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INSTRUMENT RESUMES FOR SPACE APPLICATIONS EMPLOYING A COMPUTERIZED SEARCH AND RETRIEVAL SYSTEM

Prepared Under Contract No. NAS 12-666

by

Peter Bock and William L. Vest

June 1969

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Electronics Research Center
National Aeronautics and Space Administration

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SUMMARY

The primary objective was to build and maintain a detailed cross-referenced file of existing and proposed space applications instrumentation, reflecting an accurate and complete picture of the current and historical state-of-the-art. The secondary objective was to provide convenient and automated access to the file, so that specific instruments may be retrieved on the basis of a wide variety of descriptive criteria, qualitative and/or quantitative.

An Instrument Resume form was designed to summarize technical and administrative information about each instrument. At the termination of the first year of the study approximately 150 resumes from various programs under the auspices of the NASA Space Applications (SA) Program Office have been included in the master data file.

The computer program, dubbed IRSARS (Instrument Resume Search and Retrieval System), can perform the following functions, in any order: (1) expand the file to include new resumes, (2) revise any item within any resume, (3) search the file and retrieve resumes on the basis of specified retrieval criteria, (4) search the file listing all resumes which exhibit any one or as many as possible of a set of specified keywords, (5) print the entire file on blank resume forms, and (6) list by title, spacecraft, and acronym all the resumes in the file.

1.0 INTRODUCTION

As the scope of the space program broadens, it has become increasingly apparent to cognizant offices within NASA that a systematic method of cataloging remote sensing instrumentation is in critical demand. Information of this type would prove valuable for related research and development as well as for planning of future space-science and space-applications missions. In addition to these objectives, instruments developed for a particular program could, in some instances, be applied directly or indirectly with some modification to other related programs. The trend at present is to develop new instrumentation for each distinct experiment/program. Much expense and duplicated effort could be avoided by careful analyses of the efforts of all programs and rapid intercommunication of the results of these analyses, resulting in appropriate and profitable cross-fertilization of ideas.

The primary objective, then, was to build and maintain a detailed cross-referenced file of existing or proposed space applications instrumentation, reflecting an accurate and complete picture of the current and historical state-of-the-art. The secondary objective was to provide convenient and automated access to the file, so that specific instruments may be retrieved on the basis of a wide variety of descriptive criteria, qualitative and/or quantitative.

With these two objectives in mind, the Electronics Research Center of NASA in Cambridge, Massachusetts let a contract to IIT Research Institute in June of 1968 for the purposes of (1) gathering data concerning space applications instruments and organizing them into a common format to be known as an Instrument Resume (2) building and maintaining a physical file of all the resumes, associated diagrams, and bibliographical materials used in preparing the resumes and mentioned under REFERENCES (Item 64) on the resumes, and (3) designing and

implementing an automated computer-oriented search and retrieval system for accessing these resumes. The extent of the data file in the first year of the contract was limited to approximately 150 resumes, since considerable emphasis was placed upon the development of the computer program to establish the search and retrieval capability.

The Instrument Resume form, designed to summarize technical and administrative information about each instrument, is shown in Figure 1. At the termination of the first year of the study, the 150 resumes from various programs under the auspices of the NASA Space Applications (SA) Program Office were prepared and have been included in the master data file. Within the Space Applications category, the instruments are associated with several disciplines including Meteorology, Earth Resources, Communications, Geodesy, and Navigation and Traffic-Control. These instruments cover a major portion of the electromagnetic spectrum from near UV through the visible, IR, microwave and into the radio frequencies, as shown in Figure 2. Many types of instruments are employed, such as imagers, spectrometers, radiometers, and transponders. A number of user groups are interested in this type of information. Among them are program planners, system integrators, experiment investigators, instrument manufactureres, spacecraft designers, and others. A complete list of the resumes currently in the file is given in Appendix A. The completed resumes themselves are not included in this report because of bulk and expense of reproduction: they are available upon special request through R. Minzner, Code TES, NASA/ERC, Cambridge, Massachusetts (see Appendix D).

The computer program, dubbed IRSARS (Instrument Resume Search and Retrieval System), has been written and debugged well beyond the nominal requirements of the contract. It has been designed to be used with any IBM series 360 computer (model 40 or larger) with a COBOL compiler. However, it could

FIGURE 1

INSTRUMENT RESUME

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ELECTRONICS RESEARCH CENTER
CAMBRIDGE, MASSACHUSETTS

1. TITLE | 2. ACRONYM | 3. EXP NO
(TITLE CONT.) | 4. DATE | 5. VERSION
6. PRINCIPAL INVESTIGATOR | 7. ORGANIZATION | 8. TELEPHONE
9. CO-INVESTIGATOR | 10. ORGANIZATION | 11. TELEPHONE
12. CONTRACT TYPE | 13. CONTRACT NUMBER | 14. FLASH INDEX NUMBER | 15. START DATE | 16. TERMINATION DATE | 17. STATUS
18. MONITOR | 19. AGENCY | 20. PGM OFFICE | 21. TELEPHONE
22. VENDOR | 23. LOCATION | 24. FLIGHT DATE | 25. LEAD TIME
26. INSTRUMENT TYPE | 27. SECTION
28. APPLICATION | 29. SPACECRAFT
30. PURPOSE
31. PRINCIPLES OF OPERATION
32. PHENOMENA OBSERVED
33. MEASUREMENT RANGE
34. PRECISION AND ACCURACY

FIGURE 2

35. SPECTRAL RANGE | 36. SPECTRAL RESOLUTION | 37. TIME CONSTANT
38. FIELD OF VIEW | 39. GROUND SWATH
40. ANGULAR RESOLUTION | 41. SPATIAL RESOLUTION
42. POINTING ACCURACY | 43. POINTING RATE | 44. ALTITUDE | 45. INCLINATION
46. SPECIAL REQUIREMENTS
47. COMPONENTS
48. WEIGHT | 49. VOLUME | 50. AVERAGE POWER | 51. STANDBY POWER | 52. PEAK POWER | 53. MTBF
54. RF INTERFERENCE | 55. MAGNETIC INTERFERENCE | 56. NUCLEAR INTERFERENCE | 57. THERMAL INTERFERENCE | 58. SHIELDING
59. CALIBRATION | 60. DATA RECOVERY | 61. FREQUENCY OF OBSERVATION
62. TELEMETRY REQUIREMENTS
63. ADVANTAGES AND LIMITATIONS
64. REFERENCES
65. COST PREVIOUS FY | 66. COST CURRENT FY | 67. COST TO DATE | 68. COST TO COMPLETION
69. DIAGRAMS

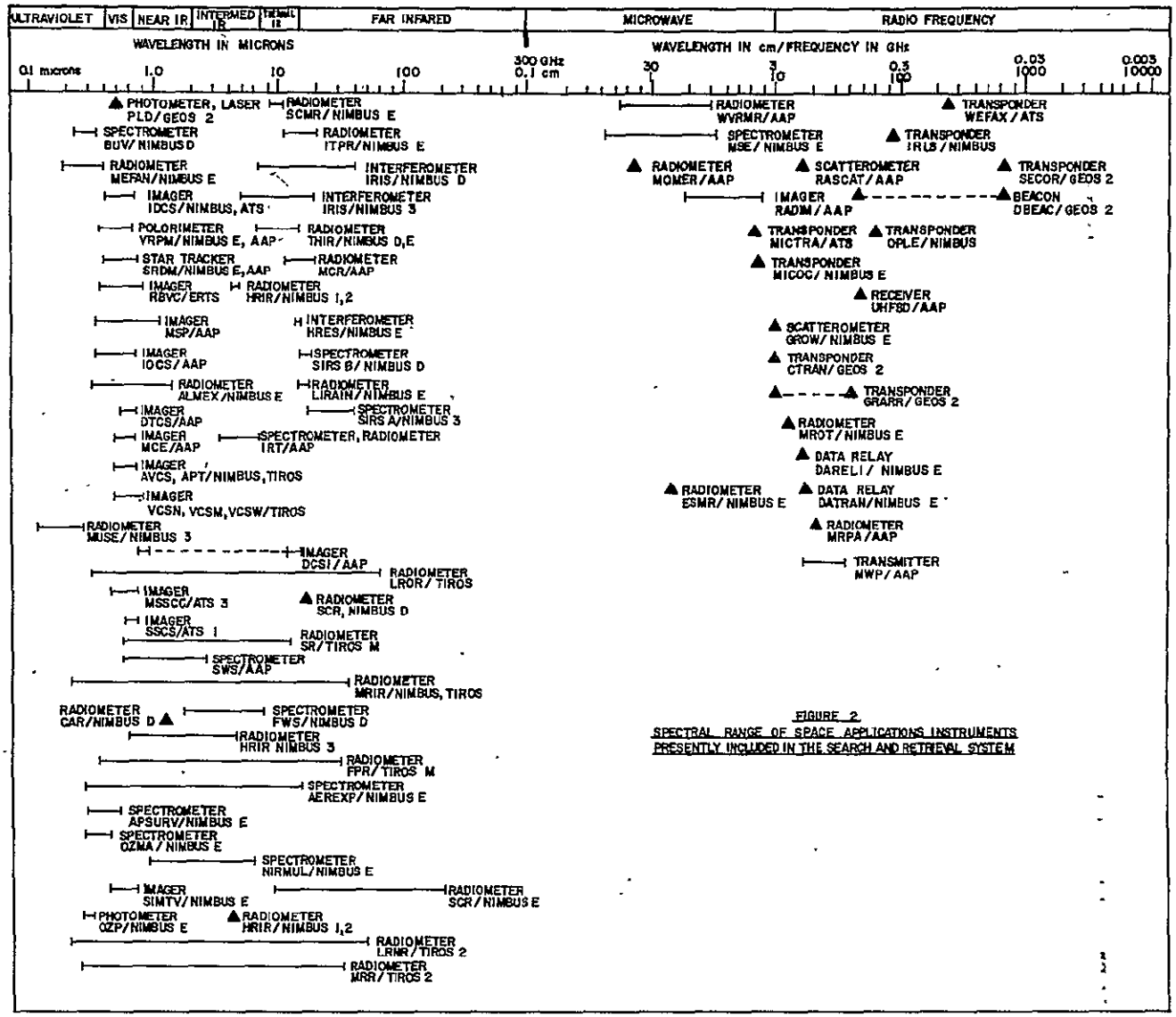


FIGURE 2
SPECTRAL RANGE OF SPACE APPLICATIONS INSTRUMENTS PRESENTLY INCLUDED IN THE SEARCH AND RETRIEVAL SYSTEM

be adapted to almost any computing system having a COBOL compiler, with relatively few modifications.

With the master data file of resumes residing on disk, the system can perform the following functions, in any order: (1) expand the file to include new resumes, (2) revise any item within any resume, (3) search the file and retrieve resumes on the basis of specified retrieval criteria, (4) search the file listing all resumes which exhibit any one or as many as possible of a set of specified keywords (not required by NASA in the original work statement, but added to the system upon request by the technical monitor), (5) print the entire file on blank resume forms, and (6) list by title, spacecraft, and acronym all the resumes in the file. A general flow chart of the system is shown in Figure 3.

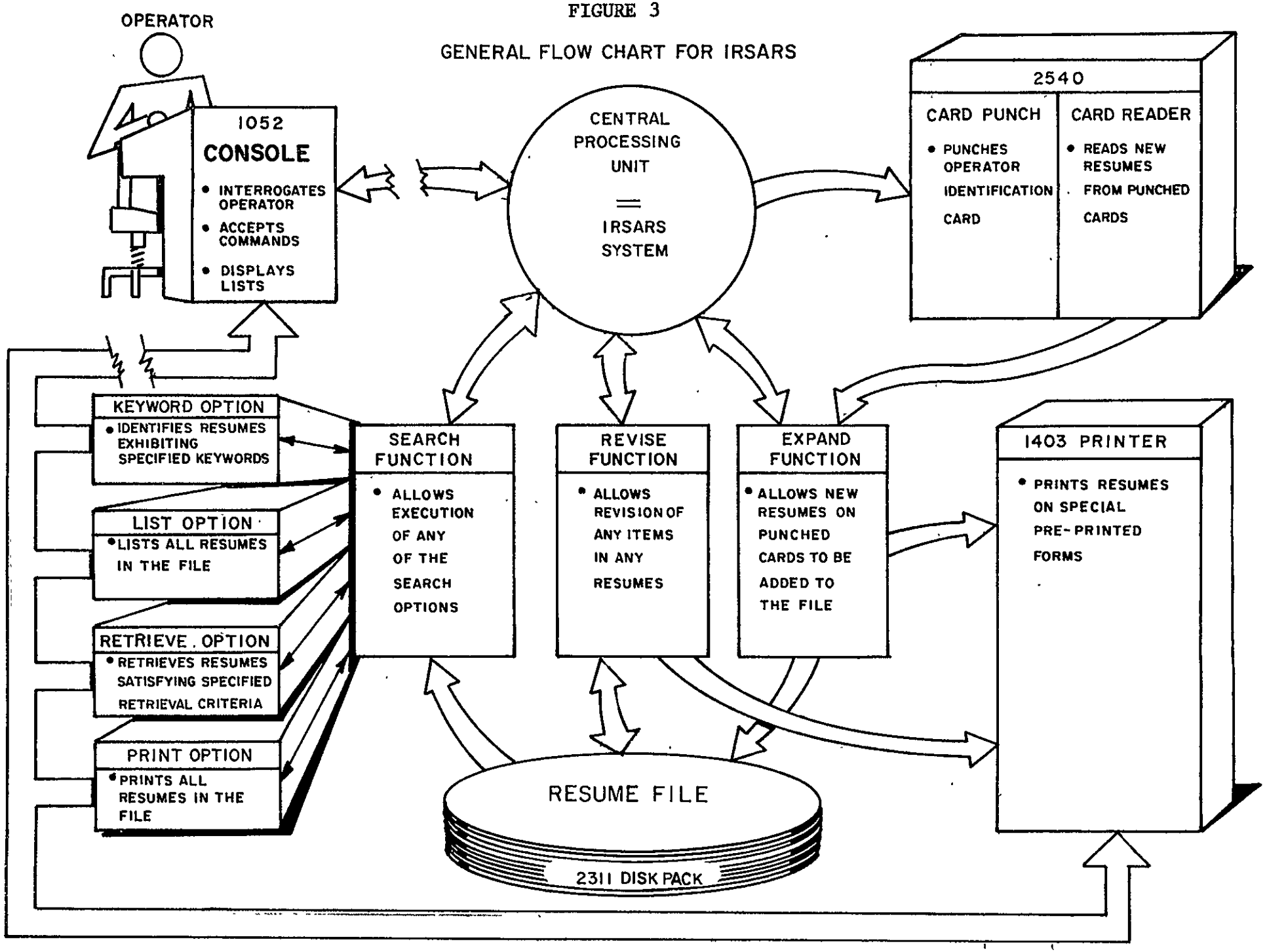
In keeping with the sponsor's desire for convenience and direct access, the system is operated through a typewriter/console, remote or on-line, using a conversational question-and-answer mode. No training in computer operations, technology, or programming is necessary to use the system. Operating instructions are built in, and the system is designed to do all the work, including recognizing any operational errors and attempting to rectify them. Allowances for storing proprietary and classified information have been programmed into the system, and only those persons who know the correct codes can gain access to such data.

The system is generally very fast, performing any one function in a matter of seconds, except for the keyword search, which requires several minutes to examine all 350,000 characters (currently) pertinent to the keyword search function.

A follow-on contract for the purpose of expanding and improving the system has been let to IITRI, commencing in June 1969.

FIGURE 3

GENERAL FLOW CHART FOR IRSARS



Acknowledgements

We would like to express our appreciation to R. A. Minzner and J. D. Oberholtzer, NASA/ERC Technical Monitors, for their project direction and review of the instrument resumes, as well as the many helpful discussions throughout the work. Also, we are indebted to the many Principal Investigators who have graciously and expeditiously reviewed the resumes of their respective instruments/experiments. This work has been accomplished under NASA Contract NAS 12-666.

2.0 THE INSTRUMENT RESUME

The format for the Instrument Resume was developed as a result of the combined efforts of the cognizant technical monitors at NASA/ERC and the IITRI staff with related inputs from the Space Applications staff at NASA Headquarters. The aim was to include both administrative and technical information about the instruments.

2.1 General Description

The resume format currently being used is shown in Figure 1. A single resume is devoted to a single instrument/spacecraft combination, and therefore, the unique identifying and discriminating characteristic of each resume is the combination of the ACRONYM (Item 2) and the SPACECRAFT (Item 29) to which the instrument is assigned. Many seemingly identical instruments may have the same ACRONYM, such as AVCS (Advanced Vidicon Camera System), yet each is associated with a different SPACECRAFT (e.g., AVCS/ESSA 3, AVCS/ESSA 5, etc.). Often such instruments, when flown on successive spacecraft are improved to reflect changes in the state-of-the-art, or modified to meet a different set of experiment objectives. In such cases, these improvements or modifications are described in the PRINCIPLES OF OPERATION (Item 31).

All lists of resumes produced on the console by the search and retrieval system (IRSARS) include both SPACECRAFT and ACRONYM. Though unnecessary for identification and cross-referencing purposes, the TITLE (Item 1) is also included in such lists to lend some general idea of subject matter. The Bibliographic File, described in a later section, is organized alphabetically first by SPACECRAFT, and then by ACRONYM within each spacecraft group. No attempt was made to number the resumes in this

sequence, since whenever new resumes are added to the file, the numbering of all subsequent resumes would have to be altered.

Generally speaking, the information presented in each resume has been checked for accuracy by the PRINCIPAL INVESTIGATOR (Item 6). Therefore, all data may be assumed to be correct as of the RESUME DATE (Item 4) indicated. If no reliable information was available as of the RESUME DATE, the item has been left blank. If an item is not applicable to a particular instrument, the entry for that item is NA. Entries for TITLE (Item 1), ACRONYM (Item 2), RESUME DATE (Item 4), VERSION (Item 5), SECURITY (Item 27), and SPACECRAFT (Item 29) are mandatory. No resume is released until proper entries have been supplied for these items. Occasionally an item may have SEE ITEM 31 entered in it. Diagrams (Item 69) are often omitted from the resume to facilitate quick reproduction of the resume. They are available in the Bibliographic File, and copies may be obtained upon special request through the Cognizant Personnel (see Appendix D).

The resumes are available in four styles. They may be produced directly on the computer on 11 by 15 inch, 60-pound, perforated-paper stock without diagrams as in Figure 4; they may be printed on the same stock with diagrams as in Figure 18; they may be reduced subsequently to 8 by 10 inch photographic paper stock with diagrams as in Figure 5; or they may be printed as facing pages in a report, with or without diagrams.

Based upon the continuing evaluation of the Instrument Resume format, subsequent to the printing of the first version, certain minor modifications were made and are described in Appendix E. In addition, it is anticipated that other modifications may also be made from time to time.

FIGURE 4

INSTRUMENT RESUME

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ELECTRONICS RESEARCH CENTER
CAMBRIDGE, MASSACHUSETTS

1. TITLE	7. ACRONYM	8. EXP NO
MEASUREMENT OF ICE SURFACE TEMPERATURES USING	EXAMI	S-61
(TITLE CONT.)	9. RESUME DATE	10. VERSION
THERMAL INFRARED MAPPING TECHNIQUES	05/30/69	0001

2. PRINCIPAL INVESTIGATOR	3. ORGANIZATION	4. TELEPHONE
SMITH, DR. J.A.	HYPOTHETICAL UNIVERSITY	812-FA4-6972-X367
5. CO-INVESTIGATOR	6. ORGANIZATION	11. TELEPHONE
JONES, M.T. (ACTING)	NORTHERN RESEARCH INST	606-391-4602-

12. CONTRACT TYPE	13. CONTRACT NUMBER	14. FLASH INDEX NUMBER	15. START DATE	16. COMPLETION DATE	17. STATUS
NONE	NA	NA	06/68	INACT	FEASIBILITY

18. MONITOR	19. AGENCY	20. PGM OFFICE	21. TELEPHONE
DOE, DR. J.S.	NASA HDQTRS	OSSA/SAZ	202-962-6513

22. VENDOR	23. LOCATION	24. FLIGHT DATE	25. LEAD TIME
AMERICAN MAPPING, INC.	SAN JOSE, CALIF.		36 MONTHS

26. INSTRUMENT TYPE	27. SECURITY
RADIOMETER, HIGH-RES ZIRCONIUM-DOPED GERMANIUM INFRARED	UNC

28. APPLICATION	29. SPACECRAFT
ERSP, OCEAN, MET	NIMBUS Z

30. PURPOSE

PRIMARY-TO MEASURE THE REFLECTED AND EMITTED THERMAL RADIATION FROM THE SURFACE OF THE ARCTIC ICE MASS***SECONDARY - TO DETERMINE THE UTILITY OF A ZIRCONIUM-DOPED GERMANIUM DETECTOR AS A TEMPERATURE MEASURING DEVICE FROM EARTH ORBIT.

31. PRINCIPLES OF OPERATION

THIS INSTRUMENT USES AN ENTIRELY NEW CONCEPT IN THE DETECTION OF EMITTED AND REFLECTED THERMAL RADIATION. USING VERY NARROW FORE-OPTICS, A NARROW BEAM OF ENERGY IMPINGES ON A CONVENTIONAL QUARTZ-SELENIUM BEAM SPLITTER. ONE OF THE RESULTANT BEAMS IS FOCUSED DIRECTLY ON THE ZIRCONIUM-DOPED GERMANIUM DETECTOR CONTINUOUSLY. THE OTHER BEAM IS REFLECTED OFF A SILVERED MIRROR WHICH IS HELD CONSTANTLY AT -195.8 DEGREES CENTIGRADE USING A LIQUID NITROGEN COOLER. THE REFLECTED BEAM THEN IMPINGES ON THE GE:ZR DETECTOR AFTER PASSING THROUGH A MECHANICAL CHOPPER WHICH BREAKS THE BEAM 4 TIMES PER SECOND. THE RESULTANT SIGNAL FROM THE DETECTOR IS AMPLIFIED, SENT THROUGH AN A/D CONVERTER, AND RECORDED ON TAPE, TO BE TELEMETERED TO THE GROUND AT CONVENIENT INTERVALS. THE EXPECTED DATA RATE INTO THE RECORDER WILL BE ABOUT 300 BPS. ANALYSIS ON THE GROUND WILL CONSIST OF SEPARATION OF THE DIRECT SIGNAL FROM THE CHOPPED SIGNAL USING LINEAR REGRESSION METHODS, FOURIER TRANSFORMS, AND MATRIX INVERSION. THE RESULTS OF THIS ANALYSIS WILL BE HIGHLY ACCURATE TEMPERATURE MEASUREMENTS OVER SMALL AREAS OF THE ARCTIC ICE PACK. SATELLITE TRACKING DATA WILL ASSOCIATE EACH MEASUREMENT WITH A SPECIFIC GEOGRAPHICAL AREA.

32. PHENOMENA OBSERVED

REFLECTED AND EMITTED THERMAL ENERGY FROM THE ARCTIC ICE MASS

33. MEASUREMENT RANGE

TEMPERATURE RANGE FROM -100 TO +100 DEG C; DYNAMIC RANGE = 100:1

34. PRECISION AND ACCURACY

TEMPERATURE WITHIN 0.5 DEG C OVER ENTIRE MEASUREMENT RANGE

This is a hypothetical example only.

FOLDOUT FRAME 1

35. SPECTRAL RANGE	36. SPECTRAL RESOLUTION	37. TIME CONSTANT
8. TO 16. MICRONS	NA	0.1 SECOND
38. FIELD OF VIEW	39. GROUND SWATH	
0.05 DEG	0.5 NM DIAM CIRCLE FROM 600 NM ALTITUDE	
40. ANGULAR RESOLUTION	41. SPATIAL RESOLUTION	
0.05 DEG	0.5 NM FROM 600 NM ALTITUDE	

42. POINTING ACCURACY	43. POINTING RATE	44. ALTITUDE	45. INCLINATION
0.05 DEG	0.5 DEG/SEC	MED CIRCULAR	POLAR

46. SPECIAL REQUIREMENTS

UNOBSTRUCTED VIEW OF NADIR, HIGH STABILITY

47. COMPONENTS

DETECTOR, ELECTRONICS, RECORDER, LIQUID NITROGEN DEWAR

48. WEIGHT	49. VOLUME	50. AVERAGE POWER	51. STANDBY POWER	52. PEAK POWER	53. MTBF
65.LB	2.5 CU FT	11.WATTS	4.WATTS	13.WATTS	14.DAYS

54. RF INTERFERENCE	55. MAGNETIC INTERFERENCE	56. NUCLEAR INTERFERENCE	57. THERMAL INTERFERENCE	58. SHIELDING
SOURCE	NONE	NONE	SENSITIVE	

59. CALIBRATION	60. DATA RECOVERY	61. FREQUENCY OF OBSERVATION
SELF-CALIBRATING	DELAYED TELEMETRY	WHEN OVER ARCTIC

62. TELEMETRY REQUIREMENTS

OUTPUT OF A/D CONVERTER IS 300 BPS; EXPECTED ACQUISITION RATE IS 20 MINUTES/ORBIT

63. ADVANTAGES AND LIMITATIONS

HIGH ACCURACY, HIGH-RESOLUTION DATA; LIQUID NITROGEN COOLANT LIMITS MTBF, PRECISE STABILIZATION REQUIRED.

64. REFERENCES

1) ICE TEMPERATURE MEASUREMENTS FROM EARTH ORBIT, SMITH, DR. J., JOURNAL ICE PHYSICS, APRIL 1969.***2) THE ZIRCONIUM-DOPED GERMANIUM DETECTOR, CLAGE, M.T., NORTHERN RESEARCH INST REPORT 96N, JAN 69.

65. COST PREVIOUS FY	66. COST CURRENT FY	67. COST TO DATE	68. COST TO COMPLETION
1968-$ 100000	NA	$ 100000	$ 11000000

69. DIAGRAMS

FOLDOUT FRAME 2

FIGURE 5

INSTRUMENT RESUME

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ELECTRONICS RESEARCH CENTER
CAMBRIDGE, MASSACHUSETTS

1 TITLE	ACRONYM	EXP NO
INFRARED INTERFEROMETER SPECTROMETER EXPERIMENT	IRIS	E02
(TITLE CONT.)	4 REVISED DATE	5 SEQ
	05/09/68	0002

6 PRINCIPAL INVESTIGATOR	7 ORGANIZATION	8 TELEPHONE
HANEL, R. A.	GODDARD SPACE FLT CENTER	301-982-4528
9 CO-INVESTIGATOR	10 ORGANIZATION	11 TELEPHONE
CONRATH, B. J.	GODDARD SPACE FLT CENTER	301-982-4235

12 CONTRACT TYPE	13 CONTRACT NUMBER	14 FLASH INDEX NUMBER	15 START DATE	16 COMPLETION DATE	17 STATUS
PROPOSAL	NA	NA			PROPOSAL

18 MONITOR	19 AGENCY	20 PGM OFFICE	21 TELEPHONE
SCHAROI, B.	NASA HDQTRS	OSSA/SAN	202-962-0891

22 VENDOR	23 LOCATION	24 FLIGHT DATE	25 LEAD TIME
GODDARD SPACE FLT CENTER	GREENBELT, MARYLAND		42 MONTHS

26 INSTRUMENT TYPE	27 SECURITY
INTERFEROMETER, INFRARED BEAM-SPLITTER MICHELSON SPECTROMETER	UNC

28 APPLICATION	29 SPACECRAFT
MET	NIMBUS E

30 PURPOSE

PRIMARY - TO DETERMINE VERTICAL ATMOSPHERIC TEMPERATURE PROFILES ON A GLOBAL BASIS *** TO OBTAIN SURFACE BRIGHTNESS TEMPERATURES WITHIN THE SPECTRAL REGION OF INTEREST.

31 PRINCIPLES OF OPERATION

A BEAM SPLITTER DIVIDES THE INCOMING RADIATION INTO TWO COMPONENTS. AFTER SUITABLE REFLECTIONS (FROM FIXED AND MOVING MIRRORS) THE TWO BEAMS INTERFERE WITH EACH OTHER (HOMODYNE) WITH A PHASE DIFFERENCE PROPORTIONAL TO THE OPTICAL PATH DIFFERENCE BETWEEN BOTH BEAMS. THE RECOMBINED COMPONENTS ARE THEN FOCUSED ONTO THE DETECTOR WHERE INTENSITY IS RECORDED AS A FUNCTION OF PATH DIFFERENCE. SINCE THE MOVING MIRROR IS PHASE LOCKED TO THE SATELLITE CLOCK, THE LIGHT PATH DIFFERENCE OF THAT COMPONENT IS THEREFORE ALSO PROPORTIONAL TO TIME.

32 PHENOMENA OBSERVED

IR THERMAL EMISSION FROM THE EARTH BETWEEN 7 AND 22 MICRONS.

33 MEASUREMENT RANGE

34 PRECISION AND ACCURACY

35 SPECTRAL RANGE			36 SPECTRAL RESOLUTION	37 [illegible]
7.6 TO 22. MICRONS			0.02 MICRON	
38 FIELD OF VIEW	39 GROUND SWATH			
2.3 DEG	44 KM DIAMETER AREA FROM 1100 KM ALTITUDE			
40 ANGULAR RESOLUTION	41 SPATIAL RESOLUTION			
2.3 DEG	44 KM DIAMETER AREA FROM 1100 KM ALTITUDE			
42 POINTING ACCURACY	43 POINTING RATE	44 ALTITUDE	45 INCLINATION	
		MEDIUM	SUN-SYNCHRONOUS	

46 SPECIAL REQUIREMENTS

CRYOSTAT WITH 1 YEAR LIFETIME

47 COMPONENTS

OPTICAL MODULE WITH CRYOSTAT; ELECTRONIC, POWER SUPPLY MODULES

48 WEIGHT	49 VOLUME	50 AVERAGE POWER	51 STANDBY POWER	52 PEAK POWER	53 MTBF
65 LB	4.32 CU FT	26 WATTS	5 WATTS	35 WATTS	

54 [illegible]	55 DIAGNOSTIC INTERFERENCE	56 NUCLEAR INTERFERENCE	57 THERMAL INTERFERENCE	58 SHIELDING
			SENSITIVE	RADIATIVE COOLING

59 CALIBRATION	60 DATA RECOVERY	61 FREQUENCY OF OBSERVATION
EVERY 15 AND 16 FRAME	DELAYED TELEMETRY	

62 TELEMETRY REQUIREMENTS

312.5 WORDS/SEC TO RECORDER *** 2 CHANNEL RECORDER REQUIRED.

63 ADVANTAGES AND LIMITATIONS

GOOD SIGNAL TO NOISE RATIO, SHORT TIME CONSTANT *** EXTENSIVE CRYOGENIC COOLING REQUIRED, IMC REQUIRED.

64 REFERENCES

1. HANEL, R.A. ET.AL.,'PROPOSAL FOR NIMBUS E INFRARED INTERFEROMETER SPECTROMETER,' GSFC, FEB 68.

65 COST PREVIOUS FY	66 COST CURRENT FY	67 COST TO DATE	68 COST TO COMPLETION

69 DIAGRAMS

PRECEDING PAGE BLANK NOT FILMED.

2.2 Detailed Description

To aid in both the interpretation and completion of the Instrument Resumes, a detailed explanation of each item is given in this section. The number and name of each item is followed by an underlined expression which specifies the required format of the entries for that item. Each position in the expression is occupied by one of the letters x, n, a, z, c, or b; a special character such as a slash, decimal point, etc.; or any upper case letter (A, B, C, D, etc.). Each of these characters means that the position it occupies may only be occupied by one of the group of letters, numbers, and/or special characters indicated below.

Format Character	Position in Item may be
x	any character in overall character set (see Figure 6).
n	any integer from 0 to 9 or a space.
a	any upper case letter of the alphabet or a space.
z	any letter, integer, or space.
c	special codes given below in the descriptions of the related item.
b	a blank or space
special characters	the actual appearance of the specified special character.
upper-case letters	the actual appearance of the specified upper-case letters.

These format codes do not exclude the possibility that NA or SEE ITEM 31 may be a legitimate entry in some items.

If several characters in a string are all the same, this may be indicated by an integer in parentheses following the character, specifying the number of times the character is repeated.

FIGURE 6

INSTRUMENT RESUME CHARACTER SET

0	A	.	period or decimal point
1	B	,	comma
2	C	;	semi-colon
3	D	:	colon
4	E	'	quote or apostrophe
5	F	=	equal sign
6	G	<	less than sign
7	H	>	greater than sign
8	I	(	left parenthesis
9	J	)	right parenthesis
	K	+	plus sign
	L	-	minus sign, hyphen, dash
	M	/	slash
	N	$	dollar sign
	O	*	asterisk
	P	&	ampersand
	Q	%	percent
	R		
	S		
	T		
	U		
	V		
	W		
	X		
	Y		
	Z		
	space		

If an item consists of more than one line of information, the format expression will be representative of any line of the item, immediately followed by the number of lines in the item.

In general, all words are or should be spelled out completely whenever space permits and special codes have not been designated. When an abbreviation is unavoidable, it should not be terminated with a period unless the abbreviation is a word itself and an ambiguous meaning might result.

To clarify the explanations given below, a hypothetical example of a completed resume is presented in Figure 4.

1. Title x(50) 2 lines

   In general, the title assigned by NASA Headquarters to the experiment/instrument. References to STATUS or SPACECRAFT should be editted out since these specifications are listed elsewhere in the resume.

2. ACRONYM z(6)

   A descriptive acronym derived from the TITLE. If no accepted or standard acronym exists, a logical and appropriate acronym must be assigned.

3. EXP NO z(16)

   The accepted number assigned by NASA to the experiment/instrument.

4. RESUME DATE nn/nn/nn

   Month, year, and day on which the resume was most recently reviewed and updated by the Cognizant Personnel (see Appendix D).

5. VERSION n(4)

   A four-digit number, starting with 0001, and increasing sequentially every time a change is made in any of the items in the resume. It is the system operator's responsibility to assure consistent incrementing.

6. PRINCIPAL INVESTIGATOR x(20)

   The last name of the principal investigator followed immediately by a comma (required), his title (if any), first name, initials, and/or other ancillary information, as space permits.

7. ORGANIZATION x(24)

   The name of the organization with which the PRINCIPAL INVESTIGATOR is affiliated.

8. TELEPHONE nnn-zzz-nnnn-zzzzz

Area-code, exchange, number, and extension of the PRINCIPAL INVESTIGATOR. The first character of the extension may be X, if so desired.

9. CO-INVESTIGATOR x(20)

The last name of the co-investigator (or second principal investigator) followed immediately by a comma (required), his title (if any), first name, initials, and/or other ancillary information, as space permits.

10. ORGANIZATION x(24)

The name of the organization with which the CO-INVESTIGATOR is affiliated.

11. TELEPHONE nnn-zzz-nnnn-zzzzz

Area-code, exchange, number, and extension of the CO-INVESTIGATOR. The first character of the extension may be X, if so desired.

12. CONTRACT TYPE c(8)

The current type of contract associated with the funding of the instrument. One of the following codes must be used.

Code	Type of Contract
NONE	No contract let at present
FPF	Fixed price firm
FPE	Fixed price escalation
FPR	Fixed price redeterminable
FPI	Fixed price incentive
C	Cost, no fee
FALIC	Fixed amount in lieu of indirect costs
CS	Cost sharing
CPFF	Cost-plus-fixed fee
CPIF	Cost-plus-incentive fee
TM	Time and materials
LH	Labor hours
CPAF	Cost-plus-award fee
G	Grant
IA	Inter-agency transfer

The entries in CONTRACT TYPE and CONTRACT NUMBER should be consistent with each other.

13. CONTRACT NUMBER x(15)

The standard number of the contract most closely related to the current STATUS of the instrument. If CONTRACT TYPE is NONE, NA should be entered.

14. FLASH INDEX NUMBER nnn-nn-nn-nn-nn

The official NASA funding number/code (as given on NASA Form 1122) corresponding to the contract described in Items 12 and 13. If CONTRACT TYPE is none, NONE should be entered.

15. START DATE nn/nn

If the instrument is being funded or considered for funding, the month and year when the contract was let or is due to be let. Otherwise, NA should be entered. This date does not necessarily indicate the start of the program.

16. COMPL DATE nn/nn or INACT

The month and year when work under the CONTRACT NUMBER was completed or is due to be completed. If the instrument is not currently funded or has been rejected at the proposal level, INACT (inactive) should be entered.

17. STATUS c(11)

The current status (life-cycle phase) of the instrument, chosen from the following list of codes.

Code	Explanation
PROPOSAL	An instrument proposal has been submitted to NASA.
FEASIBILITY	Feasibility studies are presently being conducted.
PRELIM DSGN	Initial engineering designs are being prepared.
BREADBOARD	Components are being separately built and tested.
ADVAN DSGN	Final engineering drawings are being prepared.
PROTOTYPE	A configured working model is being built and tested.
FLT MODEL	A space-hardened unit is being built and tested.

Code	Explanation
ENVRN TESTS	The flight model is being tested under critical environmental conditions.
INTEGRATION	The instrument is being mounted aboard the designated spacecraft and tested for compatibility with other instruments and spacecraft systems.
OPERATIONAL	The instrument is being flown and data acquired.
POST FLIGHT	The instrument is no longer operational (includes experiment data reduction phase).

18. MONITOR x(20)

The last name of the technical monitor of the NASA or Agency contract followed immediately by a comma (required), his ancillary information as space permits.

19. AGENCY c(15)

The name of the actual or proposed Federal funding agency, chosen from the following list of codes.

Code	Meaning
NASA HDQTRS	NASA Headquarters Washington, D.C.
NASA GSFC	Goddard Space Flight Center Greenbelt, Maryland
NASA ARC	Ames Research Center Moffett Field, California
NASA MSC	Manned Spacecraft Center Houston, Texas
NASA JPL	Jet Propulsion Laboratory Pasadena, California
NASA LARC	Langley Research Center Langley, Virginia
NASA MSFC	George C. Marshall Space Flight Center Huntsville, Alabama
NASA NESC	National Environmental Satellite Center Suitland, Maryland

The AGENCY and MONITOR must be consistent with each other. Requests for codes for agencies not listed above may be submitted to the Cognizant Personnel (see Appendix D).

20. PGM OFFICE xxxx/xxx

The program office responsible for the instrument development. The first four characters indicate the funding office. If the AGENCY is NASA, the funding office must be OSSA, OMSF, OTDA, or OART. The final three character entry in this item is the three-letter organization code of the MONITOR.

21. TELEPHONE nnn-zzz-nnnn-zzzzz

Area-code, exchange, number, and extension of the MONITOR. The first character of the extension may be X, if so desired.

22. VENDOR x(24)

The name of the proposed or contracted vendor of the instrument hardware.

23. LOCATION x(23)

The city and state in which the VENDOR is located.

24. FLIGHT DATE nn/nn

The projected or actual month and year of launch of the spacecraft to which the instrument is assigned. This information must be obtained from AGENCY sources, not from the PRINCIPAL INVESTIGATOR.

25. LEAD TIME nn MONTHS

The projected time required for the completion or acquisition of the flight hardware from the START DATE. If the STATUS is ENVRN TESTS or higher, NA should be entered.

26. INSTRUMENT TYPE x(60)

A capsule description of the type of instrument presented in the resume. A basic instrument code, selected from the list of codes below, must be entered in the first few (up to 17) characters of the item, followed immediately by a comma and a space (required). Other codes will be added, as required, by the Cognizant Personnel.

