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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

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1.0 SCOPE

This development effort provides the following new features and enhancements to KRONOS tape processing capabilities.

1. The MMTC/65X tape sub-system is supported.
2. The overall reliability and error recoverability of tape processing will be improved over that currently available by use of new techniques using the CDC tape error recovery standard as a guide.
3. Support of ANSI standard tape labels will be provided.
4. It will be possible to read a wider range of tape formats in a greater number of ways than is now possible in KRONOS 2.0.
5. Increased interchange capabilities with SCOPE 3.4.

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2.0 APPLICABLE DOCUMENTS

KRONOS 2.0 Batch User's Reference Manual

KRONOS 2.0 Operator's Guide

KRONOS 2.0 User's Instant

ANSI-STD X3.27 - 1969 Magnetic Tape Labels

CDC-STD 1.87.002 Magnetic Tape Labels

CDC-STD 1.87.004 Magnetic Tape Error Detection and Recovery

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3.0 DESCRIPTION

3.1 The following are the special considerations a user must make in order to have access to magnetic tapes in KRONOS 2.1.

3.1.1 All jobs must specify the maximum number of tapes that will be in use concurrently.

3.1.1.1 A job specifies the maximum concurrent tapes via the RESOURC control card {see Appendix E}.

3.1.1.2 A job may alter the maximum number of concurrent tapes in the following two ways:

3.1.1.2.1 The RESOURC control card may be used to reduce the number of concurrent tapes {refer also to Section 3.1.1.4}.

3.1.1.2.2 If tapes are already assigned, the RESOURC control card may be used to increase the number of concurrent tapes, but if the request cannot be satisfied, the job will be aborted.

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3.1.1.3 In all of the above cases these definitions of maximum tapes in use must be within or equal to the maximum number of tapes specified in the user's validation limit. {See KRONOS 2.0 Operating Guide, page 8-5.}

3.1.1.4 Any time that a return {see Batch User's Reference Manual, Chapter 7}, is done on a tape the number of required 7/9 track tapes for the job is decremented by one.

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3.2 Control Cards

There are six control cards which are explicitly involved with requesting, assigning, and processing of tapes. These are the ASSIGN, BLANK, LABEL, LISTLB, REQUEST, and VSN control cards.

3.2.1 ASSIGN Card

The format of the ASSIGN card is as follows:

ASSIGN{dd, lfn, p₁, p₂, ..., p_n}

dd = device description which may either be the device type in display code or the EST ordinal for the desired device.

where lfn = file name

p₁ - p_n = parameters {see parameter description in Section 3.2.4}.

The ASSIGN card should only be used in the case of tape files which are unlabeled and which have not had a Volume Serial Number declared by the operator at the time of mounting {see Section 3.2.5 for further detail on this method of assigning tapes}.

3.2.2 LABEL Card

The LABEL card should be used for all labeled tapes. This control card will cause automatic assignment of tapes to take place as well as reading or writing of labels. The general format of the LABEL card is:

LABEL{lfn, p₁, p₂, ..., p_n}

where

lfn = file name

p₁ - p_n = parameters {see parameter description in Section 3.2.4}.

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3.2.3 REQUEST Card

The REQUEST card can be used for all types of tape files. If the Volume Serial Number is present or has been previously specified by a VSN card (see Section 3.2.5), then assignment will be made automatically. The general format of the REQUEST card is:

$$\text{REQUEST}\{lfn, p_1, p_2, \dots, p_n\}$$

where:

lfn = file name

$p_1 - p_n$ = parameters (see parameter description in Section 3.2.4).

3.2.4 ASSIGN, LABEL, and REQUEST Control Card Parameters

The following parameters or keywords/options can appear order independent on the indicated control cards. Where two keywords express the same option, the first is the KRONOS definition and the second is also accepted for SCOPE compatibility.

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PARAMETER/ KEYWORD	OPTION	DEFAULT	VALID ON ASSIGN{A} LABEL{L} REQUEST{R}	DESCRIPTION
LO		Installation Default Used	A,R	200 BPI Tape Density {Implies 7 track}
HI		Installation Default Used	A,R	556 BPI Tape Density {Implies 7 track}
HY		Installation Default Used	A,R	800 BPI Tape Density {Implies 7 track}
HD		Installation Default Used	A,R	800 CPI Tape Density {Implies 9 track}
PE		Installation Default Used	A,R	1600 CPI Tape Density {Implies 9 track}
D=nn	LO,HI,HY, HD,PE	Installation Default Used	A,L,R	Same as above parameters
D=nnnn	200,556, 800,1600	Installation Default Used	A,L,R	Same as above parameters
FC=nnnnnn	nnnnnn= numeric FRAME COUNT	See Format Option Appendix D	A,L,R	Defines the maximum size block that maybe read or written. See formats in Appendix D.
C=nnnnnn	nnnnnn= numeric & BIT CHAR- ACTER COUNT	See Format Option Appendix D	A,R	Defines the maximum size block that maybe read or written. See formats in Appendix D.
CV=nn	US,AS		A,L,R	USASI{ASCII} conversion for 9 track tape
N=nn	EB		A,L,R	EBCDIC conversion for 9 track tape
MT/NT		MT	A,L,R	Seven/Nine Track
P0=C ₁ ,C ₂ , ...C _n		Absent	A,L,R	Default; abort job on RPE/WPE {unless EP set}
	A		A,L,R	Automatic abort on RPE/ WPE {even if EP set}
	N		A,L,R	No abort on RPE/WPE {with/without EP}
	R		A,L,R	Enforce ring out
	W		A,L,R	Enforce ring in
	U		A,L,R	Inhibit unload at end of usage

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PARAMETER/ KEYWORD	OPTION	DEFAULT	VALID ON ASSIGN{A} LABEL{L} REQUEST{R}	DESCRIPTION
	E		A,L,R	Error Inhibit. Negates all processing of errors when possible. The calling routine will not return error information back.
	I		A,L,R	Ignore block in progress when EOT sensed
	P		A,L,R	Accept block in progress when EOT sensed
	S		A,L,R	Stop at tape mark after EOT sensed {unlabeled} or at tape mark + EOF1 or EOF1 {labeled}

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PARAMETER/ KEYWORD	OPTION	DEFAULT	VALID ON ASSIGN{A} LABEL{L} REQUEST{R}	DESCRIPTION
F=n	I X B E S L SI F	I {LABEL} X {A,R unless VSN parameter is present then I mode.}	A,L,R	See Appendix D on tape formats.
NS=nn	nn= numeric frames		A,L,R	Noise size in frames
LB=nn	KU	KU unless VSN parameter on control card then default KL.	A,L,R	KRONOS Unlabeled
	KL	KU unless VSN parameter on control card then default KL.	A,L,R	KRONOS Labeled
	NL	KU unless VSN parameter on control card then default KL.	A,L,R	Non-Standard Labeled {Skips over labels based on tape marks. No pro- cessing of label data performed. End of reel treated as if unlabeled.}
VSN=aaaaaa	1 to 6 characters	See Label defaults Section 3.5.4.2	A,L,R	Volume Serial Number
CK			A,L,R	Will cause ID code of 7bB to be set on file to indi- cate checkpoint file where data is to be written at EOI

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PARAMETER/ KEYWORD	OPTION	DEFAULT	VALID ON ASSIGN{A} LABEL{L} REQUEST{R}	DESCRIPTION
CB			A,L,R	Checkpoint file to be written at beginning of information. Sets ID code to 75B.
FI=aaaa ...a L=aaaa ...a	1 to 17 characters	See Label defaults Section 3.5.4.2	L	File Identifier
A=n	1 character	See Label defaults Section 3.5.4.2	L	File Accessibility see Section 3.2.5
SI=aaaaaa M=aaaaaa	1 to 6 characters	See Label defaults Section 3.5.4.2	L	Set Identifier for multi-file set
SN=nnnn V=nnnn	4 digits	See Label defaults Section 3.5.4.2	L	File Section Number
QN=nnnn P=nnnn	4 digits	See Label defaults Section 3.5.4.2	L	File Sequence Number
G=nnnn	4 digits	See Label defaults Section 3.5.4.2	L	Generation Number
E=nn	2 digits	See Label defaults Section 3.5.4.2	L	Generation Version Number
CR=yyddd C=yyddo	Julian Date	See Label defaults Section 3.5.4.2	L	Creation Date
RT=yyydd	Julian Date	See Label defaults Section 3.5.4.2	L	Retention Date

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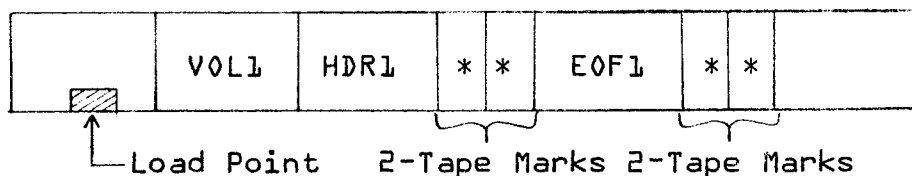
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PARAMETER/ KEYWORD	OPTION	DEFAULT	VALID ON ASSIGN{A} LABEL{L} REQUEST{R}	DESCRIPTION
T=nnn	3 digits	See Label defaults Section 3.5.4.2	L	Retention Cycle
R/W		R	L	READ/WRITE Label - On read data is read and compared. If compare fails job is aborted.

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3.2.5 BLANK Card

The BLANK card is used to initially label a magnetic tape with a Volume Header Label {VOL1}, a First File Header Label {HDR1}, and a First End-of-File Label {EOF1}. The labels are written on the tape in the structure shown below:



If a tape had been BLANK labeled with the Volume Accessibility {Accessibility field in the VOL1 label, see Section 3.5.4.2.1} blank, the tape may be relabeled using the BLANK card or it may be written as unlabeled. This is the only case where the Volume Header Label {VOL1} may be rewritten.

If a tape had been BLANK labeled under KRONOS 2.1 {determined by contents of System Code in HDR1} with the File Accessibility {Accessibility field in the HDR1 label, see Section 3.5.4.2.2}, field non blank the tape may be accessed by a user other than the owner provided the A parameter is used on the ASSIGN, LABEL, or REQUEST card {see Section 3.2.4} and matches. If the accessibility character is specified as an "A" at BLANK time, then only the owner may access the tape. The contents of the labels are their respective default values except for those fields for which there are corresponding parameters on the BLANK card. These are Volume Serial Number, Accessibility,

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Owner Identification, and Label Standard Level in the VOL1 label and Accessibility in the HDR1 label (see Section 3.5.4.2 and Appendix B).

Format of BLANK Card:

BLANK{VSN=vs n,VA=v,OWNER=family/usernum,LSL=l,FA=f,D=d,MT/NT}

vs n 1-6 character Volume Serial Number. If characters other than alphanumerics are used, the VSN must be written as a literal (see Section 3.2.8).

v 1 character Volume Accessibility (Accessibility in VOL1).

family* 1-7 character Family Name.

usernum* 1-7 character User Number.

l 1 character Label Standard Level.

f 1 character File Accessibility (Accessibility in HDR1).

d Density (see Section 3.2.4).

MT/NT Tape track type (see Section 3.2.4).

* If family or usernum are not specified and a user is making the BLANK call, the values for family and usernum are taken from the control point area.

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3.2.6 LISTLB Card

The LISTLB control card causes a standard labeled tape to be read and the contents of the labels on the tape written on a specified file.

Format of LISTLB Card:

LISTLB{p₁,p₂,...,p_n}

where parameter p_i may be any of the following:

VSN=vsn Volume Serial Number {see Section 3.2.4}
 D=d Density {see Section 3.2.4}
 SI=aaaaaa Set identification {see Section 3.2.4}
 QN=nnnn Sequence number {applicable only if SI present}
 L0= List options
 A all labels
 R or omitted - required labels {VOL1, HDR1,
 EOF1, EOV1}
 0 optional labels
 L= Output file name

The VSN= parameter must be specified. Default values are:

D = installation default
 L0 = R
 L = OUTPUT
 SI = none
 QN = none

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3.2.7 VSN Card

The VSN card associates one or more reels of tape by the Volume Serial Number of the reel with a file name appearing later in the control card record. A VSN card can contain declarations for more than one file name and Volume Serial Number.

VSN cards may be placed anywhere in the control card record as long as they precede the REQUEST or LABEL card for the file named. If a logical file name is to be re-used during a job, the first file must be released by a CLOSE/UNLOAD {see KRONOS 2.0 Batch User's Reference Manual, page 5-39} or RETURN {see KRONOS 2.0 Batch User's Reference Manual, page 5-35} control card before a VSN is given for the second file.

Format of VSN card:

VSN{lfn=vsn,....}

lfn For a single file, the 1-7 alphanumeric character logical file name

vsn 1-6 character Volume Serial Number. If characters other than letters and numbers are used, the VSN must be written as a literal {see Section 3.2.9}.

If any of several duplicate reels will suffice, equals signs should separate identifiers as in:
 FILE=1234=1235.

If the file extends to more than one reel, slashes should separate the identifiers for all reels required. KRONOS will assign the reels in the order indicated within this parameter. For example,
 FILE2=23/24/25.

Up to 55 VSN's may be defined for a file.

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If the VSN is absent, 0, or SCRATCH, any available scratch tape may be assigned to the logical file named.

3.2.8 Continuation Cards

Any of the above four control statements; ASSIGN, REQUEST, LABEL, VSN if necessary may continue over more than one 80-column card. Continuation is assumed if no termination character has been encountered prior to reaching the end of the current card. All continuation cards must contain a blank in column 1. It should be noted that it will only be possible to handle continuation cards from terminals if they are contained within procedure files.

3.2.9 Literals

Any of the above control statements may contain a literal so as to allow parameters that contain non-alphanumerics {a literal is a character string delimited by dollar signs}. Any parameter field that requires characters other than letters, numbers or asterisks must be written as a literal. Blanks within the delimiters are retained. If the literal is to contain "\$", two consecutive dollar signs must be written. The literal \$A B\$41\$ is interpreted as "A B\$41". Where continuation cards are involved, any literal must not continue from one card to another.

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3.2.10 Parameter Processing

If more than one control card parameter of a given type occurs, the last one encountered in a left to right scan is used.

If both ring enforcement options {R and W} or more than one of the end-of-tape options {I, P or S} are specified for the processing option parameter P0, an argument error will occur.

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3.3 Macro Interface

All references to words within a FET are octal numbers. The first word of the FET containing the file name is considered word 0.

