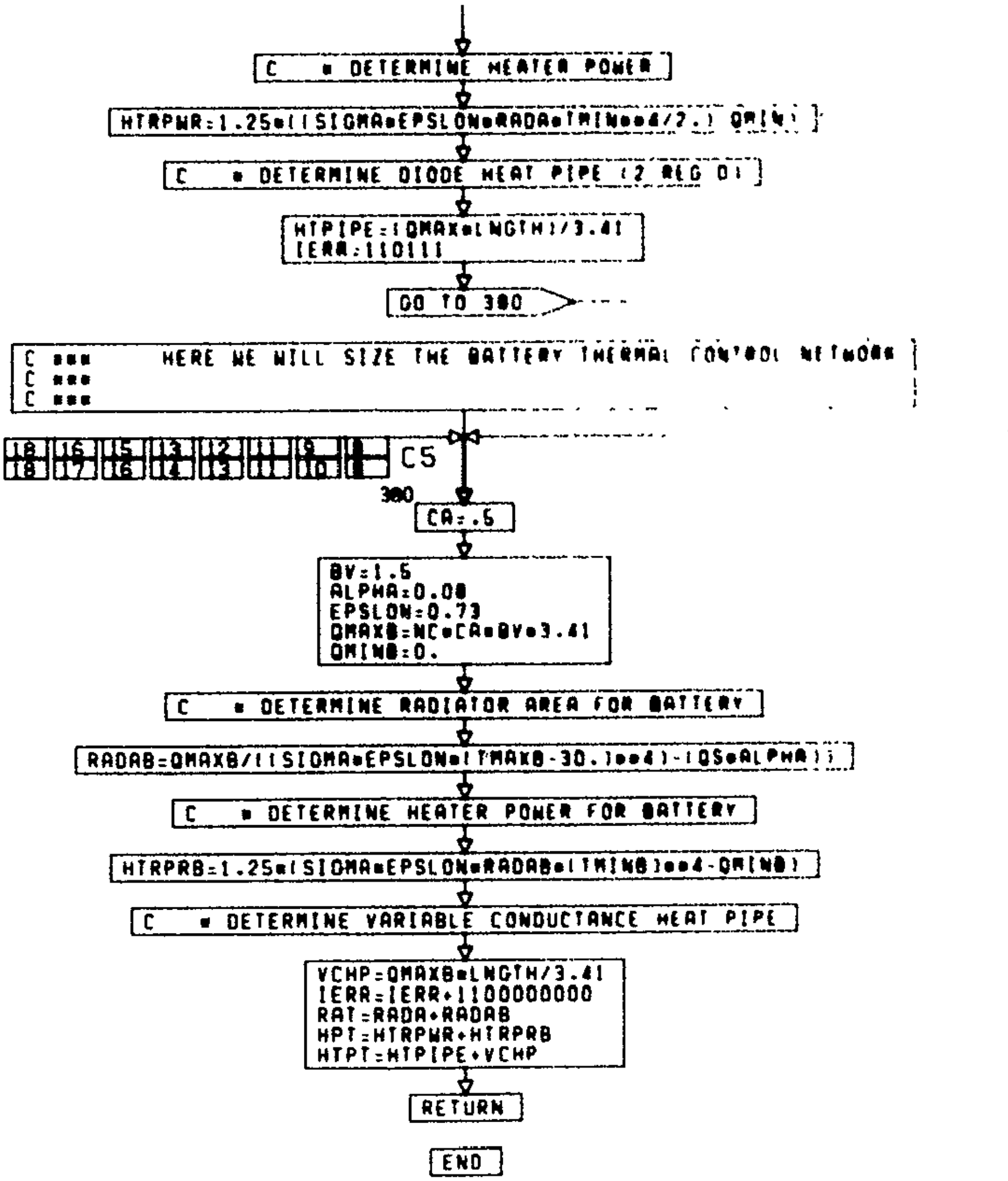
CONT. ON PG 17


C ** ORBIT GT 19000 AND,
C ** SOLAR INERTIALLY ORIENTED AND
C ** 3-AXIS STABILIZED (EQUATION 1.1.2)
16 16 16 C1
330
ALPHA=0.30
EPSLON=0.75
C * DETERMINE RADIATOR AREA
RADA=(2.*QMAX)/(SIGMA*EPSLON*TMAX**4)
C * DETERMINE HEATER POWER
HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4/2.)-QMIN)
C * DETERMINE DIODE HEAT PIPE (2 REG-D)
HTPIPE=(QMAX*LNOTH)/3.41
IERR=110111
GO TO 380
19 C5
16 C2
340
ICONF=NCONF(1)
GO TO (350,360,370,370,360), ICONF
18 C3 18 C2 18 C4 18 C3
C ** ORBIT GT 19000 AND,
C ** EARTH ORIENTED AND,
C ** DUAL OR NORMAL SPIN STABILIZED(EQUATION 1.2.3)
350
ALPHA=0.30
EPSLON=0.75
C * DETERMINE RADIATOR AREA

CONT. ON PG 18

```
RADA=QMAX/(SIGMA*EPSLON*TMAX**4)
C    * DETERMINE HEATER POWER
HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
C    * DETERMINE HEAT PIPES
HTPIPE=(QMAX*LNGTH)/3.41
IERR=10111
GO TO 380                                  19 C5

C **   ORBIT GT 19000 AND                                        **
C **   YAW SPIN STABILIZED            (EQUATION 1.2.2)           **

17 C3
360 ALPHA=0.08
EPSLON=0.73
C    * DETERMINE RADIATOR AREA
RADA=QMAX/((SIGMA*EPSLON*TMAX**4)-(QS*ALPHA/PIE))
C    * DETERMINE HEATER POWER
HTRPWR=1.25*((SIGMA*EPSLON*RADA*TMIN**4)-QMIN)
IERR=1011
GO TO 380                                  19 C5

C **   ORBIT GT 19000 AND,                                       **
C **   EARTH ORIENTED AND,                                       **
C **   3-AXIS STABILIZED              (EQUATION 1.2.1)           **

17 C4
370 ALPHA=0.30
EPSLON=0.75
C    * DETERMINE RADIATOR AREA
RADA=(2.*QMAX)/(SIGMA*EPSLON*TMAX**4)
```

CONT. ON PG 19



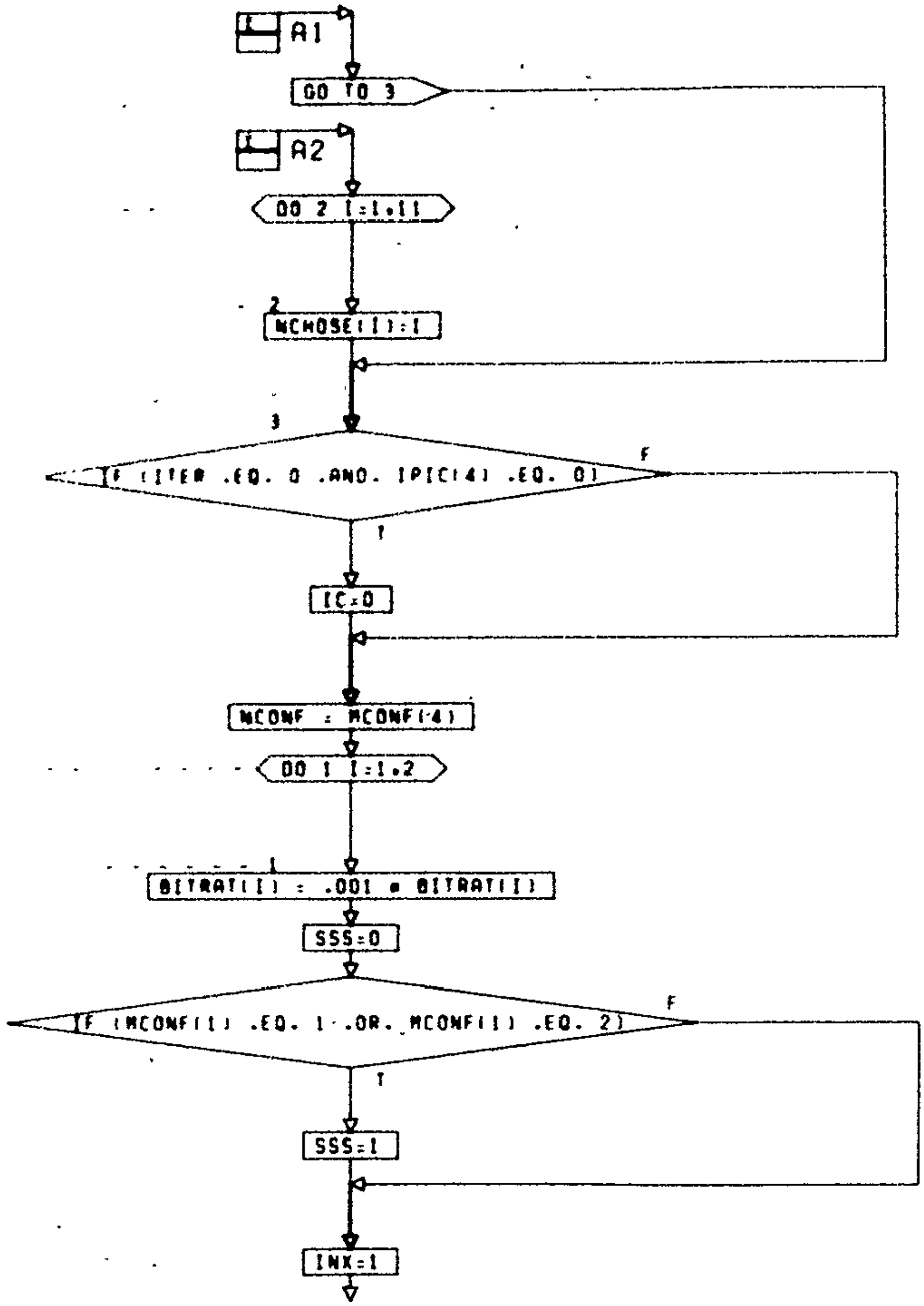
PG 19 FINAL

051

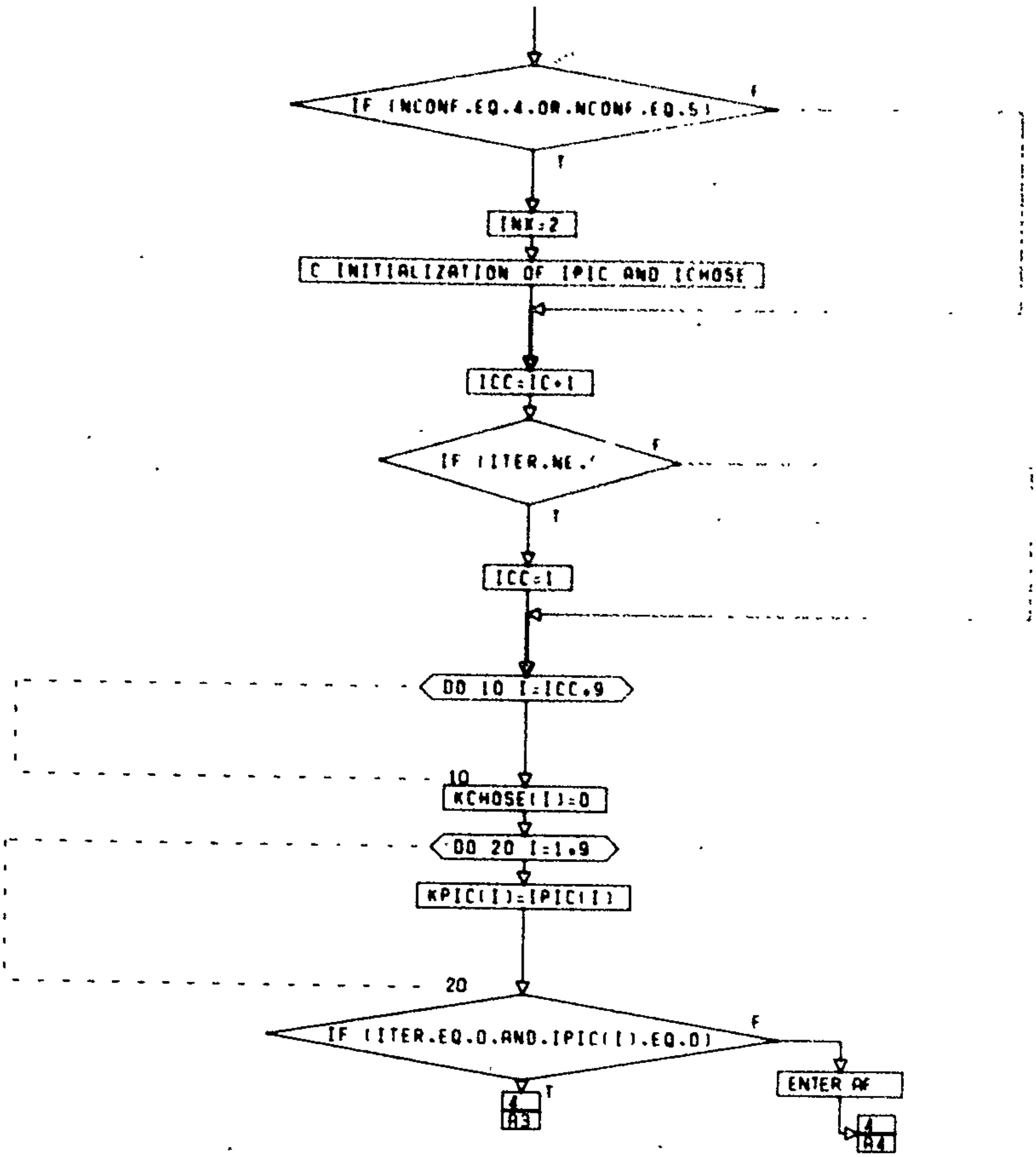
```
SUBROUTINE COMM (IPIC.IERR.ITER.MCONF.ICHOSE.NCHOSE)
INTEGER RESET.SEQ.SSS.GRP
REAL LMARG.NF.MODLOS.IBER

DIMENSION IPIC(9).ICHOSE(11).NCHOSE(11).KPIC(9).MCONF(6).
 KCHOSE(11)

DIMENSION SIGNOI(2).LMARG(2).TCLOSS(2).GT(2).MODX(2)
DIMENSION BER(14.3).IBER(14).BESSJ(2).LIMPIC(9)

COMMON /USER4/IOPTCM(3).IMSSEP.SEQ.LSOLS.LUSB.FREQX(2).APOGEE.
 NET.NADIR.FREQR.COMRAT.BWIDTH(2)

COMMON /BTWN/WT.VOL.DT.D.DX.DY.DZ.XJ.YJ.ZJ.RJ.FF.TI.PL.PLMIN.
 LMBDD.AREA.SATLG.WATE.NC.ACSWP.HARNWT.THCMWT.CONVWT.TNKWT.PASSTA.
 SATTWT.TPRIM.IBTLOC.RADA.RADAB.RAT.HTRPWR.HTRPRB.
 HPT.HTPIPE.VCHP.HTPT.FC.XNZERO.COMRT.ACSSW.BITRAT(2).
 EQBLG.SABOLG.SATWT

COMMON /DBCOM/IDB(30).DATAB(55.90)
COMMON /USERI/EQM1WT.EQM2WT.DIAMAX.ALT

EQUIVALENCE (J1.KPIC(1)). (J7.KPIC(6)). (J4.KPIC(7)). (J5.KPIC(8))
. (J6.KPIC(9))

INTEGER SEQ.SSS.GRP

DATA    SIGNOI /10..10./.  LMARG   /6..6./. SLANT /-1.E10/.
        GTOT /-1.E10/. GR/-1.E10/. T/-1.E10/. NF / 1.E10/.
        TCLOSS / 0..0./. POLOSS /0./. GAMMA /.1/. BETA /1.8/.
        GT /-1.E10.-1.E10/.  MODX /0.0/. ANTLOS /0./.
        COVER /0./.GRP /0/

C BER IS BIT ERROR RATE DEGRADATION DUE TO HARDWARE
C IBER IS ARRAY OF DATA RATES

DATA IBER/.25..50.1.0.2.0.4.0.8.0.16..32..64..128..256..512..768..
1024./

DATA BER/8*4.4.4.6.5*5.5.8*2.4.2.4.2.5.4*3.3.10*4.0.3.9.
3.3.3.4.4.1/

DATA IB1/6/.IB2/9/.IB3/11/.IA1/10/.IT1/11/.IT2/6/.IT3/12/.IT4/13/.
IT5/7/.IT6/14/.IT7/9/.IT8/8/.IT9/10/.IT10/15/.IR1/6/.IR2/10/.IR3/1
5/.IC1/7/.IC2/6/.IC3/12/.ID1/6/.ID2/11/

IF (ITER .GT. 0)      F -> 2 / A2
T -> 2 / A1
```

CONT. ON PG 2

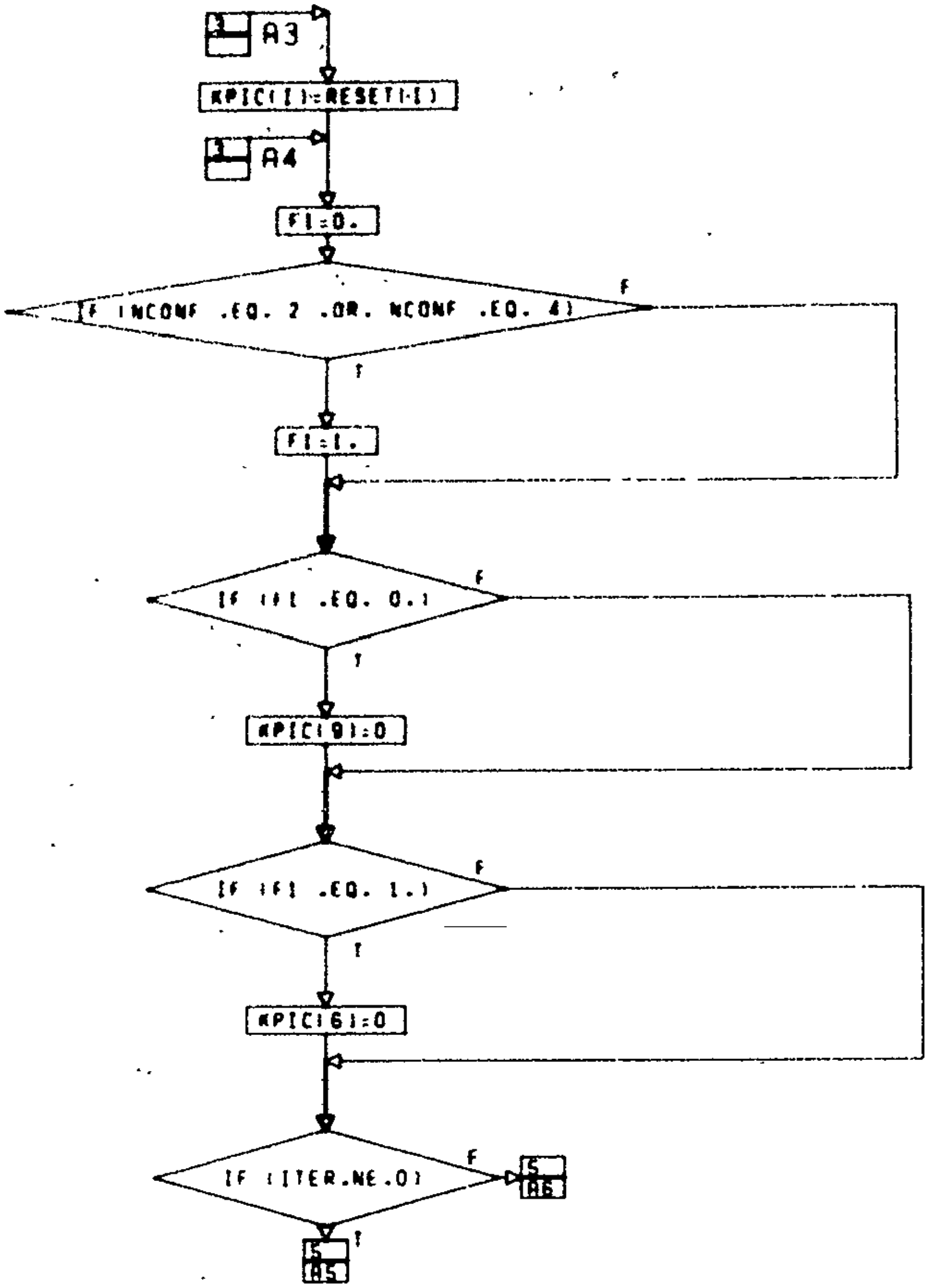
053


A1
GO TO 3
A2
DO 2 I=1,11
2
NCHOSE(I)=I
3
IF (ITER .EQ. 0 .AND. IPIC(4) .EQ. 0)
F
T
IC=0
NCONF = NCONF(4)
DO 1 I=1,2
1
BITRAT(I) = .001 * BITRAT(I)
SSS=0
IF (NCONF(I) .EQ. 1 .OR. NCONF(I) .EQ. 2)
F
T
SSS=1
INX=1

CONT. ON PG 3

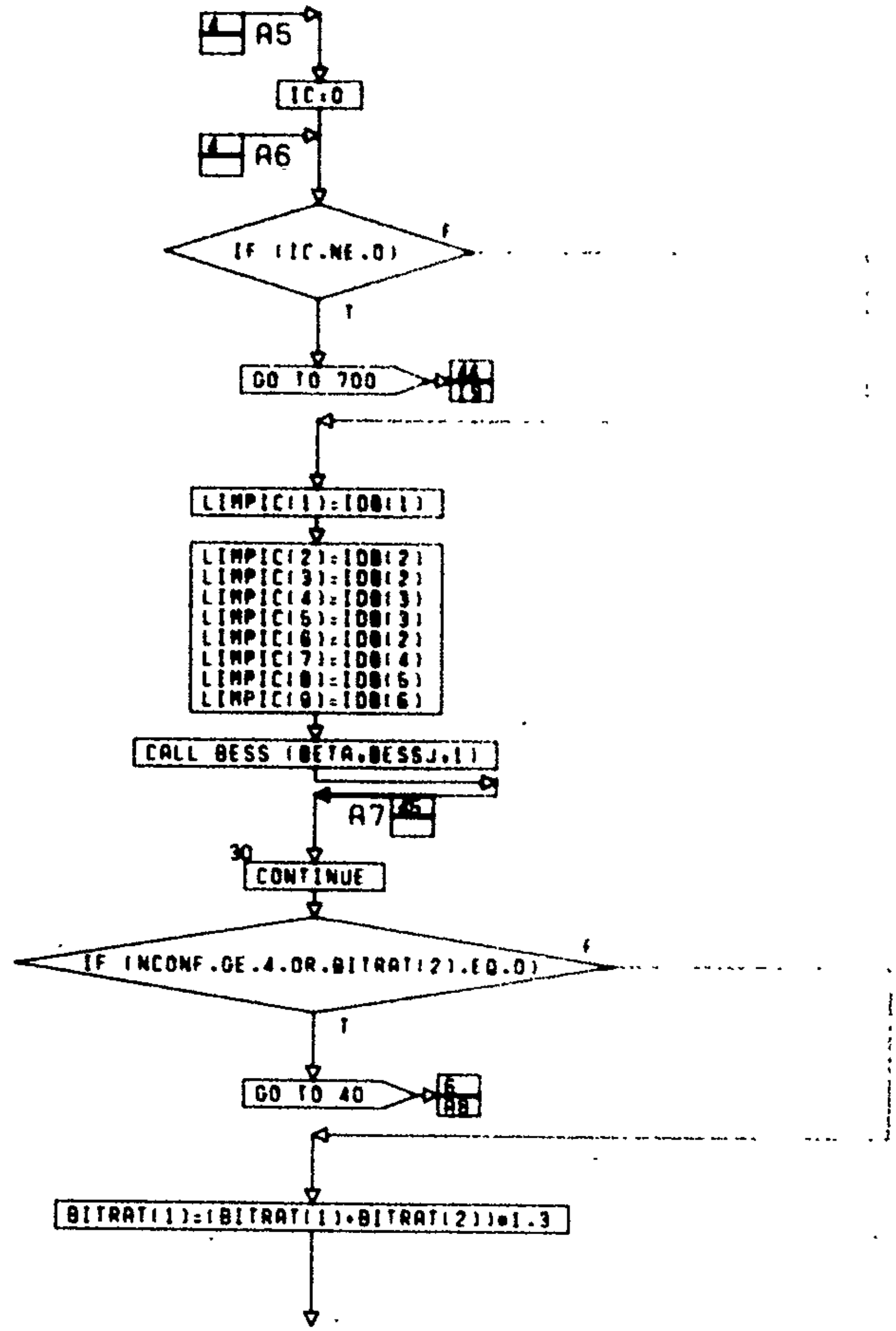

IF (NCONF.EQ.4.OR.NCONF.EQ.5)
F
T
INX=2
C INITIALIZATION OF IPIC AND ICHOSE
ICC=IC+1
IF (ITER.NE.
F
T
ICC=1
DO 10 I=ICC,9
10
KCHOSE(I)=0
DO 20 I=1,9
KPIC(I)=IPIC(I)
20
IF (ITER.EQ.0.AND.IPIC(I).EQ.0)
F
T
ENTER AF
4
A3
4
A4

CONT. ON PG 4



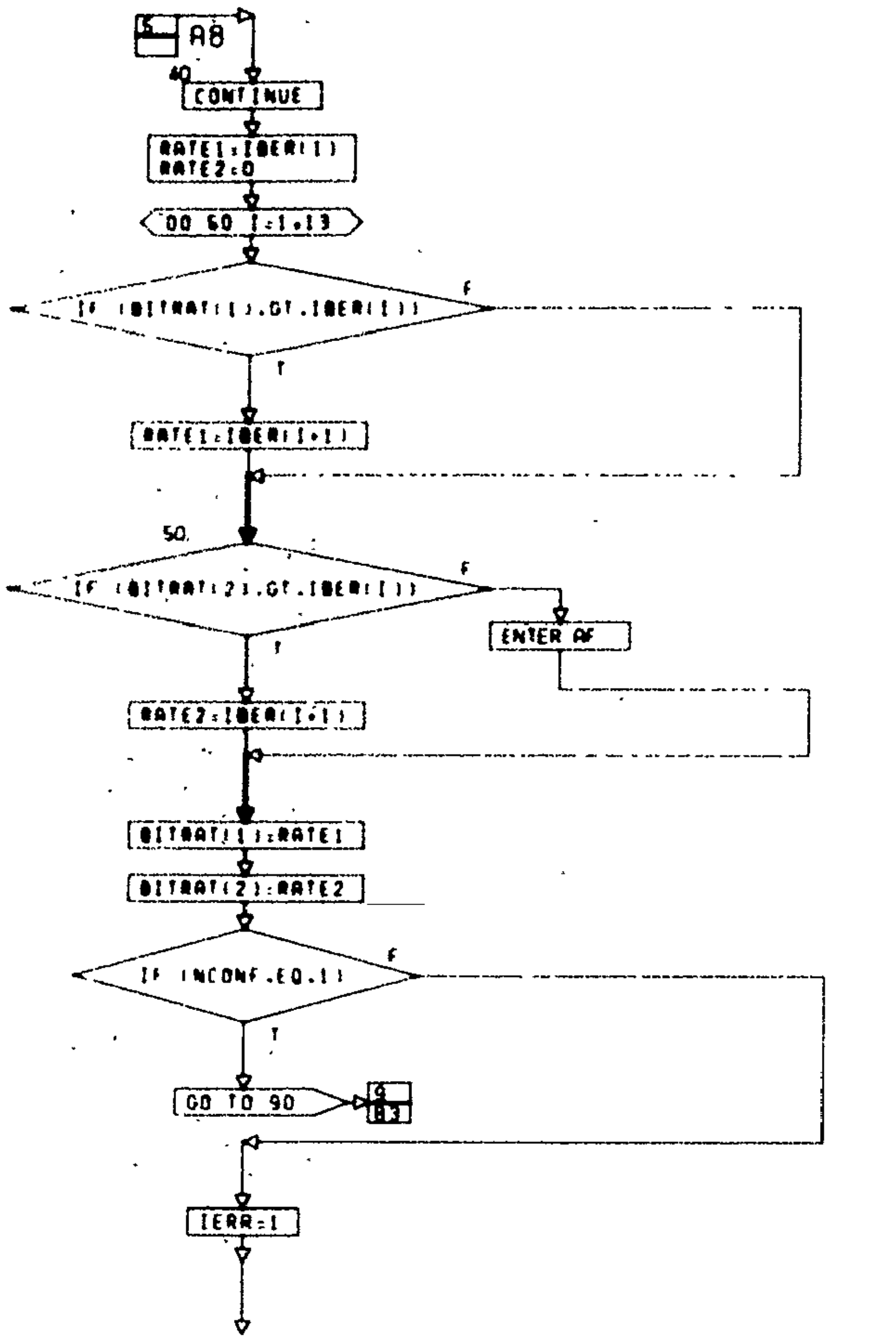
3
A3
KPIC(I)=RESET(I)
3
A4
FI=0.
IF (NCONF .EQ. 2 .OR. NCONF .EQ. 4)
F
T
FI=1.
IF (FI .EQ. 0.)
F
T
KPIC(9)=0
IF (FI .EQ. 1.)
F
T
KPIC(6)=0
IF (ITER.NE.0)
F
5
A6
T
5
A5

CONT. ON PG 5



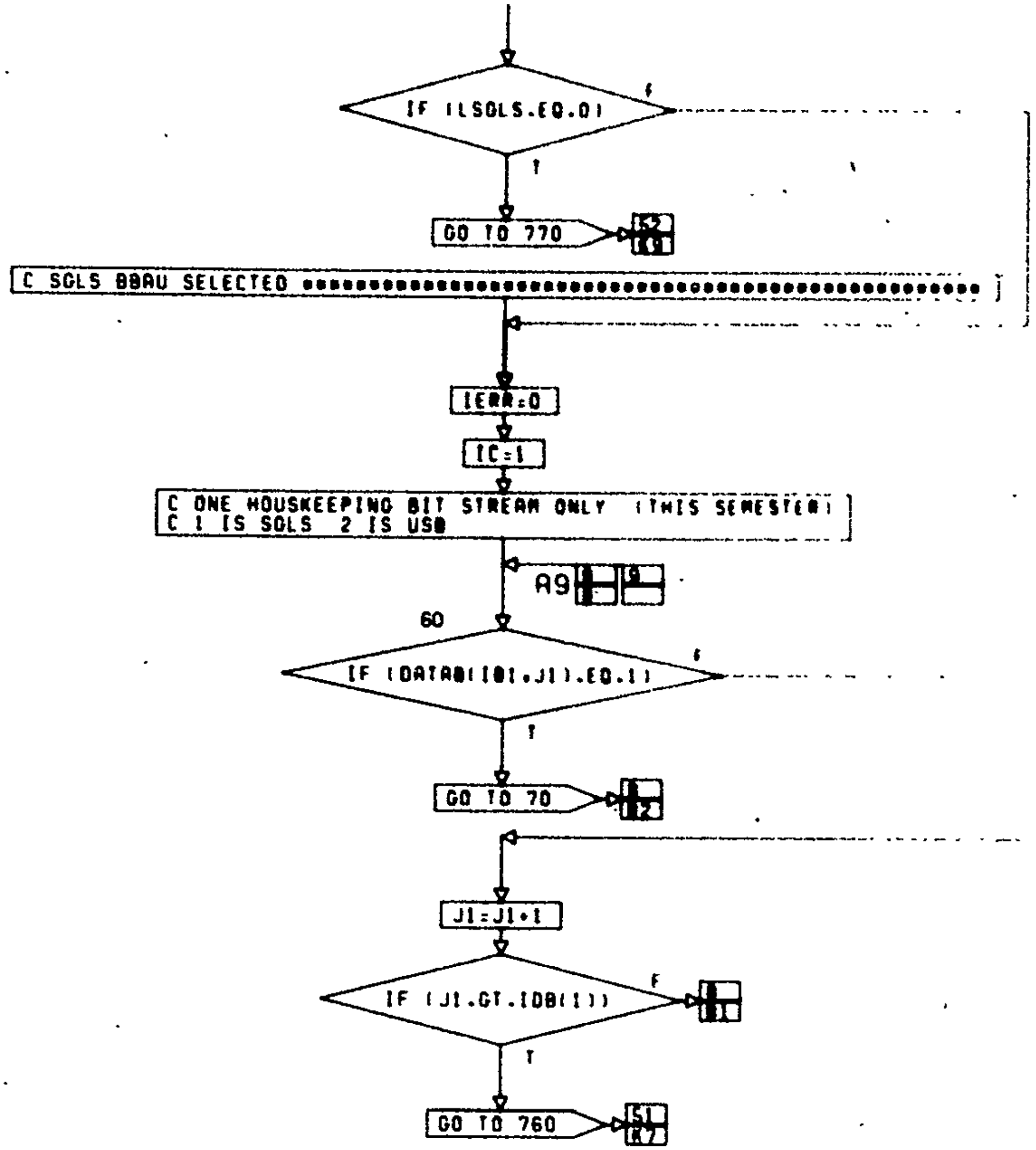
CONT. ON PG 6

035

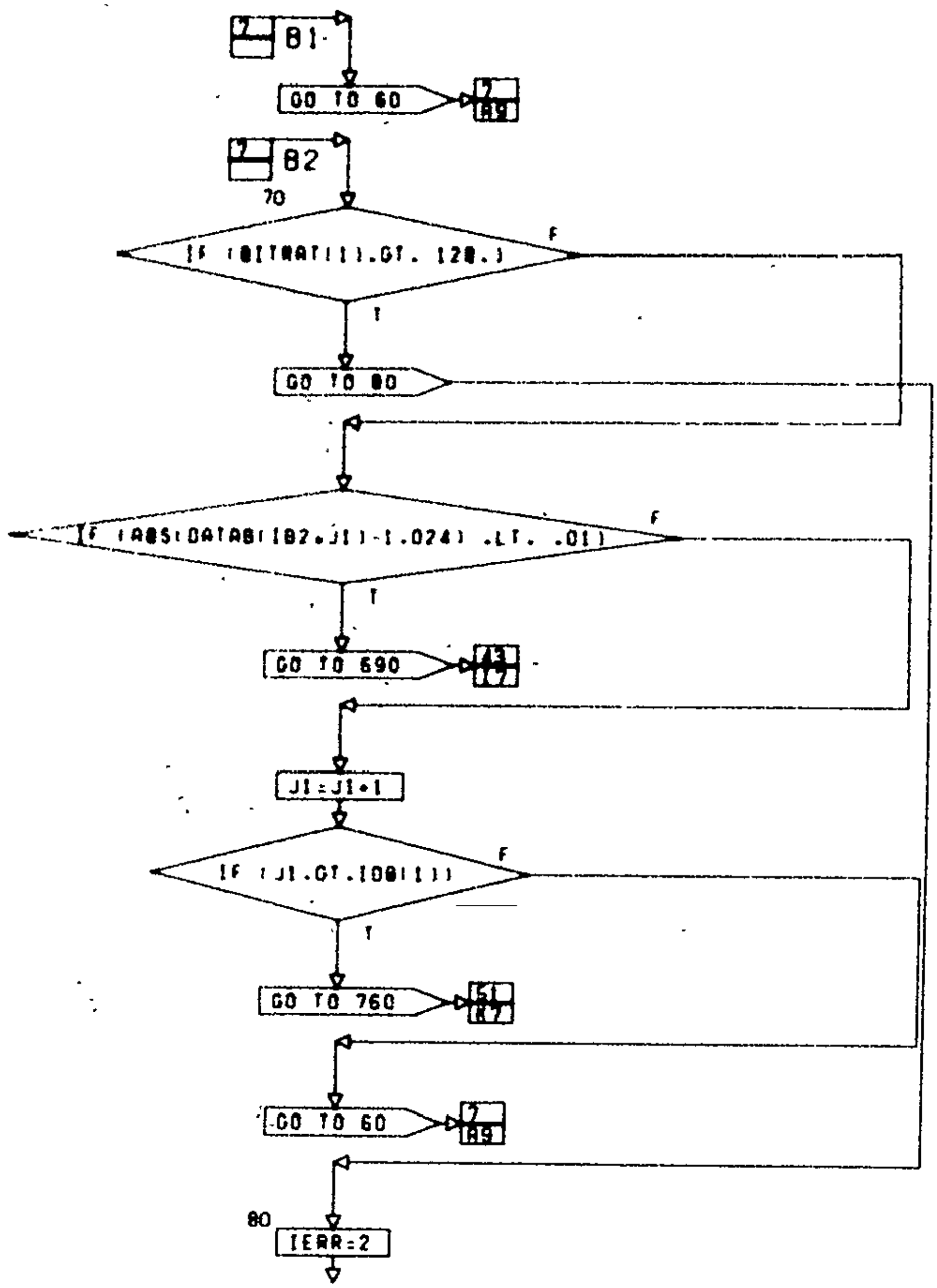


5
A8
40
CONTINUE
RATE1:IBER(1)
RATE2:0
DO 60 I:1,13
IF (BITRAT(1).GT.IBER(I))
F
T
RATE1:IBER(I+1)
50
IF (BITRAT(2).GT.IBER(I))
F
ENTER AF
T
RATE2:IBER(I+1)
BITRAT(1):RATE1
BITRAT(2):RATE2
IF (NCONF.EQ.1)
F
T
GO TO 90
G
B3
IERR:1

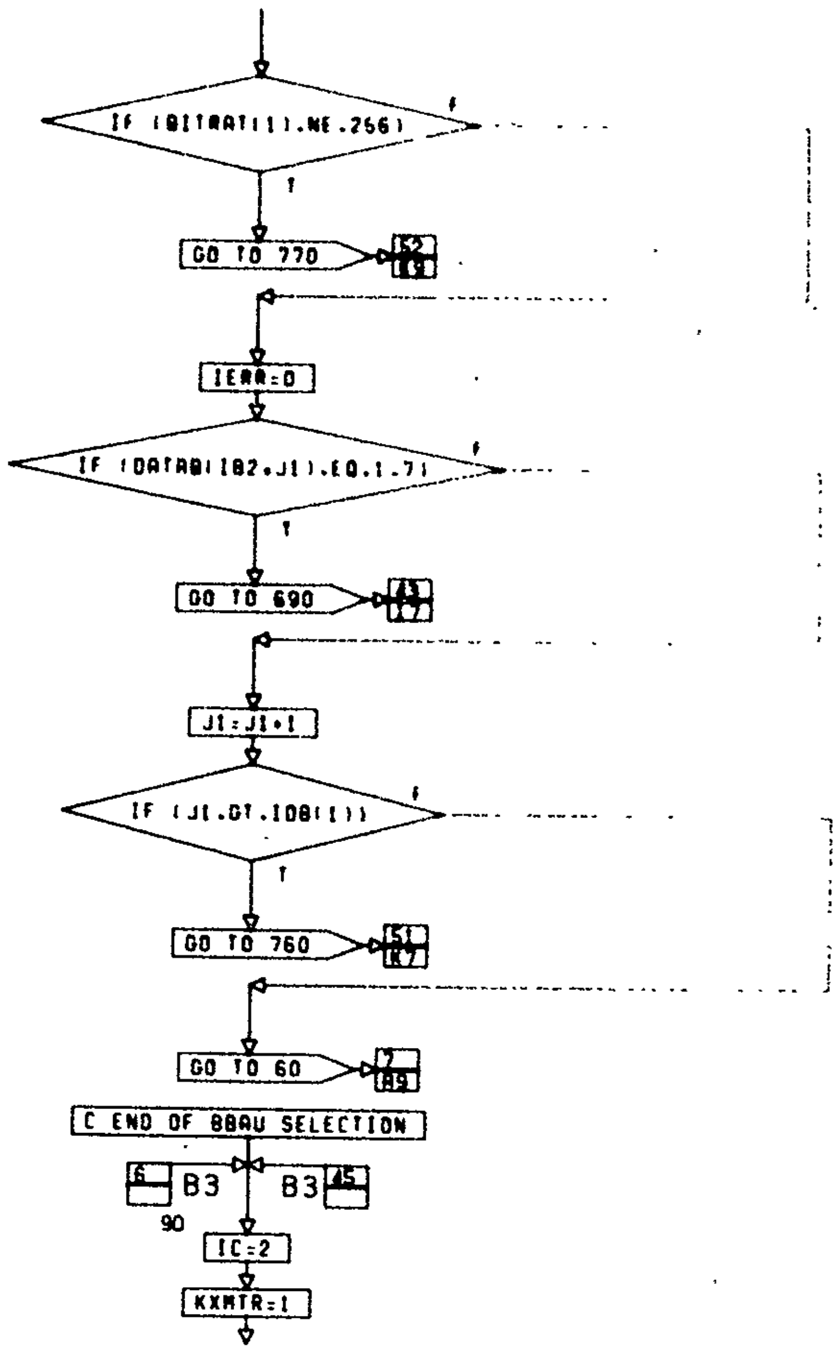
CONT. ON PG 7


IF (LSOLS.EQ.0)
F
T
GO TO 770
52
C SOLS BBAU SELECTED
IERR=0
IC=1
C ONE HOUSKEEPING BIT STREAM ONLY (THIS SEMESTER)
C 1 IS SOLS 2 IS USB
A9
60
IF (DATAB(IB1,J1).EQ.1)
F
T
GO TO 70
IF (J1.GT.IDB(1))
F
T
GO TO 760
51
K7

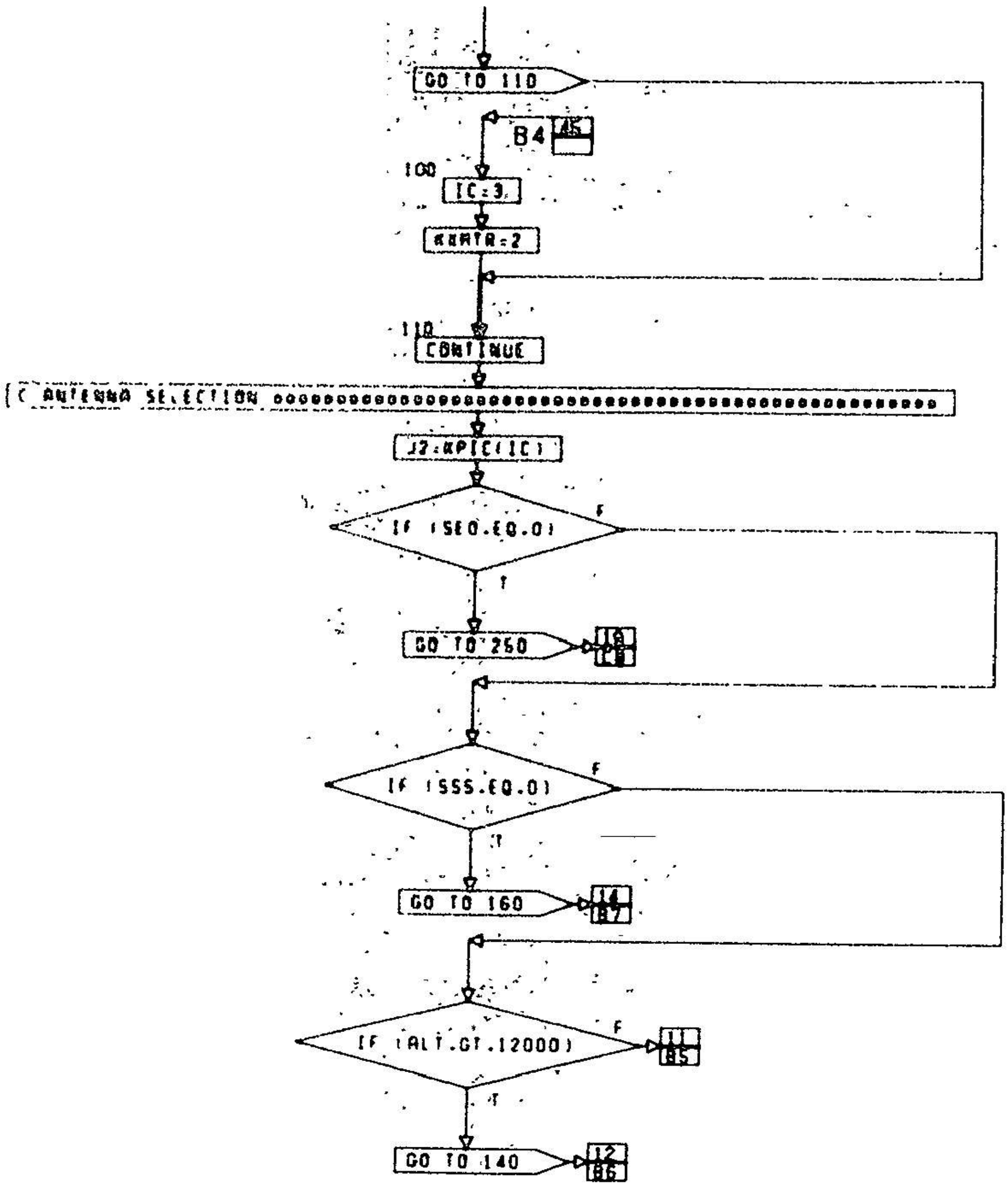
CONT. ON PG 8


7
B1
GO TO 60
7
A9
7
B2
70
IF (BITRAT(I).GT. 128.)
F
T
GO TO 80
IF (ABS(DATAB(IB2+J1)-1.024) .LT. .01)
F
T
GO TO 690
43
I7
J1=J1+1
IF (J1.GT.IDB(I))
F
T
GO TO 760
51
K7
GO TO 60
7
A9
80
IERR=2

CONT. ON PG 9

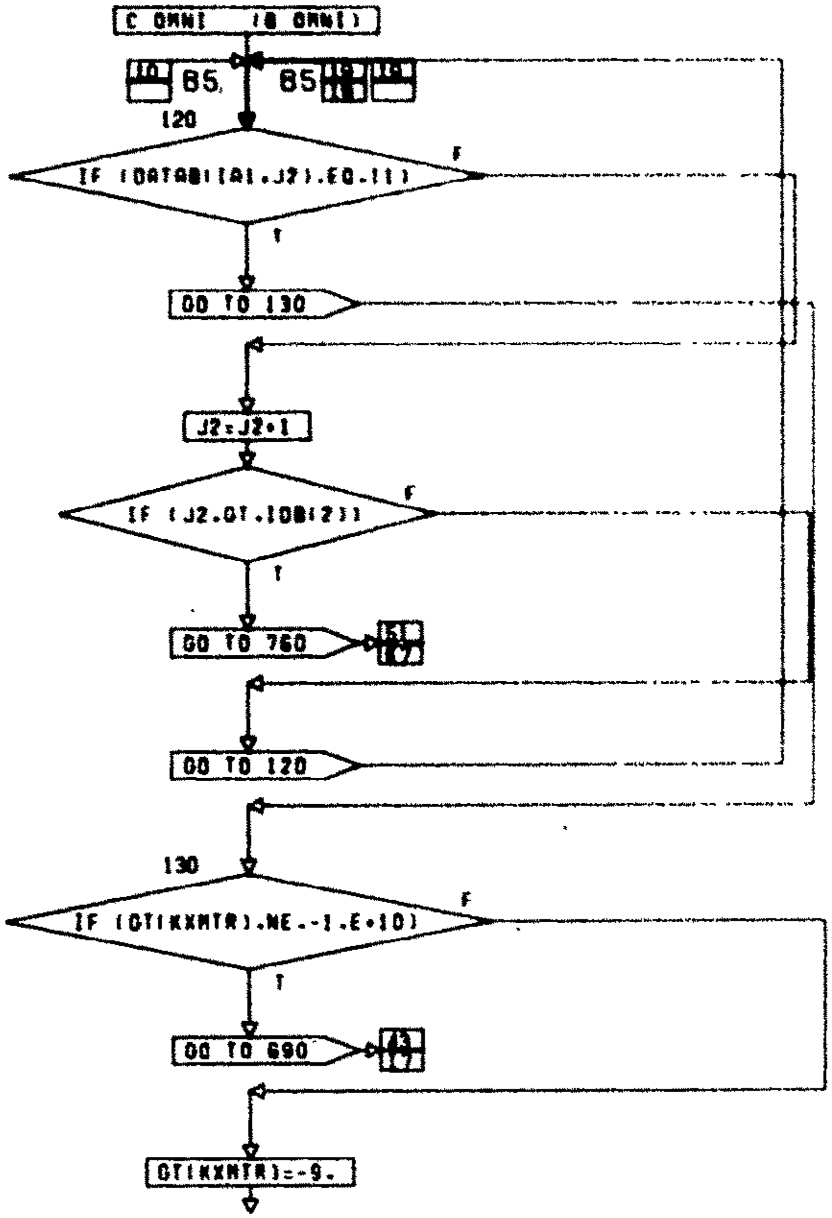

IF (BITRAT(1).NE.256)
F
T
GO TO 770
52
B9
IERR=0
IF (DATAB(IB2+J1).EQ.1.7)
F
T
GO TO 690
43
J7
J1=J1+1
IF (J1.GT.IDB(1))
F
T
GO TO 760
51
K7
GO TO 60
7
B9
C END OF BBAU SELECTION
6
B3
B3
45
90
IC=2
KXMTR=1

CONT. ON PG 10

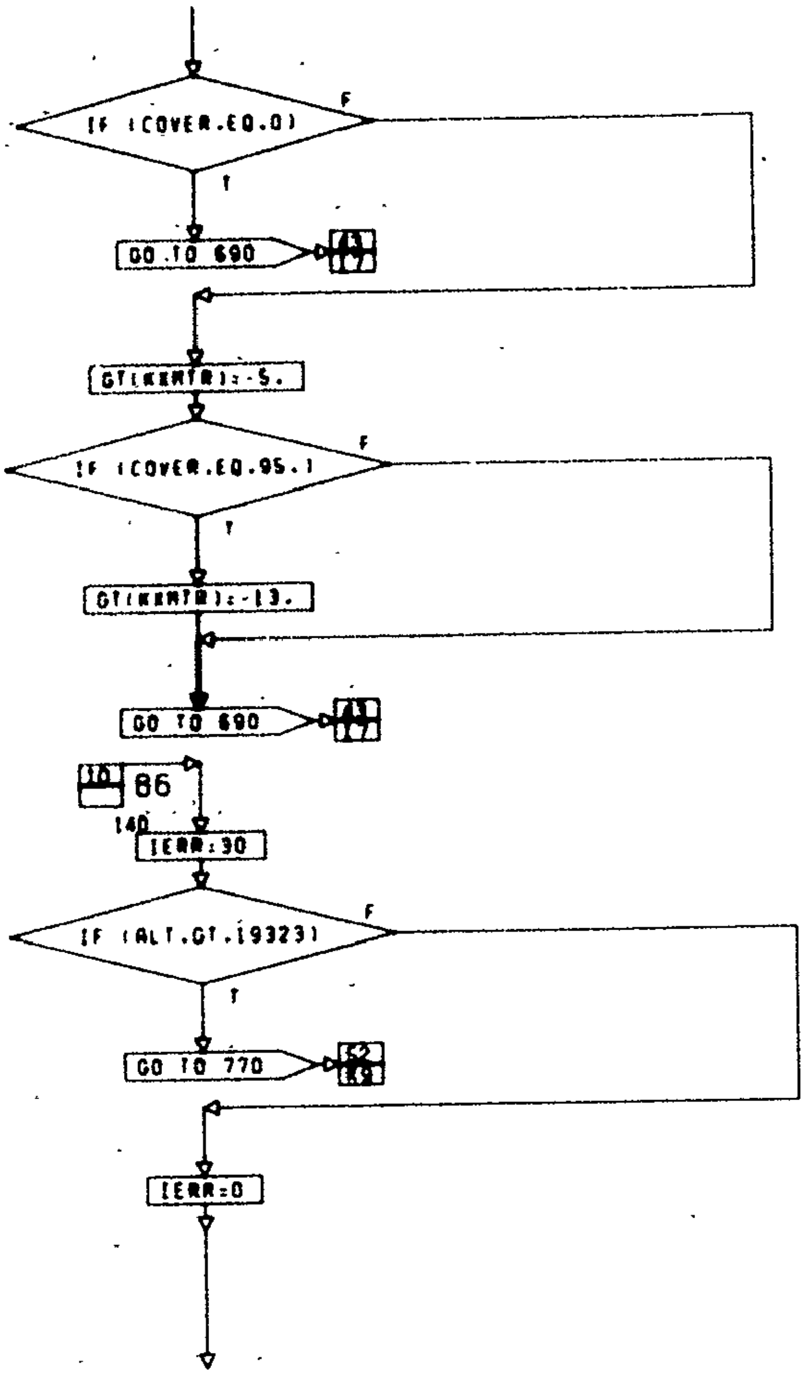


CONT. ON PG 11

PG 10OF 52

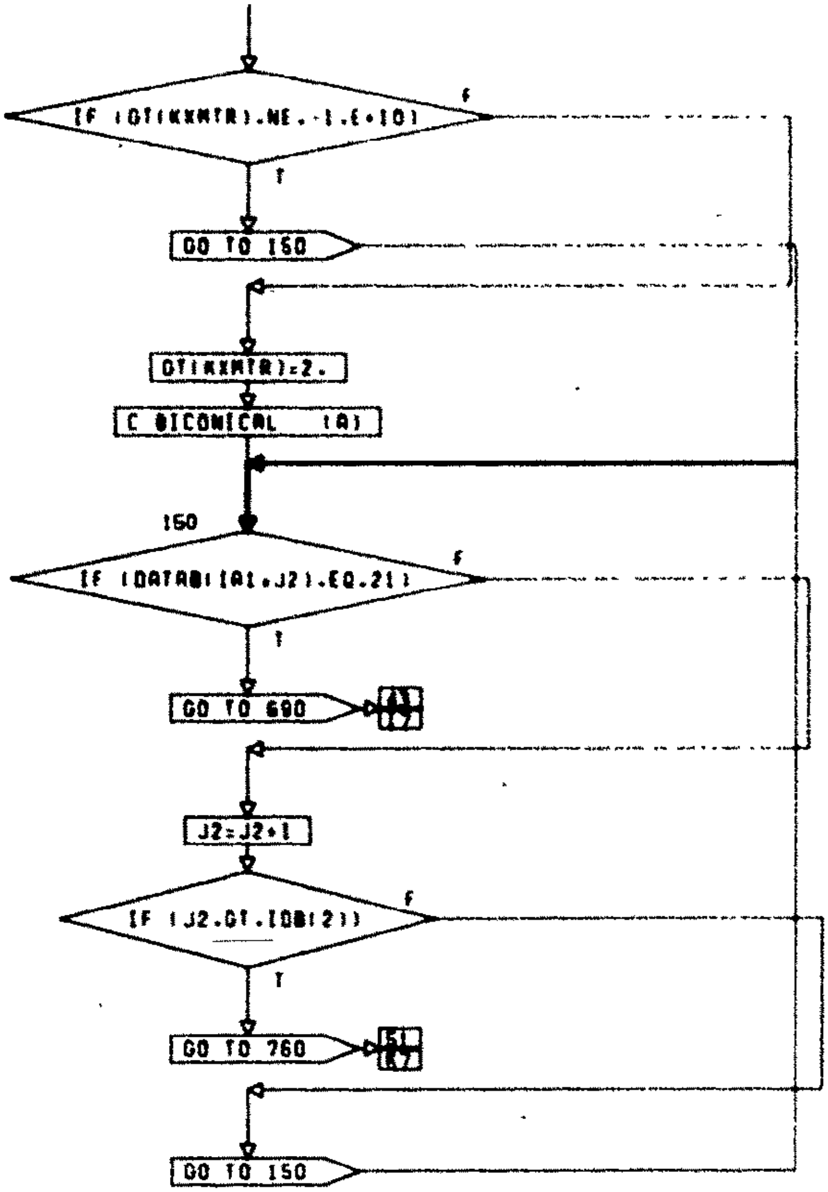

C OMNI (B OMNI)
85
85
120
IF (DATAB(IA1,J2).EQ.1)
F
T
GO TO 130
J2=J2+1
IF (J2.GT.IDB(2))
F
T
GO TO 760
GO TO 120
130
IF (DT(KXMTR).NE.-1.E+10)
F
T
GO TO 690
DT(KXMTR)=-9.

CONT. ON PG 12

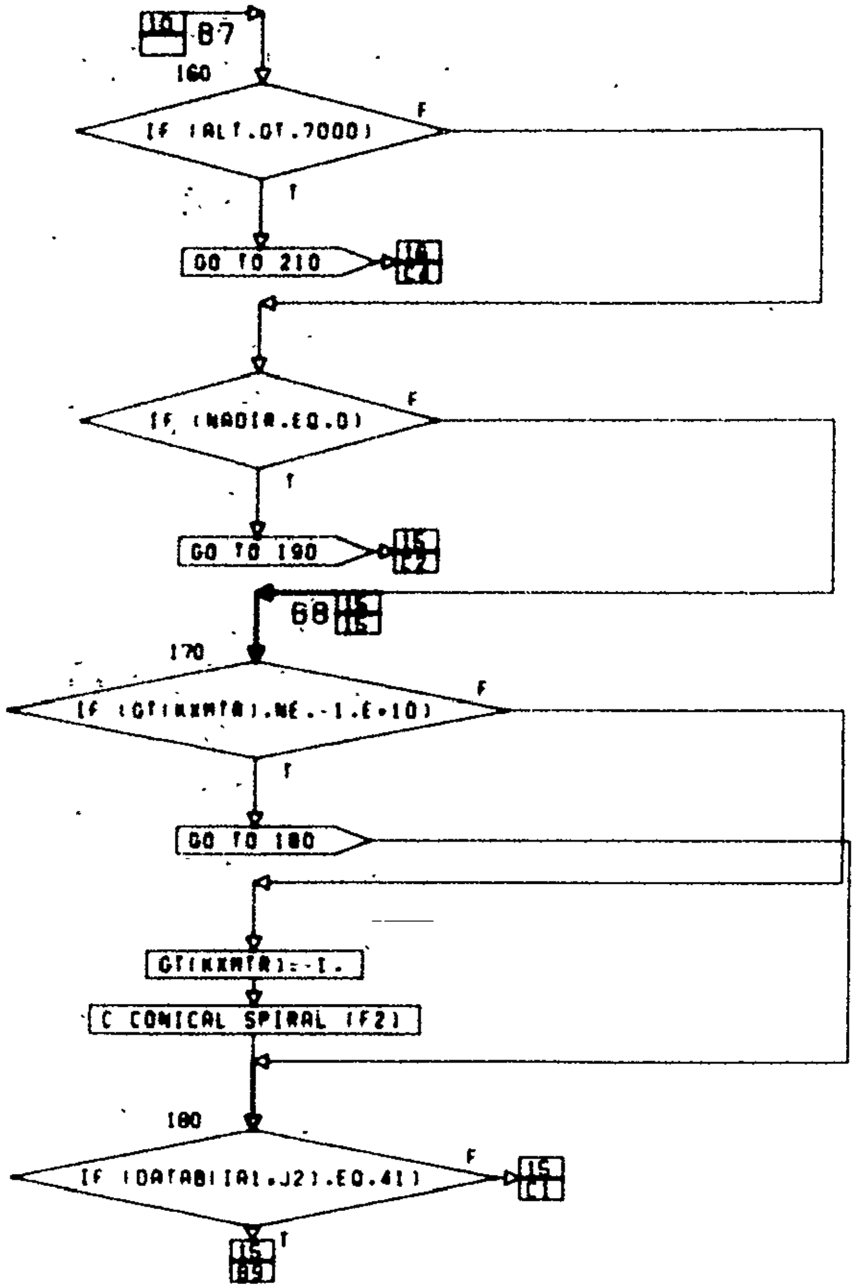


CONT. ON PG 13

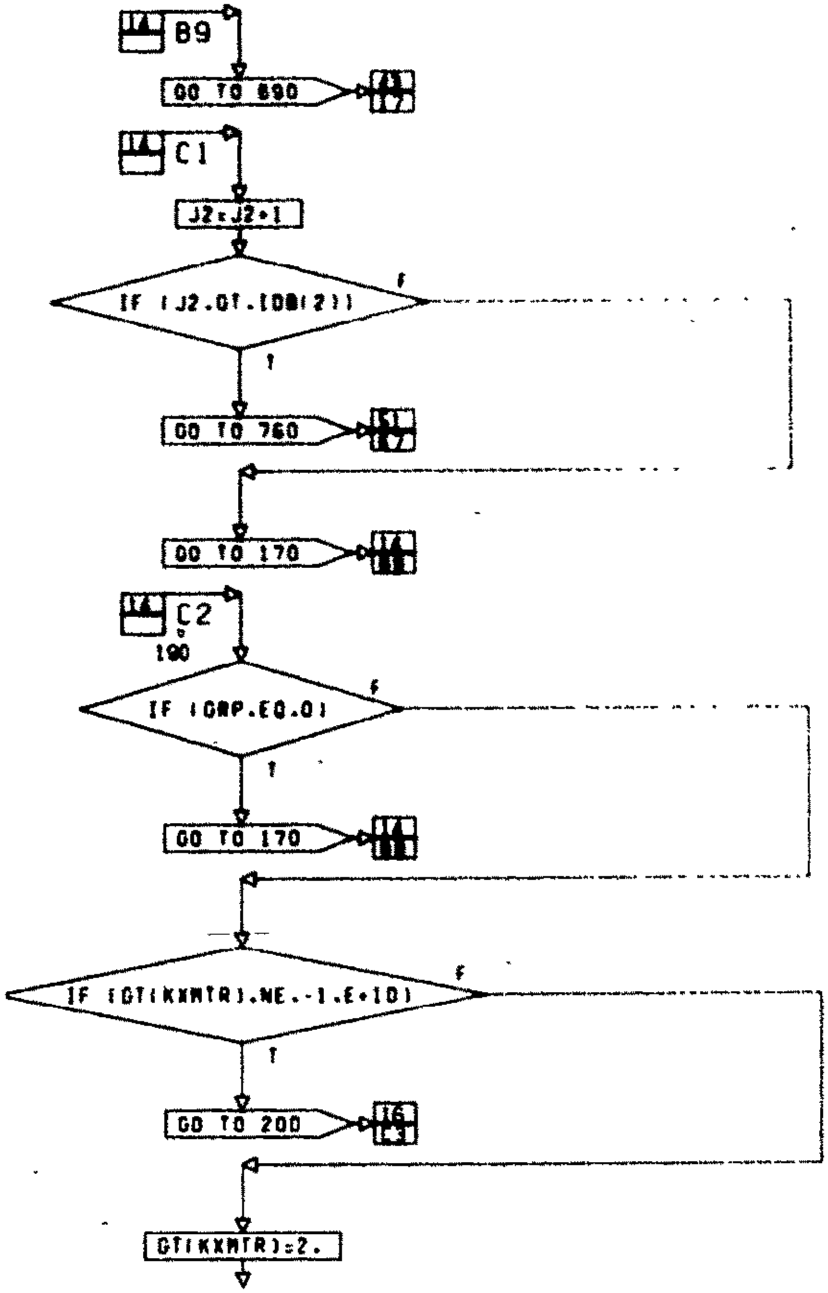
c ~ 5


IF (DT(KXMTR).NE.-1.E+10)
F
T
GO TO 150
DT(KXMTR)=2.
C BICONICAL (A)
150
IF (DATAB(IA1,J2).EQ.2))
F
T
GO TO 690
J2=J2+1
IF (J2.GT.IDB(2))
F
T
GO TO 760
GO TO 150

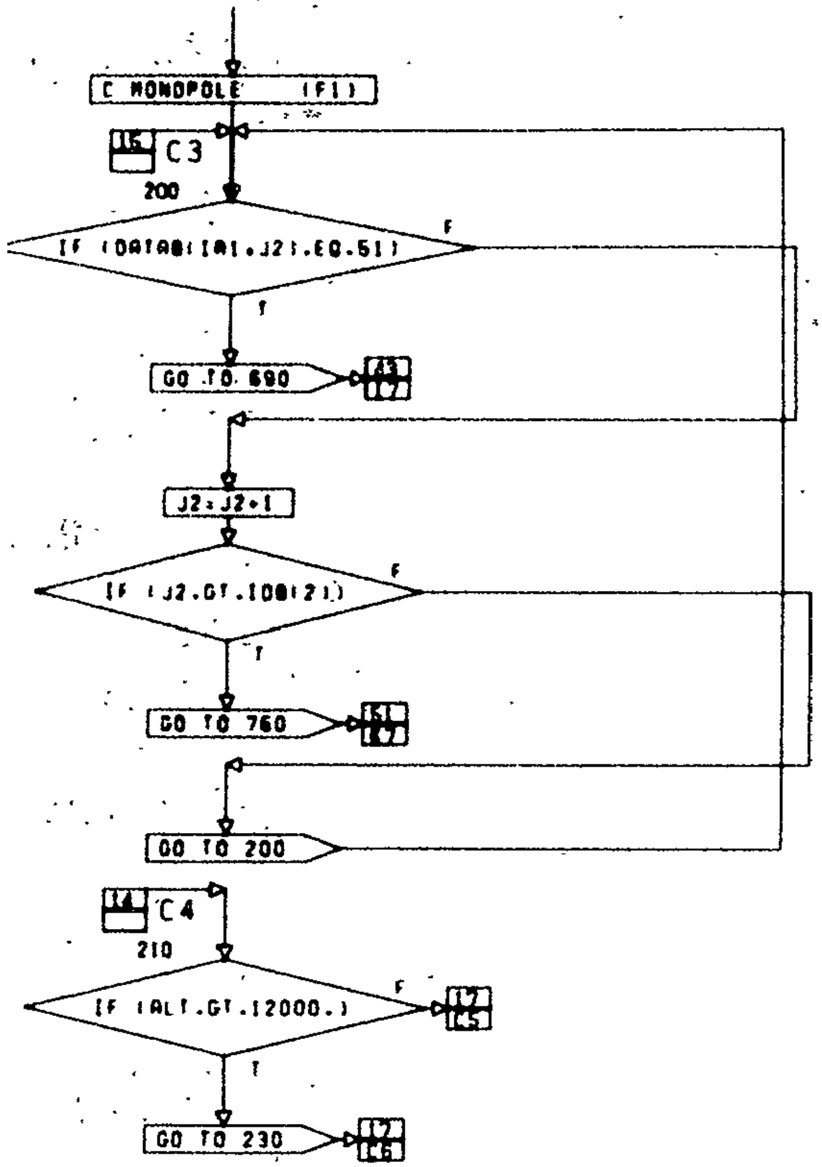
CONT. ON PG 14


160
IF (ALT.GT.7000)
GO TO 210
IF (NADIR.EQ.0)
GO TO 190
170
IF (GT(KXMTR).NE.-1.E+10)
GO TO 180
GT(KXMTR)=-1.
C CONICAL SPIRAL (F2)
180
IF (DATAB(IA1,J2).EQ.4))

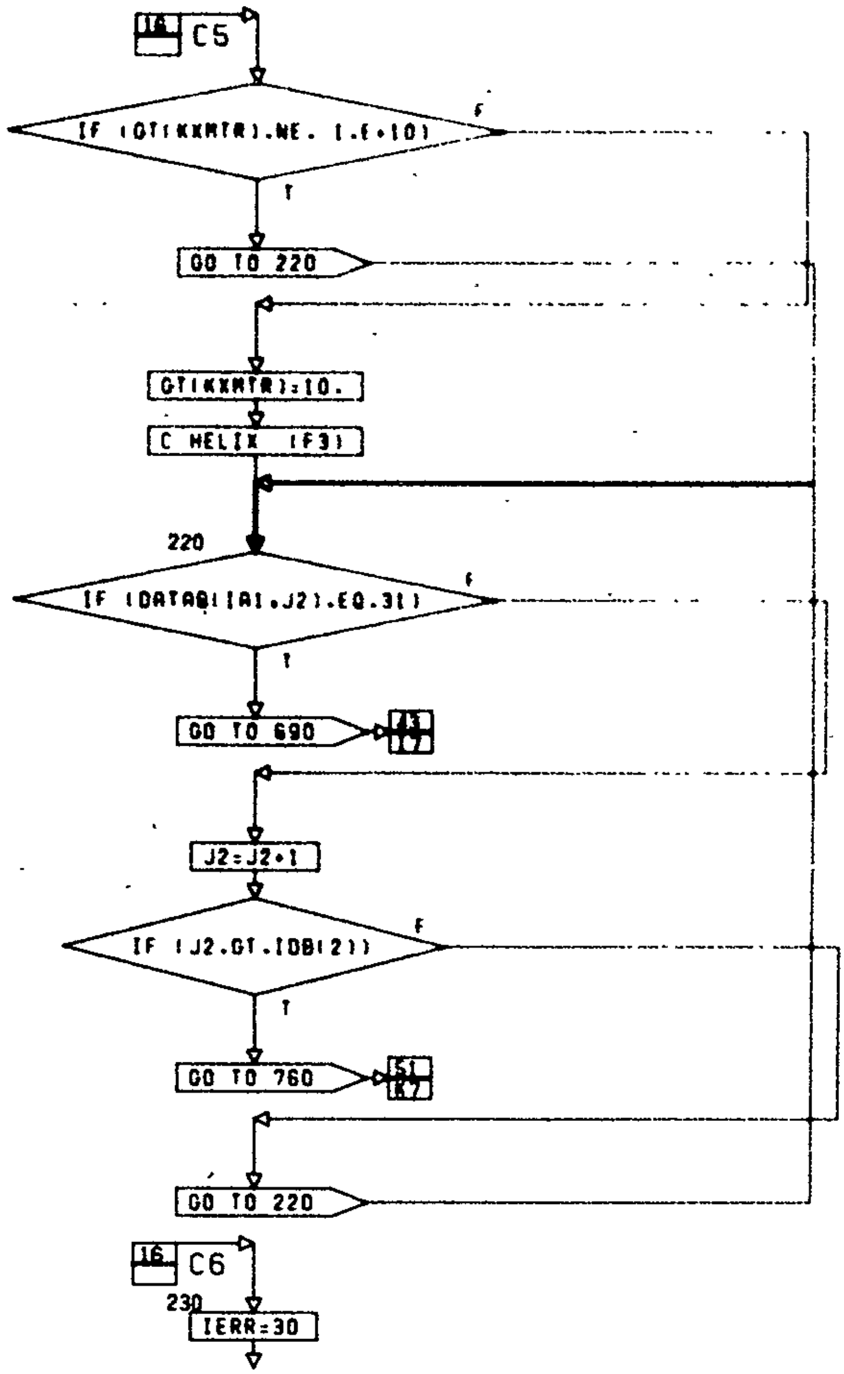
CONT. ON PG 15


B9
GO TO 890
C1
J2=J2+1
IF (J2.GT.IDB(2))
GO TO 760
GO TO 170
C2
190
IF (GRP.EQ.0)
GO TO 170
IF (GT(KXMTR).NE.-1.E+10)
GO TO 200
GT(KXMTR)=2.

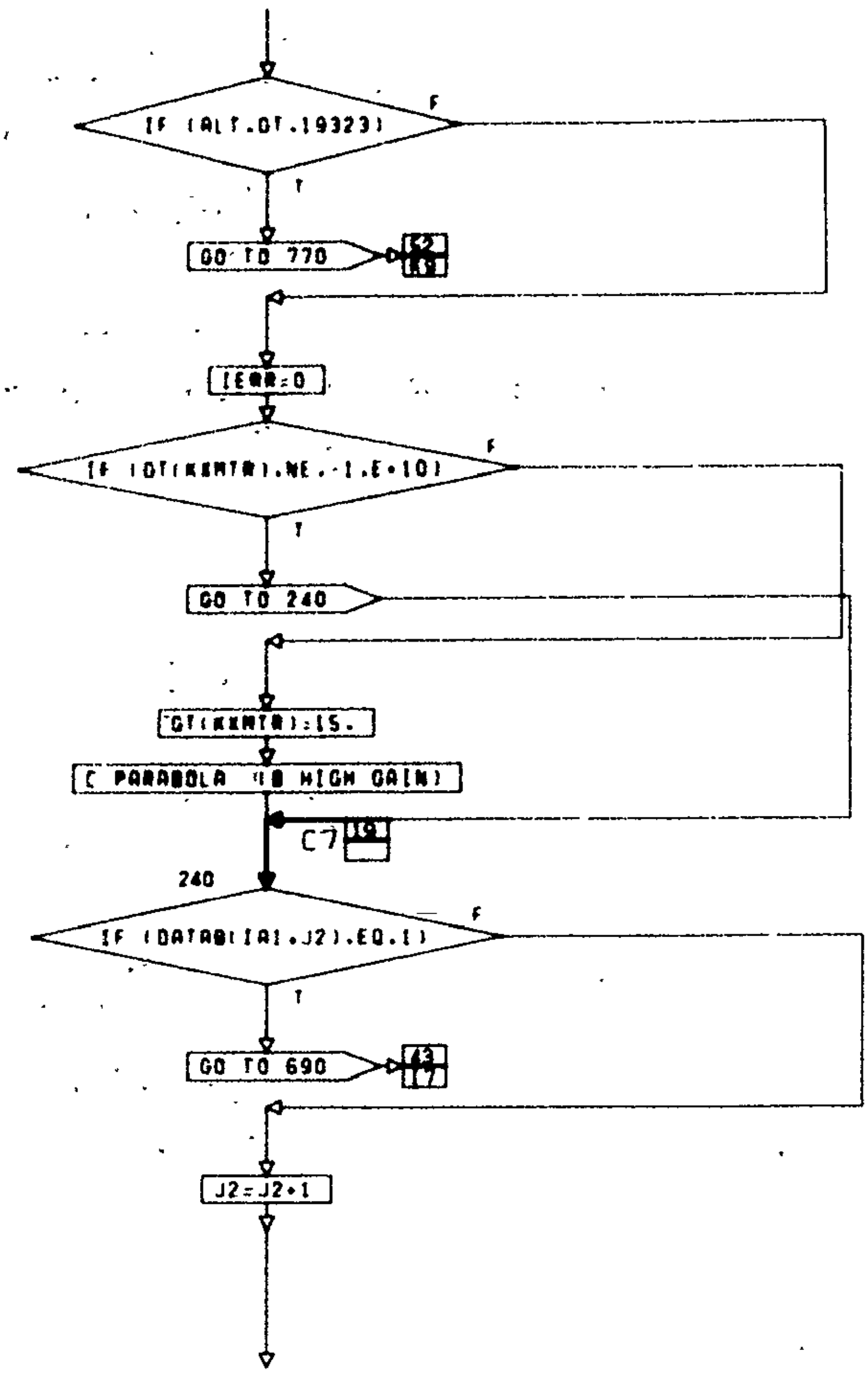
CONT. ON PG 16


C MONOPOLE (F1)
16
C3
200
IF (DATAB(IA1,J2).EQ.5)
F
T
GO TO 690
13
17
J2=J2+1
IF (J2.GT.IDB(2))
F
T
GO TO 760
51
E7
GO TO 200
14
C4
210
IF (ALT.GT.12000.)
F
17
C5
T
GO TO 230
17
C6

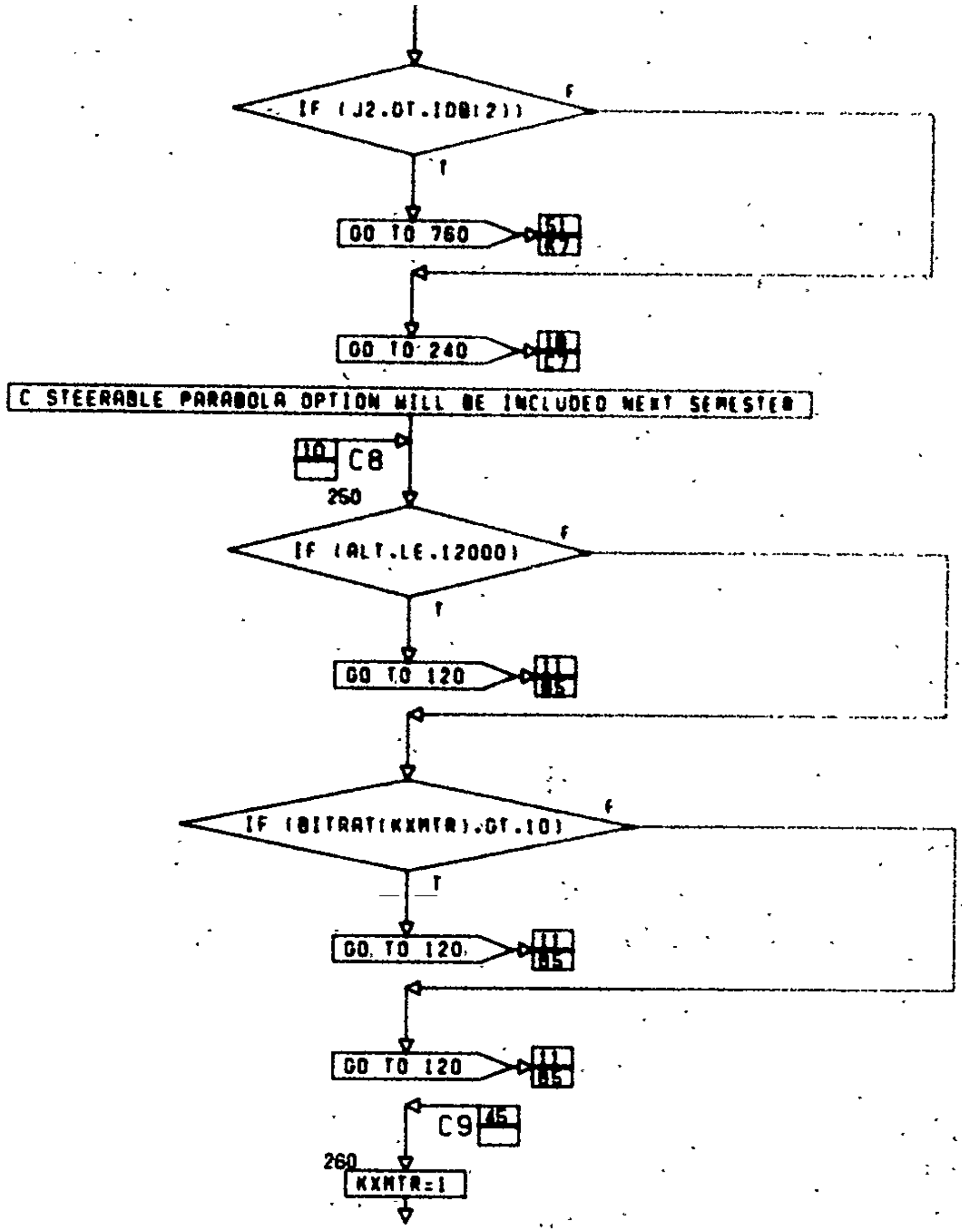
CONT. ON PG 17


16
C5
IF (QT(KXMTR).NE. 1.E+10)
F
T
GO TO 220
QT(KXMTR)=10.
C HELIX (F3)
220
IF (DATAB((A1,J2).EQ.3))
F
T
GO TO 690
43
17
J2=J2+1
IF (J2.GT.IDB(2))
F
T
GO TO 760
51
K7
GO TO 220
16
C6
230
IERR=30

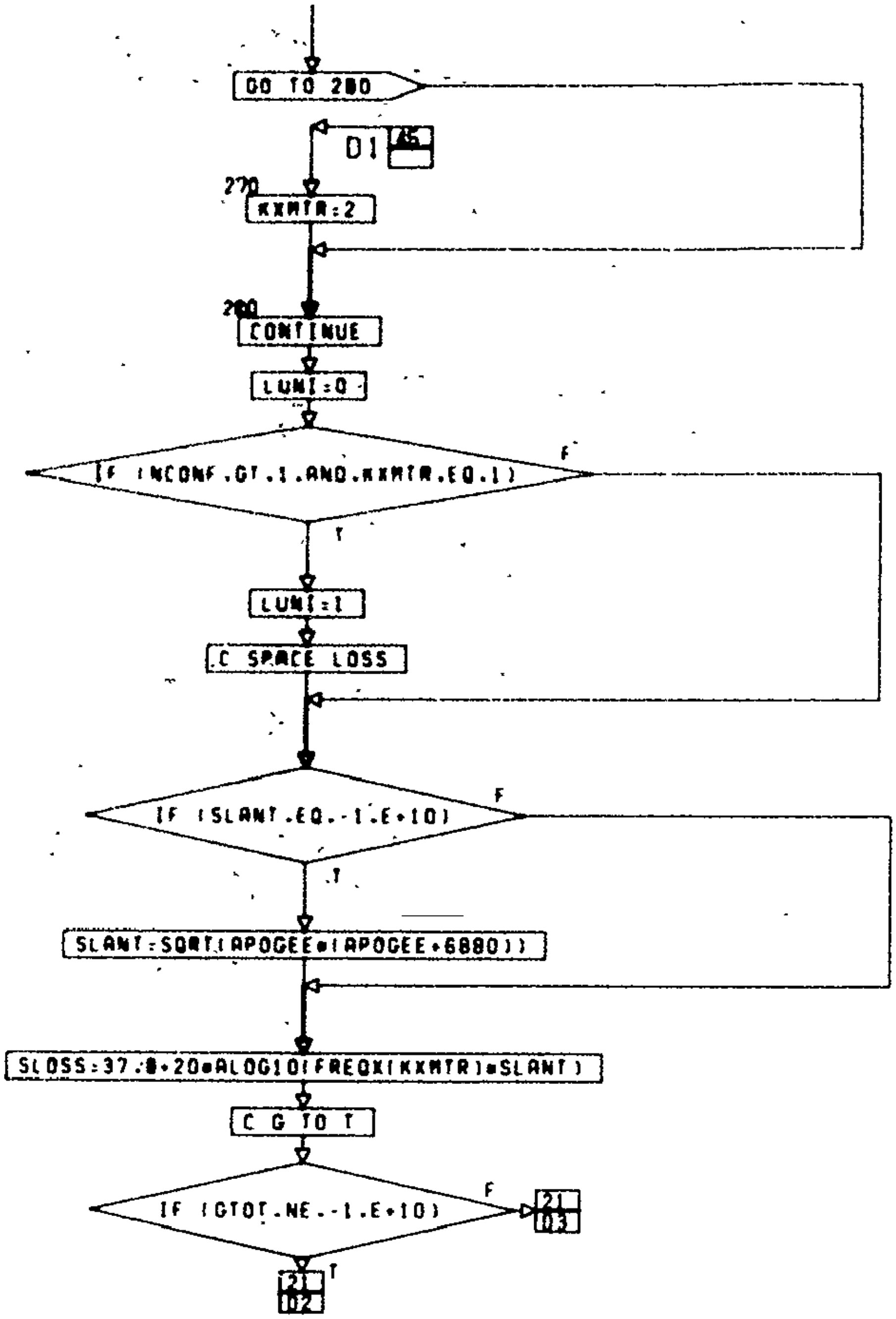
CONT. ON PG 18


IF (ALT.GT.19323)
F
T
GO TO 770
IERR=0
IF (GT(KKMTR).NE.-1.E+10)
F
T
GO TO 240
GT(KKMTR)=15.
C PARABOLA (B HIGH GAIN)
C7
19
240
IF (DATAB(IA1,J2).EQ.1)
F
T
GO TO 690
43
17
J2=J2+1

CONT. ON PG 19

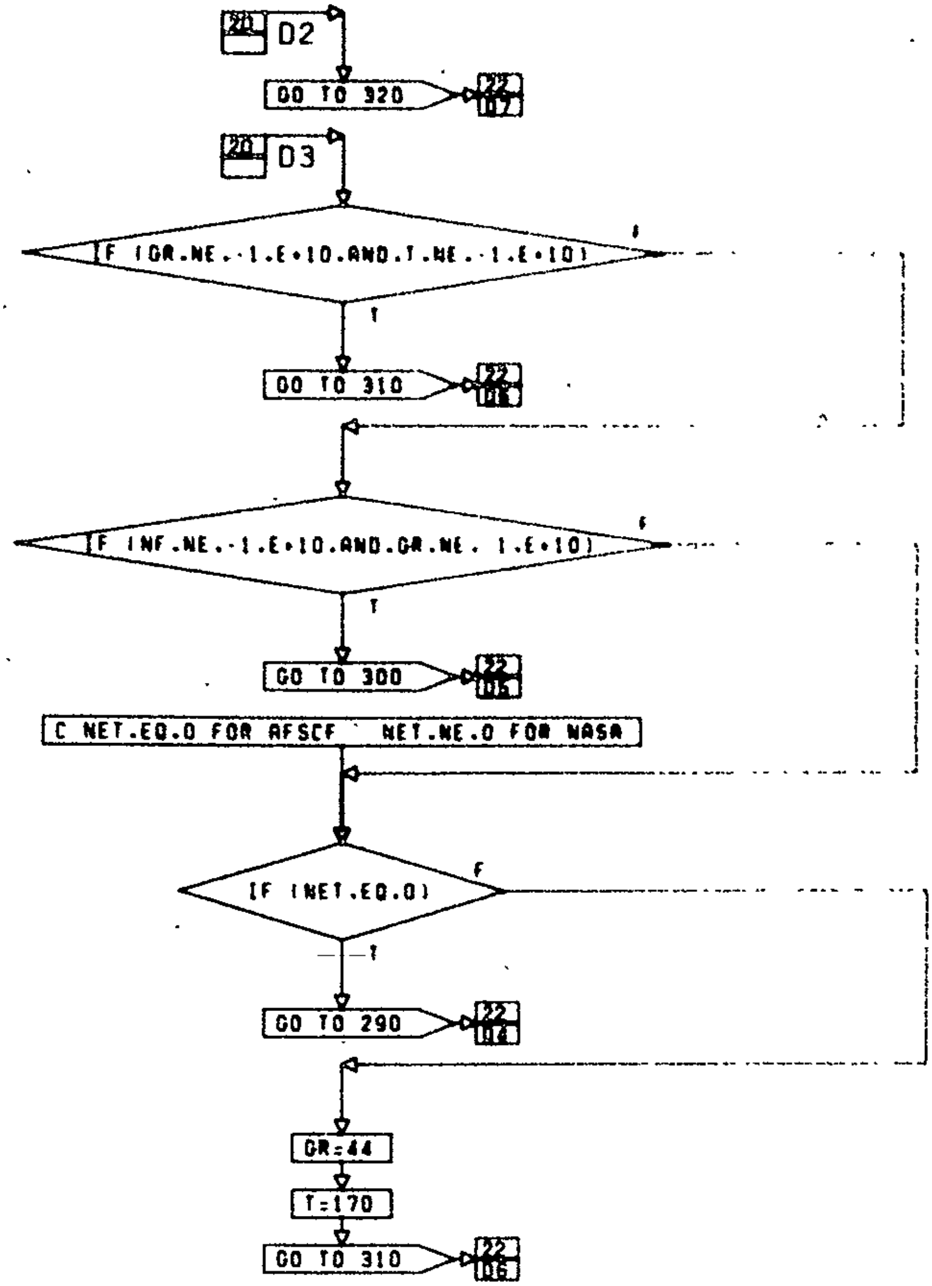

IF (J2.GT.IDB(2))
F
T
GO TO 760
GO TO 240
C STEERABLE PARABOLA OPTION WILL BE INCLUDED NEXT SEMESTER
C8
250
IF (ALT.LE.12000)
F
T
GO TO 120
IF (BITRAT(KXMTR).GT.10)
F
T
GO TO 120
GO TO 120
C9
260
KXMTR=1

CONT. ON PG 20

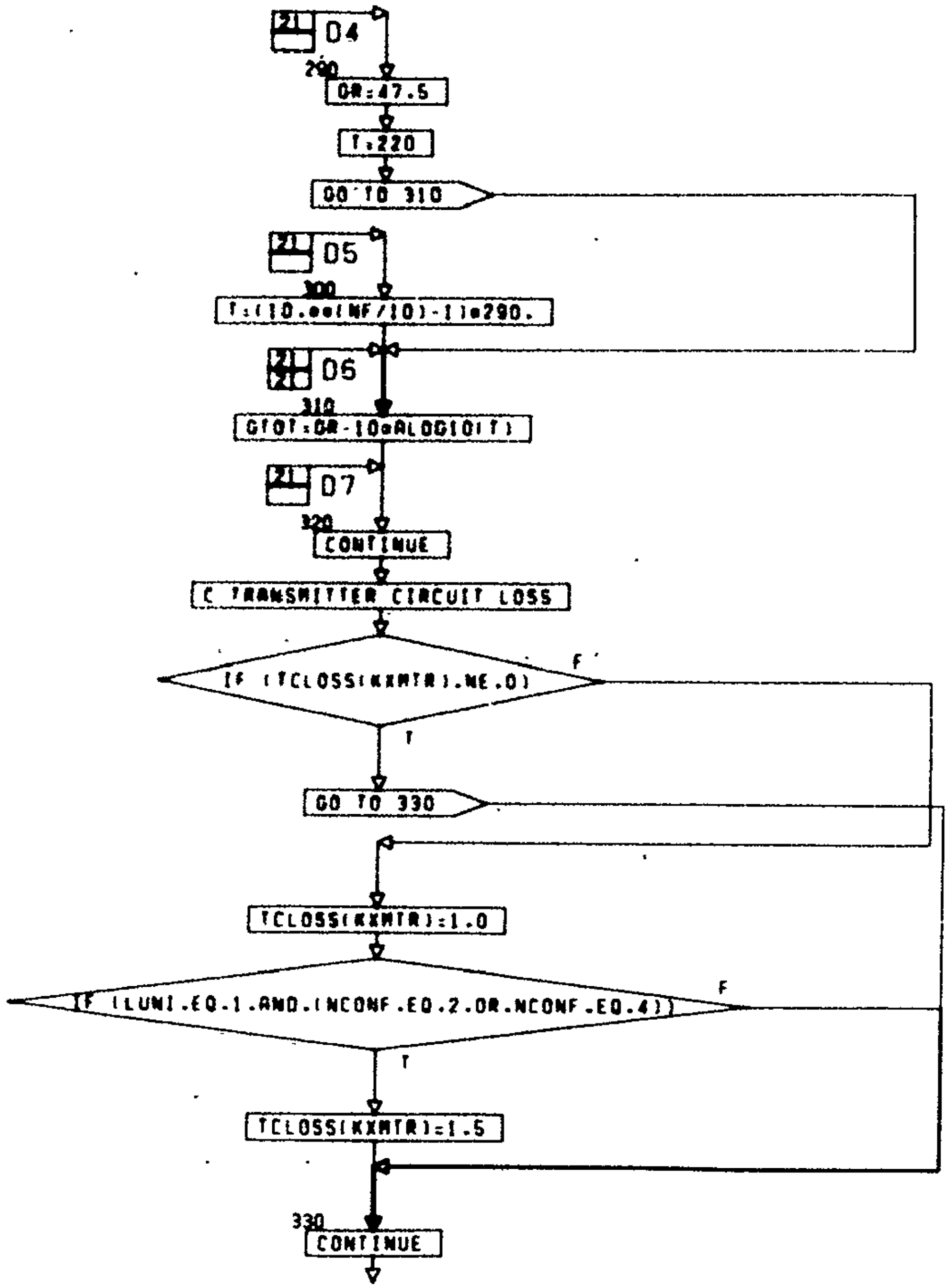


GO TO 280
D1
270
KXMTR:2
280
CONTINUE
LUNI:0
IF (NCONF.GT.1.AND.KXMTR.EQ.1)
F
T
LUNI:1
C SPACE LOSS
IF (SLANT.EQ.-1.E+10)
F
T
SLANT:SQRT(APOGEE*(APOGEE+6880))
SLOSS:37.8+20*ALOG10(FREQX(KXMTR)*SLANT)
C G TO T
IF (GTOT.NE.-1.E+10)
F
21
03
T
21
02

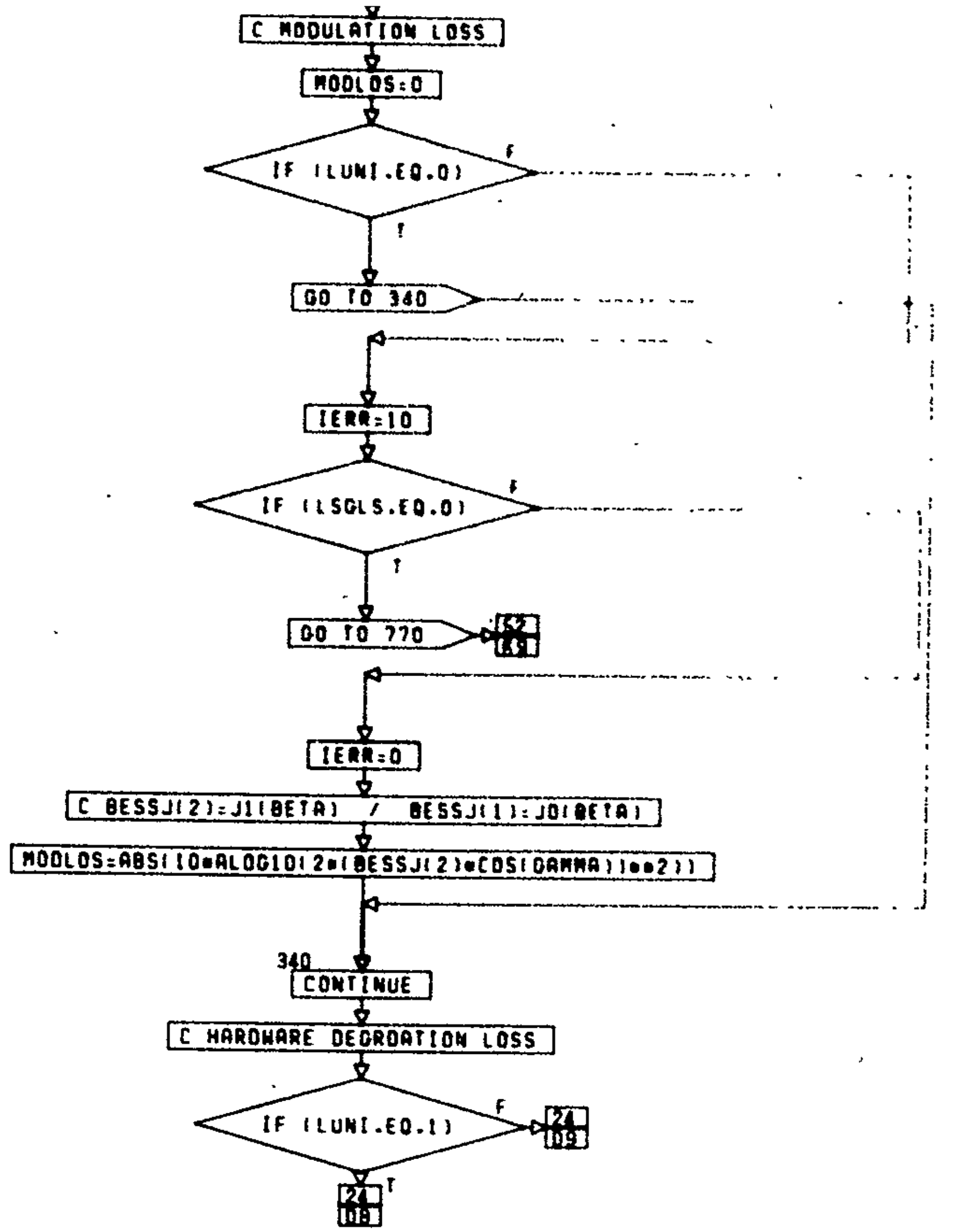
CONT. ON PG 21


20
D2
GO TO 320
22
107
20
D3
IF (GR.NE.-1.E+10.AND.T.NE.-1.E+10)
T
GO TO 310
22
106
IF (NF.NE.-1.E+10.AND.GR.NE. 1.E+10)
T
GO TO 300
22
105
C NET.EQ.0 FOR AFSCF NET.NE.0 FOR NASA
IF (NET.EQ.0)
F
T
GO TO 290
22
104
GR=44
T=170
GO TO 310
22
106

CONT. ON PG 22

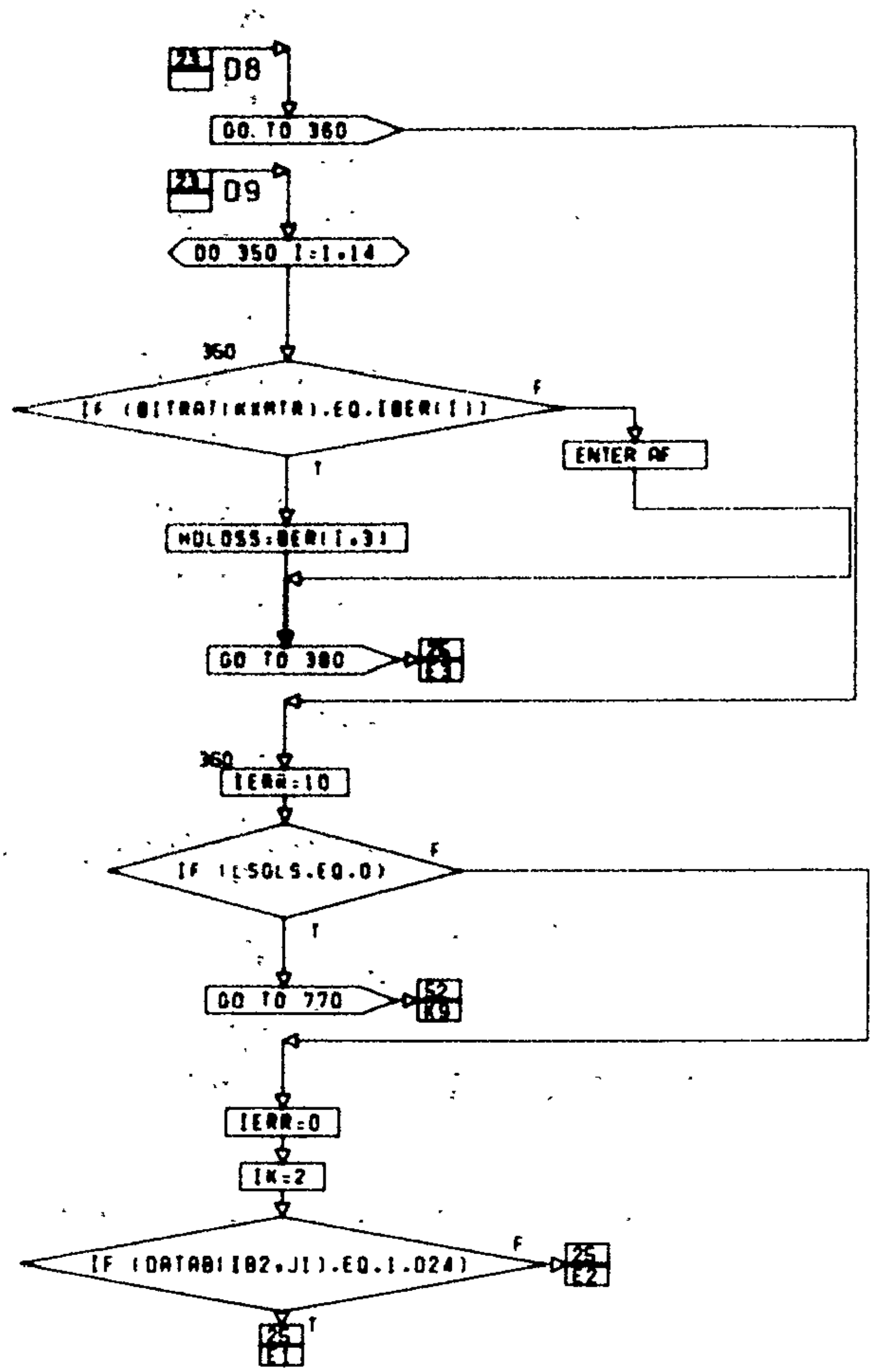

21 D4
290
OR=47.5
T=220
GO TO 310
21 D5
300
T=(10.**(NF/10)-1)*290.
21 21 D6
310
GTOT=OR-10*ALOG10(T)
21 D7
320
CONTINUE
C TRANSMITTER CIRCUIT LOSS
IF (TCLOSS(KXMTR).NE.0)
F
T
GO TO 330
TCLOSS(KXMTR)=1.0
IF (LUNI.EQ.1.AND.(NCONF.EQ.2.OR.NCONF.EQ.4))
F
T
TCLOSS(KXMTR)=1.5
330
CONTINUE

CONT. ON PG 23

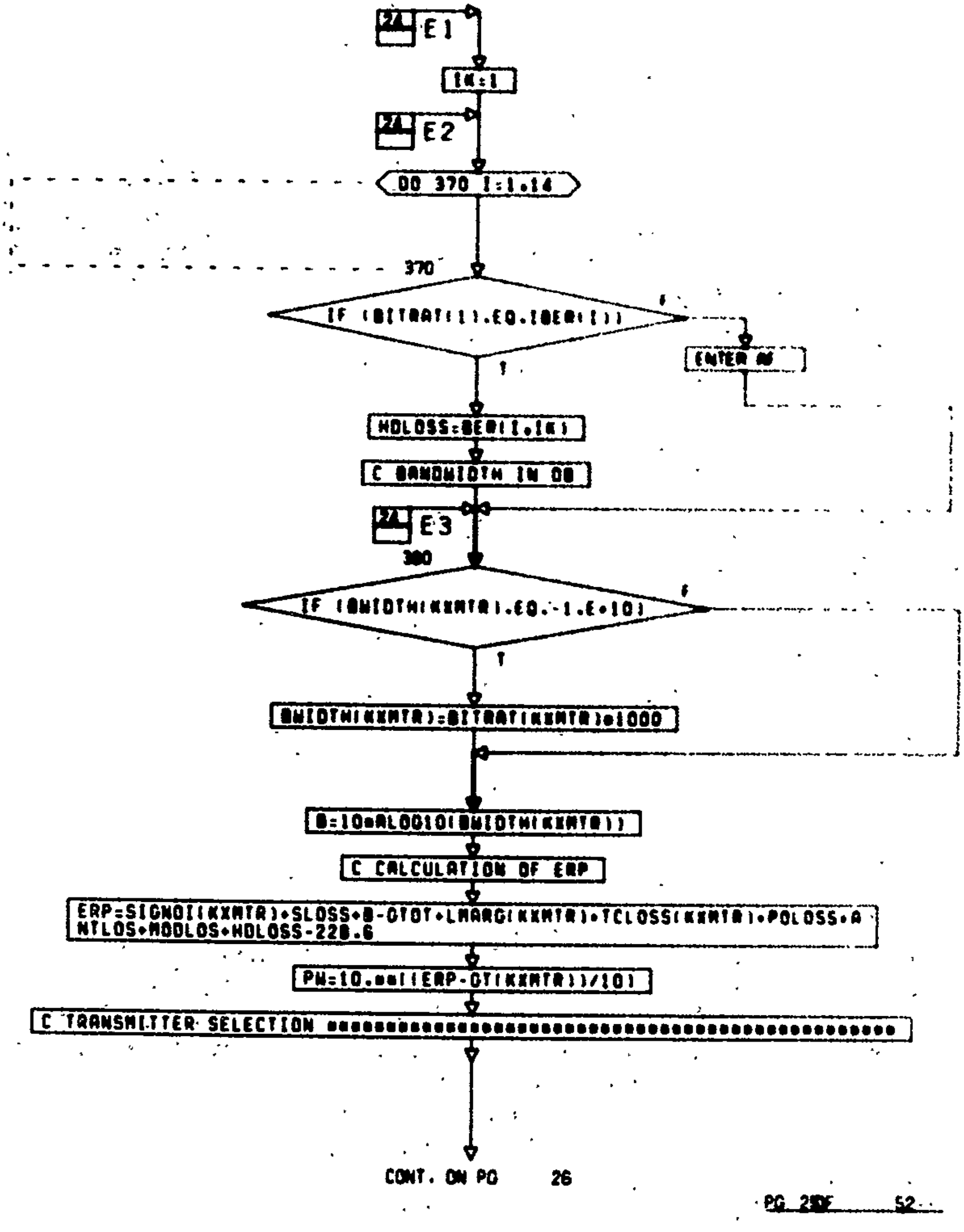


CONT. ON PG 24

064

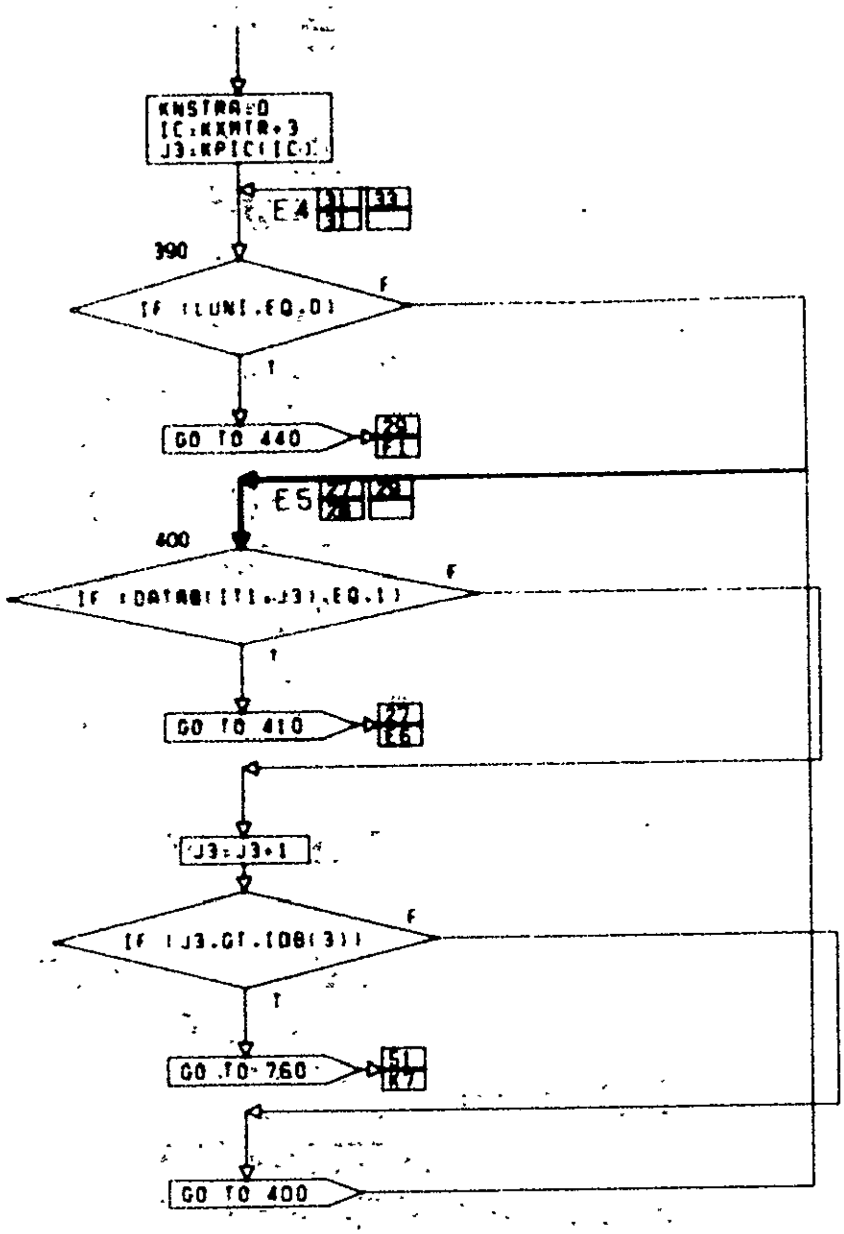

21
D8
GO TO 360
21
D9
DO 350 I=1,14
360
IF (BITRAT(KKMTR).EQ.IBER(I))
F
ENTER AF
T
NOLOSS=BER(I,3)
GO TO 380
25
E3
360
IERR=10
IF (LSOLS.EQ.0)
F
T
GO TO 770
52
K9
IERR=0
IK=2
IF (DATAB(IB2,J)).EQ.1.024)
F
25
E2
T
25
E1

CONT. ON PG 25

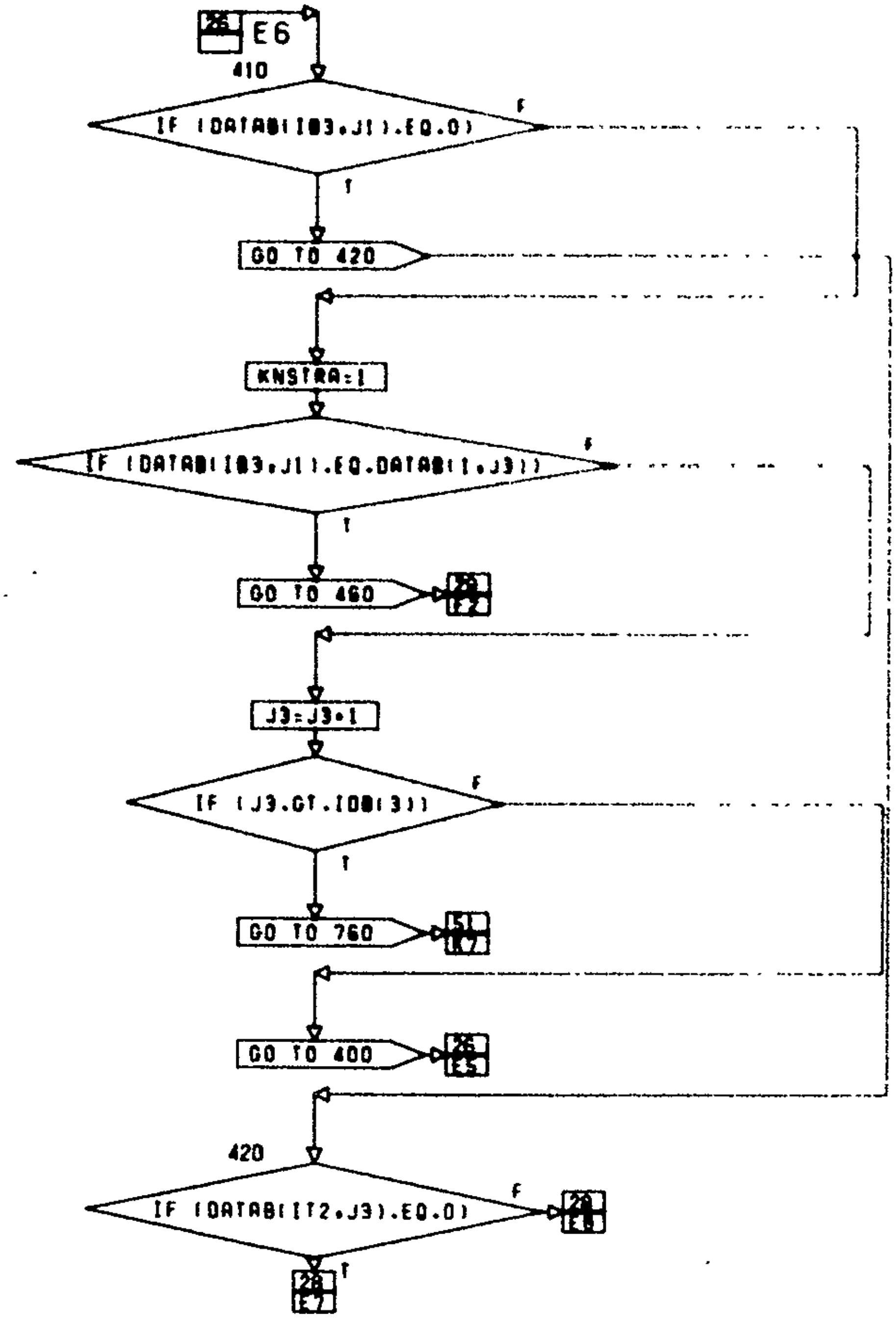


CONT. ON PG 26

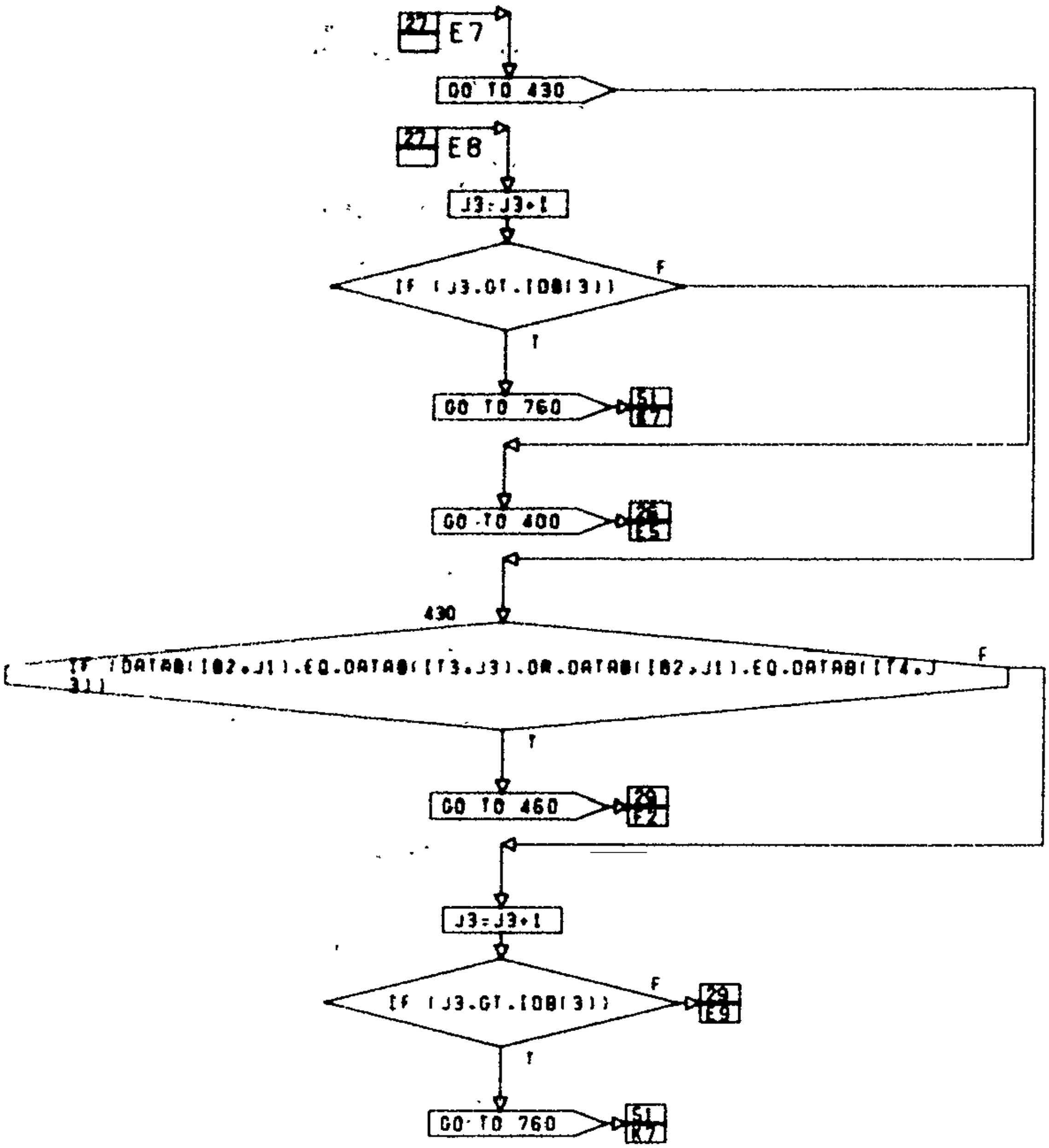
069


KNSTRA=0
IC=KXMTR+3
J3=KPIC(IC)
E4
390
IF (LUNI.EQ.0)
GO TO 440
E5
400
IF (DATAB(IT1,J3).EQ.1)
GO TO 410
J3=J3+1
IF (J3.GT.IDB(3))
GO TO 760
GO TO 400

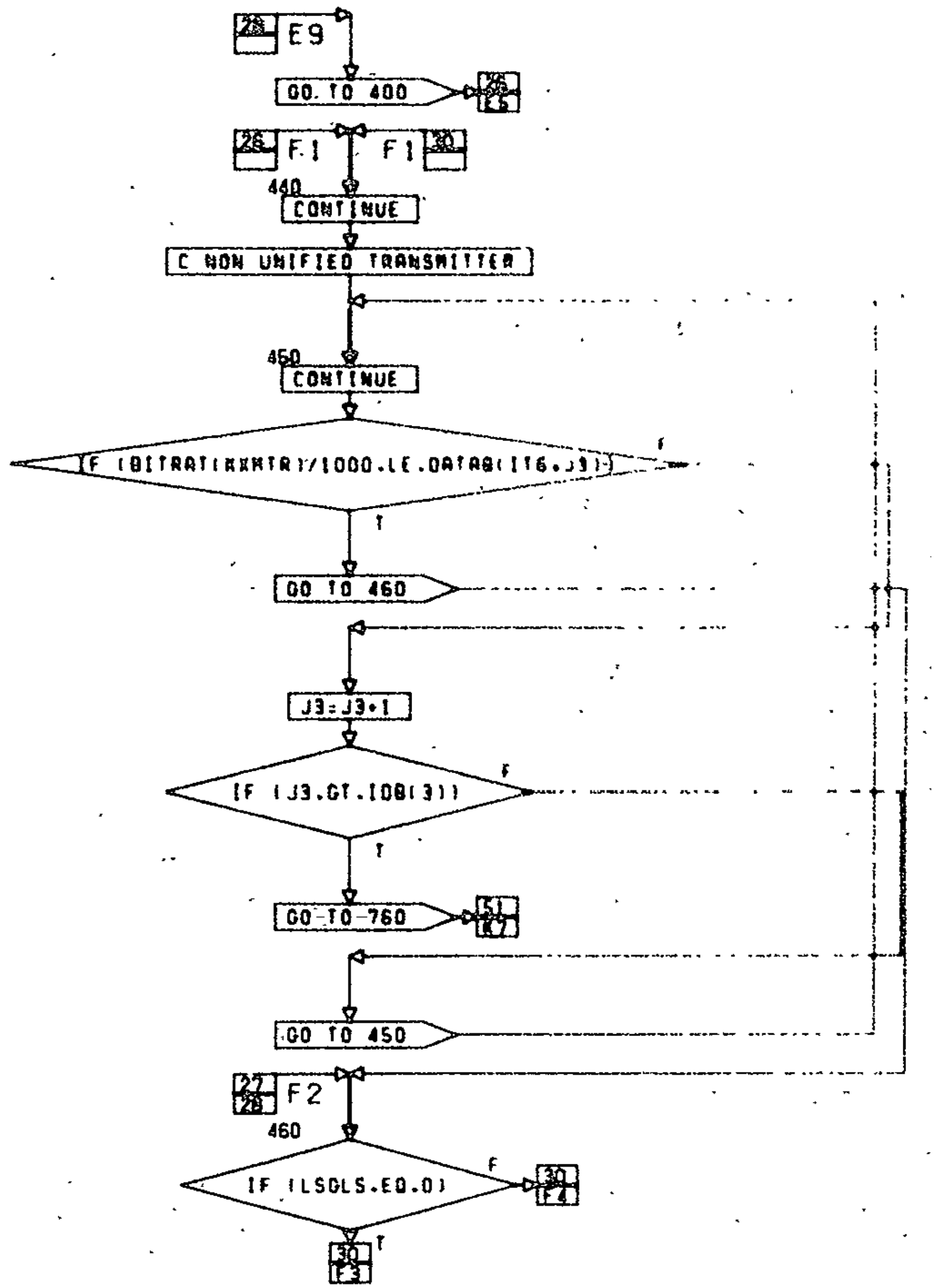
CONT. ON PG 27


26
E6
410
IF (DATAB(IB3,J1).EQ.0)
F
T
GO TO 420
KNSTRA=1
IF (DATAB(IB3,J1).EQ.DATAB(1,J3))
F
T
GO TO 460
J3=J3+1
IF (J3.GT.IDB(3))
F
T
GO TO 760
51
K7
GO TO 400
26
E5
420
IF (DATAB(IT2,J3).EQ.0)
F
T
28
E7

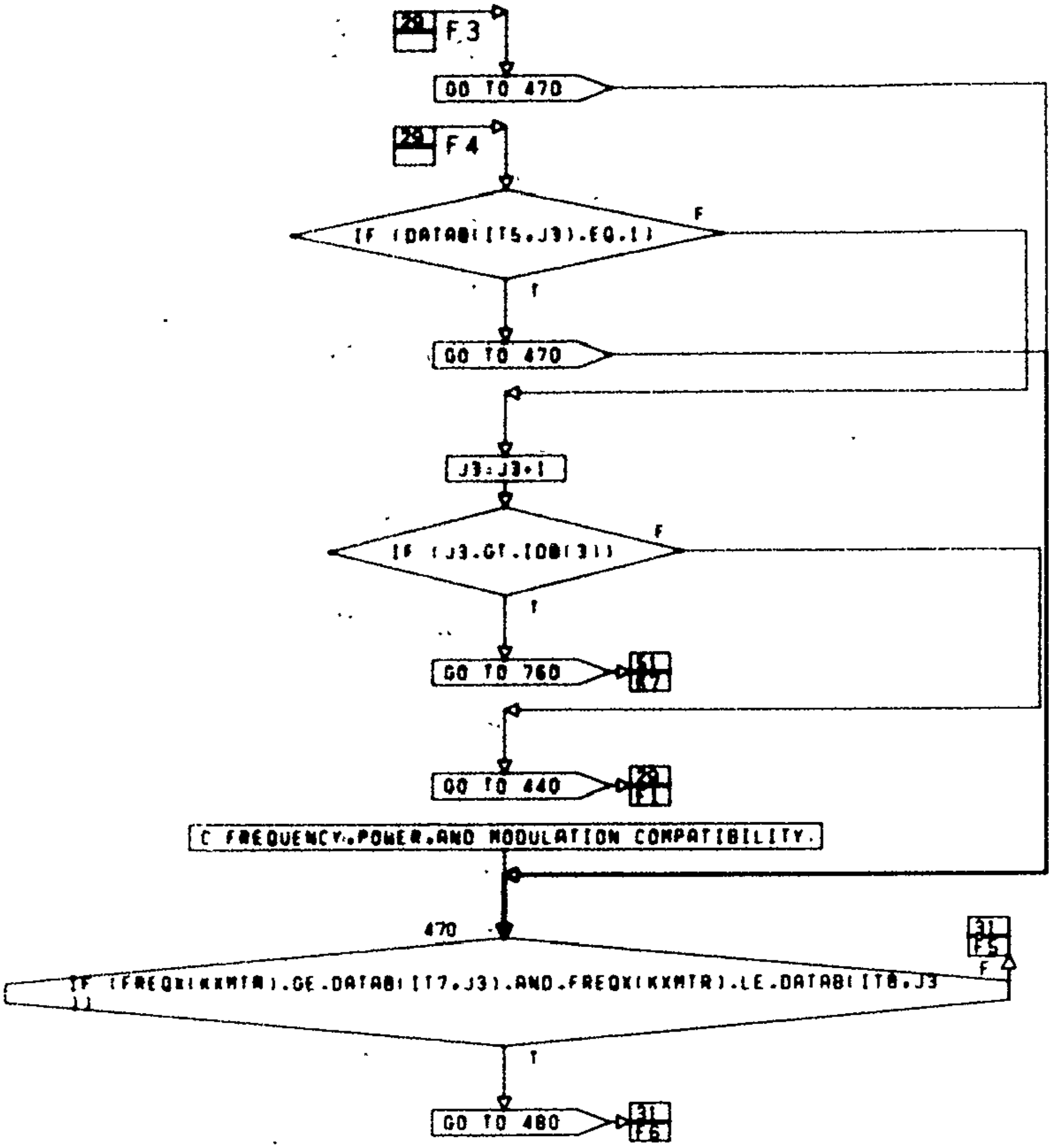
CONT. ON PG 28


E7
GO TO 430
E8
J3=J3+1
IF (J3.GT.IDB(3))
F
T
GO TO 760
GO TO 400
430
IF (DATAB(IB2,J1).EQ.DATAB(IT3,J3).OR.DATAB(IB2,J1).EQ.DATAB(IT4,J3))
GO TO 460
J3=J3+1
IF (J3.GT.IDB(3))
GO TO 760

CONT. ON PG 29

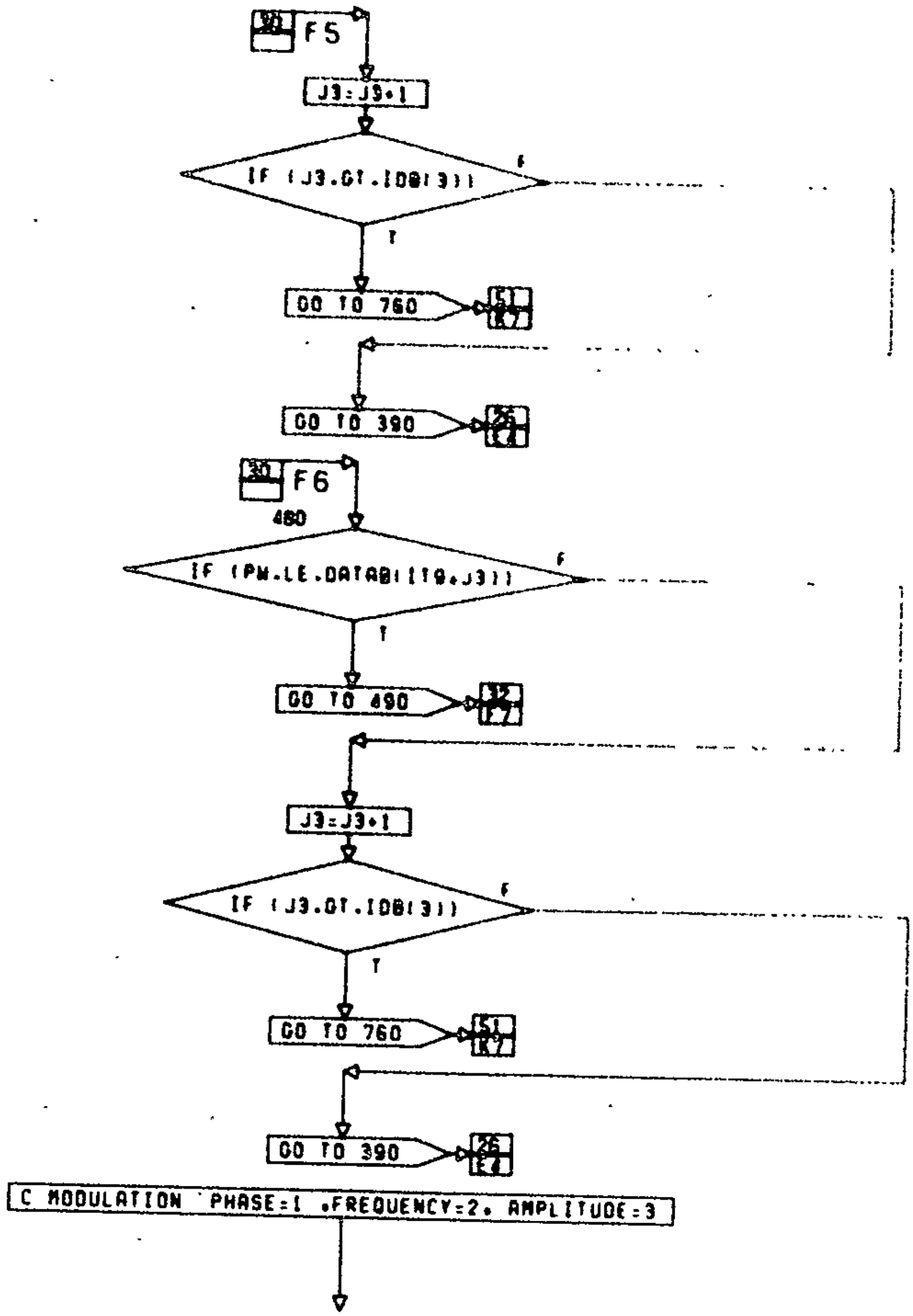

E9
GO TO 400
F1
F1
440
CONTINUE
C NON UNIFIED TRANSMITTER
450
CONTINUE
IF (BITRAT(KXMTR)/1000.LE.DATAB(IT6,J3))
GO TO 460
J3=J3+1
IF (J3.GT.IDB(3))
GO TO 760
GO TO 450
F2
460
IF (ILSOLS.EQ.0)

CONT. ON PG 30



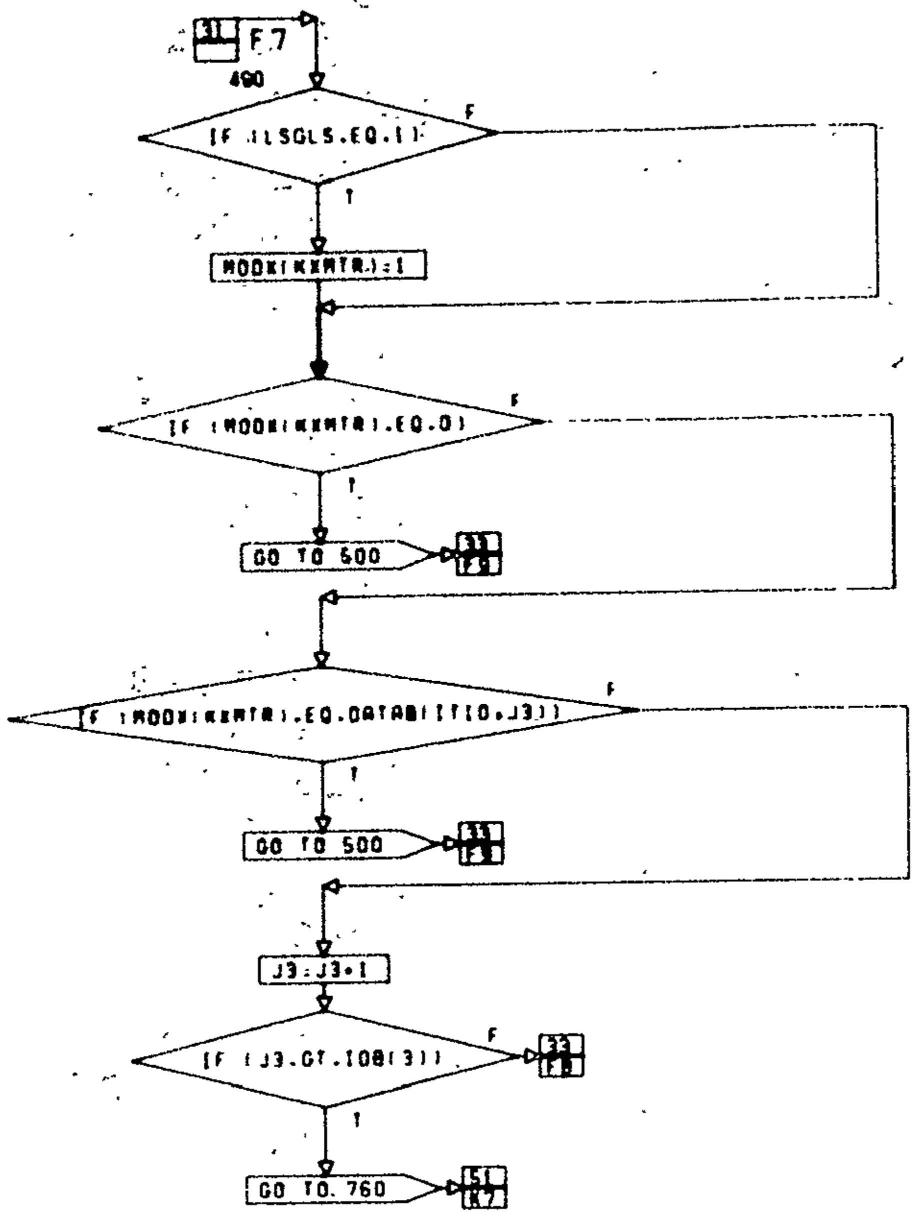
CONT. ON PG. 31

PG 30 OF 52

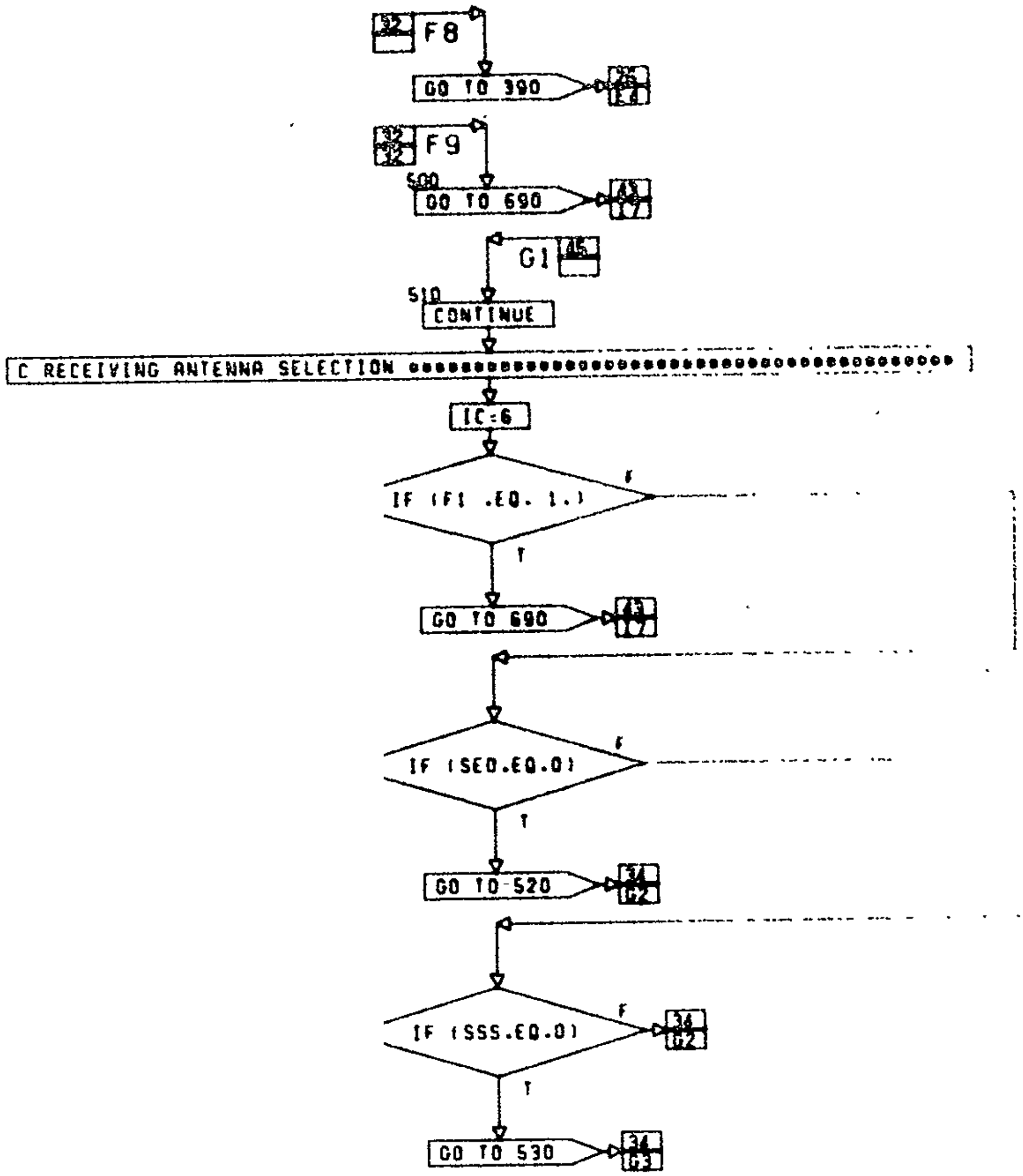


30
F5
J3=J3+1
IF (J3.GT.IDB(3))
F
T
GO TO 760
51
K7
GO TO 390
26
E4
30
F6
480
IF (PW.LE.DATAB(I T9,J3))
F
T
GO TO 490
32
E7
J3=J3+1
IF (J3.GT.IDB(3))
F
T
GO TO 760
51
K7
GO TO 390
26
E4
C MODULATION PHASE=1 ,FREQUENCY=2, AMPLITUDE=3

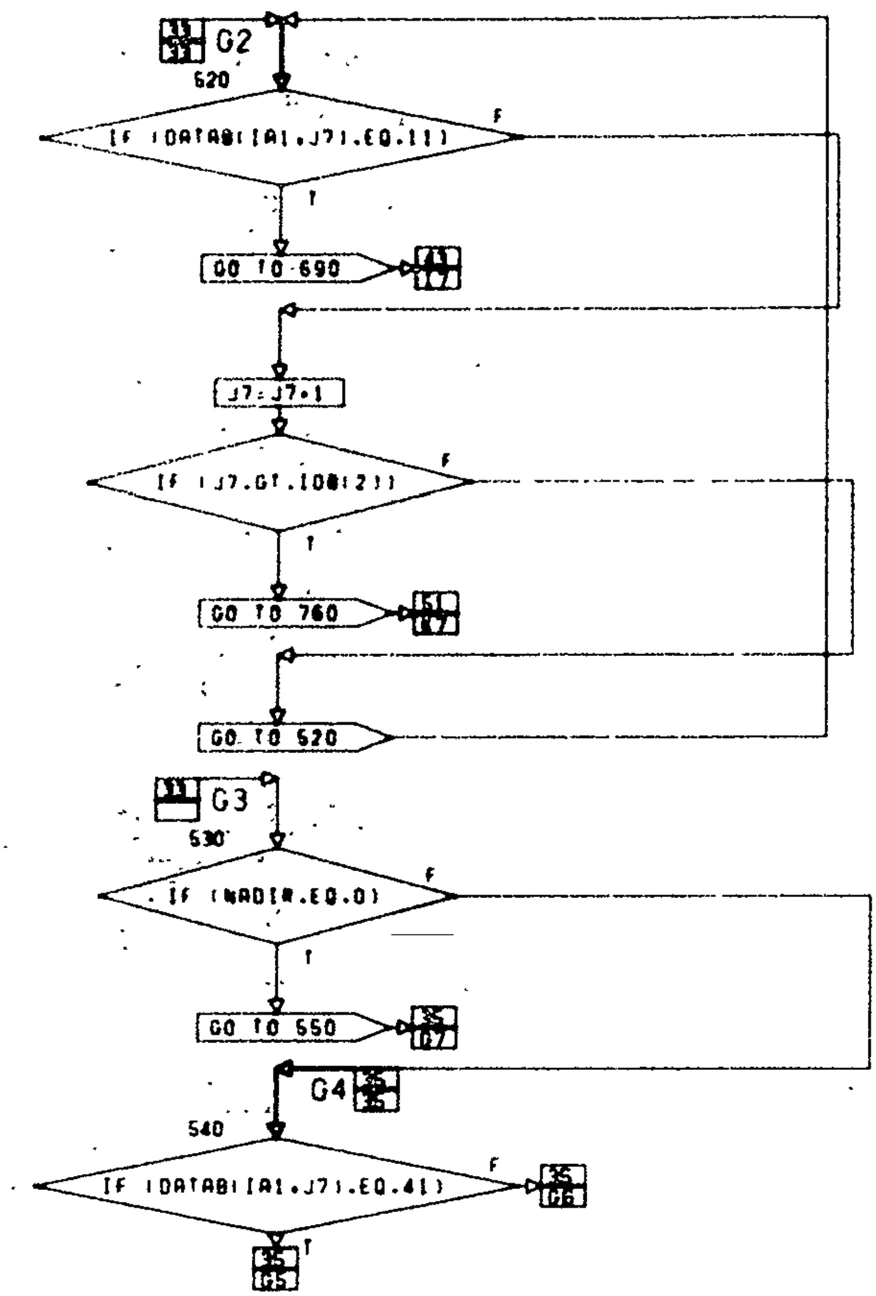
CONT. ON PG 32


31
F7
490
IF (LSQLS.EQ.1)
F
T
MODX(KXMTR)=1
IF (MODX(KXMTR).EQ.0)
F
T
GO TO 500
33
F3
IF (MODX(KXMTR).EQ.DATABIT(IO,J3))
F
T
GO TO 500
33
F3
J3=J3+1
IF (J3.GT.IOB(3))
F
33
F3
T
GO TO 760
51
K7

CONT. ON PG 33

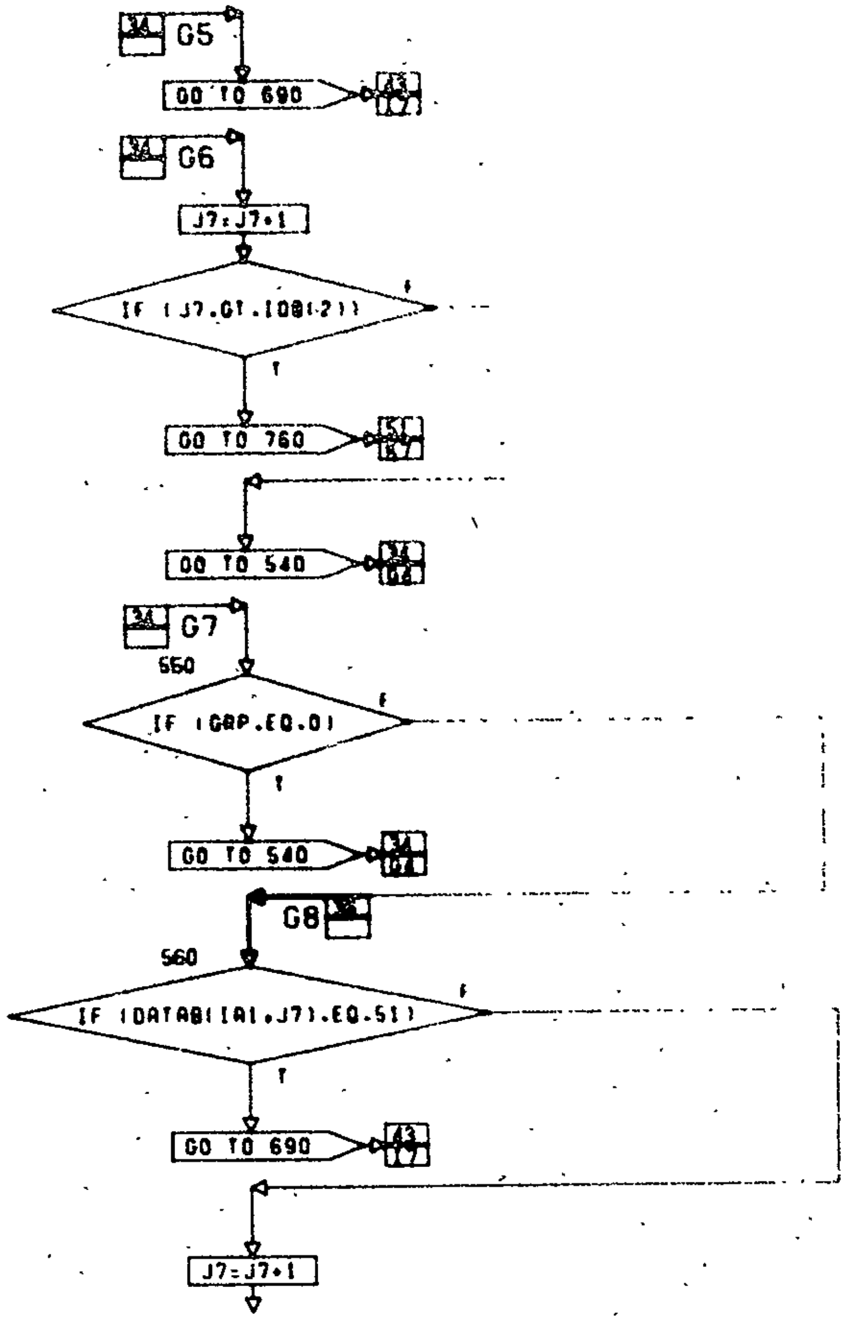

F8
GO TO 390
F9
500
GO TO 690
G1
510
CONTINUE
C RECEIVING ANTENNA SELECTION
IC=6
IF (F1 .EQ. 1.)
GO TO 690
IF (SED.EQ.0)
GO TO 520
IF (SSS.EQ.0)
GO TO 530

CONT. ON PG 34



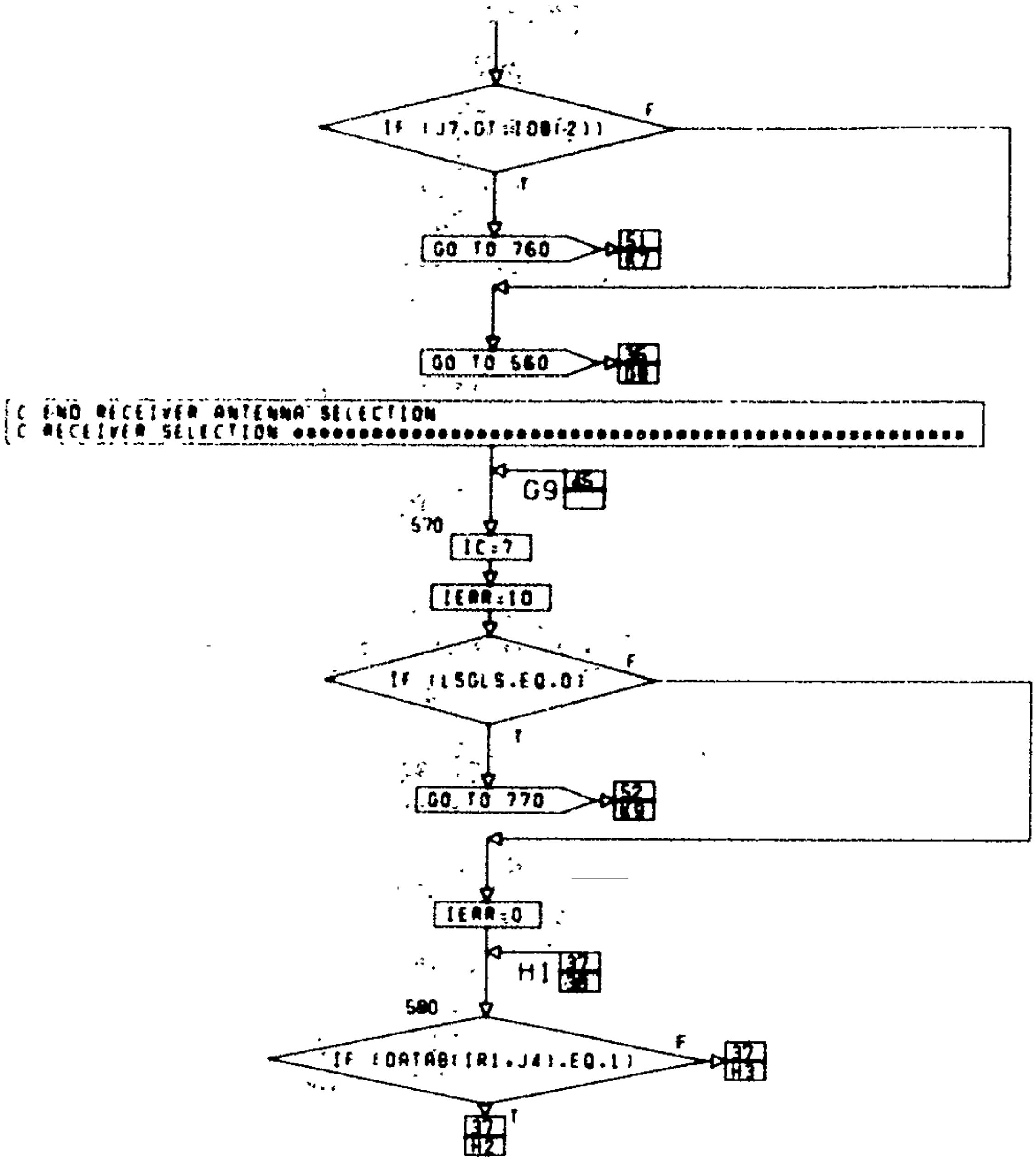
G2
620
IF (DATAB((A1,J7).EQ.1))
F
T
GO TO 690
J7=J7+1
IF (J7.GT.ID8(2))
F
T
GO TO 760
GO TO 620
G3
530
IF (NADIR.EQ.0)
F
T
GO TO 550
G4
540
IF (DATAB((A1,J7).EQ.4))
F
T