Codes

ALTIMETER
BEACON
COUNTER
DATA RELAY
GRAVIMETER
IMAGER
INTERFEROMETER
PHOTOMETER

Codes

POLARIMETER
RADIOMETER
RECEIVER
REFLECTOR
SCATTEROMETER
SPECTROMETER
STAR TRACKER
TRANSMITTER
TRANSPONDER

The comma and space should be followed by a series of modifiers which describe the instrument sufficiently well so that it cannot be confused with other similar instruments. However, if the identical instrument appears on several resumes, care should be taken to make these modifiers identical on each resume. Spaces, rather than commas, should be used to separate the modifiers; hyphens should be used to join modifiers of modifiers. See Item 26 in Figure 4.

27. SECURITY ccc

The security classification of the resume using the appropriate code selected from the list below. The entry should describe the highest classification of the information contained in the resume. Even though phases of the experiment/instrument research, hardware development, or data handling may be classified, frequently no classified information need be entered in the resume, thereby allowing UNC or PRO to be entered.

Code	Meaning
UNC	Unclassified
PRO	Proprietary
CON	Confidential
SEC	Secret
TS	Top Secret

28. APPLICATION c(39)

Up to seven of the following codes, separated from one another by a comma and a space.

Code	Meaning
AGRI	Agriculture
ASTR	Astronomy
ATM-PHYS	Atmospheric Physics
BIOL	Biology

Code	Meaning
CART	Cartography
COMM	Communications
ERSP	Earth Resources
FOR	Forestry
GEOD	Geodesy
GEOG	Geography
GEOL	Geology
GEOP	Geophysics
HYDR	Hydrology
MET	Meteorology
NAV	Navigation and Traffic Control
OCEAN	Oceanography
PART-FLD	Particles and Fields
PLAN	Planetology
PLAN-ATM	Planetary Atmospheres

Requests for codes for applications not listed above may be submitted to the Cognizant Personnel (see Appendix D).

29. SPACECRAFT x(24)

The name of the spacecraft to which the instrument is assigned. Great care should be made to establish consistent notation for each spacecraft, since this item serves as part (with ACRONYM) of the unique identifying specification of a single resume. For example, the spacecraft given on the sample resume in Figure 4 is TIROS 7. If other resumes describe other instruments which were flown on the same spacecraft, these resumes must have exactly TIROS 7 entered in item 29, and not TIROS VII, TIROS 7, (note the additional spaces between TIROS and 7), or the like, which the computer would not recognize.

30. PURPOSE x(64) 6 lines

Both the primary and secondary (if any) purposes of instrument/experiment should be defined as follows: the word PRIMARY followed by a hyphen and any number of subordinate infinitive phrases, terminated with three asterisks (or a period if there is no secondary purpose); the word SECONDARY followed by a hyphen and any number of subordinate infinitive phrases, terminated with a period.

31. PRINCIPLES OF OPERATION x(64) 20 lines

A prose description of the basic principles governing the operation of the instrument, historical use or development, spacecraft/instrument interfaces, unusual data-handling requirements, calibration procedures, etc., not described

elsewhere in the resume. While the all-inclusive spectral range may be described in Item 35, the actual channels or windows should be specified in this item.

32. PHENOMENA OBSERVED x(64)

A short qualitative description of the actual physical phenomena which the instrument observes.

33. MEASUREMENT RANGE x(64)

Short quantitative descriptions of the expected measurement ranges (e.g., dynamic ranges) characteristic of the instrument. This entry should not give the same information as given in other items, such as SPECTRAL RANGE, FIELD OF VIEW, ANGULAR RESOLUTION, or the like.

34. PRECISION AND ACCURACY x(64)

Short, quantitative descriptions of the precisions and accuracies associated with the measurement ranges given in Item 33.

35. SPECTRAL RANGE nnnnn.nnnnbTObnnnnn.nnnnbc(7)

The all-inclusive spectral range for the instrument, even though only certain bands within the range may actually be detected. The first numeric field (nnnnn.nnnn) should be used to specify the low end of the range; the second numeric field (nnnnn.nnnn), the high end. If the instrument operates at one particular frequency, the single frequency should be entered in the first numeric field, and the second numeric field should be left blank. The last seven characters are reserved for the code corresponding to the appropriate units of the given range. This code should be selected from those listed in Figure 7.

36. SPECTRAL RESOLUTION nnnn.nnnbPERCENT

The first eight positions constitute a numeric field in which is given the expected or proved spectral resolution, as a percent of the median of the SPECTRAL RANGE.

37. TIME CONSTANT nnnn.nbc(7)

The expected or proven time constant of the instrument (nnnn.n). The last seven positions are reserved for the code corresponding to the appropriate units, selected from the list in Figure 7.

FIGURE 7

GENERAL LIST OF MANDATORY UNITS CODES

CODE	MEANING
A	Angstroms
CM	Centimeters
DAYS	Days
GHZ	Gigahertz (kilomegacycles/sec)
HRS	Hours
HZ	Hertz (cycles/sec)
KHZ	Kilohertz (kilocycles/sec)
METERS	Meters
MHZ	Megahertz (megacycles/sec)
MICRONS	Microns
MILMICR	Millimicrons
MSEC	Milliseconds
MIN	Minutes
MM	Millimeters
MON	Months
SEC	Seconds
YRS	Years

38. FIELD OF VIEW nnnn.nnbBYnnnn.nnbDEG

The angular field of view subtended by the optics or detector associated with the instrument. If the instrument is defined as having a rectangular field of view (across the flats), the across-flight angle should be given in the first numeric field (nnnn.nn) and the inflight angle should be given in the second numeric field (nnnn.nn). If the instrument has a scanning field of view, the scanning angle (usually across-flight) should be given in the first numeric field, and the scanning beam width (usually the same as the ANGULAR RESOLUTION) should be given in the second numeric field. If the scanning beam width is unknown, a series of seven dashes should be entered in the second numeric field. If the instrument has a circular field of view (unmasked optics), the angle subtended by the aperture should be given in the first numeric field, and the second numeric field should be left blank. All entries must be expressed in degrees.

39. GROUND SWATH x(41)

A short quantitative description of the dimensions of the ground swath observed by the instrument from a specific altitude (consistent with the entry for ALTITUDE), geometrically commensurate with the specified FIELD OF VIEW. Corresponding to the three types of field of view mentioned in Item 38, experience has shown the formats of the following three illustrative entries to be short and easily understood.

Rectangular Field of View

430 NM BY 260 NM FROM 600 NM ALTITUDE

Scanning Field of View

430 NM BY 1.6 NM FROM 600 NM ALTITUDE
or
430 NM FROM 600 NM ALTITUDE (if beamwidth or ANGULAR RESOLUTION are unknown)

Circular Field of View

430 NM DIAM CIRCLE FROM 600 NM ALTITUDE

If the detector is not nadir-pointing (such as a side-looking radar imager), such a description of the ground swath may be somewhat deceptive. However, this can be clarified in the PRINCIPLES OF OPERATION.

40. ANGULAR RESOLUTION nnnn.nnnbDEG

The angular resolution of the optics or detector associated with the instrument, expressed in degrees (nnnn.nnn). In the case of a scanning field of view, this entry is usually the same as the entry in the second numeric field in Item 38.

41. SPATIAL RESOLUTION x(51)

A short quantitative description of the actual instantaneous length of the resolution element on the ground from a specific altitude (consistent with the entry for ALTITUDE and the same as used in the GROUND SWATH), geometrically commensurate with the specified ANGULAR RESOLUTION. Experience has shown the format of the following illustrative example to be short and easily understood.

1.6 NM FROM 600 NM ALTITUDE

42. POINTING ACCURACY nnn.nnnbDEG

The maximum permissible instantaneous instrument-attitude error for acceptable data, expressed in degrees (nnn.nnn). This entry is not to be confused with the spacecraft attitude-error control capabilities.

43. POINTING RATE nnn.nnnbDEG/SEC

The minimum permissible instrument attitude-error recovery-rate for acceptable data, expressed in degrees (nnn.nnn). This entry is not to be confused with the spacecraft attitude-error recovery-rate capabilities.

44. ALTITUDE c(5) c(9)

A coded qualitative description of the altitude and shape of the orbit to which the instrument/spacecraft is assigned. This entry consists of two sub-entries. The first sub-entry (five characters long) is chosen from the codes given below to describe the general range of orbital altitude.

Code	Meaning
LOW	less than 200 NM
MED	200 to 1000 NM
HIGH	greater than 1000 NM
SYNCH	geo-synchronous altitude
ANY	does not affect experiments

The second sub-entry (9 characters long) is chosen from the codes given below to distinguish between circular and non-circular orbits.

Code	Meaning
CIRCULAR	nominally circular orbit
ECCENTRIC	nominally non-circular orbit
ANY	does not affect experiments

Any first sub-entry may be used with any second sub-entry.

45. INCLINATION c(11) c(10)

A coded qualitative description of the inclination and launch azimuth of the instrument/spacecraft. This entry consists of two sub-entries. The first sub-entry (11 characters long) is chosen from the codes given below to describe the general range of orbital inclination.

Code	Meaning
EQUATORIAL	equatorial
LOW	less than 20 degrees
MEDIUM	20 to 70 degrees
HIGH	greater than 70 degrees
SUN-SYNCH	sun-synchronous inclination
POLAR	90 degrees (nominal)
ANY	does not affect experiments

The second sub-entry (10 characters long) is chosen from the codes given below to specify the relationship between the inclination and the launch or final orbital-insertion azimuth.

Code	Meaning
POSIGRADE	true inclination is less than 90 degrees
RETROGRADE	true inclination is greater than 90 degrees
ANY	does not affect experiments

Any second sub-entry may be used with any first sub-entry, except with POLAR (either second entry is meaningless) and SUN-SYNCH (second entry must be RETROGRADE or will be assumed so if left blank).

46. SPECIAL REQUIREMENTS x(64)

Brief descriptions of critical requirements of the instrument, mission-instrument interface, and/or spacecraft-instrument interface.

47. COMPONENTS x(64)

A list of only those components of the instrument system which contribute to the specified WEIGHT and VOLUME (Items 48 and 49). Examples are detector, electronics, recording device.

48. WEIGHT nnnnn.LB

The total weight of all components listed in Item 47. This entry must be in pounds. Decimal fractions should be rounded up to the nearest integer.

49. VOLUME nnnnn.nnbCUbFT

The total volume occupied by the components listed in Item 47. This entry must be in cubic feet.

50. AVERAGE POWER nnnn.WATTS

The average amount of electrical power required by the instrument. This entry must be in watts. Decimal fractions should be rounded up to the nearest integer.

51. STANDBY POWER nnn.WATTS

The amount of electrical power required by the instrument when in a standby mode. This entry must be in watts. Decimal fractions should be rounded up to the nearest integer.

52. PEAK POWER nnnn.WATTS

The peak amount of electrical power required by the instrument at any time during its operation. This entry must be in watts. Decimal fractions should be rounded up to the nearest integer.

53. MTBF nnn.cccc

The estimated or demonstrated mean-time-before-failure of the instrument. The last four positions of the item are reserved for the appropriate units of time selected from the list in Figure 6.

54. RF INTERFERENCE c(9)

A qualitative description of the radio-frequency interference using one of the following codes:

Code	Meaning
SOURCE	A source of interference
SENSITIVE	Sensitive to interference
SOURC/SEN	Sensitive to and a source of interference
NONE	Neither a source of nor sensitive to interference

55. MAGNETIC INTERFERENCE c(9)

A qualitative description of the magnetic interference, using one of the codes listed in the description of Item 54.

56. NUCLEAR INTERFERENCE c(9)

A qualitative description of the nuclear interference, using one of the codes listed in the description of Item 54.

57. THERMAL INTERFERENCE c(9)

A qualitative description of the thermal interference, using one of the codes listed in the description of Item 54.

58. SHIELDING x(24)

A concise description of any shielding required by the instrument, concommitant with the entries in RF, MAGNETIC, NUCLEAR, and/or THERMAL INTERFERENCE. Reference may be made to the PRINCIPLES OF OPERATION, using the phrase SEE ITEM 31, if a longer explanation is required.

59. CALIBRATION x(24)

A concise description of the in-flight calibration requirements for the instrument. Reference may be made to the PRINCIPLES OF OPERATION, using the phrase SEE ITEM 31, if a longer explanation is required.

60. DATA RECOVERY c(20)

A qualitative description of the data recovery requirements for the instrument/experiment, using one of the following codes.

Code	Meaning
REALTIME TELEMETRY	As data are acquired, they are immediately transmitted to a receiving station
DELAYED TELEMETRY	Data are buffered and later transmitted to a receiving station on a regularly scheduled basis.
TELEMETRY ON COMMAND	Data are buffered and later transmitted to a receiving station on the basis of a locally or remotely generated command (interrogation mode).

Code	Meaning
DELAYED AND REAL TIME	A combination of the DELAYED TELEMETRY and REALTIME TELEMETRY modes.
AUTOMATED RE-ENTRY	Data are returned to earth via an unmanned re-entry vehicle.
MANNED RETURN	Data are returned to earth via a manned re-entry vehicle.
EVA/MANNED RETURN	Data are covered using manned extra-vehicular activity, and then returned to earth via a manned re-entry vehicle.

61. FREQUENCY OF OBSERVATION x(18)

A concise description of the rate or frequency at which the instrument operates in a data-acquisition mode. Typical entries might be: CONTINUOUSLY, NIGHTSIDE OF ORBIT, 3 TIMES PER DAY, etc.

62. TELEMETRY REQUIREMENTS x(64) 3 lines

A quantitative description of the telemetry requirements, including bandwidth when applicable, consistent with the entry for DATA RECOVERY (Item 60).

63. ADVANTAGES AND LIMITATIONS x(64) 2 lines

Concise statements, separated by commas, describing the unique advantages of the instrument, terminated by a semi-colon. The semi-colon is followed by another group of concise statements, separated by commas, describing the significant limitations of the instrument, terminated by a period.

64. REFERENCES x(64) 6 lines

A list of references used directly in preparing the resume. Additional relevant resumes, not used directly, may also be listed as space permits. The general format for each reference is as follows: title, author, institution or agency, date, plus other standard bibliographical information as deemed

required. References are numbered in sequence with an integer followed by a right parenthesis immediately preceding the title. Each reference is terminated with three asterisks, except the last one.

65. COST PREVIOUS FY nnnn:b$n(10)*

The previous fiscal year is entered in the first four positions of the item, followed by a colon, a blank, and a dollar sign (not required). The remaining ten-position numeric field gives the total contracted cost associated with the instrument for the previous fiscal year. No commas may be used in the cost entry and the entry itself must be justified right. Print-out of this item on the resumes is suppressed without proper access codes.

66. COST CURRENT FY nnnn:b$n(10)*

The same explanation given for Item 65 is valid for this item, except that the current level of funding should be entered in the 10-position numeric field. Print-out of this item on the resumes is suppressed without proper access codes.

67. COST TO DATE $n(10)*

This item gives the total contracted cost of the instrument through its development, including the costs for the current fiscal year (Item 66). The same explanation given for the 10-position numeric field in Item 66 is valid for this item. The dollar sign may be omitted if so desired. Print-out of this item on the resumes is suppressed without proper access codes.

68. COST TO COMPLETION $n(16)*

This item gives the estimated level of funding over and above the COST TO DATE (Item 67) which will be required for successful achievement of the PURPOSE, including development, manufacture, testing, flight, and data handling. The same explanation given for the 10-position numeric field in Item 66 is valid for the 16-position numeric field in this item. The dollar sign may be omitted, if so desired. Print-out of this item on the resumes is suppressed without proper access codes.

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* Based upon subsequent analysis by the Technical Monitor and IITRI, it was decided to omit this item from future versions of the Instrument Resume Format. See Appendix E.

69. DIAGRAMS

This block on the resume is reserved for diagrams illustrating the use and operation of the instrument. The block has been designed to accommodate three diagrams originally drawn vertically on 8-1/2 by 11 inch paper, reduced to 2-1/8 by 2-3/4 inches; or one diagram originally drawn horizontally on 8-1/2 by 11-inch paper, reduced to 3-1/4 by 4-1/2 inches. Many other special arrangements are feasible.

In general, the original art work may be submitted to the Cognizant Personnel (see Appendix D) who will arrange for transferring the diagrams to the master resume. Those resumes printed by IRSARS on the computer will not have the diagrams on them. However, once a master with the diagrams is made, it may be easily reproduced and distributed.

A brief summary of some of the information detailed in this section is given in Figure 8. Additional inquiries about individual items and their interpretation and/or completion may be directed to the Cognizant Personnel (see Appendix D). A convenient form for coding the instrument resumes, in preparation for punching, is given in Appendix C. Changes in the resume format are given in Appendix E.

FIGURE 8

SUMMARY OF THE BASIC CAPABILITIES AND REQUIREMENTS OF THE INSTRUMENT RESUME ITEMS

ITEM	Number of Lines in Item	Is Item Available for Retrieval?	Is Item Available for Keyword Search?	Is Some Entry Mandatory for this Item?	Are Special Codes Used in this Item?	Must Entries Conform to a Special Format?
1. TITLE	2	YES	YES	YES	NO	NO
2. ACRONYM	1	YES	NO	YES	NO	NO
3. EXP NO.	1	YES	NO	NO	NO	NO
4. RESUME DATE	1	YES	NO	YES	NO	YES
5. VERSION	1	YES	NO	YES	NO	YES
6. PRINCIPAL INVESTIGATOR	1	YES	NO	NO	NO	YES
7. ORGANIZATION (RE: ITEM 6)	1	NO	YES	NO	NO	NO
8. TELEPHONE (RE: ITEM 6)	1	NO	NO	NO	NO	YES
9. CO-INVESTIGATOR	1	NO	NO	NO	NO	YES
10. ORGANIZATION (RE: ITEM 9)	1	NO	YES	NO	NO	NO
11. TELEPHONE (RE: ITEM 9)	1	NO	NO	NO	NO	YES
12. CONTRACT TYPE	1	NO	NO	NO	YES	NO
13. CONTRACT NUMBER	1	NO	NO	NO	NO	NO
14. FLASH INDEX NUMBER	1	NO	NO	NO	NO	YES
15. START DATE	1	NO	NO	NO	NO	YES
16. COMPLETION DATE	1	NO	NO	NO	NO	YES
17. STATUS	1	YES	NO	NO	YES	NO
18. MONITOR	1	NO	NO	NO	NO	YES
19. AGENCY (RE: ITEM 18)	1	YES	NO	NO	YES	NO
20. PROGRAM OFFICE (RE: ITEM 18)	1	YES	NO	NO	NO	YES
21. TELEPHONE (RE: ITEM 18)	1	NO	NO	NO	NO	YES
22. VENDOR	1	NO	YES	NO	NO	NO
23. LOCATION (RE: ITEM 22)	1	NO	YES	NO	YES[1]	NO
24. FLIGHT DATE	1	NO	NO	NO	NO	YES

(1) See Explanation of Item in the Instrument Resume Section

FIGURE 8 (CONT.)

SUMMARY OF THE BASIC CAPABILITIES AND REQUIREMENTS OF THE INSTRUMENT RESUME ITEMS

ITEM	Number of Lines in Item	Is Item Available for Retrieval?	Is Item Available for Keyword Search?	Is Some Entry Mandatory for this Item?	Are Special Codes Used in this Item?	Must Entries Conform to a Special Format?
25. LEAD TIME	1	NO	NO	NO	NO	YES
26. INSTRUMENT TYPE	1	YES	YES	NO	NO	YES
27. SECURITY	1	YES	NO	YES	YES	NO
28. APPLICATION	1	YES	NO	NO	YES	YES
29. SPACECRAFT	1	YES	NO	YES	YES[1]	NO
30. PURPOSE	6	NO	YES	NO	NO	YES[1]
31. PRINCIPLES OF OPERATION	20	NO	YES	NO	NO	NO
32. PHENOMENA OBSERVED	1	NO	YES	NO	NO	NO
33. MEASUREMENT RANGE	1	NO	NO	NO	NO	NO
34. PRECISION AND ACCURACY	1	NO	NO	NO	NO	NO
35. SPECTRAL RANGE	1	YES	NO	NO	YES	YES
36. SPECTRAL RESOLUTION	1	YES	NO	NO	NO	YES
37. TIME CONSTANT	1	NO	NO	NO	YES	YES
38. FIELD OF VIEW	1	YES	NO	NO	NO	YES
39. GROUND SWATH	1	NO	NO	NO	NO	YES[1]
40. ANGULAR RESOLUTION	1	YES	NO	NO	NO	YES
41. SPATIAL RESOLUTION	1	NO	NO	NO	NO	YES[1]
42. POINTING ACCURACY	1	NO	NO	NO	NO	YES
43. POINTING RATE	1	NO	NO	NO	NO	YES
44. ALTITUDE	1	YES	NO	NO	YES	YES
45. INCLINATION	1	YES	NO	NO	YES	YES
46. SPECIAL REQUIREMENTS	1	NO	NO	NO	NO	NO
47. COMPONENTS	1	NO	NO	NO	NO	NO
48. WEIGHT	1	YES	NO	NO	NO	YES
49. VOLUME	1	YES	NO	NO	NO	YES
50. AVERAGE POWER	1	YES	NO	NO	NO	YES
51. STANDBY POWER	1	YES	NO	NO	NO	YES
52. PEAK POWER	1	YES	NO	NO	NO	YES
53. MTBF	1	YES	NO	NO	YES	YES
54. RF INTERFERENCE	1	YES	NO	NO	YES	NO

(1) See Explanation of Item in the Instrument Resume Section

FIGURE 8 (CONT.)

SUMMARY OF THE BASIC CAPABILITIES AND REQUIREMENTS OF THE INSTRUMENT RESUME ITEMS

ITEM	Number of Lines in Item	Is Item Available for Retrieval?	Is Item Available for Keyword Search?	Is Some Entry Mandatory for this Item?	Are Special Codes Used in this Item?	Must Entries Conform to a Special Format?
55. MAGNETIC INTERFERENCE	1	YES	NO	NO	YES	NO
56. NUCLEAR INTERFERENCE	1	YES	NO	NO	YES	NO
57. THERMAL INTERFERENCE	1	YES	NO	NO	YES	NO
58. SHIELDING (RE: ITEMS 54-57)	1	NO	NO	NO	NO	NO
59. CALIBRATION	1	NO	NO	NO	NO	NO
60. DATA RECOVERY	1	YES	NO	NO	YES	NO
61. FREQUENCY OF OBSERVATION	1	NO	NO	NO	NO	NO
62. TELEMETRY REQUIREMENTS	3	NO	NO	NO	NO	NO
63. ADVANTAGES AND LIMITATIONS	2	NO	NO	NO	NO	YES[1]
64. REFERENCES	6	NO	NO	NO	NO	YES[1]
65. COST PREVIOUS FY	1	NO	NO	NO	NO	YES
66. COST CURRENT FY	1	NO	NO	NO	NO	YES
67. COST TO DATE	1	NO	NO	NO	NO	YES
68. COST TO COMPLETION	1	NO	NO	NO	NO	YES

(1) See Explanation of Item in the Instrument Resume Section

3.0 THE RESUME FILE

As mentioned in the Introduction, under the current contract, the resume file has been purposely limited to about 150 resumes pertaining to Space Applications. These resumes are stored on an IBM 2311 Disk Pack, occupying about 15 percent of the total available storage area on the pack. The system can be expanded to accommodate 995 resumes without changing the basic configuration currently in use. When the number of resumes exceeds 995, another 2311 will have to be added to the basic system configuration, providing space for an additional 995 resumes. Further expansion may require the use of an IBM 2314 Disk File, which is readily available in most of the larger 360 systems. The total capacity of a 2314 Disk File would be about 33,000 resumes. Since a number of these units may be linked together, it is obvious that the potential capacity of the system is virtually unlimited.

A listing of the resumes in the current file is given in Appendix A. Copies of the resumes themselves are available upon special request through the Cognizant Personnel (see Appendix D).

Examination of the resumes in the current file will reveal that many items have been left blank. As explained previously, this means that no information was available. As new information is received, these items will be completed using the REVISE function of IRSARS. (see section 5.1). Similarly, as any information on the resumes becomes out-of-date, and more recent information becomes available, the resumes will be updated via the REVISE function.

One of the basic objectives of the follow-on contract is to maintain and update the resume file. Any inputs to this task will be gratefully received by the Cognizant Personnel (see Appendix D).

4.0 THE BIBLIOGRAPHIC FILE

In addition to the Disk File, a physical Bibliographic File is maintained. The purpose of this file is four-fold:

Firstly, as mentioned previously, the diagrams (Item 69) associated with each resume cannot be stored on the Disk File. Thus, the Bibliographic File is the prime source of resumes on which diagrams have been printed. These resumes may be easily reproduced and distributed to interested parties. Application may be made through the Cognizant Personnel (see Appendix D).

Secondly, the Bibliographic File contains not only the most current resumes, but also all prior versions of the resumes. Examination of previous editions can yield an accurate historical picture of the development of an instrument, a concept useful to space mission planners.

Thirdly, the Bibliographic File also contains copies of all the reference material used in compiling the resume. Often additional reference material, not used directly in compiling the resume is also included. This insures a sound basis for documentation of the information in the resumes.

Fourthly, the Bibliographic File serves as a physical backup to the Disk File, should all copies of the latter be inadvertently lost or destroyed.

The resumes in the Bibliographic File are first arranged alphabetically by SPACECRAFT (Item 29), and then within each SPACECRAFT group, alphabetically by ACRONYM (Item 2). Letters are considered to be lower in the collating-sequence than numbers and therefore follow numbers in natural order. Thus the spacecraft NIMBUS 2 would be found closer to the physical beginning of the file than NIMBUS E, and the acronym ACV2 would be found closer to the physical beginning of its spacecraft group than ACVB.

Information in the Bibliographic File is readily available to interested parties upon special request to the Cognizant Personnel (see Appendix D).

5.0 THE SEARCH AND RETRIEVAL SYSTEM (IRSARS)

IRSARS (Instrument Resume Search and Retrieval System) is a high-speed, automated, computer-oriented, conversational-mode, search and retrieval system, designed to provide several useful and convenient means of access to the instrument resumes. A general flow chart for IRSARS, showing the various functions of the system and their interelationships, is given in Figure 9. A general logic chart is given in Appendix E, which will be found in the pocket on the back cover of this report. The source listing of IRSARS, which is written in COBOL, is given in Appendix B. A basic description of the capabilities of the system follows.

5.1 Program Description

The System can perform three separate functions, some having several options and sub-options in conjunction with the Master Disk File.

1) SEARCH - Four separate options are available within the function SEARCH.

   a) LIST

      The purpose of this option is to list all the resumes in the master data file on the typewriter/console. Each resume is identified by TITLE, SPACECRAFT, and ACRONYM. If it is in the PROPOSAL phase, that is indicated. If the instrument/spacecraft combination is not currently being considered for flight, that is also indicated by the word INACTIVE.

   b) PRINT

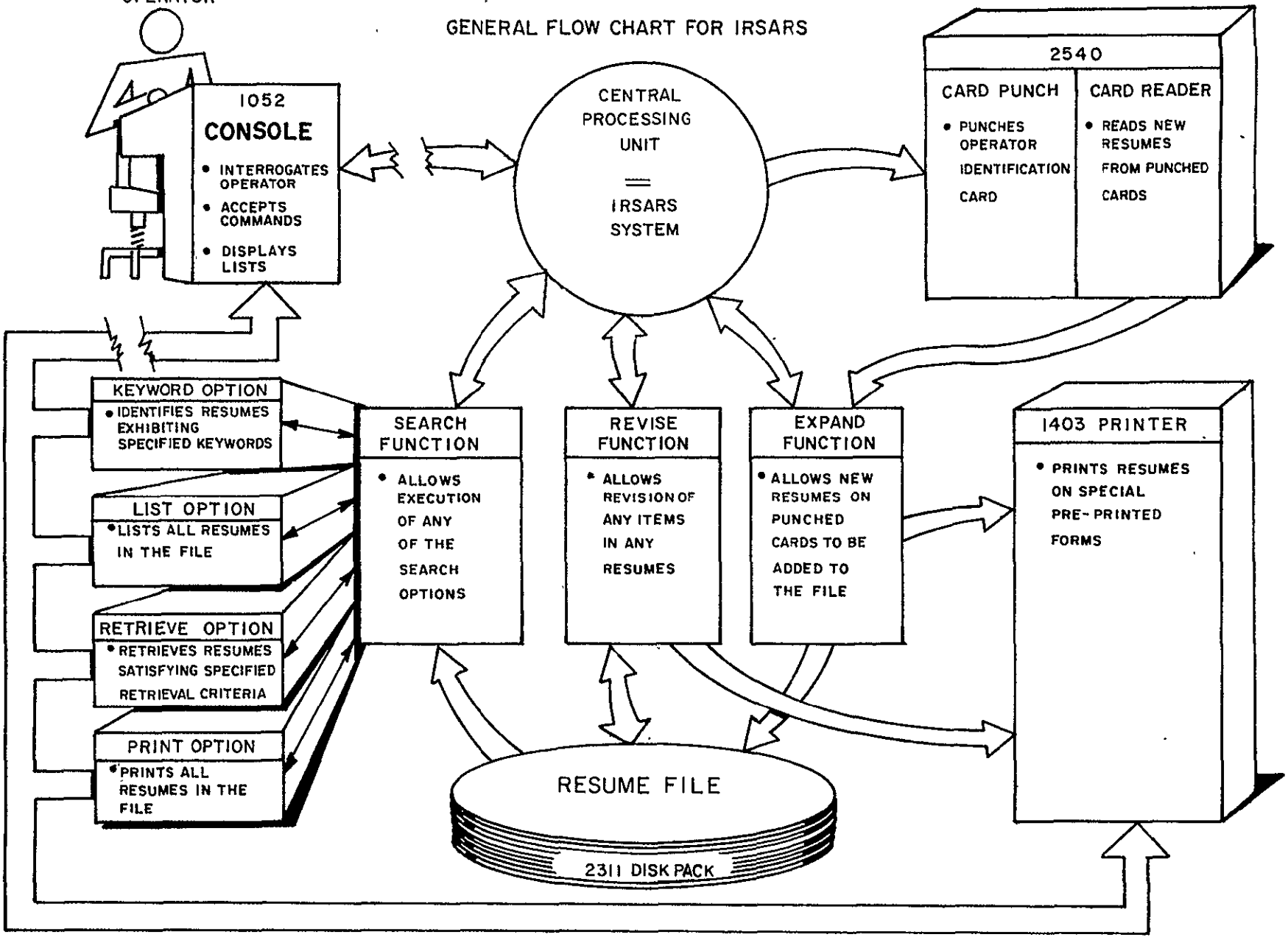
      The purpose of this option is to print out all the resumes in the Disk File on the high speed printer using the special resume forms. The resumes may be paginated.

   c) RETRIEVE

      The purpose of this function is to search the master data file for certain specific

FIGURE 9

GENERAL FLOW CHART FOR IRSARS



resumes, selection being based upon any number of simultaneous criteria supplied by the operator on the computer console. The criteria may be loose enough to retrieve many resumes, or tight enough to retrieve very few. Retrieval may be based upon as many selection criteria as desired. The following items are presently available for retrieval.

Resume Item Number	Description
1	TITLE
2	ACRONYM
3	EXPERIMENT NUMBER
4	RESUME DATE
5	VERSION
6	PRINCIPAL INVESTIGATOR
17	STATUS
19	AGENCY
20	PROGRAM OFFICE
26	INSTRUMENT TYPE
27	SECURITY
28	APPLICATION
29	SPACECRAFT
35	SPECTRAL RANGE
36	SPECTRAL RESOLUTION
38	FIELD OF VIEW
40	ANGULAR RESOLUTION
44	ALTITUDE (AND ECCENTRICITY)
45	INCLINATION (AND LAUNCH AZIMUTH)
48	WEIGHT
49	VOLUME
50	AVERAGE POWER
51	STANDBY POWER
52	PEAK POWER
53	MTBF (MEAN TIME BEFORE FAILURE)
54	RF INTERFERENCE
55	MAGNETIC INTERFERENCE
56	NUCLEAR INTERFERENCE
57	THERMAL INTERFERENCE
60	DATA RECOVERY

Most of the other items are not intended nor suitable for retrieval on the basis of given criteria (PRINCIPLES OF OPERATION, Item 31, for example). However, the next SEARCH option, described below, provides a method of accessing the information within a number of these non-retrievable items.

d) KEYWORD

The purpose of this option is to search certain items of each resume for the occurrence of specified keywords. From one to four keywords may be specified at one time. Provision has been made to link the specified keywords in the search mode by either AND (sub-option 1) or OR (sub-option 2) logic.[1] Resumes in which one (or more) of the keywords appear are listed on the console/typewriter in the same manner as they are in the LIST option, except that, in addition, the keyword(s) found are also listed along with the item numbers in which they were found. The following items, in order of search priority, are those examined in the KEYWORD option:

Resume Item Number	Description
1	TITLE
30	PURPOSE
31	PRINCIPLES OF OPERATION
32	PHENOMENA OBSERVED
26	INSTRUMENT TYPE
7	ORGANIZATION OF THE PRINCIPAL INVESTIGATOR
10	ORGANIZATION OF THE CO-INVESTIGATOR
22	VENDOR
23	LOCATION OF VENDOR

The KEYWORD search, by virtue of the complex logic involved, is lengthy. The average time is 3.65 seconds per keyword per resume. Thus care should be taken in the choice of meaningful keywords.

2) EXPAND - The purpose of this function is to expand the existing Disk File to include more resumes. Input to the file is via punched cards, which are

---

1) While the OR logic is truly formulated under the Boolean concepts of "prioritized exclusion" logic, the AND logic is not pure. The purpose of the AND logic is to find as many as possible, but not necessarily all, of the specified keywords. If the OR logic is chosen, as soon as one keyword is found, the next resume is accessed, searched for the first keyword, and so forth.

added to the Disk File in the correct format for the system. A convenient form for coding the Instrument Resumes is given in Appendix C. About 150 resumes have been prepared under the current contract; however, up to 995 resumes may be stored on a single disk pack. Additional disk packs may be tied automatically into the system to increase the data volume (see section 3.0).

3) REVISE - The purpose of this function is to enable the system operator to revise any item or group of items on any resume at will. Revisions are typed in on the console by the operator. No punched cards are used in the performance of the function. Selection, retrieval, and revision of items is entirely automatic.

The above functions may be performed in any order any number of times.

No training in computer operations, technology, or programming is necessary to use the system. Via the console/typewriter, the operator submits commands and supplies answers to questions posed by the computer in English. After sufficient information has been given to the computer, it automatically performs the requested function, and then asks for additional tasks.

Operating instructions are built in, and the system is designed to do the vast majority of the work, including recognizing any operational errors and attempting to rectify them. Allowances for storing proprietary and classified information have been programmed into the system, and only those persons who know the correct access codes can gain access to classified resumes. (As of the termination of the current contract, there are no classified resumes in the file.) A detailed operating manual is included with this report.

5.2 System Configuration

IRSARS is currently designed to be run under IBM Disk Operating System (DOS) software, release 18 or higher. The program currently requires about 12500 hexadecimal, or 75,000 decimal core locations in one phase, in addition to the number of core locations required for the Supervisor. The DOS release 19 Supervisor requires 4C48 hexadecimal, or about 20,000 decimal core locations. Thus, the total core requirement for the current system running under DOS release 19 is about 17000 hexadecimal, or 95,000 decimal core locations.

Thus, in terms of current machine configurations, the system can be run on any IBM series 360 computer, Model 40 or larger, supporting DOS release 18 or higher. It must be pointed out, however, that IRSARS could be adapted to almost any computing system having a COBOL compiler, an on-line typewriter/console, and a total core capacity of about 100K, with relatively few modifications.

The program is currently stored on 9-track magnetic tape in object (machine language) form. This tape may be mounted on any on-line 2400 series 9-track magnetic tape drive, which is then defined as the standard input device (see Operating Manual).

The instrument resumes are stored on a 2311 Disk Pack in standard sequential format. Each resume requires two tracks on a 2311 Disk Pack, and is actually stored as two records: page one of the resume (Items 1 through 34) on the first track, and page two of the resume (Items 35 through 68) on the second track. Each disk pack has 2000 tracks available. Thus the total number of resumes which may be stored on a single disk pack is 995, allowing 10 tracks for VTOC (Volume Table of Contents, required by COBOL under DOS). Provisions for expanding the file are described in Section 3.0.

IRSARS is currently designed to use the on-line 1052 console/typewriter (standard equipment on any IBM System 360) as the means of entering commands, and receiving program messages. However, conversion to a batch mode, in which commands are read in on punched cards as data to the program, is possible. The disadvantage of such a conversion, is the loss of the "hands-on" conversational mode, which allows real-time modification of search requests, and immediate response to outputs in terms of possible new methods of access.

The resumes may be printed out on the printer on blank resume forms, if so desired. The standard printer used with the 360 computer is the 1403. The blank forms are mounted by the operator. IRSARS has a built-in set of instructions which allows for aligning the blank resume forms properly, but the actual adjustments of the printer carriage must be done manually.

Though the program is loaded from tape, IRSARS still requires a card reader to input any resumes which are to be added to the Disk File via the function EXPAND (see section 5.1). Also the card punch is necessary to produce the punched card for the System Log[1)]. The standard card reader/punch associated with the 360 computer is the 2540.

The total amount of equipment required for IRSARS may be divided into three categories, as shown below.

IRSARS Equipment

1	Program Tape
1	2311 Disk Pack (Instrument Resume File)
	Blank Resume Forms (Optional)

1) The System Log is a physical file of punched cards produced by IRSARS everytime the system is used. The cards give the name of the operator and the date of use. The System Log is maintained by the Cognizant Personnel (see Appendix D).

DOS Equipment

3	2311 Disk Packs (DOS Systems Pack, Work Pack, and Private Library Pack)

360 Computer Equipment

1	Central Processing Unit
1	1052 Console
1	2400 Series 9-Track Tape Drive
4	2311 Disk Drives
1	1403 High-Speed Printer
1	2540 Card Reader/Punch
	Various Control Units

It will be noted that all the operator need bring to the computer each time is the program tape, the disk file, and a supply of blank resume forms, if needed. The remaining equipment is supplied by the computer installation.

6.0 THE PERFORMANCE OF THE SYSTEM

While the various search and retrieval options are very flexible, there is merit in considering the comparative speed and efficiency of alternative search options in order to minimize the time required and maximize the resulting information in terms of the user objectives. This section presents graphs showing the speed with which various types of searches can be made. The formulas for the graphs are empirical, based upon actual measurements of the performance of this system. They apply only to the IBM 360 Model 40 computer, and should be considered approximate.