3.3.1 LABEL Macro

The format of the LABEL macro is as follows:

```
LABEL lfn,N
```

where:

lfn = file name

N = do not process labels if present

The LABEL macro may be used to reference all tapes, both labeled and unlabeled. Label processing will be performed {see Section 3.3.5} by means of an OPEN/ALTER or OPEN/WRITE depending on the setting of bit 2⁵⁹ in FET+10B. If "N" is present, no label processing will be performed. The FET format for the LABEL macro is described in Section 3.3.4.

3.3.2 POSMF Macro

The format of the POSMF macro is as follows:

```
POSMF mfn,R
```

where:

mfn = multi-file set name

R = recall

The POSMF macro positions standard labeled multi-file magnetic tape sets to a member of the set. The named multi-file set is positioned to the specified file and an OPEN with rewind is

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performed. The file to be opened is determined by the contents of the HDR1 label for the file. The contents of the HDR1 label may be found in words 11B - 15B of the FET {see Section 3.3.4} in standard label processing mode or in the user label buffer in extended label processing mode. The position of the file within the multi-file set {Set Identification field in the HDR1 label {see Section 3.5.4.2.2}} is determined by the File Sequence Number in the HDR1 label. If the File Sequence Number is not specified, the set position is determined by the File Identifier. If the File Identifier is also not specified, the set will be positioned to the beginning of the next file. The delivery of the contents of the HDR1 label to the user is as defined for "open for read" in standard and extended label processing {see Section 3.3.5}. If the File Sequence Number is 9999, the OPEN of the file is as defined for "open for write" and the set will be positioned after the last member of the set. The tape executive will alter the File Sequence Number to be equal to the File Sequence Number of the last member of the set plus 1. The FET format for the POSMF macro is as described in Section 3.3.4.

3.3.3 REQUEST Macro

The format of the REQUEST macro is unchanged from KRONOS 2.0 {see Batch User's Reference Manual, page 7-27}.

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3.3.4 FET format for macros

The FET format for tape related macros is as specified below.
Compatibility to SCOPE product sets will be provided through
the special SCOPE interface routine {SFP}.

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FET + 10B thru FET + 15B

of Tape Files at Request Time

<u>Location</u>	<u>Bit Field</u>	<u>Meaning</u>
FET+10B	59	If set, LABEL is to be written.
FET+10B	58	If set, defines tape as labeled.
FET+10B	57	If set, defines non-standard labels.
FET+10B	56	If set, tape request for nine track where default is seven track.
FET+10B	55-54	Flag bits not currently in use.
FET+10B	53-51	Density: 0 = installation default 1 = 556 BPI 2 = 200 BPI 3 = 800 BPI 4 = 1600 CPI
FET+10B	50-48	Conversion mode: 0 = installation default 1 = ASCII/USASII conversion for 9 tracks 2 = EBCDIC conversion for 9 tracks
FET+10B	47-36	Processing Options: bit 47 set = ignore block in progress when EOT sensed bit 46 set = accept block in progress when EOT sensed
		NOTE: Only one of bits 47 or 46 may be set. If neither is set, stop at tape mark after EOT sensed {un-labeled} or at tape mark + EOF1 or EOF1 after EOT sensed {labeled}
		bit 41 set = inhibit unload at end of usage
		bit 40 set = enforce ring in
		bit 39 set = enforce ring out
		bit 38 set = inhibit error processing
		bit 37 set = no abort on RPE/WPE
		bit 36 set = abort on RPE/WPE even if EP set

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Location Bit Field Meaning

NOTE: If neither 38, 37, or 36 is set,
 abort on RPE/WPE unless EP set

FET+10B 35-30

Format:

0 = I
 1 = SI
 2 = X
 3 = S or L
 4 = E
 5 = B
 6 = F

FET+10B

29-24

Noise size in frames.

FET+10B

23-00

Block size in frames.

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Location Bit Field Meaning

FET+11B	59-24	6 display code characters = Volume Serial Number
FET+11B	23-18	1 display code character = File Accessibility
FET+11B	17-15	Unused {3 bits}
FET+11B	14-0	15 bit binary File Section Number
FET+12B	59-0	First 10 display code characters of File Identifier
FET+13B	59-18	Last 7 display code characters of File Identifier
FET+13B	17-15	Unused {3 bits}
FET+13B	14-0	15 bit binary File Sequence Number
FET+14B	59-24	6 display code characters = Set Identifier
FET+14B	23-15	9 bit binary Generation Version Number
FET+14B	14-0	15 bit binary Generation Number
FET+15B	59-30	5 display code characters for Julian Expiration Date
FET+15B	29-0	5 display code characters for Julian Creation Date

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3.3.5 LABEL Processing for OPEN/CLOSE Requests

There are two modes of label processing: standard and extended. Standard label processing is indicated by the XL bit {bit 2⁴¹} in FET+1 being set off {XL=0} in which case any information for label processing is contained in FET+11B-15B of FET's whose length is at least 16B words {see Section 3.3.4}. Extended label processing is indicated by the XL bit being set on {XL=1} in which case a user label buffer pointed to by FET+11B is used to hold all labels to be processed.

Throughout this section the terms "open for read" will mean an open using CI0 codes 100B, 120B, 140B, 160B, 300B or 340B, "open for write" will mean an open using CI0 codes 104B or 144B, and "closed" will mean closed using CI0 codes 130B, 150B, 170B or 174B. {See Appendix D for handling of CLOSER - close reel.}

3.3.5.1 Standard Label Processing

In standard label processing mode only, the required ANSI format labels are processed. These are the Volume Header Label {VOL1}, the File Header Label {HDR1}, and End-of-File Label {EOF1}, and the End-of-Volume Label {EOV1}. Optional user labels and optional operating system labels not generated by KRONOS 2.1 will be ignored. When a magnetic tape file is opened, the tape executive guarantees that no processing will occur unless the Volume Serial Number contained in the VOL1 label agrees with that requested by the user. If the

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file is opened for read, the information contained within the HDR1 label is delivered to the user's file buffer if sufficient space permits when the HDR1 label has been successfully verified. If the user's FET is less than 16B words in length, any label will be accepted without verification. If the FET is at least 16B words long, the information contained in the HDR1 label is compared with the information contained in words 11B-15B of the FET. Should any mandatory field disagree, an informative diagnostic will be issued and processing will continue as if an unrecoverable parity error had occurred. {i.e. - The error options will determine job status.} If the file is opened for write, the HDR1 label is formatted within the tape executive. If the FET is at least 16B words long, the information contained in words 11B-15B of the FET is used in formatting the HDR1 label. If the FET is less than 16B words in length, default values are used in formatting the HDR1 label {see Section 3.5.4.2.2}.

When a magnetic tape file is closed, if the last operation was a write, the tape executive writes a tape mark, the EOF1 label or the EOV1 label. The optional contents of the EOF1 and EOV1 trailer labels are taken from the optional fields of the HDR1 label {see Appendix D for more details}.

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3.3.5.2 Extended Label Processing

In extended label processing, all labels read or written by the system are found in the user label buffer. The user label buffer is defined by word FET+11B as follows:

59	35	17	0	
	Length of Label Buffer	FWA of Label Buffer		FET+11B

Within the label buffer, each label that appears is in display code with the same format it has on the tape (see Appendix B) and is preceded by a status word of the format:

59	11	0
	Characters in label	

Only bits 0-11 should be set by the user to show the number of characters in the label. The last label in the buffer must be followed by a status word of all zeros.

When a magnetic tape file is opened, the tape executive guarantees that no processing will occur unless the Volume Serial Number {VSN} contained in the VOL1 label agrees with that requested by the user. If the file is opened for read, the user label buffer is searched for a HDR1 label. If found, the HDR1 tape label is compared with the information contained in the user label buffer. If any discrepancies occur, an informative diagnostic is issued and processing continues as defined for standard label processing. If no HDR1 label is found in the user label buffer, the HDR1 tape label is accepted without verification. After the open is

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issued, all labels {both required and optional} are delivered to the user label buffer beginning with V0L1. The responsibility for the verification of all labels other than V0L1 and HDR1 resides with the user.

If the file is opened for write or closed, any user labels to be written must be present in the user label buffer order independent. The user may, but need not, specify the required labels. Required labels will be generated using default values if not specified. User specified V0L1 labels are ignored; HDR1 labels in the label buffer will be used if the file is being opened for write. EOF1 and EOV1 present in the label buffer will be used if the file is being closed.

Extended label processing will be implemented as time and funding permits.

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3.4 Operator Interface

3.4.1 On all tape requests where a VSN is absent or has not previously been specified by a VSN card, the operator assignment will be handled as in KRONOS 2.0 {see KRONOS 2.0 Operator's Guide, page 3-10}. This is not the recommended procedure in KRONOS 2.1, but it is retained for compatibility.

However, if the tape request had specified an equipment number {e.g., ASSIGN card}, a pseudo-VSN will be given to the tape mounted on the specified equipment and the assignment is handled as if the VSN had been specified {see Section 3.4.1.1}.

3.4.1.1 Whenever a VSN is known for the tape, tape assignment occurs automatically when the tape becomes available providing the assignment of the tape does not create a deadlock situation {see Appendix E}.

3.4.1.2 If a tape is a standard labeled tape, then the availability of the tape is determined automatically by the system by checking the VOL1 label at the time the tape is mounted.

If a tape is not a standard labeled tape or after the system has determined the Volume Serial Number on a standard labeled tape, it is possible for an operator to enter a Volume Serial Number for a given unit {see Section 3.4.6.1}.

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3.4.2 The operator will be notified via the tape display (see Section 3.4.5 and Appendix C) to mount a particular tape if it is the next reel in a multi-reel set or has been dismounted during the assignment sequence.

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3.4.3 The EST entry format to specify tapes is as follows:

$EQee = MT-n,av,eq,uu,cha, chb, chc, chd.$

where:

ee = Starting EST ordinal.

n = Number of units. "n" EST entries will actually be generated consecutively starting at ee.

av = ON or OFF. This will only be meaningful in regards to ASSIGN cards.

eq = Controller equipment number.

uu = Starting unit number. The actual units in use must start with unit number uu and there must be n units available with consecutive unit numbers.

cha, chb, chc, chd = 1 to 4 optional channels.

3.4.4 In order to obtain optimum tape performance and throughput, the following restrictions are placed on tape configurations:

3.4.4.1 When more than one channel access is available to some tapes, the configuration for all units that may be accessed by multiple channels must be the same. In addition, all other tapes to be supported must be on one of the multiple channels.

An example of this is as follows:

Given:

3528-3 and a 3228. If the 3528-3 is accessed thru channels 7 and 13, then the 3228 will have to be on either channel 7 or 13. Also if another 3528-3 was added to the above it would have to be on channels 7 and 13 also.

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3.4.4.2 Unit numbers on tape units must not be switched after tape executive initialization. Otherwise, for example, unit types such as 7 and 9 track will get confused.

3.4.5 DSD Displays

A tape display will be provided in order to provide the operator with an easy way to determine tape availability, drive status, Volume Serial Number of tape mounted, job assigned to, etc. A second display will be provided in order to provide the operator with a list of Volume Serial Numbers and removable disk Packnames which active jobs will need to have mounted so that they may eventually complete. See Appendix C for the description of these displays.

3.4.6 Operator Commands

3.4.6.1 VSN Command

The VSN command allows the operator to specify a Volume Serial Number for a mounted unlabeled tape so that it may be assigned and referenced from a job automatically. The format of the command is as follows:

VSN,nn,aaaaaa.

where:

nn = unit number

aaaaaa = Volume Serial Number.

This allows automatic assignment for non-labeled tapes.

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3.4.6.2 DOWN Command

The DOWN command allows the operator to logically remove a tape or disk drive{S} from the operating environment while retaining all tables associated with the drive. The format of the command is:

DOWN,eq.

where:

eq is the EST ordinal of the equipment.

3.4.6.3 UP Command

The UP command allows the operator to logically restore a tape or disk drive{S} to the operating environment. The format of the command is:

UP,eq.

where:

eq is the EST ordinal of the equipment.

3.4.6.4 UNLOAD Command

The UNLOAD command causes a tape or disk drive to be temporarily unavailable while the operator dismounts the tape or disk pack. For removable packs, no new users will be allowed to access the pack. Current users may use the pack to complete their jobs. The format of the command is:

UNLOAD,eq.

where:

eq is the EST ordinal of the equipment.

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| 3.4.6.5 n.MAGNET. Command

This command allows the operator to initiate the KRONOS tape executive {MAGNET} at control point n. It is necessary for MAGNET to be active in order for tape processing to take place under KRONOS 2.1.

| 3.4.6.6 Enable/Disable Commands

Two commands are provided for the operator to be able to control whether MAGNET is initiated or not on an AUTO or MAINTENANCE DSD command {see Operator's Guide, Chapter 3}.

The format of these commands are as follows:

ENABLE,MAGNET.

DISABLE,MAGNET.

The entering of MAGNET in an IPRDECK or during deadstart, while SET is processing IPRDECK, will toggle the status of initialization for MAGNET.

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3.5 Tape Formats

3.5.1 See Appendix D.

3.5.2 This section contains no information.

3.5.3 This section contains no information.

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3.5.4 Label Parameters and Fields

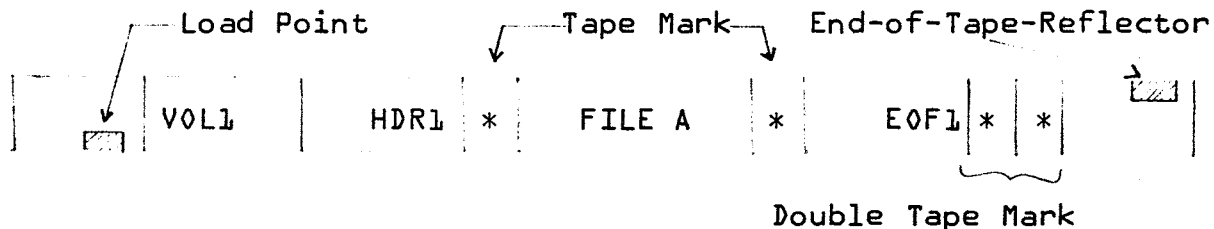
3.5.4.1 ANSI Standard Label Fields

The four required ANSI labels are as follows. Tape marks separating items are completely system controlled.