CONT. ON PG 35

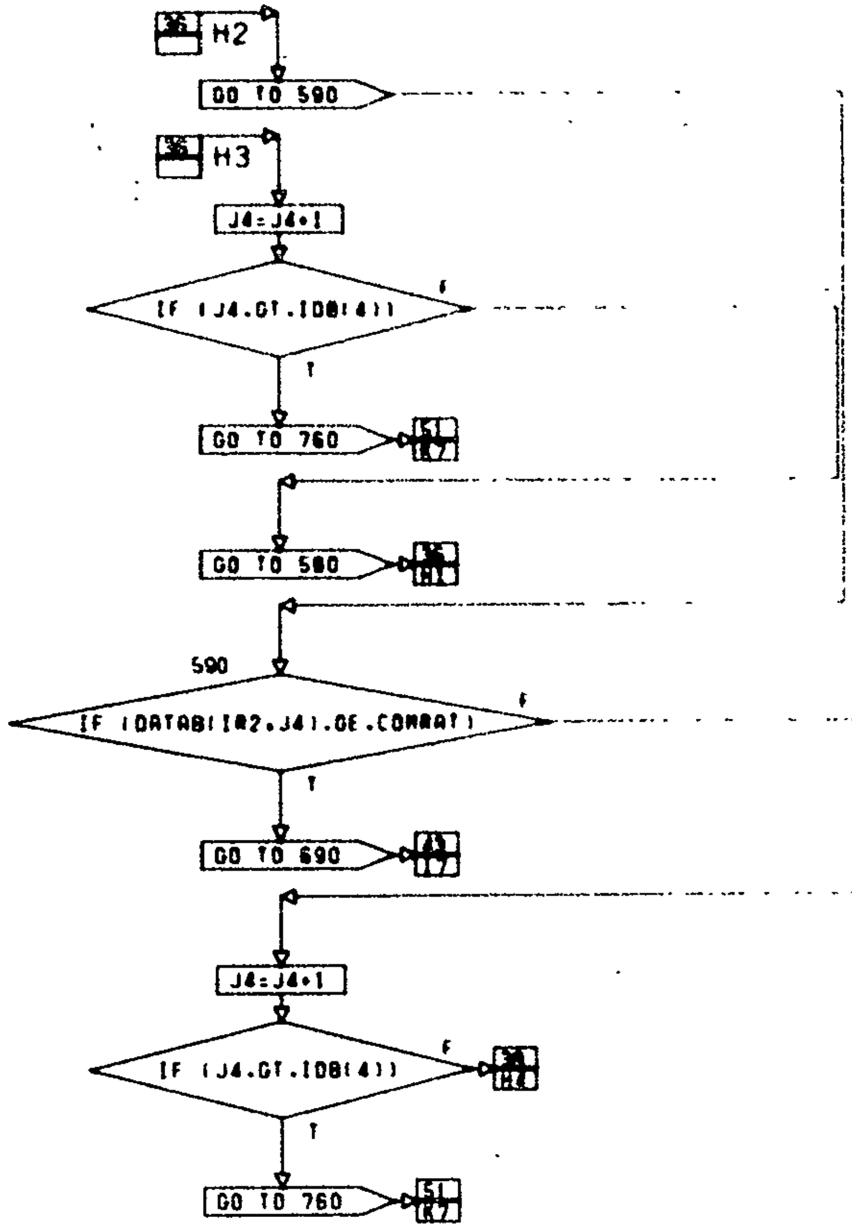


CONT. ON PG 36

078

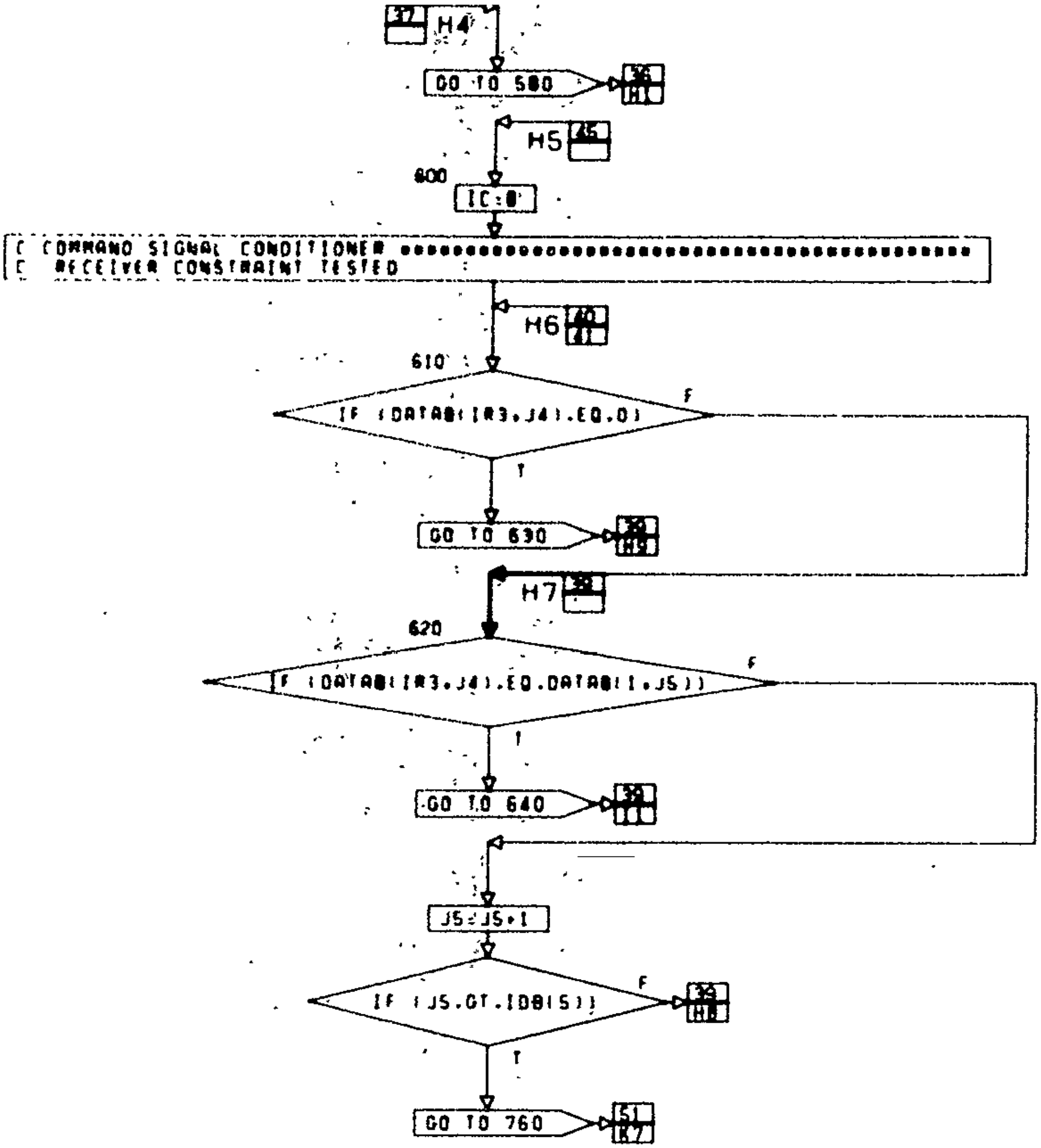

IF (J7.GT.IOB(2))
F
T
GO TO 760
51
K7
GO TO 660
36
D1
C END RECEIVER ANTENNA SELECTION
C RECEIVER SELECTION
G9
45
570
IC=7
IERR=10
IF (LSGLS.EQ.0)
F
T
GO TO 770
52
K9
IERR=0
H1
37
580
IF (DATAB(IR1,J4).EQ.1)
F
37
H3
T
37
H2

CONT. ON PG 37

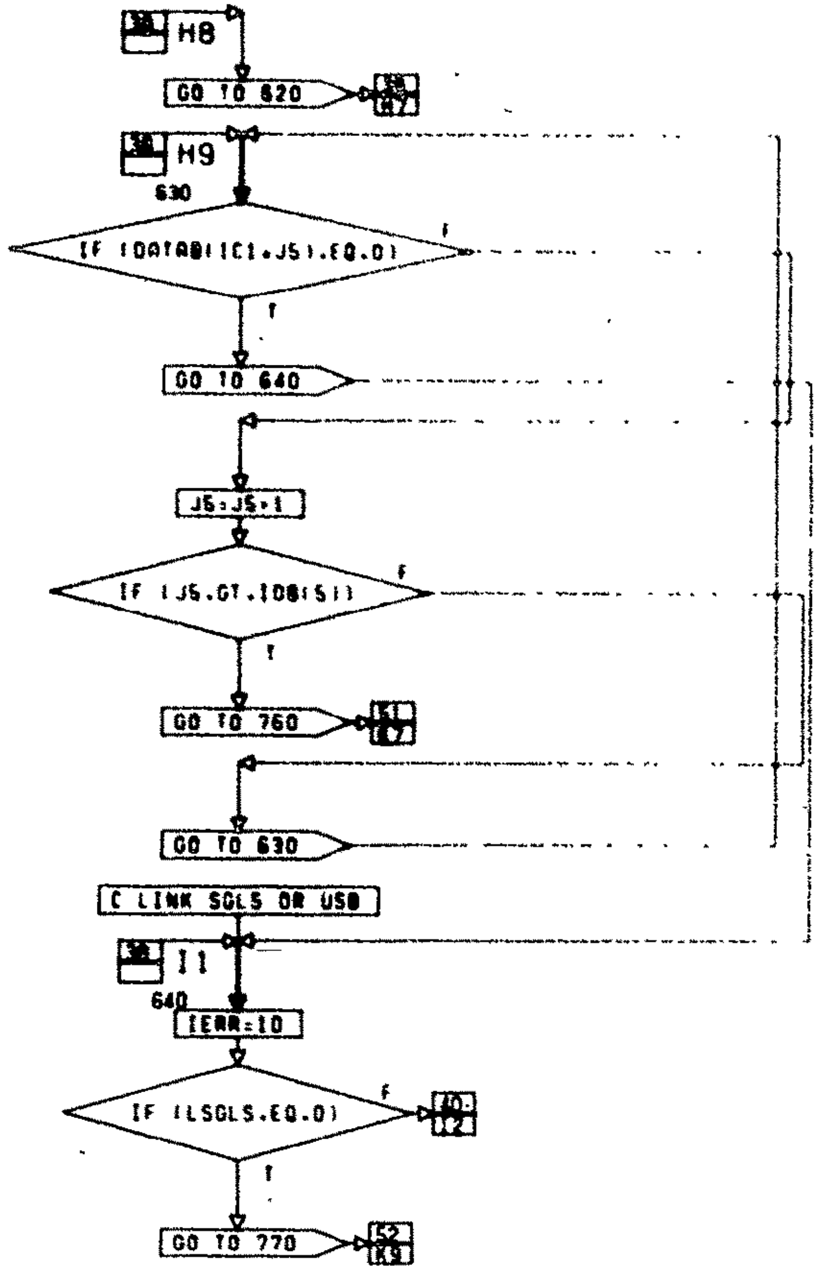


CONT. ON PG 38

071

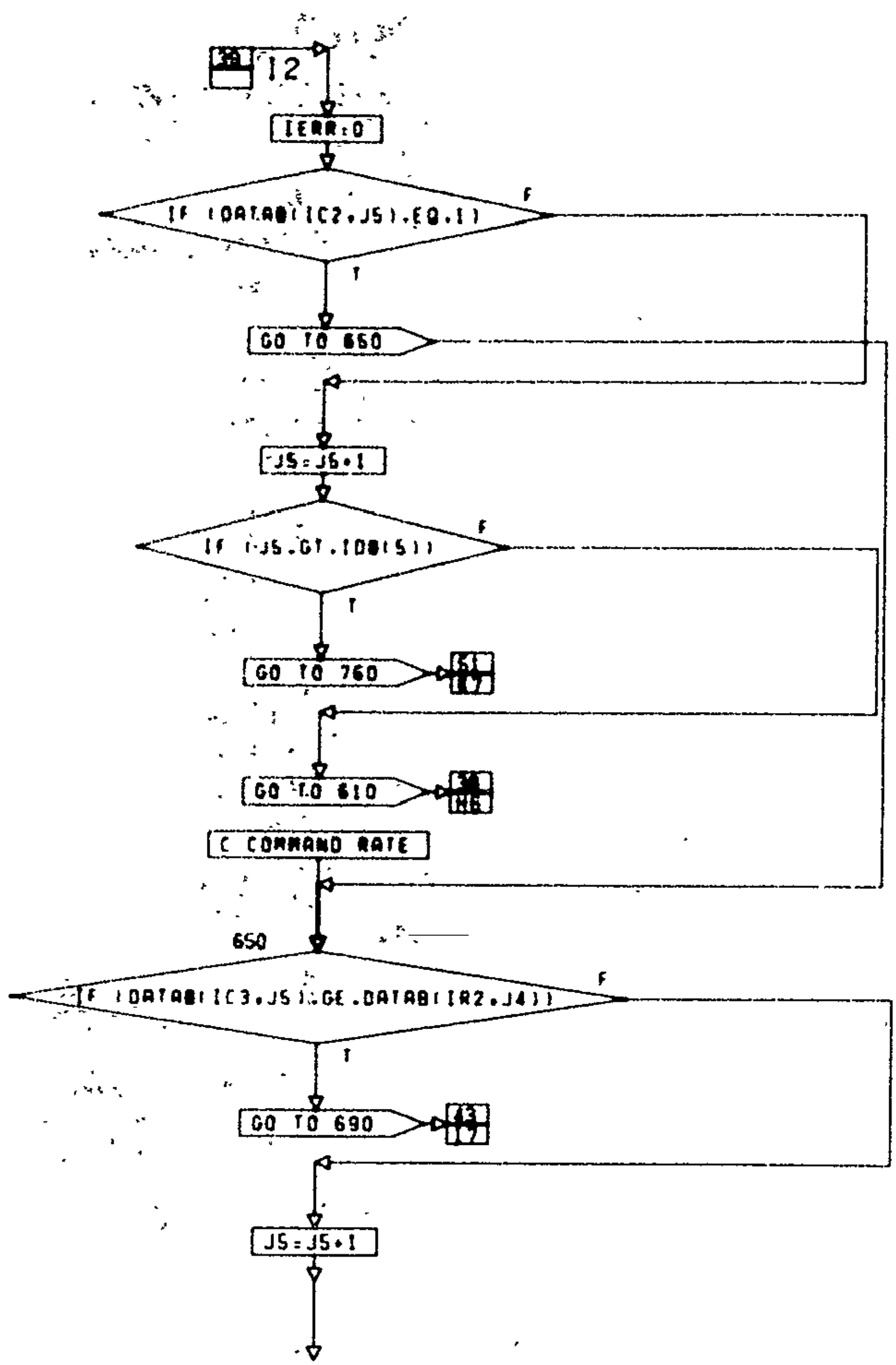

37
H4
GO TO 580
36
H1
H5
45
600
IC=0
C COMMAND SIGNAL CONDITIONER **
C RECEIVER CONSTRAINT TESTED
H6
40
41
610
IF (DATAB(IR3,J4).EQ.0)
F
T
GO TO 630
39
H9
H7
38
620
IF (DATAB(IR3,J4).EQ.DATAB(I,J5))
F
T
GO TO 640
39
I1
J5=J5+1
IF (J5.GT.IDB(5))
F
39
H8
T
GO TO 760
51
K7

CONT. ON PG 39

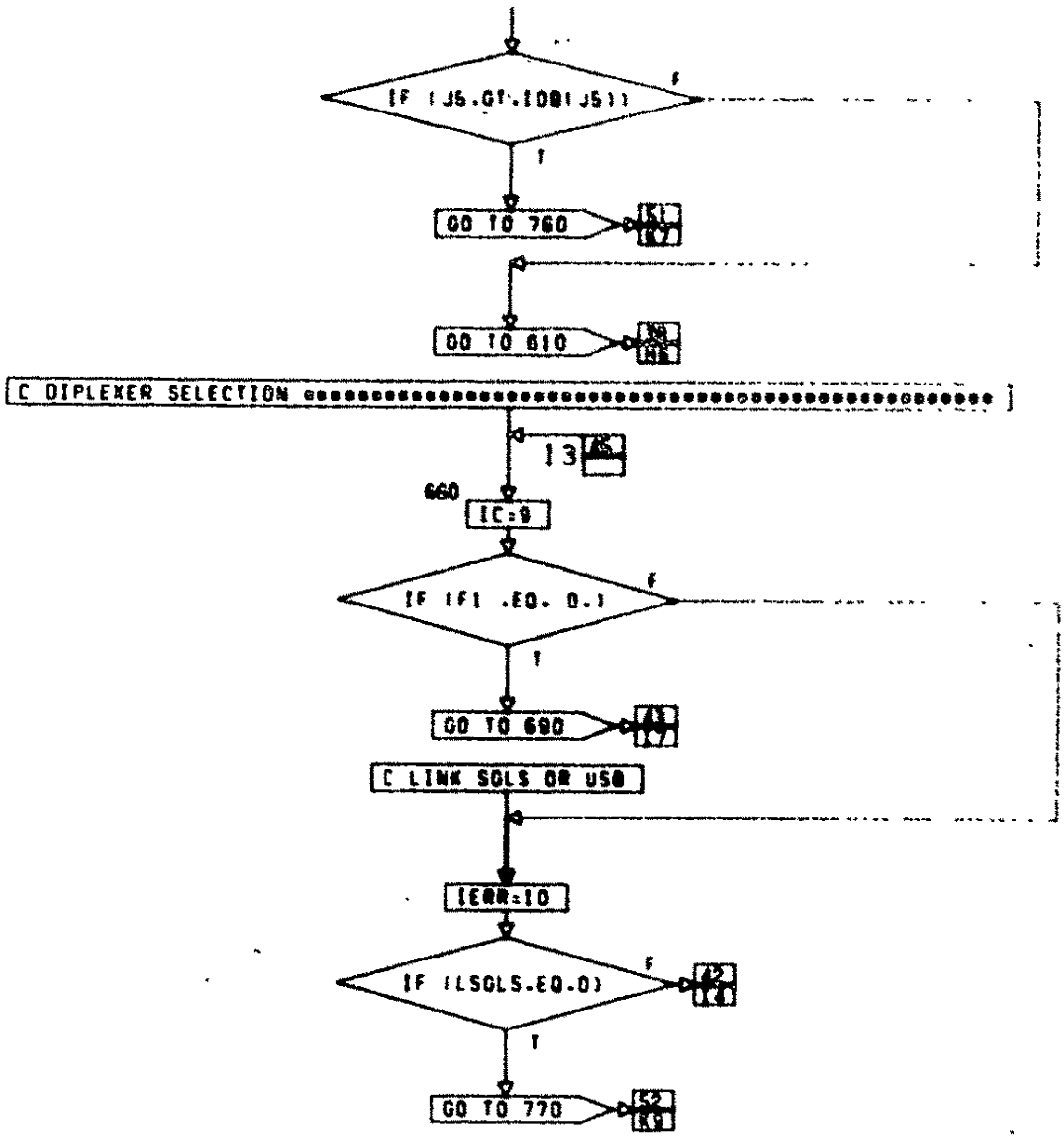


3A H8
GO TO 620
3A H9
630
IF (DATAB(IC1,J5).EQ.0)
GO TO 640
J5=J5+1
IF (J5.GT.IDB(S))
GO TO 760
GO TO 630
C LINK SGLS OR USB
3A I1
640
IERR=10
IF (LSGLS.EQ.0)
GO TO 770

CONT. ON PG 40

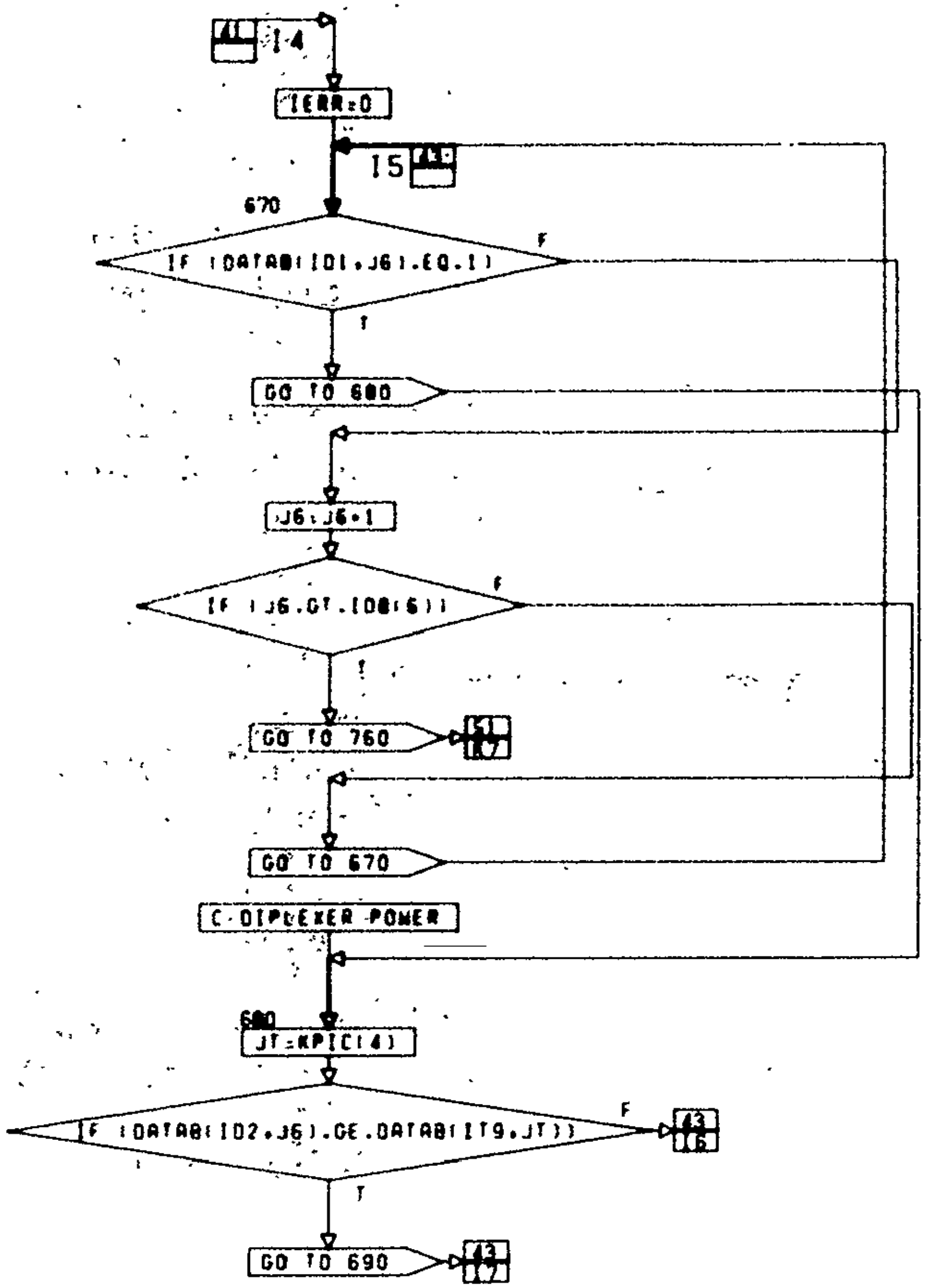

38
I2
IERR=0
IF (DATAB(IC2,J5).EQ.1)
F
T
GO TO 650
J5=J5+1
IF (J5.GT.IDB(5))
F
T
GO TO 760
51
I7
GO TO 610
38
H6
C COMMAND RATE
650
IF (DATAB(IC3,J5).GE.DATAB(IR2,J4))
F
T
GO TO 690
43
I7
J5=J5+1

CONT. ON PG 41

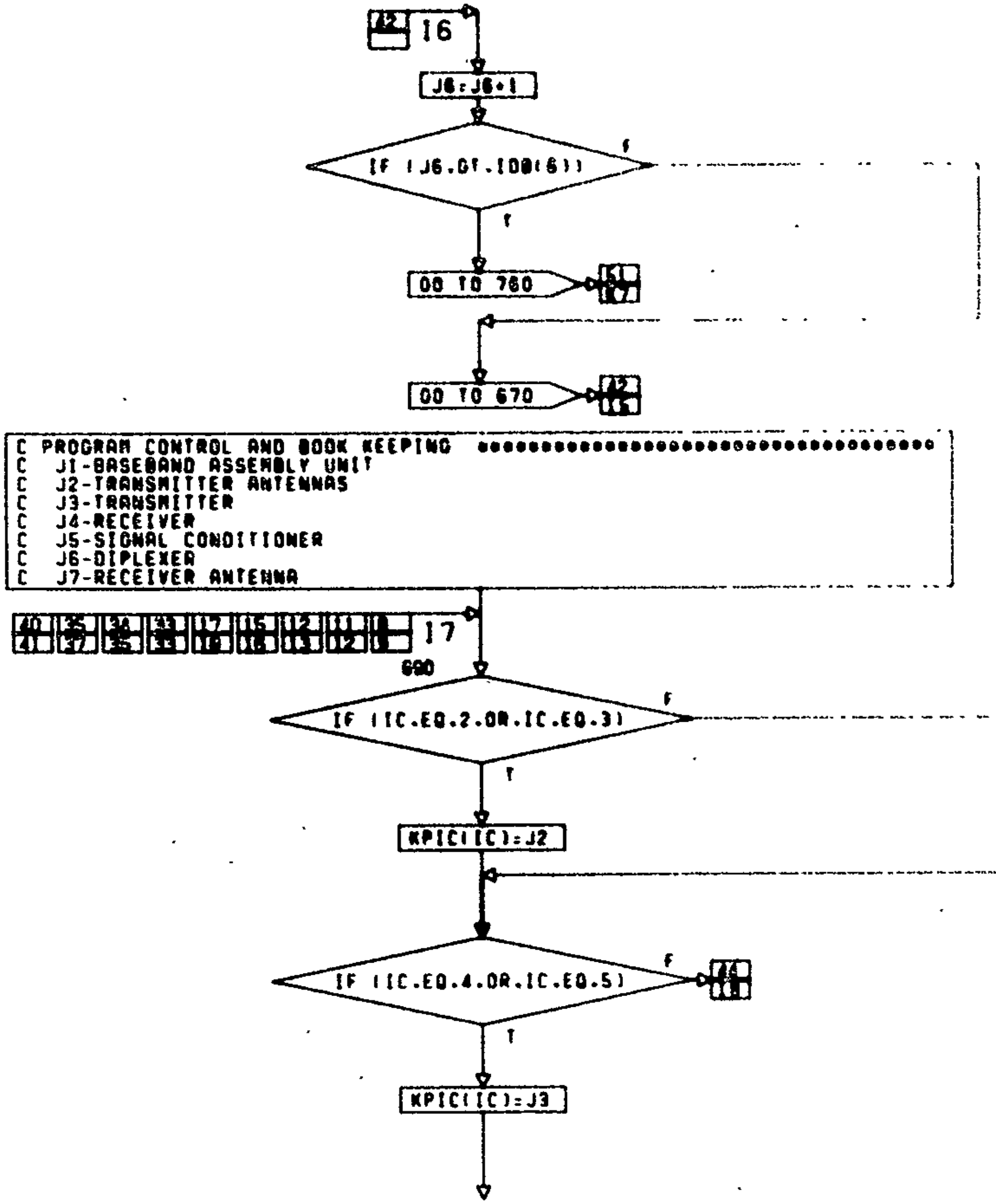


CONT. ON PG 42

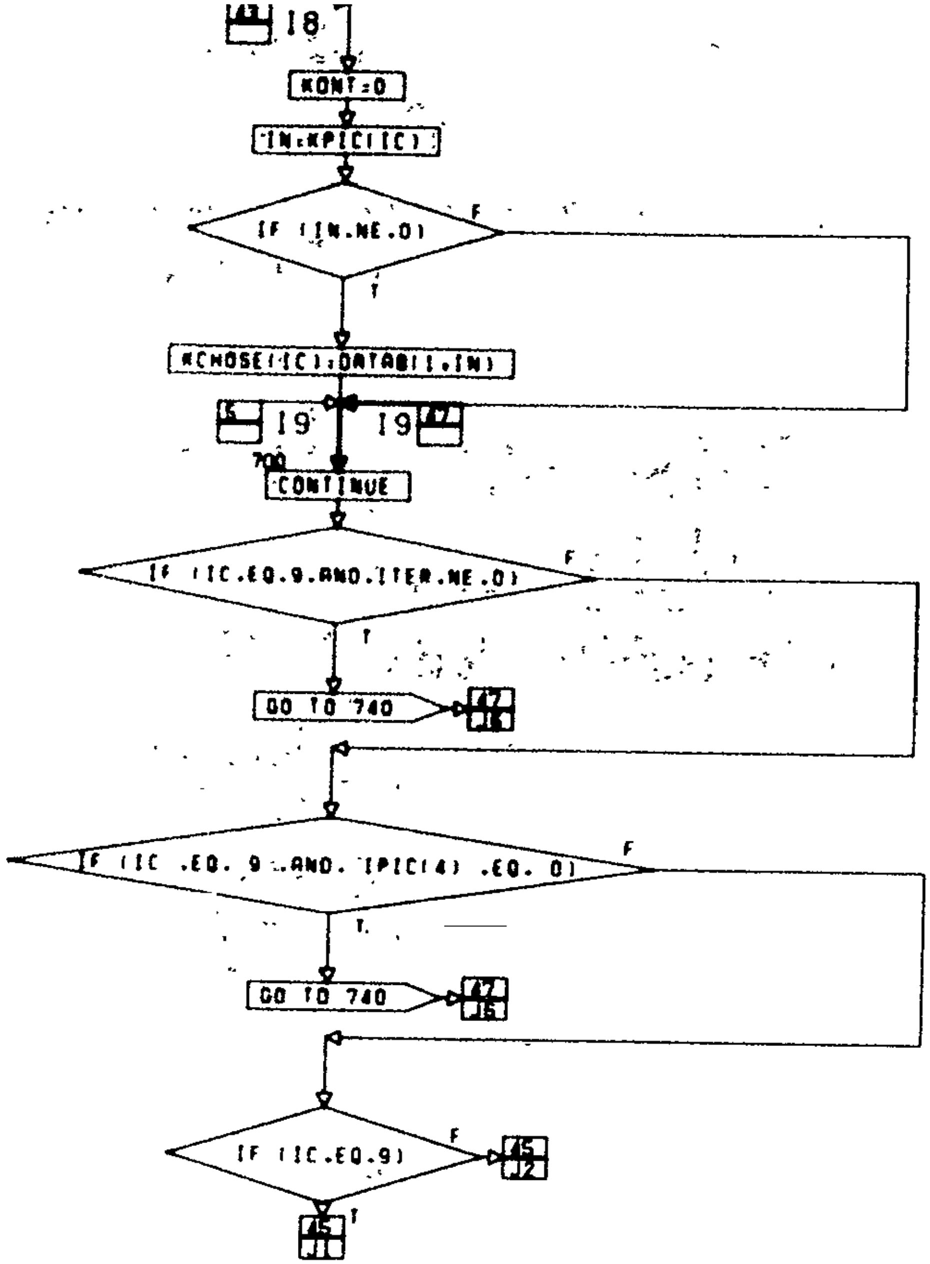
073


41
14
IERR=0
15
41
670
IF (DATAB(ID1,J6).EQ.1)
F
T
GO TO 680
J6=J6+1
IF (J6.GT.IDB(6))
F
T
GO TO 760
51
17
GO TO 670
C DIPLEXER POWER
680
JT=KPIC(4)
IF (DATAB(ID2,J6).GE.DATAB(IT9,JT))
F
43
16
T
GO TO 690
43
17

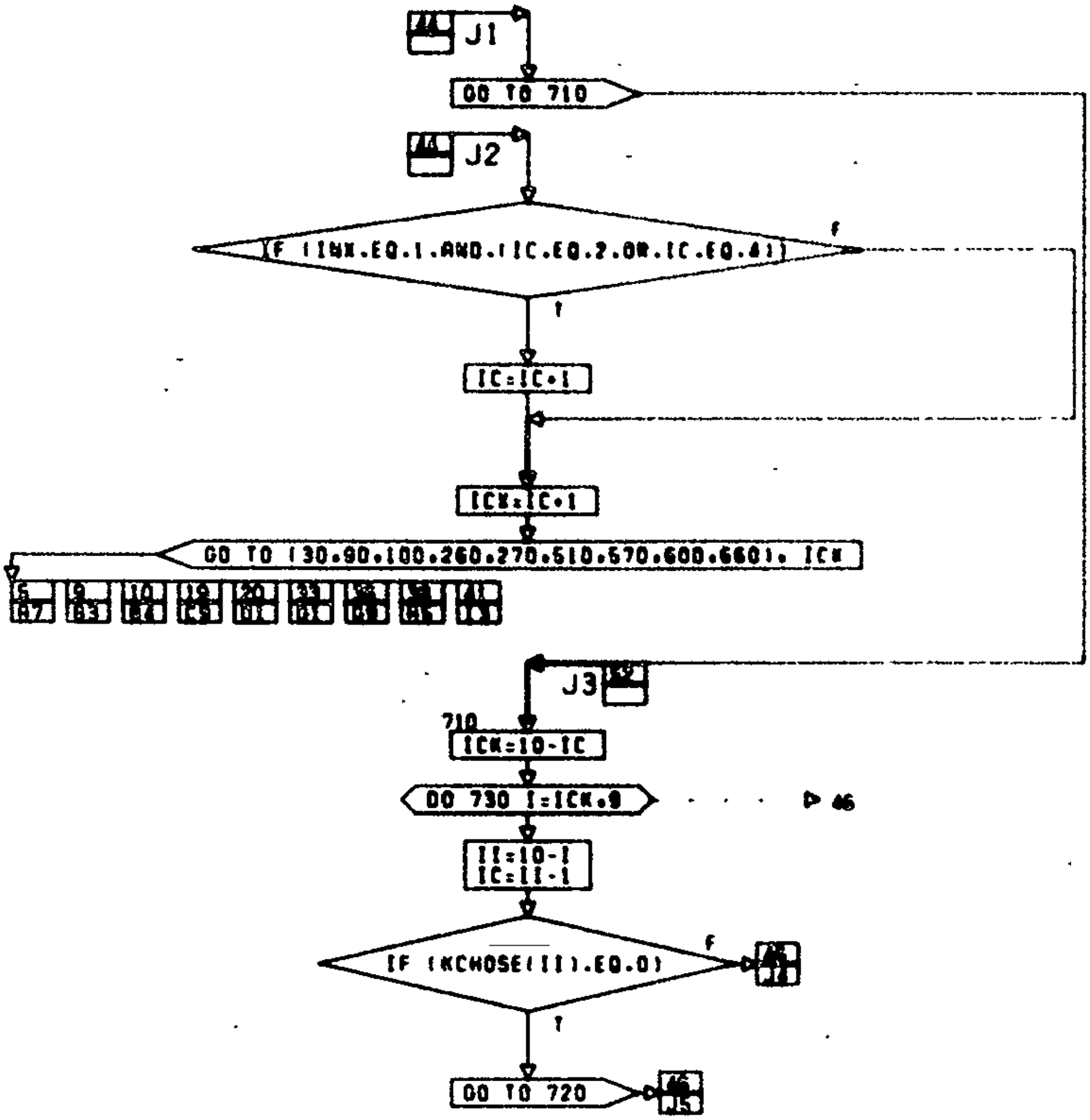
CONT. ON PG 43


16
J6=J6+1
IF (J6.GT.IDB(6))
GO TO 760
GO TO 670
C PROGRAM CONTROL AND BOOK KEEPING
C J1-BASEBAND ASSEMBLY UNIT
C J2-TRANSMITTER ANTENNAS
C J3-TRANSMITTER
C J4-RECEIVER
C J5-SIGNAL CONDITIONER
C J6-DIPLEXER
C J7-RECEIVER ANTENNA
17
690
IF (IC.EQ.2.OR.IC.EQ.3)
KPIC(IC)=J2
IF (IC.EQ.4.OR.IC.EQ.5)
KPIC(IC)=J3

CONT. ON PG 44

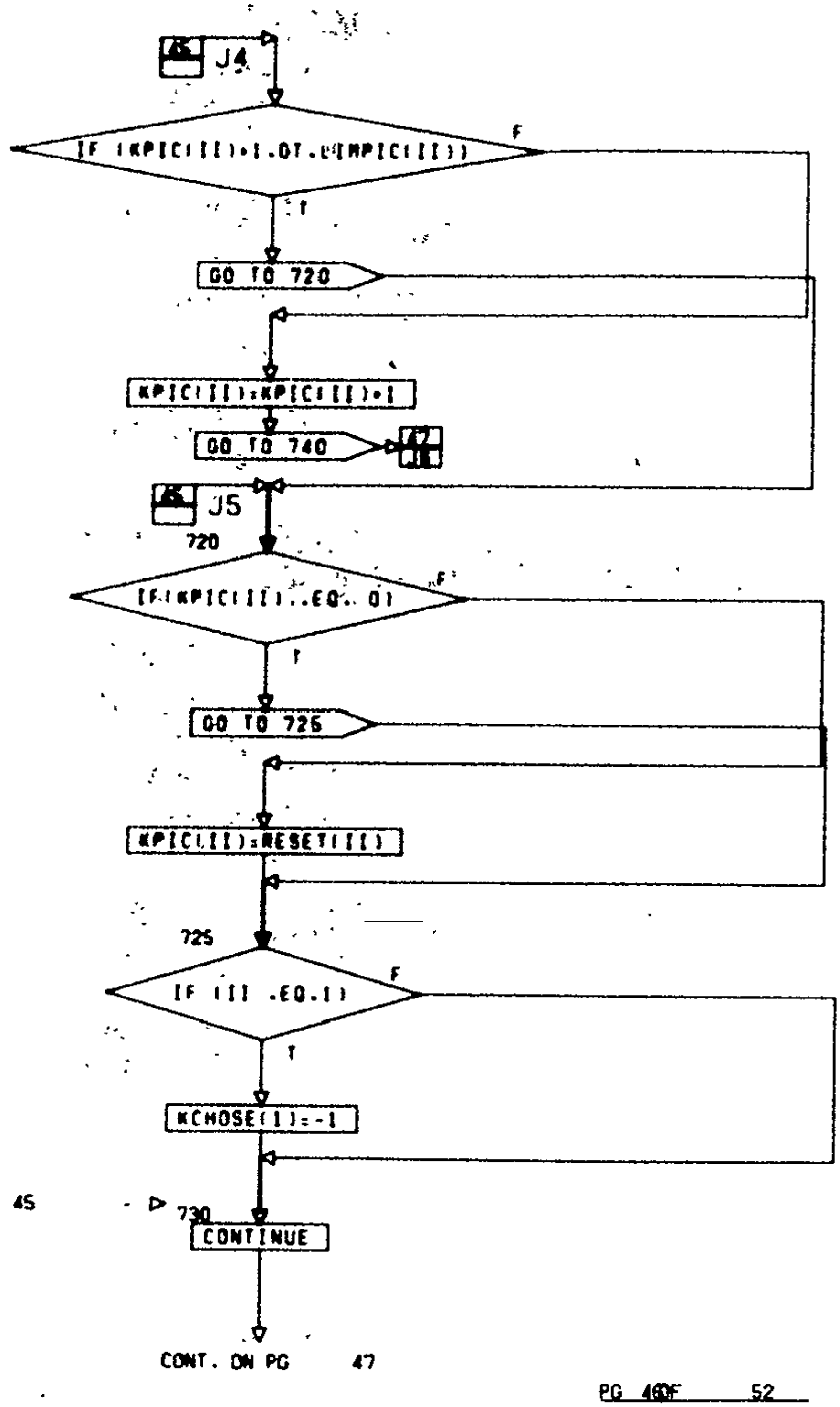

I8
KONT=0
IN=KPIC(IC)
IF (IN.NE.0)
F
T
KCHOSE(IC)=DATAB(1,IN)
I9
I9
47
700
CONTINUE
IF (IC.EQ.9.AND.ITER.NE.0)
F
T
GO TO 740
47
J6
IF (IC .EQ. 9 .AND. IPIC(4) .EQ. 0)
F
T
GO TO 740
47
J6
IF (IC.EQ.9)
F
45
J2
T
45
J1

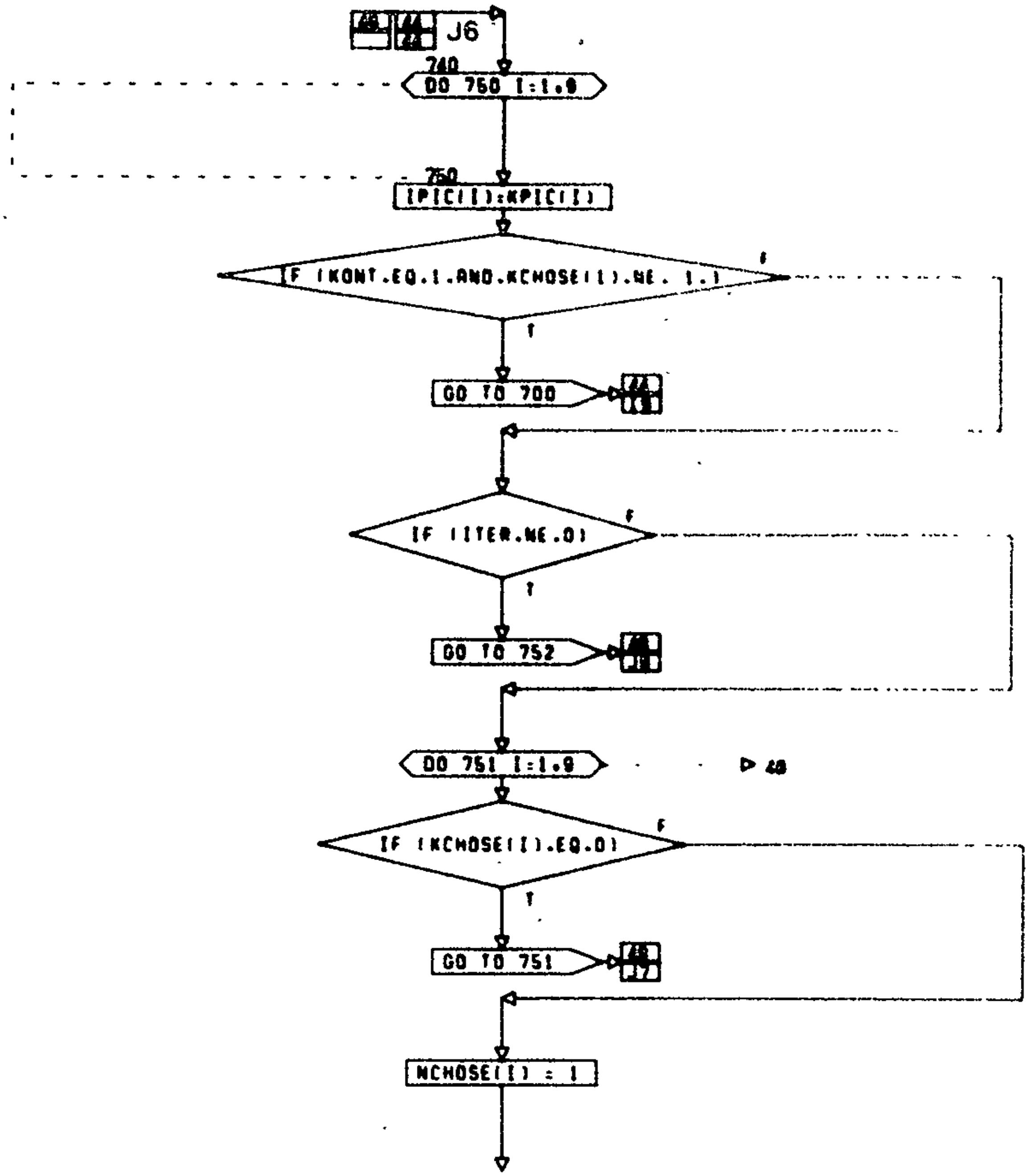
CONT. ON PG 45



J1
GO TO 710
J2
IF (INX.EQ.1.AND.(IC.EQ.2.OR.IC.EQ.4))
F
T
IC=IC+1
ICX=IC+1
GO TO (30,90,100,260,270,610,670,600,660), ICX
J3
710
ICX=10-IC
DO 730 I=ICX,9
46
II=10-I
IC=II-1
IF (KCHOSE(II).EQ.0)
F
T
GO TO 720

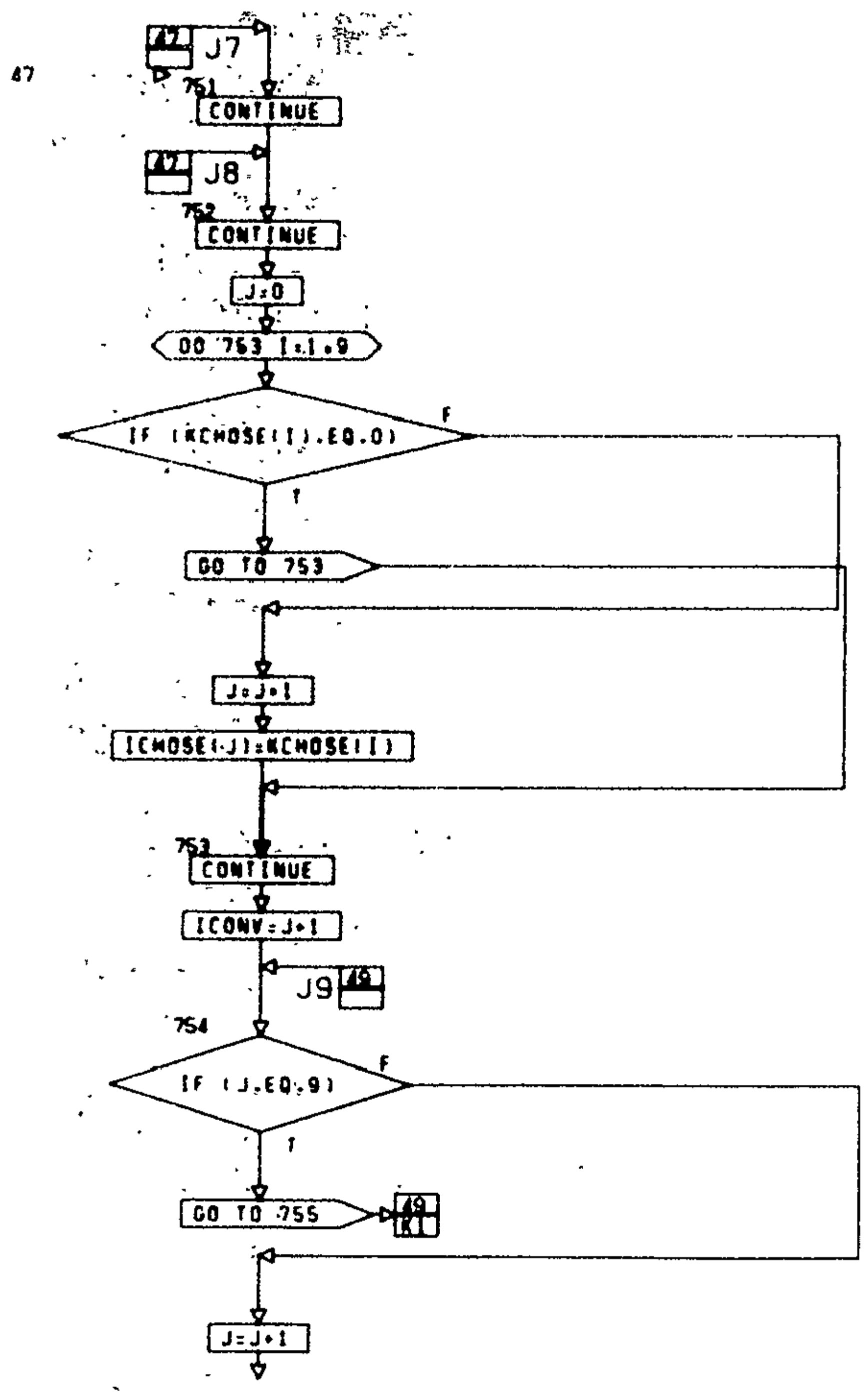
CONT. ON PG 46


J4
IF (KPIC(I(I))+1.GT.LIM(PIC(I(I)))
F
T
GO TO 720
KPIC(I(I))=KPIC(I(I))+1
GO TO 740
47
J5
720
IF (KPIC(I(I)).EQ. 0)
GO TO 725
KPIC(I(I))=RESET(I(I))
725
IF (I(I) .EQ.1)
KCHOSE(I)=-1
45
730
CONTINUE
CONT. ON PG 47
PG 46 OF 52



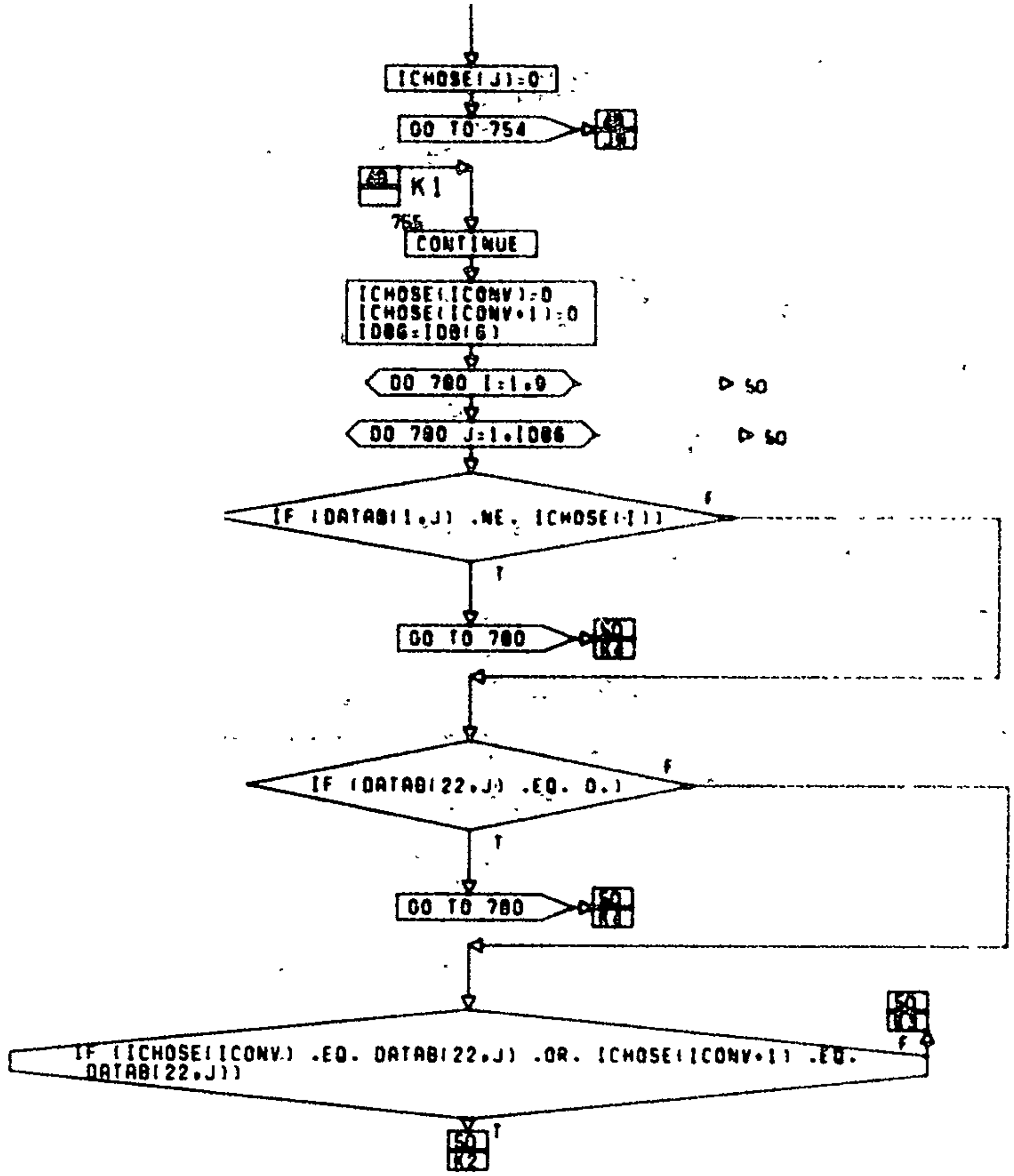
CONT. ON PG 48

PG 47 OF 52

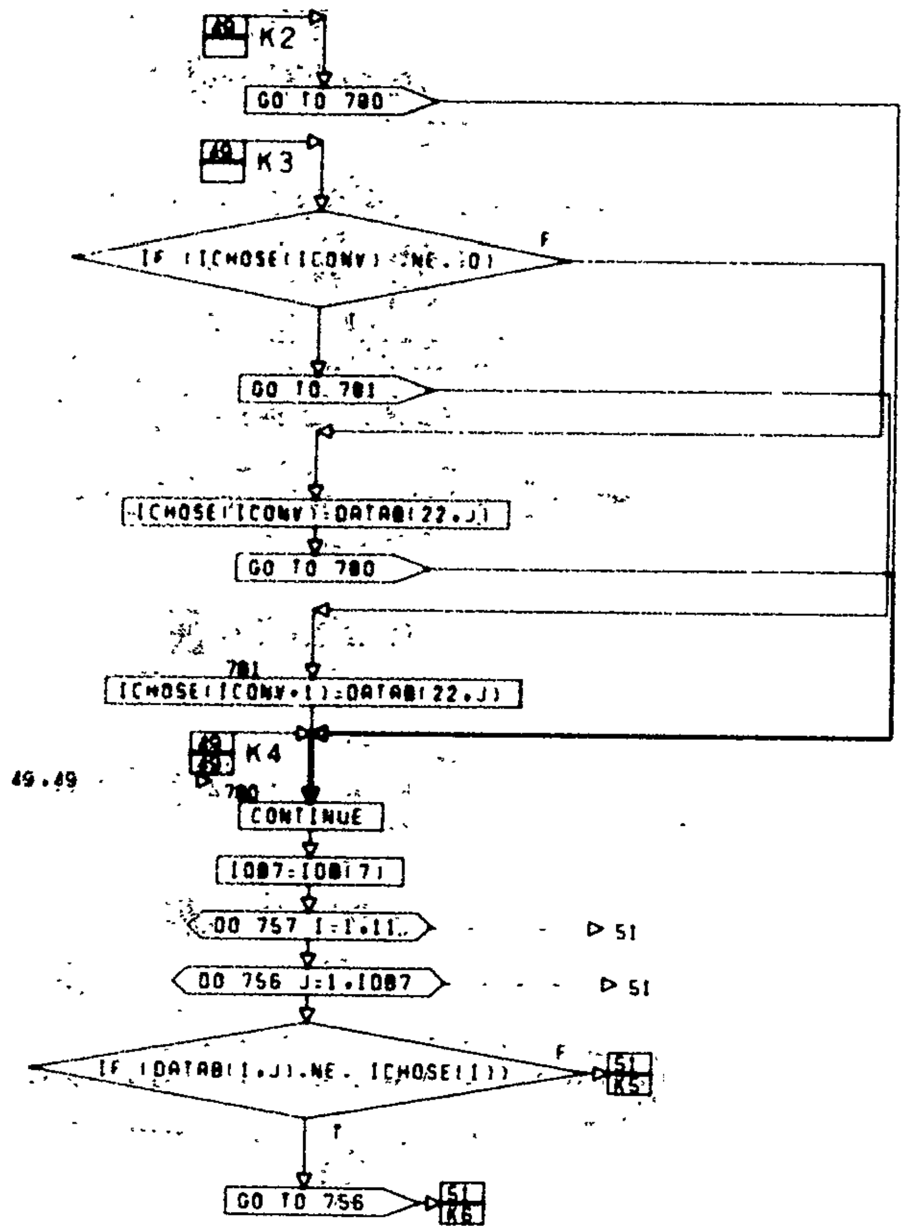


47
J7
751
CONTINUE
47
J8
752
CONTINUE
J=0
DO 753 I=1,9
IF (KCHOSE(I).EQ.0)
F
T
GO TO 753
J=J+1
ICHOSE(J)=KCHOSE(I)
753
CONTINUE
ICONV=J+1
J9
49
754
IF (J.EQ.9)
F
T
GO TO 755
49
K1
J=J+1

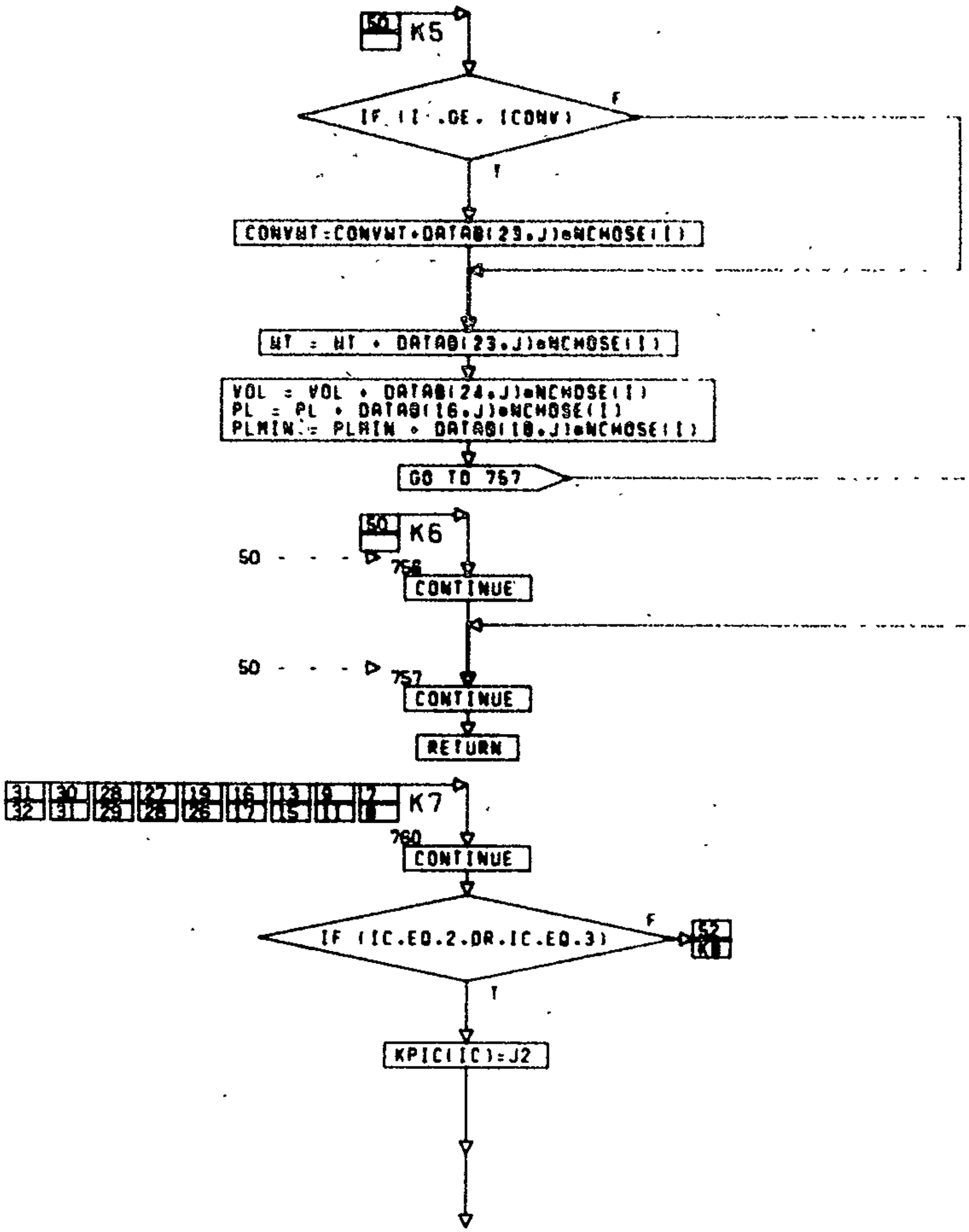
CONT. ON PG 49


ICHOSE(J)=0
DO TO 754
K1
765
CONTINUE
ICHOSE(ICONV)=0
ICHOSE(ICONV+1)=0
IDB6=IDB(6)
DO 780 I=1,9
DO 780 J=1,IDB6
IF (DATAB(1,J) .NE. ICHOSE(I))
GO TO 780
IF (DATAB(22,J) .EQ. 0.)
GO TO 780
IF (ICHOSE(ICONV) .EQ. DATAB(22,J) .OR. ICHOSE(ICONV+1) .EQ. DATAB(22,J))
K2
K3

CONT. ON PG 50

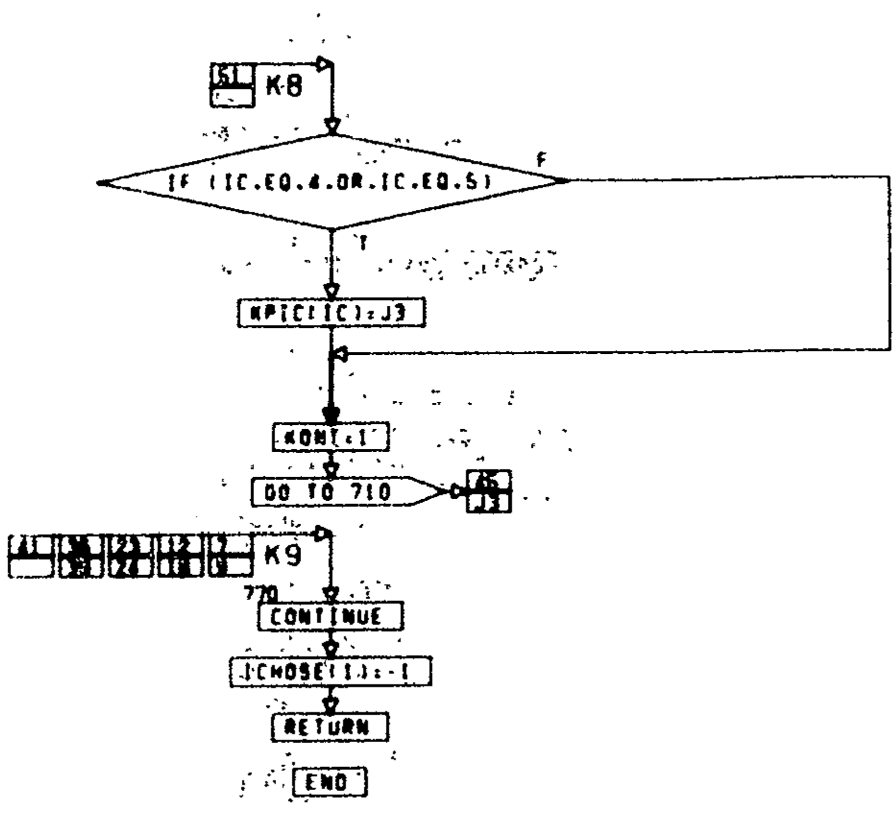

K2
GO TO 700
K3
IF (ICHOSE(ICONV).NE.0)
F
T
GO TO 701
ICHOSE(ICONV)=DATAB(22,J)
GO TO 700
701
ICHOSE(ICONV+1)=DATAB(22,J)
K4
49,49
700
CONTINUE
IDB7=IDB(7)
DO 757 I=1,11
51
DO 756 J=1,IDB7
51
IF (DATAB(I,J).NE. ICHOSE(I))
F
51
K5
T
GO TO 756
51
K6

CONT. ON PG 51



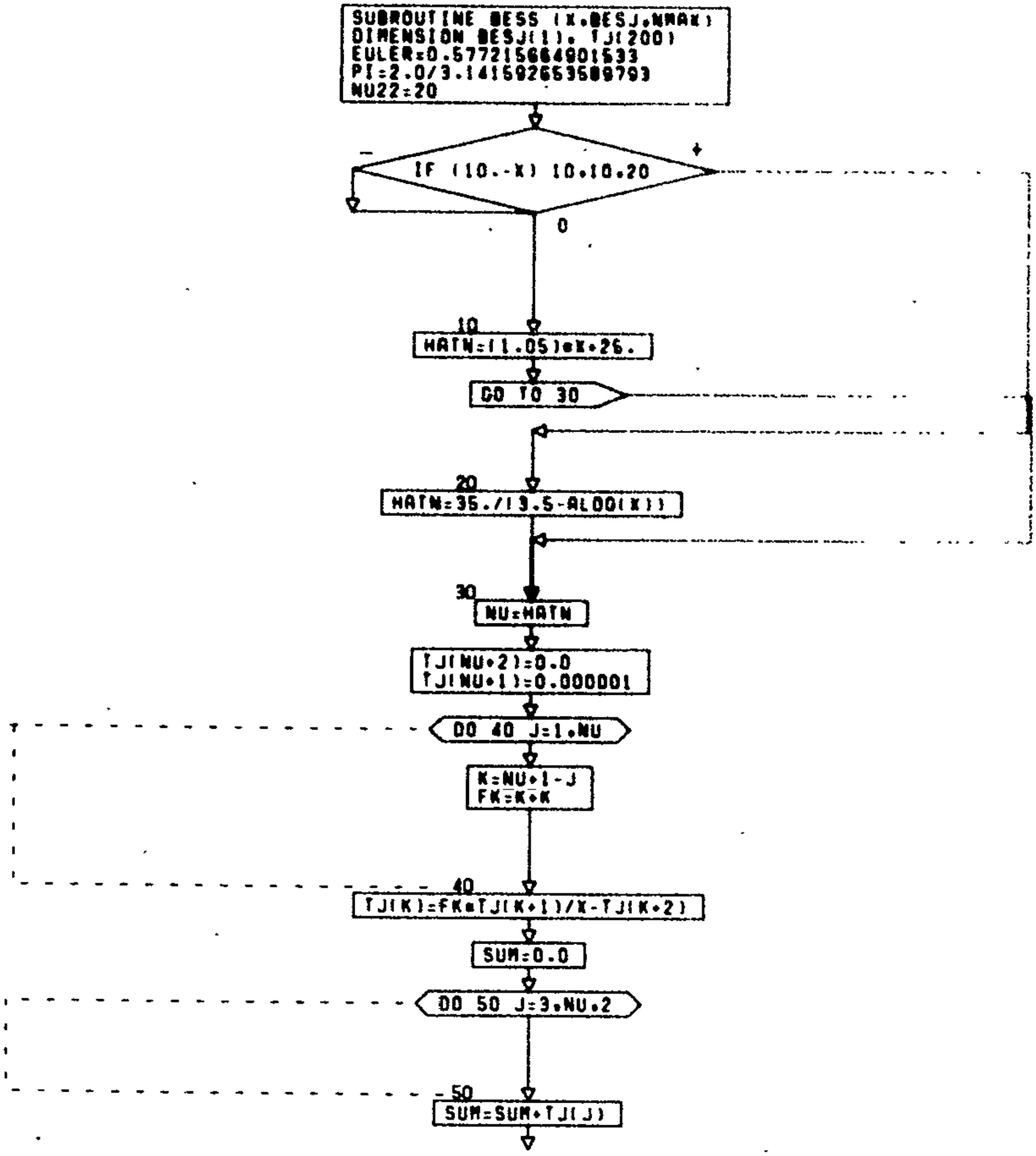
CONT. ON PG 52

PG 5 OF 52

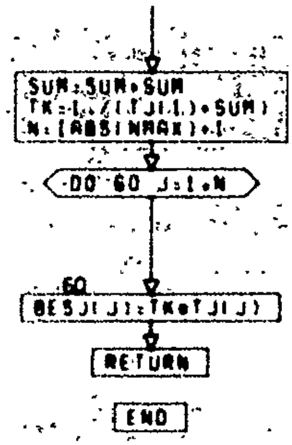


K8
IF (IC.EQ.4.OR.IC.EQ.5)
F
T
KPIC(IC)=J3
KONT=1
GO TO 710
J3
K9
770
CONTINUE
JCHOSE(I)=-1
RETURN
END

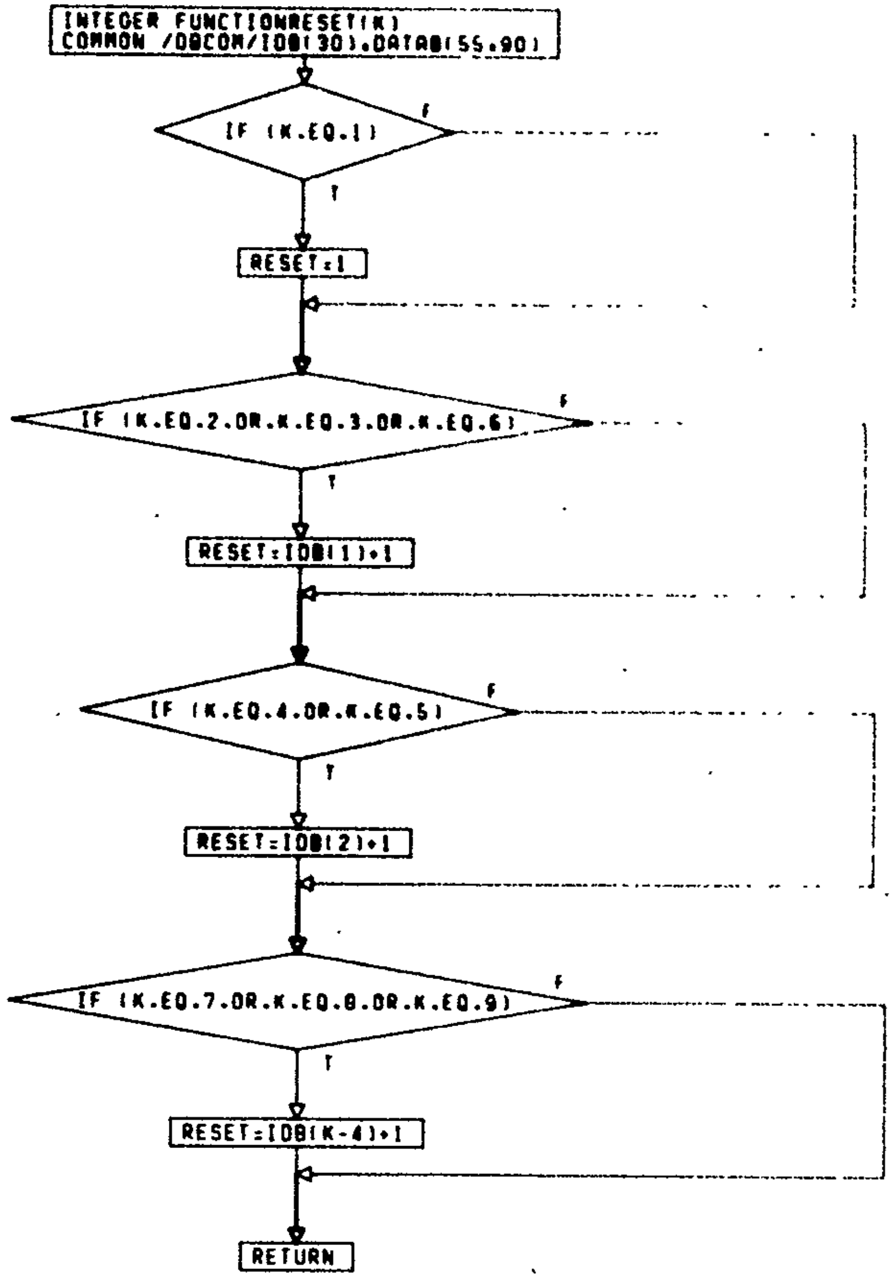
PG 52 FINAL


SUBROUTINE BESS (X,BESJ,NMAX)
DIMENSION BESJ(1), TJ(200)
EULER=0.577215664901533
PI=2.0/3.141592653589793
NU22=20
IF (10.-X) 10,10,20
−
+
0
10
HATN=(1.05)*X+26.
GO TO 30
20
HATN=35./(3.5-ALOG(X))
30
NU=HATN
TJ(NU+2)=0.0
TJ(NU+1)=0.000001
DO 40 J=1,NU
K=NU+1-J
FK=K+K
40
TJ(K)=FK*TJ(K+1)/X-TJ(K+2)
SUM=0.0
DO 50 J=3,NU,2
50
SUM=SUM+TJ(J)

CONT. ON PG 2



PG 2 FINAL

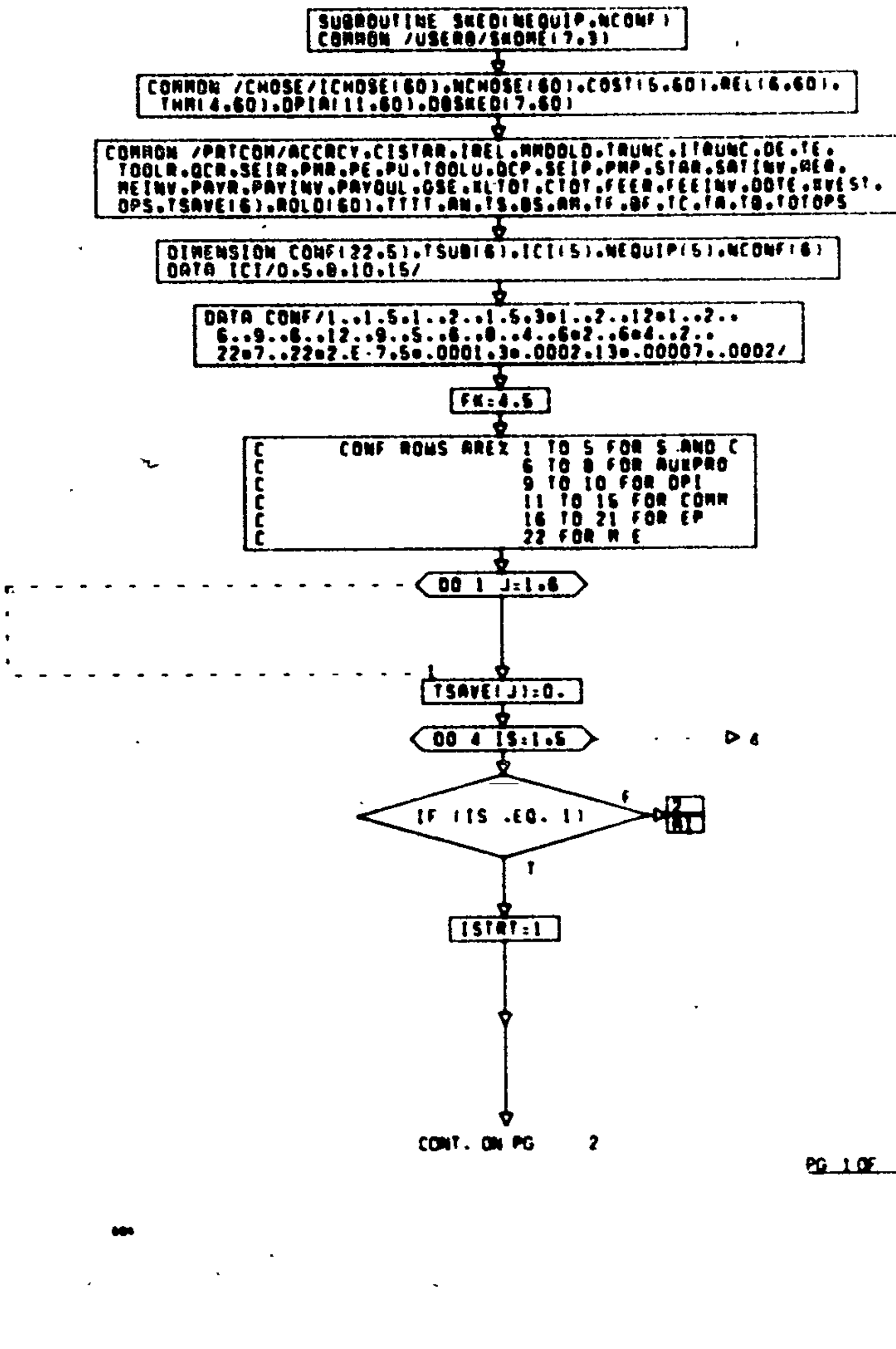


CONT. ON PG 2

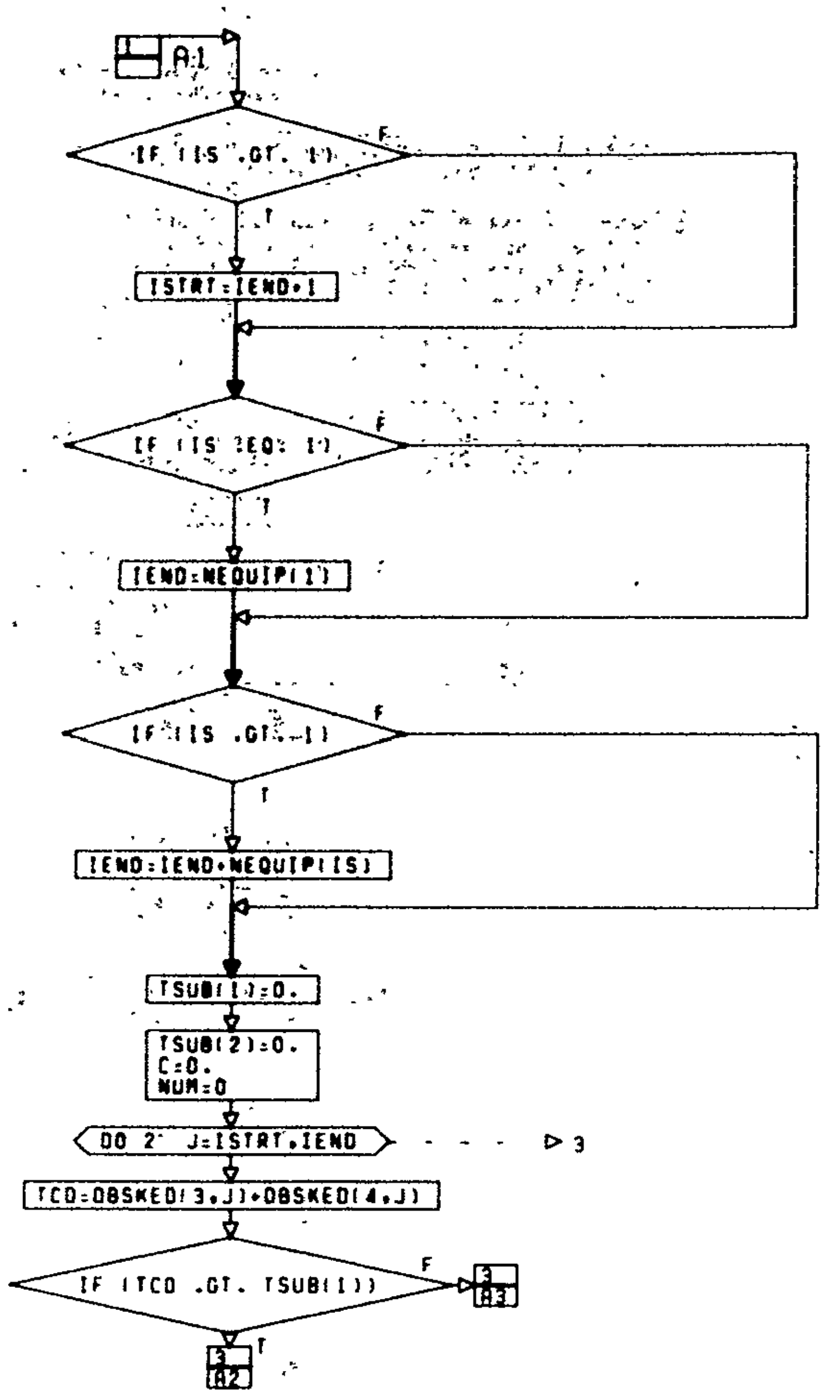
002

END

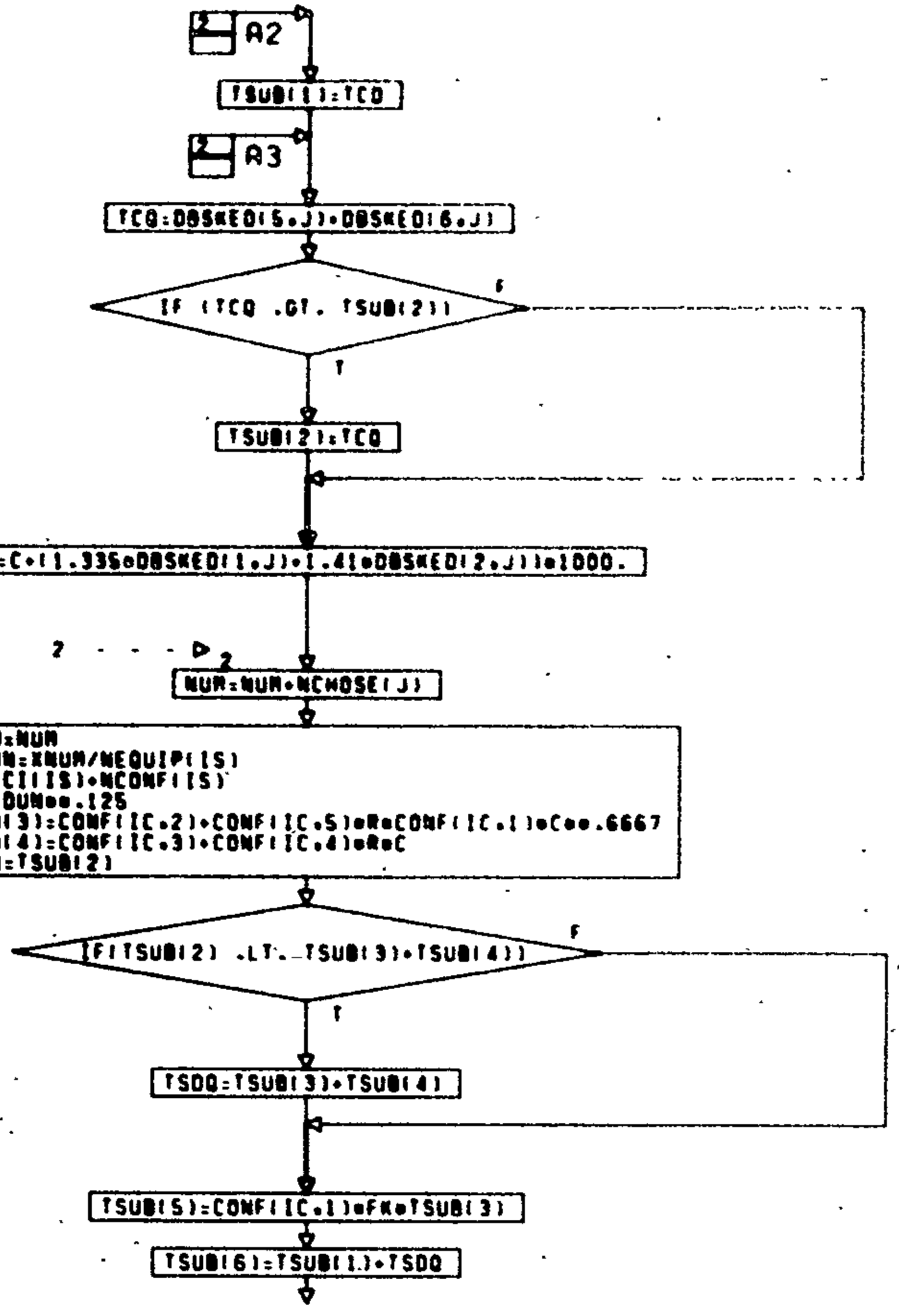
PG 2 FINAL


SUBROUTINE SKED(NEQUIP,NCONF)
COMMON /USER0/SHOME(7,3)
COMMON /CHOSE/ICHOSE(60),NCHOSE(60),COST(5,60),REL(6,60),
TMR(4,60),OPIA(11,60),OBSKED(7,60)
COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMODLD,TRUNC,ITRUNC,DE,TE,
TOOLR,QCR,SEIR,PMR,PE,PU,TOOLU,QCP,SEIP,PMP,STAR,SATINV,AEQ,
MEINV,PAYR,PAYINV,PAYQUL,OSE,KLTOT,CTOT,FEER,FEEINV,DOTE,XVEST,
OPS,TSAVE(6),ROLD(60),TTTT,AN,TS,BS,AR,TF,BF,TC,TA,TB,TOTOPS
DIMENSION CONF(22,5),TSUB(6),ICI(5),NEQUIP(5),NCONF(6)
DATA ICI/0,5,8,10,15/
DATA CONF/1.,1.5,1.,2.,1.5,3*1.,2.,12*1.,2.,
6.,9.,6.,12.,9.,5.,6.,8.,4.,6*2.,6*4.,2.,
22*7.,22*2.E-7,5*.0001,3*.0002,13*.00007,.0002/
FK=4.5
C CONF ROWS AREZ 1 TO 5 FOR S AND C
C 6 TO 8 FOR AUXPRO
C 9 TO 10 FOR OPI
C 11 TO 15 FOR COMM
C 16 TO 21 FOR EP
C 22 FOR M E
DO 1 J=1,6
1
TSAVE(J)=0.
DO 4 IS=1,5
4
IF (IS .EQ. 1)
F
T
ISTRT=1

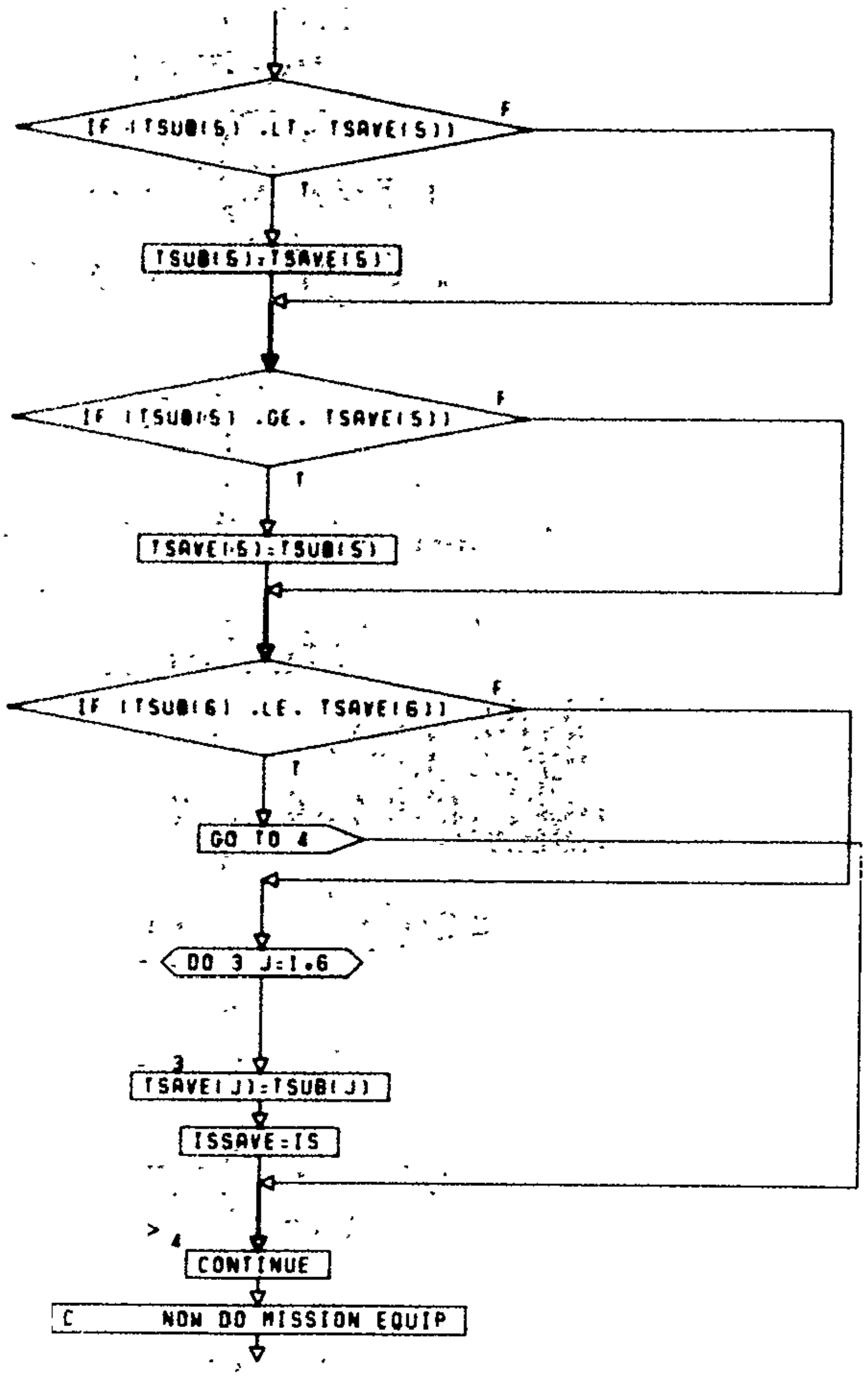
CONT. ON PG 2


A1
IF (IS .GT. 1)
ISTRT=IEND+1
IF (IS .EQ. 1)
IEND=NEQUIP(1)
IF (IS .GT. 1)
IEND=IEND+NEQUIP(IS)
TSUB(1)=0.
TSUB(2)=0.
C=0.
NUM=0
DO 2 J=ISTRT,IEND
3
TCD=OBSKED(3,J)+OBSKED(4,J)
IF (TCD .GT. TSUB(1))
F
T
3
A3
3
A2

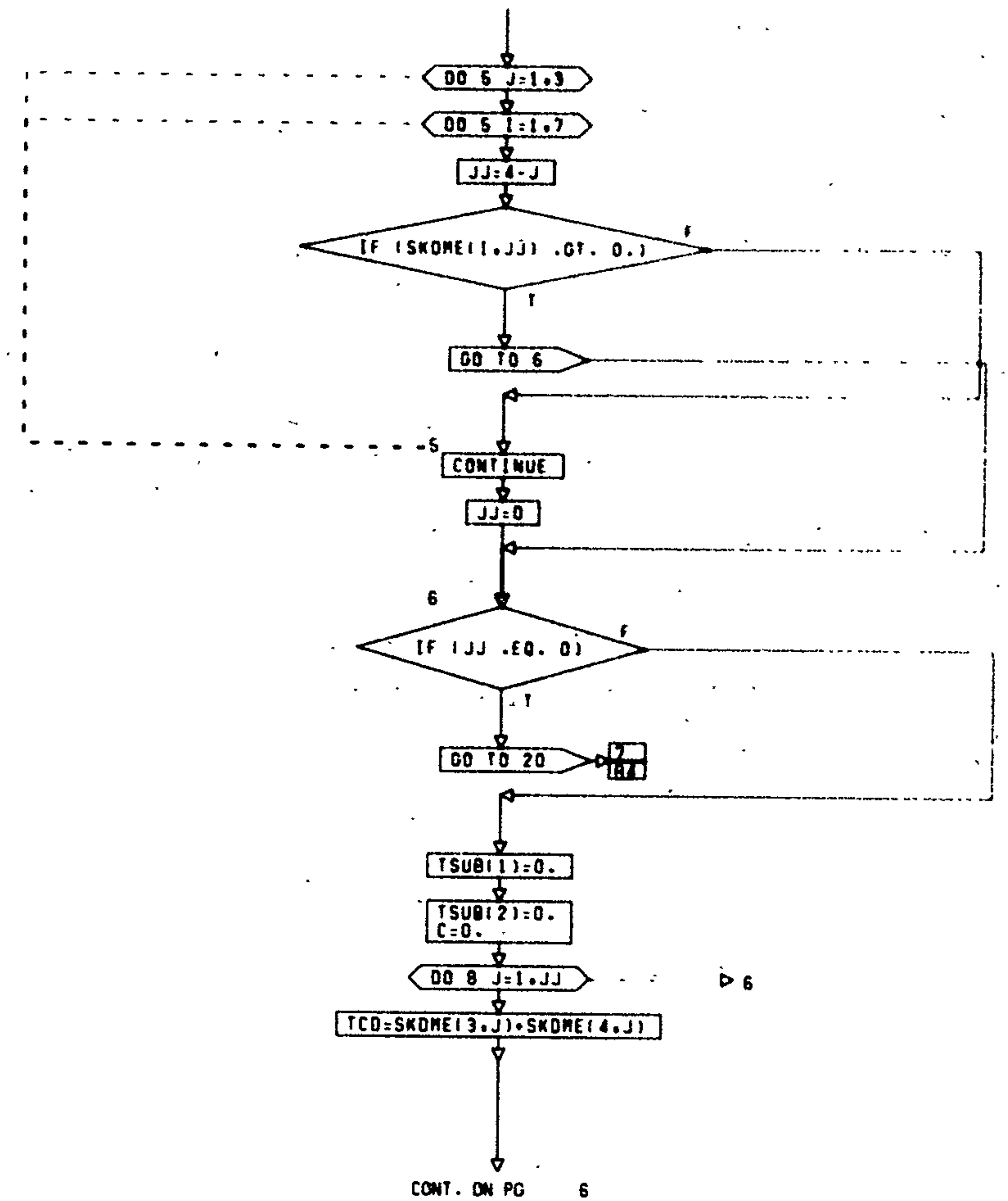
CONT. ON PG 3


A2
TSUB(1)=TCQ
A3
TCQ=DBSKED(5,J)+DBSKED(6,J)
IF (TCQ .GT. TSUB(2))
F
T
TSUB(2)=TCQ
C=C+(1.335*DBSKED(1,J)+1.41*DBSKED(2,J))*1000.
2
2
NUM=NUM+NCHOSE(J)
XNUM=NUM
REDUN=XNUM/NEQUIP(IS)
IC=ICI(IS)+NCONF(IS)
R=REDUN**.125
TSUB(3)=CONF(IC,2)+CONF(IC,5)*R*CONF(IC,1)*C**.6667
TSUB(4)=CONF(IC,3)+CONF(IC,4)*R*C
TSDQ=TSUB(2)
IF(TSUB(2) .LT. TSUB(3)+TSUB(4))
F
T
TSDQ=TSUB(3)+TSUB(4)
TSUB(5)=CONF(IC,1)*FK*TSUB(3)
TSUB(6)=TSUB(1)+TSDQ

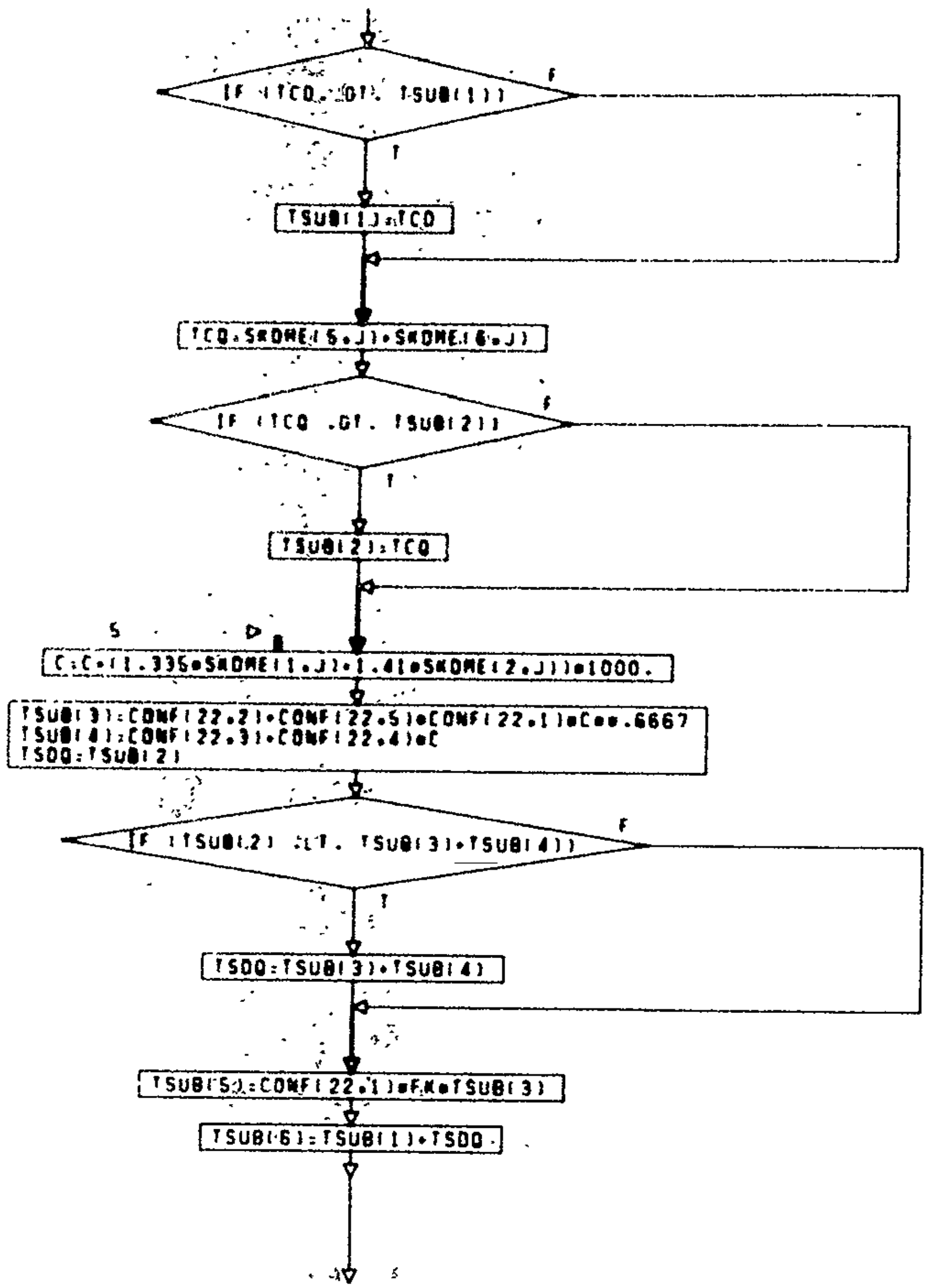
CONT. ON PG 4


IF (TSUB(5) .LT. TSAVE(5))
F
T
TSUB(5)=TSAVE(5)
IF (TSUB(5) .GE. TSAVE(5))
F
T
TSAVE(5)=TSUB(5)
IF (TSUB(6) .LE. TSAVE(6))
F
T
GO TO 4
DO 3 J=1,6
3
TSAVE(J)=TSUB(J)
ISSAVE=IS
4
CONTINUE
C NOW DO MISSION EQUIP

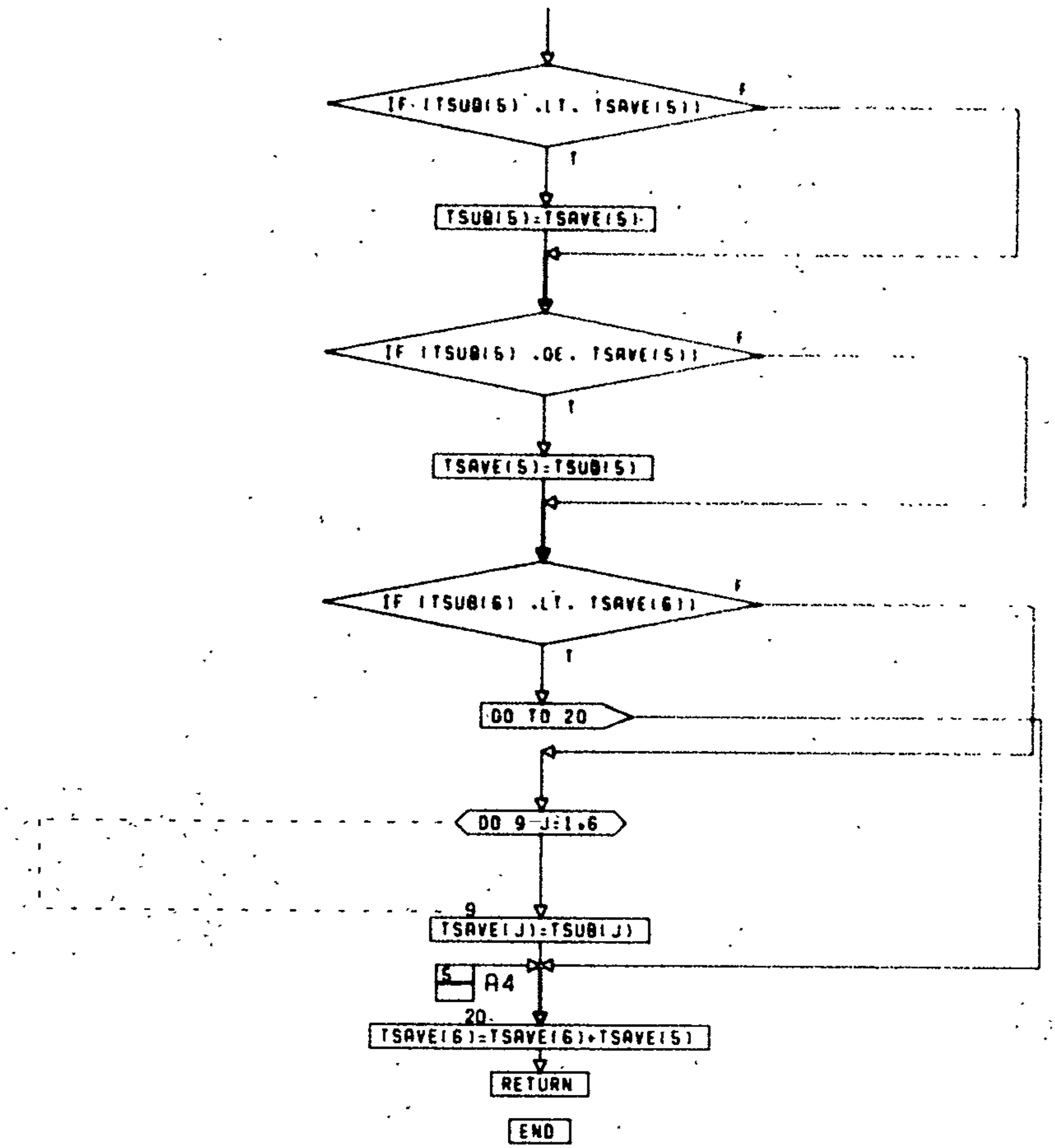
CONT. ON PG 5


DO 5 J=1,3
DO 5 I=1,7
JJ=4-J
IF (SKDME(I,JJ) .GT. 0.)
F
T
GO TO 6
5
CONTINUE
JJ=0
6
IF (JJ .EQ. 0)
F
T
GO TO 20
TSUB(1)=0.
TSUB(2)=0.
C=0.
DO 8 J=1,JJ
6
TCD=SKDME(3,J)+SKDME(4,J)
CONT. ON PG 6

PG 5 OF 7


IF (TCQ .GT. TSUB(1))
F
T
TSUB(1)=TCQ
TCQ=SKDME(5,J)+SKDME(6,J)
IF (TCQ .GT. TSUB(2))
F
T
TSUB(2)=TCQ
C=C+(1.335*SKDME(1,J)+1.41*SKDME(2,J))*1000.
TSUB(3)=CONF(22,2)+CONF(22,5)*CONF(22,1)*C**.6667
TSUB(4)=CONF(22,3)+CONF(22,4)*C
TSDQ=TSUB(2)
IF (TSUB(2) .LT. TSUB(3)+TSUB(4))
F
T
TSDQ=TSUB(3)+TSUB(4)
TSUB(5)=CONF(22,1)*FK*TSUB(3)
TSUB(6)=TSUB(1)+TSDQ

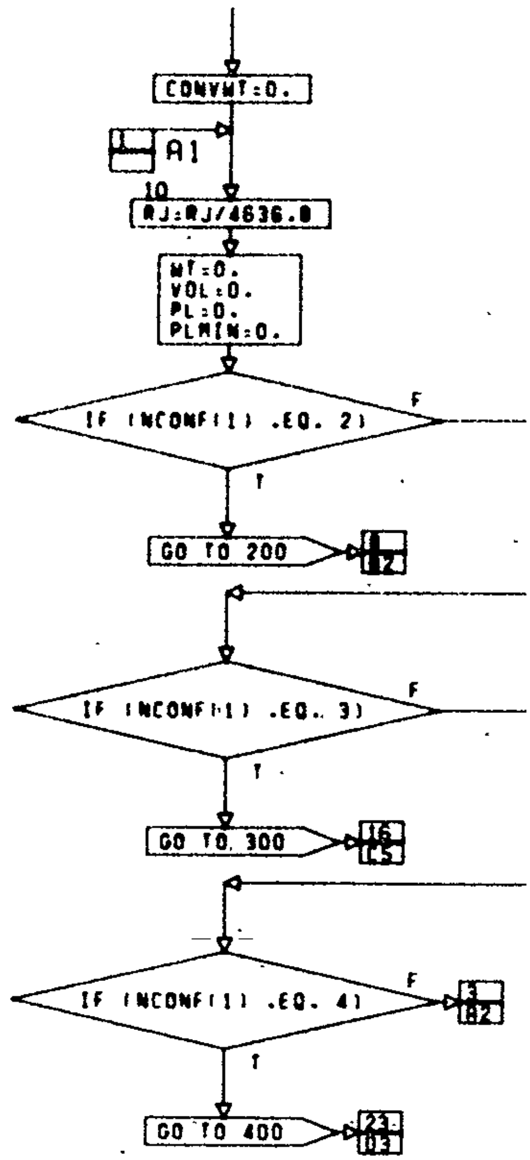
CONT. ON PG 7


IF (TSUB(5) .LT. TSAVE(5))
F
T
TSUB(5)=TSAVE(5)
IF (TSUB(5) .GE. TSAVE(5))
F
T
TSAVE(5)=TSUB(5)
IF (TSUB(6) .LT. TSAVE(6))
F
T
GO TO 20
DO 9 J=1,6
9
TSAVE(J)=TSUB(J)
5
A4
20
TSAVE(6)=TSAVE(6)+TSAVE(5)
RETURN
END

PG 7 FINAL

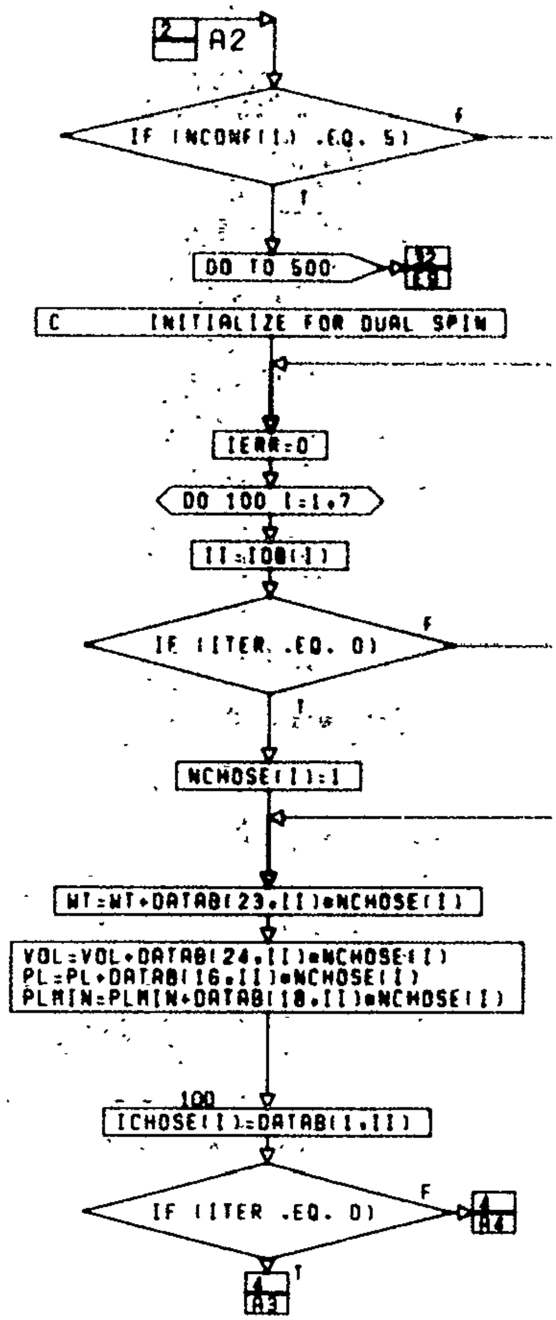
```
SUBROUTINE SANDC(IPIC,IERR,ITER,NCONF,ICHOSE,NCHOSE)

C          ICHOSE(10) IS SELECTED EQUIP AS FOUR DIGIT EQUIP : -- MANF :
C          NCONF IS CONFIGURATION NUMBER,ITER IS NUMBER OF THIS ITERATION
C          IERR IS A MULTIPLE MESSAGE ERROR FLAG,IPIC IS THE LAST
C          SET OF SUBSCRIPTS CHOSEN
C          COMMON USER LISTS USER INPUT PARAMETERS
C          COMMON BTWN LISTS NECESSARY COMMUNICATION BETWEEN SUBROUTINES
C          COMMON CDATA HAS LAST SUBSCRIPT FOR EACH PIECE OF EQUIP,AND
C          THE NECESSARY PIECE OF THE DATA BASE

DIMENSION  ICHOSE(9),IPIC(3),ES(6),C(5),DMA(2),G(3),F(9),NCHOSE(9)
DIMENSION NCONF(6)

COMMON /USER1/DPHI,FE,TSMALL,XNU,PDOTO,TAUX,TAUY,TAUZ,T,
PHIRX,PHIRY,PHIRZ,PDOTX,PDOTY,PDOTZ,XN,YN,ZN,PDOTRX,PDOTRY,
PDOTRZ,OMEGS,OMEGR,PJ,XNN,K,MANY,IPAYAW,EP1,AX,AY,AZ,
 EA,EANT,ALPHA,TL,TACCEL,XNNN,THOLD,PDOTAV,PDOTST,PHIFOV,ISAT

COMMON /BTWN/ WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,
 LMBDD,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,
 SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,PTRPRB,
 HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),
 EQBLG,SABOLG,SATWT

COMMON /DBCOM/IDB(30),DATAB(55,90)
COMMON /USERI/EQM1WT,EQM2WT,DIAMAX,ALT
DATA XMD,YMD,ZMD,DI,XMD2,YMD2,ZMD2/3*.0003,.03,3*.04/
ACSSN=2.

IF (NCONF(1) .EQ. 1)
    T:  GO TO 10   (2 / A1)
    F:

DT=DT/12.

D=D/12.
DX=DX/12.
DY=DY/12.
DZ=DZ/12.
XJ=XJ/4636.8
YJ=YJ/4636.8
ZJ=ZJ/4636.8
RJ=1.
```

CONT. ON PG 2



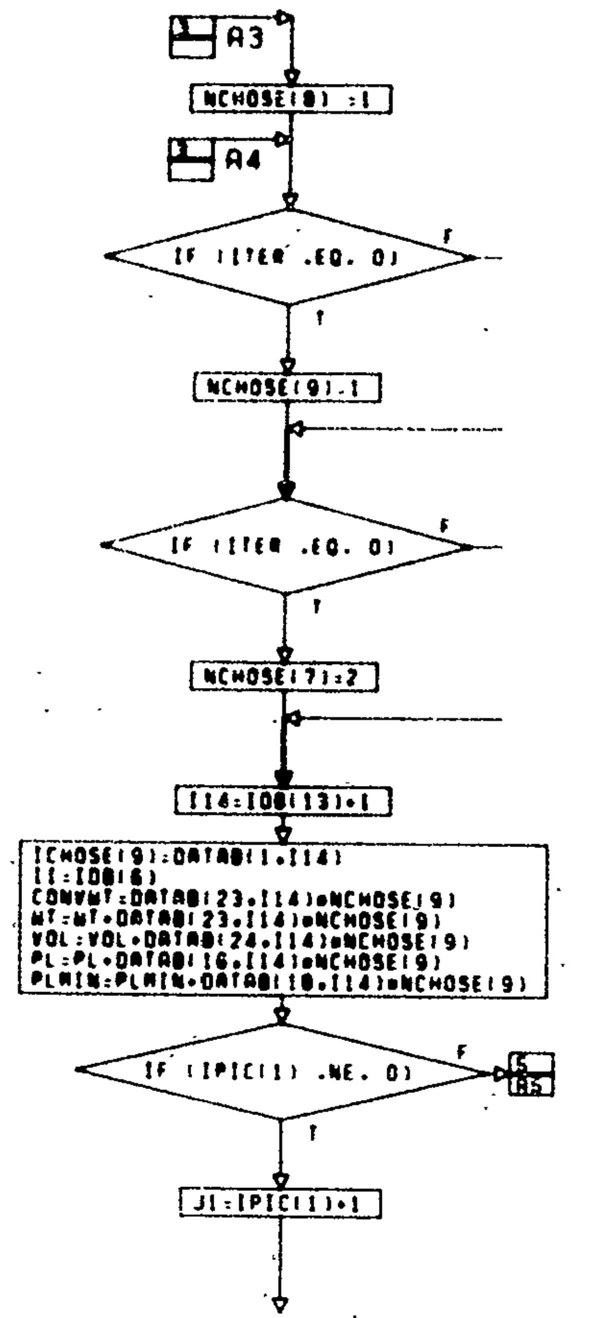
CONT. ON PG

PG 2 OF



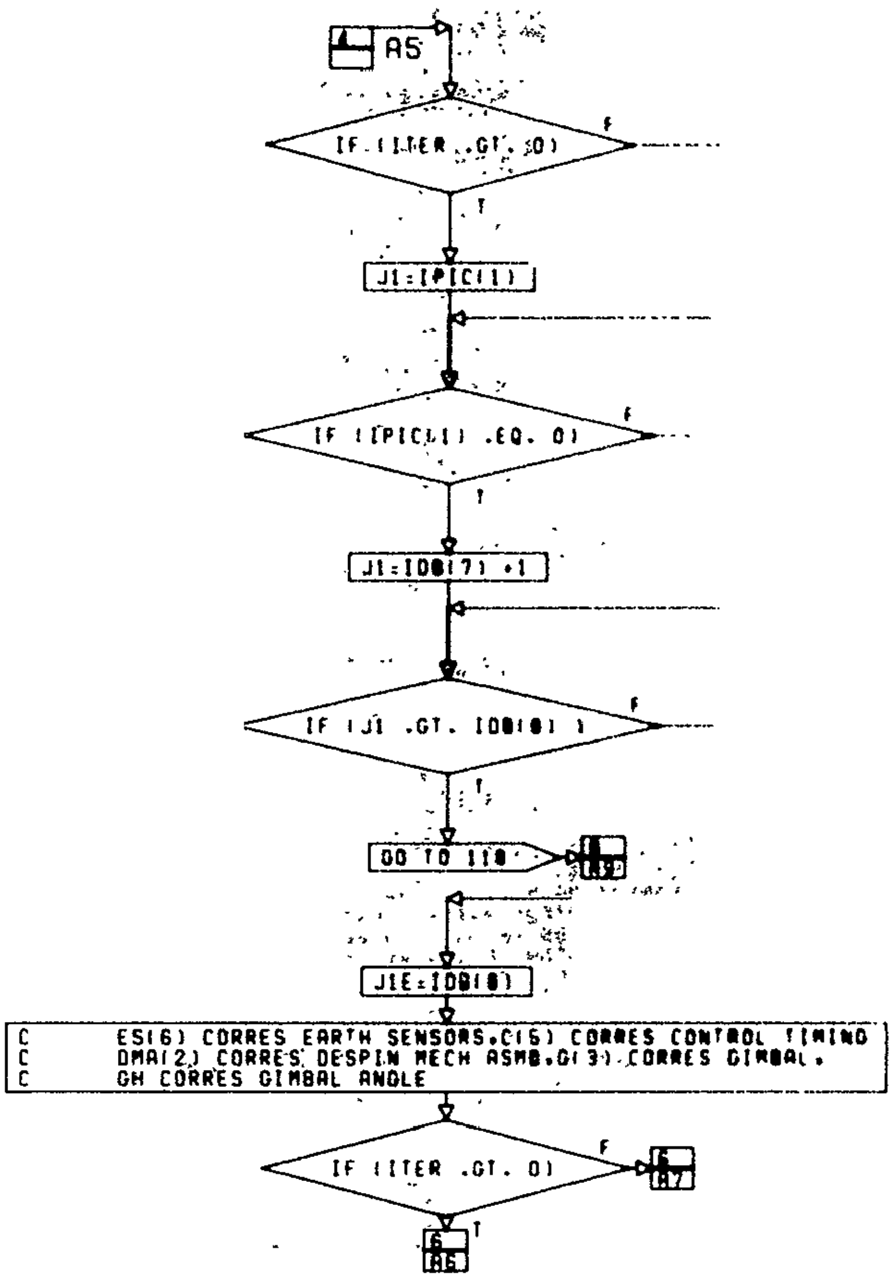
CONT. ON PG 4

090

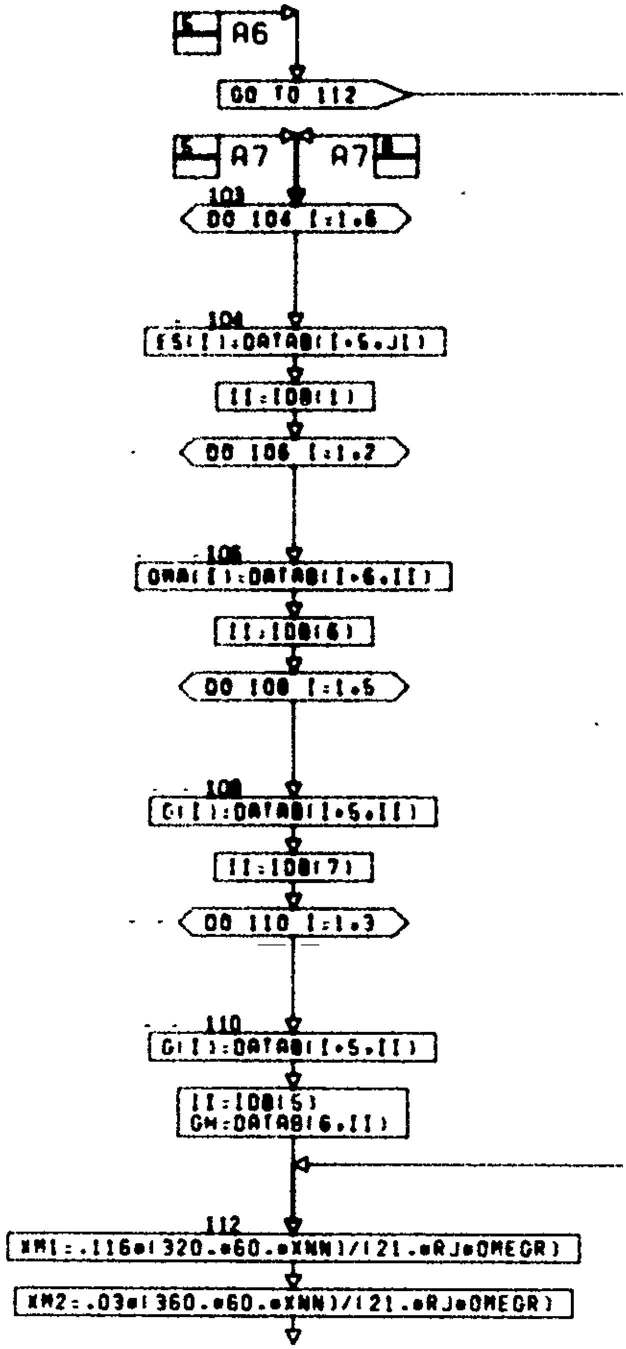


A3
NCHOSE(8) :1
A4
IF (ITER .EQ. 0)
F
T
NCHOSE(9):1
IF (ITER .EQ. 0)
F
T
NCHOSE(7):2
I14:IDB(13)+1
ICHOSE(9):DATAB(1,I14)
I1:IDB(6)
CONVWT:DATAB(23,I14)*NCHOSE(9)
WT:WT+DATAB(23,I14)*NCHOSE(9)
VOL:VOL+DATAB(24,I14)*NCHOSE(9)
PL:PL+DATAB(16,I14)*NCHOSE(9)
PLMIN:PLMIN+DATAB(18,I14)*NCHOSE(9)
IF (IPIC(1) .NE. 0)
F
T
5
A5
J1:IPIC(1)+1

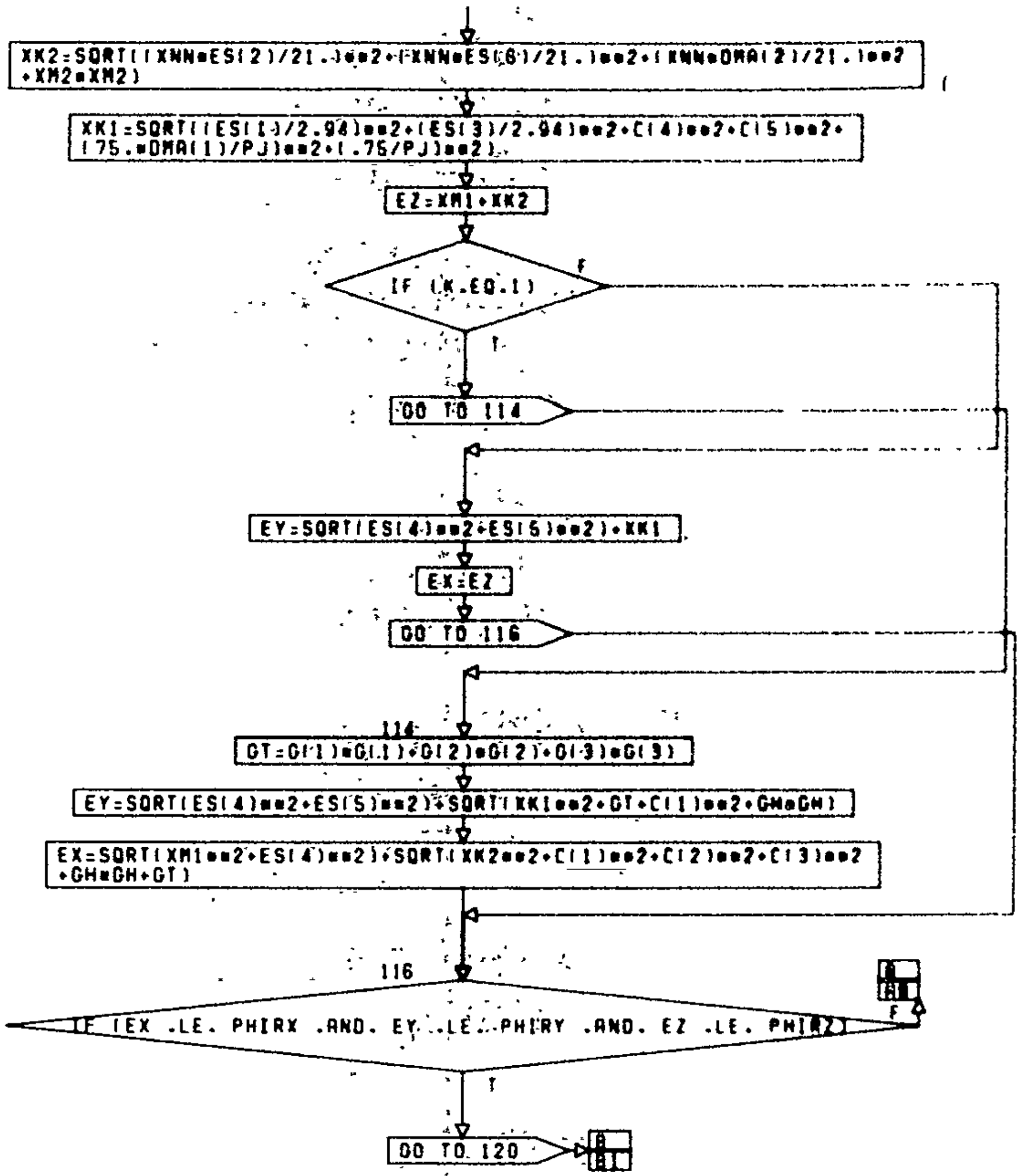
CONT. ON PG 5


A5
IF (ITER .GT. 0)
F
T
J1=IPIC(1)
IF (IPIC(1) .EQ. 0)
J1=IDB(7) +1
IF (J1 .GT. IDB(8))
GO TO 118
J1E=IDB(8)
C ES(6) CORRES EARTH SENSORS,C(5) CORRES CONTROL TIMING
C DMA(2) CORRES DESPIN MECH ASMB,G(3) CORRES GIMBAL,
C GH CORRES GIMBAL ANGLE
IF (ITER .GT. 0)
6
A7
6
A6

CONT. ON PG

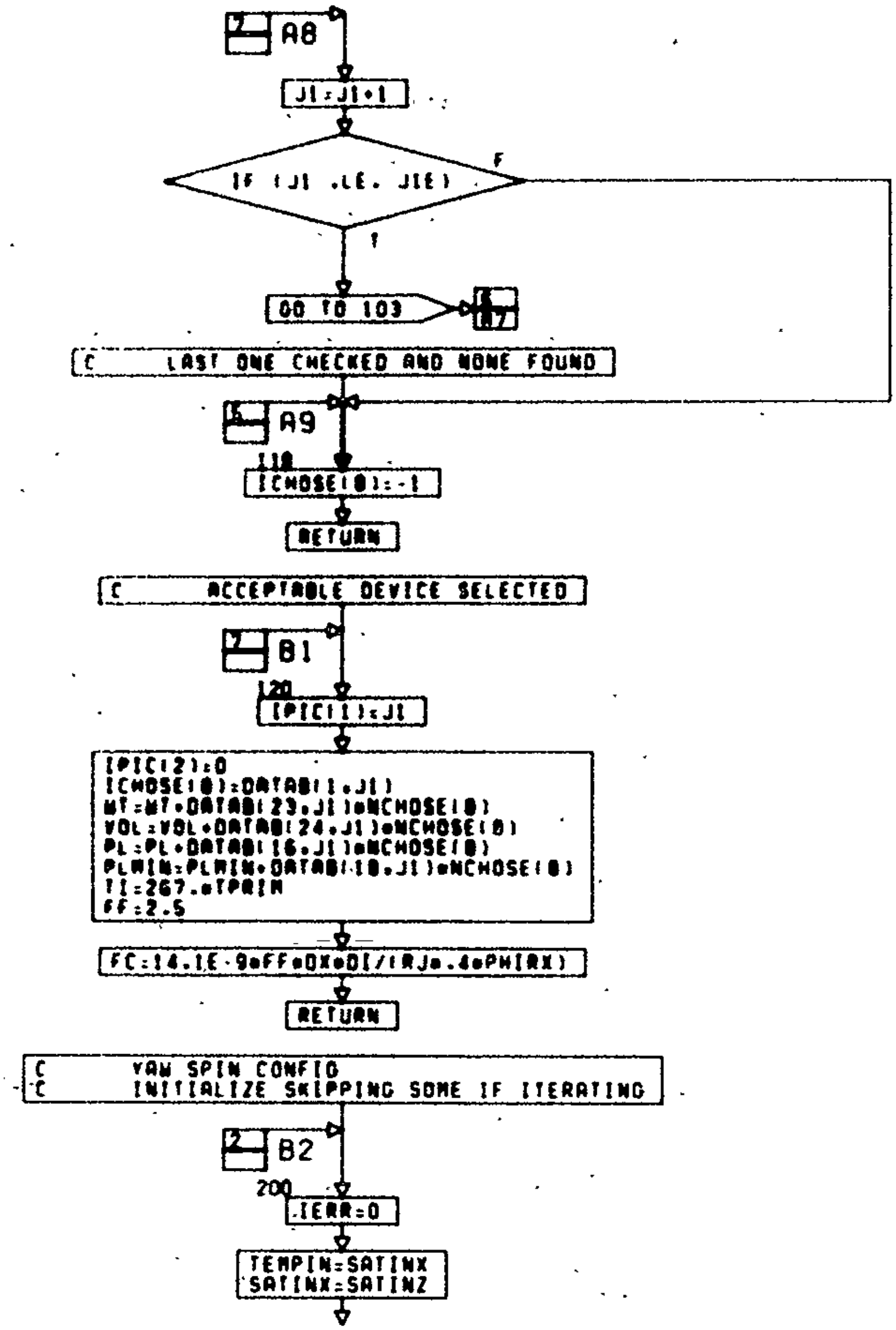

A6
GO TO 112
A7
A7
103
DO 104 I=1,6
104
FS(I)=DATAB(I+5,J1)
I1=IDB(1)
DO 106 I=1,2
106
OMA(I)=DATAB(I+6,I1)
I1=IDB(6)
DO 108 I=1,5
108
G(I)=DATAB(I+5,I1)
I1=IDB(7)
DO 110 I=1,3
110
G(I)=DATAB(I+5,I1)
I1=IDB(5)
GM=DATAB(6,I1)
112
XM1=.116*(320.*60.*XNN)/(21.*RJ*OMEGR)
XM2=.03*(360.*60.*XNN)/(21.*RJ*OMEGR)

CONT. ON PG 7

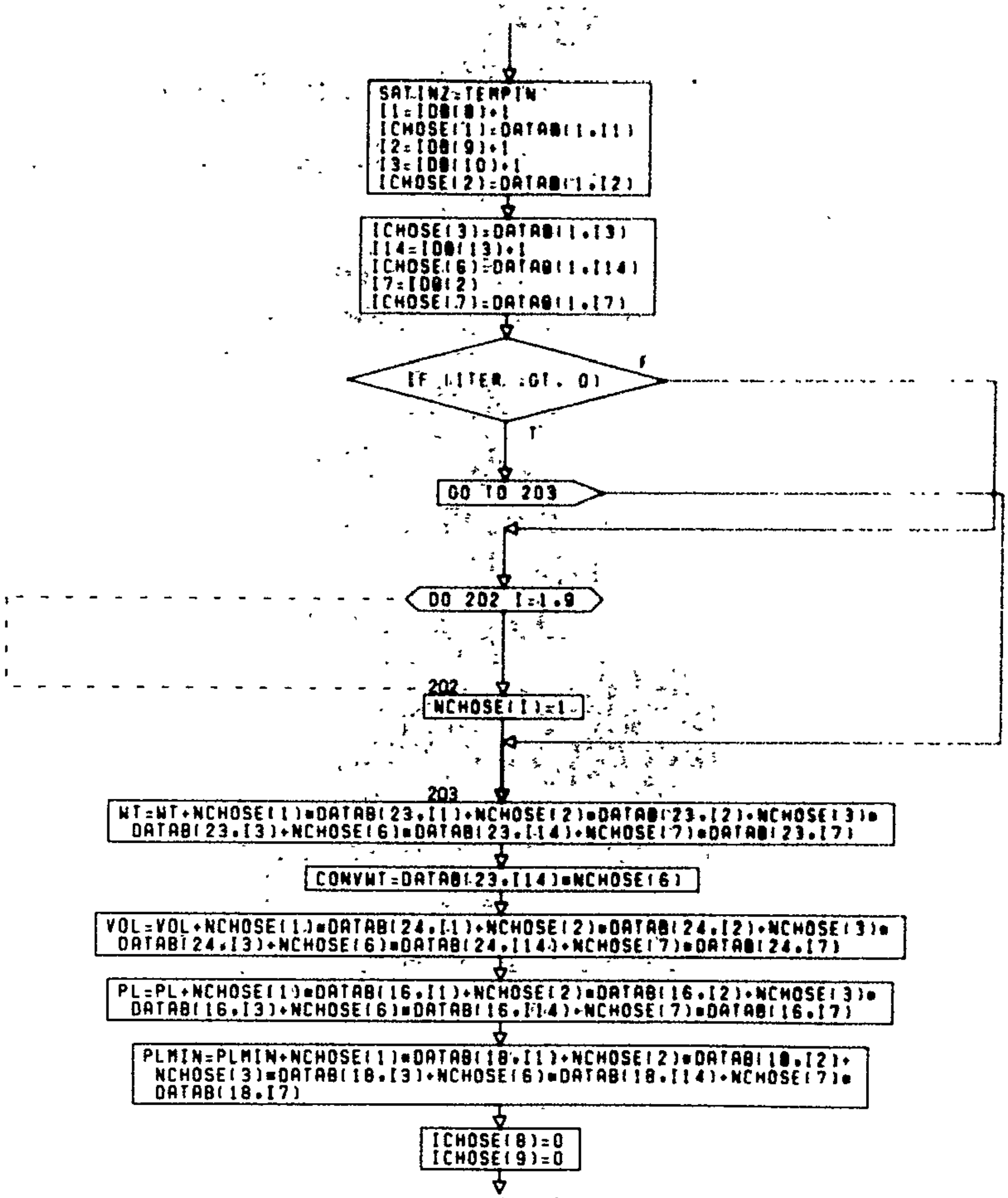


CONT. ON PG . 8

092

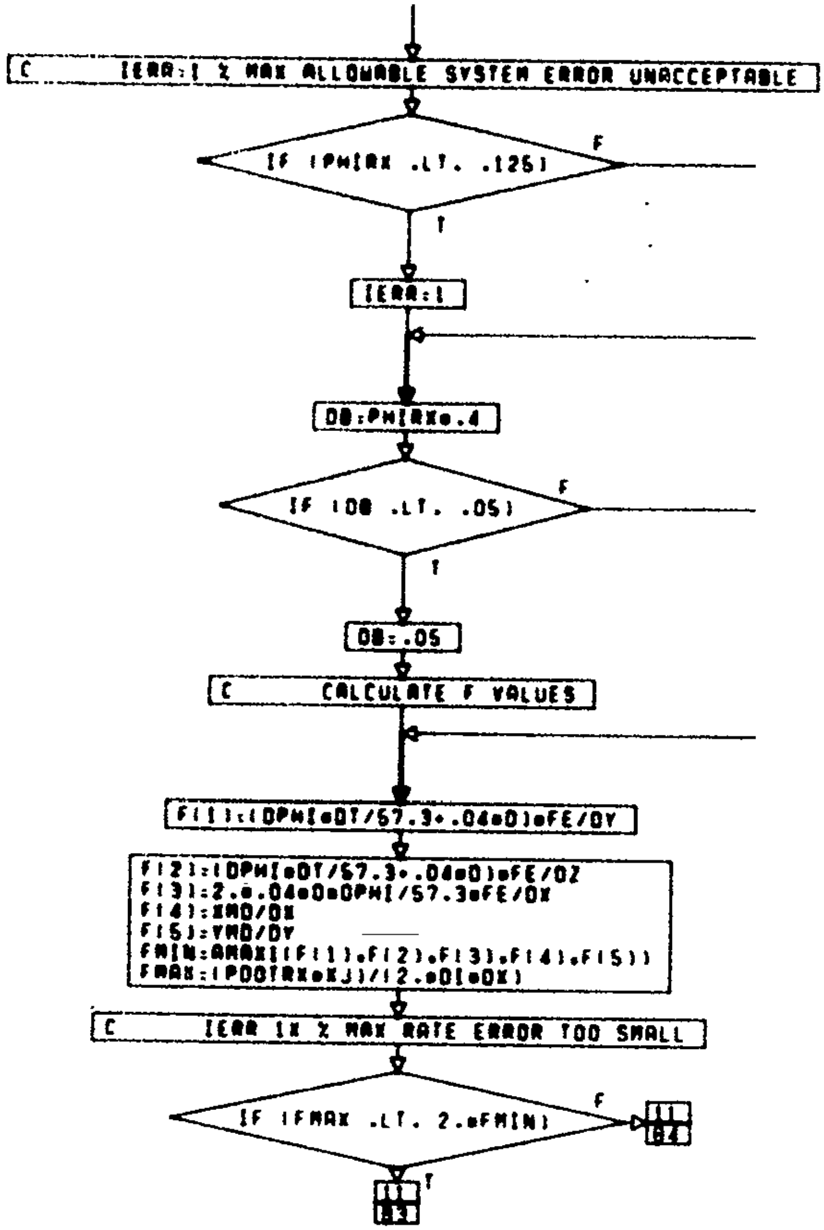

7 A8
J1=J1+1
IF (J1 .LE. J1E)
F
T
GO TO 103
6 B7
C LAST ONE CHECKED AND NONE FOUND
5 A9
110
ICHOSE(8)=-1
RETURN
C ACCEPTABLE DEVICE SELECTED
7 B1
120
IPIC(1)=J1
IPIC(2)=0
ICHOSE(8)=DATAB(1,J1)
WT=WT+DATAB(23,J1)*NCHOSE(8)
VOL=VOL+DATAB(24,J1)*NCHOSE(8)
PL=PL+DATAB(16,J1)*NCHOSE(8)
PLMIN=PLMIN+DATAB(18,J1)*NCHOSE(8)
TI=267.*TPRIM
FF=2.5
FC=14.1E-9*FF*DX*DI/(RJ*.4*PHIRX)
RETURN
C YAW SPIN CONFIG
C INITIALIZE SKIPPING SOME IF ITERATING
2 B2
200
IERR=0
TEMPIN=SATINX
SATINX=SATINZ

CONT. ON PG 9

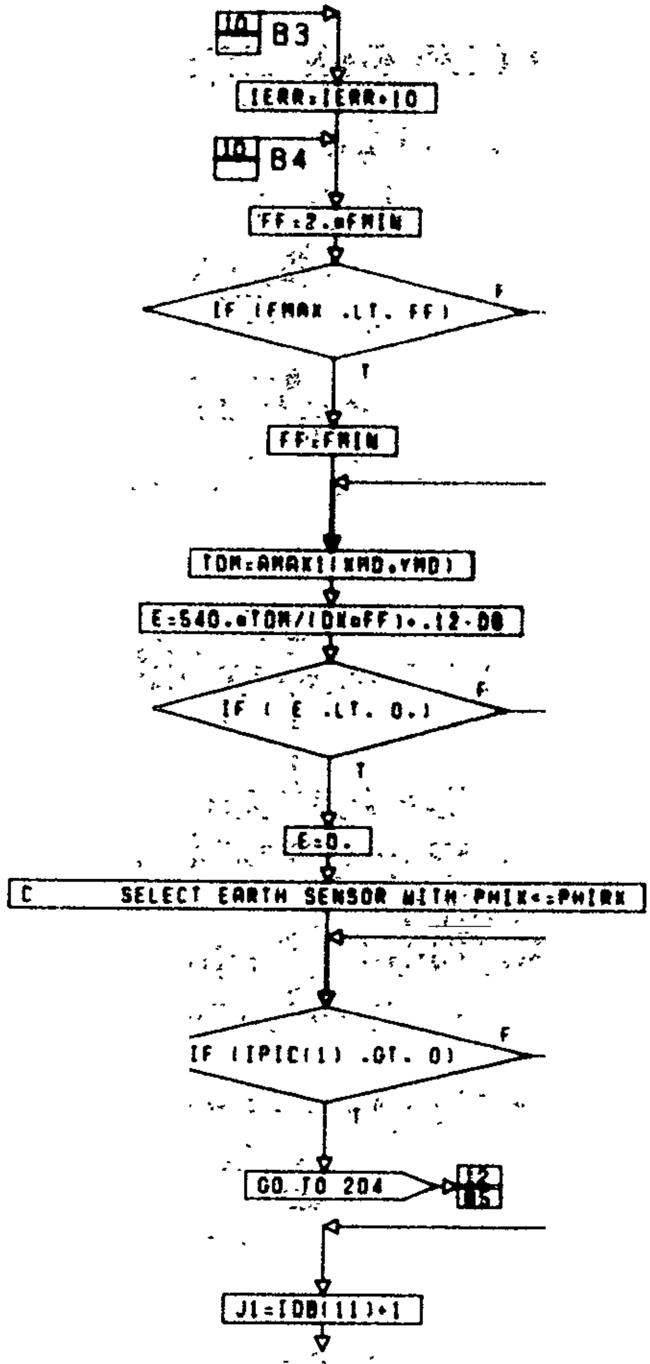


CONT. ON PG 10

093

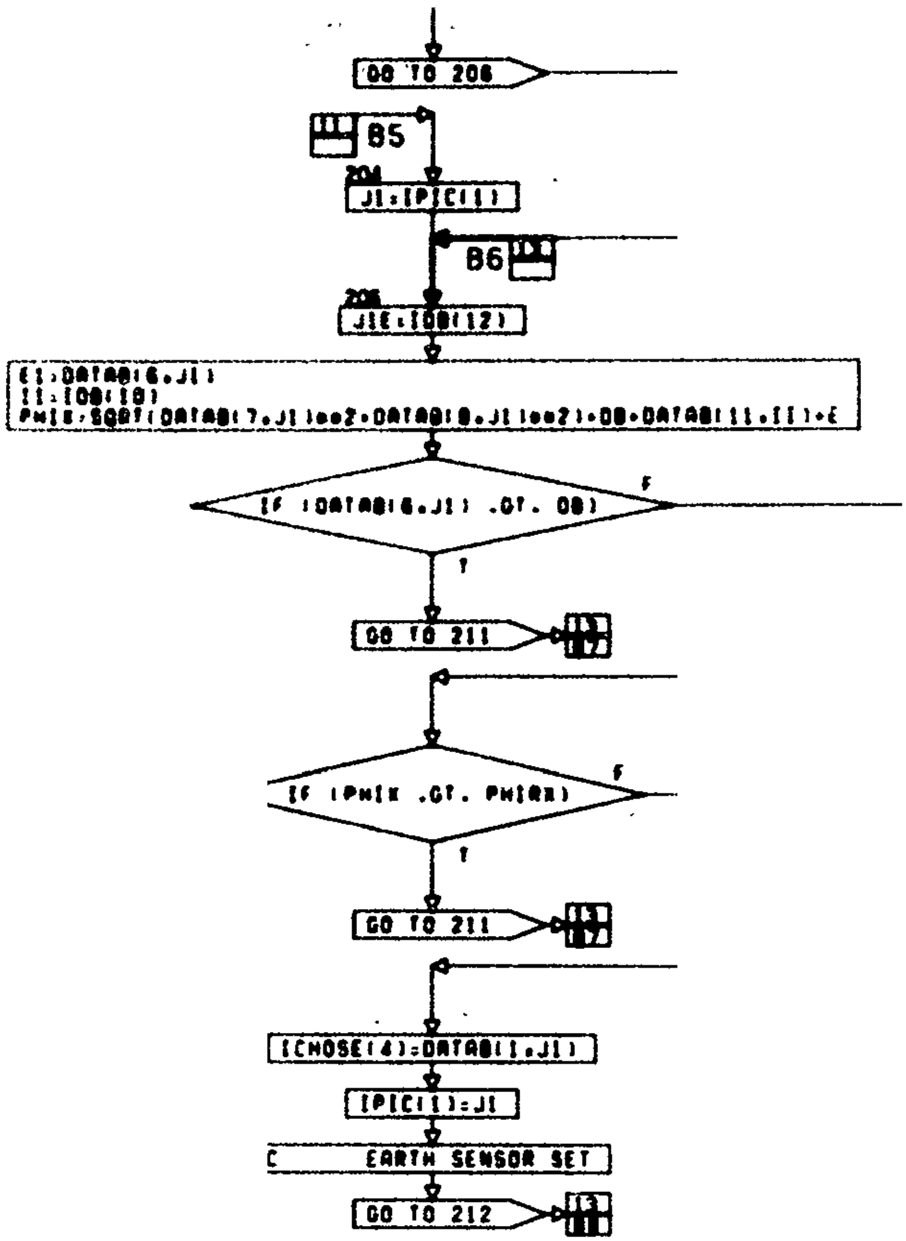

C IERR=1 % MAX ALLOWABLE SYSTEM ERROR UNACCEPTABLE
IF (PHIRX .LT. .125)
F
T
IERR=1
DB=PHIRX*.4
IF (DB .LT. .05)
F
T
DB=.05
C CALCULATE F VALUES
F(1)=(DPHI*DT/57.3+.04*D)*FE/DY
F(2)=(DPHI*DT/57.3+.04*D)*FE/DZ
F(3)=2.*.04*D*DPHI/57.3*FE/DX
F(4)=XMD/DX
F(5)=YMD/DY
FMIN=AMAX1(F(1),F(2),F(3),F(4),F(5))
FMAX=(PDOTRX*KJ)/(2.*DI*DX)
C IERR 1X % MAX RATE ERROR TOO SMALL
IF (FMAX .LT. 2.*FMIN)
F
11
B4
T
11
B3