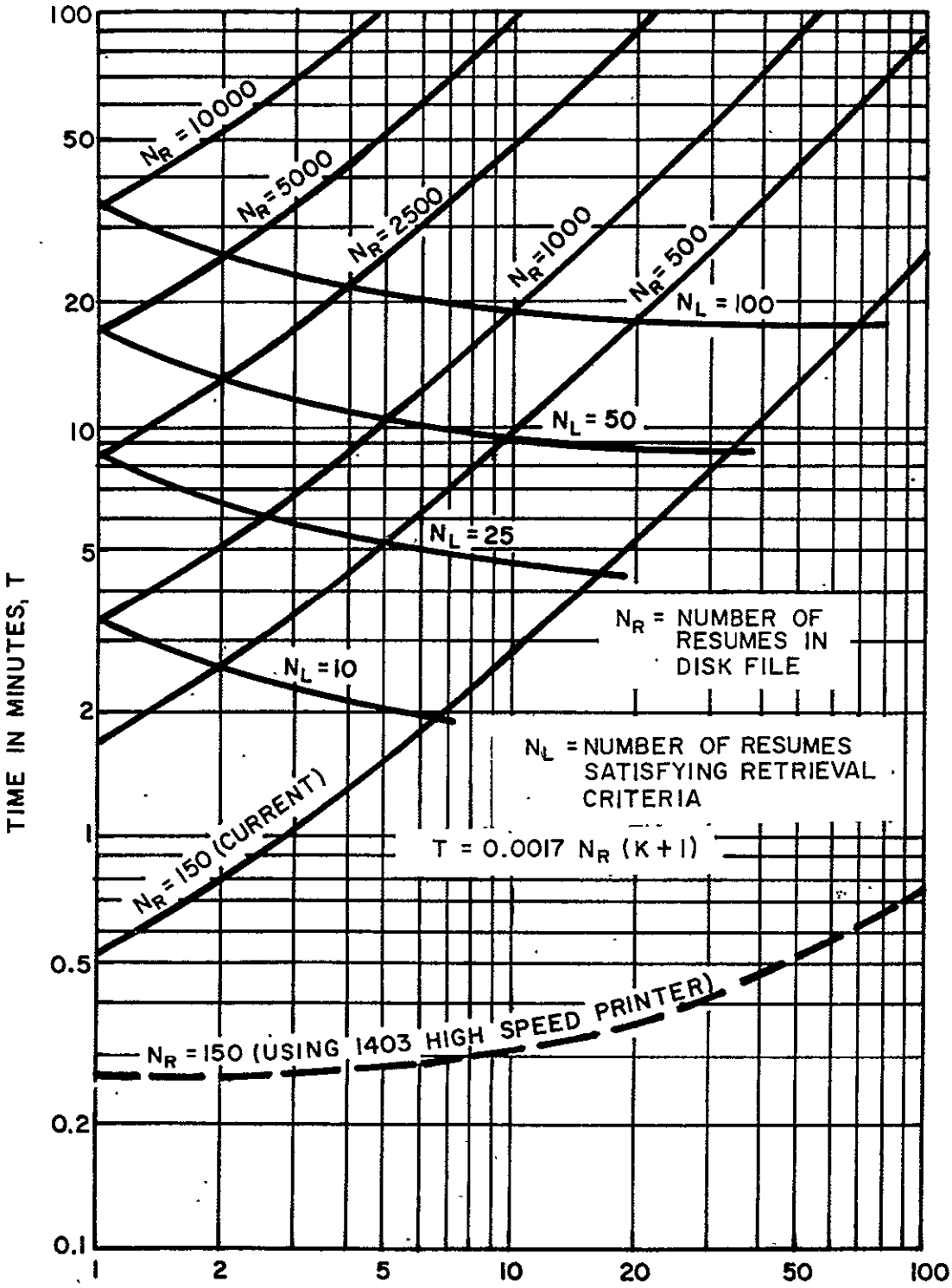
This section also presents a few examples of the application of the system to real problems to illustrate optimum procedures.

6.1 Speed and Efficiency

In every mode except the KEYWORD option, IRSARS is extremely fast internally. For example, in the RETRIEVE option, IRSARS requires approximately one-tenth of a second to examine a single resume to see if the appropriate items satisfy the specified retrieval criteria. However, the typewriter/console requires about 10 seconds to print out the TITLE, SPACECRAFT, and ACRONYM of each resume which satisfies the given criteria. During this print-out or external time, no further searching is performed, i.e., the computer waits for the completion of the print-out before continuing with the search. Thus, theoretically, if no resumes satisfying the criteria were found, the current file would be searched in about 15 seconds or 0.25 minutes (150 resumes x 0.1 second/resume). As the percent or number of resumes retrieved becomes greater than zero, the amount of external (printing) time required increases rapidly. Figure 10 shows the total (internal and external) processing time re-

FIGURE 10

TOTAL PROCESSING TIME REQUIRED FOR RETRIEVAL
OF RESUMES SATISFYING SPECIFIED RETRIEVAL CRITERIA



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quired for the retrieval of resumes satisfying specified retrieval criteria. The dashed line gives the total processing time if the resume could be listed on the high-speed printer, instead of the typewriter/console. This option has not been built into the system as yet, but is planned as a task for the follow-on contract. Of course, the high-speed printer could only be used for listing resumes if the blank resume forms were not used.

Figure 11 gives the percent of the total processing time required exclusively for listing on the typewriter/console vis a vis the high-speed printer (dashed-line). The time saved by using the high-speed printer is dramatically illustrated in this figure.

The KEYWORD options, on the other hand, are almost as slow internally, as they are externally. IRSARS requires about 3.7 seconds to examine one resume all the way through to see if it exhibits one of the specified keywords.

The first KEYWORD sub-option (AND logic) searches for occurrences of as many as possible of the specified keywords, up to a maximum of four. When it finds one, it lists it, and then searches the same resume from the beginning checking for occurrences of the remaining specified keywords, one at a time. The external time to list the TITLE, SPACECRAFT, and ACRONYM of the applicable resume is about the same as in the RETRIEVE option: 10 seconds. The time to list each keyword is about 2 seconds, assuming the average time to find a keyword is half of the 3.7 seconds required to examine an entire resume, and assuming a listed resume exhibits an average of 1.5 keywords, the total time required to process the entire file is given in Figure 12 as a function of the number of keywords specified and the percent of resumes exhibiting at least one of the specified keywords. Figure 13 gives the percent of the total processing time required exclusively for listing the resumes

FIGURE 11

PERCENT OF TOTAL PROCESSING TIME REQUIRED EXCLUSIVELY FOR EXTERNAL (I/O) FUNCTIONS FOR THE RETRIEVAL OPTION

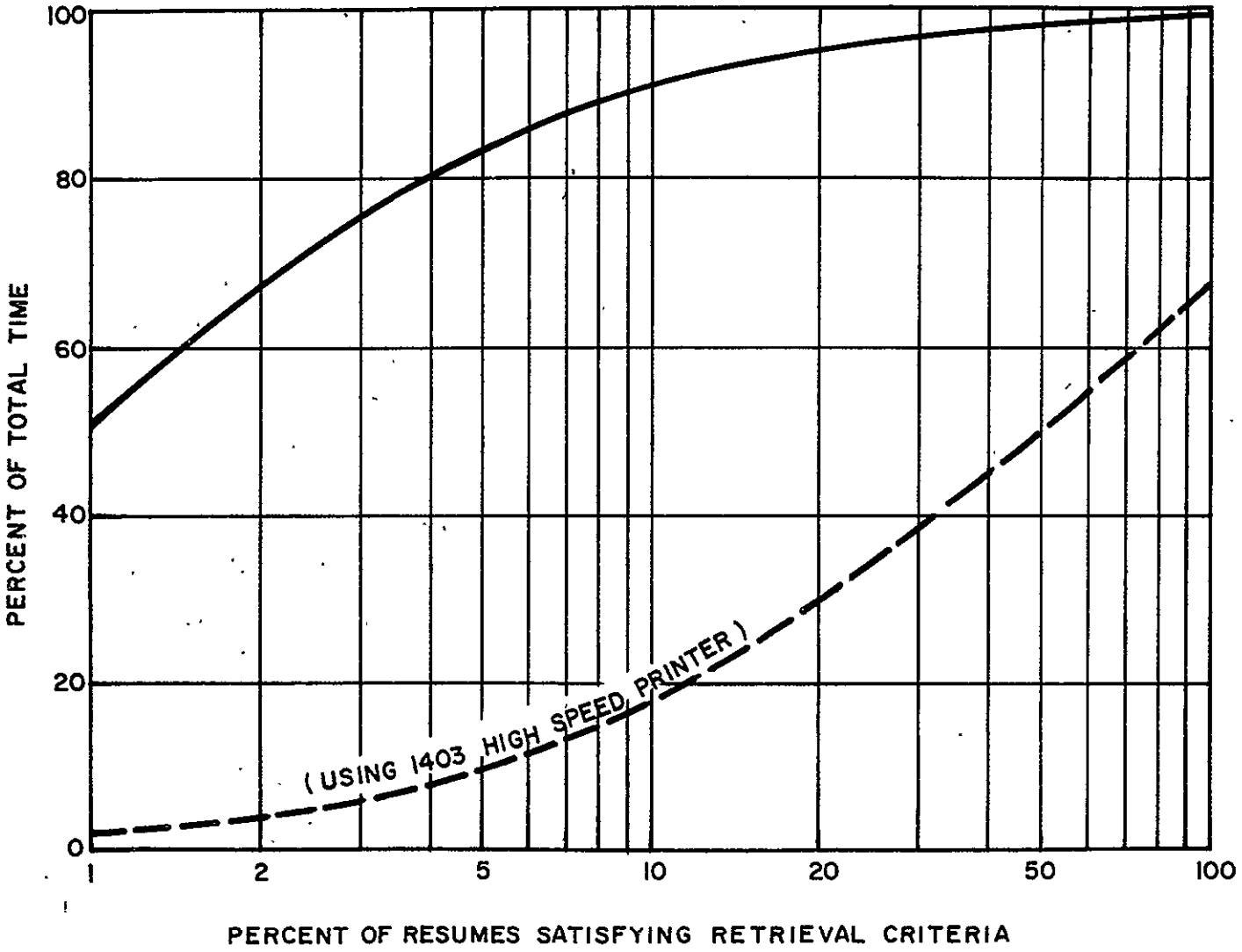

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FIGURE 12

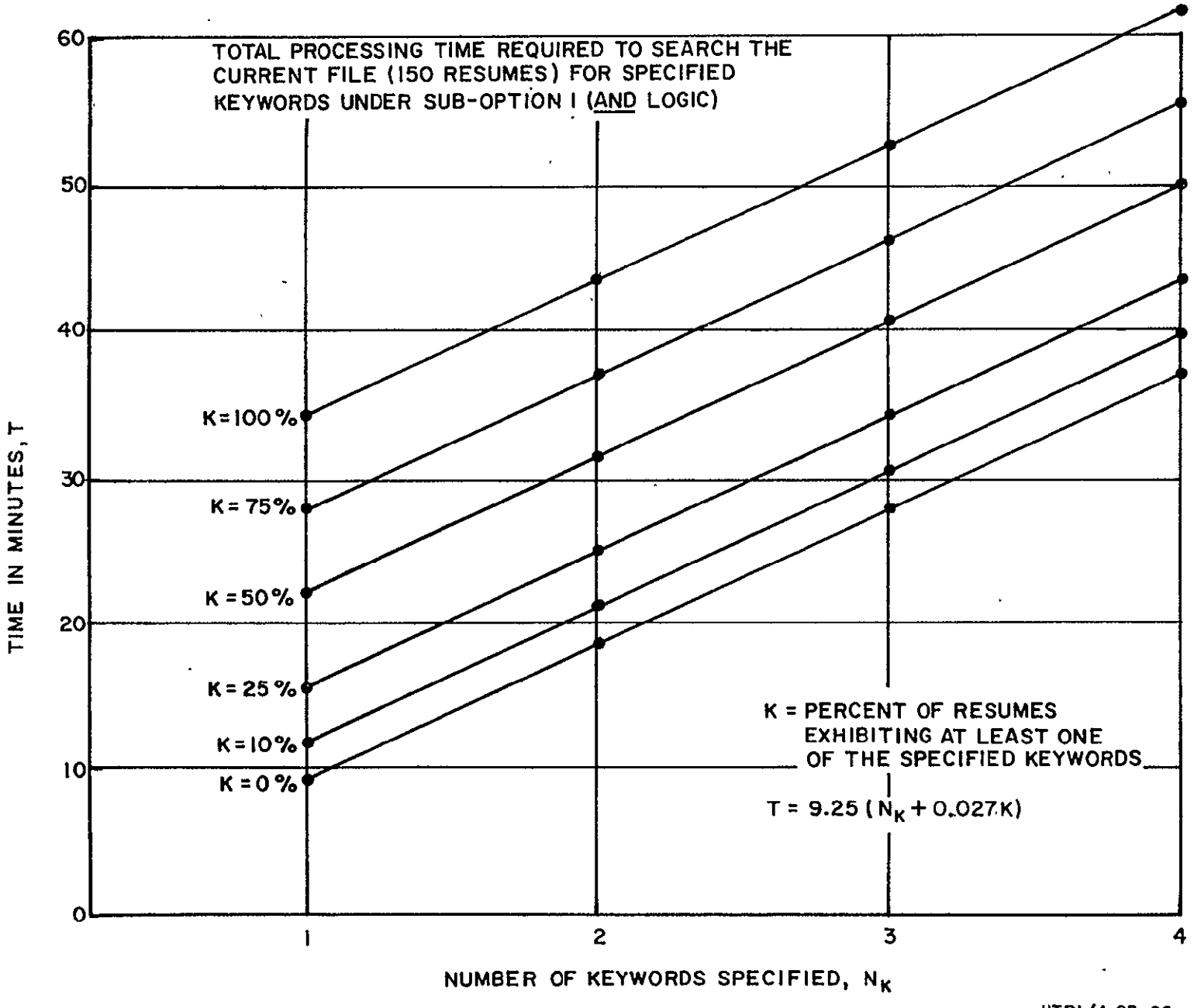
TOTAL PROCESSING TIME REQUIRED TO SEARCH THE CURRENT FILE (150 RESUMES) FOR SPECIFIED KEYWORDS UNDER SUB-OPTION I (AND LOGIC)
TIME IN MINUTES, T
60
50
40
30
20
10
0
K=100%
K=75%
K=50%
K=25%
K=10%
K=0%
K = PERCENT OF RESUMES EXHIBITING AT LEAST ONE OF THE SPECIFIED KEYWORDS
T = 9.25 (N_K + 0.027K)
1
2
3
4
NUMBER OF KEYWORDS SPECIFIED, N_K
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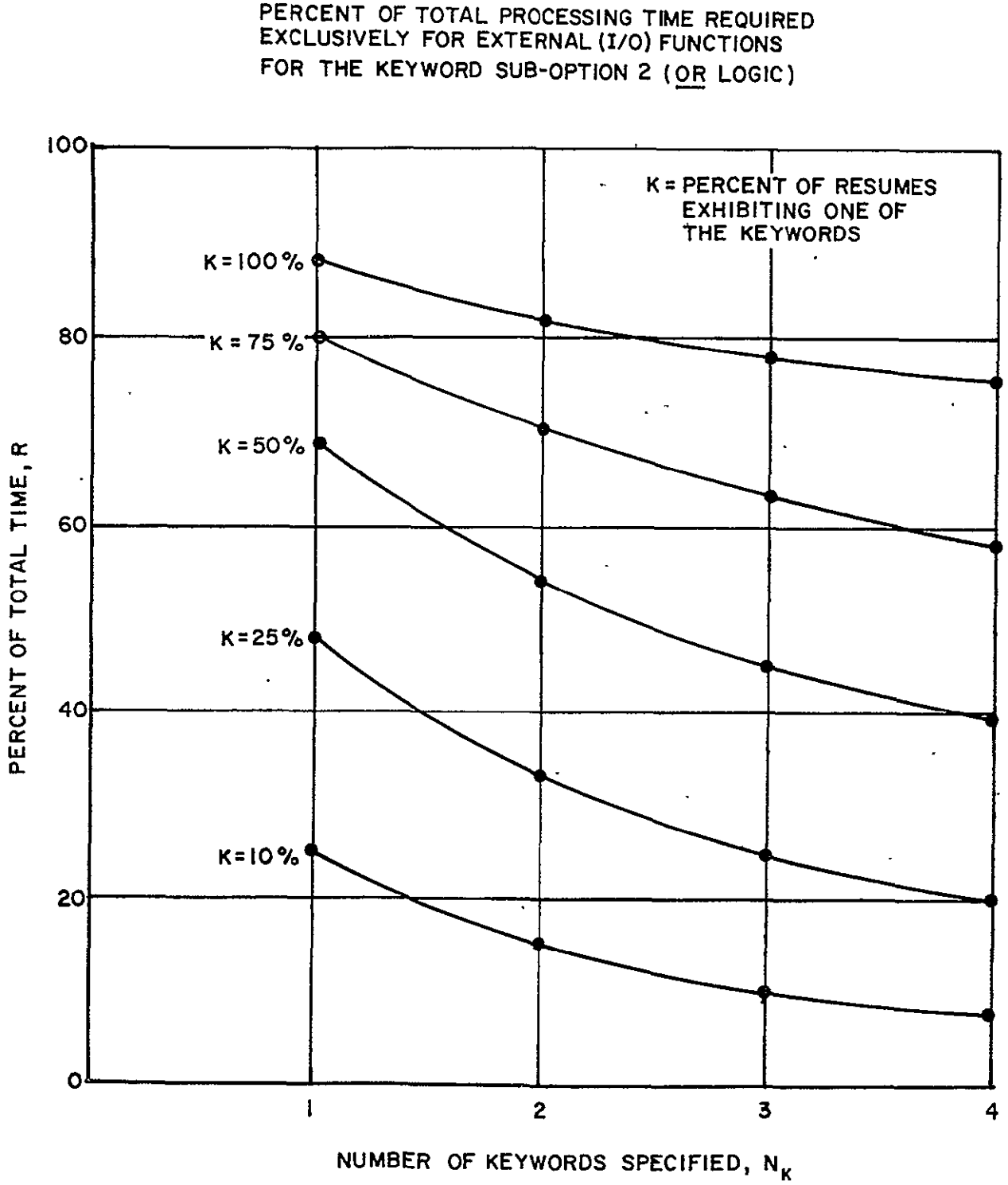
FIGURE 13


PERCENT OF TOTAL PROCESSING TIME REQUIRED
EXCLUSIVELY FOR EXTERNAL (I/O) FUNCTIONS
FOR THE KEYWORD SUB-OPTION 2 (OR LOGIC)
K = PERCENT OF RESUMES
EXHIBITING ONE OF
THE KEYWORDS
K = 100 %
K = 75 %
K = 50 %
K = 25 %
K = 10 %
PERCENT OF TOTAL TIME, R
100
80
60
40
20
0
1
2
3
4
NUMBER OF KEYWORDS SPECIFIED, N_K

under KEYWORD sub-option 1. Figures 14 and 15 show the same relationships as in Figures 12 and 13 as they apply to the KEYWORD sub-option 2 (OR logic).

Comparing Figures 12 and 14, it is easily seen that the first sub-option (AND logic) should be used only when it is absolutely essential to check for the simultaneous appearance of more than one keyword. When the appearance of any one of the specified keywords, in order of priority, is sufficiently significant, the second sub-option should be used.

The PRINT option requires about 5 seconds to print a single resume on the 1403 high-speed printer (@ 1300 lines/minute). Thus, to print the current file of 150 resumes requires about 12 minutes.

The times required for execution of the LIST option may be determined from Figure 10, where K is equal to 100% (since all resumes are to be listed).

Based on expected returns from various types of searches, Figures 10 through 15 may be used to determine the most efficient options and sub-options as methods of access. The Cognizant Personnel (see Appendix D) are well versed in the trade-offs among the various methods of access and can be helpful in planning orderly and efficient use of the system.

For example, if a user wishes to list all resumes describing instruments which operate in the near-infrared band of the spectrum, it would be foolish to specify NEAR-INFRARED as a keyword. Instead, the RETRIEVAL option should be used, using NEAR-INFRARED as a retrieval criterion for Item 35 (SPECTRAL RANGE). If 10 percent of the resumes satisfy the criterion, from Figure 10, the job will be finished in 2.8 minutes (or 18 seconds if the high-speed printer were used). If the KEYWORD sub-option 2 were used, the job would require almost 12 minutes (from Figure 14) and there would be no guarantee of retrieving all the resumes operating in the near-infrared band;

FIGURE 14

TOTAL PROCESSING TIME REQUIRED TO SEARCH THE CURRENT FILE (150 RESUMES) FOR SPECIFIED KEYWORDS UNDER SUB-OPTION 2 (OR LOGIC)

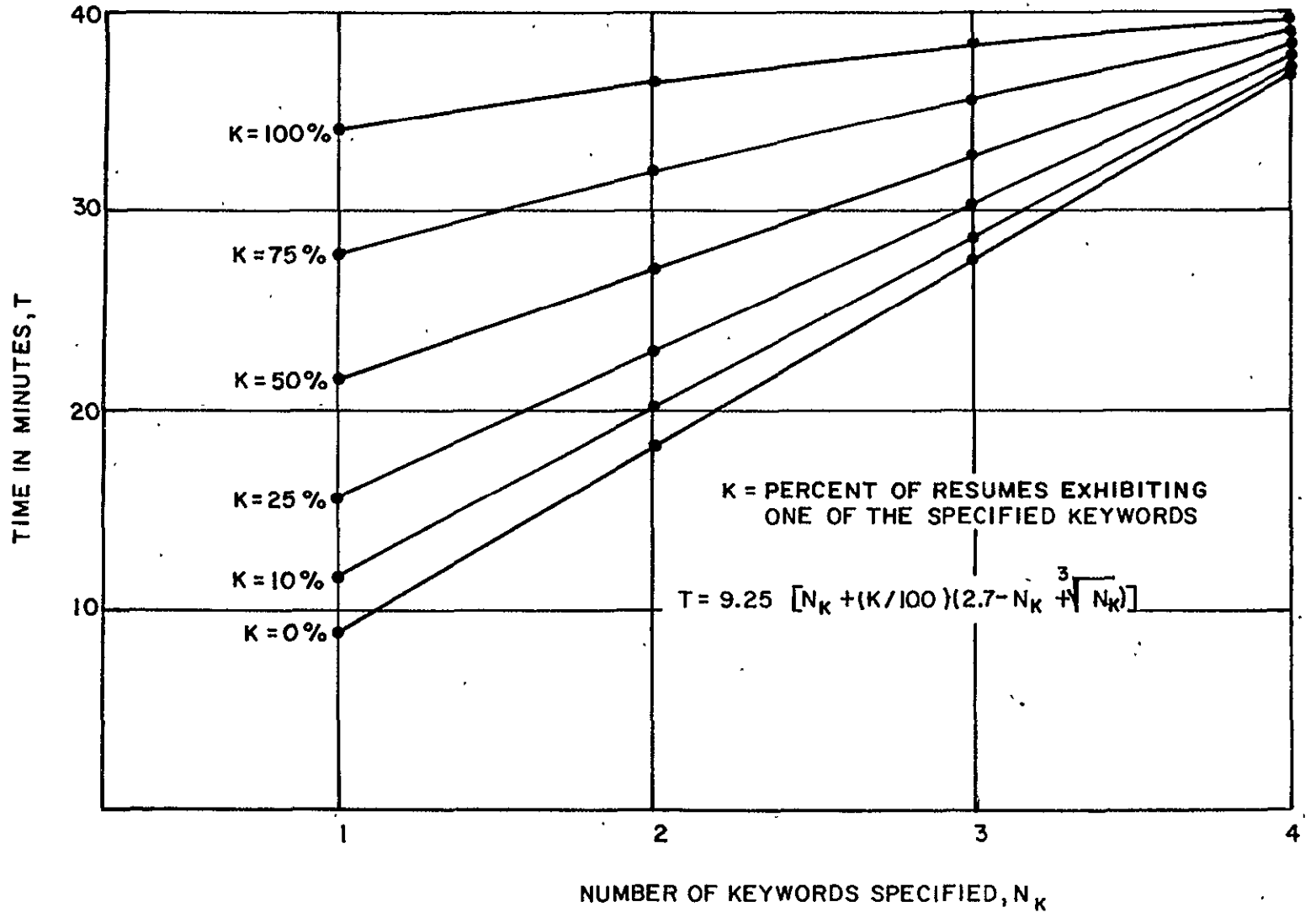


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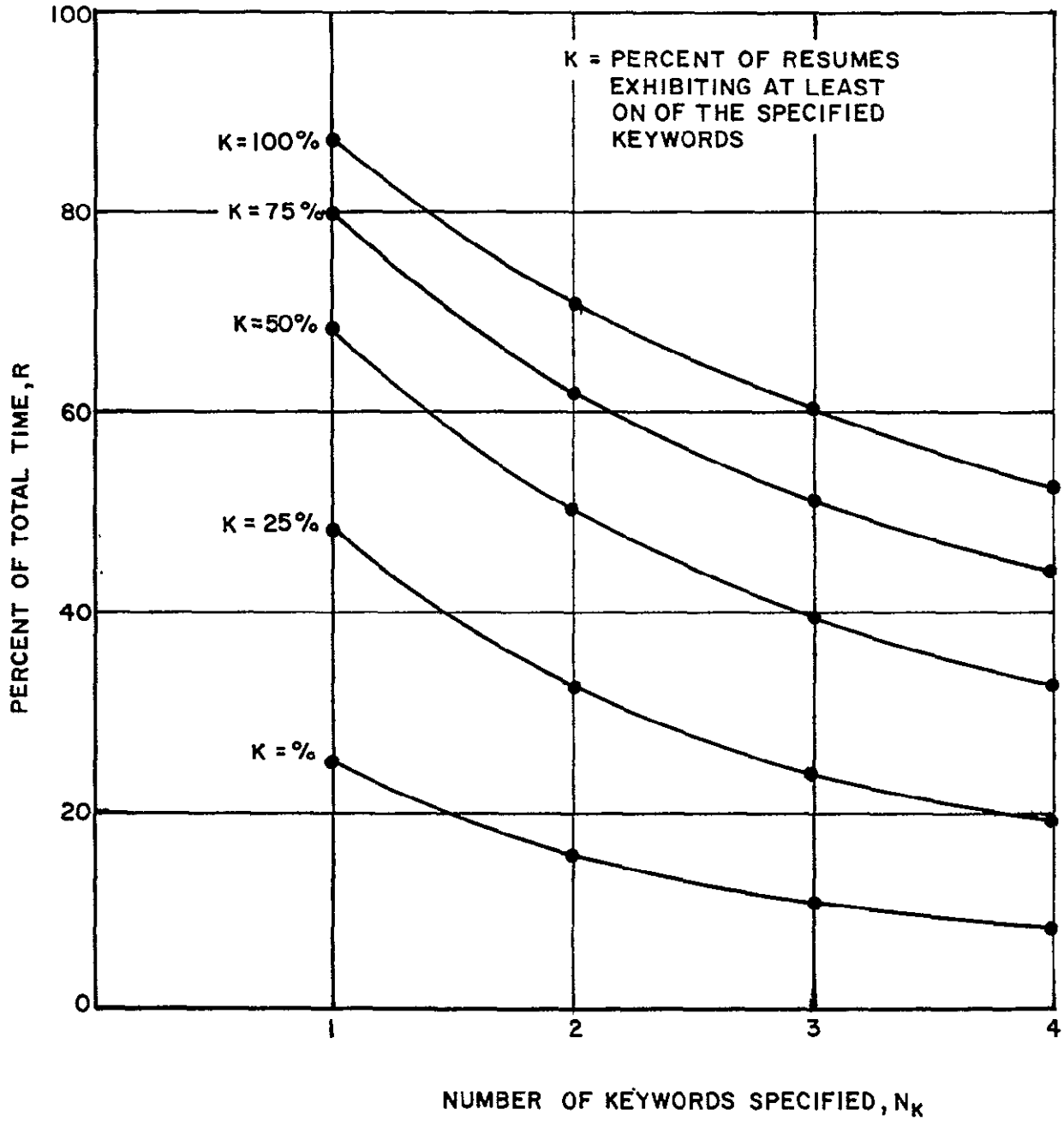
FIGURE 15

PERCENT OF TOTAL PROCESSING TIME REQUIRED EXCLUSIVELY FOR EXTERNAL (I/O) FUNCTIONS FOR THE KEYWORD SUB-OPTION I (AND LOGIC)



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only those that mentioned the exact phrase NEAR-INFRARED somewhere in one of the items listed on page 5-4 would be listed.

On the other hand, if it is the user's wish to retrieve those resumes which pertain to sea surface temperature measurements, a likely method of access would be via KEYWORD sub-option 1 (AND logic), by specifying three simultaneous keywords: SEA, SURFACE, TEMPERATURE. If about 25 percent of the resumes are expected to exhibit an average of 1.5 of these keywords, the job would require 32 minutes.

One of the tasks proposed for the contract is to combine the KEYWORD options, so that resumes may be retrieved on the basis of constraints and keywords simultaneously. In the example just given, it would then be possible to search for only one keyword under KEYWORD sub-option 2: SEA. This would require about 15 minutes. At the same time, each resume exhibiting SEA, would be examined for a spectral range including either the thermal IR region or the microwave region, both of which point rather definitively to temperature detection applications. This would require about 1 minute (2 runs using the high-speed printer), resulting in a total time of 16 minutes, or half of what would be required using the KEYWORD option alone.

6.2 Sample Applications

This section presents several typical applications of the RETRIEVE and KEYWORD options.

Suppose a user wishes to list all the radiometers which operate in the thermal-infrared band. He submits RADIOMETER as a criterion for Item 26 (INSTRUMENT TYPE), and THERMAL-IR as a criterion for Item 35 (SPECTRAL RANGE). He, of course, could have specified an exact spectral range, say 8-15 microns, if he had so desired. But instead, he chose to use one of the

general specifications available as criteria for spectral range (see Operating Manual for a full explanation of this option). Using only two simultaneous criteria, he received a list of 21 instruments shown in Figure 16, each of which supposedly satisfies the dual condition that it be a THERMAL-IR RADIOMETER. Note that NIMBUS E/MICRAD has an asterisk preceding its title. From the footnote it is learned that in this resume, at least one of the two items searched, SPECTRAL RANGE or INSTRUMENT TYPE, must be blank, and that the other item, if not blank, must satisfy the criterion. Examining the resume NIMBUS E/MICRAD reveals that SPECTRAL RANGE is blank.

Suppose however, the user does not want 21 resumes as the result of his search. He wishes to reduce the number of retrieved resumes by submitting additional criteria. IRSARS gives him this opportunity, and he further specifies that the weight of the thermal-IR radiometer must be less than or equal to 15 pounds via Item 48 (WEIGHT). This time IRSARS retrieves only 13 resumes, shown in Figure 17. Note also that there are no asterisks on the list, meaning that every resume on the list actually satisfies the retrieval criteria.

Finally the user submits a fourth retrieval criterion, specifying that one of the applications (Item 28) of the instrument must be to the Earth Resources Survey Program (ERSP). IRSARS now finds only one resume satisfying all four criteria:

MEDIUM RESOLUTION INFRARED RADIOMETER
NIMBUS 2 MRIR

Having now found a single resume satisfying his retrieval criteria, the user asks the computer to print it out, which it does, as shown in Figure 18. Note that the spectral range is 0.2 to 30.0 microns, which obviously includes the thermal-IR region; the instrument is a radiometer (Item 26); it weighs 14 pounds, which is less than 15 pounds; and is applied to ERSP (Item 28).

FIGURE 16

SAMPLE APPLICATION 1

```
BG                LIST OF INSTRUMENT RESUMES
BG             BY TITLE, SPACECRAFT, AND ACRONYM
BG          SATISFYING THE FOLLOWING RETRIEVAL CRITERIA:
BG
BG
BG     INSTRUMENT TYPE = RADIOMETER
BG     SPECTRAL RANGE = THERMAL-IR
BG
BG
BG     MEDIUM RESOLUTION INFRARED RADIOMETER
BG        NIMBUS 2                        MRIR
BG
BG     HIGH RESOLUTION SURFACE COMPOSITION MAPPING          -PROPOSAL
BG        NIMBUS E                        HRMR
BG
BG     MEASUREMENT OF ATMOSPHERIC TEMPERATURE AND
BG     HUMIDITY PROFILES WITH AN INFRARED RADIOMETER        -PROPOSAL
BG        NIMBUS E                        ITPR
BG
BG     LIMB RADIANCE INVERSION EXPERIMENT                   -PROPOSAL/INACTIVE
BG        NIMBUS E                        LIRAIN
BG
BG    *SATELLITE MICROWAVE RADIOMETRY TO SENSE THE
BG     SURFACE TEMPERATURE OF THE WORLD OCEANS              -PROPOSAL/INACTIVE
BG        NIMBUS E                        MICRAD
BG
BG     SELECTIVE CHOPPER RADIOMETER FOR WATER VAPOR CLOUD
BG     AND ATMOSPHERIC TEMPERATURE SOUNDING                 -PROPOSAL
BG        NIMBUS E                        SCRWV2
BG
BG     NIMBUS WIND VELOCITY EXPERIMENT B - CLOUD
BG     ALTITUDE RADIOMETER (CAR) (SEE EXP NO E18A)          -PROPOSAL
BG        NIMBUS E                        WVIR
BG
BG     LOW RESOLUTION NONSCANNING RADIOMETER
BG        TIROS 2                         LRNR
BG
BG     MEDIUM RESOLUTION RADIOMETER
BG        TIROS 2                         MRR
BG
BG     LOW RESOLUTION NONSCANNING RADIOMETER
BG        TIROS 3                         LRNR
BG
BG     MEDIUM RESOLUTION RADIOMETER
BG        TIROS 3                         MRR
BG
BG     LOW RESOLUTION NONSCANNING RADIOMETER
BG        TIROS 4                         LRNR
BG
BG     MEDIUM RESOLUTION RADIOMETER
BG        TIROS 4                         MRR
BG
BG
BG
BG
BG
BG
BG
BG                                                    6-12
BG
```

FIGURE 16 (Cont.)

```
MEDIUM RESOLUTION RADIOMETER
   TIROS 7                          MRR

SCANNING RADIOMETER
   TIROS M                          SR

TEMPERATURE HUMIDITY INFRARED RADIOMETER
   NIMBUS D                         THIR

MEDIUM RESOLUTION INFRARED RADIOMETER
   NIMBUS B2                        MRIR

LOW RESOLUTION OMNIDIRECTIONAL RADIOMETER
   TIROS 4                          LROR

LOW RESOLUTION OMNIDIRECTIONAL RADIOMETER
   TIROS 7                          LROR

LOW RESOLUTION OMNIDIRECTIONAL RADIOMETER
   TIROS 3                          LROR

LOW RESOLUTION OMNIDIRECTIONAL RADIOMETER
   EXPLORER 7                       LROR

----------
AN ASTERISK (*) PRECEDING A TITLE INDICATES THAT NO INFORMATION
IS GIVEN FOR ONE OR MORE OF THE RETRIEVED ITEMS IN THE RESUME.
```

FIGURE 17

SAMPLE APPLICATION 2

```
BG                LIST OF INSTRUMENT RESUMES
BG             BY TITLE, SPACECRAFT, AND ACRONYM
BG          SATISFYING THE FOLLOWING RETRIEVAL CRITERIA:
BG
BG
BG     INSTRUMENT TYPE = RADIOMETER
BG     SPECTRAL RANGE = THERMAL-IR
BG     WEIGHT =      0 TO     15 POUNDS
BG
BG
BG     MEDIUM RESOLUTION INFRARED RADIOMETER
BG        NIMBUS 2                        MRIR
BG
BG     NIMBUS WIND VELOCITY EXPERIMENT B - CLOUD
BG     ALTITUDE RADIOMETER (CAR) (SEE EXP NO E18A)          -PROPOSAL
BG        NIMBUS E                        WVIR
BG
BG     LOW RESOLUTION NONSCANNING RADIOMETER
BG        TIROS 2                         LRNR
BG
BG     MEDIUM RESOLUTION RADIOMETER
BG        TIROS 2                         MRR
BG
BG     LOW RESOLUTION NONSCANNING RADIOMETER
BG        TIROS 3                         LRNR
BG
BG     MEDIUM RESOLUTION RADIOMETER
BG        TIROS 3                         MRR
BG
BG     LOW RESOLUTION NONSCANNING RADIOMETER
BG        TIROS 4                         LRNR
BG
BG     MEDIUM RESOLUTION RADIOMETER
BG        TIROS 4                         MRR
BG
BG     MEDIUM RESOLUTION RADIOMETER
BG        TIROS 7                         MRR
BG
BG     LOW RESOLUTION OMNIDIRECTIONAL RADIOMETER
BG        TIROS 4                         LROR
BG
BG     LOW RESOLUTION OMNIDIRECTIONAL RADIOMETER
BG        TIROS 7                         LROR
BG
BG     LOW RESOLUTION OMNIDIRECTIONAL RADIOMETER
BG        TIROS 3                         LROR
BG
BG     LOW RESOLUTION OMNIDIRECTIONAL RADIOMETER
BG        EXPLORER 7                      LROR
BG
BG
BG
BG
BG
BG
BG
BG
```

FIGURE 18

INSTRUMENT RESUME

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ELECTRONICS RESEARCH CENTER
CAMBRIDGE, MASSACHUSETTS

1 TITLE	ACRONYM	EXP NO
MEDIUM RESOLUTION INFRARED RADIOMETER	MRIR	

TITLE CONT.	RESUME DATE	VERSION
	06/22/68	0002

2 PRINCIPAL INVESTIGATOR	7 ORGANIZATION	8 TELEPHONE
NORDBERG, DR. W.	GODDARD SPACE FLT CENTER	301-982-5003

CO-INVESTIGATOR	ORGANIZATION	TELEPHONE

CONTRACT TYPE	CONTRACT NUMBER	FLASH INDEX NUMBER	START DATE	COMPLETION DATE	STATUS
					POST FLIGHT

MONITOR	AGENCY	RGM OFFICE	TELEPHONE
HALEY, DR. R. L.	NASA HQTRS	OSSA/SAN	202-962-0891

VENDOR	LOCATION	FLIGHT DATE	LEAD TIME
SANTA BARBARA RES CTR	GOLETA, CALIFORNIA	05/66	

INSTRUMENT TYPE	SECURITY
RADIOMETER, 5-CHANNEL MEDIUM-RESOLUTION IR/VISIBLE SCANNING	UNC

APPLICATION	SPACECRAFT
MET, ERSP	NIMBUS 2

PURPOSE

PRIMARY-TO MEASURE ELECTROMAGNETIC RADIATION EMITTED AND REFLECTED FROM THE EARTH AND ITS ATMOSPHERE IN 5 SELECTED WAVELENGTH INTERVALS. PARAMETERS TO BE STUDIED ARE: ATMOSPHERIC WATER VAPOR ABSORPTION BAND; SURFACE OR NEAR-SURFACE TEMPERATURE AND CLOUD COVER DATA;RADIATION FROM STRATOSPHERE(CO2) BAND ;HEAT BUDGET OF THE EARTH AND INTENSITY OF REFLECTED SOLAR ENERGY.

PRINCIPLES OF OPERATION

THE 5 CHANNEL NIMBUS MRIR,USING FILTERS AND BOLOMETER DETECTORS, WAS SIMILAR IN PURPOSE TO THE EARLIER TIROS MRR BUT WAS A NEW INSTRUMENT DESIGN.THE SPECTRAL INTERVALS WERE: 6.4-6.9,10-11,14-16.5.0-30.0,AND 0.2-4.0 MICRONS. THE RADIANT ENERGY FROM THE EARTH IS COLLECTED BY A FLAT SCANNING MIRROR INCLINED AT 45 DEG TO THE OPTICAL AXIS. THE MIRROR ROTATES 350 DEG AT 8 RPM AND SCANS IN A PLANE PERP TO THE DIRECTION OF MOTION OF THE SATELLITE. EACH OF THE 5 CHANNELS CONTAINS A 1.7 IN. DIAMETER FOLDED TELESCOPE AND A THERMISTOR BOLOMETER WITH A 2.8 DEG FOV.CALIBRATION OF THE IR CHANNELS OCCUR AT 2 POINTS DURING EACH SCAN, COLD SPACE AND THE RADIOMETER HOUSING. THE INCIDENT FLUX FOCUSED ON THE BOLOMETER DETECTOR IS MODULATED AT 60 HZ BY A MECHANICAL CHOPPER TO PRODUCE AN A.C. SIGNAL FROM THE DETECTOR. (REFERENCE TEMP OF THE RADIOMETER). THE ABSOLUTE TEMP OF THE TARGET IS DETERMINED BY INTRODUCING AN ELECTRONIC VOLTAGE IN SUCH A PROPORTION THAT A TARGET OF A GIVEN TEMP WILL ALWAYS PRODUCE THE SAME ABSOLUTE VOLTAGE OUTPUT. THE ELECTRICAL SIGNAL FROM THE DETECTOR IS THEN AMPLIFIED AND SYNCHRONOUSLY DEMODULATED TO YIELD AN ANALOG OUTPUT OF 0 TO -.4 VOLTS TO COVER THE DESIRED RANGE OF TARGET TEMP FOR EACH CHANNEL.