- VOLL** Must be the first label on a labeled tape. Each volume in a volume set must be identified as VOLL; a field in the following HDR1 label gives an actual reel number.
- HDR1** Required label before each file or continuation of a file on another volume. It is preceded by a VOLL label or tape mark. Each file must have a HDR1 label which specifies an actual position number for multi-file sets.
- EOF1** Terminating label for file defined by HDR1 label; the EOF1 label is the KRONOS end-of-information for the file. A single tape mark precedes EOF1. A double tape mark written after the EOF1 label marks the end of a multi-file set.
- EOVL** Required only if physical end-of-tape reflector is encountered before an EOF1 is written or if a multi-file set is continued on another volume. It is preceded by a single tape mark and followed by a double tape mark.

The structure of KRONOS tapes that results from these required labels is shown below. The label identifier and number is used to denote the entire 80-character label in these figures.

Single Reel File:



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Multi-Reel File:

	VOL1	HDR1	*	FILE A	*	EOF1	*	*	
--	------	------	---	--------	---	------	---	---	--

	VOL1	HDR1	*	FILE A {Continued}	*	EOF1	*	*	
--	------	------	---	-----------------------	---	------	---	---	--

Multi-File Reel:

	VOL1	HDR1	*	FILE A	*	EOF1	*	HDR1	*	FILE B	*	EOF1	*	*
--	------	------	---	--------	---	------	---	------	---	--------	---	------	---	---

Multi-file multi-reels in a volume set are also possible.

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3.5.4.2 Format and Contents of Labels

The word "optional" is sometimes used in the name or description of fields in this specification. When used, "optional" means that the field may, but need not, contain the information described. If an optional field does not contain the designated information, it shall contain spaces. In the following descriptions, "n" means any numeric digit, 0 through 9. An "a" means any of the characters occupying the center four columns of ASCII {American National Standard Code for Information Interchange} except position 5/15 and those positions where there is a provision for alternative graphic representation.

The limitation on "a" characters is intended as a guide to provide maximum interchangeability and consistent printing especially when international interchange is a possibility. Checking for conformity to this limitation is not implied.

Fields which are not described as "optional" are required and will be written as specified.

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3.5.4.2.1 Volume Header Label

<u>Character Position</u>	<u>Field Name</u>	<u>Length</u>	<u>Description</u>	<u>Default</u>
1-3	Label Identifier	3	Must be VOL	
4	Label Number	1	Must be 1	
5-10	Volume Serial Number	6	Six "a" characters permanently assigned by the owner to identify this physical volume {that is, reel of tape}	As read from existing label
11	Accessibility	1	An "a" character which indicates any restrictions on who may have access to the information in the volume. A "space" means unlimited access; any other character means special handling, in the manner agreed between the interchange parties.	Blank giving unlimited access
12-31	Reserved for future standardization	20	Must be "spaces"	
32-37	Reserved for future standardization	6	Must be "spaces"	
38-51	Owner Identification	14	Any "a" characters, identifying the owner of the physical volume	Family Name User Number
52-79	Reserved for future standardization	28	Must be "spaces"	

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<u>Character Position</u>	<u>Field Name</u>	<u>Length</u>	<u>Description</u>	<u>Default</u>
80	9 Label Standard Level	1	1 means the labels and data formats on this volume conform to the requirements of the ANSI standard. "Space" means the labels and data formats on this volume require the agreement of the interchange parties.	Blank

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3.5.4.2.2 First File Header Label

<u>Character Position</u>	<u>Field Name</u>	<u>Length</u>	<u>Description</u>	<u>Default</u>
1-3	1 Label Identifier	3	Must be HDR	
4	2 Label Number	1	Must be 1	
5-21	3 File Identifier	17	Any "a" characters agreed on between originator and recipient.	Blank
22-27	4 Set Identification	6	Any "a" characters to identify the set of files of which this is one. This identification must be the same for all files of a multi-file set.	Blank
28-31	5 File Section Number	4	The file section number of the first header label of each file is 0001. This applies to the first or only file on a volume and to subsequent files on a multi-file volume. This field is incremented by one on each subsequent volume of the file.	0001
32-35	6 File Sequence Number	4	Four "n" characters denoting the sequence {that is, 0001, 0002, etc.} of files within the volume or set of volumes. In all the labels for a given file, this field will contain the same number.	0001

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 PRODUCT MODEL NO. EDAB*2.1
 MACHINE SERIES BDDO/CDC CYBER 72.73.74
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<u>Character Position</u>	<u>Field Name</u>	<u>Length</u>	<u>Description</u>	<u>Default</u>
36-39	7 Generation Number {optional}	4	Four "n" characters denoting the current stage in the succession of one file generation by the next. When a file is first created, its generation number is 0001.	0001
40-41	8 Generation Version Number {optional}	2	Two "n" characters distinguishing successive iterations of the same generation. The generation version number of the first attempt to produce a file is 00.	00
42-47	9 Creation Date	6	A "space" followed by two "n" characters for the year, followed by three "n" characters for the day {001 to 366} within the year.	Current date
48-53	10 Expiration Date	6	Same format as field 9. This file is regarded as "expired" when today's date is equal to, or later than, the date given in this field. When this condition is satisfied, the remainder of this volume may be overwritten. To be effective on multi-file volumes therefore, the expiration date of a file must be less than, or equal to, the expiration date of all previous files on the volume.	Current date

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<u>Character Position</u>	<u>Field Name</u>	<u>Length</u>	<u>Description</u>	<u>Default</u>
54	11 Accessibility	1	An "a" character which indicates any restrictions on who may have access to the information in this file. A "space" means unlimited access; any other character means special handling, in a manner agreed between the interchange parties.	Blank
55-60	12 Block Count	6	Must be "zeros"	
61-73	13 System Code {optional}	13	Thirteen "a" characters identifying the operating system that recorded this file.	KRONOS 2.1-nn {where nn=EST ordinal of unit written on.}
74-80	14 Reserved for future standardization	7	Must be "spaces"	

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3.5.4.2.3 First End-of-File Label

<u>Character Position</u>	<u>Field</u>	<u>Name</u>	<u>Length</u>	<u>Description</u>	<u>Default</u>
1-3	1	Label Identifier	3	Must be EOF	
4	2	Label Number	1	Must be 1	
5-54	3-11	Same as corresponding fields in the first file header label {optional}	50	Same as corresponding fields in the first file header label	
55-60	12	Block Count	6	Six "n" characters denoting the number of data blocks {exclusive of labels and tape marks} since the preceding HDR label group	
61-80	13,14	Same as corresponding fields in the first file header label {optional}	20	Same as corresponding fields in the first file header label	

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3.5.4.2.4 First End-of-Volume Label

<u>Character Position</u>	<u>Field Name</u>	<u>Length</u>	<u>Description</u>	<u>Default</u>
1-3	1 Label Identifier	3	Must be EOV	
4	2 Label Number	1	Must be 1	
5-54	3-11 Same as corresponding fields in the first file header label {optional}	50 {total}	Same as corresponding fields in the first file header label	
55-60	12 Block Count	6	Six "n" characters denoting the number of data blocks {exclusive of labels and tape marks} since the preceding HDR label group	
61-80	13-14 Same as corresponding fields in the first file header label {optional}	20 {total}	Same as corresponding fields in the first file header label	

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3.6 Deadstart

KRONOS will be able to deadstart from a 604, 607, 657 or 659 tape unit.

3.7 Other

3.7.1 Limitations

An ability to handle PRU's greater than 2560 bytes in length will be provided for read on all drives except possibly the 659-3 and 659-4 at 1600 BPI. The upper limit on this for all drives will be 20,000 bytes. A free channel besides the tape channel will be required for this capability.

3.7.2 Reliability

3.7.2.1 Controlled Backspace will be used in error recovery.

3.7.2.2 Programmable Clip will be considered based on available time, funding, and hardware. Implementation of this feature does not change these external specifications.

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4.0 DEFINITIONS

BLOCK

A group of contiguous characters recorded on or read from magnetic tape as a unit.

FILE

A collection of information, consisting of the records pertaining to a general subject. The absence of information may result in the creation of a file {delimited by adjacent tape marks} without information.

FILE SET

A collection of one or more related files recorded on one or more volumes. A file set may consist of:

- One file recorded on a single volume.
- More than one file recorded on a single volume.
- One file recorded on more than one volume.
- More than one file recorded on more than one volume.

LABEL

A block at the beginning or end of a volume or a file, which serves to identify or delimit, or both identify and delimit, that volume or file.

LABEL GROUP

A collection of contiguous labels pertaining to a file that precede or follow that file or part of that file on one volume. The Volume Header Label or labels together with the File Header Label

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or labels that follow them are considered to be the first label group on the volume.

RECORD

A collection of related items of data, which for operating system logic purposes is treated as a unit of information.

TAPE MARK

A special configuration recorded on magnetic tape, essentially indicating the boundary between files and labels, and also between certain label groups. The tape mark configuration is defined in the relevant recorded magnetic tape standards.

VOLUME

A physical unit of storage media. The word "volume", as used in reference to labels, is completely synonymous with "reel of magnetic tape".

APPENDIX A

KRONOS 2.1

STANDARD CHARACTER SETS FOR MAGNETIC TAPES

CDC Graphic	ASCII Graphic Subset	Display Code	Hollerith Punch {026}	External BCD Code	ASCII Punch {029}	ASCII Code
‡	:	00‡	8-2	00	8-2	3A
A	A	01	12-1	61	12-1	41
B	B	02	12-2	62	12-2	42
C	C	03	12-3	63	12-3	43
D	D	04	12-4	64	12-4	44
E	E	05	12-5	65	12-5	45
F	F	06	12-6	66	12-6	46
G	G	07	12-7	67	12-7	47
H	H	10	12-8	70	12-8	48
I	I	11	12-9	71	12-9	49
J	J	12	11-1	41	11-1	4A
K	K	13	11-2	42	11-2	4B
L	L	14	11-3	43	11-3	4C

‡ Twelve or more zero bits at the end of a 60-bit word are interpreted as end-of-line mark rather than two colons. End-of-line mark is converted to external BCD 1632.

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CDC Graphic	ASCII Graphic Subset	Display Code	Hollerith Punch {026}	External BCD Code	ASCII Punch {029}	ASCII Code
M	M	15	11-4	44	11-4	4D
N	N	16	11-5	45	11-5	4E
O	O	17	11-6	46	11-6	4F
P	P	20	11-7	47	11-7	50
Q	Q	21	11-8	50	11-8	51
R	R	22	11-9	51	11-9	52
S	S	23	0-2	22	0-2	53
T	T	24	0-3	23	0-3	54
U	U	25	0-4	24	0-4	55
V	V	26	0-5	25	0-5	56
W	W	27	0-6	26	0-6	57
X	X	30	0-7	27	0-7	58
Y	Y	31	0-8	30	0-8	59
Z	Z	32	0-9	31	0-9	5A
0	0	33	0	12	0	30
1	1	34	1	01	1	31
2	2	35	2	02	2	32
3	3	36	3	03	3	33
4	4	37	4	04	4	34

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CDC Graphic	ASCII Graphic Subset	Display Code	Hollerith Punch {026}	External BCD Code	ASCII Punch {029}	ASCII Code
5	5	40	5	05	5	35
6	6	41	6	06	6	36
7	7	42	7	07	7	37
8	8	43	8	10	8	38
9	9	44	9	11	9	39
+	+	45	12	60	12-8-6	28
-	-	46	11	40	11	2D
*	*	47	11-8-4	54	11-8-4	2A
/	/	50	0-1	21	0-1	2F
{	{	51	0-8-4	34	12-8-5	28
}	}	52	12-8-4	74	11-8-5	29
\$	\$	53	11-8-3	53	11-8-3	24
=	=	54	8-3	13	8-6	3D
blank	blank	55	no punch	20	no punch	20
, {comma}	, {comma}	56	0-8-3	33	0-8-3	2C
. {period}	. {period}	57	12-8-3	73	12-8-3	2E
≡	#	60	0-8-6	36	8-3	23
[[61	8-7	17	12-8-2	5B
]]	62	0-8-2	32	11-8-2	5D

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 PRODUCT MODEL NO. EDBA*2.1
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CDC Graphic	ASCII Graphic Subset	Display Code	Hollerith Punch {026}	External BCD Code	ASCII Punch {029}	ASCII Code
%††	%	63	8-6	16	0-8-4	25
#	"{quote}	64	8-4	14	8-7	22
→	_ {underline}	65	0-8-5	35	0-8-5	5F
√	!	66	11-0	52	12-8-7	21
^	&	67	0-8-7	37	12	26
↑	' {apostrophe}	70	11-8-5	55	8-5	27
↓	?	71	11-8-6	56	0-8-7	3F
<	<	72	12-0	72	12-8-4	3C
>	>	73	11-8-7	57	0-8-6	3E
∩	@	74	8-5	15	8-4	40
∪	/	75	12-8-5	75	0-8-2	5C
┌	~ {circumflex}	76	12-8-6	76	11-8-7	5E
; {semicolon}	; {semicolon}	77	12-8-7	77	11-8-6	3B

†† In installations using the CDC 63-graphic set, display code 00 has no associated graphic or Hollerith code; display code 63 is the colon {8-2 punch}. The selection of 63 or 64 character set for tapes is an installation option at deadstart.