CONT. ON PG 11

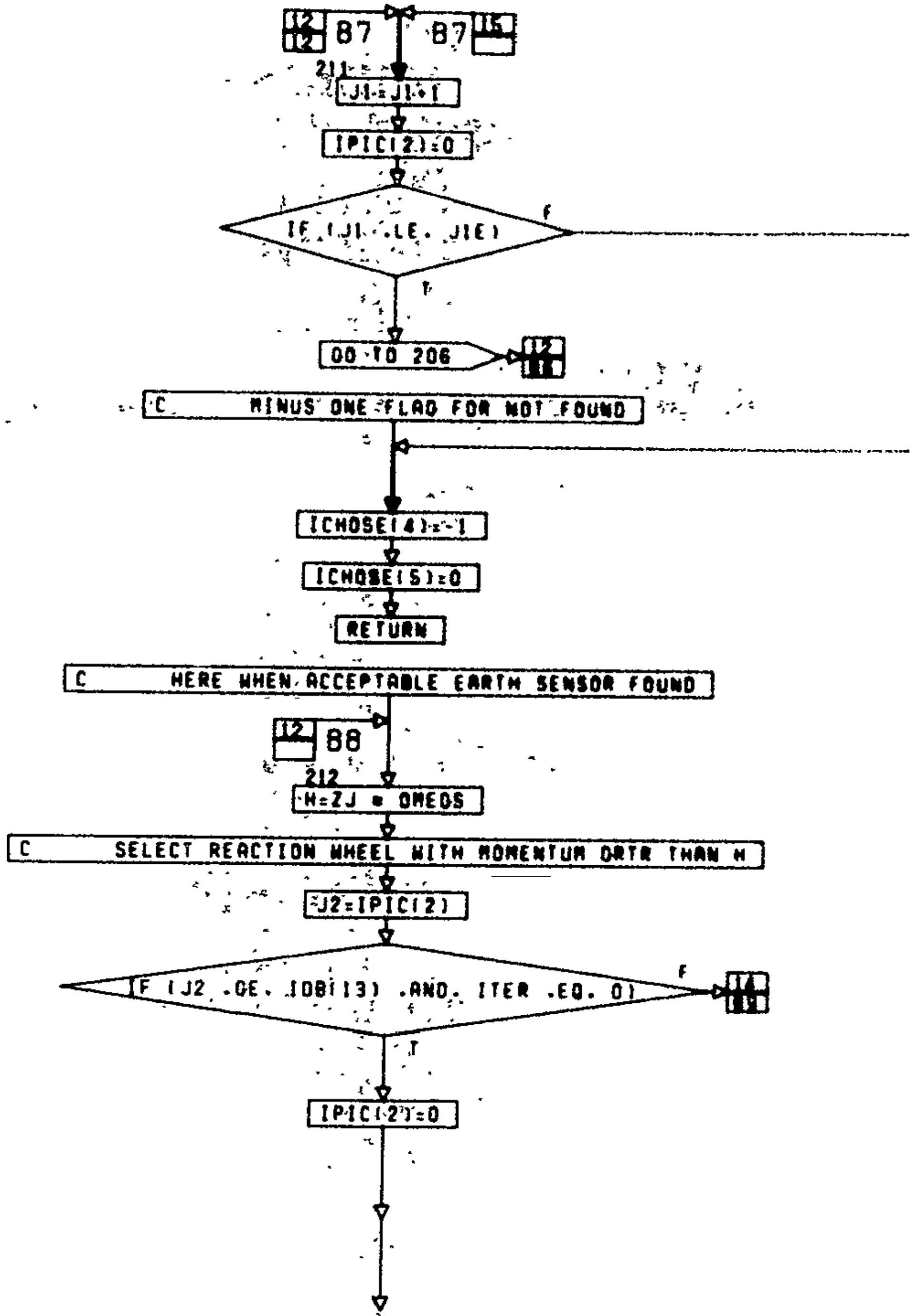


CONT. ON PG 12

PG 1 OF 37

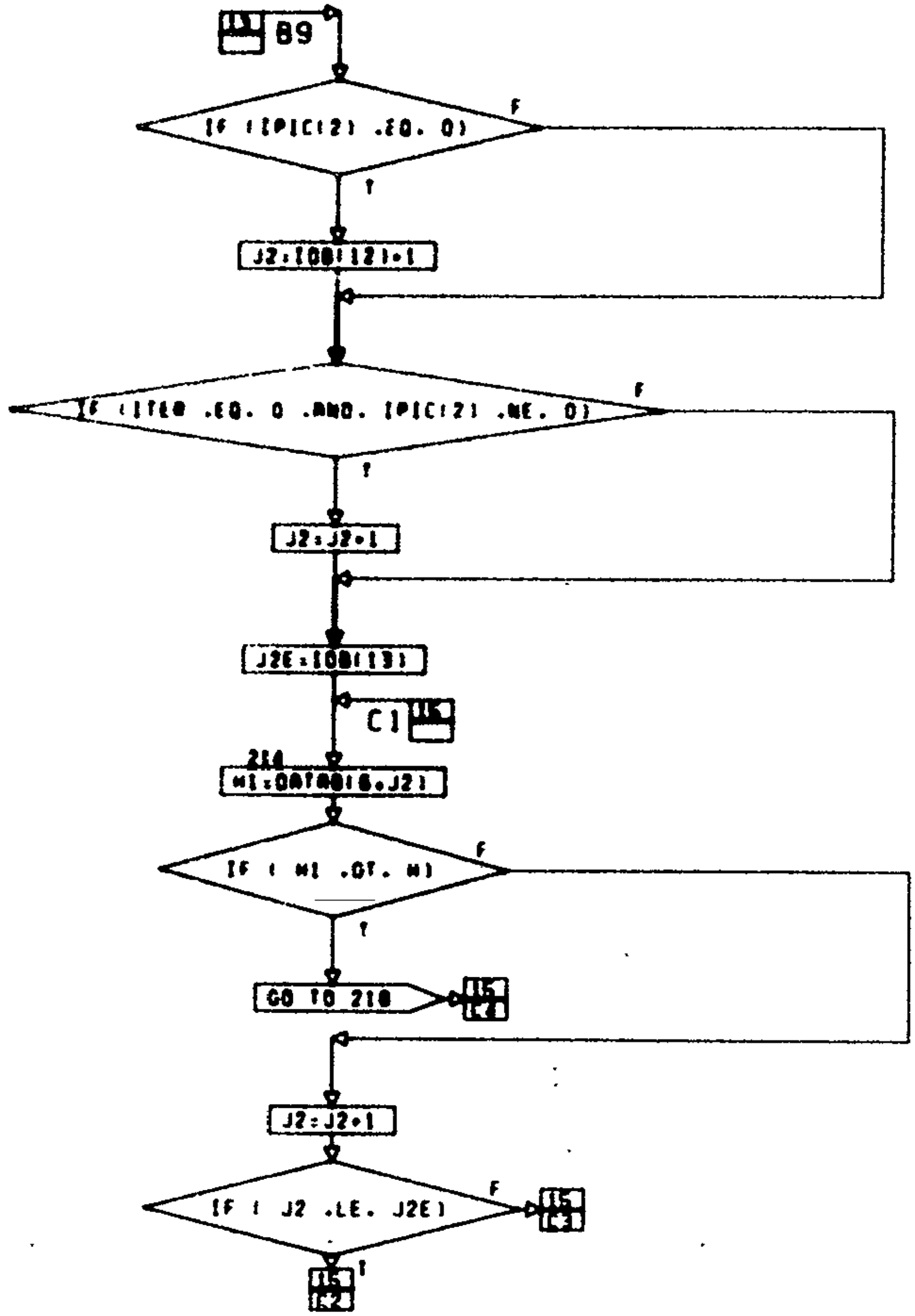

GO TO 206
B5
204
JI=IPIC(1)
B6
206
JIE=IOB(12)
E1=DATAB(6,JI)
I1=IOB(10)
PHIX=SQRT(DATAB(7,JI)**2+DATAB(8,JI)**2)+DB+DATAB(11,I1)+E
IF (DATAB(6,JI) .GT. DB)
F
T
GO TO 211
IF (PHIX .GT. PHIRX)
F
T
GO TO 211
ICHOSE(4)=DATAB(1,JI)
IPIC(1)=JI
C EARTH SENSOR SET
GO TO 212

CONT. ON PG 13

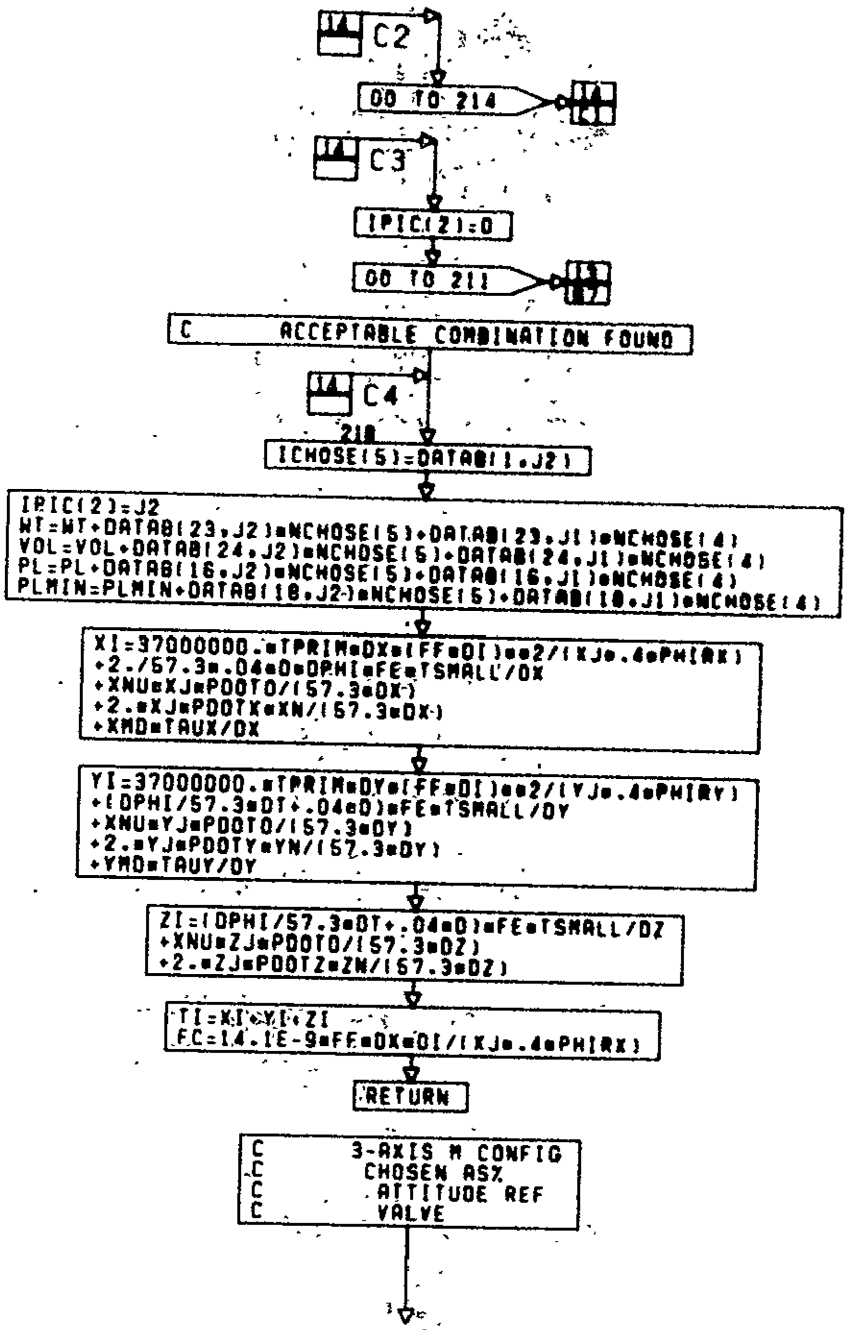


87
87
211
J1=J1+1
IPIC(2)=0
IF (J1 .LE. JIE)
F
T
GO TO 206
C MINUS ONE FLAG FOR NOT FOUND
ICHOSE(4)=-1
ICHOSE(5)=0
RETURN
C HERE WHEN ACCEPTABLE EARTH SENSOR FOUND
88
212
H=ZJ * OMEGS
C SELECT REACTION WHEEL WITH MOMENTUM GRTR THAN H
J2=IPIC(2)
IF (J2 .GE. IDB(13) .AND. ITER .EQ. 0)
F
T
IPIC(2)=0

CONT. ON PG 14

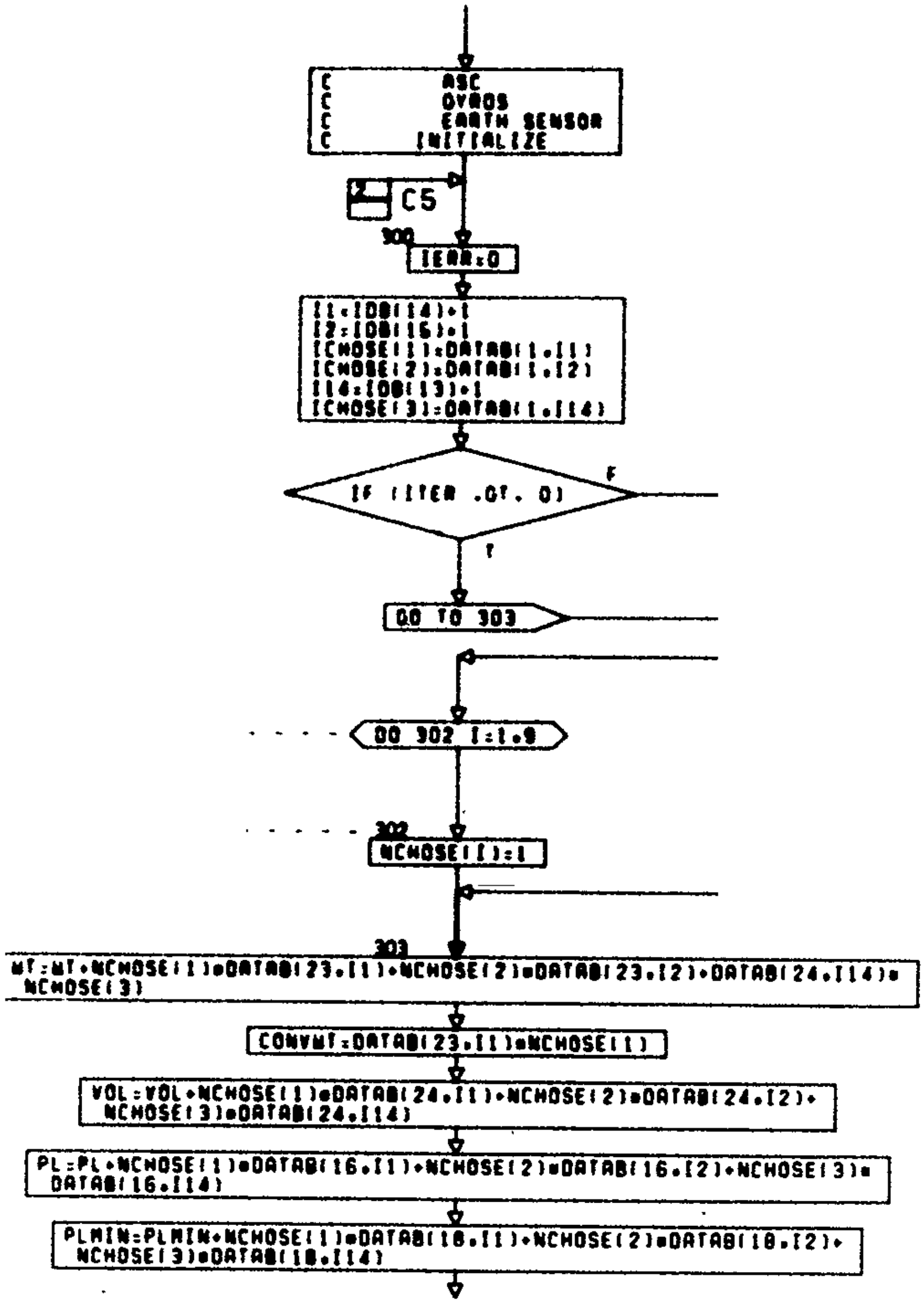

B9
IF (IPIC(2) .EQ. 0)
F
T
J2:IOB(12)+1
IF (ITER .EQ. 0 .AND. IPIC(2) .NE. 0)
F
T
J2:J2+1
J2E:IOB(13)
C1
210
W1:DATA0(6,J2)
IF (W1 .GT. W)
F
T
GO TO 210
J2:J2+1
IF (J2 .LE. J2E)
F
T

CONT. ON PG 15

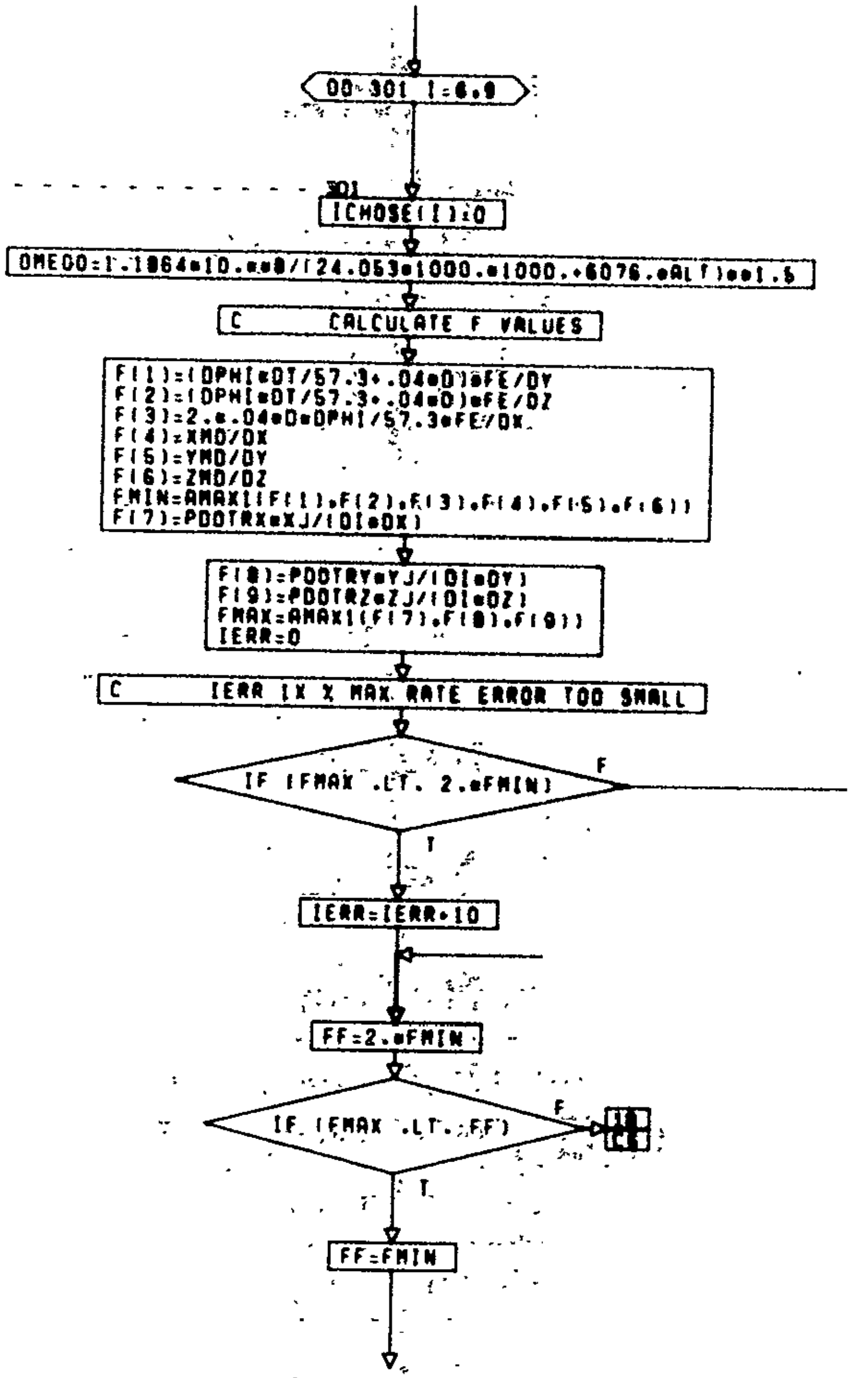


1A
C2
GO TO 214
1A
C3
IPIC(2)=0
GO TO 211
C ACCEPTABLE COMBINATION FOUND
1A
C4
218
ICHOSE(5)=DATAB(1,J2)
IPIC(2)=J2
WT=WT+DATAB(23,J2)*NCHOSE(5)+DATAB(23,J1)*NCHOSE(4)
VOL=VOL+DATAB(24,J2)*NCHOSE(5)+DATAB(24,J1)*NCHOSE(4)
PL=PL+DATAB(16,J2)*NCHOSE(5)+DATAB(16,J1)*NCHOSE(4)
PLMIN=PLMIN+DATAB(18,J2)*NCHOSE(5)+DATAB(18,J1)*NCHOSE(4)
XI=37000000.*TPRIM*DX*(FF*DI)**2/(XJ*.4*PHIRX)
+2./57.3*.04*D*DPHI*FE*TSMALL/DX
+XNU*XJ*PDOTO/(57.3*DX)
+2.*XJ*PDOTX*XN/(57.3*DX)
+XMD*TAUX/DX
YI=37000000.*TPRIM*DY*(FF*DI)**2/(YJ*.4*PHIRY)
+(DPHI/57.3*DT+.04*D)*FE*TSMALL/DY
+XNU*YJ*PDOTO/(57.3*DY)
+2.*YJ*PDOTY*YN/(57.3*DY)
+YMD*TAUY/DY
ZI=(DPHI/57.3*DT+.04*D)*FE*TSMALL/DZ
+XNU*ZJ*PDOTO/(57.3*DZ)
+2.*ZJ*PDOTZ*ZN/(57.3*DZ)
TI=XI+YI+ZI
FC=14.1E-9*FF*DX*DI/(XJ*.4*PHIRX)
RETURN
C 3-AXIS M CONFIG
C CHOSEN AS%
C ATTITUDE REF
C VALVE

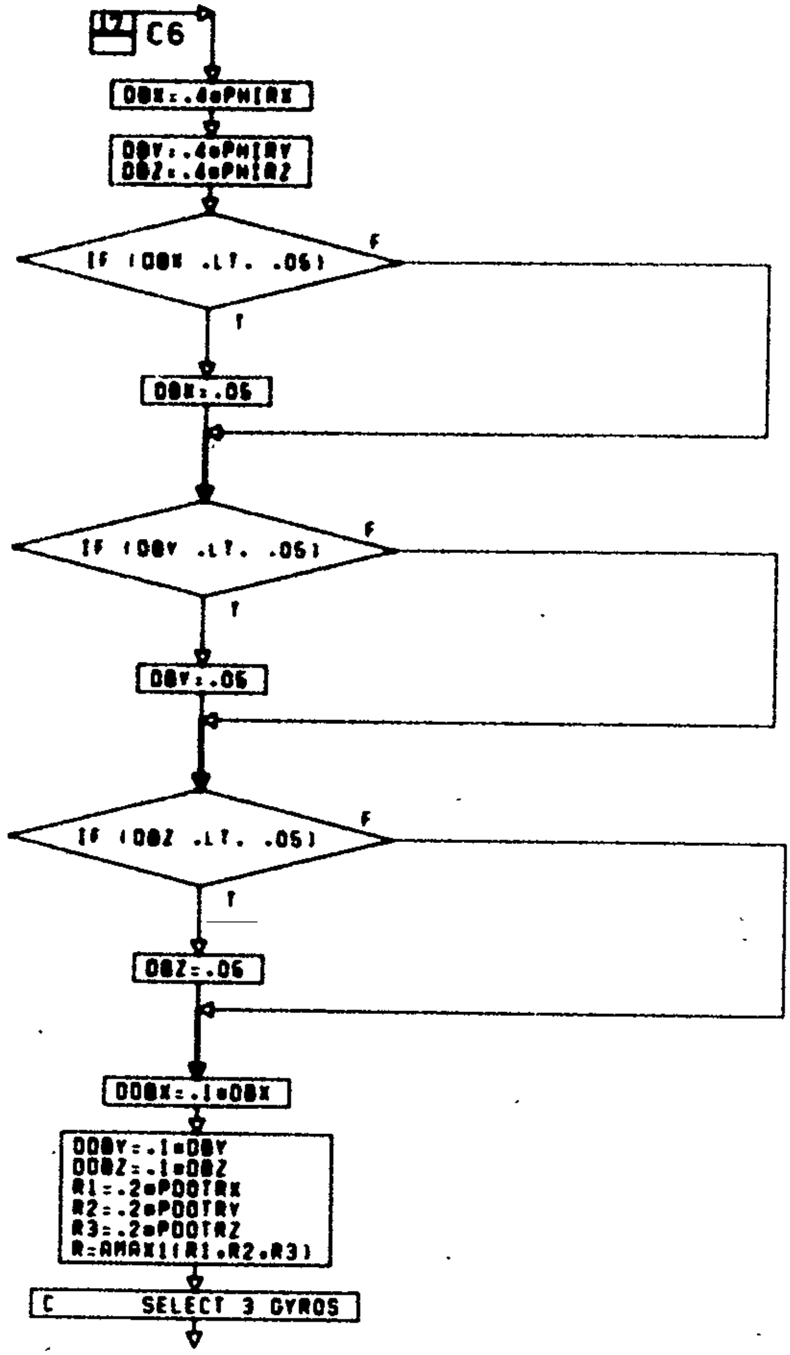
CONT. ON PG 16


C ASC
C GYROS
C EARTH SENSOR
C INITIALIZE
C5
300
IERR:0
I1:IDB(14)+1
I2:IDB(15)+1
ICHOSE(1):DATAB(1,I1)
ICHOSE(2):DATAB(1,I2)
I14:IDB(13)+1
ICHOSE(3):DATAB(1,I14)
IF (ITER .GT. 0)
F
T
GO TO 303
DO 302 I:1,8
302
NCHOSE(I):1
303
WT:WT+NCHOSE(1)*DATAB(23,I1)+NCHOSE(2)*DATAB(23,I2)+DATAB(24,I14)*
NCHOSE(3)
CONVWT:DATAB(23,I1)*NCHOSE(1)
VOL:VOL+NCHOSE(1)*DATAB(24,I1)+NCHOSE(2)*DATAB(24,I2)+
NCHOSE(3)*DATAB(24,I14)
PL:PL+NCHOSE(1)*DATAB(16,I1)+NCHOSE(2)*DATAB(16,I2)+NCHOSE(3)*
DATAB(16,I14)
PLMIN:PLMIN+NCHOSE(1)*DATAB(18,I1)+NCHOSE(2)*DATAB(18,I2)+
NCHOSE(3)*DATAB(18,I14)

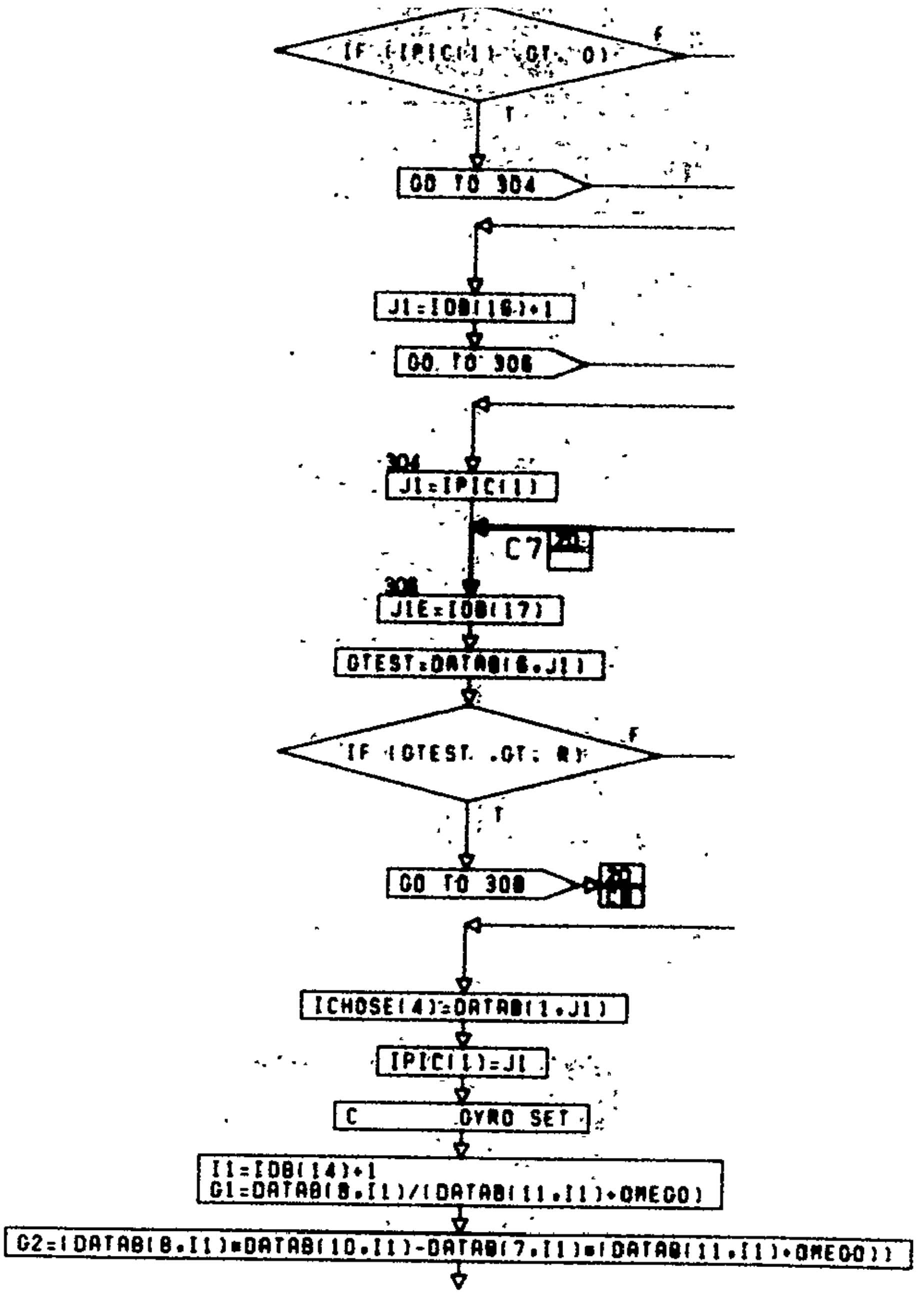
CONT. ON PG 17


DO 301 I=6,9
301
ICHOSE(I)=0
OMEGO=1.1864*10.**8/(24.053*1000.*1000.+6076.*ALT)**1.5
C CALCULATE F VALUES
F(1)=(DPHI*DT/57.3+.04*D)*FE/DY
F(2)=(DPHI*DT/57.3+.04*D)*FE/DZ
F(3)=2.*.04*D*DPHI/57.3*FE/DX
F(4)=XMD/DX
F(5)=YMD/DY
F(6)=ZMD/DZ
FMIN=AMAX1(F(1),F(2),F(3),F(4),F(5),F(6))
F(7)=PDOTRX*XJ/(DI*DX)
F(8)=PDOTRY*YJ/(DI*DY)
F(9)=PDOTRZ*ZJ/(DI*DZ)
FMAX=AMAX1(F(7),F(8),F(9))
IERR=0
C IERR IX % MAX RATE ERROR TOO SMALL
IF (FMAX .LT. 2.*FMIN)
F
T
IERR=IERR+10
FF=2.*FMIN
IF (FMAX .LT. FF)
F
T
FF=FMIN

CONT. ON PG 18

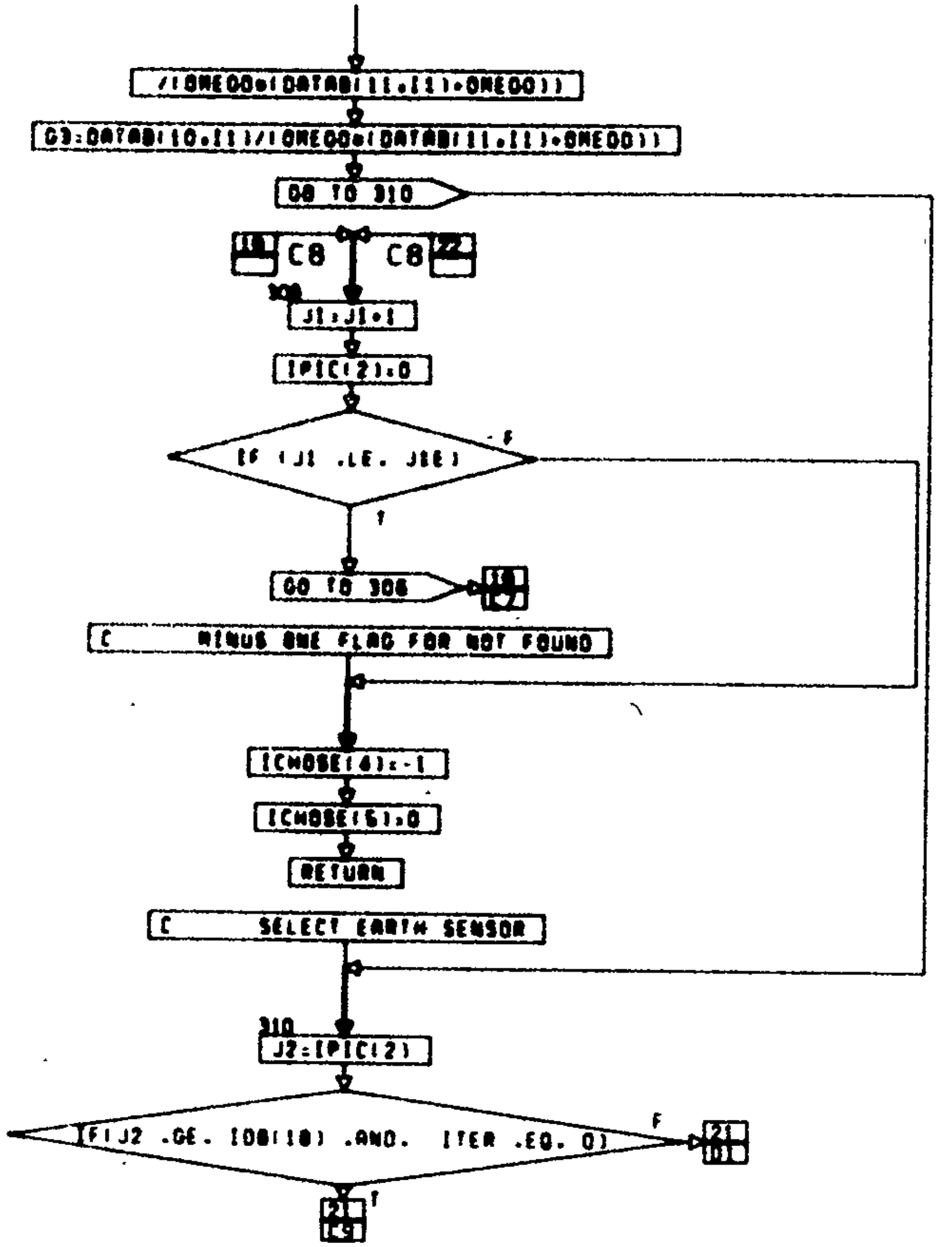

17
C6
DBX=.4*PHIRX
DBY=.4*PHIRY
DBZ=.4*PHIRZ
IF (DBX .LT. .06)
F
T
DBX=.06
IF (DBY .LT. .06)
F
T
DBY=.06
IF (DBZ .LT. .06)
F
T
DBZ=.06
DDBX=.1*DBX
DDBY=.1*DBY
DDBZ=.1*DBZ
R1=.2*PDOTRX
R2=.2*PDOTRY
R3=.2*PDOTRZ
R=AMAX1(R1,R2,R3)
C SELECT 3 GYROS

CONT. ON PG 19

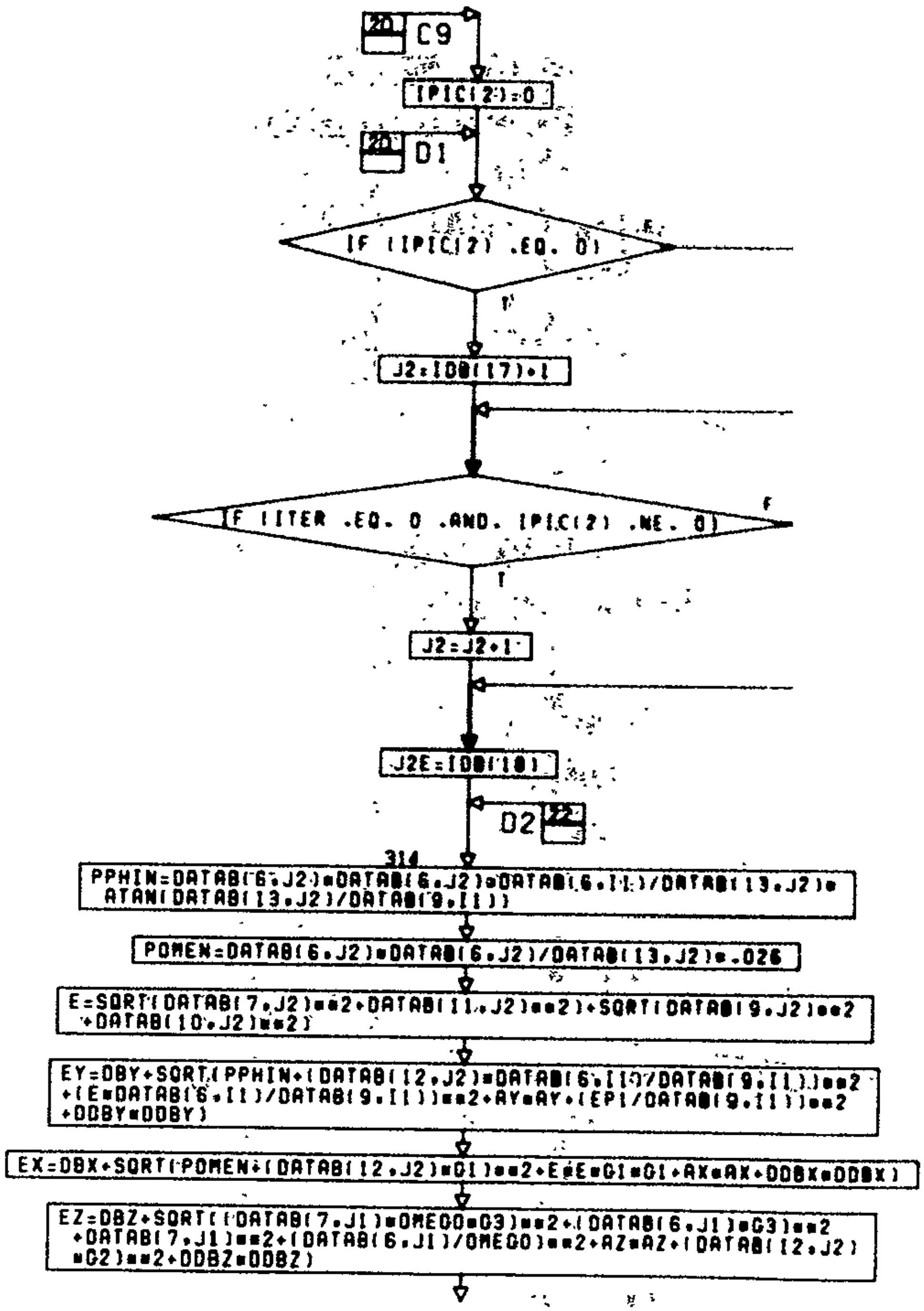


CONT. ON PG 20

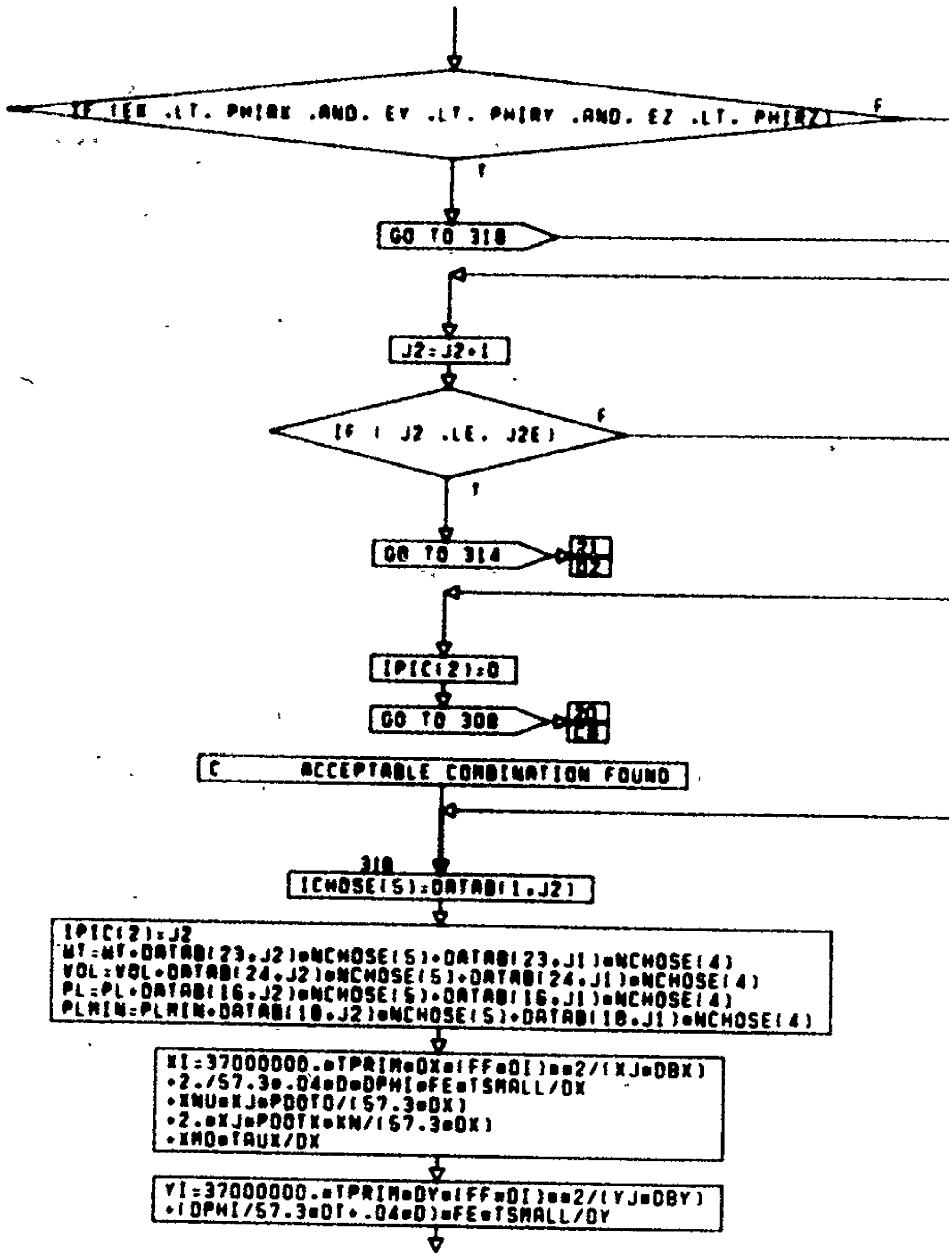
PG 19 OF 37


/(ONEDO+(DATAB(11,I1)+ONEDO))
G3=DATAB(10,I1)/(ONEDO+(DATAB(11,I1)+ONEDO))
GO TO 310
C8
C8
308
J1=J1+1
IPIC(2)=0
IF (J1 .LE. J1E)
F
T
GO TO 308
C   MINUS ONE FLAG FOR NOT FOUND
ICHOSE(4)=-1
ICHOSE(5)=0
RETURN
C   SELECT EARTH SENSOR
310
J2=IPIC(2)
IF(J2 .GE. IOB(18) .AND. ITER .EQ. 0)
F
T

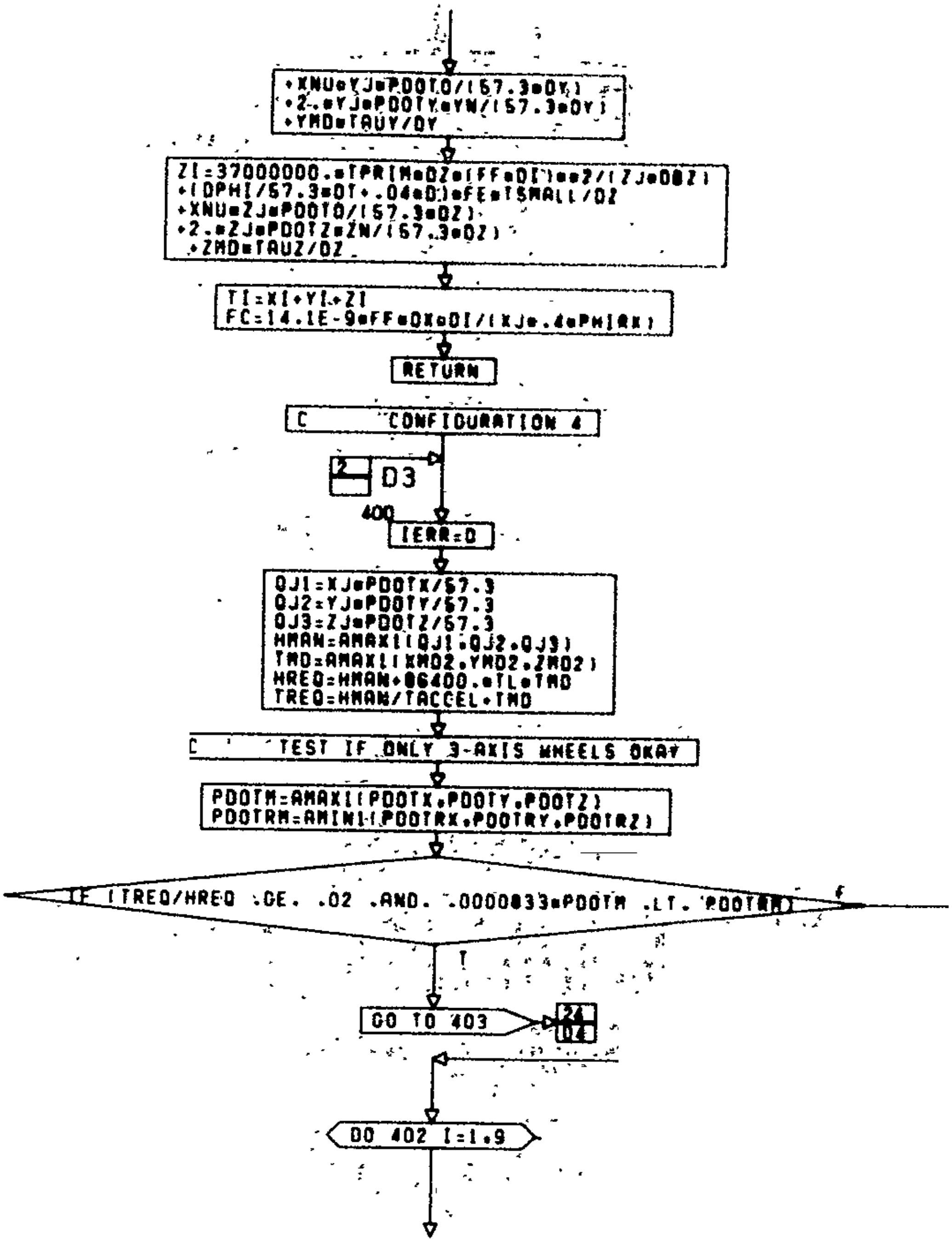
CONT. ON PG 21


20 C9
IPIC(2)=0
20 D1
IF (IPIC(2) .EQ. 0)
F
T
J2=IDB(17)+1
IF (ITER .EQ. 0 .AND. IPIC(2) .NE. 0)
F
T
J2=J2+1
J2E=IDB(18)
D2 22
314
PPHIN=DATAB(6,J2)*DATAB(6,J2)*DATAB(6,I1)/DATAB(13,J2)*ATAN(DATAB(13,J2)/DATAB(9,I1))
POMEN=DATAB(6,J2)*DATAB(6,J2)/DATAB(13,J2)*.026
E=SQRT(DATAB(7,J2)**2+DATAB(11,J2)**2)+SQRT(DATAB(9,J2)**2+DATAB(10,J2)**2)
EY=DBY+SQRT(PPHIN+(DATAB(12,J2)*DATAB(6,I1)/DATAB(9,I1))**2+(E*DATAB(6,I1)/DATAB(9,I1))**2+AY*AY+(EP1/DATAB(9,I1))**2+DDBY*DDBY)
EX=DBX+SQRT(POMEN+(DATAB(12,J2)*G1)**2+E*E*G1*G1+AX*AX+DDBX*DDBX)
EZ=DBZ+SQRT((DATAB(7,J1)*OMEGO*G3)**2+(DATAB(6,J1)*G3)**2+DATAB(7,J1)**2+(DATAB(6,J1)/OMEGO)**2+AZ*AZ+(DATAB(12,J2)*G2)**2+DDBZ*DDBZ)

CONT. ON PG 22

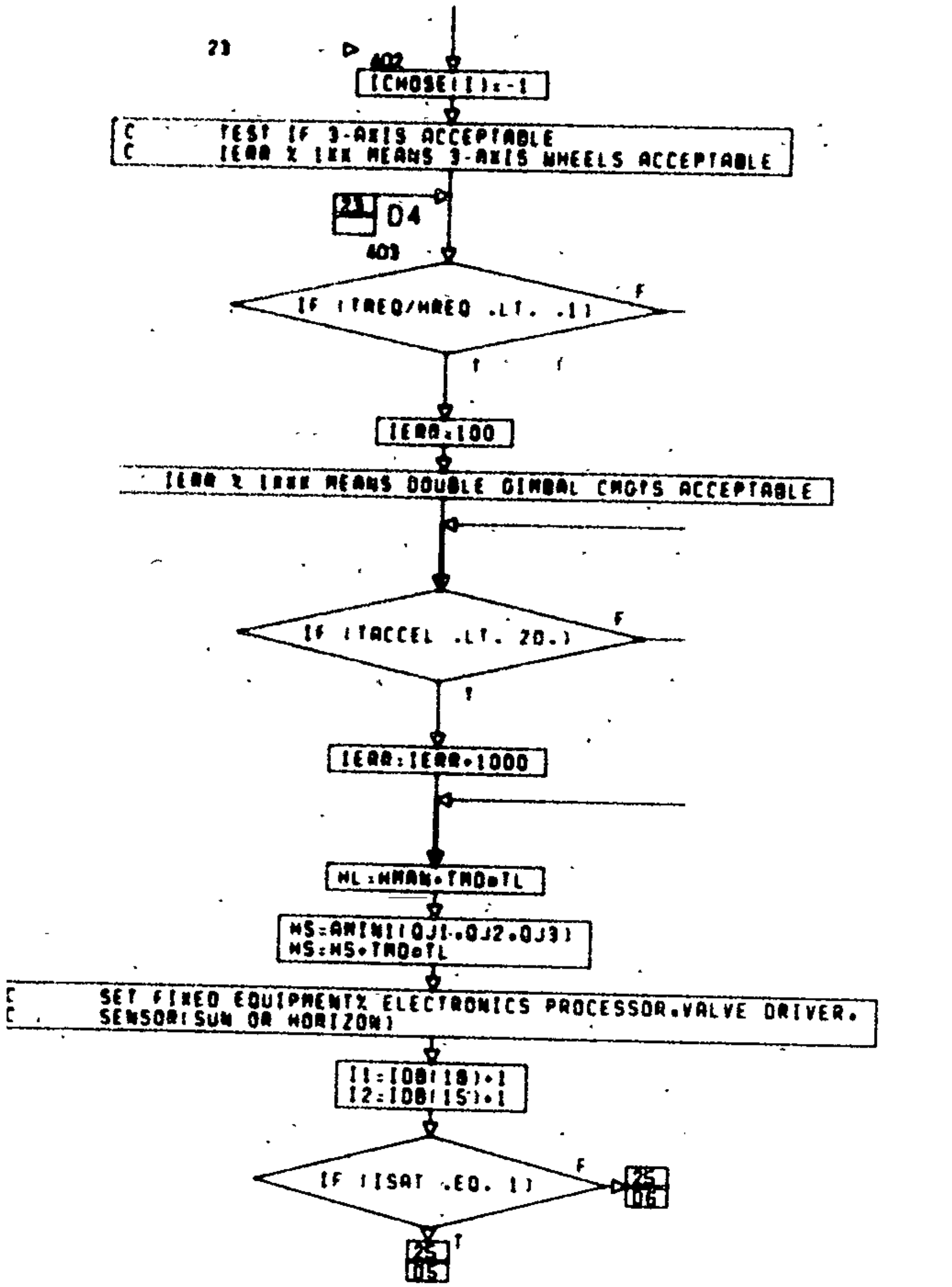

IF (EX .LT. PHIRX .AND. EY .LT. PHIRY .AND. EZ .LT. PHIRZ)
F
T
GO TO 318
J2=J2+1
IF (J2 .LE. J2E)
F
T
GO TO 314
IPIC(2)=0
GO TO 308
C ACCEPTABLE COMBINATION FOUND
318
ICHOSE(5)=DATAB(1,J2)
IPIC(2)=J2
WT=WT+DATAB(23,J2)*NCHOSE(5)+DATAB(23,J1)*NCHOSE(4)
VOL=VOL+DATAB(24,J2)*NCHOSE(5)+DATAB(24,J1)*NCHOSE(4)
PL=PL+DATAB(16,J2)*NCHOSE(5)+DATAB(16,J1)*NCHOSE(4)
PLMIN=PLMIN+DATAB(18,J2)*NCHOSE(5)+DATAB(18,J1)*NCHOSE(4)
XI=37000000.*TPRIM*DX*(FF*DI)**2/(XJ*DBX)
+2./57.3*.04*D*DPHI*FE*TSMALL/DX
+XNU*XJ*PDOTO/(57.3*DX)
+2.*XJ*PDOTX*XN/(57.3*DX)
+XMO*TAUX/DX
YI=37000000.*TPRIM*DY*(FF*DI)**2/(YJ*DBY)
+(DPHI/57.3*DT+.04*D)*FE*TSMALL/DY

CONT. ON PG 23

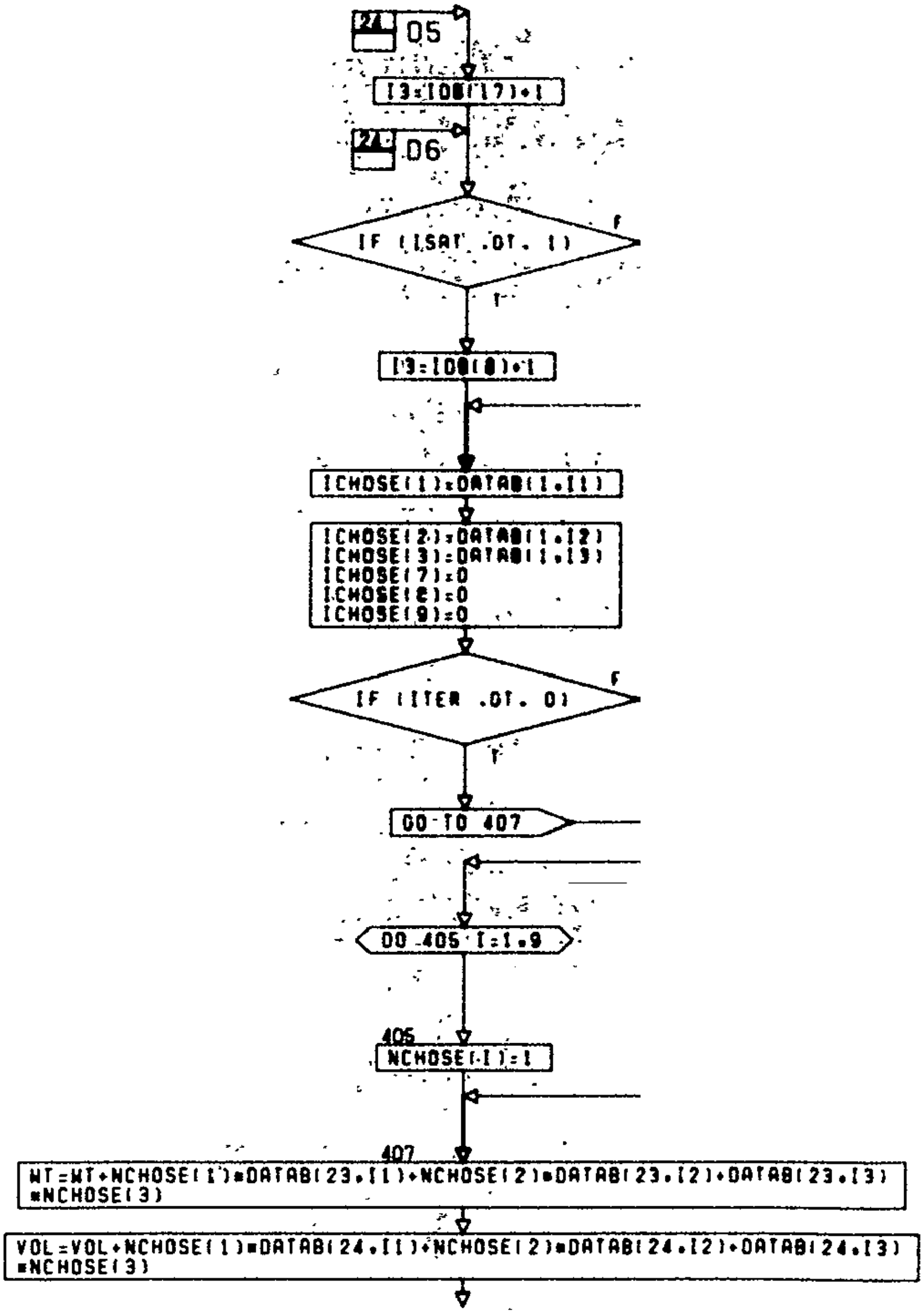


CONT. ON PG 24

PG 23 OF 37

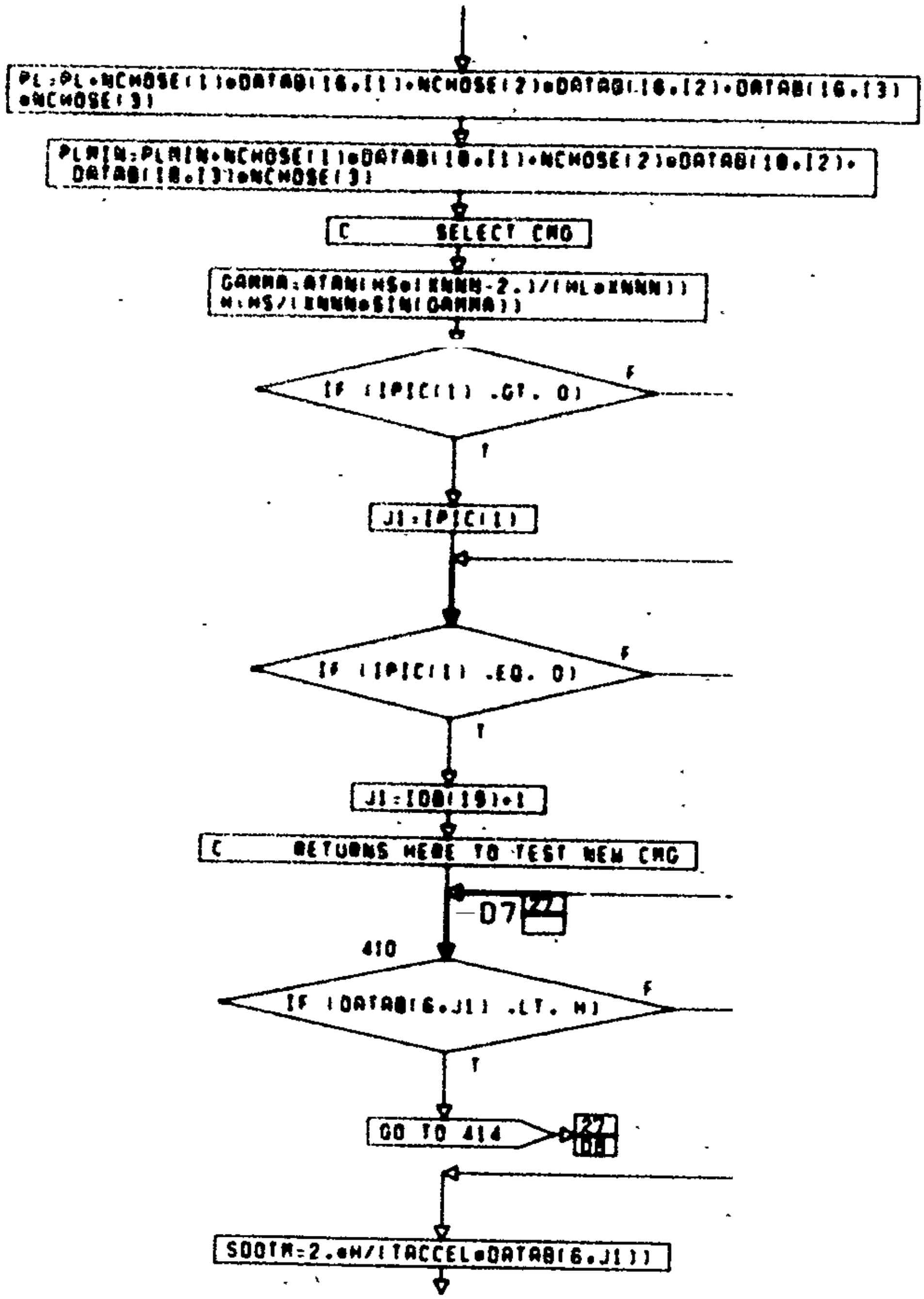

23
402
ICHOSE(I)=-1
C TEST IF 3-AXIS ACCEPTABLE
C IERR % 1XX MEANS 3-AXIS WHEELS ACCEPTABLE
23
D4
403
IF (TREQ/HREQ .LT. .1)
F
T
IERR=100
IERR % 1XXX MEANS DOUBLE GIMBAL CMGS ACCEPTABLE
IF (TACCEL .LT. 20.)
F
T
IERR=IERR+1000
HL=HMAN+TMD*TL
HS=AMIN1(QJ1,QJ2,QJ3)
HS=HS+TMD*TL
C SET FIXED EQUIPMENT% ELECTRONICS PROCESSOR,VALVE DRIVER,
C SENSOR(SUN OR HORIZON)
I1=IDB(18)+1
I2=IDB(15)+1
IF (ISAT .EQ. 1)
F
25
06
T
25
05

CONT. ON PG 25

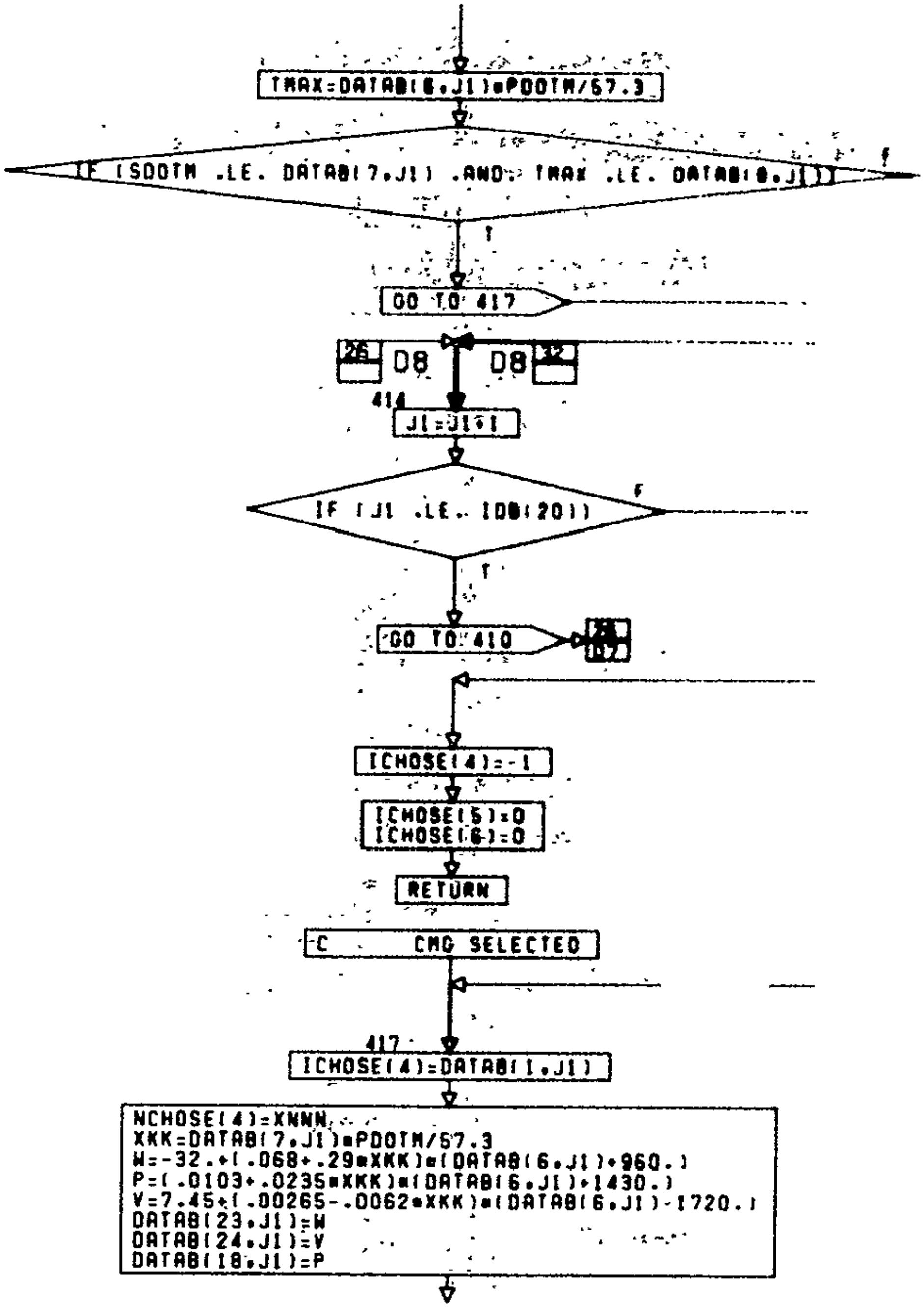


24 05
I3=IOB(17)+1
24 06
IF (ISAT .GT. 1)
F
T
I3=IOB(8)+1
ICHOSE(1)=DATAB(1,I1)
ICHOSE(2)=DATAB(1,I2)
ICHOSE(3)=DATAB(1,I3)
ICHOSE(7)=0
ICHOSE(8)=0
ICHOSE(9)=0
IF (ITER .GT. 0)
F
T
GO TO 407
DO 405 I=1,9
405
NCHOSE(I)=1
407
WT=WT+NCHOSE(1)*DATAB(23,I1)+NCHOSE(2)*DATAB(23,I2)+DATAB(23,I3)
*NCHOSE(3)
VOL=VOL+NCHOSE(1)*DATAB(24,I1)+NCHOSE(2)*DATAB(24,I2)+DATAB(24,I3)
*NCHOSE(3)

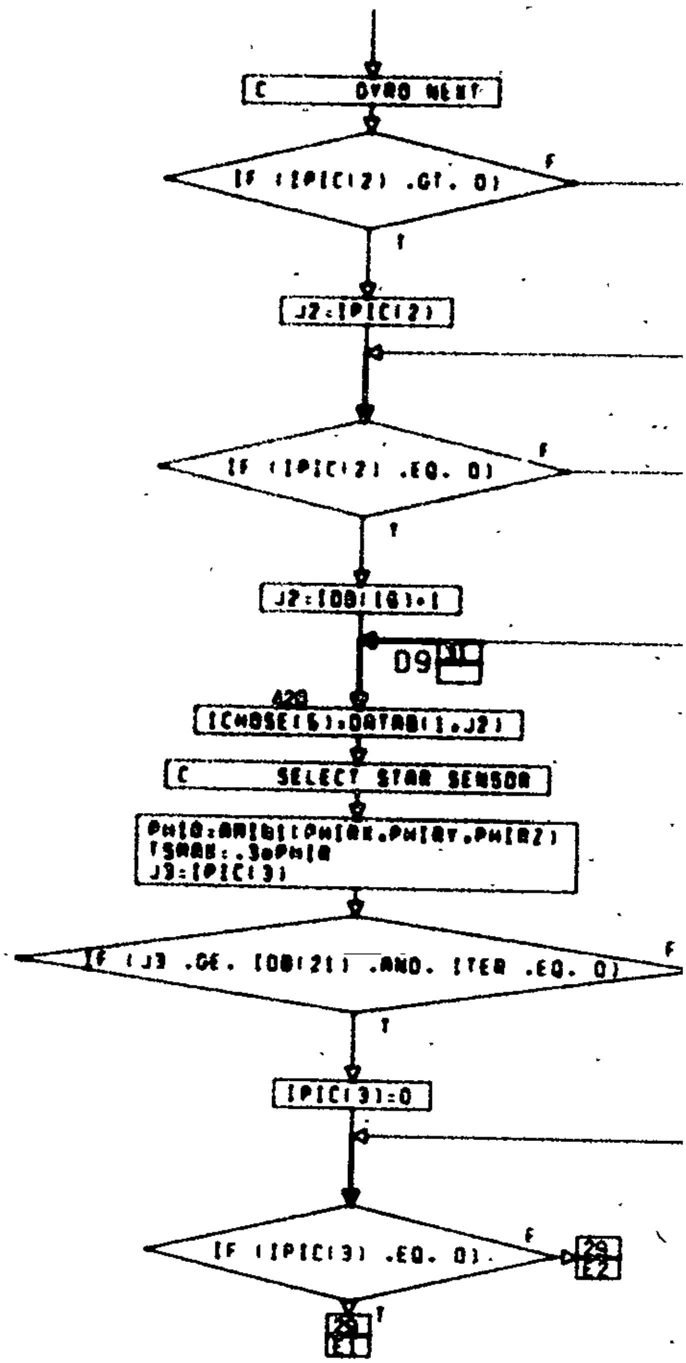
CONT. ON PG 26


PL:PL+NCHOSE(1)*DATAB(16,I1)+NCHOSE(2)*DATAB(16,I2)+DATAB(16,I3)
*NCHOSE(3)
PLMIN:PLMIN+NCHOSE(1)*DATAB(18,I1)+NCHOSE(2)*DATAB(18,I2)+
DATAB(18,I3)*NCHOSE(3)
C SELECT CMG
GAMMA:ATAN(HS*(XNNN-2.)/(HL*XNNN))
H:HS/(XNNN*SIN(GAMMA))
IF ((IPIC(1) .GT. 0)
F
T
J1:IPIC(1)
IF ((IPIC(1) .EQ. 0)
F
T
J1:IDB(19)+1
C RETURNS HERE TO TEST NEW CMG
D7
27
410
IF (DATAB(6,J1) .LT. H)
F
T
GO TO 414
27
D8
SDOTM=2.*H/(TACCEL*DATAB(6,J1))

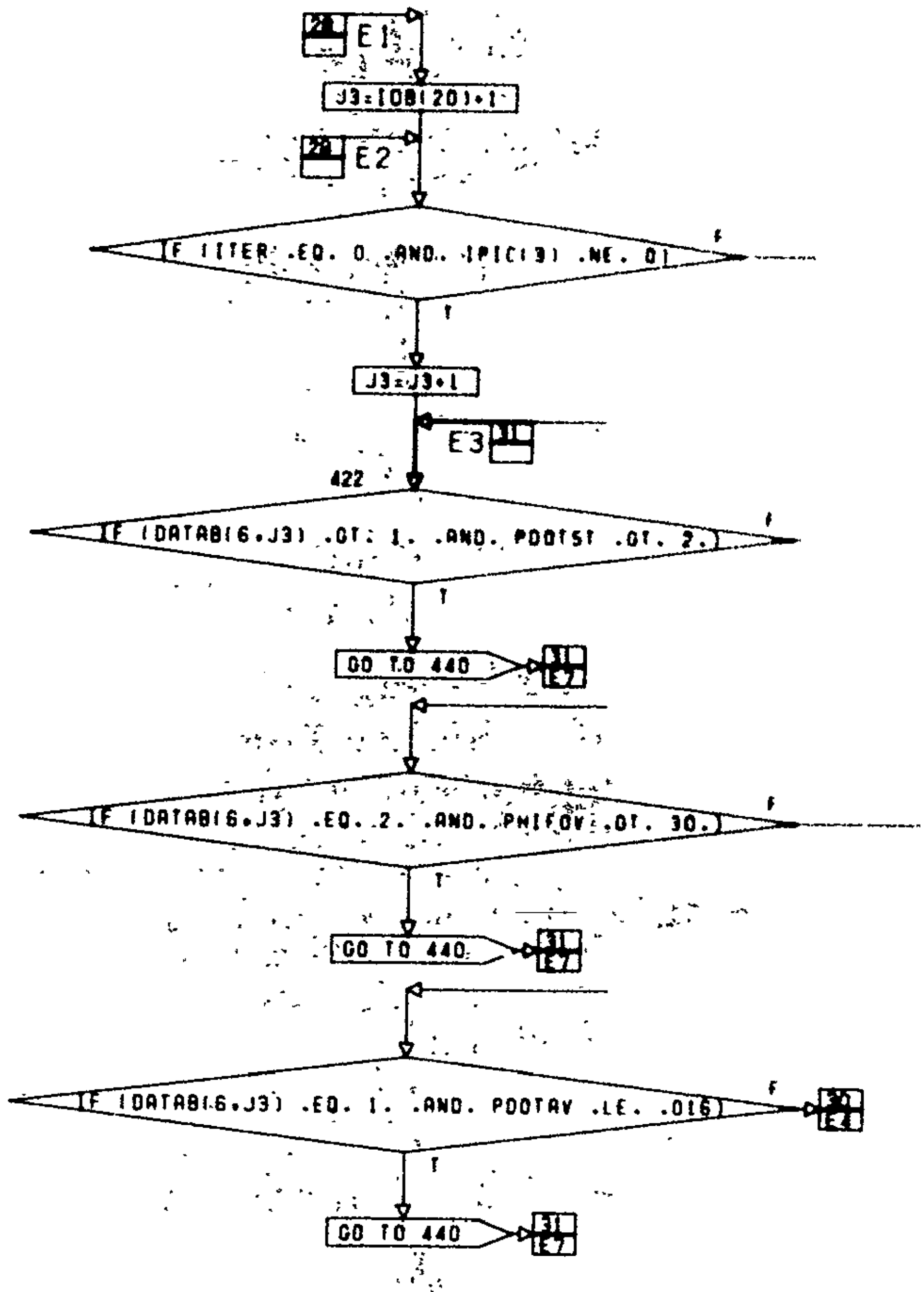
CONT. ON PG 27


TMAX=DATAB(6,J1)*PDOTM/57.3
IF (SDOTM .LE. DATAB(7,J1) .AND. TMAX .LE. DATAB(8,J1))
F
T
GO TO 417
26
D8
D8
32
414
J1=J1+1
IF (J1 .LE. IDB(20))
F
T
GO TO 410
26
D7
ICHOSE(4)=-1
ICHOSE(5)=0
ICHOSE(6)=0
RETURN
C CMG SELECTED
417
ICHOSE(4)=DATAB(1,J1)
NCHOSE(4)=XNNN
XKK=DATAB(7,J1)*PDOTM/57.3
W=-32.+(.068+.29*XKK)*(DATAB(6,J1)+960.)
P=(.0103+.0235*XKK)*(DATAB(6,J1)+1430.)
V=7.45+(.00265-.0062*XKK)*(DATAB(6,J1)-1720.)
DATAB(23,J1)=W
DATAB(24,J1)=V
DATAB(18,J1)=P

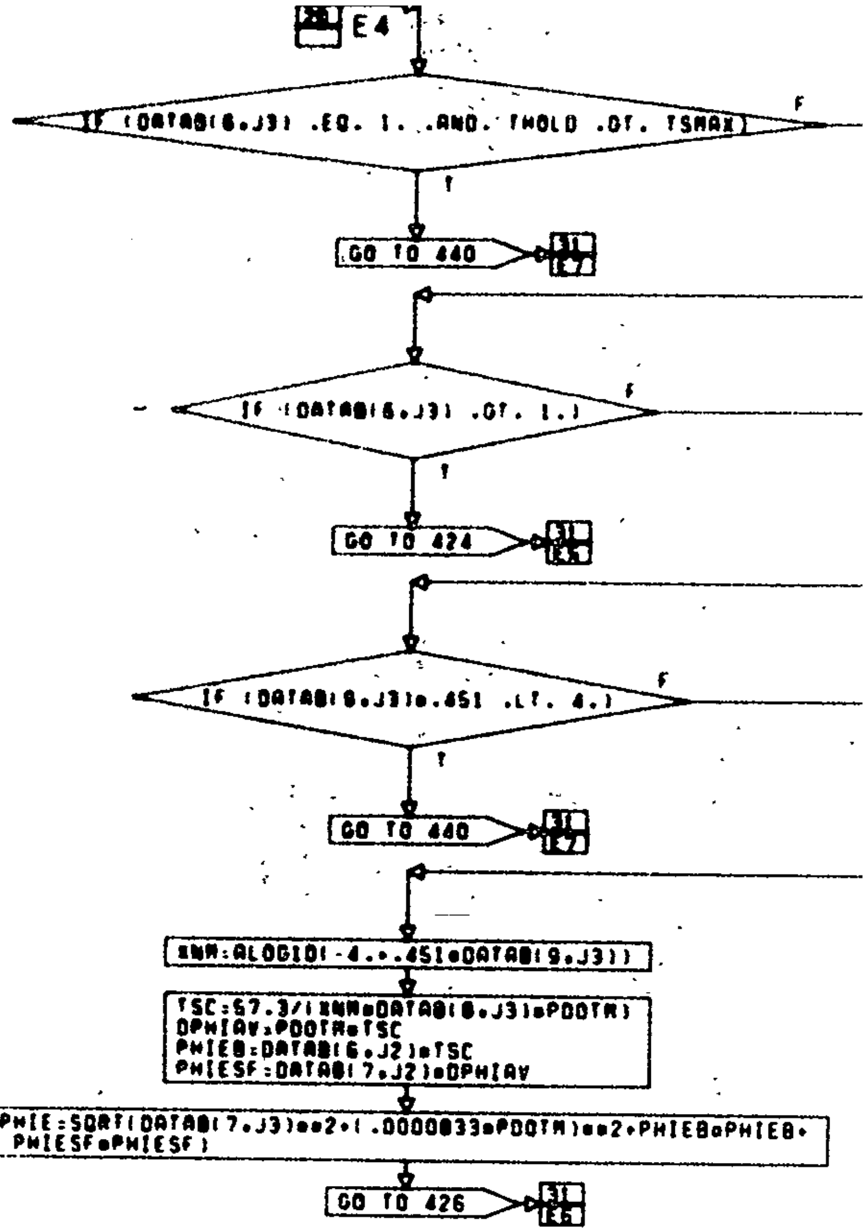
CONT. ON PG 28


C GYRO NEXT
IF (IPIC(2) .GT. 0)
J2=IPIC(2)
IF (IPIC(2) .EQ. 0)
J2=IDB(6)+1
D9
420
ICHOSE(5)=DATAB(1,J2)
C SELECT STAR SENSOR
PHIQ=AMIN1(PHIRX,PHIRY,PHIRZ)
TSAAB=.3*PHIQ
J3=IPIC(3)
IF (J3 .GE. IDB(21) .AND. ITER .EQ. 0)
IPIC(3)=0
IF (IPIC(3) .EQ. 0)
29
E2
E1

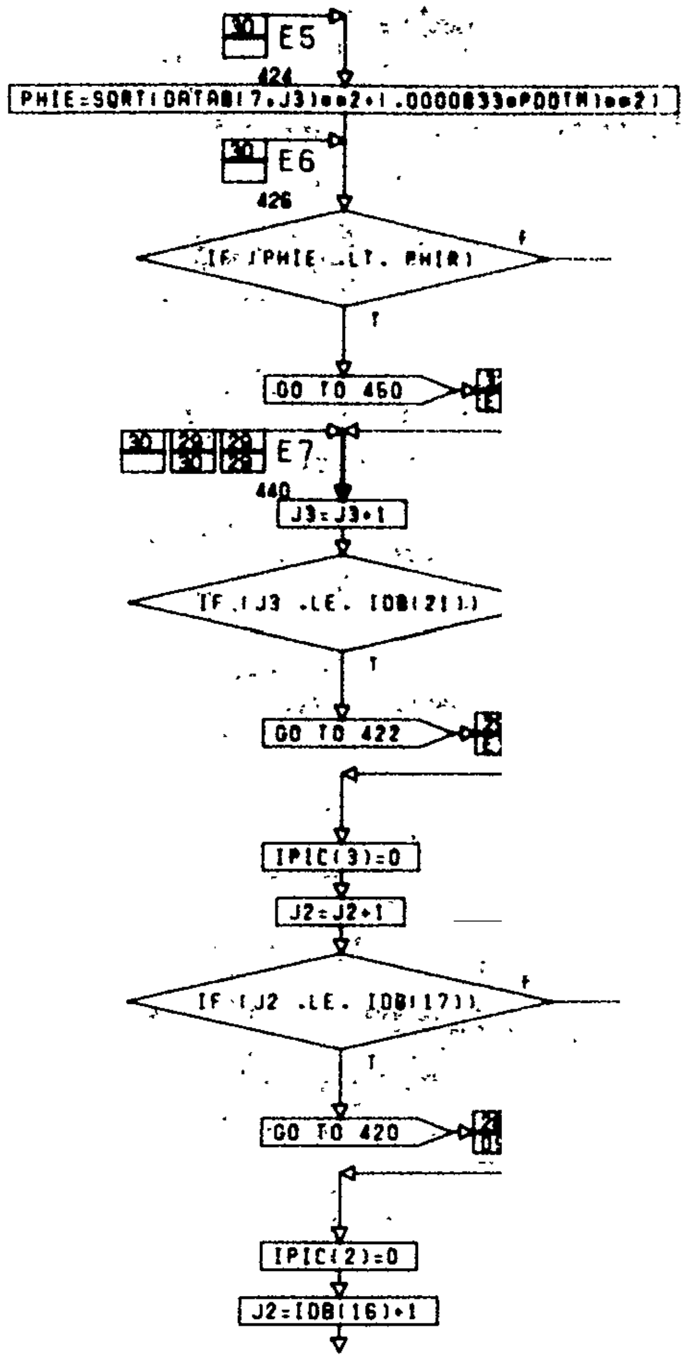
CONT. ON PG 29


E1
J3=IDB(20)+1
E2
IF (ITER .EQ. 0 .AND. IPIC(3) .NE. 0)
J3=J3+1
E3
422
IF (DATAB(6,J3) .GT. 1. .AND. PODTST .GT. 2.)
GO TO 440
31
E7
IF (DATAB(6,J3) .EQ. 2. .AND. PHIFOV .GT. 30.)
GO TO 440
31
E7
IF (DATAB(6,J3) .EQ. 1. .AND. PODTAV .LE. .016)
30
E4
GO TO 440
31
E7

CONT. ON PG 30


E4
IF (DATAB(6,J3) .EQ. 1. .AND. THOLD .GT. TSMAX)
F
T
GO TO 440
31
E7
IF (DATAB(6,J3) .GT. 1.)
F
T
GO TO 424
31
E5
IF (DATAB(8,J3)*.451 .LT. 4.)
F
T
GO TO 440
31
E7
XNM=ALOG10(-4.+.451*DATAB(9,J3))
TSC=57.3/(XNM*DATAB(8,J3)*PDOTM)
DPHIAV=PDOTM*TSC
PHIEB=DATAB(6,J2)*TSC
PHIESF=DATAB(7,J2)*DPHIAV
PHIE=SQRT(DATAB(7,J3)**2+(.0000833*PDOTM)**2+PHIEB*PHIEB+
PHIESF*PHIESF)
GO TO 426
31
E6

CONT. ON PG 31

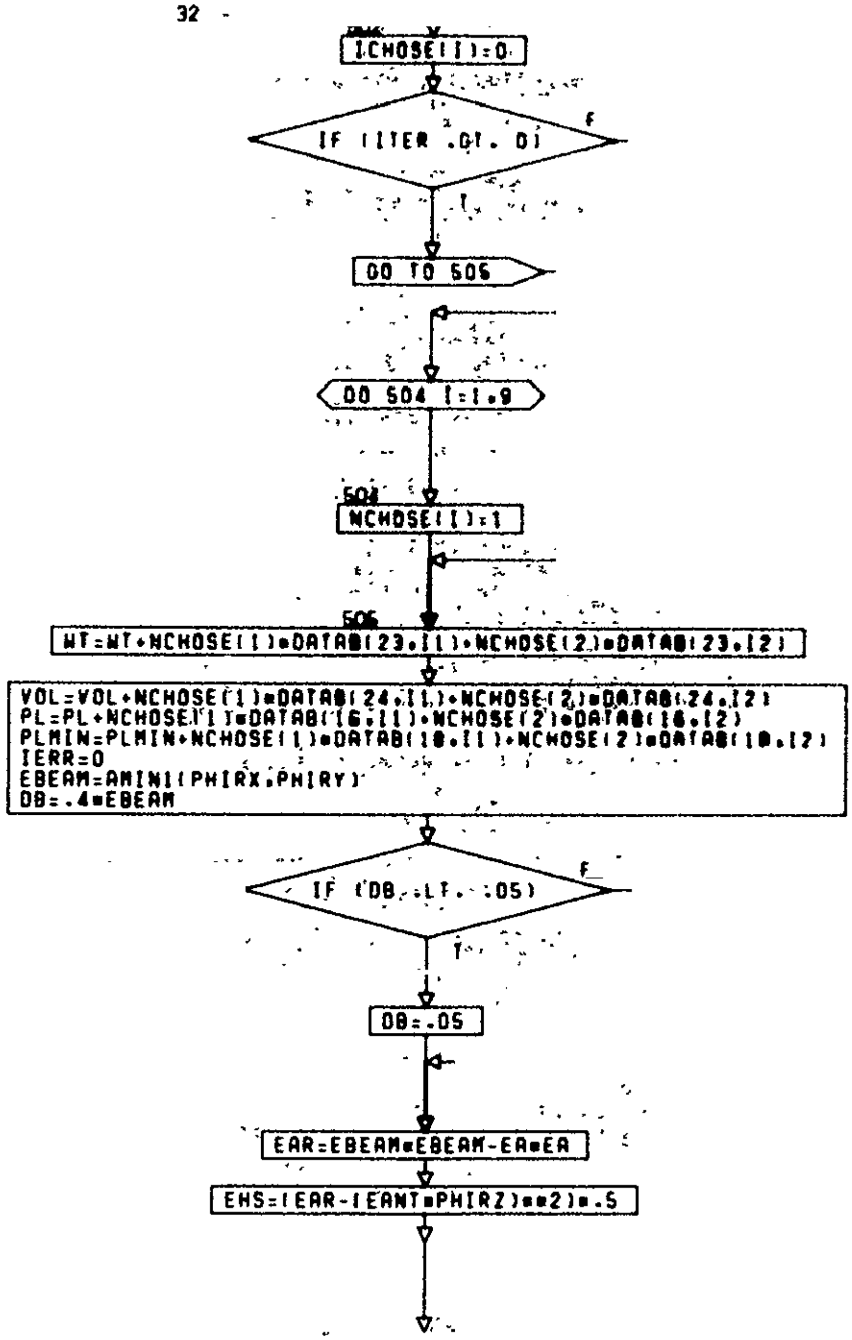

30
E5
424
PHIE=SQRT(DATAB(7,J3)**2+(.0000833*PDOT(M))**2)
30
E6
426
IF (PHIE .LT. PHI(R))
F
T
GO TO 450
30
20
30
20
20
E7
440
J3=J3+1
IF (J3 .LE. IDB(2))
T
GO TO 422
IPIC(3)=0
J2=J2+1
IF (J2 .LE. IDB(17))
F
T
GO TO 420
IPIC(2)=0
J2=IDB(16)+1

CONT. ON PG# 32

```
GO TO 414 ──> 27 / 10

C      ACCEPTABLE COMBINATION FOUND

31  E8
460
ICHOSE(6)=DATAB(1,J3)

IPIC(1)=J1
IPIC(2)=J2
IPIC(3)=J3
WT=WT+W*XNNN+NCHOSE(5)*DATAB(23,J2)+NCHOSE(6)*DATAB(23,J3)
VOL=VOL+V*XNNN+NCHOSE(5)*DATAB(24,J2)+NCHOSE(6)*DATAB(24,J3)
PL=PL+P*XNNN+NCHOSE(5)*DATAB(16,J2)+NCHOSE(6)*DATAB(16,J3)

PLMIN=PLMIN+DATAB(18,J1)*XNNN+NCHOSE(5)*DATAB(18,J2)+NCHOSE(6)*
 DATAB(18,J3)

C      NOW THRUST AND IMPULSE

F(1)=(DPMI*BT/57.3+.04*D)*FE/DY
F(2)=(DPMI*BT/57.3+.04*D)*FE/DZ
F(3)=2./57.3*.04*D*DPMI*FE/DX
FF=AMAX1(F(1),F(2),F(3))

TI=(F(1)+F(2)+F(3))*BI
 +XMU*PDOTO/57.3*(XJ/DX+YJ/DY+ZJ/DZ)
 +TPRIM*2602000.*(XMD/DX+YMD/DY+ZMD/DZ)

FC=FF*DX*DI/(XJ*.4*PMI(RH))*14.1E-9

RETURN

C      CONFIGURATION 5
C      SELECT FIXED EQUIPMENT

1  E9
500
I1=IDB(15)+1

I2=IDB(21)+1
ICHOSE(1)=DATAB(1,I1)
ICHOSE(2)=DATAB(1,I2)
OMEGO=1.1864*10.**8/(24.053*1000.*1000.+6076.*ALT)**1.5

DO 502 I=5,9   - - -  > 33
```

CONT. ON PG 33

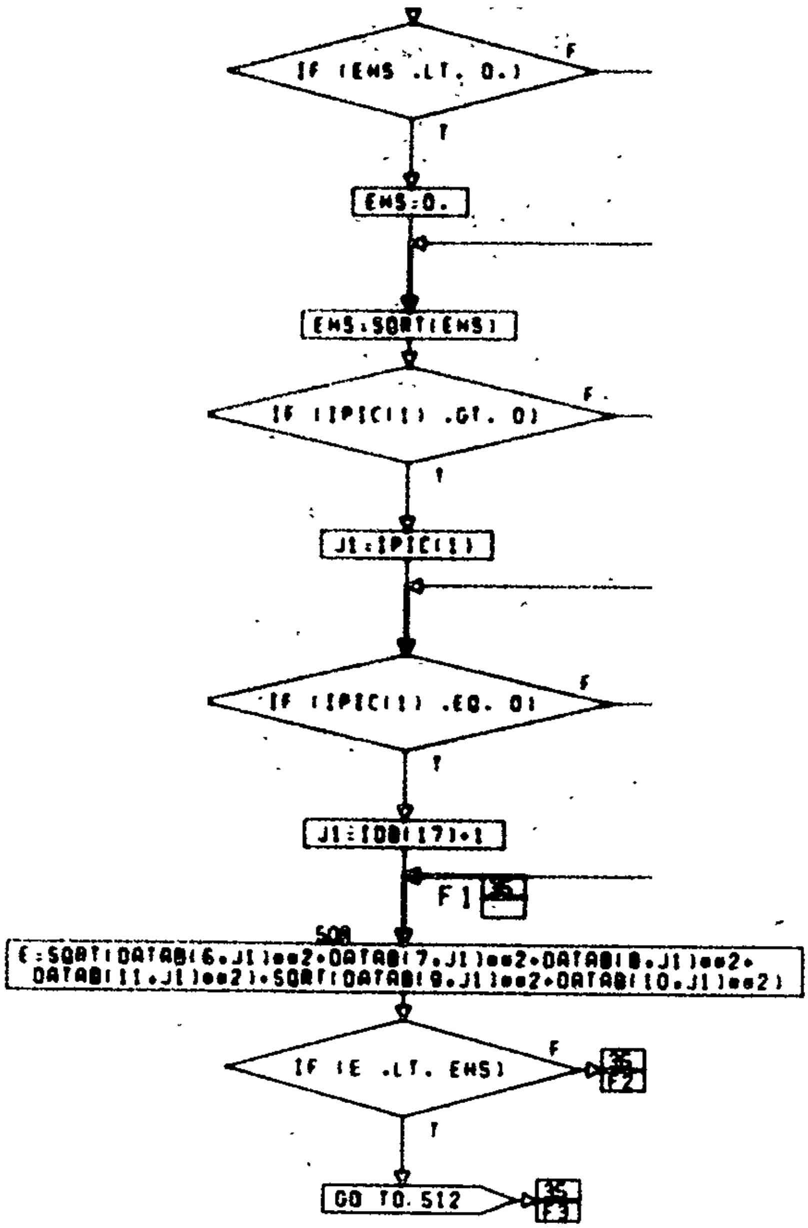
PG 32 OF 37



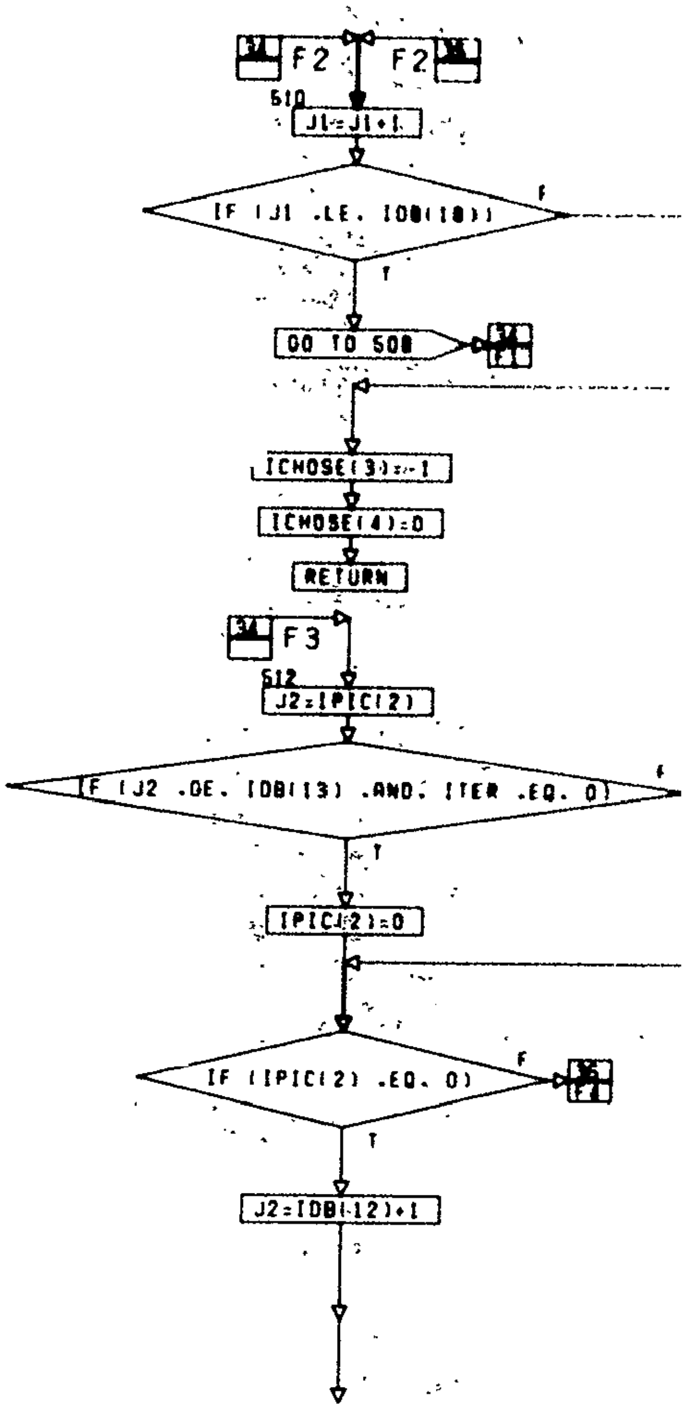
CONT. ON PG 34

PG 33OF

185

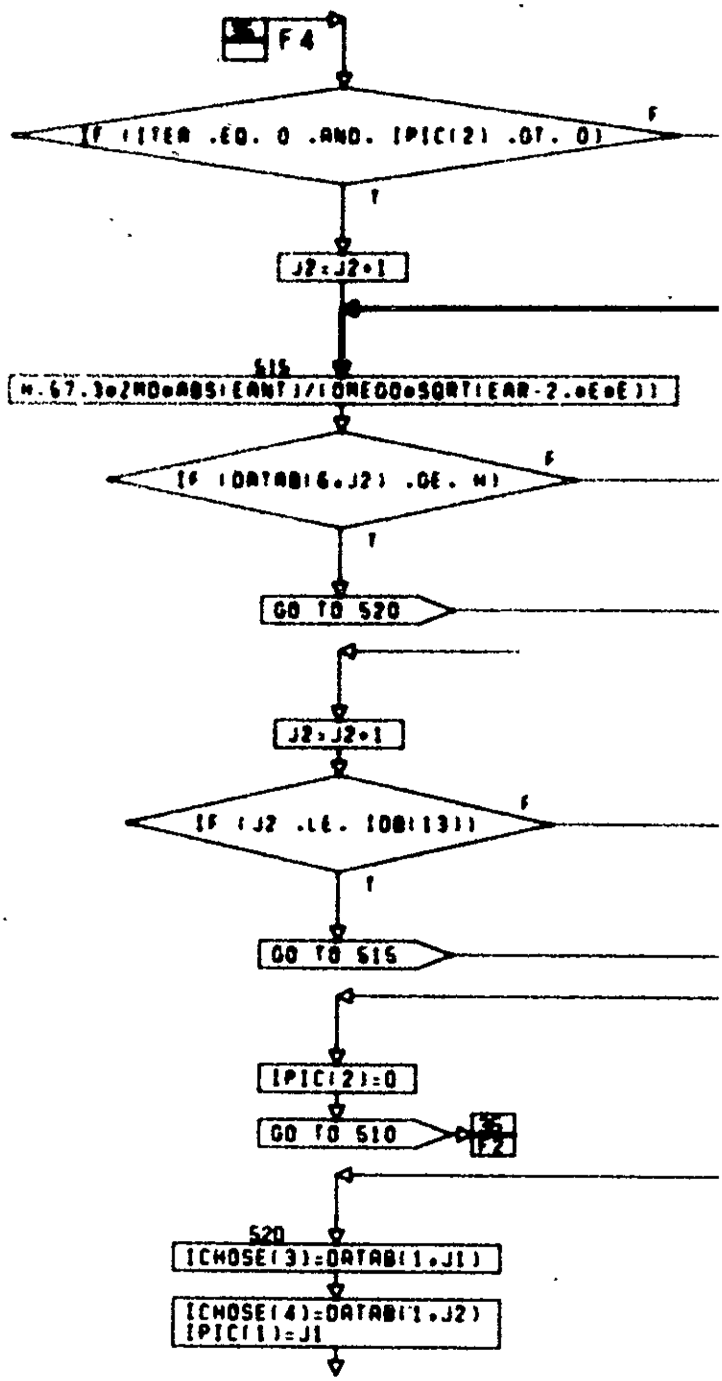

IF (EMS .LT. 0.)
F
T
EMS=0.
EMS=SQRT(EMS)
IF (IPIC(1) .GT. 0)
F
T
J1=IPIC(1)
IF (IPIC(1) .EQ. 0)
F
T
J1=IDB(17)+1
F1
35
508
E=SQRT(DATAB(6,J1)**2+DATAB(7,J1)**2+DATAB(8,J1)**2+
DATAB(11,J1)**2)+SQRT(DATAB(9,J1)**2+DATAB(10,J1)**2)
IF (E .LT. EMS)
F
35
F2
T
GO TO 512
35
F3

CONT. ON PG 35

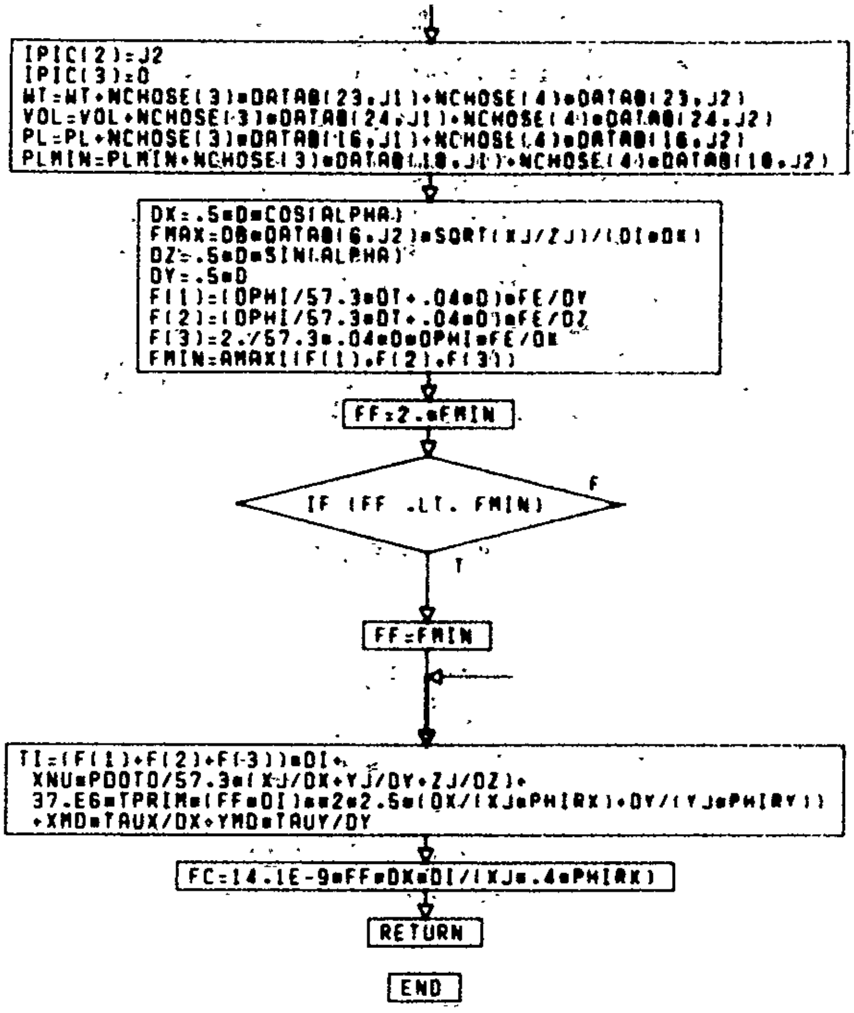


CONT. ON PG 36

PG 35DF

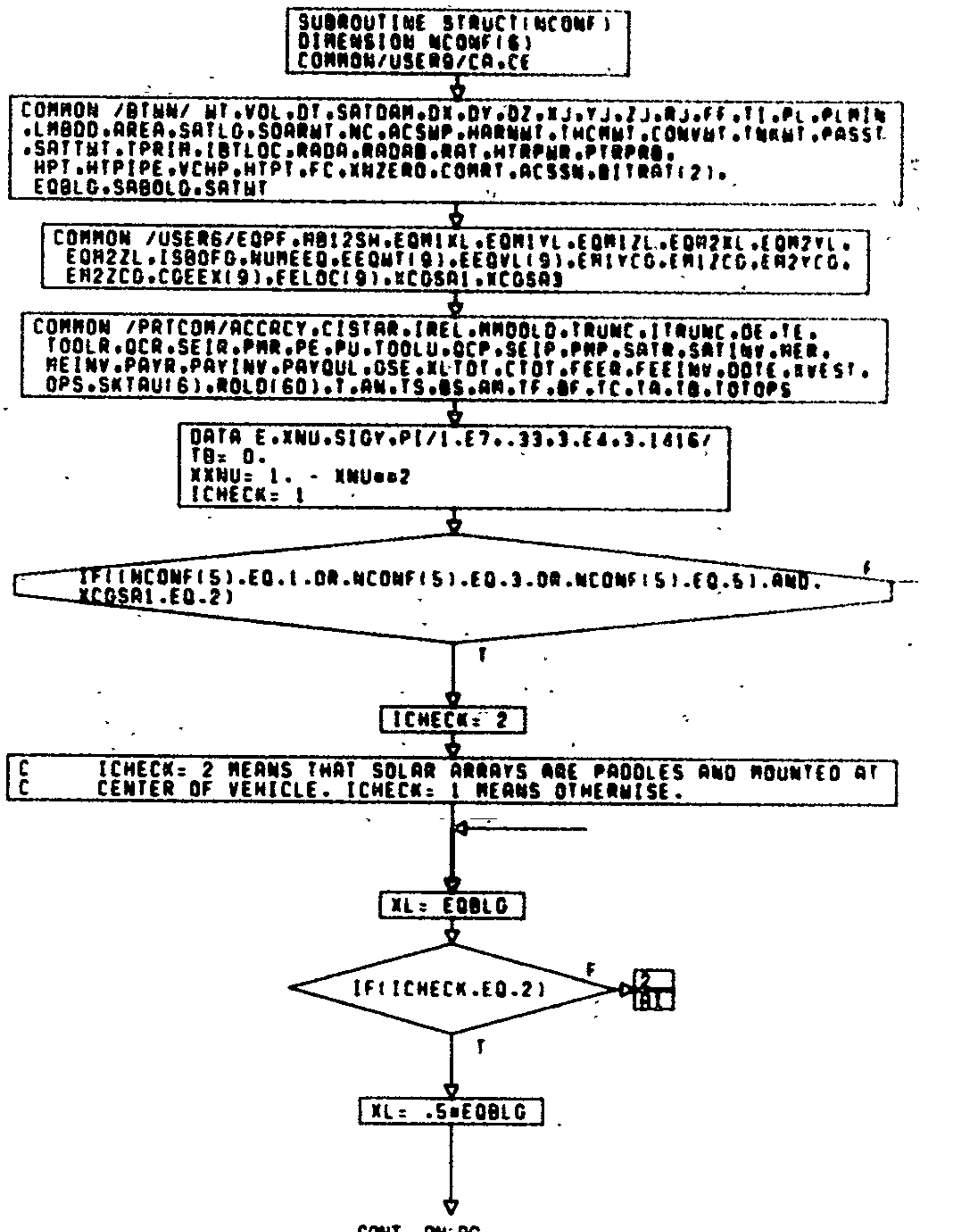

F4
IF (ITER .EQ. 0 .AND. IPIC(2) .GT. 0)
J2=J2+1
515
H=67.3*ZMD*ABS(EANT)/(ONEDD*SQRT(EAR-2.*E*E))
IF (DATAB(6,J2) .GE. H)
GO TO 520
J2=J2+1
IF (J2 .LE. IOB(13))
GO TO 515
IPIC(2)=0
GO TO 510
F2
520
ICHOSE(3)=DATAB(1,J1)
ICHOSE(4)=DATAB(1,J2)
IPIC(1)=J1

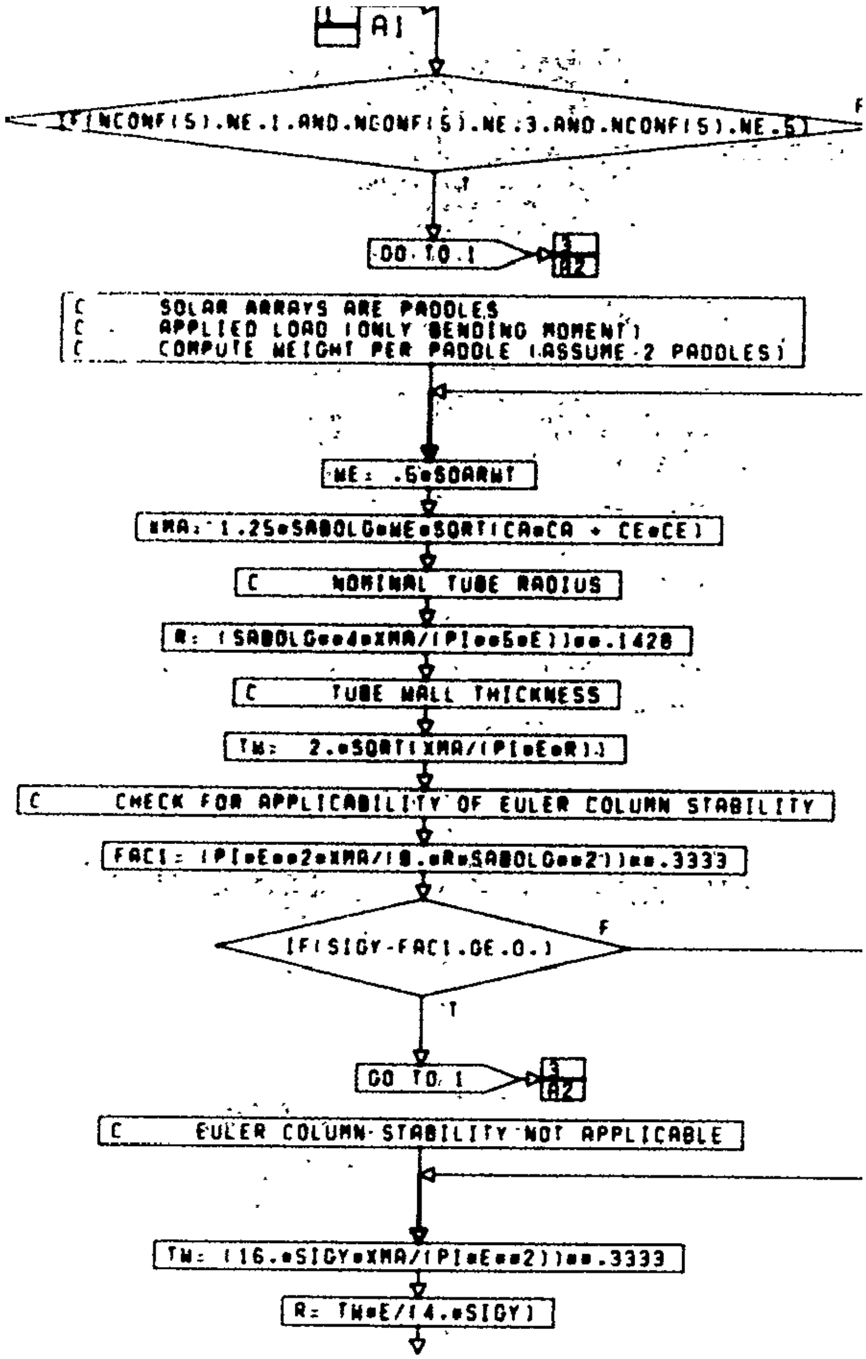
CONT. ON PG 37



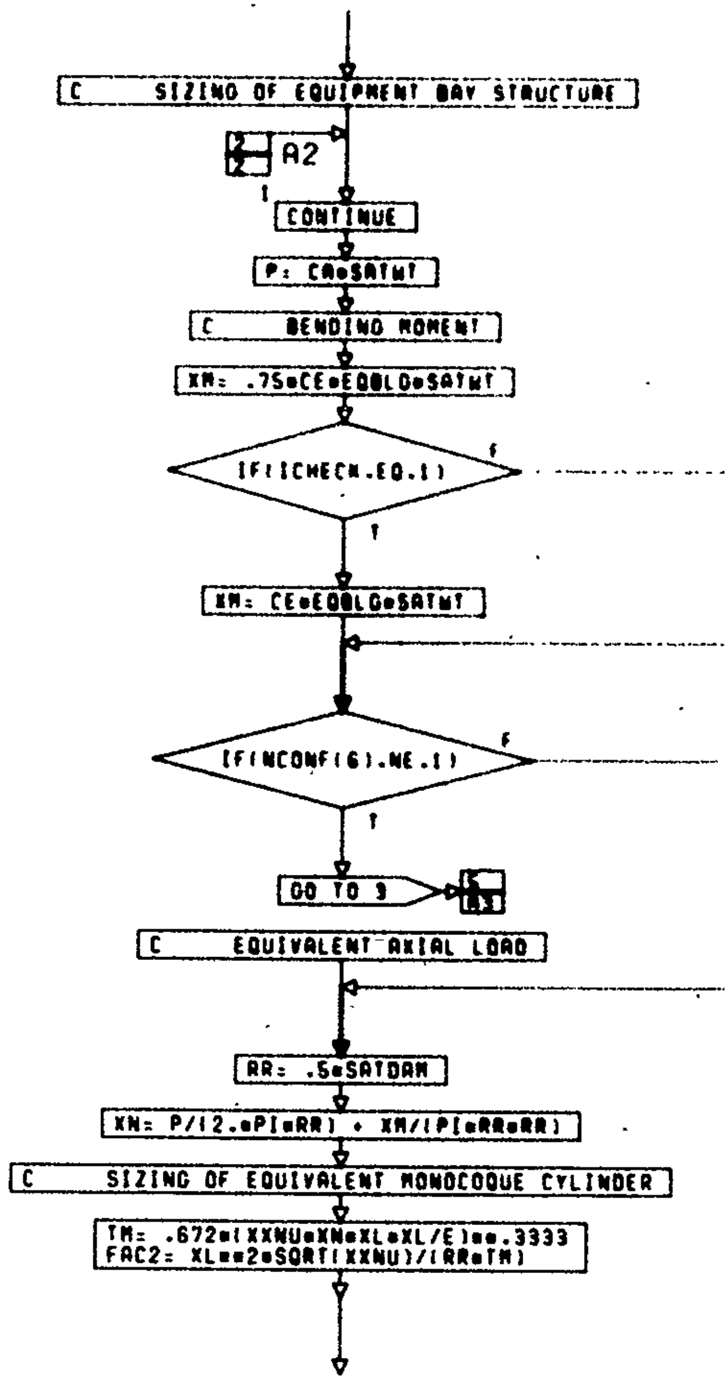
ORIGINAL PAGE IS
OF POOR QUALITY

PG 37 FINAL

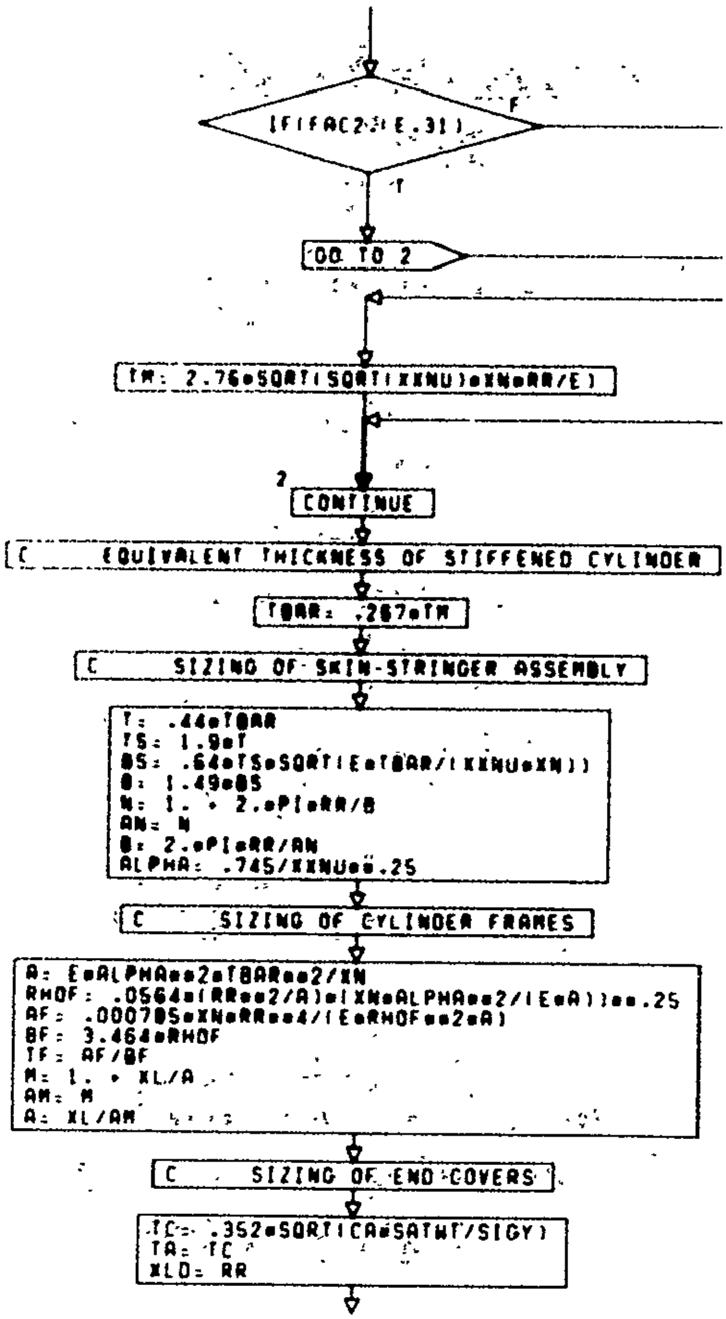

SUBROUTINE STRUCT(NCONF)
DIMENSION NCONF(6)
COMMON/USER9/CA,CE
COMMON /BTWN/ WT,VOL,DT,SATDAM,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,LMBDD,AREA,SATLO,SOARWT,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASST,SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,PTRPRO,HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSW,BITRAT(2),EQBLG,SABOLD,SATWT
COMMON /USER6/EQPF,MB12SW,EQM1XL,EQM1YL,EQM1ZL,EQM2XL,EQM2YL,EQM2ZL,ISBOFG,NUMEEQ,EEQWT(9),EEQVL(9),EM1YCG,EM1ZCG,EM2YCG,EM2ZCG,CGEEX(9),FELOC(9),XCOSA1,XCOSA3
COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMODLD,TRUNC,ITRUNC,DE,TE,TOOLR,QCR,SEIR,PMR,PE,PU,TOOLU,QCP,SEIP,PMP,SATR,SATINV,MER,MEINV,PAYR,PAYINV,PAYQUL,OSE,XLTOT,CTOT,FEER,FEEINV,DDTE,RVEST,OPS,SKTAU(6),ROLD(60),T,AN,TS,BS,AM,TF,BF,TC,TA,TB,TOTOPS
DATA E,XNU,SIGY,PI/1.E7,.33,3.E4,3.1416/
TB= 0.
XXNU= 1. - XNU**2
ICHECK= 1
IF((NCONF(5).EQ.1.OR.NCONF(5).EQ.3.OR.NCONF(5).EQ.5).AND.XCOSA1.EQ.2)
F
T
ICHECK= 2
C ICHECK= 2 MEANS THAT SOLAR ARRAYS ARE PADDLES AND MOUNTED AT
C CENTER OF VEHICLE. ICHECK= 1 MEANS OTHERWISE.
XL= EQBLG
IF(ICHECK.EQ.2)
F
2
B1
T
XL= .5*EQBLG
CONT. ON PG
PG 1 OF 7


A1
IF(NCONF(5).NE.1.AND.NCONF(5).NE.3.AND.NCONF(5).NE.5)
F
T
GO TO 1
3
A2
C SOLAR ARRAYS ARE PADDLES
C APPLIED LOAD (ONLY BENDING MOMENT)
C COMPUTE WEIGHT PER PADDLE (ASSUME 2 PADDLES)
WE= .5*SOARWT
XMA= 1.25*SABOLG*WE*SQRT(CA*CA + CE*CE)
C NOMINAL TUBE RADIUS
R= (SABOLG**4*XMA/(PI**5*E))**.1428
C TUBE WALL THICKNESS
TW= 2.*SQRT(XMA/(PI*E*R))
C CHECK FOR APPLICABILITY OF EULER COLUMN STABILITY
FAC1= (PI*E**2*XMA/(8.*R*SABOLG**2))**.3333
IF(SIGY-FAC1.GE.0.)
F
T
GO TO 1
3
A2
C EULER COLUMN STABILITY NOT APPLICABLE
TW= (16.*SIGY*XMA/(PI*E**2))**.3333
R= TW*E/(4.*SIGY)

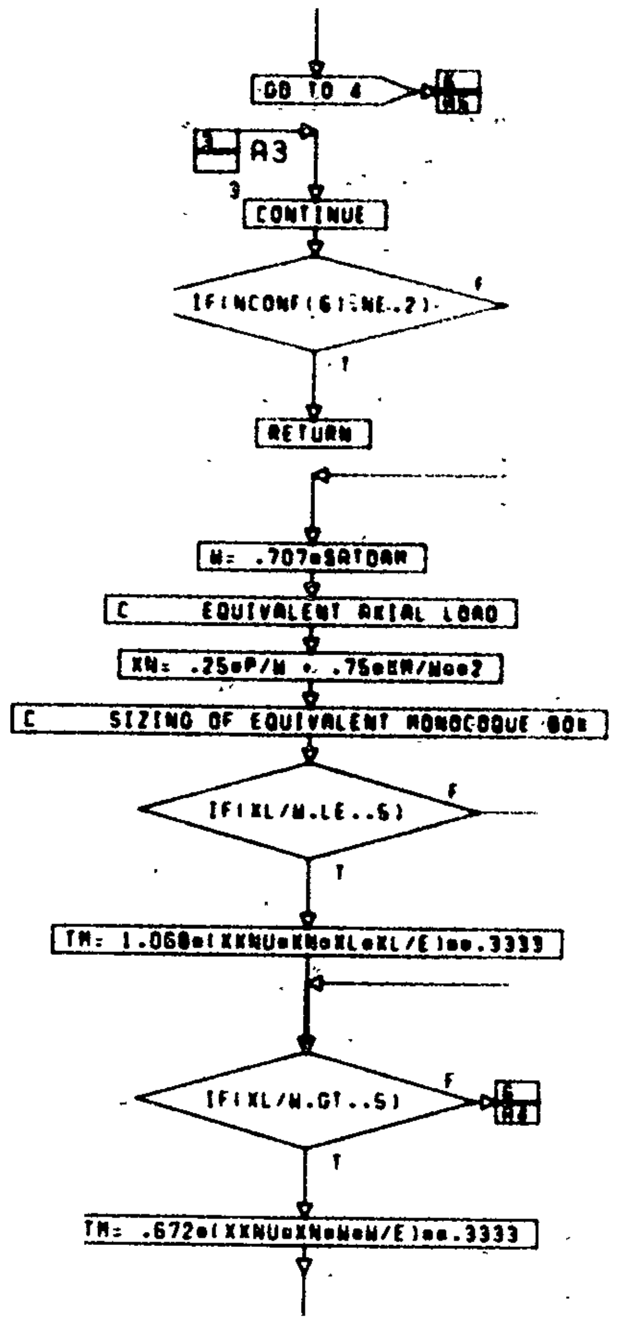
CONT. ON PG 3


C SIZING OF EQUIPMENT BAY STRUCTURE
A2
CONTINUE
P= CA*SATWT
C BENDING MOMENT
XM= .75*CE*EQBLD*SATWT
IF(ICHECK.EQ.1)
F
T
XM= CE*EQBLG*SATWT
IF(NCONF(6).NE.1)
F
T
GO TO 9
C EQUIVALENT AXIAL LOAD
RR= .5*SATDAM
XN= P/(2.*PI*RR) + XM/(PI*RR*RR)
C SIZING OF EQUIVALENT MONOCOQUE CYLINDER
TM= .672*(XXNU*XN*XL*XL/E)**.3333
FAC2= XL**2*SQRT(XXNU)/(RR*TM)

CONT. ON PG 4

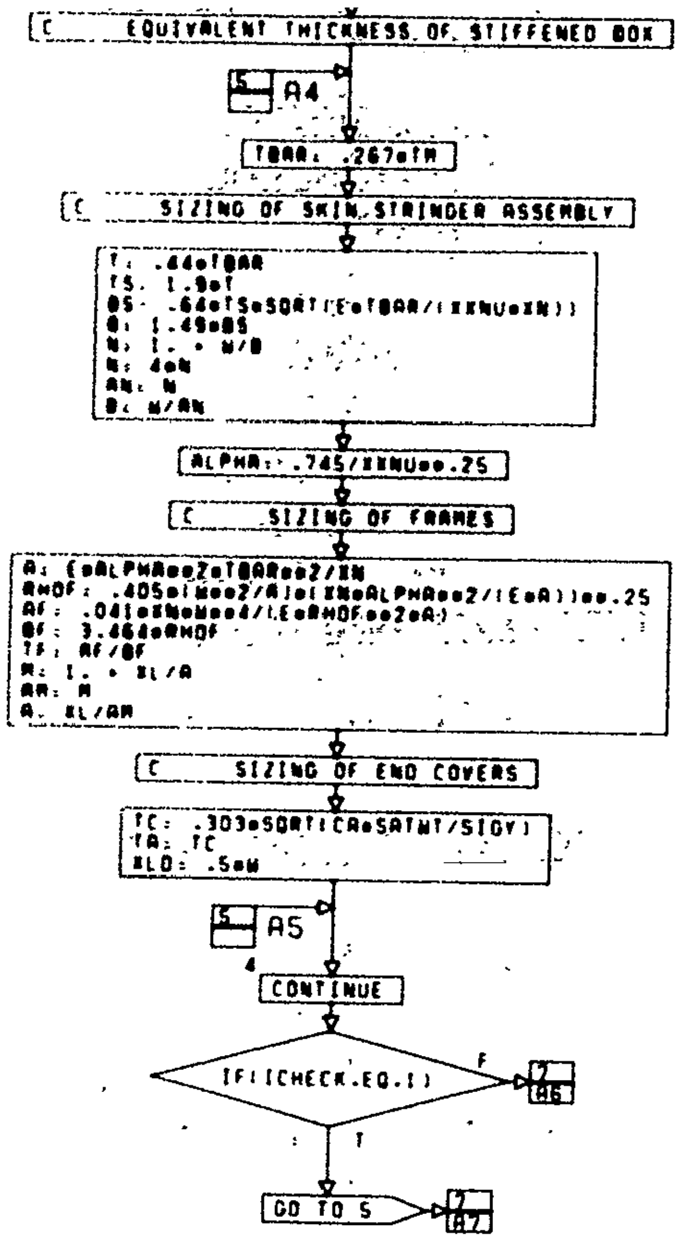

IF(FAC2.LE.31)
F
T
GO TO 2
TW= 2.76*SQRT(SQRT(XXNU)*XN*RR/E)
2
CONTINUE
C EQUIVALENT THICKNESS OF STIFFENED CYLINDER
TBAR= .267*TW
C SIZING OF SKIN-STRINGER ASSEMBLY
T= .44*TBAR
TS= 1.9*T
BS= .64*TS*SQRT(E*TBAR/(XXNU*XN))
B= 1.49*BS
N= 1. + 2.*PI*RR/B
AN= N
B= 2.*PI*RR/AN
ALPHA= .745/XXNU**.25
C SIZING OF CYLINDER FRAMES
A= E*ALPHA**2*TBAR**2/XN
RHOF= .0564*(RR**2/A)*(XN*ALPHA**2/(E*A))**.25
AF= .000785*XN*RR**4/(E*RHOF**2*A)
BF= 3.464*RHOF
TF= AF/BF
M= 1. + XL/A
AM= M
A= XL/AM
C SIZING OF END COVERS
TC= .352*SQRT(CA*SATWT/SIGY)
TA= TC
XLD= RR

CONT. ON PG 5

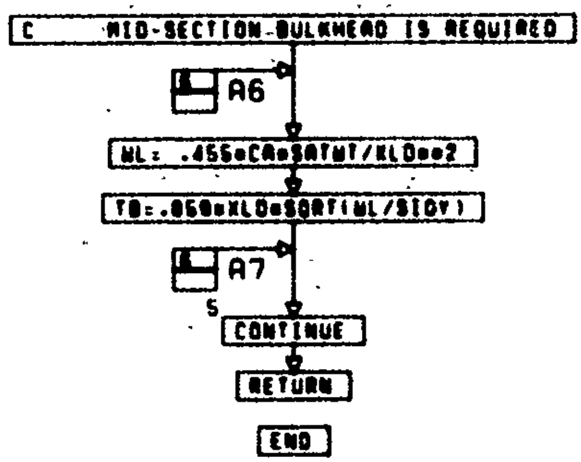


CONT. ON PG

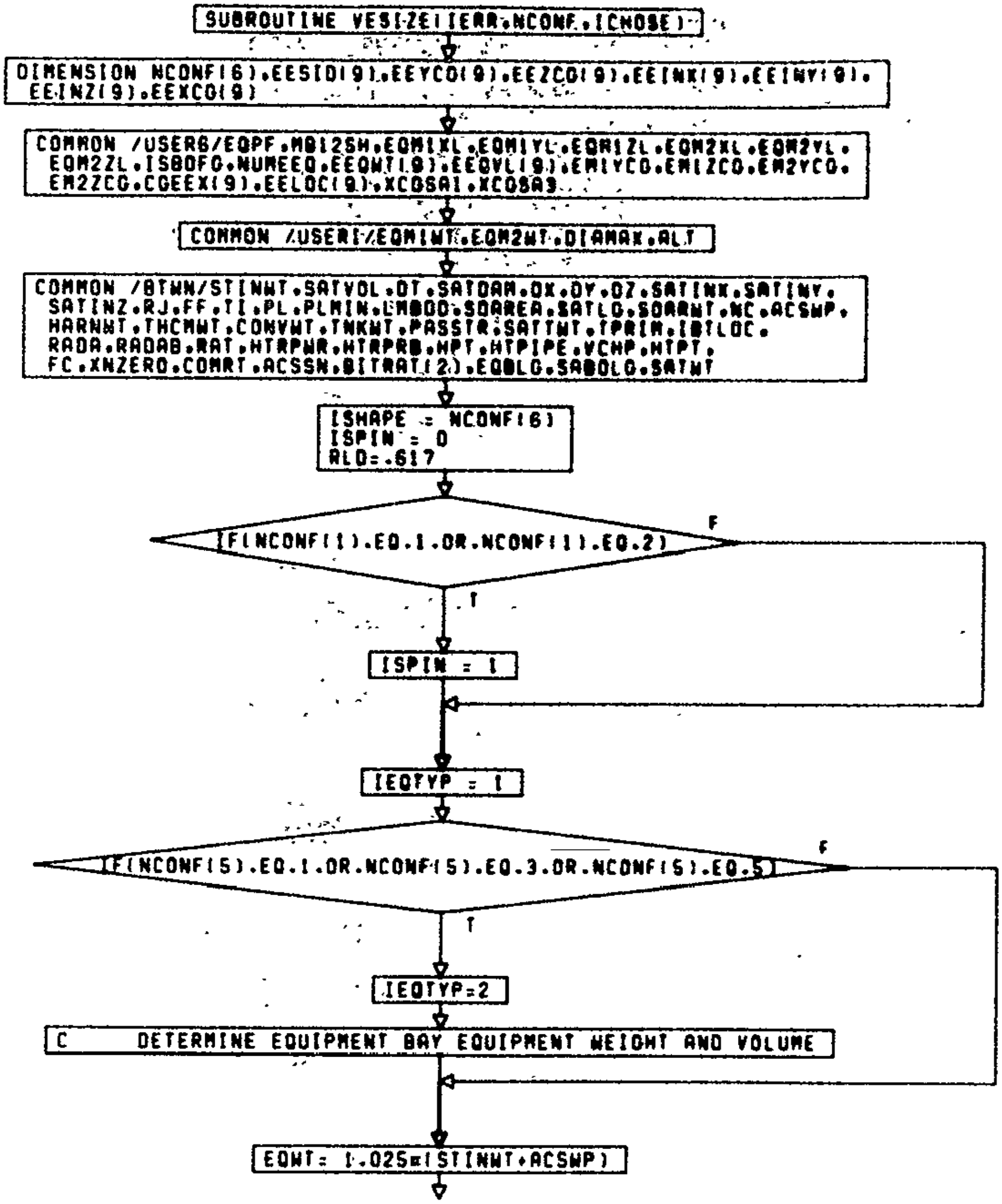
PG 5 OF


C EQUIVALENT THICKNESS OF STIFFENED BOX
5
A4
TBAR= .267*TM
C SIZING OF SKIN-STRINDER ASSEMBLY
T= .44*TBAR
TS= 1.9*T
BS= .64*TS*SQRT(E*TBAR/(XKNU*XN))
B= 1.49*BS
N= 1. + W/B
N= 4*N
AN= N
B= W/AN
ALPHA= .745/XKNU**.25
C SIZING OF FRAMES
A= (*ALPHA**2*TBAR**2/XN
RHOF= .405*(W**2/A)*(XN*ALPHA**2/(E*A))**.25
AF= .041*XN*W**4/(E*RHOF**2*A)
BF= 3.464*RHOF
TF= AF/BF
M= 1. + XL/A
AM= M
A= XL/AM
C SIZING OF END COVERS
TC= .303*SQRT(CA*SATMT/SIGY)
TA= TC
XLD= .5*W
5
A5
4
CONTINUE
IF(ICHECK.EQ.1)
F
7
A6
T
GO TO 5
7
A7

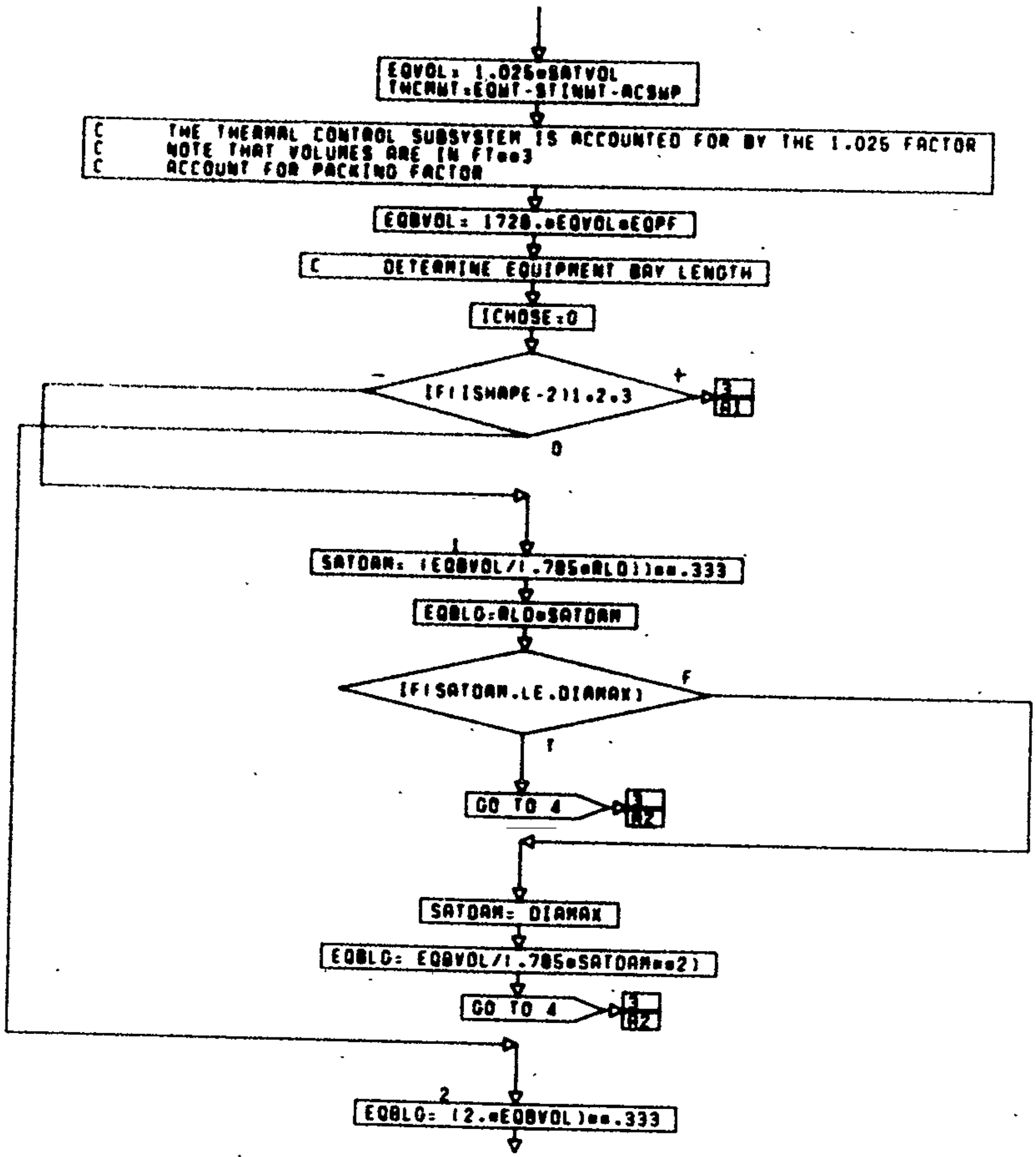
CONT. ON PG 7


C MID-SECTION BULKHEAD IS REQUIRED
A6
WL= .455*CA*SATWT/XLD**2
TB=.050*XLD*SQRT(WL/SIGY)
A7
5
CONTINUE
RETURN
END

PG 7 FINAL

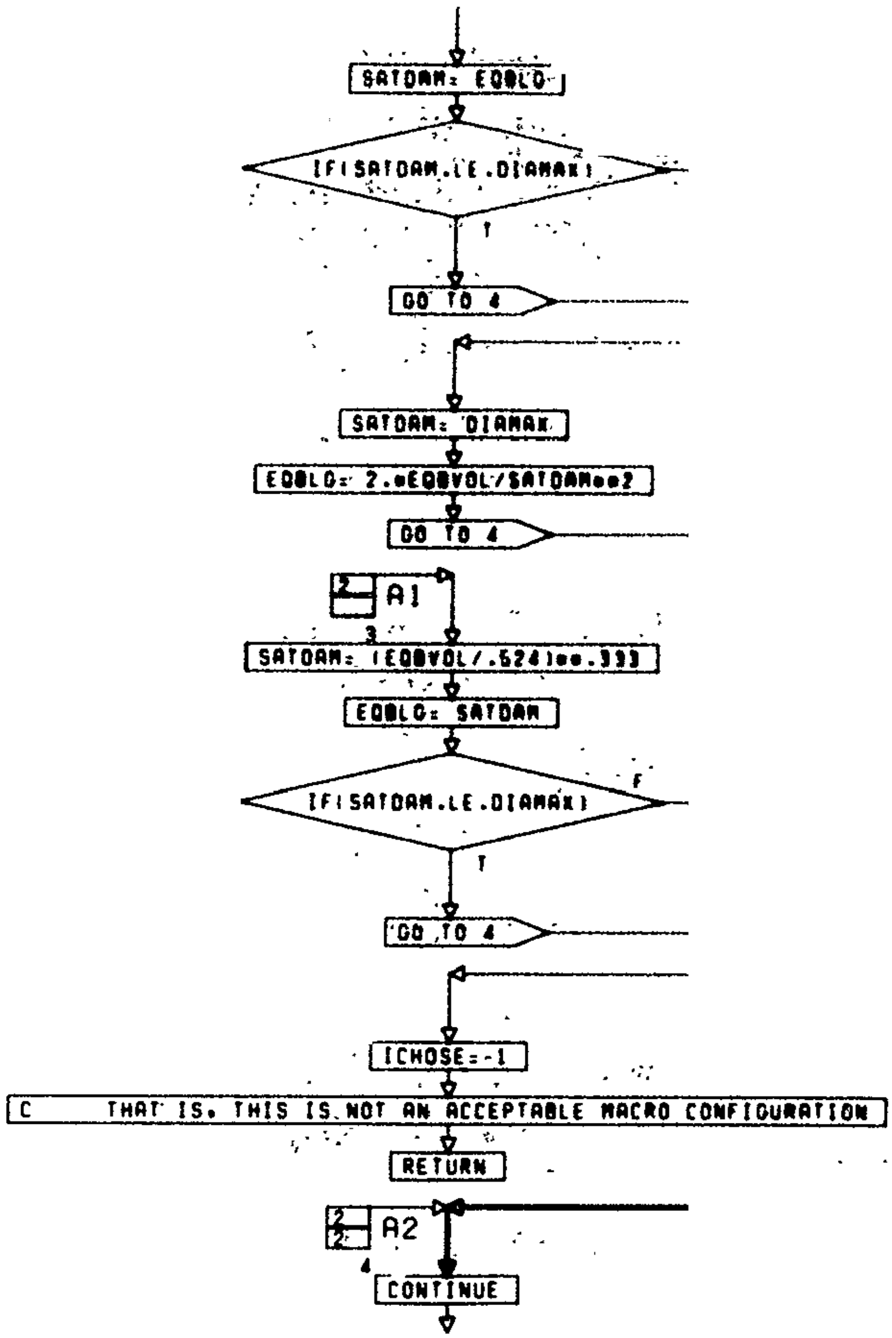

SUBROUTINE VESIZE(IERR,NCONF,ICHOSE)
DIMENSION NCONF(6),EESID(9),EEYCO(9),EEZCO(9),EEINX(9),EEINY(9),
EEINZ(9),EEXCO(9)
COMMON /USER6/EQPF,MB12SH,EQM1XL,EQM1YL,EQM1ZL,EQM2XL,EQM2YL,
EQM2ZL,ISBOFG,NUMEEQ,EEQWT(9),EEQVL(9),EM1YCG,EM1ZCG,EM2YCG,
EM2ZCG,CGEEX(9),EELOC(9),XCOSA1,XCOSA3
COMMON /USER1/EQM1WT,EQM2WT,DIAMAX,ALT
COMMON /BTWN/STINWT,SATVOL,DT,SATDAM,DX,DY,DZ,SATINX,SATINY,
SATINZ,RJ,FF,TI,PL,PLMIN,LMBOD,SOAREA,SATLG,SOARWT,NC,ACSWP,
HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,SATTWT,TPRIM,IBTLOC,
RADA,RADAB,RAT,HTRPWR,HTRPRB,HPT,HTPIPE,VCHP,HTPT,
FC,XNZERO,COMRT,ACSSN,BITRAT(2),EQBLG,SABOLG,SATWT
ISHAPE = NCONF(6)
ISPIN = 0
RLD=.617
IF(NCONF(1).EQ.1.OR.NCONF(1).EQ.2)
F
T
ISPIN = 1
IEQTYP = 1
IF(NCONF(5).EQ.1.OR.NCONF(5).EQ.3.OR.NCONF(5).EQ.5)
F
T
IEQTYP=2
C DETERMINE EQUIPMENT BAY EQUIPMENT WEIGHT AND VOLUME
EQWT= 1.025*(STINWT+ACSWP)

CONT. ON PG 2



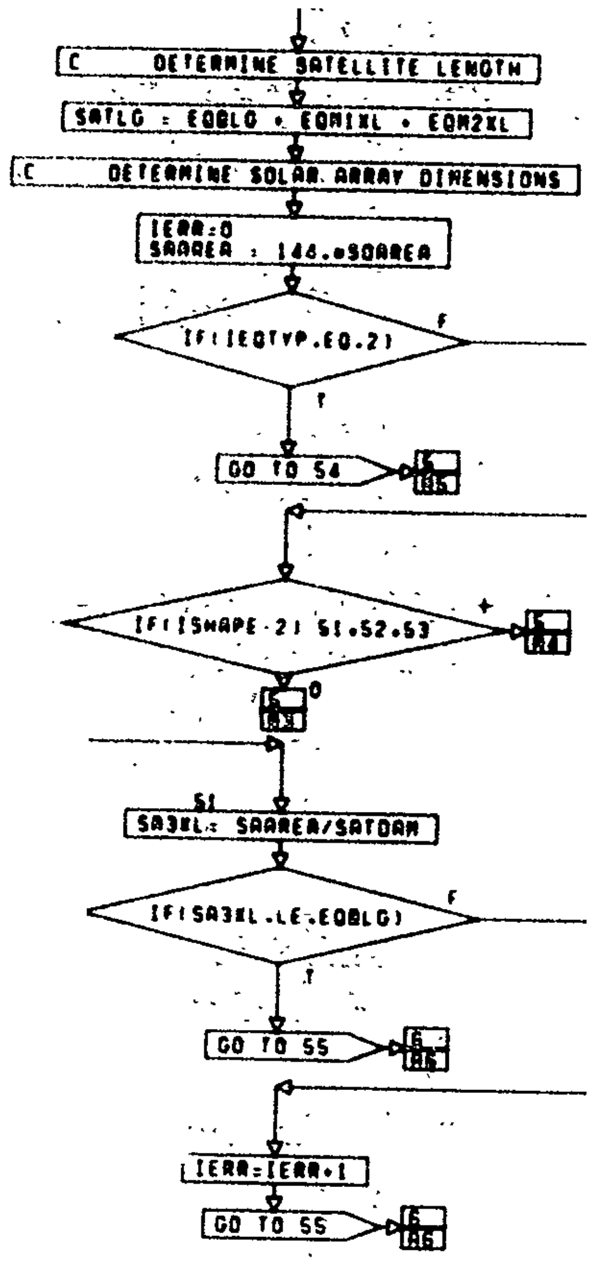
CONT. ON PG 3

C.4

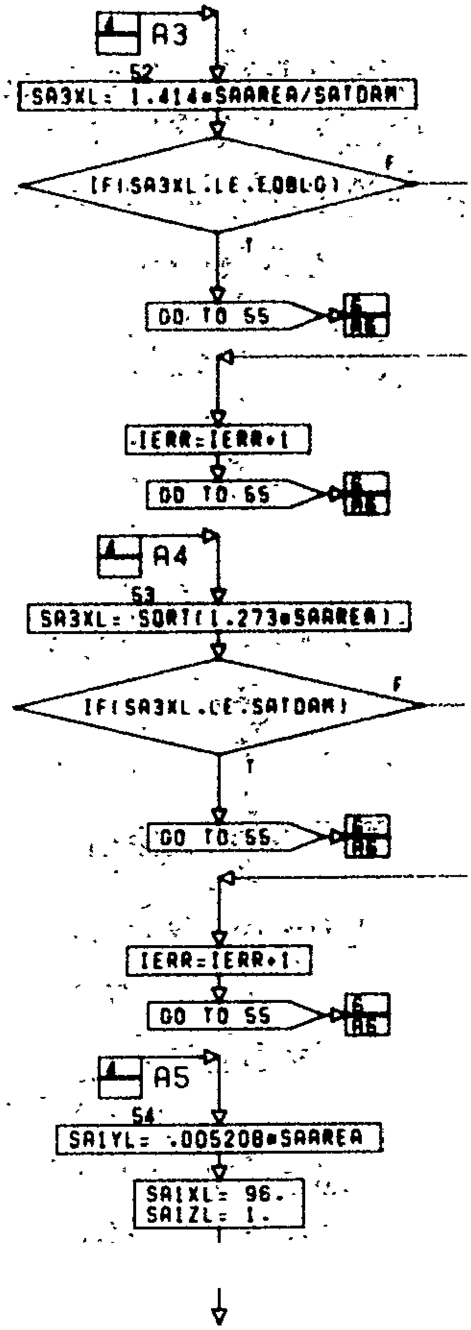


CONT. ON PG

115

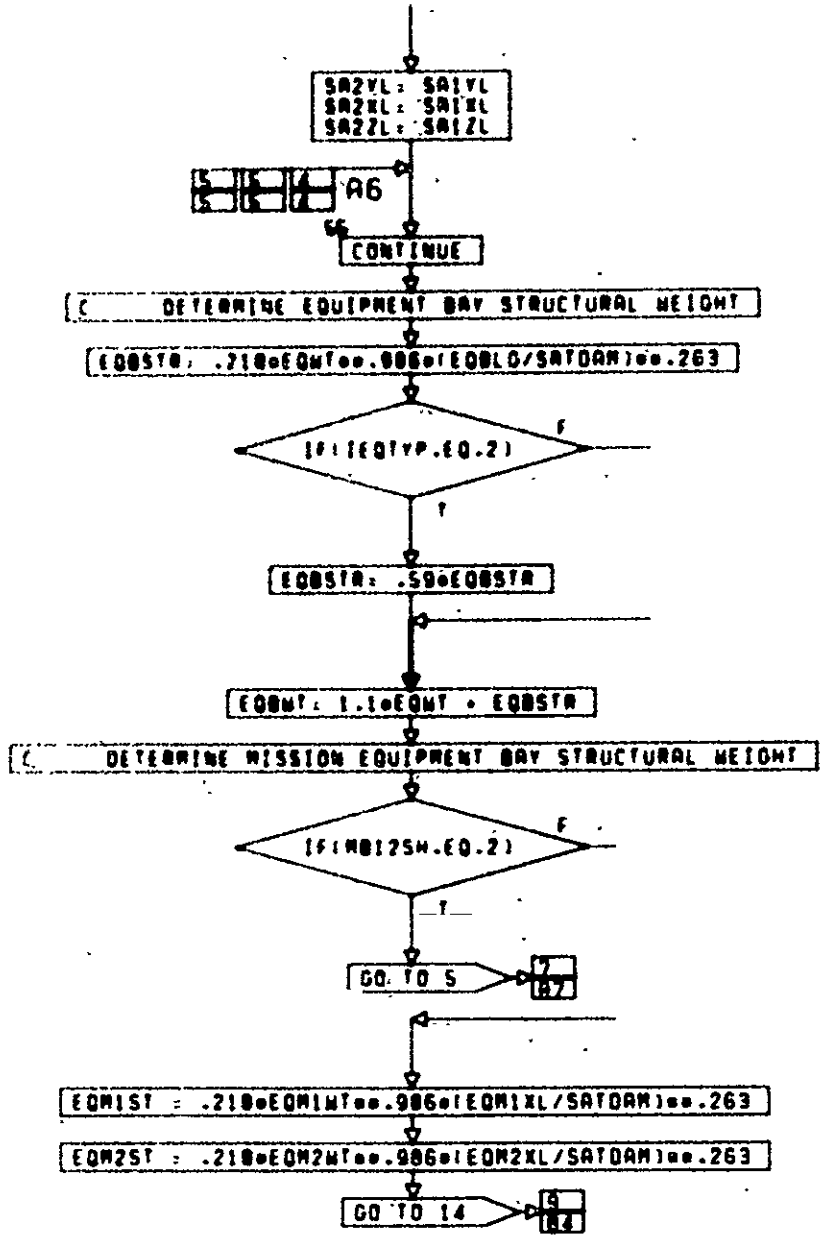

C DETERMINE SATELLITE LENGTH
SATLG = EQBLG + EQM1XL + EQM2XL
C DETERMINE SOLAR ARRAY DIMENSIONS
IERR=0
SAAREA = 144.*SQAREA
IF(IEQTYP.EQ.2)
F
T
GO TO 54
IF(ISHAPE-2) 51,52,53
+
0
51
SA3XL= SAAREA/SATDAM
IF(SA3XL.LE.EQBLG)
F
T
GO TO 55
IERR=IERR+1
GO TO 55