PHENOMENA OBSERVED

RADIATION FROM THE EARTH AND ATMOSPHERE

MEASUREMENT RANGE

PRECISION AND ACCURACY

A S/N RATIO OF BETTER THAN 30 DB;ABSOLUTE ACCURACY OF +-7 DEG C.

SPECTRAL RANGE	SPECTRAL RESOLUTION	TIME CONSTANT
C.2 TO 30.0 MICRONS	SEE ITEM 31	

FIELD OF VIEW	GROUND SWATH
2.8 DEG	FULL EARTH DISC

ANGULAR RESOLUTION	SPATIAL RESOLUTION
2.4 DEG	ABOUT 25 NM FROM 600 NM ALTITUDE

POINTING ACCURACY	POINTING RATE	ALTITUDE	INCLINATION
		MED CIRCULAR	SUN-SYNCH RETROGRADE

SPECIAL REQUIREMENTS

COMPONENTS

RADIOMETER, ELECTRONICS

WEIGHT	VOLUME	AVERAGE POWER	STANDBY POWER	PEAK POWER	MTBF
14 LB		8 WATTS			

INPUT INTERFERENCE	MAGNETIC INTERFERENCE	NUCLEAR INTERFERENCE	THERMAL INTERFERENCE	SHIELDING
			SENSITIVE	

CALIBRATION	DATA RECOVERY	FREQUENCY OF OBSERVATION
2 MEAS.PER CHAN.PER SCAN	DELAYED TELEMETRY	CONTINUOUS

TELEMETRY REQUIREMENTS

ANALOG SIGNALS ARE SAMPLED 33-1/3 TIMES PER SEC AND CONVERTED TO 7-BIT DIGITAL DATA. EACH DATA WORD BIT IS THEN RECORDED ON TAPE FOR PLAYBACK.

ADVANTAGES AND LIMITATIONS

IMPROVED SPECTRAL RESPONSE AND AN IN-FLIGHT CALIBRATION OF THE SIGNAL LEVEL HAS INCREASED ACCURACY OF DATA OVER TIROS MRR.

REFERENCES

1) NIMBUS 2 USER'S GUIDE. GSFC, JUL.66.***2)DATA CATALOG OF SATELLITE AND ROCKET EXPERIMENTS. NASA/GSFC, NATIONAL SPACE SCI DATA CTR, REPORT NO. NSSDC 68-01, JAN 68.***3) SIG ACHIEV IN SPACE APP.NASA SP-156, 1967.***4) GOLDBERG, I.L.: MET IR INSTRUMENTS FOR SATELLITES., NASA/GSFC, AUG.68.***5) DATA AVAILABLE FROM NATIONAL SPACE SCIENCE DATA CENTER, NASA/GSFC.

COST PREVIOUS FY	COST CURRENT FY	COST TO DATE	COST TO COMPLETION

DIAGRAMS

Now suppose the user wishes to find all resumes which exhibit the word TEMPERATURE. Using the KEYWORD sub-option 2 (OR logic), he obtains a list of 26 resumes, as shown in Figure 19. Twenty-six resumes constitute about 17 percent of the current file; thus it took about 14 minutes to create the list (from Figure 14). About 14 percent or 6 minutes of this time was used exclusively for printing the items on the console (from Figure 14).

Now in addition to TEMPERATURE, the user introduces another keyword under the first option: SEA. Since the resumes listed as a result of this search (Figure 20) are the same as those listed in Figure 19, it may be concluded that the word SEA never appears without the word TEMPERATURE.

The list in Figure 20 was completed in about 23 minutes (from Figure 12). About 24 percent or 6 minutes of this time was used exclusively for printing the items on the console (from Figure 13). This latter external time, of course, is almost the same as the external time required for one keyword, since these lists are identical, except for an occasional listing of the second keyword SEA under certain resumes.

Of course, it is up to the user to determine the significance of the differences between the two lists and how well each may satisfy the objectives of his search.

FIGURE 19

```
BG                LIST OF INSTRUMENT RESUMES
BG              BY TITLE, SPACECRAFT, AND ACRONYM
BG            WHICH EXHIBIT IN THE INDICATED ITEMS
BG             ANY ONE OF THE FOLLOWING KEYWORDS:
BG
BG
BG      TEMPERATURE
BG
BG
BG     MEDIUM RESOLUTION INFRARED RADIOMETER
BG        NIMBUS 2                      MRIR
BG           TEMPERATURE      IN PURPOSE
BG
BG     ALBEDO MEASUREMENT EXPERIMENT                          -PROPOSAL/INACTIVE
BG        NIMBUS E                      ALMEX
BG           TEMPERATURE      IN PRINCIPLES OF OPERATION
BG
BG     ELECTROSTATIC PROBE STUDIES OF THE IONOSPHERE IN A
BG     CIRCULAR SUN-SYNCHRONOUS ORBIT                         -PROPOSAL
BG        NIMBUS E                      EPSI
BG           TEMPERATURE      IN PRINCIPLES OF OPERATION
BG
BG     ELECTRICALLY SCANNING MICROWAVE RADIOMETER FOR
BG     MAPPING EARTH RADIATION AND CLOUD STRUCTURE            -PROPOSAL
BG        NIMBUS E                      ESMR
BG           TEMPERATURE      IN PRINCIPLES OF OPERATION
BG
BG     HIGH RESOLUTION FABRY-PEROT ETALON SPECTROMETER
BG     FOR 15 MICRON TEMPERATURE INVERSION                    -PROPOSAL/INACTIVE
BG        NIMBUS E                      HRFPES
BG           TEMPERATURE      IN TITLE
BG
BG     HIGH RESOLUTION SURFACE COMPOSITION MAPPING            -PROPOSAL
BG        NIMBUS E                      HRMR
BG           TEMPERATURE      IN PRINCIPLES OF OPERATION
BG
BG     INFRARED INTERFEROMETER SPECTROMETER EXPERIMENT        -PROPOSAL/INACTIVE
BG        NIMBUS E                      IRIS
BG           TEMPERATURE      IN PURPOSE
BG
BG     MEASUREMENT OF ATMOSPHERIC TEMPERATURE AND
BG     HUMIDITY PROFILES WITH AN INFRARED RADIOMETER          -PROPOSAL
BG        NIMBUS E                      ITPR
BG           TEMPERATURE      IN TITLE
BG
BG     LIMB RADIANCE INVERSION EXPERIMENT                     -PROPOSAL/INACTIVE
BG        NIMBUS E                      LIRAIN
BG           TEMPERATURE      IN PURPOSE
BG
BG     MICROWAVE OCCULTATION EXPERIMENT                       -PROPOSAL/INACTIVE
BG        NIMBUS E                      MICOC
BG           TEMPERATURE      IN PURPOSE
BG
BG
BG
BG
BG                                  6-17
BG
BG
BG
BG
```

FIGURE 19 (Cont.)

```
SATELLITE MICROWAVE RADIOMETRY TO SENSE THE
SURFACE TEMPERATURE OF THE WORLD OCEANS                -PROPOSAL/INACTIVE
   NIMBUS E                    MICRAD
      TEMPERATURE      IN TITLE

MICROWAVE SPECTROMETER                                 -PROPOSAL
   NIMBUS E                    MISPEC
      TEMPERATURE      IN PURPOSE

NEAR-INFRARED MULTIDETECTOR GRATING SPECTROMETER       -PROPOSAL/INACTIVE
   NIMBUS E                    NIRMUL
      TEMPERATURE      IN PURPOSE

SELECTIVE CHOPPER RADIOMETER FOR WATER VAPOR CLOUD
AND ATMOSPHERIC TEMPERATURE SOUNDING                   -PROPOSAL
   NIMBUS E                    SCRWV2
      TEMPERATURE      IN TITLE

MEASUREMENT OF THE SOLAR CONSTANT - ABSOLUTE VALUE
AND SHORT TERM FLUCTUATION                             -PROPOSAL
   NIMBUS E                    SOLCON
      TEMPERATURE      IN PRINCIPLES OF OPERATION

STELLAR OCCULTATION - REFRACTION MEASUREMENTS          -PROPOSAL/INACTIVE
   NIMBUS E                    STOCRF
      TEMPERATURE      IN PURPOSE

NIMBUS WIND VELOCITY EXPERIMENT B - CLOUD
ALTITUDE RADIOMETER (CAR) (SEE EXP NO E18A)            -PROPOSAL
   NIMBUS E                    WVIR
      TEMPERATURE      IN PRINCIPLES OF OPERATION

NIMBUS WIND VELOCITY EXPERIMENT A-MODIFIED ADVANC-
ED VIDICON CAMERA SYSTEM (AVCS) (SEE EXP NO E18B)      -PROPOSAL
   NIMBUS E                    WVTV
      TEMPERATURE      IN PRINCIPLES OF OPERATION

SCANNING RADIOMETER
   TIROS M                     SR
      TEMPERATURE      IN PURPOSE

HIGH RESOLUTION INFRARED RADIOMETER
   NIMBUS 1                    HRIR
      TEMPERATURE      IN PURPOSE

TEMPERATURE HUMIDITY INFRARED RADIOMETER
   NIMBUS D                    THIR
      TEMPERATURE      IN TITLE

SATELLITE INFRARED SPECTROMETER
   NIMBUS B2                   SIRS A
      TEMPERATURE      IN PURPOSE
```

FIGURE 19 (Cont.)

```
SELECTIVE CHOPPER RADIOMETER
   NIMBUS D                         SCR
      TEMPERATURE       IN PURPOSE

SATELLITE INFRARED SPECTROMETER
   NIMBUS D                         SIRSB
      TEMPERATURE       IN PURPOSE

INFRARED INTERFEROMETER SPECTROMETER
   NIMBUS D                         IRIS
      TEMPERATURE       IN PURPOSE

INFRARED INTERFEROMETER SPECTROMETER
   NIMBUS B2                        IRIS
      TEMPERATURE       IN PURPOSE

LOW RESOLUTION OMNIDIRECTIONAL RADIOMETER
   TIROS 4                          LROR
      TEMPERATURE       IN PRINCIPLES OF OPERATION

ELECTRON TEMPERATURE PROBE
   TIROS 7                          ETP
      TEMPERATURE       IN TITLE

LOW RESOLUTION OMNIDIRECTIONAL RADIOMETER
   TIROS 7                          LROR
      TEMPERATURE       IN PRINCIPLES OF OPERATION

LOW RESOLUTION OMNIDIRECTIONAL RADIOMETER
   TIROS 3                          LROR
      TEMPERATURE       IN PRINCIPLES OF OPERATION
```

FIGURE 20

```
BG                LIST OF INSTRUMENT RESUMES
BG              BY TITLE, SPACECRAFT, AND ACRONYM
BG            WHICH EXHIBIT IN THE INDICATED ITEMS
BG       AS MANY AS POSSIBLE OF THE FOLLOWING KEYWORDS:
BG
BG     SEA              TEMPERATURE
BG
BG
BG   ALBEDO MEASUREMENT EXPERIMENT                          -PROPOSAL/INACTIVE
BG      NIMBUS E                        ALMEX
BG         TEMPERATURE       IN ITEM 31
BG
BG   ELECTROSTATIC PROBE STUDIES OF THE IONOSPHERE IN A
BG   CIRCULAR SUN-SYNCHRONOUS ORBIT                        -PROPOSAL
BG      NIMBUS E                        EPSI
BG         TEMPERATURE       IN ITEM 31
BG
BG   ELECTRICALLY SCANNING MICROWAVE RADIOMETER FOR
BG   MAPPING EARTH RADIATION AND CLOUD STRUCTURE           -PROPOSAL
BG      NIMBUS E                        ESMR
BG         TEMPERATURE       IN ITEM 31
BG
BG   HIGH RESOLUTION FABRY-PEROT ETALON SPECTROMETER
BG   FOR 15 MICRON TEMPERATURE INVERSION                   -PROPOSAL/INACTIVE
BG      NIMBUS E                        HRFPES
BG         TEMPERATURE       IN ITEM  1
BG
BG   HIGH RESOLUTION SURFACE COMPOSITION MAPPING           -PROPOSAL
BG      NIMBUS E                        HRMR
BG         SEA               IN ITEM 30
BG         TEMPERATURE       IN ITEM 31
BG
BG   MEASUREMENT OF ATMOSPHERIC TEMPERATURE AND
BG   HUMIDITY PROFILES WITH AN INFRARED RADIOMETER         -PROPOSAL
BG      NIMBUS E                        ITPR
BG         TEMPERATURE       IN ITEM  1
BG
BG   LIMB RADIANCE INVERSION EXPERIMENT                    -PROPOSAL/INACTIVE
BG      NIMBUS E                        LIRAIN
BG         TEMPERATURE       IN ITEM 30
BG
BG   MICROWAVE OCCULTATION EXPERIMENT                      -PROPOSAL/INACTIVE
BG      NIMBUS E                        MICOC
BG         TEMPERATURE       IN ITEM 30
BG
BG   SATELLITE MICROWAVE RADIOMETRY TO SENSE THE
BG   SURFACE TEMPERATURE OF THE WORLD OCEANS               -PROPOSAL/INACTIVE
BG      NIMBUS E                        MICRAD
BG         SEA               IN ITEM 30
BG         TEMPERATURE       IN ITEM  1
BG
BG   MICROWAVE SPECTROMETER                                -PROPOSAL
BG      NIMBUS E                        MISPEC
BG         TEMPERATURE       IN ITEM 30
BG
BG
BG                                  6-20
BG
BG
```

```
BG
BG
BG
BG
BG
BG
BG     NEAR-INFRARED MULTIDETECTOR GRATING SPECTROMETER    -PROPOSAL
BG        NIMBUS E                        NIRMUL
BG           TEMPERATURE      IN ITEM 30
BG
BG     SELECTIVE CHOPPER RADIOMETER FOR WATER VAPOR CLOUD
BG     AND ATMOSPHERIC TEMPERATURE SOUNDING               -PROPOSAL
BG        NIMBUS E                        SCRWV2
BG           TEMPERATURE      IN ITEM  1
BG
BG     MEASUREMENT OF THE SOLAR CONSTANT - ABSOLUTE VALUE
BG     AND SHORT TERM FLUCTUATION                         -PROPOSAL
BG        NIMBUS E                        SOLCON
BG           TEMPERATURE      IN ITEM 31
BG
BG     STELLAR OCCULTATION - REFRACTION MEASUREMENTS      -PROPOSAL/INACTIVE
BG        NIMBUS E                        STOCRF
BG           TEMPERATURE      IN ITEM 30
BG
BG     NIMBUS WIND VELOCITY EXPERIMENT B - CLOUD
BG     ALTITUDE RADIOMETER (CAR) (SEE EXP NO E18A)        -PROPOSAL
BG        NIMBUS E                        WVIR
BG           SEA              IN ITEM  1
BG           TEMPERATURE      IN ITEM 31
BG
BG     NIMBUS WIND VELOCITY EXPERIMENT A-MODIFIED ADVANC-
BG     ED VIDICON CAMERA SYSTEM (AVCS) (SEE EXP NO E18B)  -PROPOSAL
BG        NIMBUS E                        WVTV
BG           SEA              IN ITEM  1
BG           TEMPERATURE      IN ITEM 31
BG
BG     SCANNING RADIOMETER
BG        TIROS M                         SR
BG           SEA              IN ITEM 30
BG           TEMPERATURE      IN ITEM 30
BG
BG     HIGH RESOLUTION INFRARED RADIOMETER
BG        NIMBUS 1                        HRIR
BG           TEMPERATURE      IN ITEM 30
BG
BG     TEMPERATURE HUMIDITY INFRARED RADIOMETER
BG        NIMBUS D                        THIR
BG           TEMPERATURE      IN ITEM  1
BG
BG     SATELLITE INFRARED SPECTROMETER
BG        NIMBUS B2                       SIRS A
BG           TEMPERATURE      IN ITEM 30
BG
BG     SELECTIVE CHOPPER RADIOMETER
BG        NIMBUS D                        SCR
BG           TEMPERATURE      IN ITEM 30
BG
BG     SATELLITE INFRARED SPECTROMETER
BG        NIMBUS D                        SIRSB
BG           TEMPERATURE      IN ITEM 30
BG
BG
BG                                   6-21
BG
BG
```

INFRARED INTERFEROMETER SPECTROMETER
NIMBUS D IRIS
TEMPERATURE IN ITEM 30

INFRARED INTERFEROMETER SPECTROMETER
NIMBUS B2 IRIS
TEMPERATURE IN ITEM 30

ELECTRON TEMPERATURE PROBE
TIROS 7 ETP
TEMPERATURE IN ITEM 1

LOW RESOLUTION OMNIDIRECTIONAL RADIOMETER
TIROS 3 LROR
TEMPERATURE IN ITEM 31

7.0 CONCLUSIONS

At the termination of the first year of the contract (NAS 12-666), approximately 150 resumes have been compiled using a specially designed Instrument Resume Form. This resume form summarizes technical and administrative information relative to various instruments/experiments which are under the auspices of the NASA Space Applications (SA) Programs Office. Within the Space Applications category, the instruments are associated with several disciplines, namely Meteorology, Earth Resources, Communications, Navigation and Traffic Control, and Geodesy. The various instruments, which include imagers, radiometers, spectrometers, and transponders, among others, operate over a major portion of the electromagnetic spectrum from the near UV, through the visible, IR, microwave, and into the radio frequencies.

The computer program, dubbed IRSARS (Instrument Resume Search and Retrieval System), has been written and debugged well beyond the nominal requirements of the contract. It has been designed to be used with any IBM series 360 computer (model 40 or larger) with a COBOL compiler. However, it could be adapted to almost any computing system having a COBOL compiler, with relatively few modifications.

With the master data file of resumes residing on disk, the system can perform the following functions, in any order: (1) expand the file to include new resumes, (2) revise any item within any resume, (3) search the file and retrieve resumes on the basis of specified retrieval criteria, (4) search the file listing all resumes which exhibit any one or as many as possible of a set of specified keywords, (5) print the entire file on blank resume forms and (6) list by title, spacecraft, and acronym all the resumes in the file. In keeping with the sponsor's desire for convenience and direct access, the system is operated through a typewriter/console, remote or on-line, using a conversational question-and-answer mode.

A follow-on contract for the purpose of maintaining, expanding, and improving the system has been let to IIT Research Institute commencing in May 1969. More specifically, IITRI will maintain and update the computer-based library of instrument resumes by revising them to reflect current instrument development, by adding resumes of instruments suitable for space-applications measurements, and by improving the computer program as dictated by usage and experience. In addition, computer searches and reviews of the existing library of instrument resumes will be conducted to answer specific questions, and to determine the performance capabilities of various classes of instruments with the objective of assisting in determining future instrument development requirements.

APPENDIX A

COMPLETE LIST* OF INSTRUMENTS BY TITLE, SPACECRAFT, AND ACRONYM CURRENTLY STORED IN THE MASTER FILE

SECTION I

MULTIBAND TERRAIN PHOTOGRAPHY	
APOLLO 9	MTP
FLUXGATE MAGNETOMETER	
ATS 1	FMAG
MICROWAVE TRANSPONDER	
ATS 1	MICTRA
SPIN SCAN CLOUD CAMERA	
ATS 1	SSCC
VHF TRANSPONDER	
ATS 1	VTRAN
WEATHER FACSIMILE EXPERIMENT	
ATS 1	WEFAX
ADVANCED VIDICON CAMERA SYSTEM	
ATS 2	AVCS
MICROWAVE TRANSPONDER	
ATS 2	MICTRA
VLF POWER SPECTRUM	
ATS 2	VPS
ELECTRON CONTENT OF IONOSPHERE	
ATS 3	ECI
IMAGE DISSECTOR CAMERA SYSTEM	
ATS 3	IDCS

---

* This list is divided into two sections. The first section lists those instruments that have either flown in space or are scheduled to be flown. The second section lists those instruments that have been proposed for flight and are either still under consideration or have previously been rejected.

MICROWAVE TRANSPONDER	
ATS 3	MICTRA
MULTICOLOR SPIN SCAN CLOUD CAMERA	
ATS 3	MSSCC
OMEGA POSITION AND LOCATION EQUIPMENT	
ATS 3	OPLE
VHF TRANSPONDER	
ATS 3	VTRAN
WEATHER FACSIMILE EXPERIMENT	
ATS 3	WEFAX
IMAGE ORTHICON CAMERA SYSTEM	
ATS 4	IOCS
MICROWAVE TRANSPONDER	
ATS 4	MICTRA
L BAND TRANSPONDER	
ATS E	LTRAN
MICROWAVE TRANSPONDER	
ATS E	MICTRA
MILLIMETER WAVE PROPAGATION	
ATS E	MWP
VIDICON CAMERA SYSTEM, WIDE ANGLE LENS	
ESSA 1	VCSW
AUTOMATIC PICTURE TRANSMISSION	
ESSA 2	APT
ADVANCED VIDICON CAMERA SYSTEM	
ESSA 3	AVCS
FLAT PLATE RADIOMETER	
ESSA 3	FPR
AUTOMATIC PICTURE TRANSMISSION	
ESSA 4	APT
ADVANCED VIDICON CAMERA SYSTEM	
ESSA 5	AVCS

FLAT PLATE RADIOMETER	
ESSA 5	FPR
AUTOMATIC PICTURE TRANSMISSION	
ESSA 6	APT
ADVANCED VIDICON CAMERA SYSTEM	
ESSA 7	AVCS
AUTOMATIC PICTURE TRANSMISSION	
ESSA 8	APT
ADVANCED VIDICON CAMERA SYSTEM	
ESSA 9	AVCS
LOW RESOLUTION, OMNIDIRECTIONAL RADIOMETER	
EXPLORER 7	LROR
C-BAND PASSIVE REFLECTOR	
GEOS 2	CPAR
C-BAND TRANSPONDER	
GEOS 2	CTRAN
DOPPLER BEACONS	
GEOS 2	DBEAC
GODDARD RANGE AND RANGE RATE	
GEOS 2	GRARR
LASER REFLECTORS	
GEOS 2	LREF
OPTICAL BEACONS	
GEOS 2	OBEAC
PHOTOCELL LASER DETECTOR	
GEOS 2	PLD
SEQUENTIAL COLLATION OF RANGE	
GEOS 2	SECOR
SOLAR SCIENCE ELECTRON DETECTOR	
GEOS 2	SSED
AUTOMATIC PICTURE TRANSMISSION	
NIMBUS 1	APT
ADVANCED VIDICON CAMERA SYSTEM	
NIMBUS 1	AVCS

HIGH RESOLUTION INFRARED RADIOMETER
NIMBUS 1 HRIR

AUTOMATIC PICTURE TRANSMISSION
NIMBUS 2 APT

ADVANCED VIDICON CAMERA SYSTEM
NIMBUS 2 AVCS

HIGH RESOLUTION INFRARED RADIOMETER
NIMBUS 2 HRIR

MEDIUM RESOLUTION INFRARED RADIOMETER
NIMBUS 2 MRIR

HIGH RESOLUTION INFRARED RADIOMETER
NIMBUS 3 HRIR

IMAGE DISSECTOR CAMERA SYSTEM
NIMBUS 3 IDCS

INFRARED INTERFEROMETER SPECTROMETER
NIMBUS 3 IRIS

INTERROGATION, RECORDING AND LOCATION SYSTEM
NIMBUS 3 IRLS

MEDIUM RESOLUTION INFRARED RADIOMETER
NIMBUS 3 MRIR

MONITOR OF ULTRAVIOLET SOLAR ENERGY
NIMBUS 3 MUSE

SATELLITE INFRARED SPECTROMETER
NIMBUS 3 SIRSA

BACKSCATTERED ULTRAVIOLET MEASUREMENT
NIMBUS D BUV

FILTER WEDGE SPECTROMETER
NIMBUS D FWS

IMAGE DISSECTOR CAMERA SYSTEM
NIMBUS D IDCS

INFRARED INTERFEROMETER SPECTROMETER
NIMBUS D IRIS

INTERROGATION, RECORDING AND LOCATION SYSTEM
NIMBUS D IRLS

MONITOR OF ULTRAVIOLET SOLAR ENERGY	
NIMBUS D	MUSE
SELECTIVE CHOPPER RADIOMETER	
NIMBUS D	SCR
SATELLITE INFRARED SPECTROMETER	
NIMBUS D	SIRS B
TEMPERATURE-HUMIDITY INFRARED RADIOMETER	
NIMBUS D	THIR
ELECTRICALLY SCANNING MICROWAVE RADIOMETER	
NIMBUS E	ESMR
IONOSPHERE ELECTROSTATIC PROBE	
NIMBUS E	IEP
INFRARED TEMPERATURE PROFILE RADIOMETER	
NIMBUS E	ITPR
MICROWAVE SPECTROMETER EXPERIMENT	
NIMBUS E	MSE
POSITIVE ION COMPOSITION SPECTROMETER	
NIMBUS E	PICS
SURFACE COMPOSITION MAPPING RADIOMETER	
NIMBUS E	SCMR
SELECTIVE CHOPPER RADIOMETER	
NIMBUS E	SCR
TEMPERATURE-HUMIDITY INFRARED RADIOMETER	
NIMBUS E	THIR
VIDICON CAMERA SYSTEM, NARROW ANGLE LENS	
TIROS 1	VCSN
VIDICON CAMERA SYSTEM, WIDE ANGLE LENS	
TIROS 1	VCSW
LOW RESOLUTION, NONSCANNING RADIOMETER	
TIROS 2	LRNR
MEDIUM RESOLUTION RADIOMETER	
TIROS 2	MRR
VIDICON CAMERA SYSTEM, NARROW ANGLE LENS	
TIROS 2	VCSN

VIDICON CAMERA SYSTEM, WIDE ANGLE LENS
TIROS 2 VCSW

LOW RESOLUTION, NONSCANNING RADIOMETER
TIROS 3 LRNR

LOW RESOLUTION, OMNIDIRECTIONAL RADIOMETER
TIROS 3 LROR

MEDIUM RESOLUTION INFRARED RADIOMETER
TIROS 3 MRIR

VIDICON CAMERA SYSTEM, WIDE ANGLE LENS
TIROS 3 VCSW

LOW RESOLUTION, NONSCANNING RADIOMETER
TIROS 4 LRNR

LOW RESOLUTION, OMNIDIRECTIONAL RADIOMETER
TIROS 4 LROR

MEDIUM RESOLUTION INFRARED RADIOMETER
TIROS 4 MRIR

VIDICON CAMERA SYSTEM, MEDIUM ANGLE LENS
TIROS 4 VCSM

VIDICON CAMERA SYSTEM, WIDE ANGLE LENS
TIROS 4 VCSW

VIDICON CAMERA SYSTEM, MEDIUM ANGLE LENS
TIROS 5 VCSM

VIDICON CAMERA SYSTEM, WIDE ANGLE IENS
TIROS 5 VCSW

VIDICON CAMERA SYSTEM, MEDIUM ANGLE LENS
TIROS 6 VCSM

VIDICON CAMERA SYSEM, WIDE ANGLE LENS
TIROS 6 VCSW

ELECTRON TEMPERATURE PROBE
TIROS 7 ETP

LOW RESOLUTION, OMNIDIRECTIONAL RADIOMETER
TIROS 7 LROR

MEDIUM RESOLUTION INFRARED RADIOMETER
TIROS 7 MRIR

VIDICON CAMERA SYSTEM, WIDE ANGLE LENS
TIROS 7 VCSW

AUTOMATIC PICTURE TRANSMISSION
TIROS 8 APT

VIDICON CAMERA SYSTEM, WIDE ANGLE LENS
TIROS 8 VCSW

VIDICON CAMERA SYSTEM, WIDE ANGLE LENS
TIROS 9 VCSW

VIDICON CAMERA SYSTEM, WIDE ANGLE LENS
TIROS 10 VCSW

AUTOMATIC PICTURE TRANSMISSION
TIROS M APT

ADVANCED VIDICON CAMERA SYSTEM
TIROS M AVCS

FLAT PLATE RADIOMETER
TIROS M FPR

SOLAR PROTON MONITOR
TIROS M SPM

SCANNING RADIOMETER
TIROS M SR

AUTOMATIC PICTURE TRANSMISSION
TOS H APT

OPTICAL SCANNER
VANGUARD 2 OPTS

SECTION II

DUAL CHANNEL SCANNER IMAGER AAP	DCSI	PROPOSAL/INACTIVE
DIELECTRIC TAPE CAMERA SYSTEM AAP	DTCS	PROPOSAL/INACTIVE
FILTER WEDGE SPECTROMETER AAP	FWS	PROPOSAL/INACTIVE

IMAGE ORTHICON CAMERA SYSTEM		
AAP	IOCS	PROPOSAL/INACTIVE
INTEGRATED PASSIVE MICROWAVE EXP 1, WATER VAPOR RESONANCE		
AAP	IPME1	PROPOSAL/INACTIVE
INTEGRATED PASSIVE MICROWAVE EXP 2, MOLECULAR OXYGEN EMIS		
AAP	IPME2	PROPOSAL/INACTIVE
INFRARED INTERFEROMETER SPECTROMETER		
AAP	IRIS	PROPOSAL/INACTIVE
INFRARED TEMPERATURE SOUNDING		
AAP	IRT	PROPOSAL/INACTIVE
INFRARED TEMPERATURE PROFILE RADIOMETER		
AAP	ITPR	PROPOSAL/INACTIVE
METRIC CAMERA (SPECIAL) EXPERIMENT		
AAP	MCE	PROPOSAL/INACTIVE
MULTICHANNEL RADIOMETER		
AAP	MCR	PROPOSAL/INACTIVE
MULTIBAND PHOTOGRAPHY		
AAP	MP	PROPOSAL/INACTIVE
MULTIBAND PHOTOGRAPHY EXPERIMENT		
AAP	MPE	PROPOSAL/INACTIVE
MICROWAVE RADIOMETER, PHASED ARRAY ANTENNA		
AAP	MRPA	PROPOSAL/INACTIVE
MULTIBAND SYNOPTIC PHOTOGRAPHY		
AAP	MSP	PROPOSAL/INACTIVE
MICROWAVE TEMPERATURE SOUNDER		
AAP	MTS	PROPOSAL/INACTIVE
MILLIMETER WAVE PROPAGATION EXPERIMENT		
AAP	MWPE	PROPOSAL/INACTIVE
RADAR IMAGER SYSTEM		
AAP	RADIM	PROPOSAL/INACTIVE

RADAR ALTIMETER/SCATTEROMETER		
AAP	RAS	PROPOSAL/INACTIVE
SELECTIVE CHOPPER RADIOMETER		
AAP	SCR	PROPOSAL/INACTIVE
STELLAR REFRACTION DENSITY MEASUREMENT		
AAP	SRDM	PROPOSAL/INACTIVE
SHORT WAVELENGTH SPECTROMETER		
AAP	SWS	PROPOSAL/INACTIVE
VISIBLE RADIATION POLARIZATION MEASUREMENT		
AAP	VRPM	PROPOSAL/INACTIVE
CLOUD TOP ALTITUDE RADIOMETER		
NIMBUS D	CAR	PROPOSAL/INACTIVE
UHF SFERICS DETECTION		
NIMBUS D	UHFSD	PROPOSAL/INACTIVE
MIT AERONOMY EXPERIMENT		
NIMBUS E	AEREX	PROPOSAL/INACTIVE
ALBEDO MEASUREMENT EXPERIMENT		
NIMBUS E	ALMEX	PROPOSAL/INACTIVE
AIR POLLUTION SURVEY EXPERIMENT		
NIMBUS E	APSURV	PROPOSAL/INACTIVE
BACKSCATTERED ULTRAVIOLET MEASUREMENT		
NIMBUS E	BUV	PROPOSAL/INACTIVE
WIDE BAND REAL TIME DATA TRANSMISSION		
NIMBUS E	DATRAN	PROPOSAL/INACTIVE
GLOBAL RADAR FOR OCEAN WAVES AND WINDS		
NIMBUS E	GROW	PROPOSAL/INACTIVE
HIGH RESOLUTION FABRY PEROT ETALON SPECTROMETER		
NIMBUS E	HRES	PROPOSAL/INACTIVE
IONIZING RADIATION EXPERIMENT A, T E I C		
NIMBUS E	IREA	PROPOSAL/INACTIVE

IONIZING RADIATION EXPERIMENT B, L E T SPECTROMETER		
NIMBUS E	IREB	PROPOSAL/INACTIVE
INFRARED INTERFEROMETER SPECTROMETER EXPERIMENT		
NIMBUS E	IRIS	PROPOSAL/INACTIVE
INTERROGATION, RECORDING AND LOCATION SYSTEM		
NIMBUS E	IRLS	PROPOSAL/INACTIVE
LIMB RADIANCE INVERSION EXPERIMENT		
NIMBUS E	LIRAIN	PROPOSAL/INACTIVE
METEOR FLASH ANALYZER EXPERIMENT		
NIMBUS E	MEFAN	PROPOSAL/INACTIVE
MICROWAVE OCCULTATION EXPERIMENT		
NIMBUS E	MICO	PROPOSAL/INACTIVE
MICROWAVE RADIOMETER FOR OCEAN SURFACE TEMPERATURE		
NIMBUS E	MROT	PROPOSAL/INACTIVE
NEAR INFRARED MULTIDETECTOR GRATING SPECTROMETER		
NIMBUS E	NIRMUL	PROPOSAL/INACTIVE
OZONE MEASUREMENTS IN THE TERRESTRIAL ATMOSPHERE		
NIMBUS E	OZMA	PROPOSAL/INACTIVE
OZONE CONCENTRATION PROFILE ABOVE 40 KM		
NIMBUS E	OZP	PROPOSAL/INACTIVE
RETURN BEAM VIDICON CAMERA SYSTEM		
NIMBUS E	RBV	PROPOSAL/INACTIVE
SIMPLIFIED DATA COLLECTION EXPERIMENT		
NIMBUS E	SDC	PROPOSAL/INACTIVE
SIMPLIFIED TELEVISION CAMERA		
NIMBUS E	SIMTV	PROPOSAL/INACTIVE
ATMOSPHERIC DENSITY BY STELLAR REFRACTION		
NIMBUS E	SRDM	PROPOSAL/INACTIVE

SOLAR CONSTANT ABSOLUTE VALUE AND FLUCTUATION MEASUREMENT		
NIMBUS E	SOLCON	PROPOSAL/INACTIVE
TRACKING AND DATA RELAY LINK		
NIMBUS E	TDR	PROPOSAL/INACTIVE
VISIBLE RADIATION POLARIZATION MEASUREMENT		
NIMBUS E	VRPM	PROPOSAL/INACTIVE
WIND VELOCITY EXPERIMENT B, CAR		
NIMBUS E	WVIR	PROPOSAL/INACTIVE
WIND VELOCITY EXPERIMENT A, AVCS		
NIMBUS E	WVTV	PROPOSAL/INACTIVE
MONITOR OF SOLAR X RAY SPECTRUM BELOW 25 A		
NIMBUS E	XSPEC	PROPOSAL/INACTIVE