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CONTROL DATA CORPORATION

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DOCUMENT CLASS ERS PAGE NO. I A-5 Rev A 1
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

CONTROL DATA CHARACTER SETS

SHOWING TRANSLATIONS BETWEEN DISPLAY CODE AND ASCII/EBCDIC

DISPLAY CODE		ASCII				EBCDIC			
		UPPER CASE		LOWER CASE		UPPER CASE		LOWER CASE	
OCTAL	CH	CH	HEX	CH	HEX	CH	HEX	CH	HEX
00	:	:	3A	SUB	1A	:	7A	SUB	3F
01	A	A	41	a	61	A	C1	a	81
02	B	B	42	b	62	B	C2	b	82
03	C	C	43	c	63	C	C3	c	83
04	D	D	44	d	64	D	C4	d	84
05	E	E	45	e	65	E	C5	e	85
06	F	F	46	f	66	F	C6	f	86
07	G	G	47	g	67	G	C7	g	87
10	H	H	48	h	68	H	C8	h	88
11	I	I	49	i	69	I	C9	i	89
12	J	J	4A	j	6A	J	D1	j	91
13	K	K	4B	k	6B	K	D2	k	92
14	L	L	4C	l	6C	L	D3	l	93
15	M	M	4D	m	6D	M	D4	m	94
16	N	N	4E	n	6E	N	D5	n	95
17	O	O	4F	o	6F	O	D6	o	96
20	P	P	50	p	70	P	D7	p	97
21	Q	Q	51	q	71	Q	D8	q	98

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

DISPLAY CODE		ASCII				EBCDIC			
		UPPER CASE		LOWER CASE		UPPER CASE		LOWER CASE	
OCTAL	CH	CH	HEX	CH	HEX	CH	HEX	CH	HEX
22	R	R	52	r	72	R	D9	r	99
23	S	S	53	s	73	S	E2	s	A2
24	T	T	54	t	74	T	E3	t	A3
25	U	U	55	u	75	U	E4	u	A4
26	V	V	56	v	76	V	E5	v	A5
27	W	W	57	w	77	W	E6	w	A6
30	X	X	58	x	78	X	E7	x	A7
31	Y	Y	59	y	79	Y	E8	y	A8
32	Z	Z	5A	z	7A	Z	E9	z	A9
33	0	0	30	DLE	10	0	F0	DLE	10
34	1	1	31	DC1	11	1	F1	DC1	11
35	2	2	32	DC2	12	2	F2	DC2	12
36	3	3	33	DC3	13	3	F3	TM	13
37	4	4	34	DC4	14	4	F4	DC4	3C
40	5	5	35	NAK	15	5	F5	NAK	3D
41	6	6	36	SYN	16	6	F6	SYN	32
42	7	7	37	ETB	17	7	F7	ETB	26
43	8	8	38	CAN	18	8	F8	CAN	18
44	9	9	39	EM	19	9	F9	EM	19
45	+	+	2B	VT	0B	+	4E	VT	0B
46	-	-	2D	CR	0D	-	60	CR	0D

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DOCUMENT CLASS ERS PAGE NO. I A-7 Rev 41
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

DISPLAY CODE		ASCII				EBCDIC			
		UPPER CASE		LOWER CASE		UPPER CASE		LOWER CASE	
OCTAL	CH	CH	HEX	CH	HEX	CH	HEX	CH	HEX
47	*	*	2A	LF	0A	*	5C	LF	25
50	/	/	2F	SI	0F	/	61	SI	0F
51	{	{	28	BS	08	{	4D	BS	16
52	}	}	29	HT	09	}	5D	HT	05
53	⌘	⌘	24	EOT	04	⌘	5B	EOT	37
54	=	=	3D	GS	1D	=	7E	IGS	1D
55	SP	SP	20	NUL	00	SP	40	NUL	00
56	,	,	2C	FF	0C	,	6B	FF	0C
57	.	.	2E	S0	0E	.	4B	S0	0E
60	≡	#	23	ETX	03	#	7B	ETX	03
61	[	[	5B	FS	1C	⌘	4A	IFS	1C
62	]	]	5D	SOH	01	!	5A	SOH	01
63	%	%	25	ENQ	05	%	6C	ENQ	2D
64	≠	"	22	STX	02	"	7F	STX	02
65	∇	_	5F	DEL	7F	_	6D	DEL	07
66	√	!	21	}	7D	|	4F	}	0D
67	∧	&	26	ACK	06	&	50	ACK	2E
70	↑	,	27	BEL	07	,	7D	BEL	2F
71	↓	?	3F	US	1F	?	6F	IUS	1F
72	<	<	3C	}	7B	<	4C	}	0D

CONTROL DATA CORPORATION

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DOCUMENT CLASS ERS PAGE NO. I A-8 Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EQ88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

DISPLAY CODE		ASCII				EBCDIC			
		UPPER CASE		LOWER CASE		UPPER CASE		LOWER CASE	
OCTAL	CH	CH	HEX	CH	HEX	CH	HEX	CH	HEX
73	>	>	3E	RS	1E	>	6E	IRS	1E
74	≤	@	40	\	60	@	7C	\	79
75	≥	|	5C	|	7C	|	E0	|	6A
76	⌋	~	5E	~	7E	⌋	5F	~	A1
77	;	;	3B	ESC	1B	;	5E	ESC	27

NOTES:

1. The terms "upper case" and "lower case" apply only to the case conversions, and do not necessarily reflect any true "case".
2. When translating from Display Code to ASCII/EBCDIC, the "upper case" equivalent character is taken.
3. When translating from ASCII/EBCDIC to Display Code, the "upper case" and "lower case" characters fold together to a single Display Code equivalent character.
4. All EBCDIC codes not listed are translated to Display Code 55 {SP}.
5. If a 9 track tape is read with ASCII conversion, and a character value above 7F is encountered, a flag word error will be given.
6. In a 63-character set system, the display code for the : graphic is 63. The % character does not exist, and translations from ASCII/EBCDIC % or ENQ yield blank {55g}.

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPENDIX B

MAGNETIC TAPE LABELS

ANSI Labels

KRONOS system file labels are defined for files recorded on 1/2 inch magnetic tape. These labels are designed to conform to the American National Standard Magnetic Tape Labels for Information Interchange X3.27-1969.

KRONOS system labels are recorded at the same density as the data on the tape. All system labels are 80 characters in length.

The first three characters of an ANSI label identify the label type. The fourth character indicates a number within the label type.

<u>Type</u>	<u>No.</u>	<u>Label Name</u>	<u>Used At</u>	
VOL	1	Volume header label	Beginning of volume	Required
UVL	1-9	User volume label	Beginning of volume	Optional
HDR	1	File header label	Beginning of file	Required
HDR	2-9	File header label	Beginning of file	Optional
UHL	†	User header label	Beginning of file	Optional
EOF	1	End-of-file label	End of file	Required
EOF	2-9	End-of-file label	End of file	Optional
EOV	1	End-of-volume label	End of volume	Required when appropriate
EOV	2-9	End-of-volume label	End of volume	Optional
UTL	†	User trailer label	End of file	Optional

† Any member of CDC 6-bit subset of ASCII character set.

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DIVISION

DOCUMENT CLASS ERS PAGE NO. I B-2
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

TAPE FILE STRUCTURE

KRONOS standard system labels and tape marks establish the tape file structure according to the following rules. Required labels are indicated by a 4-character identifier, and tape marks are indicated by asterisks. In all the cases below, optional labels are placed as follows:

HDR2 through HDR9 may immediately follow HDR1.

EOF2 through EOF9 may immediately follow EOF1.

E0V2 through E0V9 may immediately follow E0V1.

UVL{a} {User Volume Label} may immediately follow VOL1.

UHL{a} {User Header Label} may immediately follow the last HDR{a} label.

UTL{a} {User Trailer Label} may immediately follow the last E0V{a} or EOF{a} label.

{a} indicates any 6-bit CDC character. {a} indicates any numeric character.

Single-Volume File

VOL1 HDR1* ... Data Blocks ... *EOF1**

Multi-Volume File

VOL1 HDR1* ... First Volume Data ... *E0V1**

VOL1 HDR1* ... Last Volume Data ... *EOF1**

Multi-File Volume

VOL1 HDR1* ... File A ... *EOF1*HDR1* File B *EOF1**

DOCUMENT CLASS ERS PAGE NO. I B-3
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EQ88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

Multi-Volume Multi-File

VOLL HDR1* ... File A ... *EOF1*HDR1* ... File B ... *EOV1**

VOLL HDR1* ... Continuation of File B ... *EOV1**

VOLL HDR1* ... Last of File B ... *EOF1*HDR1* ... File C ... *EOF1**

Volume Header Label

The first PRU in the volume must be a volume header label; it may not appear elsewhere.

File Header Label

Every file must be preceded by a file header label and every file header must be preceded by a tape mark or a volume header label. When a volume ends within a file, the continuation of that file in the next volume must also be preceded by a file header.

File Trailer Label

A file trailer label is required as the last block of every file. A file trailer must be preceded and followed by a tape mark, and if it is the last file trailer in the volume, two following tape marks are required.

Volume Trailer Label

When a volume ends within a file, the last PRU of the file in that volume must be followed by a volume trailer label which must be preceded and followed by tape marks.

When end-of-volume and end-of-file coincide, the labeling configuration is one of the following {* indicates tape mark}:

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DOCUMENT CLASS ERS PAGE NO. I B-4
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

```
VOLL HDR1* ... File A ... *E0V1**  
VOLL HDR1**E0F1*HDR1 ... File B ... *E0F1**  
    {A}    {A} {B}  
VOLL HDR1* ... File A ... *E0F1*HDR1**E0V1**  
    {A}                                {B}  
VOLL HDR1* ... File B ... *E0F1**  
    {B}  
VOLL HDR1* ... File A ... *E0F1*E0V1**  
    {A}                                {A}  
VOLL HDR1* ... File B ... *E0F1**  
    {B}                                {B}
```

ANSI LABELS

The labels processed by KRONOS are the ANSI labels which follow:

DOCUMENT CLASS ERS
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED&B*2.1
 MACHINE SERIES 6000/CDC CYBER 72-73-74
 PAGE NO. I B-5Rev A

Character Position	Field	ANSI Name {KRONOS Name}	Length	Contents	Default Written	Checked On Read
1-3	1	Label Identifier	3	VOL	VOL	Yes
4	2	Label Number	1	1	1	Yes
5-10	3	Volume Serial Number	6	Any "a" characters	As specified	Yes if file assigned by VSN
11	4	Accessibility	1	1 "a" character	space	No**
12-31	5	Reserved	20	spaces	spaces	No
32-37	6	Reserved	6	spaces	spaces	No
38-51	7	Owner ID	14	Any "a" characters	Family Name, User Number	No
52-79	8	Reserved	28	spaces	spaces	No
80	9	Label Standard Level	1	blank	blank	No
1-3	1	Label Identifier	3	HDR	HDR	Yes
4	2	Label Number	1	1	1	Yes
5-21	3	File Identifier	17	Any "a" characters	spaces	Yes
22-27	4	Set Identification	6	Any "a" characters	blank	No*
28-31	5	File Section Number	4	4 "n" characters indicating number of volume in file	0001	Yes

Volume Header Label

First File Header Label

* Check if specified.
 ** See Section 3.2.5.

DOCUMENT CLASS

ERS

PRODUCT NAME

KRONOS 2.1

PAGE NO. I B-b Rev A

PRODUCT MODEL NO.

ED58*2.1

MACHINE SERIES BDD0/CDC CYBER 72,73,74

Character Position	Field	ANSI Name {KRONOS Name}	Length	Contents	Default Written	Checked On Read
32-35	6	File Sequence Number	4	4 "n" characters indicating number of file in multi-file set	0001	Yes
36-39	7	Generation Number	4	4 "n" characters	0001	No*
40-41	8	Generation Version Number	2	2 "n" characters indicating the edition of file	00	Yes
42-47	9	Creation Date	6	Space followed by 2 "n" characters for year, 3 "n" characters for day	Current date is used	Yes
48-53	10	Expiration Date	6	Same as field 9	Same as field 9	Yes
54	11	Accessibility	1	Any "a" characters	space	No**
55-60	12	Block Count	6	Zeros	Zeros	No
61-73	13	System Code	13	Any "a" characters	KRONOS 2.1- nn {where nn-EST ordinal of unit written on.}	No
74-80	14	Reserved	7	spaces	spaces	No

* Check if specified.

** See Section 3.2.5.

	Character Position	Field	ANSI Name {KRONOS Name}	Length	Contents	Default Written	Checked On Read
Additional File Header Labels	1-3	1	Label Identifier	3	HDR	HDR	Yes
	4	2	Label Number	1	2-9	2-9	Yes
	All other fields are not checked on read; they are written as received by KRONOS from user.						
First End-of-File Label	1-3	1	Label Identifier	3	EOF	EOF	Yes
	4	2	Label Number	1	1	1	Yes
	5-54	3-11	Same as corresponding HDR1 label fields				
	55-60	12	Block Count	6	6 "n" characters; number of data blocks since last HDR label group		Yes
	61-80	13-14	Same as corresponding HDR1 label fields				
Additional End-of-File Labels	1-3	1	Label Identifier	3	EOF	EOF	Yes
	4	2	Label Number	1	2-9	2-9	Yes
	All other fields are not checked on read; they are written as received by KRONOS from user.						
First End-of-Volume Label	1-3	1	Label Identifier	3	EOV	EOV	Yes
	4	2	Label Number	1	1	1	Yes
	All other fields are identical to EOF1 label.						
Additional End-of-Volume Labels	1-3	1	Label Identifier	3	EOF	EOF	Yes
	4	2	Label Number	1	2-9	2-9	Yes
	All other fields are not checked on read; they are written as received by KRONOS from user.						

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DOCUMENT CLASS ERS PAGE NO. I B-B
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EDBB*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

	Character Position	Field	ANSI Name {KRONOS Name}	Length	Contents	Default Written	Checked On Read
USER Labels	1-3	1	Label Identifier	3	3 letter code; UVL, UHL, or UTL		Yes
	4-80	Any "a" characters. Content of these fields is not checked on read; is written as received by KRONOS from the user.					

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EQ88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPENDIX C

TAPE ASSOCIATED DISPLAYS

The displays related to magnetic tape processing are the E.T. and E.P. displays. These displays are subsets of the E display.

1. E.T. Display

TAPE STATUS

EQ	VSN	DEN	R	F	CP	JOB	STATUS
MT00	123456 ABCDEFGHIJKLMNO P	200	IN	I	2.	TESABCDB	READY
MT01							IDLE
MT02	SCRATCH	800		S	4.	AAQBOOST	LOADPT
MT03		556		X	2.	TESABCDB	READY
NT04	VOLUME 1600 KRONOS TAPE		IN	SI		SCPTAAQB	ROLLED
NT05							DOWN
NT06	UNIT06	800		F	3.	TESABCDB	READY

EQ = Equipment

MTuu = seven track, uu = unit number
 NTuu = nine track, uu = unit number

VSN = Volume Serial Number

Volume Serial Number {1-6 characters}
 File Identifier {1-17 characters}

DEN = Density, will be one of:

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

absent
 200
 556
 800
 1600

R = Ring Status, will be one of:

IN if ring in
 absent if ring out

F = Format, will be one of {L format will be displayed as S}:

I
 SI
 X
 S
 E
 B
 F

CP = Control Point

JOB = Jobname and origin

STATUS = Status, will be one of:

READY
 IDLE
 LOADPT
 ROLLED
 DOWN

2. E.P. Display

PREVIEW

JOB	VSN	EQ	JOB	VSN	EQ
SCPOAABB	TAPE99	MT	PFTTAANB	RPAC002	D12

JOB = Jobname and origin

VSN = Volume Serial Number or Packname

EQ = Resource type

DOCUMENT CLASS ERS PAGE NO. I D-1 Rev H |
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. EDBB*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPENDIX D

END OF TAPE and TAPE FORMATS

DEFINITIONS:

BINARY

No code conversion performed. 7 track and 9 track both are written and read in odd parity.