CONT. ON PG 5

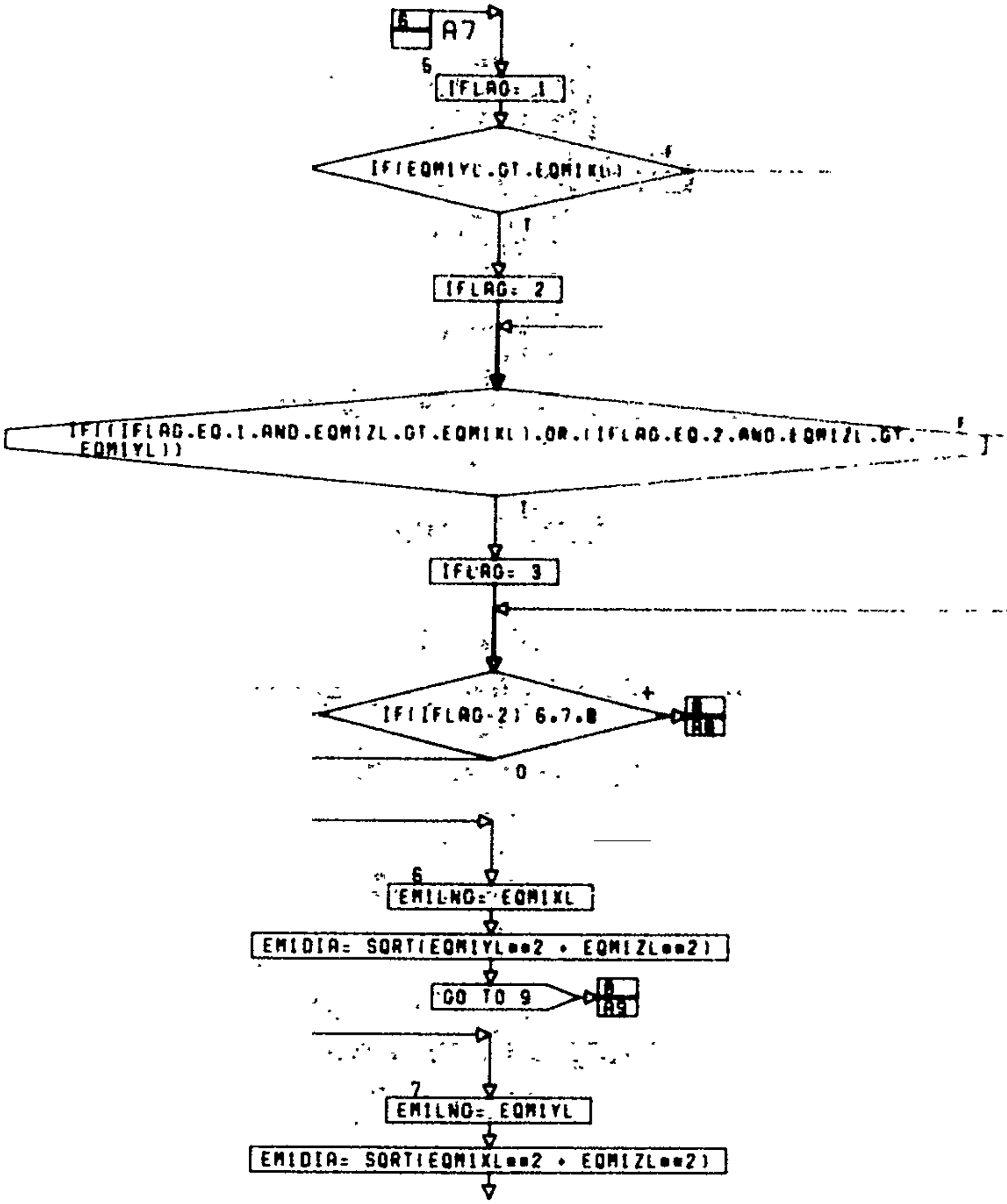


CONT. ON PG. 6

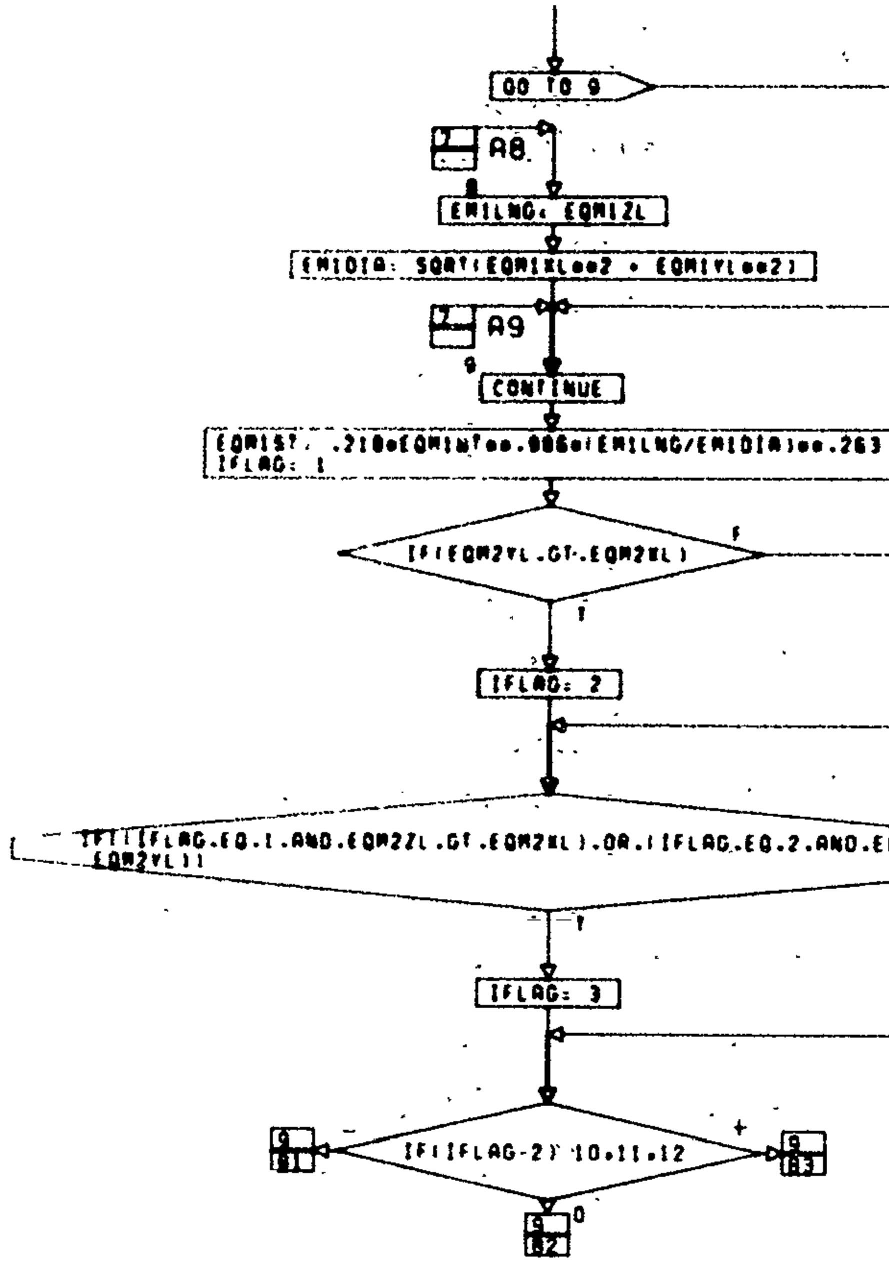
116


SA2YL = SA1YL
SA2XL = SA1XL
SA2ZL = SA1ZL
A6
CONTINUE
C DETERMINE EQUIPMENT BAY STRUCTURAL WEIGHT
EQBSTR = .218*EQWT**.986*(EQBLD/SATDAM)**.263
IF(IEQTYP.EQ.2)
F
T
EQBSTR = .59*EQBSTR
EQBWT = 1.1*EQWT + EQBSTR
C DETERMINE MISSION EQUIPMENT BAY STRUCTURAL WEIGHT
IF(MBI2SW.EQ.2)
F
T
GO TO 5
7
A7
EQM1ST = .218*EQM1WT**.986*(EQM1XL/SATDAM)**.263
EQM2ST = .218*EQM2WT**.986*(EQM2XL/SATDAM)**.263
GO TO 14
A4

CONT. ON PG. 7

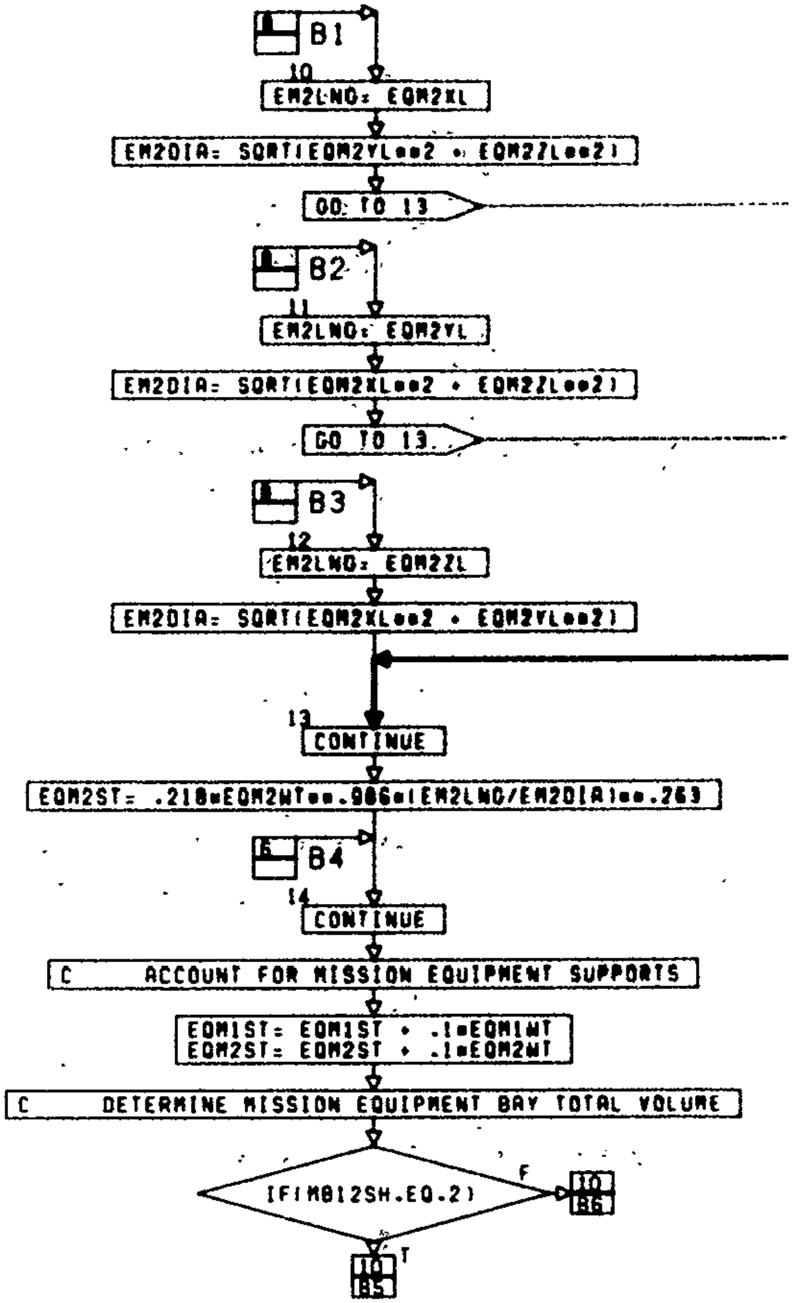

A7
IFLAG= 1
IF(EQMIYL.GT.EQMIXL)
IFLAG= 2
IF((IFLAG.EQ.1.AND.EQMIZL.GT.EQMIXL).OR.(IFLAG.EQ.2.AND.EQMIZL.GT.EQMIYL))
IFLAG= 3
IF(IFLAG-2) 6,7,8
A8
EMILNO= EQMIXL
EMIDIA= SQRT(EQMIYL**2 + EQMIZL**2)
GO TO 9
A9
EMILNO= EQMIYL
EMIDIA= SQRT(EQMIXL**2 + EQMIZL**2)

CONT. ON PG 8

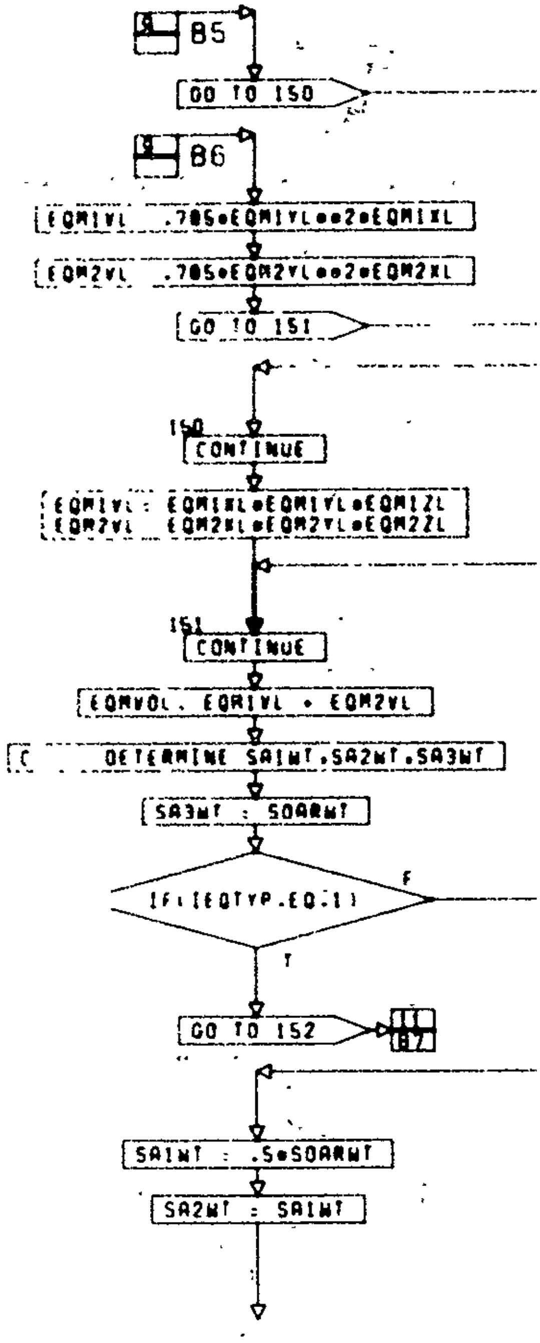


GO TO 9
A8
EMILNG= EQM1ZL
EMIDIA= SQRT(EQM1XL**2 + EQM1YL**2)
A9
9
CONTINUE
IFLAG= 1
IF(EQM2YL.GT.EQM2XL)
F
T
IFLAG= 2
IF((IFLAG.EQ.1.AND.EQM2ZL.GT.EQM2XL).OR.(IFLAG.EQ.2.AND.E
EQM2YL))
T
IFLAG= 3
IF(IFLAG-2) 10,11,12
-
+
0
9
B1
9
B2
9
B3

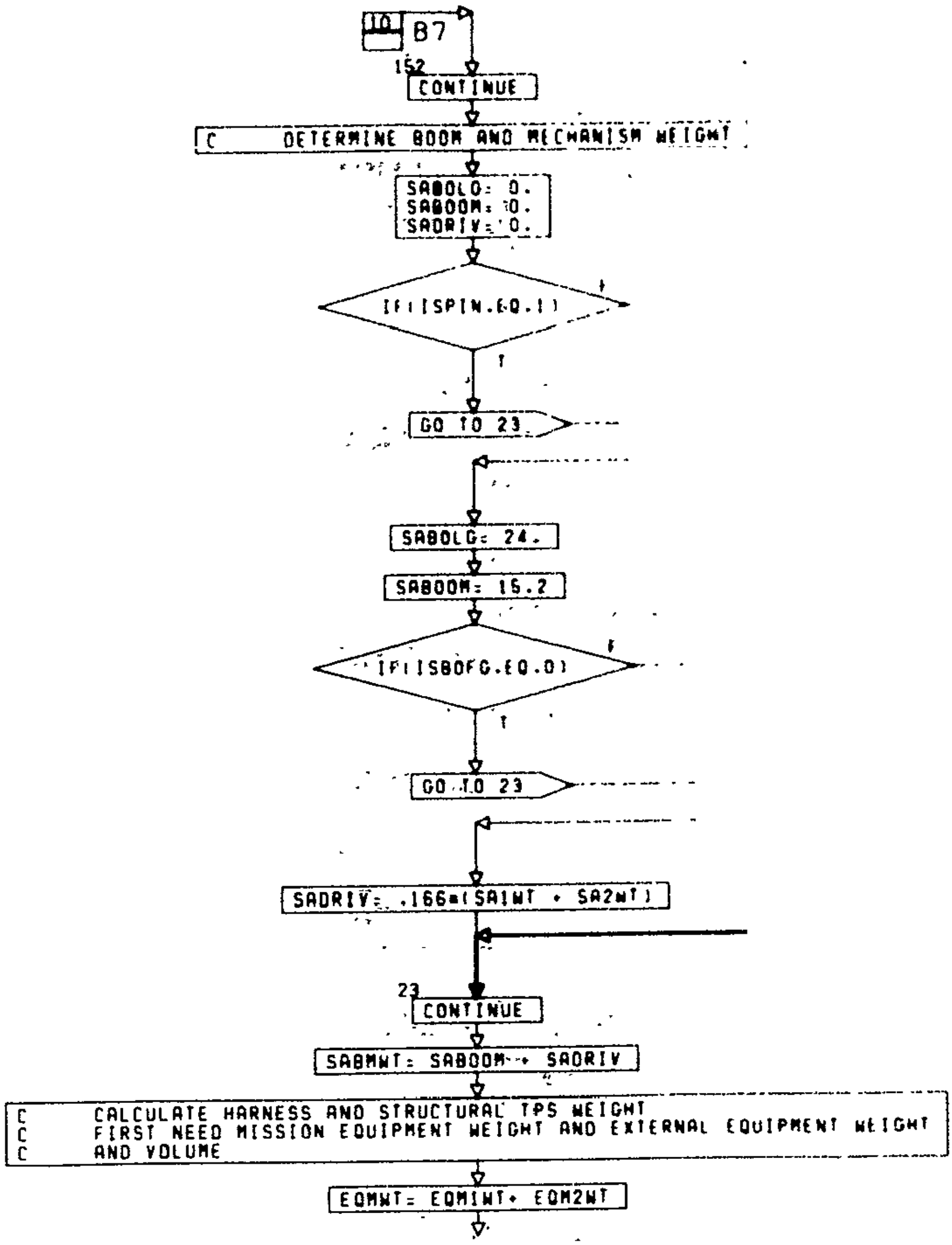
CONT. ON PG 9


B1
10
EM2LNO= EQM2XL
EM2DIA= SQRT(EQM2YL**2 + EQM2ZL**2)
GO TO 13
B2
11
EM2LNO= EQM2YL
EM2DIA= SQRT(EQM2XL**2 + EQM2ZL**2)
GO TO 13
B3
12
EM2LNO= EQM2ZL
EM2DIA= SQRT(EQM2XL**2 + EQM2YL**2)
13
CONTINUE
EQM2ST= .218*EQM2WT**.986*(EM2LNO/EM2DIA)**.263
B4
14
CONTINUE
C ACCOUNT FOR MISSION EQUIPMENT SUPPORTS
EQM1ST= EQM1ST + .1*EQM1WT
EQM2ST= EQM2ST + .1*EQM2WT
C DETERMINE MISSION EQUIPMENT BAY TOTAL VOLUME
IF(MB12SH.EQ.2)
F
10
B6
T
10
B5

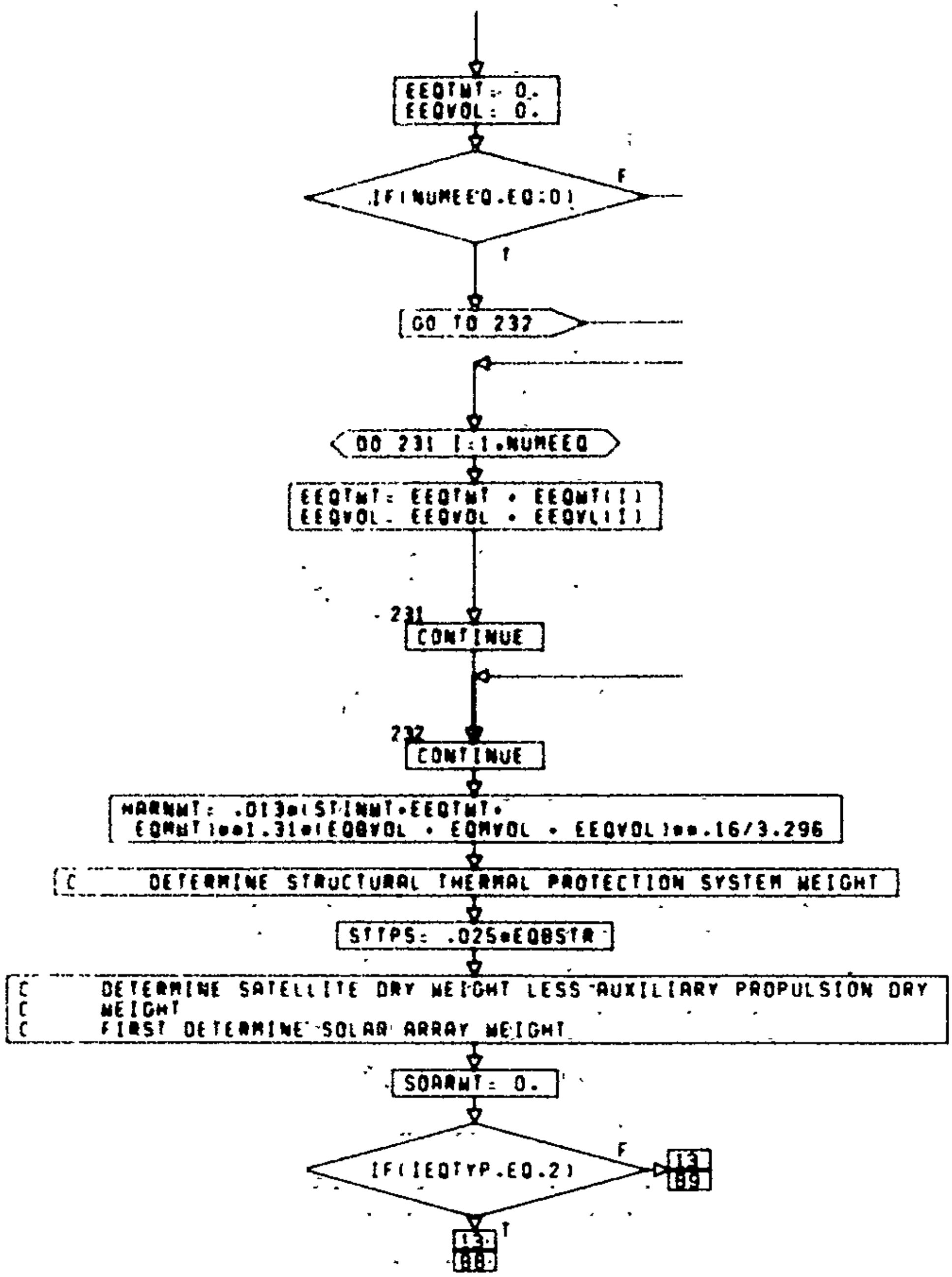
CONT. ON PG 10


B5
GO TO 150
B6
EQM1VL .785*EQM1VL**2*EQM1XL
EQM2VL .785*EQM2VL**2*EQM2XL
GO TO 151
150
CONTINUE
EQM1VL = EQM1XL*EQM1VL*EQM1ZL
EQM2VL EQM2XL*EQM2VL*EQM2ZL
151
CONTINUE
EQMVOL. EQM1VL + EQM2VL
C DETERMINE SA1WT,SA2WT,SA3WT
SA3WT = SOARWT
IF(IEQTYP.EQ.1)
F
T
GO TO 152
B7
SA1WT = .5*SOARWT
SA2WT = SA1WT

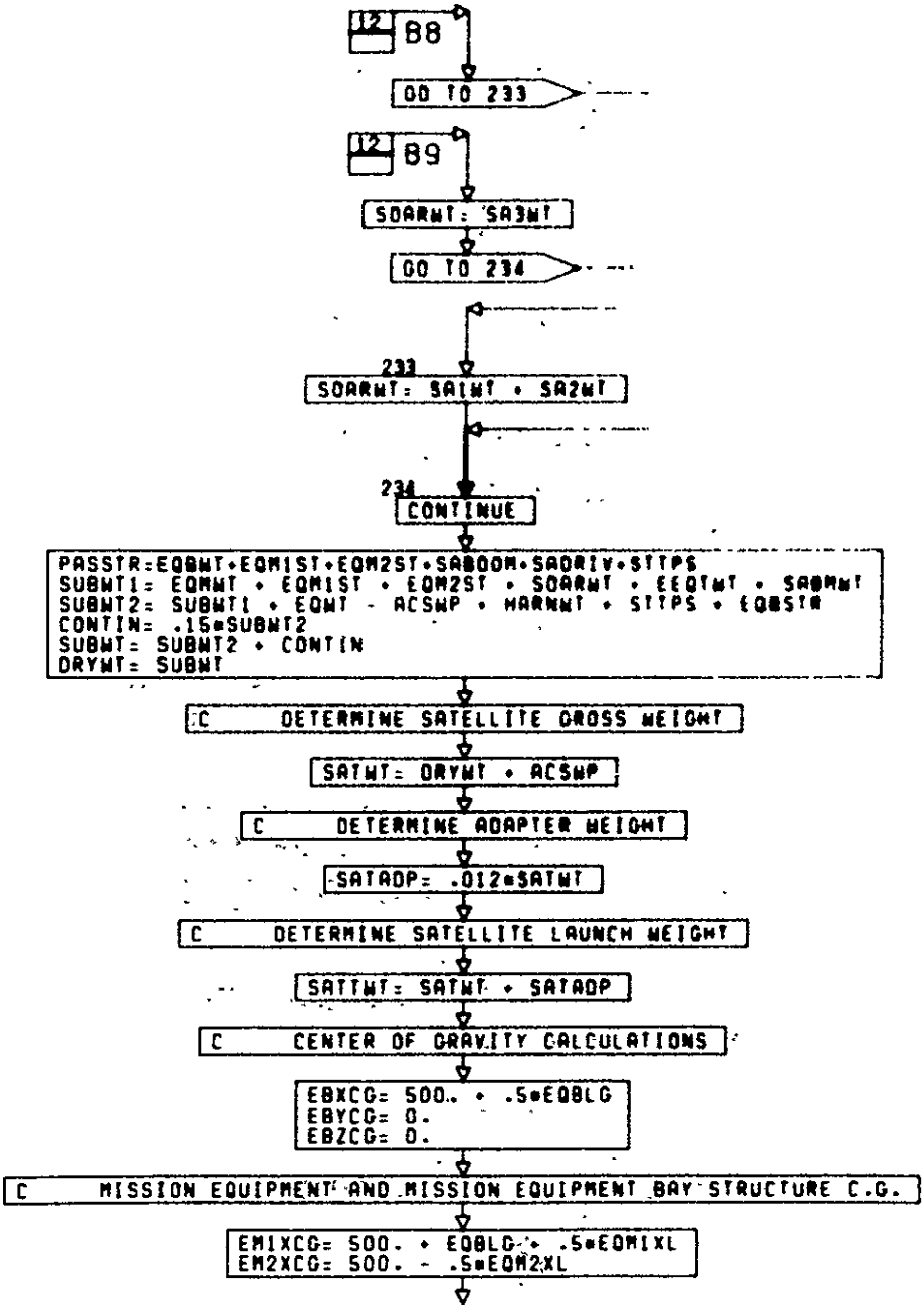
CONT. ON PG


10
B7
152
CONTINUE
C DETERMINE BOOM AND MECHANISM WEIGHT
SABOLG= 0.
SABOOM= 0.
SADRIV= 0.
IF(ISPIN.EQ.1)
T
GO TO 23
SABOLG= 24.
SABOOM= 15.2
IF(ISBOFG.EQ.0)
T
GO TO 23
SADRIV= .166*(SA1WT + SA2WT)
23
CONTINUE
SABMWT= SABOOM + SADRIV
C CALCULATE HARNESS AND STRUCTURAL TPS WEIGHT
C FIRST NEED MISSION EQUIPMENT WEIGHT AND EXTERNAL EQUIPMENT WEIGHT
C AND VOLUME
EQMWT= EQM1WT+ EQM2WT

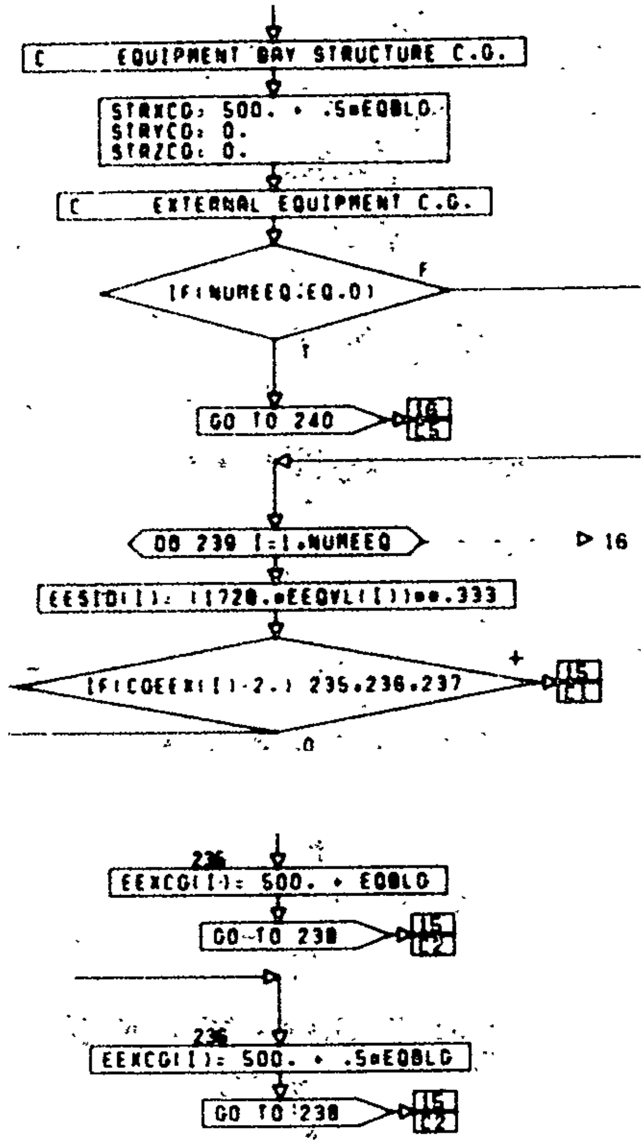
CONT. ON PG 12


EEQTWT= 0.
EEQVOL= 0.
IF(NUMEEQ.EQ.0)
F
T
GO TO 232
DO 231 I=1,NUMEEQ
EEQTWT= EEQTWT + EEQWT(I)
EEQVOL= EEQVOL + EEQVL(I)
231
CONTINUE
232
CONTINUE
HARNWT= .013*(STINWT+EEQTWT+
EQMWT)**1.31*(EQBVOL + EQMVOL + EEQVOL)**.16/3.296
C DETERMINE STRUCTURAL THERMAL PROTECTION SYSTEM WEIGHT
STTPS= .025*EQBSTR
C DETERMINE SATELLITE DRY WEIGHT LESS AUXILIARY PROPULSION DRY
C WEIGHT
C FIRST DETERMINE SOLAR ARRAY WEIGHT
SOARWT= 0.
IF(IEQTYP.EQ.2)
F
13
B9
T
13
B8

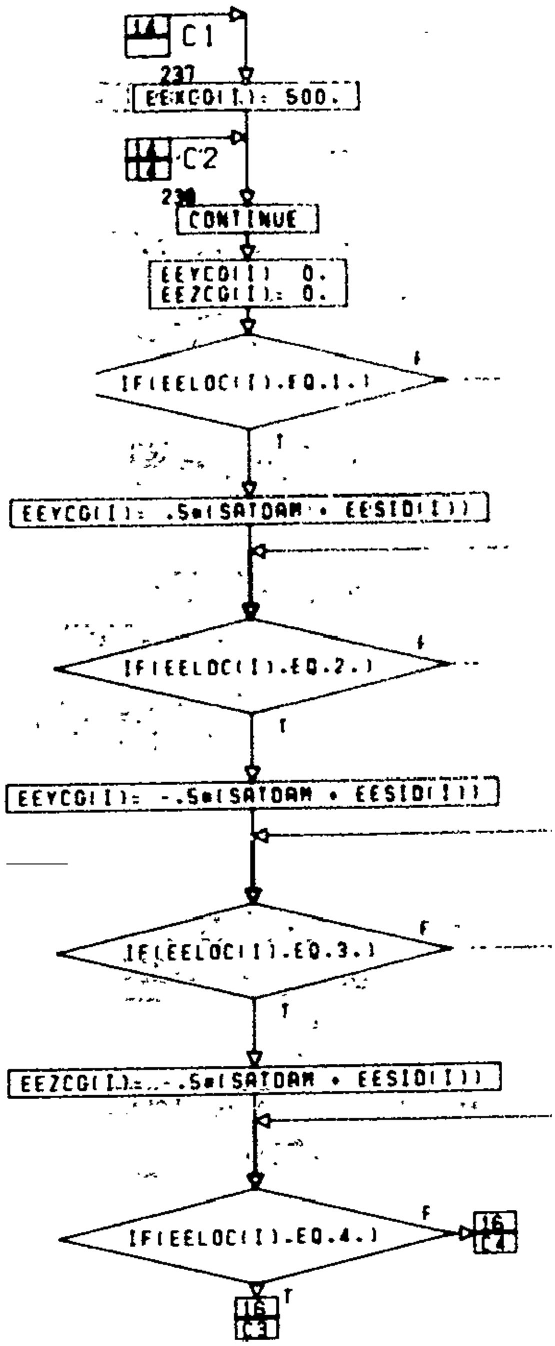
CONT. ON PG 13


12 B8
GO TO 233
12 B9
SOARWT= SA3WT
GO TO 234
233
SOARWT= SA1WT + SA2WT
234
CONTINUE
PASSTR=EQBWT+EQM1ST+EQM2ST+SABOOM+SADRIV+STTPS
SUBWT1= EQMWT + EQM1ST + EQM2ST + SOARWT + EEQTWT + SABMWT
SUBWT2= SUBWT1 + EQWT - ACSWP + HARNWT + STTPS + EQBSTR
CONTIN= .15*SUBWT2
SUBWT= SUBWT2 + CONTIN
DRYWT= SUBWT
C DETERMINE SATELLITE GROSS WEIGHT
SATWT= DRYWT + ACSWP
C DETERMINE ADAPTER WEIGHT
SATADP= .012*SATWT
C DETERMINE SATELLITE LAUNCH WEIGHT
SATTWT= SATWT + SATADP
C CENTER OF GRAVITY CALCULATIONS
EBXCG= 500. + .5*EQBLG
EBYCG= 0.
EBZCG= 0.
C MISSION EQUIPMENT AND MISSION EQUIPMENT BAY STRUCTURE C.G.
EM1XCG= 500. + EQBLG + .5*EQM1XL
EM2XCG= 500. - .5*EQM2XL

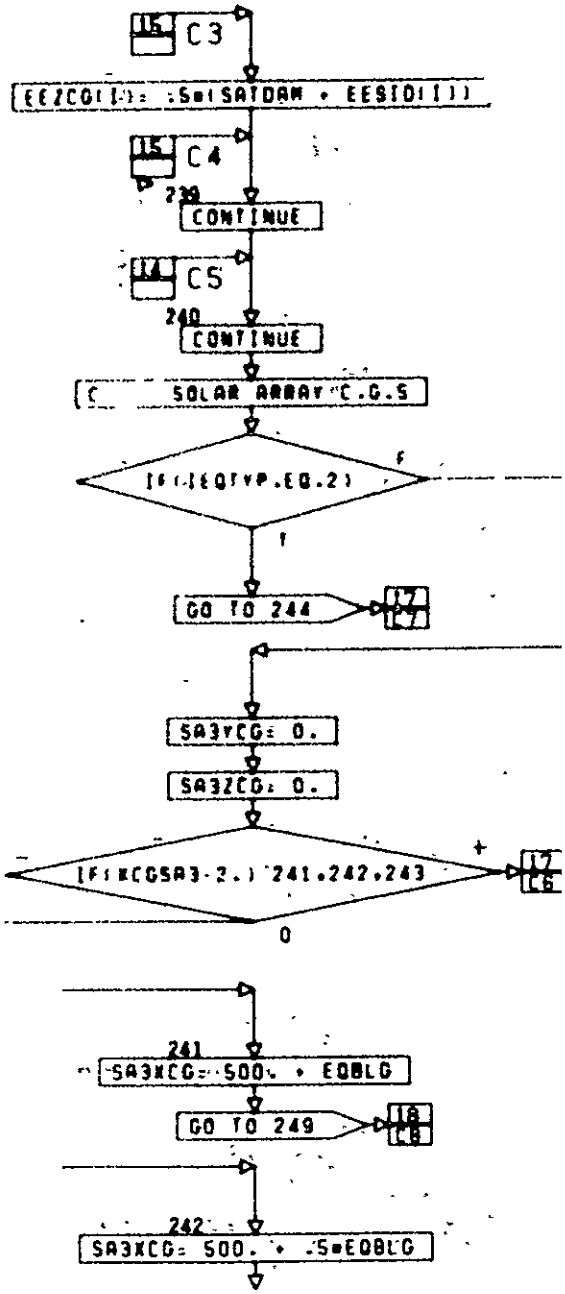
CONT. ON PG 14


C EQUIPMENT BAY STRUCTURE C.G.
STRXCG: 500. + .5*EQBLG
STRYCG: 0.
STRZCG: 0.
C EXTERNAL EQUIPMENT C.G.
IF(NUMEEQ.EQ.0)
F
T
GO TO 240
16
C5
DO 239 I=1,NUMEEQ
▷ 16
EESIO(I): (1728.*EEQVL(I))**.333
IF(CGEEX(I)-2.) 235,236,237
-
+
0
15
C1
236
EEXCG(I): 500. + EQBLG
GO TO 238
15
C2
236
EEXCG(I): 500. + .5*EQBLG
GO TO 238
15
C2

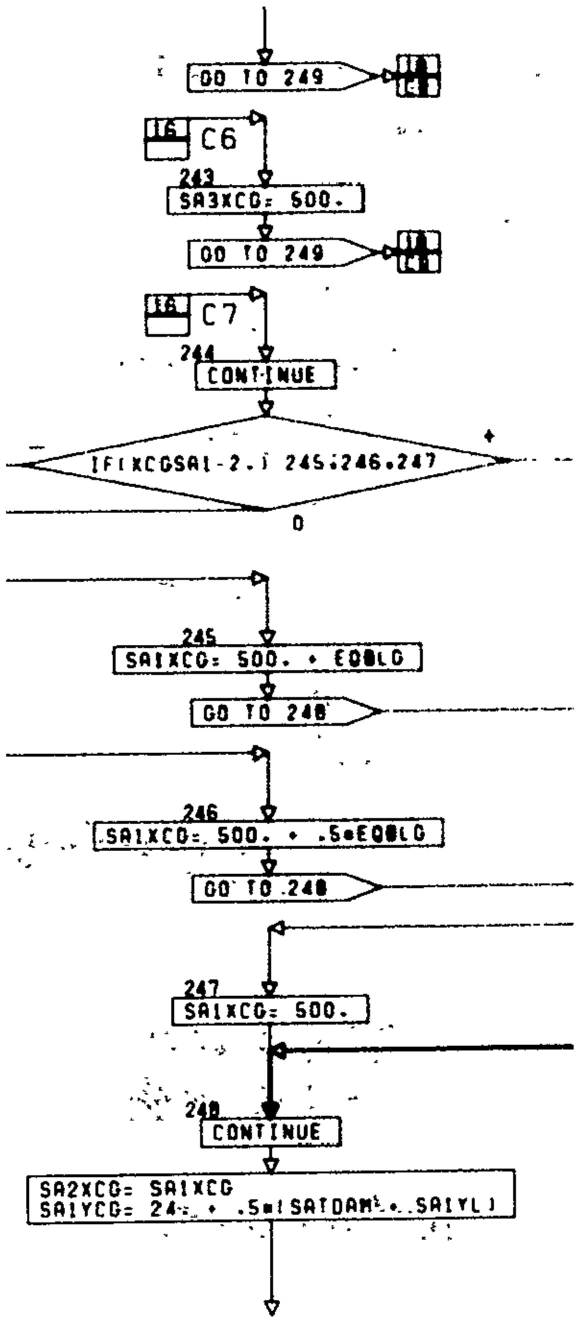
CONT. ON PG 15


C1
237
EEXCG(I)= 500.
C2
238
CONTINUE
EEYCG(I) 0.
EEZCG(I)= 0.
IF(EELOC(I).EQ.1.)
F
T
EEYCG(I)= .5*(SATDAM + EESID(I))
IF(EELOC(I).EQ.2.)
F
T
EEYCG(I)= -.5*(SATDAM + EESID(I))
IF(EELOC(I).EQ.3.)
F
T
EEZCG(I)= -.5*(SATDAM + EESID(I))
IF(EELOC(I).EQ.4.)
F
16
C4
T
16
C3

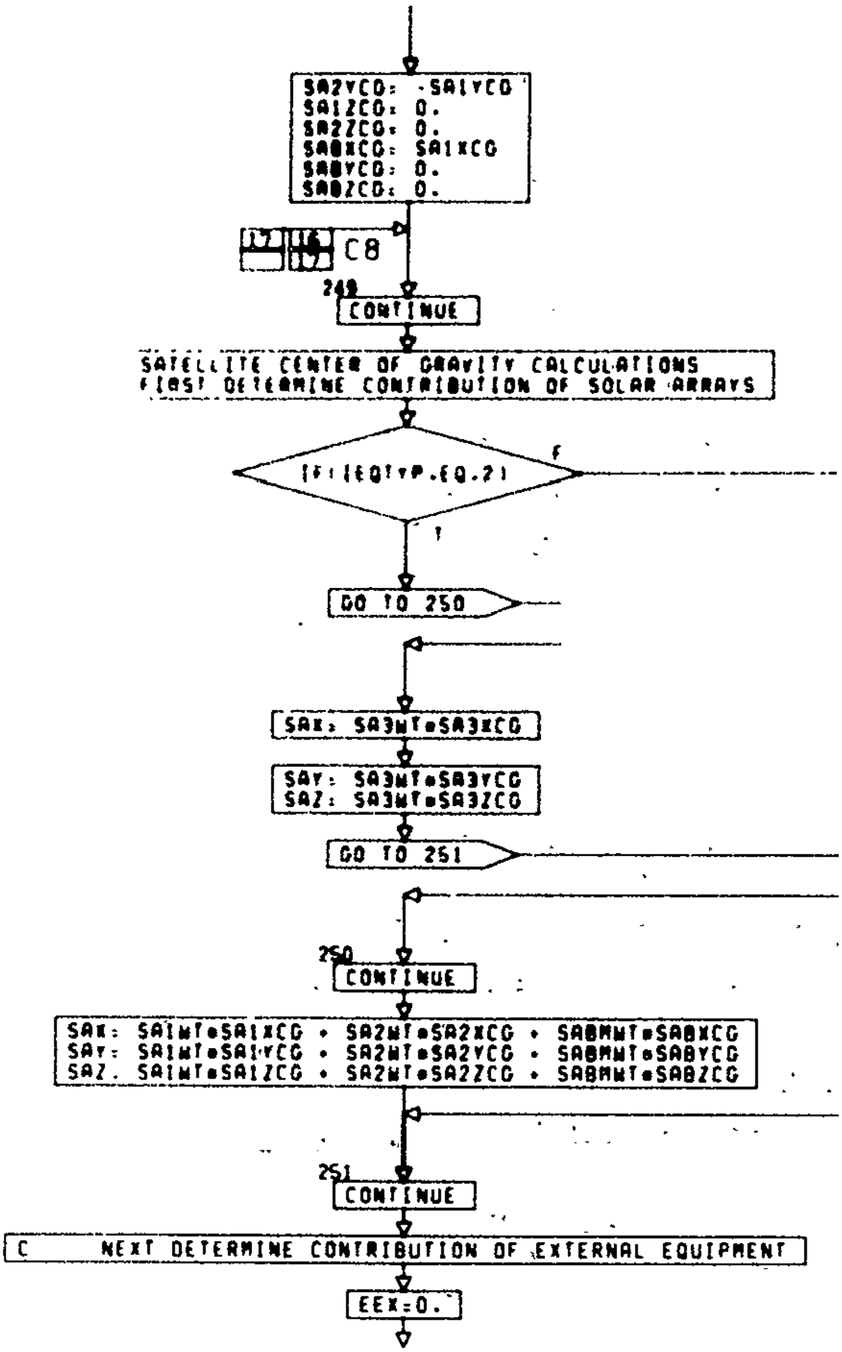
CONT. ON PG 16


15 C3
EEZCG(I)= .5*(SATDAM + EESID(I))
15 C4
239
CONTINUE
14 C5
240
CONTINUE
C SOLAR ARRAY C.G.S
IF(.(EQTYP.EQ.2)
F
T
GO TO 244
17 C7
SA3YCG= 0.
SA3ZCG= 0.
IF(XCGSA3-2.) 241,242,243
+
17 C6
0
241
SA3XCG= 500. + EQBLG
GO TO 249
18 C8
242
SA3XCG= 500. + .5*EQBLG

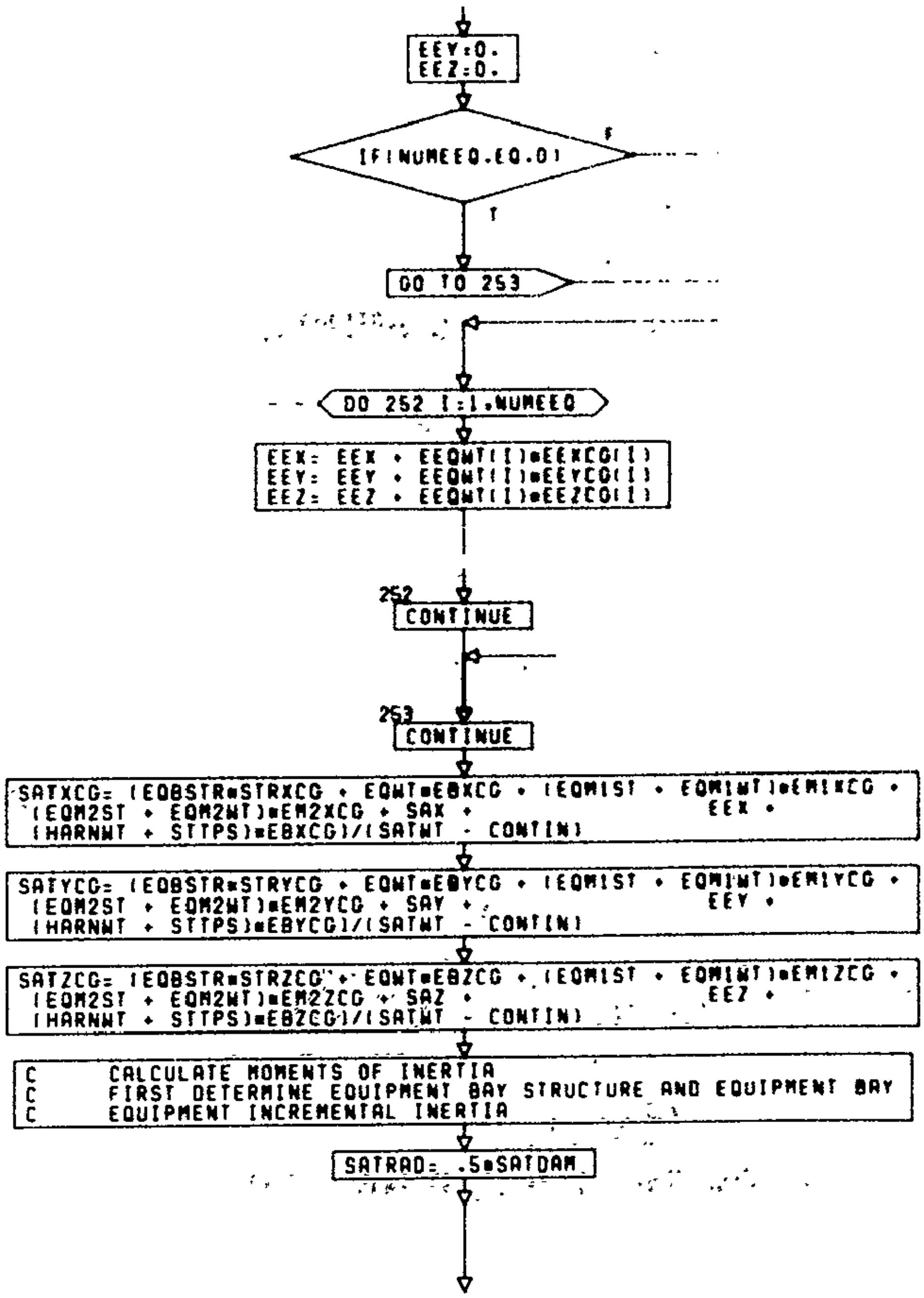
CONT. ON PG 17


GO TO 249
C6
243
SA3XCG= 500.
GO TO 249
C7
244
CONTINUE
IF(XCGSA1-2.) 245,246,247
0
+
245
SA1XCG= 500. + EQBLG
GO TO 248
246
SA1XCG= 500. + .5*EQBLG
GO TO 248
247
SA1XCG= 500.
248
CONTINUE
SA2XCG= SA1XCG
SA1YCG= 24. + .5*(SATDAM + SA1YL)

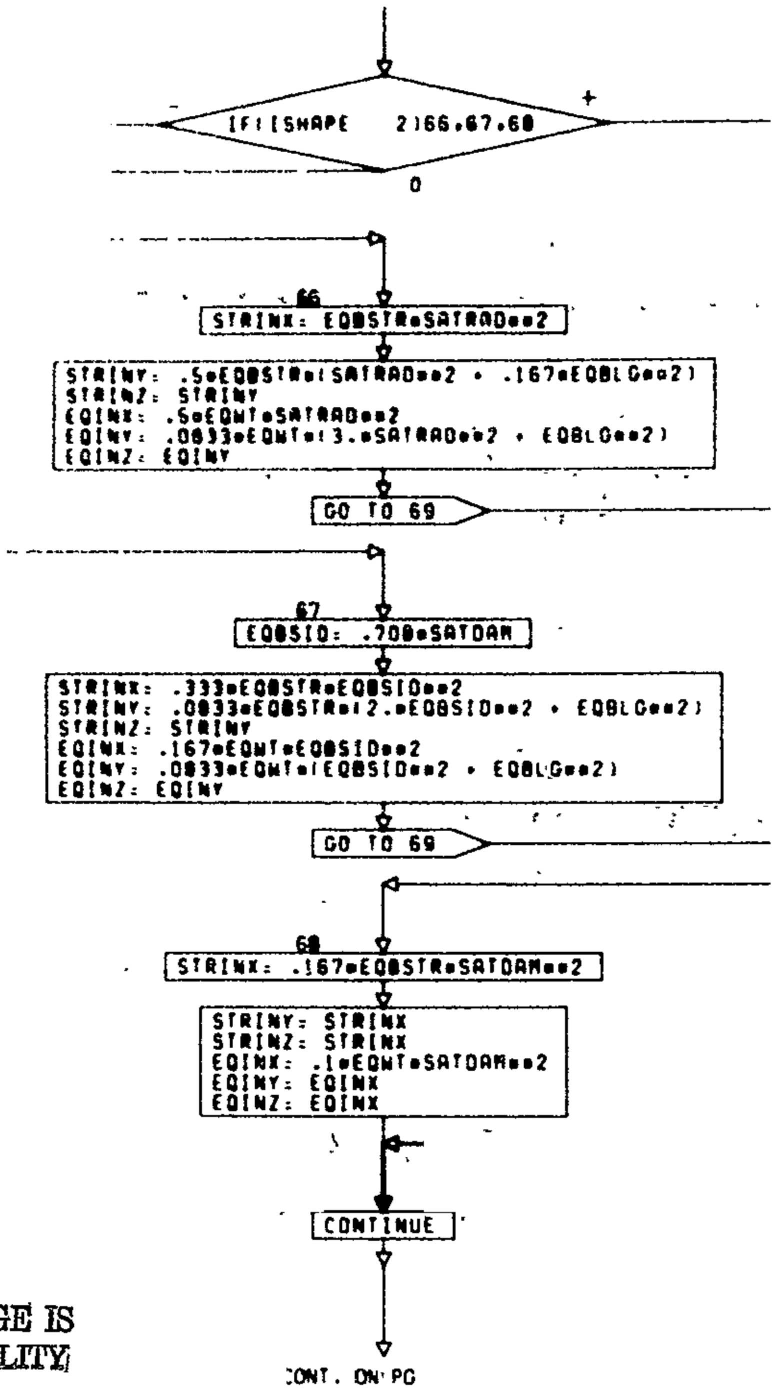
CONT. ON PG 18

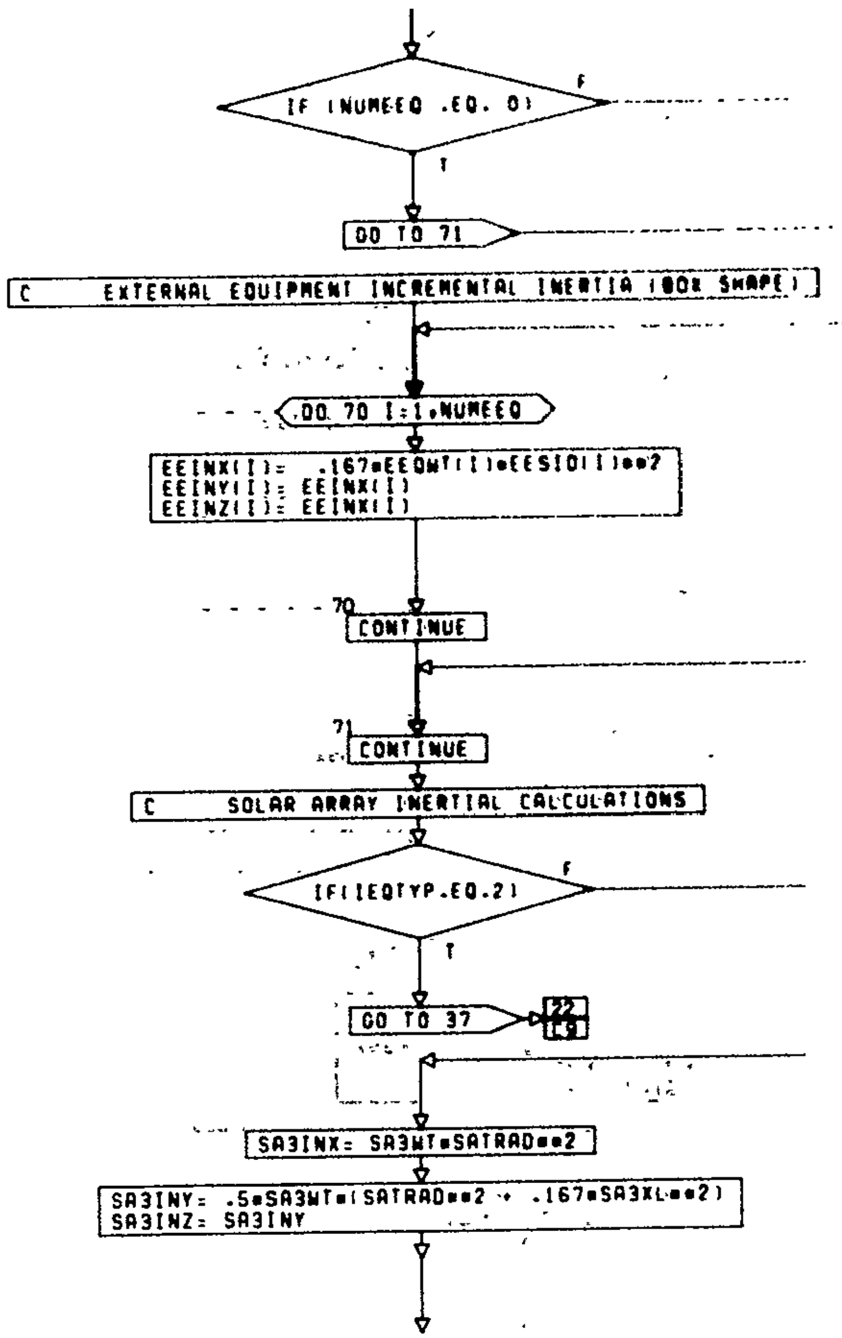

SA2YCO= -SA1YCO
SA1ZCO= 0.
SA2ZCO= 0.
SABXCO= SA1XCO
SABYCO= 0.
SABZCO= 0.
C8
249
CONTINUE
SATELLITE CENTER OF GRAVITY CALCULATIONS
FIRST DETERMINE CONTRIBUTION OF SOLAR ARRAYS
IF (IEQTYP.EQ.2)
F
T
GO TO 250
SAX= SA3WT*SA3XCG
SAY= SA3WT*SA3YCG
SAZ= SA3WT*SA3ZCG
GO TO 251
250
CONTINUE
SAX= SA1WT*SA1XCG + SA2WT*SA2XCG + SABMWT*SABXCG
SAY= SA1WT*SA1YCG + SA2WT*SA2YCG + SABMWT*SABYCG
SAZ= SA1WT*SA1ZCG + SA2WT*SA2ZCG + SABMWT*SABZCG
251
CONTINUE
C NEXT DETERMINE CONTRIBUTION OF EXTERNAL EQUIPMENT
EEX=0.

CONT. ON PG 19

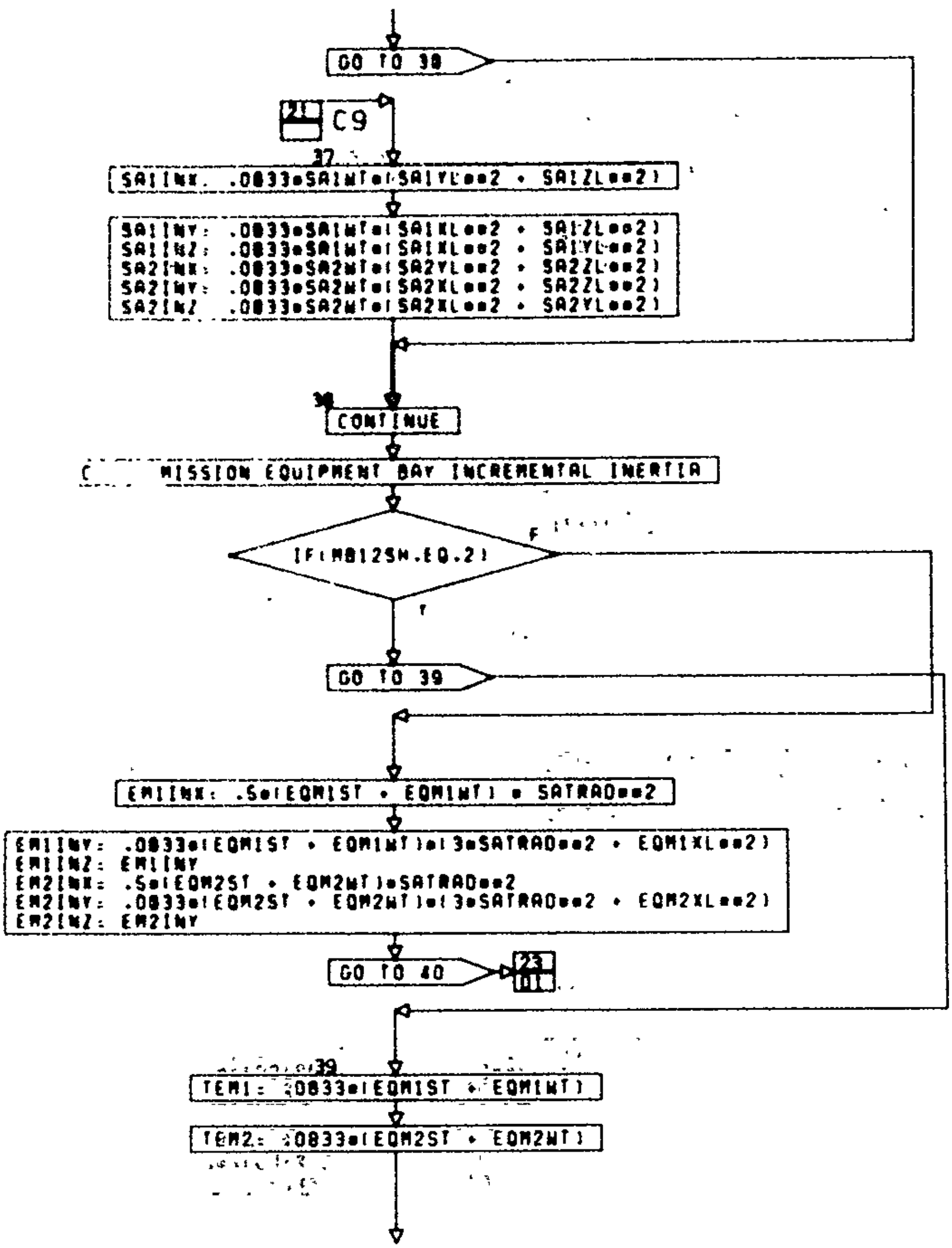

EEY=0.
EEZ=0.
IF(NUMEEQ.EQ.0)
F
T
GO TO 253
DO 252 I=1,NUMEEQ
EEX= EEX + EEQWT(I)*EEXCG(I)
EEY= EEY + EEQWT(I)*EEYCG(I)
EEZ= EEZ + EEQWT(I)*EEZCG(I)
252
CONTINUE
253
CONTINUE
SATXCG= (EQBSTR*STRXCG + EQWT*EBXCG + (EQM1ST + EQM1WT)*EM1XCG + (EQM2ST + EQM2WT)*EM2XCG + SAX + EEX + (HARNWT + STTPS)*EBXCG)/(SATWT - CONTIN)
SATYCG= (EQBSTR*STRYCG + EQWT*EBYCG + (EQM1ST + EQM1WT)*EM1YCG + (EQM2ST + EQM2WT)*EM2YCG + SAY + EEY + (HARNWT + STTPS)*EBYCG)/(SATWT - CONTIN)
SATZCG= (EQBSTR*STRZCG + EQWT*EBZCG + (EQM1ST + EQM1WT)*EM1ZCG + (EQM2ST + EQM2WT)*EM2ZCG + SAZ + EEZ + (HARNWT + STTPS)*EBZCG)/(SATWT - CONTIN)
C CALCULATE MOMENTS OF INERTIA
C FIRST DETERMINE EQUIPMENT BAY STRUCTURE AND EQUIPMENT BAY
C EQUIPMENT INCREMENTAL INERTIA
SATRAD= .5*SATDAM

CONT. ON PG 20

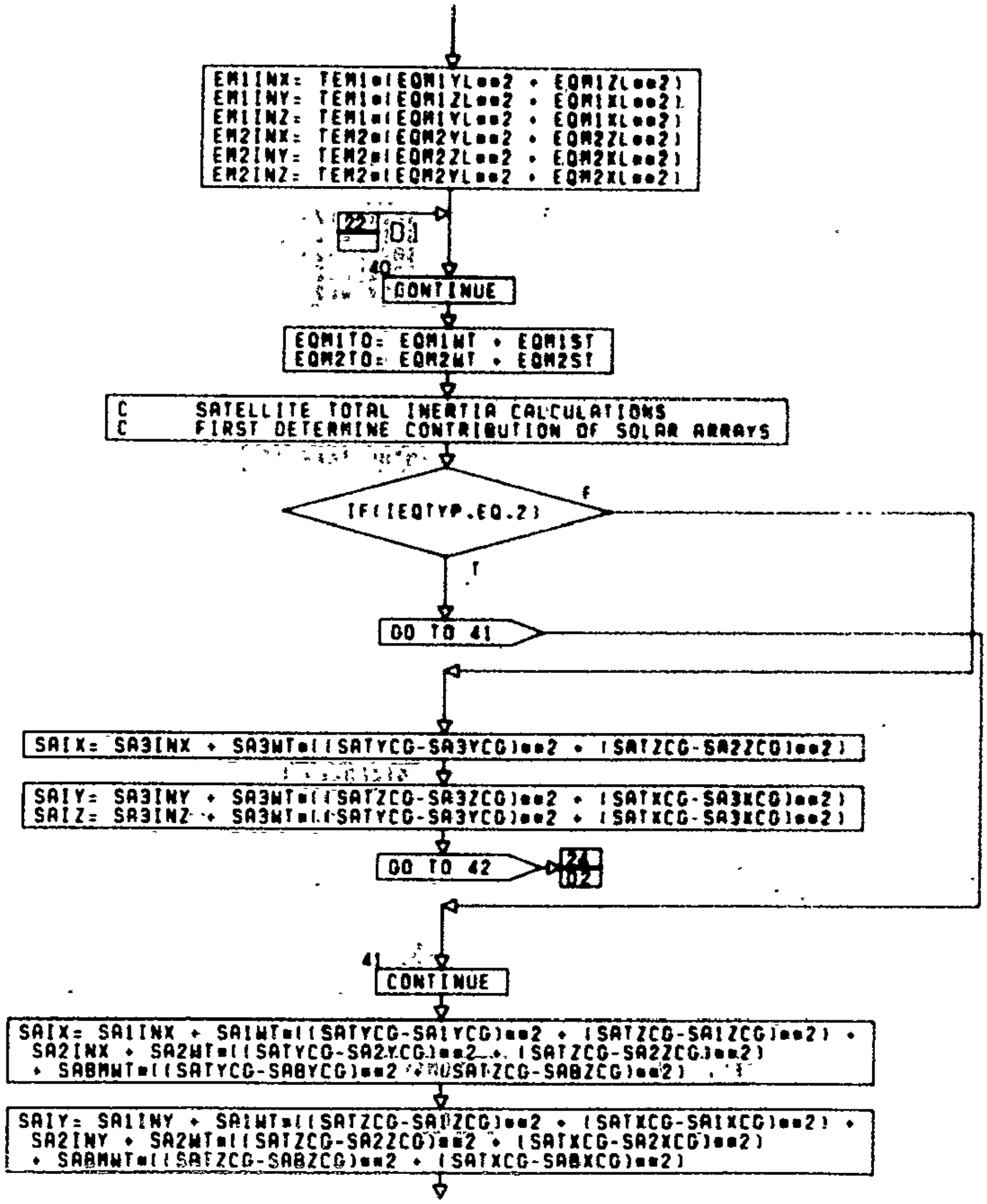

IF(ISHAPE - 2)66,67,68
-
+
0
66
STRINX= EQBSTR*SATRAD**2
STRINY= .5*EQBSTR*(SATRAD**2 + .167*EQBLG**2)
STRINZ= STRINY
EQINX= .5*EQWT*SATRAD**2
EQINY= .0833*EQWT*(3.*SATRAD**2 + EQBLG**2)
EQINZ= EQINY
GO TO 69
67
EQBSID= .708*SATDAM
STRINX= .333*EQBSTR*EQBSID**2
STRINY= .0833*EQBSTR*(2.*EQBSID**2 + EQBLG**2)
STRINZ= STRINY
EQINX= .167*EQWT*EQBSID**2
EQINY= .0833*EQWT*(EQBSID**2 + EQBLG**2)
EQINZ= EQINY
GO TO 69
68
STRINX= .167*EQBSTR*SATDAM**2
STRINY= STRINX
STRINZ= STRINX
EQINX= .1*EQWT*SATDAM**2
EQINY= EQINX
EQINZ= EQINX
CONTINUE
CONT. ON PG


IF (NUMEEQ .EQ. 0)
F
T
GO TO 71
C EXTERNAL EQUIPMENT INCREMENTAL INERTIA (BOX SHAPE)
DO 70 I=1,NUMEEQ
EEINX(I)= .167*EEQWT(I)*EESIDI(I)**2
EEINY(I)= EEINX(I)
EEINZ(I)= EEINX(I)
70
CONTINUE
71
CONTINUE
C SOLAR ARRAY INERTIAL CALCULATIONS
IF(IEQTYP.EQ.2)
F
T
GO TO 37
22
L9
SA3INX= SA3WT*SATRAD**2
SA3INY= .5*SA3WT*(SATRAD**2 + .167*SA3XL**2)
SA3INZ= SA3INY

CONT. ON PG 22

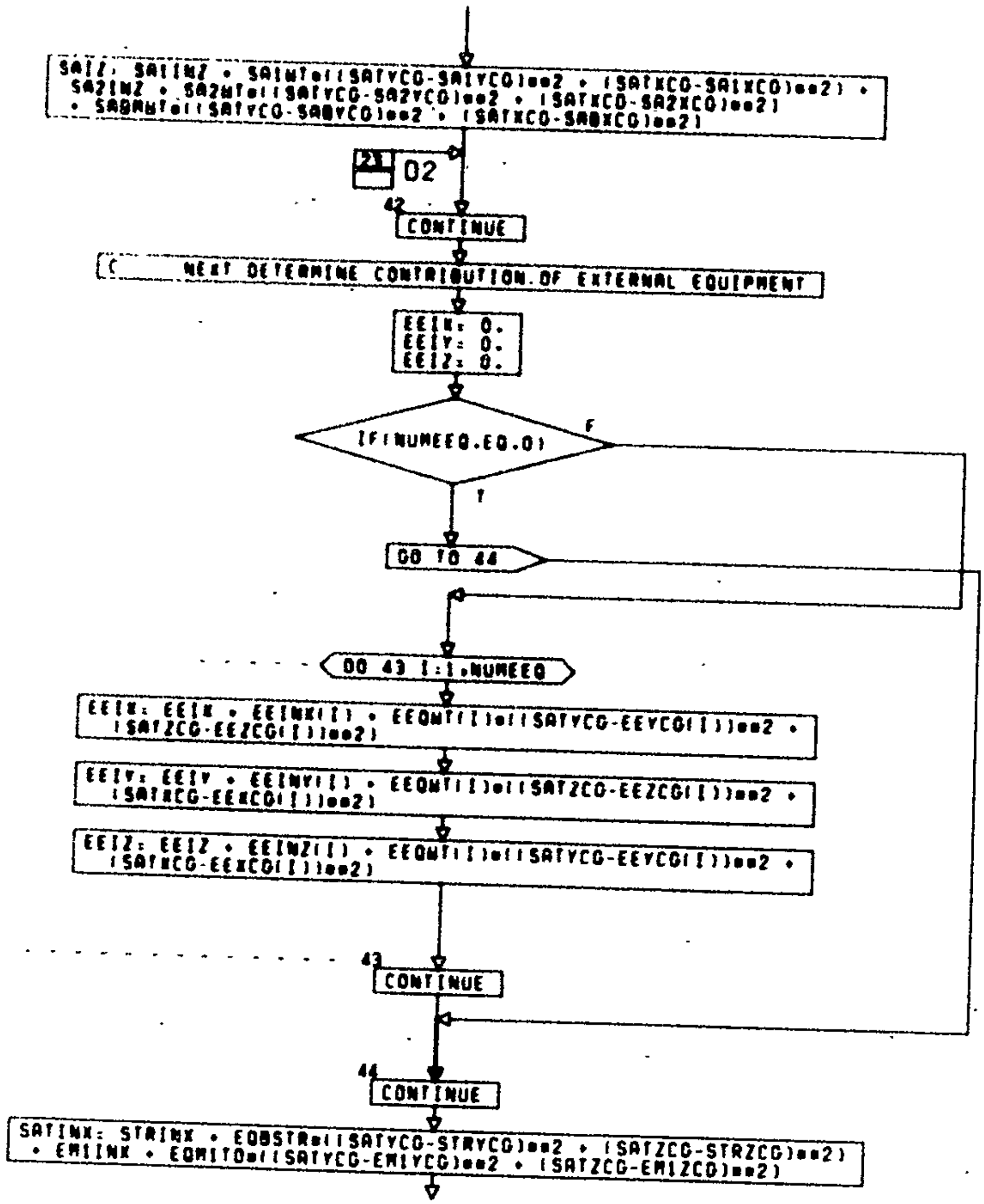

GO TO 38
21
C9
37
SA1INX: .0833*SA1WT*(SA1YL**2 + SA1ZL**2)
SA1INY: .0833*SA1WT*(SA1XL**2 + SA1ZL**2)
SA1INZ: .0833*SA1WT*(SA1XL**2 + SA1YL**2)
SA2INX: .0833*SA2WT*(SA2YL**2 + SA2ZL**2)
SA2INY: .0833*SA2WT*(SA2XL**2 + SA2ZL**2)
SA2INZ .0833*SA2WT*(SA2XL**2 + SA2YL**2)
38
CONTINUE
C MISSION EQUIPMENT BAY INCREMENTAL INERTIA
IF(MB12SW.EQ.2)
F
T
GO TO 39
EM1INX: .5*(EQM1ST + EQM1WT) * SATRAD**2
EM1INY: .0833*(EQM1ST + EQM1WT)*(3*SATRAD**2 + EQM1XL**2)
EM1INZ: EM1INY
EM2INX: .5*(EQM2ST + EQM2WT)*SATRAD**2
EM2INY: .0833*(EQM2ST + EQM2WT)*(3*SATRAD**2 + EQM2XL**2)
EM2INZ: EM2INY
GO TO 40
23
D1
39
TEM1: .0833*(EQM1ST + EQM1WT)
TEM2: .0833*(EQM2ST + EQM2WT)

CONT. ON PG 23



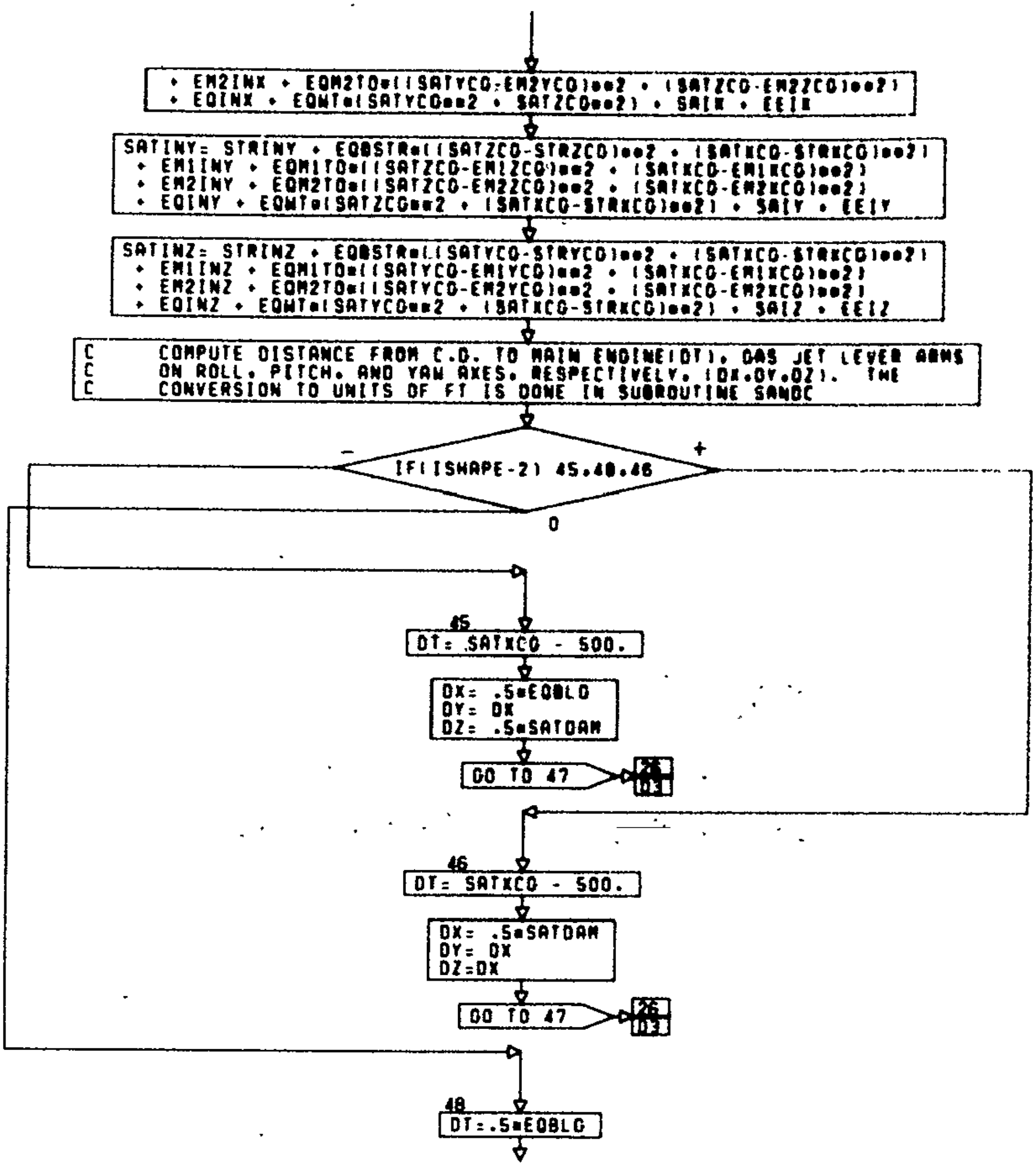
EM1INX= TEM1*(EQM1YL**2 + EQM1ZL**2)
EM1INY= TEM1*(EQM1ZL**2 + EQM1XL**2)
EM1INZ= TEM1*(EQM1YL**2 + EQM1XL**2)
EM2INX= TEM2*(EQM2YL**2 + EQM2ZL**2)
EM2INY= TEM2*(EQM2ZL**2 + EQM2XL**2)
EM2INZ= TEM2*(EQM2YL**2 + EQM2XL**2)
22
40
CONTINUE
EQM1TO= EQM1WT + EQM1ST
EQM2TO= EQM2WT + EQM2ST
C SATELLITE TOTAL INERTIA CALCULATIONS
C FIRST DETERMINE CONTRIBUTION OF SOLAR ARRAYS
IF(IEQTYP.EQ.2)
F
T
GO TO 41
SAIX= SA3INX + SA3WT*((SATYCG-SA3YCG)**2 + (SATZCG-SA2ZCG)**2)
SAIY= SA3INY + SA3WT*((SATZCG-SA3ZCG)**2 + (SATXCG-SA3XCG)**2)
SAIZ= SA3INZ + SA3WT*((SATYCG-SA3YCG)**2 + (SATXCG-SA3XCG)**2)
GO TO 42
24
02
41
CONTINUE
SAIX= SA1INX + SA1WT*((SATYCG-SA1YCG)**2 + (SATZCG-SA1ZCG)**2) +
SA2INX + SA2WT*((SATYCG-SA2YCG)**2 + (SATZCG-SA2ZCG)**2)
+ SABMWT*((SATYCG-SABYCG)**2 + (SATZCG-SABZCG)**2)
SAIY= SA1INY + SA1WT*((SATZCG-SA1ZCG)**2 + (SATXCG-SA1XCG)**2) +
SA2INY + SA2WT*((SATZCG-SA2ZCG)**2 + (SATXCG-SA2XCG)**2)
+ SABMWT*((SATZCG-SABZCG)**2 + (SATXCG-SABXCG)**2)

CONT. ON PG 24



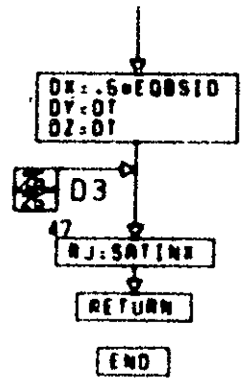
SAIZ: SAIINZ + SAIWT*((SATYCG-SAIYCG)**2 + (SATXCG-SAIXCG)**2) +
SA2INZ + SA2WT*((SATYCG-SA2YCG)**2 + (SATXCG-SA2XCG)**2)
+ SABNWT*((SATYCG-SABYCG)**2 + (SATXCG-SABXCG)**2)
23
02
42
CONTINUE
C NEXT DETERMINE CONTRIBUTION.OF EXTERNAL EQUIPMENT
EEIX: 0.
EEIY: 0.
EEIZ: 0.
IF(NUMEEQ.EQ.0)
F
T
GO TO 44
DO 43 I:1,NUMEEQ
EEIX: EEIX + EEINX(I) + EEQWT(I)*((SATYCG-EEYCG(I))**2 +
(SATZCG-EEZCG(I))**2)
EEIY: EEIY + EEINY(I) + EEQWT(I)*((SATZCG-EEZCG(I))**2 +
(SATXCG-EEXCG(I))**2)
EEIZ: EEIZ + EEINZ(I) + EEQWT(I)*((SATYCG-EEYCG(I))**2 +
(SATXCG-EEXCG(I))**2)
43
CONTINUE
44
CONTINUE
SATINX: STRINX + EQBSTR*((SATYCG-STRYCG)**2 + (SATZCG-STRZCG)**2)
+ EMIINX + EQMITO*((SATYCG-EMIYCG)**2 + (SATZCG-EMIZCG)**2)

CONT. ON PG 25



CONT. ON PG 26

126


DX:.5*EQBSID
DY:0T
DZ:0T
D3
47
RJ:SATINX
RETURN
END

```
SUBROUTINE EP (IPIC,IERR,ITER,NCONF,ICHOSE,NCHOSE)
```

```
C ***********************************************************************
C *   SUBROUTINE EP - -                                                 *
C *         WILL SELECT AND SIZE THE ELECTRICAL SUBSYSTEM WHICH WILL BE *
C *         THESE CONFIGURATIONS AS FOLLOWS - -                         *
C *                   NCONF (1) = 1   IS  DUAL SPIN                     *
C *                   NCONF (1) = 2   IS  YAW SPIN                      *
C *                   NCONF (1) = 3   IS  MASS EXPULSION                *
C *                   NCONF (1) = 4   IS  MASS EXPULSION(MOMENTUM BIAS) *
```

```
C *                   NCONF (1) = 5   IS  PITCH MOMENTUM BIAS
C *                   NCONF (5) = 1   IS  SHUNT  -  PADDLE              *
C *                   NCONF (5) = 2   IS  SHUNT  -  BODY                *
C *                   NCONF (5) = 3   IS  S + D  -  PADDLE              *
C *                   NCONF (5) = 4   IS  S + D  -  BODY                *
C *                   NCONF (5) = 5   IS  SERIES    PADDLE              *
C *                   NCONF (5) = 6   IS  SERIES    BODY                *
C *                   NCONF (6) = 1   IS  CYLINDER                      *
```

```
C *                   NCONF (6) = 2   IS  BOX                           *
C *                   NCONF (6) = 3   IS  SPHERE                        *
C ***********************************************************************
C ***********************************************************************
C *       A LIST OF THE VARIABLES FOLLOWS - -                           *
C *                                                                     *
C *       VARIABLE  HOW USED  FROM      TO         DEFAULT   DESCRIPTION*
C *                                                                     *
```

```
C *       A         INT       EP        EP                   FT HE + HP  *
C *       A1        INT       EPS       EPS             FT**2 ARRAY AREA*
C *       A32       INT       EP        EP                   A**(3/2)    *
C *       ALT       I,INT     USER      EPR                  MI ALTITUDE *
C *       AREA      O         EPS       VESIZE          FT**2 ARRAY AREA*
C *       CA        INT       EPS       EPS                A-H MIN REQ CP*
C *       CAPMAX    INT       DB        EPR                A-H MIN REQ CP*
C *       CCELL     INT       DB        EPS                A-H CAP SEL CL*
```

```
C *       CHMINT    INT       EPS       EPS        2.0     HRS MIN CHG TM*
C *       CI        INT       EPS       EPS                A-HMIN INST CP*
C *       CISTAR    INT       EPS       EPS                A-HCAP SEL CEL*
C *       CR        INT       EPS       EPS                W-HMIN REQ CAP*
C *       DATAB     I,INT,O   MAIN      EPR,EPS              DATA BASE   *
C *       DELF      INT       EPS       EPS        .03       XMIS LOSS   *
C *       DELI      INT       EPS       EPS        .02       FAB LOSS    *
C *       DELM      INT       EPS       EPS        .01       MISC LOSS   *
```

```
C *       DELR      INT       EPS       EPS        .05 OR .3 RAD DEG FAC*
C *       DELT      INT       EPS       EPS        TABLE     TEMP.CORR.  *
C *       ETAC      INT       DB        EPR        1.0       EFF CHGR    *
C *       ETAD      INT       DB        EPR,EPS    0.85      EFF DISCH   *
C *       ETAE      INT       DB        EPR,EPS    0.65      EFF BATT    *
C *       ETAI      INT       EPS       EPS        0.105     SOLAR CL EF*
C *       ETALR     INT       DB        EPR        0.90      EFF LD REG *
C *       ETAR      INT       EPR       EPR,EPS    1.0       PWR DIST LS*
```

CONT. ON PG 2

C *	FS	INT	EPS	EPS		SIZE FACT. *
C *	FW	INT	EPS	EPS		WT FACTOR *
C *	HE	INT	EP	EP	20.902E6FT	RAD EARTH *
C *	HEOA	INT	EP	EP		HE/A *
C *	HP	INT	EP	EP		FT PERIGEE *
C *	I	INT	EP	EP		INT INDEX *
C *	ICCU	INT	EPR	EPR		CCU INDEX *
C *	ICELL	INT	EPS	EPS		COL INDX CL*

C *	ICELLE	INT	EPS	EPS		END CELLS *
C *	ICH	INT	EPR	EPR		AMP CHG CURR *
C *	ICHGR	INT	EPR	EPR		COL INDX CH*
C *	ICHGRE	INT	EPS	EPS		END CHGRS *
C *	ICHOSE	O	EPR.EPS	MAIN		HDWR ID *
C *	ICONF	INT	EPR.EPS	EPR.EPS		VAR ON CONF*
C *	IDB	I	MAIN	EPR.EPS		LAST HDWR *
C *	IDR	INT	EPR	EPR		COL INDX DR*

C *	IDRE	INT	EPR	EPR		END DISCH *
C *	IERR	O	EPR	MAIN		ERROR FLG *
C *	ILR	INT	EPR	EPR		COL INDX LR*
C *	ILRE	INT	EPR	EPR		END LR *
C *	IPCU	INT	EPR	EPR		PCU INDEX *
C *	IPCUE	INT	EPR	EPR		END PCU *
C *	IPD	INT	EPR	EPR		PD INDEX *
C *	IPDE	INT	EPR	EPR		END PD *

C *	IPIC	I.O	EPR.EPS	MAIN		HDWR INDEX *
C *	ISPD	INT	EPR	EPR		SPD INDEX *
C *	ISPDE	INT	EPR	EPR		END SPD *
C *	ISR1	INT	EPR	EPR		SR1 INDEX *
C *	ISR1E	INT	EPR	EPR		END SR1 *
C *	ISR2	INT	EPR	EPR		SR2 INDEX *
C *	ISR2E	INT	EPR	EPR		END SR2 *
C *	K1	INT	EPS	EPS	1.02	BATT PKG F *

C *	K2	INT	EPS	EPS	1.4	BAT ST WT F*
C *	LMBDD	INT.O	EPR	EPR.REL	0.3	AV DP DISCH*
C *	LMBDG	INT	EPS	EPS	-	ORINT FACT *
C *	LMBDP	INT	EPS	EPS	0.9	SLR PKG FAC*
C *	MU	INT	EP	EP	1.408E16	CONSTANT *
C *	W	INT	EP	EP		EARTH RATE *
C *	NB	INT	EPS	EPS	2	NO BATT *
C *	NC	INT	EPS	EPS		NO SLR CELL*

C *	NCCU	INT	EPR	EPR		NO.CCU *
C *	NCH	INT	EPS	EPS	2	NO CHGRS *
C *	NCHOSE	O	EPR.EPS	MAIN		NO. EQUIP. *
C *	NCONF(1)	I.EPS.O	MAIN	EPS.MAIN		SANDC MACRO*
C *	NCONF(5)	I.EP .O	MAIN	EP .MAIN		EP MACRO *
C *	NCONF(6)	I.EPS.O	MAIN	EPS.MAIN		VSIZE MACRO*
C *	ND	INT	EPR	EPR		NO DISCH RG*
C *	NLR	INT	EPR	EPR		NO LD REG *

C *	NPCU	INT	EPR	EPR		NO.PCU *
C *	NPD	INT	EPR	EPR		NO. PD *

CONT. ON PG 3

```
C *          NSPD        INT      EPR         EPR                        NO. SPD        *
C *          NSR         INT      EPR         EPR                        NO SHNT REG    *
C *          OPTEMP      I        USER        EP           15. DEG. C BAT TEMP          *
C *          PBOL        INT      EPR         EPR,EPS                WATTPWR B.O.L.     *
C *          PD          INT      EPR         EPR                    WATTBAT PWR REQ    *
C *          PEXCES      INT      EPR         EPR,EPS                WATTPWD 2B DISP    *
```

```
C *          PIE         INT      EPS         EPS          3.14159    CONSTANT          *
C *          PL          I        ALL  S/S    EPR                   WATT AV PWR LD      *
C *          PLMIN       I        ALL  S/S    EPR                   WATT MIN PWR LD     *
C *          PLR         INT      EPR         EPR                    WATTTOT PWR LRE    *
C *          PLRD        D        EPR         THERMAL                WATTPWR DISP LR    *
C *          PS          INT      EPR         EPR,EPS                WATTEOL SOL OUT    *
C *          RFD         INT      EPS         EPS                        TEMP DEG FC    *
C *          S           INT      EP          EP           USED IN CALC OF TE           *
```

```
C *          SOL         INT      EPS         EPS          1353  W/M2AV SOL INT         *
C *          TE          INT      EPS         EPR                        ECPS TIME      *
C *          TEDTS       INT      EPS         EPS                        DARK/LITE      *
C *          VB          INT      EPS         EPS                 FT**3UNIT BATVOL      *
C *          VBM         INT      EPR         EPS                  VDCMIN BAT VLT       *
C *          VBT         INT      EPS         EPS                 FT**3TOT BAT VOL      *
C *          VC          INT      EPS         EPS          1.1     VDCMIN CELL U        *
C *          VCELL       INT      DB          MAIN                    M3VOL CELL        *
```

```
C *          VDB         INT      EPR         EPR                    VDCAVE ALL VOL     *
C *          VOL         D        MAIN                            FT**3 EP VOL          *
C *          WATE        INT,D    EPS         VESIZE                KG ARRAY WT         *
C *          WB          INT      EPS         EPS                   KGUNIT BAT WT       *
C *          WBT         INT      EPS         EPS                   KGTOT BAT WT        *
C *          WCELL       INT      DB          EPS                   LB CELL WGT         *
C *          WT          D        MAIN                              LBS EP WT           *
C *                                                                                     *
```

```
C ***************************************************************************
```

```
COMMON /USER5/ IVOLT,OPTEMP
```

```
COMMON /BTWN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,
 LMBDD,AREA,SATLG,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,
 SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,HTRPRB,
 HPT,HTPIPE,VCHP,HTPT,FC,N,COMRT,ACSSN,BITRAT(2),
 EDBLG,SABOLG,SATWT
```

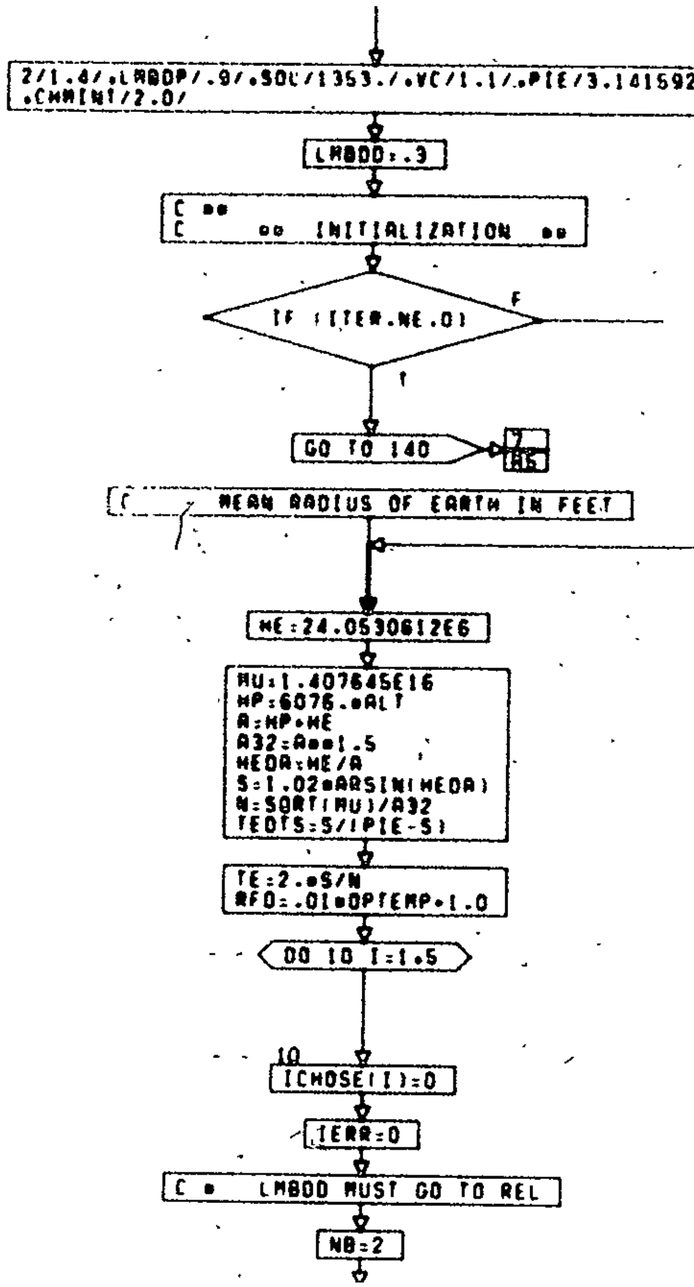
```
COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMODLD,TRUNC,ITRUNC,DE,TE,
 TOOLR,OCR,SEIR,PMR,PE,PU,TOOLU,OCP,SEIP,PMP,SATR,SATINV,MER,
 MEINV,PAYR,PAYINV,PAUQUL,GSE,XLTOT,CTOT,FEER,FEEINV,DDTE,XVEST,
 OPS,SKTAU(6),ROLD(60),TTT,AN,TS,BS,AM,TF,BF,TC,TA,TB,TOTOPS
```

```
COMMON /USERI/EQM1WT,EQM2WT,DIAMAX,ALT
COMMON /DBCOM/ IDB(30),DATAB(55,90)
DIMENSION NCONF(10), IPIC(5), ICHOSE(5), NCHOSE(5)
REAL MU,N,ICH,LMBDD,LMBDG,LMBDP,K1,K2
```

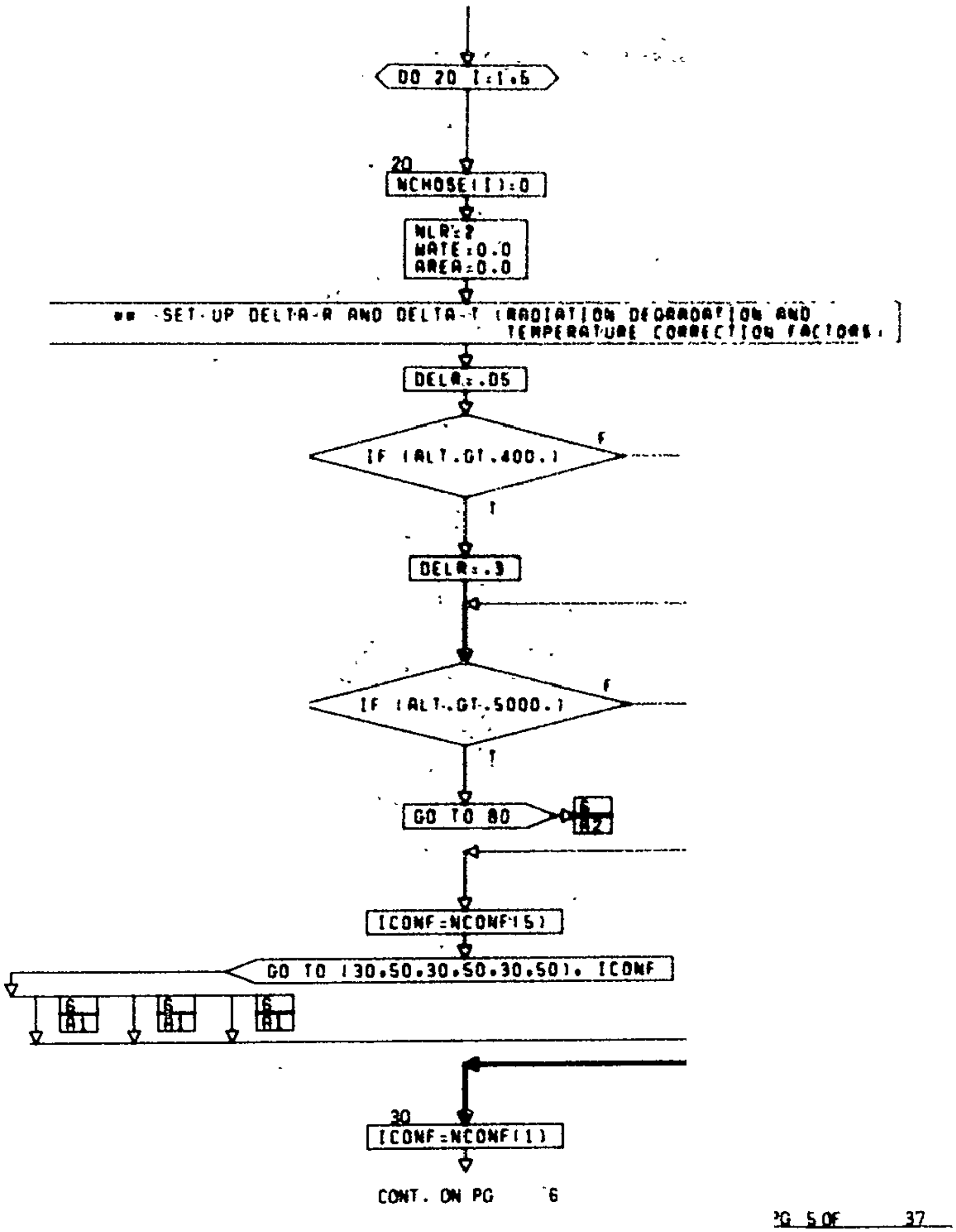
```
DATA DELF/.03/,DELI/.02/,DELM/.01/,ETAI/.105/,ETAR/1.0/,K1/1.02/,K
```

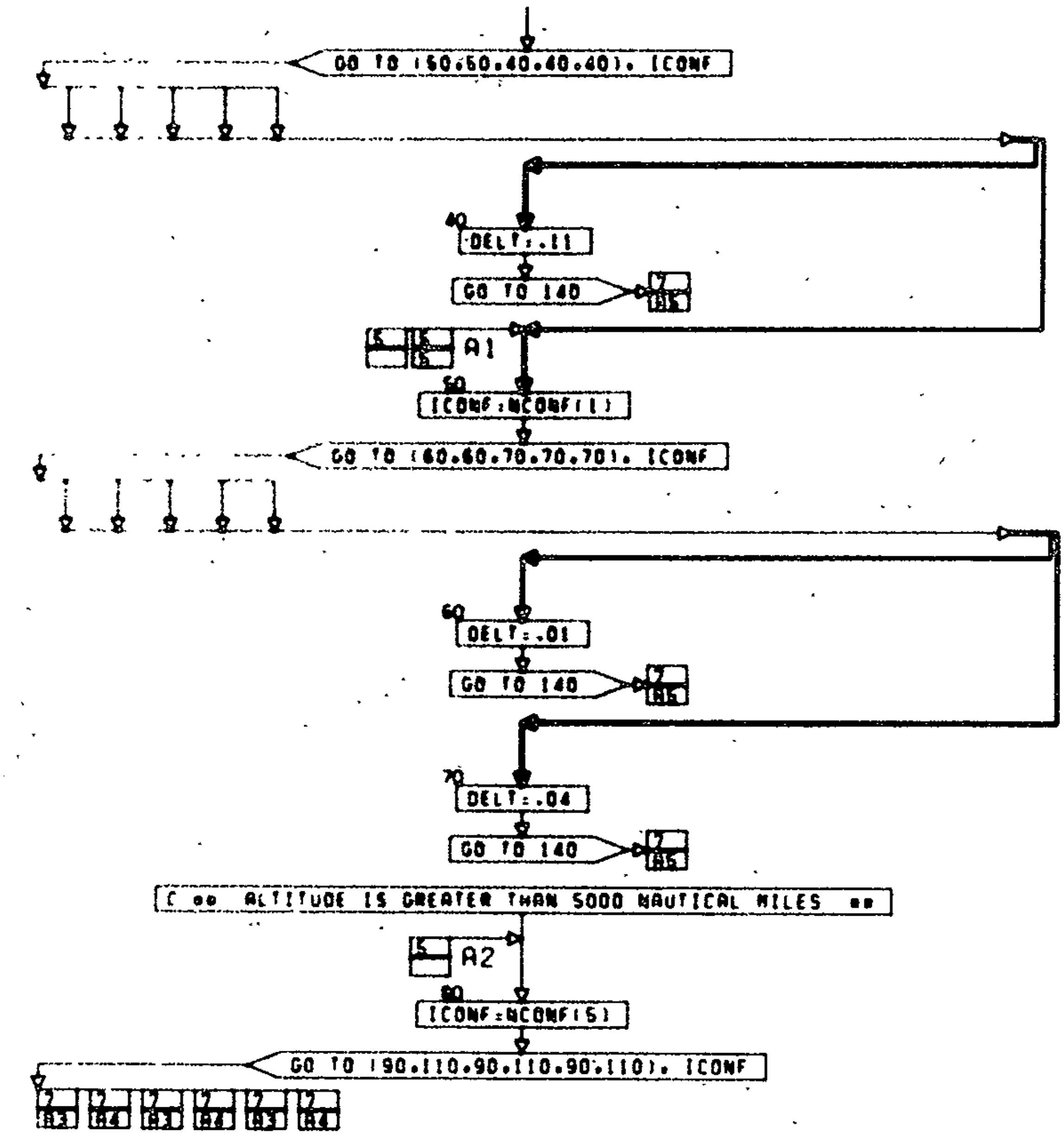
CONT. ON PG 4

129

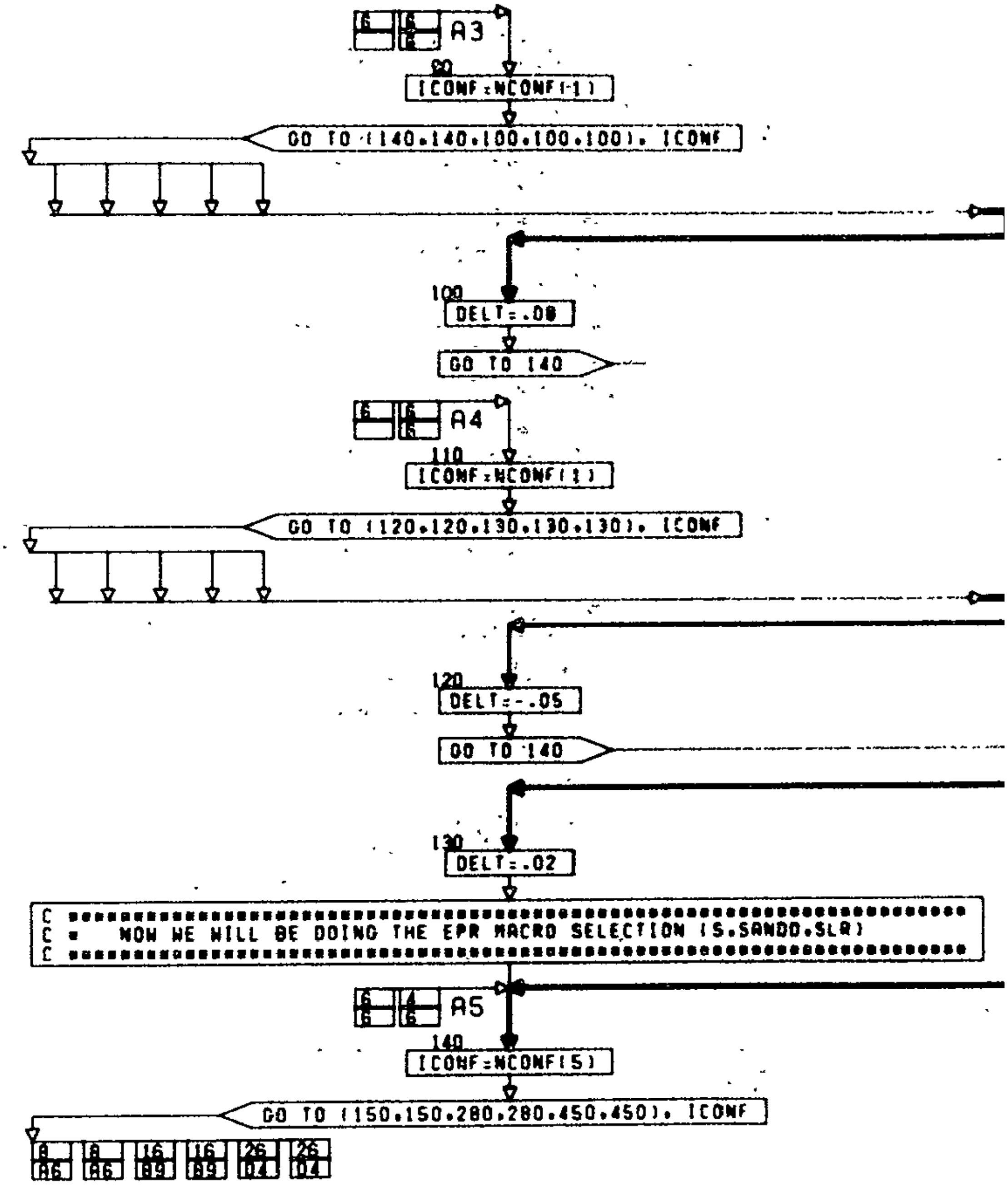

2/1.4/,LMBDP/.9/,SOL/1353./,VC/1.1/,PIE/3.1415926/
,CMMINT/2.0/
LMBDD:.3
C **
C ** INITIALIZATION **
IF (ITER.NE.0)
F
T
GO TO 140
7
A6
C MEAN RADIUS OF EARTH IN FEET
RE:24.0530612E6
MU:1.407645E16
HP:6076.*ALT
A:HP+RE
A32:A**1.5
REDA:RE/A
S:1.02*ARSIN(REDA)
W:SQRT(MU)/A32
TEDTS:S/(PIE-S)
TE:2.*S/W
RFD:.01*OPTEMP+1.0
DO 10 I:1,5
10
ICHOSE(I)=0
IERR:0
C * LMBDD MUST GO TO REL
NB:2

CONT. ON PG 5

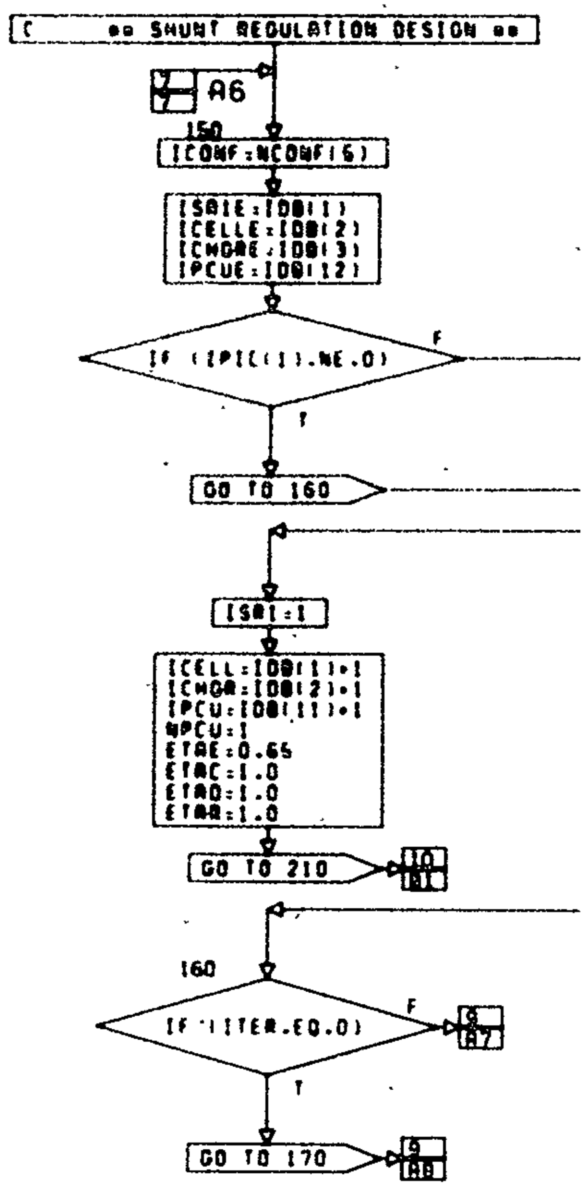

DO 20 I=1,6
20
NCHOSE(I)=0
NLR=2
WATE=0.0
AREA=0.0
** SET UP DELTA-R AND DELTA-T (RADIATION DEGRADATION AND TEMPERATURE CORRECTION FACTORS)
DELR=.05
IF (ALT.GT.400.)
F
T
DELR=.3
IF (ALT.GT.5000.)
F
T
GO TO 80
6
A2
ICONF=NCONF(5)
GO TO (30,50,30,50,30,50), ICONF
6
A1
6
A1
6
A1
30
ICONF=NCONF(1)
CONT. ON PG 6
PG 5 OF 37


GO TO (50,50,40,40,40), ICONF
40
DELT=.11
GO TO 140
A1
50
ICONF=NCONF(1)
GO TO (60,60,70,70,70), ICONF
60
DELT=.01
GO TO 140
70
DELT=.04
GO TO 140
C ** ALTITUDE IS GREATER THAN 5000 NAUTICAL MILES **
A2
80
ICONF=NCONF(5)
GO TO (90,110,90,110,90,110), ICONF

CONT. ON PG

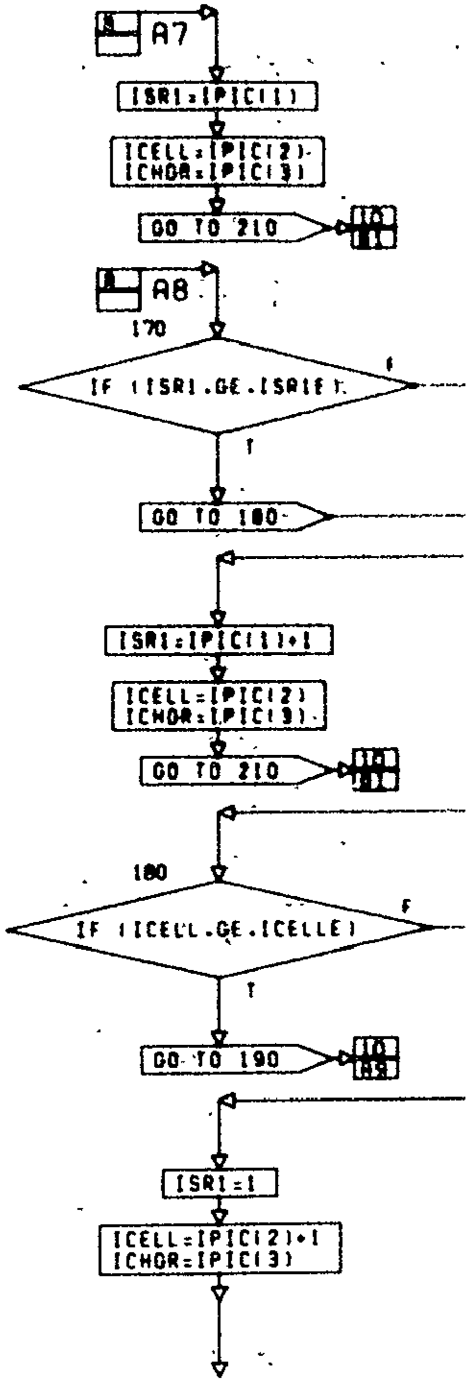

A3
90
ICONF=NCONF(1)
GO TO (140,140,100,100,100), ICONF
100
DELT=.08
GO TO 140
A4
110
ICONF=NCONF(1)
GO TO (120,120,130,130,130), ICONF
120
DELT=-.05
GO TO 140
130
DELT=.02
C **
C *   NOW WE WILL BE DOING THE EPR MACRO SELECTION (S,SANDD,SLR)
C **
A5
140
ICONF=NCONF(5)
GO TO (150,150,280,280,450,450), ICONF

CONT. ON PG 8

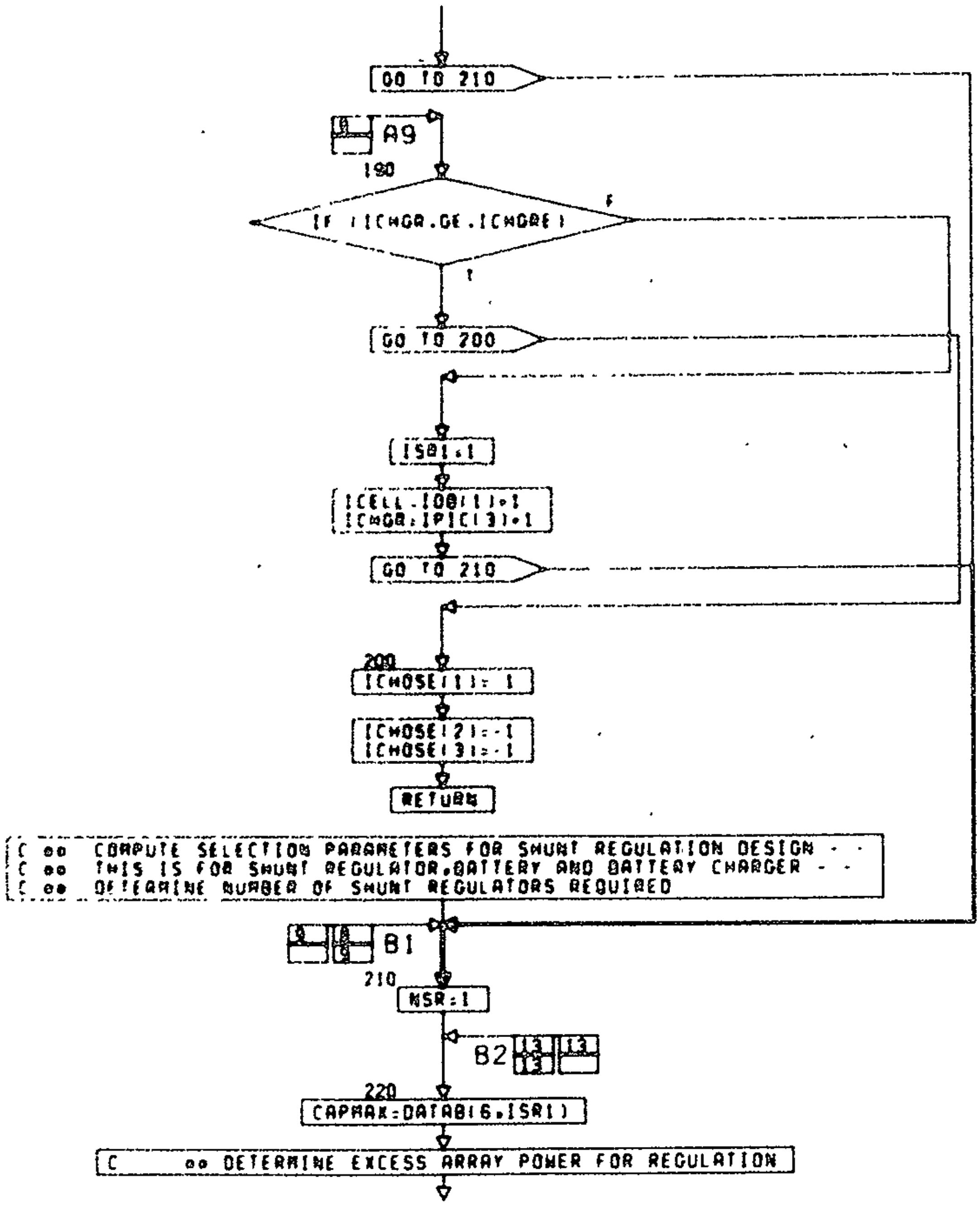


CONT. ON PG 9

ORIGINAL PAGE IS
OF POOR QUALITY

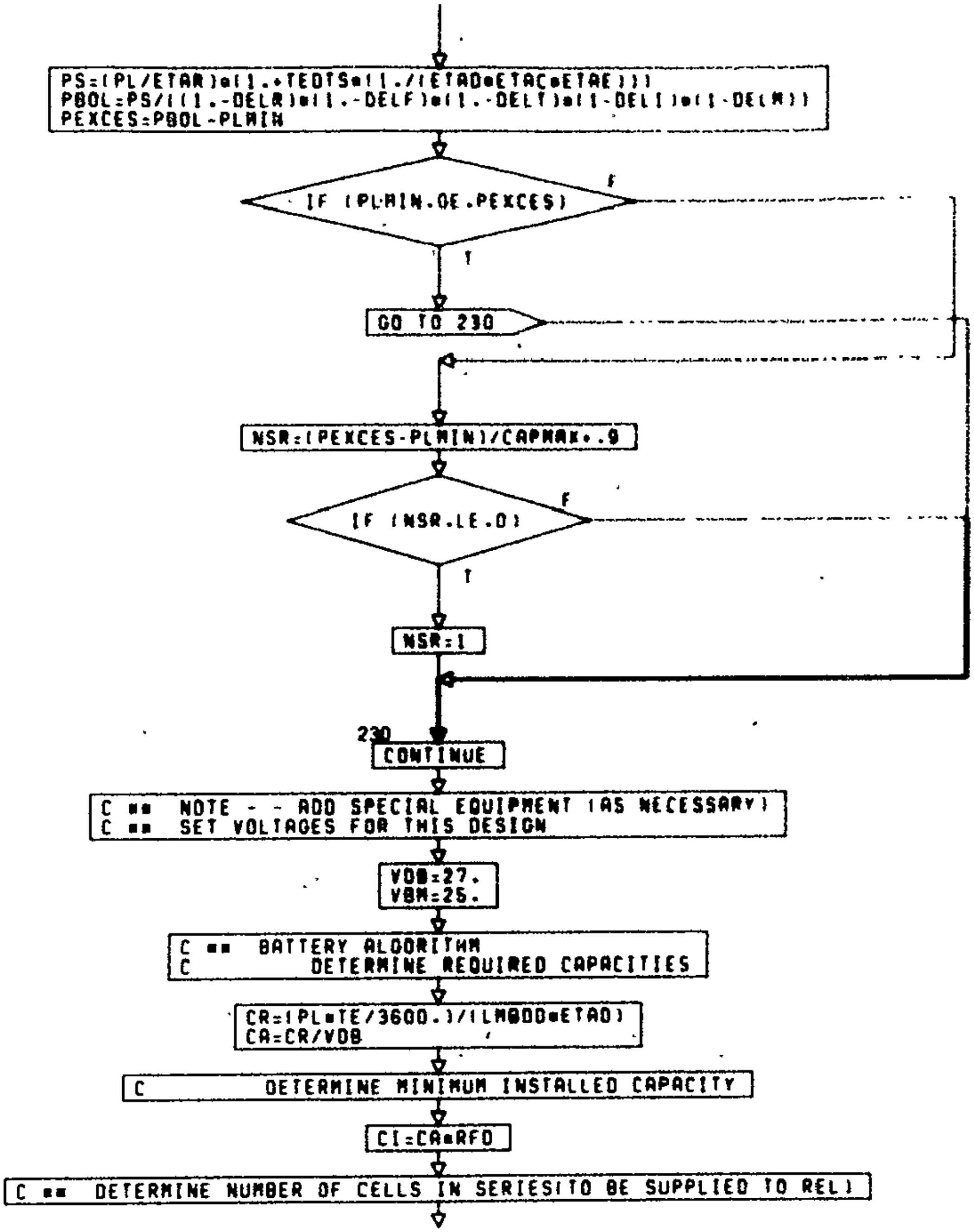

A7
ISR1=IPIC(1)
ICELL=IPIC(2)
ICHOR=IPIC(3)
GO TO 210
A8
170
IF (ISR1.GE.ISR1E)
F
T
GO TO 180
ISR1=IPIC(1)+1
ICELL=IPIC(2)
ICHOR=IPIC(3)
GO TO 210
180
IF (ICELL.GE.ICELLE)
F
T
GO TO 190
10
A9
ISR1=1
ICELL=IPIC(2)+1
ICHOR=IPIC(3)

CONT. ON PG. 10



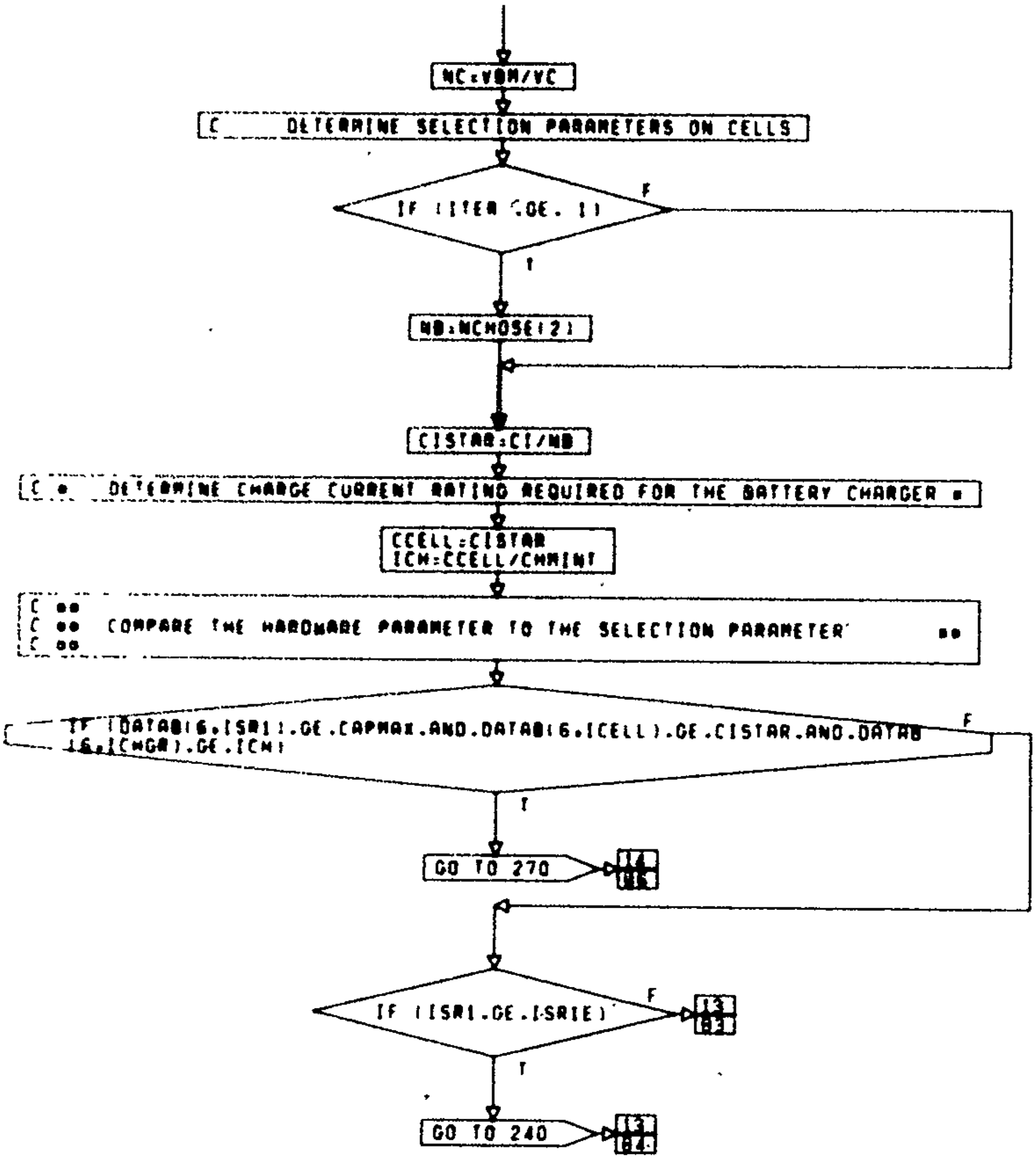
GO TO 210
A9
190
IF (ICHGR.GE.ICHGRE)
F
T
GO TO 200
ISRI:1
ICELL:IDB(1)+1
ICHGR:IPIC(3)+1
GO TO 210
200
ICHOSE(1): 1
ICHOSE(2):-1
ICHOSE(3):-1
RETURN
C ** COMPUTE SELECTION PARAMETERS FOR SHUNT REGULATION DESIGN - -
C ** THIS IS FOR SHUNT REGULATOR,BATTERY AND BATTERY CHARGER - -
C ** DETERMINE NUMBER OF SHUNT REGULATORS REQUIRED
B1
210
NSR:1
B2
220
CAPMAX:DATAB(6,ISR1)
C ** DETERMINE EXCESS ARRAY POWER FOR REGULATION

CONT. ON PG 11.

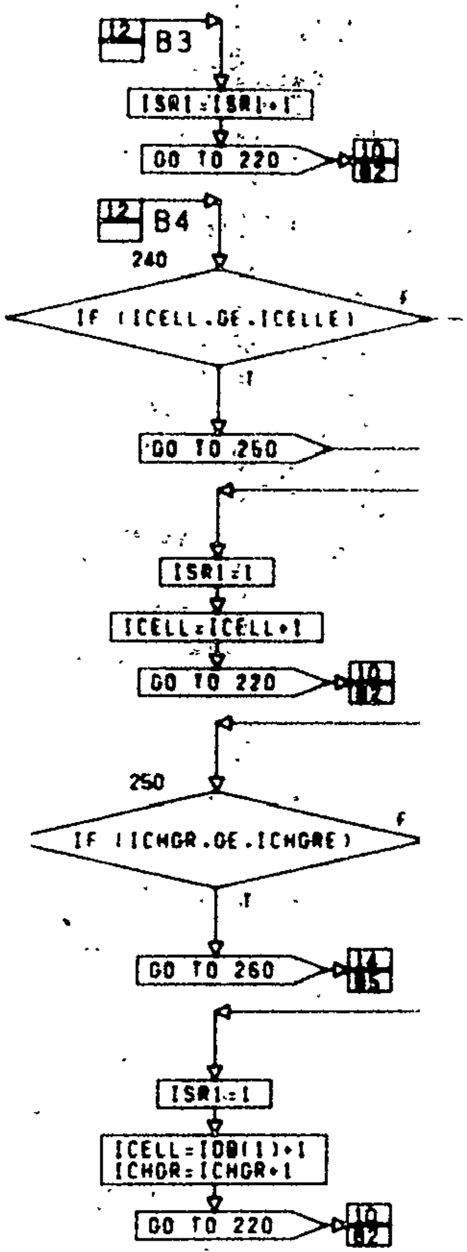


CONT. ON PG 12

133

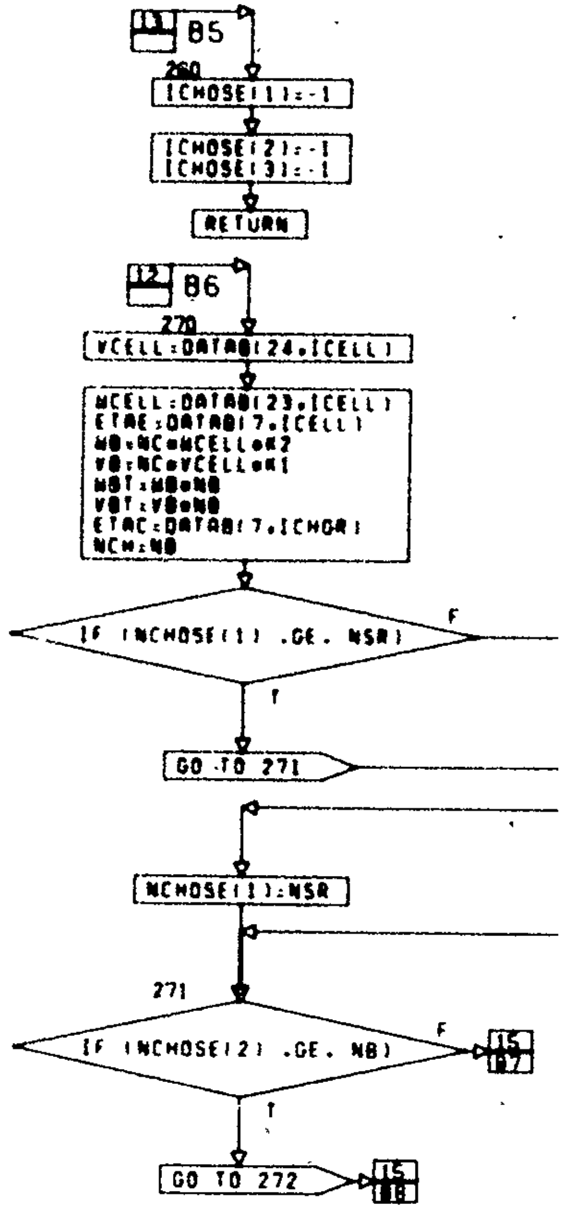

NC:VBM/VC
C DETERMINE SELECTION PARAMETERS ON CELLS
IF (ITER .GE. 1)
F
T
NB:NCHOSE(2)
CISTAR:CI/NB
C * DETERMINE CHARGE CURRENT RATING REQUIRED FOR THE BATTERY CHARGER *
CCELL:CISTAR
ICH:CCELL/CHMINT
C **
C ** COMPARE THE HARDWARE PARAMETER TO THE SELECTION PARAMETER **
C **
IF (DATAB(6,ISR1).GE.CAPMAX.AND.DATAB(6,ICELL).GE.CISTAR.AND.DATAB(6,ICHGR).GE.ICH)
F
T
GO TO 270
IF (ISR1.GE.ISR1E)
F
T
GO TO 240

CONT. ON PG 13

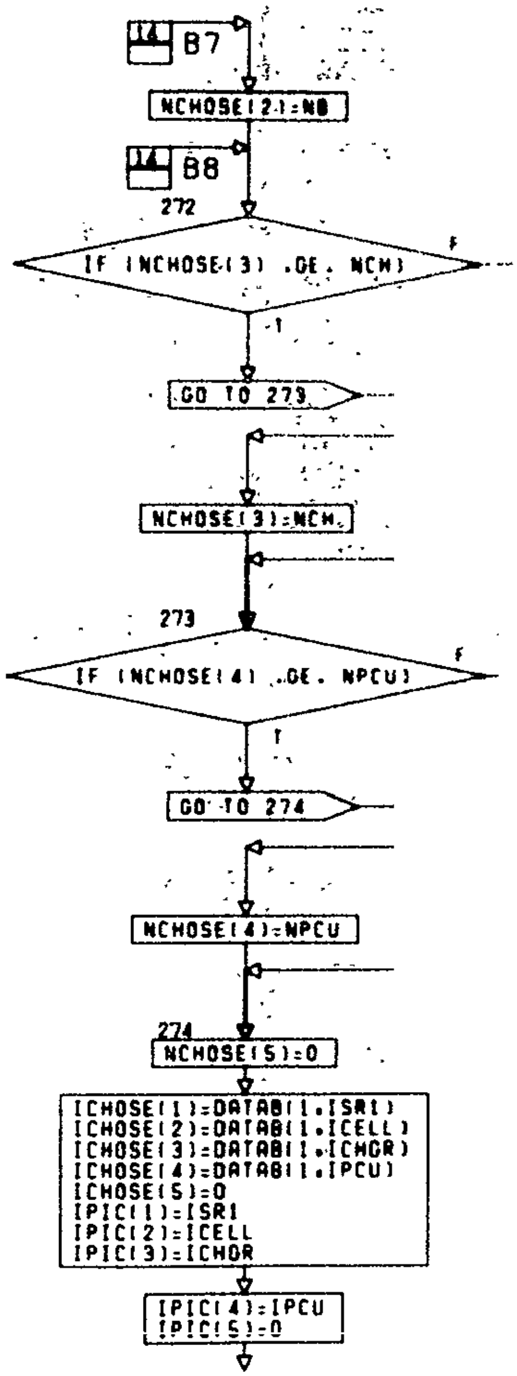


CONT. ON PG 14

134

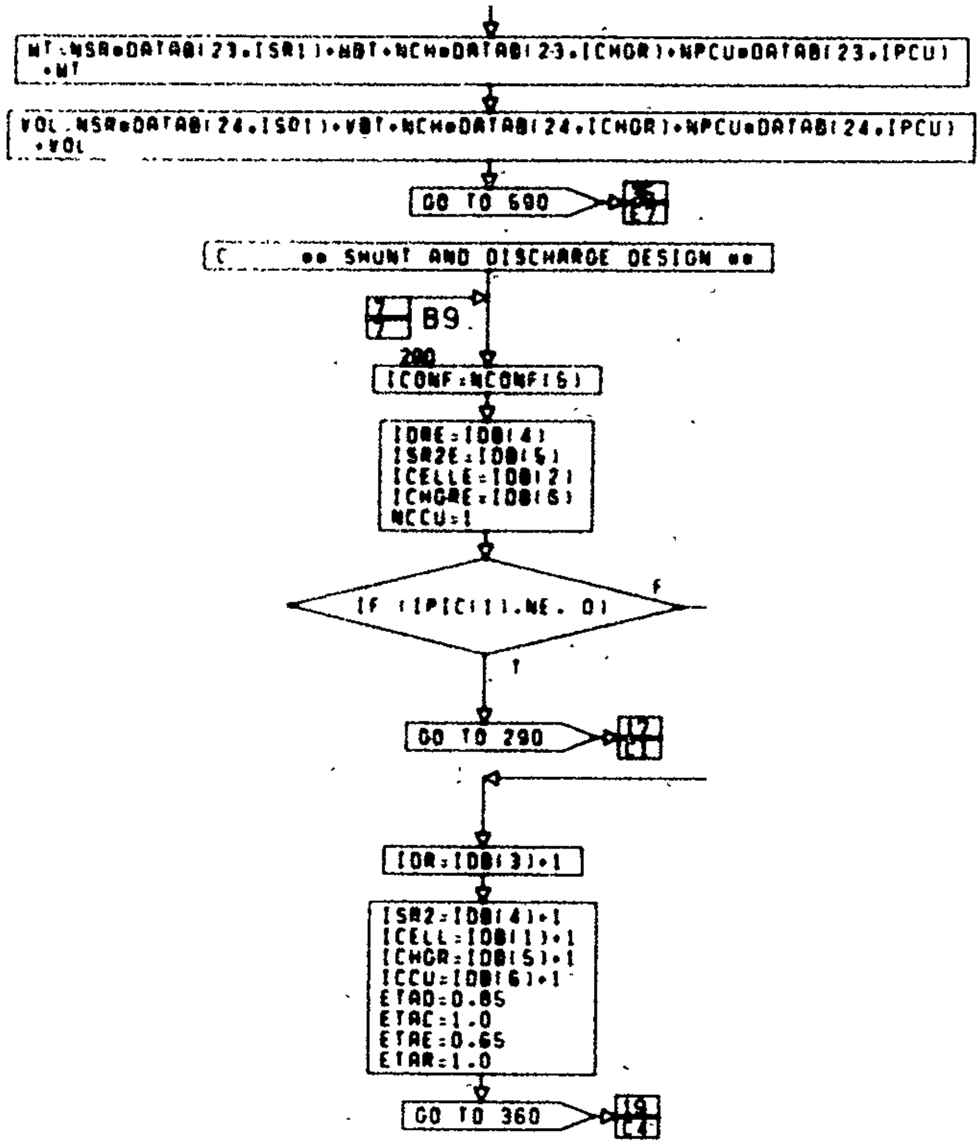

11
B5
260
ICHOSE(1):-1
ICHOSE(2):-1
ICHOSE(3):-1
RETURN
12
B6
270
VCELL:DATAB(24,ICELL)
WCELL:DATAB(23,ICELL)
ETAE:DATAB(7,ICELL)
WB:NC*WCELL*K2
VB:NC*VCELL*K1
WBT:WB*NB
VBT:VB*NB
ETAC:DATAB(7,ICHOR)
NCH:NB
IF (NCHOSE(1) .GE. NSR)
F
T
GO TO 271
NCHOSE(1):NSR
271
IF (NCHOSE(2) .GE. NB)
F
T
15
GO TO 272

CONT. ON PG 15

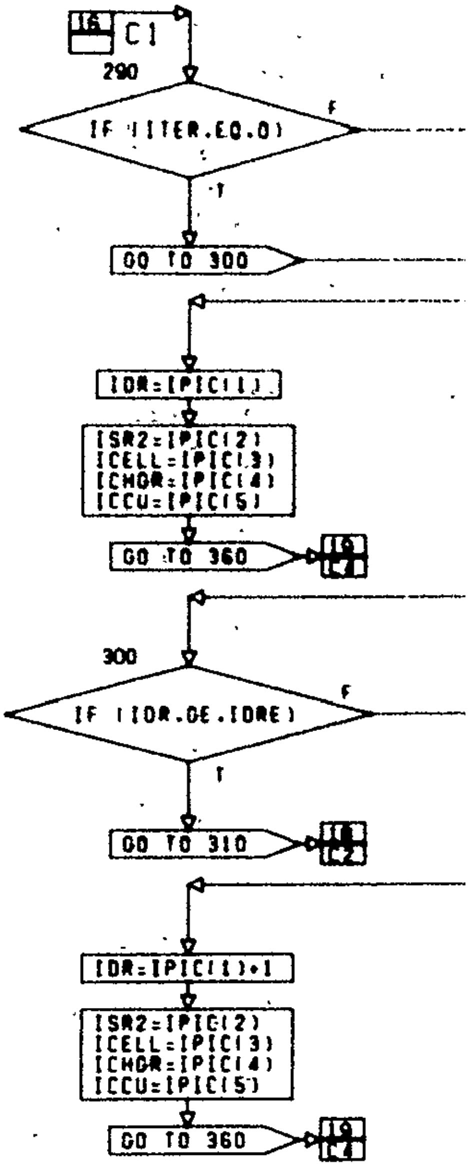


14 B7
NCHOSE(2)=NB
14 B8
272
IF (NCHOSE(3) .GE. NCH)
F
T
GO TO 273
NCHOSE(3)=NCH
273
IF (NCHOSE(4) .GE. NPCU)
F
T
GO TO 274
NCHOSE(4)=NPCU
274
NCHOSE(5)=0
ICHOSE(1)=DATAB(1,ISR)
ICHOSE(2)=DATAB(1,ICELL)
ICHOSE(3)=DATAB(1,ICHOR)
ICHOSE(4)=DATAB(1,IPCU)
ICHOSE(5)=0
IPIC(1)=ISR
IPIC(2)=ICELL
IPIC(3)=ICHOR
IPIC(4)=IPCU
IPIC(5)=0

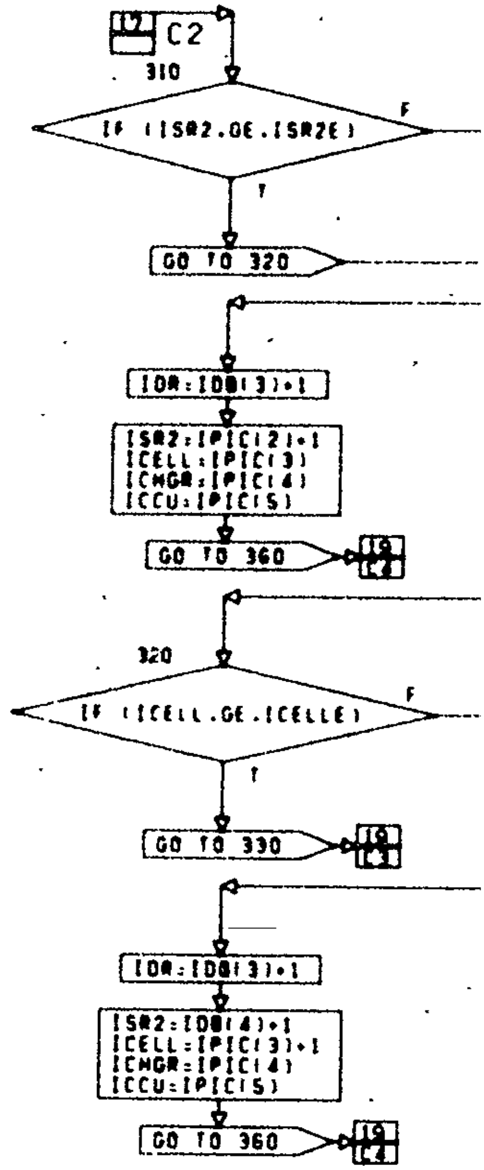
CONT. ON PG 16


WT=NSR*DATAB(23,ISR1)+WBT+NCH*DATAB(23,ICHGR)+NPCU*DATAB(23,IPCU)
+WT
VOL=NSR*DATAB(24,ISR1)+VBT+NCH*DATAB(24,ICHGR)+NPCU*DATAB(24,IPCU)
+VOL
GO TO 690
C ** SHUNT AND DISCHARGE DESIGN **
B9
200
ICONF=NCONF(5)
IDRE=IDB(4)
ISR2E=IDB(5)
ICELLE=IDB(2)
ICHGRE=IDB(6)
NCCU=1
IF (IPIC(1).NE. 0)
F
T
GO TO 290
IDR=IDB(3)+1
ISR2=IDB(4)+1
ICELL=IDB(1)+1
ICHGR=IDB(5)+1
ICCU=IDB(6)+1
ETAD=0.85
ETAC=1.0
ETAE=0.65
ETAR=1.0
GO TO 360

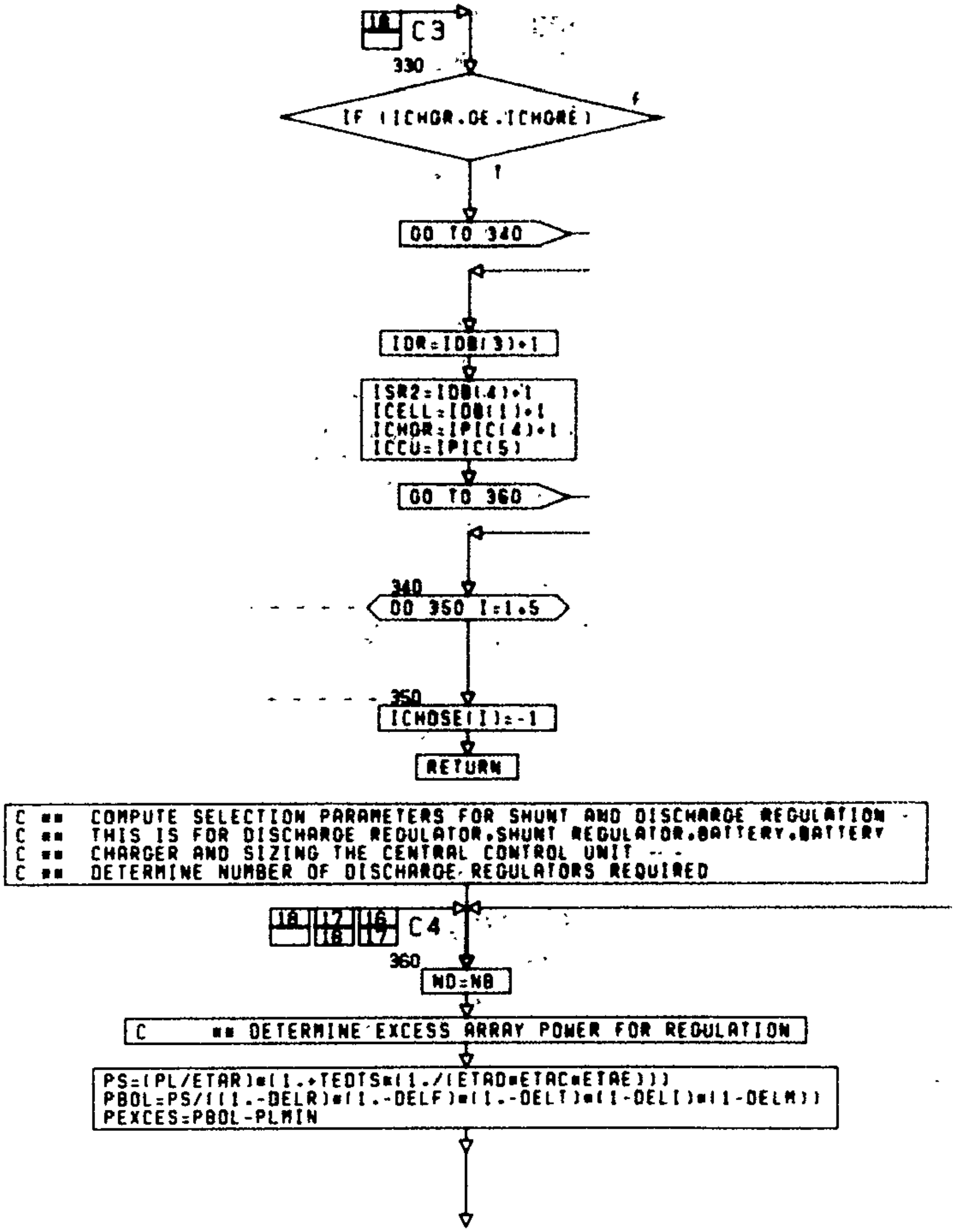
CONT. ON PG 17


16
C1
290
IF (ITER.EQ.0)
F
T
GO TO 300
IDR=IPIC(1)
ISR2=IPIC(2)
ICELL=IPIC(3)
ICHOR=IPIC(4)
ICCU=IPIC(5)
GO TO 360
300
IF (IDR.GE.IDRE)
F
T
GO TO 310
IDR=IPIC(1)+1
ISR2=IPIC(2)
ICELL=IPIC(3)
ICHOR=IPIC(4)
ICCU=IPIC(5)
GO TO 360