APPENDIX B

COBOL SOURCE LISTING OF IRSARS

```
IDENTIFICATION DIVISION.
PROGRAM-ID. 'IRSARS'.
AUTHOR. PETER BOCK, IIT RESEARCH INSTITUTE.
DATE-WRITTEN. 1968-9.
REMARKS. INSTRUMENT RESUME SEARCH AND RETRIEVAL SYSTEM.

ENVIRONMENT DIVISION.
CONFIGURATION SECTION.
SOURCE-COMPUTER. IBM-360 G40.
OBJECT-COMPUTER. IBM-360 G40.
INPUT-OUTPUT SECTION.
FILE-CONTROL.

    SELECT SIS-FORM-INPUT-FILE
        ASSIGN TO 'SYS004' UNIT-RECORD 2540R UNIT
        RESERVE NO ALTERNATE AREA.
    SELECT PRINT-FILE
        ASSIGN TO 'SYS005' UNIT-RECORD 1403 UNIT
        RESERVE NO ALTERNATE AREA.
    SELECT DISK-FILE
        ASSIGN TO 'SYS006' DIRECT-ACCESS 2311 UNIT
        RESERVE NO ALTERNATE AREA.

DATA DIVISION.

FILE SECTION.

FD  SIS-FORM-INPUT-FILE
    RECORDING MODE IS F
    LABEL RECORDS ARE OMITTED
    DATA RECORD IS CARD.

01  CARD PICTURE X(64).

FD  PRINT-FILE
    RECORDING MODE IS F
    LABEL RECORDS ARE OMITTED
    DATA RECORDS ARE OUTPUT-LINE-PAGE-1, OUTPUT-LINE-PAGE-2.

01  OUTPUT-LINE-PAGE-1 PICTURE X(132).
01  OUTPUT-LINE-PAGE-2 PICTURE X(132) JUSTIFIED RIGHT.

FD  DISK-FILE
    RECORDING MODE IS F
    LABEL RECORDS ARE STANDARD
    DATA RECORD IS DISK-RECORD.

01  DISK-RECORD.

    02  PART-1 PICTURE X(10).
    02  PART-2 PICTURE X(2460).

WORKING-STORAGE SECTION.
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                SOURCE STATEMENT

77  WORDS PICTURE X(65).
77  FIRST-NAME  PICTURE X(12).
77  LAST-NAME   PICTURE X(12).
77  DATE-USED   PICTURE X(8).
77  DATE-COUNTER PICTURE 9.
77  VC PICTURE 9.
77  FUNCTION                       PICTURE X(6).
77  SPACECRAFT-TEST                PICTURE X(24).
77  ACRONYM-TEST                   PICTURE X(6).
77  REV-1                          PICTURE X(64).
77  REV-2                          PICTURE X(65) JUSTIFIED RIGHT.
77  ACCESS-CODE-IN                 PICTURE X(6).
77  REVISION-ACCESS-CODE-IN        PICTURE X(6).
77  REVISION-ACCESS-CODE           PICTURE X(6) VALUE '181926'.
77  ACCESS-CODE-1                  PICTURE X(6) VALUE '503533'.
77  ACCESS-CODE-2                  PICTURE X(6) VALUE '303421'.
77  VERSION-CHK PICTURE X(4).
77  VERSION-NUM PICTURE 9(4).
77  COUNTER                        PICTURE 9.
77  I                              PICTURE 99.
77  I-HOLD  PICTURE 99.
77  M                              PICTURE 99.
77  N                              PICTURE 999  VALUE ZERO.
77  LINES-LEFT                     PICTURE 99.
77  SIZE-1  PICTURE X(1) JUSTIFIED RIGHT.
77  SIZE-2  PICTURE X(2) JUSTIFIED RIGHT.
77  SIZE-3  PICTURE X(3) JUSTIFIED RIGHT.
77  SIZE-4  PICTURE X(4) JUSTIFIED RIGHT.
77  SIZE-5  PICTURE X(5) JUSTIFIED RIGHT.
77  SIZE-6  PICTURE X(6) JUSTIFIED RIGHT.
77  SIZE-7  PICTURE X(7).
77  ANSWER                         PICTURE XXX.
77  NONE                           PICTURE X, VALUE '+'.
77  ONE                            PICTURE X, VALUE ' '.
77  TWO                            PICTURE X, VALUE '0'.
77  THREE                          PICTURE X, VALUE '-'.

77  ASTERISK PICTURE X.
77  APPLICATION-HOLD PICTURE X(39).
77  AREA-3 PICTURE X(3).
77  AREA-4 PICTURE X(4).
77  AREA-5 PICTURE X(5).
77  AREA-8 PICTURE X(8).
77  AREA-29 PICTURE X(29) JUSTIFIED RIGHT.
77  AREA-32 PICTURE X(32) JUSTIFIED RIGHT.
77  AREA-33 PICTURE X(33) JUSTIFIED RIGHT.
77  AREA-34 PICTURE X(34) JUSTIFIED RIGHT.
77  AAA PICTURE X(10).
77  BBB PICTURE X(10).

77  CR01A PICTURE X(50).
77  CR01B PICTURE X(50).
77  CR02A PICTURE X(6).
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                SOURCE STATEMENT

    77  CR03A PICTURE X(6).
    77  CR05A PICTURE X(4).
    77  CR05B PICTURE X(4).
    77  CR06A PICTURE X(20).
    77  CR17A  PICTURE X(11).
    77  CR19A  PICTURE X(15).
    77  CR20A  PICTURE X(8).
    77  CR26A PICTURE X(4).
    77  CR26B PICTURE X(15).
    77  CR27A  PICTURE X(3).
    77  CR29A  PICTURE X(24).
    77  CR35A PICTURE X(10).
    77  CR35B PICTURE X(10).
    77  CR35C PICTURE X(7).
    77  CR35D PICTURE X(10).
    77  CR35E PICTURE X(10).
    77  CR35F PICTURE X(7).
    77  CR35G PICTURE X(10).
    77  CR35H PICTURE X(10).
    77  CR35I PICTURE X(7).
    77  CR36A PICTURE X(8).
    77  CR36D PICTURE X(8).
    77  CR38A PICTURE X(7).
    77  CR38B PICTURE X(7).
    77  CR40A PICTURE X(8).
    77  CR40B PICTURE X(8).
    77  CR44A PICTURE X(5).
    77  CR44B PICTURE X(9).
    77  CR45A PICTURE X(11).
    77  CR45B PICTURE X(10).
    77  CR48A PICTURE X(5).
    77  CR48B PICTURE X(5).
    77  CR49A PICTURE X(8).
    77  CR49B PICTURE X(8).
    77  CR50A PICTURE X(4).
    77  CR51A PICTURE X(3).
    77  CR52A PICTURE X(4).
    77  CR53A PICTURE X(3).
    77  CR53B PICTURE X(4).
    77  CR54A PICTURE X(9).
    77  CR55A PICTURE X(9).
    77  CR56A PICTURE X(9).
    77  CR57A PICTURE X(9).
    77  CR60A PICTURE X(20).
    77  INTF  PICTURE X(9).
    77  TERM PICTURE X(15).

    77  CR35X PICTURE X(10).
    77  CR35Y PICTURE X(10).
    77  CR36Y PICTURE X(8).
    77  CR36X PICTURE X(8).
    77  CR38X PICTURE X(7).
    77  CR38Y PICTURE X(7).
    77  CR40Y PICTURE X(8).
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                SOURCE STATEMENT

77  CR40X PICTURE X(8).
77  CR48X PICTURE X(5).
77  CR48Y PICTURE X(5).
77  CR49Y PICTURE X(8).
77  CR49X PICTURE X(8).
77  CR50X PICTURE X(4).
77  CR51X PICTURE X(3).
77  CR52X PICTURE X(4).
77  CR53X PICTURE X(3).
77  PI2 PICTURE X(2).
77  PI3 PICTURE X(3).
77  PI4 PICTURE X(4).
77  PI5 PICTURE X(5).
77  PI6 PICTURE X(6).
77  PI7 PICTURE X(7).
77  PI8 PICTURE X(8).
77  PI9 PICTURE X(9).
77  PI10 PICTURE X(10).
77  PI11 PICTURE X(11).
77  PI12 PICTURE X(12).
77  PI-TEST PICTURE X(20).
77  V  PICTURE 9.
77  J PICTURE 9.
77  K PICTURE 9.
77  K-HOLD PICTURE 9.
77  KK  PICTURE 9.
77  K5 PICTURE 9.
77  JJ  PICTURE 9.
77  KKK PICTURE 9.
77  ITEM-NO PICTURE 99.
77  PAGE-NO PICTURE 9(5), VALUE ZERO.
77  ANNUM PICTURE XX.
77  ANNUM-TRUNC PICTURE X.
77  ANNUM-RIGHT PICTURE XX JUSTIFIED RIGHT.
77  NUM PICTURE XX.
77  SIZE-11 PICTURE X(11).
77  SIZE-10 PICTURE X(10) JUSTIFIED RIGHT.
77  SIZE-09 PICTURE X(9) JUSTIFIED RIGHT.
77  SIZE-08 PICTURE X(8) JUSTIFIED RIGHT.
77  SIZE-07 PICTURE X(7) JUSTIFIED RIGHT.
77  SIZE-06 PICTURE X(6) JUSTIFIED RIGHT.
77  SIZE-05 PICTURE X(5) JUSTIFIED RIGHT.
77  SIZE-04 PICTURE X(4) JUSTIFIED RIGHT.
77  SIZE-03 PICTURE X(3) JUSTIFIED RIGHT.

77  N1 PICTURE X(38).
77  N2 PICTURE 9.
77  N3 PICTURE 99.
77  N4 PICTURE 9.
77  N5 PICTURE 9.
77  N6 PICTURE 9.
77  N7          PICTURE 99.
77  N8          PICTURE 99.
77  NEW-LINE PICTURE X(67).
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                SOURCE STATEMENT

77  KEYWORD-OUT PICTURE X(15).
77  SPAN PICTURE 99.
77  PROGRESS PICTURE 99.
77  TAB          PICTURE 99.
77  TAB-SPACE    PICTURE 99.

77  STATUS-OUT-1 PICTURE X(9).
77  STATUS-OUT-2 PICTURE X(9).
77  NO-LINES PICTURE 99.
77  R1 PICTURE X(9).
77  R2 PICTURE X(9).

01  CR04A.
    02  CR04AA  PICTURE XX.
    02  FILLER  PICTURE X.
    02  CR04AB  PICTURE XX.
    02  FILLER  PICTURE X.
    02  CR04AC  PICTURE XX.
01  CR04B.
    02  CR04BA  PICTURE XX.
    02  FILLER  PICTURE X.
    02  CR04BB  PICTURE XX.
    02  FILLER  PICTURE X.
    02  CR04BC  PICTURE XX.
01  CURRENT-DATE.
    02  YR  PICTURE XX.
    02  MO  PICTURE XX.
    02  DY  PICTURE XX.
01  TEST-DATE.
    02  YER  PICTURE XX.
    02  MON  PICTURE XX.
    02  DYA  PICTURE XX.

01  APPLICATION-TEST.
    02  APPL  OCCURS 7 TIMES PICTURE X(8).

01  APPLICATION-CR.
    02  CR28 OCCURS 7 TIMES PICTURE X(8).

01  KEYWORD-TABLE.
    02  KEYWORD OCCURS 4 TIMES PICTURE X(15).

01  LENGTH-TABLE.
    02  LENGTH OCCURS 4 TIMES PICTURE 99.

01  TRANSFORMATION-TABLE.
    02  LINE  OCCURS 34 TIMES PICTURE X(65).

01 LINE-TABLE.
    02  POSITION OCCURS 66 TIMES PICTURE X.

01  LEGEND-TABLE.
    02  LEGEND OCCURS 4 TIMES PICTURE X(15).
```

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SOURCE STATEMENT

01  ALIGNMENT.
    02  FILLER                     PICTURE X(65), VALUE SPACES.
    02  FILLER                     PICTURE X, VALUE '.'.
    02  FILLER                     PICTURE X(66), VALUE SPACES.

01  65-SPACES                      PICTURE X(65), JUSTIFIED RIGHT.

01  BLANK-LINE                     PICTURE X(132), VALUE SPACES.

01  PAGE-LINE.
    02  FILLER                     PICTURE X(55), VALUE SPACES.
    02  PAGE                       PICTURE Z(5).
    02  FILLER                     PICTURE X(72), VALUE SPACES.

01  PAGE-1.

02  LINE-01.
    03  FILLER                     PICTURE X.
    03  TITLE                      PICTURE X(51).
    03  ACRONYM                    PICTURE X(7).
    03  EXP-NO                     PICTURE X(6).

02  LINE-02.
    03  FILLER                     PICTURE X.
    03  TITLE-CONTD                PICTURE X(51).
    03  RESUME-DATE.
        04  MONTH                  PICTURE XX.
        04  FILLER                 PICTURE X.
        04  DAY                    PICTURE XX.
        04  FILLER                 PICTURE X.
        04  YEAR                   PICTURE XX.
        04  FILLER                 PICTURE X.
    03  VERSION                    PICTURE X(4).

02  LINE-03.
    03  FILLER                     PICTURE X.
    03  PRINCIPAL-INVESTIGATOR.
        04  NAME                   PICTURE X(21).
        04  ORGANIZATION           PICTURE X(25).
        04  TELEPHONE.
            05  AREA-CODE          PICTURE X(3).
            05  FILL-5             PICTURE X.
            05  EXCHANGE           PICTURE X(3).
            05  FILLER             PICTURE X.
            05  NUMBER             PICTURE X(4).
            05  FILL-6             PICTURE X.
            05  EXTENSION          PICTURE X(5).