CODED

7 track is written and read in even parity. 9 track is written and read in odd parity. On 7 track, code conversion will be performed between external BCD and display code. On 9 track, read conversion will be performed from an eight bit ASCII or EBCDIC character to a six bit display code character. On 9 track write, six bit display code characters will be mapped to eight bit ASCII or EBCDIC characters. The selection of ASCII or EBCDIC is a user option.

END OF TAPE

The following are the user options available when End-of-Tape {EOT} is sensed.

1. On write when EOT is sensed the block on which EOT occurred will be rewritten as the first block on the following reel. No trailer information will be placed on the current reel. On read the block on which EOT occurred will be discarded and the read will continue on the next reel. If a tape mark and EOT occur at the same time, EOT will be ignored. {This is compatible with KRONOS 2.0.}

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PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

2. On write tape marks will be written following the block on which EOT was sensed. The write will then continue on the next reel. On read the block on which EOT is sensed as well as all following blocks will be transferred to the user until a tape mark is sensed. The read will then continue on the next reel. If a tape mark and EOT are sensed at the same time then EOT will be ignored {SCOPE 3.4 unlabeled compatible}.
3. On write when an EOT is sensed a trailer label sequence {tape mark plus EOV1 label} will be written following that block. The next block will then be written on the next reel. On read, an EOT will be ignored. A read will stop at a tape mark followed by an EOV1 label. Reading will then continue on the next reel.

USER ERROR PROCESSING BY EP BIT

If the user wishes to do his own error processing, the EP bit {bit 44 in FET+1} must be set {EP=1}. If default RPE/WPE processing has been selected and EP is set, the error code of 4 will be returned in bits 10-13 of FET+0 if an unrecoverable tape error is detected.

REWIND/UNLOAD PROCESSING

Any time a REWIND/UNLOAD is performed and the last operation on the tape was a write the following will be performed.

1. On an unlabeled tape {except I, SI format} four tape marks will be written.

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2. On a labeled tape {unlabeled I, SI format also} a trailer label sequence will be written.

Positioning of the tape after a REWIND will be as follows:

1. If user processing selected, the tape will be positioned at the beginning of data for the current reel or current file whichever occurred first {where file is in reference to a multi-file tape}.
2. If no user processing selected, positioning will be at the beginning of file. If this requires backing over reels this will be done transparently to the user. The system will request the appropriate previous reel based on the VSN file. If tape assignments are being made via the old method of operator assignment of equipment numbers and thus the system is assigning default VSN's, then multi reel operations may leave the operator confused as to what reel to mount.

The following defines the action taken by the system when end-of-reel is encountered during tape operations {where occurrence of end-of-reel is as defined by one of the options specified earlier}.

1. User processing not selected in FET
 - a. Processing will continue as if user had performed a CLOSER function without user processing selected {see definition of CLOSER}.
2. User processing selected in FET
 - a. Control will be returned to the calling program with end-of-reel status set in the FET. Tape will be positioned

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. EO88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

so that if user attempts to perform another I/O operation the result will be the same. Thus, a user cannot run off end of reel.

- b. The user would not normally either issue a CLOSER function or an unload. {See definition of these functions.}
3. REWIND and UNLOAD after end of reel as well as CLOSER at all times will cause the following to occur:
 - a. If the last operation on the tape was a write:
 - 1} If unlabeled, a tape mark will be written.
 - 2} If labeled, a trailer label sequence will be written.
 - a} If next VSN has been previously declared, an optional operating system label will be written containing the VSN of the next reel.
 - b} If next VSN has not been declared before, the trailer label sequence will not be performed until the operator has specified the next VSN. Then action will continue as in step above.
 - 3} If I or SI format and unlabeled, the optional operating system label will be written only if the VSN has been previously specified or if the VSN specified by the operator was not a system default VSN.
 - b. If the last operation on the tape was a read:
 - 1} If next VSN for the tape previously declared, proceed to 3.c.
 - 2} If next VSN not previously declared and if tape has a trailer label sequence on it with an optional operat-

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ing system label of the correct format then extract
the next VSN otherwise continue.

- c. The present reel will be rewound and {or} unloaded.
 - d. If a CLOSER operation without UP, the type is declared as labeled, and the FET is long enough to allow for a label field, the file section number will be incremented in the users FET.
 - e. The FET is completed. If CLOSER with user processing selected, end-of-reel status is returned again.
4. Continuation of operation on next reel:
- a. If VSN for next reel is not yet known, then notify operator next VSN needs to be specified.
 - b. When next VSN is known for file request operator to mount it if it is not already mounted. This new tape does not have to be on the same drive as the previous one.
5. If labeled operation, the calling program may do an open on the file to get label information returned to its buffer.

BLOCK TERMINATOR

A block terminator will be used after certain data blocks as specified below. This block terminator will be in one of two formats:

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DOCUMENT CLASS ERS PAGE NO. I D-6 Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

1. Binary Mode Block Terminator Format

47	35	11	3	0
BYTE COUNT	BLOCK NUMBER	0	LN	

BYTE COUNT = Total number of bytes in the block including the block terminator.

BLOCK NUMBER = Count of blocks since the last "HDR1" label.

LN = Level number.

2. Coded Mode Block Terminator Format prior to Code Conversion

47	5	0
7 BLANKS {55}	LN	

where L = 55 for level 0, L = 1 through 17 for all other levels.

Block Terminator Usage:

1. All data blocks in I format will have a block terminator except for labels.
2. All data blocks of less than 1000B CM words for binary or 200B CM words for coded will have a block terminator for SI format.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

PHYSICAL CHARACTERISTICS:

I Format {Internal}

1. Mode

Binary always. CODED/BINARY bit {bit 1 in word 0 of FET} in the FET has no meaning.

2. Block Size

The actual data block will range from 0 to 1000B CM words in exact multiples of CM words. All blocks will include a block terminator except for labels. A block may contain only a block terminator. User specified frame or character counts have no meaning.

3. EOR

Any block with less than 1000B CM words of data will represent an EOR. The level number field will contain the level number from the FET or control word {204 CIO code}. On read an EOR and the contents of the level field will be returned. If level 17, then EOF will be returned also.

4. EOF

An EOF will be block consisting of only a block terminator with a level of 17. The system will also insure that an EOR will always precede an EOF by writing a block terminator with a level of 0 if necessary prior to EOF.

5. EOI

A tape mark followed by an EOF1 label. If a tape mark is encountered without a valid label following, it will be considered as an error.

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6. End of Reel

See Item 3 under end of tape.

7. Noise

All blocks of less than 7 frames {7 track} or 5 frames {9 track} will be considered as noise.

8. Other

- a. All 9 track tapes will be written as an even multiple of bytes such that fill status will never occur.
- b. All reads will check both the block length read and the block number expected against those in the block terminator as well as checking for fill status where available. If any of these occur, messages will be issued and recovery procedures initiated. This should in general prevent dropped blocks, etc. This should provide a much higher degree of reliability than any other format.

SI Format {SCOPE Internal}

1. Mode

Binary or coded determined by BINARY/CODED bit in the FET {bit 1 in word 0 of FET}.

2. Block Size

The actual data block will range from 0 to 1000B CM words for binary in exact multiples of CM words {0 to 200B for coded}. All blocks less than the maximum size will include a block terminator except for labels. A block may contain only a block terminator. User specified frame or character counts have no meaning.

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3. E0R

Any block with less than 1000B CM words of data will represent an E0R. The level number field on write will contain the level number from the FET or control word {204 CIO code}. On read an E0R and the contents of the level field will be returned. If level 17, then E0F will be returned also.

4. E0F

Same as I mode.

5. E0I

Same as I mode.

6. End of Reel

Same as I mode.

7. Noise

Same as I mode.

8. Other

- a. All 9 track tapes will be written with EN + 2 to insure exact frame count.
- b. No block validation checking will be done.
- c. Code conversion will be as follows:
 - 1} 7 track see coded data conversion.
 - 2} 9 track no conversion performed.
- d. On a coded 7 track tape a 1632 external BCD in byte 4 of position of a CM word represents an end of line 0000 in display code.

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X Format {External - KRONOS 2.0 Binary Compatible}

1. Mode

Same as I format.

2. Block Size

The data block will range from 0 to 1000B CM words. Only a block terminator will be appended in the case of a 0 CM word count. All blocks must be an exact multiple of CM words.

3. EOR

Any block with less than 1000B CM words of data will represent an EOR. Level numbers 1 through 16 will be considered as level 0.

4. EOF

Tape mark. Cannot be labeled.

5. EOI

None.

6. End of Reel

See Item 1 under end of tape.

7. Noise

Same as I mode.

8. Other

a. Same as KRONOS 2.0 Standard Binary Tape.

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S {L} Format {SCOPE STRANGER/LONG Record}

1. Mode

Same as SI format.

2. Block Size

Cannot be greater than CM buffer size. No explicit multiple of frames required. Maximum block size may be either designated at tape request time or through the MLRS field in the FET. Once a value is established, however, that value will be used for all further operations even though the FET might contain a different MLRS value. The block size is used to determine whether to continue reads or writes based on data/room in buffer. Thus, one should not simply pick some large value for this number.

3. EOR

None.

4. EOF

Tape mark.

5. EOI

If unlabeled, none. If labeled, tape mark plus EOF1 label.

6. End of Reel

See Item 2 under end of tape.

7. Noise

All blocks of less than 18 frames {7 track} or 12 frames {9 track}.

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B. Other

- a. CI0 codes 10, 14, 24, and 34 all perform a one block operation {PRU operation}. With the unused bit count and the word count being taken from/returned to the FET.
- b. CI0 codes 200, 204, 260, and 264 all perform as normal except for level numbers.
- c. Level numbers 1 through 16 will be considered as 0.
- d. Code conversion applies to both 7 and 9 track.

E Format {Line Image Mode - Coded Only}

1. Code Only

BINARY/CODED bit in FET is ignored.

2. Block Size

Cannot be greater than 5120 frames. Some hardware will not allow odd number of frames to be written. In this case a space will be appended. Maximum block size will be assumed to be 5120 characters unless specified when tape requested.

3. EOR

On write none. On read an EOR will be returned when a tape mark is encountered. An additional read will then return an EOF.

4. EOF

Tape mark.

5. EOI

If unlabeled, none. If labeled, tape mark plus EOF1 label.

b. End of Reel

See Item 2 under end of tape.

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7. Noise

All blocks of less than 18 frames {7 track} or 12 frames {9 track}.

8. Other

- a. On write E mode will stop at a zero byte in byte four of a CM word or it will stop at the multiple of CM words based on the character/frame count specified. The buffer will then be space filled to the amount of frames specified. The write will have a length exactly as specified.
- b. On read, will space fill last 6 bits of a byte if odd number of characters. It will then delete trailing spaces. Data is then stored in the buffer with at least 12 bits of zero insured.
- c. This will provide user same capability as E mode in KRONOS 2.0, but some of the end cases are more clearly defined.

B Format {Blocked Mode - Coded Only}

1. Code Only

BINARY/CODED bit in FET is ignored.

2. Block Size

Cannot be greater than 5120 frames. Some hardware will not allow odd number of frames to be written. In this case a space will be appended. Maximum block size will be assumed to be 5120 characters unless specified when tape requested.

3. EOR

On write none. On read an EOR will be returned when a tape

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mark is encountered. An additional read will then return an EOF.

4. EOF

Tape mark.

5. EOI

If unlabeled, none. If labeled, tape mark plus EOF1 label.

6. End of Reel

See Item 2 under end of tape.

7. Noise

All blocks of less than 18 frames {7 track} or 12 frames {9 track}.

8. Other

- a. On write B mode will stop at the first zero byte encountered at any position in a CM word or at a multiple of CM words based on frame/character count specified. Length of record written will then be determined by when termination was reached.
- b. On read, it insures one byte of zeroes.
- c. This will provide user same capability as B mode in KRONOS 2.0, but some of the end cases are more clearly defined.
- d. Code conversion applies to both 7 and 9 track.

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F Format {Foreign} {Will be implemented if time and funding permit.}

1. Mode

Binary {9 track}, BINARY/CODED {7 track} as needed.

2. Block Size

Cannot be greater than CM buffer size. No explicit multiple of frames required. Maximum block size must be designated at tape request time. The block size is used to determine whether to continue reads or writes based on data/room in buffer. Thus, one should not simply pick some large value for this number.

3. EOR

None.

4. EOF

Tape mark.

5. EOI

None.

6. End of Reel

See Item 1 under end of tape.

7. Noise

All blocks of less than 18 frames {7 track} or 12 frames {9 track}.

8. Other

a. In 7 track if a parity error is encountered due to tape being written in the opposite mode then the mode will be switched.

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APPENDIX E

RESOURCE ALLOCATION

1.0 Resource Assignment Philosophy

The assignment of magnetic tape and removable disk pack resources is done in such a manner so as to prevent a resource deadlock due to tape and pack overcommitment. A resource deadlock occurs when resources have been assigned in such a manner that by assigning the requested resource to the user one of the jobs currently having assigned resources cannot go to completion. Resources will be overcommitted, that is, a job may demand more units than are currently free, as long as there exists a sequence of job completion which allows all jobs with currently assigned resources to complete.

2.0 Resource Demand

Each job is required to specify its resource demand, that is, the maximum number of units that will be in use concurrently for each type of resource. Any job which uses only one unit of any resource type at a time need not specify its resource demand. All resource demands must fall within the user's validation limits and there must be enough units in the installation to satisfy the demand.

2.1 RESOURC Card

The RESOURC control card is used to specify resource demands.

This card has the format:

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$$\text{RESOURCE}\{RT_1=n_1, RT_2=n_2, \dots, RT_n=n_n\}$$

where:

RT_i = resource type

n_i = maximum number of units to be in concurrent use

2.1.1 Resource Types

The following mnemonics will be used to specify the type of resource on the RESOURS control card.

2.1.1.1 Magnetic Tape Resource Types

MT seven track tape

NT nine track tape

2.1.1.2 Removable Pack Resource Types

DDi $1 \leq i \leq 4$ 853/854-i $1 \leq i \leq 4$

DIi $1 \leq i \leq 8$ 844-i $1 \leq i \leq 8$

MDi $1 \leq i \leq 8$ 841-i $1 \leq i \leq 8$

2.1.2 As new hardware is developed or other types of hardware need be included in the resource allocation, the mnemonic for the device used for CMRDECK entries will be used as the resource type mnemonic.