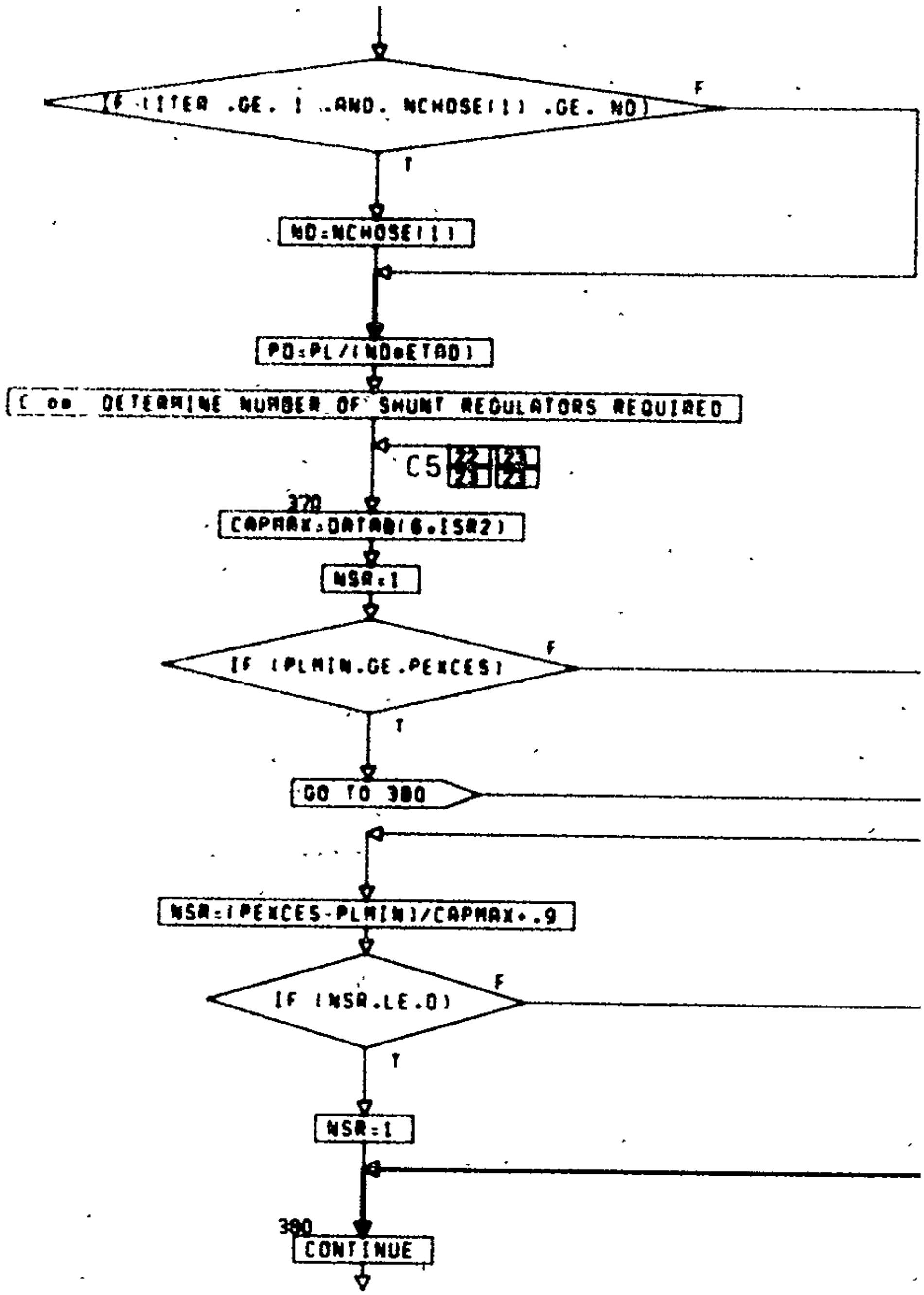
CONT. ON PG 18


18
C2
310
IF (ISR2.GE.ISR2E)
F
T
GO TO 320
IDR=IDB(3)+1
ISR2=IPIC(2)+1
ICELL=IPIC(3)
ICHGR=IPIC(4)
ICCU=IPIC(5)
GO TO 360
19
C4
320
IF (ICELL.GE.ICELLE)
F
T
GO TO 330
19
C3
IDR=IDB(3)+1
ISR2=IDB(4)+1
ICELL=IPIC(3)+1
ICHGR=IPIC(4)
ICCU=IPIC(5)
GO TO 360
19
C4

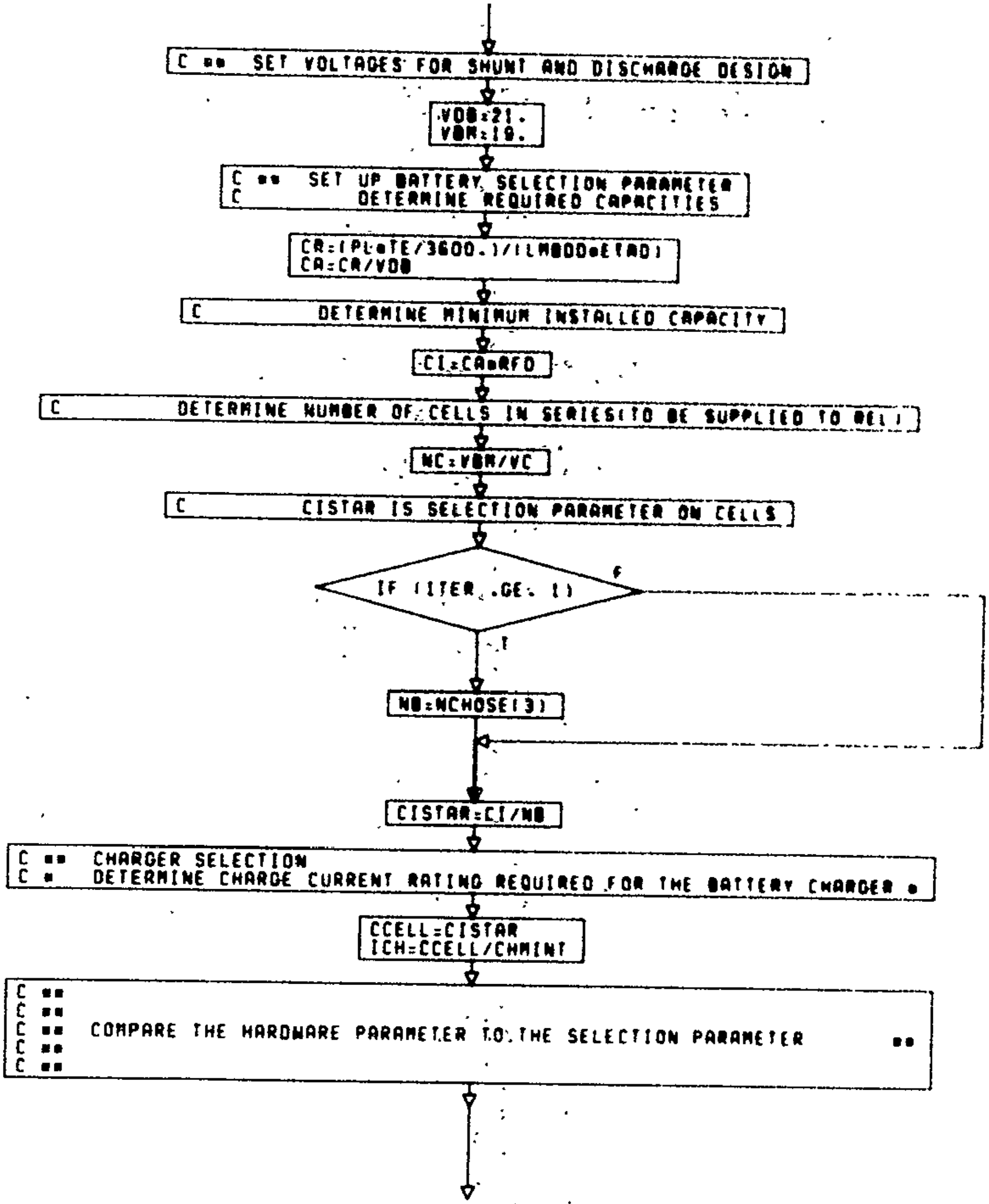
CONT. ON PG 19


18 C3
330
IF (ICHGR.GE.ICHGRE)
F
T
GO TO 340
IDR=IDB(3)+1
ISR2=IDB(4)+1
ICELL=IDB(1)+1
ICHGR=IPIC(4)+1
ICCU=IPIC(5)
GO TO 360
340
DO 350 I=1,5
350
ICHOSE(I)=-1
RETURN
C ** COMPUTE SELECTION PARAMETERS FOR SHUNT AND DISCHARGE REGULATION
C ** THIS IS FOR DISCHARGE REGULATOR,SHUNT REGULATOR,BATTERY,BATTERY
C ** CHARGER AND SIZING THE CENTRAL CONTROL UNIT
C ** DETERMINE NUMBER OF DISCHARGE REGULATORS REQUIRED
18 17 18 16 17 C4
360
ND=NB
C ** DETERMINE EXCESS ARRAY POWER FOR REGULATION
PS=(PL/ETAR)*(1.+TEDTS*(1./(ETAD*ETAC*ETAE)))
PBOL=PS/((1.-DELR)*(1.-DELF)*(1.-DELT)*(1-DELI)*(1-DELM))
PEXCES=PBOL-PLMIN

CONT. ON PG 20

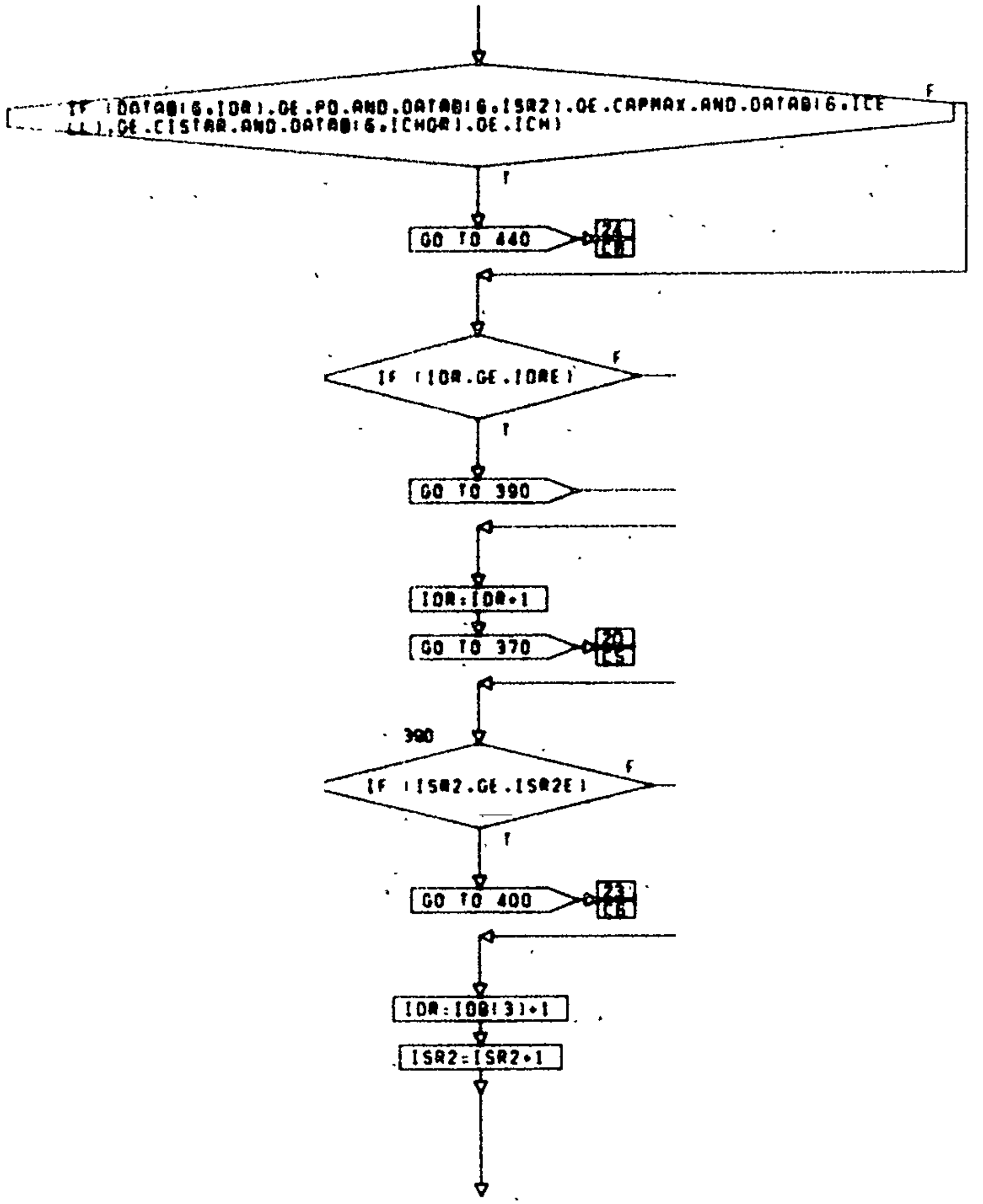

IF (ITER .GE. 1 .AND. NCHOSE(1) .GE. NO)
F
T
NO=NCHOSE(1)
PO=PL/(NO*ETAO)
C ** DETERMINE NUMBER OF SHUNT REGULATORS REQUIRED
C5
370
CAPMAX=DATAB(6,ISR2)
NSR=1
IF (PLMIN.GE.PEXCES)
F
T
GO TO 380
NSR=(PEXCES-PLMIN)/CAPMAX+.9
IF (NSR.LE.0)
F
T
NSR=1
380
CONTINUE

CONT. ON PG 21

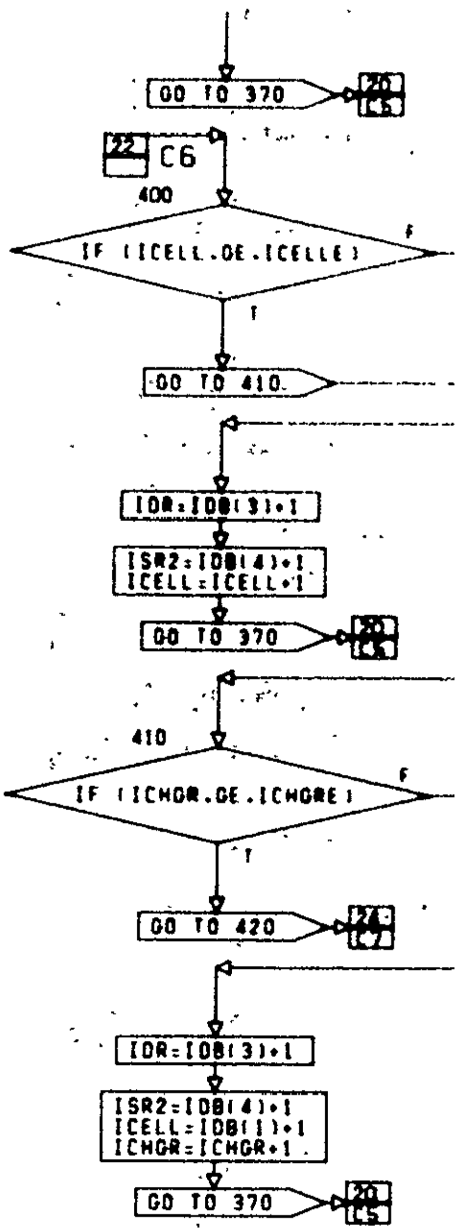


CONT. ON PG 22

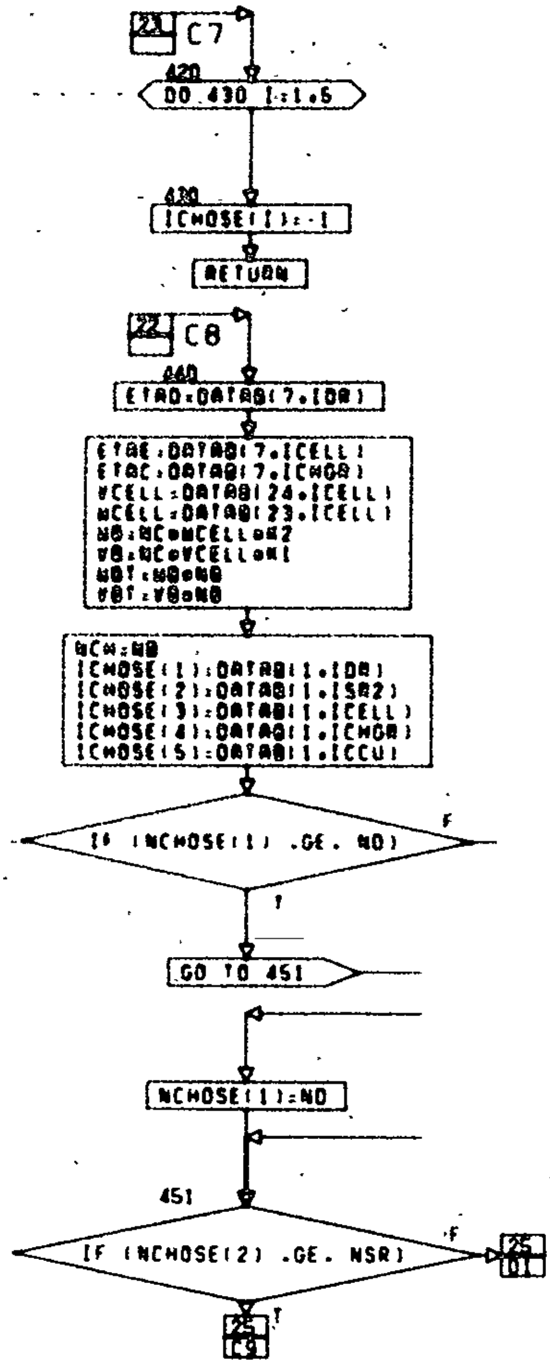
PG 2 OF 37


IF (DATAB(6,IDR).GE.PO.AND.DATAB(6,ISR2).GE.CAPMAX.AND.DATAB(6,ICE(L)).GE.CISTAR.AND.DATAB(6,ICHOR).GE.ICH)
F
T
GO TO 440
24
C8
IF (IDR.GE.IDRE)
F
T
GO TO 390
IDR=IDR+1
GO TO 370
20
C5
390
IF (ISR2.GE.ISR2E)
F
T
GO TO 400
23
C6
IDR=IDB(3)+1
ISR2=ISR2+1

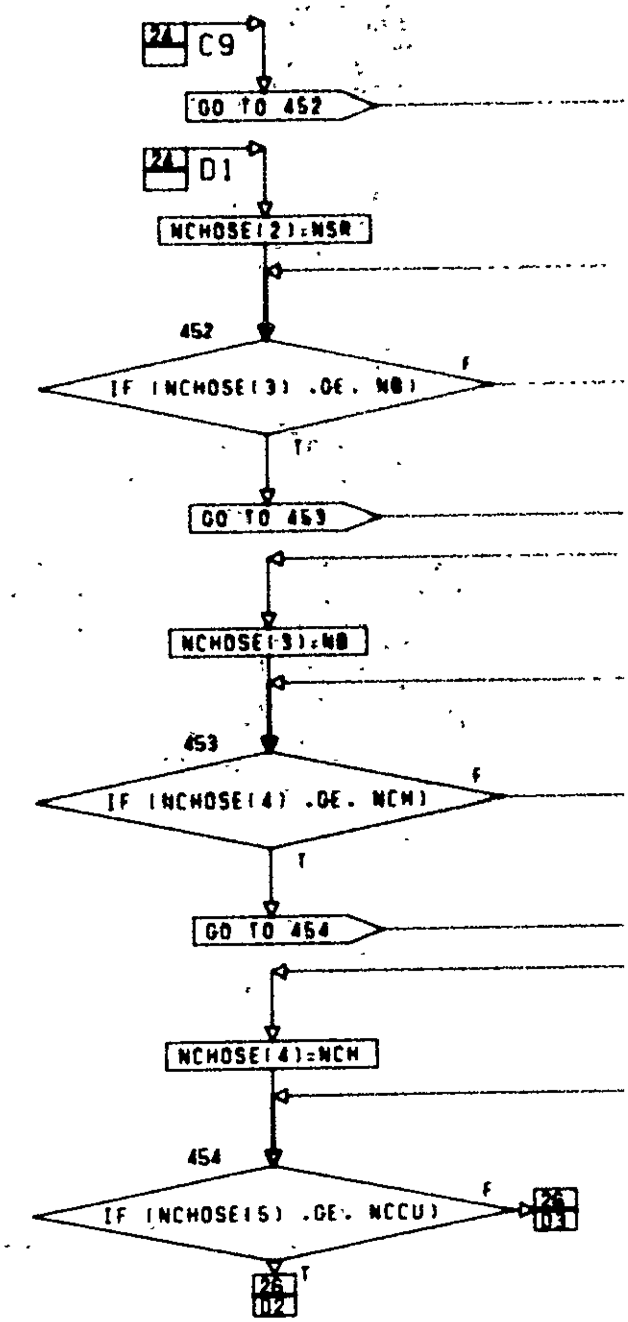
CONT. ON PG 23


GO TO 370
20
C5
22
C6
400
IF (ICELL.GE.ICELLE)
F
T
GO TO 410
IDR=IDB(3)+1
ISR2=IDB(4)+1
ICELL=ICELL+1
GO TO 370
20
C5
410
IF (ICHGR.GE.ICHGRE)
F
T
GO TO 420
24
C7
IDR=IDB(3)+1
ISR2=IDB(4)+1
ICELL=IDB(1)+1
ICHGR=ICHGR+1
GO TO 370
20
C5

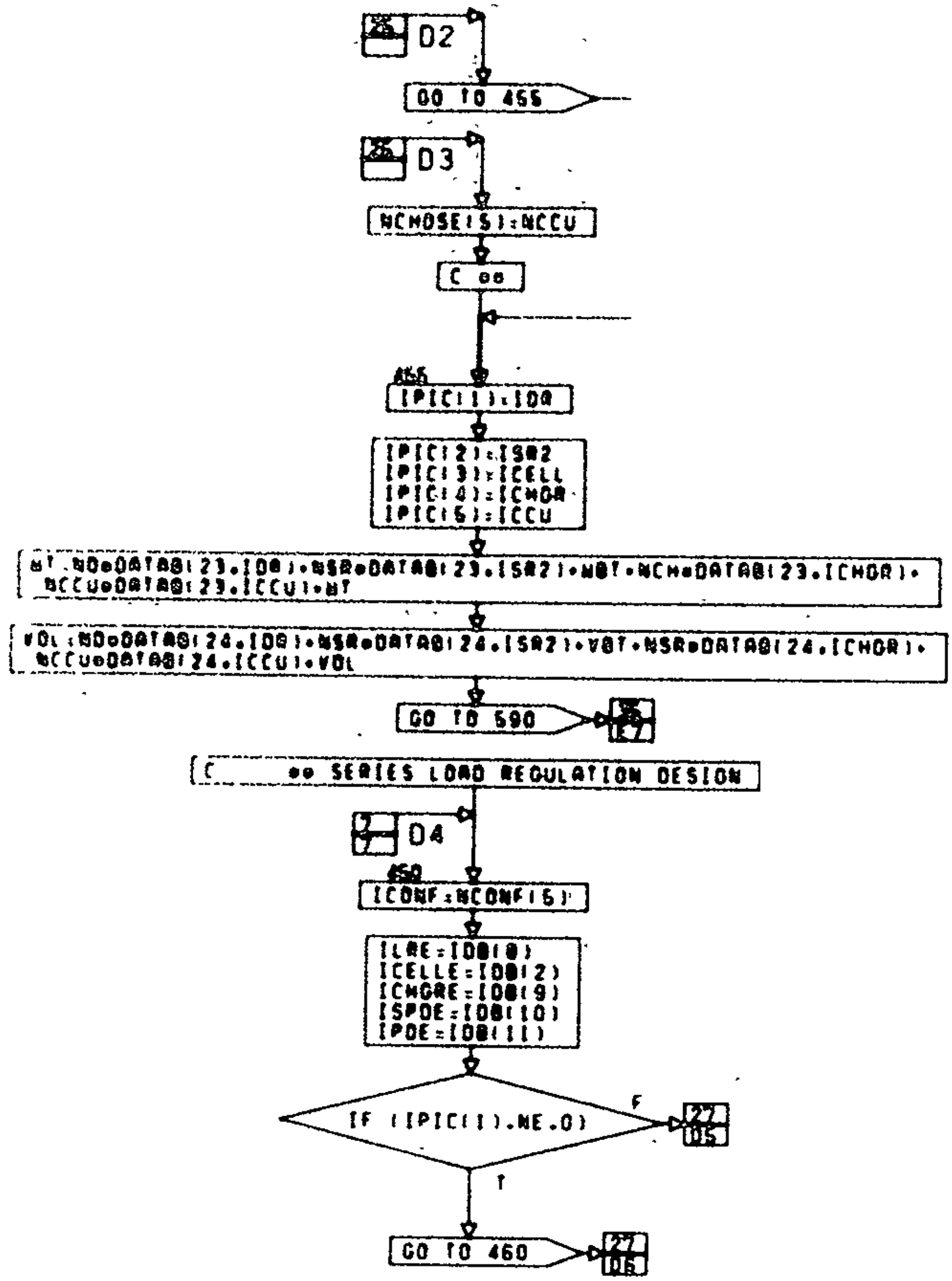
CONT. ON PG 24


21 C7
420
DO 430 I=1,6
430
ICHOSE(I)=-1
RETURN
22 C8
440
ETAD=DATAB(7,IDR)
ETAE=DATAB(7,ICELL)
ETAC=DATAB(7,ICHOR)
VCELL=DATAB(24,ICELL)
WCELL=DATAB(23,ICELL)
WB=WC*WCELL*2
VB=WC*VCELL*1
WBT=WB*NB
VBT=VB*NB
WCH=WB
ICHOSE(1)=DATAB(1,IDR)
ICHOSE(2)=DATAB(1,ISR2)
ICHOSE(3)=DATAB(1,ICELL)
ICHOSE(4)=DATAB(1,ICHOR)
ICHOSE(5)=DATAB(1,ICCU)
IF (NCHOSE(1) .GE. ND)
F
T
GO TO 451
NCHOSE(1)=ND
451
IF (NCHOSE(2) .GE. NSR)
F
25 D1
T
25 C9

CONT. ON PG 25

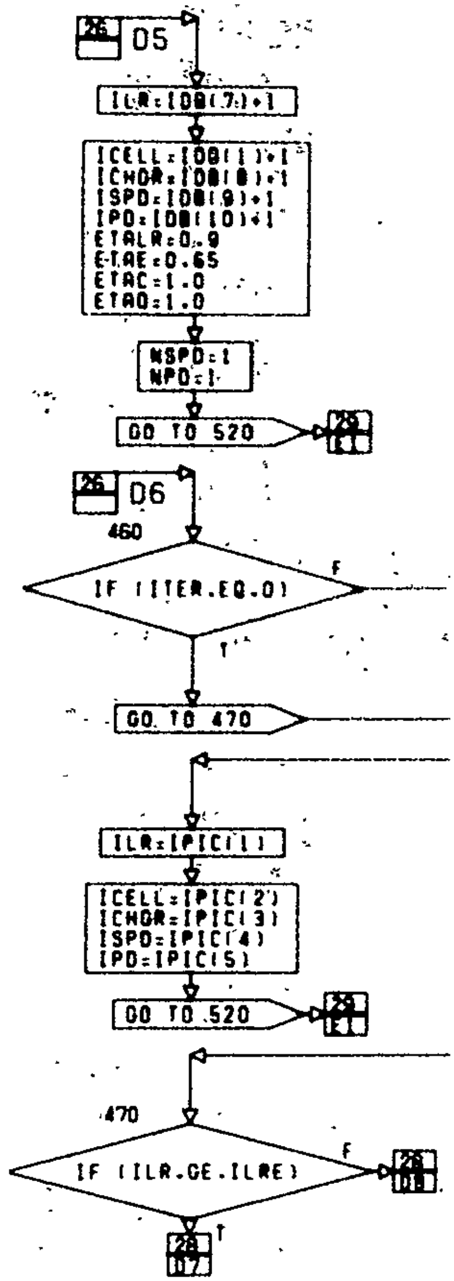

24
C9
GO TO 452
24
D1
NCHOSE(2)=NSR
452
IF (NCHOSE(3) .GE. NB)
F
T
GO TO 453
NCHOSE(3)=NB
453
IF (NCHOSE(4) .GE. NCM)
F
T
GO TO 454
NCHOSE(4)=NCM
454
IF (NCHOSE(5) .GE. NCCU)
F
26
D3
T
26
D2

CONT. ON PG 26

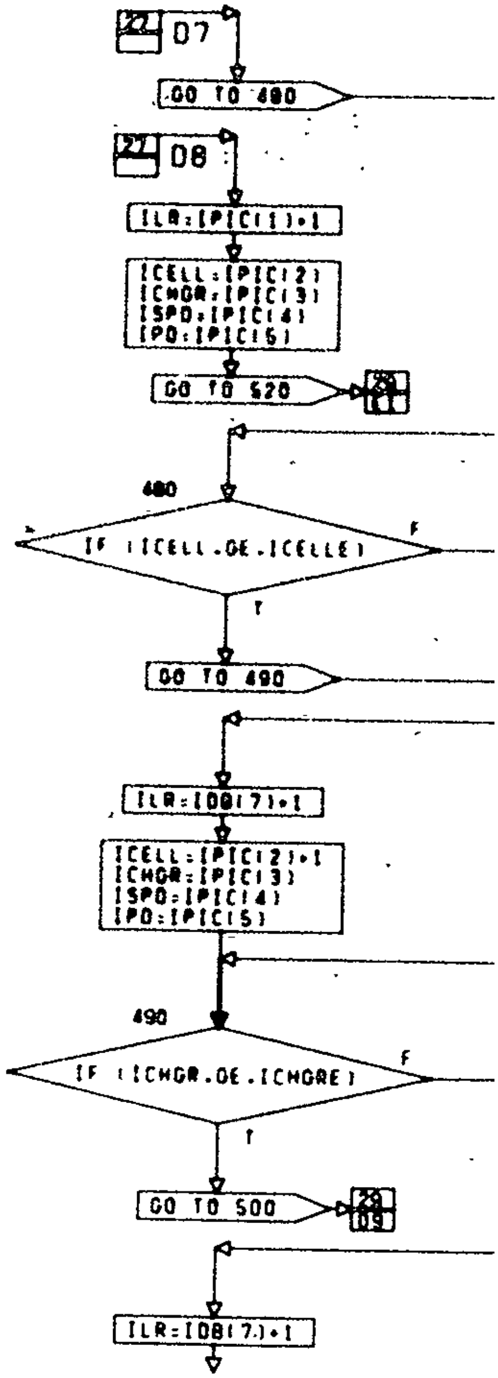


26
D2
GO TO 455
26
D3
NCHOSE(5)=NCCU
C **
455
IPIC(1)=IDR
IPIC(2)=ISR2
IPIC(3)=ICELL
IPIC(4)=ICHOR
IPIC(5)=ICCU
WT=ND*DATAB(23,IDR)+NSR*DATAB(23,ISR2)+WBT+NCH*DATAB(23,ICHOR)+
NCCU*DATAB(23,ICCU)+WT
VOL=ND*DATAB(24,IDR)+NSR*DATAB(24,ISR2)+VBT+NSR*DATAB(24,ICHOR)+
NCCU*DATAB(24,ICCU)+VOL
GO TO 590
26
E7
C ** SERIES LOAD REGULATION DESIGN
7
7
D4
450
ICONF=NCONF(5)
ILRE=IDB(8)
ICELLE=IDB(2)
ICHORE=IDB(9)
ISPOE=IDB(10)
IPOE=IDB(11)
IF (IPIC(1).NE.0)
F
T
27
D5
GO TO 460
27
D6

CONT. ON PG 27

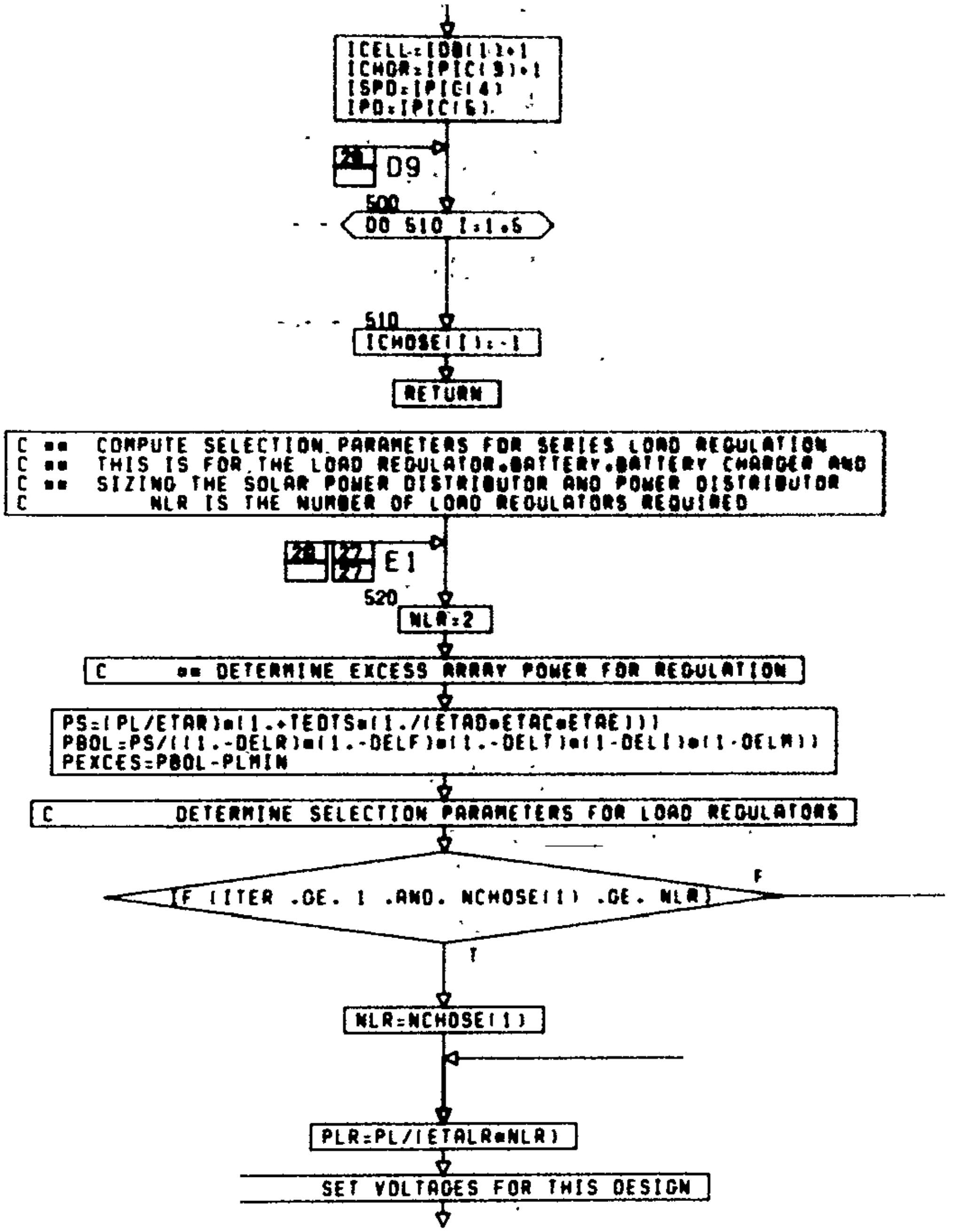

26
D5
ILR=IDB(7)+1
ICELL=IDB(1)+1
ICHOR=IDB(8)+1
ISPD=IDB(9)+1
IPD=IDB(10)+1
ETALR=0.9
ETAE=0.65
ETAC=1.0
ETAD=1.0
NSPD=1
NPD=1
GO TO 520
26
D6
460
IF (ITER.EQ.0)
F
T
GO TO 470
ILR=IPIC(1)
ICELL=IPIC(2)
ICHOR=IPIC(3)
ISPD=IPIC(4)
IPD=IPIC(5)
GO TO 520
470
IF (ILR.GE.ILRE)
F
T
26
D7

CONT. ON PG 28

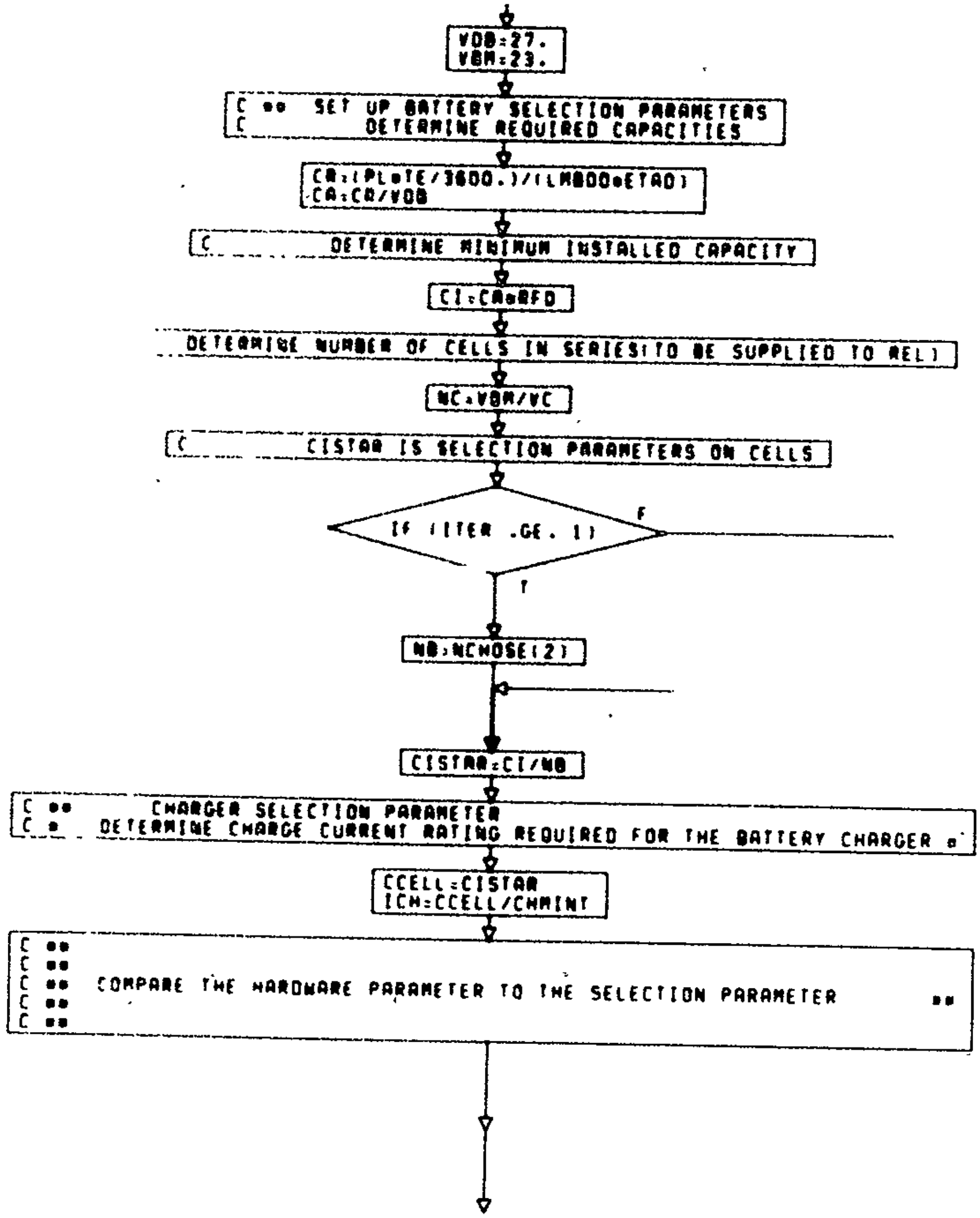


27
D7
GO TO 480
27
D8
ILR=IPIC(1)+1
ICELL=IPIC(2)
ICHGR=IPIC(3)
ISPD=IPIC(4)
IPD=IPIC(5)
GO TO 520
480
IF (ICELL.GE.ICELLE)
F
T
GO TO 490
ILR=ID8(7)+1
ICELL=IPIC(2)+1
ICHGR=IPIC(3)
ISPD=IPIC(4)
IPD=IPIC(5)
490
IF (ICHGR.GE.ICHGRE)
F
T
GO TO 500
29
D9
ILR=ID8(7)+1

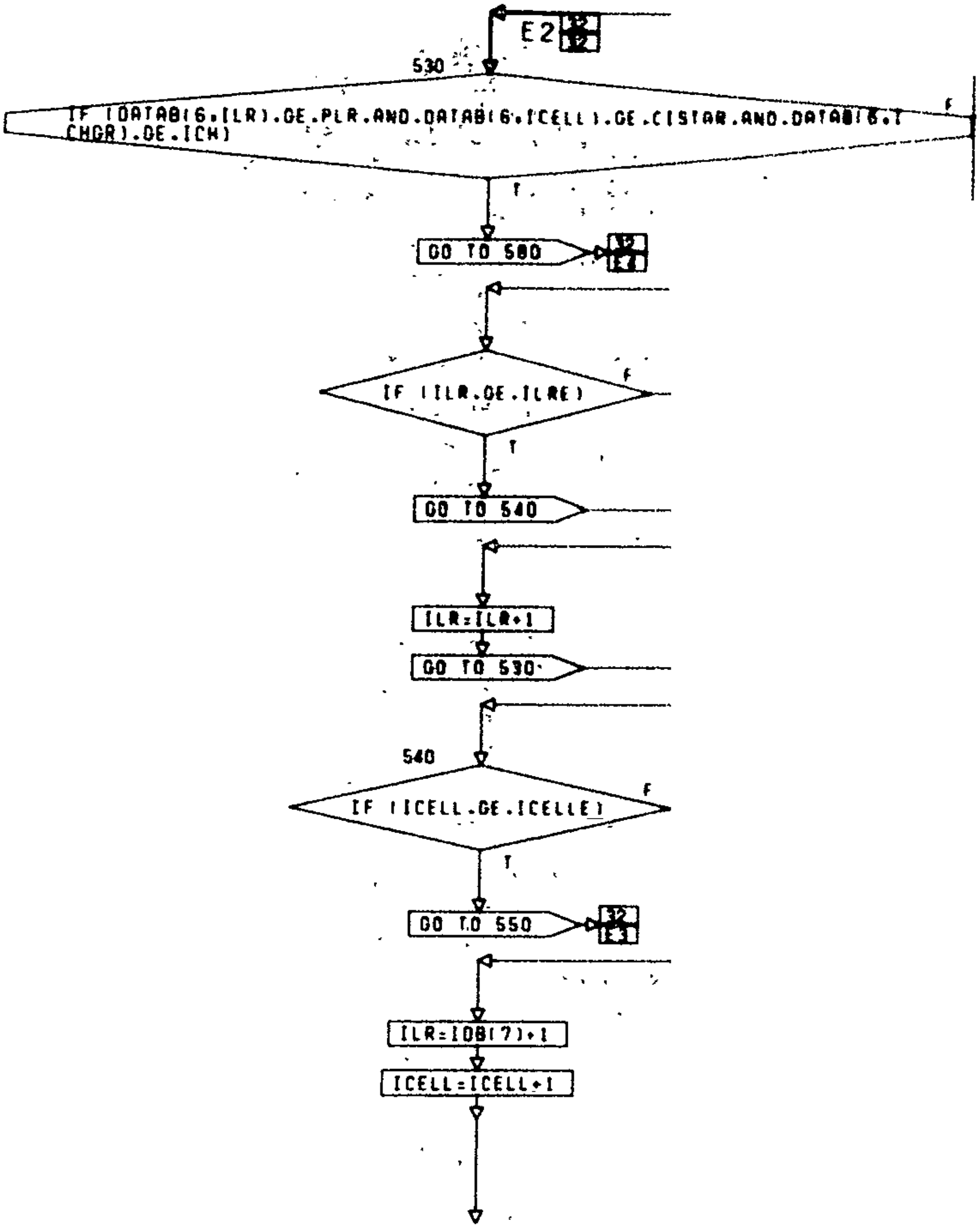
CONT. ON PG 29


ICELL=IDB(1)+1
ICHGR=IPIC(3)+1
ISPD=IPIC(4)
IPD=IPIC(5)
28
D9
500
DO 510 I=1,6
510
ICHOSE(I)=-1
RETURN
C ** COMPUTE SELECTION PARAMETERS FOR SERIES LOAD REGULATION
C ** THIS IS FOR THE LOAD REGULATOR,BATTERY,BATTERY CHARGER AND
C ** SIZING THE SOLAR POWER DISTRIBUTOR AND POWER DISTRIBUTOR
C NLR IS THE NUMBER OF LOAD REGULATORS REQUIRED
28
27
27
E1
520
NLR=2
C ** DETERMINE EXCESS ARRAY POWER FOR REGULATION
PS=(PL/ETAR)*(1.+TEDTS*(1./(ETAD*ETAC*ETAE)))
PBOL=PS/((1.-DELR)*(1.-DELF)*(1.-DELT)*(1-DELI)*(1-DELM))
PEXCES=PBOL-PLMIN
C DETERMINE SELECTION PARAMETERS FOR LOAD REGULATORS
IF (ITER .GE. 1 .AND. NCHOSE(1) .GE. NLR)
F
T
NLR=NCHOSE(1)
PLR=PL/(ETALR*NLR)
SET VOLTAGES FOR THIS DESIGN

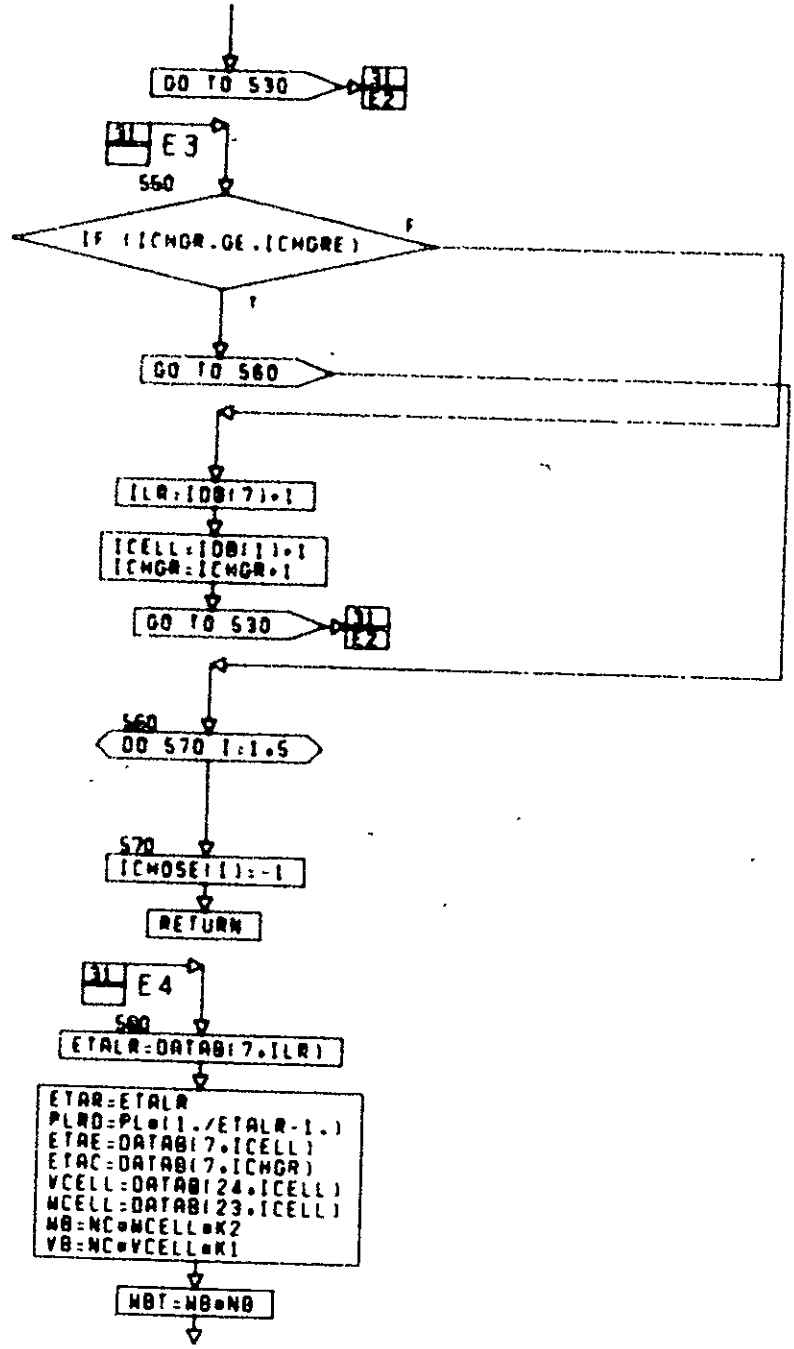
CONT. ON PG 30


VDB=27.
VBM=23.
C ** SET UP BATTERY SELECTION PARAMETERS
C DETERMINE REQUIRED CAPACITIES
CR=(PL*TE/3600.)/(LMBDO*ETAD)
CA=CR/VDB
C DETERMINE MINIMUM INSTALLED CAPACITY
CI=CA*RFD
DETERMINE NUMBER OF CELLS IN SERIES(TO BE SUPPLIED TO REL)
NC=VBM/VC
C CISTAR IS SELECTION PARAMETERS ON CELLS
IF (ITER .GE. 1)
F
T
NB=NCHOSE(2)
CISTAR=CI/NB
C ** CHARGER SELECTION PARAMETER
C * DETERMINE CHARGE CURRENT RATING REQUIRED FOR THE BATTERY CHARGER *
CCELL=CISTAR
ICH=CCELL/CHMINT
C **
C **
C ** COMPARE THE HARDWARE PARAMETER TO THE SELECTION PARAMETER **
C **
C **

CONT. ON PG 31

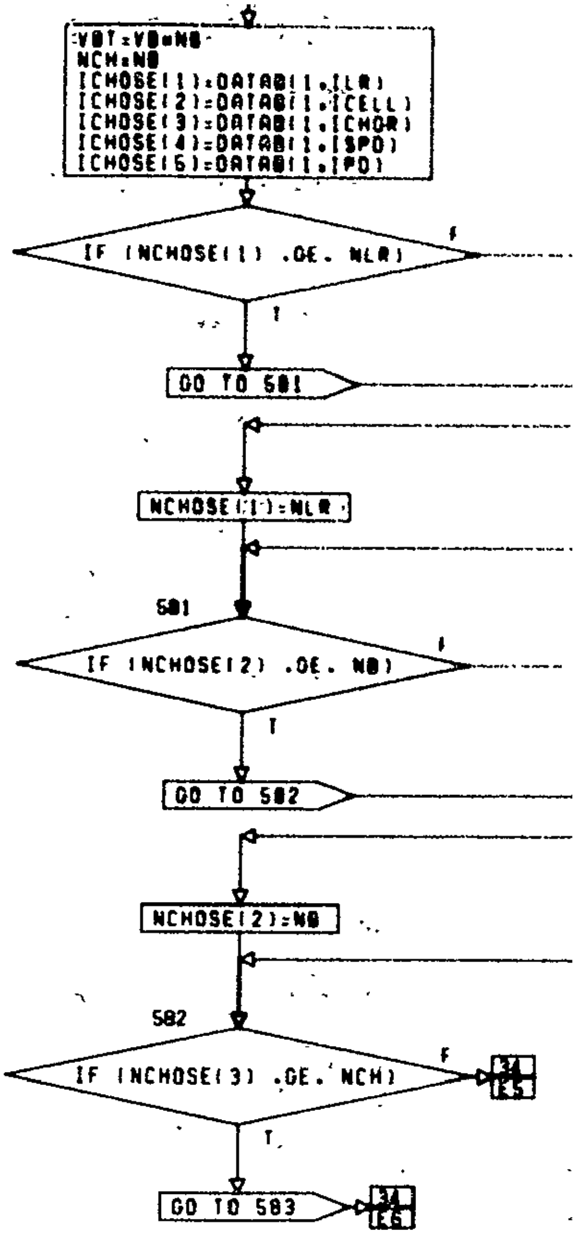

E2
530
IF (DATAB(6,ILR).GE.PLR.AND.DATAB(6,ICELL).GE.CISTAR.AND.DATAB(6,ICHGR).GE.ICH)
GO TO 580
IF (ILR.GE.ILRE)
GO TO 540
ILR=ILR+1
GO TO 530
540
IF (ICELL.GE.ICELLE)
GO TO 550
ILR=IDB(7)+1
ICELL=ICELL+1

CONT. ON PG 32

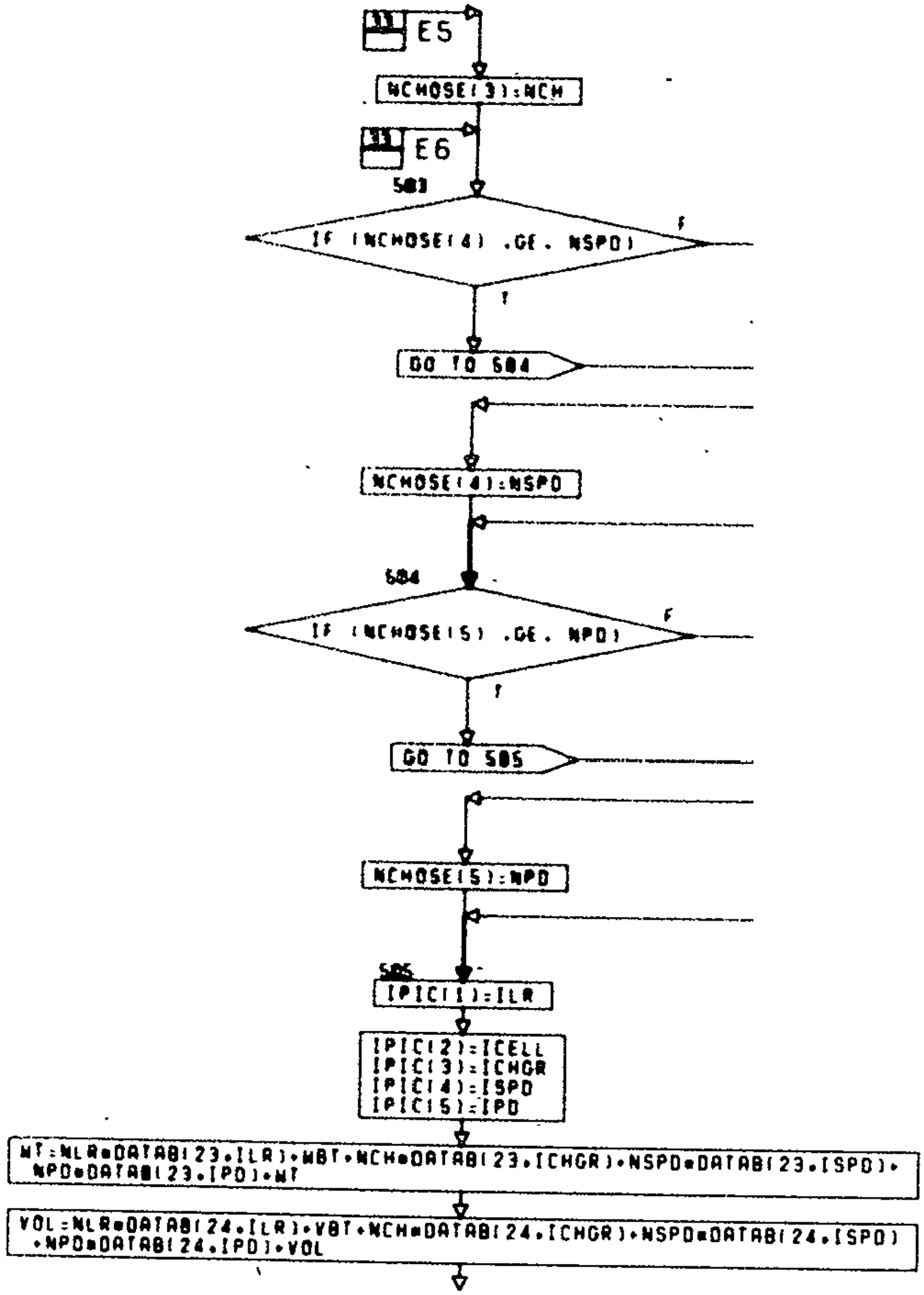


GO TO 530
31 E2
31 E3
560
IF (ICHGR.GE.ICHGRE)
F
T
GO TO 560
ILR=IDB(7)+1
ICELL=IDB(1)+1
ICHGR=ICHGR+1
GO TO 530
31 E2
560
DO 570 I=1,5
570
ICHOSE(I)=-1
RETURN
31 E4
580
ETALR=DATAB(7,ILR)
ETAR=ETALR
PLRD=PL*(1./ETALR-1.)
ETAE=DATAB(7,ICELL)
ETAC=DATAB(7,ICHGR)
VCELL=DATAB(24,ICELL)
WCELL=DATAB(23,ICELL)
WB=NC*WCELL*K2
VB=NC*VCELL*K1
WBT=WB*NB

CONT. ON PG 33

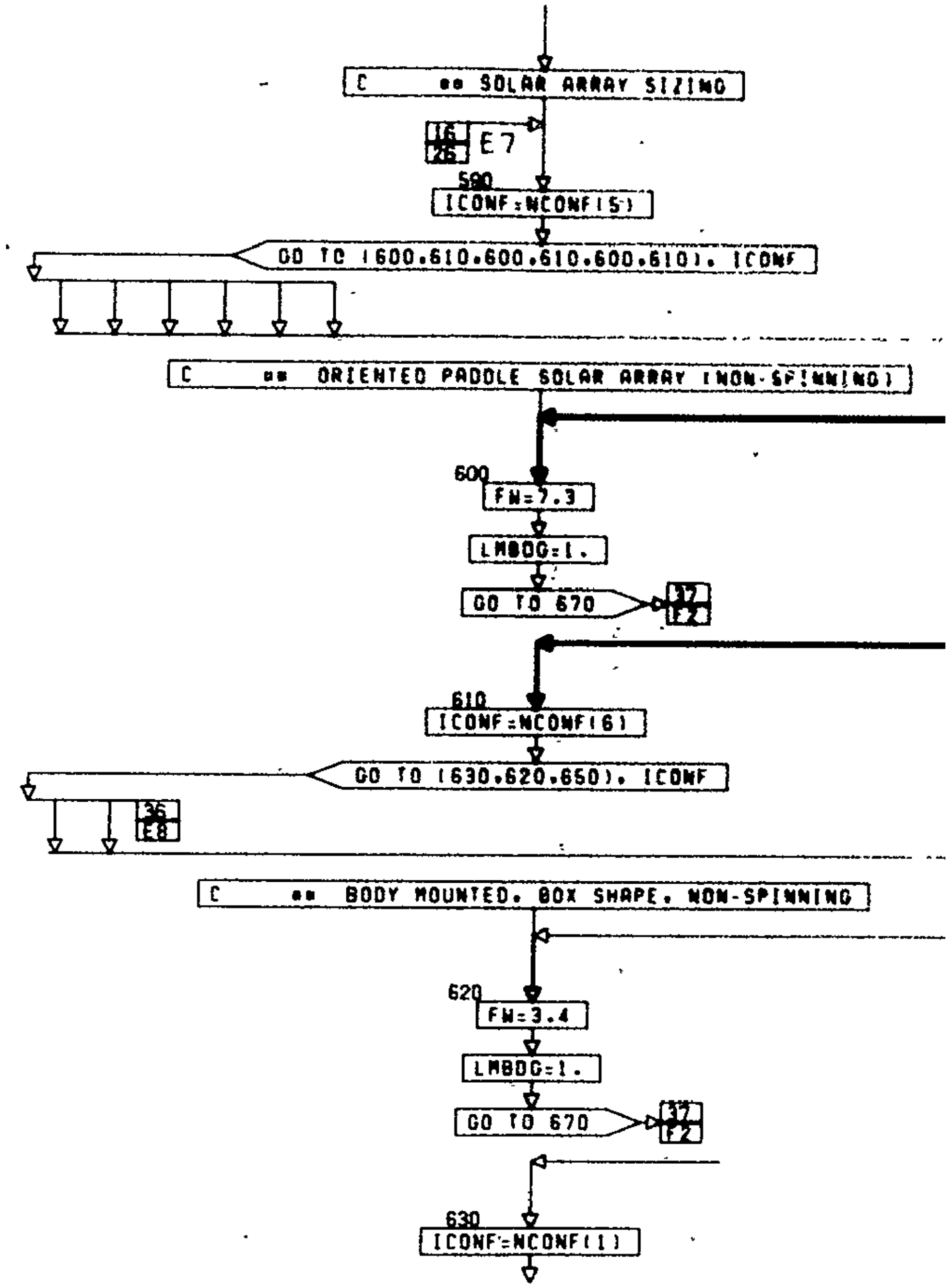

VBT=VB=NB
NCH=NB
ICHOSE(1)=DATAB(1,ILR)
ICHOSE(2)=DATAB(1,ICELL)
ICHOSE(3)=DATAB(1,ICHOR)
ICHOSE(4)=DATAB(1,ISPD)
ICHOSE(6)=DATAB(1,IPD)
IF (NCHOSE(1) .GE. NLR)
F
T
GO TO 581
NCHOSE(1)=NLR
581
IF (NCHOSE(2) .GE. NB)
F
T
GO TO 582
NCHOSE(2)=NB
582
IF (NCHOSE(3) .GE. NCH)
F
T
34
E5
GO TO 583
34
E6

CONT. ON PG 34

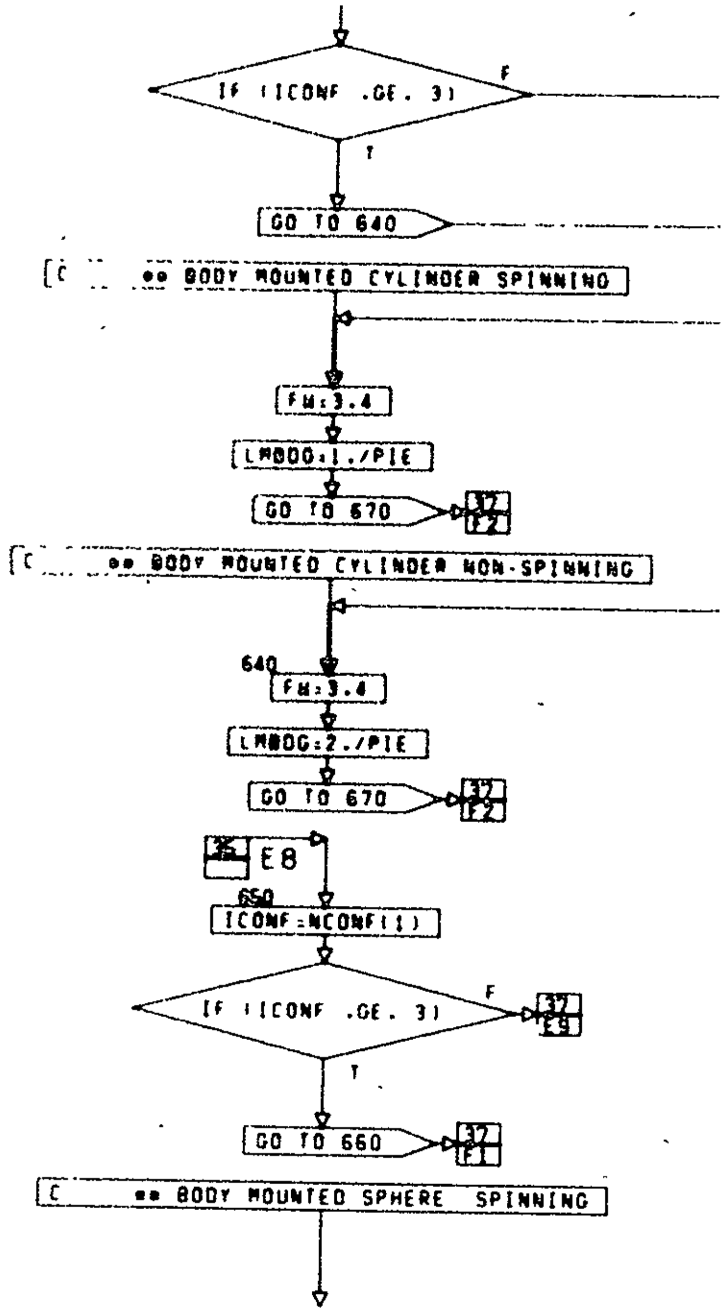


E5
NCHOSE(3):NCH
E6
503
IF (NCHOSE(4) .GE. NSPD)
F
T
GO TO 504
NCHOSE(4):NSPD
504
IF (NCHOSE(5) .GE. NPD)
F
T
GO TO 505
NCHOSE(5):NPD
505
IPIC(1):ILR
IPIC(2):ICELL
IPIC(3):ICHGR
IPIC(4):ISPD
IPIC(5):IPD
WT:NLR*DATAB(23,ILR)+WBT+NCH*DATAB(23,ICHGR)+NSPD*DATAB(23,ISPD)+
NPD*DATAB(23,IPD)+WT
VOL:NLR*DATAB(24,ILR)+VBT+NCH*DATAB(24,ICHGR)+NSPD*DATAB(24,ISPD)
+NPD*DATAB(24,IPD)+VOL

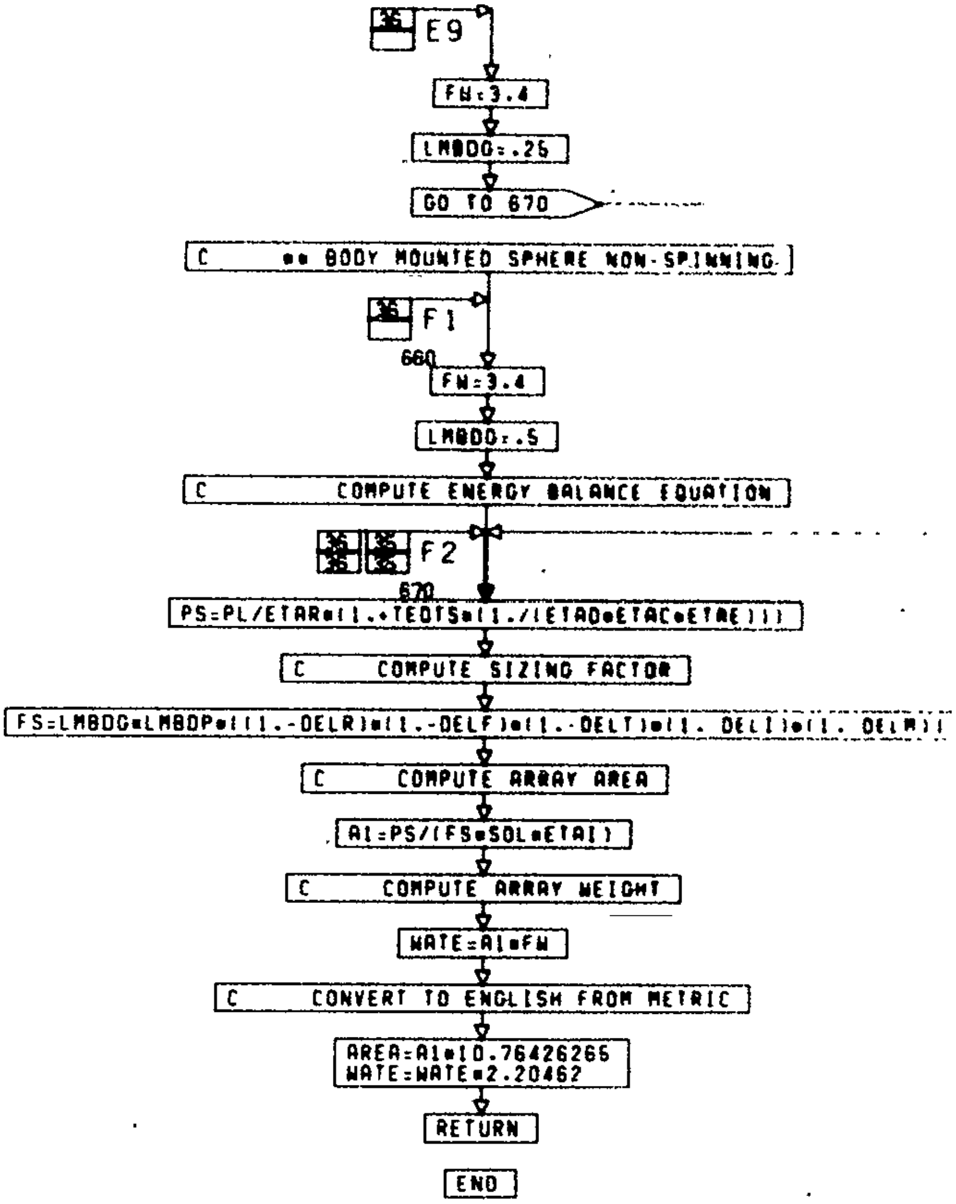
CONT. ON PG 35


C ** SOLAR ARRAY SIZING
16
26
E7
590
ICONF=NCONF(5)
GO TO (600,610,600,610,600,610), ICONF
C ** ORIENTED PADDLE SOLAR ARRAY (NON-SPINNING)
600
FW=7.3
LMBDG=1.
GO TO 670
37
F2
610
ICONF=NCONF(6)
GO TO (630,620,650), ICONF
36
E8
C ** BODY MOUNTED, BOX SHAPE, NON-SPINNING
620
FW=3.4
LMBDG=1.
GO TO 670
37
F2
630
ICONF=NCONF(1)

CONT. ON PG 36

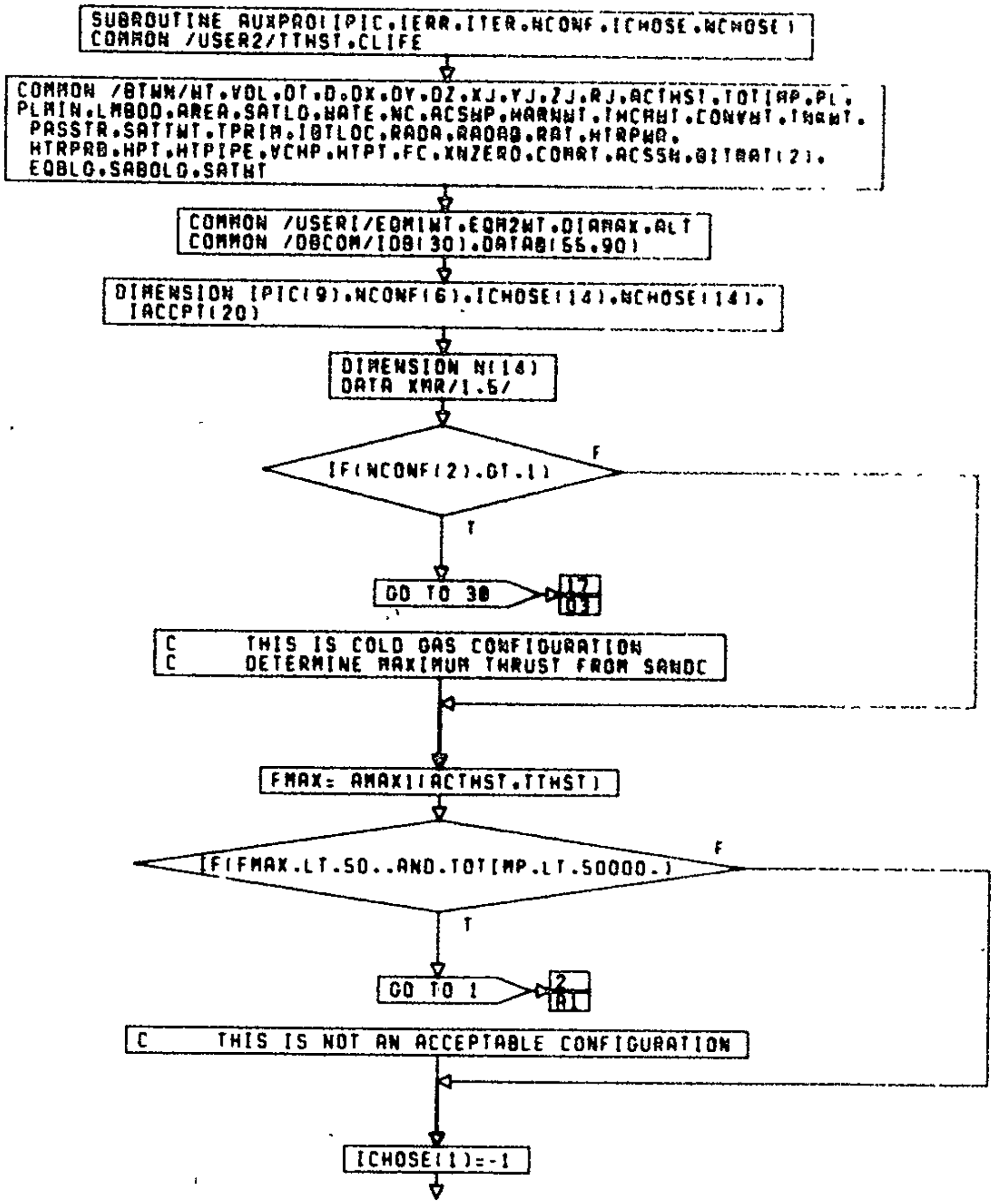

IF (ICONF .GE. 3)
F
T
GO TO 640
C ** BODY MOUNTED CYLINDER SPINNING
FW=3.4
LMBDG=1./PIE
GO TO 670
37
F2
C ** BODY MOUNTED CYLINDER NON-SPINNING
640
FW=3.4
LMBDG=2./PIE
GO TO 670
37
F2
36
E8
650
ICONF=NCONF(I)
IF (ICONF .GE. 3)
F
37
E9
T
GO TO 660
37
F1
C ** BODY MOUNTED SPHERE SPINNING

CONT. ON PG 37



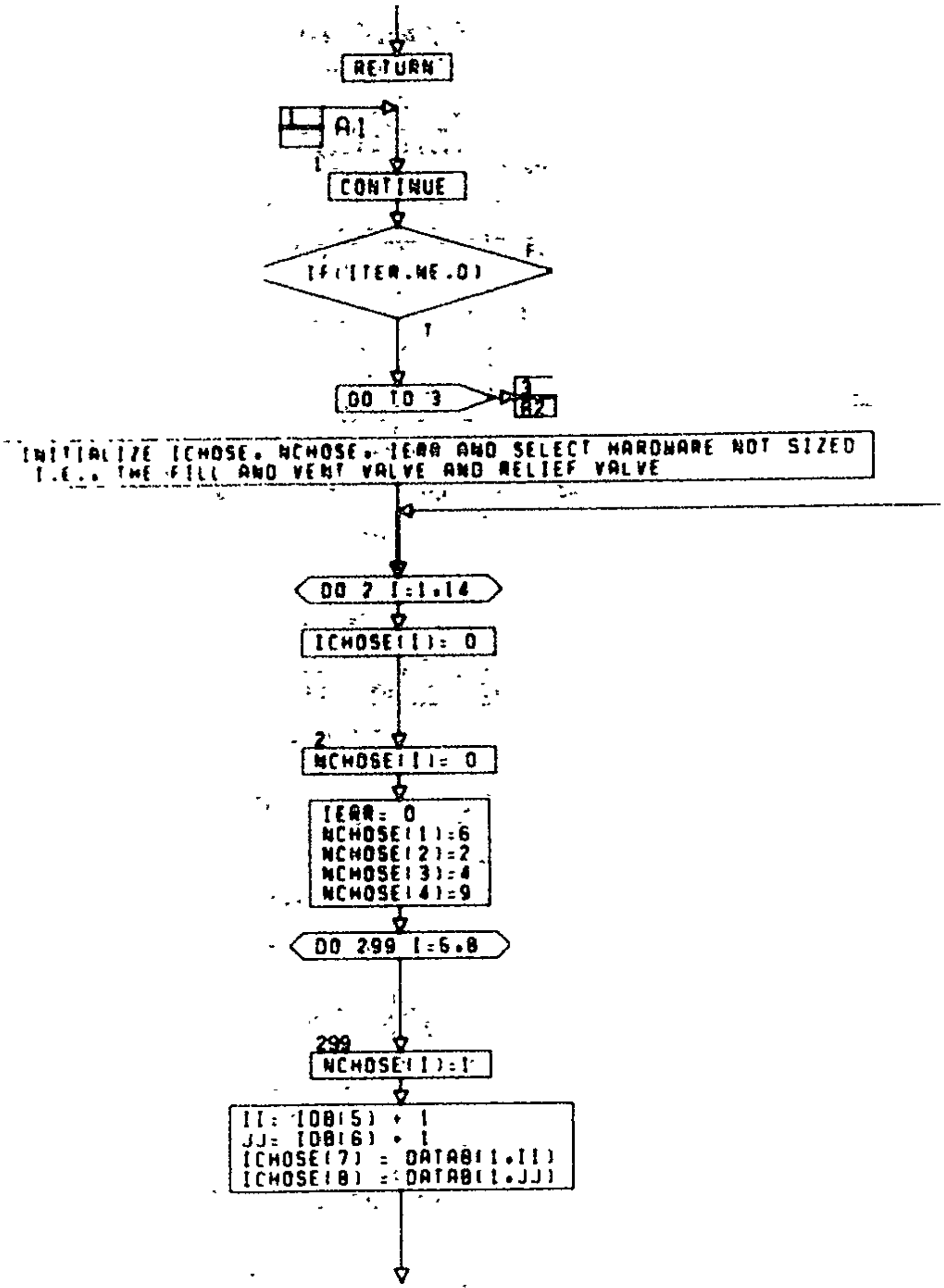
36
E9
FW=3.4
LMBDG=.25
GO TO 670
C ** BODY MOUNTED SPHERE NON-SPINNING
36
F1
660
FW=3.4
LMBDG=.5
C COMPUTE ENERGY BALANCE EQUATION
36 36
36 36
F2
670
PS=PL/ETAR*(1.+TEDTS*(1./(ETAD*ETAC*ETRE)))
C COMPUTE SIZING FACTOR
FS=LMBDG*LMBDP*((1.-DELR)*(1.-DELF)*(1.-DELT)*(1. DELI)*(1. DELM))
C COMPUTE ARRAY AREA
AI=PS/(FS*SOL*ETAI)
C COMPUTE ARRAY WEIGHT
WATE=AI*FW
C CONVERT TO ENGLISH FROM METRIC
AREA=AI*10.76426265
WATE=WATE*2.20462
RETURN
END

PG 37 FINAL



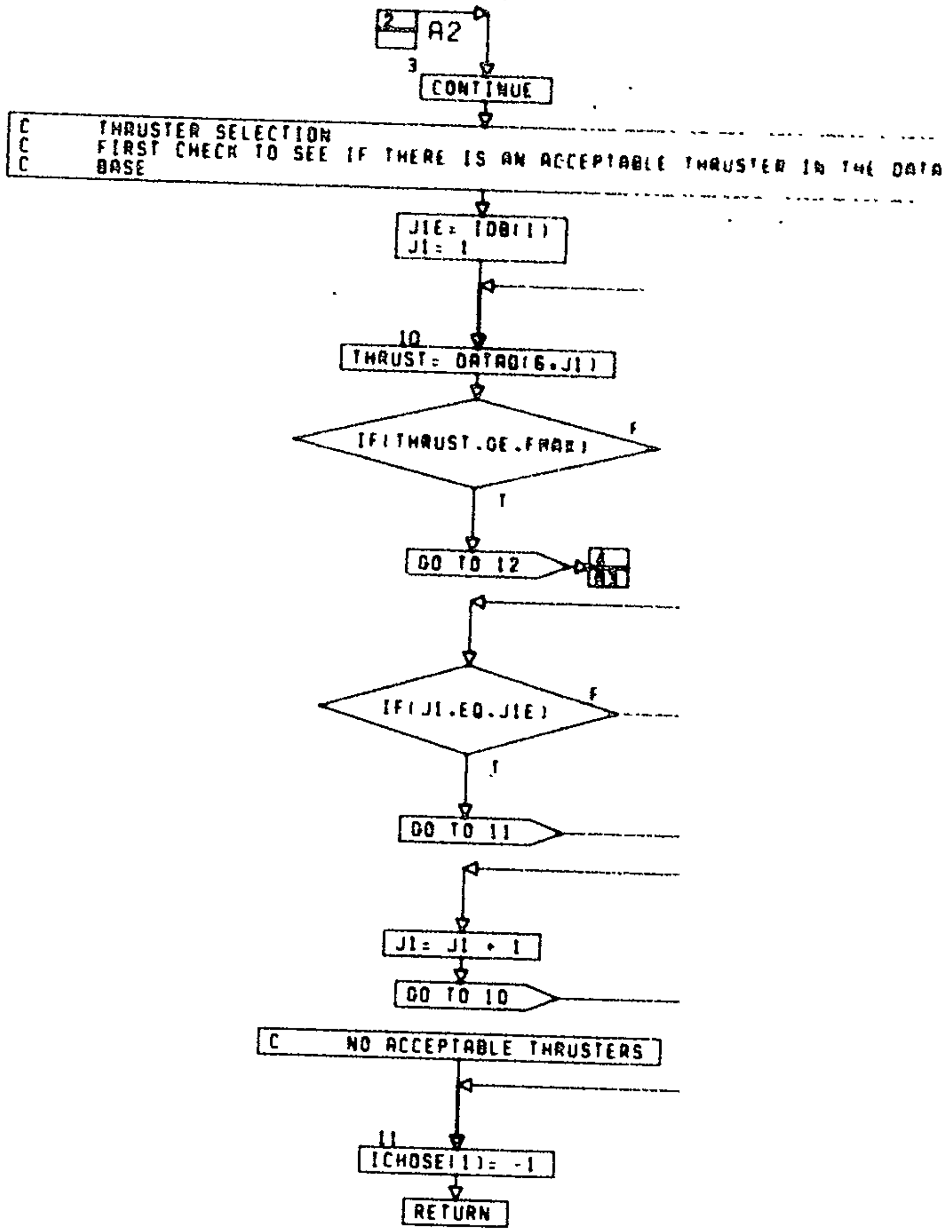
CONT. ON PG 2

ORIGINAL PAGE IS
OF POOR QUALITY

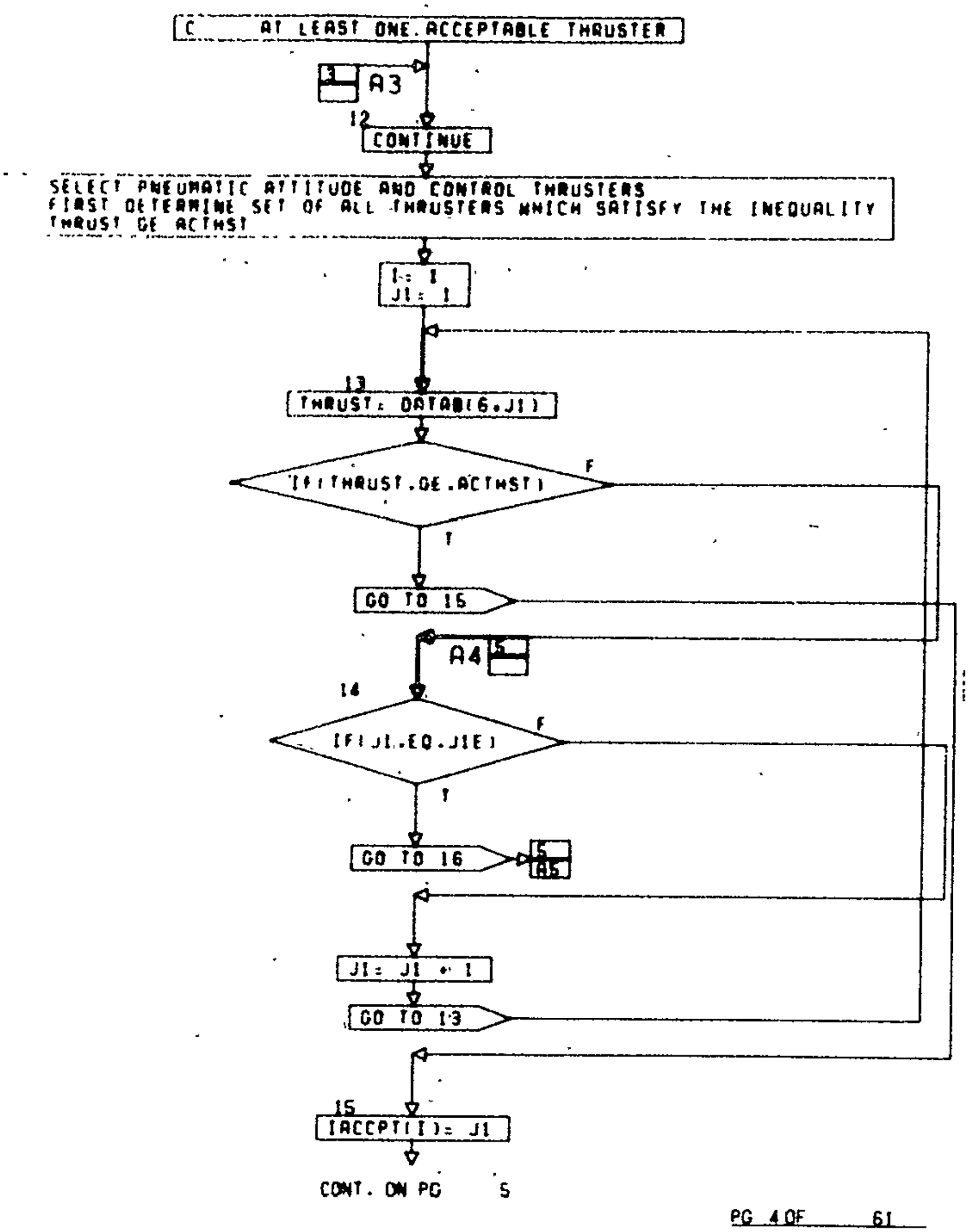


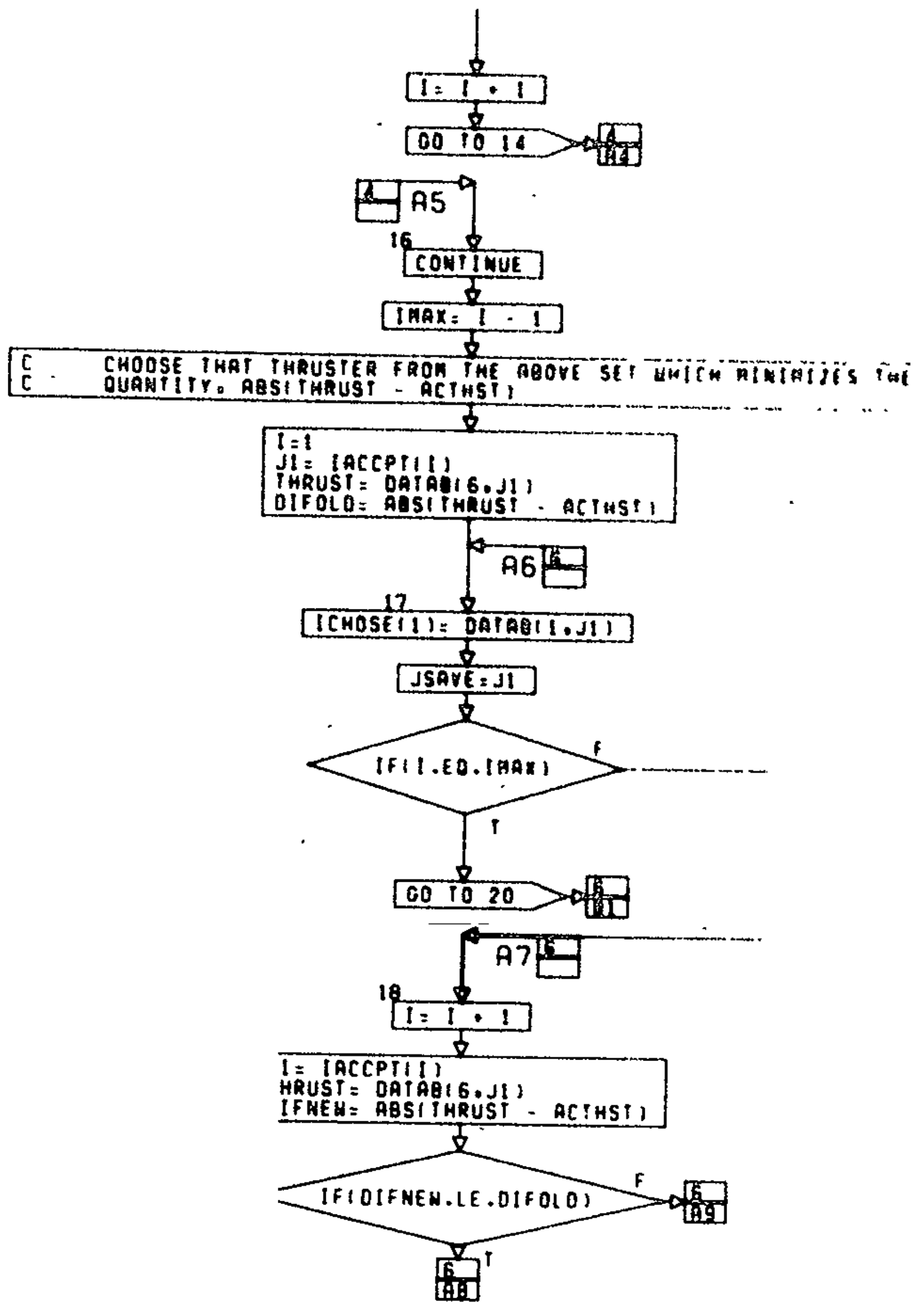
RETURN
A1
1
CONTINUE
IF(ITER.NE.0)
F
T
DO TO 3
3
B2
INITIALIZE ICHOSE, NCHOSE, IERR AND SELECT HARDWARE NOT SIZED
I.E., THE FILL AND VENT VALVE AND RELIEF VALVE
DO 2 I=1,14
ICHOSE(I)= 0
2
NCHOSE(I)= 0
IERR= 0
NCHOSE(1)=6
NCHOSE(2)=2
NCHOSE(3)=4
NCHOSE(4)=9
DO 299 I=6,8
299
NCHOSE(I)=1
II= IDB(5) + 1
JJ= IDB(6) + 1
ICHOSE(7) = DATAB(1,II)
ICHOSE(8) = DATAB(1,JJ)

CONT. ON PG 3

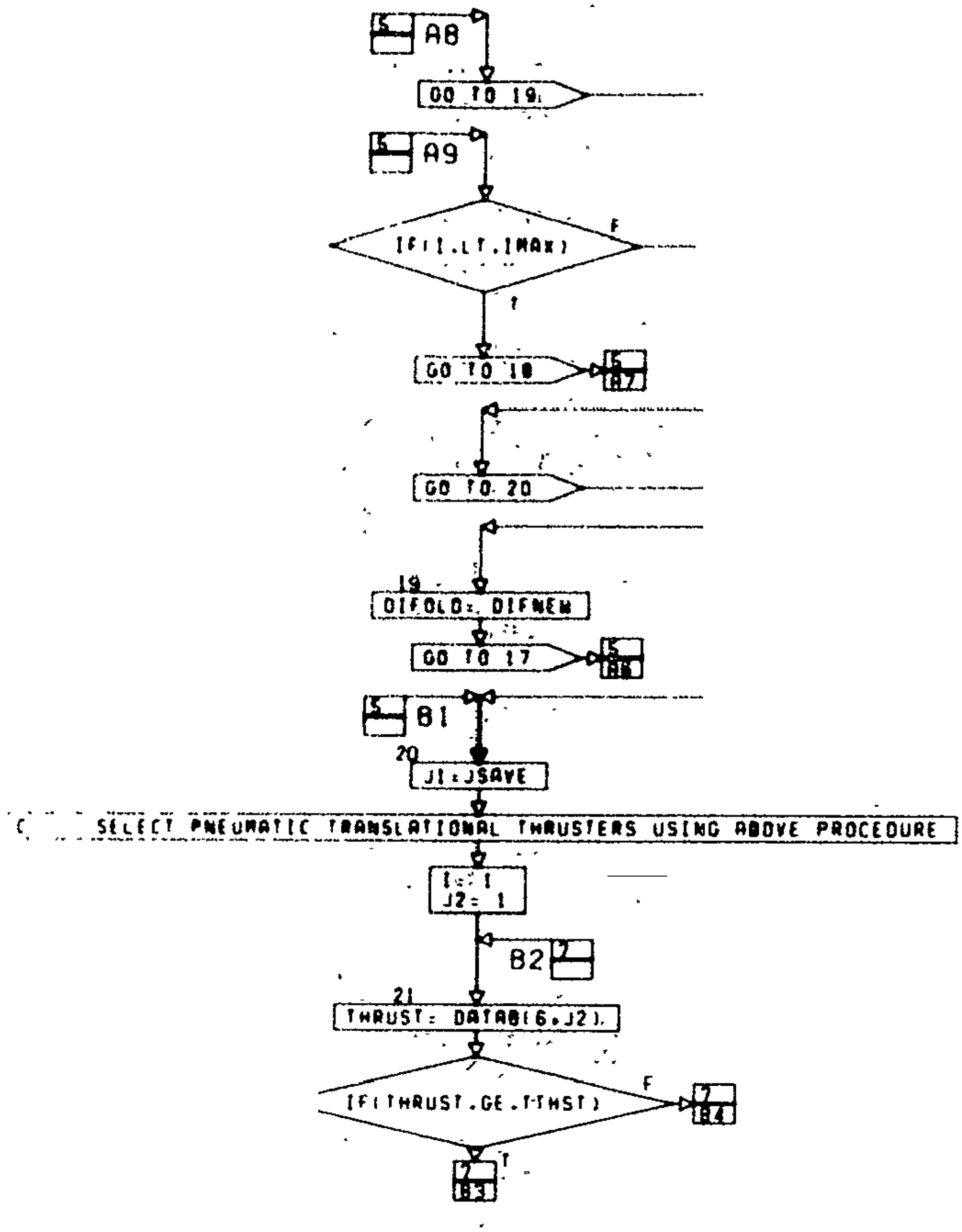

2
A2
3
CONTINUE
C THRUSTER SELECTION
C FIRST CHECK TO SEE IF THERE IS AN ACCEPTABLE THRUSTER IN THE DATA
C BASE
JIE= IDB(1)
J1= 1
10
THRUST= DATAD(6,J1)
IF(THRUST.GE.FMAX)
F
T
GO TO 12
4
A1
IF(J1.EQ.JIE)
F
T
GO TO 11
J1= J1 + 1
GO TO 10
C NO ACCEPTABLE THRUSTERS
11
ICHOSE(1)= -1
RETURN

CONT. ON PG 4

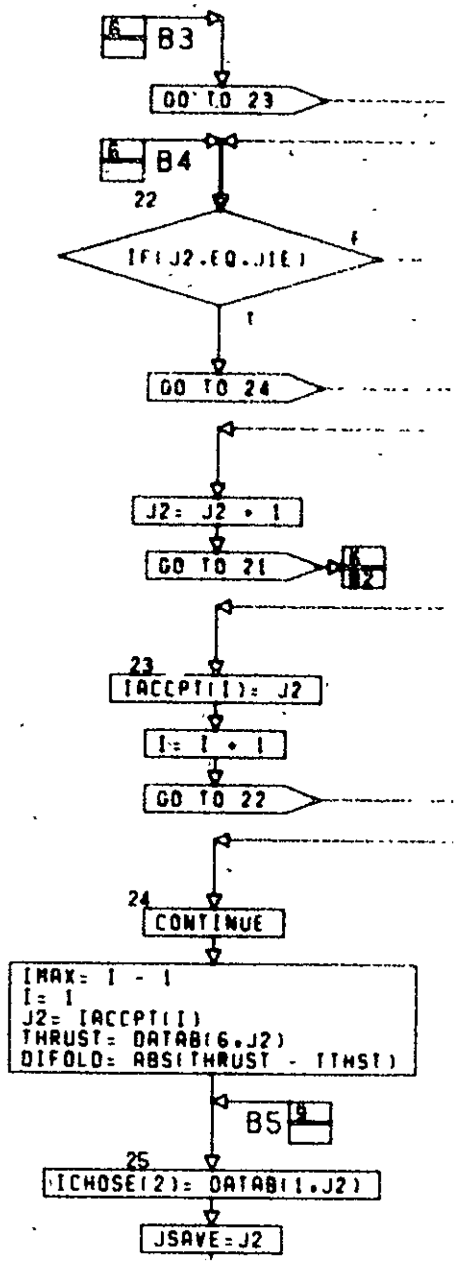

C AT LEAST ONE ACCEPTABLE THRUSTER
3
A3
12
CONTINUE
SELECT PNEUMATIC ATTITUDE AND CONTROL THRUSTERS
FIRST DETERMINE SET OF ALL THRUSTERS WHICH SATISFY THE INEQUALITY
THRUST GE ACTHST
I= 1
J1= 1
13
THRUST= DATAB(6,J1)
IF(THRUST.GE.ACTHST)
F
T
GO TO 15
A4
5
14
IF(J1.EQ.J1E)
F
T
GO TO 16
5
A5
J1= J1 + 1
GO TO 13
15
IACCPT(I)= J1
CONT. ON PG 5
PG 4 OF 61


I= I + 1
GO TO 14
A5
16
CONTINUE
IMAX= I - 1
C CHOOSE THAT THRUSTER FROM THE ABOVE SET WHICH MINIMIZES THE
C QUANTITY, ABS(THRUST - ACTHST)
I=1
J1= IACCPT(I)
THRUST= DATAB(6,J1)
DIFOLD= ABS(THRUST - ACTHST)
A6
17
ICHOSE(1)= DATAB(1,J1)
JSAVE=J1
IF(I.EQ.IMAX)
F
T
GO TO 20
A7
18
I= I + 1
I= IACCPT(I)
HRUST= DATAB(6,J1)
IFNEW= ABS(THRUST - ACTHST)
IF(DIFNEW.LE.DIFOLD)
F
T
A9
A8

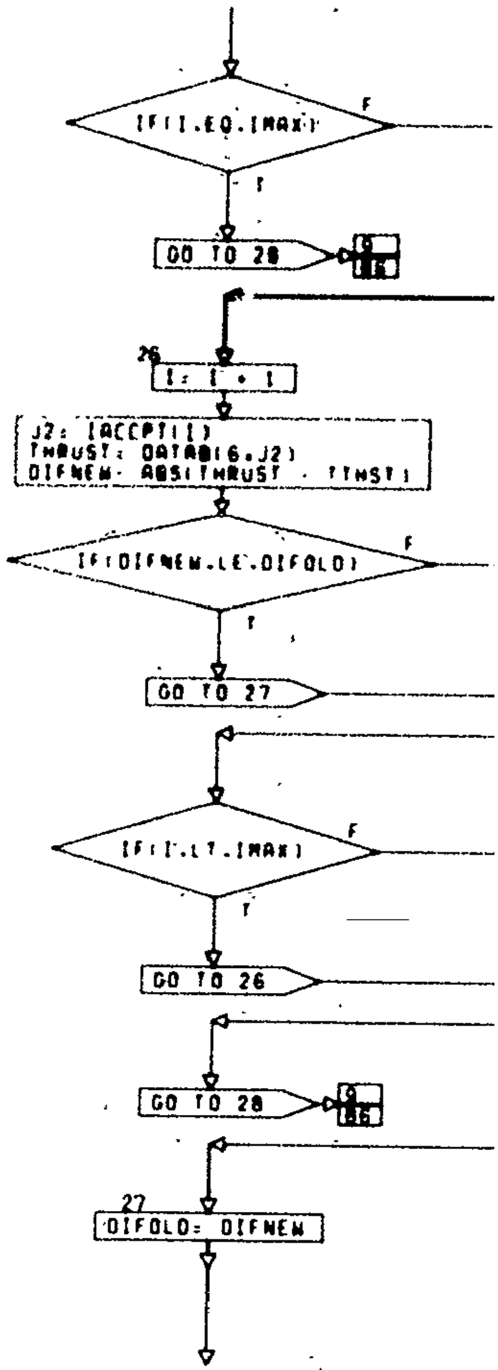
CONT. ON PG 6


A8
GO TO 19
A9
IF(I.LT.IMAX)
F
T
GO TO 18
GO TO 20
19
DIFOLD= DIFNEW
GO TO 17
B1
20
J1=JSAVE
C SELECT PNEUMATIC TRANSLATIONAL THRUSTERS USING ABOVE PROCEDURE
I= 1
J2= 1
B2
21
THRUST= DATAB(6,J2)
IF(THRUST.GE.TTHST)
F
T

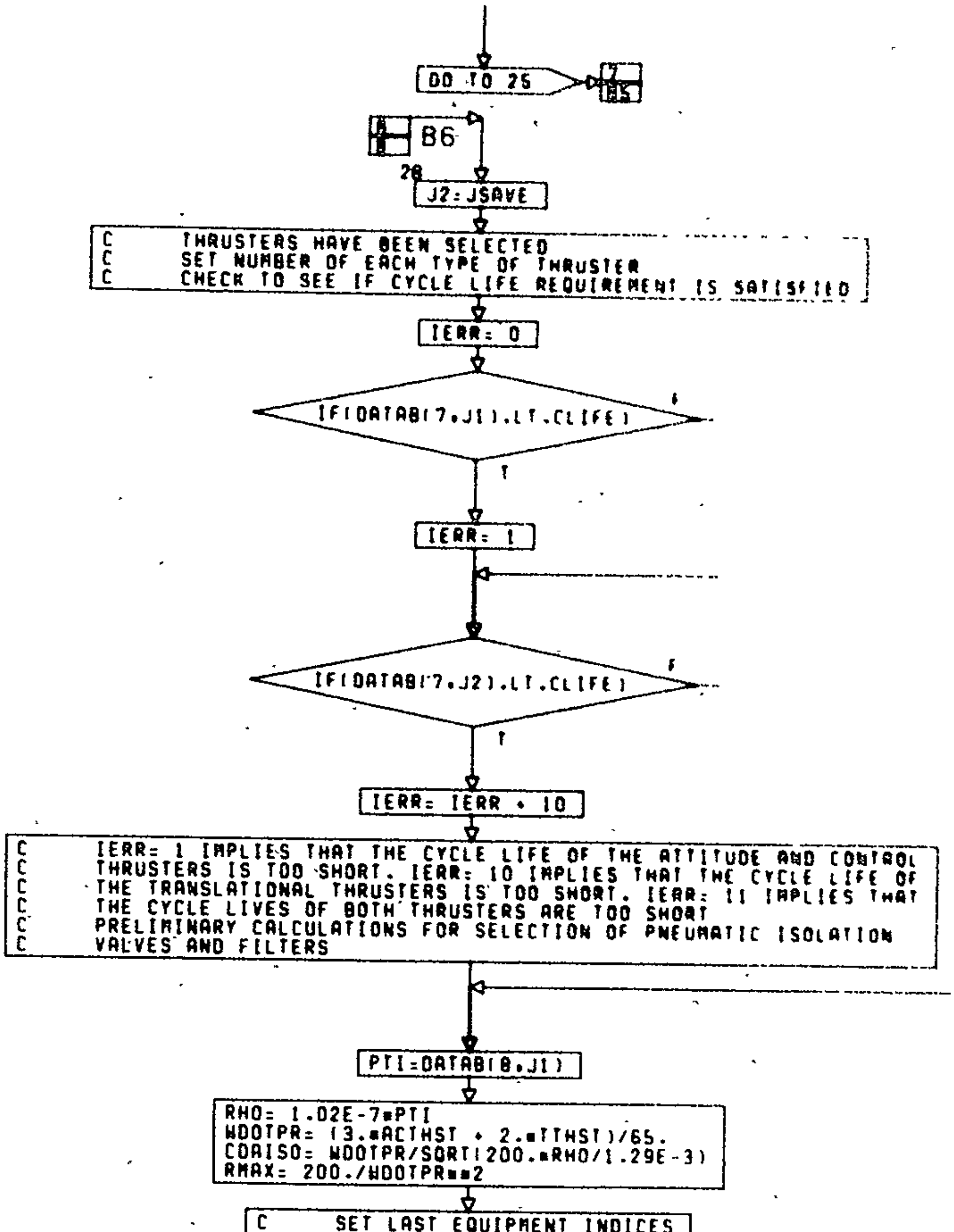
CONT. ON PG 7


B3
GO TO 23
B4
22
IF(J2.EQ.JIE)
F
T
GO TO 24
J2= J2 + 1
GO TO 21
B2
23
IACCPT(I)= J2
I= I + 1
GO TO 22
24
CONTINUE
IMAX= I - 1
I= 1
J2= IACCPT(I)
THRUST= DATAB(6,J2)
DIFOLD= ABS(THRUST - TTHST)
B5
25
ICHOSE(2)= DATAB(1,J2)
JSAVE=J2

CONT. ON PG 8

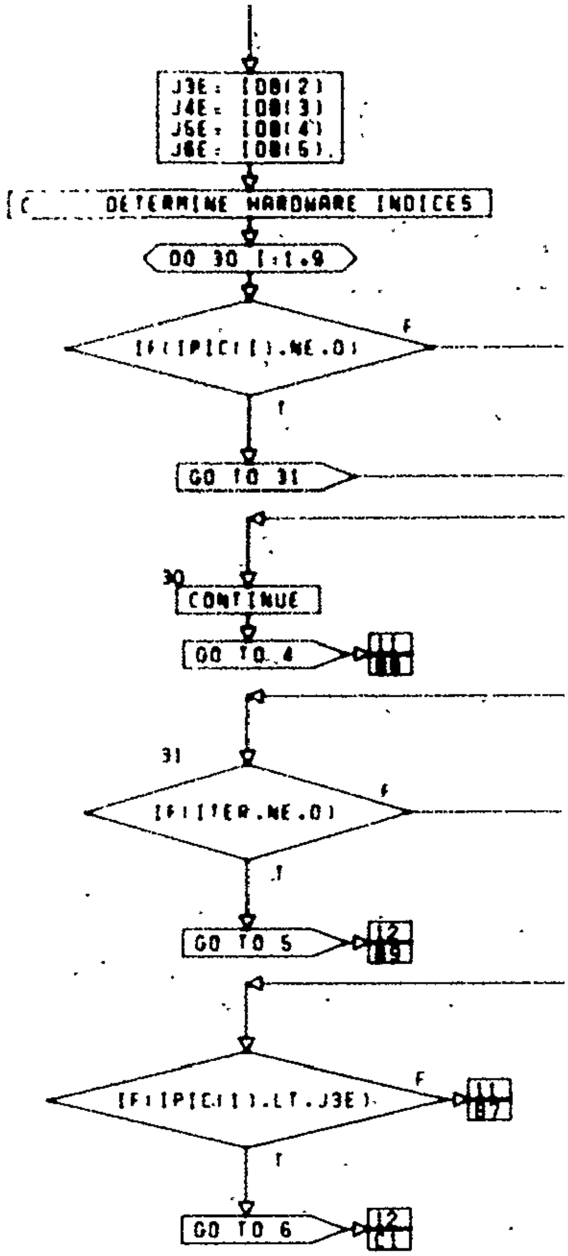

IF(I.EQ.IMAX)
F
T
GO TO 28
9
86
26
I= I + 1
J2= IACCPT(I)
THRUST= DATAB(6,J2)
DIFNEW= ABS(THRUST - TTHST)
IF(DIFNEW.LE.DIFOLD)
F
T
GO TO 27
IF(I.LT.IMAX)
F
T
GO TO 26
GO TO 28
9
86
27
DIFOLD= DIFNEW

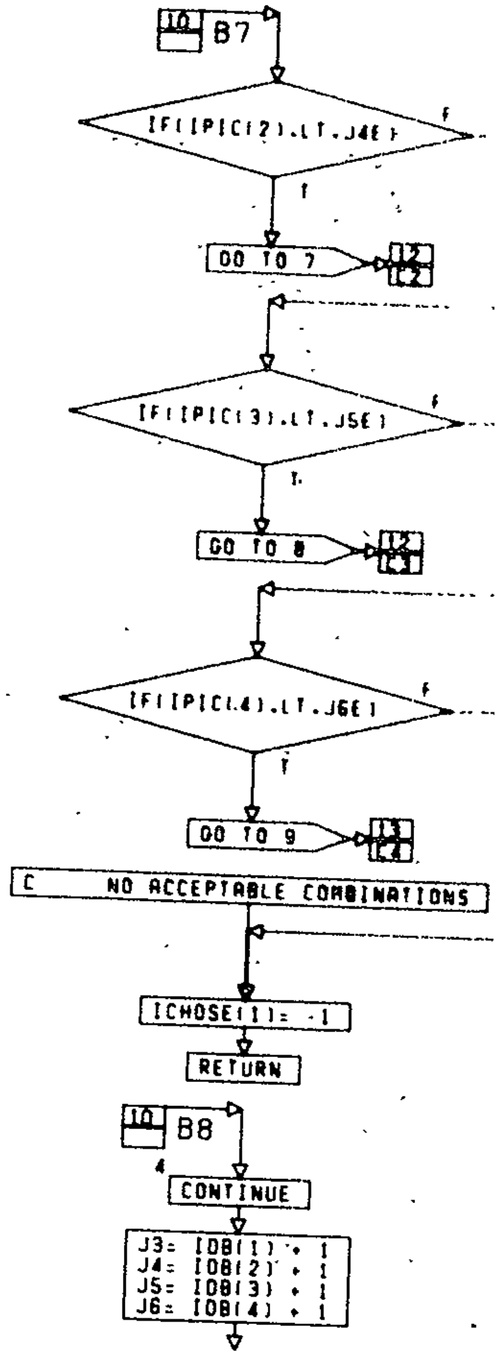
CONT. ON PG 9



DO TO 25
B6
28
J2=JSAVE
C THRUSTERS HAVE BEEN SELECTED
C SET NUMBER OF EACH TYPE OF THRUSTER
C CHECK TO SEE IF CYCLE LIFE REQUIREMENT IS SATISFIED
IERR= 0
IF(DATAB(7,J1).LT.CLIFE)
F
T
IERR= 1
IF(DATAB(7,J2).LT.CLIFE)
F
T
IERR= IERR + 10
C IERR= 1 IMPLIES THAT THE CYCLE LIFE OF THE ATTITUDE AND CONTROL
C THRUSTERS IS TOO SHORT. IERR= 10 IMPLIES THAT THE CYCLE LIFE OF
C THE TRANSLATIONAL THRUSTERS IS TOO SHORT. IERR= 11 IMPLIES THAT
C THE CYCLE LIVES OF BOTH THRUSTERS ARE TOO SHORT
C PRELIMINARY CALCULATIONS FOR SELECTION OF PNEUMATIC ISOLATION
C VALVES AND FILTERS
PTI=DATAB(8,J1)
RHO= 1.02E-7*PTI
WDOTPR= (3.*ACTHST + 2.*TTHST)/65.
CDAISO= WDOTPR/SQRT(200.*RHO/1.29E-3)
RMAX= 200./WDOTPR**2
C SET LAST EQUIPMENT INDICES

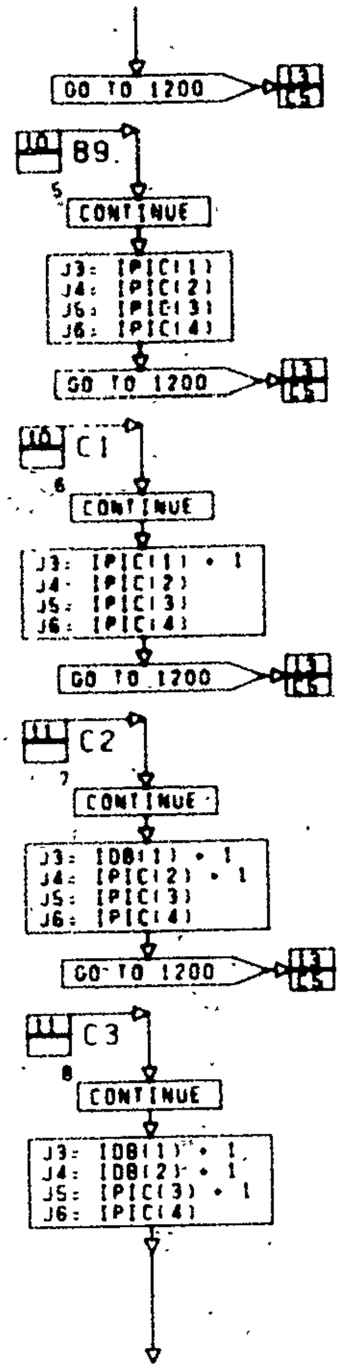
CONT. ON PG 10


J3E= IDB(2)
J4E= IDB(3)
J5E= IDB(4)
J6E= IDB(5)
C DETERMINE HARDWARE INDICES
DO 30 I=1,9
IF(IPIC(I).NE.0)
F
T
GO TO 31
30
CONTINUE
GO TO 4
11
B8
31
IF(ITER.NE.0)
F
T
GO TO 5
12
B9
IF(IPIC(I).LT.J3E)
F
11
B7
T
GO TO 6
12
C1

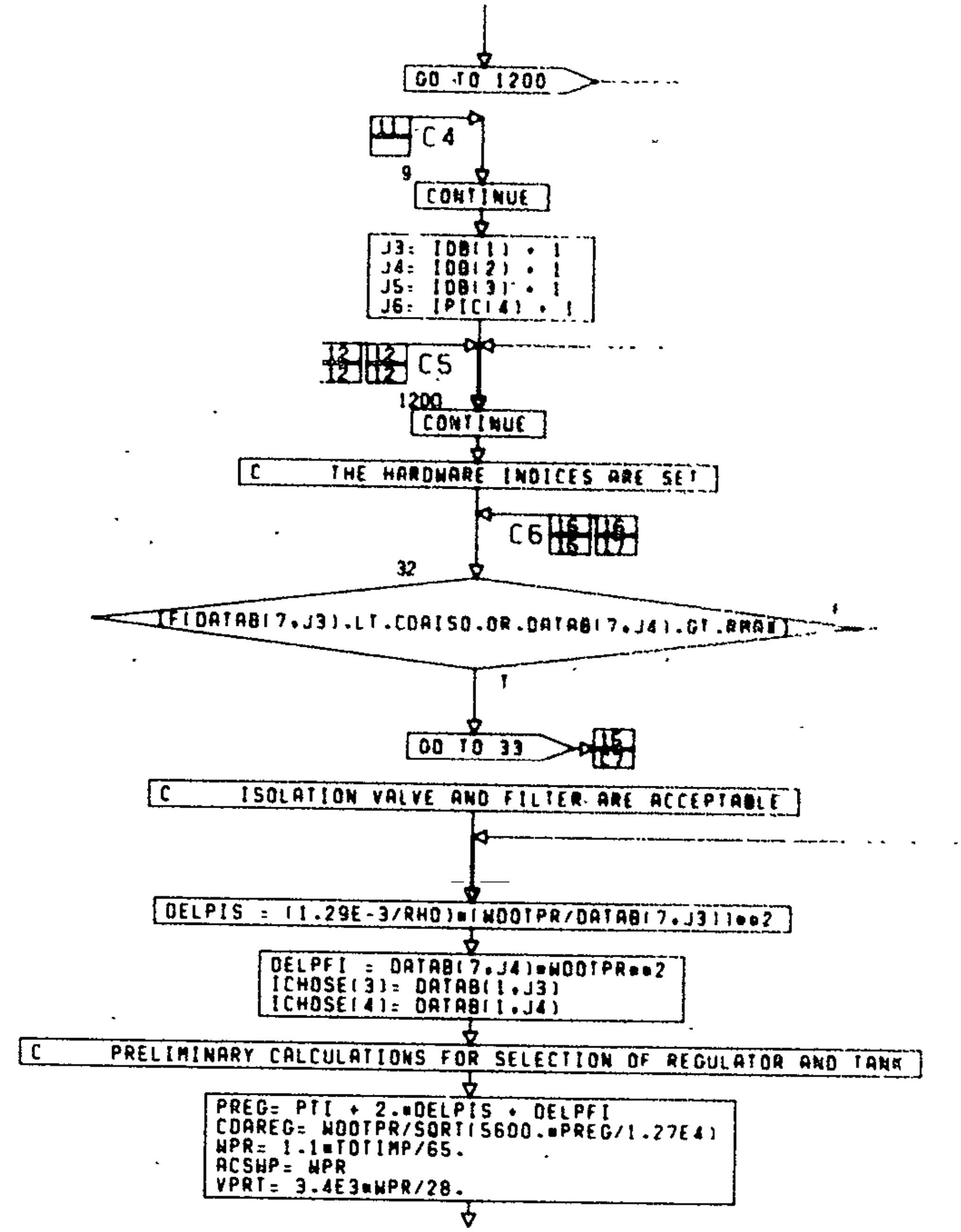


10
B7
IF(IPIC(2).LT.J4E)
F
T
GO TO 7
12
C2
IF(IPIC(3).LT.J5E)
F
T
GO TO 8
12
C3
IF(IPIC(4).LT.J6E)
F
T
GO TO 9
13
C4
C NO ACCEPTABLE COMBINATIONS
ICHOSE(1)= -1
RETURN
10
B8
4
CONTINUE
J3= IDB(1) + 1
J4= IDB(2) + 1
J5= IDB(3) + 1
J6= IDB(4) + 1

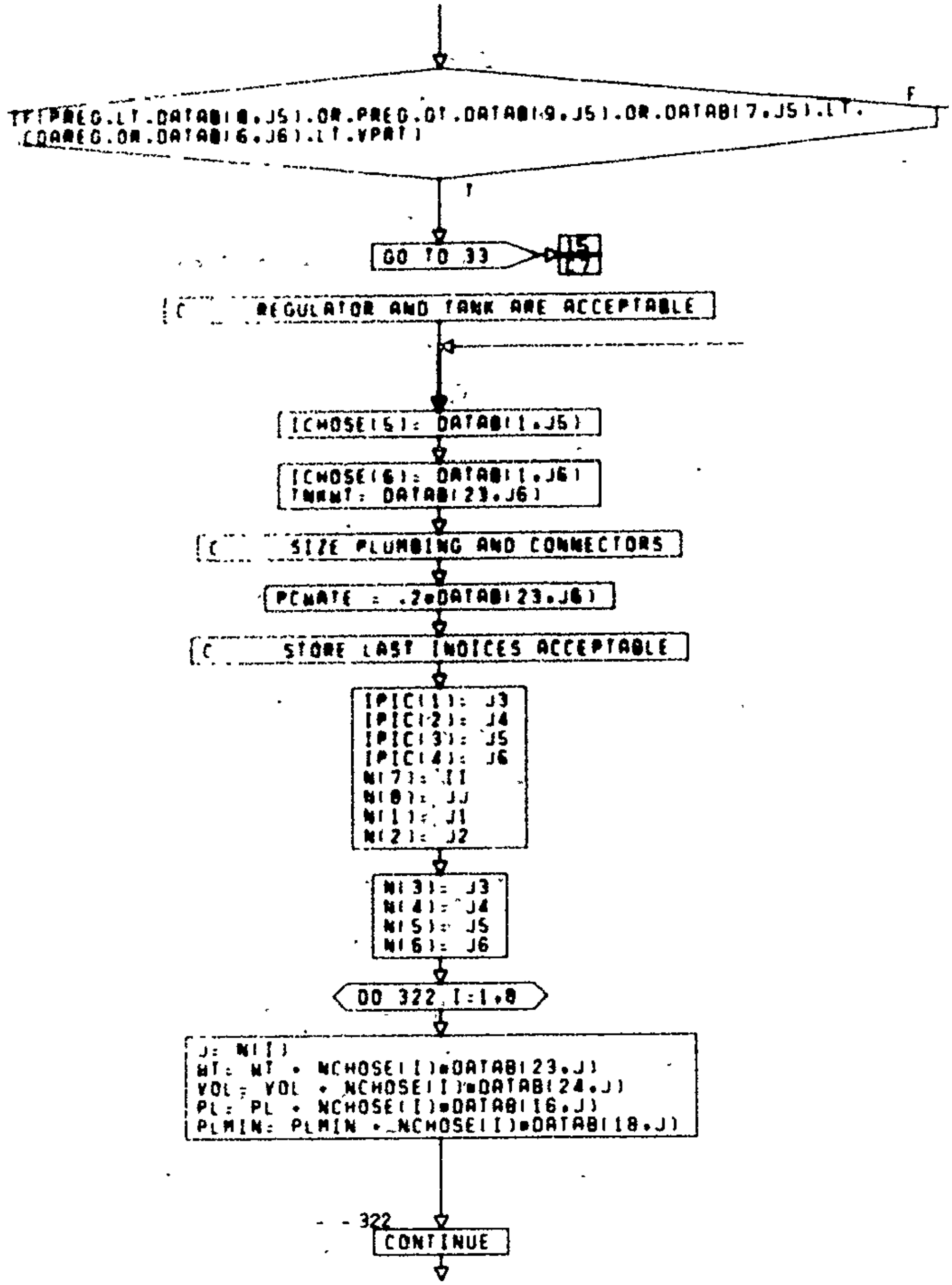
CONT. ON PG 12


GO TO 1200
13
C5
10
B9
5
CONTINUE
J3: IPIC(1)
J4: IPIC(2)
J6: IPIC(3)
J6: IPIC(4)
GO TO 1200
13
C5
10
C1
6
CONTINUE
J3: IPIC(1) + 1
J4: IPIC(2)
J5: IPIC(3)
J6: IPIC(4)
GO TO 1200
13
C5
11
C2
7
CONTINUE
J3: IDB(1) + 1
J4: IPIC(2) + 1
J5: IPIC(3)
J6: IPIC(4)
GO TO 1200
13
C5
11
C3
8
CONTINUE
J3: IDB(1) + 1
J4: IDB(2) + 1
J5: IPIC(3) + 1
J6: IPIC(4)

CONT. ON PG 13

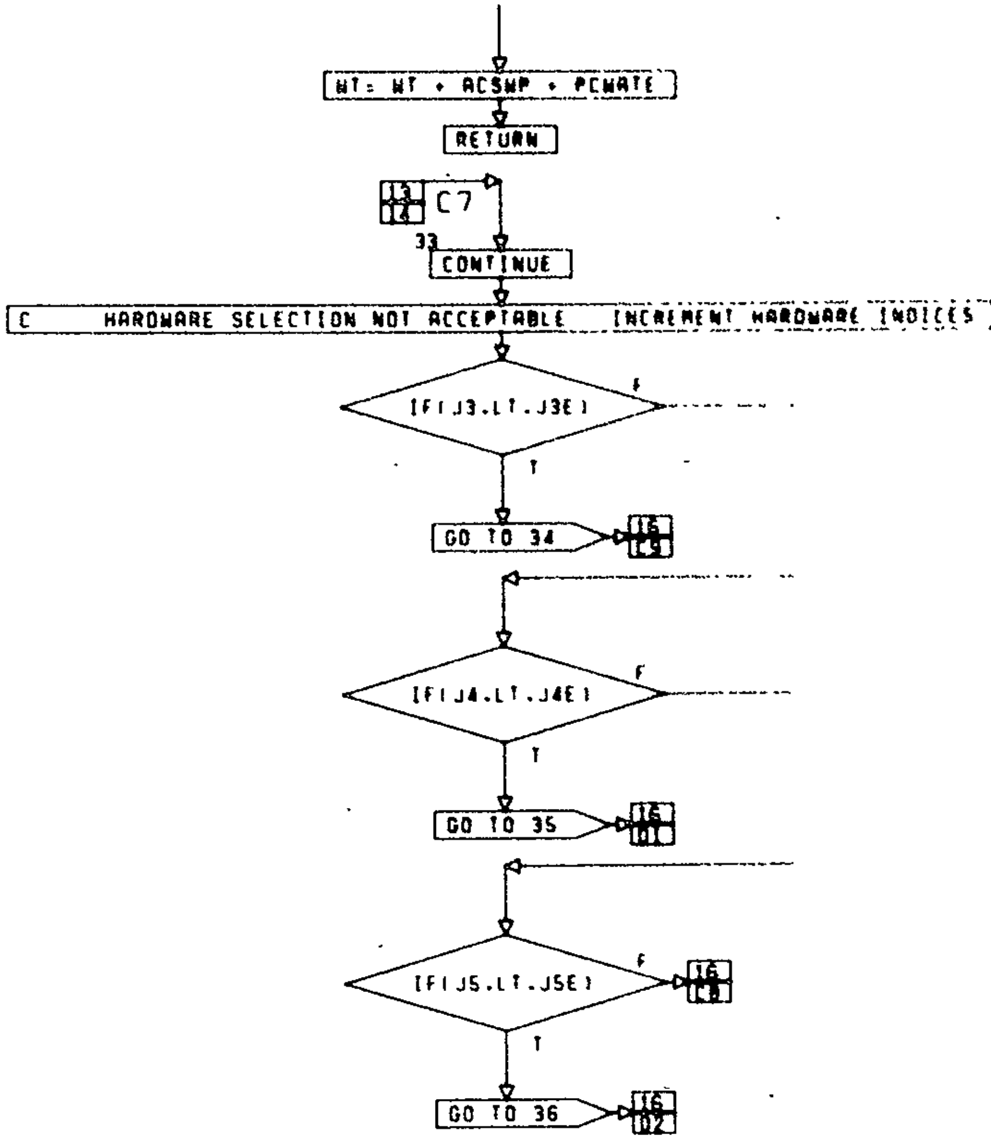

GO TO 1200
11
C4
9
CONTINUE
J3= IDB(1) + 1
J4= IDB(2) + 1
J5= IDB(3) + 1
J6= IPIC(4) + 1
12
C5
1200
CONTINUE
C THE HARDWARE INDICES ARE SET
C6
16
32
IF(DATAB(7,J3).LT.CDAISO.OR.DATAB(7,J4).GT.AMAX)
T
GO TO 33
C ISOLATION VALVE AND FILTER ARE ACCEPTABLE
DELPIS = (1.29E-3/RHO)*(WDOTPR/DATAB(7,J3))**2
DELPFI = DATAB(7,J4)*WDOTPR**2
ICHOSE(3)= DATAB(1,J3)
ICHOSE(4)= DATAB(1,J4)
C PRELIMINARY CALCULATIONS FOR SELECTION OF REGULATOR AND TANK
PREG= PTI + 2.*DELPIS + DELPFI
CDAREG= WDOTPR/SQRT(5600.*PREG/1.27E4)
WPR= 1.1*TOTIMP/65.
ACSWP= WPR
VPRT= 3.4E3*WPR/28.

CONT. ON PG 14

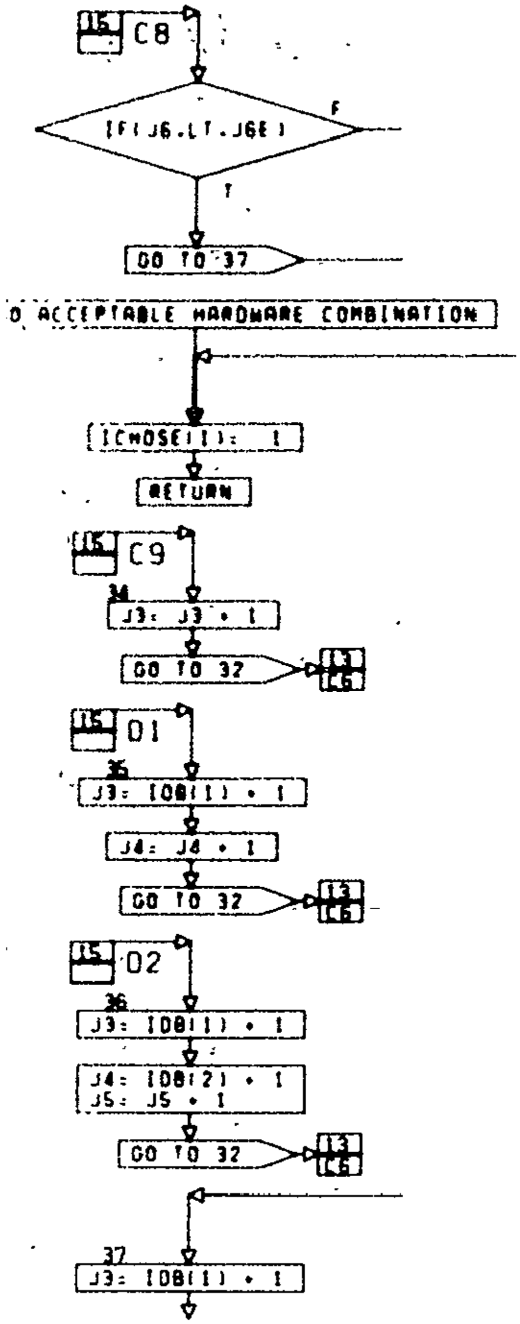


CONT. ON PG 15

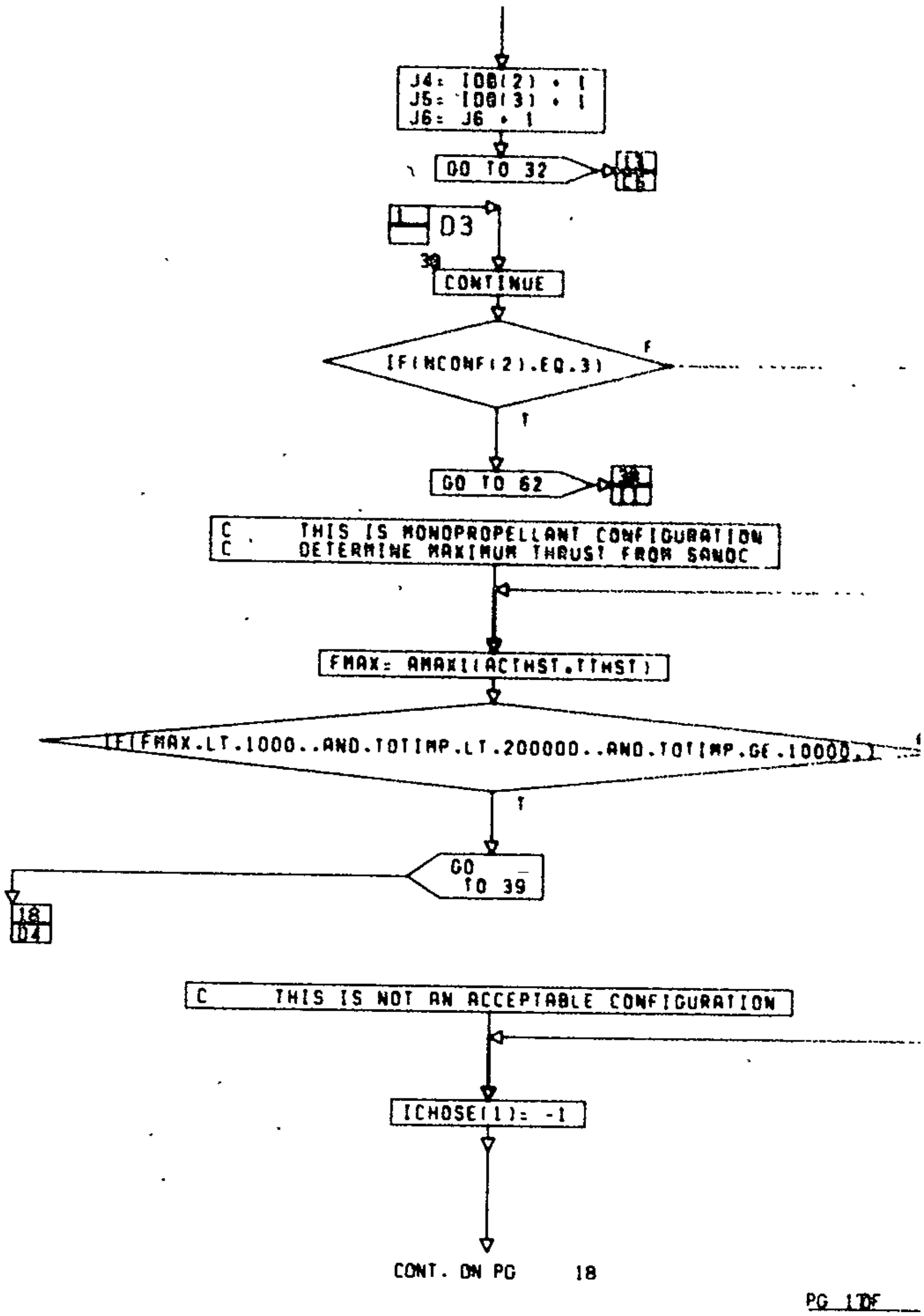
PG 14 OF 61

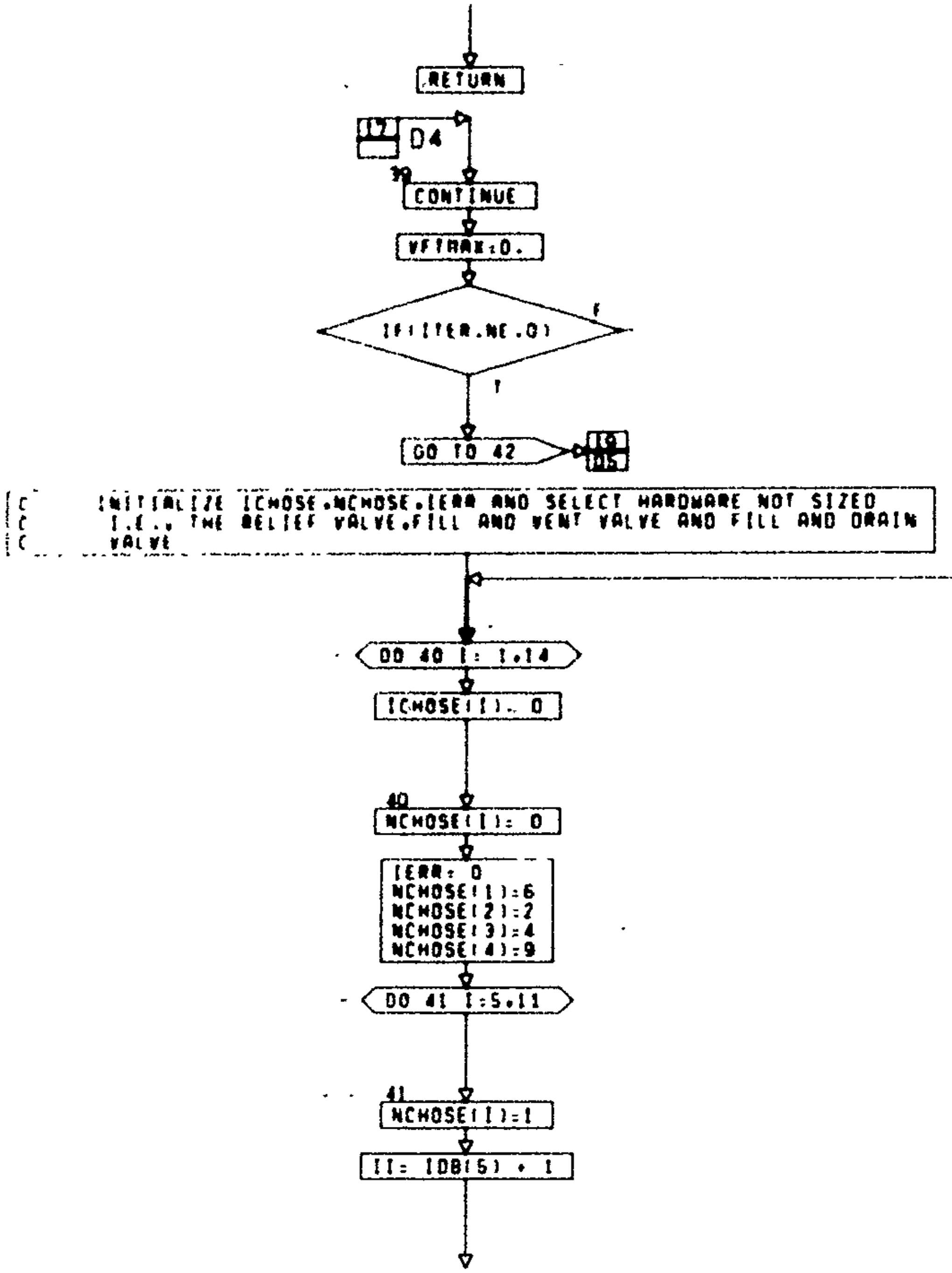

WT= WT + ACSWP + PCWATE
RETURN
13
14
C7
33
CONTINUE
C HARDWARE SELECTION NOT ACCEPTABLE INCREMENT HARDWARE INDICES
IF(J3.LT.J3E)
F
T
GO TO 34
16
IF(J4.LT.J4E)
F
T
GO TO 35
16
IF(J5.LT.J5E)
F
16
T
GO TO 36
16
D2

CONT. ON PG 16

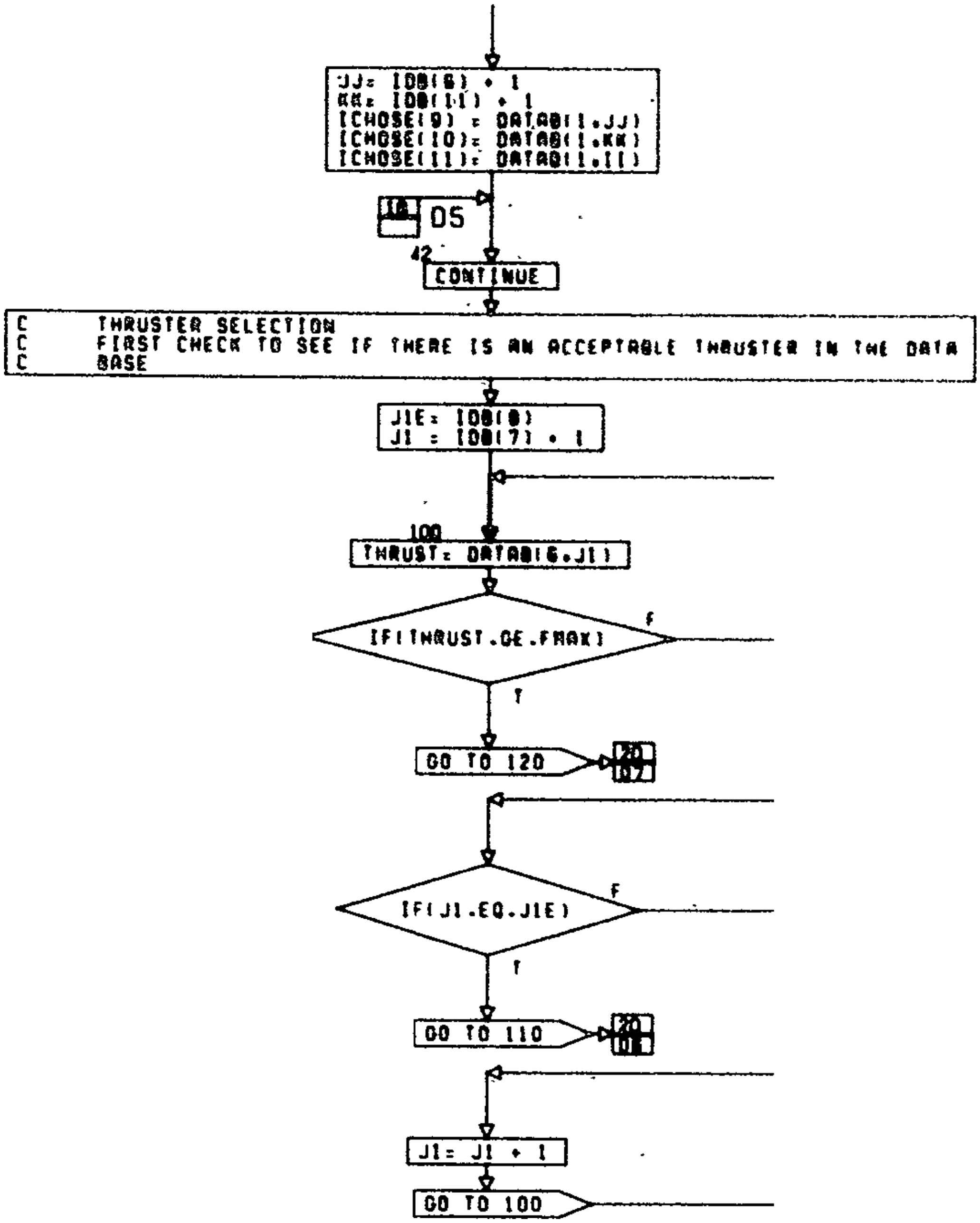

15
C8
IF(J6.LT.J6E)
F
T
GO TO 37
O ACCEPTABLE HARDWARE COMBINATION
ICHOSE(1)= 1
RETURN
15
C9
34
J3= J3 + 1
GO TO 32
13
C6
15
D1
36
J3= IDB(1) + 1
J4= J4 + 1
GO TO 32
13
C6
15
D2
36
J3= IDB(1) + 1
J4= IDB(2) + 1
J5= J5 + 1
GO TO 32
13
C6
37
J3= IDB(1) + 1

CONT. ON PG 17

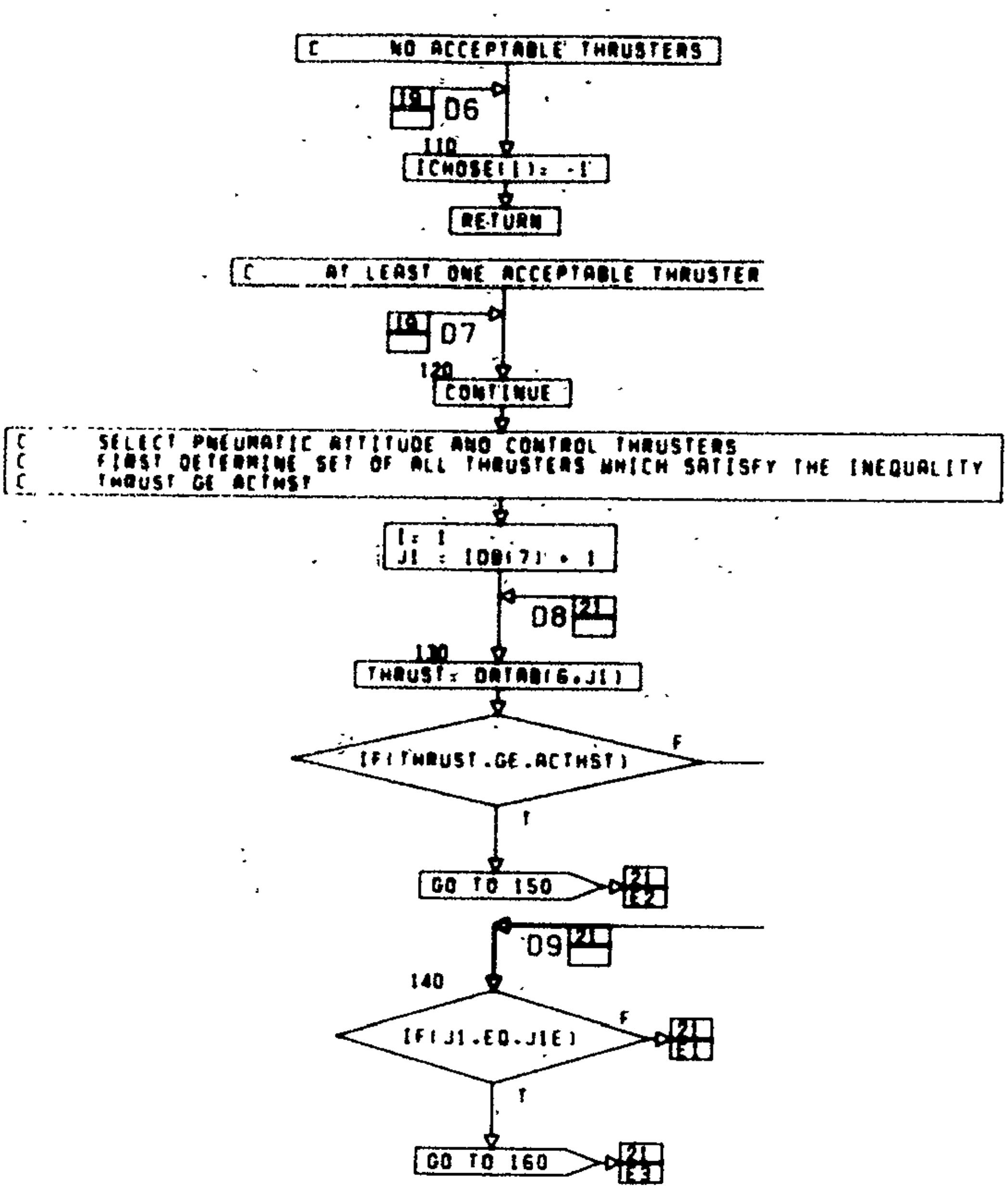

J4: IDB(2) + 1
J5: IDB(3) + 1
J6: J6 + 1
GO TO 32
D3
30
CONTINUE
IF(NCONF(2).EQ.3)
F
T
GO TO 62
C THIS IS MONOPROPELLANT CONFIGURATION
C DETERMINE MAXIMUM THRUST FROM SANOC
FMAX= AMAX1(ACTHST,TTHST)
IF(FMAX.LT.1000..AND.TOTIMP.LT.200000..AND.TOTIMP.GE.10000.)
T
GO TO 39
18
D4
C THIS IS NOT AN ACCEPTABLE CONFIGURATION
ICHOSE(1)= -1
CONT. ON PG 18
PG 17 OF


RETURN
17
D4
39
CONTINUE
VFTMAX:0.
IF(ITER.NE.0)
F
T
GO TO 42
19
D5
C INITIALIZE ICHOSE,NCHOSE,IERR AND SELECT HARDWARE NOT SIZED
C I.E., THE RELIEF VALVE,FILL AND VENT VALVE AND FILL AND DRAIN
C VALVE
DO 40 I: 1,14
ICHOSE(I).. 0
40
NCHOSE(I): 0
IERR: 0
NCHOSE(1):6
NCHOSE(2):2
NCHOSE(3):4
NCHOSE(4):9
DO 41 I:5,11
41
NCHOSE(I):1
II: IDB(5) + 1

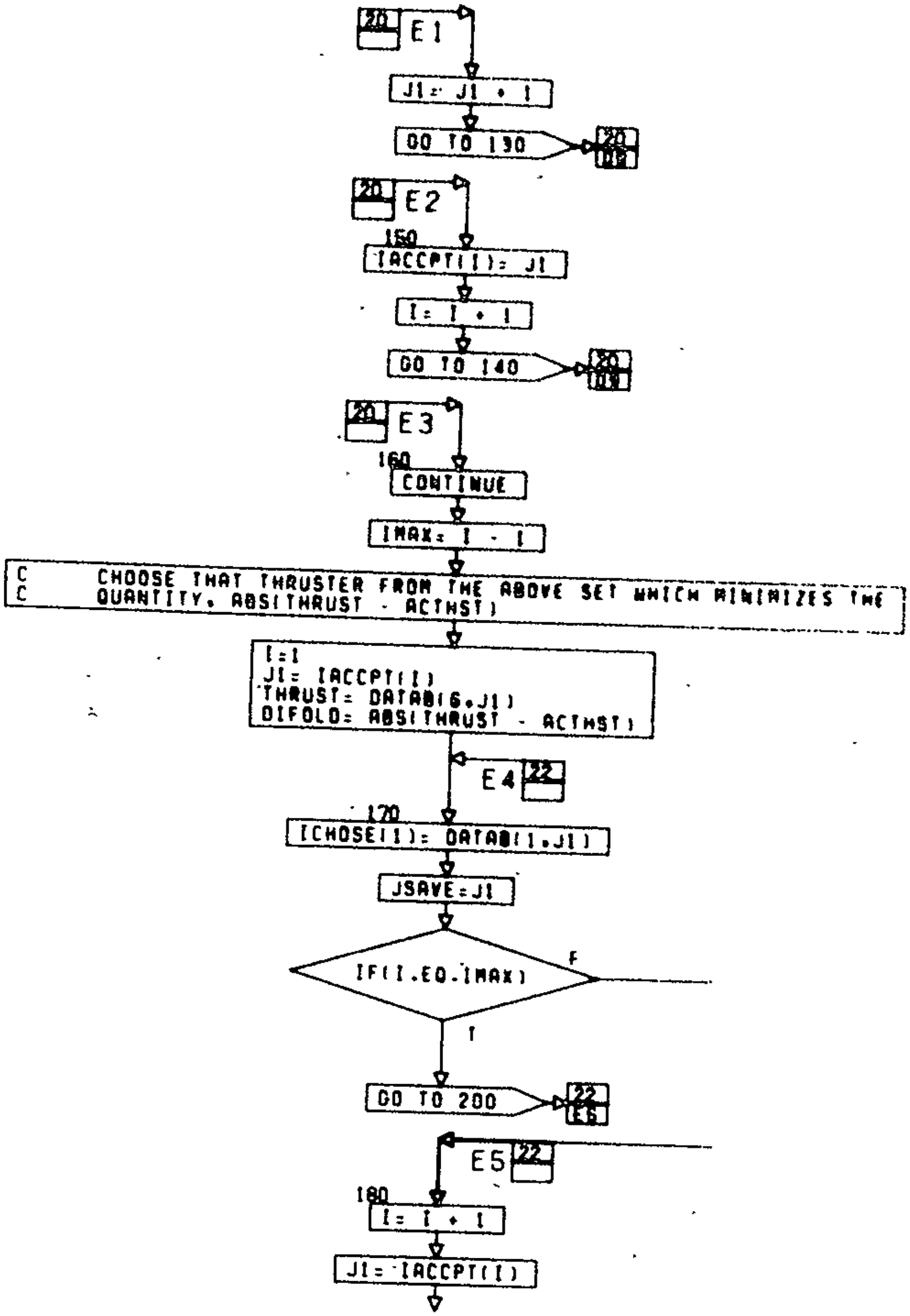
CONT. ON PG 19


JJ= IDB(6) + 1
KK= IDB(11) + 1
ICHOSE(9) = DATAB(I,JJ)
ICHOSE(10)= DATAB(I,KK)
ICHOSE(11)= DATAB(I,II)
18
DS
42
CONTINUE
C THRUSTER SELECTION
C FIRST CHECK TO SEE IF THERE IS AN ACCEPTABLE THRUSTER IN THE DATA
C BASE
J1E= IDB(8)
J1 = IDB(7) + 1
100
THRUST= DATAB(6,J1)
IF(THRUST.GE.FMAX)
F
T
GO TO 120
20
07
IF(J1.EQ.J1E)
F
T
GO TO 110
20
06
J1= J1 + 1
GO TO 100