02  LINE-04.
    03  FILLER                     PICTURE X.
    03  CO-INVESTIGATOR.
        04  NAME                   PICTURE X(21).
        04  ORGANIZATION           PICTURE X(25).
        04  TELEPHONE.
```

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SOURCE STATEMENT

                05  AREA-CODE          PICTURE X(3).
                05  FILL-7             PICTURE X.
                05  EXCHANGE           PICTURE X(3).
                05  FILLER             PICTURE X.
                05  NUMBER             PICTURE X(4).
                05  FILL-8             PICTURE X.
                05  EXTENSION          PICTURE X(5).

02  LINE-05.
    03  FILLER                         PICTURE X.
    03  CONTRACT-TYPE                  PICTURE X(9).
    03  CONTRACT-NUMBER                PICTURE X(16).
    03  FLASH-INDEX-NUMBER             PICTURE X(16).
    03  START-DATE.
        04  MONTH                      PICTURE XX.
        04  FILLER                     PICTURE X.
        04  YEAR                       PICTURE XX.
        04  FILLER                     PICTURE X.
    03  COMPLETION-DATE.
        04  MONTH                      PICTURE XX.
        04  FILLER                     PICTURE X.
        04  YEAR                       PICTURE XX.
        04  FILLER                     PICTURE X.
    03  STATUS                         PICTURE X(11).

02  LINE-06.
    03  FILLER                         PICTURE X.
    03  MONITOR.
        04  NAME                       PICTURE X(21).
        04  AGENCY                     PICTURE X(16).
        04  PROGRAM-OFFICE.
            05  OFFICE                 PICTURE XXXX.
            05  FILLER                 PICTURE X.
            05  CODE                   PICTURE XXX.
            05  FILLER                 PICTURE X.
        04  TELEPHONE.
            05  AREA-CODE              PICTURE X(3).
            05  FILL-9                 PICTURE X.
            05  EXCHANGE               PICTURE X(3).
            05  FILLER                 PICTURE X.
            05  NUMBER                 PICTURE X(4).
            05  FILL-10                PICTURE X.
            05  EXTENSION              PICTURE X(5).
02  LINE-07.
    03  FILLER                         PICTURE X.
    03  VENDOR                         PICTURE X(25).
    03  LOCATION                       PICTURE X(24).
    03  FLIGHT-DATE.
        04  MONTH                      PICTURE XX.
        04  FILLER                     PICTURE X.
        04  YEAR                       PICTURE XX.
        04  FILLER                     PICTURE X.
    03  LEAD-TIME.
        04  MONTHS                     PICTURE XX.
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SOURCE STATEMENT

        04  UNITS                      PICTURE X(7).

02  LINE-08.
    03  FILLER                        PICTURE X.
    03  INSTRUMENT-TYPE.
        04  CODE                      PICTURE XXXX.
        04  REMAINDER                 PICTURE X(56).
        04  FILLER                    PICTURE X.
    03  SECURITY                      PICTURE XXX.

02  LINE-09.
    03  FILLER                        PICTURE X.
    03  APPLICATION                   PICTURE X(40).
    03  SPACECRAFT                    PICTURE X(24).
02  LINE-10                           PICTURE X(65).
02  LINE-11                           PICTURE X(65).
02  LINE-12                           PICTURE X(65).
02  LINE-13                           PICTURE X(65).
02  LINE-14                           PICTURE X(65).
02  LINE-15                           PICTURE X(65).
02  LINE-16                           PICTURE X(65).
02  LINE-17                           PICTURE X(65).
02  LINE-18                           PICTURE X(65).
02  LINE-19                           PICTURE X(65).
02  LINE-20                           PICTURE X(65).
02  LINE-21                           PICTURE X(65).
02  LINE-22                           PICTURE X(65).
02  LINE-23                           PICTURE X(65).
02  LINE-24                           PICTURE X(65).
02  LINE-26                           PICTURE X(65).
02  LINE-27                           PICTURE X(65).
02  LINE-28                           PICTURE X(65).
02  LINE-25                           PICTURE X(65).
02  LINE-29                           PICTURE X(65).
02  LINE-30                           PICTURE X(65).
02  LINE-31                           PICTURE X(65).
02  LINE-32                           PICTURE X(65).
02  LINE-33                           PICTURE X(65).
02  LINE-34                           PICTURE X(65).
02  LINE-35                           PICTURE X(65).
02  LINE-36                           PICTURE X(65).
02  LINE-37                           PICTURE X(65).
02  LINE-38                           PICTURE X(65).

01  PAGE-2.

02  LINE-39.
    03  SPECTRAL-RANGE.
        04  LOW-END                   PICTURE X(10).
        04  FILL-1                    PICTURE XXXX.
        04  HIGH-END                  PICTURE X(10).
        04  FILL-2                    PICTURE X.
        04  UNITS                     PICTURE X(7).
        04  FILLER                    PICTURE X.
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                SOURCE STATEMENT

        03  SPECTRAL-RESOLUTION.
            04  LIMIT                  PICTURE X(8).
            04  FILLER                 PICTURE X.
            04  UNITS                  PICTURE X(7).
            04  FILLER                 PICTURE X.
        03  TIME-CONSTANT.
            04  TIME                   PICTURE X(7).
            04  UNITS                  PICTURE X(7).

    02  LINE-40.
        03  FIELD-OF-VIEW.
            04  ACROSS                 PICTURE X(7).
            04  FILL-3                 PICTURE XXXX.
            04  IN-LINE                PICTURE X(7).
            04  FILL-4                 PICTURE X(5).
        03  GROUND-SWATH               PICTURE X(41).

    02  LINE-41.
        03  ANGULAR-RESOLUTION.
            04  LIMIT                  PICTURE X(8).
            04  FILLER                 PICTURE X(5).
        03  SPATIAL-RESOLUTION         PICTURE X(51).

    02  LINE-42.
        03  POINTING-ACCURACY.
            04  LIMIT                  PICTURE X(7).
            04  FILLER                 PICTURE X(5).
        03  POINTING-RATE.
            04  LIMIT                  PICTURE X(7).
            04  FILLER                 PICTURE X(9).
        03  ALTITUDE.
            04  RANGE                  PICTURE X(5).
            04  ECCENTRICITY           PICTURE X(9).
            04  FILLER                 PICTURE X.
        03  INCLINATION.
            04  RANGE                  PICTURE X(11).
            04  DIRECTION              PICTURE X(10).

    02  LINE-43                        PICTURE X(64).
    02  LINE-44                        PICTURE X(64).

    02  LINE-45.
        03  WEIGHT.
            04  AMOUNT                 PICTURE X(5).
            04  FILLER                 PICTURE X(4).
        03  VOLUME.
            04  SIZE                   PICTURE X(8).
            04  FILLER                 PICTURE X(7).
        03  AVERAGE-POWER.
            04  AMOUNT                 PICTURE X(4).
            04  FILLER                 PICTURE X(7).
        03  STANDBY-POWER.
            04  AMOUNT                 PICTURE X(3).
            04  FILLER                 PICTURE X(7).
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                SOURCE STATEMENT

      03  PEAK-POWER.
          04  AMOUNT                  PICTURE X(4).
          04  FILLER                  PICTURE X(7).
      03  MTBF.
          04  TIME                    PICTURE XXX.
          04  FILLER                  PICTURE X.
          04  UNITS                   PICTURE X(4).

  02  LINE-46.
      03  RF-INTERFERENCE             PICTURE X(10).
      03  MAGNETIC-INTERFERENCE       PICTURE X(10).
      03  NUCLEAR-INTERFERENCE        PICTURE X(10).
      03  THERMAL-INTERFERENCE        PICTURE X(10).
      03  SHIELDING                   PICTURE X(24).

  02  LINE-47.
      03  CALIBRATION                 PICTURE X(25).
      03  DATA-RECOVERY               PICTURE X(21).
      03  FREQUENCY-OF-OBSERVATION PICTURE X(18).

  02  LINE-48                         PICTURE X(64).
  02  LINE-49                         PICTURE X(64).
  02  LINE-50                         PICTURE X(64).
  02  LINE-51                         PICTURE X(64).
  02  LINE-52                         PICTURE X(64).
  02  LINE-53                         PICTURE X(64).
  02  LINE-54                         PICTURE X(64).
  02  LINE-55                         PICTURE X(64).
  02  LINE-56                         PICTURE X(64).
  02  LINE-57                         PICTURE X(64).
  02  LINE-58                         PICTURE X(64).

  02  LINE-59.
      03  COST-PREVIOUS-FY.
          04  PREVIOUS-FY             PICTURE XXXX.
          04  FILLER                  PICTURE XX.
          04  AMOUNT                  PICTURE X(11).
          04  FILLER                  PICTURE X.
      03  COST-CURRENT-FY.
          04  CURRENT-FY              PICTURE XXXX.
          04  FILLER                  PICTURE XX.
          04  AMOUNT                  PICTURE X(11).
          04  FILLER                  PICTURE X.
      03  COST-TO-DATE                PICTURE X(12).
      03  COST-TO-COMPLETION.
          04  YEAR-OF-COMPLETION      PICTURE XXXX.
          04  FILLER                  PICTURE X.
          04  AMOUNT                  PICTURE X(11).

  02  FILLER                          PICTURE X(1126).

PROCEDURE DIVISION.

START.
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SOURCE STATEMENT

     OPEN OUTPUT PRINT-FILE.
     DISPLAY 'YOU HAVE JUST GAINED ACCESS TO THE MASTER DATA FILE
-    'OF INSTRUMENT' UPON CONSOLE.
     DISPLAY 'RESUMES PERTAINING TO SPACE RESEARCH AND APPLICATION
-    'S. BEFORE YOU' UPON CONSOLE.
     DISPLAY 'BEGIN TO USE THE SYSTEM, FOR THE RECORDS, PLEASE TYP
-    'E YOUR LAST NAME.' UPON CONSOLE
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO LAST-NAME.
     IF LAST-NAME = 'X' GO TO FORM-CHOICE.
     EXAMINE LAST-NAME REPLACING FIRST SPACE BY ','.
     DISPLAY 'NOW PLEASE TYPE YOUR FIRST NAME.' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO FIRST-NAME.
     DISPLAY 'TYPE TODAYS DATE (MONTH,DAY,AND YEAR) IN THE FOLLOWI
-    'NG FORMAT:' UPON CONSOLE.
     DISPLAY '00/00/00' UPON CONSOLE.
     ACCEPT DATE-USED FROM CONSOLE.
     DISPLAY 'PLEASE READY THE PUNCH SO THIS INFORMATION CAN BE PU
-    'NCHED ON A CARD.' UPON CONSOLE.
     DISPLAY 'WHEN PUNCH IS READY, TYPE GO.' UPON CONSOLE.
     ACCEPT ANSWER FROM CONSOLE.
     DISPLAY LAST-NAME FIRST-NAME DATE-USED UPON SYSPUNCH.
     DISPLAY ' ' UPON SYSPUNCH.
     DISPLAY 'PLEASE RETURN THE CARD WHICH HAS JUST BEEN PUNCHED T
-    'O THE SYSTEM' UPON CONSOLE.
     DISPLAY 'LIBRARIAN WHEN YOU RETURN THE SYSTEM.' UPON CONSOLE.

 FORM-CHOICE.
     DISPLAY 'DO YOU WISH TO MOUNT THE RESUME FORMS ON THE PRINTER
-    '?' UPON CONSOLE.
     ACCEPT ANSWER FROM CONSOLE.
     PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = '   '
     OR ANSWER = 'NO' OR ANSWER = '  '.
     IF ANSWER = 'NO' OR ANSWER = '  ' GO TO FIRST-FUNCTION.
     DISPLAY 'MOUNT THE BLANK RESUME FORMS ON THE PRINTER AND READ
-    'Y THE PRINTER.' UPON CONSOLE.
     DISPLAY 'WHEN FINISHED, TYPE GO.' UPON CONSOLE.
     ACCEPT ANSWER FROM CONSOLE.
     WRITE OUTPUT-LINE-PAGE-1 FROM BLANK-LINE AFTER ADVANCING 0.
     WRITE OUTPUT-LINE-PAGE-1 FROM BLANK-LINE AFTER ADVANCING 3.
     WRITE OUTPUT-LINE-PAGE-1 FROM ALIGNMENT  AFTER ADVANCING 2.
     DISPLAY 'CHECK ALIGNMENT OF THE OUTPUT BY NOTING THE POSITION
-    ' OF THE PERIOD' UPON CONSOLE.
     DISPLAY 'RELATIVE TO THE RIGHT HAND BORDER OF PAGE ONE. IT SH
-    'OULD LIE ON THE LINE' UPON CONSOLE.
     DISPLAY 'AND SLIGHTLY ABOVE THE TOP OF THE BLUE BOX ENTITLED
-    'EXP NO.' UPON CONSOLE.

 ADJUST-PRINT-ALIGNMENT.
     DISPLAY 'IS THE ALIGNMENT SATISFACTORY?' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO ANSWER.
     PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
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SOURCE STATEMENT

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     IF ANSWER = 'YES' GO TO FIRST-FUNCTION.
     DISPLAY 'MAKE APPROPRIATE ADJUSTMENTS ON THE PRINTER. WHEN FI
-    'NISHED, TYPE GO.' UPON CONSOLE.
     ACCEPT ANSWER FROM CONSOLE.
     WRITE OUTPUT-LINE-PAGE-1 FROM BLANK-LINE AFTER ADVANCING 0.
     WRITE OUTPUT-LINE-PAGE-1 FROM BLANK-LINE AFTER ADVANCING 3.
     WRITE OUTPUT-LINE-PAGE-1 FROM ALIGNMENT AFTER ADVANCING 2.
     GO TO ADJUST-PRINT-ALIGNMENT.

 FIRST-FUNCTION.
     OPEN INPUT SIS-FORM-INPUT-FILE. MOVE ZERO TO PAGE, PAGE-NO.
     DISPLAY 'THIS SYSTEM IS CAPABLE OF PERFORMING THREE FUNCTIONS
-    ':' UPON CONSOLE.
     DISPLAY '1) REVISE' UPON CONSOLE.
     DISPLAY '2) EXPAND' UPON CONSOLE.
     DISPLAY '3) SEARCH'   UPON CONSOLE.
     DISPLAY 'THESE FUNCTIONS MAY BE REQUESTED IN ANY ORDER, ANY N
-    'UMBER OF TIMES.' UPON CONSOLE.
     GO TO FUNCTION-ENTRY.

 NEXT-FUNCTION.
     CLOSE DISK-FILE.
     DISPLAY 'DO YOU WISH TO PERFORM ADDITIONAL FUNCTIONS (REVISE,
-    'EXPAND, OR SEARCH)?' UPON CONSOLE.
     DISPLAY 'WARNING: AN ANSWER OF ' QUOTE 'NO' QUOTE ' WILL TERM
-    'INATE ACCESS TO THE SYSTEM.' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO ANSWER.
     PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
     IF ANSWER = 'NO' CLOSE SIS-FORM-INPUT-FILE,
     PRINT-FILE, STOP RUN. MOVE ZERO TO PAGE-NO, PAGE.

 FUNCTION-ENTRY.
     DISPLAY 'PLEASE TYPE THE FUNCTION YOU WISH TO PERFORM.' UPON
     CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO FUNCTION.
     IF FUNCTION = 'REVISE' GO TO REVISE.
     IF FUNCTION = 'EXPAND' GO TO EXPAND.
     IF FUNCTION = 'SEARCH' GO TO RETRIEVE.
     DISPLAY FUNCTION ' IS NOT A VALID FUNCTION.' UPON CONSOLE.
     GO TO FUNCTION-ENTRY.

 EXPAND.
     DISPLAY 'STACK THE DATA CARDS TO BE ADDED TO THE FILE IN THE
-    'CARD READER,' UPON CONSOLE.
     DISPLAY 'AND READY SAME. WHEN FINISHED, TYPE GO.'
     UPON CONSOLE. OPEN I-O DISK-FILE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO ANSWER.

 READ-TO-EOF.
     READ DISK-FILE RECORD AT END GO TO FILE-FULL.
     IF ANSWER = 'NF' GO TO READ-NEW-RESUME-CARDS.
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SOURCE STATEMENT

    IF PART-1 = '          ' GO TO READ-NEW-RESUME-CARDS.
    READ DISK-FILE RECORD AT END GO TO FILE-FULL.
    GO TO READ-TO-EOF.

FILE-FULL.
    DISPLAY 'MASTER DATA FILE IS COMPLETELY FILLED. CONSULT SYSTE
-   'M OPERATING MANUAL' UPON CONSOLE.
    DISPLAY 'FOR INSTRUCTIONS FOR FURTHER EXPANSION OF THE FILE.'
    UPON CONSOLE. GO TO NEXT-FUNCTION.

READ-NEW-RESUME-CARDS.
    PERFORM READ-RESUME-CARDS-INTO-MEMORY.
    IF YEAR OF RESUME-DATE = '  ' MOVE SPACES TO RESUME-DATE.
    IF EXCHANGE OF TELEPHONE OF PRINCIPAL-INVESTIGATOR = '   '
       MOVE SPACES TO TELEPHONE OF PRINCIPAL-INVESTIGATOR.
    IF AREA-CODE OF TELEPHONE OF PRINCIPAL-INVESTIGATOR = '   '
       MOVE ' ' TO FILL-5.
    IF EXTENSION OF TELEPHONE OF PRINCIPAL-INVESTIGATOR = '     '
       MOVE ' ' TO FILL-6.
    IF EXCHANGE OF TELEPHONE OF CO-INVESTIGATOR = '   '
       MOVE SPACES TO TELEPHONE OF CO-INVESTIGATOR.
    IF AREA-CODE OF TELEPHONE OF CO-INVESTIGATOR = '   ' MOVE
       ' ' TO FILL-7.
    IF EXTENSION OF TELEPHONE OF CO-INVESTIGATOR = '     ' MOVE
       ' ' TO FILL-8.
    IF FLASH-INDEX-NUMBER = 'NA - - - -   ' MOVE 'NA' TO
       FLASH-INDEX-NUMBER.
    IF FLASH-INDEX-NUMBER = '   - - - -   ' MOVE SPACES TO
       FLASH-INDEX-NUMBER.
    IF MONTH OF START-DATE = '  ' MOVE SPACES TO START-DATE.
    IF MONTH OF COMPLETION-DATE = '  ' MOVE SPACES TO
       COMPLETION-DATE.
    IF EXCHANGE OF TELEPHONE OF MONITOR = '   '
       MOVE SPACES TO TELEPHONE OF MONITOR.
    IF AREA-CODE OF TELEPHONE OF MONITOR = '   '
       MOVE ' ' TO FILL-9.
    IF EXTENSION OF TELEPHONE OF MONITOR = '     '
       MOVE ' ' TO FILL-10.
    IF OFFICE = '    ' MOVE SPACES TO PROGRAM-OFFICE.
    IF MONTH OF FLIGHT-DATE = '  ' MOVE SPACES TO FLIGHT-DATE.
    IF MONTHS = '  ' MOVE SPACES TO LEAD-TIME.
    IF LOW-END = '    .    ' OR LOW-END = '         ' MOVE
       SPACES TO SPECTRAL-RANGE.
    IF LOW-END = 'NA   .    ' OR LOW-END = 'NA       '
       MOVE SPACES TO SPECTRAL-RANGE, MOVE 'NA       ' TO
       LOW-END.
    IF HIGH-END = '    .    ' OR HIGH-END = '         ' MOVE
       SPACES TO FILL-1, HIGH-END, FILL-2.
    IF LIMIT OF SPECTRAL-RESOLUTION = '    .    ' MOVE SPACES
       TO SPECTRAL-RESOLUTION.
    IF LIMIT OF SPECTRAL-RESOLUTION = 'NA  .    ' MOVE 'NA      '
       TO SPECTRAL-RESOLUTION.
    IF TIME OF TIME-CONSTANT = '       ' OR TIME OF TIME-CONSTANT
       = '    .    ' MOVE SPACES TO TIME-CONSTANT.
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      SOURCE STATEMENT

IF TIME OF TIME-CONSTANT = 'NA      ' OR TIME OF TIME-CONSTANT
    = 'NA  .  ' MOVE 'NA' TO TIME-CONSTANT.
IF ANGULAR-RESOLUTION = '     .        ' OR ANGULAR-RESOLUTION
    = '     .     DEG' OR ANGULAR-RESOLUTION = '          DEG'
    MOVE SPACES TO ANGULAR-RESOLUTION.
IF ANGULAR-RESOLUTION = 'NA   .        ' OR ANGULAR-RESOLUTION
    = 'NA  .     DEG' OR ANGULAR-RESOLUTION = 'NA       DEG'
    MOVE 'NA' TO ANGULAR-RESOLUTION.
IF ACROSS = '        ' OR ACROSS = '     .  ' MOVE SPACES TO
    FIELD-OF-VIEW.
IF ACROSS = 'NA      ' OR ACROSS = 'NA  .  ' MOVE 'NA' TO
    FIELD-OF-VIEW.
EXAMINE FILL-3 TALLYING ALL 'M'. IF TALLY > ZERO, MOVE SPACES
TO IN-LINE. IF TALLY = ZERO AND (IN-LINE = '     .  ' OR
IN-LINE = '        ') MOVE SPACES TO FILL-3, IN-LINE.
IF POINTING-ACCURACY = '     .          ' OR POINTING-ACCURACY
    = '     .     DEG ' OR POINTING-ACCURACY = '          DEG '
    MOVE SPACES TO POINTING-ACCURACY.
IF POINTING-ACCURACY = 'NA .     DEG ' OR POINTING-ACCURACY
    = 'NA .          ' OR POINTING-ACCURACY = 'NA       DEG '
    MOVE 'NA' TO POINTING-ACCURACY.
IF POINTING-RATE = '     .     DEG/SEC' OR POINTING-RATE =
    '     .              ' OR POINTING-RATE = '          DEG/SEC '
    MOVE SPACES TO POINTING-RATE.
IF POINTING-RATE = 'NA .     DEG/SEC ' OR POINTING-RATE =
    'NA .              ' OR POINTING-RATE = 'NA       DEG/SEC '
    MOVE 'NA' TO POINTING-RATE.
IF RANGE OF INCLINATION = 'SUN-SYNCH' MOVE 'RETROGRADE' TO
DIRECTION. IF RANGE OF INCLINATION = 'POLAR' MOVE 'NA'
TO DIRECTION.
EXAMINE WEIGHT REPLACING ALL '.' BY ' '.
IF WEIGHT = '       LB ' MOVE SPACES TO WEIGHT.
IF WEIGHT = 'NA     LB ' MOVE 'NA' TO WEIGHT.
IF VOLUME = '      .   CU FT ' OR VOLUME = '          CU FT '
   OR VOLUME = '     .          ' MOVE SPACES TO VOLUME.
IF VOLUME = 'NA    .   CU FT ' OR VOLUME = 'NA        CU FT '
   OR VOLUME = 'NA   .          ' MOVE 'NA' TO VOLUME.
EXAMINE AVERAGE-POWER REPLACING ALL '.' BY ' '.
IF AVERAGE-POWER = '     WATTS ' MOVE SPACES TO
   AVERAGE-POWER.
IF AVERAGE-POWER = 'NA    WATTS ' MOVE 'NA' TO AVERAGE-POWER.
IF AMOUNT OF AVERAGE-POWER = '   1' MOVE '   1 WATT   ' TO
   AVERAGE-POWER.
IF AMOUNT OF AVERAGE-POWER = '   0' MOVE 'NONE' TO
AVERAGE-POWER.
EXAMINE STANDBY-POWER REPLACING ALL '.' BY ' '.
IF STANDBY-POWER = '     WATTS ' MOVE SPACES TO STANDBY-POWER.
IF STANDBY-POWER = 'NA  WATTS ' MOVE 'NA' TO STANDBY-POWER.
IF AMOUNT OF STANDBY-POWER = '  1' MOVE '  1 WATT  ' TO
   STANDBY-POWER.
IF AMOUNT OF STANDBY-POWER = '  0' MOVE 'NONE' TO
STANDBY-POWER.
EXAMINE PEAK-POWER REPLACING ALL '.' BY ' '.
IF PEAK-POWER = '      WATTS ' MOVE SPACES TO PEAK-POWER.
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          SOURCE STATEMENT

     IF PEAK-POWER = 'NA   WATTS ' MOVE 'NA' TO PEAK-POWER.
     IF AMOUNT OF PEAK-POWER = '   1' MOVE '   1 WATT  ' TO
        PEAK-POWER.
     IF AMOUNT OF PEAK-POWER = '   0' MOVE 'NONE' TO PEAK-POWER.
     EXAMINE MTBF REPLACING ALL '.' BY ' '.
     MOVE UNITS OF SPECTRAL-RANGE TO SIZE-7.
EXAMINATION.
     EXAMINE SIZE-7 TALLYING LEADING SPACES.
     IF TALLY = 1 MOVE SIZE-7 TO SIZE-6 MOVE SIZE-6 TO SIZE-7
     GO TO SWITCH-1.
     IF TALLY = 2 MOVE SIZE-7 TO SIZE-5 MOVE SIZE-5 TO SIZE-7
     GO TO SWITCH-1.
     IF TALLY = 3 MOVE SIZE-7 TO SIZE-4 MOVE SIZE-4 TO SIZE-7
     GO TO SWITCH-1.
     IF TALLY = 4 MOVE SIZE-7 TO SIZE-3 MOVE SIZE-3 TO SIZE-7
     GO TO SWITCH-1.
     IF TALLY = 5 MOVE SIZE-7 TO SIZE-2 MOVE SIZE-2 TO SIZE-7
     GO TO SWITCH-1.
     IF TALLY = 6 MOVE SIZE-7 TO SIZE-1 MOVE SIZE-1 TO SIZE-7.

SWITCH-1.
     GO TO SWITCH-2.
SWITCH-2.
     MOVE SIZE-7 TO UNITS OF SPECTRAL-RANGE. MOVE EXP-NO TO SIZE-7
     ALTER SWITCH-1 TO PROCEED TO SWITCH-3. GO TO EXAMINATION.

SWITCH-3.
     MOVE SIZE-7 TO EXP-NO. MOVE UNITS OF TIME-CONSTANT TO SIZE-7.
     ALTER SWITCH-1 TO PROCEED TO SWITCH-4. GO TO EXAMINATION.

SWITCH-4.
     MOVE SIZE-7 TO UNITS OF TIME-CONSTANT. MOVE UNITS OF MTBF TO
     SIZE-7. ALTER SWITCH-1 TO PROCEED TO SWITCH-5.
     GO TO EXAMINATION.

SWITCH-5.
     MOVE SIZE-7 TO UNITS OF MTBF. MOVE ACRONYM TO SIZE-7.
     ALTER SWITCH-1 TO PROCEED TO SWITCH-6. GO TO EXAMINATION.

SWITCH-6.
     MOVE SIZE-7 TO ACRONYM. ALTER SWITCH-1 TO PROCEED TO
     SWITCH-2.
     MOVE RANGE OF ALTITUDE TO SIZE-11.

EXAM.
     EXAMINE SIZE-11 TALLYING LEADING SPACES.
     IF TALLY = 01 MOVE SIZE-11 TO SIZE-10 MOVE SIZE-10 TO SIZE-11
     GO TO SWITCH-7.
     IF TALLY = 02 MOVE SIZE-11 TO SIZE-09 MOVE SIZE-09 TO SIZE-11
     GO TO SWITCH-7.
     IF TALLY = 03 MOVE SIZE-11 TO SIZE-08 MOVE SIZE-08 TO SIZE-11
     GO TO SWITCH-7.
     IF TALLY = 04 MOVE SIZE-11 TO SIZE-07 MOVE SIZE-07 TO SIZE-11
     GO TO SWITCH-7.
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                SOURCE STATEMENT

           IF TALLY = 05 MOVE SIZE-11 TO SIZE-06 MOVE SIZE-06 TO SIZE-11
           GO TO SWITCH-7.
           IF TALLY = 06 MOVE SIZE-11 TO SIZE-05 MOVE SIZE-05 TO SIZE-11
           GO TO SWITCH-7.
           IF TALLY = 07 MOVE SIZE-11 TO SIZE-04 MOVE SIZE-04 TO SIZE-11
           GO TO SWITCH-7.
           IF TALLY = 08 MOVE SIZE-11 TO SIZE-03 MOVE SIZE-03 TO SIZE-11
           GO TO SWITCH-7.

       SWITCH-7.
           GO TO SWITCH-8.

       SWITCH-8.
           MOVE SIZE-11 TO RANGE OF ALTITUDE. MOVE ECCENTRICITY TO
           SIZE-11. ALTER SWITCH-7 TO PROCEED TO SWITCH-9. GO TO EXAM.

       SWITCH-9.
           MOVE SIZE-11 TO ECCENTRICITY. MOVE RANGE OF INCLINATION TO
           SIZE-11. ALTER SWITCH-7 TO PROCEED TO SWITCH-10. GO TO EXAM.

       SWITCH-10.
           MOVE SIZE-11 TO RANGE OF INCLINATION. MOVE DIRECTION TO
           SIZE-11. ALTER SWITCH-7 TO PROCEED TO SWITCH-11. GO TO EXAM.

       SWITCH-11.
           MOVE SIZE-11 TO DIRECTION. ALTER SWITCH-7 TO PROCEED TO
           SWITCH-8.

           PERFORM PRINT-RESUME.
           REWRITE DISK-RECORD FROM PAGE-1.
           READ DISK-FILE RECORD AT END GO TO FILE-FULL.
           REWRITE DISK-RECORD FROM PAGE-2.
           READ DISK-FILE RECORD AT END GO TO FILE-FULL.
           GO TO READ-NEW-RESUME-CARDS.

       TRANSITION.
           DISPLAY 'THE DATA FILE ON THE DISK HAS BEEN EXPANDED TO INCLU
       -   'DE THOSE RESUMES' UPON CONSOLE.
           DISPLAY 'WHICH WERE STACKED IN THE CARD READER AND DISPLAYED
       -   'ON THE PRINTER.' UPON CONSOLE. GO TO NEXT-FUNCTION.
       REVISE.
           DISPLAY 'IN ORDER TO REVISE RESUMES IN THE FILE, AN ACCESS CO
       -   'DE IS REQUIRED.' UPON CONSOLE.
           DISPLAY 'PLEASE TYPE THIS CODE.' UPON CONSOLE.
           ACCEPT REVISION-ACCESS-CODE-IN FROM CONSOLE.
           IF REVISION-ACCESS-CODE-IN IS NOT EQUAL TO
           REVISION-ACCESS-CODE, DISPLAY 'THIS IS NOT THE CORRECT CODE.'
           UPON CONSOLE, GO TO NEXT-FUNCTION.
           OPEN I-O DISK-FILE.
           MOVE ZERO TO DATE-COUNTER.
           DISPLAY 'SHOULD THE RESUME DATES OF THE REVISED RESUMES BE BR
       -   'OUGHT UP TO DATE?' UPON CONSOLE.
           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
           MOVE WORDS TO ANSWER.
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                SOURCE STATEMENT

           PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
           IF ANSWER = 'NO' GO TO CHOOSE-RESUME. MOVE 1 TO DATE-COUNTER.

       CHOOSE-RESUME.
           MOVE 1 TO VC.
           MOVE 1 TO COUNTER. MOVE ZERO TO N.
           DISPLAY 'PLEASE TYPE THE SPACECRAFT OF THE RESUME YOU WISH TO
      -    ' REVISE.' UPON CONSOLE.
           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
           MOVE WORDS TO SPACECRAFT-TEST.
           DISPLAY 'PLEASE TYPE THE ACRONYM OF THE RESUME YOU WISH TO RE
           'VISE.' UPON CONSOLE.
           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
           MOVE WORDS TO ACRONYM-TEST.

       I-IN.
           DISPLAY 'PLEASE TYPE THE NUMBER OF THE ITEM YOU WISH TO REVIS
      -    'E.' UPON CONSOLE.
           ACCEPT ANNUM FROM CONSOLE. PERFORM NUMBER-EXAM THRU
           NUMBER-CONVERSION. MOVE ITEM-NO TO I.
           IF I IS GREATER THAN 68, DISPLAY I ' IS NOT A VALID ITEM NUMB
      -    'ER.' UPON CONSOLE, GO TO I-IN.

       READ-TAPE-TO-FIND-RESUME.
           READ DISK-FILE RECORD INTO PAGE-1 AT END GO TO
           VERIFY-COMPLETE-READ.
           IF VC = 1 PERFORM VERSION-UP.
           IF DATE-COUNTER = 1, MOVE DATE-USED TO RESUME-DATE.
           IF I > 34, REWRITE DISK-RECORD FROM PAGE-1,
           READ DISK-FILE RECORD INTO PAGE-2
           AT END GO TO VERIFY-COMPLETE-READ.
           IF SPACECRAFT = SPACECRAFT-TEST AND ACRONYM = ACRONYM-TEST,
           GO TO RESUME-SECURITY-CHECK. IF ACRONYM = '      '
           GO TO VERIFY-COMPLETE-READ. IF I IS NOT GREATER THAN 34,
           READ DISK-FILE RECORD AT END GO TO VERIFY-COMPLETE-READ.
           GO TO READ-TAPE-TO-FIND-RESUME.

       RESUME-SECURITY-CHECK.
           IF SECURITY = 'UNC' OR SECURITY = 'PRO' GO TO ITEM-SELECTION.
           DISPLAY 'THE RESUME YOU HAVE REQUESTED IS CLASSIFIED. TO GAIN
      -    ' ACCESS TO IT,' UPON CONSOLE.
           DISPLAY 'TYPE THE CURRENT 6-DIGIT SECURITY ACCESS CODE.' UPON
           CONSOLE.
           ACCEPT ACCESS-CODE-IN FROM CONSOLE.
           IF ACCESS-CODE-IN = ACCESS-CODE-1 GO TO ITEM-SELECTION.
           DISPLAY 'THIS IS NOT THE CORRECT SECURITY ACCESS CODE.' UPON
           CONSOLE. IF I IS NOT GREATER THAN 34, READ DISK-FILE RECORD
           AT END GO TO NEXT-REVISION.
           GO TO NEXT-REVISION.

       VERIFY-COMPLETE-READ.
           CLOSE DISK-FILE.
           IF COUNTER = 2, MOVE 3 TO COUNTER, DISPLAY 'NO RESUME WITH SP
      -    'ACECRAFT ' SPACECRAFT-TEST ' AND ACRONYM ' ACRONYM-TEST UPON
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                SOURCE STATEMENT

           CONSOLE, DISPLAY 'EXISTS IN THE MASTER FILE.' UPON
           CONSOLE, GO TO NEXT-REVISION. MOVE 2 TO COUNTER,
           OPEN I-O DISK-FILE. GO TO READ-TAPE-TO-FIND-RESUME.

       WRITE-REVISION.
           IF I IS GREATER THAN 34, REWRITE DISK-RECORD FROM PAGE-2.
           IF I IS NOT GREATER THAN 34, REWRITE DISK-RECORD FROM PAGE-1,
           READ DISK-FILE RECORD INTO PAGE-2 AT END GO TO
           VERIFY-COMPLETE-READ. PERFORM PRINT-RESUME.

       NEXT-REVISION.
           DISPLAY 'DO YOU WISH TO REVISE OTHER RESUMES?' UPON CONSOLE.
           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
           MOVE WORDS TO ANSWER.
           PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
           IF ANSWER = 'YES' AND COUNTER = 3,
           OPEN I-O DISK-FILE, GO TO CHOOSE-RESUME.
           IF ANSWER = 'YES' GO TO CHOOSE-RESUME.
           GO TO NEXT-FUNCTION.
       CHECK.
           DISPLAY 'TYPE THE NUMBER OF THE ITEM TO BE REVISED.' UPON
           CONSOLE. ACCEPT ANNUM FROM CONSOLE. PERFORM NUMBER-EXAM THRU
           NUMBER-CONVERSION. MOVE ITEM-NO TO I-HOLD.
           IF I-HOLD IS GREATER THAN 68, DISPLAY I-HOLD ' IS NOT A VALID
       -   ' ITEM NUMBER.' UPON CONSOLE, GO TO CHECK.
           IF I-HOLD IS GREATER THAN 34 AND I IS GREATER THAN 34 OR
           I-HOLD IS NOT GREATER THAN 34 AND I IS NOT GREATER THAN 34,
           MOVE I-HOLD TO I, GO TO ITEM-SELECTION.
           IF I-HOLD IS GREATER THAN 34 AND I IS NOT GREATER THAN 34,
           REWRITE DISK-RECORD FROM PAGE-1, MOVE I-HOLD TO I, READ
           DISK-FILE RECORD INTO PAGE-2 AT END GO TO
           VERIFY-COMPLETE-READ, GO TO ITEM-SELECTION.
           IF I-HOLD IS NOT GREATER THAN 34 AND I IS GREATER THAN 34,
           REWRITE DISK-RECORD FROM PAGE-2, CLOSE DISK-FILE, OPEN I-O
           DISK-FILE, MOVE I-HOLD TO I, GO TO READ-TAPE-TO-FIND-RESUME.

       ITEM-SELECTION.
           IF I IS NOT EQUAL TO 27 GO TO ITEM-REVISION.
           DISPLAY 'A REVISION OF ITEM 27 (SECURITY) REQUIRES AN ADDITIO
       -   'NAL ACCESS CODE.' UPON CONSOLE.
           DISPLAY 'TYPE THIS 6-DIGIT ACCESS CODE.' UPON CONSOLE.
           ACCEPT ACCESS-CODE-IN FROM CONSOLE.
           IF ACCESS-CODE-IN = ACCESS-CODE-2 GO TO ENTER-ITEM-REVISIONS.
           DISPLAY 'THIS IS NOT THE CORRECT ACCESS CODE.' UPON CONSOLE.
           GO TO NEXT-ITEM.

       ITEM-REVISION.
           IF I = 01 OR I = 30 OR I = 31 OR I = 62 OR I = 63 OR I = 64,
           GO TO MULTIPLE-LINE-REVISION.

       ENTER-ITEM-REVISIONS.
           DISPLAY 'TYPE ENTIRE CONTENTS OF ITEM ' I ' INCLUDING ALL DES,
       -   'IRED REVISIONS.' UPON CONSOLE.
           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
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      SOURCE STATEMENT

MOVE WORDS TO REV-1.
MOVE REV-1 TO REV-2.
IF I = 02 MOVE REV-1 TO ACRONYM.
IF I = 03 MOVE REV-1 TO EXP-NO.
IF I = 04 MOVE REV-1 TO RESUME-DATE.
IF I = 05 MOVE REV-1 TO VERSION.
IF I = 06 MOVE REV-1 TO NAME OF PRINCIPAL-INVESTIGATOR.
IF I = 07 MOVE REV-1 TO ORGANIZATION OF
                        PRINCIPAL-INVESTIGATOR.
IF I = 08 MOVE REV-1 TO TELEPHONE OF PRINCIPAL-INVESTIGATOR.
IF I = 09 MOVE REV-1 TO NAME OF CO-INVESTIGATOR.
IF I = 10 MOVE REV-1 TO ORGANIZATION OF CO-INVESTIGATOR.
IF I = 11 MOVE REV-1 TO TELEPHONE OF CO-INVESTIGATOR.
IF I = 12 MOVE REV-1 TO CONTRACT-TYPE.
IF I = 13 MOVE REV-1 TO CONTRACT-NUMBER.
IF I = 14 MOVE REV-1 TO FLASH-INDEX-NUMBER.
IF I = 15 MOVE REV-1 TO START-DATE.
IF I = 16 MOVE REV-1 TO COMPLETION-DATE.
IF I = 17 MOVE REV-1 TO STATUS.
IF I = 18 MOVE REV-1 TO NAME OF MONITOR.
IF I = 19 MOVE REV-1 TO AGENCY.
IF I = 20 MOVE REV-1 TO PROGRAM-OFFICE.
IF I = 21 MOVE REV-1 TO TELEPHONE OF MONITOR.
IF I = 22 MOVE REV-1 TO VENDOR.
IF I = 23 MOVE REV-1 TO LOCATION.
IF I = 24 MOVE REV-1 TO FLIGHT-DATE.
IF I = 25 MOVE REV-1 TO LEAD-TIME.
IF I = 26 MOVE REV-1 TO INSTRUMENT-TYPE.
IF I = 27 MOVE REV-1 TO SECURITY.
IF I = 28 MOVE REV-1 TO APPLICATION.
IF I = 29 MOVE REV-1 TO SPACECRAFT.
IF I = 32 MOVE REV-2 TO LINE-36.
IF I = 33 MOVE REV-2 TO LINE-37.
IF I = 34 MOVE REV-2 TO LINE-38.
IF I = 35 MOVE REV-1 TO SPECTRAL-RANGE.
IF I = 36 MOVE REV-1 TO SPECTRAL-RESOLUTION.
IF I = 37 MOVE REV-1 TO TIME-CONSTANT.
IF I = 38 MOVE REV-1 TO FIELD-OF-VIEW.
IF I = 39 MOVE REV-1 TO GROUND-SWATH.
IF I = 40 MOVE REV-1 TO ANGULAR-RESOLUTION.
IF I = 41 MOVE REV-1 TO SPATIAL-RESOLUTION.
IF I = 42 MOVE REV-1 TO POINTING-ACCURACY.
IF I = 43 MOVE REV-1 TO POINTING-RATE.
IF I = 44 MOVE REV-1 TO ALTITUDE.
IF I = 45 MOVE REV-1 TO INCLINATION.
IF I = 46 MOVE REV-1 TO LINE-43.
IF I = 47 MOVE REV-1 TO LINE-44.
IF I = 48 MOVE REV-1 TO WEIGHT.
IF I = 49 MOVE REV-1 TO VOLUME.
IF I = 50 MOVE REV-1 TO AVERAGE-POWER.
IF I = 51 MOVE REV-1 TO STANDBY-POWER.
IF I = 52 MOVE REV-1 TO PEAK-POWER.
IF I = 53 MOVE REV-1 TO MTBF.
IF I = 54 MOVE REV-1 TO RF-INTERFERENCE.
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SOURCE STATEMENT

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      IF I = 55 MOVE REV-1 TO MAGNETIC-INTERFERENCE.
      IF I = 56 MOVE REV-1 TO NUCLEAR-INTERFERENCE.
      IF I = 57 MOVE REV-1 TO THERMAL-INTERFERENCE.
      IF I = 58 MOVE REV-1 TO SHIELDING.
      IF I = 59 MOVE REV-1 TO CALIBRATION.
      IF I = 60 MOVE REV-1 TO DATA-RECOVERY.
      IF I = 61 MOVE REV-1 TO FREQUENCY-OF-OBSERVATION.
      IF I = 65 MOVE REV-1 TO COST-PREVIOUS-FY.
      IF I = 66 MOVE REV-1 TO COST-CURRENT-FY.
      IF I = 67 MOVE REV-1 TO COST-TO-DATE.
      IF I = 68 MOVE REV-1 TO COST-TO-COMPLETION.
      ADD 1 TO N.
      DISPLAY 'REVISION OF ITEM ' I ' IN THIS RESUME HAS BEEN COMPI
     -    'ETED.' UPON CONSOLE.

 NEXT-ITEM.
      DISPLAY 'DO YOU WISH TO REVISE OTHER ITEMS IN THIS RESUME?'
      UPON CONSOLE.
      ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
      MOVE WORDS TO ANSWER.
      PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
      IF ANSWER = 'YES' GO TO CHECK.
      IF N IS NOT EQUAL TO ZERO,
      DISPLAY 'A TOTAL OF ' N ' REVISIONS HAVE BEEN MADE IN THE RES
     -    'UME FOR ACRONYM ' ACRONYM-TEST UPON CONSOLE, DISPLAY 'AND SP
          'ACECRAFT ' SPACECRAFT-TEST UPON CONSOLE,
      GO TO WRITE-REVISION.
      IF I IS NOT GREATER THAN 34, READ DISK-FILE RECORD AT END
      GO TO NEXT-REVISION. GO TO NEXT-REVISION.

 MULTIPLE-LINE-REVISION.
      DISPLAY 'ITEM ' I ' CONSISTS OF SEVERAL LINES OF INFORMATION.
     -    ' REVISIONS IN ANY' UPON CONSOLE.
      DISPLAY 'OF THESE LINES MAY BE MADE, ONE AT A TIME.'
      UPON CONSOLE.

 ENTER-LINE-REVISION.
      DISPLAY 'TYPE THE NUMBER OF THE LINE YOU WISH TO REVISE.'
      UPON CONSOLE.
      ACCEPT ANNUM FROM CONSOLE. PERFORM NUMBER-EXAM THRU
      NUMBER-CONVERSION. MOVE ITEM-NO TO M.
      DISPLAY 'TYPE THE ENTIRE CONTENTS OF LINE ' M ' IN ITEM ' I
          ' INCLUDING ALL' UPON CONSOLE.
      DISPLAY 'DESIRED REVISIONS OF THAT LINE.' UPON CONSOLE.
      ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
      MOVE WORDS TO REV-1.
      MOVE REV-1 TO REV-2.
      IF I = 01 GO TO TITLE-REVISION.
      IF I = 30 GO TO PURPOSE-REVISION.
      IF I = 31 GO TO PRINCIPLES-REVISION.
      IF I = 62 GO TO TELEMETRY-REVISION.
      IF I = 63 GO TO EVALUATION-REVISION.

 REFERENCES-REVISION.
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                SOURCE STATEMENT

           IF M = 01 MOVE REV-1 TO LINE-53 GO TO MULTIPLE-LINE-EXIT.
           IF M = 02 MOVE REV-1 TO LINE-54 GO TO MULTIPLE-LINE-EXIT.
           IF M = 03 MOVE REV-1 TO LINE-55 GO TO MULTIPLE-LINE-EXIT.
           IF M = 04 MOVE REV-1 TO LINE-56 GO TO MULTIPLE-LINE-EXIT.
           IF M = 05 MOVE REV-1 TO LINE-57 GO TO MULTIPLE-LINE-EXIT.
           IF M = 06 MOVE REV-1 TO LINE-58 GO TO MULTIPLE-LINE-EXIT.
           GO TO MULTIPLE-LINE-ERROR.

EVALUATION-REVISION.
           IF M = 01 MOVE REV-1 TO LINE-51 GO TO MULTIPLE-LINE-EXIT.
           IF M = 02 MOVE REV-1 TO LINE-52 GO TO MULTIPLE-LINE-EXIT.
           GO TO MULTIPLE-LINE-ERROR.

TELEMETRY-REVISION.
           IF M = 01 MOVE REV-1 TO LINE-48 GO TO MULTIPLE-LINE-EXIT.
           IF M = 02 MOVE REV-1 TO LINE-49 GO TO MULTIPLE-LINE-EXIT.
           IF M = 03 MOVE REV-1 TO LINE-50 GO TO MULTIPLE-LINE-EXIT.
           GO TO MULTIPLE-LINE-ERROR.

TITLE-REVISION.
           IF M = 01 MOVE REV-1 TO TITLE   GO TO MULTIPLE-LINE-EXIT.
           IF M = 02 MOVE REV-1 TO TITLE-CONTD GO TO MULTIPLE-LINE-EXIT.
           GO TO MULTIPLE-LINE-ERROR.

PURPOSE-REVISION.
           IF M = 01 MOVE REV-2 TO LINE-10 GO TO MULTIPLE-LINE-EXIT.
           IF M = 02 MOVE REV-2 TO LINE-11 GO TO MULTIPLE-LINE-EXIT.
           IF M = 03 MOVE REV-2 TO LINE-12 GO TO MULTIPLE-LINE-EXIT.
           IF M = 04 MOVE REV-2 TO LINE-13 GO TO MULTIPLE-LINE-EXIT.
           IF M = 05 MOVE REV-2 TO LINE-14 GO TO MULTIPLE-LINE-EXIT.
           IF M = 06 MOVE REV-2 TO LINE-15 GO TO MULTIPLE-LINE-EXIT.
           GO TO MULTIPLE-LINE-ERROR.

PRINCIPLES-REVISION.
           IF M = 01 MOVE REV-2 TO LINE-16 GO TO MULTIPLE-LINE-EXIT.
           IF M = 02 MOVE REV-2 TO LINE-17 GO TO MULTIPLE-LINE-EXIT.
           IF M = 03 MOVE REV-2 TO LINE-18 GO TO MULTIPLE-LINE-EXIT.
           IF M = 04 MOVE REV-2 TO LINE-19 GO TO MULTIPLE-LINE-EXIT.
           IF M = 05 MOVE REV-2 TO LINE-20 GO TO MULTIPLE-LINE-EXIT.
           IF M = 06 MOVE REV-2 TO LINE-21 GO TO MULTIPLE-LINE-EXIT.
           IF M = 07 MOVE REV-2 TO LINE-22 GO TO MULTIPLE-LINE-EXIT.
           IF M = 08 MOVE REV-2 TO LINE-23 GO TO MULTIPLE-LINE-EXIT.
           IF M = 09 MOVE REV-2 TO LINE-24 GO TO MULTIPLE-LINE-EXIT.
           IF M = 10 MOVE REV-2 TO LINE-25 GO TO MULTIPLE-LINE-EXIT.
           IF M = 11 MOVE REV-2 TO LINE-26 GO TO MULTIPLE-LINE-EXIT.
           IF M = 12 MOVE REV-2 TO LINE-27 GO TO MULTIPLE-LINE-EXIT.
           IF M = 13 MOVE REV-2 TO LINE-28 GO TO MULTIPLE-LINE-EXIT.
           IF M = 14 MOVE REV-2 TO LINE-29 GO TO MULTIPLE-LINE-EXIT.
           IF M = 15 MOVE REV-2 TO LINE-30 GO TO MULTIPLE-LINE-EXIT.
           IF M = 16 MOVE REV-2 TO LINE-31 GO TO MULTIPLE-LINE-EXIT.
           IF M = 17 MOVE REV-2 TO LINE-32 GO TO MULTIPLE-LINE-EXIT.
           IF M = 18 MOVE REV-2 TO LINE-33 GO TO MULTIPLE-LINE-EXIT.
           IF M = 19 MOVE REV-2 TO LINE-34 GO TO MULTIPLE-LINE-EXIT.
           IF M = 20 MOVE REV-2 TO LINE-35 GO TO MULTIPLE-LINE-EXIT.
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 MULTIPLE-LINE-ERROR.
      DISPLAY M ' IS NOT AN EXISTING LINE NUMBER IN ITEM ' I ' AND
-     'REVISION WAS NOT' UPON CONSOLE.
      DISPLAY 'EFFECTED. PLEASE CHECK YOUR LINE NUMBER ENTRY CAREFU
      'LLY.' UPON CONSOLE. GO TO ENTER-LINE-REVISION.

 MULTIPLE-LINE-EXIT.
      DISPLAY 'THIS REVISION HAS BEEN ACCEPTED.' UPON CONSOLE.
      DISPLAY 'DO YOU WISH TO REVISE OTHER LINES IN ITEM ' I '?'
      UPON CONSOLE. ADD 1 TO N.
      ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
      MOVE WORDS TO ANSWER.
      PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
      IF ANSWER = 'NO' GO TO NEXT-ITEM.
      GO TO ENTER-LINE-REVISION.

 RETRIEVE.
      OPEN INPUT DISK-FILE.
      DISPLAY 'IF YOU WISH TO LIST ALL RESUMES IN THE FILE, TYPE LS
-     'T.' UPON CONSOLE.
      DISPLAY 'IF YOU WISH TO PRINT ALL RESUMES, TYPE PRT.' UPON
      CONSOLE.
      DISPLAY 'IF YOU WISH TO SUBMIT RETRIEVAL CRITERIA, TYPE RET.'
      UPON CONSOLE.
      DISPLAY 'IF YOU WISH TO SEARCH FOR KEY WORDS, TYPE KEY.'
      UPON CONSOLE.
 TRY-AGAIN.
      ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
      MOVE WORDS TO ANSWER.
      IF ANSWER = 'KEY'
      GO TO INITIALIZE-FOR-KEY-WORD-SEARCH.
      IF ANSWER = 'LST'
      DISPLAY 'ADVANCE CONSOLE CARRIAGE TO START LIST 6 LINES FROM
-     'TOP OF NEXT BLANK' UPON CONSOLE,
      DISPLAY 'PAGE. WHEN FINISHED, TYPE TWO SPACES.' UPON CONSOLE,
      ACCEPT ANNUM-TRUNC FROM CONSOLE,
      DISPLAY '                COMPLETE LIST OF INSTRUMENT RESUMES'
      UPON CONSOLE,
      DISPLAY '                 BY TITLE, SPACECRAFT, AND ACRONYM'
      UPON CONSOLE,
      DISPLAY '                CURRENTLY STORED IN THE MASTER FILE'
      UPON CONSOLE, PERFORM SPACE-AWAY 2 TIMES,
      PERFORM INITIATION, MOVE 4 TO V, GO TO SEARCH.
      IF ANSWER IS NOT EQUAL TO 'PRT' GO TO RET-ENTRY.
      DISPLAY 'IF YOU WISH TO HAVE ALL CLASSIFIED (AS WELL AS UNCLA
-     'SSIFIED) RESUMES' UPON CONSOLE,
      DISPLAY 'PRINTED OUT, TYPE THE CORRECT ACCESS CODE. OTHERWISE
-     ' TYPE NONE.' UPON CONSOLE,
      ACCEPT ACCESS-CODE-IN FROM CONSOLE,
      DISPLAY 'DO YOU WISH THE RETRIEVED RESUMES NUMBERED IN SEQUEN
-     'CE?' UPON CONSOLE.
      ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
      MOVE WORDS TO ANSWER.
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                SOURCE STATEMENT

           PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
           IF ANSWER = 'YES' MOVE 00001 TO PAGE-NO.
           GO TO PRINT-ALL-RESUMES.
       RET-ENTRY.
           IF ANSWER = 'RET' GO TO INITIATION.
           DISPLAY 'INVALID RESPONSE. TYPE LST, PRT, RET, OR KEY.' UPON
           CONSOLE. GO TO TRY-AGAIN.

       PRINT-ALL-RESUMES.
           READ DISK-FILE RECORD INTO PAGE-1 AT END GO TO NEXT-FUNCTION.
           READ DISK-FILE RECORD INTO PAGE-2 AT END GO TO NEXT-FUNCTION.
           IF ACRONYM = '        ' GO TO NEXT-FUNCTION.
           IF SECURITY IS NOT EQUAL TO 'PRO' AND SECURITY IS NOT EQUAL
           TO 'UNC' AND ACCESS-CODE-IN IS NOT EQUAL TO ACCESS-CODE-1,
           GO TO PRINT-ALL-RESUMES. MOVE PAGE-NO TO PAGE. PERFORM
           PRINT-RESUME. IF PAGE-NO > ZERO, ADD 00001 TO PAGE-NO.
           GO TO PRINT-ALL-RESUMES.

       INITIATION.
           MOVE SPACES TO CR01A CR01B CR02A CR03A CR04A CR04B CR05A
                          CR05B CR06A CR17A CR19A CR20A CR25A
                          CR27A CR29A CR36A CR36D CR48A CR48B
                          CR35A CR35B CR35C CR35D CR35E CR35F CR35G
                          CR35H CR35I CR38A CR38B CR40A CR40B CR44A
                          CR44B CR45A CR45B CR49A CR49B CR50A CR51A
                          CR52A CR53A CR53B CR54A CR55A CR56A CR57A
                          CR60A INTF TERM
                          ASTERISK APPLICATION-CR CURRENT-DATE TEST-DATE
           MOVE 1 TO K, K5.

       ITEM-RETRIEVAL.
           DISPLAY 'TYPE THE NUMBER OF THE ITEM YOU WISH TO RETRIEVE.'
           UPON CONSOLE. MOVE ZERO TO V. ACCEPT ANNUM FROM CONSOLE.
           MOVE ZERO TO N2, N6.
           MOVE ZERO TO PAGE-NO.
           MOVE 9 TO NO-LINES.
           PERFORM NUMBER-EXAM THRU NUMBER-CONVERSION.
           GO TO 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18
                 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
                 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
                 54 54 54 58 59 60 61 62 63 64 65 66 67 68
                 DEPENDING ON ITEM-NO. DISPLAY ITEM-NO ' IS NOT A VALID
       -   'ITEM NUMBER.' UPON CONSOLE. GO TO ITEM-RETRIEVAL.

       COMPARISON.
           DISPLAY 'ADVANCE CONSOLE CARRIAGE TO START LIST 6 LINES FROM
       -   'TOP OF NEXT BLANK' UPON CONSOLE.
           DISPLAY 'PAGE. WHEN FINISHED, TYPE TWO SPACES.' UPON CONSOLE.
           ACCEPT ANNUM-TRUNC FROM CONSOLE.
           DISPLAY '                    LIST OF INSTRUMENT RESUMES'
           UPON CONSOLE.
           DISPLAY '                BY TITLE, SPACECRAFT, AND ACRONYM'
           UPON CONSOLE.
           DISPLAY '        SATISFYING THE FOLLOWING RETRIEVAL CRITERIA:
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      SOURCE STATEMENT

'' UPON CONSOLE.
PERFORM SPACE-AWAY 2 TIMES. ADD 2 TO NO-LINES.
IF CR01A IS NOT EQUAL TO '  '
DISPLAY '   TITLE = ' CR01A UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR01B IS NOT EQUAL TO '  '
DISPLAY '           ' CR01B UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR02A IS NOT EQUAL TO '  '
DISPLAY '   ACRONYM = ' CR02A UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR03A IS NOT EQUAL TO '  '
DISPLAY '   EXPERIMENT NUMBER = ' CR03A UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR04A IS NOT EQUAL TO '  '
DISPLAY '   RESUMES WRITTEN BETWEEN ' CR04A ' AND ' CR04B
UPON CONSOLE ADD 1 TO NO-LINES.
IF CR05A IS NOT EQUAL TO '  ' AND CR05B > CR05A
DISPLAY '   VERSION NUMBERS FROM ' CR05A ' TO ' CR05B ' INCLU
'SIVE' UPON CONSOLE ADD 1 TO NO-LINES.
IF CR05A IS NOT EQUAL TO '  ' AND CR05A = CR05B
DISPLAY '   VERSION NUMBER = ' CR05A UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR06A IS NOT EQUAL TO '  '
DISPLAY '   PRINCIPAL INVESTIGATOR = ' CR06A UPON CONSOLE.
ADD 1 TO NO-LINES.
IF CR17A IS NOT EQUAL TO '  '
DISPLAY '   STATUS = ' CR17A UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR19A IS NOT EQUAL TO '  '
DISPLAY '   AGENCY = ' CR19A UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR20A IS NOT EQUAL TO '  '
DISPLAY '   PROGRAM OFFICE = ' CR20A UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR26A IS NOT EQUAL TO '  '
DISPLAY '   INSTRUMENT TYPE = ' CR26A UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR27A IS NOT EQUAL TO '  '
DISPLAY '   SECURITY CLASSIFICATION = ' CR27A UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR28 (1) IS NOT EQUAL TO '  '
DISPLAY '   APPLICATIONS = ' CR28 (1) ' ' CR28 (2) ' '
CR28 (3) ' ' CR28 (4) UPON CONSOLE, ADD 1 TO NO-LINES.
IF CR28 (5) IS NOT EQUAL TO '  '
DISPLAY '                  ' CR28 (5) ' ' CR28 (6) ' '
CR28 (7) UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR29A IS NOT EQUAL TO '  '
DISPLAY '   SPACECRAFT = ' CR29A UPON CONSOLE
ADD 1 TO NO-LINES.
IF TERM = '2'
DISPLAY '   SPECTRAL RANGE = ' CR35X ' TO ' CR35Y ' ' CR35C
UPON CONSOLE ADD 1 TO NO-LINES.
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      SOURCE STATEMENT

IF TERM IS NOT EQUAL TO '  ' AND TERM IS NOT EQUAL TO '2'
DISPLAY '   SPECTRAL RANGE = ' TERM UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR36A IS NOT EQUAL TO '  '
DISPLAY '   SPECTRAL RESOLUTION = ' CR36X ' TO ' CR36Y ' PERC
'ENT' UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR38A IS NOT EQUAL TO '  '
DISPLAY '   FIELD OF VIEW NORMAL TO THE FLIGHT PATH = ' CR38X
'  TO ' CR38Y ' DEGREES' UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR40A IS NOT EQUAL TO '  '
DISPLAY '   ANGULAR RESOLUTION = ' CR40X ' TO ' CR40Y ' DEGRE
'ES' UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR44A IS NOT EQUAL TO '  '
DISPLAY '   ALTITUDE = ' CR44A ' ' CR44B UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR45A IS NOT EQUAL TO '  '
DISPLAY '   INCLINATION = ' CR45A ' ' CR45B UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR48A IS NOT EQUAL TO '  '
DISPLAY '   WEIGHT = ' CR48X ' TO ' CR48Y ' POUNDS'
UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR49A IS NOT EQUAL TO '  '
DISPLAY '   VOLUME = ' CR49X ' TO ' CR49Y ' CU FT'
UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR50A IS NOT EQUAL TO '  '
DISPLAY '   AVERAGE POWER = ' CR50X ' WATTS' UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR51A IS NOT EQUAL TO '  '
DISPLAY '   STANDBY POWER = ' CR51X ' WATTS' UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR52A IS NOT EQUAL TO '  '
DISPLAY '   PEAK POWER = ' CR52X ' WATTS' UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR53A IS NOT EQUAL TO '  '
DISPLAY '   MEAN-TIME-BEFORE-FAILURE = ' CR53X ' ' CR53B
UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR54A IS NOT EQUAL TO '  '
DISPLAY '   RF INTERFERENCE = ' CR54A UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR55A IS NOT EQUAL TO '  '
DISPLAY '   MAGNETIC INTERFERENCE = ' CR55A UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR56A IS NOT EQUAL TO '  '
DISPLAY '   NUCLEAR INTERFERENCE = ' CR56A UPON CONSOLE
ADD 1 TO NO-LINES.
IF CR57A IS NOT EQUAL TO '  '
DISPLAY '   THERMAL INTERFERENCE = ' CR57A UPON CONSOLE
ADD 1 TO NO-LINES.
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        SOURCE STATEMENT

    IF CR60A IS NOT EQUAL TO '  '
    DISPLAY '   DATA RECOVERY = ' CR60A UPON CONSOLE
    ADD 1 TO NO-LINES.
    PERFORM SPACE-AWAY 2 TIMES. ADD 2 TO NO-LINES.

SEARCH.
    IF NO-LINES > 57, SUBTRACT NO-LINES FROM 70 GIVING
    LINES-LEFT, PERFORM SPACE-AWAY LINES-LEFT TIMES,
    MOVE 4 TO NO-LINES. MOVE 1 TO KKK.
    READ DISK-FILE RECORD INTO PAGE-1 AT END GO TO FINISH-UP.
    READ DISK-FILE RECORD INTO PAGE-2 AT END GO TO FINISH-UP.
    IF ACRONYM = '       ' GO TO FINISH-UP.

ITEM-1.
    IF CR01A = '      ' OR (CR01A = TITLE AND CR01B = TITLE-CONTD)
    GO TO ITEM-2.
    MOVE SPACE TO ASTERISK. GO TO SEARCH

ITEM-2.
    IF CR02A = '       ' OR ACRONYM = CR02A GO TO ITEM-3.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-3.
    IF CR03A = '      ' OR EXP-NO = CR03A GO TO ITEM-4.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-4.
    IF CR04A = '  ' GO TO ITEM-5.
    MOVE CR04AA TO MON. MOVE CR04AB TO DYA. MOVE CR04AC TO YER.
    MOVE MONTH OF RESUME-DATE TO MO. MOVE DAY OF RESUME-DATE TO
    DY. MOVE YEAR OF RESUME-DATE TO YR.
    IF TEST-DATE > CURRENT-DATE, MOVE SPACE TO ASTERISK, GO TO
    SEARCH.
    MOVE CR04BA TO MON. MOVE CR04BB TO DYA. MOVE CR04BC TO YER.
    IF TEST-DATE < CURRENT-DATE, MOVE SPACE TO ASTERISK, GO TO
    SEARCH. GO TO ITEM-5.

ITEM-5.
    EXAMINE VERSION REPLACING ALL ' ' BY '0'.
    IF CR05A = '     ' OR (VERSION > CR05A AND VERSION < CR05B)
    OR VERSION = CR05A OR VERSION = CR05B, GO TO ITEM-6.
    MOVE SPACE TO ASTERISK, GO TO SEARCH.

ITEM-6.
    IF CR06A = '                    ' GO TO ITEM-7.
    IF NAME OF PRINCIPAL-INVESTIGATOR = '
    MOVE '*' TO ASTERISK, GO TO ITEM-7.
    EXAMINE NAME OF PRINCIPAL-INVESTIGATOR TALLYING UNTIL FIRST
    ','.
    IF TALLY = 02 MOVE NAME OF PRINCIPAL-INVESTIGATOR TO PI2.
    IF TALLY = 02 MOVE PI2  TO PI-TEST.

    IF TALLY = 03 MOVE NAME OF PRINCIPAL-INVESTIGATOR TO PI3.
    IF TALLY = 03 MOVE PI3  TO PI-TEST.
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        SOURCE STATEMENT

    IF TALLY = 04 MOVE NAME OF PRINCIPAL-INVESTIGATOR TO PI4.
    IF TALLY = 04 MOVE PI4  TO PI-TEST.

    IF TALLY = 05 MOVE NAME OF PRINCIPAL-INVESTIGATOR TO PI5.
    IF TALLY = 05 MOVE PI5  TO PI-TEST.

    IF TALLY = 06 MOVE NAME OF PRINCIPAL-INVESTIGATOR TO PI6.
    IF TALLY = 06 MOVE PI6  TO PI-TEST.

    IF TALLY = 07 MOVE NAME OF PRINCIPAL-INVESTIGATOR TO PI7.
    IF TALLY = 07 MOVE PI7  TO PI-TEST.

    IF TALLY = 08 MOVE NAME OF PRINCIPAL-INVESTIGATOR TO PI8.
    IF TALLY = 08 MOVE PI8  TO PI-TEST.

    IF TALLY = 09 MOVE NAME OF PRINCIPAL-INVESTIGATOR TO PI9.
    IF TALLY = 09 MOVE PI9  TO PI-TEST.

    IF TALLY = 10 MOVE NAME OF PRINCIPAL-INVESTIGATOR TO PI10.
    IF TALLY = 10 MOVE PI10 TO PI-TEST.

    IF TALLY = 11 MOVE NAME OF PRINCIPAL-INVESTIGATOR TO PI11.
    IF TALLY = 11 MOVE PI11 TO PI-TEST.

    IF TALLY = 12 MOVE NAME OF PRINCIPAL-INVESTIGATOR TO PI12.
    IF TALLY = 12 MOVE PI12 TO PI-TEST.
    IF CR06A = PI-TEST GO TO ITEM-7.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-7.

ITEM-17.
    IF CR17A = '  ' OR CR17A = STATUS, GO TO ITEM-18.
    IF STATUS = '  ' MOVE '*' TO ASTERISK GO TO ITEM-18.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-18.

ITEM-19.
    IF CR19A = '  ' OR CR19A = AGENCY, GO TO ITEM-20.
    IF AGENCY = '  ' MOVE '*' TO ASTERISK, GO TO ITEM-20.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-20.
    IF CR20A = '  ' OR CR20A = PROGRAM-OFFICE, GO TO ITEM-21.
    IF PROGRAM-OFFICE = '  ' MOVE '*' TO ASTERISK, GO TO ITEM-21.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-21.


ITEM-26.
    IF CR26A = '  ' OR CR26A = CODE OF INSTRUMENT-TYPE
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          SOURCE STATEMENT

    GO TO ITEM-27.
    IF CODE OF INSTRUMENT-TYPE = '    ', MOVE '*' TO ASTERISK,
    GO TO ITEM-27.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-27.
    IF CR27A = '   ' OR CR27A = SECURITY, GO TO ITEM-28.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-28.
    IF CR28 (1) = '         ' GO TO ITEM-29.
    IF APPLICATION = '  ' MOVE '*' TO ASTERISK GO TO ITEM-29.
    MOVE SPACES TO APPLICATION-TEST.
    MOVE 1 TO J.
    MOVE APPLICATION TO APPLICATION-HOLD.
    EXAMINE APPLICATION-HOLD REPLACING ALL SPACES BY ','.

APPLICATION-EXAMINATION.
    EXAMINE APPLICATION-HOLD TALLYING UNTIL FIRST ','
    IF TALLY = ZERO, GO TO CROSS-COMPARISON.

    IF TALLY = 3 MOVE APPLICATION-HOLD TO AREA-3, MOVE AREA-3 TO
    APPL (J), MOVE APPLICATION-HOLD TO AREA-34, MOVE AREA-34 TO
    APPLICATION-HOLD, ADD 1 TO J, GO TO APPLICATION-EXAMINATION.

    IF TALLY = 4 MOVE APPLICATION-HOLD TO AREA-4, MOVE AREA-4 TO
    APPL (J), MOVE APPLICATION-HOLD TO AREA-33, MOVE AREA-33 TO
    APPLICATION-HOLD, ADD 1 TO J, GO TO APPLICATION-EXAMINATION.

    IF TALLY = 5 MOVE APPLICATION-HOLD TO AREA-5, MOVE AREA-5 TO
    APPL (J), MOVE APPLICATION-HOLD TO AREA-32, MOVE AREA-32 TO
    APPLICATION-HOLD, ADD 1 TO J, GO TO APPLICATION-EXAMINATION.

    MOVE APPLICATION-HOLD TO AREA-8. MOVE AREA-8 TO APPL (J).
    MOVE APPLICATION-HOLD TO AREA-29. MOVE AREA-29 TO
    APPLICATION-HOLD, ADD 1 TO J, GO TO APPLICATION-EXAMINATION.

CROSS-COMPARISON.
    PERFORM APPL-VARIATION VARYING JJ FROM 1 BY 1 UNTIL JJ = J.
    GO TO FINAL-COMPARISON.

APPL-VARIATION.
    PERFORM CRITERION-VARIATION VARYING KK FROM 1 BY 1 UNTIL
    CR28 (KK) =      SPACES.

CRITERION-VARIATION.
    IF CR28 (KK) = APPL (JJ), ADD 1 TO KKK.

FINAL-COMPARISON.
    IF KKK = K AND KKK > 1 GO TO ITEM-29.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-29.
    IF CR29A = '   ' OR CR29A = SPACECRAFT, GO TO ITEM-30.
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          SOURCE STATEMENT

    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-30.

ITEM-35.
    IF TERM = '     ' GO TO ITEM-36.
    IF LOW-END = 'NA' MOVE SPACE TO ASTERISK, GO TO SEARCH.
    IF LOW-END = '          ' OR LOW-END = 'SEE ITEM 3'
    MOVE '*' TO ASTERISK GO TO ITEM-36.
    MOVE LOW-END TO AAA. MOVE HIGH-END TO BBB.
    EXAMINE LOW-END REPLACING ALL ' ' BY '0'.
    EXAMINE HIGH-END REPLACING ALL ' ' BY '0'.
    EXAMINE UNITS OF SPECTRAL-RANGE REPLACING ALL 'S' BY ' '.
    IF ((LOW-END = CR35B
         OR (LOW-END > CR35A AND LOW-END < CR35B))
     OR (HIGH-END = CR35B
         OR (HIGH-END > CR35A AND HIGH-END < CR35B))
     OR ((LOW-END = CR35A OR LOW-END < CR35A) AND
         (HIGH-END = CR35B OR HIGH-END > CR35B)))
     AND UNITS OF SPECTRAL-RANGE = CR35C,
    MOVE AAA TO LOW-END, MOVE BBB TO HIGH-END, GO TO ITEM-35.

    IF ((LOW-END = CR35E
         OR (LOW-END > CR35D AND LOW-END < CR35E))
     OR (HIGH-END = CR35E
         OR (HIGH-END > CR35D AND HIGH-END < CR35E))
     OR ((LOW-END = CR35D OR LOW-END < CR35D) AND
         (HIGH-END = CR35E OR HIGH-END > CR35E)))
     AND UNITS OF SPECTRAL-RANGE = CR35F,
    MOVE AAA TO LOW-END, MOVE BBB TO HIGH-END, GO TO ITEM-36.

    IF ((LOW-END = CR35H
         OR (LOW-END > CR35G AND LOW-END < CR35H))
     OR (HIGH-END = CR35H
         OR (HIGH-END > CR35G AND HIGH-END < CR35H))
     OR ((LOW-END = CR35G OR LOW-END < CR35G) AND
         (HIGH-END = CR35H OR HIGH-END > CR35H)))
     AND UNITS OF SPECTRAL-RANGE = CR35I,
    MOVE AAA TO LOW-END, MOVE BBB TO HIGH-END, GO TO ITEM-36.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-36.
    IF CR36A = '          ' GO TO ITEM-37.
    IF LIMIT OF SPECTRAL-RESOLUTION = 'NA      ', MOVE SPACE TO
    ASTERISK, GO TO SEARCH.
    IF LIMIT OF SPECTRAL-RESOLUTION = '          ' OR LIMIT
    OF SPECTRAL-RESOLUTION = 'SEE ITEM' MOVE '*' TO ASTERISK
    GO TO ITEM-37. MOVE LIMIT OF SPECTRAL-RESOLUTION TO AAA.
    EXAMINE LIMIT OF SPECTRAL-RESOLUTION REPLACING ALL ' ' BY '0'
    IF (LIMIT OF SPECTRAL-RESOLUTION > CR36A OR
        LIMIT OF SPECTRAL-RESOLUTION = CR36A) AND
       (LIMIT OF SPECTRAL-RESOLUTION < CR36D OR
        LIMIT OF SPECTRAL-RESOLUTION = CR36D)
    MOVE AAA TO LIMIT OF SPECTRAL-RESOLUTION, GO TO ITEM-37.
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          SOURCE STATEMENT

    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-37.

ITEM-38.
    IF CR38A = '  ' GO TO ITEM-39.
    IF ACROSS = 'NA' MOVE SPACE TO ASTERISK, GO TO SEARCH.
    IF ACROSS = '      ' OR ACROSS = 'SEE ITE' MOVE '*' TO
    ASTERISK, GO TO ITEM-39. MOVE ACROSS TO AAA.
    EXAMINE ACROSS REPLACING ALL ' ' BY '0'.
    IF (ACROSS = CR38A OR ACROSS > CR38A) AND
       (ACROSS = CR38B OR ACROSS < CR38B)
    MOVE AAA TO ACROSS, GO TO ITEM-39.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-39.

ITEM-40.
    IF CR40A = '  ' GO TO ITEM-41.
    IF LIMIT OF ANGULAR-RESOLUTION = 'NA' MOVE SPACE TO ASTERISK,
    GO TO SEARCH.
    IF LIMIT OF ANGULAR-RESOLUTION = '        ' OR LIMIT OF
    ANGULAR-RESOLUTION = 'SEE ITEM' MOVE '*' TO ASTERISK, GO TO
     ITEM-41. MOVE LIMIT OF ANGULAR-RESOLUTION TO AAA.
    EXAMINE LIMIT OF ANGULAR-RESOLUTION REPLACING ALL ' ' BY '0'.
    IF (LIMIT OF ANGULAR-RESOLUTION = CR40A OR
        LIMIT OF ANGULAR-RESOLUTION > CR40A) AND
       (LIMIT OF ANGULAR-RESOLUTION = CR40B OR
        LIMIT OF ANGULAR-RESOLUTION < CR40B)
    MOVE AAA TO LIMIT OF ANGULAR-RESOLUTION, GO TO ITEM-41.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-41.

ITEM-44.
    IF CR44A = '   ' GO TO ITEM-45.
    IF CR44A = 'ANY' GO TO ITEM-44B.
    IF RANGE OF ALTITUDE = '  ' MOVE '*' TO ASTERISK,
    GO TO ITEM-44B.
    IF RANGE OF ALTITUDE = CR44A GO TO ITEM-44B.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-44B.
    IF CR44B = 'ANY' GO TO ITEM-45.
    IF ECCENTRICITY = '  ' MOVE '*' TO ASTERISK, GO TO ITEM-45.
    IF ECCENTRICITY = CR44B GO TO ITEM-45.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-45.
    IF CR45A = '   ' GO TO ITEM-46.
    IF CR45A = 'ANY' GO TO ITEM-45B.
    IF RANGE OF INCLINATION = '  ' MOVE '*' TO ASTERISK,
    GO TO ITEM-45B.
    IF RANGE OF INCLINATION = CR45A GO TO ITEM-45B.
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          SOURCE STATEMENT

    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-45B.
    IF CR45B = 'ANY' GO TO ITEM-46.
    IF DIRECTION = '  ' MOVE '*' TO ASTERISK, GO TO ITEM-46.
    IF DIRECTION = CR45B GO TO ITEM-46.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-46.

ITEM-48.
    IF CR48A = '      '    GO TO ITEM-49.
    IF AMOUNT OF WEIGHT = '      ' MOVE '*' TO ASTERISK, GO TO
    ITEM-49. MOVE AMOUNT OF WEIGHT TO AAA.
    EXAMINE AMOUNT OF WEIGHT REPLACING ALL ' ' BY '0'.
    IF (AMOUNT OF WEIGHT > CR48A OR AMOUNT OF WEIGHT = CR48A) AND
       (AMOUNT OF WEIGHT < CR48B OR AMOUNT OF WEIGHT = CR48B)
    MOVE AAA TO AMOUNT OF WEIGHT, GO TO ITEM-49.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-49.
    IF CR49A = '  ' GO TO ITEM-50.
    IF SIZE = '         ' MOVE '*' TO ASTERISK, GO TO ITEM-50.
    MOVE SIZE TO AAA.
    EXAMINE SIZE REPLACING ALL ' ' BY '0'.
    IF (SIZE = CR49A OR SIZE > CR49A) AND
       (SIZE = CR49B OR SIZE < CR49B)
    MOVE AAA TO SIZE, GO TO ITEM-50.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-50.
    IF CR50A = '  ' GO TO ITEM-51.
    IF AMOUNT OF AVERAGE-POWER = '     ' MOVE '*' TO ASTERISK,
    GO TO ITEM-51. MOVE AMOUNT OF AVERAGE-POWER TO AAA.
    EXAMINE AMOUNT OF AVERAGE-POWER REPLACING ALL ' ' BY '0'.
    IF AMOUNT OF AVERAGE-POWER = 'NONE' MOVE ZEROS TO AMOUNT OF
       AVERAGE-POWER.
    IF CR50A = 'NONE' MOVE ZEROS TO CR50A.
    IF AMOUNT OF AVERAGE-POWER < CR50A OR
       AMOUNT OF AVERAGE-POWER = CR50A
    MOVE AAA TO AMOUNT OF AVERAGE-POWER, GO TO ITEM-51.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-51.
    IF CR51A = '  ' GO TO ITEM-52.
    IF AMOUNT OF STANDBY-POWER = '    ' MOVE '*' TO ASTERISK,
    GO TO ITEM-52. MOVE AMOUNT OF STANDBY-POWER TO AAA.
    EXAMINE AMOUNT OF STANDBY-POWER REPLACING ALL ' ' BY '0'.
    IF AMOUNT OF STANDBY-POWER = 'NON' MOVE ZEROS TO AMOUNT OF
       STANDBY-POWER.
    IF CR51A = 'NON' MOVE ZEROS TO CR51A.
    IF AMOUNT OF STANDBY-POWER < CR51A OR
       AMOUNT OF STANDBY-POWER = CR51A
    MOVE AAA TO AMOUNT OF STANDBY-POWER, GO TO ITEM-52.
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          SOURCE STATEMENT

    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-52.
    IF CR52A = ' ' GO TO ITEM-53.
    IF AMOUNT OF PEAK-POWER = '   ' MOVE '*' TO ASTERISK,
    GO TO ITEM-53. MOVE AMOUNT OF PEAK-POWER TO AAA.
    EXAMINE AMOUNT OF PEAK-POWER REPLACING ALL ' ' BY '0'.
    IF AMOUNT OF PEAK-POWER = 'NONE' MOVE ZEROS TO AMOUNT OF
    PEAK-POWER. IF CR52A = 'NONE' MOVE ZEROS TO CR52A.
    IF AMOUNT OF PEAK-POWER < CR52A OR
       AMOUNT OF PEAK-POWER = CR52A
    MOVE AAA TO AMOUNT OF PEAK-POWER, GO TO ITEM-53.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-53.
    IF CR53A = '  ' GO TO ITEM-54.
    IF TIME OF MTBF = '  ' MOVE '*' TO ASTERISK, GO TO ITEM-54.
    MOVE TIME OF MTBF TO AAA.
    EXAMINE TIME OF MTBF REPLACING ALL ' ' BY '0'.
    IF CR53B IS NOT EQUAL TO UNITS OF MTBF MOVE SPACE TO ASTERISK
    GO TO SEARCH.
    IF TIME OF MTBF > CR53A OR
       TIME OF MTBF = CR53A
    MOVE AAA TO TIME OF MTBF, GO TO ITEM-54.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-54.
    IF CR54A = ' ' GO TO ITEM-55.
    IF RF-INTERFERENCE = '  ' MOVE '*' TO ASTERISK GO TO ITEM-55.
    IF RF-INTERFERENCE = CR54A GO TO ITEM-55.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-55.
    IF CR55A = '  ' GO TO ITEM-56.
    IF MAGNETIC-INTERFERENCE = '  ' MOVE '*' TO ASTERISK
    GO TO ITEM-56.
    IF MAGNETIC-INTERFERENCE = CR55A GO TO ITEM-56.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-56.
    IF CR56A = '  ' GO TO ITEM-57.
    IF NUCLEAR-INTERFERENCE = '  ' MOVE '*' TO ASTERISK
    GO TO ITEM-57.
    IF NUCLEAR-INTERFERENCE = CR56A GO TO ITEM-57.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-57.
    IF CR57A = '  ' GO TO ITEM-58.
    IF THERMAL-INTERFERENCE = '  ' MOVE '*' TO ASTERISK
    GO TO ITEM-58.
    IF THERMAL-INTERFERENCE = CR57A GO TO ITEM-58.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-58.
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                SOURCE STATEMENT

ITEM-60.
    IF CR60A = '     ' GO TO ITEM-61.
    IF DATA-RECOVERY = '     ' MOVE '*' TO ASTERISK GO TO ITEM-61.
    IF DATA-RECOVERY = CR60A GO TO ITEM-61.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

ITEM-61.

EXIT-SEARCH.
    IF (V = 2 AND PAGE-NO > ZERO AND ACCESS-CODE-IN =
        ACCESS-CODE-2) OR (V = 2 AND PAGE-NO > ZERO AND (SECURITY
       = 'UNC' OR SECURITY = 'PRO')) MOVE PAGE-NO TO PAGE PERFORM
    PRINT-RESUME, MOVE SPACE TO ASTERISK, ADD 00001 TO PAGE-NO,
    GO TO SEARCH.
    IF (V = 2 AND ACCESS-CODE-IN = ACCESS-CODE-2) OR (V = 2 AND
       (SECURITY = 'UNC' OR SECURITY = 'PRO')) PERFORM
        PRINT-RESUME, MOVE SPACE TO ASTERISK, GO TO SEARCH.
    MOVE SPACES TO STATUS-OUT-1, STATUS-OUT-2, R1, R2.
    IF STATUS = 'PROPOSAL    ' OR CONTRACT-TYPE = 'PROPOSAL ',
    MOVE '-PROPOSAL' TO STATUS-OUT-1, STATUS-OUT-2.
    IF COMPLETION-DATE = 'INACT' MOVE '/INACTIVE' TO R1, R2.
    IF TITLE-CONTD IS NOT EQUAL TO '     ' MOVE SPACES TO
    STATUS-OUT-1, R1.
    IF ASTERISK = '*' MOVE 1 TO N2.
    DISPLAY '  ' ASTERISK TITLE STATUS-OUT-1 R1 UPON CONSOLE.
    IF TITLE-CONTD IS NOT EQUAL TO '     ',
    DISPLAY '    ' TITLE-CONTD STATUS-OUT-2 R2 UPON CONSOLE,
    ADD 1 TO NO-LINES.
    DISPLAY '       ' SPACECRAFT '    ' ACRONYM UPON CONSOLE.
    ADD  3 TO NO-LINES. DISPLAY ' ' UPON CONSOLE.
    IF N6 = ZERO OR N6 = 1, ADD 1 TO N6.
    IF V IS NOT EQUAL TO 4, MOVE 1 TO V.
    MOVE SPACE TO ASTERISK. GO TO SEARCH.

FINISH-UP.
    MOVE 1 TO K5.
    CLOSE DISK-FILE. OPEN INPUT DISK-FILE.
    IF V = 1 AND N2 = 1, DISPLAY '   ----------' UPON CONSOLE,
    DISPLAY '   AN ASTERISK (*) PRECEDING A TITLE INDICATES THAT
-   'NO INFORMATION' UPON CONSOLE,
    DISPLAY '   IS GIVEN FOR ONE OR MORE OF THE RETRIEVED ITEMS I
-   'N THE RESUME.' UPON CONSOLE, ADD 3 TO NO-LINES,
    GO TO RESUMES-EXIST.
    IF V = 1, GO TO RESUMES-EXIST.
    IF V = 2 GO TO NEXT-RETRIEVAL.
    IF V = 4 SUBTRACT NO-LINES FROM 70 GIVING LINES-LEFT,
    PERFORM SPACE-AWAY LINES-LEFT TIMES, GO TO NEXT-RETRIEVAL.
    DISPLAY 'NO RESUMES SATISFYING THE RETRIEVAL CRITERIA HAVE BE
-   'EN FOUND.' UPON CONSOLE.
    COMPUTE NO-LINES = 60 - NO-LINES.
    PERFORM SPACE-AWAY NO-LINES TIMES.
    DISPLAY 'DO YOU WISH TO RELIEVE THE RETRIEVAL CONSTRAINTS FOR
-   ' ANY ITEM(S)?' UPON CONSOLE.
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                SOURCE STATEMENT

           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
           MOVE WORDS TO ANSWER.
           PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
           IF ANSWER = 'NO' GO TO NEXT-RETRIEVAL.
           MOVE SPACES TO APPLICATION-CR.
           MOVE 1 TO K. MOVE 9 TO NO-LINES. GO TO ITEM-RETRIEVAL.

       RESUMES-EXIST.
           SUBTRACT NO-LINES FROM 70 GIVING LINES-LEFT.
           PERFORM SPACE-AWAY LINES-LEFT TIMES.
           IF N6 = 1, DISPLAY 'DO YOU WISH TO HAVE THE RESUME LISTED AB
       -   'VE PRINTED OUT?' UPON CONSOLE, GO TO ANSWER-POINT.
           DISPLAY 'DO YOU WISH TO SUBMIT ADDITIONAL RETRIEVAL CRITERIA
       -   'TO LIMIT THE NUMBER' UPON CONSOLE.
           DISPLAY 'OF RESUMES LISTED ABOVE?' UPON CONSOLE.
           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
           MOVE WORDS TO ANSWER.
           PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
           IF ANSWER = 'YES' GO TO ITEM-RETRIEVAL.
           DISPLAY 'DO YOU WISH TO HAVE THE RESUMES LISTED ABOVE PRINTED
       -   ' OUT?' UPON CONSOLE.

       ANSWER-POINT.
           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
           MOVE WORDS TO ANSWER.
           PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
           IF ANSWER = 'NO' GO TO NEXT-RETRIEVAL.
           DISPLAY 'IF YOU WISH TO HAVE ALL THE RETRIEVED RESUMES WHICH
       -   'ARE CLASSIFIED' UPON CONSOLE.
           DISPLAY '(AS WELL AS UNCLASSIFIED) PRINTED OUT, TYPE THE CORR
       -   'ECT ACCESS CODE.' UPON CONSOLE.
           DISPLAY 'OTHERWISE, TYPE NONE.' UPON CONSOLE.
           ACCEPT ACCESS-CODE-IN FROM CONSOLE.
           DISPLAY 'DO YOU WISH TO HAVE THE RESUMES NUMBERED IN SEQUENCE
       -   '?' UPON CONSOLE.
           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
           MOVE WORDS TO ANSWER.
           PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
           IF ANSWER = 'YES' MOVE 00001 TO PAGE-NO.
           MOVE 2 TO V. MOVE SPACE TO ASTERISK. GO TO SEARCH.

       01.
           DISPLAY 'TYPE THE FIRST LINE OF THE TITLE YOU WISH TO RETRIEV
       -   'E.' UPON CONSOLE.
           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
           MOVE WORDS TO CR01A.
           DISPLAY 'TYPE THE SECOND LINE OF THE TITLE YOU WISH TO RETRIE
       -   'VE.' UPON CONSOLE.
           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
           MOVE WORDS TO CR01B.
           GO TO SIMULTANEOUS-CR.


       02.
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SOURCE STATEMENT

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    DISPLAY 'TYPE THE ACRONYM YOU WISH TO RETRIEVE.' UPON CONSOLE
    ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
    MOVE WORDS TO CR02A.
    GO TO SIMULTANEOUS-CR.

03.
    DISPLAY 'TYPE THE EXPERIMENT NUMBER YOU WISH TO RETRIEVE.'
    UPON CONSOLE.
    ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
    MOVE WORDS TO CR03A.
    GO TO COMPARISON.

04.
    DISPLAY 'TYPE THE MONTH, DAY, AND YEAR OT THE EARLIEST RESUME
-   'S YOU WISH TO' UPON CONSOLE.
    DISPLAY 'RETRIEVE, IN THE FOLLOWING FORMAT:' UPON CONSOLE.
    DISPLAY '00/00/00' UPON CONSOLE.
    ACCEPT CR04A FROM CONSOLE.
    EXAMINE CR04A TALLYING UNTIL FIRST SPACE.
    IF TALLY < 8, DISPLAY 'RESUME DATE IMPROPERLY ENTERED.' UPON
    CONSOLE GO TO 04.

04A.
    DISPLAY 'TYPE THE MONTH, DAY, AND YEAR OF THE LATEST RESUMES
-   'YOU WISH TO RETRIEVE' UPON CONSOLE.
    DISPLAY 'IN THE SAME FORMAT.' UPON CONSOLE.
    ACCEPT CR04B FROM CONSOLE.
    EXAMINE CR04B TALLYING UNTIL FIRST SPACE.
    IF TALLY < 8, DISPLAY 'RESUME DATE IMPROPERLY ENTERED.' UPON
    CONSOLE GO TO 04A.
    GO TO SIMULTANEOUS-CR.

05.
    DISPLAY 'TYPE THE EARLIEST VERSION YOU WISH TO RETRIEVE, IN T
-   'HE FOLLOWING FORMAT:' UPON CONSOLE.
    DISPLAY '0000' UPON CONSOLE.
    ACCEPT CR05A FROM CONSOLE.
    EXAMINE CR05A REPLACING ALL ' ' BY '0'.
    DISPLAY 'TYPE THE LATEST VERSION YOJ WISH TO RETRIEVE, IN THE
-   ' SAME FORMAT.' UPON CONSOLE.
    ACCEPT CR05B FROM CONSOLE.
    EXAMINE CR05B REPLACING ALL ' ' BY '0'.
    GO TO SIMULTANEOUS-CR.

06.
    DISPLAY 'TYPE THE LAST NAME OF THE PRINCIPAL INVESTIGATOR YOU
-   ' WISH TO RETRIEVE.' UPON CONSOLE.
    ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
    MOVE WORDS TO CR06A.
    GO TO SIMULTANEOUS-CR.

07.
    GO TO NA.
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            SOURCE STATEMENT

08.
    GO TO NA.

09.
    GO TO NA.

10.
    GO TO NA.

11.
    GO TO NA.

12.
    GO TO NA.

13.
    GO TO NA.

14.
    GO TO NA.

15.
    GO TO NA.

16.
    GO TO NA.

17.
    DISPLAY 'TYPE THE STATUS YOU WISH TO RETRIEVE.' UPON CONSOLE.
    ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
    MOVE WORDS TO CR17A.
    GO TO SIMULTANEOUS-CR.

18.
    GO TO NA.

19.
    DISPLAY 'TYPE THE AGENCY YOU WISH TO RETRIEVE.' UPON CONSOLE.
    ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
    MOVE WORDS TO CR19A.
    GO TO SIMULTANEOUS-CR.

20.
    DISPLAY 'TYPE THE OFFICE AND CODE OF THE PROGRAM OFFICE YOU W
-   'ISH TO RETRIEVE' UPON CONSOLE.
    DISPLAY 'IN THE FOLLOWING FORMAT:' UPON CONSOLE.
    DISPLAY 'XXXX/XXX' UPON CONSOLE.
    ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
    MOVE WORDS TO CR20A.
    GO TO SIMULTANEOUS-CR.

21.
    GO TO NA.
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                SOURCE STATEMENT

22.
     GO TO NA.

23.
     GO TO NA.

24.
     GO TO NA.

25.
     GO TO NA.

26.
     DISPLAY 'TYPE THE INSTRUMENT TYPE YOU WISH TO RETRIEVE.' UPON
     CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO CR26A, CR26B.
     GO TO SIMULTANEOUS-CR.

27.
     DISPLAY 'TYPE THE SECURITY CLASSIFICATION YOU WISH TO RETRIEV
-    'E.' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO CR27A.
     GO TO SIMULTANEOUS-CR.

28.
     IF K5 = 0, MOVE 1 TO K.
     SUBTRACT K FROM 8 GIVING K-HOLD.
     DISPLAY 'FROM 1 TO ' K-HOLD ' APPLICATIONS MAY BE LISTED AS S
-    'IMULTANEOUS RETRIEVAL' UPON CONSOLE. IF K > 1,
     DISPLAY 'CRITERIA IN ADDITION TO THOSE ALREADY SPECIFIED.'
     UPON CONSOLE, GO TO 28A.
     DISPLAY 'CRITERIA. LIST THEM ONE AT A TIME, AS REQUESTED. WHE
-    'N YOU HAVE COMPLETED' UPON CONSOLE.
     DISPLAY 'THE LIST, AND THE NEXT APPLICATION IS REQUESTED, TYP
-    'E END.' UPON CONSOLE.
28A.
     DISPLAY 'TYPE THE CORRECT ABBREVIATION OF AN APPLICATION YOU
-    'WISH TO RETRIEVE.' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO CR28 (K).
     IF CR28 (K) = 'END', MOVE SPACES TO CR28 (K),
     GO TO SIMULTANEOUS-CR.
     IF K < 7 ADD 1 TO K GO TO 28A.
     DISPLAY 'NO MORE THAN 7 APPLICATIONS MAY BE CONSIDERED SIMULT
-    'ANEOUSLY.' UPON CONSOLE. GO TO SIMULTANEOUS-CR.

29.
     DISPLAY 'TYPE THE SPACECRAFT YOU WISH TO RETRIEVE.'
     UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO CR29A.
     GO TO SIMULTANEOUS-CR.
```