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3.0 Implementation Scheme

When a tape or pack is requested, the current environment is examined to determine what tapes and packs are mounted. The resource executive determines if the assignment of the requested resource will cause a resource deadlock. If such is the case, the requesting job will be event rolled out waiting for a change in the environment. If a resource deadlock does not occur, a scan for the requested tape or pack is performed. If the requested VSN is not found, the VSN is made available for operator previewing {see Appendix C for Preview Display} and the job is event rolled out waiting for the VSN to become part of the environment. If the requested tape or pack is found, it is assigned to the requestor.

3.1 Shared Removable Disk Packs

If a removable pack request finds the pack mounted but assigned to another user, the requestor is assigned the pack on a "shared" basis. A count of the number of shares is kept to determine when the pack may be dismounted.

The attachment of the first direct access permanent file which resides on a sharable pack will charge the pack to the job in fulfilling its resource demand. Accesses to indirect access permanent files will not be charged if the file resides on a sharable pack; however, if the pack must be mounted to satisfy the request, it will be charged to the job in fulfilling the resource demand.

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APPENDIX F
ERROR MESSAGES

Message Data

Messages are issued in the following format:

MT,C13-5-02,ABCDEF,RD,53,50,3207, 3001.

MT,C13,F04, BN000123, NNNNNN.

The first message would tell the following:

1. Channel 13, equipment 5, unit 2.
2. Volume Serial Number is "ABCDEF".
3. Operation was a read. {Any operation not involving an actual read or write will be called a read.}
4. The "53" is the EST ordinal of the unit the tape was written on. This will only be available for labeled tapes generated under KRONOS 2.1. It will normally be blanks in all other cases.
5. Status of 6681/6684.
6. Status of controller.
7. Status - 2 of controller if available.

The second message would tell the following:

1. Channel 13 - This is repeated so that if errors are occurring on more than one tape channel at the same time the two messages can be associated.
2. The error occurred on a software function 4.
3. The block number the error occurred on was 123.
4. Additional description.

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NO WRITE ENABLE.

READY DROP.

EOP TIME OUT.

WNB TIME OUT.

CONNECT XPE.

CONNECT REJECT EXT.

XPE DATA.

CONNECT REJECT INT.

ON THE FLY COR.

Block Length Errors

Expected block length will be a meaningless number if truncation occurred.

User Error Messages

All errors listed here are fatal.

BLANK TAPE.

NO WRITE ENABLE.

BLOCK TOO LARGE.

BUFFER ARGUMENT ERROR.

HARDWARE MALFUNCTION.

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Control Card Error Messages

ARGUMENT ERROR.

The usage of a control card parameter is syntactically incorrect.

DUPLICATE VSN.

The VSN association for the file has already been established.

MISSING VSN.

A VSN has not been supplied by a previous VSN card or the VSN= parameter when using the LABEL card.

RESOURCE DEMAND ERROR.

The user has attempted to do one of the following:

1. Request an illegal resource type.
2. Exceed validation limits for the resource type.
3. Request more resource units than exist in the installation.
4. Use more resource units than the specified demand.
5. Decrement demand to less than the number of currently assigned units.
6. Increment demand so as to cause a deadlock.

Tape Assignment Error Messages

FATAL ASSIGNMENT ERRORS.

The user has improper ring status or accessibility. The message

IMPROPER RING STATUS. or *IMPROPER ACCESSIBILITY.* will also be issued.

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NON-MATCHING DENSITY.

Density of tape does not agree with requested density. This is not-fatal.

NON-MATCHING CONVERSION.

Conversion mode of tape does not agree with requested specification. This is not-fatal.

USER NOT VALIDATED.

User is not validated for assigned equipment.

VSN NOT ASSIGNABLE.

VSN is present but is not of correct track type.

Resource Executive Error Messages

DEMAND FILE ERROR.

An error has occurred in processing the demand file.

ILLEGAL EXTERNAL CALL.

A call to the resource executive from using tape request macros {LFM functions}, SCOPE 3.4 tape requests {SFP}, or any removable pack request {PFM functions} is incorrect.

OVERCOMMITMENT ALGORITHM ERROR.

An error has been detected while executing the overcommitment algorithm.

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RESOURCE ENVIRONMENT ERROR.

The resource executive detects an error while extracting information from the Mass Storage Tables {MST} or from the tape executive {MAGNET}.

SUB-SYSTEM COMMUNICATION ERROR.

The resource executive is unable to communicate with the tape executive {MAGNET}.

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1.0 SCOPE

1.1 This document describes the capabilities of the system to support permanent file devices in such a way that they can be activated in or removed from the system without interruption to normal system operation. This includes devices defined as removable devices or normal permanent file devices.

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2.0 APPLICABLE DOCUMENTS

KRONOS V2.1 Product Objectives Document E088*2.1

KRONOS V2.0 Batch User's Reference Manual 59150600-B

KRONOS V2.0 Time Sharing User's Reference Manual 59151300-B

KRONOS V2.0 Operating Guide 59151600-B

KRONOS V2.0 Installation Manual

Instant KRONOS

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3.0 DESCRIPTION

Two additional capabilities exist for manipulation of permanent file devices in KRONOS 2.1. They are:

Interchangeability of permanent file families between KRONOS 2.1 systems.

Removable devices.

The operational characteristics of these features and the user's interface to them will be discussed in the following sections.

3.1 Interchangeability of Permanent File Families

This feature allows permanent file devices to be introduced into an alternate system without interruption to the alternate system. Installations which have more than one system, or groups of installations, have the capability of connecting the permanent file devices to an alternate system.

For example: An installation with two systems might normally run with the following mass storage configuration.

	<u>EQ</u>	<u>DEVICE</u>	<u>ACCESS</u>	<u>CONTENTS</u>
System A	0	808	A	Direct access files.
	1	841-4	A	Master device.
System B	0	808	B	Direct access files.
	1	841-4	B	Master device.

If System B became inoperative, access B for the 808 and 841-4 could be switched to System A. This could be done without

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interruption to System A. Similarly if some installation had permanent files on disk packs {841} and that installation became inoperable, those packs could be introduced into such a system as System A or B.

The following limitations exist:

1. The equipments to be introduced must be defined at system configuration time and status set as not available. As in the example above for System A, access B would have to be defined. The CMRDECK entries might appear as:*

```
EQ0=DB,ON,1,0,0.          ACCESS A
EQ1=MD-4,ON,4,0,2.        ACCESS A
EQ2=DB,NA,1,0,1.**        ACCESS B
EQ3=MD-4,NA,4,0,3.        ACCESS B
```

Similarly for System B

```
EQ0=DB,ON,1,0,1.          ACCESS B
EQ1=MD-4,ON,4,0,3.        ACCESS B
EQ2=DB,NA,1,0,0.          ACCESS A
EQ3=MD-4,NA,4,0,2.        ACCESS A
```

* See Operator's Guide, page 5-12 for description of CMRDECK entries.

** NOTE: Parameter NA indicates device is not available.

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2. Users can access permanent files within their own family.
Access to files for users in another family is not permitted.
3. Any portion of a family may be introduced into another system providing that portion includes the device which contains user control and validation data {VALIDUS File}*. This will be the master device that has device mask** bit 7 set plus whatever device the VALIDUS File resides on if not on the master device. If a user whose master device is not introduced into the alternate system tries to access his files on the new system, the message:

PERMANENT FILES NOT AVAILABLE

will be issued for any permanent file requests made. Other portions may be introduced at any time after the introduction of the device containing VALIDUS.

4. If a non-master device is not introduced and a user tries to access files on that device the message:

DIRECT ACCESS DEVICE ERROR

will be issued. However, the user will be able to access all indirect files. For example, in the above configuration if the 841 for System B were moved to a system that the 808 was not connected to, the users for System B could access all files except those that resided on the 808, providing the VALIDUS file resided on the 841.

* See Operator's Guide, Chapter 8 for definition of this file.
** See definition of Device Mask in Operator's Guide, page 7-2.

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3.1.1 System Configuration

A system may be configured to accommodate additional families of permanent file devices by specifying the correct entries when configuring the system. Following are descriptions of the CMRDECK entries required for this.

3.1.1.1 E@nn=dt,st,en,un,ch1,ch2,R.

This entry defines the equipments which can be accessed by the system.*

nn = Equipment Status Table Ordinal

dt = Device Type

st = ON Device available for system allocation.

= OFF Device available, but no system allocation permitted.

= NA** Device not available. This status would be used for devices to be introduced from alternate systems, or as removable devices.

= IN** This specifies device is interchangeable and is available for access.

en = Physical Equipment Number.

un = Physical Unit Number.

ch1,ch2 = Channels equipment is connected to.***

R If specified, automatic release of reservation is performed when channel is released.

* See Operator's Guide, page 5-12 for further description of this entry and full descriptions of all parameters.

** This is only change in this entry from KRONOS 2.0.

*** See ERS for support of CYBER hardware enhancements.

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3.1.1.2 PF=nn, st, ty, dm, fn, dn.

PF=nn, st, ty, fn. {If ty=R}

This entry defines the permanent file characteristics of the equipment referenced. This entry is necessary only when the device is being initialized. This entry must be made after equipment is defined {EQnn entry}. If the equipment is redefined after the PF entry has been made, the PF entry must be re-entered since redefinition of an equipment or clearing an equipment definition {EQnn=0.} clears PF description for that device.

nn = Equipment Status Table Ordinal

st = ON Device is considered active PF device and system will attempt to recover PF during system recovery. Users will be able to access files on this device.

= OFF Device is considered inactive for PF access. Users will not be able to access files on this device.

ty = I Device may contain only indirect permanent files. This must be a master device {i.e., dm≠0}.

= D Device may contain direct access files. {This does not exclude the residence of indirect files. Master devices always contain indirect files.}

= R Device is considered removable. This must be specified if any of the removable device commands are to be issued for this device {see Section 3.2}. Removable devices may contain direct and indirect access files.

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NOTE: If ty=R, this indicates only that the device being recovered is a removable device. This equipment may be used during operation of the system for either removable devices or alternate family devices.

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- dm Device mask {see Section 4.11 for definition}. Not entered if ty=R.
- fn Family Name. This is a 1-7 character parameter defining the permanent file family this device belongs to. Combined dm for family must be 377B. If ty=R then the fn parameter represents the pack name associated with the device.
- dn Device Number. This number {1-77B} defines the device within a family. This should be a unique number within a family. If ty=R this parameter is not entered.

NOTE: See Appendix D for method of recovery of permanent files between 2.1 systems and 2.0 systems.

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3.1.1.3 INITIALIZE,nn,nc.*

This entry will cause system to place a label on device nn, release all existing PF space defined and initialize those portions of the device required for PF access {i.e., catalog tracks, permit tracks and indirect access tracks}.

nn Equipment Number

nc Number of Catalog Tracks. This is optional parameter which may be used to specify a number of catalog tracks other than the default.** If nn is not a master device*

ILLEGAL ENTRY error message

will be issued. nc must be a power of 2 {i.e., 1, 2, 4} and maximum of 200g.

If nn is defined as a non removable PF device, then the parameters dm {if master device}, fn and dn are defined on the PF entry. If nn is a removable device fn is defined on the PF entry.***

If the E0 entry specifies the st=NA, then no physical initialization will take place but initialization status will be maintained for this device and will take place whenever the device becomes available.

* This entry is legal only as console CMRDECK entry. If contained in CMRDECK loaded from deadstart tape message ILLEGAL ENTRY will be issued.

** The default number of catalog tracks is defined in APPENDIX B.

*** If a removable device is to be initialized with any parameters other than pack name {i.e., if user number or password is to be specified} then the device must be initialized after deadstart via the MDI command - see Section 3.2.1.1.

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3.1.1.4 FAMILY=nn.

For normal mode of operation, users at an installation do not have to specify the family to which they belong. However, when multiple families are active in the system, the user must identify his family at login or job initiation time (see Section 3.1.4). To ease user conversion to an alternate system, the "system default family" can be defined which will indicate the family which is assumed if none is specified by the user at job initiation or login. The FAMILY CMRDECK entry allows defining of this default.

nn. This specifies equipment number of any active permanent file device in the family desired to be default.

This entry must follow the E0 entry for the equipment indicated.

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3.1.2 System Processing

Two steps are included in the successful recovery of a permanent file system. They are:

System Configuration

Recovery of information from devices

Following is a brief description of what occurs, the potential errors that can be encountered and the action that can be taken.

3.1.2.1 System Configuration

Before any system activity can take place, the equipments must be defined. CMRDECK entries are provided for this purpose. Depending on the level of recovery, the CMRDECK entries will be processed as follows:*

- Level 3 All CMRDECK entries ignored. Equipment definitions and PF definitions recovered from CM.
- Level 2.1. All CMRDECK entries ignored except those defining mass storage characteristics. These entries are as specified in CMRDECK. CMRDECK is recovered from mass storage as of last checkpoint.
- Level 0 All CMRDECK entries processed.

When CMRDECK entries are made, in general, they are only validated for correctness of format not logical content.

* For further description of levels of recovery, refer to Operator's Guide, page 5-7.

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For example, no check is made to insure device masks {dm}
for all PF devices in a family equal 377B.

The error for E0 and PF CMRDECK entries that will be
detected and the message

ILLEGAL ENTRY

displayed is:

1. PF entry specified for equipment nn where nn is not
defined as mass storage entry.

In this situation, the operator can re-enter the E0 and
PF entries to correct the error.

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3.1.2.2 Mass Storage Device Recovery

Recovery of the permanent file information from a mass storage device can occur in three situations:

Deadstart

Introduction of Interchangeable Device

Introduction of a Removable Device

The internal function of these three methods are similar; however, the operational characteristics are somewhat different.

3.1.2.2.1 Deadstart

The level of recovery requested determines what is performed for recovery of permanent file devices. During recovery of these devices the message

RECOVERING dtnn

will be displayed. dt is device type and nn is equipment ordinal.

Below this line two types of error messages may be displayed.

TYPE 1 The message displayed is:

* error message description RECOVERY OF DEVICE
IMPOSSIBLE.*

If either GO or IGNORE is entered, recovery of remaining devices will continue and this device will be initialized just as if CMRDECK entry INITIALIZE,nn had been entered. Note that no PF definitions for device will be specified in this situation.

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TYPE 2 The message displayed is:

* error message description IN CM, DATA FROM LABEL IS
USED.*

If this message is issued, then upon entry of GO or IGNORE,
the PF parameters residing on the device {fn, dm, dn, etc.}
will be placed in CMR and processing for that device will
continue.

3.1.2.2.1.1 For all levels of recovery the following steps take place.

The label for each mass storage device is read and
verified against that specified by the EQ definitions,
{see Section 3.1.1}. The label is not read if EQ
entry specified st=NA. Several steps are involved
in label verification for a device.