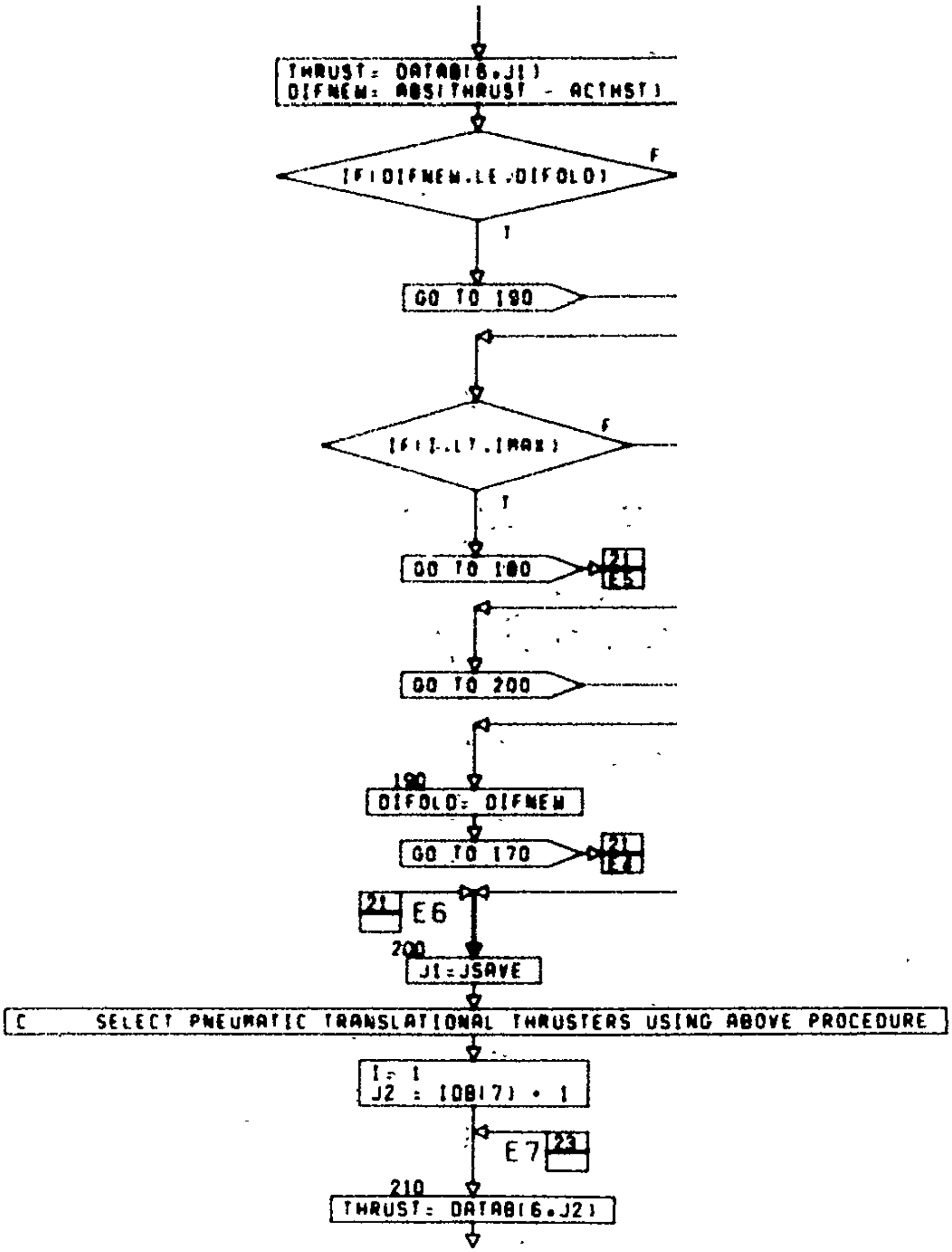
CONT. ON PG 20


C NO ACCEPTABLE THRUSTERS
19
D6
110
ICHOSE(I)= -1
RETURN
C AT LEAST ONE ACCEPTABLE THRUSTER
19
D7
120
CONTINUE
C SELECT PNEUMATIC ATTITUDE AND CONTROL THRUSTERS
C FIRST DETERMINE SET OF ALL THRUSTERS WHICH SATISFY THE INEQUALITY
C THRUST GE ACTHST
I= 1
J1 = IDB(7) + 1
D8
21
130
THRUST= DATAB(6,J1)
IF(THRUST.GE.ACTHST)
F
T
GO TO 150
21
E2
D9
21
140
IF(J1.EQ.J1E)
F
21
E1
T
GO TO 160
21
E3

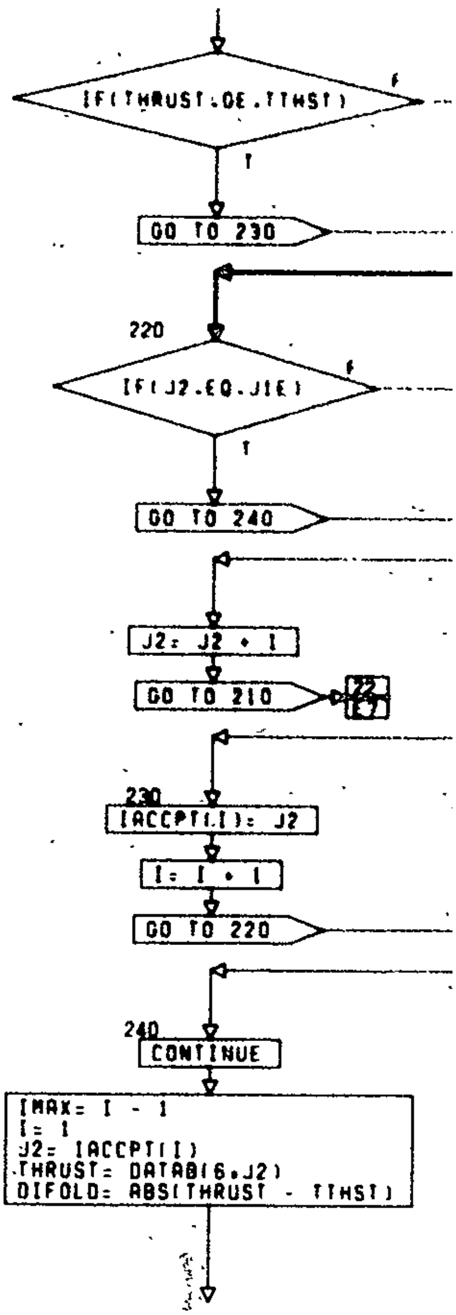
CONT. ON PG 21


20 E1
J1= J1 + 1
GO TO 130
20 D9
20 E2
150
IACCPT(I)= J1
I= I + 1
GO TO 140
20 D9
20 E3
160
CONTINUE
IMAX= I - 1
C CHOOSE THAT THRUSTER FROM THE ABOVE SET WHICH MINIMIZES THE
C QUANTITY, ABS(THRUST - ACTHST)
I=1
J1= IACCPT(I)
THRUST= DATAB(6,J1)
DIFOLD= ABS(THRUST - ACTHST)
E4 22
170
ICHOSE(1)= DATAB(1,J1)
JSAVE=J1
IF(I.EQ.IMAX)
F
T
GO TO 200
22 E5
E5 22
180
I= I + 1
J1= IACCPT(I)

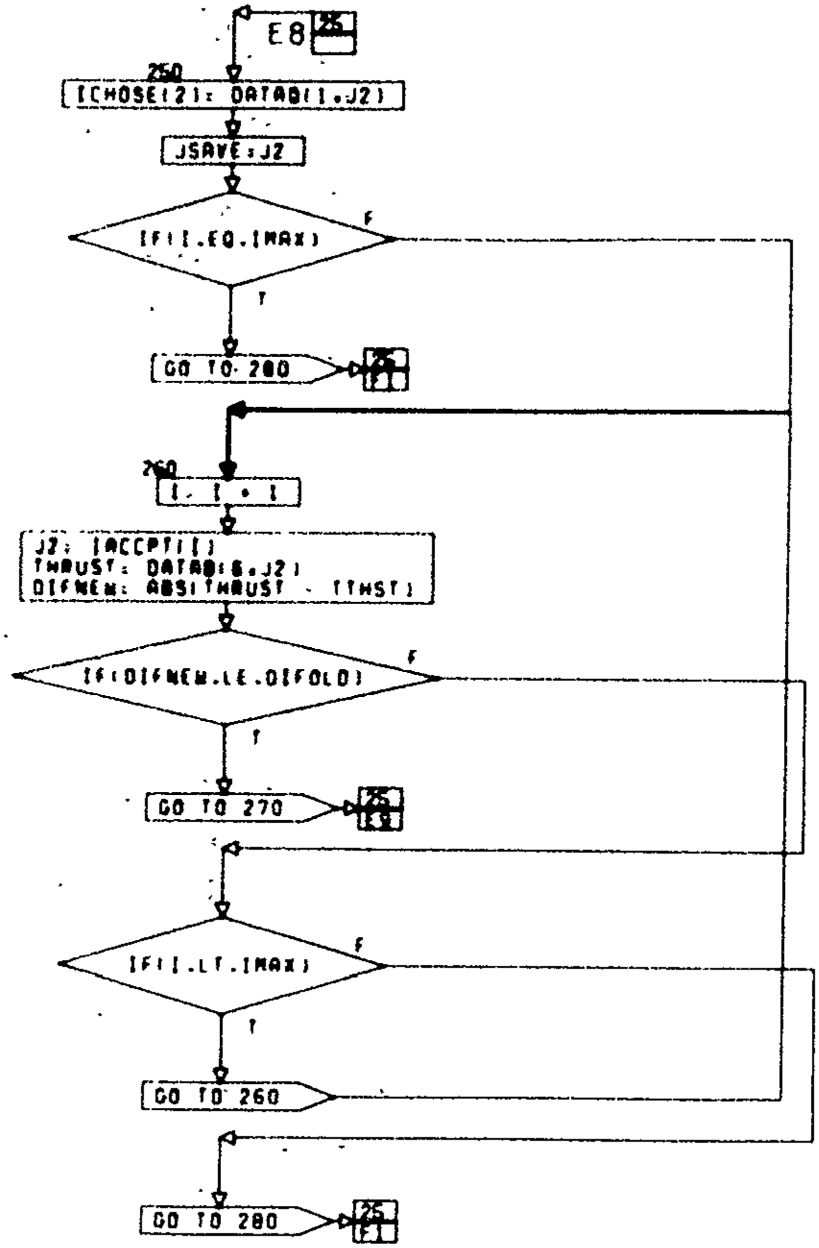
CONT. ON PG 22


THRUST= DATAB(6,J1)
DIFNEW= ABS(THRUST - ACTHST)
IF(DIFNEW.LE.DIFOLD)
F
T
GO TO 190
IF(I.LT.IMAX)
F
T
GO TO 180
21
E5
GO TO 200
190
DIFOLD= DIFNEW
GO TO 170
21
E4
21
E6
200
J1=JSAVE
C SELECT PNEUMATIC TRANSLATIONAL THRUSTERS USING ABOVE PROCEDURE
I= 1
J2 = IDB(7) + 1
E7
23
210
THRUST= DATAB(6,J2)

CONT. ON PG 23

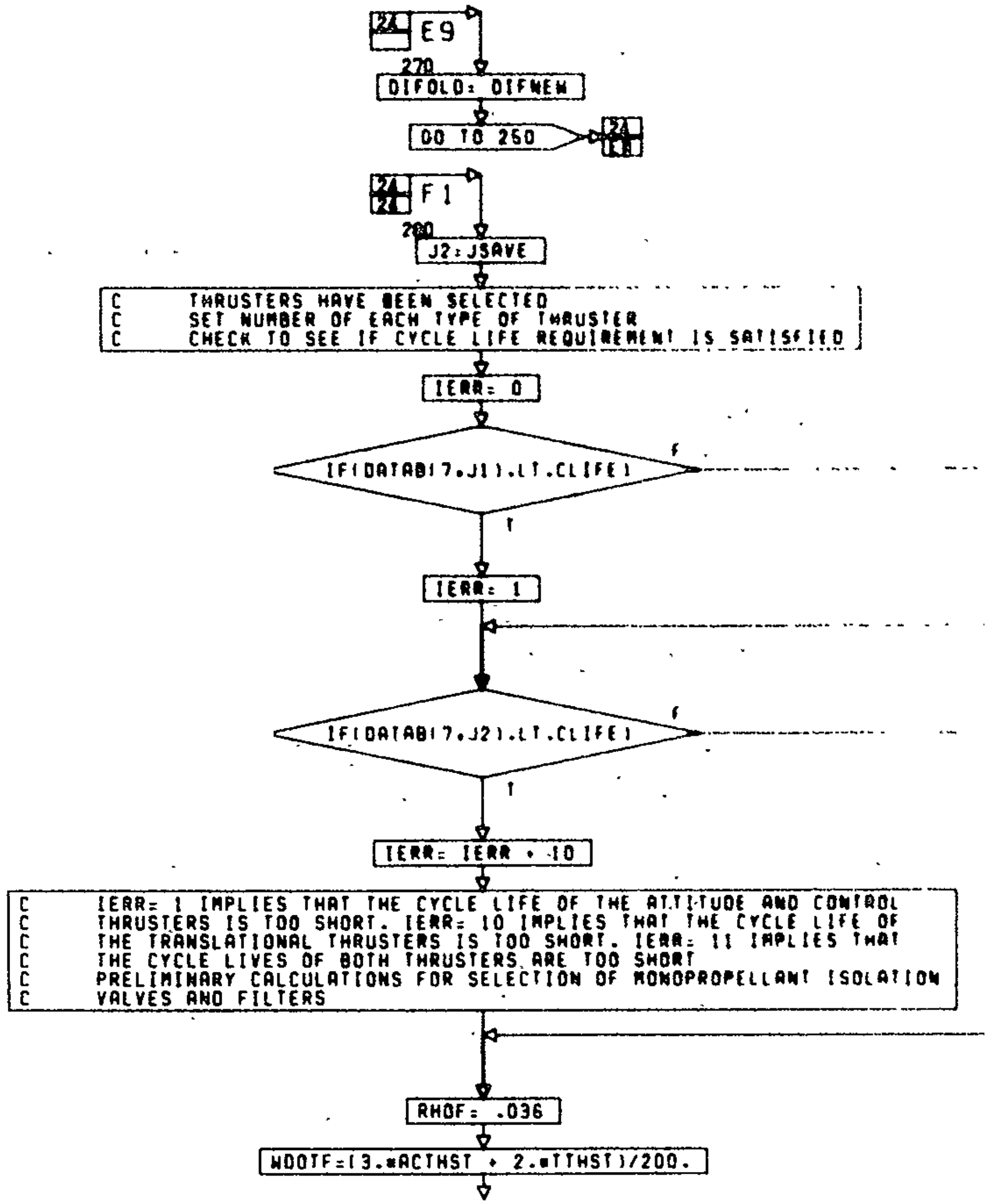

IF(THRUST.GE.TTHST)
F
T
GO TO 230
220
IF(J2.EQ.JIE)
F
T
GO TO 240
J2= J2 + 1
GO TO 210
230
IACCPT(I)= J2
I= I + 1
GO TO 220
240
CONTINUE
IMAX= I - 1
I= 1
J2= IACCPT(I)
THRUST= DATAB(6,J2)
DIFOLD= ABS(THRUST - TTHST)

CONT. ON PG 24

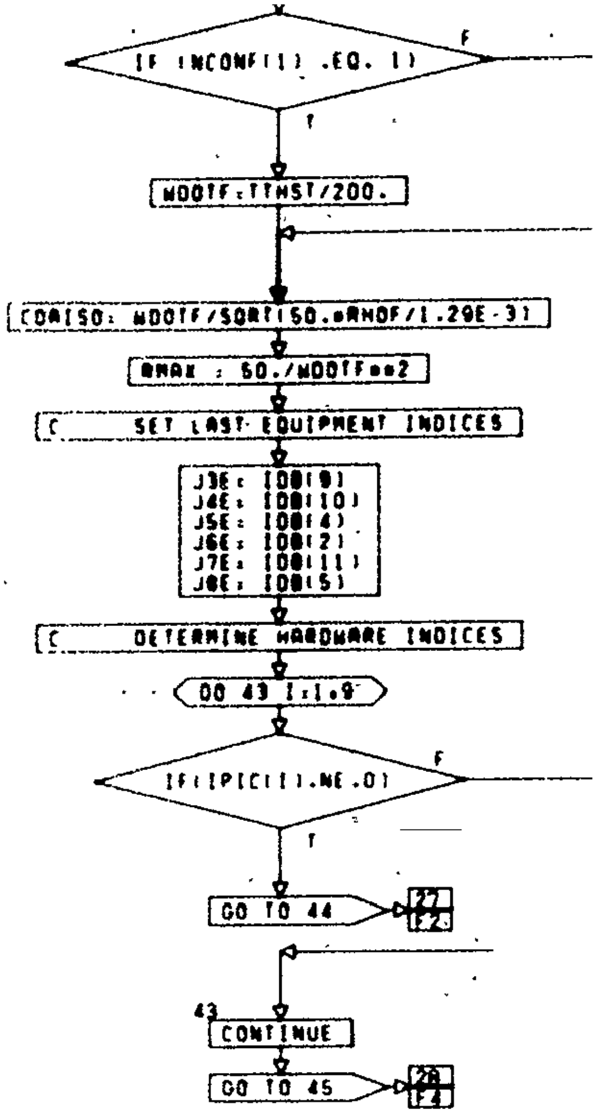


E8
25
250
ICHOSE(2)= DATAB(1,J2)
JSAVE=J2
IF(I.EQ.IMAX)
F
T
GO TO 280
25
F1
260
I= I + 1
J2= IACCPT(I)
THRUST= DATAB(6,J2)
DIFNEW= ABS(THRUST - TTHST)
IF(DIFNEW.LE.DIFOLD)
F
T
GO TO 270
25
E3
IF(I.LT.IMAX)
F
T
GO TO 260
GO TO 280
25
F1

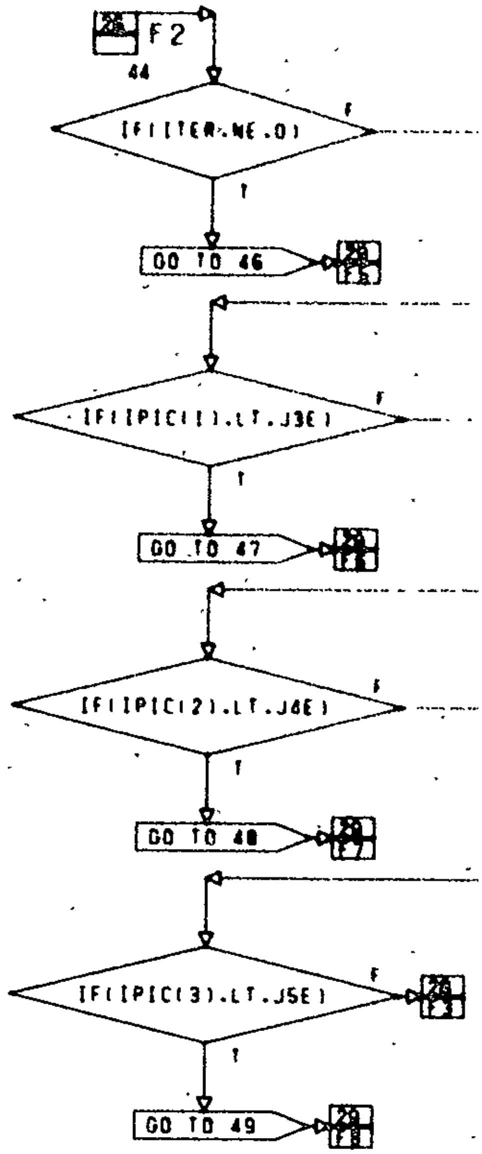
CONT. ON PG 25


24
E9
270
DIFOLD= DIFNEW
GO TO 250
24
E8
24
24
F1
200
J2=JSAVE
C THRUSTERS HAVE BEEN SELECTED
C SET NUMBER OF EACH TYPE OF THRUSTER
C CHECK TO SEE IF CYCLE LIFE REQUIREMENT IS SATISFIED
IERR= 0
IF(DATAB(7,J1).LT.CLIFE)
F
T
IERR= 1
IF(DATAB(7,J2).LT.CLIFE)
F
T
IERR= IERR + 10
C IERR= 1 IMPLIES THAT THE CYCLE LIFE OF THE ATTITUDE AND CONTROL
C THRUSTERS IS TOO SHORT. IERR= 10 IMPLIES THAT THE CYCLE LIFE OF
C THE TRANSLATIONAL THRUSTERS IS TOO SHORT. IERR= 11 IMPLIES THAT
C THE CYCLE LIVES OF BOTH THRUSTERS ARE TOO SHORT
C PRELIMINARY CALCULATIONS FOR SELECTION OF MONOPROPELLANT ISOLATION
C VALVES AND FILTERS
RHOF= .036
WDOTF=(3.*ACTHST + 2.*TTHST)/200.

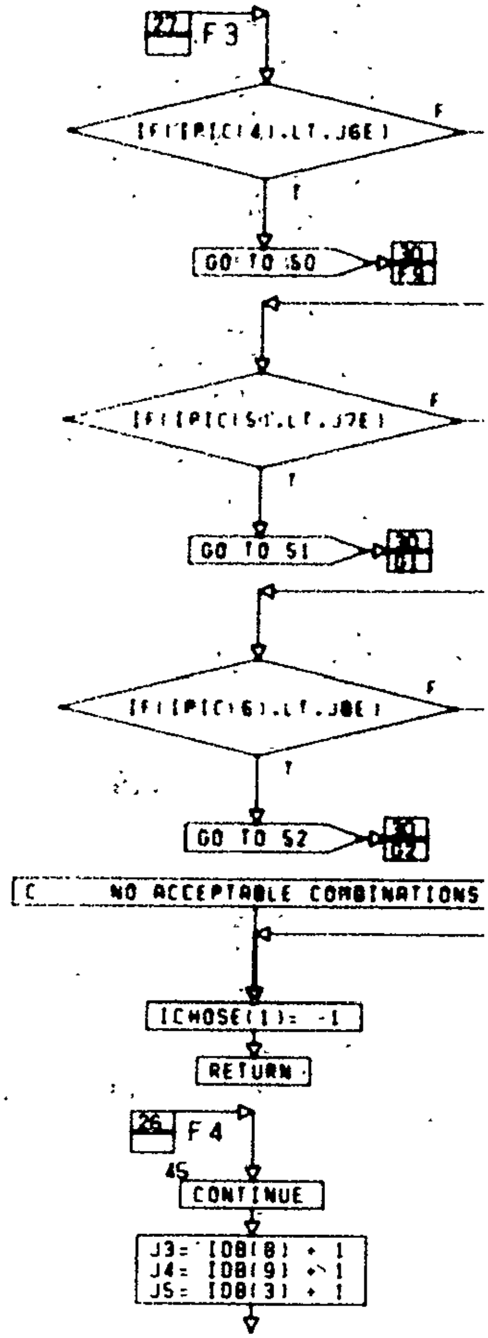
CONT. ON PG 26


IF (NCONF(1) .EQ. 1)
F
T
WDOTF=TTHST/200.
CDAISO= WDOTF/SQRT(50.*RHOF/1.29E-3)
AMAX = 50./WDOTF**2
C SET LAST EQUIPMENT INDICES
J3E= IDB(9)
J4E= IDB(10)
J5E= IDB(4)
J6E= IDB(2)
J7E= IDB(11)
J8E= IDB(5)
C DETERMINE HARDWARE INDICES
DO 43 I=1,9
IF(IPIC(I).NE.0)
F
T
GO TO 44
27
F2
43
CONTINUE
GO TO 45
28
F4

CONT. ON PG 27

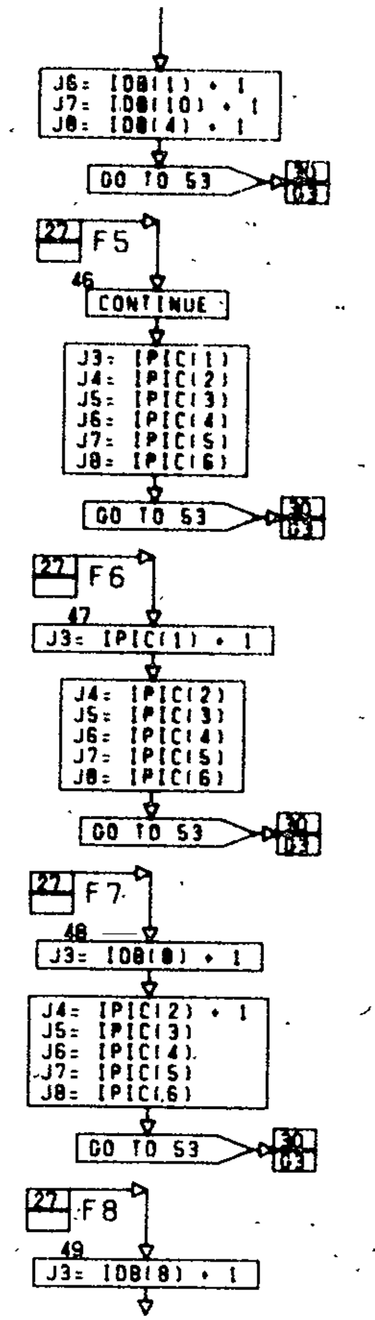

F 2
44
IF((ITER.NE.0)
F
T
GO TO 46
IF((PIC(1).LT.J3E)
F
T
GO TO 47
IF((PIC(2).LT.J4E)
F
T
GO TO 48
IF((PIC(3).LT.J5E)
F
T
GO TO 49

CONT. ON PG 28

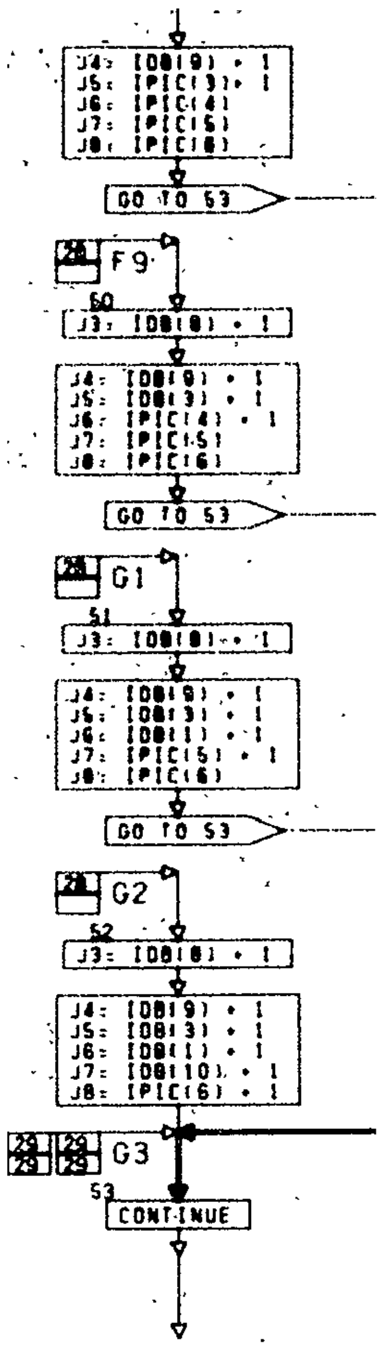


27
F3
IF(IPIC(4).LT.J6E)
F
T
GO TO 50
30
F3
IF(IPIC(5).LT.J7E)
F
T
GO TO 51
30
IF(IPIC(6).LT.J8E)
F
T
GO TO 52
30
C NO ACCEPTABLE COMBINATIONS
ICHOSE(1)= -1
RETURN
26
F4
45
CONTINUE
J3= IDB(8) + 1
J4= IDB(9) + 1
J5= IDB(3) + 1

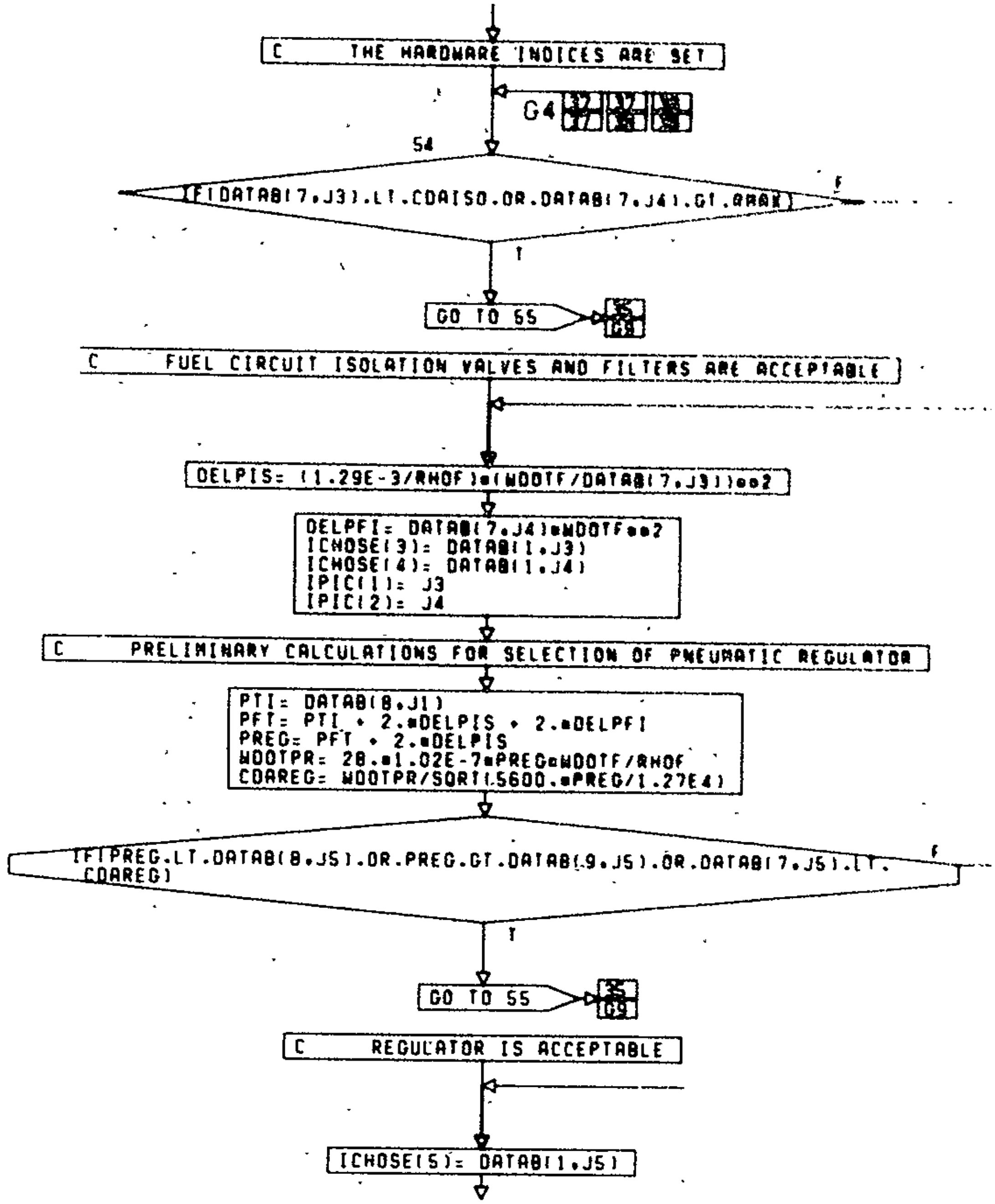
CONT. ON PG 29


J6= IDB(1) + 1
J7= IDB(10) + 1
J8= IDB(4) + 1
GO TO 53
30
D3
27
F5
46
CONTINUE
J3= IPIC(1)
J4= IPIC(2)
J5= IPIC(3)
J6= IPIC(4)
J7= IPIC(5)
J8= IPIC(6)
GO TO 53
30
D3
27
F6
47
J3= IPIC(1) + 1
J4= IPIC(2)
J5= IPIC(3)
J6= IPIC(4)
J7= IPIC(5)
J8= IPIC(6)
GO TO 53
30
D3
27
F7
48
J3= IDB(8) + 1
J4= IPIC(2) + 1
J5= IPIC(3)
J6= IPIC(4)
J7= IPIC(5)
J8= IPIC(6)
GO TO 53
30
D3
27
F8
49
J3= IDB(8) + 1

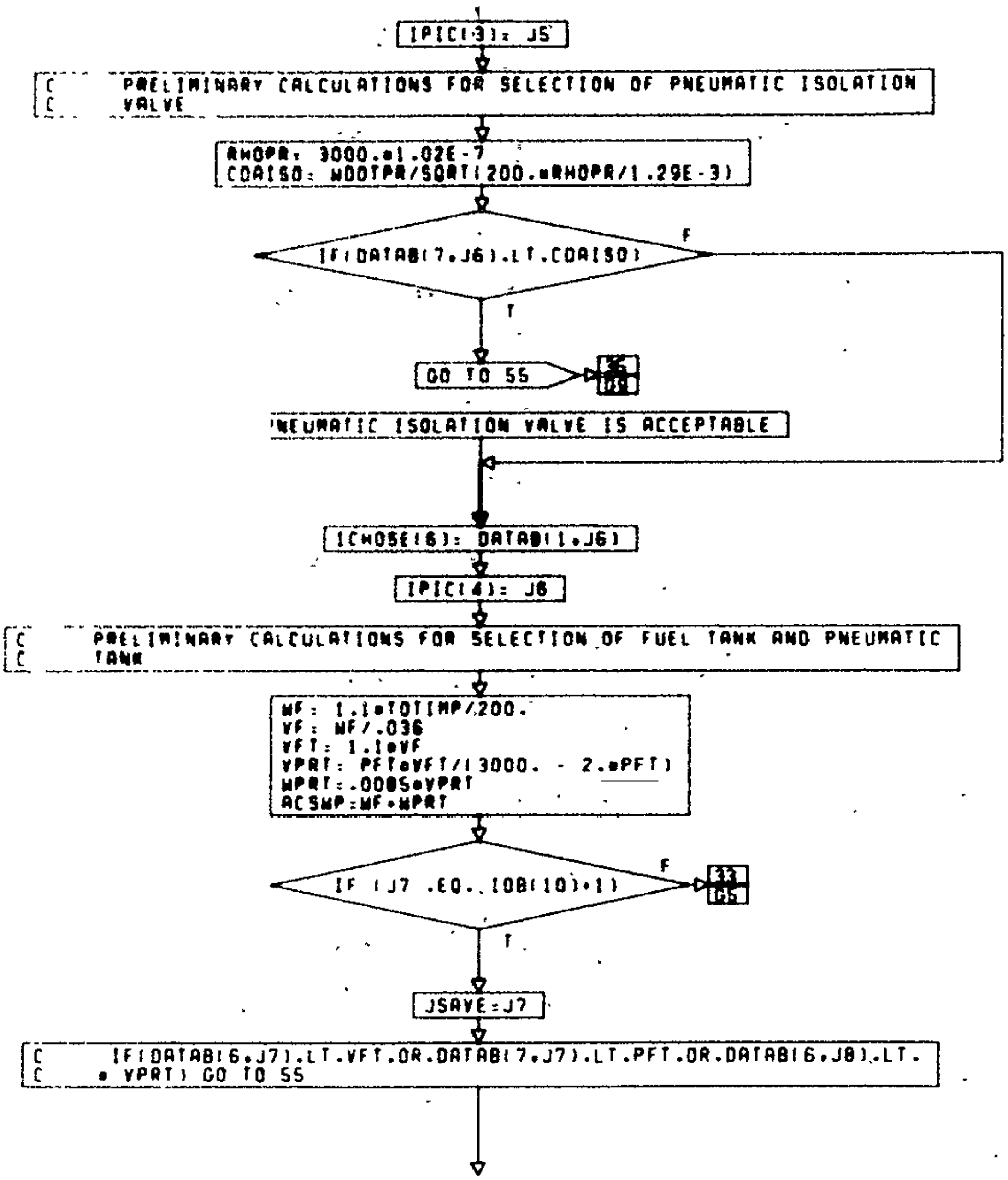
CONT. ON PG 30


J4= IDB(9) + 1
J5= IPIC(3)+ 1
J6= IPIC(4)
J7= IPIC(5)
J8= IPIC(6)
GO TO 53
28
F9
50
J3= IDB(8) + 1
J4= IDB(9) + 1
J5= IDB(3) + 1
J6= IPIC(4) + 1
J7= IPIC(5)
J8= IPIC(6)
GO TO 53
28
G1
51
J3= IDB(8) + 1
J4= IDB(9) + 1
J5= IDB(3) + 1
J6= IDB(1) + 1
J7= IPIC(5) + 1
J8= IPIC(6)
GO TO 53
28
G2
52
J3= IDB(8) + 1
J4= IDB(9) + 1
J5= IDB(3) + 1
J6= IDB(1) + 1
J7= IDB(10) + 1
J8= IPIC(6) + 1
29 29
29 29
G3
53
CONTINUE

CONT. ON PG 31

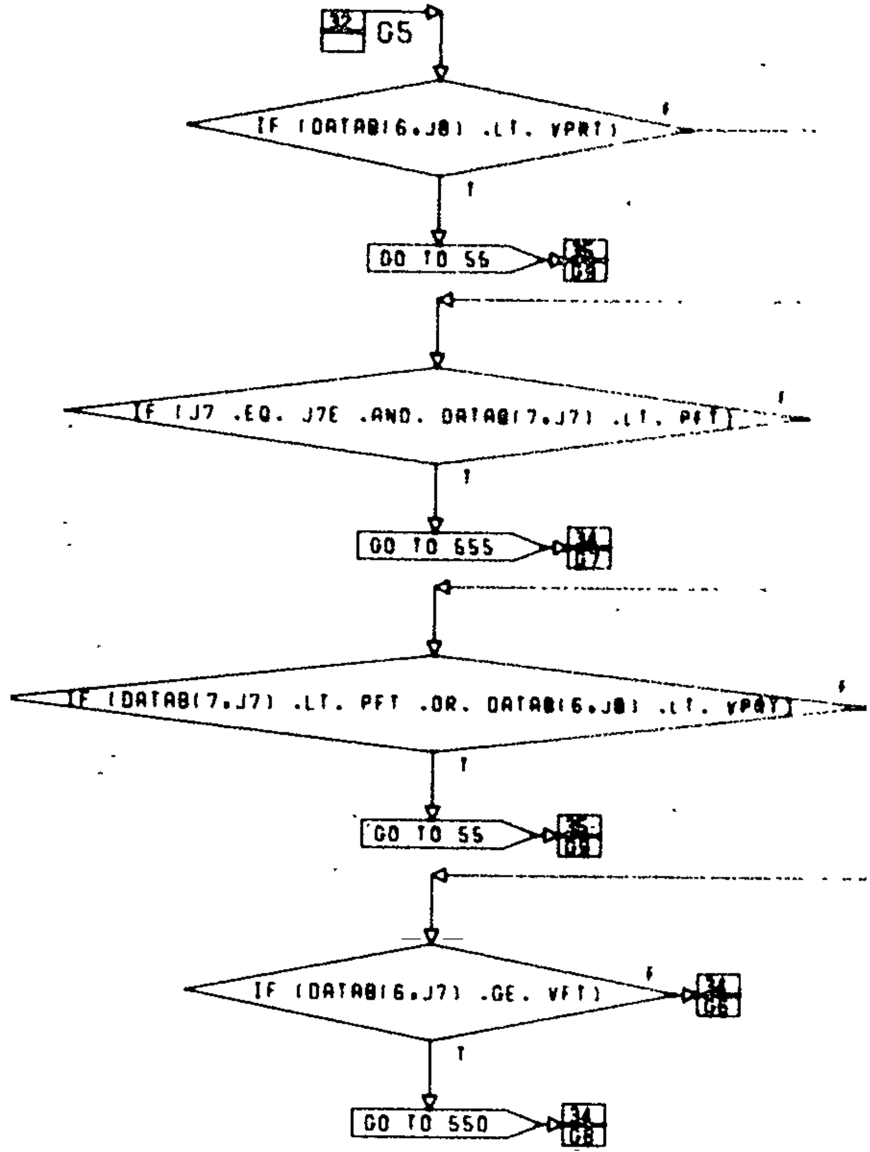

C THE HARDWARE INDICES ARE SET
G4
54
IF(DATAB(7,J3).LT.CDAISO.OR.DATAB(7,J4).GT.AMAX)
F
T
GO TO 55
C FUEL CIRCUIT ISOLATION VALVES AND FILTERS ARE ACCEPTABLE
DELPIS= (1.29E-3/RHOF)*(WDOTF/DATAB(7,J3))**2
DELPFI= DATAB(7,J4)*WDOTF**2
ICHOSE(3)= DATAB(1,J3)
ICHOSE(4)= DATAB(1,J4)
IPIC(1)= J3
IPIC(2)= J4
C PRELIMINARY CALCULATIONS FOR SELECTION OF PNEUMATIC REGULATOR
PTI= DATAB(8,J1)
PFT= PTI + 2.*DELPIS + 2.*DELPFI
PREG= PFT + 2.*DELPIS
WDOTPR= 28.*1.02E-7*PREG*WDOTF/RHOF
CDAREG= WDOTPR/SQRT(5600.*PREG/1.27E4)
IF(PREG.LT.DATAB(8,J5).OR.PREG.GT.DATAB(9,J5).OR.DATAB(7,J5).LT.
CDAREG)
F
T
GO TO 55
C REGULATOR IS ACCEPTABLE
ICHOSE(5)= DATAB(1,J5)

CONT..ON PG 32



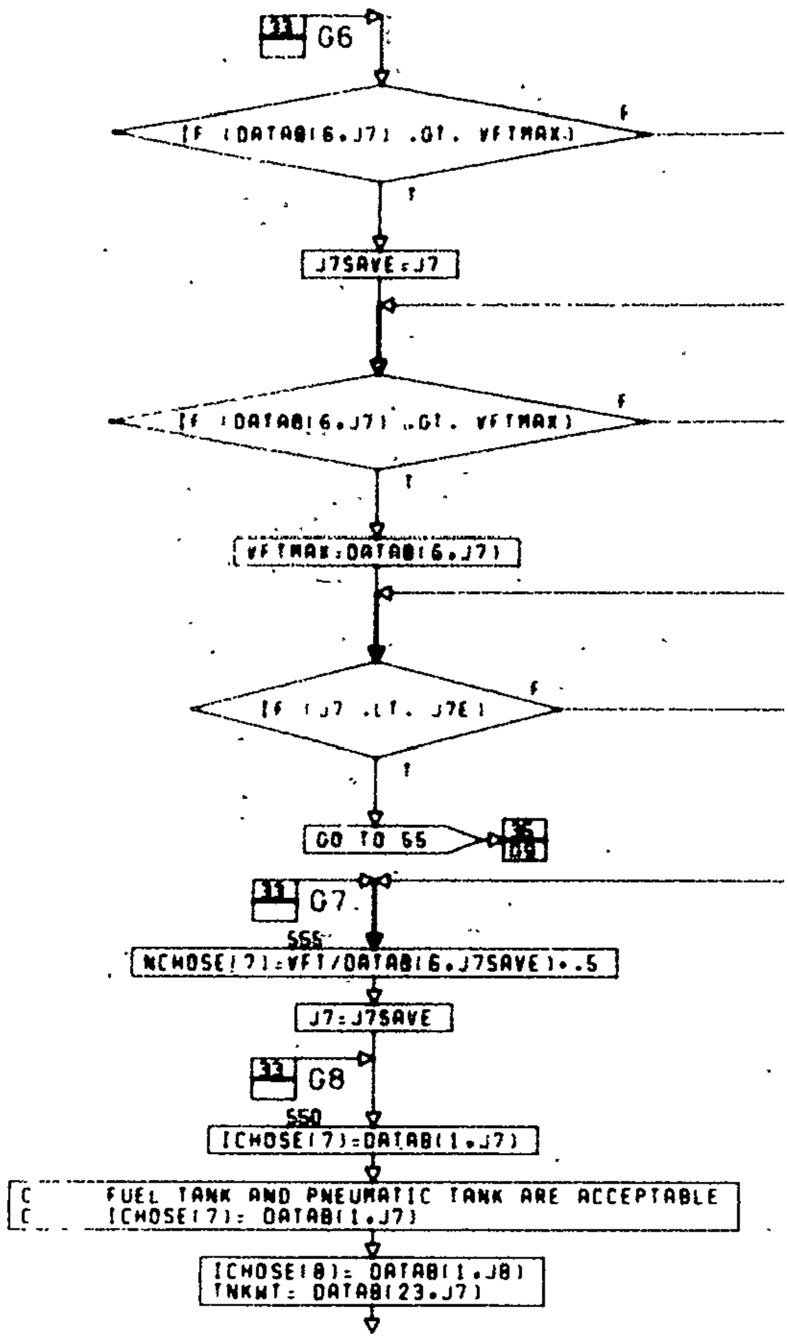
IPIC(3)= J5
C PRELIMINARY CALCULATIONS FOR SELECTION OF PNEUMATIC ISOLATION
C VALVE
RHOPR= 3000.*1.02E-7
CDAISO= WDOTPR/SQRT(200.*RHOPR/1.29E-3)
IF(DATAB(7,J6).LT.CDAISO)
F
T
GO TO 55
PNEUMATIC ISOLATION VALVE IS ACCEPTABLE
ICHOSE(6)= DATAB(1,J6)
IPIC(4)= J8
C PRELIMINARY CALCULATIONS FOR SELECTION OF FUEL TANK AND PNEUMATIC
C TANK
WF= 1.1*TOTIMP/200.
VF= WF/.036
VFT= 1.1*VF
VPRT= PFT*VFT/(3000. - 2.*PFT)
WPRT=.0085*VPRT
ACSWP=WF+WPRT
IF (J7 .EQ. IOB(10)+1)
F
33
G5
T
JSAVE=J7
C IF(DATAB(6,J7).LT.VFT.OR.DATAB(7,J7).LT.PFT.OR.DATAB(6,J8).LT.
C * VPRT) GO TO 55

CONT. ON PG 33

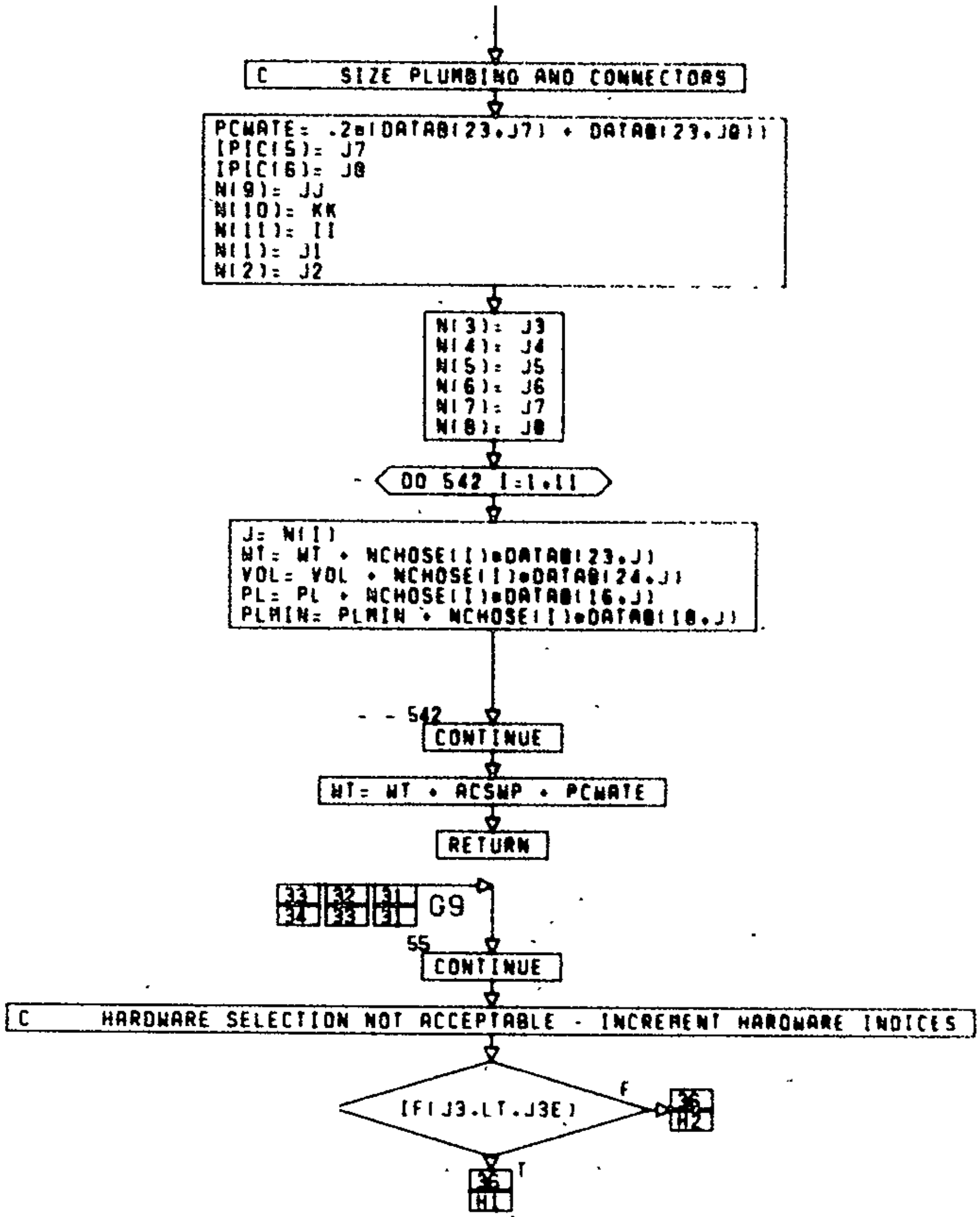


32
G5
IF (DATAB(6,J8) .LT. VPRT)
F
T
GO TO 56
IF (J7 .EQ. J7E .AND. DATAB(7,J7) .LT. PFT)
F
T
GO TO 655
IF (DATAB(7,J7) .LT. PFT .OR. DATAB(6,J8) .LT. VPRT)
F
T
GO TO 55
IF (DATAB(6,J7) .GE. VFT)
F
T
GO TO 550

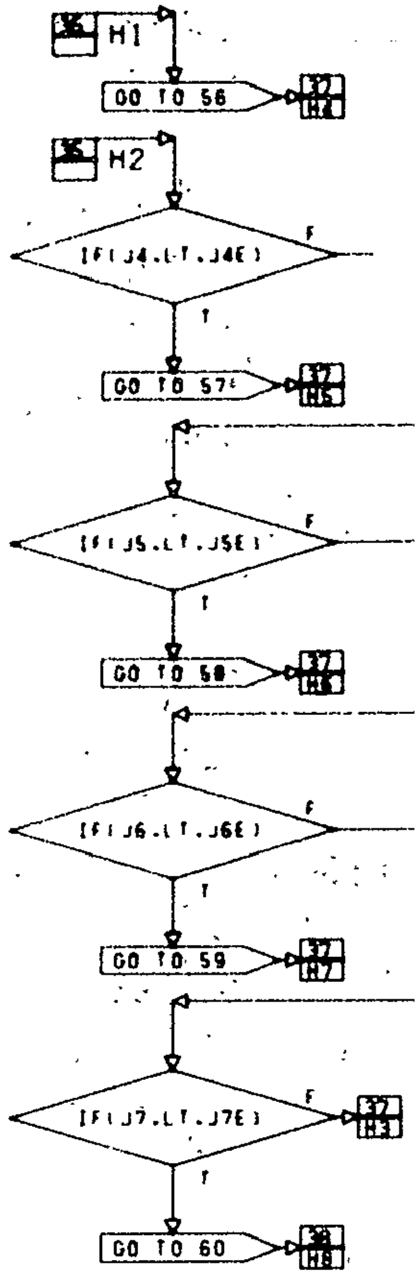
CONT. ON PG 34


33 G6
IF (DATAB(6,J7) .GT. VFTMAX)
F
T
J7SAVE=J7
IF (DATAB(6,J7) .GT. VFTMAX)
F
T
VFTMAX=DATAB(6,J7)
IF (J7 .LT. J7E)
F
T
GO TO 65
35 D9
33 G7
555
NCHOSE(7)=VFT/DATAB(6,J7SAVE)+.5
J7=J7SAVE
33 G8
550
ICHOSE(7)=DATAB(1,J7)
C FUEL TANK AND PNEUMATIC TANK ARE ACCEPTABLE
C ICHOSE(7)= DATAB(1,J7)
ICHOSE(8)= DATAB(1,J8)
TNKWT= DATAB(23,J7)

CONT. ON PG 35


C SIZE PLUMBING AND CONNECTORS
PCWATE= .2*(DATAB(23,J7) + DATAB(23,J8))
IPIC(5)= J7
IPIC(6)= J8
N(9)= JJ
N(10)= KK
N(11)= II
N(1)= J1
N(2)= J2
N(3)= J3
N(4)= J4
N(5)= J5
N(6)= J6
N(7)= J7
N(8)= J8
DO 542 I=1,11
J= N(I)
WT= WT + NCHOSE(I)*DATAB(23,J)
VOL= VOL + NCHOSE(I)*DATAB(24,J)
PL= PL + NCHOSE(I)*DATAB(16,J)
PLMIN= PLMIN + NCHOSE(I)*DATAB(18,J)
542
CONTINUE
WT= WT + ACSWP + PCWATE
RETURN
33 34
32 33
31 31
G9
55
CONTINUE
C HARDWARE SELECTION NOT ACCEPTABLE - INCREMENT HARDWARE INDICES
IF(J3.LT.J3E)
F
36 H2
T
36 H1

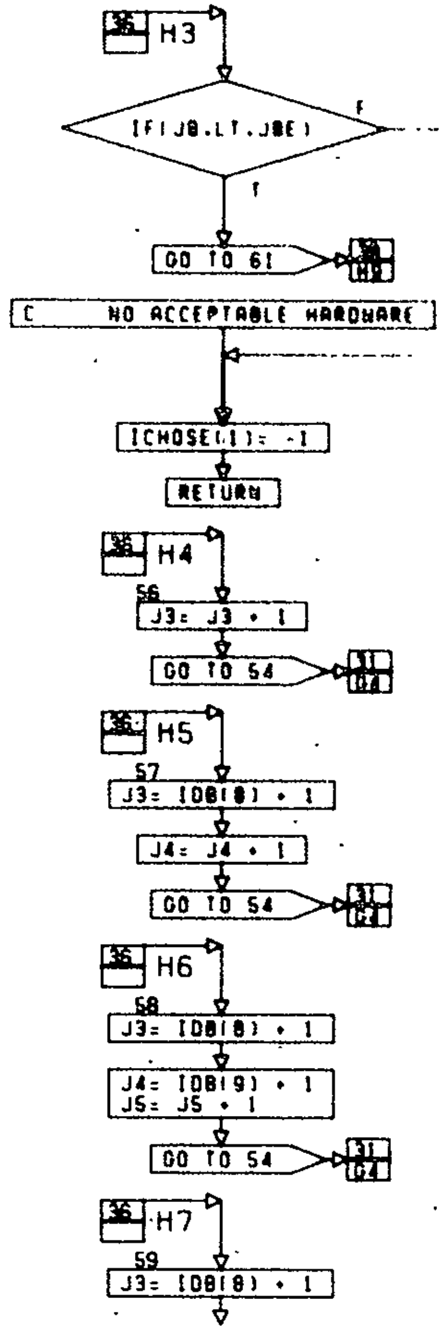
CONT. ON PG 36



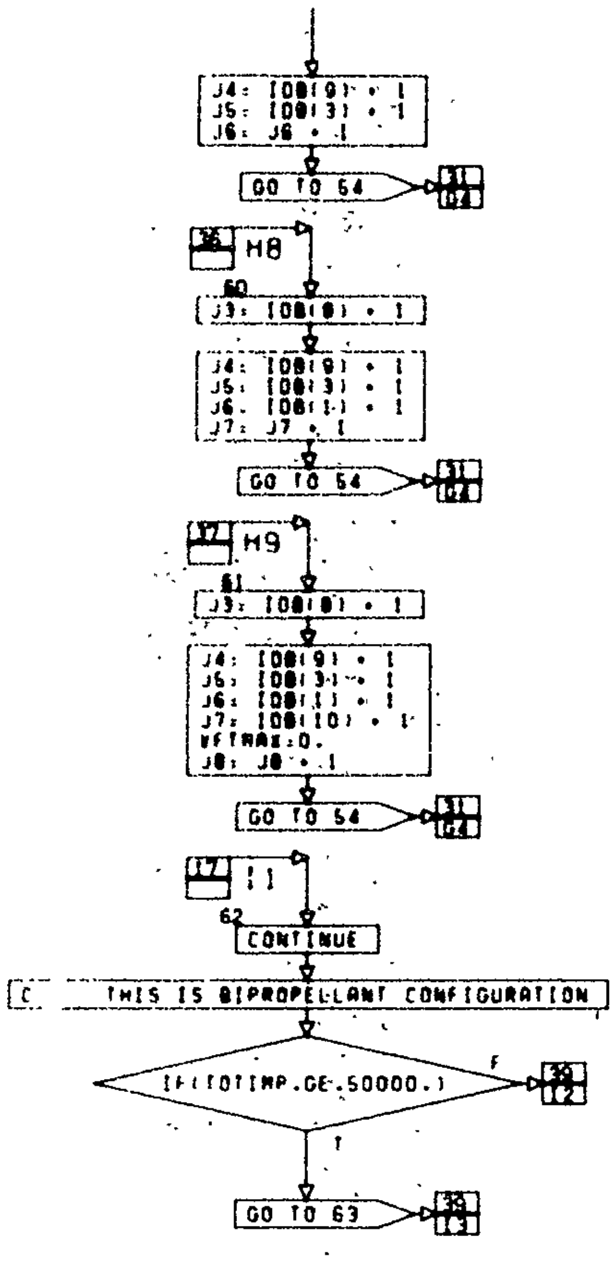
ORIGINAL PAGE IS
OF POOR QUALITY

CONT. ON PG 37

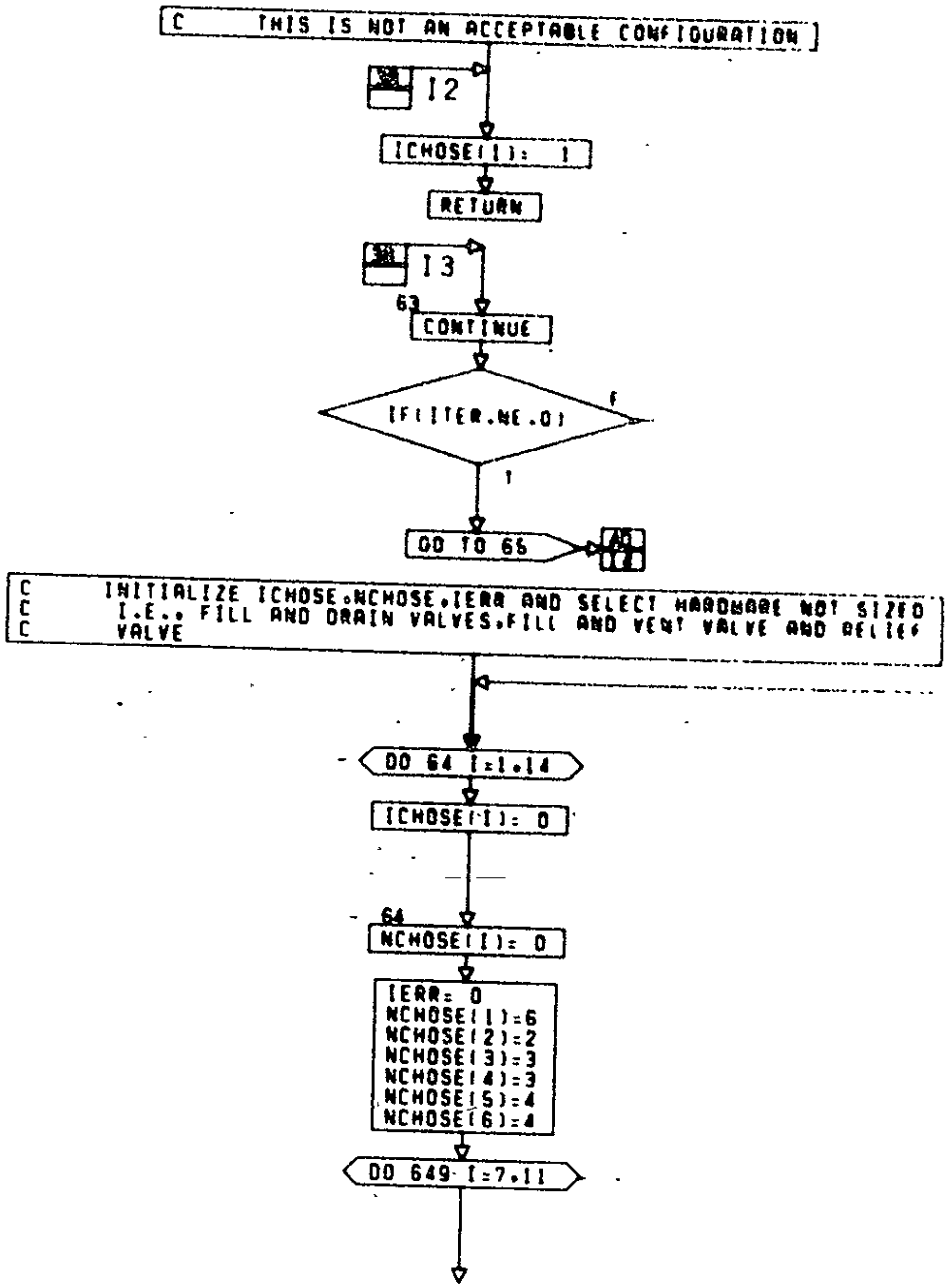
c-7


36
H3
IF(J8.LT.J8E)
F
T
GO TO 61
NO ACCEPTABLE HARDWARE
C
ICHOSE(L1)= -1
RETURN
36
H4
56
J3= J3 + 1
GO TO 54
31
36
H5
57
J3= IDB(8) + 1
J4= J4 + 1
GO TO 54
31
36
H6
58
J3= IDB(8) + 1
J4= IDB(9) + 1
J5= J5 + 1
GO TO 54
31
36
H7
59
J3= IDB(8) + 1

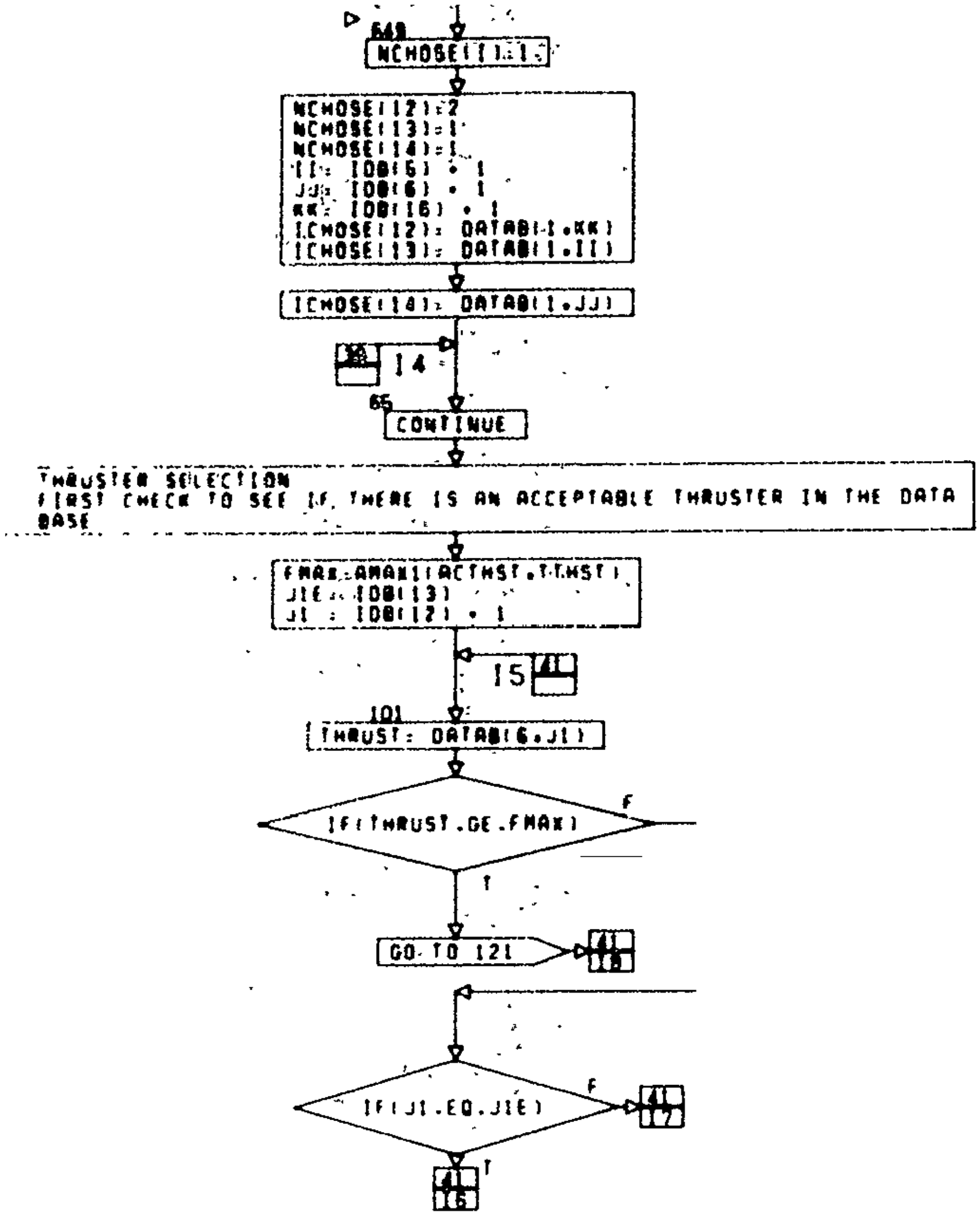
CONT. ON PG 38


J4: IDB(9) + 1
J5: IDB(3) + 1
J6: J6 + 1
GO TO 64
H8
60
J3: IDB(8) + 1
J4: IDB(9) + 1
J5: IDB(3) + 1
J6: IDB(1) + 1
J7: J7 + 1
GO TO 64
H9
61
J3: IDB(8) + 1
J4: IDB(9) + 1
J5: IDB(3) + 1
J6: IDB(1) + 1
J7: IDB(10) + 1
VFTMAX:0.
J8: J8 + 1
GO TO 64
I1
62
CONTINUE
C THIS IS BIPROPELLANT CONFIGURATION
IF(TOTIMP.GE.50000.)
F
T
GO TO 63

CONT. ON PG 39

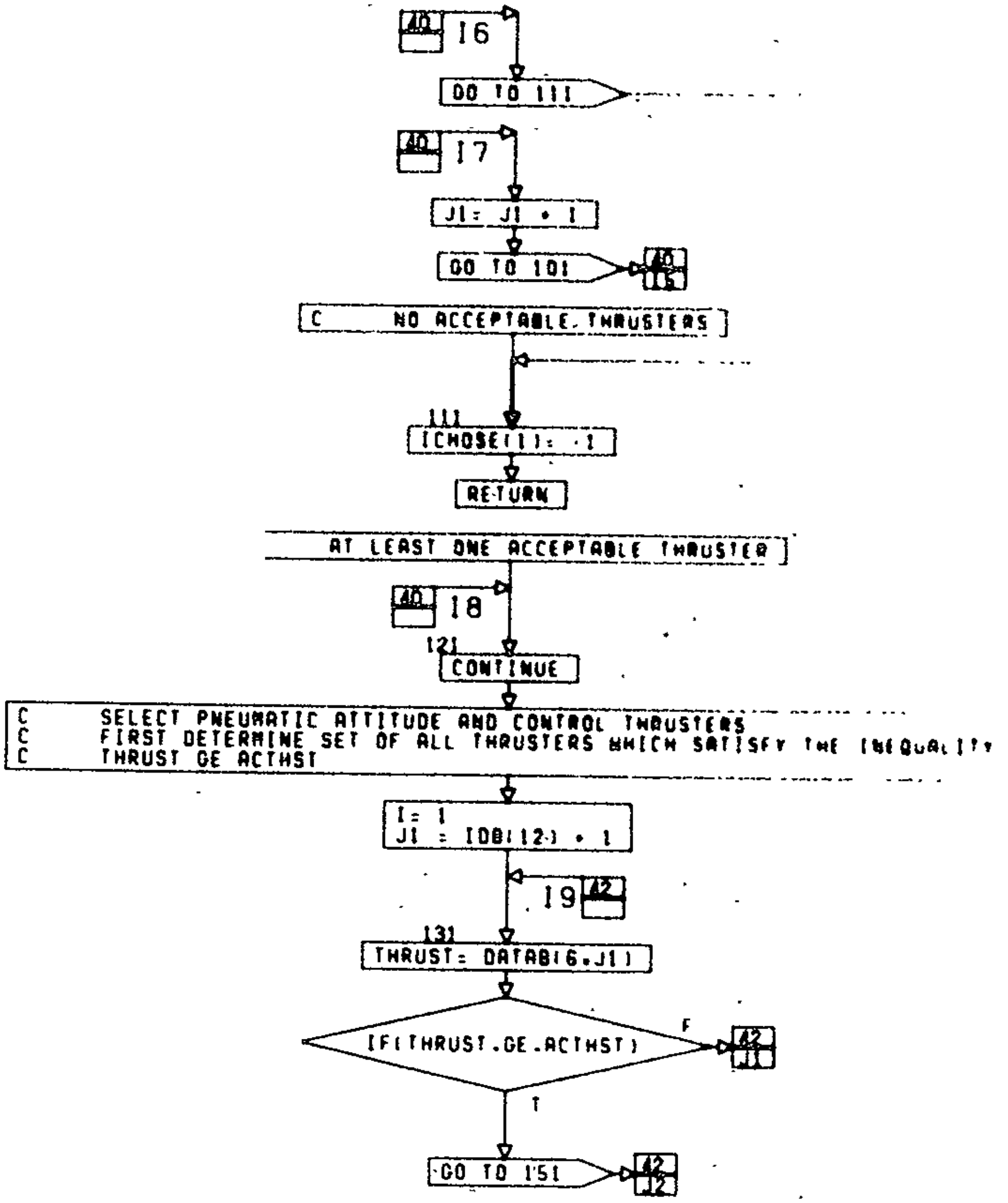

C THIS IS NOT AN ACCEPTABLE CONFIGURATION
I2
ICHOSE(1)= 1
RETURN
I3
63
CONTINUE
IF(ITER.NE.0)
F
T
GO TO 66
C INITIALIZE ICHOSE,NCHOSE,IERR AND SELECT HARDWARE NOT SIZED
C I.E., FILL AND DRAIN VALVES,FILL AND VENT VALVE AND RELIEF
C VALVE
DO 64 I=1,14
ICHOSE(I)= 0
64
NCHOSE(I)= 0
IERR= 0
NCHOSE(1)=6
NCHOSE(2)=2
NCHOSE(3)=3
NCHOSE(4)=3
NCHOSE(5)=4
NCHOSE(6)=4
DO 649 I=7,11

CONT. ON PG 40

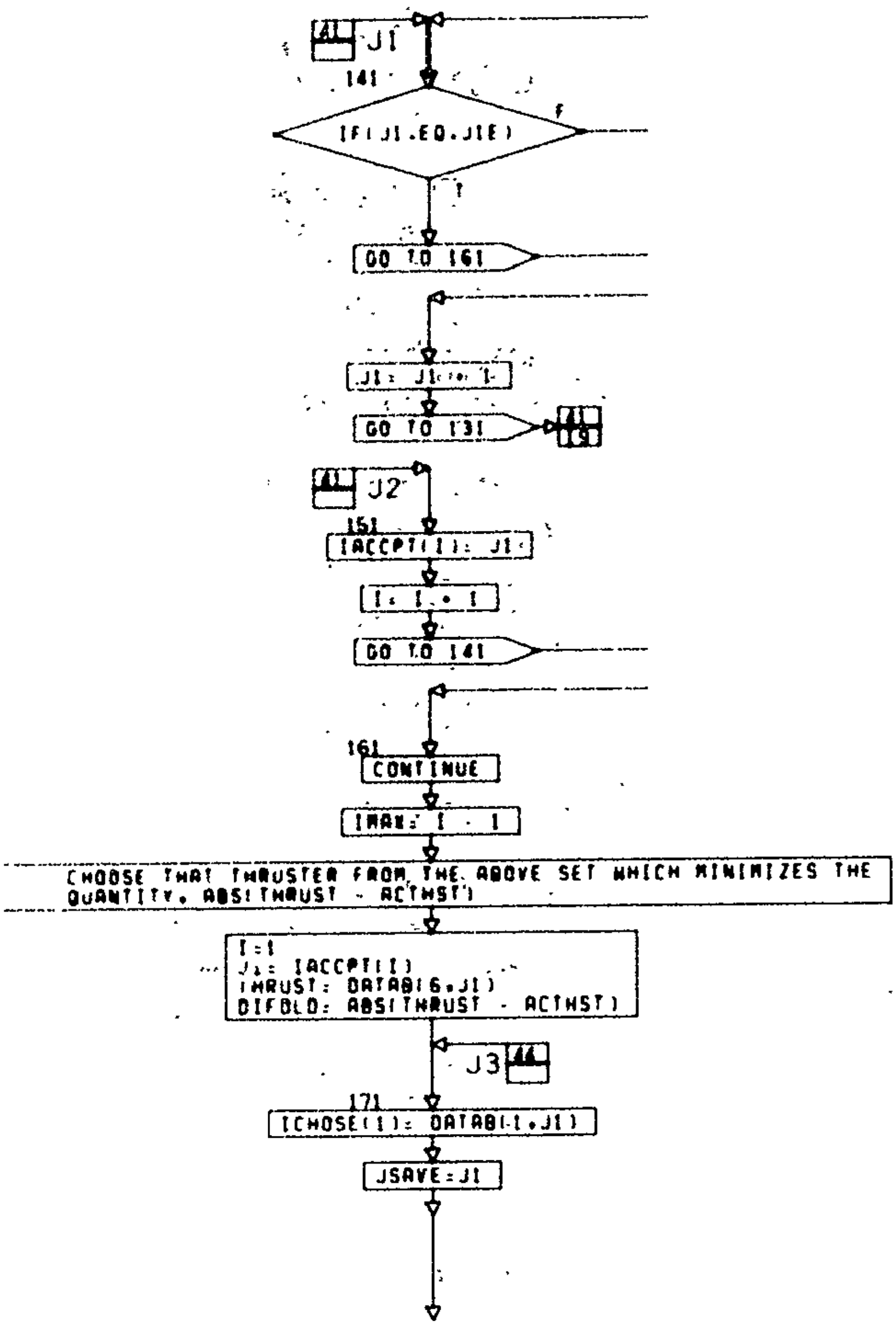


648
NCHOSE(11)=1
NCHOSE(12)=2
NCHOSE(13)=1
NCHOSE(14)=1
II= IDB(5) + 1
JJ= IDB(6) + 1
KK= IDB(6) + 1
ICHOSE(12)= DATAB(1,KK)
ICHOSE(13)= DATAB(1,II)
ICHOSE(14)= DATAB(1,JJ)
14
65
CONTINUE
THRUSTER SELECTION
FIRST CHECK TO SEE IF THERE IS AN ACCEPTABLE THRUSTER IN THE DATA BASE
FMAX=AMAX1(ACTHST,TTHST)
JIE= IDB(13)
J1 = IDB(12) + 1
15
41
101
THRUST= DATAB(6,J1)
IF(THRUST.GE.FMAX)
F
T
GO TO 121
41
18
IF(J1.EQ.JIE)
F
41
17
T
41
16

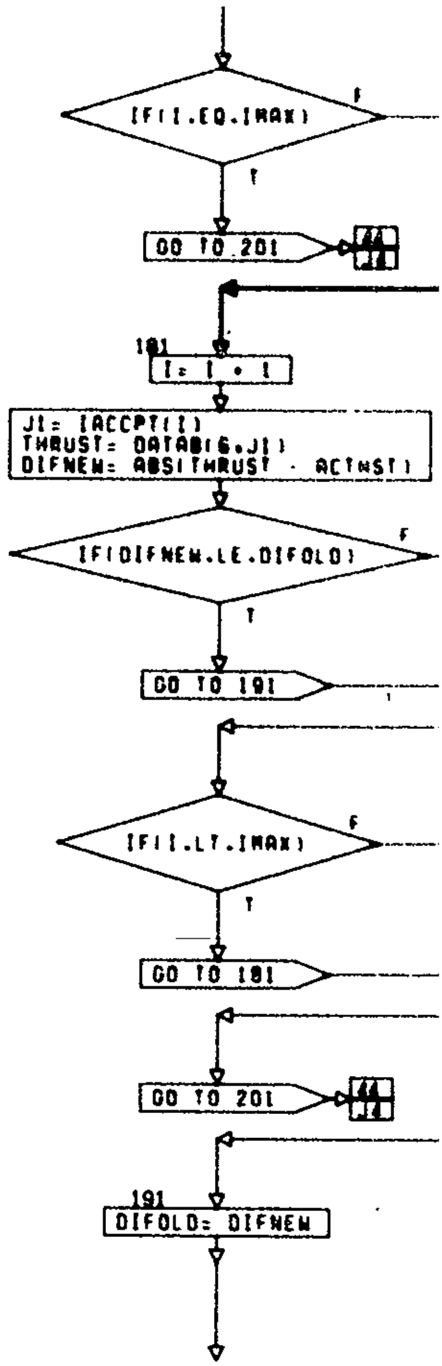
CONT. ON PG 41


40
16
DO TO 111
40
17
J1= J1 + 1
GO TO 101
40
15
C NO ACCEPTABLE THRUSTERS
111
ICHOSE(1)= -1
RETURN
AT LEAST ONE ACCEPTABLE THRUSTER
40
18
121
CONTINUE
C SELECT PNEUMATIC ATTITUDE AND CONTROL THRUSTERS
C FIRST DETERMINE SET OF ALL THRUSTERS WHICH SATISFY THE INEQUALITY
C THRUST GE ACTHST
I= 1
J1 = IDB(12) + 1
19
42
131
THRUST= DATAB(6,J1)
IF(THRUST.GE.ACTHST)
F
42
J1
T
GO TO 151
42
J2

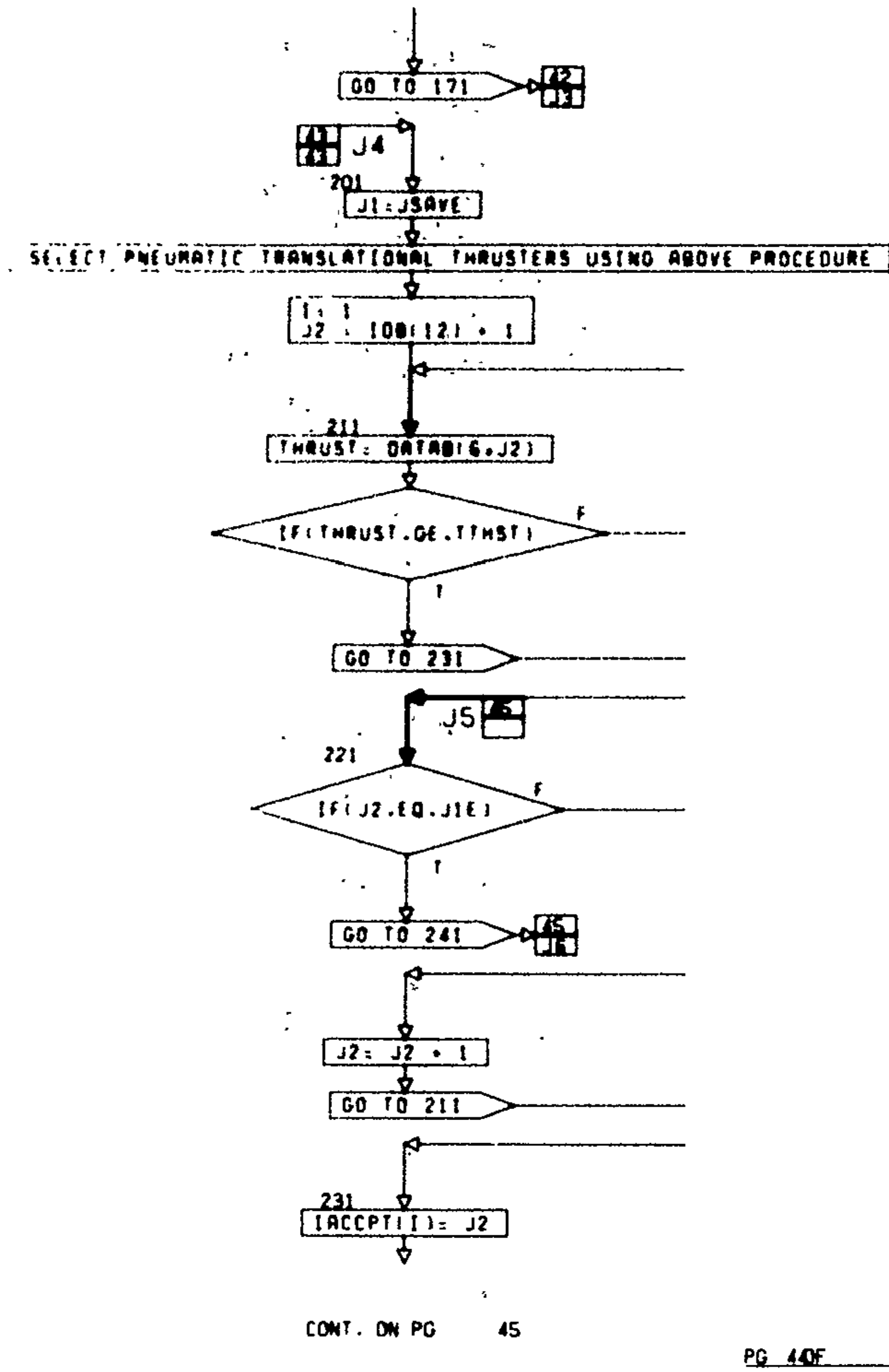
CONT. ON PG 42


41
J1
141
IF(J1.EQ.JIE)
F
T
GO TO 161
J1= J1 + 1
GO TO 131
41
19
41
J2
151
IACCPT(I)= J1
I= I + 1
GO TO 141
161
CONTINUE
IMAX= I - 1
CHOOSE THAT THRUSTER FROM THE ABOVE SET WHICH MINIMIZES THE
QUANTITY, ABS(THRUST - ACTHST)
I=1
J1= IACCPT(I)
THRUST= DATAB(6,J1)
DIFOLD= ABS(THRUST - ACTHST)
J3
44
171
ICHOSE(I)= DATAB(1,J1)
JSAVE=J1

CONT. ON PG 43

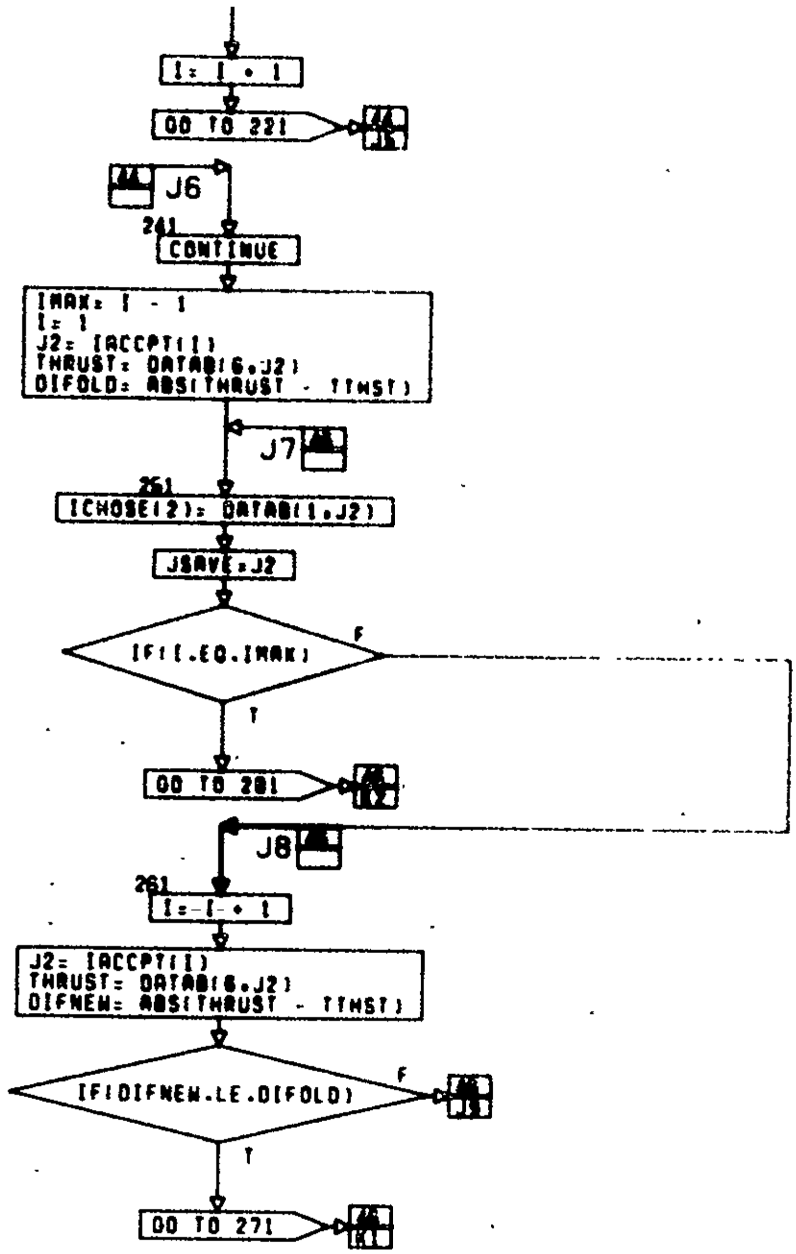

IF(I.EQ.IMAX)
F
T
GO TO 201
44
J4
191
I= I + 1
JI= IACCPT(I)
THRUST= DATAB(6,JI)
DIFNEW= ABS(THRUST - ACTHST)
IF(DIFNEW.LE.DIFOLD)
F
T
GO TO 191
IF(I.LT.IMAX)
F
T
GO TO 181
GO TO 201
44
J4
191
DIFOLD= DIFNEW

CONT. ON PG 44



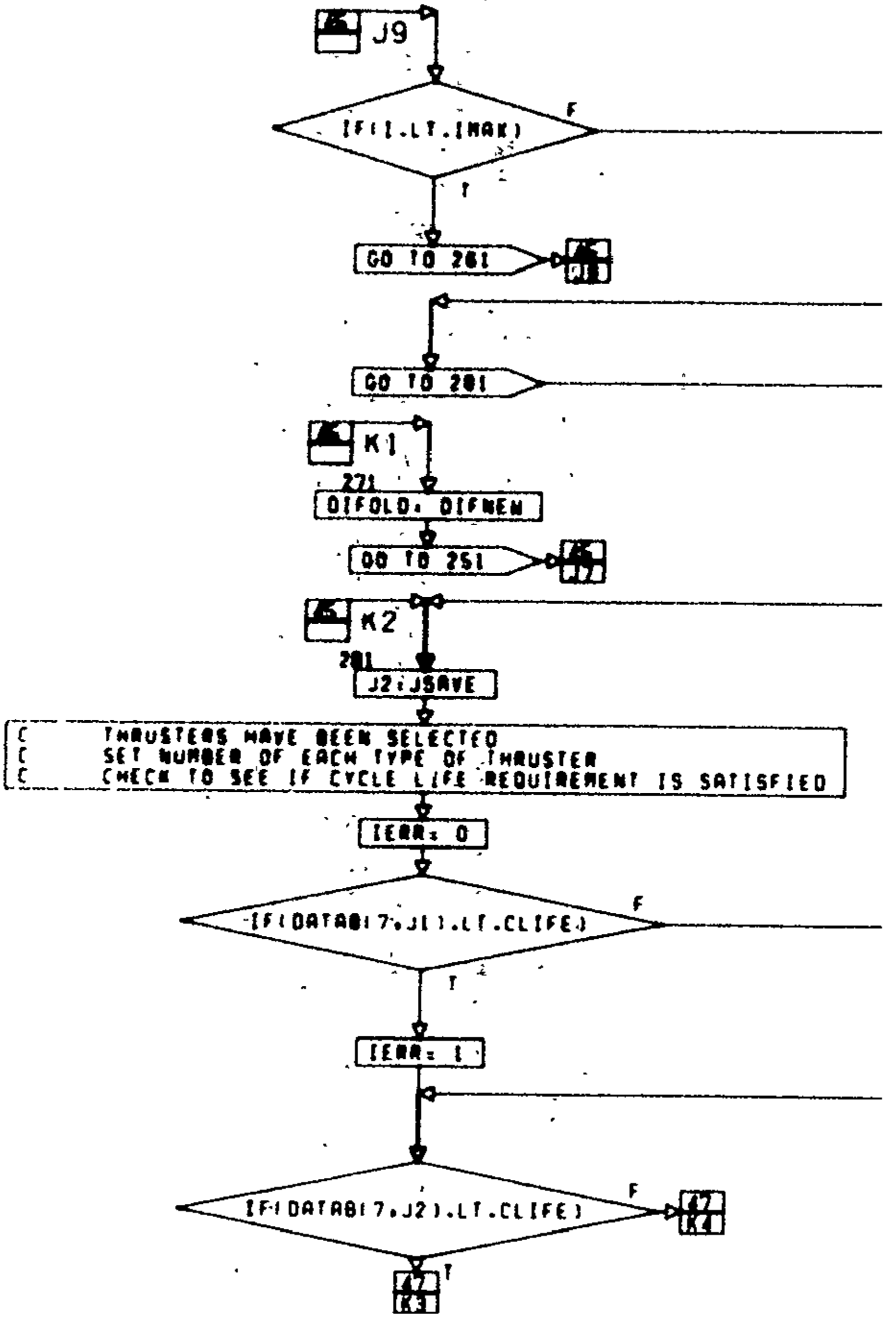
GO TO 171
J4
201
J1=JSAVE
SELECT PNEUMATIC TRANSLATIONAL THRUSTERS USING ABOVE PROCEDURE
I= 1
J2 = IDB(12) + 1
211
THRUST= DATAB(6,J2)
IF(THRUST.GE.TTHST)
F
T
GO TO 231
J5
221
IF(J2.EQ.J1E)
F
T
GO TO 241
J2= J2 + 1
GO TO 211
231
IACCPT(I)= J2

CONT. ON PG 45

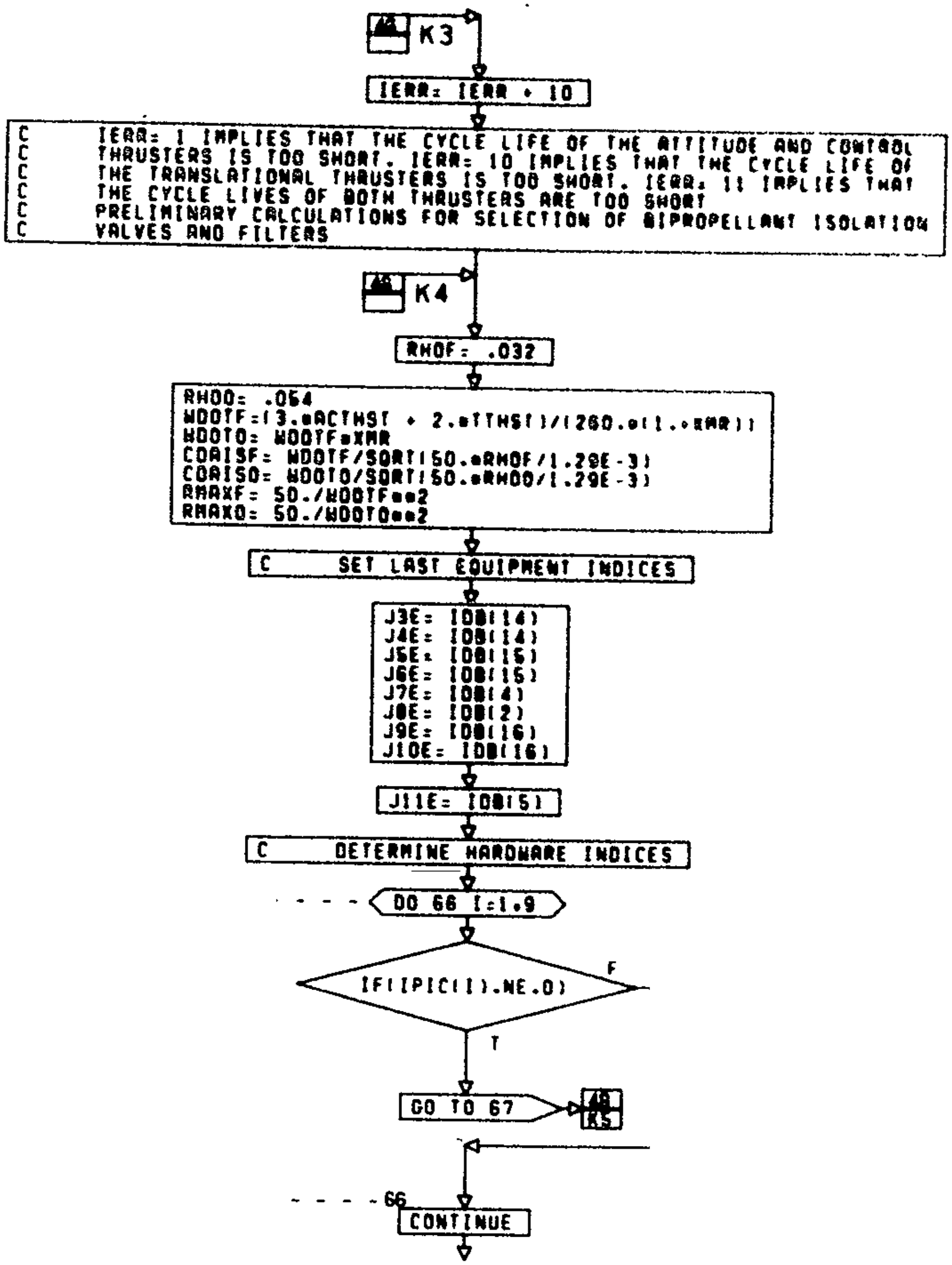


I= I + 1
GO TO 221
J6
241
CONTINUE
IMAX= I - 1
I= 1
J2= IACCPT(I)
THRUST= DATAB(6,J2)
DIFOLD= ABS(THRUST - TTHST)
J7
261
ICHOSE(2)= DATAB(1,J2)
JSAVE=J2
IF(I.EQ.IMAX)
F
T
GO TO 281
J8
261
I= I + 1
J2= IACCPT(I)
THRUST= DATAB(6,J2)
DIFNEW= ABS(THRUST - TTHST)
IF(DIFNEW.LE.DIFOLD)
F
T
GO TO 271

CONT. ON PG 46

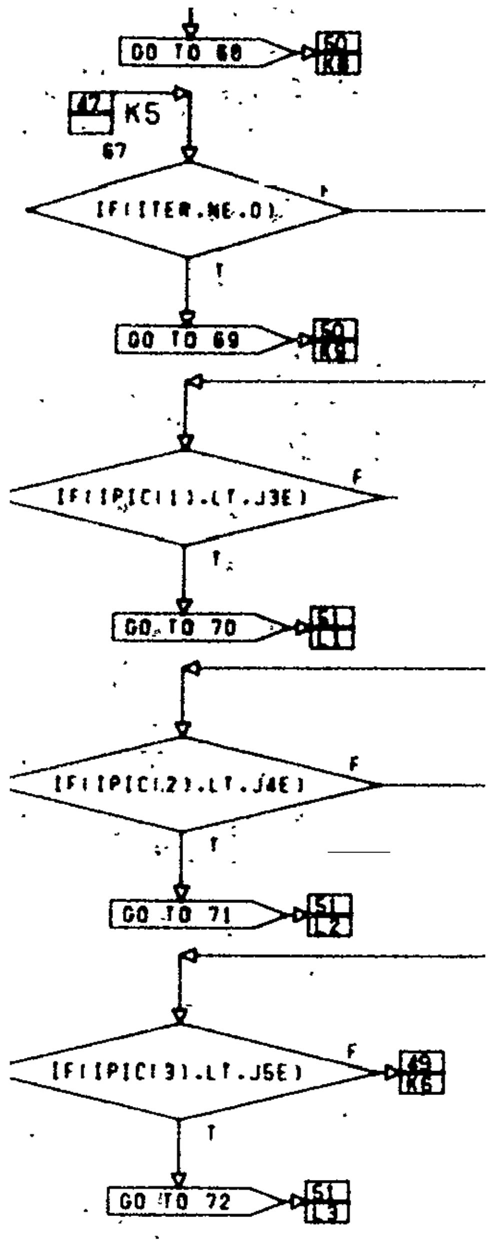

J9
IF(I.LT.IMAX)
F
T
GO TO 261
GO TO 281
K1
271
DIFOLD= DIFNEW
GO TO 251
K2
281
J2=JSAVE
C THRUSTERS HAVE BEEN SELECTED
C SET NUMBER OF EACH TYPE OF THRUSTER
C CHECK TO SEE IF CYCLE LIFE REQUIREMENT IS SATISFIED
IERR= 0
IF(DATAB(7,J1).LT.CLIFE)
IERR= 1
IF(DATAB(7,J2).LT.CLIFE)
47
K4
47
K3

CONT. ON PG 47

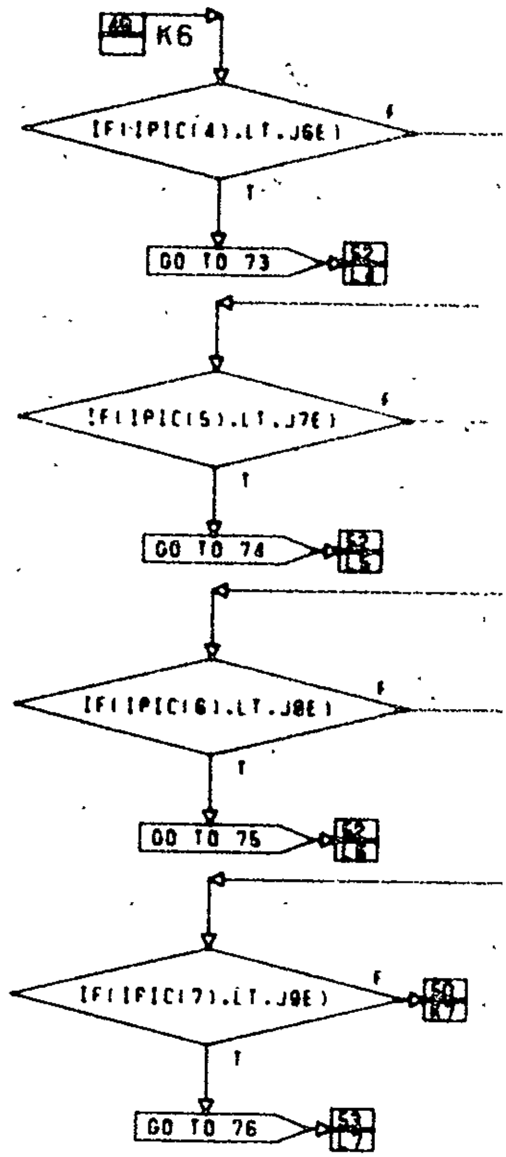


CONT. ON PG 48

ORIGINAL PAGE IS
OF POOR QUALITY

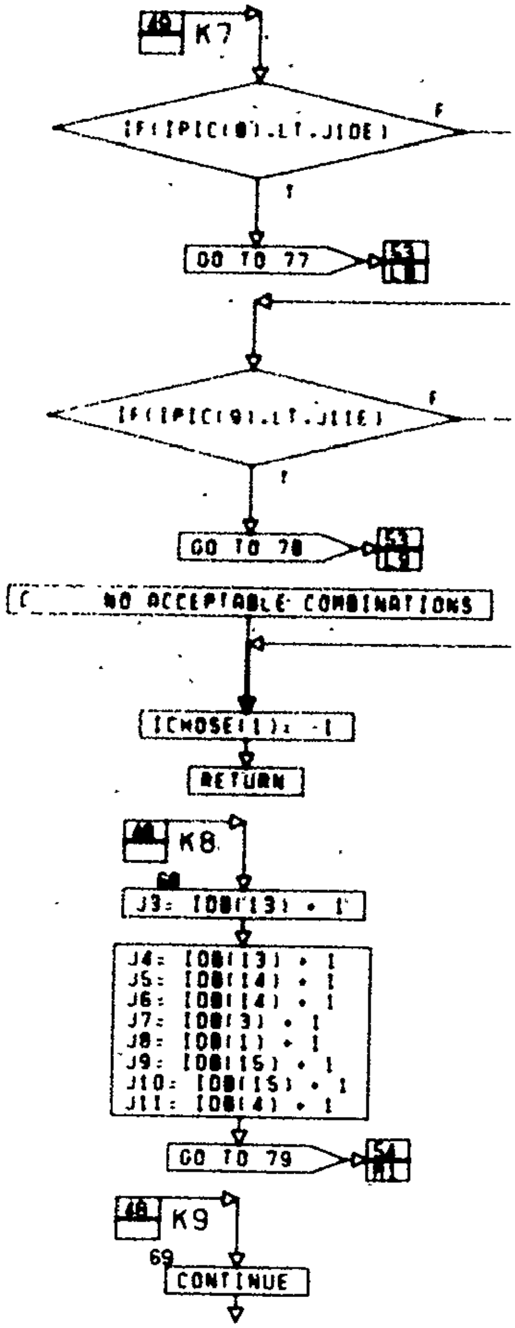

GO TO 68
50
K8
47
K5
67
IF(ITER.NE.0)
GO TO 69
50
IF(IPIC(1).LT.J3E)
GO TO 70
51
L1
IF(IPIC(2).LT.J4E)
GO TO 71
51
L2
IF(IPIC(3).LT.J5E)
49
K6
GO TO 72
51
L3

CONT. ON PG 49

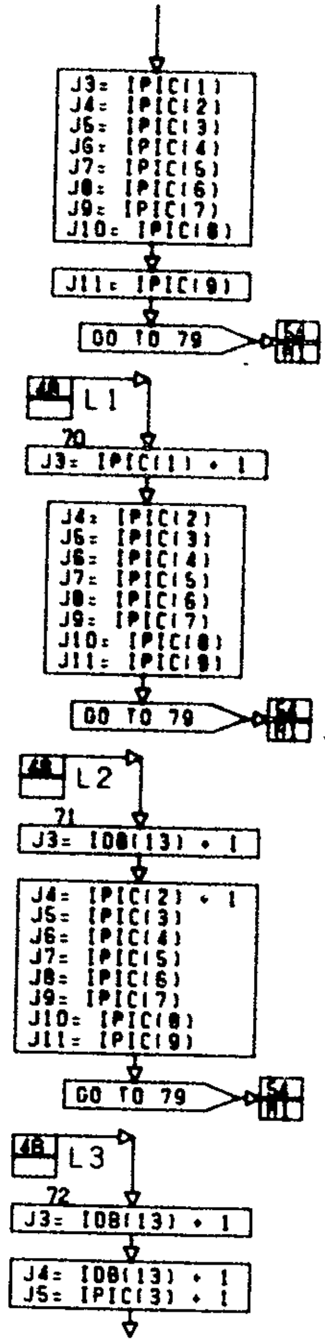


49
K6
IF(IPIC(4).LT.J6E)
F
T
GO TO 73
52
L4
IF(IPIC(5).LT.J7E)
F
T
GO TO 74
52
L5
IF(IPIC(6).LT.J8E)
F
T
GO TO 75
52
L6
IF(IPIC(7).LT.J9E)
F
50
K7
T
GO TO 76
53
L7

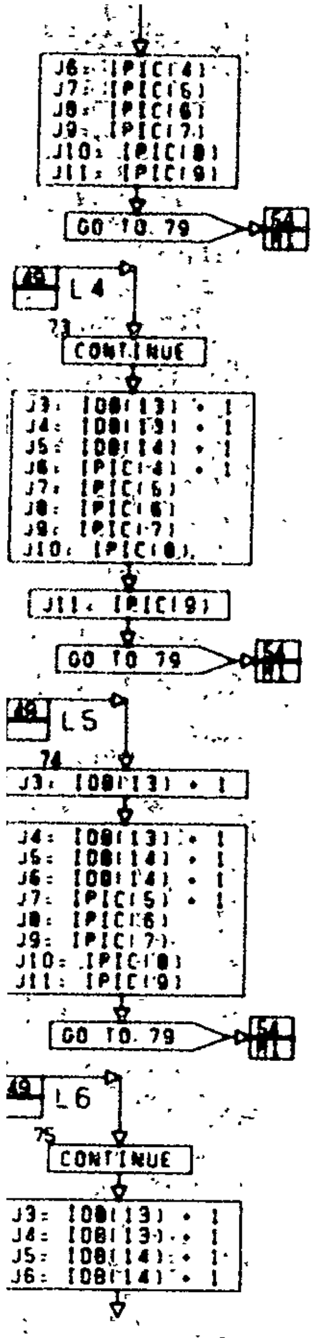
CONT. ON PG 50


K7
IF(IPIC(8).LT.JIDE)
F
T
GO TO 77
53
L8
IF(IPIC(9).LT.JIIE)
F
T
GO TO 78
53
L9
C NO ACCEPTABLE COMBINATIONS
ICHOSE(1)= -1
RETURN
K8
68
J3= IDB(13) + 1
J4= IDB(13) + 1
J5= IDB(14) + 1
J6= IDB(14) + 1
J7= IDB(3) + 1
J8= IDB(1) + 1
J9= IDB(5) + 1
J10= IDB(5) + 1
J11= IDB(4) + 1
GO TO 79
54
M1
K9
69
CONTINUE

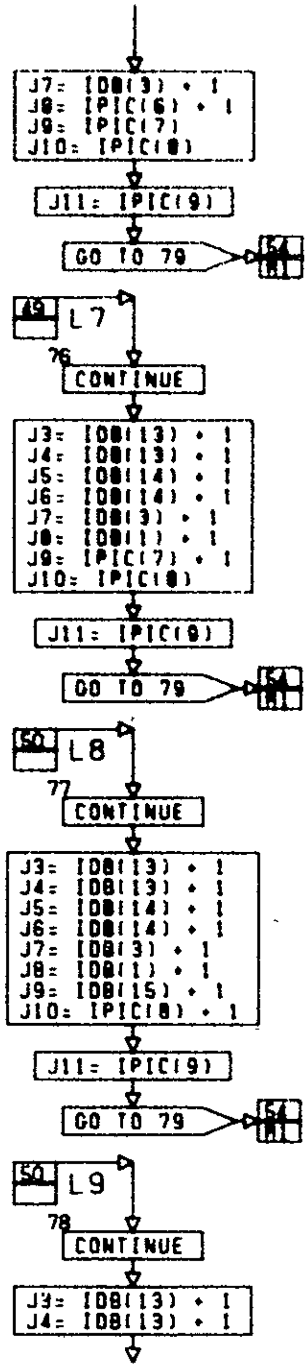
CONT. ON PG 51


J3= IPIC(1)
J4= IPIC(2)
J5= IPIC(3)
J6= IPIC(4)
J7= IPIC(5)
J8= IPIC(6)
J9= IPIC(7)
J10= IPIC(8)
J11= IPIC(9)
GO TO 79
L1
70
J3= IPIC(1) + 1
J4= IPIC(2)
J5= IPIC(3)
J6= IPIC(4)
J7= IPIC(5)
J8= IPIC(6)
J9= IPIC(7)
J10= IPIC(8)
J11= IPIC(9)
GO TO 79
L2
71
J3= IDB(13) + 1
J4= IPIC(2) + 1
J5= IPIC(3)
J6= IPIC(4)
J7= IPIC(5)
J8= IPIC(6)
J9= IPIC(7)
J10= IPIC(8)
J11= IPIC(9)
GO TO 79
L3
72
J3= IDB(13) + 1
J4= IDB(13) + 1
J5= IPIC(3) + 1

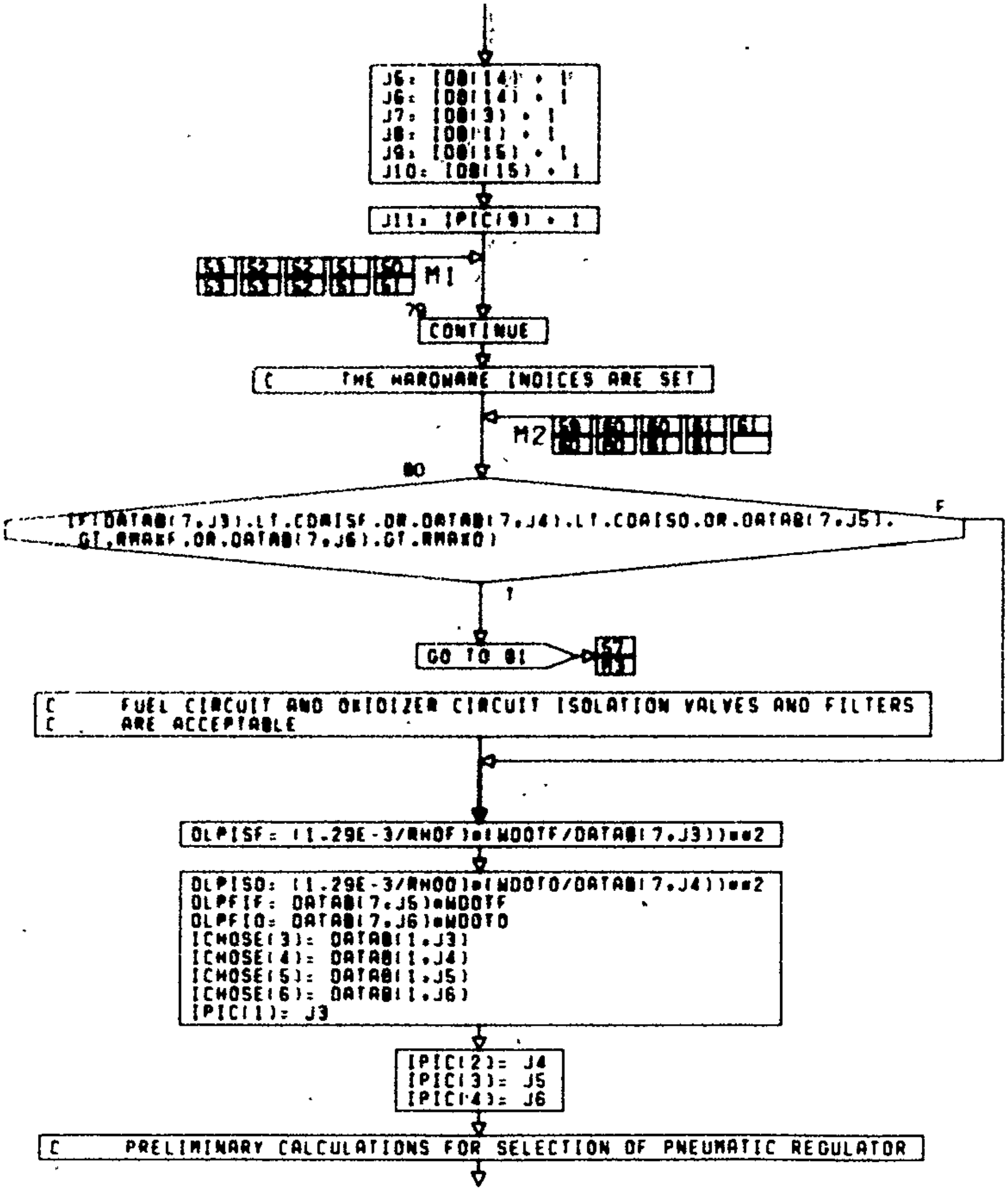
CONT. ON PG 52


J6= IPIC(4)
J7= IPIC(5)
J8= IPIC(6)
J9= IPIC(7)
J10= IPIC(8)
J11= IPIC(9)
GO TO 79
54
L4
73
CONTINUE
J3= IDB(13) + 1
J4= IDB(13) + 1
J5= IDB(14) + 1
J6= IPIC(4) + 1
J7= IPIC(5)
J8= IPIC(6)
J9= IPIC(7)
J10= IPIC(8)
J11= IPIC(9)
GO TO 79
54
L5
74
J3= IDB(13) + 1
J4= IDB(13) + 1
J5= IDB(14) + 1
J6= IDB(14) + 1
J7= IPIC(5) + 1
J8= IPIC(6)
J9= IPIC(7)
J10= IPIC(8)
J11= IPIC(9)
GO TO 79
54
49
L6
75
CONTINUE
J3= IDB(13) + 1
J4= IDB(13) + 1
J5= IDB(14) + 1
J6= IDB(14) + 1

CONT. ON PG 53


J7= IDB(3) + 1
J8= IPIC(6) + 1
J9= IPIC(7)
J10= IPIC(8)
J11= IPIC(9)
GO TO 79
54
49
L7
76
CONTINUE
J3= IDB(13) + 1
J4= IDB(13) + 1
J5= IDB(14) + 1
J6= IDB(14) + 1
J7= IDB(3) + 1
J8= IDB(1) + 1
J9= IPIC(7) + 1
J10= IPIC(8)
J11= IPIC(9)
GO TO 79
54
50
L8
77
CONTINUE
J3= IDB(13) + 1
J4= IDB(13) + 1
J5= IDB(14) + 1
J6= IDB(14) + 1
J7= IDB(3) + 1
J8= IDB(1) + 1
J9= IDB(15) + 1
J10= IPIC(8) + 1
J11= IPIC(9)
GO TO 79
54
50
L9
78
CONTINUE
J3= IDB(13) + 1
J4= IDB(13) + 1

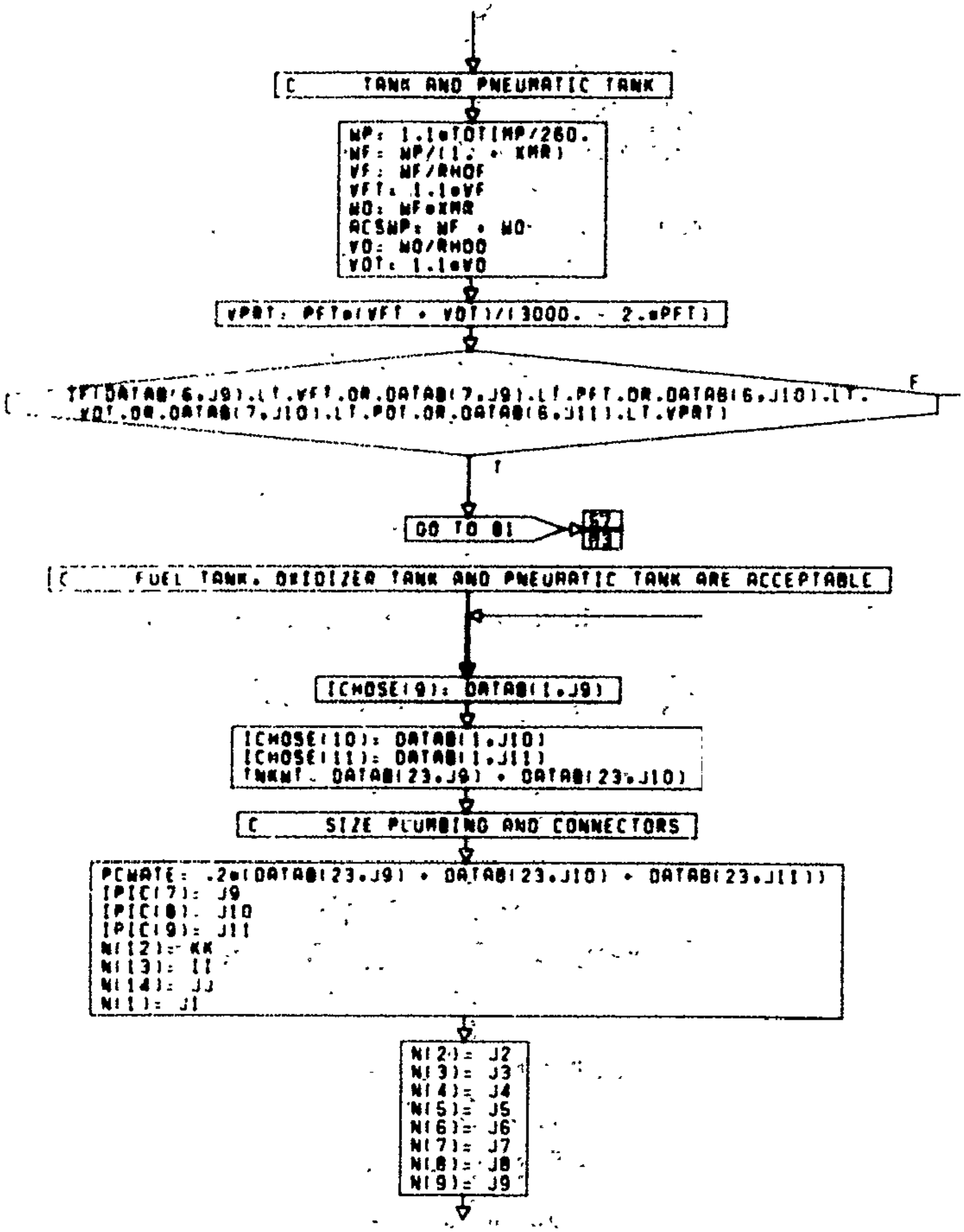
CONT. ON PG 54


J5= IDB(14) + 1
J6= IDB(14) + 1
J7= IDB(3) + 1
J8= IDB(1) + 1
J9= IDB(16) + 1
J10= IDB(15) + 1
J11= IPIC(9) + 1
M1
79
CONTINUE
C THE HARDWARE INDICES ARE SET
M2
80
IF(DATAB(7,J3).LT.CDAISF.OR.DATAB(7,J4).LT.CDAISO.OR.DATAB(7,J5).
GT.AMAXF.OR.DATAB(7,J6).GT.AMAXO)
F
T
GO TO 81
C FUEL CIRCUIT AND OXIDIZER CIRCUIT ISOLATION VALVES AND FILTERS
C ARE ACCEPTABLE
DLPISF= ((1.29E-3/RHOF)*(WDOTF/DATAB(7,J3))**2
DLPISO= ((1.29E-3/RHOO)*(WDOTO/DATAB(7,J4))**2
DLPFIF= DATAB(7,J5)*WDOTF
DLPFIO= DATAB(7,J6)*WDOTO
ICHOSE(3)= DATAB(1,J3)
ICHOSE(4)= DATAB(1,J4)
ICHOSE(5)= DATAB(1,J5)
ICHOSE(6)= DATAB(1,J6)
IPIC(1)= J3
IPIC(2)= J4
IPIC(3)= J5
IPIC(4)= J6
C PRELIMINARY CALCULATIONS FOR SELECTION OF PNEUMATIC REGULATOR

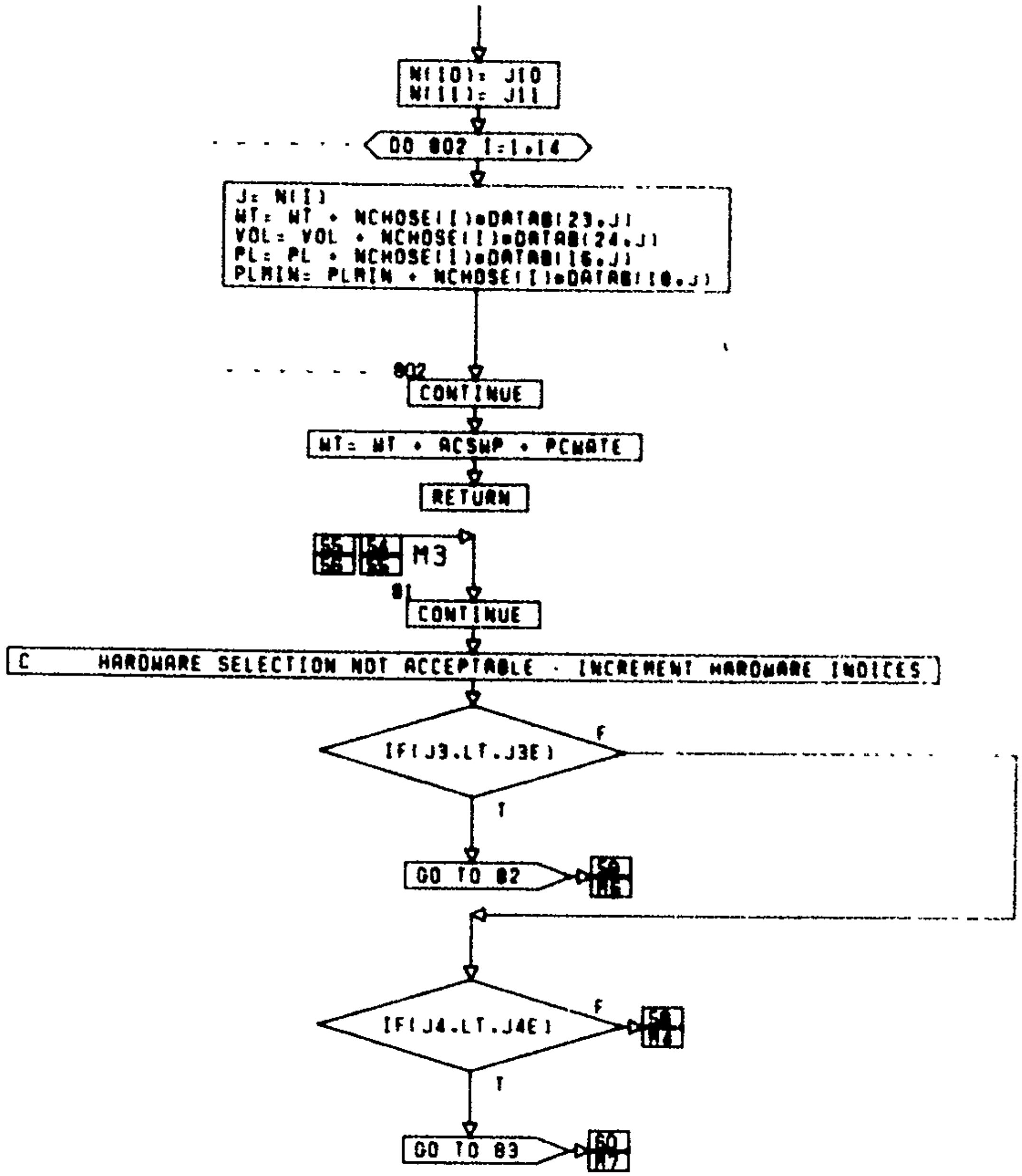
CONT. ON PG 55

```
PTI= DATAB(8,J1)
PFT= PTI + 2.*DLPISF + 2.*DLPFIF
POT= PTI + 2.*DLPISO + 2.*DLPFIO.
PREQ= AMAX1(PFT,POT)
WDOTPR= 1.05*1.02E-7*28.*PREQ*(WDOTF/RHOF + WDOTO/RHOO)
CDAREG= WDOTPR/SQRT(5600.*PREQ/1.27E4)

IF(PREQ.LT.DATAB(8,J7).OR.PREQ.GT.DATAB(9,J7).OR.DATAB(7,J7).LT.
 CDAREG)
        F
        T
GO TO 81        57
                H3

C      REGULATOR IS ACCEPTABLE

ICHOSE(7)= DATAB(1,J7)

IPIC(5)= J7

C      PRELIMINARY CALCULATIONS FOR SELECTION OF PNEUMATIC ISOLATION
C      VALVE

RHOPR= 1.02E-7*3000.
CDAISO= WDOTPR/SQRT(200.*RHOPR/1.29E-3)

IF(DATAB(7,J8).LT.CDAISO)
        F
        T
GO TO 81        57
                H3

C      PNEUMATIC ISOLATION VALVE IS ACCEPTABLE

ICHOSE(8)= DATAB(1,J8)

IPIC(6)= J8

C      PRELIMINARY CALCULATIONS FOR SELECTION OF FUEL TANK,OXIDIZER
```

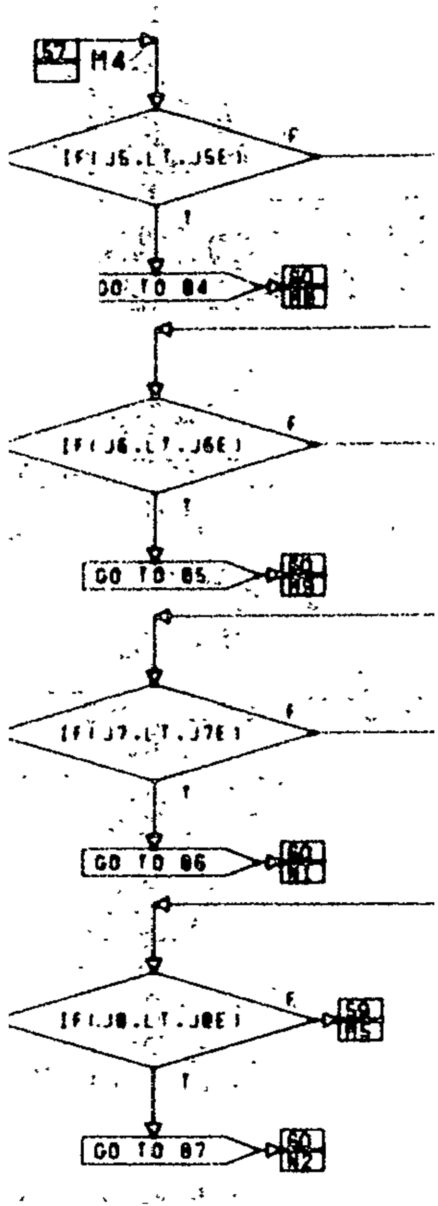
CONT. ON PG 56


C TANK AND PNEUMATIC TANK
WP: 1.1*TOTIMP/280.
WF: WP/(1. + XMR)
VF: WF/RHOF
VFT: 1.1*VF
WO: WF*XMR
ACSWP: WF + WO
VO: WO/RHOO
VOT: 1.1*VO
VPRT: PFT*(VFT + VOT)/(3000. - 2.*PFT)
IF(DATAB(6,J9).LT.VFT.OR.DATAB(7,J9).LT.PFT.OR.DATAB(6,J10).LT.
VOT.OR.DATAB(7,J10).LT.POT.OR.DATAB(6,J11).LT.VPRT)
F
T
GO TO 81
57
63
C FUEL TANK, OXIDIZER TANK AND PNEUMATIC TANK ARE ACCEPTABLE
ICHOSE(9): DATAB(1,J9)
ICHOSE(10): DATAB(1,J10)
ICHOSE(11): DATAB(1,J11)
TNKWT: DATAB(23,J9) + DATAB(23,J10)
C SIZE PLUMBING AND CONNECTORS
PCWATE: .2*(DATAB(23,J9) + DATAB(23,J10) + DATAB(23,J11))
IPIC(7): J9
IPIC(8): J10
IPIC(9): J11
N(12): KK
N(13): II
N(14): JJ
N(1): J1
N(2): J2
N(3): J3
N(4): J4
N(5): J5
N(6): J6
N(7): J7
N(8): J8
N(9): J9

CONT. ON PG 57

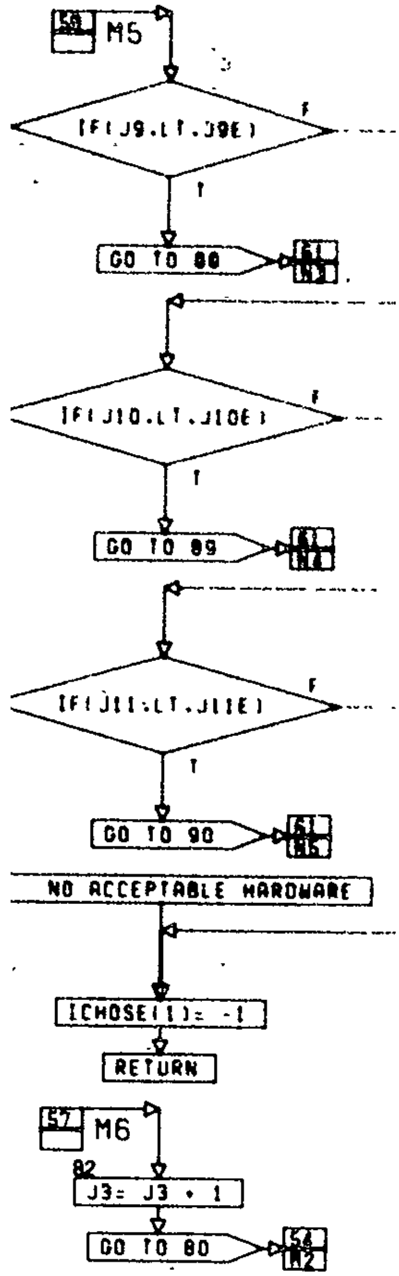

N(10)= J10
N(11)= J11
DO 802 I=1,14
J= N(I)
WT= WT + NCHOSE(I)*DATAB(23,J)
VOL= VOL + NCHOSE(I)*DATAB(24,J)
PL= PL + NCHOSE(I)*DATAB(16,J)
PLMIN= PLMIN + NCHOSE(I)*DATAB(18,J)
802
CONTINUE
WT= WT + ACSWP + PCWATE
RETURN
M3
81
CONTINUE
C HARDWARE SELECTION NOT ACCEPTABLE - INCREMENT HARDWARE INDICES
IF(J3.LT.J3E)
F
T
GO TO 82
IF(J4.LT.J4E)
F
T
GO TO 83

CONT. ON PG 58

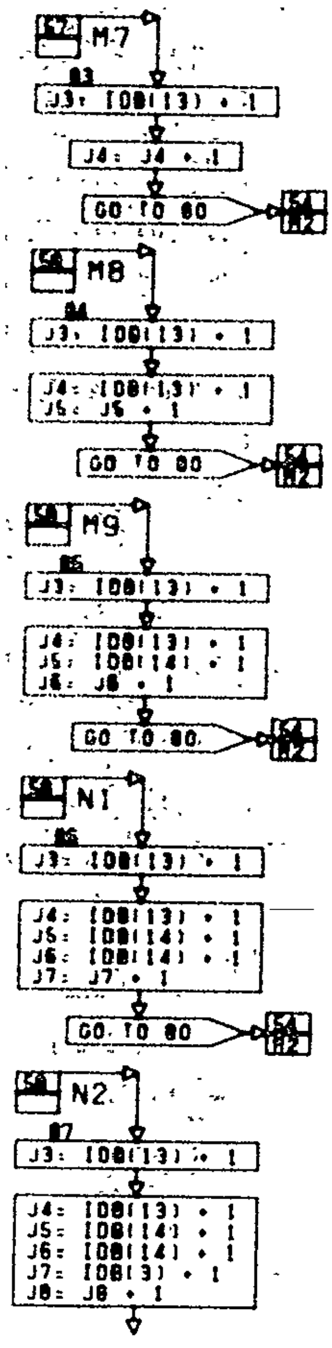


57
M4
IF(J5.LT.J5E)
F
T
GO TO 84
IF(J6.LT.J6E)
F
T
GO TO 85
IF(J7.LT.J7E)
F
T
GO TO 86
IF(J8.LT.J8E)
F
59
T
GO TO 87
60
N2

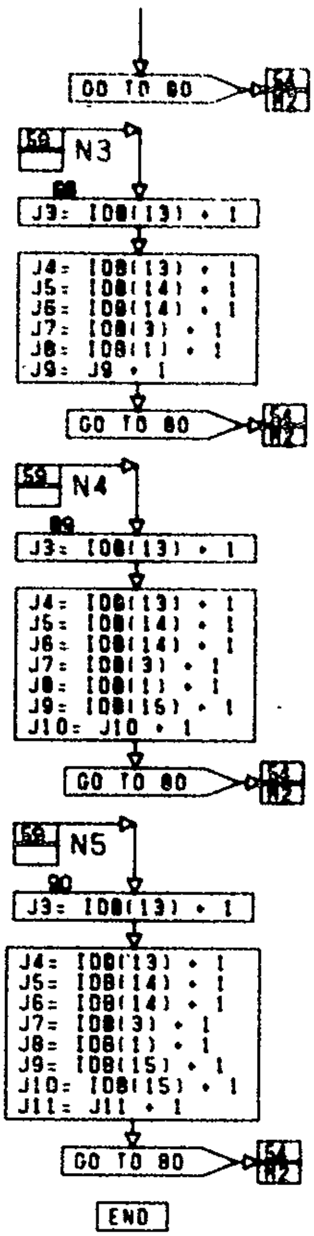
CONT. ON PG 59


56
M5
IF(J9.LT.J9E)
F
T
GO TO 88
61
N3
IF(J10.LT.J10E)
F
T
GO TO 89
61
N4
IF(J11.LT.J11E)
F
T
GO TO 90
61
N5
NO ACCEPTABLE HARDWARE
ICHOSE(1)= -1
RETURN
57
M6
82
J3= J3 + 1
GO TO 80
54
N2

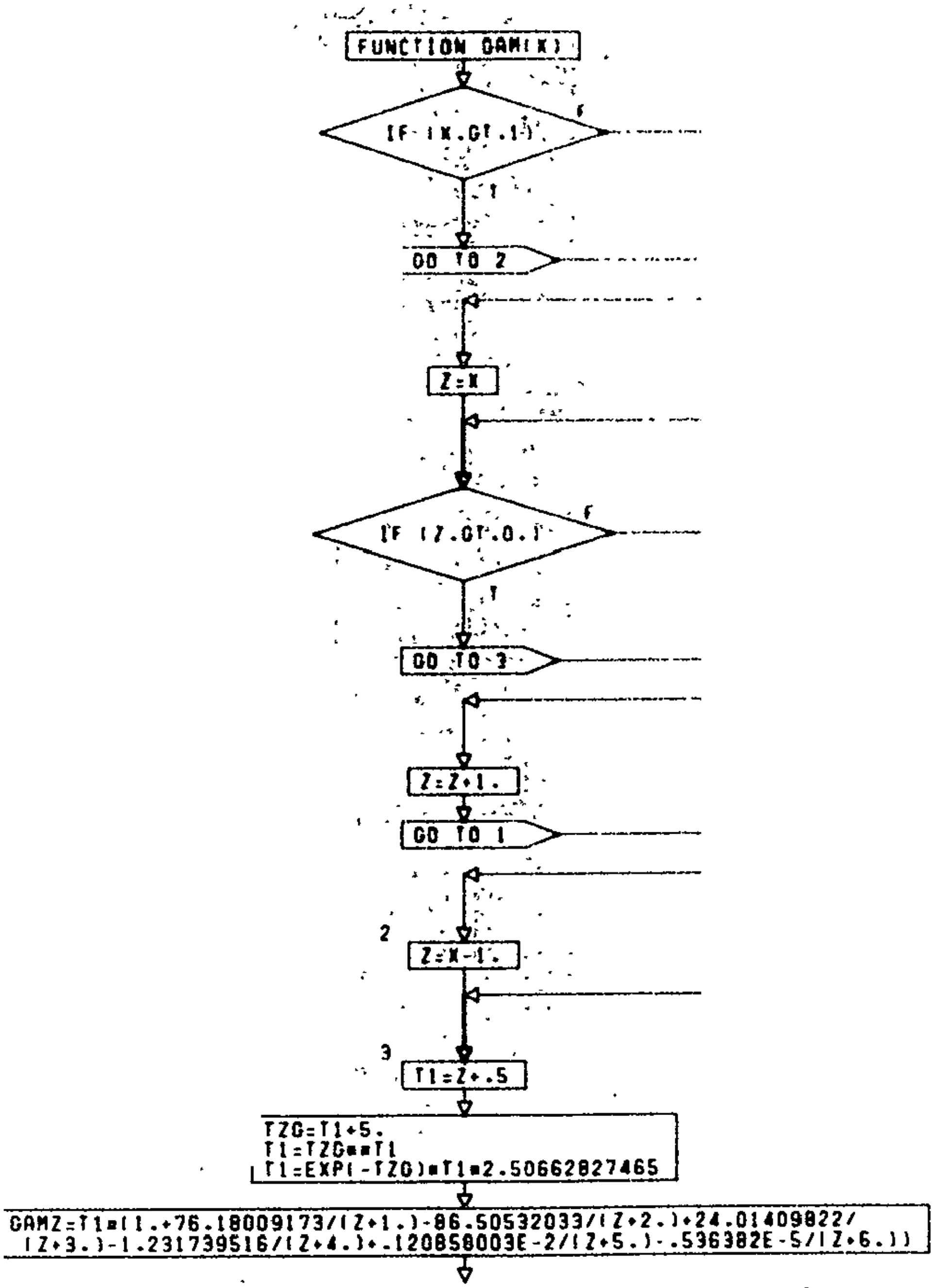
CONT. ON PG 60


M7
J3: IDB(13) + 1
J4: J4 + 1
GO TO 80
M8
J3: IDB(13) + 1
J4: IDB(13) + 1
J6: J6 + 1
GO TO 80
M9
J3: IDB(13) + 1
J4: IDB(13) + 1
J5: IDB(14) + 1
J6: J6 + 1
GO TO 80
N1
J3: IDB(13) + 1
J4: IDB(13) + 1
J5: IDB(14) + 1
J6: IDB(14) + 1
J7: J7 + 1
GO TO 80
N2
J3: IDB(13) + 1
J4: IDB(13) + 1
J5: IDB(14) + 1
J6: IDB(14) + 1
J7: IDB(3) + 1
J8: J8 + 1

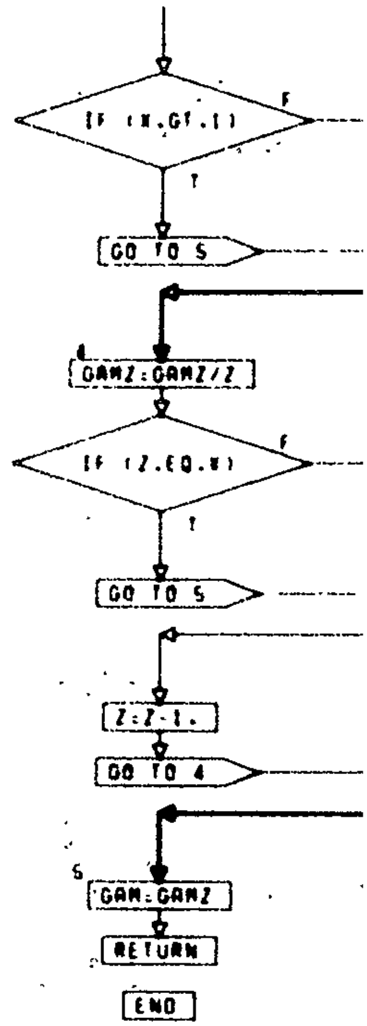
CONT. ON PG 61


GO TO 80
N3
J3= IDB(13) + 1
J4= IDB(13) + 1
J5= IDB(14) + 1
J6= IDB(14) + 1
J7= IDB(3) + 1
J8= IDB(1) + 1
J9= J9 + 1
GO TO 80
N4
J3= IDB(13) + 1
J4= IDB(13) + 1
J5= IDB(14) + 1
J6= IDB(14) + 1
J7= IDB(3) + 1
J8= IDB(1) + 1
J9= IDB(15) + 1
J10= J10 + 1
GO TO 80
N5
90
J3= IDB(13) + 1
J4= IDB(13) + 1
J5= IDB(14) + 1
J6= IDB(14) + 1
J7= IDB(3) + 1
J8= IDB(1) + 1
J9= IDB(15) + 1
J10= IDB(15) + 1
J11= J11 + 1
GO TO 80
END

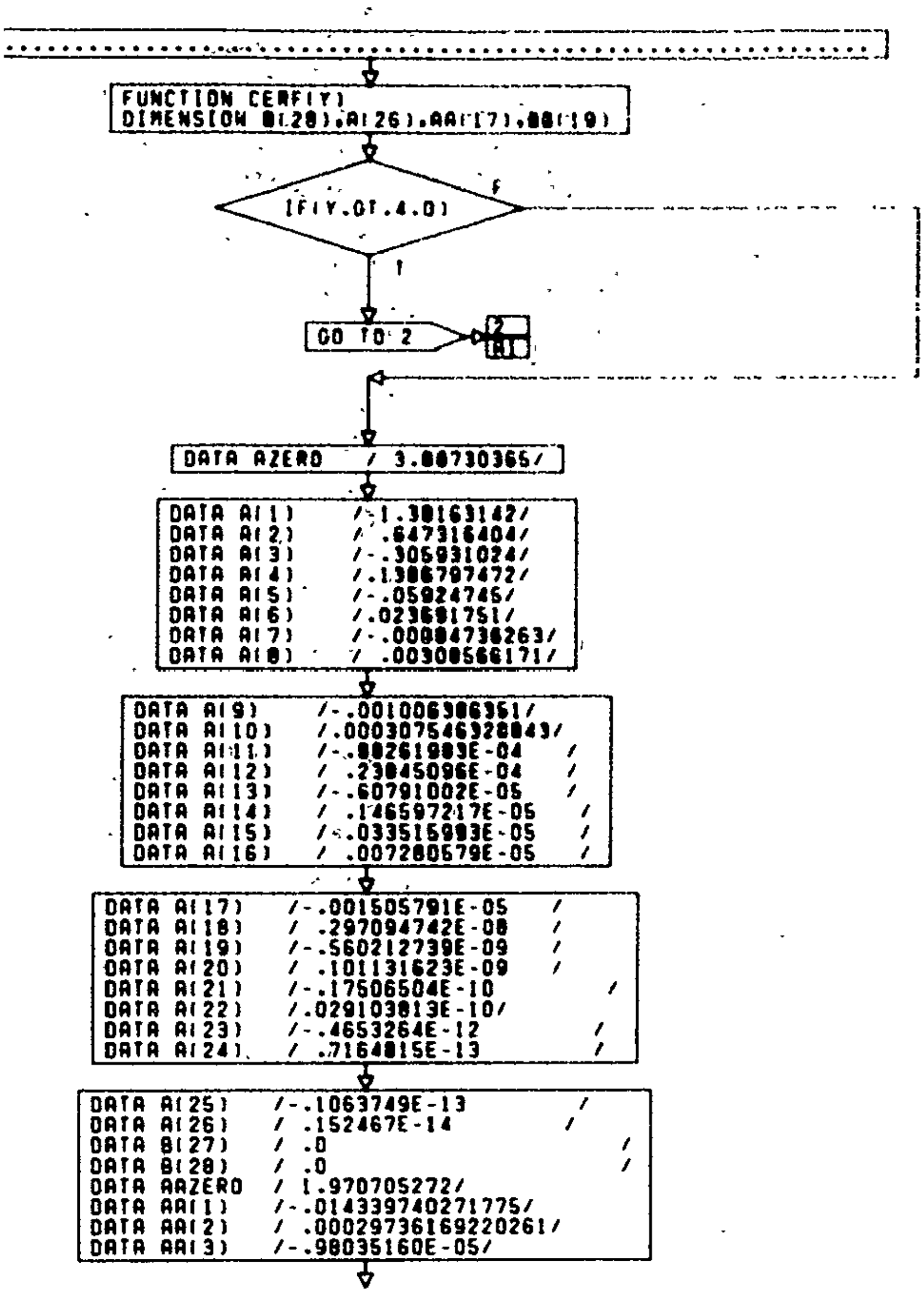
PG 61 FINAL


FUNCTION GAM(X)
IF (X.GT.1)
F
T
GO TO 2
Z=X
IF (Z.GT.0.)
F
T
GO TO 3
Z=Z+1.
GO TO 1
2
Z=X-1.
3
T1=Z+.5
TZG=T1+5.
T1=TZG**T1
T1=EXP(-TZG)*T1*2.50662827465
GAMZ=T1*(1.+76.18009173/(Z+1.)-86.50532033/(Z+2.)+24.01409822/
(Z+3.)-1.231739516/(Z+4.)+.120858003E-2/(Z+5.)-.536382E-5/(Z+6.))