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            SOURCE STATEMENT

 30.
     GO TO NA.

 31.
     GO TO NA.

 32.
     GO TO NA.

 33.
     GO TO NA.

 34.
     GO TO NA.

 35.
     DISPLAY 'FOR RETRIEVAL ON THE BASIS OF SPECTRAL RANGE, TWO OP
-    'TIONS ARE AVAILABLE:' UPON CONSOLE.
     DISPLAY '   1) DEFINITION OF THE GENERAL SPECTRAL REGION, OR'
     UPON CONSOLE.
     DISPLAY '   2) SPECIFICATION OF THE EXACT LIMITS OF THE REGIO
-    'N.' UPON CONSOLE.
     DISPLAY 'TYPE THE NUMBER OF THE OPTION YOU WISH TO USE.'
     UPON CONSOLE.

 35A.
     ACCEPT ANSWER FROM CONSOLE.
     IF ANSWER = '1  ' OR ANSWER = '01 ' GO TO 35B.
     IF ANSWER = '2  ' OR ANSWER = '02 ' GO TO 35C.
     DISPLAY 'INVALID RESPONSE. TYPE 1 OR 2.' UPON CONSOLE.
     GO TO 35A.
 35B.
     DISPLAY 'FROM THE LIST OF ACCEPTED TERMS (SEE OPERATING MANUA
-    'L), TYPE THE TERM' UPON CONSOLE.
     DISPLAY 'WHICH BEST DESCRIBES THE SPECTRAL REGION YOU WISH TO
-    ' RETRIEVE.' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO TERM, ANSWER.
     IF ANSWER = 'GAM'
         MOVE '00100.0000' TO CR35A
         MOVE '10000.0000' TO CR35B, CR35E
         MOVE 'KEV' TO CR35C
         MOVE '00000.1000' TO CR35D
         MOVE 'MEV' TO CR35F GO TO 35F.
     IF ANSWER = 'X-R'
         MOVE '10000.0000' TO CR35B
         MOVE '00100.0000' TO CR35A, CR35E, CR35H
         MOVE 'EV' TO CR35C
         MOVE '00000.1000' TO CR35D, CR35G
         MOVE 'KEV' TO CR35F
         MOVE 'A' TO CR35I GO TO 35F.
     IF ANSWER = 'UV ' OR ANSWER = 'ULT'
         MOVE '00100.0000' TO CR35A
```

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      SOURCE STATEMENT

     MOVE '04000.0000' TO CR35B
     MOVE 'A' TO CR35C
     MOVE '00000.0100' TO CR35D
     MOVE '00000.4000' TO CR35E
     MOVE 'MICRON' TO CR35F
     MOVE '00010.0000' TO CR35G
     MOVE '00400.0000' TO CR35H
     MOVE 'MILMICR' TO CR35I GO TO 35F.
IF ANSWER = 'VIS'
     MOVE '04000.0000' TO CR35A
     MOVE '07000.0000' TO CR35B
     MOVE 'A' TO CR35C
     MOVE '00000.4000' TO CR35D
     MOVE '00000.7000' TO CR35E
     MOVE 'MICRON' TO CR35F
     MOVE '00400.0000' TO CR35G
     MOVE '00700.0000' TO CR35H
     MOVE 'MILMICR' TO CR35I GO TO 35F.
IF ANSWER = 'NEA'
     MOVE '07000.0000' TO CR35A
     MOVE '20000.0000' TO CR35B
     MOVE 'A' TO CR35C
     MOVE '00000.7000' TO CR35D
     MOVE '00002.0000' TO CR35E
     MOVE 'MICRON' TO CR35F
     MOVE '00700.0000' TO CR35G
     MOVE '02000.0000' TO CR35H
     MOVE 'MILMICR' TO CR35I GO TO 35F.
IF ANSWER = 'INT'
     MOVE '00002.0000' TO CR35A, CR35D,  CR35G
     MOVE '00008.0000' TO CR35B, CR35E, CR35H
     MOVE 'MICRON' TO CR35C, CR35F, CR35I
     GO TO 35F.
IF ANSWER = 'THE'
     MOVE '00008.0000' TO CR35A, CR35D, CR35G
     MOVE '00014.0000' TO CR35B, CR35E, CR35H
     MOVE 'MICRON' TO CR35C, CR35F, CR35I
     GO TO 35F.
IF ANSWER = 'FAR'
     MOVE '00014.0000' TO CR35A, CR35D, CR35G
     MOVE '01000.0000' TO CR35B, CR35E, CR35H
     MOVE 'MICRON' TO CR35C, CR35F, CR35I GO TO 35F.
IF ANSWER = 'MIL'
     MOVE '00001.0000' TO CR35A, CR35E
     MOVE '00010.0000' TO CR35B
     MOVE 'MM' TO CR35C
     MOVE '00000.1000' TO CR35D
     MOVE 'CM' TO CR35F
     MOVE '00030.0000' TO CR35G
     MOVE '00300.0000' TO CR35H
     MOVE 'GHZ' TO CR35I GO TO 35F.
IF ANSWER = 'MIC'
     MOVE '00001.0000' TO CR35A
     MOVE '00010.0000' TO CR35B
```

SOURCE STATEMENT

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        MOVE 'CM' TO CR35C
        MOVE '00003.0000' TO CR35D, CR35G
        MOVE '00030.0000' TO CR35E, CR35H
        MOVE 'GHZ' TO CR35F, CR35I GO TO 35F.
    IF ANSWER = 'UHF'
        MOVE '00010.0000' TO CR35A
        MOVE '00100.0000' TO CR35B
        MOVE 'CM' TO CR35C
        MOVE '00000.1000' TO CR35D
        MOVE '00001.0000' TO CR35E
        MOVE 'METER' TO CR35F
        MOVE '00300.0000' TO CR35G
        MOVE '03000.0000' TO CR35H
        MOVE 'MHZ' TO CR35I GO TO 35F.
    IF ANSWER = 'VHF'
        MOVE '00001.0000' TO CR35A
        MOVE '00010.0000' TO CR35B
        MOVE 'METER' TO CR35C
        MOVE '00030.0000' TO CR35D, CR35G
        MOVE '00300.0000' TO CR35E, CR35H
        MOVE 'MHZ' TO CR35F, CR35I GO TO 35F.
    IF ANSWER = 'HF'
        MOVE '00010.0000' TO CR35A
        MOVE '00100.0000' TO CR35B
        MOVE 'METER' TO CR35C
        MOVE '00003.0000' TO CR35D, CR35G
        MOVE '00030.0000' TO CR35E, CR35H
        MOVE 'MHZ' TO CR35F, CR35I GO TO 35F.
    IF ANSWER = 'MF'
        MOVE '00100.0000' TO CR35A
        MOVE '01000.0000' TO CR35B
        MOVE 'METER' TO CR35C
        MOVE '00300.0000' TO CR35D
        MOVE '03000.0000' TO CR35E
        MOVE 'KHZ' TO CR35F
        MOVE '00000.3000' TO CR35G
        MOVE '00003.0000' TO CR35H
        MOVE 'MHZ' TO CR35I GO TO 35F.
    IF ANSWER = 'LF'
        MOVE '00001.0000' TO CR35A
        MOVE '01000.0000' TO CR35B
        MOVE 'KM' TO CR35C
        MOVE '00000.0000' TO CR35D, CR35G
        MOVE '00300.0000' TO CR35E
        MOVE 'KHZ' TO CR35F
        MOVE '00000.3000' TO CR35H
        MOVE 'MHZ' TO CR35I GO TO 35F.
    DISPLAY TERM ' IS NOT A VALID SPECTRAL REGION.' UPON CONSOLE.
    GO TO 35B.

35C.
    DISPLAY 'TYPE THE LOWER LIMIT OF THE SPECTRAL RANGE YOU WISH
-       'TO RETRIEVE' UPON CONSOLE.
    DISPLAY 'IN THE FOLLOWING FORMAT:' UPON CONSOLE.
```

```
      SOURCE STATEMENT

     DISPLAY '00000.0000' UPON CONSOLE.
     ACCEPT CR35A FROM CONSOLE. MOVE CR35A TO CR35X.
     EXAMINE CR35A REPLACING ALL ' ' BY '0'.
     EXAMINE CR35A TALLYING ALL '.'. IF TALLY IS NOT EQUAL TO 1,
     DISPLAY 'INVALID ENTRY. YOU MUST INCLUDE ONE DECIMAL POINT.'
     UPON CONSOLE, GO TO 35C.
     DISPLAY 'TYPE THE UPPER LIMIT OF THE SPECTRAL RANGE YOU WISH
    -    'TO RETRIEVE' UPON CONSOLE.
     DISPLAY 'IN THE SAME FORMAT.' UPON CONSOLE.

  35D.
     ACCEPT CR35B FROM CONSOLE. MOVE CR35B TO CR35Y.
     EXAMINE CR35B REPLACING ALL ' ' BY '0'.
     EXAMINE CR35B TALLYING ALL '.'. IF TALLY = 1, GO TO 35E.
     DISPLAY 'INVALID ENTRY. YOU MUST INCLUDE ONE DECIMAL POINT. T
    -    'YPE THE UPPER LIMIT' UPON CONSOLE.
     DISPLAY 'IN THE FOLLOWING FORMAT:' UPON CONSOLE.
     DISPLAY '00000.0000' UPON CONSOLE. GO TO 35D.

  35E.
     DISPLAY 'TYPE THE UNITS CORRESPONDING TO THESE VALUES IN THE
    -    'FOLLOWING FORMAT:' UPON CONSOLE.
     DISPLAY 'XXXXXXX' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO CR35C. MOVE '2' TO TERM.

  35F.
     GO TO SIMULTANEOUS-CR.

  36.
     DISPLAY 'TYPE THE LOWEST ACCEPTABLE LIMIT OF SPECTRAL RESOLUT
    -    'ION IN PERCENT' UPON CONSOLE.
     DISPLAY 'IN THE FOLLOWING FORMAT:' UPON CONSOLE.
     DISPLAY '000.0000' UPON CONSOLE.
     ACCEPT CR36A FROM CONSOLE. MOVE CR36A TO CR36X.
     EXAMINE CR36A REPLACING ALL ' ' BY '0'.
     DISPLAY 'TYPE THE HIGHEST ACCEPTABLE LIMIT OF SPECTRAL RESOLU
    -    'TION IN PERCENT' UPON CONSOLE.
     DISPLAY 'IN THE FOLLOWING FORMAT:' UPON CONSOLE.
     DISPLAY '000.0000' UPON CONSOLE.
     ACCEPT CR36D FROM CONSOLE. MOVE CR36D TO CR36Y.
     EXAMINE CR36D REPLACING ALL ' ' BY '0' GO TO SIMULTANEOUS-CR.

  37.
     GO TO NA.

  38.
     DISPLAY 'TYPE THE LOWER LIMIT OF THE FIELD OF VIEW NORMAL TO
    -    'THE FLIGHT PATH' UPON CONSOLE.
     DISPLAY 'IN DEGREES IN THE FOLLOWING FORMAT:' UPON CONSOLE.
     DISPLAY '0000.00' UPON CONSOLE.
     ACCEPT CR38A FROM CONSOLE. MOVE CR38A TO CR38X.
     EXAMINE CR38A REPLACING ALL ' ' BY '0'.
     DISPLAY 'TYPE THE UPPER LIMIT OF THE FIELD OF VIEW NORMAL TO
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                SOURCE STATEMENT

-       'THE FLIGHT PATH' UPON CONSOLE.
        DISPLAY 'IN THE SAME FORMAT' UPON CONSOLE.
        ACCEPT CR38B FROM CONSOLE. MOVE CR38B TO CR38Y.
        EXAMINE CR38B REPLACING ALL ' ' BY '0'.
        GO TO SIMULTANEOUS-CR.

    39.
        GO TO NA.

    40.
        DISPLAY 'TYPE THE LOWEST ACCEPTABLE ANGULAR RESOLUTION IN DEG
-       'REES' UPON CONSOLE.
        DISPLAY 'IN THE FOLLOWING FORMAT:' UPON CONSOLE.
        DISPLAY '0000.000' UPON CONSOLE.
        ACCEPT CR40A FROM CONSOLE. MOVE CR40A TO CR40X.
        EXAMINE CR40A REPLACING ALL ' ' BY '0'.
        DISPLAY 'TYPE THE HIGHEST ACCEPTABLE ANGULAR RESOLUTION IN TH
-       'E SAME FORMAT.' UPON CONSOLE.
        ACCEPT CR40B FROM CONSOLE. MOVE CR40B TO CR40Y.
        EXAMINE CR40B REPLACING ALL ' ' BY '0'.
        GO TO SIMULTANEOUS-CR.

    41.
        GO TO NA.

    42.
        GO TO NA.

    43.
        GO TO NA.

    44.
        DISPLAY 'FROM THE LIST OF ACCEPTED TERMS (SEE OPERATING MANUA
-       'L) TYPE THE RANGE OF' UPON CONSOLE.
        DISPLAY 'ALTITUDE YOU WISH TO RETRIEVE IN THE FOLLOWING FORMA
-       'T:' UPON CONSOLE.
        DISPLAY 'XXXXX' UPON CONSOLE.

    44A.
        ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
        MOVE WORDS TO CR44A.
        EXAMINE CR44A TALLYING LEADING SPACES. IF TALLY > 0 DISPLAY
        'TYPED ENTRY MUST BE JUSTIFIED LEFT. PLEASE RETYPE.'
        UPON CONSOLE, GO TO 44A.
        DISPLAY 'FROM THE LIST OF ACCEPTED TERMS TYPE THE ECCENTRICIT
-       'Y YOU WISH' UPON CONSOLE.
        DISPLAY 'TO RETRIEVE IN THE FOLLOWING FORMAT:' UPON CONSOLE.
        DISPLAY 'XXXXXXXXX' UPON CONSOLE.

    44B.
        ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
        MOVE WORDS TO CR44B.
        EXAMINE CR44B TALLYING LEADING SPACES. IF TALLY > 0 DISPLAY
        'TYPED ENTRY MUST BE JUSTIFIED LEFT. PLEASE RETYPE.'
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                SOURCE STATEMENT

           UPON CONSOLE, GO TO 44B. GO TO SIMULTANEOUS-CR.

       45.
           DISPLAY 'FROM THE LIST OF ACCEPTED TERMS (SEE OPERATING MANUA
       -   'L) TYPE THE RANGE OF' UPON CONSOLE.
           DISPLAY 'INCLINATION YOU WISH TO RETRIEVE IN THE FOLLOWING FO
       -   'RMAT:' UPON CONSOLE.
           DISPLAY 'XXXXXXXXXXX' UPON CONSOLE.

       45A.
           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
           MOVE WORDS TO CR45A.
           EXAMINE CR45A TALLYING LEADING SPACES. IF TALLY > 0 DISPLAY
           'TYPED ENTRY MUST BE JUSTIFIED LEFT. PLEASE RETYPE RANGE.'
           UPON CONSOLE, GO TO 45A.
           DISPLAY 'FROM THE LIST OF ACCEPTED TERMS TYPE THE LAUNCH AZIM
       -   'UTH YOU WISH TO' UPON CONSOLE.
           DISPLAY 'RETRIEVE IN THE FOLLOWING FORMAT:' UPON CONSOLE.
           DISPLAY 'XXXXXXXXXX' UPON CONSOLE.

       45B.
           ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
           MOVE WORDS TO CR45B.
           EXAMINE CR45B TALLYING LEADING SPACES. IF TALLY > 0 DISPLAY
           'TYPED ENTRY MUST BE JUSTIFIED LEFT. PLEASE RETYPE.'
           UPON CONSOLE, GO TO 45B. GO TO SIMULTANEOUS-CR.