1. Label must conform to standard system sector
format.*
2. Equipment type and sector limit specified in
label must conform with that specified by system
configuration. {Sector limit is function of
Device Type parameter - i.e., MD-4 is 841 with
4 spindles included as one logical device
SLM=4*40.}

* See APPENDIX B for description of label and system sector.

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3. Labels on all units of multi-unit device must agree and sector number must verify. This is to insure units are mounted in proper order when mounting multi-unit device.
4. If the device has been defined as an interchangeable device, the system will attempt to utilize those interchangeable equipments that can be chained. These are any devices defined as interchangeable, single unit, and with consecutive physical unit numbers. For example, consider the following configuration:

E003=MD-1,IN,6,0,4.
E005=MD-1,IN,6,1,4.
E006=MD-1,IN,6,2,4.

If the system encountered a label on E003 which indicated it was the first unit of a 3 unit device {specified in label}, the system would determine if other equipments were available to accommodate the remaining units of the logical device. In this configuration, equipments 5, and 6 would be chained so as to indicate a three unit device. Once this had been accomplished, the system would attempt to read labels on the remaining units just as if E003 had been specified as a MD-3. If the labels are good, the system will recover the device. If any of the labels fail the verification, then the units are

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returned to their MD-1 status and EQ03 is set with not available status in the EST. Single unit device or a MD-2 could be accommodated by this configuration also.

In this situation, the labels on EQ05 and EQ06 would also be investigated to determine if the labels are valid.

5. If in attempting to read the label, a physical error is encountered, the following action is taken.

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Type of Device	Type of Error			
	Not Ready	Read Error*	Label Verification	Bad Label {Not Label Sector}
Interchangeable	Set Device Unavailable	Advance to next track and try to read.	Set Device Unavailable	Set Device Unavailable
Non-Interchangeable	Wait and retry	Advance to next track and try to read.	Issue Error *CONFIGURATION IS IN ERROR.*	Issue Error *LABEL ERROR ON UNIT NN.*

* n tracks will be searched starting at track 0. If this limit is exceeded, device will be initialized as per the CMR deck PF definitions. If no PF definition exists, device will be initialized as non-permanent file device. For on line recovery of a pack, device will be left as unavailable device. n will be an assembly time parameter in COMSDSL.

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If the operator types GO or IGNORE, the definitions specified by the CMRDECK entries will be those used to initialize the device.

3.1.2.2.1.2 For level 3 recovery only, checking of the label includes:

1. Device mask {dm} specified in label is verified against that specified by CM.
2. Family Name {fn}, or Packname for removable device, is verified with that specified by CM.
3. Device Number {dn}, is verified against that specified by CM.

If any of the above conditions are not met, then the type 2 error:

DEVICE DESCRIPTION ERROR IN CM, DATA FROM LABEL IS USED.

is issued. If the operator decides to proceed with recovery, those parameters found on the device will be inserted in CMR as the PF description. If device being recovered and CM do not agree on residence bits {equipment specifications for permanent files, direct access files, or removable status}, the type 2 error

DEVICE RESIDENCE CONFLICT IN CM, DATA FROM LABEL IS USED.

is issued. If either GO or IGNORE is entered, device status will be specified as that in label.

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Also, the following is performed.

1. Verification of catalog track count.
2. Verification of location of catalog tracks, permit information and indirect access files.

If either of these conditions are not met, then type
2 error

CATALOG RECOVERY ERROR IN CM, DATA FROM LABEL IS
USED.

is issued. If the operator decides to proceed with
recovery, those parameters found on the device will be
inserted in CMR as the location and description of
catalog information.

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3.1.2.2.1.3 For level 2, 1 or 0 recovery, the following additional steps will take place.

TRT will be read from mass storage and placed in CM. If error occurs in this step, type 1 error:

LENGTH OF DEVICES TRT BAD RECOVERY OF DEVICE IS IMPOSSIBLE.

is issued. Device will be initialized.

3.1.2.2.1.4 For level 0 recovery, when the TRT is copied from the mass storage device to central memory, it will be edited to remove all chains that are not permanent file information. If an error occurs in this process, the type 1 error:

PERM. FILE LINKAGE ERROR RECOVERY OF DEVICE IS IMPOSSIBLE.

is issued. If GO or IGNORE is entered, device is initialized.

Also for level 0 recovery, direct access file interlocks will be cleared (see Section 3.1.2.2.4).

After deadstart is complete, no verification is done to check:

1. dm for equipment in family = 377B. When searching for the users master device, the system will use the first device encountered which satisfies user's master device definition.

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2. Duplicate device numbers within one family. Files defined will contain the device number specified with the equipment. Utility operations for a device number will use the first one encountered in searching the Mass Storage Table from the beginning.

3.1.2.2.1.5 Because some of the errors encountered may cause initialization of the device, it is recommended that the P.F. CMRDECK entries describing the device be kept as part of the CMRDECK. If one of the errors that causes device initialization is encountered, the parameters currently residing in the MST {those specified by the PF entry} will be used in initialization of the device.

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3.1.2.2.2 Introduction of Interchangeable Devices

When an interchangeable device is introduced into the system {see Section 3.1.3 for method}, the following steps will be performed.

Label Verification

Recovery and Verification of System and Allocation Information

Release of Interlocks for Direct Access Files

3.1.2.2.2.1 The system will periodically interrogate the interchangeable devices to determine the following:

1. If the equipment is specified as not available, the label is read to determine if a good device has been mounted on the drive. This label verification is described in Section 3.1.2.2.1.1.
2. If the equipment is specified as available in the system, the label will be read and verified with that information kept in CM. This process is the same as that described in Section 3.1.2.2.1.2 for level 3 recovery. If an error is encountered, the device is left in "emergency status" with all PF access to device prevented.

The error messages are the same in this situation with the exception of the last portion - IN CM, DATA FROM LABEL IS USER. In this situation, the

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data from the label is not set in CM as the device is currently active.

If the operator wishes to introduce a device or devices into the system, the following should be performed:

- a. Interrogate Mass Storage Table Display to determine what physical drives are available.
- b. Mount device on drive and make ready.
- c. Interrogate MST display to determine if errors have been encountered. Any errors encountered in recovery of device will be issued to error log {i.e., TRT LENGTH ERROR, PERM. FILE LINKAGE ERROR, etc.}.

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3.1.2.2.3 Introduction of Removable Devices

The steps performed for introduction of a removable device into the system are exactly the same as those for an interchangeable device.

3.1.2.2.4 Clearing of Interlock Data for Direct Access Files

For level 0 recovery or whenever a device, removable or interchangeable, is introduced, the interlock information contained in the system sector for all direct access files must be cleared. This must be done because files on the device may have been left in any of the interlocked states due to premature dismounting of device or deadstart of the system. Dayfile messages will be issued to reflect the direct access files recovered from the device. For system deadstart, the following messages will be in the system dayfile. For operator commands or user requests, the messages will be placed in the job dayfile, and

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printed when processing is complete.

nnnn DIRECT ACCESS FILES RECOVERED

This will be count of files successfully recovered.

nnnn DIRECT ACCESS FILES PURGED

This will be count of files encountered whose system sector was not legal. This will not include those files purged because purge status was set in interlock information.

nnnn DIRECT ACCESS FILE ERRORS

This will be count of files whose interlock information specified file was in write access mode and last sector in system allocation table {TRT} was read and found not to be EOI. This count should match number of PF ERROR messages issued.

The following steps are performed to clear direct access file interlock data.

System sector is read and verified as legal system sector.* If this fails, the file purge count nnnn is incremented, but file space is not released.

If file interlock status reflects no activity, file is recovered and count is incremented.

* See APPENDIX B for format of this System Sector.

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If file interlock status reflects purge status, the space is released.

If file interlock status reflects read access, this is cleared, system sector is rewritten and the file recovered count is incremented.

If file interlock status reflects write access, then EOI is located from TRT. This sector is read and if not an EOI sector, the following message is issued to the ERROR LOG and SYSTEM dayfiles {job dayfile also for operator or user request}.

PF ERROR *pfname* *index*

pf name = Permanent file name as found in system sector.

index = User index for file as found in system sector.

The file interlocks will be cleared and the system sector rewritten. File error count will be incremented. The file will be left as is on the device for further interrogation by the user or operator.*

* This situation could occur when a user has allocated or de-allocated space on the file, and then written a new EOI on file. If the device is physically removed for system dead-started} before system has chance to checkpoint TRT to device, this situation will occur.

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If PF dump is performed on this device, this file should cause length error.

If the sector read was an EOI, interlock is cleared, the system sector rewritten and the file recovered count incremented.

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3.1.3 Operator Commands

The following operator commands are available for control of interchangeable devices.

3.1.3.1 MOUNT, FN=family name, DN=device number, EQ=equipment number.

This command will initiate system verification of the device and introduction of those parameters necessary for users to access permanent files residing on the device.

Section 3.1.2 describes the error messages that can be encountered as a result of this command. A message

MOUNT REQUEST COMPLETE

will be issued upon successful completion of the command.

This command deals with only one logical permanent file device, thus enabling portions of a permanent file family to be introduced with the restrictions described in

Section 3.1 {3.4}.

FN Family name of device being introduced.

DN Device number of device being introduced.

EQ Equipment entry to be used for new device. This is an optional parameter; if omitted, system will flash request for operator assignment. The entry assigned must have been previously defined at system configuration time and have inactive, unavailable status. This status can be determined by the mass storage table display (see Appendix A). See Section 3.1.1.1 and 3.1.1.2 for method of definition of inactive, unavailable device.

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3.1.3.2 REMOVE, FN=family name, DN=device number

Before a device is physically removed from the system {removable device such as 841 removed or device such as 808 switched to another system}, the operator should insure that users are no longer accessing the device. The REMOVE command will prevent any new users from accessing the device; however, users may currently be attached to files on the device. The operator may determine if any users are currently attached to files by interrogating the mass storage table display {see Appendix A for format of this display}.

FN Family name of device to be removed.

DN Device number of device to be removed.

If device is not active in the system, message

DEVICE NOT AVAILABLE

is issued and command aborted.

If operation is completed, message

REMOVE REQUEST COMPLETE

will be issued.

The device, after completion of this function, will be set as inactive {same as PF CMRDECK entry st=OFF}, and, if no active users were attached to device equipment, status will be set to unavailable {same as EQ CMRDECK entry st=NA}. If users are currently attached to files

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on the device, then the device will be set inactive, but unavailable status will not be set until last user has released attachment to device. The status of the device may also be determined from the mass storage table display.

After device is removed from system, any user access to that device (even if status is still available), will result in either:

PERMANENT FILES NOT AVAILABLE

for access to a users master device, or

DIRECT ACCESS DEVICE ERROR

for access to direct access files on an alternate device.

CAUTION:

If device is physically removed from system before users have released their attached files (user count $\neq 0$), two things could occur:

1. Mass storage device status error may occur.
2. If another pack has been mounted, accesses made by a previously attached user may well destroy information on the new pack or the user may retrieve information from the new device which he is not necessarily privileged to access. Mass storage errors are possible in this situation also.

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3.1.4 User Interface

The user is not normally required to specify the family name under which his permanent files reside for requests to the system. However, there are certain situations where the family name must be provided. Following is a description of these situations.

3.1.4.1 Time Sharing Access

The user does not normally have to provide the family name upon login to the system. However, if access is attempted to a system other than the users normal one {such as a back up system}, then the family name must be provided on the LOGIN command. The installation must notify users if they are to dial into an alternate system. The parameters to be supplied during the login process* are:

username,password,family.

The system will normally at login request:

USERNUMBER:

PASSWORD:

If more than one family is active in the system, the system will request:

USER NUMBER:

PASSWORD:

FAMILY:

* See Time Sharing User's Guide, page 2-1 for description of LOGIN procedure.

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If the user responds with only CR for FAMILY, the system default {see Section 3.1.1.4} will be assumed.

If validation file for the family specified is not available {see Restriction 3 Section 3.1}, then message

ILLEGAL LOGIN

will be issued at the terminal. Note error messages in Section 3.1 - 3.4 for permanent file requests issued on alternate system. This will occur for any PF request from the terminal including OLD, LIB, SAVE, etc.

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3.1.4.2 Batch Jobs

Jobs submitted to the normal system require no specification of family name. However, if the job is to have the capability of running on an alternate system {that has the originators permanent file devices introduced}, the family name must be supplied on an ACCOUNT card. If the user always supplies family name on the ACCOUNT card, he can be assured that his job will be run even if his normal system is not available and his permanent file family had to be moved to an alternate system. Format of ACCOUNT card*

ACCOUNT, usernum, passwor, family.

family is optional parameter.

The error messages indicated in Section 3.1 - 3, 4 will be issued if the devices that the user attempts to access are not available.

3.1.4.3 Remote Batch Access

Because jobs submitted via a remote batch terminal {and the output generated by these jobs} are identified by the user number used during login, a limitation exists when a user must use an alternate system via a remote batch terminal. To login on the alternate system, the user must know a legal user number for the default family on the system.**

* See Batch User's Reference Manual, page 5-2 for description of ACCOUNT card.

** See EXPORT/IMPORT Reference Manual, page 3-2 for description of LOGIN procedure.

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Once logged in, jobs submitted from this terminal may contain account cards for another family {just as described for BATCH JOBS}. Output will be returned, based on user number specified by LOGIN command not user number and family specified in job deck submitted.

3.1.4.4 System Origin Access

It may be necessary in certain situations to alter the family name associated with a job. This might occur, for example, when creating a VALIDUS file for an alternate family with no VALIDUS file that has been introduced onto the system. The FAMILY command is available to system jobs and users with system origin privileges {if system is in DEBUG mode}.

Format of the command is:

FAMILY, family name

If issued by non-system origin job, message

ILLEGAL CONTROL CARD

will be issued and job aborted.

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3.2 Removable Devices

This feature allows users to retain permanent files on devices other than those within the normal permanent file family. This might be done if the user required access to files at relatively infrequent intervals. The following limitations exist:

1. The user must insure that the device desired for access is mounted and active in the system before accessing files. Automatic request of the device specified, when file access is attempted, is not performed. If access to a device not available on the system is attempted, message

PERMANENT FILES NOT AVAILABLE

is issued and request is aborted.
2. The user must be aware of the device defined size, i.e., the number of units and capacity of these units, when creating data on the device. For example, if the user knows 50 million characters of data are to be created on a device, he must specify to the installation, when requesting device initialization, that a device capable of this capacity be used (i.e., MD-23). If user exceeds this capacity, he will receive one of the following messages, depending on what caused overflow.