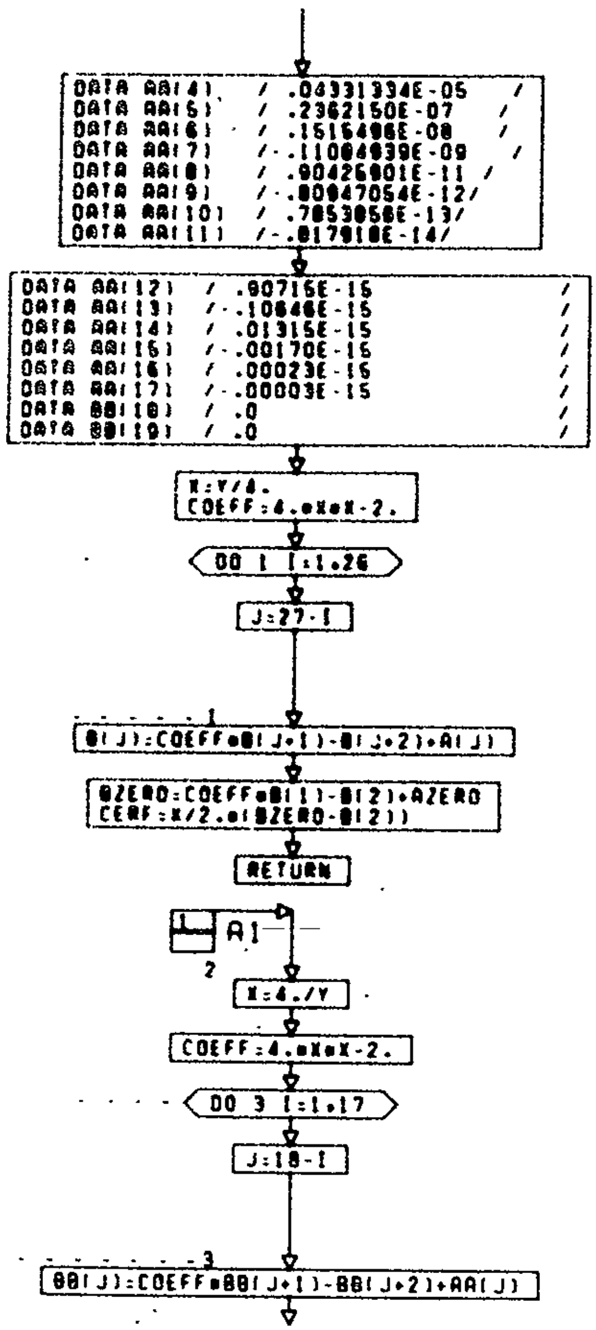
CONT. ON PG 2


IF (X.GT.1)
F
T
GO TO 5
4
GAMZ=GAMZ/Z
IF (Z.EQ.X)
F
T
GO TO 5
Z=Z-1.
GO TO 4
5
GAM=GAMZ
RETURN
END

PG 2 FINAL


FUNCTION CERF(Y)
DIMENSION B(28),A(26),AA(17),BB(19)
IF(Y.GT.4.0)
F
T
GO TO 2
2
B1
DATA AZERO / 3.00730365/
DATA A(1) /-1.30163142/
DATA A(2) / .647316404/
DATA A(3) /-.306931024/
DATA A(4) /.1306797472/
DATA A(5) /-.05924746/
DATA A(6) /.02369175l/
DATA A(7) /-.00084730263/
DATA A(8) / .00300566171/
DATA A(9) /-.001006306351/
DATA A(10) /.0003075463280043/
DATA A(11) /-.80261983E-04 /
DATA A(12) / .23045096E-04 /
DATA A(13) /-.60791002E-05 /
DATA A(14) / .146597217E-05 /
DATA A(15) /-.033515993E-05 /
DATA A(16) / .007280579E-05 /
DATA A(17) /-.001505791E-05 /
DATA A(18) / .297094742E-08 /
DATA A(19) /-.560212739E-09 /
DATA A(20) / .101131623E-09 /
DATA A(21) /-.17506504E-10 /
DATA A(22) /.029103813E-10/
DATA A(23) /-.4653264E-12 /
DATA A(24) / .7164815E-13 /
DATA A(25) /-.1063749E-13 /
DATA A(26) / .152467E-14 /
DATA B(27) / .0 /
DATA B(28) / .0 /
DATA AAZERO / 1.970705272/
DATA AA(1) /-.014339740271775/
DATA AA(2) / .00029736169220261/
DATA AA(3) /-.98035160E-05/

CONT. ON PG 2



DATA AA(4) / .04331334E-05 /
DATA AA(5) / .2362150E-07 /
DATA AA(6) / .1516496E-08 /
DATA AA(7) /-.11004939E-09 /
DATA AA(8) / .904269O1E-11 /
DATA AA(9) /-.00947054E-12/
DATA AA(10) / .7853056E-13/
DATA AA(11) /-.817918E-14/
DATA AA(12) / .80716E-15 /
DATA AA(13) /-.10846E-15 /
DATA AA(14) / .01315E-15 /
DATA AA(15) /-.00170E-15 /
DATA AA(16) / .00023E-15 /
DATA AA(17) /-.00003E-15 /
DATA BB(18) / .0 /
DATA BB(19) / .0 /
X:Y/8.
COEFF:4.*X*X-2.
DO 1 I:1,26
J:27-I
1
B(J):COEFF*B(J+1)-B(J+2)+A(J)
BZERO:COEFF*B(1)-B(2)+AZERO
CERF:X/2.*(BZERO-B(2))
RETURN
A1
2
X:4./Y
COEFF:4.*X*X-2.
DO 3 I:1,17
J:18-I
3
BB(J):COEFF*BB(J+1)-BB(J+2)+AA(J)

CONT. ON PG 3

```
BBZERO=COEFF*BB(1)-BB(2)+AAZERO
CERF=(BBZERO-BB(2))/(2.*Y*EXP(Y*Y))*.564189583547756
```

```
RETURN
```

```
END
```

PG 3 FINAL

```
C        ..................................................................

SUBROUTINE RELY (IRTN.IDS.NEQUIP)

COMMON /BTWN/WT.VOL.DT.P.DX.DY.DZ.XJ.YJ.ZJ.RJ.FF.TI.PL.PLMIN.
 D.AREA.SATLD.WATE.NC.ACSWP.HARNWT.THCMWT.CONVWT.TNKWT.PASSTR.
 SATTWT.TPRIM.IBTLOC.RADA.RADAB.RAT.HTRPWR.HTRPRB.
 HPT.HTPIPE.VCHP.HTPT.FC.NZERO.COMRT.ACSSN.BITRAT(2).
 EQBLG.SABOLG.SATWT

COMMON /USERR/KEOPT.SYSLB.RFIXED.SLBMX.ISPT.SPEC(6).CONS.ISUB
COMMON /USERI/EQM1WT.EQM2WT.DIAMAX.ALT

COMMON /CHOSE/ICHOSE(60).NCHOSE(60).COSTM(5.60).DATAB(6.60).
 THM(4.60).DPIA(11.60).SKD(7.60)

COMMON /PATCOM/ACCRCY.CISTAR.IREL.MMOOLD.TRUNC.ITRUNP.DE.TE.
 TOOLR.QCR.SEIR.PMR.PE.PU.TOOLU.QCP.SEIP.PMP.SATA.SATINV.MER.
 MEINV.PAYR.PAUINV.PAYOUL.GSE.XLTOT.CTOT.FEER.FEEINV.DDTE.KVEST.
 OPS.SKTAU(6).ROLD(60).TSRTT.AN.TS.DS.AM.TF.BF.TC.TA.TB.TOTOPS

COMMON /USER5/IVOLT.TBI
DIMENSION N(5).NEQUIP(5)

COMMON /DBCOM/R(31).NR(60).RI(31.60).Z(31).RO(31).ROUM(31).SAVR(31
 ).SAVRNW(31).RNEW(31).NMX(60).SAVMX(60).COST(60).DUM(2563)

REAL MMOOLD.MMONEW.LAMS.NZERO
INTEGER SAVMX.SAVNSR

C
C        ...................................................................
C                                        INITIAL
C        VARIABLES        SIZE           ORIGIN-       DEFN
C                                        CHANGE
C          NSMX             1            EXT-NC        MAX NUM SYSTEM REDUNDANCIES
C          NSR              1            EXT- C        CURRENT NUM OF SYSTEM
C                                                      REDUNDANCIES
C          IRTN             1            EXT-NC        RETURN INDICATOR

C          JMIN             1            EXT-NC        LOWER LIMIT ON MODULE NUM
C          JMAX             1            EXT-NC        UPPER LIMIT ON MODULE NUM
C          NR             N(NSS)         EXT- C        CURRENT NUM OF REDUNDANCIES IN
C                                                      MODULE J
C          NMX            N(NSS)         EXT-NC        MAX NUM REDUNDANCIES IN MODULE
C                                                      J
C                                                      =1           R(TRUNC) MODE
C          NT               1            EXT-NC        LOOP AND OPTION PARAMETER

C          DELH             1            EXT-NC        TIME INCREMENT
C         ITRUNC            1            EXT-NC        NUM OF  TIME  POINTS
C           R            ITRUNC           INT          RELIABILITY FNC FOR MODULE J
C                                                      =ITRUNC      MMD MODE
```

CONT. ON PG 2

```
C         ROLD        ITRUNC    EXT-C      PREVIOUS VALUE OF SYSTEM
C                                          RELIABILITY
C         RNEW        ITRUNC     INT       SYSTEM RELIABILITY WITH WITH A
C                                          REDUNDANCY ADDED
```

```
C          RI          ITRUNC    EXT-C      SYSTEM RELIABILITY MATRIX
C                      *N(NSS)
C         COST          N(NSS)   EXT-NC     VALUE OF EXPENSE OPTION FOR
C                                           MODULE J
C          RHO            1       INT       DECISION PARAMETER
C                                            ABS(*NEW - *OLD)/EXPENSE
C         RHOTH           1      EXT-NC     LOWER BOUND FOR RHO
C         OLDRHO          1       INT       PREVIOUS VALUE OF RHO
```

```
C         MMDOLD          1       INT      PREVIOUS MMD VALUE
C         MMDNEW          1       INT      MMD VALUE WITH A REDUNDANCY
C                                          ADDED
C         JSAVE           1       INT      MODULE WITH LARGEST VALUE OF
C                                          RHO
C         SAVRNW       ITRUNC     INT      SYSTEM RELIABILITY FNC WITH A
C                                          REDUNDANCY IN MODULE JSAVE
C         SAVR         ITRUNC     INT      RELIABILITY FNC FOR MODULE
```

```
C                                          JSAVE WITH A REDUNDANCY ADDED
C        SAVMMD           1       INT      MMD WITH A REDUNDANCY ADDED IN
C                                          MODULE JSAVE
C        SYSLB            1      EXT-C     SYSTEM WEIGHT
C        SLBMX            1      EXT-NC    MAX SYSTEM WEIGHT
C       DATAB(I,J)     N(NSS)    EXT-NC    REDUNDANCY WEIGHT FOR MODULE J
C        IND              1       INT      LOOP INDEX
C         I               1       INT      INDEX
```

```
C        RFIXED           1      EXT-NC    INITIAL RELIABILITY
C     SUBROUTINES CALLED
C                     QSF  -  INTEGRATION BY SIMPSON'S RULE  (SSP)
C                     RIMOD- RELIABILITY MODELS CALCULATION
C
C     ..................................................................
C          *** PROGRAM INITIALIZATIONS   ***
C     ..................................................................
```

```
DO 110 I=1,60
```

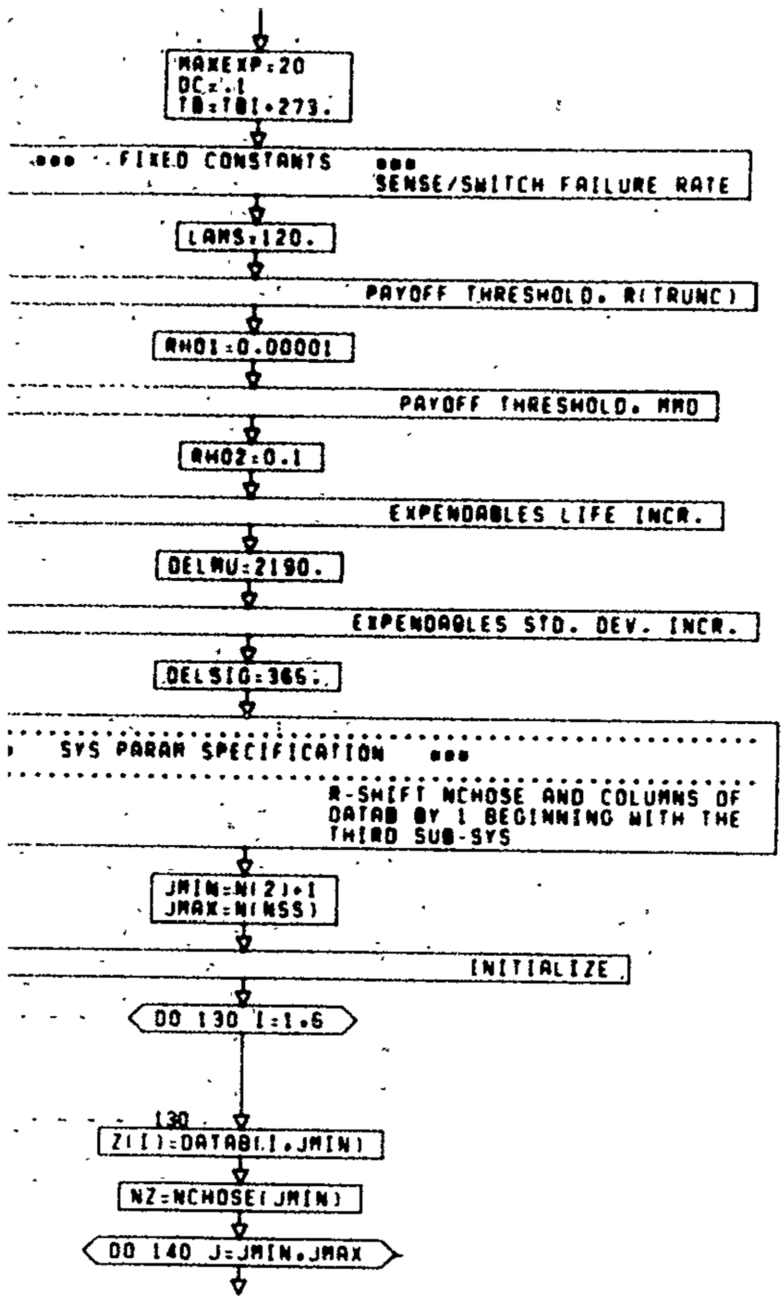
```
110 NR(I)=0
```

```
C                   ***   USER INPUTS   ***
C       KEOPT       EXPENSE OPTION INDICATOR
C                             1           WEIGHT
C                             OTHERWISE   COST
C       RFIXED      INITIAL SYS RELIABILITY
C       SYSLB       INITIAL WEIGHT (POUNDS)
C       SLBMX       MAX SYS WEIGHT
C       TRUNC       MISSION LENGTH (HRS)
```

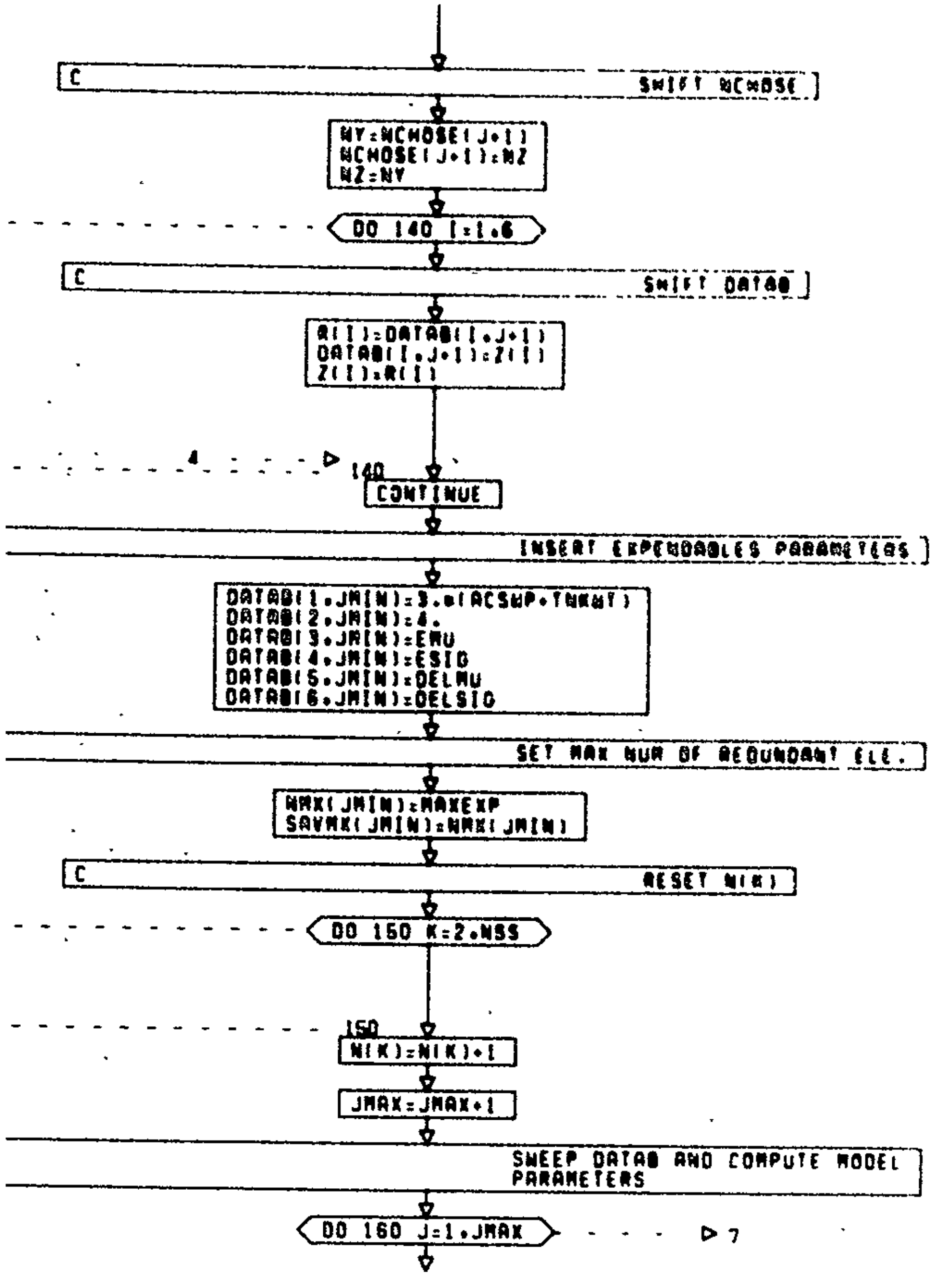
CONT. ON PG 3

```
C       ITRUNC          NUM OF TIME POINTS
C       ISUB            REQUIREMENTS OPTION
C                                 1              AT LEAST ONE SUB SYS SPEC
C                                 OTHERWISE      NO SUB-SYS SPEC
C       ISPT            SINGLE POINT FAILURE REQUIREMENTS OPTION
C                                 0              REQ NOT IN EFFECT
C                                 OTHERWISE REQ IN EFFECT
C       SPECI           MND SYS REQUIREMENT (HRS)

C       SPEC(K)         R(ITRUNC) SUB-SYS REQ; K=1,NSS
C                                 DEFAULT VALUE IS 0.0
C       SPEC(NSS+1)     R(ITRUNC) SYS REQ   DEFAULT VALUE IS 0.0
C       N(K)            CUMULATIVE NUM OF MODULES THRU SUB-SYS K

RFNL=0.7
TRUNC=TPRIM*730.
ALPHA=TRUNC/((-ALOG(RFNL))**.625)
SPECI=CONS*730.
ITRUNC=31
SYSLB=SATTWT

C                                                  SET NUM OF SUB SYS

NSS=6

C                                                  ACCUMULATE N

N(1)=NEQUIP(1)

DO 100 I=2,NSS

100
N(I)=NEQUIP(I)+N(I-1)

C                    ***   SIS INPUTS   ***
C       ACSWP        INITIAL EXPENDABLES WEIGHT  (POUNDS)              AP
C       EMU          EXPENDABLES INITIAL MEAN LIFETIME  (HRS)          AP
C       ESIG         EXPENDABLES INITIAL STD. DEV.  (HRS)              AP
C       MAXEXP       MAX NUM OF EXPENDABLE INCREMENTS                  AP
C       NZERO        ORBITAL MEAN MOTION  (RAD/HRS)                    AP
C       DC           DUTY CYCLE                                        OTHER
C       TB           BATTERY TEMP  (DEGREES KELVIN)                    OTHER

C       D            DEPTH OF DISCHARGE  (BETWEEN 0 AND 100)           OTHER
C       NC           TOTAL NUM OF CELLS  (ALL BATTERIES)               OTHER
C       PARAMETERS NECESSARY TO COMPUTE THE CYCLES/HR FACTOR           S&C
C                    NOW FIXED AT 4.0E-11, REF MODEL 5

EMU=TRUNC
ESIG=TRUNC/6.
```

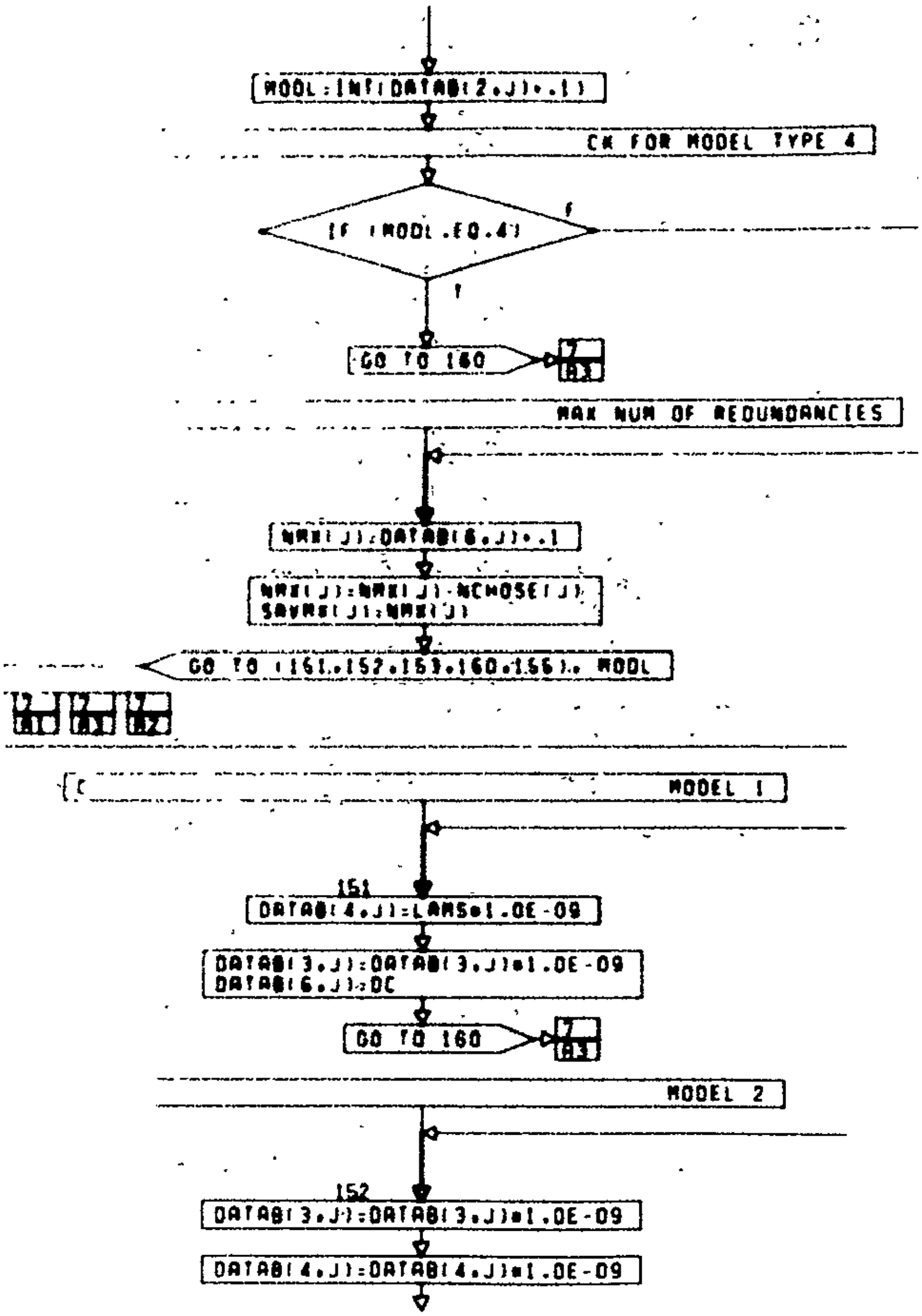
CONT. ON PG 4


MAXEXP=20
DC=.1
TB=TBI+273.
*** FIXED CONSTANTS ***
SENSE/SWITCH FAILURE RATE
LAMS=120.
PAYOFF THRESHOLD, R(TRUNC)
RHO1=0.00001
PAYOFF THRESHOLD, MMD
RHO2=0.1
EXPENDABLES LIFE INCR.
DELMU=2190.
EXPENDABLES STD. DEV. INCR.
DELSIG=365.
SYS PARAM SPECIFICATION ***
R-SHIFT NCHOSE AND COLUMNS OF DATAB BY 1 BEGINNING WITH THE THIRD SUB-SYS
JMIN=N(2)+1
JMAX=N(NSS)
INITIALIZE
DO 130 I=1,6
130
Z(I)=DATAB(I,JMIN)
NZ=NCHOSE(JMIN)
DO 140 J=JMIN,JMAX

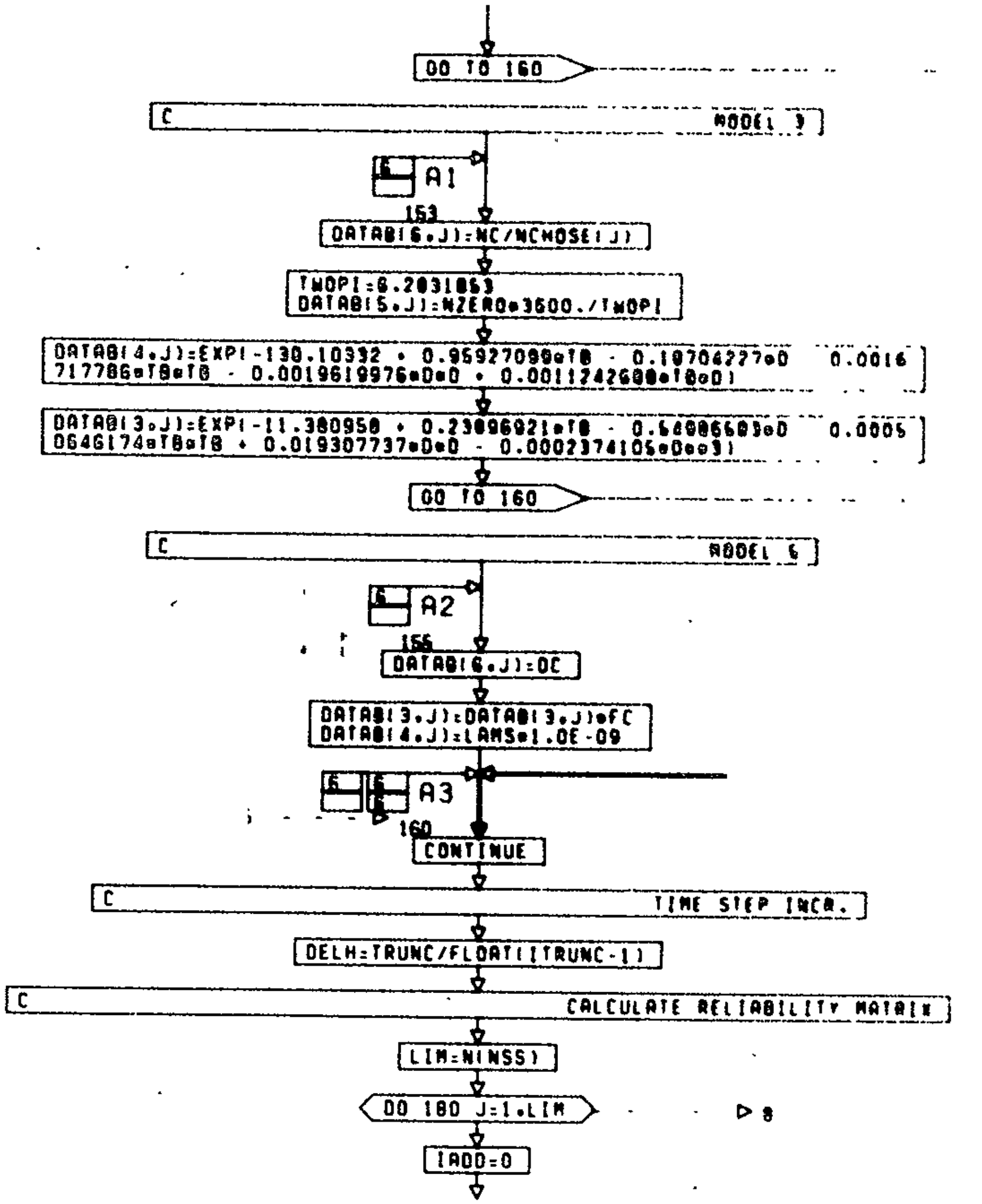
CONT. ON PG


C
SHIFT NCHOSE
NY=NCHOSE(J+1)
NCHOSE(J+1)=NZ
NZ=NY
DO 140 I=1,6
C
SHIFT DATAB
R(I)=DATAB(I,J+1)
DATAB(I,J+1)=Z(I)
Z(I)=R(I)
4
140
CONTINUE
INSERT EXPENDABLES PARAMETERS
DATAB(1,JMIN)=3.*(ACSWP+TNKWT)
DATAB(2,JMIN)=4.
DATAB(3,JMIN)=EMU
DATAB(4,JMIN)=ESIG
DATAB(5,JMIN)=DELMU
DATAB(6,JMIN)=DELSIG
SET MAX NUM OF REDUNDANT ELE.
NMX(JMIN)=MAXEXP
SAVMX(JMIN)=NMX(JMIN)
C
RESET N(K)
DO 150 K=2,NSS
150
N(K)=N(K)+1
JMAX=JMAX+1
SWEEP DATAB AND COMPUTE MODEL PARAMETERS
DO 160 J=1,JMAX
7

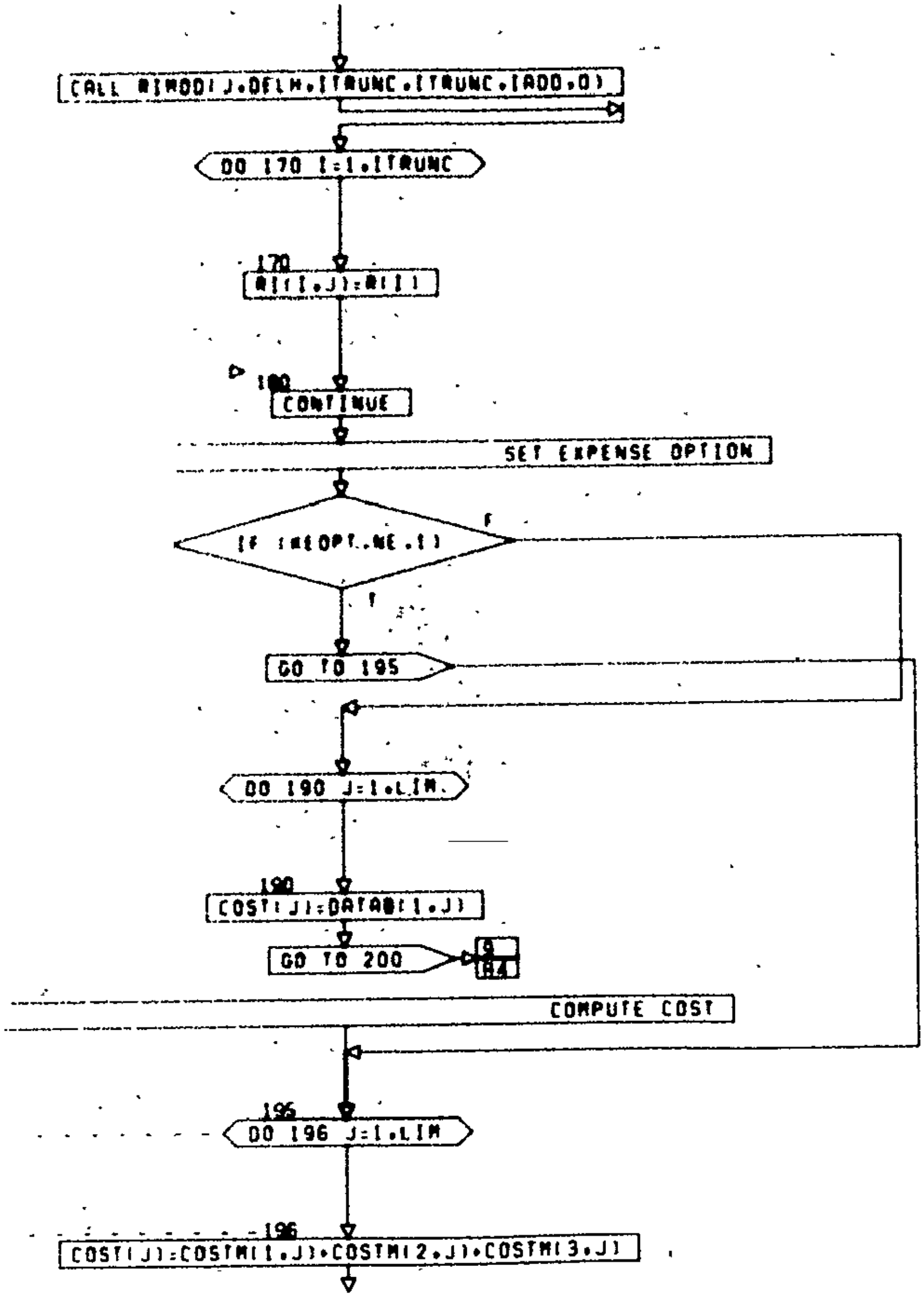
CONT. ON PG 6


MODL=INT(DATAB(2,J)+.1)
CK FOR MODEL TYPE 4
IF (MODL.EQ.4)
F
T
GO TO 160
7
A3
MAX NUM OF REDUNDANCIES
NMX(J)=DATAB(6,J)+.1
NMX(J)=NMX(J)-NCHOSE(J)
SAVMX(J)=NMX(J)
GO TO (151,152,153,160,156), MODL
7
A1
7
A3
7
A2
MODEL 1
151
DATAB(4,J)=LAMS*1.0E-09
DATAB(3,J)=DATAB(3,J)*1.0E-09
DATAB(6,J)=DC
GO TO 160
7
A3
MODEL 2
152
DATAB(3,J)=DATAB(3,J)*1.0E-09
DATAB(4,J)=DATAB(4,J)*1.0E-09

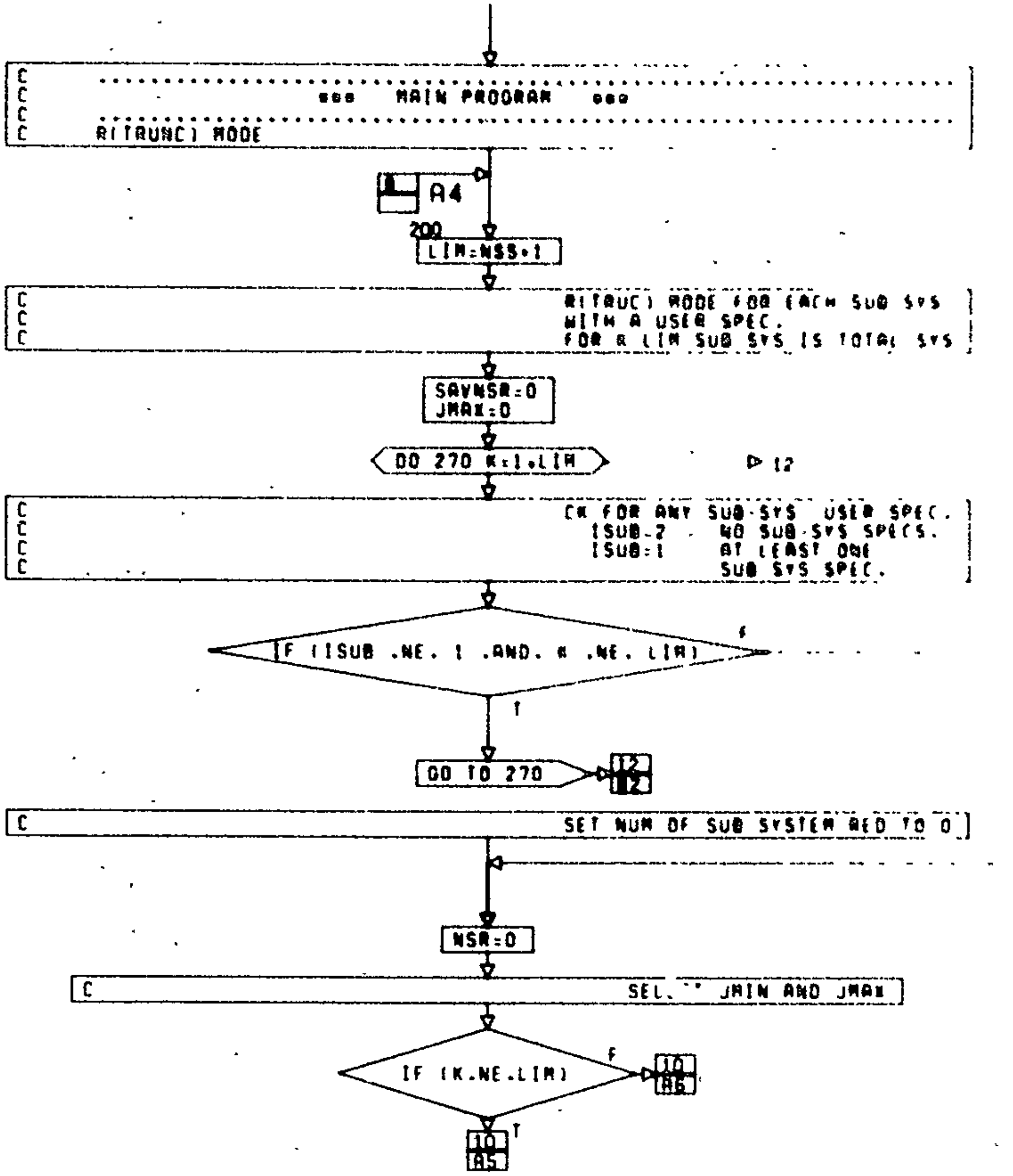
CONT. ON PG 7


GO TO 160
C MODEL 3
A1
153
DATAB(6,J)=NC/NCHOSE(J)
TWOPI=6.2831853
DATAB(5,J)=NZERO*3600./TWOPI
DATAB(4,J)=EXP(-130.10332 + 0.95927099*TB - 0.10704277*D 0.0016
717786*TB*TB - 0.0019619976*D*D + 0.0011242600*TB*D)
DATAB(3,J)=EXP(-11.380950 + 0.23096921*TB - 0.64906603*D 0.0005
064G174*TB*TB + 0.019307737*D*D - 0.00023741056*D**3)
GO TO 160
C MODEL 6
A2
156
DATAB(6,J)=DC
DATAB(3,J)=DATAB(3,J)*FC
DATAB(4,J)=LAMS*1.0E-09
A3
160
CONTINUE
C TIME STEP INCR.
DELH=TRUNC/FLOAT(ITRUNC-1)
C CALCULATE RELIABILITY MATRIX
LIM=N(NSS)
DO 180 J=1,LIM
8
IADD=0

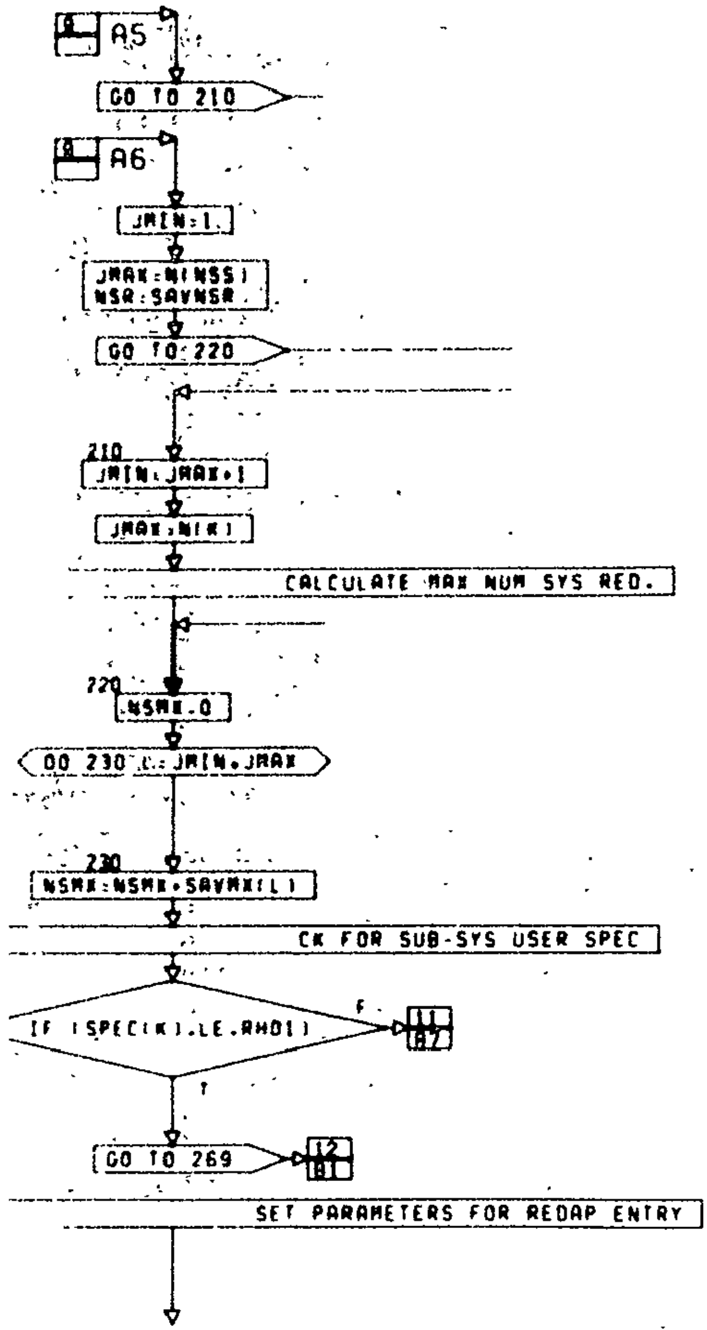
CONT. ON PG 8


CALL RIMOD(J,DFLM,ITRUNC,ITRUNC,IADD,0)
DO 170 I=1,ITRUNC
170
RI(I,J)=RI(I)
180
CONTINUE
SET EXPENSE OPTION
IF (IEOPT.NE.1)
F
T
GO TO 195
DO 190 J=1,LIM.
190
COST(J)=DATAB(1,J)
GO TO 200
9
R4
COMPUTE COST
196
DO 196 J=1,LIM
196
COST(J)=COSTM(1,J)+COSTM(2,J)+COSTM(3,J)

CONT. ON PG 9

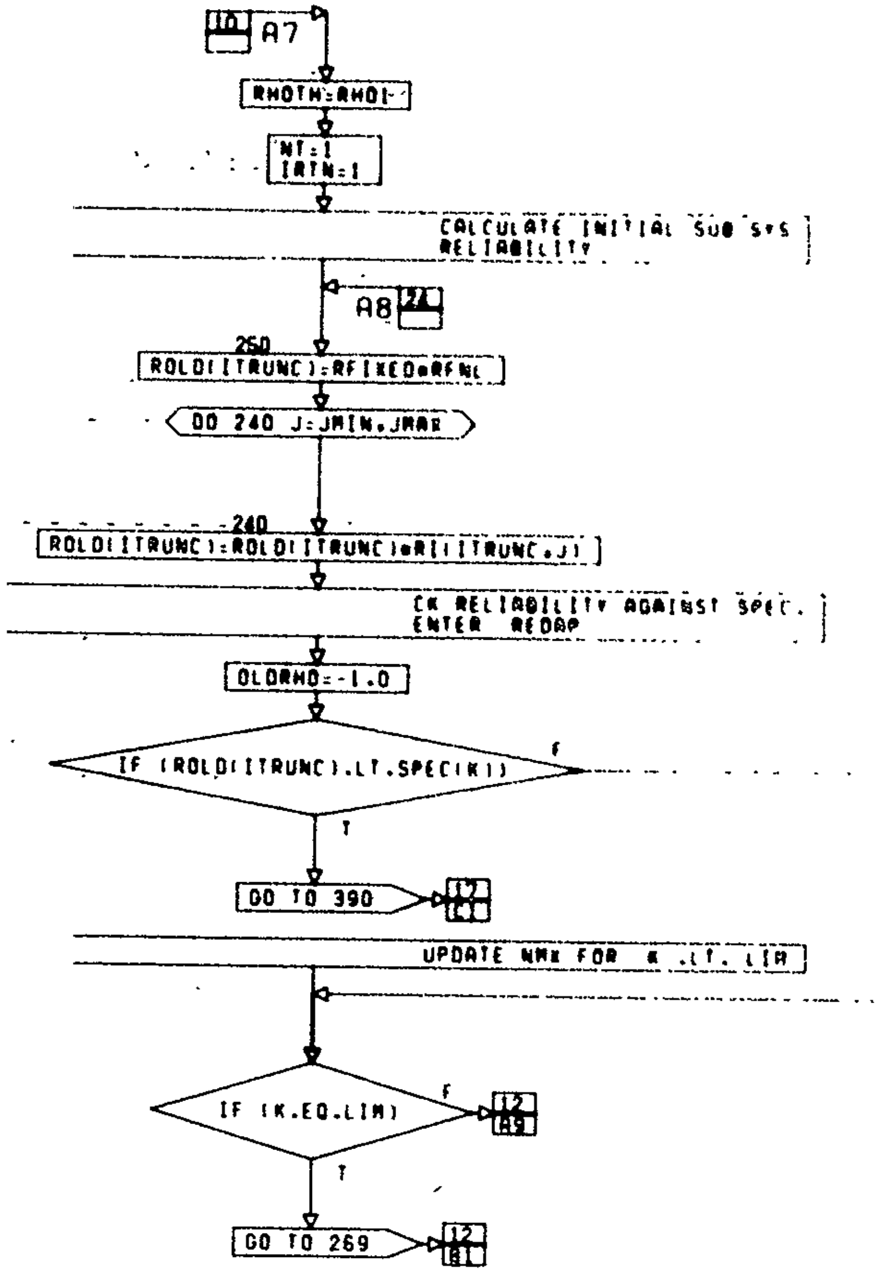

C
C *** MAIN PROGRAM ***
C
C R(TRUNC) MODE
A4
200
LIM=NSS+1
C R(TRUC) MODE FOR EACH SUB SYS
C WITH A USER SPEC.
C FOR K LIM SUB SYS IS TOTAL SYS
SAVNSR=0
JMAX=0
DO 270 K=1,LIM
12
C CK FOR ANY SUB-SYS USER SPEC.
C ISUB-2 NO SUB-SYS SPECS.
C ISUB=1 AT LEAST ONE
C SUB SYS SPEC.
IF (ISUB .NE. 1 .AND. K .NE. LIM)
F
T
GO TO 270
12
12
C SET NUM OF SUB SYSTEM RED TO 0
NSR=0
C SEL. JMIN AND JMAX
IF (K.NE.LIM)
F
10
A6
T
10
A5

CONT. ON PG 10



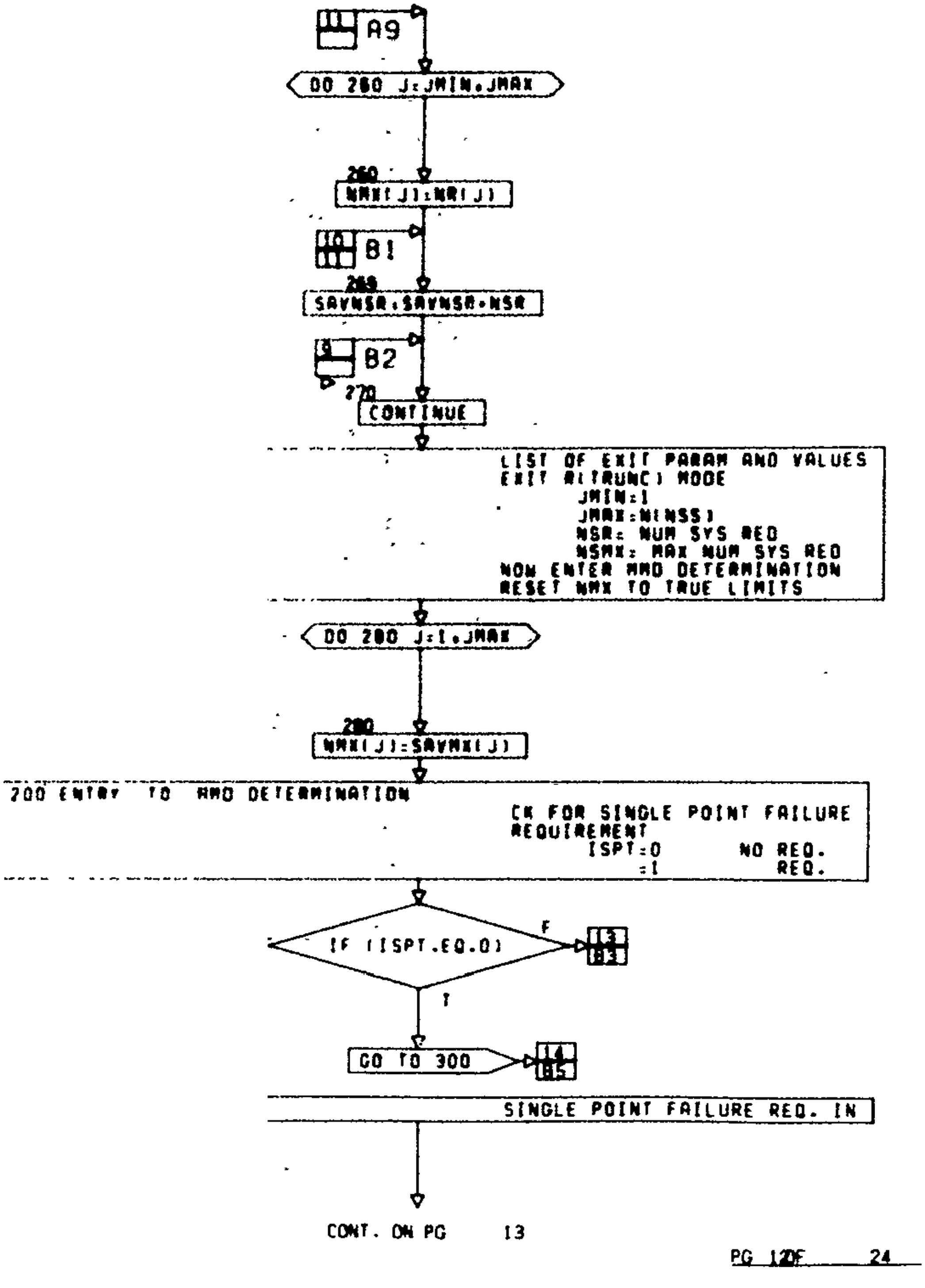
A5
GO TO 210
A6
JMIN:1.
JMAX:N(NSS)
NSR:SAVNSR.
GO TO 220
210
JMIN:JMAX+1
JMAX:N(K)
CALCULATE MAX NUM SYS REQ.
220
NSMX.0
DO 230 L=JMIN,JMAX
230
NSMX:NSMX+SAVMX(L)
CK FOR SUB-SYS USER SPEC
IF (SPEC(K).LE.RHO1)
F
T
11
A7
GO TO 269
12
B1
SET PARAMETERS FOR REDAP ENTRY

CONT. ON PG 11

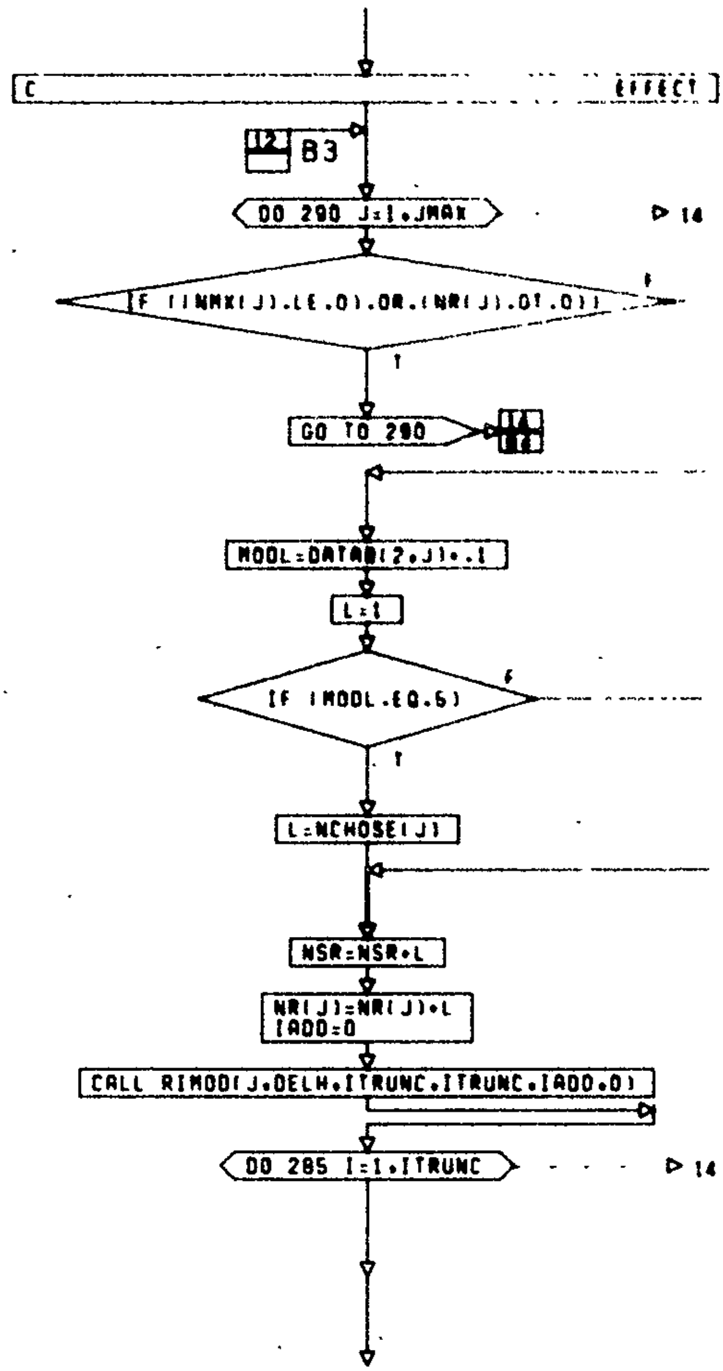


10
A7
RHOTN=RHOL
NT=1
IRTN=1
CALCULATE INITIAL SUB SYS RELIABILITY
A8
250
ROLD(ITRUNC)=RFIXED*RFNL
DO 240 J=JMIN,JMAX
240
ROLD(ITRUNC)=ROLD(ITRUNC)*R(I(ITRUNC,J)
CK RELIABILITY AGAINST SPEC. ENTER REDAP
OLDRHO=-1.0
IF (ROLD(ITRUNC).LT.SPEC(K))
F
T
GO TO 390
12
C1
UPDATE NMX FOR K .LT. LIM
IF (K.EQ.LIM)
F
12
A9
T
GO TO 269
12
B1

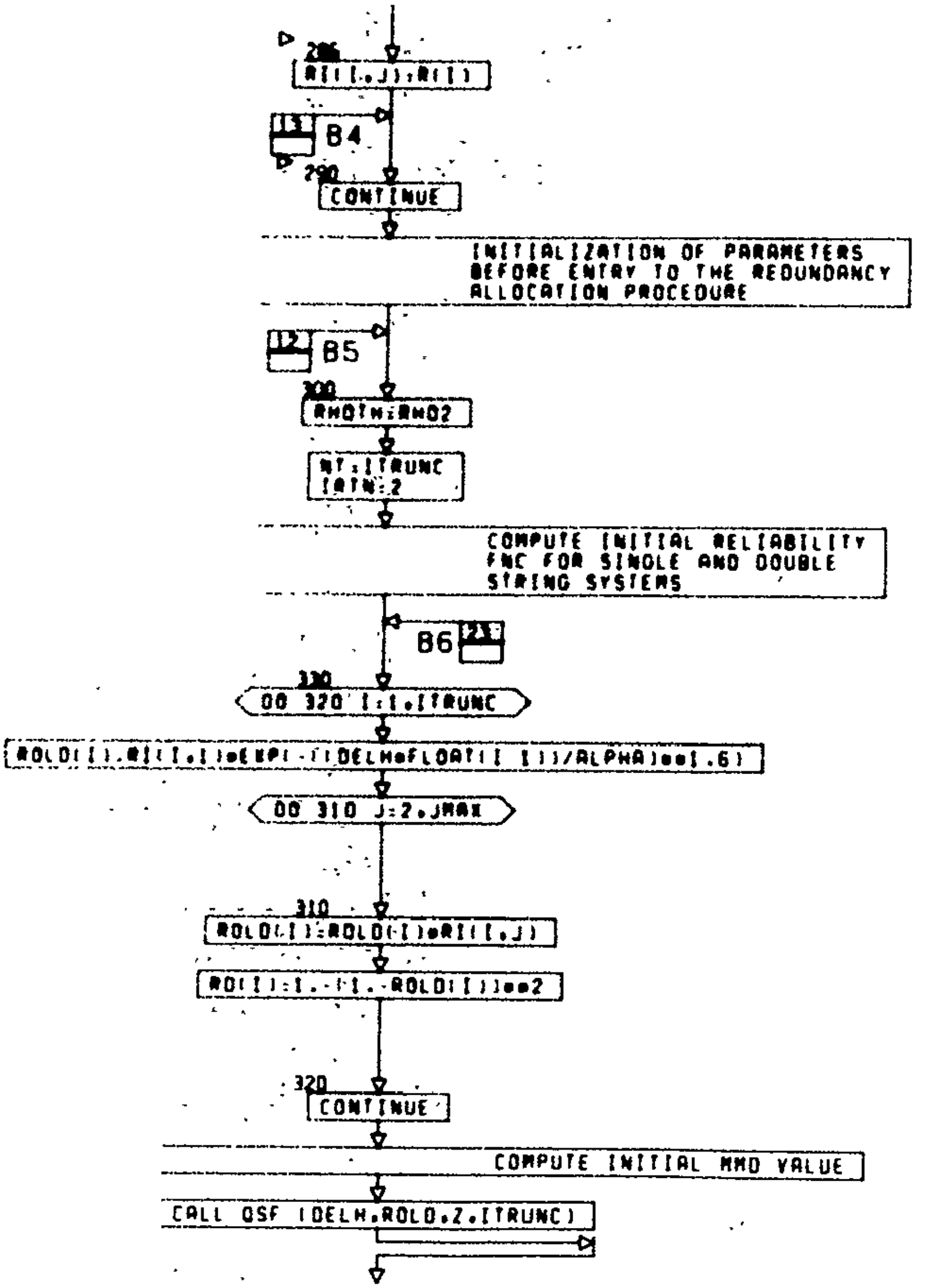
CONT. ON PG 12


11
A9
DO 260 J=JMIN,JMAX
260
NMX(J)=NR(J)
10
11
B1
269
SAVNSR=SAVNSR+NSR
9
B2
270
CONTINUE
LIST OF EXIT PARAM AND VALUES
EXIT R(TRUNC) MODE
JMIN=1
JMAX=N(NSS)
NSR= NUM SYS REQ
NSMX= MAX NUM SYS REQ
NOW ENTER MMD DETERMINATION
RESET NMX TO TRUE LIMITS
DO 280 J=1,JMAX
280
NMX(J)=SAVMX(J)
200 ENTRY TO MMD DETERMINATION
CK FOR SINGLE POINT FAILURE
REQUIREMENT
ISPT=0 NO REQ.
=1 REQ.
IF (ISPT.EQ.0)
F
13
B3
T
GO TO 300
14
B5
SINGLE POINT FAILURE REQ. IN

CONT. ON PG 13

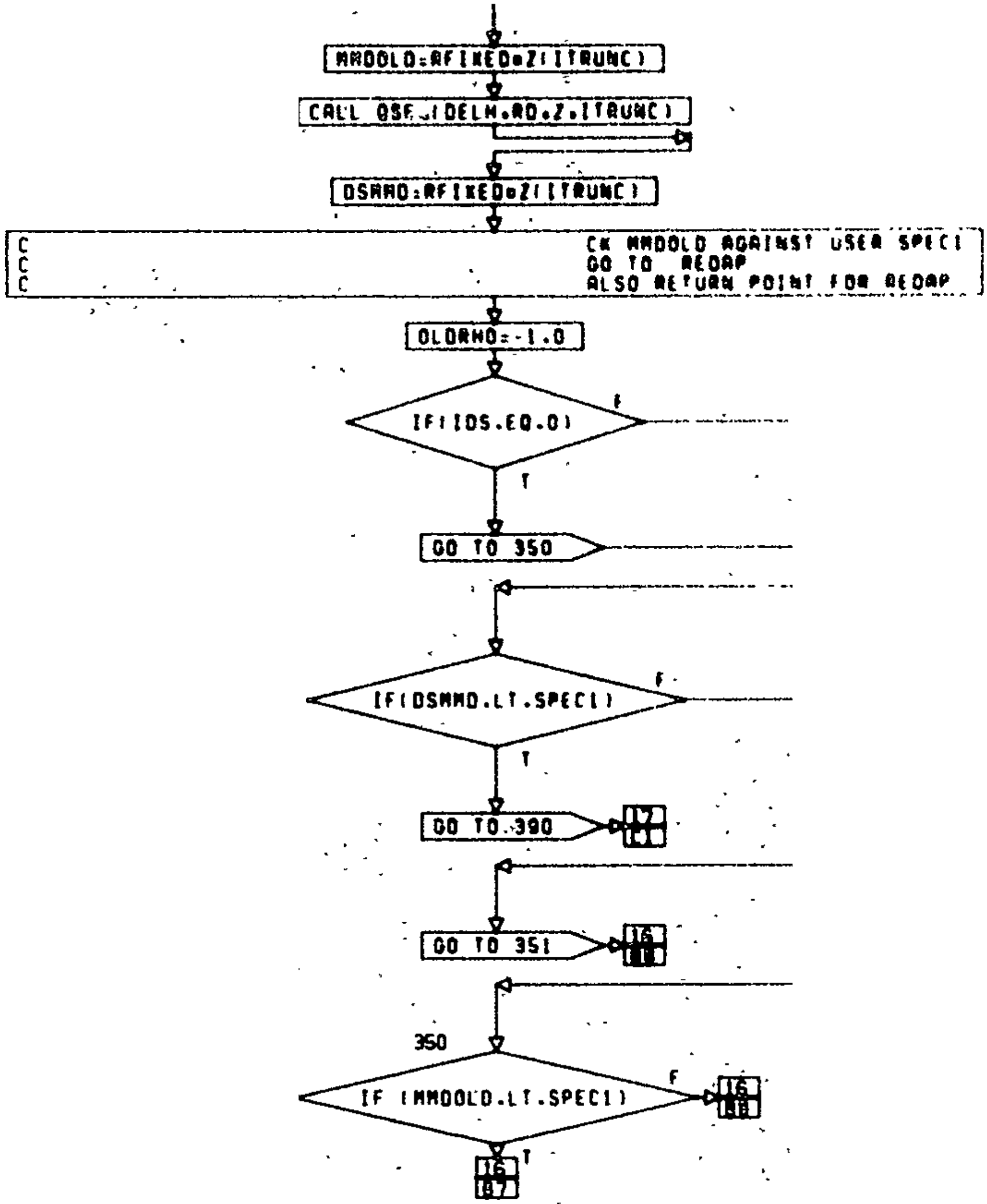

C EFFECT
12
B3
DO 290 J=1,JMAX
14
IF ((NMX(J).LE.0).OR.(NR(J).GT.0))
F
T
GO TO 290
MODL=DATAB(2,J)+.1
L=1
IF (MODL.EQ.6)
F
T
L=NCHOSE(J)
NSR=NSR+L
NR(J)=NR(J)+L
IADD=0
CALL RIMOD(J,DELH,ITRUNC,ITRUNC,IADD,0)
DO 285 I=1,ITRUNC
14

CONT. ON PG 14

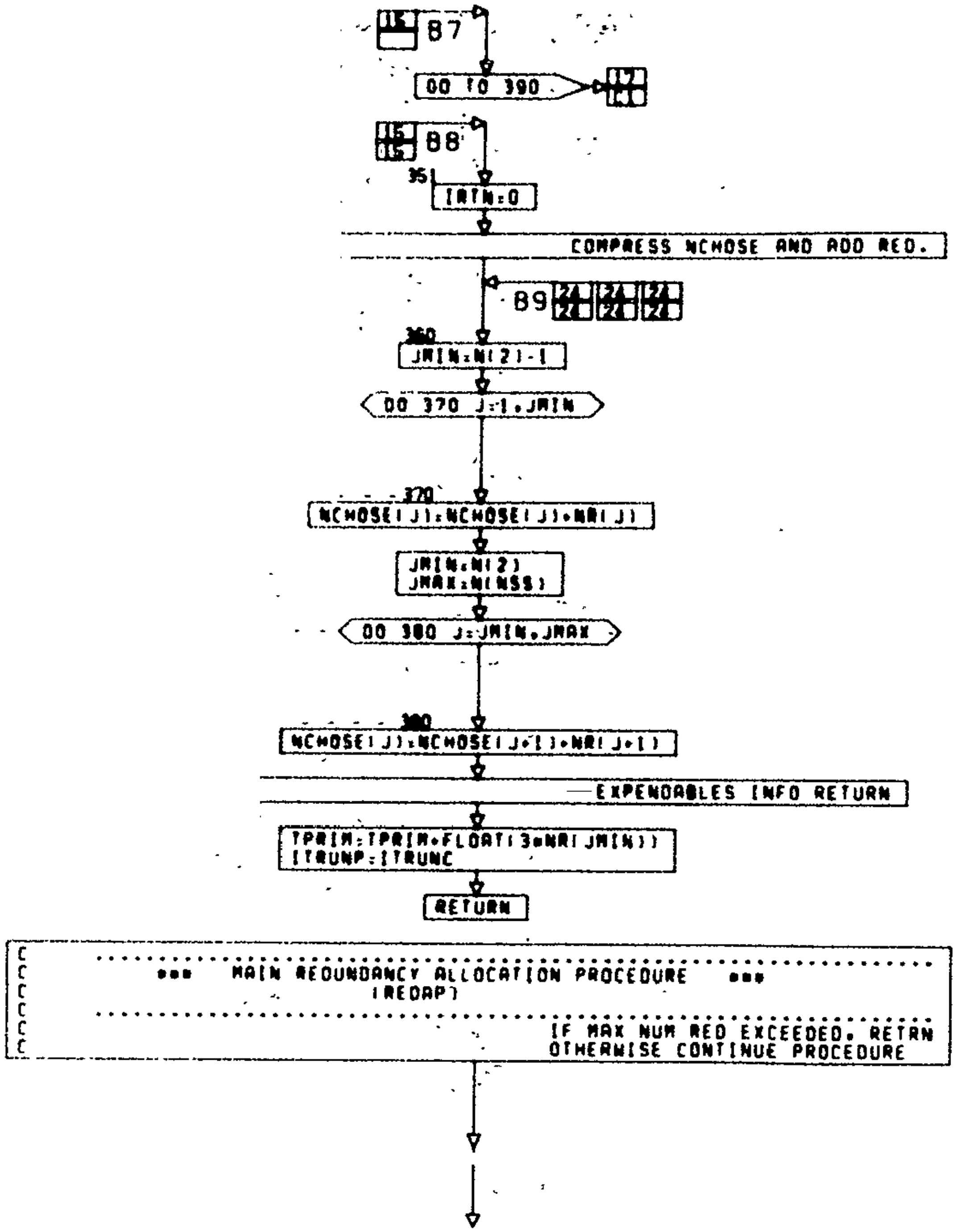


286
RI(I,J)=RI(I)
B4
290
CONTINUE
INITIALIZATION OF PARAMETERS BEFORE ENTRY TO THE REDUNDANCY ALLOCATION PROCEDURE
B5
300
RMOTN=RMO2
NT=ITRUNC
IATN=2
COMPUTE INITIAL RELIABILITY FNC FOR SINGLE AND DOUBLE STRING SYSTEMS
B6
330
DO 320 I=1,ITRUNC
ROLD(I)=RI(I,1)*EXP(-((DELH*FLOAT(I-1))/ALPHA)**1.6)
DO 310 J=2,JMAX
310
ROLD(I)=ROLD(I)*RI(I,J)
RO(I)=1.-(1.-ROLD(I))**2
320
CONTINUE
COMPUTE INITIAL MMD VALUE
CALL QSF (DELH,ROLD,Z,ITRUNC)

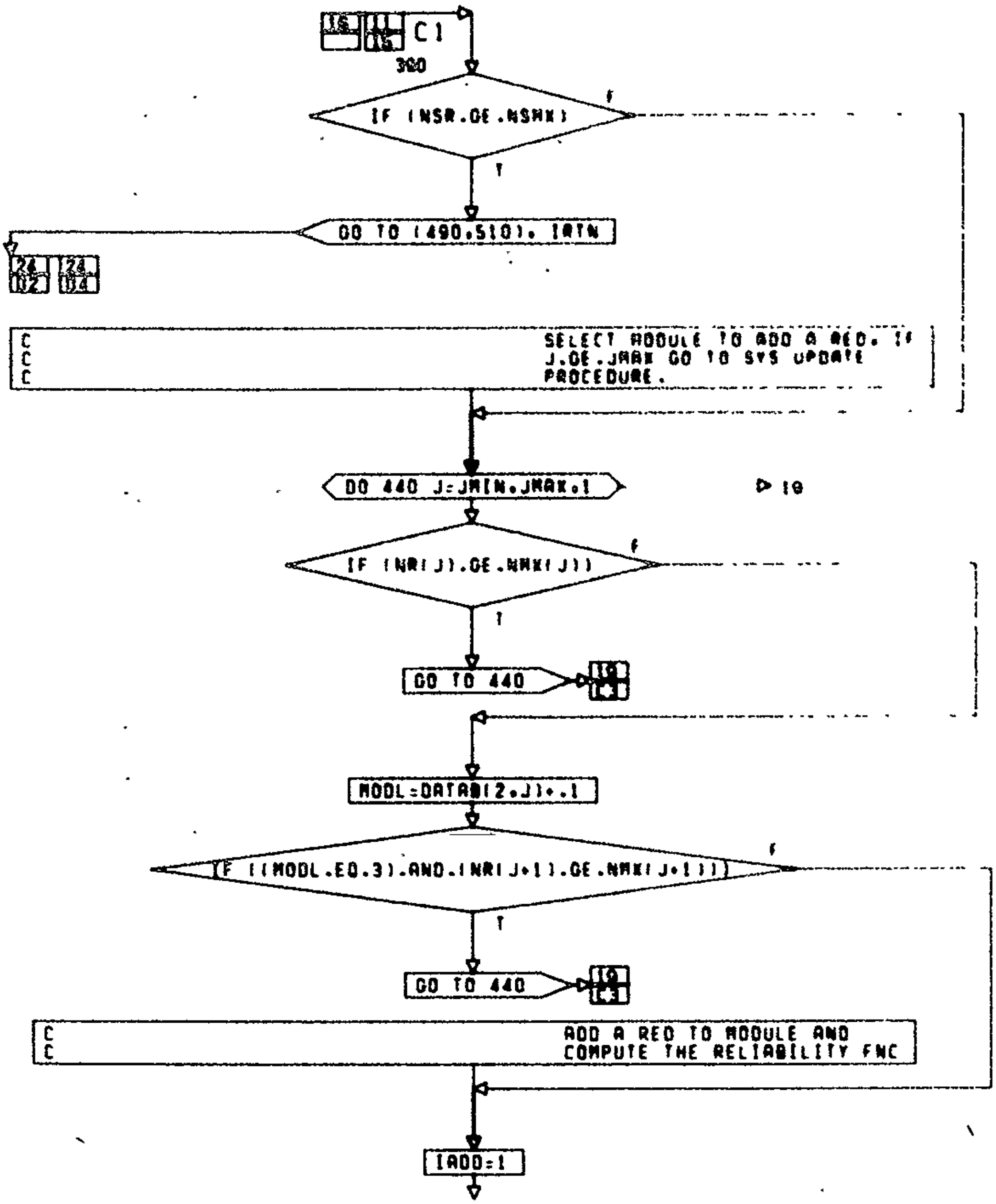
CONT. ON PG 15


MMOOLD:RFIXED*Z(ITRUNC)
CALL QSF (DELM,RO,Z,ITRUNC)
DSMMO:RFIXED*Z(ITRUNC)
C CK MMOOLD AGAINST USER SPEC1
C GO TO REDAP
C ALSO RETURN POINT FOR REDAP
OLDRHO:-1.0
IF(IDS.EQ.0)
F
T
GO TO 350
IF(DSMMO.LT.SPEC1)
F
T
GO TO 390
17
GO TO 351
16
350
IF (MMOOLD.LT.SPEC1)
F
16
T
16
B7

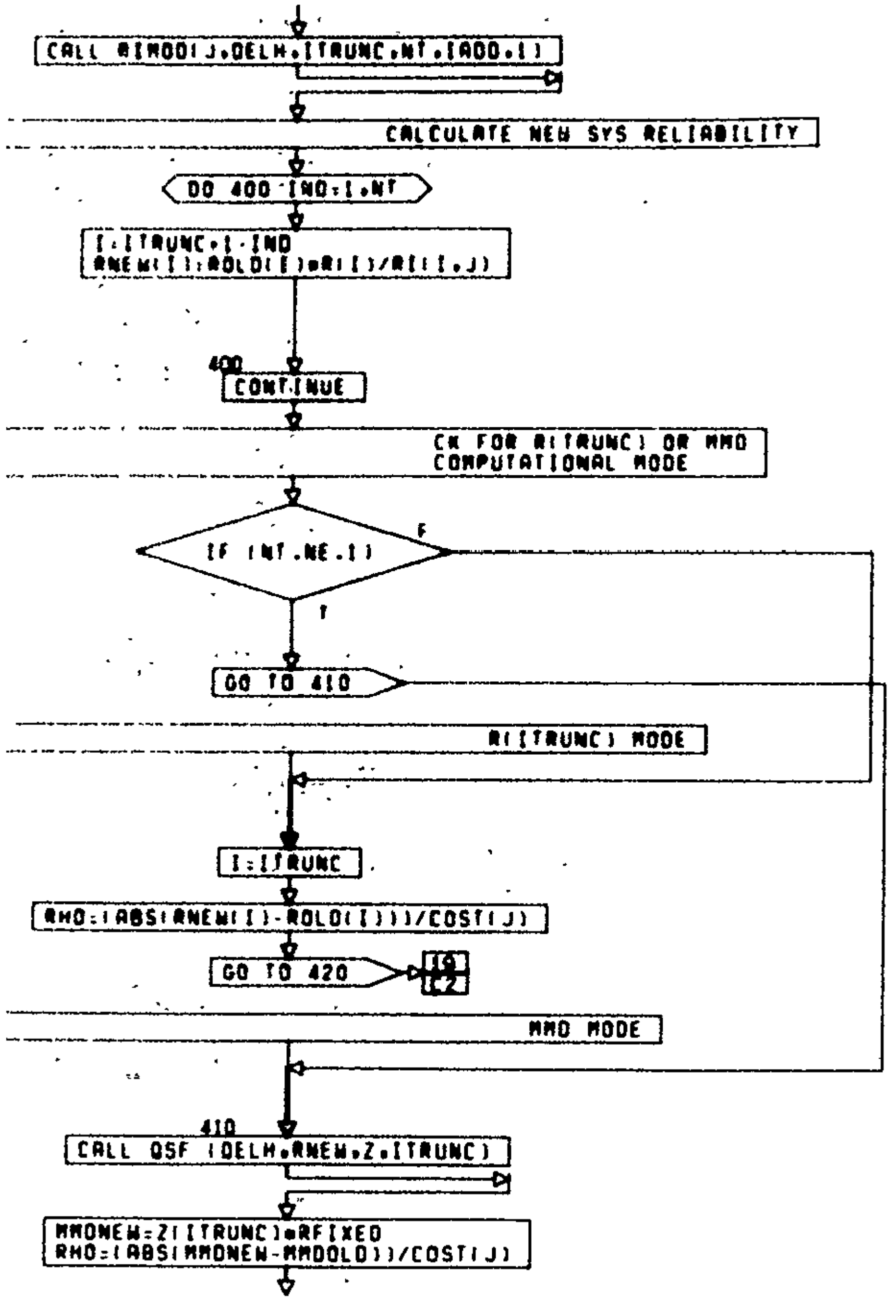
CONT. ON PG 16


B7
DO TO 390
B8
35
IRTN=0
COMPRESS NCHOSE AND ADD RED.
B9
360
JMIN=N(2)-1
DO 370 J=1,JMIN
370
NCHOSE(J)=NCHOSE(J)+NR(J)
JMIN=N(2)
JMAX=N(NSS)
DO 380 J=JMIN,JMAX
380
NCHOSE(J)=NCHOSE(J+1)+NR(J+1)
EXPENDABLES INFO RETURN
TPRIM=TPRIM+FLOAT(3*NR(JMIN))
ITRUNP=ITRUNC
RETURN
C ....
C *** MAIN REDUNDANCY ALLOCATION PROCEDURE ***
C (REDAP)
C
C ....
C IF MAX NUM RED EXCEEDED, RETRN
C OTHERWISE CONTINUE PROCEDURE

CONT. ON PG 17

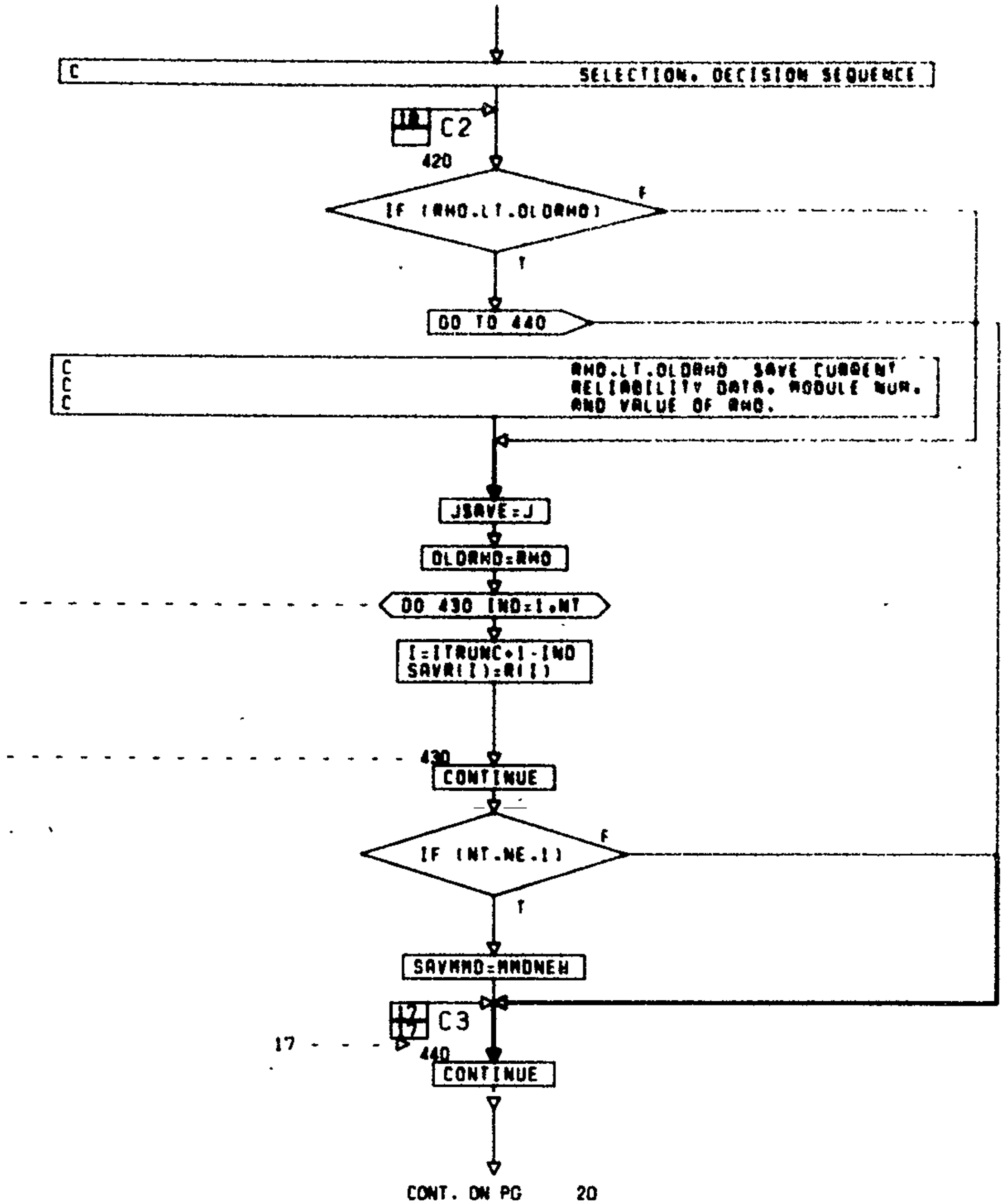

C1
300
IF (NSR.GE.NSMX)
F
T
GO TO (490,510), IRTN
C SELECT MODULE TO ADD A RED. IF
C J.GE.JMAX GO TO SYS UPDATE
C PROCEDURE.
DO 440 J=JMIN,JMAX,1
IF (NR(J).GE.NMX(J))
GO TO 440
MODL=DATAB(2,J)+.1
IF ((MODL.EQ.3).AND.(NR(J+1).GE.NMX(J+1)))
GO TO 440
C ADD A RED TO MODULE AND
C COMPUTE THE RELIABILITY FNC
IADD=1

CONT. ON PG 18

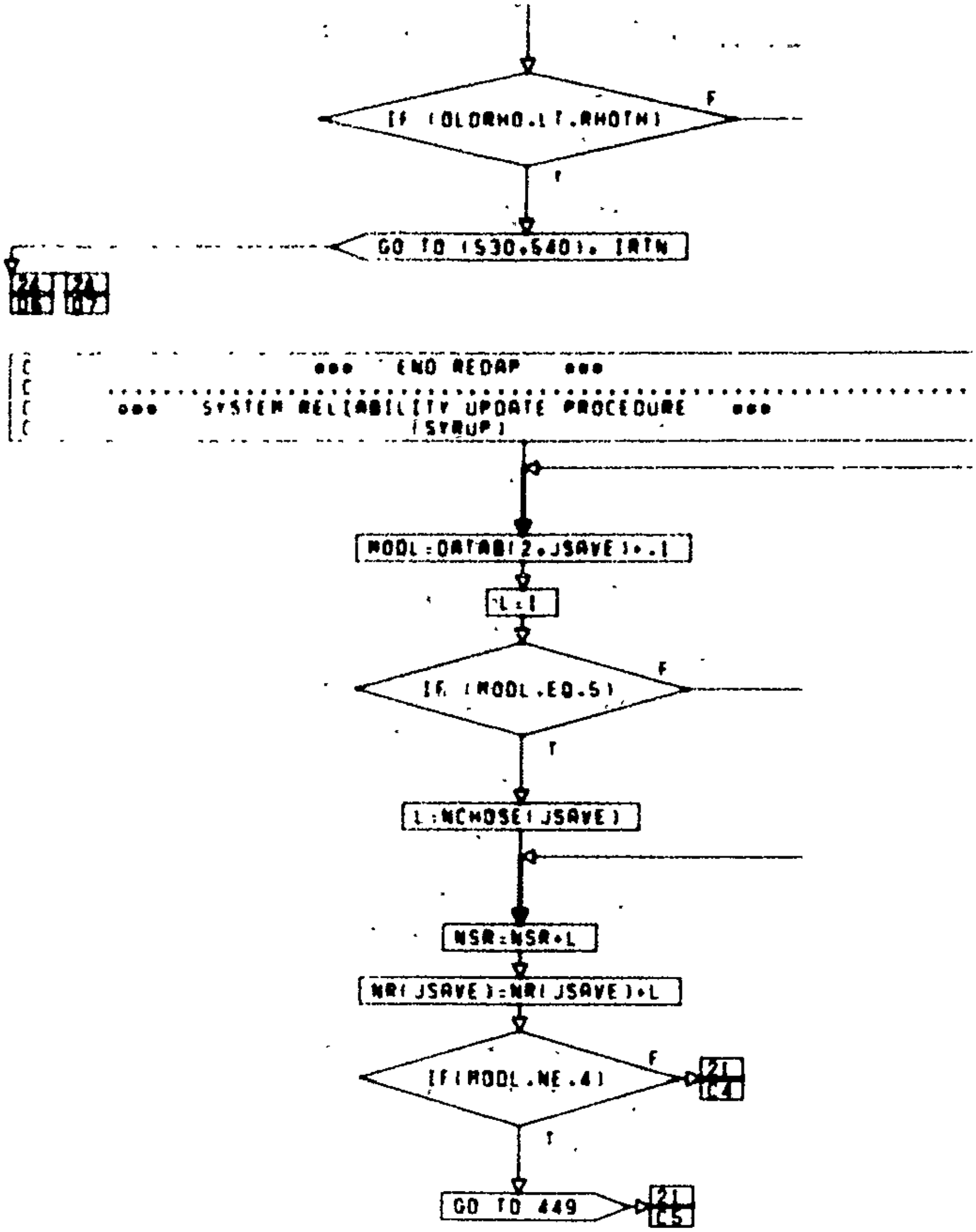


CONT. ON PG 19

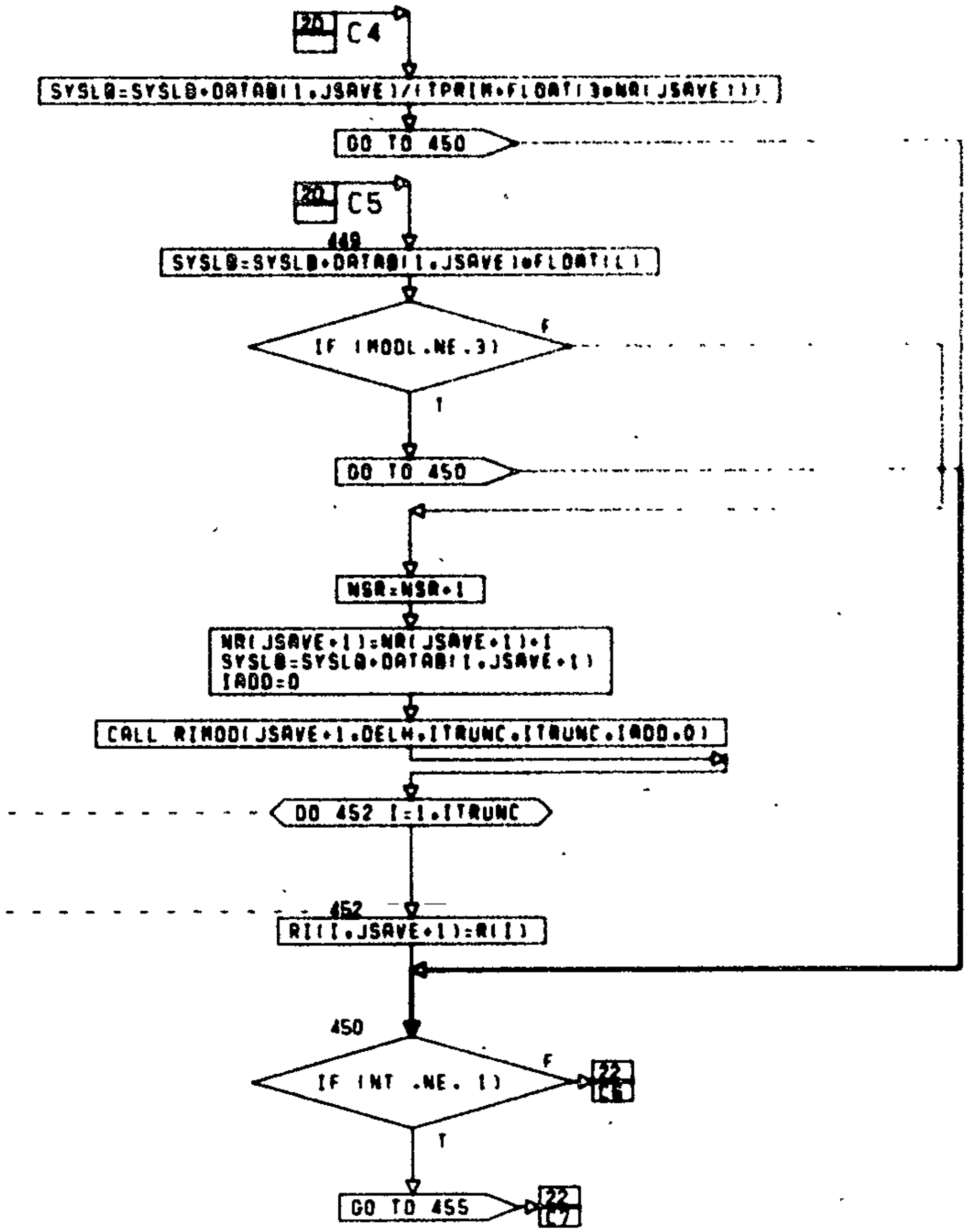
PG 18OF 24


C SELECTION, DECISION SEQUENCE
C2
420
IF (RHO.LT.OLDRHO)
F
T
GO TO 440
C RHO.LT.OLDRHO SAVE CURRENT
C RELIABILITY DATA, MODULE NUM,
C AND VALUE OF RHO.
JSAVE=J
OLDRHO=RHO
DO 430 IND=1,NT
I=ITRUNC+1-IND
SAVR(I)=R(I)
430
CONTINUE
IF (NT.NE.1)
F
T
SAVMMO=MMONEW
17
17
C3
17
440
CONTINUE
CONT. ON PG 20

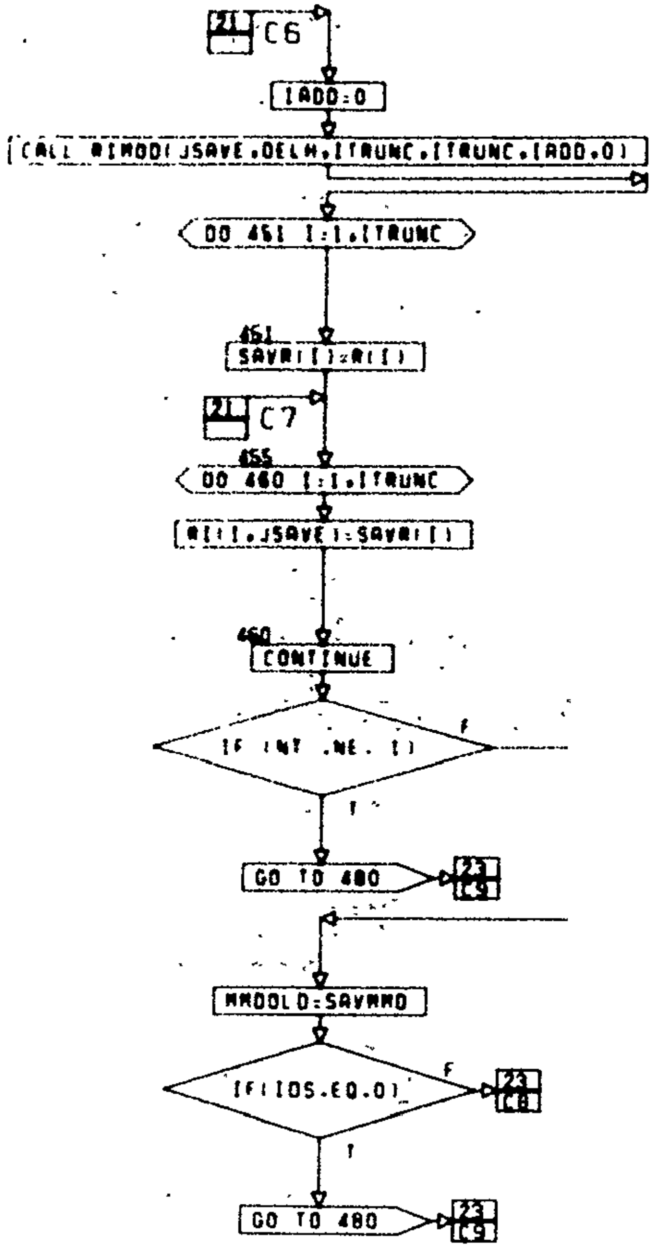
PG 19 OF 24


IF (OLDRHO.LT.RHOTH)
GO TO (530,540), IRTN
C *** END REDAP ***
C *** SYSTEM RELIABILITY UPDATE PROCEDURE ***
C (SYRUP)
MODL:DATAB(2,JSAVE)+.1
L:1
IF (MODL.EQ.5)
L:NCHOSE(JSAVE)
NSR:NSR+L
NR(JSAVE):NR(JSAVE)+L
IF(MODL.NE.4)
GO TO 449

CONT. ON PG 21

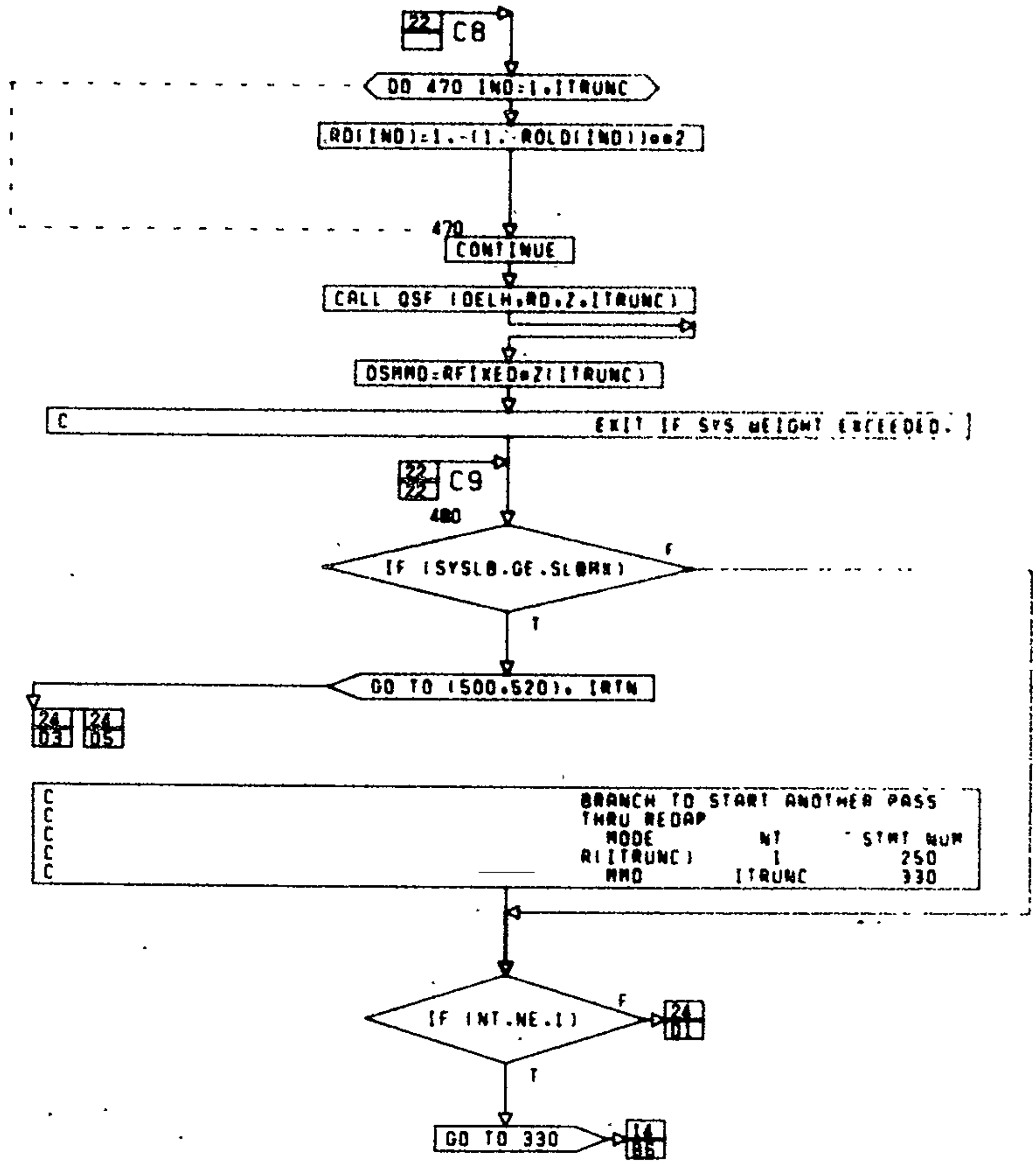

20 C4
SYSLB=SYSLB+DATAB(I,JSAVE)/(TPR(M+FLOAT(3*NR(JSAVE)))
GO TO 450
20 C5
449
SYSLB=SYSLB+DATAB(I,JSAVE)*FLOAT(L)
IF (MODL.NE.3)
F
T
GO TO 450
NSR=NSR+1
NR(JSAVE+1)=NR(JSAVE+1)+1
SYSLB=SYSLB+DATAB(I,JSAVE+1)
IADD=0
CALL RIMOD(JSAVE+1,DELM,ITRUNC,ITRUNC,IADD,0)
DO 452 I=1,ITRUNC
452
RI(I,JSAVE+1)=R(I)
450
IF (INT .NE. 1)
F
22 C6
T
GO TO 455
22 C7

CONT. ON PG 22

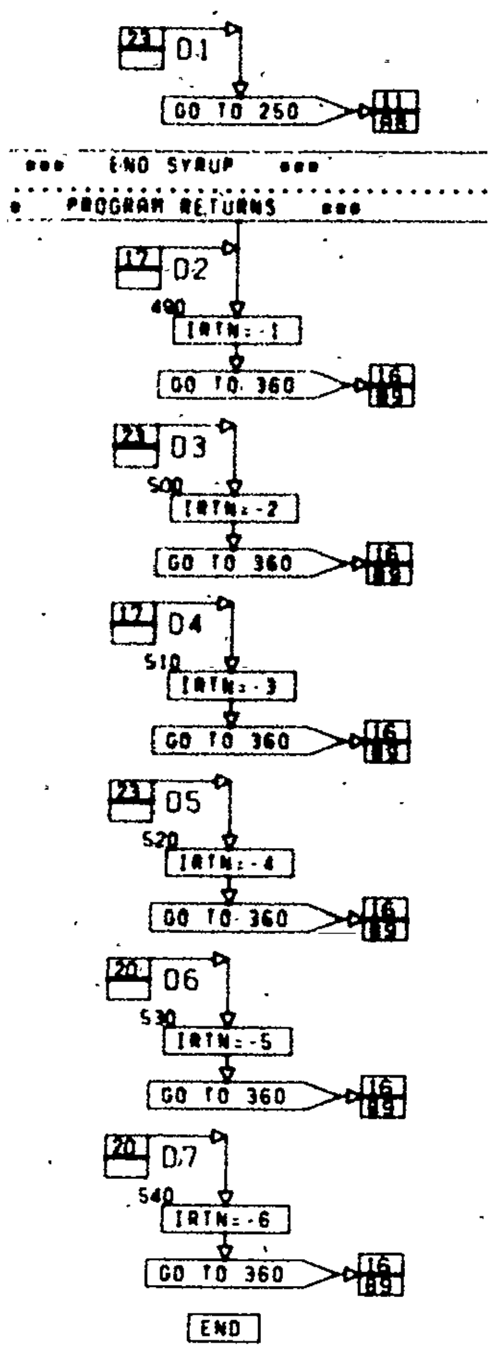


21
C6
IADD:0
CALL RIMOD(JSAVE,DELH,ITRUNC,ITRUNC,IADD,0)
DO 451 I:1,ITRUNC
451
SAVR(I):R(I)
21
C7
455
DO 460 I:1,ITRUNC
R(I,JSAVE):SAVR(I)
460
CONTINUE
IF (NT .NE. 1)
F
T
GO TO 480
23
C9
MMODOLD:SAVMMD
IF(IOS.EQ.0)
F
23
C8
T
GO TO 480
23
C9

CONT. ON PG 23


22 C8
DO 470 IND=1,ITRUNC
RD(IND)=1.-(1.-ROLD(IND))**2
470 CONTINUE
CALL QSF (DELH,RD,Z,ITRUNC)
DSMMD=RFIXED*Z(ITRUNC)
C EXIT IF SYS WEIGHT EXCEEDED.
22 22 C9
480
IF (SYSLB.GE.SLBMX)
F
T
GO TO (500,520), IRTN
24 D3
24 D5
C BRANCH TO START ANOTHER PASS
C THRU REDAP
C MODE NT STMT NUM
C R(ITRUNC) 1 250
C MMD ITRUNC 330
IF (NT.NE.1)
F
24 D1
T
GO TO 330
14 B6

CONT. ON PG 24



D1
GO TO 250
END SYRUP
PROGRAM RETURNS
D2
400
IRTN=-1
GO TO 360
D3
500
IRTN=-2
GO TO 360
D4
510
IRTN=-3
GO TO 360
D5
520
IRTN=-4
GO TO 360
D6
530
IRTN=-5
GO TO 360
D7
540
IRTN=-6
GO TO 360
END

PG 24 FINAL

```
C     ..................................................................
```

```
      SUBROUTINE RIMOD(J,DELH,ITRUNC,NT,IADD,IOPT)
```

```
      COMMON /CHOSE/ICHOSE(60),NCHOSE(60),COSTM(5,60),SYSPAR(6,60),
     THM(4,60),OPIA(11,60),SKD(7,60)
```

```
      COMMON /DBCOM/R(31),NR(60),RI(31,60),W(31),RD(31),RDUM(31),SAVW(31
     ),SAVRNW(31),RNEW(31),NMX(60),SAVMX(60),COST(60),DUM(256))
```

```
      COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMODLO,TRUNC,ITRUNP,DE,TE,
     TOOLR,QCR,SEIR,PMR,PE,PU,TOOLU,QCP,SEIP,PMP,SATR,SATINV,MER,
     MEINV,PAYR,PAUINV,PAYQUL,GSE,XLTOT,CTOT,FEER,FEEINV,DOTE,XVEST,
     OPS,SKTAU(6),ROLD(60),TSRTT,AN,TS,DS,AM,TF,BF,TC,TA,TB,TOTOPS
```

```
      REAL LAM,LAMBAR,LAMS
```

```
C     ..................................................................
C          SUBROUTINE RIMOD
C          PURPOSE
C             TO COMPUTE THE RELIABILITY FUNCTION FOR MODULE J AFTER
C             REDUNDANCIES ARE ADDED TO THE MODULE.
C          USAGE
C             CALL RIMOD(R,NR,J,DELH,ITRUNC,NT,IADD,IOPT)
C          DESCRIPTION OF PARAMETERS
```

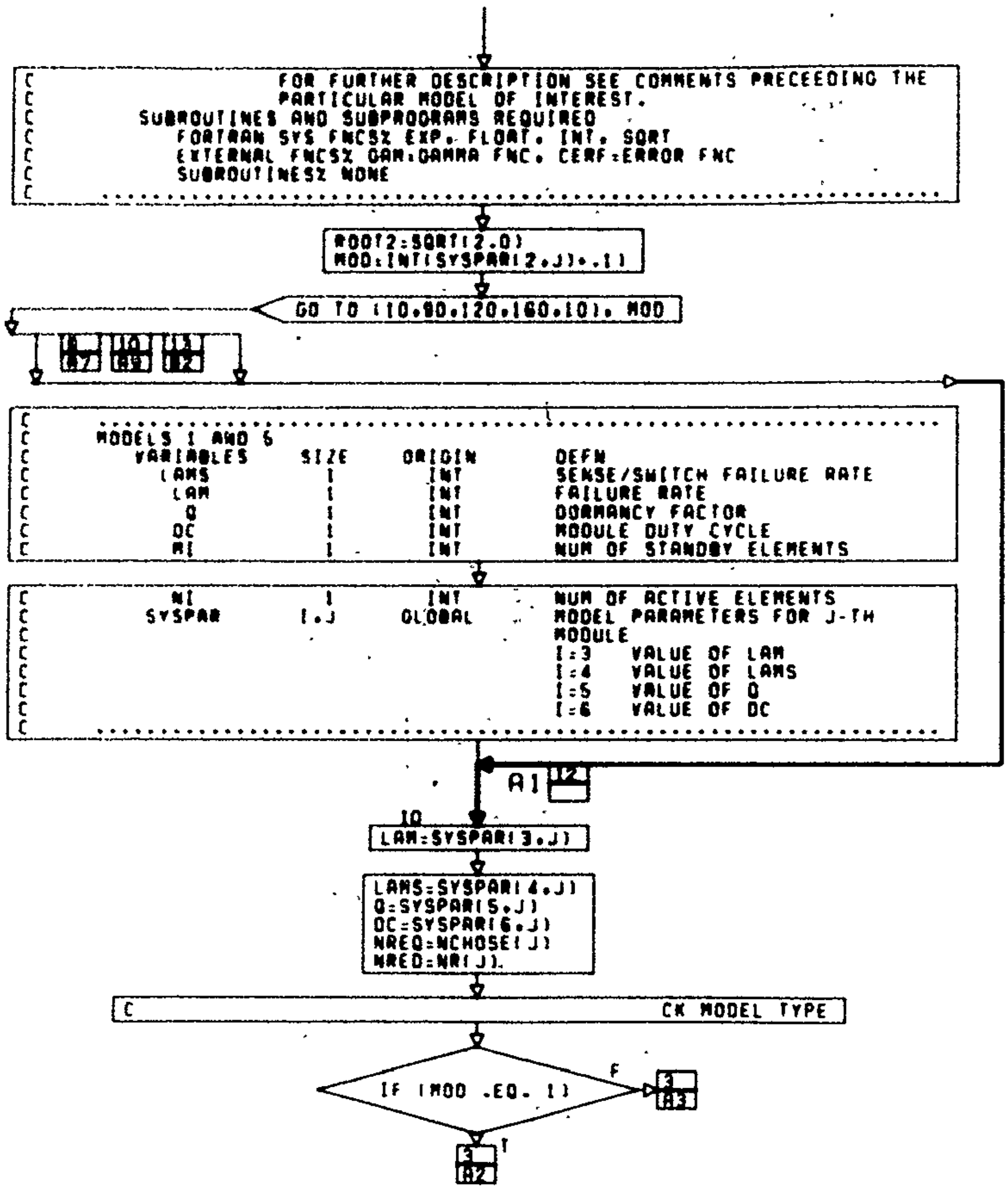
```
C             J      -INPUT MODULE NUM
C             DELH   -DELTA TIME, THE TIME INCREMENT
C             ITRUNC -THE NUM OF TIME POINTS
C             NT     -INPUT OPTION PARAMETER
C             IADD   -INPUT OPTION PARAMETER
C             IOPT   -INPUT OPTION PARAMETER
C          REMARKS
C             OPTION PARAMETER  VALUE      ACTION
```

```
C              NT             1         ONLY COMPUTE RELIABILITY AT
C                                       TRUNCATION TIME. RETURN VALUE IN
C                                       R(ITRUNC).
C                           ITRUNC      COMPUTE RELIABILITY AT EACH TIME
C                                       RETURN VALUES IN R.
C              IADD           0         ADD NO REDUNDANCIES BEFORE COM-
C                                       PUTING THE RELIABILITY FUNCTION.
C                             1         ADD REDUNDANCIES BEFORE COMPUT-
```

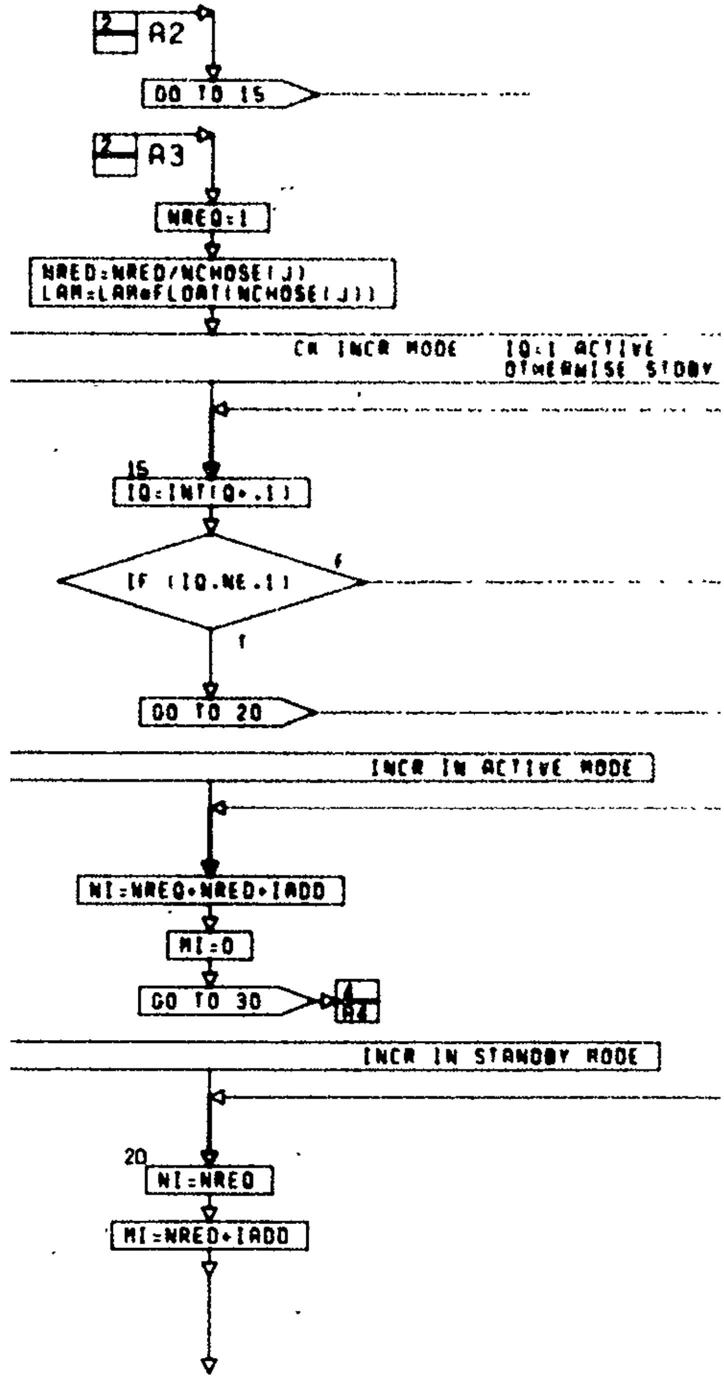
```
C                                       ING THE RELIABILITY FUNCTION.
C              IOPT           0         UNCOUPLE MODELS 1 AND 3.
C                           OTHER       COUPLE MODELS 1 AND 3.
C          GLOBAL VARIABLES PASSED THOUGH COMMON
C             R      -THE RESULTING RELIABILITY FUNCTION
C             NR     -INPUT VECTOR OF THE NUM OF REDUNDANCIES BY MODULE
C             NCHOS  -INITIAL NUM OF ELEMENTS IN MODULES
C             SYSPAR -MATRIX OF MODEL PARAMETERS
```

```
C                       SYSPAR(2,J)= MODEL ID FOR J-TH MODULE
```

CONT. ON PG 2

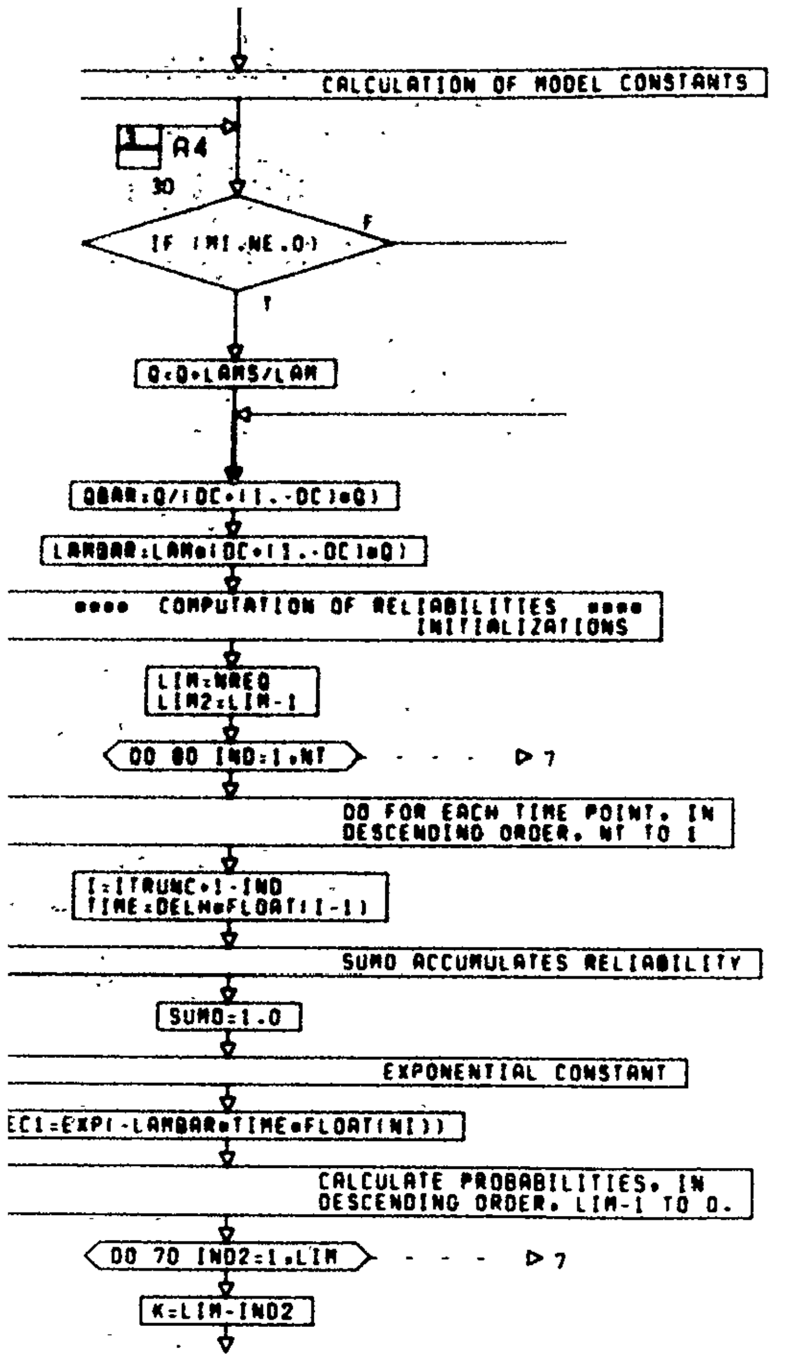

C FOR FURTHER DESCRIPTION SEE COMMENTS PRECEEDING THE
C PARTICULAR MODEL OF INTEREST.
C SUBROUTINES AND SUBPROGRAMS REQUIRED
C FORTRAN SYS FNCS% EXP, FLOAT, INT, SQRT
C EXTERNAL FNCS% GAM:GAMMA FNC, CERF:ERROR FNC
C SUBROUTINES% NONE
C ....
ROOT2:SQRT(2.0)
MOD:INT(SYSPAR(2,J)+.1)
GO TO (10,90,120,160,10), MOD
8 A7
10 A9
13 A2
C ....
C MODELS 1 AND 6
C VARIABLES SIZE ORIGIN DEFN
C LAMS 1 INT SENSE/SWITCH FAILURE RATE
C LAM 1 INT FAILURE RATE
C Q 1 INT DORMANCY FACTOR
C DC 1 INT MODULE DUTY CYCLE
C MI 1 INT NUM OF STANDBY ELEMENTS
C NI 1 INT NUM OF ACTIVE ELEMENTS
C SYSPAR I,J GLOBAL MODEL PARAMETERS FOR J-TH
C MODULE
C I:3 VALUE OF LAM
C I:4 VALUE OF LAMS
C I:5 VALUE OF Q
C I:6 VALUE OF DC
C ....
A1 12
10
LAM:SYSPAR(3,J)
LAMS:SYSPAR(4,J)
Q:SYSPAR(5,J)
DC:SYSPAR(6,J)
NREQ:NCHOSE(J)
NRED:NR(J)
C CK MODEL TYPE
IF (MOD .EQ. 1)
F
3 A3
T
3 A2

CONT. ON PG 3

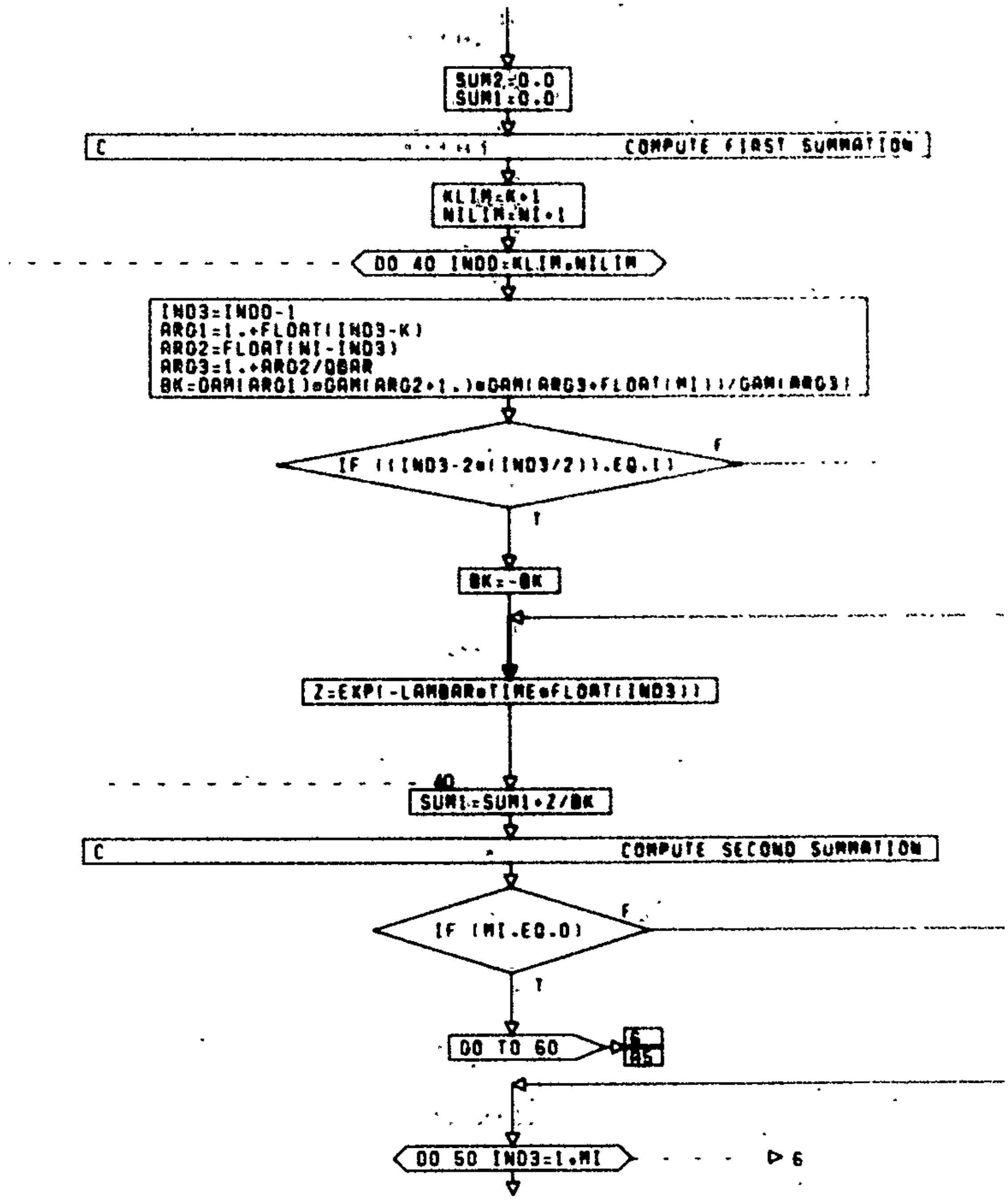


CONT. ON PG 4

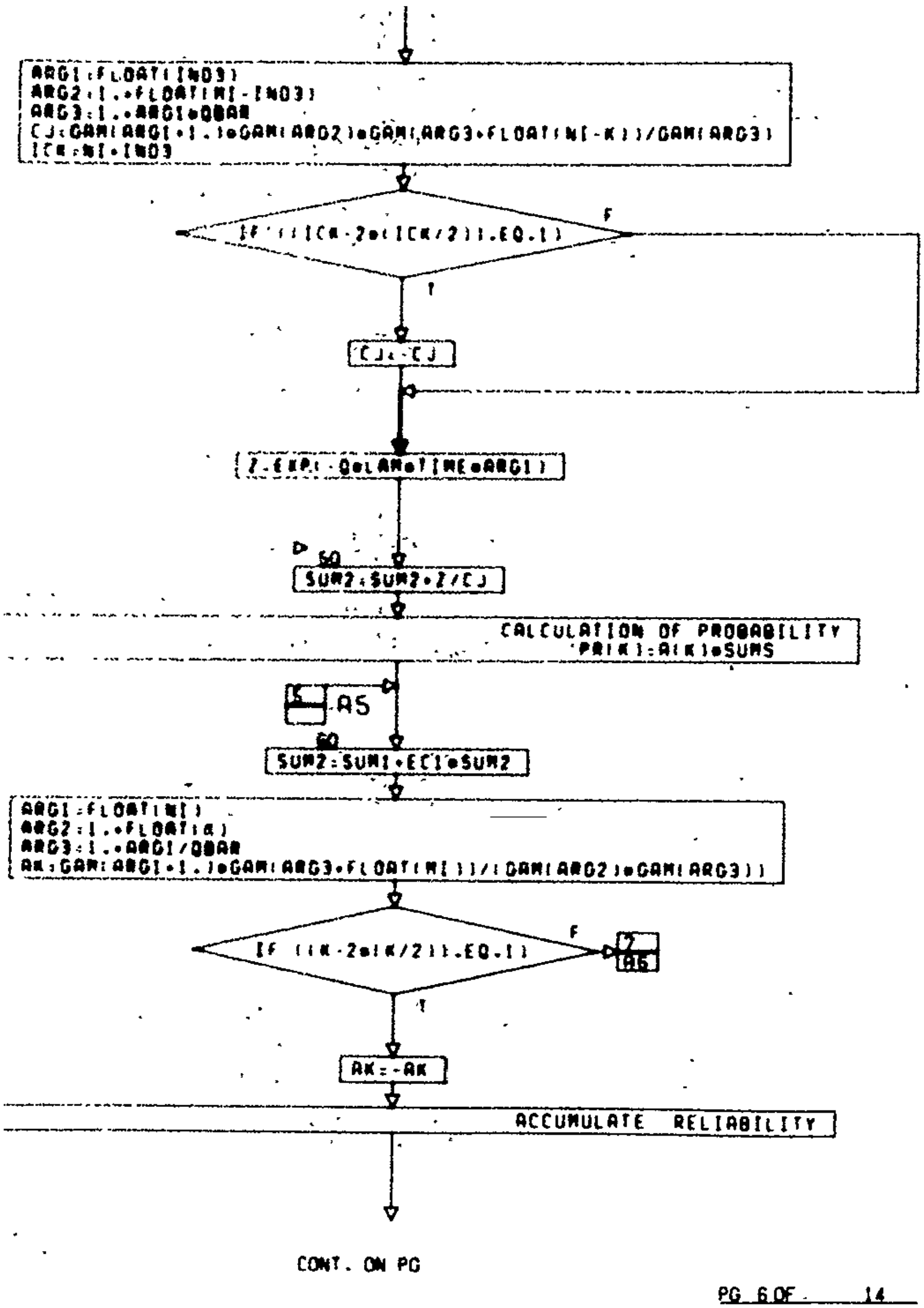
PG 3 OF 14

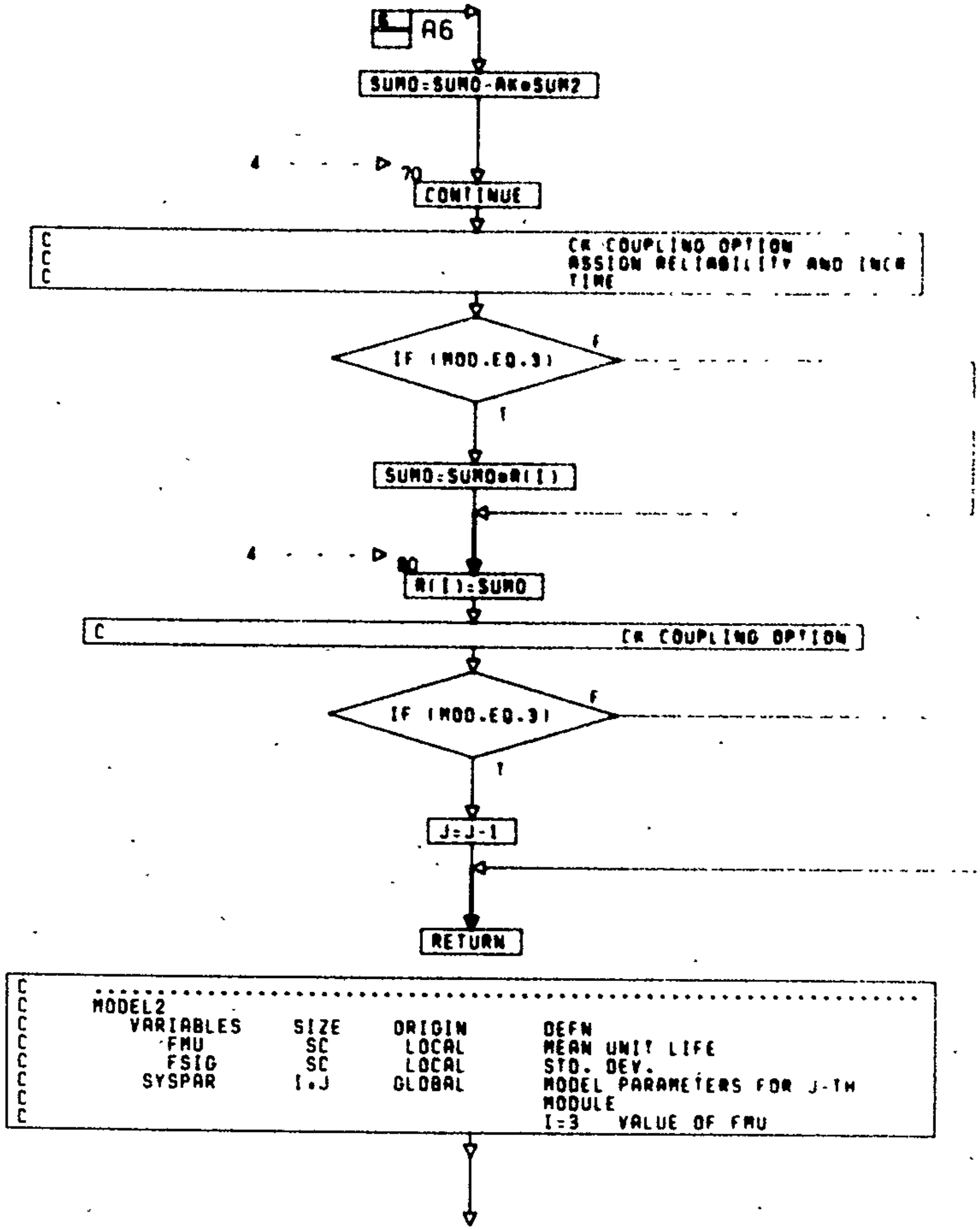

CALCULATION OF MODEL CONSTANTS
A4
30
IF (NI.NE.0)
F
T
Q=Q+LAMS/LAM
QBAR=Q/(DC+(1.-DC)*Q)
LAMBAR=LAM*(DC+(1.-DC)*Q)
**** COMPUTATION OF RELIABILITIES ****
INITIALIZATIONS
LIM=NREQ
LIM2=LIM-1
DO 80 IND=1,NT
7
DO FOR EACH TIME POINT, IN
DESCENDING ORDER, NT TO 1
I=ITRUNC+1-IND
TIME=DELM*FLOAT(I-1)
SUMD ACCUMULATES RELIABILITY
SUMD=1.0
EXPONENTIAL CONSTANT
EC1=EXP(-LAMBAR*TIME*FLOAT(NI))
CALCULATE PROBABILITIES, IN
DESCENDING ORDER, LIM-1 TO 0.
DO 70 IND2=1,LIM
7
K=LIM-IND2

CONT. ON PG 5


SUM2=0.0
SUM1=0.0
C COMPUTE FIRST SUMMATION
KLIM=K+1
NILIM=NI+1
DO 40 INDO=KLIM,NILIM
IND3=INDO-1
ARG1=1.+FLOAT(IND3-K)
ARG2=FLOAT(NI-IND3)
ARG3=1.+ARG2/QBAR
BK=GAM(ARG1)*GAM(ARG2+1.)*GAM(ARG3+FLOAT(MI))/GAM(ARG3)
IF ((IND3-2*(IND3/2)).EQ.1)
F
T
BK=-BK
Z=EXP(-LAMBAR*TIME*FLOAT(IND3))
40
SUM1=SUM1+Z/BK
C COMPUTE SECOND SUMMATION
IF (MI.EQ.0)
F
T
GO TO 60
6
B5
DO 50 IND3=1,MI
6

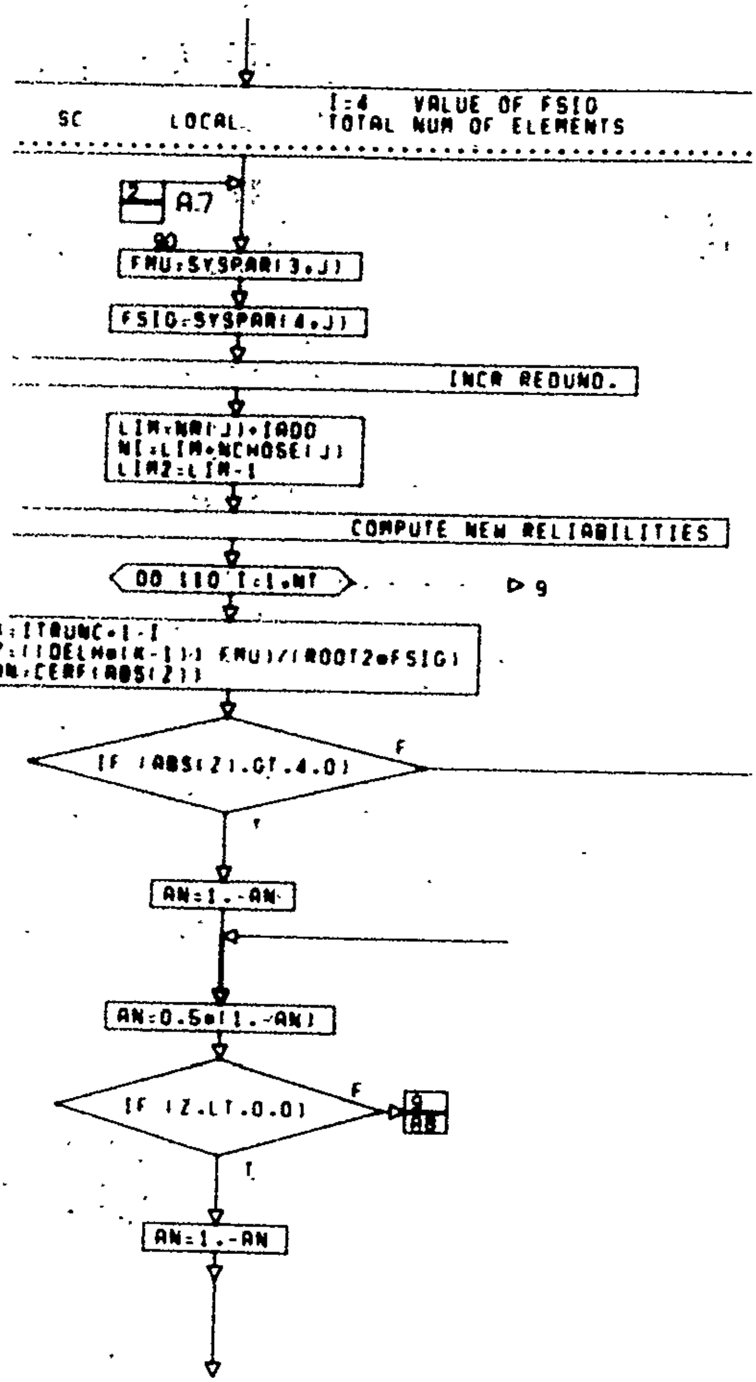
CONT. ON PG 6


ARG1:FLOAT(IND3)
ARG2:1.+FLOAT(NI-IND3)
ARG3:1.+ARG1*QBAR
CJ:GAM(ARG1+1.)*GAM(ARG2)*GAM(ARG3+FLOAT(NI-K))/GAM(ARG3)
ICK:NI+IND3
IF (((ICK-2*(ICK/2)).EQ.1)
F
T
CJ:-CJ
Z:EXP(-Q*LAM*TIME*ARG1)
50
SUM2:SUM2+Z/CJ
CALCULATION OF PROBABILITY
PR(K):A(K)*SUMS
5
A5
60
SUM2:SUM1+EC1*SUM2
ARG1:FLOAT(NI)
ARG2:1.+FLOAT(K)
ARG3:1.+ARG1/QBAR
AK:GAM(ARG1+1.)*GAM(ARG3+FLOAT(NI))/(GAM(ARG2)*GAM(ARG3))
IF ((K-2*(K/2)).EQ.1)
F
7
A6
T
AK:-AK
ACCUMULATE RELIABILITY
CONT. ON PG
PG 6 OF 14



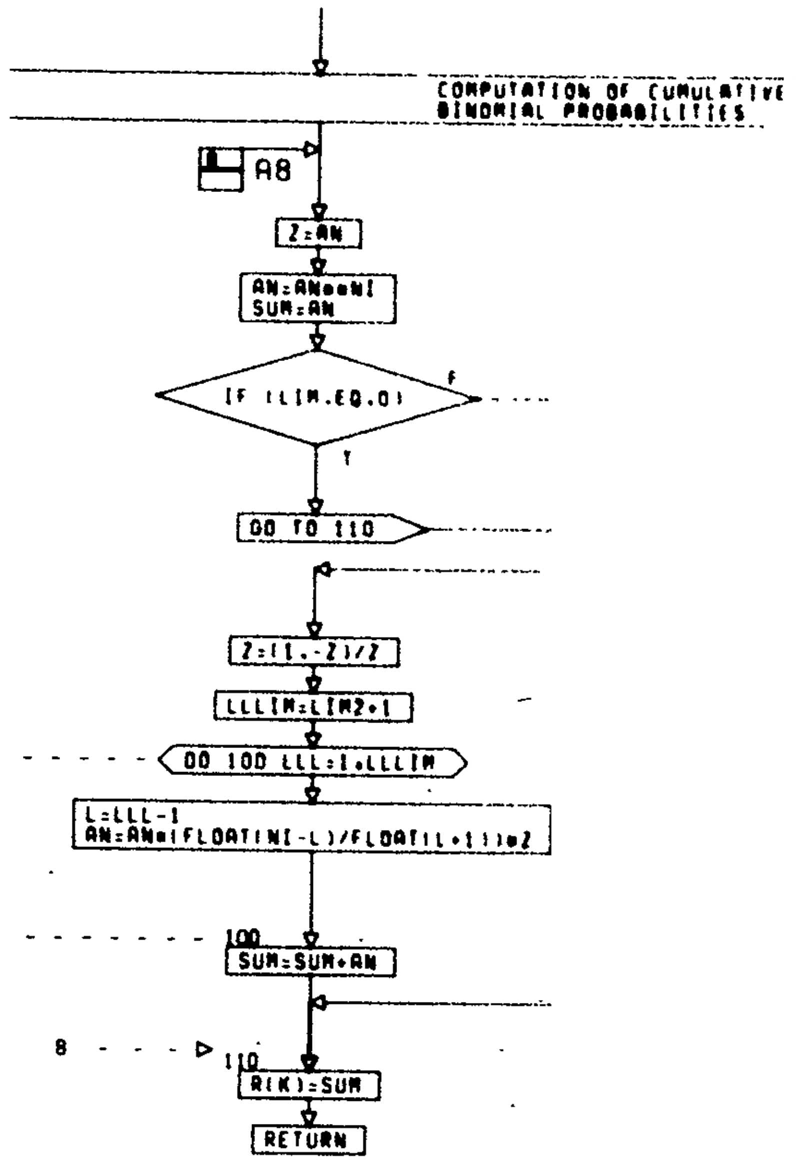
A6
SUMO:SUMO-AK*SUM2
4
70
CONTINUE
C CR COUPLING OPTION
C ASSIGN RELIABILITY AND INCR
C TIME
IF (MOD.EQ.3)
F
T
SUMO:SUMO*R(I)
4
80
R(I):SUMO
C CR COUPLING OPTION
IF (MOD.EQ.3)
F
T
J:J-1
RETURN
C MODEL2
C VARIABLES SIZE ORIGIN DEFN
C FMU SC LOCAL MEAN UNIT LIFE
C FSIG SC LOCAL STD. DEV.
C SYSPAR I,J GLOBAL MODEL PARAMETERS FOR J-TH
C MODULE
C I=3 VALUE OF FMU

CONT. ON PG 8



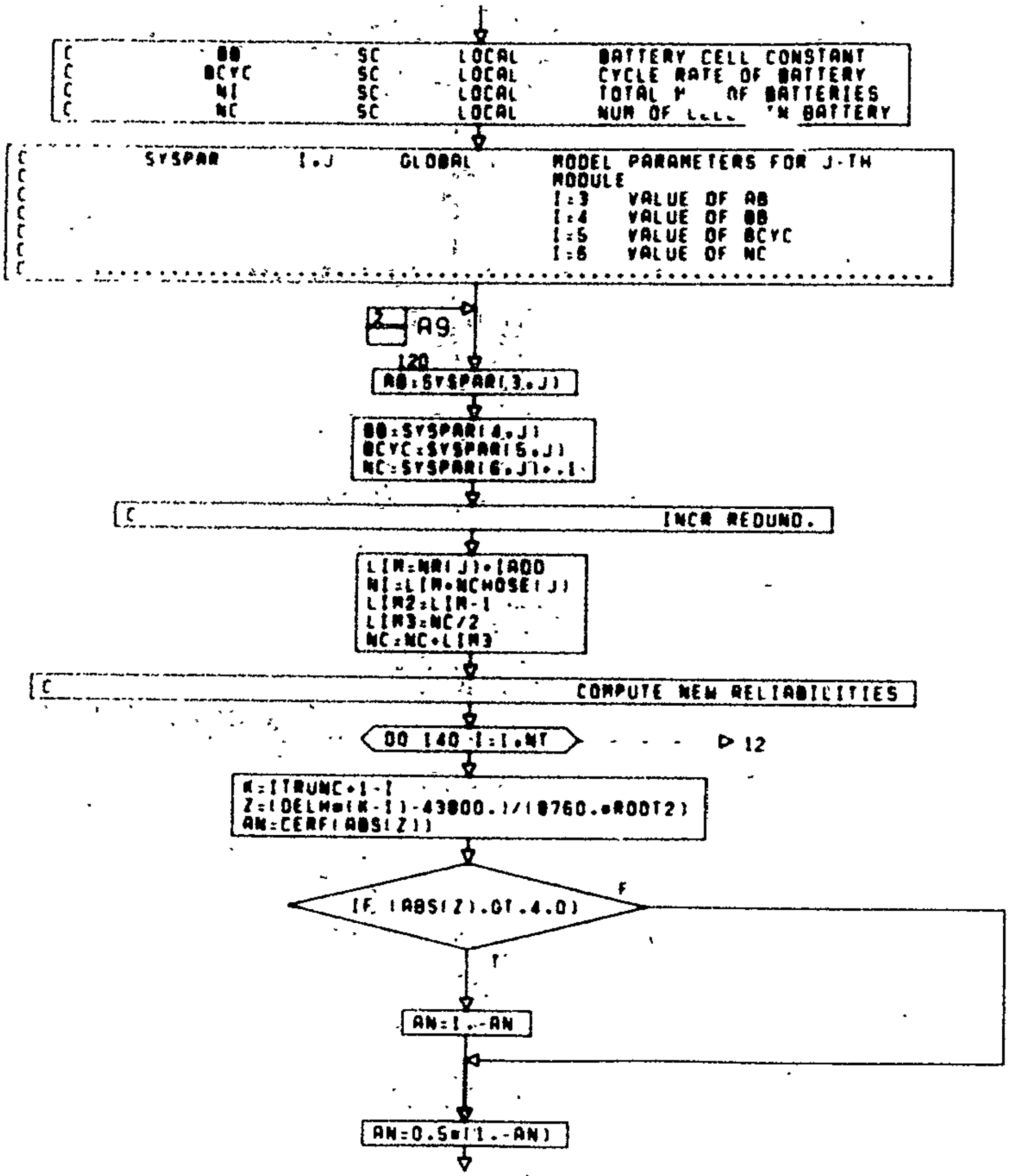
CONT. ON PG 9

PG 8 OF 14

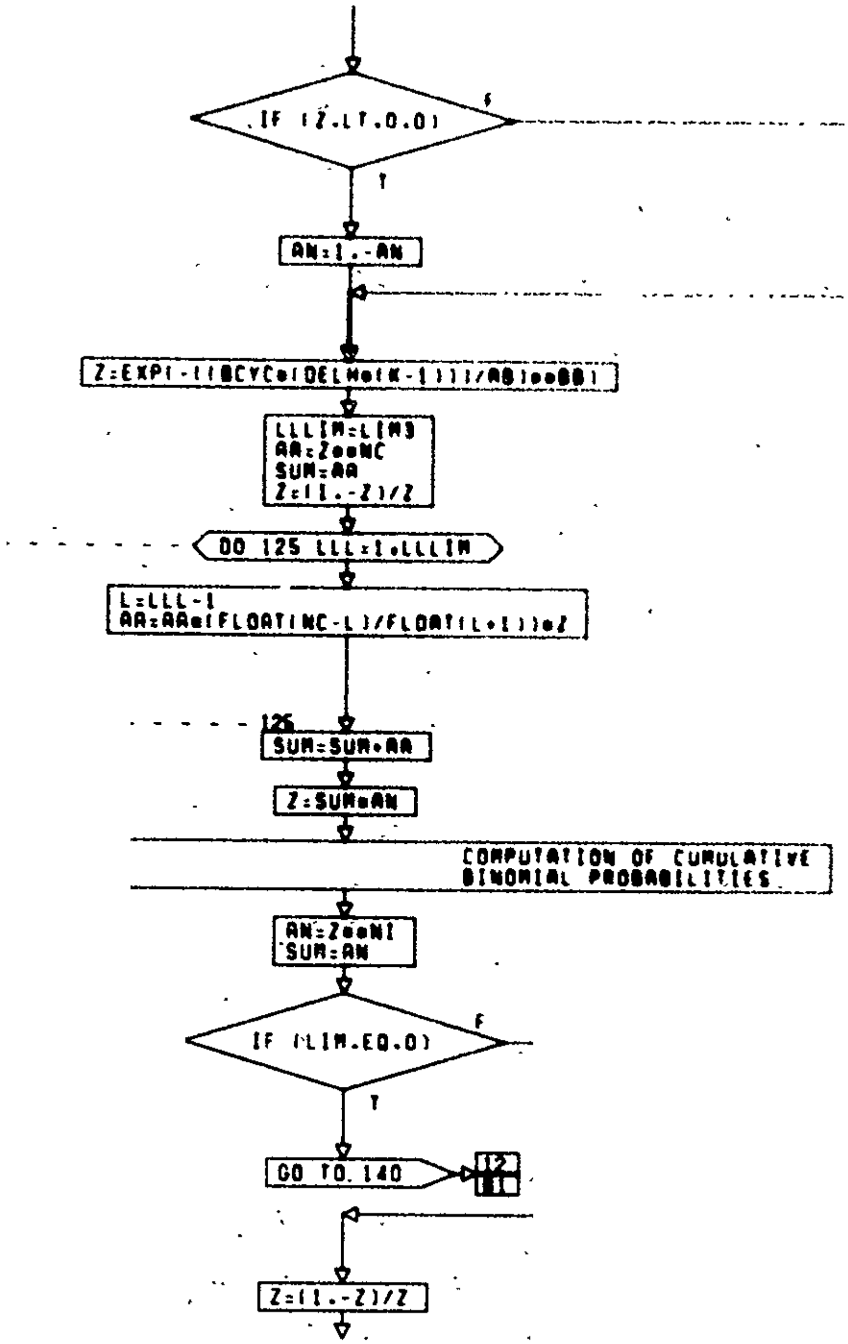



```
C      ...........................................................................
C      MODEL3
C          VARIABLES        SIZE       ORIGIN          DEFN
C             AB             SC         LOCAL          BATTERY CELL CONSTANT
```

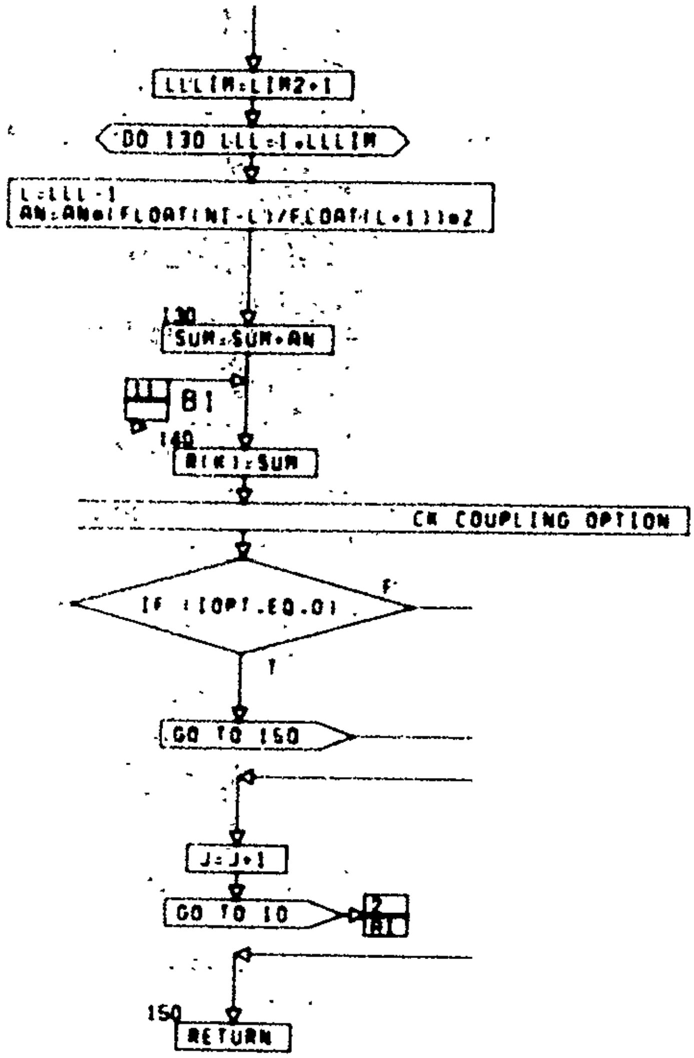
CONT. ON PG 10


C BB SC LOCAL BATTERY CELL CONSTANT
C BCYC SC LOCAL CYCLE RATE OF BATTERY
C NI SC LOCAL TOTAL N[illegible] OF BATTERIES
C NC SC LOCAL NUM OF [illegible] N BATTERY
C SYSPAR I,J GLOBAL MODEL PARAMETERS FOR J-TH MODULE
I=3 VALUE OF AB
I=4 VALUE OF BB
I=5 VALUE OF BCYC
I=6 VALUE OF NC
2
A9
120
AB=SYSPAR(3,J)
BB=SYSPAR(4,J)
BCYC=SYSPAR(5,J)
NC=SYSPAR(6,J)+.1
C INCR REDUND.
LIM=NR(J)+IADD
NI=LIM*NCHOSE(J)
LIM2=LIM-1
LIM3=NC/2
NC=NC+LIM3
C COMPUTE NEW RELIABILITIES
DO 140 I=1,NT
12
K=ITRUNC+1-I
Z=(DELM*(K-1)-43800.)/(8760.*ROOT2)
AN=CERF(ABS(Z))
IF (ABS(Z).GT.4.0)
F
T
AN=1.-AN
AN=0.5*(1.-AN)