       46.
           GO TO NA.

       47.
           GO TO NA.

       48.
           DISPLAY 'TYPE THE LOWEST ACCEPTABLE LIMIT OF WEIGHT (IN POUND
       -   'S) YOU WISH TO' UPON CONSOLE.
           DISPLAY 'RETRIEVE IN THE FOLLOWING FORMAT:' UPON CONSOLE.
           DISPLAY '00000.' UPON CONSOLE.
           ACCEPT CR48A FROM CONSOLE. MOVE CR48A TO CR48X.
           EXAMINE CR48A REPLACING ALL ' ' BY '0'.
           DISPLAY 'TYPE THE HIGHEST ACCEPTABLE LIMIT OF WEIGHT IN THE F
       -   'OLLOWING FORMAT:' UPON CONSOLE.
           DISPLAY '00000.' UPON CONSOLE.
           ACCEPT CR48B FROM CONSOLE. MOVE CR48B TO CR48Y.
           EXAMINE CR48B REPLACING ALL ' ' BY '0' GO TO SIMULTANEOUS-CR.

       49.
           DISPLAY 'TYPE THE LOWEST ACCEPTABLE VOLUME IN CUBIC FEET IN T
       -   'HE FOLLOWING FORMAT:' UPON CONSOLE.
           DISPLAY '00000.00' UPON CONSOLE.
           ACCEPT CR49A FROM CONSOLE. MOVE CR49A TO CR49X.
           EXAMINE CR49A REPLACING ALL ' ' BY '0'.
           DISPLAY 'TYPE THE HIGHEST ACCEPTABLE VOLUME IN THE SAME FORMA
       -   'T:' UPON CONSOLE.
```

SOURCE STATEMENT

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     ACCEPT CR49B FROM CONSOLE. MOVE CR49B TO CR49Y.
     EXAMINE CR49B REPLACING ALL ' ' BY '0'.
     GO TO SIMULTANEOUS-CR.

 50.
     DISPLAY 'TYPE THE HIGHEST ACCEPTABLE AVERAGE POWER REQUIREMEN
-    'T IN WATTS' UPON CONSOLE.
     DISPLAY 'IN THE FOLLOWING FORMAT:' UPON CONSOLE.
     DISPLAY '0000.' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO CR50A, CR50X.
     EXAMINE CR50A REPLACING ALL ' ' BY '0'.
     GO TO SIMULTANEOUS-CR.

 51.
     DISPLAY 'TYPE THE HIGHEST ACCEPTABLE STANDBY POWER REQUIREMEN
-    'T IN WATTS' UPON CONSOLE.
     DISPLAY 'IN THE FOLLOWING FORMAT:' UPON CONSOLE.
     DISPLAY '000.' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO CR51A, CR51X.
     EXAMINE CR51A REPLACING ALL ' ' BY '0'.
     GO TO SIMULTANEOUS-CR.

 52.
     DISPLAY 'TYPE THE HIGHEST ACCEPTABLE PEAK POWER REQUIREMENTS
-    'IN WATTS' UPON CONSOLE.
     DISPLAY 'IN THE FOLLOWING FORMAT:' UPON CONSOLE.
     DISPLAY '0000.' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO CR52A, CR52X.
     EXAMINE CR52A REPLACING ALL ' ' BY '0'.
     GO TO SIMULTANEOUS-CR.

 53.
     DISPLAY 'TYPE THE LOWEST ACCEPTABLE MEAN TIME BEFORE FAILURE
-    '(MTBF)' UPON CONSOLE.
     DISPLAY 'IN THE FOLLOWING FORMAT:' UPON CONSOLE.
     DISPLAY '000.' UPON CONSOLE.
     ACCEPT CR53A FROM CONSOLE. MOVE CR53A TO CR53X.
     EXAMINE CR53A REPLACING ALL ' ' BY '0'.
     DISPLAY 'TYPE THE UNITS CORRESPONDING TO THIS VALUE IN THE FO
-    'LLOWING FORMAT:' UPON CONSOLE.
     DISPLAY 'XXXX' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO CR53B.
     GO TO SIMULTANEOUS-CR.

 54.
     DISPLAY 'TYPE SOURCE, SENSITIVE, SOURC/SEN, OR NONE IN THE FO
-    'LLOWING FORMAT:' UPON CONSOLE.
     DISPLAY 'XXXXXXXXX' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO INTF.
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          SOURCE STATEMENT

     EXAMINE INTF TALLYING ALL ' '. IF INTF = 'NONE' OR TALLY =
     ZERO GO TO 54A. DISPLAY 'INVALID RESPONSE.' UPON CONSOLE,
     GO TO 54.

 54A.
     IF ITEM-NO = 54 MOVE INTF TO CR54A.
     IF ITEM-NO = 55 MOVE INTF TO CR55A.
     IF ITEM-NO = 56 MOVE INTF TO CR56A.
     IF ITEM-NO = 57 MOVE INTF TO CR57A. GO TO SIMULTANEOUS-CR.

 58.
     GO TO NA.

 59.
     GO TO NA.

 60.
     DISPLAY 'FROM THE LIST OF ACCEPTED TERMS (SEE OPERATING MANUA
-    'L), TYPE THE MODE OF' UPON CONSOLE.
     DISPLAY 'DATA RECOVERY YOU WISH TO RETRIEVE IN THE FOLLOWING
-    'FORMAT:' UPON CONSOLE.
     DISPLAY 'XXXXXXXXXXXXXXXXXXX' UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO CR60A.
     GO TO SIMULTANEOUS-CR.

 61.
     GO TO NA.

 62.
     GO TO NA.

 63.
     GO TO NA.

 64.
     GO TO NA.

 65.
     GO TO NA.

 66.
     GO TO NA.

 67.
     GO TO NA.

 68.
     GO TO NA.

 NA.
     DISPLAY 'RETRIEVAL ON THE BASIS OF ITEM ' ITEM-NO ' IS NOT AV
-    'AILABLE IN THE' UPON CONSOLE.
     DISPLAY 'CURRENT SYSTEM. DO YOU WISH TO RETRIEVE ON THE BASIS
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                SOURCE STATEMENT

-       ' OF ANOTHER ITEM?' UPON CONSOLE.
        ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
        MOVE WORDS TO ANSWER.
        PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
        IF ANSWER = 'NO' GO TO NEXT-FUNCTION.
        MOVE 0 TO K5 GO TO ITEM-RETRIEVAL.

    SIMULTANEOUS-CR.
        DISPLAY 'DO YOU WISH TO RETRIEVE SIMULTANEOUSLY ON THE BASIS
-       'OF ANOTHER ITEM?' UPON CONSOLE.
        ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
        MOVE WORDS TO ANSWER.
        PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
        IF ANSWER = 'NO' GO TO COMPARISON.
        MOVE 0 TO K5 GO TO ITEM-RETRIEVAL.

    READ-RESUME-CARDS-INTO-MEMORY.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
        AT END GO TO TRANSITION.
        MOVE 65-SPACES TO LINE-01.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
        AT END GO TO TRANSITION.
        MOVE 65-SPACES TO LINE-02.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
        AT END GO TO TRANSITION.
        MOVE 65-SPACES TO LINE-03.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
        AT END GO TO TRANSITION.
        MOVE 65-SPACES TO LINE-04.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
        AT END GO TO TRANSITION.
        MOVE 65-SPACES TO LINE-05.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
        AT END GO TO TRANSITION.
        MOVE 65-SPACES TO LINE-06.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
        AT END GO TO TRANSITION.
        MOVE 65-SPACES TO LINE-07.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
        AT END GO TO TRANSITION.
        MOVE 65-SPACES TO LINE-08.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
        AT END GO TO TRANSITION.
        MOVE 65-SPACES TO LINE-09.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
        AT END GO TO TRANSITION.
        MOVE 65-SPACES TO LINE-10.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
        AT END GO TO TRANSITION.
        MOVE 65-SPACES TO LINE-11.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
        AT END GO TO TRANSITION.
        MOVE 65-SPACES TO LINE-12.
        READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
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```
      SOURCE STATEMENT

AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-13.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-14.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-15.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-16.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-17.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-18.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-19.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-20.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-21.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-22.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-23.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-24.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-25.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-26.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-27.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-28.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-29.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-30.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
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```
      SOURCE STATEMENT

AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-31.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-32.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-33.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-34.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-35.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-36.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-37.
READ SIS-FORM-INPUT-FILE RECORD INTO 65-SPACES
AT END GO TO TRANSITION.
MOVE 65-SPACES TO LINE-38.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-39
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-40
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-41
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-42
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-43
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-44
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-45
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-46
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-47
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-48
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-49
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-50
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-51
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-52
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-53
AT END GO TO TRANSITION.
READ SIS-FORM-INPUT-FILE RECORD INTO LINE-54
```

```
        SOURCE STATEMENT

     AT END GO TO TRANSITION.
     READ SIS-FORM-INPUT-FILE RECORD INTO LINE-55
     AT END GO TO TRANSITION.
     READ SIS-FORM-INPUT-FILE RECORD INTO LINE-56
     AT END GO TO TRANSITION.
     READ SIS-FORM-INPUT-FILE RECORD INTO LINE-57
     AT END GO TO TRANSITION.
     READ SIS-FORM-INPUT-FILE RECORD INTO LINE-58
     AT END GO TO TRANSITION.
     READ SIS-FORM-INPUT-FILE RECORD INTO LINE-59
     AT END GO TO TRANSITION.

PRINT-RESUME.
     WRITE OUTPUT-LINE-PAGE-1 FROM BLANK-LINE AFTER ADVANCING 0.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-39 AFTER ADVANCING THREE.
     WRITE OUTPUT-LINE-PAGE-1 FROM PAGE-LINE AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-40 AFTER ADVANCING TWO.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-01 AFTER ADVANCING TWO.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-41 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-02 AFTER ADVANCING TWO.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-42 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-03 AFTER ADVANCING TWO.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-43 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-04 AFTER ADVANCING TWO.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-44 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-05 AFTER ADVANCING TWO.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-45 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-06 AFTER ADVANCING TWO.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-46 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-07 AFTER ADVANCING TWO.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-47 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-08 AFTER ADVANCING TWO.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-48 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-49 AFTER ADVANCING ONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-09 AFTER ADVANCING ONE.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-50 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-10 AFTER ADVANCING TWO.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-51 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-11 AFTER ADVANCING ONE.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-52 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-12 AFTER ADVANCING ONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-13 AFTER ADVANCING ONE.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-53 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-14 AFTER ADVANCING ONE.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-54 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-15 AFTER ADVANCING ONE.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-55 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-56 AFTER ADVANCING ONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-16 AFTER ADVANCING ONE.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-57 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-17 AFTER ADVANCING ONE.
     WRITE OUTPUT-LINE-PAGE-2 FROM LINE-58 AFTER ADVANCING NONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-18 AFTER ADVANCING ONE.
     WRITE OUTPUT-LINE-PAGE-1 FROM LINE-19 AFTER ADVANCING ONE.
```

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SOURCE STATEMENT

    WRITE OUTPUT-LINE-PAGE-2 FROM LINE-59 AFTER ADVANCING NONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-20 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-21 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-22 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-23 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-24 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-25 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-26 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-27 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-28 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-29 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-30 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-31 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-32 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-33 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-34 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-35 AFTER ADVANCING ONE.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-36 AFTER ADVANCING TWO.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-37 AFTER ADVANCING TWO.
    WRITE OUTPUT-LINE-PAGE-1 FROM LINE-38 AFTER ADVANCING TWO.

NEXT-RETRIEVAL.
    DISPLAY 'DO YOU WISH TO SUBMIT NEW RETRIEVAL CRITERIA?' UPON
    CONSOLE.
    ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
    MOVE WORDS TO ANSWER.
    PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = 'NO'.
    IF ANSWER = 'YES' GO TO INITIATION. GO TO NEXT-FUNCTION.

VERSION-UP.
    MOVE ZERO TO VC. PERFORM INCREMENT-VERSION VARYING
    VERSION-NUM FROM 1 BY 1 UNTIL VERSION-CHK = VERSION.
    ADD 1 TO VERSION-NUM. MOVE VERSION-NUM TO VERSION.

INCREMENT-VERSION.
    MOVE VERSION-NUM TO VERSION-CHK.

ANSWER-CHECK.
    DISPLAY 'INVALID RESPONSE. TYPE YES OR NO.' UPON CONSOLE.
    ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
    MOVE WORDS TO ANSWER.

NUMBER-EXAM.
    TRANSFORM ANNUM FROM '@%*<-/QWERTYUIOPASDFGHJKLZXCVBNM,.#,$.+
    '_)  |&>:;¬?"= (' TO ' '.
    EXAMINE ANNUM TALLYING ALL SPACES REPLACING BY '0'.
    IF TALLY = 0 GO TO NUMBER-CONVERSION. EXAMINE ANNUM TALLYING
    UNTIL FIRST '0'. IF TALLY = 0 GO TO NUMBER-CONVERSION. MOVE
    ANNUM TO ANNUM-TRUNC. MOVE ANNUM-TRUNC TO ANNUM-RIGHT.
    EXAMINE ANNUM-RIGHT REPLACING ALL SPACES BY '0'. MOVE
    ANNUM-RIGHT TO ANNUM.

NUMBER-CONVERSION.
    MOVE 01 TO ITEM-NO, NUM. PERFORM CYCLE UNTIL ANNUM = NUM.
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          SOURCE STATEMENT

 CYCLE.
     ADD 01 TO ITEM-NO. MOVE ITEM-NO TO NUM.

 INITIALIZE-FOR-KEY-WORD-SEARCH.
     MOVE SPACES TO KEYWORD-TABLE, LEGEND-TABLE.
     MOVE 14 TO NO-LINES. MOVE SPACES TO N1.
     EXAMINE KEYWORD-TABLE REPLACING ALL ' ' BY ' '.
     MOVE ZEROS TO LENGTH-TABLE.
     MOVE 1 TO N2.
     DISPLAY 'WHEN SEARCHING FOR KEYWORDS, TWO OPTIONS ARE AVAILAB
-    'LE:' UPON CONSOLE.
     DISPLAY '   1) THE FIRST OCCURRENCE WITHIN A RESUME OF AS MAN
-    'Y AS POSSIBLE' UPON CONSOLE.
     DISPLAY '      OF THE SPECIFIED KEYWORDS CAN BE LISTED, OR'
     UPON CONSOLE.
     DISPLAY '   2) THE FIRST OCCURRENCE WITHIN A RESUME OF ANY ON
-    'E OF THE SPECIFIED' UPON CONSOLE.
     DISPLAY '      KEYWORDS CAN BE LISTED.' UPON CONSOLE.
     DISPLAY 'TYPE THE NUMBER OF THE OPTION YOU WISH TO USE.'
     UPON CONSOLE.

 RETRY.
     ACCEPT ANSWER FROM CONSOLE.
     IF ANSWER = '1  ' OR
        ANSWER = '01 ' MOVE '1  ' TO ANSWER GO TO KEYWORD-SEARCH.
     IF ANSWER = '2  ' OR
        ANSWER = '02 ' MOVE '2  ' TO ANSWER GO TO KEYWORD-SEARCH.
     DISPLAY 'INVALID RESPONSE. TYPE 1 OR 2.' UPON CONSOLE,
     GO TO RETRY.

 KEYWORD-SEARCH.
     DISPLAY 'FROM 1 TO 4 KEY WORDS MAY BE SPECIFIED AS INDEPENDEN
-    'T RETRIEVAL' UPON CONSOLE.
     DISPLAY 'CRITERIA. LIST THEM ONE AT A TIME, AS REQUESTED. WHE
-    'N YOU HAVE COMPLETED' UPON CONSOLE.
     DISPLAY 'THE LIST, AND THE NEXT KEY WORD IS REQUESTED, TYPE E
-    'ND.' UPON CONSOLE.

 ENTER-KEYWORDS.
     DISPLAY 'TYPE A KEY WORD FOR WHICH YOU WISH TO SEARCH.'
     UPON CONSOLE.
     ACCEPT WORDS FROM CONSOLE. PERFORM CAPITALIZATION.
     MOVE WORDS TO KEYWORD (N2), LEGEND (N2).
     IF KEYWORD (N2) IS NOT EQUAL TO 'END' GO TO TAILOR-KEYWORD.
     MOVE SPACES TO KEYWORD (N2), LEGEND (N2).
     EXAMINE KEYWORD (N2) REPLACING ALL ' ' BY ' '.

 LAST-WORD.
     MOVE ZERO TO N6,
     DISPLAY 'ADVANCE CONSOLE CARRIAGE TO START LIST 6 LINES FROM
-    'TOP OF NEXT BLANK' UPON CONSOLE,
     DISPLAY 'PAGE. WHEN FINISHED, TYPE TWO SPACES.' UPON CONSOLE,
     ACCEPT ANNUM-TRUNC FROM CONSOLE,
```

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        SOURCE STATEMENT

    DISPLAY '                    LIST OF INSTRUMENT RESUMES'
    UPON CONSOLE.
    DISPLAY '                BY TITLE, SPACECRAFT, AND ACRONYM'
    UPON CONSOLE.
    DISPLAY '              WHICH EXHIBIT IN THE INDICATED ITEMS'
    UPON CONSOLE.
    IF ANSWER = '1  '
    DISPLAY '       AS MANY AS POSSIBLE OF THE FOLLOWING KEYWORDS:
    '' UPON CONSOLE.
    IF ANSWER = '2  '
    DISPLAY '                ANY ONE OF THE FOLLOWING KEYWORDS: '
    UPON CONSOLE.
    DISPLAY ' ' UPON CONSOLE.
    DISPLAY '    ' LEGEND (1) ' ' LEGEND (2) ' ' LEGEND (3) ' '
    LEGEND (4) UPON CONSOLE.
    PERFORM SPACE-AWAY 2 TIMES, GO TO INITIATE-SEARCH.

TAILOR-KEYWORD.
    EXAMINE KEYWORD (N2) TALLYING UNTIL FIRST ' '.
    MOVE TALLY TO LENGTH (N2).
    EXAMINE KEYWORD (N2) REPLACING ALL ' ' BY ' '.
    IF N2 < 4 ADD 1 TO N2 GO TO ENTER-KEYWORDS.
    DISPLAY 'NO MORE THAN 4 KEY WORDS MAY BE CONSIDERED AT ONE TI
    'ME.' UPON CONSOLE. GO TO LAST-WORD.

INITIATE-SEARCH.
    IF N1 IS NOT EQUAL TO '  ' DISPLAY ' ' UPON CONSOLE.
    IF NO-LINES > 57, SUBTRACT NO-LINES FROM 72 GIVING
    LINES-LEFT, PERFORM SPACE-AWAY LINES-LEFT TIMES,
    MOVE 6 TO NO-LINES. MOVE SPACES TO N1.
    READ DISK-FILE RECORD INTO PAGE-1 AT END GO TO END-KEYWORD.
    READ DISK-FILE RECORD INTO PAGE-2 AT END GO TO END-KEYWORD.
    IF ACRONYM = '  ' GO TO END-KEYWORD. MOVE 1 TO N5.
    MOVE TITLE TO LINE (1).
    MOVE TITLE-CONTD TO LINE (2).
    MOVE LINE-10 TO LINE (3).
    MOVE LINE-11 TO LINE (4).
    MOVE LINE-12 TO LINE (5).
    MOVE LINE-13 TO LINE (6).
    MOVE LINE-14 TO LINE (7).
    MOVE LINE-15 TO LINE (8).
    MOVE LINE-16 TO LINE (9).
    MOVE LINE-17 TO LINE (10).
    MOVE LINE-18 TO LINE (11).
    MOVE LINE-19 TO LINE (12).
    MOVE LINE-20 TO LINE (13).
    MOVE LINE-21 TO LINE (14).
    MOVE LINE-22 TO LINE (15).
    MOVE LINE-23 TO LINE (16).
    MOVE LINE-24 TO LINE (17).
    MOVE LINE-25 TO LINE (18).
    MOVE LINE-26 TO LINE (19).
    MOVE LINE-27 TO LINE (20).
    MOVE LINE-28 TO LINE (21).
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          SOURCE STATEMENT

     MOVE LINE-29 TO LINE (22).
     MOVE LINE-30 TO LINE (23).
     MOVE LINE-31 TO LINE (24).
     MOVE LINE-32 TO LINE (25).
     MOVE LINE-33 TO LINE (26).
     MOVE LINE-34 TO LINE (27).
     MOVE LINE-35 TO LINE (28).
     MOVE LINE-36 TO LINE (29).
     MOVE INSTRUMENT-TYPE TO LINE (30).
     MOVE ORGANIZATION OF PRINCIPAL-INVESTIGATOR TO LINE (31).
     MOVE ORGANIZATION OF CO-INVESTIGATOR TO LINE (32).
     MOVE VENDOR TO LINE (33).
     MOVE LOCATION TO LINE (34).
     MOVE ZERO TO N3. MOVE 1 TO N4.

TRANSFORM-LINE.
     MOVE ZERO TO TAB-SPACE, TAB.
     ADD 1 TO N3. IF N3 > 34 ADD 1 TO N4, MOVE 1 TO N3.
     IF N4 = 5 OR KEYWORD (N4) = '     ' GO TO INITIATE-SEARCH.
     MOVE LINE (N3) TO LINE-TABLE.
     TRANSFORM LINE-TABLE FROM KEYWORD (N4) TO ' '.
     PERFORM TABULATION VARYING N7 FROM 1 BY 1 UNTIL N7 = 66 OR
     TAB-SPACE = LENGTH (N4). GO TO TRANSFORM-LINE.

TABULATION.
     IF POSITION (N7) IS NOT EQUAL TO ' ', MOVE ZERO TO TAB.
     IF POSITION (N7) IS NOT EQUAL TO ' ', MOVE ZERO TO TAB-SPACE.
     IF POSITION (N7) = ' ' ADD 1 TO TAB-SPACE.
     IF POSITION (N7) = ' ' ADD 1 TO TAB.
     IF TAB = LENGTH (N4) COMPUTE N8 = N7 + 1
                          TRANSFORM POSITION (N8)
                          FROM '',.:;?*()/+&=><%$@#' TO ' ',
                          TRANSFORM POSITION (N8)
                          FROM QUOTE TO SPACE.
     IF TAB = LENGTH (N4) AND POSITION (N8) = ' ',
                          GO TO LIST-RESUME.

LIST-RESUME.
     MOVE 1 TO N6.
     IF N5 > 1 GO TO KEYWORD-LIST. MOVE 2 TO N5.
     MOVE SPACES TO STATUS-OUT-1, STATUS-OUT-2, R1, R2.
     IF STATUS = 'PROPOSAL    ' OR CONTRACT-TYPE = 'PROPOSAL ',
     MOVE '-PROPOSAL' TO STATUS-OUT-1, STATUS-OUT-2.
     IF COMPLETION-DATE = 'INACT' MOVE '/INACTIVE' TO R1, R2.
     IF TITLE-CONTD IS NOT EQUAL TO '     ' MOVE SPACES TO
     STATUS-OUT-1, R1.
     DISPLAY '    ' TITLE STATUS-OUT-1 R1 UPON CONSOLE.
     IF TITLE-CONTD IS NOT EQUAL TO '     ',
     DISPLAY '    ' TITLE-CONTD STATUS-OUT-2 R2 UPON CONSOLE,
     ADD 1 TO NO-LINES.
     DISPLAY '       ' SPACECRAFT '    ' ACRONYM UPON CONSOLE.
     ADD 3 TO NO-LINES.

KEYWORD-LIST.
```
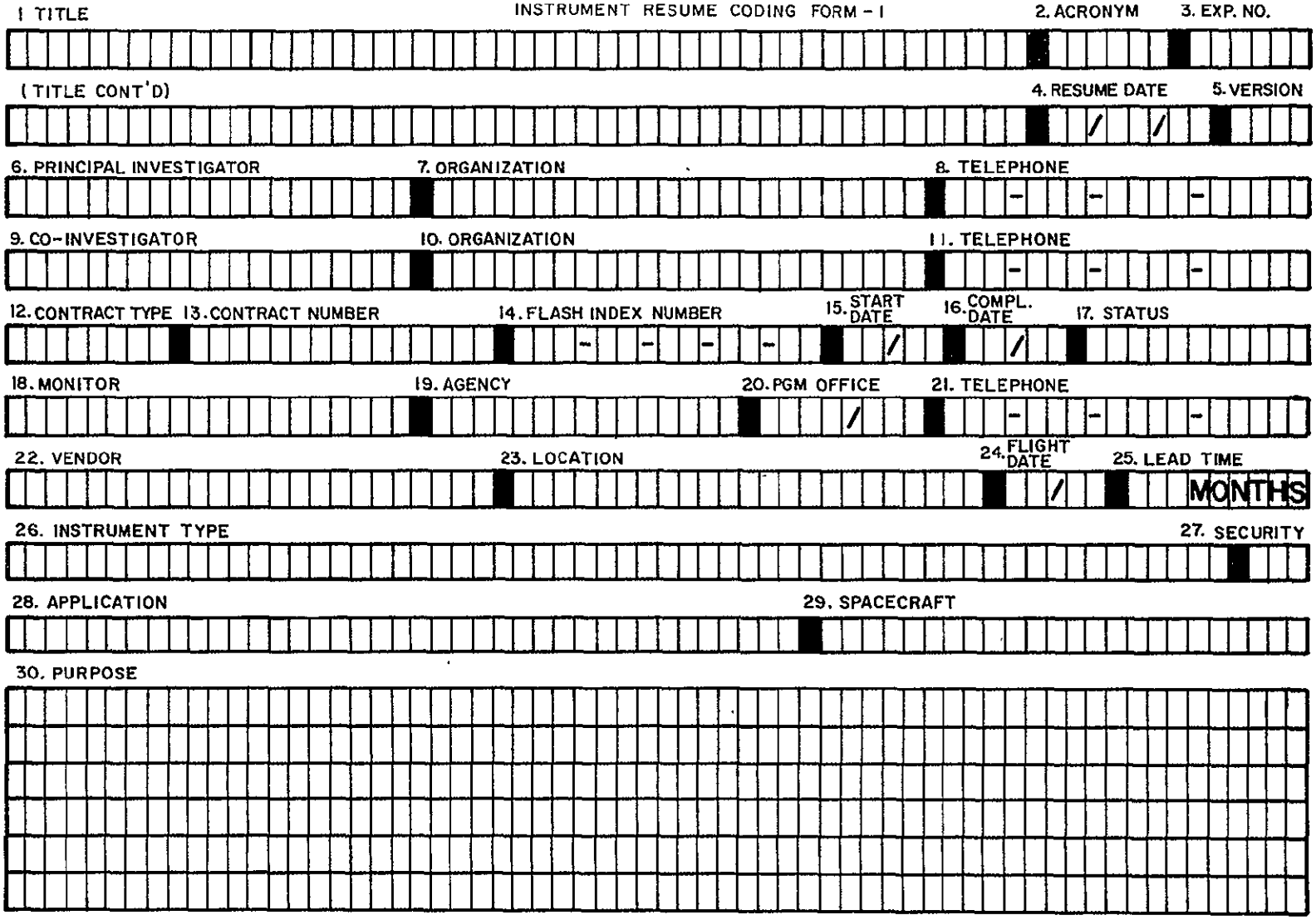

```
        SOURCE STATEMENT

    MOVE KEYWORD (N4) TO KEYWORD-OUT.
    EXAMINE KEYWORD-OUT REPLACING ALL ' ' BY ' '.
    IF N3 = 1 OR N3 = 2, MOVE '1' TO N1.
    IF N3 = 3 OR N3 = 4 OR N3 = 5 OR N3 = 6 OR N3 = 7 OR N3 = 8,
    MOVE 'PURPOSE' TO N1.
    IF N3 = 9 OR N3 = 10 OR N3 = 11 OR N3 = 12 OR N3 = 13 OR
       N3 = 14 OR N3 = 15 OR N3 = 16 OR N3 = 17 OR N3 = 18 OR
       N3 = 19 OR N3 = 20 OR N3 = 21 OR N3 = 22 OR N3 = 23 OR
       N3 = 24 OR N3 = 25 OR N3 = 26 OR N3 = 27 OR N3 = 28,
    MOVE 'PRINCIPLES OF OPERATION' TO N1.
    IF N3 = 29,
    MOVE 'PHENOMENA OBSERVED' TO N1.
    IF N3 = 30
    MOVE 'INSTRUMENT TYPE' TO N1.
    IF N3 = 31
    MOVE 'ORGANIZATION OF PRINCIPAL INVESTIGATOR' TO N1.
    IF N3 = 32
    MOVE 'ORGANIZATION OF CO-INVESTIGATOR' TO N1.
    IF N3 = 33
    MOVE 'VENDOR' TO N1.
    IF N3 = 34
    MOVE 'LOCATION OF VENDOR' TO N1.
    DISPLAY '          ' KEYWORD-OUT ' IN ITEM ' N1 UPON CONSOLE.
    ADD 1 TO NO-LINES. MOVE 35 TO N3. IF ANSWER = '2  ',
    GO TO INITIATE-SEARCH. GO TO TRANSFORM-LINE.

END-KEYWORD.
    DISPLAY ' ' UPON CONSOLE.
    IF N6 = 0 DISPLAY 'NO RESUMES WERE FOUND WITH THE SPECIFIED K
    'EY WORDS.' UPON CONSOLE, PERFORM SPACE-AWAY 57 TIMES.
    IF N6 > 0, SUBTRACT NO-LINES FROM 72 GIVING LINES-LEFT,
    PERFORM SPACE-AWAY LINES-LEFT TIMES.
    DISPLAY 'DO YOU WISH TO SPECIFY A NEW SET OF KEY WORDS?'
    UPON CONSOLE.
    ACCEPT ANSWER FROM CONSOLE.
    PERFORM ANSWER-CHECK UNTIL ANSWER = 'YES' OR ANSWER = '   '
    OR ANSWER = 'NO' OR ANSWER = '  '.
    IF ANSWER = 'YES' OR ANSWER = '   ' CLOSE DISK-FILE, OPEN
    INPUT DISK-FILE, GO TO INITIALIZE-FOR-KEY-WORD-SEARCH.
    GO TO NEXT-FUNCTION.

CAPITALIZATION.
    TRANSFORM WORDS FROM '
                      TO 'ABCDEFGHIJKLMNOPQRSTUVWXYZ'.

SPACE-AWAY.
    DISPLAY ' ' UPON CONSOLE.
```

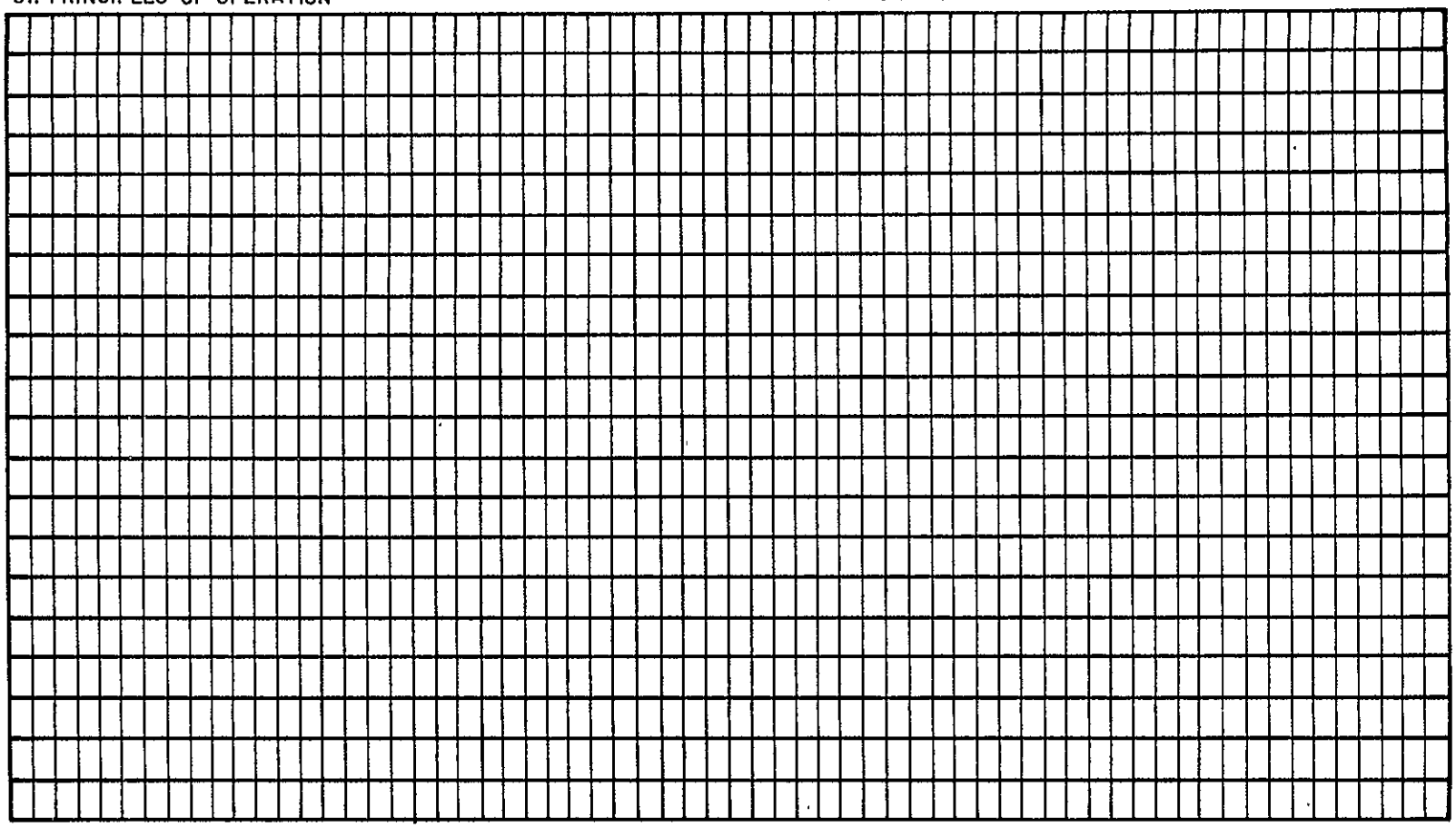
APPENDIX C

INSTRUMENT RESUME CODING FORM - I



31. PRINCIPLES OF OPERATION

INSTRUMENT RESUME CODING FORM-2



INSTRUMENT RESUME CODING FORM-3

32. PHENOMENA OBSERVED

33. MEASUREMENT RANGE

34. PRECISION AND ACCURACY

35. SPECTRAL RANGE . TO .

36. SPECTRAL RESOLUTION .

37. TIME CONSTANT .

38. FIELD OF VIEW . BY . DEG

39. GROUND SWATH

40. ANGULAR RESOLUTION . DEG

41. SPATIAL RESOLUTION

42. POINTING ACCURACY . DEG

43. POINTING RATE . DEG/SEC

44. ALTITUDE

45. INCLINATION

46. SPECIAL REQUIREMENTS

47. COMPONENTS

48. WEIGHT . LB

49. VOLUME . CU FT

50. AVERAGE POWER .WATTS

51. STANDBY POWER .WATTS

52. PEAK POWER .WATTS

53. MTBF .

54. RF INTF.

55. MAGNETIC INTF.

56. NUCLEAR INTF.

57. THERMAL INTF.

58. SHIELDING

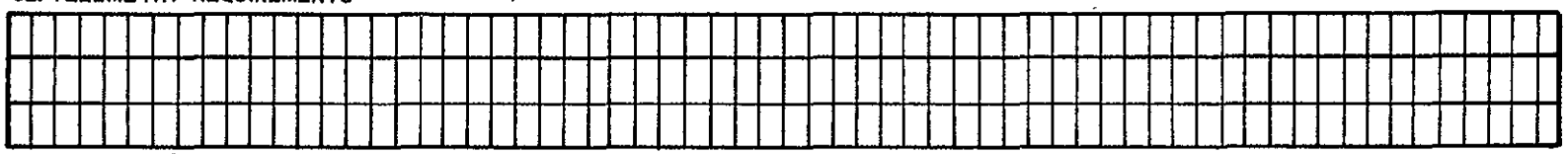
59. CALIBRATION

60. DATA RECOVERY

61. FREQUENCY OF OBSERVATION

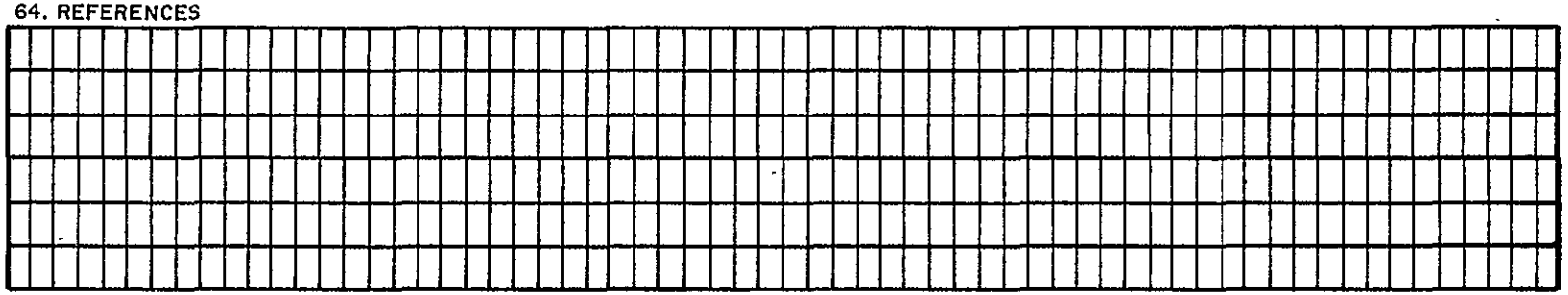
62. TELEMETRY REQUIREMENTS

. INSTRUMENT RESUME CODING FORM - 4



63. ADVANTAGES AND LIMITATIONS

64. REFERENCES



65. COST PREVIOUS FY

66. COST CURRENT FY

67. COST TO DATE

68. COST TO COMPLETION

APPENDIX D

COGNIZANT PERSONNEL

The following persons may be contacted for further information regarding the use of the search and retrieval system described in this contract report. All official requests should be directed to the NASA personnel. Unofficial information may be obtained through the IITRI personnel.

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APPENDIX E

MODIFICATIONS OF THE INSTRUMENT RESUME FORMAT

Immediately prior to the publication of this document, several modifications of the format of the Instrument Resume were initiated. These modifications were made as a result of a continuing evaluation of the basic resume format in an effort to improve its utility. This appendix describes briefly these modifications.

To facilitate reproduction of the resume using the Xerox process, the color of the resumes has been changed. The new edition will have a light green screened background wherever the dark blue appears in the original edition. Dividing lines, boundaries, and item titles and numbers will be printed in very dark green ink over the light green background.

Items 65, 66, 67, and 68 have been eliminated upon the request of the Contract and Technical Monitors. It became evident that the proprietary nature of this information severely limited the distribution of the completed resumes. Consequently, the space formerly occupied by these items has been combined into a single item numbered 65 and entitled HISTORICAL REMARKS. The format of this new item will be x(64). The purpose of this item is to list any pertinent information concerning the historical development of the instrument - technical or administrative. Descriptions of past uses and applications of the instrument, now described in PRINCIPLES OF OPERATION, will now be given in HISTORICAL REMARKS. This new item may also be used to describe difficulties encountered during development, changes in technical or administrative personnel, cost figures, etc.

It was also decided to impress upon those preparing the resumes the importance of including in item 62 (TELEMETRY REQUIREMENTS) definitive information describing the required bandwidth for the telemetry systems used with the instrument. This information must necessarily take into account the rate and frequency of data acquisition, the overall mission profile, the frequency, the bandwidth, the availability of ground-based data-receiving stations, and many other parameters that affect the transmission of acquired data.

It was further decided to emphasize the importance of including definitive sensitivity and noise figures, whenever possible, in either item 33 (MEASUREMENT RANGE) or item 34 (PRECISION AND ACCURACY).

Undoubtedly further modifications of the format of the Instrument Resume will evolve in the future. These changes will be reported periodically either as addenda to this report, or in subsequent reports.