CONT. ON PG 11

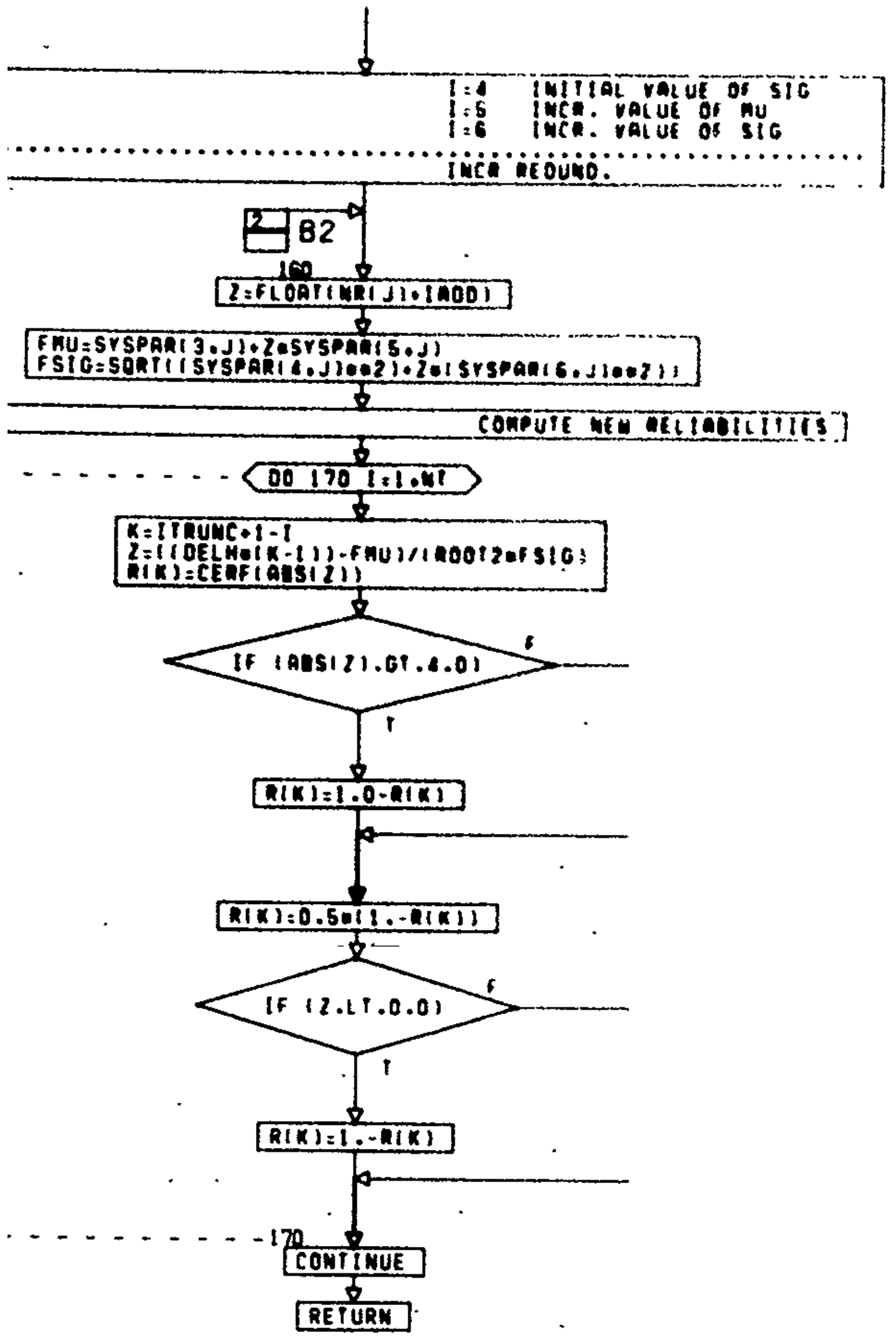

IF (Z.LT.0.0)
F
T
AN=1.-AN
Z=EXP(-((BCYC*(DELM*(K-1)))/AB)**BB)
LLLIM=LIM3
AA=Z**NC
SUM=AA
Z=(1.-Z)/Z
DO 125 LLL=1,LLLIM
L=LLL-1
AA=AA*(FLOAT(NC-L)/FLOAT(L+1))*Z
125
SUM=SUM+AA
Z=SUM*AN
COMPUTATION OF CUMULATIVE
BINOMIAL PROBABILITIES
AN=Z**NI
SUM=AN
IF (LIM.EQ.0)
F
T
GO TO 140
12
B1
Z=(1.-Z)/Z

CONT. ON PG 12




```
C     ..........................................................................
C     MODEL4
C         VARIABLES       SIZE      ORIGIN         DEFN
C             FMU          SC        LOCAL         MEAN EXPENABLE DEPLETION TIME
C             FSIG         SC        LOCAL         STD. DEV. OF DEPLETION TIME
C           SYSPAR         I,J       GLOBAL        MODEL PARAMETERS FOR J-TH
C                                                  MODULE
C                                                  I=3   INITIAL VALUE OF MU
```

CONT. ON PG 13


I:4 INITIAL VALUE OF SIG
I:5 INCR. VALUE OF MU
I:6 INCR. VALUE OF SIG
INCR REDUND.
2
B2
160
Z=FLOAT(NR(J)+IADD)
FMU=SYSPAR(3,J)+Z*SYSPAR(5,J)
FSIG=SQRT((SYSPAR(4,J)**2)+Z*(SYSPAR(6,J)**2))
COMPUTE NEW RELIABILITIES
DO 170 I=1,NT
K=ITRUNC+1-I
Z=((DELH*(K-1))-FMU)/(ROOT2*FSIG)
R(K)=CERF(ABS(Z))
IF (ABS(Z).GT.4.0)
F
T
R(K)=1.0-R(K)
R(K)=0.5*(1.-R(K))
IF (Z.LT.0.0)
F
T
R(K)=1.-R(K)
170
CONTINUE
RETURN

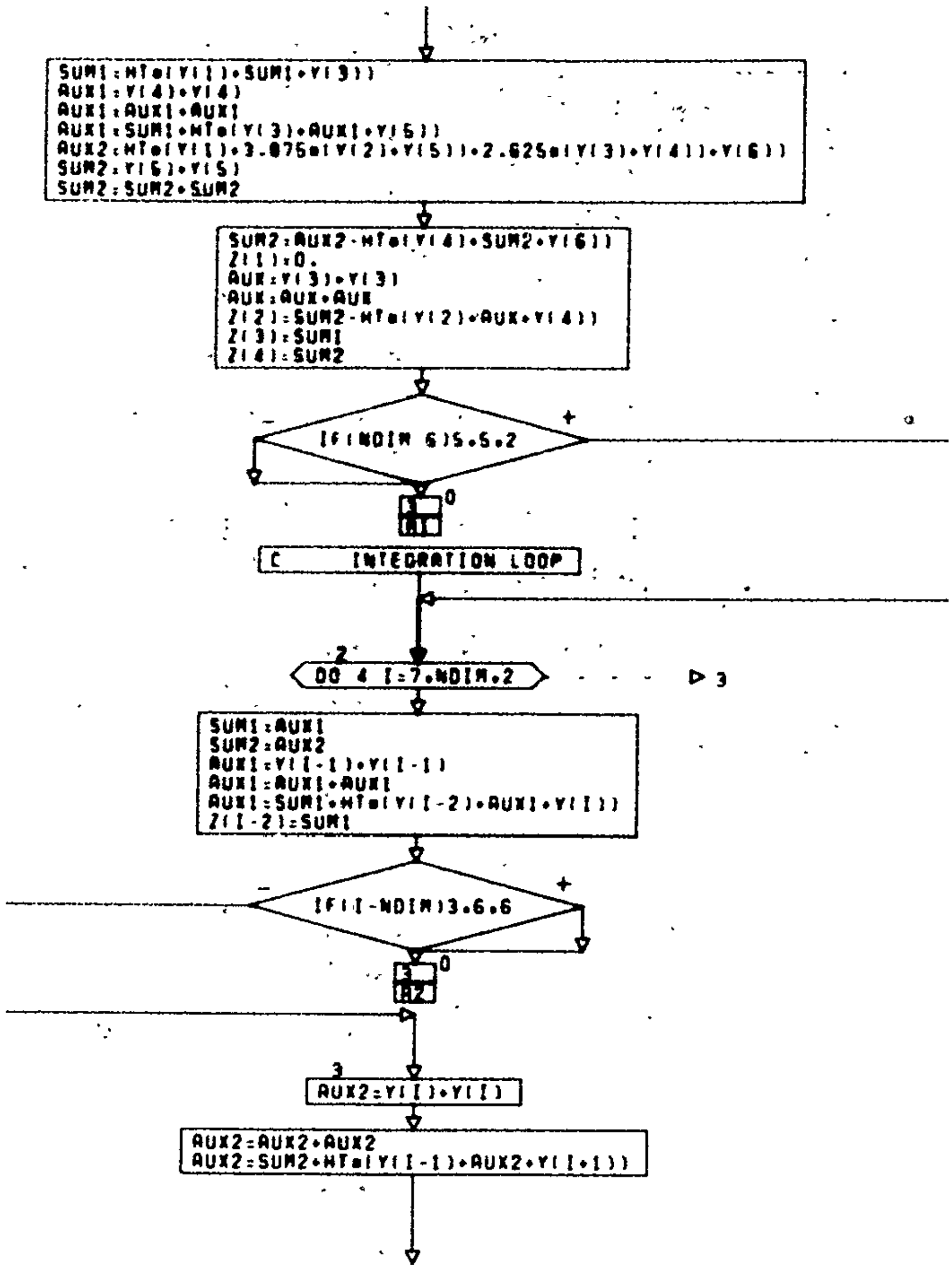
CONT. ON PG 14

END

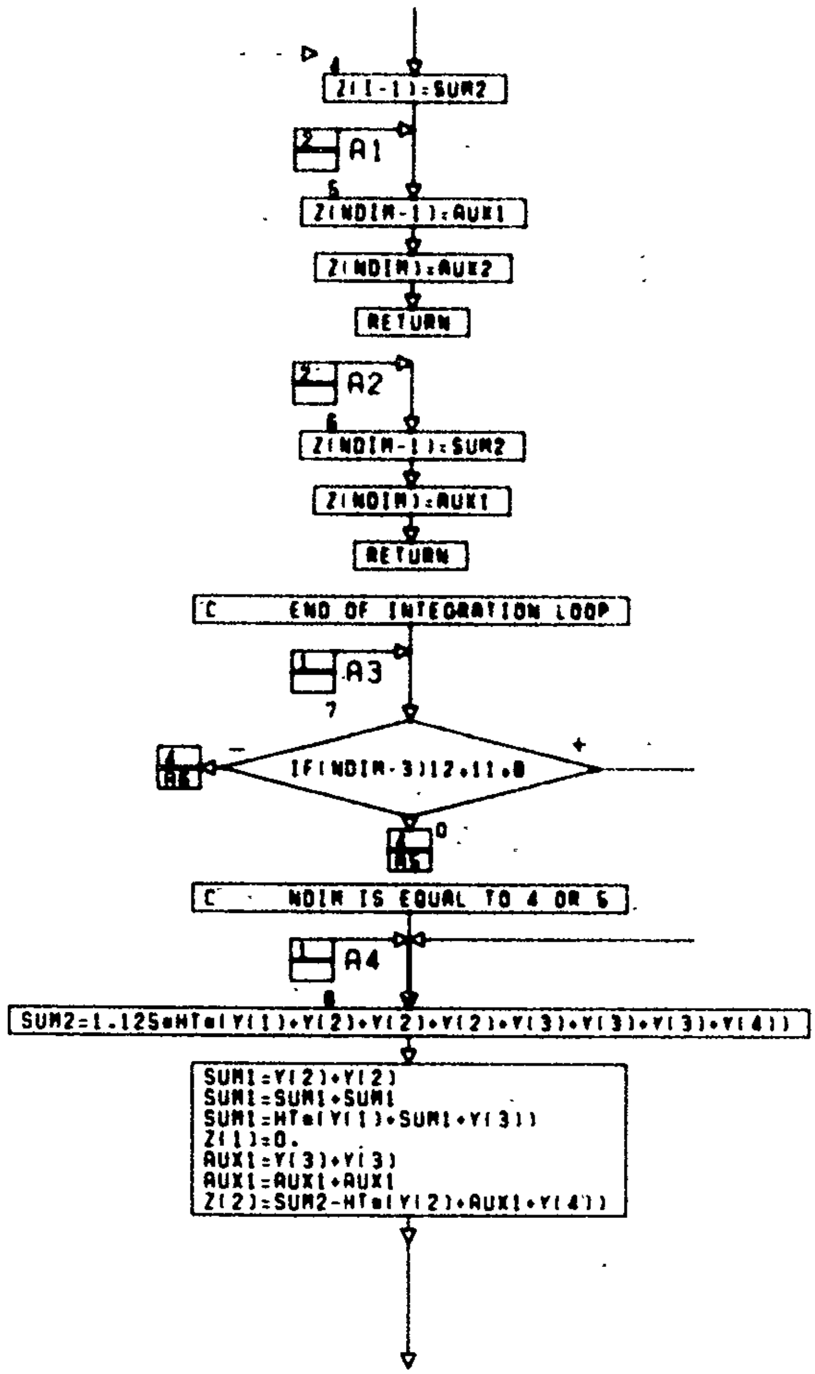
PG 14 FINAL

```
SUBROUTINE QSF(H,Y,Z,NDIM)

C      ..................................................................
C         SUBROUTINE QSF
C         PURPOSE
C            TO COMPUTE THE VECTOR OF INTEGRAL VALUES FOR A GIVEN
C            EQUIDISTANT TABLE OF FUNCTION VALUES.
C         USAGE
C            CALL QSF (H,Y,Z,NDIM)
C         DESCRIPTION OF PARAMETERS

C            H      - THE INCREMENT OF ARGUMENT VALUES.
C            Y      - THE INPUT VECTOR OF FUNCTION VALUES.
C            Z      - THE RESULTING VECTOR OF INTEGRAL VALUES. Z MAY BE
C                     IDENTICAL WITH Y.
C            NDIM   - THE DIMENSION OF VECTORS Y AND Z.
C         REMARKS
C            NO ACTION IN CASE NDIM LESS THAN 3.
C         SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED

C            NONE
C         METHOD
C            BEGINNING WITH Z(1)=0, EVALUATION OF VECTOR Z IS DONE BY
C            MEANS OF SIMPSONS RULE TOGETHER WITH NEWTONS 3/8 RULE OR A
C            COMBINATION OF THESE TWO RULES. TRUNCATION ERROR IS OF
C            ORDER H**5 (I.E. FOURTH ORDER METHOD). ONLY IN CASE NDIM=3
C            TRUNCATION ERROR OF Z(2) IS OF ORDER H**4.
C            FOR REFERENCE, SEE

C            (1) F.B.HILDEBRAND, INTRODUCTION TO NUMERICAL ANALYSIS,
C                MCGRAW-HILL, NEW YORK/TORONTO/LONDON, 1956, PP.71-76.
C            (2) R.ZURMUEHL, PRAKTISCHE MATHEMATIK FUER INGENIEURE UND
C                PHYSIKER, SPRINGER, BERLIN/GOETTINGEN/HEIDELBERG, 1963,
C                PP.214-221.
C      ..................................................................

DIMENSION Y(1),Z(1)
HT=.3333333*H

IF(NDIM-5)7,8,1
   -  -> 3 / A3
   0  -> 8 / A4
   +  -> 1

C      NDIM IS GREATER THAN 5. PREPARATIONS OF INTEGRATION LOOP

1  SUM1=Y(2)+Y(2)
   SUM1=SUM1+SUM1
```

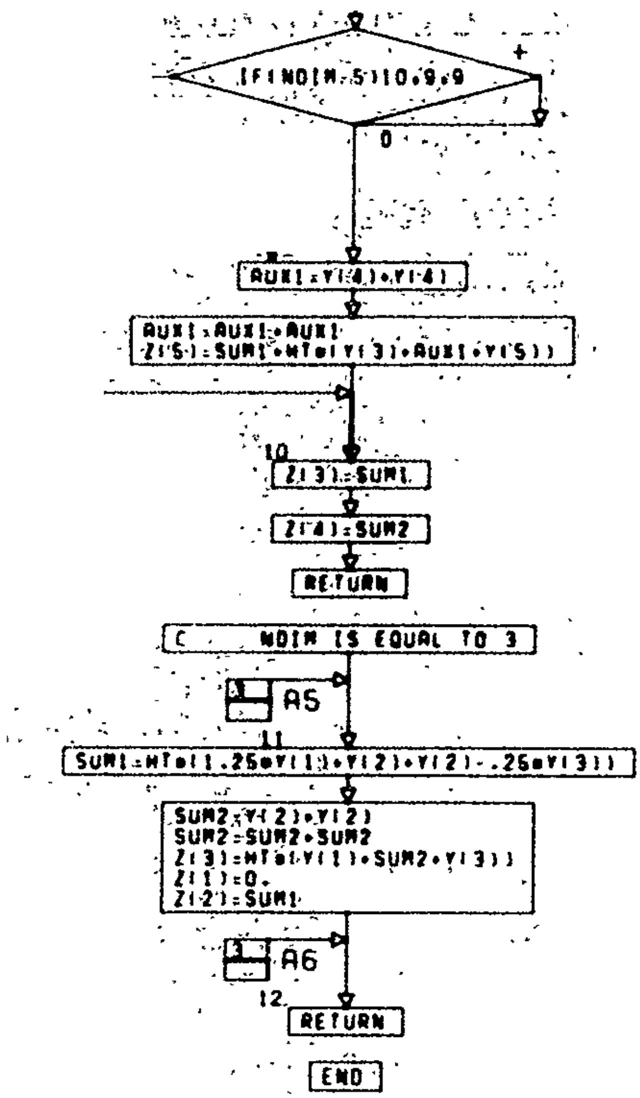
CONT. ON PG 2


SUM1=HT*(Y(1)+SUM1+Y(3))
AUX1=Y(4)+Y(4)
AUX1=AUX1+AUX1
AUX1=SUM1+HT*(Y(3)+AUX1+Y(5))
AUX2=HT*(Y(1)+3.875*(Y(2)+Y(5))+2.625*(Y(3)+Y(4))+Y(6))
SUM2=Y(5)+Y(5)
SUM2=SUM2+SUM2
SUM2=AUX2-HT*(Y(4)+SUM2+Y(6))
Z(1)=0.
AUX=Y(3)+Y(3)
AUX=AUX+AUX
Z(2)=SUM2-HT*(Y(2)+AUX+Y(4))
Z(3)=SUM1
Z(4)=SUM2
−
+
IF(NDIM-6)5,5,2
0
C INTEGRATION LOOP
2
DO 4 I=7,NDIM,2
3
SUM1=AUX1
SUM2=AUX2
AUX1=Y(I-1)+Y(I-1)
AUX1=AUX1+AUX1
AUX1=SUM1+HT*(Y(I-2)+AUX1+Y(I))
Z(I-2)=SUM1
−
+
IF(I-NDIM)3,6,6
0
3
AUX2=Y(I)+Y(I)
AUX2=AUX2+AUX2
AUX2=SUM2+HT*(Y(I-1)+AUX2+Y(I+1))

CONT. ON PG 3


4
Z(I-1)=SUM2
2 A1
5
Z(NDIM-1)=AUX1
Z(NDIM)=AUX2
RETURN
2 A2
6
Z(NDIM-1)=SUM2
Z(NDIM)=AUX1
RETURN
C END OF INTEGRATION LOOP
1 A3
7
IF(NDIM-3)12,11,8
-
+
0
A6
A5
C NDIM IS EQUAL TO 4 OR 5
1 A4
8
SUM2=1.125*HT*(Y(1)+Y(2)+Y(2)+Y(2)+Y(3)+Y(3)+Y(3)+Y(4))
SUM1=Y(2)+Y(2)
SUM1=SUM1+SUM1
SUM1=HT*(Y(1)+SUM1+Y(3))
Z(1)=0.
AUX1=Y(3)+Y(3)
AUX1=AUX1+AUX1
Z(2)=SUM2-HT*(Y(2)+AUX1+Y(4))

CONT. ON PG 4


IF(NDIM-5)10,9,9
+
0
AUX1=Y(4)+Y(4)
AUX1=AUX1+AUX1
Z(5)=SUM1+HT*(Y(3)+AUX1+Y(5))
10
Z(3)=SUM1
Z(4)=SUM2
RETURN
C NDIM IS EQUAL TO 3
A5
11
SUM1=HT*(1.25*Y(1)+Y(2)+Y(2)-.25*Y(3))
SUM2=Y(2)+Y(2)
SUM2=SUM2+SUM2
Z(3)=HT*(Y(1)+SUM2+Y(3))
Z(1)=0.
Z(2)=SUM1
A6
12
RETURN
END

PG 4 FINAL

```
SUBROUTINE DPI (IPIC,IERR,ITER,NCONF,ICHOSE,NCHOSE,NOMAT)
DIMENSION IPIC(2), ICHOSE(2), NCONF(6), NCHOSE(2)
COMMON /USER3/BTRMK,SCSFL,TPRFL,OPSMS,ARRAYN(11,3),NMSEQ
```

```
COMMON /BTWN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,
 LMBOD,AREA,SATLO,WATE,WC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,
 SATTWT,TPRIM,IBTL  ,RADA,RADAB,RAT,HTRPWR,HTRPRO,
 HPT,HTPIPE,VCHP,H  T,FC,XNZERO,COMRT,ACSSN,BITRAT(2),
 EQBLG,SABOLO,SATWT
```

```
COMMON /DBCOM/IDB(30),DATAB(55,90)
```

```
COMMON /CHOSE/ICHOSO(60),NCHOSO(60),COST(5,60),REL(6,60),
 THM(4,60),ARRAY(11,60),SKD(7,60)
```

```
COMMON /DPITAB/ HSRT(60),TLPTH(60),GRANH(60),XSRT(60),TLPTL(60),GR
ANL(60)
```

```
COMMON /PRTCOM/ACCRCY,CISTAR,IREL,MMDOLO,TRUNC,ITRUNP,DE,TE,
 TOOLR,QCR,SEIR,PMR,PE,PU,TOOLU,QCP,SEIP,PMP,SATR,SATINV,MER,
 MEINV,PAYR,PAUINV,PAYQUL,OSE,KLTOT,CTOT,FEER,FEEINV,DDTE,XVEST,
 OPS,SKTAU(6),ROLD(60),TSRTT,AN,TS,DS,AM,TF,BF,TC,TA,TB,TOTOPS
```

```
DATA ACSRT,ACSOP,COMOP,DPREQ/10.,50.,6.,4./
```

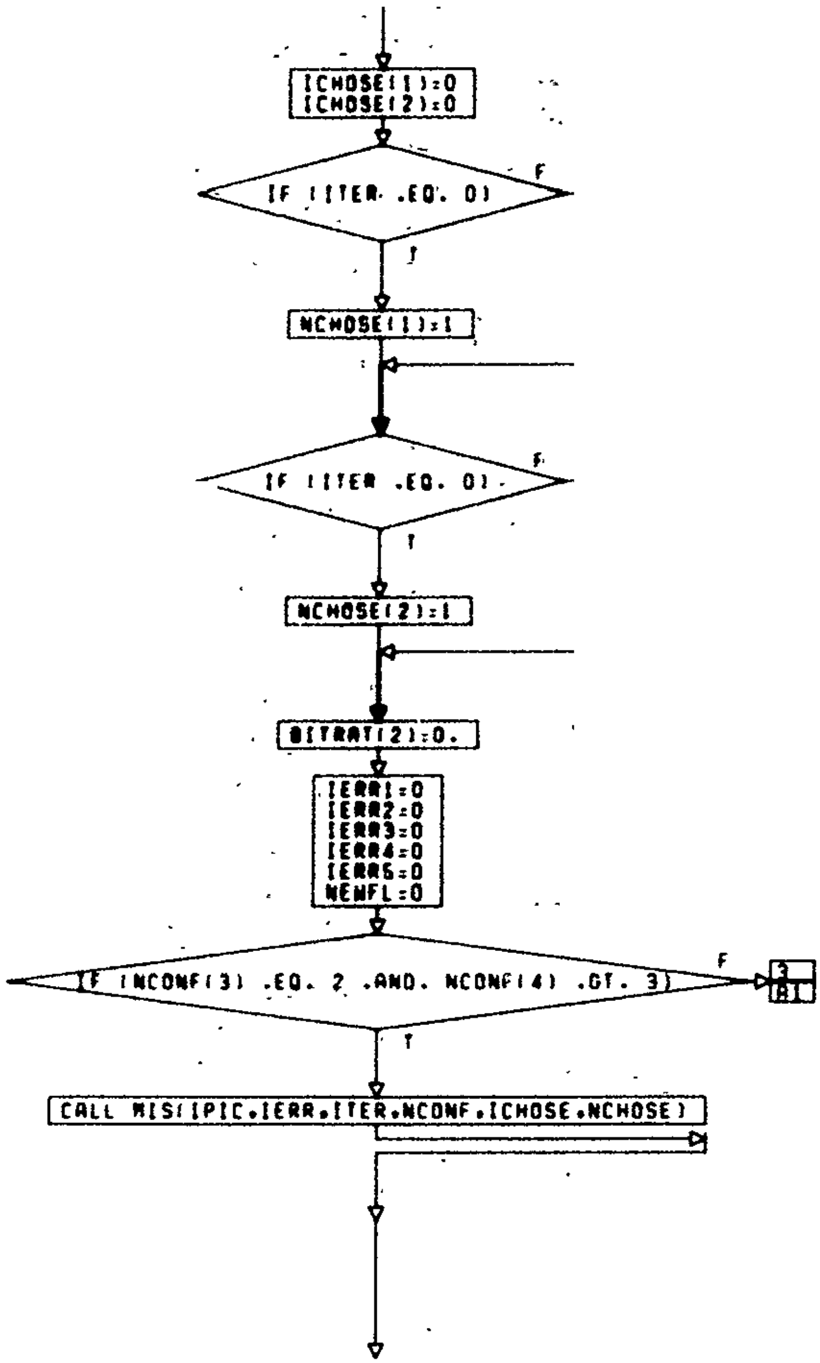
```
C             INPUTS  FOR DATA PROCESSING SUBSYSTEMS - DPI
C   INPUT   CDPI    T D SOURCE  UNITS  DESCRIPTION
C   VAR.   .IN.
C   GRANH  .36      R Y ALL S/S        GRANULARITY HIGH RATE TABLE
C   HSRT    35      R Y ALL S/S SPS    SAMPLE RATE HIGH TABLE
C   TLPTH   34+35   R Y ALL S/S        NO OF ANOL AND DIG POINTS HIGH
C   GRANL   40      R Y ALL S/S        GRANULARITY LOW RATE TABLE
C   XSRT    39      R Y ALL S/S SPS    SAMPLE RATE LOW TABLE
```

```
C   TLPTL   37+38   R Y ALL S/S        NO OF ANOL AND DIG POINTS LOW
C   SCSFL           R   U              SPECIAL COMMAND SYNC FLAG
C   TOTCM   30T032  R   DB             TOTAL NO OF COMMANDS
C   COMTY          -R   MACRO          NCONF(3) - SPEC OR GEN COMPUTER FLAG
C   TTCPL   32      R                  TIME TAG COMMAND FLAG
C   TPRFL           R   U              TELEM PROCESS FLAG
C   ACSSN           R   SC             SUM OF ACS  SENSOR
C   COMRT           R   COMM           COMMAND RATE
```

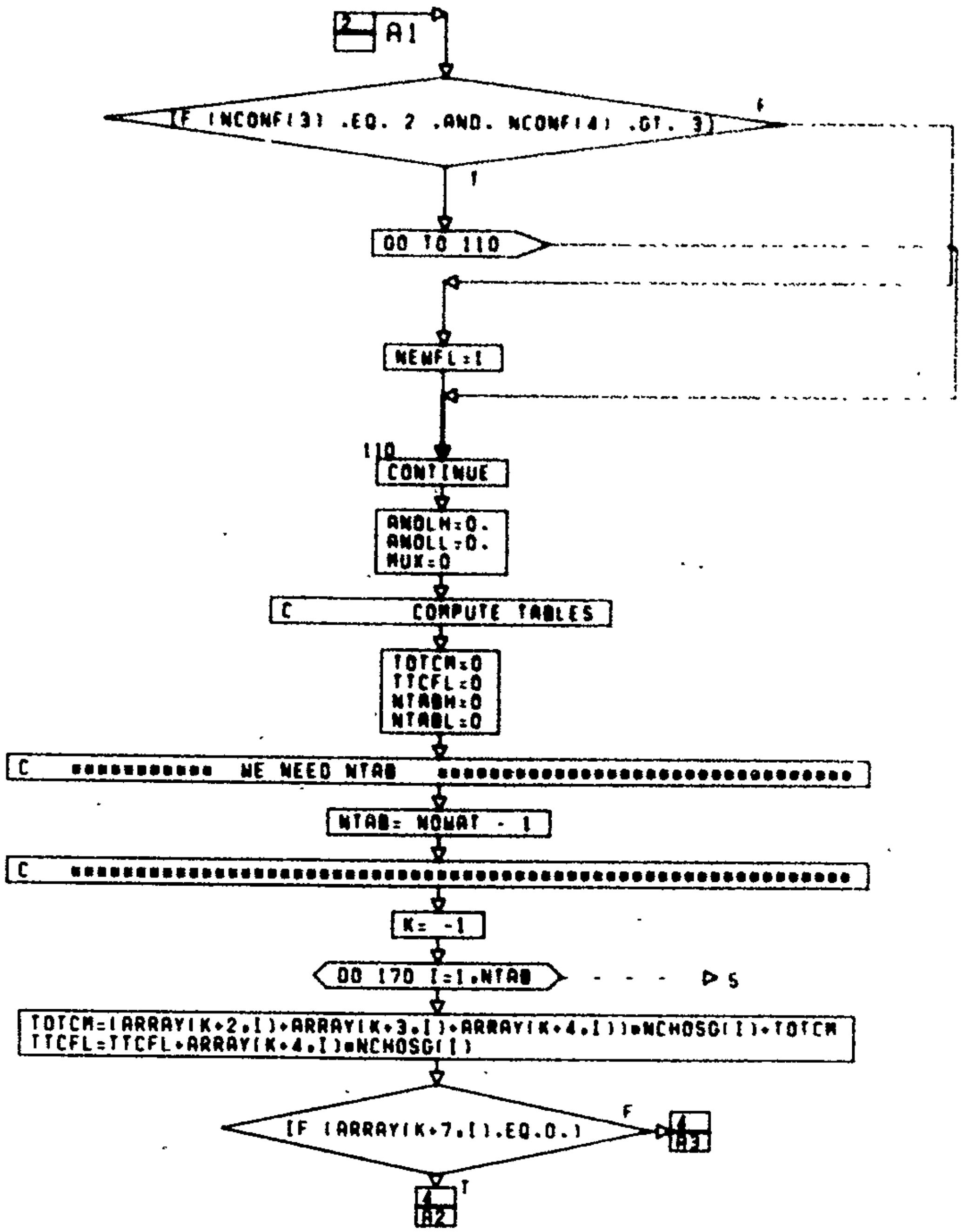
```
C   OPSMS          R    U       SEC-1  MISSION OPS
C   MISPD          I    U              MISSION DATA PROC. FLAG
C            ERROR FLAGS
C            IERR = 1     MUX IS REQUIRED
C            IERR = 10    WORD LENGTH GREATER THAN 256
C            IERR = 100   BIT RATE IS TOO LARGE
C            IERR = 1000 SPECIAL COMMAND SYNC FLAG IS NOT EQUAL TO ZERO
C            IERR = 10000  J1 .GE. JIE
```

```
IERR=0
```

CONT. ON PG 2

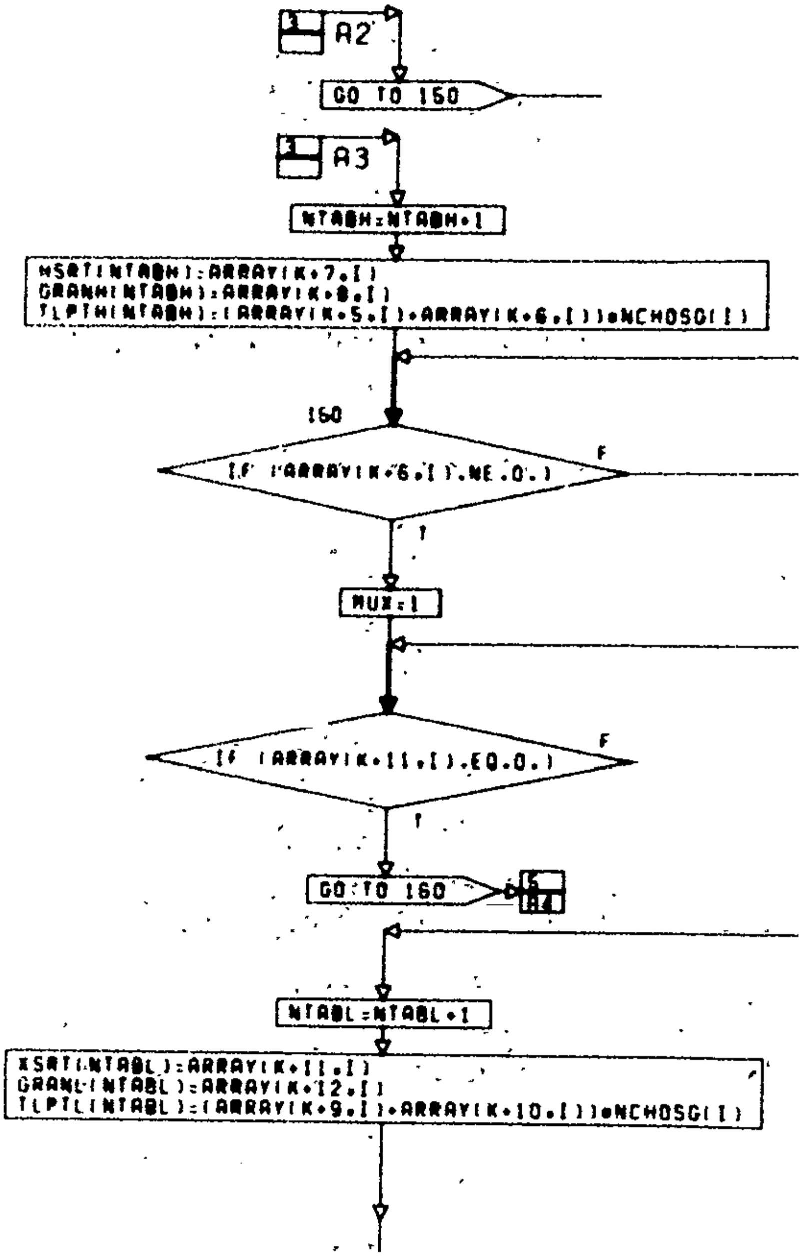

ICHOSE(1)=0
ICHOSE(2)=0
IF (ITER .EQ. 0)
F
T
NCHOSE(1)=1
IF (ITER .EQ. 0)
F
T
NCHOSE(2)=1
BITRAT(2)=0.
IERR1=0
IERR2=0
IERR3=0
IERR4=0
IERR5=0
NEWFL=0
IF (NCONF(3) .EQ. 2 .AND. NCONF(4) .GT. 3)
F
T
3
B1
CALL MIS(IPIC,IERR,ITER,NCONF,ICHOSE,NCHOSE)

CONT. ON PG

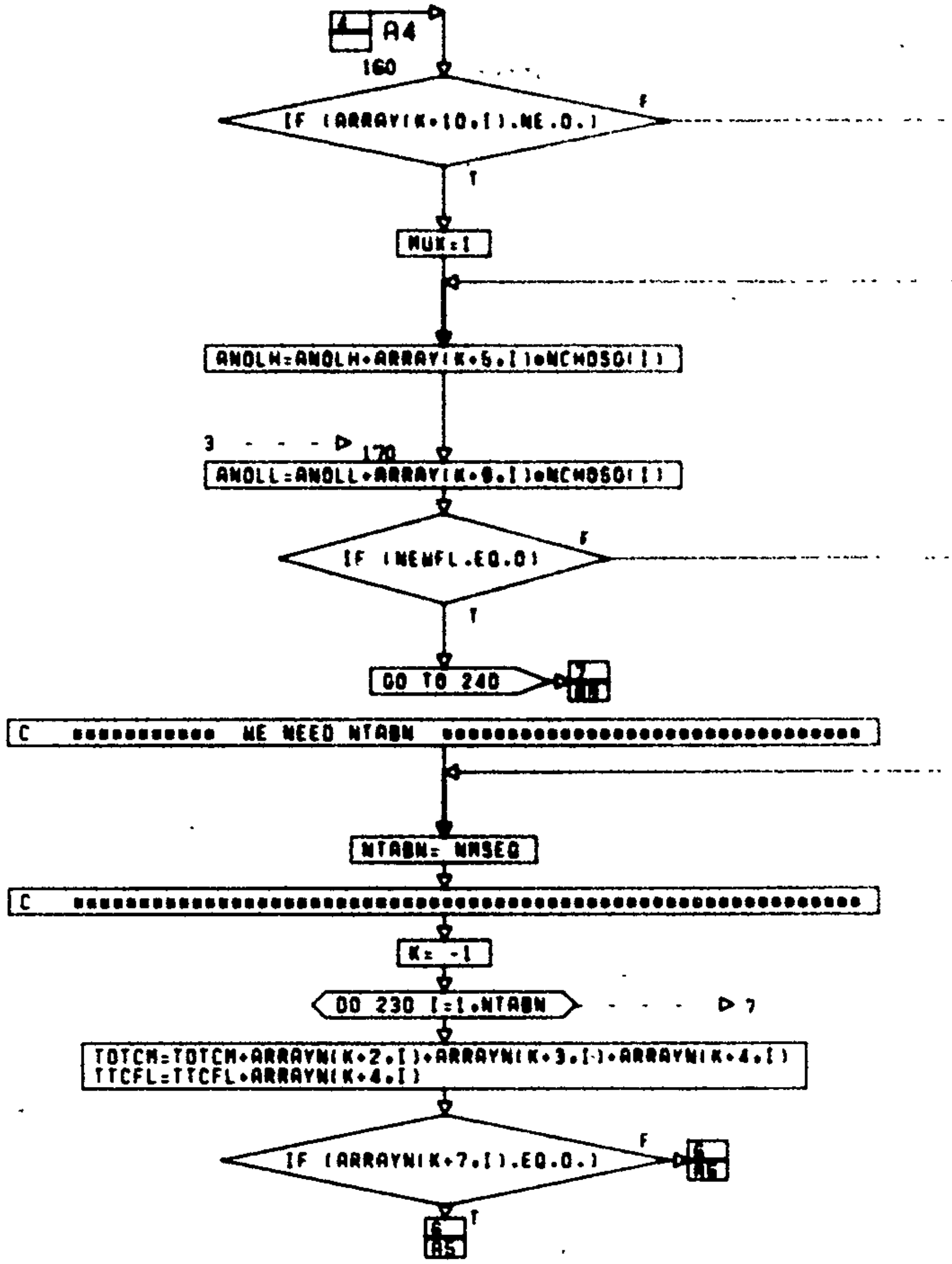


CONT. ON PG 4

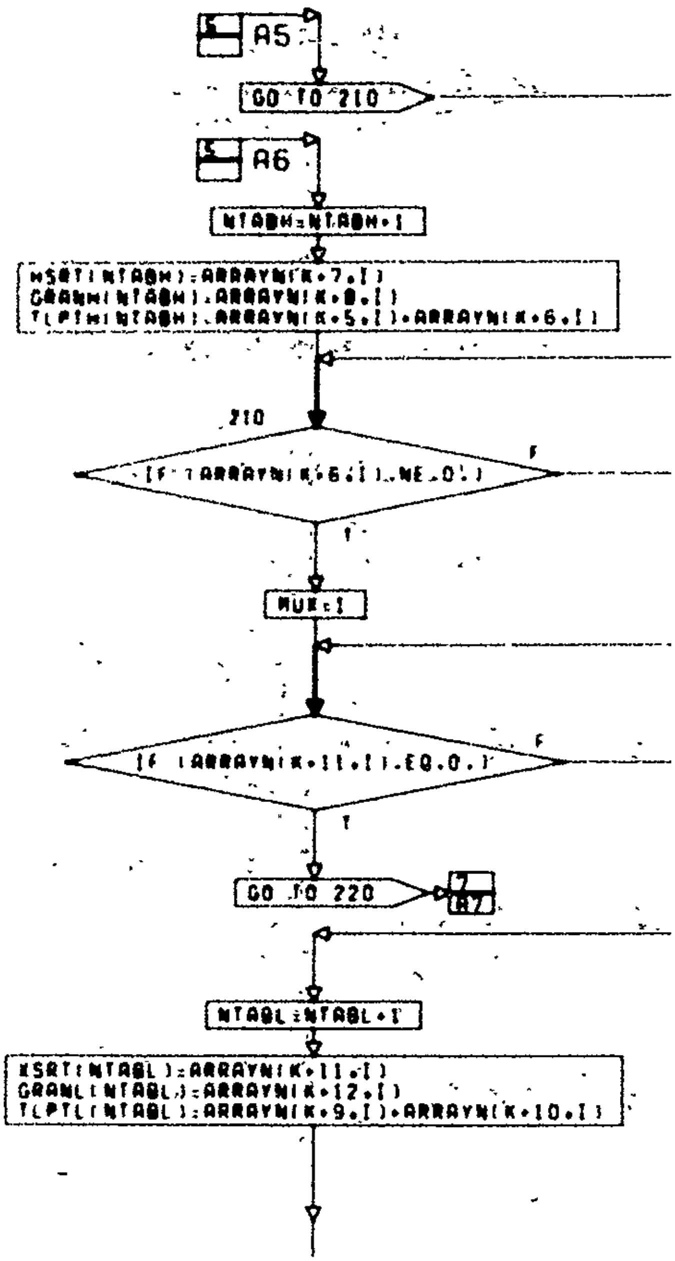
218


A2
GO TO 150
A3
NTABH=NTABH+1
XSRT(NTABH)=ARRAY(K+7,I)
GRANH(NTABH)=ARRAY(K+8,I)
TLPTH(NTABH)=(ARRAY(K+5,I)+ARRAY(K+6,I))*NCHOSG(I)
160
IF (ARRAY(K+6,I).NE.0.)
F
T
MUX=1
IF (ARRAY(K+11,I).EQ.0.)
F
T
GO TO 160
5
A4
NTABL=NTABL+1
XSRT(NTABL)=ARRAY(K+11,I)
GRANL(NTABL)=ARRAY(K+12,I)
TLPTL(NTABL)=(ARRAY(K+9,I)+ARRAY(K+10,I))*NCHOSG(I)

CONT. ON PG 5

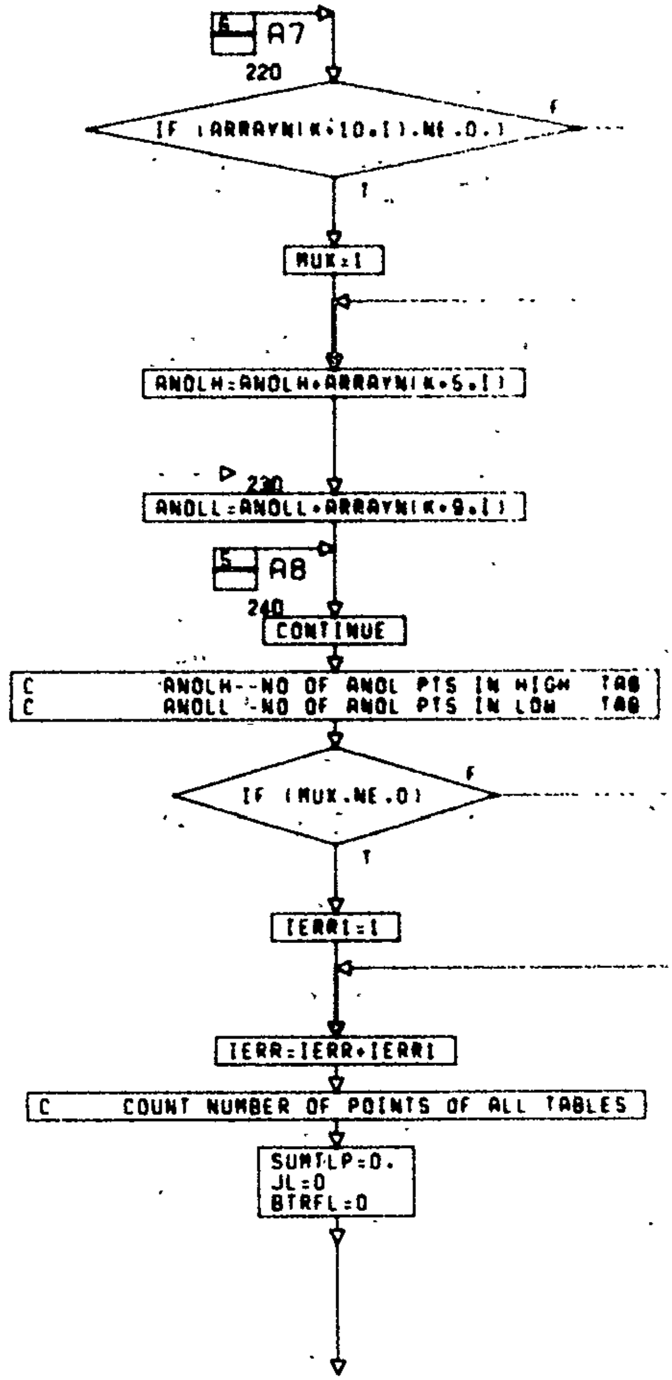

A4
160
IF (ARRAY(K+10,I).NE.0.)
F
T
MUX=1
ANOLH=ANOLH+ARRAY(K+5,I)*NCHOSO(I)
3
170
ANOLL=ANOLL+ARRAY(K+6,I)*NCHOSO(I)
IF (NEWFL.EQ.0)
GO TO 240
C ************ WE NEED NTABN ********************************
NTABN= NNSEG
C **
K= -1
DO 230 I=1,NTABN
7
TOTCM=TOTCM+ARRAYN(K+2,I)+ARRAYN(K+3,I)+ARRAYN(K+4,I)
TTCFL=TTCFL+ARRAYN(K+4,I)
IF (ARRAYN(K+7,I).EQ.0.)
A5

CONT. ON PG 6

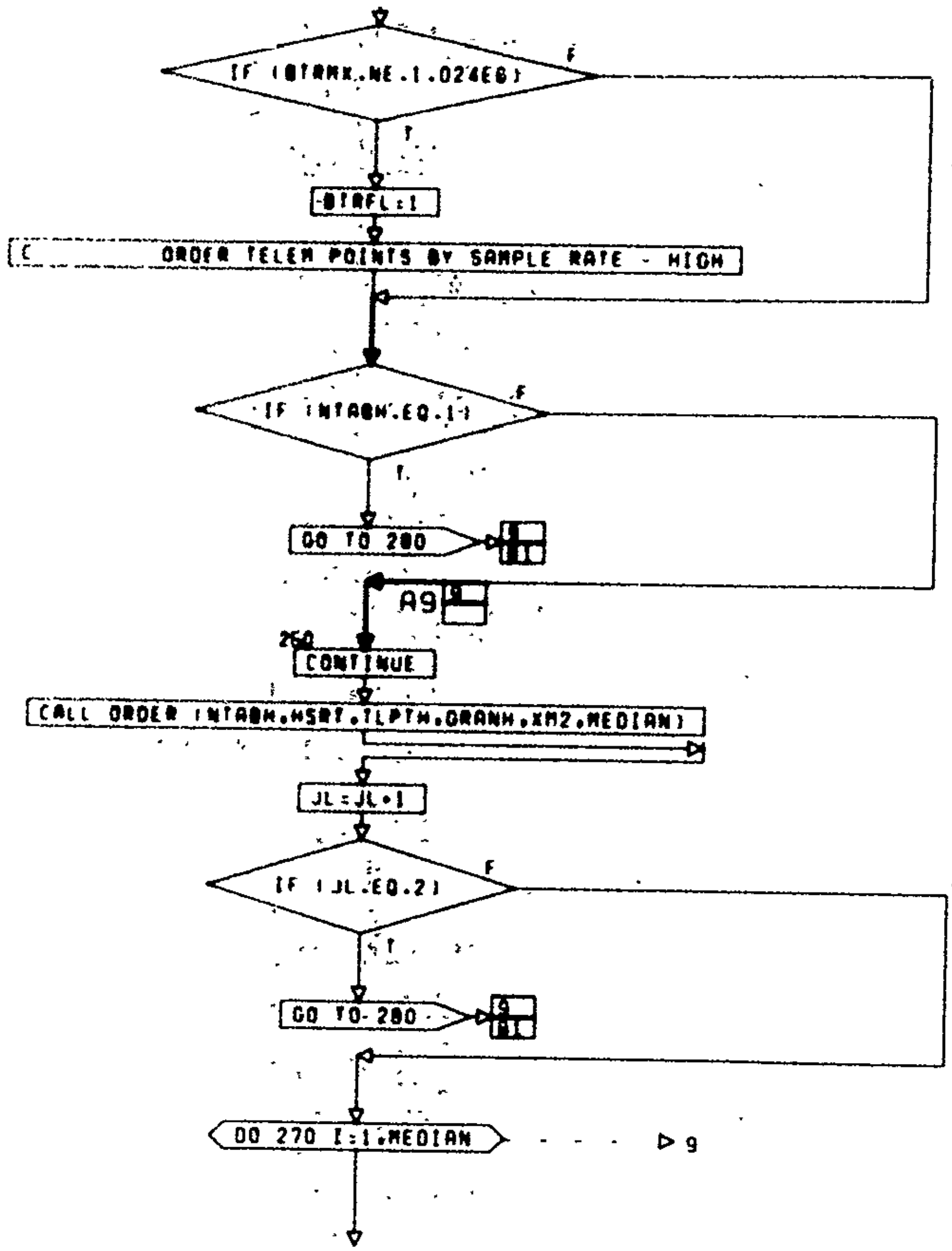


A5
GO TO 210
A6
NTABH=NTABH+1
XSRT(NTABH)=ARRAYN(K+7,I)
GRANH(NTABH)=ARRAYN(K+8,I)
TLPTH(NTABH)=ARRAYN(K+5,I)+ARRAYN(K+6,I)
210
IF (ARRAYN(K+6,I).NE.0.)
F
T
NUX=1
IF (ARRAYN(K+11,I).EQ.0.)
F
T
GO TO 220
7
A7
NTABL=NTABL+1
XSRT(NTABL)=ARRAYN(K+11,I)
GRANL(NTABL)=ARRAYN(K+12,I)
TLPTL(NTABL)=ARRAYN(K+9,I)+ARRAYN(K+10,I)

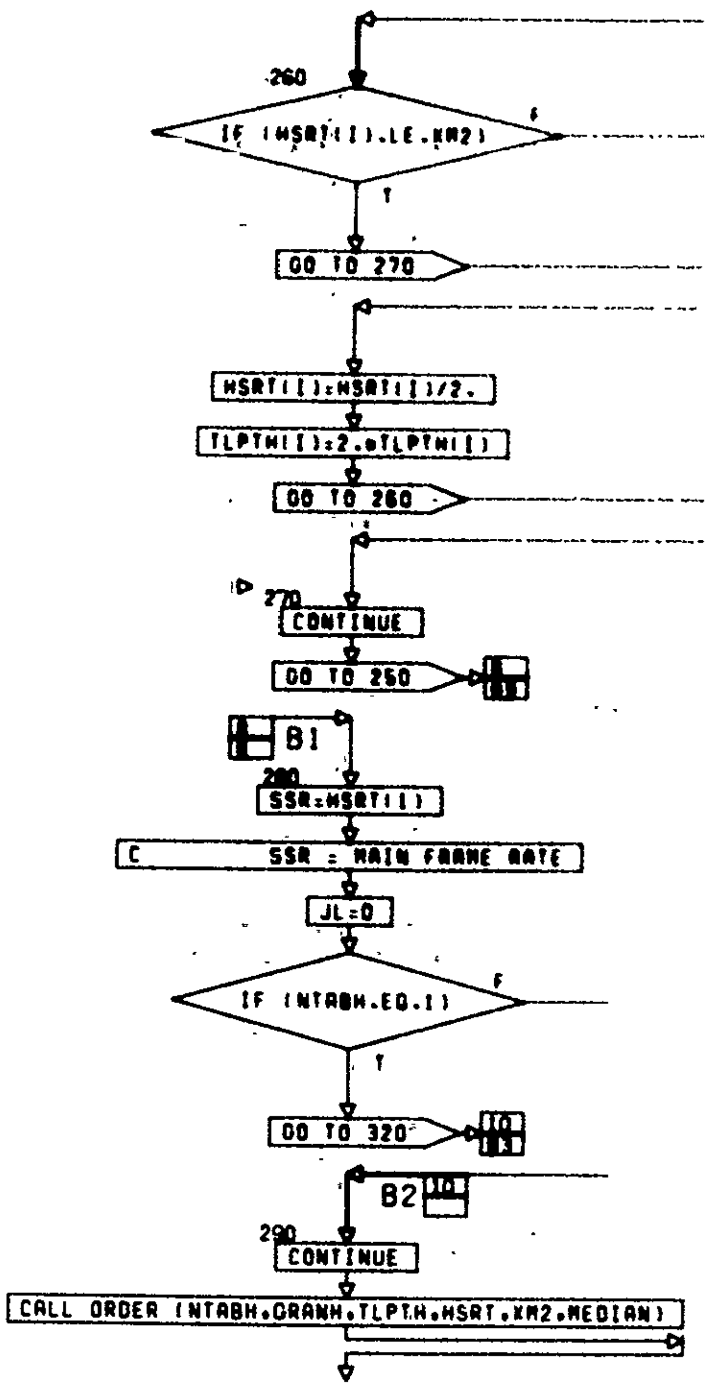
CONT. ON PG


6 A7
220
IF (ARRAYN(K+10,I).NE.0.)
F
T
MUX=1
ANOLH=ANOLH+ARRAYN(K+5,I)
230
ANOLL=ANOLL+ARRAYN(K+9,I)
5 A8
240
CONTINUE
C ANOLH--NO OF ANOL PTS IN HIGH TAB
C ANOLL--NO OF ANOL PTS IN LOW TAB
IF (MUX.NE.0)
F
T
IERR1=1
IERR=IERR+IERR1
C COUNT NUMBER OF POINTS OF ALL TABLES
SUMTLP=0.
JL=0
BTRFL=0

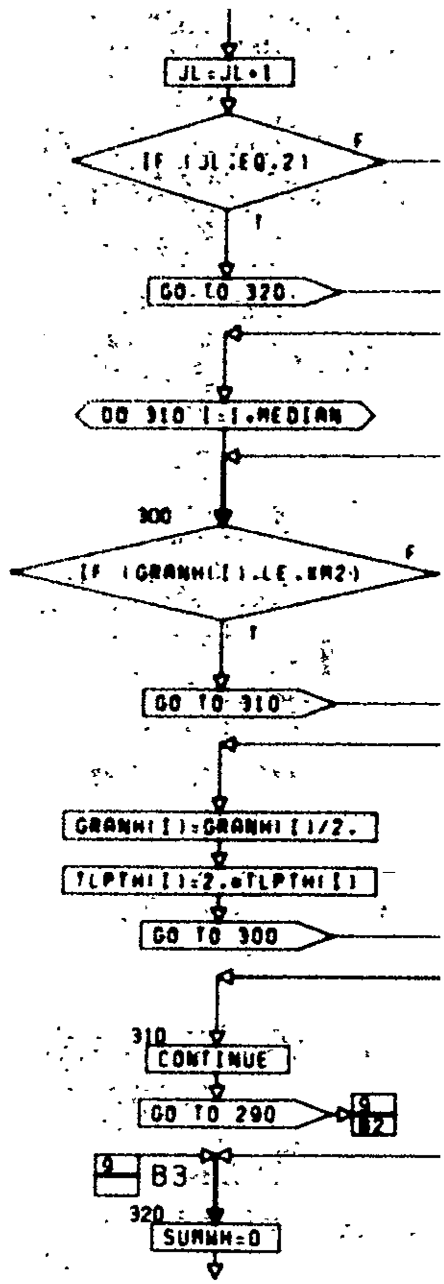
CONT. ON PG 8


IF (BTRMX.NE.1.024E6)
F
T
BTRFL=1
C ORDER TELEM POINTS BY SAMPLE RATE - HIGH
IF (NTABH.EQ.1)
F
T
GO TO 280
A9
250
CONTINUE
CALL ORDER (NTABH,HSRT,TLPTH,ORANH,XM2,MEDIAN)
JL=JL+1
IF (JL.EQ.2)
F
T
GO TO 280
DO 270 I=1,MEDIAN
9

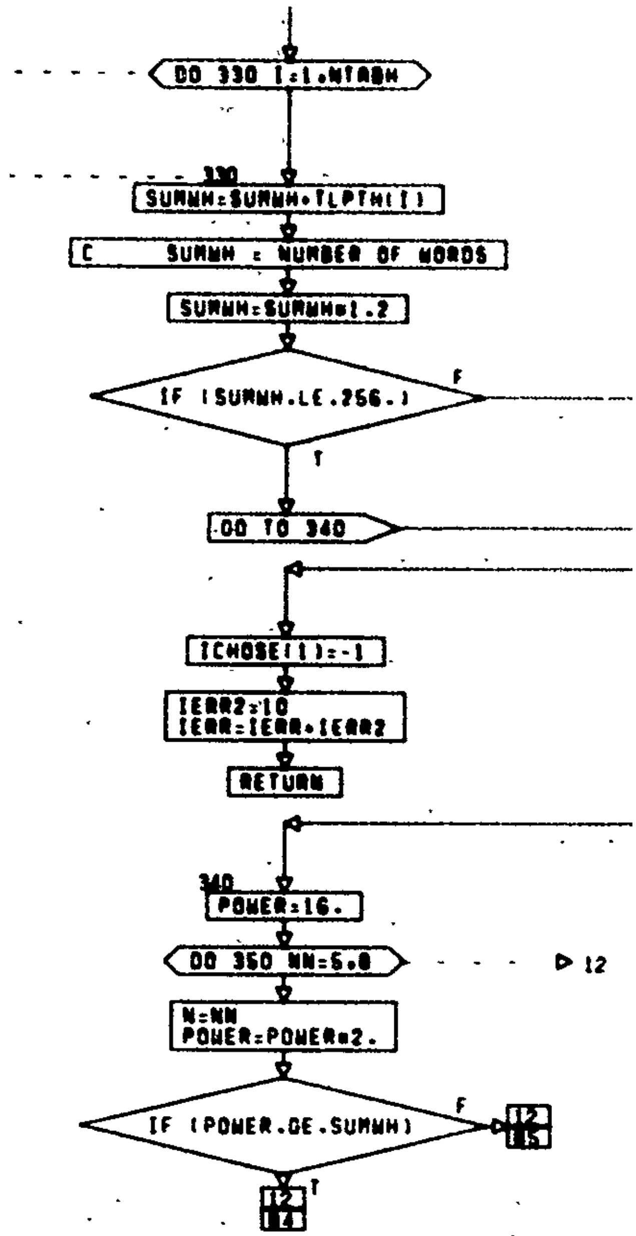
CONT. ON PG 9


260
IF (HSRT(I).LE.XM2)
F
T
GO TO 270
HSRT(I)=HSRT(I)/2.
TLPTH(I)=2.*TLPTH(I)
GO TO 260
270
CONTINUE
GO TO 250
B1
280
SSR=HSRT(I)
C SSR = MAIN FRAME RATE
JL=0
IF (NTABH.EQ.1)
F
T
GO TO 320
B2
290
CONTINUE
CALL ORDER (NTABH,GRANH,TLPTH,HSRT,XM2,MEDIAN)

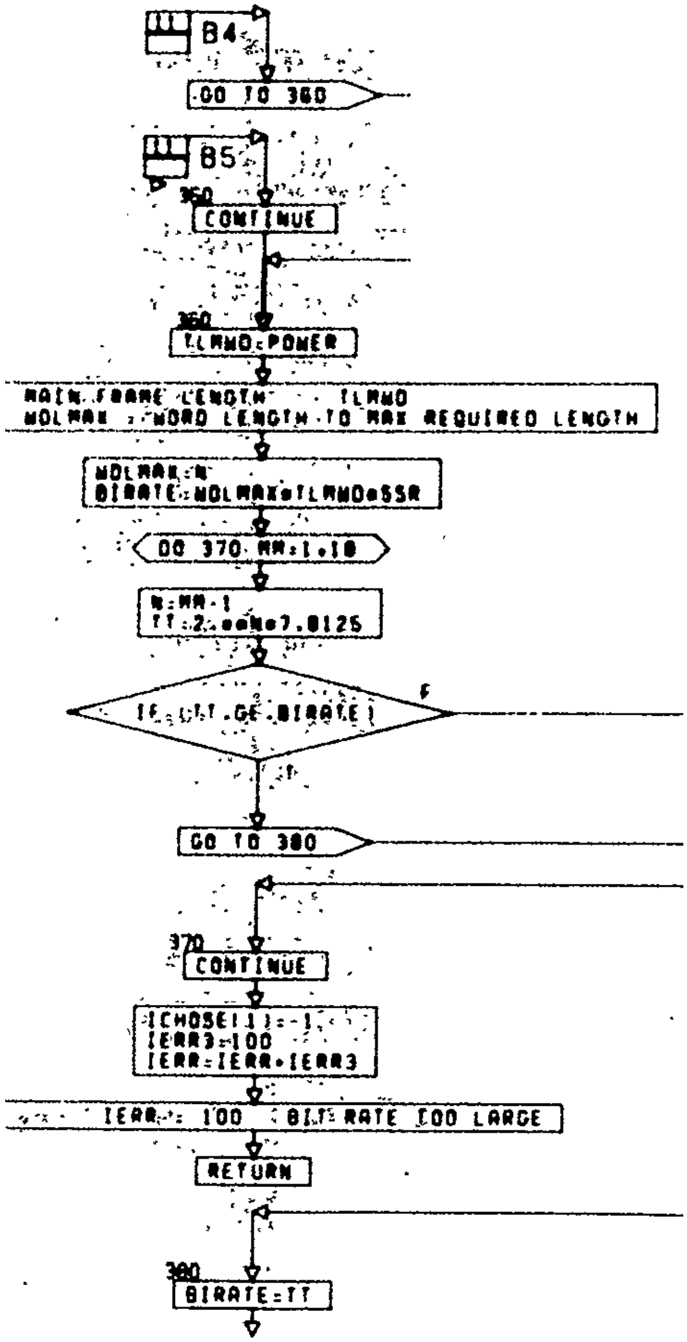
CONT. ON PG 10


JL=JL+1
IF (JL.EQ.2)
F
T
GO TO 320.
DO 310 I=1,MEDIAN
300
IF (GRANH(I).LE.XM2)
F
T
GO TO 310
GRANH(I)=GRANH(I)/2.
TLPTH(I)=2.*TLPTH(I)
GO TO 300
310
CONTINUE
GO TO 290
9
B2
9
B3
320
SUMMH=0

CONT. ON PG 11

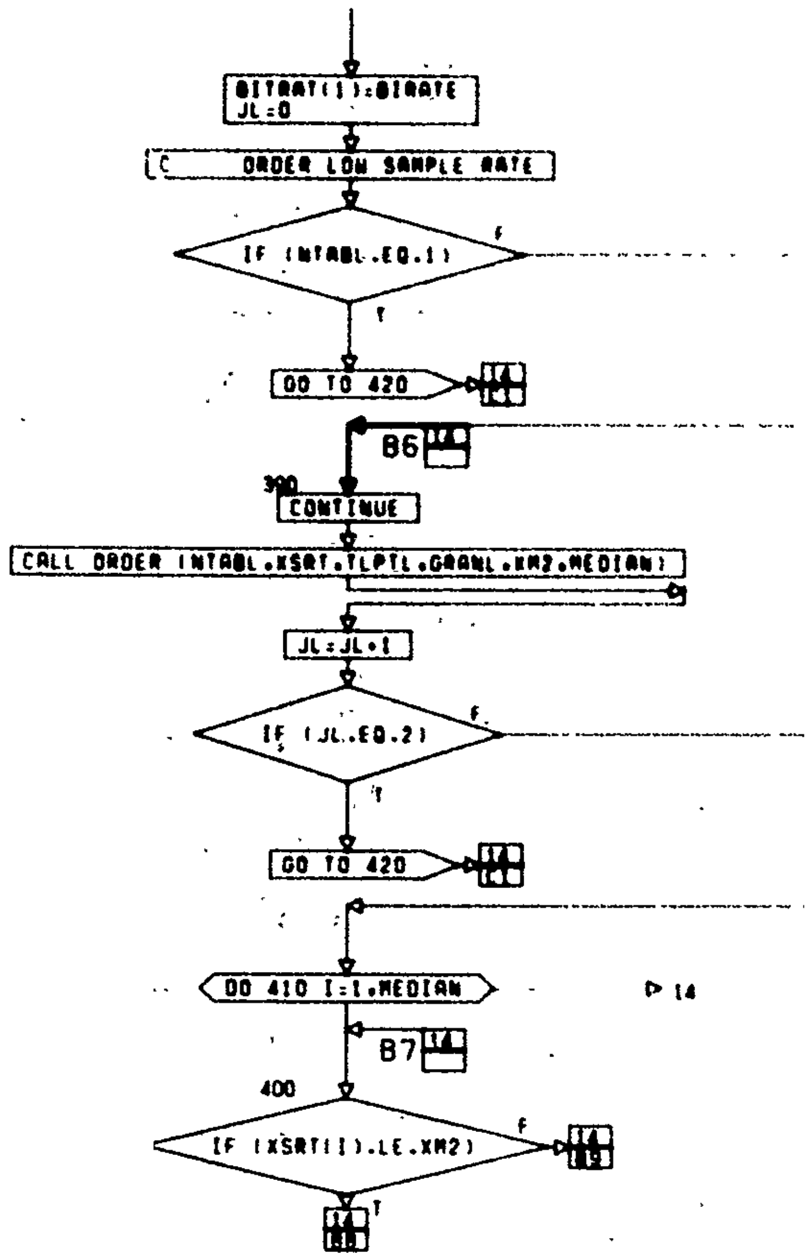

DO 330 I=1,NTABH
330
SUMWH=SUMWH+TLPTH(I)
C SUMWH = NUMBER OF WORDS
SUMWH=SUMWH*1.2
IF (SUMWH.LE.256.)
F
T
GO TO 340
ICHOSE(I)=-1
IERR2=10
IERR=IERR+IERR2
RETURN
340
POWER=16.
DO 350 NN=5,8
12
N=NN
POWER=POWER*2.
IF (POWER.GE.SUMWH)
F
12
15
T
12
14

CONT. ON PG 12

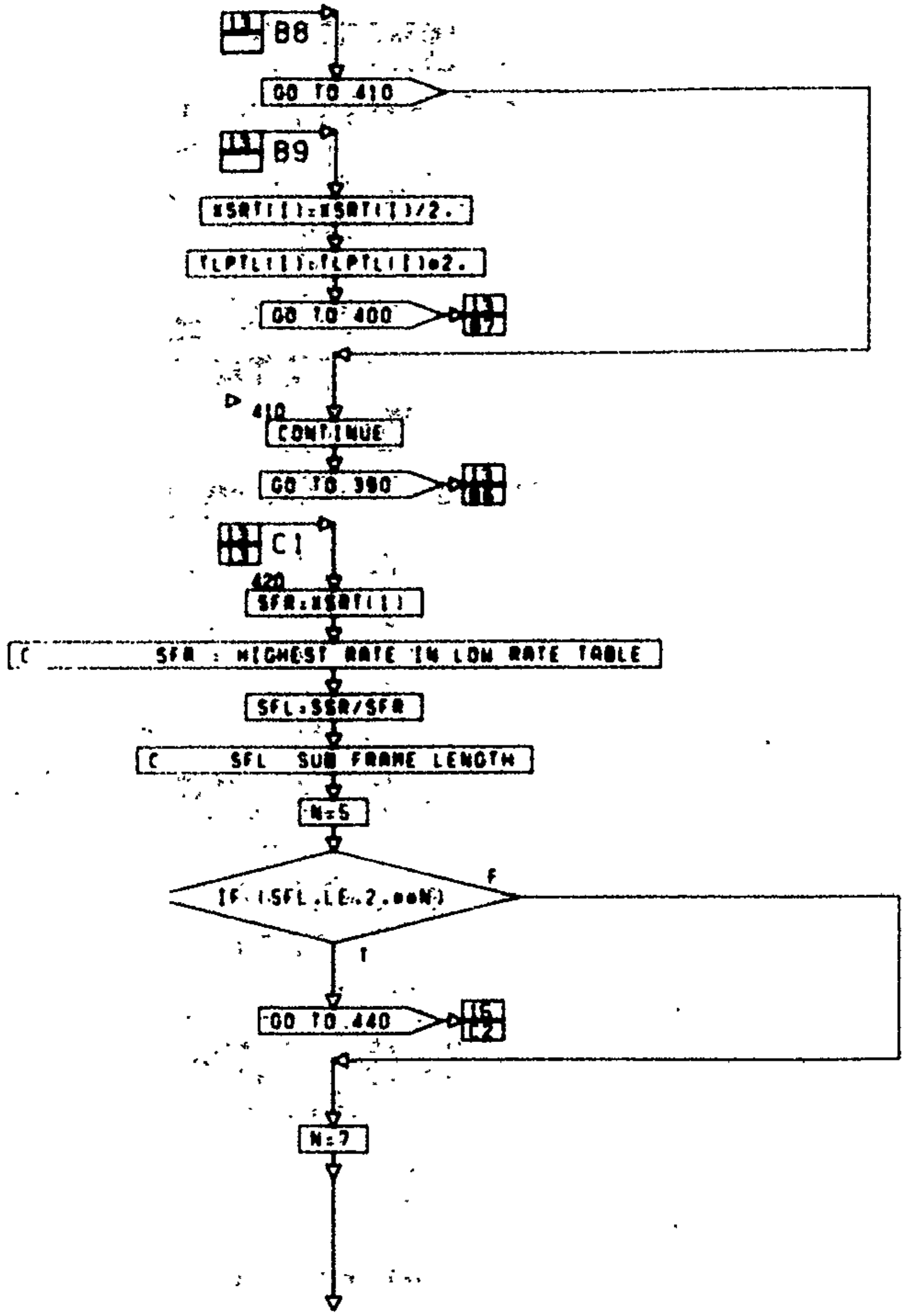


CONT. ON PG 13

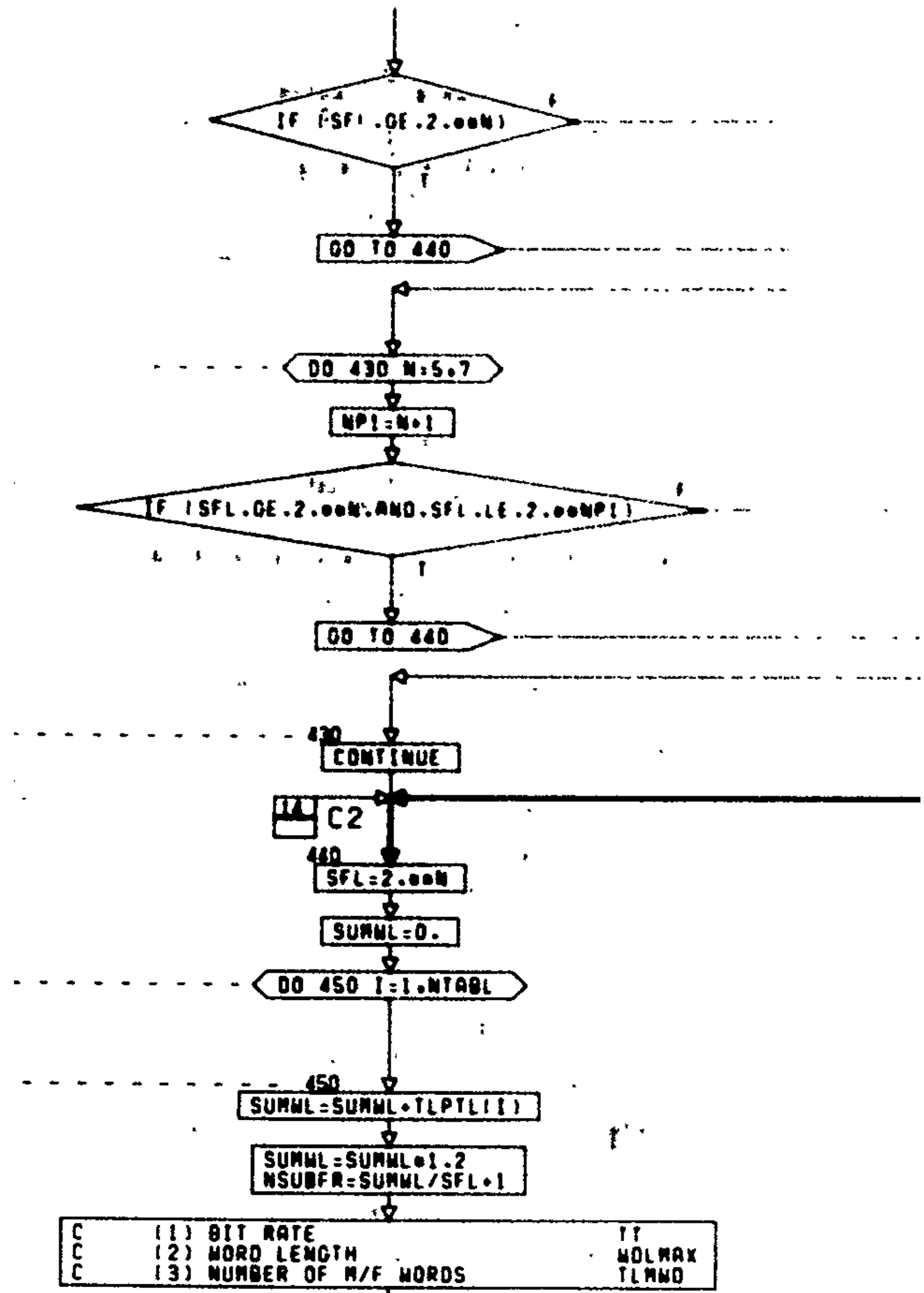
PG 12DF 21


BITRAT(1)=BIRATE
JL=0
C ORDER LOW SAMPLE RATE
IF (INTABL.EQ.1)
F
T
GO TO 420
B6
300
CONTINUE
CALL ORDER (INTABL,XSRT,TLPTL,GRANL,XM2,MEDIAN)
JL=JL+1
IF (JL.EQ.2)
F
T
GO TO 420
DO 410 I=1,MEDIAN
14
B7
400
IF (XSRT(I).LE.XM2)
F
T

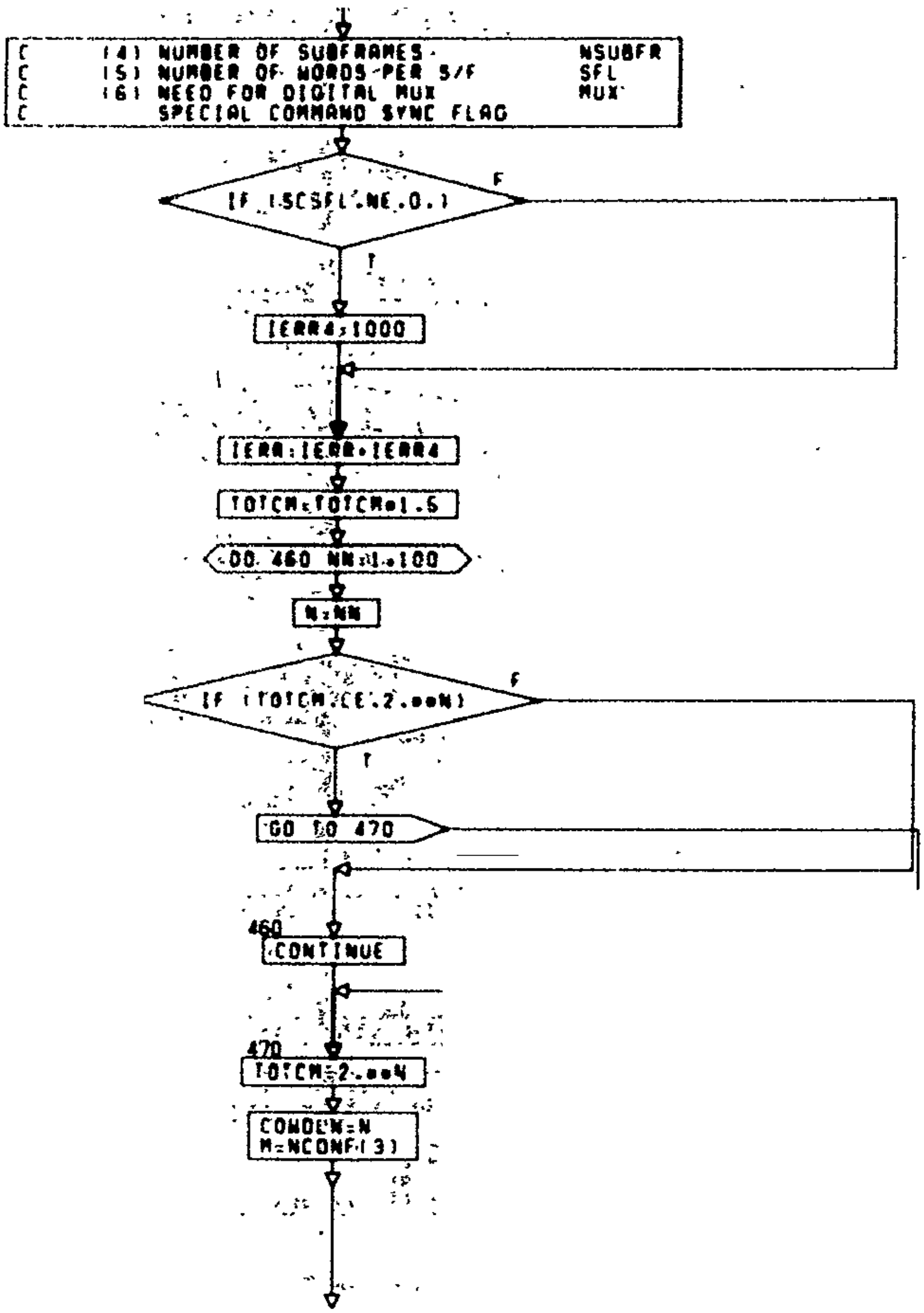
CONT. ON PG 14


B8
GO TO 410
B9
XSRT(I)=XSRT(I)/2.
TLPTL(I)=TLPTL(I)*2.
GO TO 400
410
CONTINUE
GO TO 390
C1
420
SFR=XSRT(I)
C SFR : HIGHEST RATE IN LOW RATE TABLE
SFL=SSR/SFR
C SFL SUB FRAME LENGTH
N=5
IF (SFL.LE.2.**N)
F
T
GO TO 440
N=7

CONT. ON PG 15

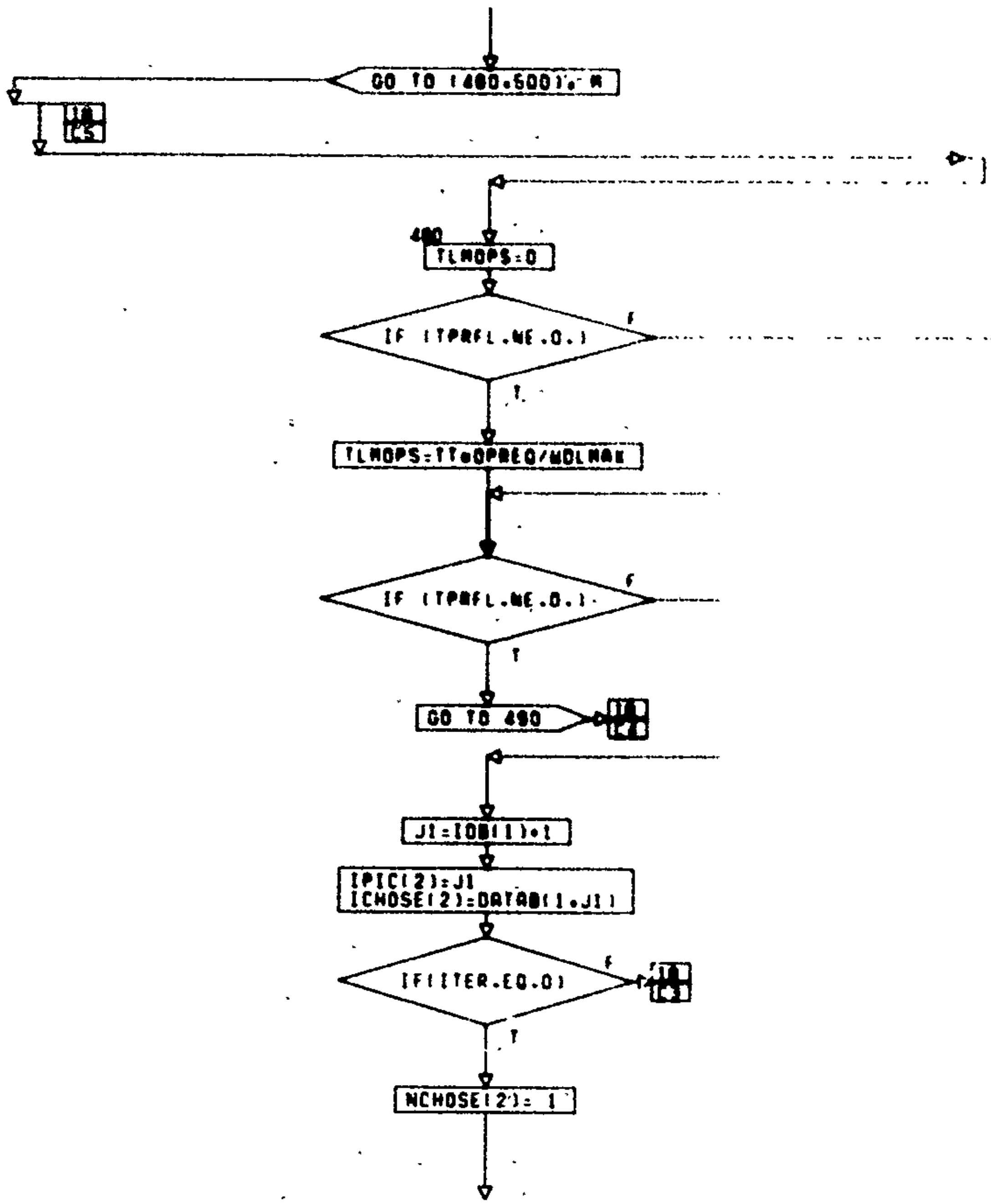

IF (SFL.GE.2.**N)
GO TO 440
DO 430 N=5,7
NP1=N+1
IF (SFL.GE.2.**N.AND.SFL.LE.2.**NP1)
GO TO 440
430
CONTINUE
C2
440
SFL=2.**N
SUMWL=0.
DO 450 I=1,NTABL
450
SUMWL=SUMWL+TLPTL(I)
SUMWL=SUMWL*1.2
NSUBFR=SUMWL/SFL+1
C (1) BIT RATE TT
C (2) WORD LENGTH WDLMAX
C (3) NUMBER OF M/F WORDS TLMWD

CONT. ON PG 16

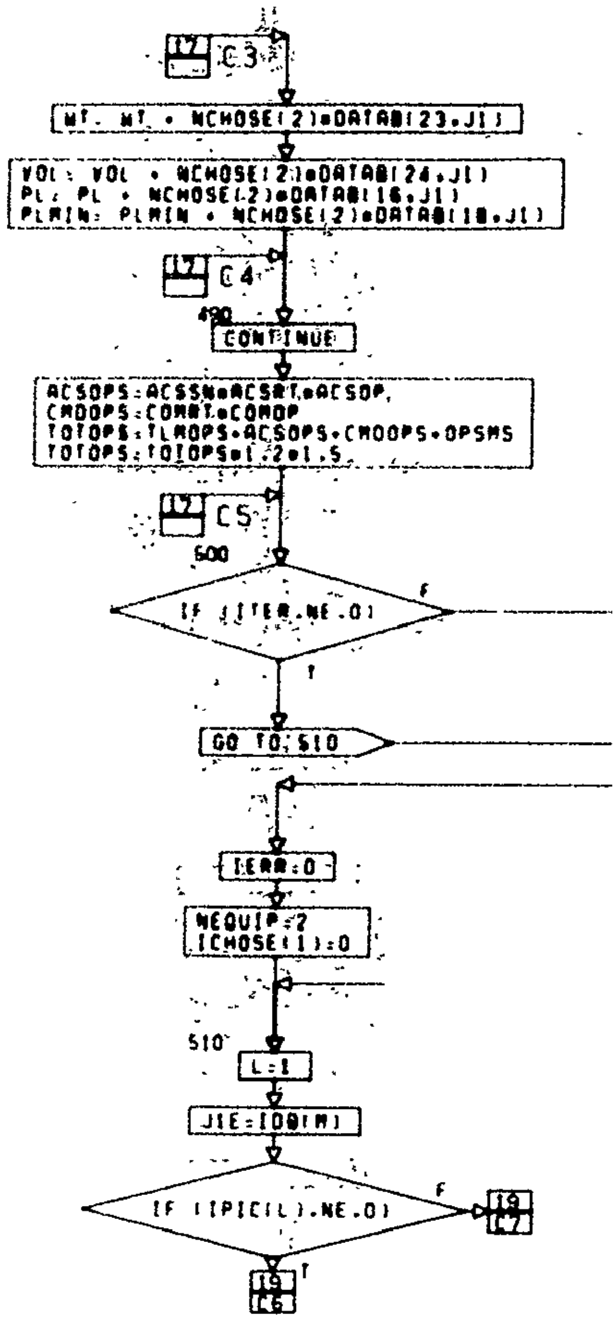


C (4) NUMBER OF SUBFRAMES NSUBFR
C (5) NUMBER OF WORDS PER S/F SFL
C (6) NEED FOR DIGITAL MUX MUX
C SPECIAL COMMAND SYNC FLAG
IF (SCSFL.NE.0.)
F
T
IERR4=1000
IERR=IERR+IERR4
TOTCM=TOTCM*1.5
DO 460 NN=1,100
N=NN
IF (TOTCM.GE.2.**N)
F
T
GO TO 470
460
CONTINUE
470
TOTCM=2.**N
COMDEN=N
M=NCONF(3)

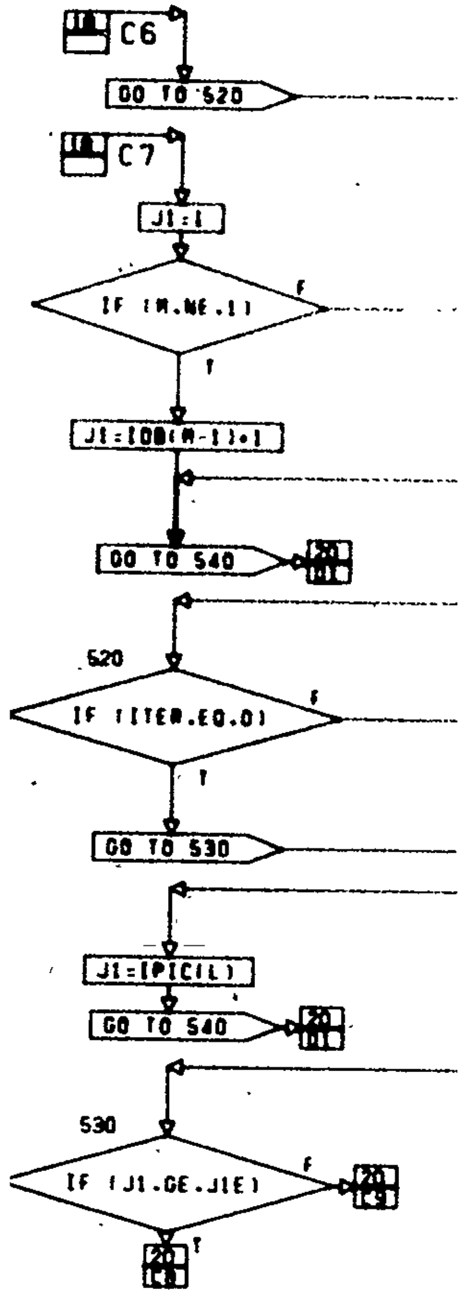
CONT. ON PG 17


GO TO (480,500), M
480
TLMOPS=0
IF (TPRFL.NE.0.)
TLMOPS=TT*OPREQ/MDLMAX
IF (TPRFL.NE.0.)
GO TO 490
J1=IDB(1)+1
IPIC(2)=J1
ICHOSE(2)=DATAB(1,J1)
IF(ITER.EQ.0)
NCHOSE(2)= 1

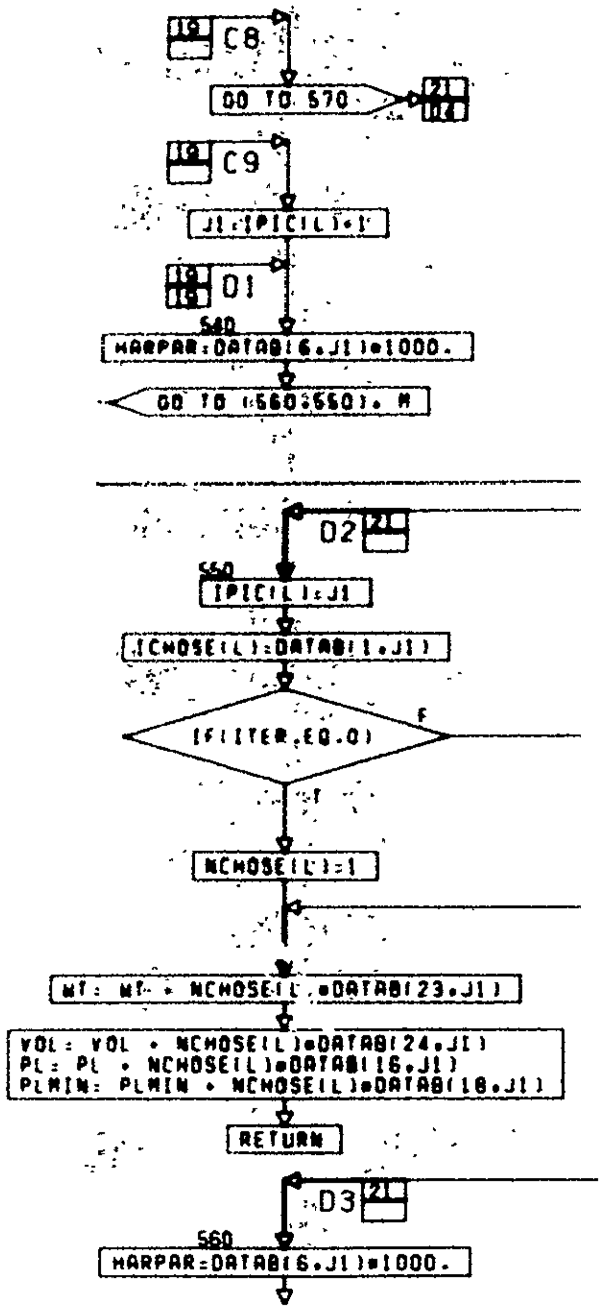
CONT. ON PG 18


17
C3
WT = WT + NCHOSE(2)*DATAB(23,J)
VOL = VOL + NCHOSE(2)*DATAB(24,J)
PL = PL + NCHOSE(2)*DATAB(16,J)
PLMIN = PLMIN + NCHOSE(2)*DATAB(18,J)
17
C4
490
CONTINUE
ACSOPS=ACSSN*ACSRT*ACSOP,
CMOOPS=COMRT*COMOP
TOTOPS=TLMOPS+ACSOPS+CMOOPS+OPSMS
TOTOPS=TOTOPS*1.2*1.5
17
C5
600
IF (ITER.NE.0)
F
T
GO TO 510
IERR=0
NEQUIP=2
ICHOSE(1)=0
510
L=1
JIE=IDB(M)
IF (IPIC(L).NE.0)
F
19
C7
T
19
C6

CONT. ON PG 19

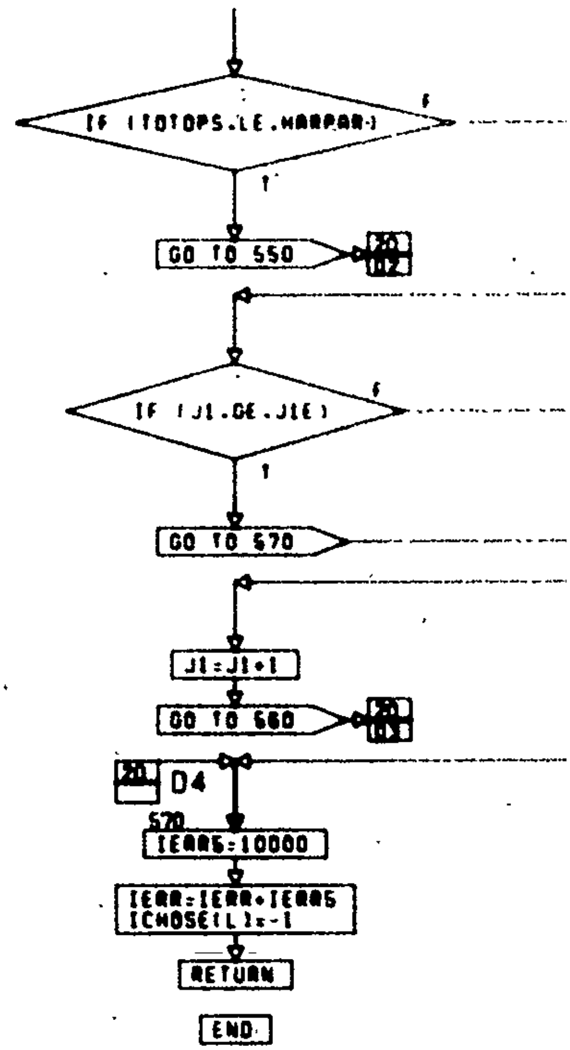

C6
GO TO 520
C7
J1:1
IF (M.NE.1)
F
T
J1:IDB(M-1)+1
GO TO 540
520
IF (ITER.EQ.0)
F
T
GO TO 530
J1:IPIC(L)
GO TO 540
530
IF (J1.GE.J1E)
F
T

CONT. ON PG 20



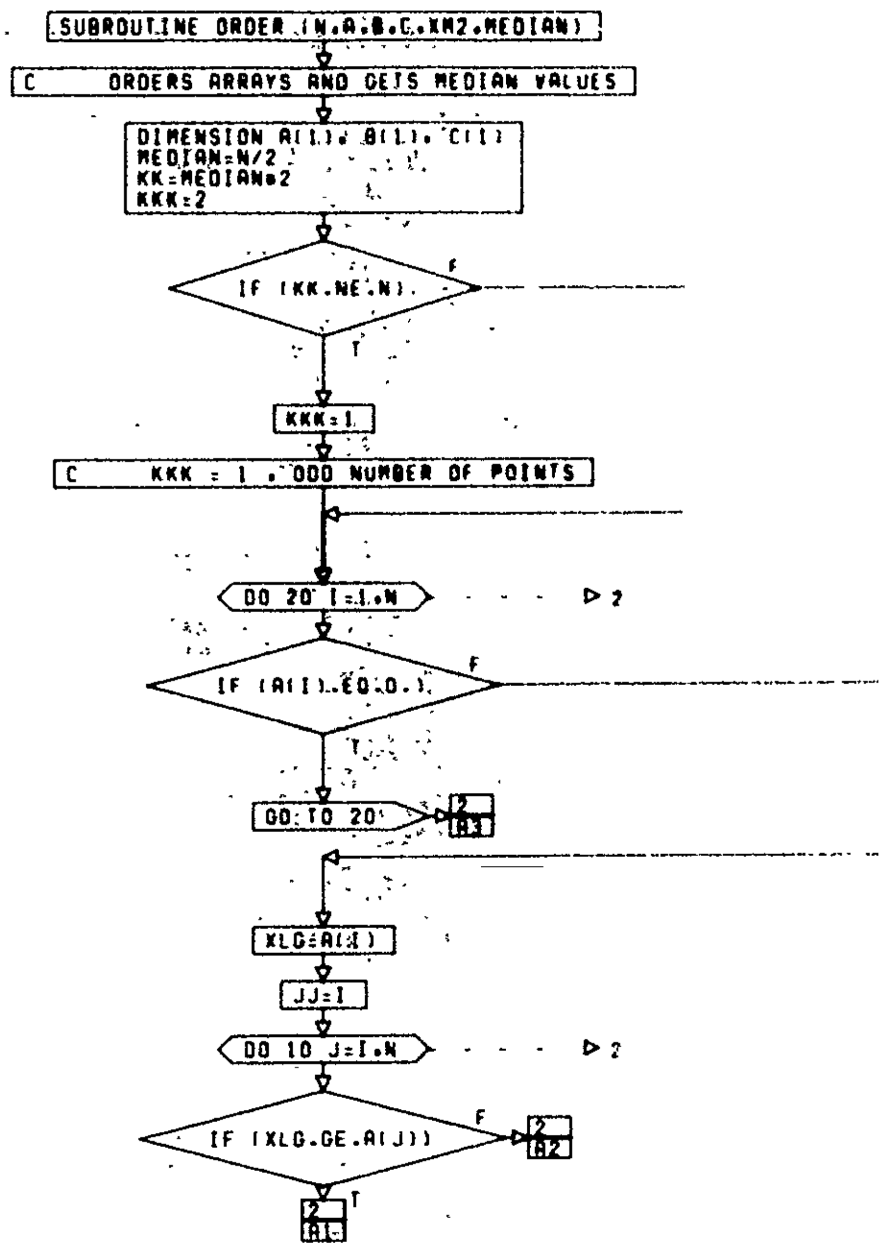
19
C8
GO TO 570
21
D4
19
C9
J1=IPIC(L)+1
19
19
D1
540
HARPAR=DATAB(6,J1)*1000.
GO TO (560,550), M
D2
21
560
IPIC(L)=J1
ICHOSE(L)=DATAB(1,J1)
IF(ITER.EQ.0)
F
T
NCHOSE(L)=1
WT= WT + NCHOSE(L)*DATAB(23,J1)
VOL= VOL + NCHOSE(L)*DATAB(24,J1)
PL= PL + NCHOSE(L)*DATAB(16,J1)
PLMIN= PLMIN + NCHOSE(L)*DATAB(18,J1)
RETURN
D3
21
560
HARPAR=DATAB(6,J1)*1000.

CONT. ON PG 21

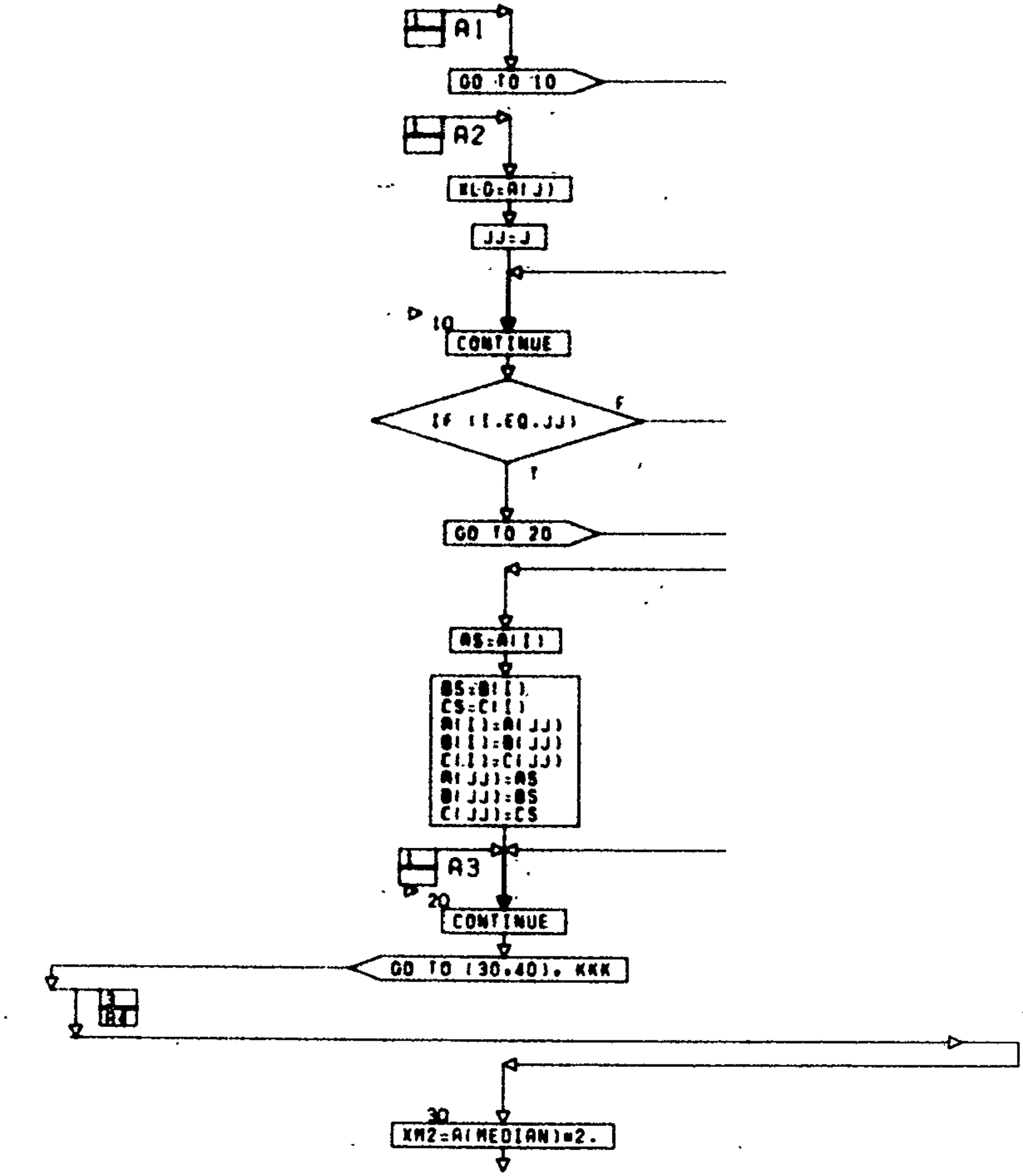


IF (ITOTOPS.LE.MAXPAR)
F
T
GO TO 550
20
102
IF (J1.GE.J1E)
F
T
GO TO 570
J1=J1+1
GO TO 560
20
103
20
D4
570
IERR5=10000
IERR=IERR+IERR5
ICHOSE(L)=-1
RETURN
END

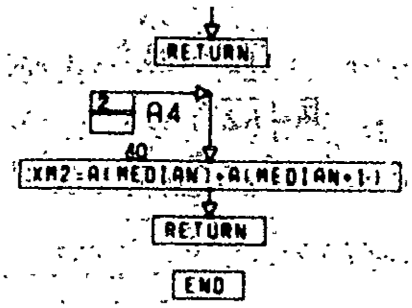
PG 21 FINAL


SUBROUTINE ORDER (N,A,B,C,XM2,MEDIAN)
C ORDERS ARRAYS AND GETS MEDIAN VALUES
DIMENSION A(1), B(1), C(1)
MEDIAN=N/2
KK=MEDIAN*2
KKK=2
IF (KK.NE.N)
F
T
KKK=1
C KKK = 1 , ODD NUMBER OF POINTS
DO 20 I=1,N
2
IF (A(I).EQ.0.)
F
T
GO TO 20
2
A3
XLG=A(I)
JJ=I
DO 10 J=I,N
2
IF (XLG.GE.A(J))
F
2
A2
T
2
A1

CONT. ON PG 2


A1
GO TO 10
A2
XLO=A(J)
JJ=J
10
CONTINUE
IF (I.EQ.JJ)
F
T
GO TO 20
AS=A(I)
BS=B(I)
CS=C(I)
A(I)=A(JJ)
B(I)=B(JJ)
C(I)=C(JJ)
A(JJ)=AS
B(JJ)=BS
C(JJ)=CS
A3
20
CONTINUE
GO TO (30,40), KKK
30
XM2=A(MEDIAN)*2.

CONT. ON PG 3



PG 3 FINAL

```
SUBROUTINE MIS (IPIC,IERR,ITER,NCONF,ICHOSE,NCHOSE)
DIMENSION IPIC(2), ICHOSE(2), NCONF(6), NCHOSE(2)
COMMON /USER3/BTRMX,SCSFL,TPRFL,OPSMS,ARRAYN(11,3),NMSEQ
```

```
COMMON /BTWN/WT,VOL,DT,D,DX,DY,DZ,XJ,YJ,ZJ,RJ,FF,TI,PL,PLMIN,
 LMBDD,AREA,SATLO,WATE,NC,ACSWP,HARNWT,THCMWT,CONVWT,TNKWT,PASSTR,
 SATTWT,TPRIM,IBTLOC,RADA,RADAB,RAT,HTRPWR,HTRPRB,
 HPT,HTPIPE,VCHP,HTPT,FC,XNZERO,COMRT,ACSSN,BITRAT(2),
 EQBLO,SABOLO,SATWT
```

```
COMMON /DBCOM/IDB(30),DATAB(55,90)
```

```
COMMON /CHOSE/ICHOSO(60),NCHOSO(60),COST(5,60),REL(6,60),
 THM(4,60),ARRAY(11,60),SKD(7,60)
```

```
COMMON /MISTAB/ HSRT(60),TLPTH(60),GRANH(60),XSRT(60),TLPTL(60),GR
ANL(60)
```

```
C          INPUTS  FOR DATA PROCESSING SUBSYSTEMS - MIS
C   INPUT  COPI    T D SOURCE  UNITS  DESCRIPTION
C   VAR.   IN.
C   GRANH  36      R Y ALL S/S        GRANULARITY HIGH RATE TABLE
C   HSRT   35      R Y ALL S/S SPS    SAMPLE RATE HIGH TABLE
C   TLPTH  34+35   R Y ALL S/S        NO OF ANOL AND DIG POINTS HIGH
C   GRANL  40      R Y ALL S/S        GRANULARITY LOW RATE TABLE
C   XSRT   39      R Y ALL S/S SPS    SAMPLE RATE LOW TABLE
```

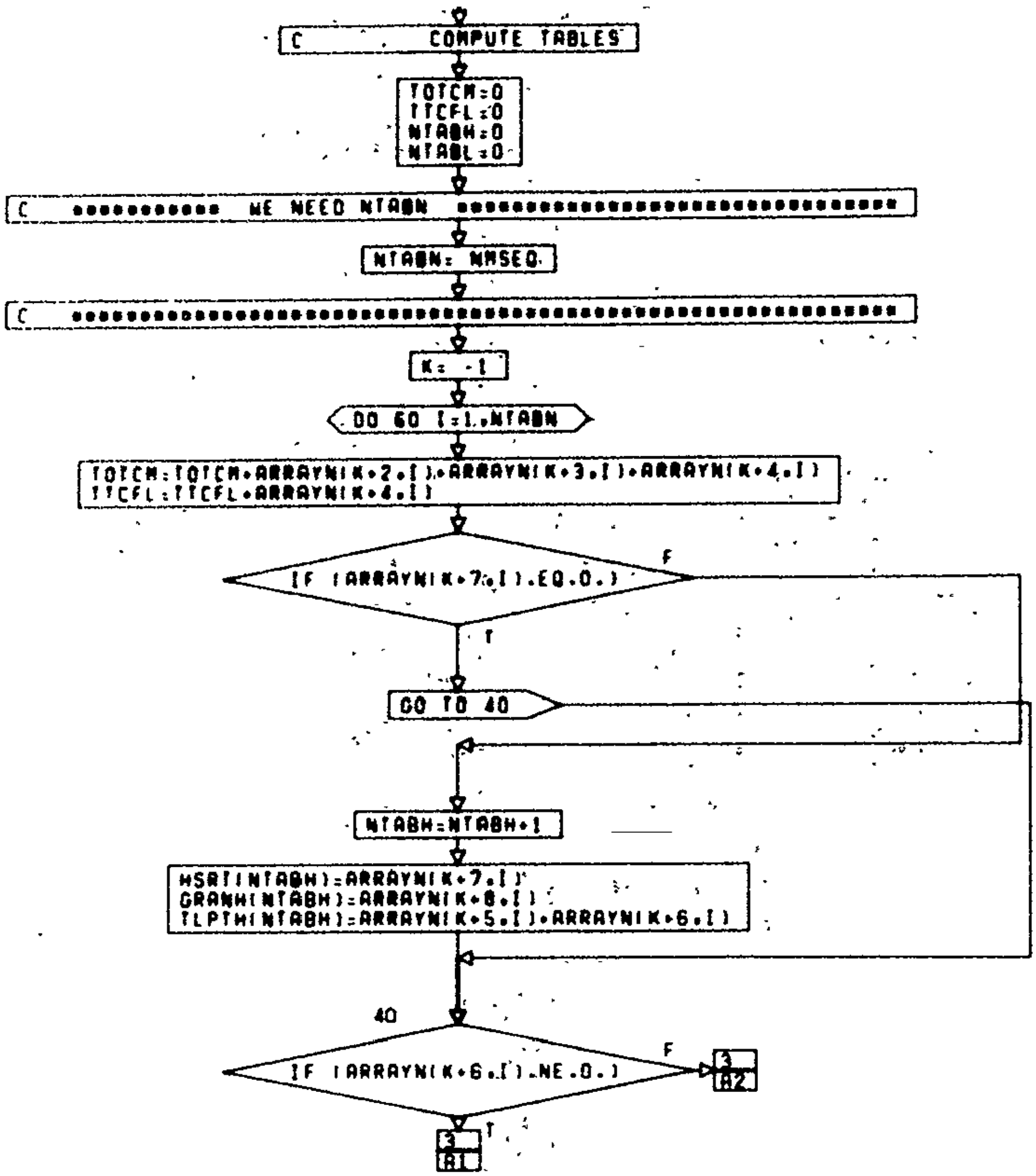
```
C   TLPTL   37+38  R Y ALL S/S        NO OF ANOL AND DIG POINTS LOW
C   SCSFL          R    U             SPECIAL COMMAND SYNC FLAG
C   TOTCM   30TO32 R   DB             TOTAL NO OF COMMANDS
C   COMTY          R   MACRO          NCONF(3) - SPEC OR GEN COMPUTER FLAG
C   TTCPL   32     R                  TIME TAG COMMAND FLAG
C   TPRFL          R   U              TELEM PROCESS FLAG
C   ACSSN          R   SC             SUM OF ACS  SENSOR
C   COMRT          R   COMM           COMMAND RATE
```

```
C   OPSMS          R    U        SEC-1  MISSION OPS
C   MISPD          I    U               MISSION DATA PROC. FLAG
C         ERROR FLAGS
C         IERR = 1      MUX IS REQUIRED
C         IERR = 10     WORD LENGTH GREATER THAN 256
C         IERR = 100    BIT RATE IS TOO LARGE
C         IERR = 1000 SPECIAL COMMAND SYNC FLAG IS NOT EQUAL TO ZERO
C         IERR = 10000  J1 .GE. J1E
```

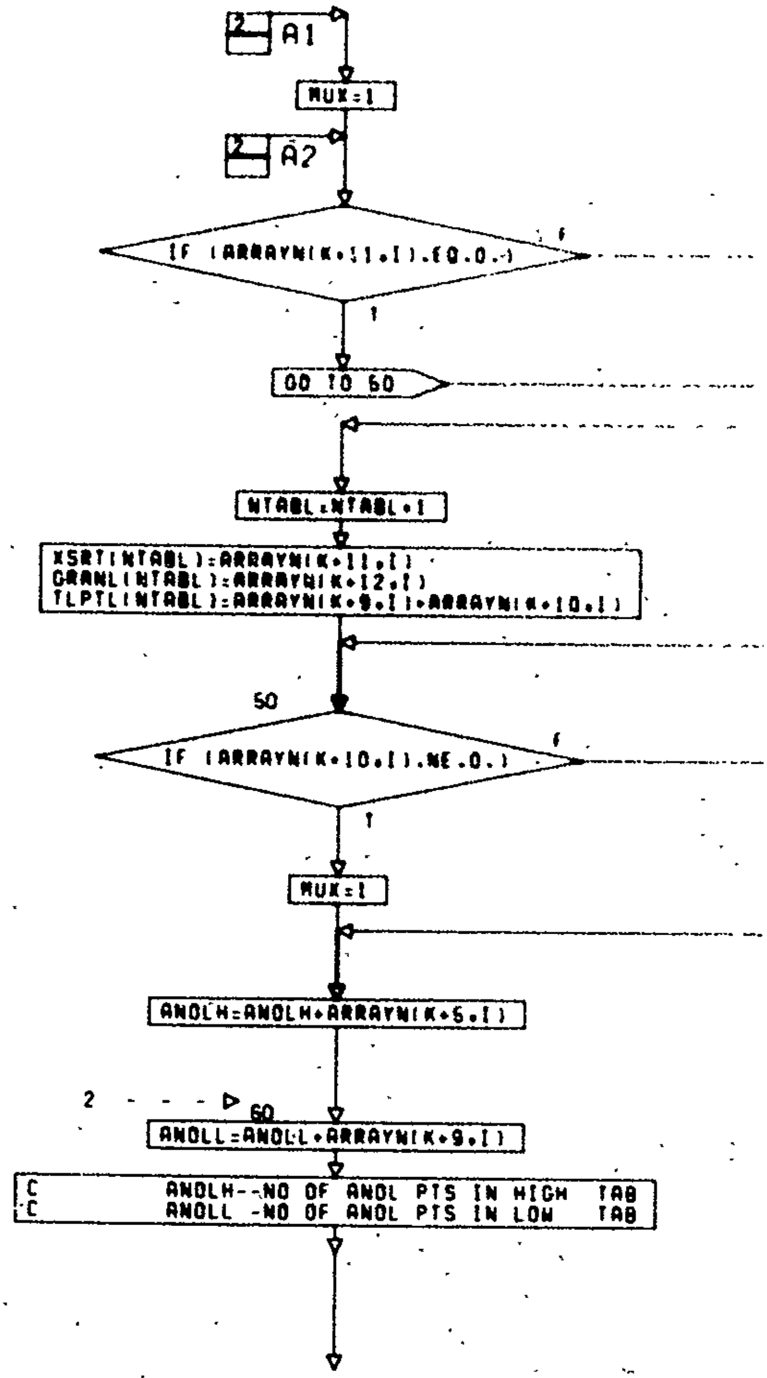
```
IERR=0
IERR1=0
IERR2=0
IERR3=0
IERR4=0
IERR5=0
ANOLH=0.
ANOLL=0.
```

```
MUX=0
```

CONT. ON PG 2

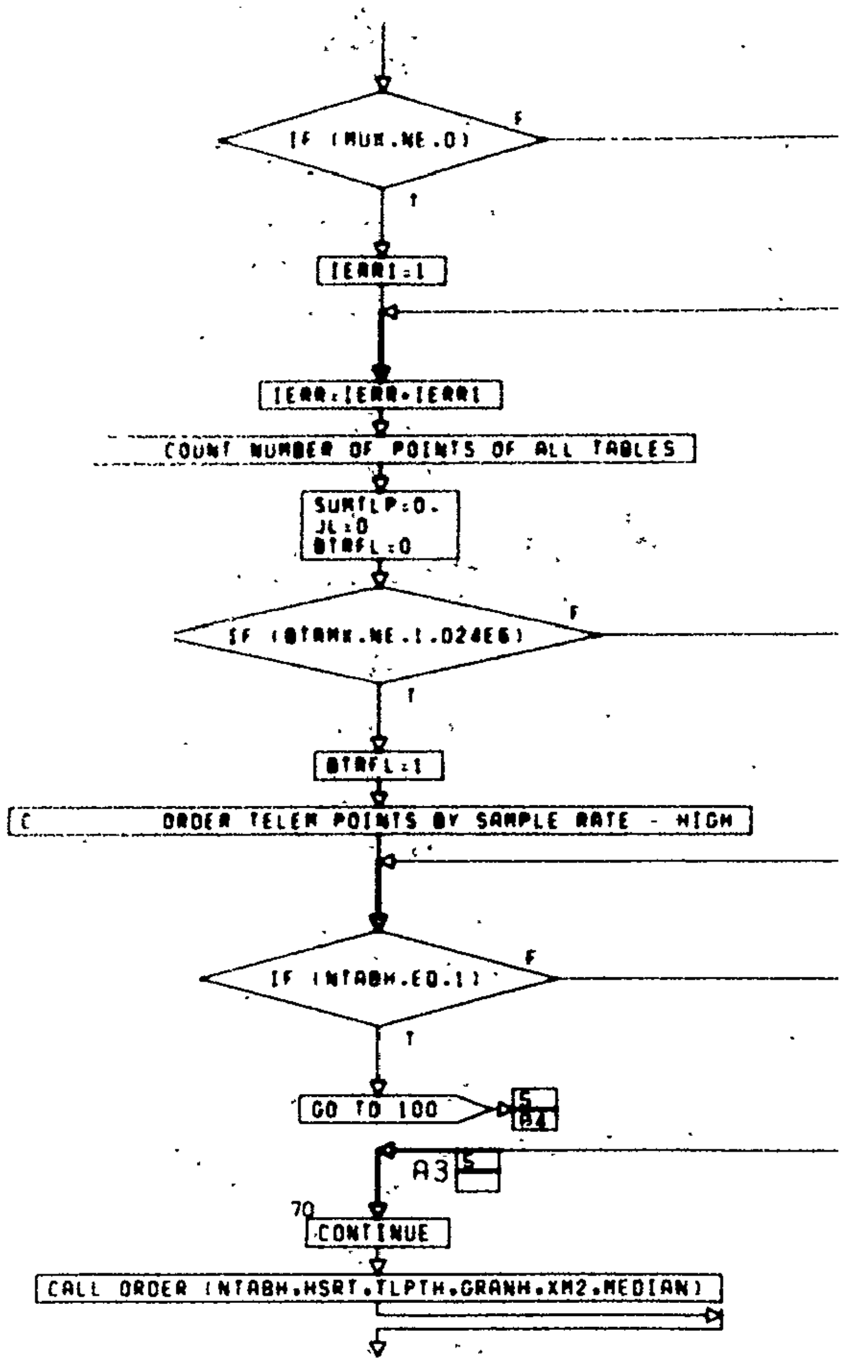

C COMPUTE TABLES
TOTCM=0
TTCFL=0
NTABH=0
NTABL=0
C ************ WE NEED NTABN ********************************
NTABN= NMSEQ
C **
K= -1
DO 60 I=1,NTABN
TOTCM=TOTCM+ARRAYN(K+2,I)+ARRAYN(K+3,I)+ARRAYN(K+4,I)
TTCFL=TTCFL+ARRAYN(K+4,I)
IF (ARRAYN(K+7,I).EQ.0.)
F
T
GO TO 40
NTABH=NTABH+1
HSRT(NTABH)=ARRAYN(K+7,I)
GRANH(NTABH)=ARRAYN(K+8,I)
TLPTH(NTABH)=ARRAYN(K+5,I)+ARRAYN(K+6,I)
40
IF (ARRAYN(K+6,I).NE.0.)
F
3
A2
T
3
A1

CONT. ON PG 3

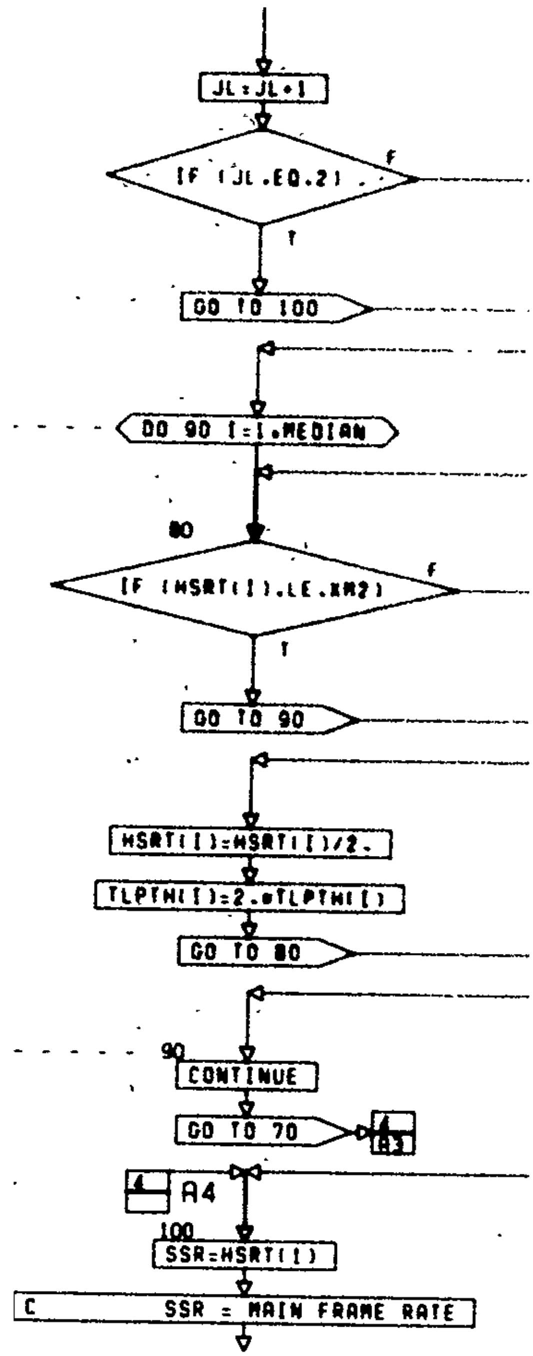


CONT. ON PG 4

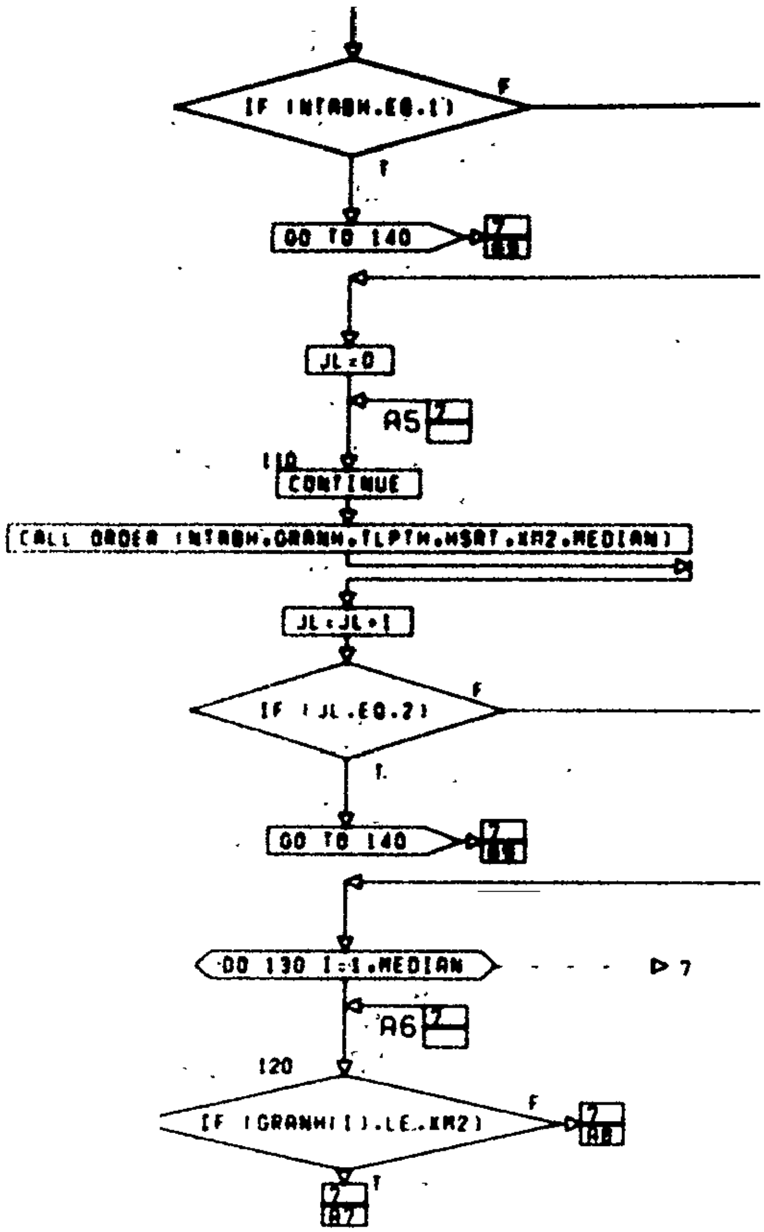
PG 3 OF


IF (MUX.NE.0)
F
T
IERR1=1
IERR=IERR+IERR1
COUNT NUMBER OF POINTS OF ALL TABLES
SUMTLP=0.
JL=0
BTAFL=0
IF (BTAMX.NE.1.024E6)
F
T
BTAFL=1
C ORDER TELEM POINTS BY SAMPLE RATE - HIGH
IF (NTABH.EQ.1)
F
T
GO TO 100
5
B4
A3
5
70
CONTINUE
CALL ORDER (NTABH,HSRT,TLPTH,GRANH,XM2,MEDIAN)

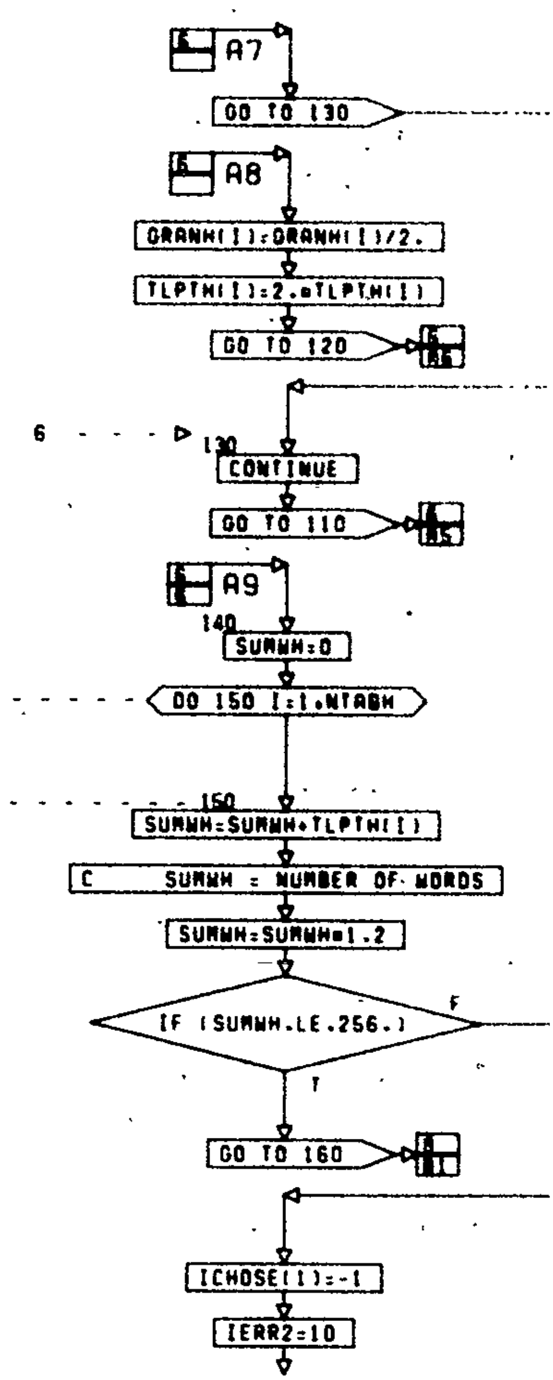
CONT. ON PG 5


JL=JL+1
IF (JL.EQ.2)
F
T
GO TO 100
DO 90 I=1,MEDIAN
80
IF (HSRT(I).LE.XM2)
F
T
GO TO 90
HSRT(I)=HSRT(I)/2.
TLPTH(I)=2.*TLPTH(I)
GO TO 80
90
CONTINUE
GO TO 70
4
A3
4
A4
100
SSR=HSRT(I)
C SSR = MAIN FRAME RATE

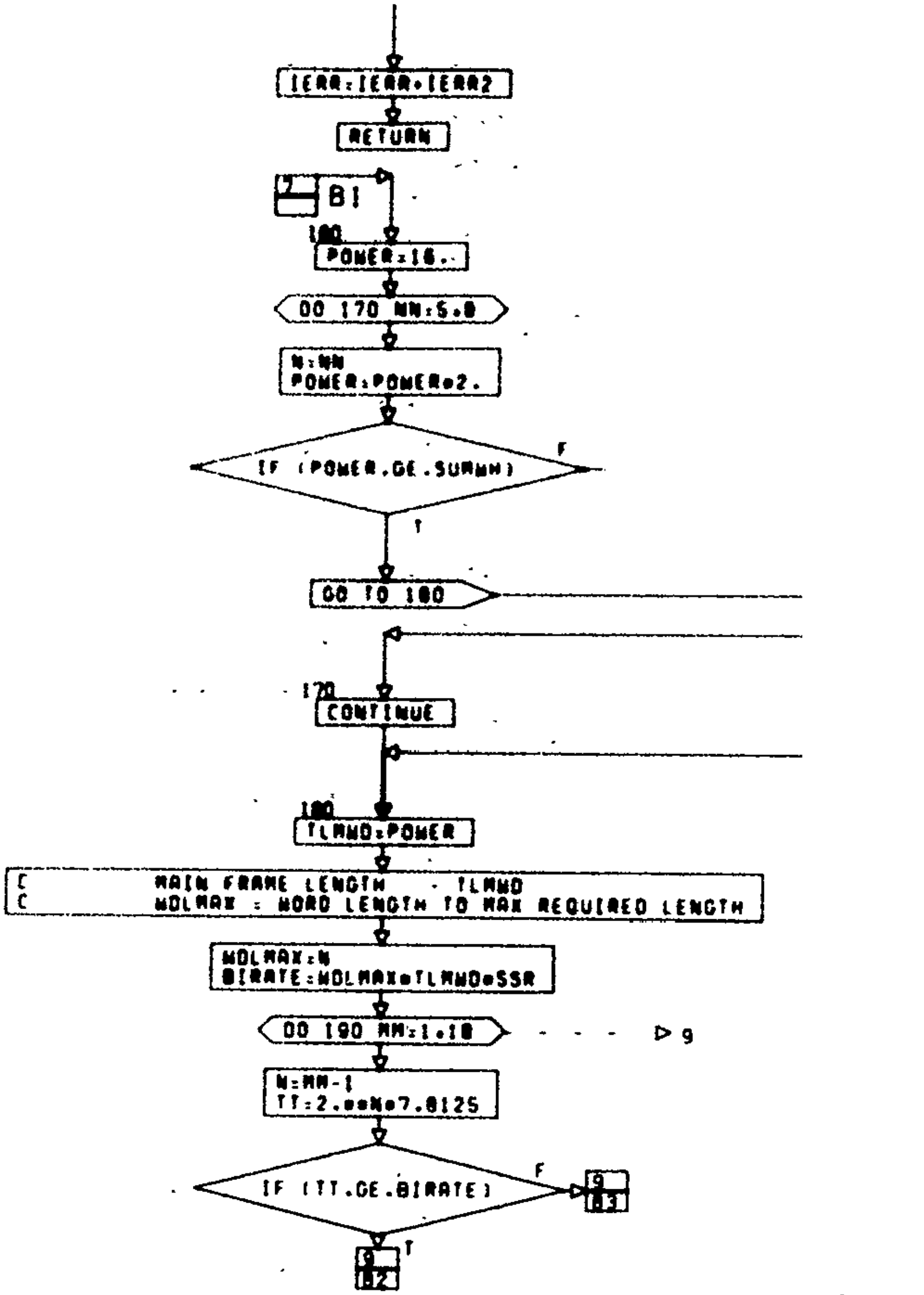
CONT. ON PG 6


IF (NTABH.EQ.1)
F
T
GO TO 140
7
B3
JL=0
A5
7
110
CONTINUE
CALL ORDER (NTABH,GRANH,TLPTH,NSRT,XM2,MEDIAN)
JL=JL+1
IF (JL.EQ.2)
F
T
GO TO 140
7
B3
DO 130 I=1,MEDIAN
7
A6
7
120
IF (GRANH(I).LE.XM2)
F
7
A8
T
7
A7

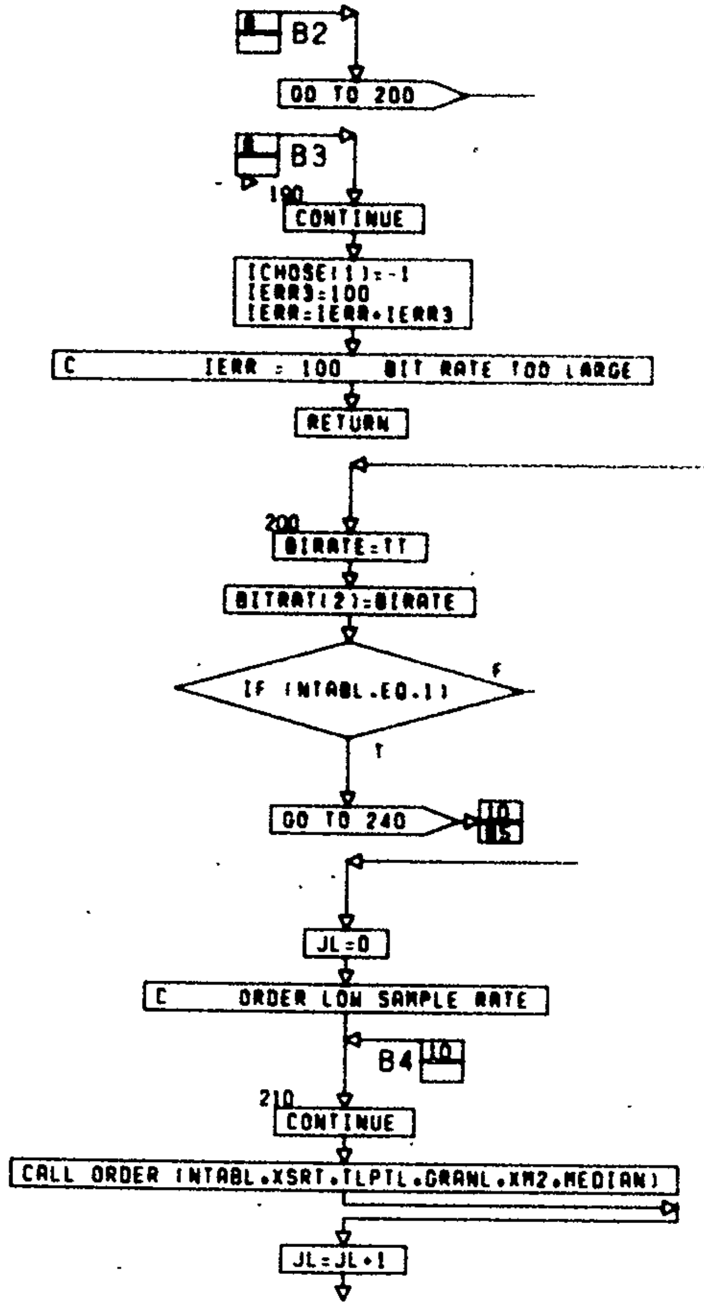
CONT. ON PG 7


A7
GO TO 130
A8
QRANH(I)=QRANH(I)/2.
TLPTH(I)=2.*TLPTH(I)
GO TO 120
6
130
CONTINUE
GO TO 110
A9
140
SUMWH=0
DO 150 I=1,NTABH
150
SUMWH=SUMWH+TLPTH(I)
C SUMWH = NUMBER OF WORDS
SUMWH=SUMWH*1.2
IF (SUMWH.LE.256.)
F
T
GO TO 160
ICHOSE(I)=-1
IERR2=10

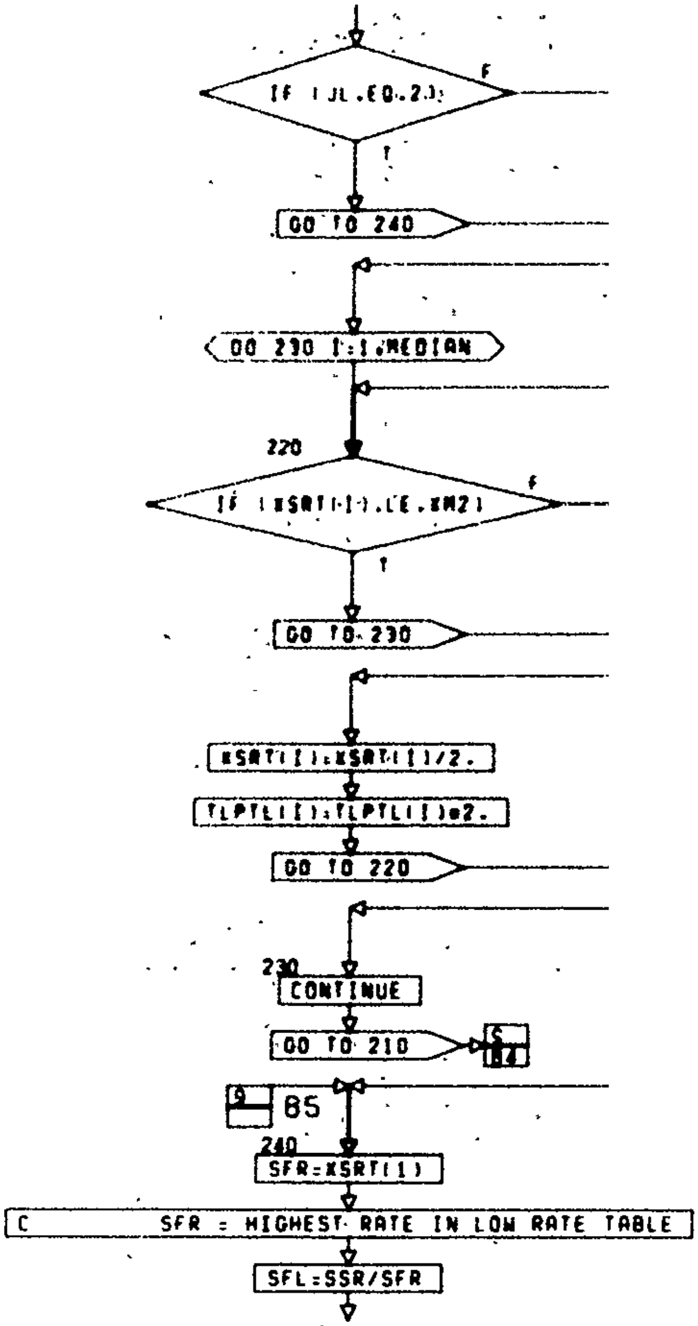
CONT. ON PG 8


IERR=IERR+IERR2
RETURN
7 B1
100
POWER=16.
DO 170 NN=5,8
N=NN
POWER=POWER*2.
IF (POWER.GE.SUMWH)
F
T
GO TO 180
170
CONTINUE
180
TLMWD=POWER
C MAIN FRAME LENGTH - TLMWD
C WDLMAX = WORD LENGTH TO MAX REQUIRED LENGTH
WDLMAX=N
BIRATE=WDLMAX*TLMWD*SSR
DO 190 MM=1,18
N=MM-1
TT=2.**N*7.8125
IF (TT.GE.BIRATE)
F
T
9 B3
9 B2

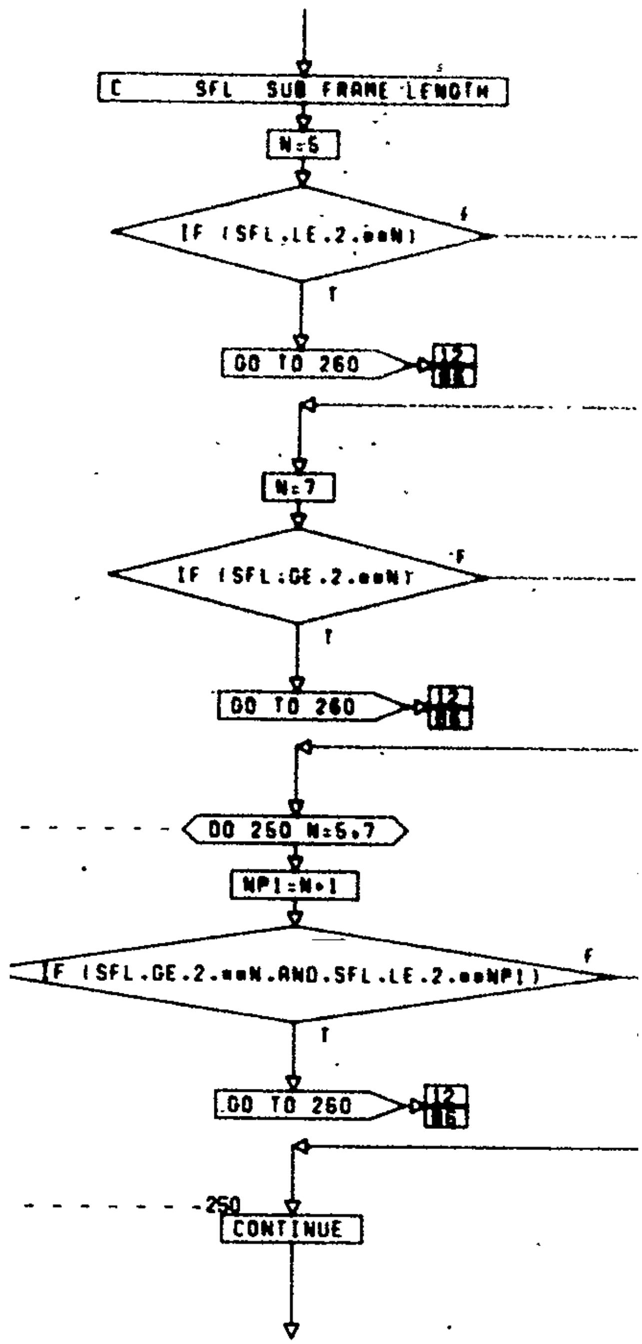
CONT. ON PG 9


B2
GO TO 200
B3
190
CONTINUE
ICHOSE(1)=-1
IERR3=100
IERR=IERR+IERR3
C IERR = 100 BIT RATE TOO LARGE
RETURN
200
BIRATE=TT
BITRAT(2)=BIRATE
IF (INTABL.EQ.1)
F
T
GO TO 240
JL=0
C ORDER LOW SAMPLE RATE
B4
210
CONTINUE
CALL ORDER (INTABL,XSRT,TLPTL,GRANL,XM2,MEDIAN)
JL=JL+1

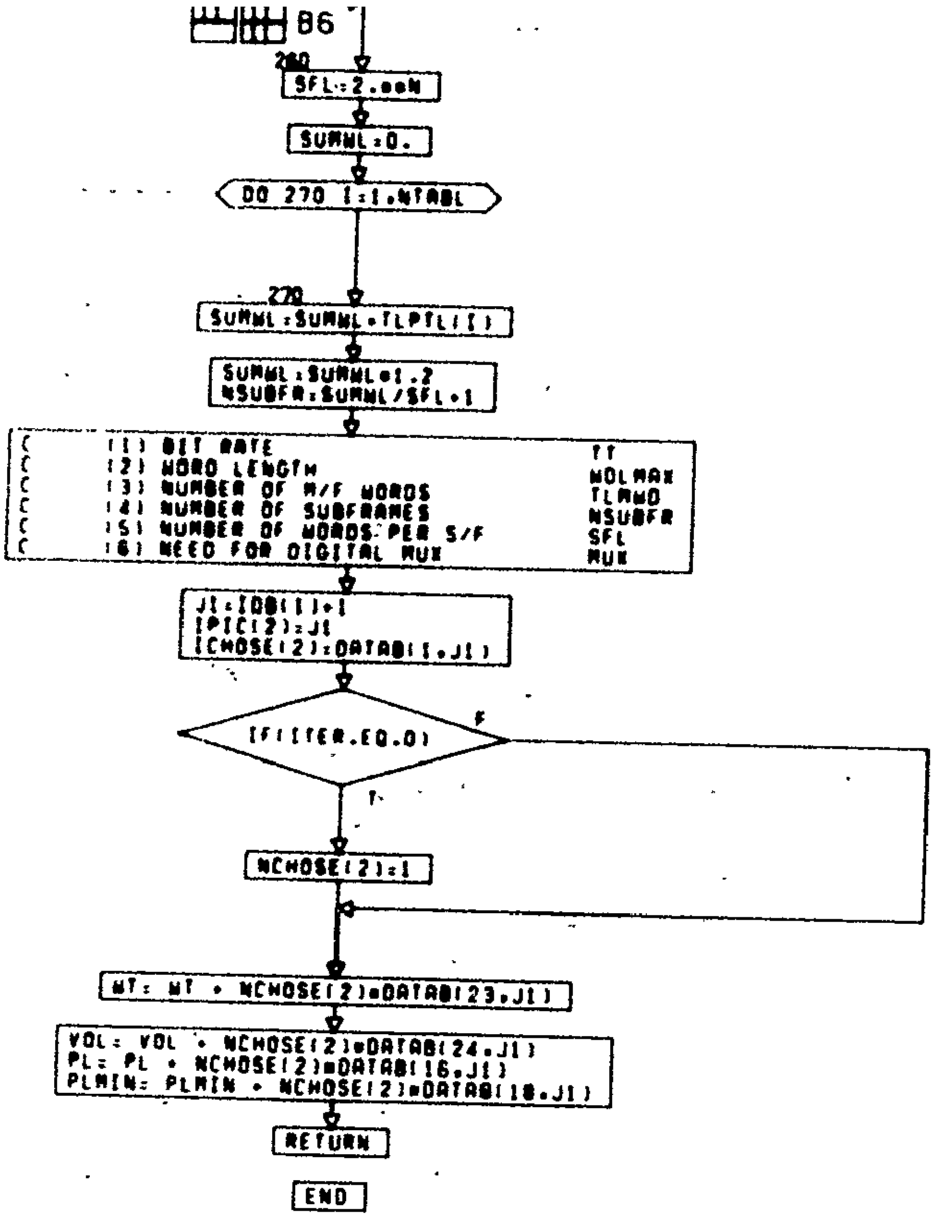
CONT. ON PG 10


IF (JL.EQ.2)
F
T
GO TO 240
DO 230 I=1,MEDIAN
220
IF (XSRT(I).LE.XM2)
F
T
GO TO 230
XSRT(I)=XSRT(I)/2.
TLPTL(I)=TLPTL(I)*2.
GO TO 220
230
CONTINUE
GO TO 210
6
B4
9
B5
240
SFR=XSRT(1)
C SFR = HIGHEST RATE IN LOW RATE TABLE
SFL=SSR/SFR

CONT. ON PG 11


C SFL SUB FRAME LENGTH
N=6
IF (SFL.LE.2.**N)
F
T
GO TO 260
N=7
IF (SFL.GE.2.**N)
F
T
GO TO 260
DO 250 N=6,7
NP1=N+1
IF (SFL.GE.2.**N.AND.SFL.LE.2.**NP1)
F
T
GO TO 260
250
CONTINUE

CONT. ON PG 12


86
280
SFL=2.**N
SUMWL=0.
DO 270 I=1,NTABL
270
SUMWL=SUMWL+TLPTL(I)
SUMWL=SUMWL*1.2
NSUBFR=SUMWL/SFL+1
C (1) BIT RATE TT
C (2) WORD LENGTH WDLMAX
C (3) NUMBER OF M/F WORDS TLAWD
C (4) NUMBER OF SUBFRAMES NSUBFR
C (5) NUMBER OF WORDS PER S/F SFL
C (6) NEED FOR DIGITAL MUX MUX
J1=IDB(I)+1
IPIC(2)=J1
ICHOSE(2)=DATAB(I,J1)
IF(ITER.EQ.0)
F
T
NCHOSE(2)=1
WT= WT + NCHOSE(2)*DATAB(23,J1)
VOL= VOL + NCHOSE(2)*DATAB(24,J1)
PL= PL + NCHOSE(2)*DATAB(16,J1)
PLMIN= PLMIN + NCHOSE(2)*DATAB(18,J1)
RETURN
END

PG 12 FINAL

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