SYSTEM ERROR - EQnn TRACK LIMIT

PFM could not allocate space on device assigned as equipment nn.

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E0nn, TRACK LIMIT

Normal system access {CIO write request} could not allocate space required for write on device specified.

3.2.1 Operational Characteristics

The installation must determine the number of equipments desired for removable device access when configuring system. The removable devices are specified by the proper equipment {EQ} and permanent file {PF} entries {see Section 3.1.1}. Following is an example of how CMRDECK entries might be set up to accommodate 4 units of an 841 as removable devices.

The equipments would be defined as four single unit devices:

E03=MD-1,NA,5,2,7.
 E04=MD-1,NA,5,3,7.
 E05=MD-1,NA,5,4,7.
 E06=MD-1,NA,5,5,7.

Note the physical unit numbers are consecutive. This is to allow mounting of a four unit device. The unit numbers need be consecutive only to the limit of the largest size {number of units} device to be accommodated. Device types may not be mixed, i.e., an equipment may not be defined as an MD-1 and then successfully mount DD-1 as this equipment.

During deadstart a removable device will be recovered like any other mass storage device. If the label indicates this is a removable device, then it will be specified as such during system operation.

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3.2.1.1 MDI - Mass Storage Device Initialization

MDI is called to a control point to perform various initialization functions for mass storage devices. These functions include:

1. Definition, labeling and initialization of any type of mass storage device.
2. The ability to flaw mass storage devices on-line, and
3. The ability to format {write headers on} an 844 disk pack.

3.2.1.1.1 MDI may be initiated directly through the following call:

MDI, EQ=nn.

- where nn is the EST ordinal of the device to be initialized.

No further operator intervention is required if the device to be initialized is a removable device. To initialize all other device types, the initialize status must first be set in the MST {see Appendix B-8, word PFIL}.

MDI may also be initiated with the following call:

MDI.

Through this call, all parameters must be entered via the K-display.* This method enables the operator to change the device description associated with the device, when it is initialized. Once all parameters have been

* For K-display operations, see Operator's Guide, pages 7-1 and 7-2.

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entered, the operator must enter GO. and then initialization proceeds. {See Appendix E for example of the K-display.}

For both types of calls, the initialization process proceeds automatically for removable devices. However, for all other mass storage device types, the initialize status must first be set in the MST {see Appendix B-8, word PFIL}.

3.2.1.1.2 Any of the following parameters may be entered via the K-display.

- FN 1-7 character family name. This is the family that this device will be initialized to be part of.
- PN 1-7 character pack name. This is the name by which this unit or group of units will be referred to whenever access to or operations on it are desired.
- UN 1-7 character user number. This parameter can only be entered in conjunction with PN. If specified, this device is considered a private device and only this user will be allowed to place files on the device {perform SAVE, REPLACE, or DEFINE requests}.
- PW 1-7 character password. This parameter provides a level of security for a removable device. If this parameter is specified when the device is defined, then it must be specified whenever the device is mounted by any one but the operator {console MOUNT request}, user with system privileges {system in DEBUG mode}, or owner if the device is private.
- DM Three octal digit device mask. This parameter is required whenever a master permanent file device is being initialized. It defines which users have this device as their master device.
- NC Octal number of catalog tracks {power of two}. Optional parameter which may be used to specify

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a number of catalog tracks other than the default.* If UN is specified (private device), then this parameter is illegal since only one catalog track will be allocated. The maximum value is 200g.

- EQ** EST ordinal of device. This is the first equipment number of device to be initialized. For multi-unit devices, this must be the first of NU consecutive units.
- NU** Number of physical units that the device is to be defined for. Default is 1.
- DN** Logical device number that will uniquely identify the device within the system.
- PU** Physical unit number of 844 pack to be formatted.
- OP** Initialize option.
- 0 = Full initialize (see Section 3.2.3.3).
 1 = Initialize and recover flaws (see Section 3.2.3.4).
 2 = Enter flaws (see Section 3.2.3.5).
 3 = Format pack {844} (see Section 3.2.3.6).

For a description of the RTK, TTK, and STK parameters for flawing a device, refer to Section 3.2.1.1.5.

3.2.1.1.3 Full Initialize

For initializing a system permanent file device, the FN, DM, NC, EQ, and DN parameters are inspected and the device is initialized accordingly. The full initialize clears all previous permanent file definition on the device. The device is then defined, labeled, and initialized as directed by the inputted parameters.

* The default number of catalog tracks is defined in Appendix B.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

For initializing a removable device, the PN, UN, PW, EQ, NC, and NU parameters are used to define, label and initialize the device. This is the only method available to define a device as a private device or a public device with a password specified. All units of the device must be mounted to perform this process. Mass storage errors* will be issued for any unit not mounted. The operator should physically label all units for a device since it is necessary to have them in proper order when mounting.

If EQ is specified, the device must be inactive, with no active users attached to files on the device {see mass storage display Appendix A to determine this} to perform this function. If EQ is not specified, then the system will search for the removable device described and, then if located with no active users, labeling will take place.

This command will also cause initialization of a device, as described in Section 3.1.1.3, which causes all permanent file information to be released and catalog tracks and permit file initialized.

3.2.1.1.4 Initialize and Recover Flaws

This type of initialization is identical to that which is described in Section 3.2.1.1.3 with the following exception.

* Refer to Operator's Guide, page B-2 for description of these errors.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

An attempt is made to recover a TRT from the device. If this is successful, all flaws indicated in the TRT are retained when initializing the device.

3.2.1.1.5 Flaw Device

This option permits on-line flawing of a mass storage device. The parameters for doing this are constructed similar to those entered as CMRDECK entries for flawing a device at deadstart time. The E0 entry must be entered before any of the flaw entries in order that a device type is designated. This is needed to determine the algorithm to be used in interpreting the flaw entries. A maximum of 20_g flaw entries may be entered for each MDI call.

Three types of flaw entries are provided:

- RTK This takes the inputted physical address, converts it to a logical address and indicates in the TRT that this track is a reserved, flawed track.
- TTK Input is same as RTK, however, reservation is toggled. If the track was previously not reserved, then, this command produces the same results as an RTK. If the track was previously reserved as a flawed track, then, that reservation is removed.
- STK This takes the inputted logical address {no conversion required} and proceeds as an RTK.

For all flaw entries, if the indicated track is already reserved by the system {but not as a flawed track} an error status is returned.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.1.1.6 Format Pack

This option provides the means of formatting {writing headers on} an 844 disk pack on-line. Only one unit can be formatted per MDI call. This option requires entry of the EQ and PU parameters. Once formatted, the unit is also initialized according to any entered parameters. Initialization takes place according to the same rules applied to the CMRDECK entry INITIALIZE {see Section 3.1.1.3}.*

* For further description of 844 Format, refer to the 7054/844 ERS.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.1.2 MOUNTP, PN=packname, UN=user number, EQ=equipment, NP=np

This command is processed the same as the MOUNT request for interchangeable devices {Section 3.1.3.1}. Refer to Section 3.1.2.2.2 for processing that is performed and, when family name is referenced, in these descriptions use packname {PN parameter} and, when device number is referenced, use user number {UN parameter}. For the removable device mount command, MOUNTP, the unit count must be supplied to allow system to check for available units. If equipment is assigned which does not have the number of consecutive units available that is required {NP parameter}, the message

ILLEGAL DEVICE ASSIGNMENT

is issued, device released and another equipment assignment requested. If mount request is successful, all units associated with device will be specified as such in mass storage tables, so operator can determine what units are assigned to which packs by interrogating mass storage table display. {See Appendix A.}

Other error messages encountered are:

EQUIPMENT DEFINITION CONFLICT

DEVICE ACTIVE

Further description of error message is in Appendix C.

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.1.3 REMOVEP, PN=packname, UN=user number

This command is processed the same as the REMOVE request for interchangeable devices {Section 3.1.3.2}. The error messages are the same and the processing performed the same with the exception that the family name parameter is replaced with packname and device number replaced with user number, if specified. If UN is not specified, device with PN = packname and UN=0 will be removed.

Error messages encountered are:

DEVICE NOT AVAILABLE

See Appendix C for further description of this message.

3.2.1.4 MOVE, eq1, eq2

This command enables operator to switch the physical units numbers for two packs to make units available for multi unit devices.

eq1 Equipment ordinal to be switched.

eq2 Equipment ordinal to be switched.

NOTE: Operator should be careful to insure units being switched are for equipments specified on this command. Refer to mass storage display to determine proper units {Appendix A}.

After command is issued, flashing message will appear at control point:

SWITCH - MD, CHn, EQm, UNn - CHn, EQm, UNn

where n can be any two digit number, and m can be any one digit number.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

Operator should verify that the equipments involved are those desired and if not correct, enter n.DROP and reissue command. If correct, operator should idle system to insure no access is currently taking place on devices. After system is idle and physical units or packs have been switched, operator should enter n.G0. and when this operation is complete, AUTO to allow system to continue operation.

If eq1 or eq2 is not currently specified as single unit devices in equipment definition, message

ILLEGAL DEVICE ASSIGNMENT

is issued and command is aborted. This would occur for example, if either eq1 or eq2 were one unit of a currently mounted and active multi unit device.

The following example illustrates a typical example of the use of the MOVE command based on the removable device configuration described in the beginning of Section 3.2.1.

1. User A requests mounting of removable device A which contains 2 units. Since all removable equipments are available, the operator assigns equipment 3. This now makes equipment 3 and equipment 4 occupied, since it is a 2 unit device.

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EDBB*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

2. User B requests mounting of removable device B which contains 1 unit. The operator assigns the next available unit, equipment 5. The status of the removable devices is now:

Logical -	eq3	eq4	eq5	eq6
Physical-	Unit 2	Unit 3	Unit 4	Unit 5
Pack	- A-1	A-2	B-1	{Unused}

3. User A completes access to device A and issues remove command. This leaves only equipment 5 {Unit 4} active.
4. User C now requests mounting of device C which contains 3 units. Since 3 consecutive units are not available, but 3 units are free, operator must move device B to make 3 consecutive units available. The operator issues command

MOVE 5,B.

and message displayed is

SWITCH - MD,CH7,EQ5,U4 - CH7,EQ5,U5.

At this point the operator should idle system. After switching physical units or packs, operator enters n.G0 to control point flashing switch request and then AUTO to resume system operation.

Operator can now assign equipment 2 to user C's mount request. The status of the removable devices, after completion of mount request, is:

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

Logical - eq3 eq4 eq5 eq6
 Physical - Unit 2 Unit 3 Unit 5 Unit 4
 Pack - C-1 C-2 B-1 C-3

3.2.1.5 PF Utilities*

The normal permanent file utilities may be used on a removable device by performing the following:

where the FN parameter is required
 supply the packname.

All the options available for normal PF devices are available for removable devices. All units of a removable device must be mounted and available to perform utility operations on them.

3.2.1.6 User Control

User access to removable devices and the use of removable device commands - REMOVEP, MOUNTP etc. can be controlled by the user validation controls. A bit set in the access word {AW={SRP}}** specifies the user's privileges to issue control commands {MOUNTP, REMOVEP} and create files on removable devices. If attempt is made to issue either of these commands or a PF allocation command {SAVE, REPLACE or DEFINE} without this access privilege, message ILLEGAL USER ACCESS is issued.

* See PFM and Utilities Enhancement ERS for full description of parameters.
 ** See Operator's Guide, page 8-7 for description of Access word.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.2 User Interface

Three control cards, and macros, exist to enable the user to access permanent files on a removable device. Additional parameters have been added to all permanent file commands and macros to specify access to a removable device. The following procedure is used by the system to determine what device to access for a permanent file request.

1. Use packname parameter if specified on PF request.
2. If no packname specified on PF request, use packname specified in control point area {set by PACKNAM command - see Section 3.2.2.3}.
3. If no packname specified on request, or in control point area, access user's normal master device.

In addition, the following user restrictions exist.

Any direct access files defined for a removable device must reside on that removable device. A user can insure this by issuing a DEFINE command using the PN parameter before creating the file.

The user must have validation permission to create or replace a file on a removable device or issue any of the removable device commands {MOUNTP,REMOVEP}.* If this validation privilege is

* See Time Sharing User's Guide, Chapter 5 for PF commands available.

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not set, the message

ILLEGAL USER ACCESS

is issued and the request is aborted.

The device manipulation commands REMOVEP and MOUNTP are available only in the BATCH subsystem for time sharing users - if the validation privilege has been given. The PACKNAM command and the PN parameter on PF commands are accepted in any subsystem, just as other PF commands are.*

3.2.2.1 MOUNTP, PN=packname, UN=user number, PW=password, NP=units

This command is processed exactly the same as the MOUNTP operator command {Section 3.2.1.2} with the following exceptions.

1. User may not specify equipment number. Operator must assign equipment.
2. If device specified is private device {UN#0}, the user requesting mount {unless user has user number same as user number of device, which is kept in device label} must supply password specified in label of device. If proper password is not specified, message

DEVICE LABEL ERROR

will be issued and job will be terminated. The password will not be checked for system origin users or users with system origin privileges {if system is DEBUG mode}.

* See Time Sharing User's Guide, Chapter 5 for PF commands available.

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PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3. When device is available or if currently available, the message:

MOUNT REQUEST COMPLETE

is issued to job dayfile.

4. Messages specified for operator MOUNTP command are issued at console for operator, for user MOUNTP requests.
5. Note: User must supply number of units required for device specified. Operator will mount devices specified and assign the appropriate equipment {n.ASSIGN {nn}}. If the number of units available does not match the number specified, the request will be aborted after issuing message:

DEVICE LABEL ERROR UNIT nn

The request will also be aborted if label verification {see Section 3.1.2.2.1.1} fails; the same message will be returned.

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EDBB*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.2.2 REMOVEP, PN=packname, UN=user number

This command is processed exactly the same as the REMOVEP operator command {Section 3.2.1.3} with the following exceptions.

1. If the device is private {UN≠0}, only the originating user number {owner of device} may remove it. Any other user request for removal of private devices will result in message

DEVICE NOT AVAILABLE

and the command aborted. Other users may remove the private device only if they have system origin privileges {and SYSTEM in DEBUG mode}. In this situation, user must supply UN parameter. Owner of device does not have to supply UN parameter. Operator may also remove device by specifying both PN and UN.

3.2.2.3 PACKNAM {PN=packname}

Set default packname. This command causes all subsequent permanent file requests to go to the removable device specified. This eliminates the need for the PN parameter on the PF requests.

PN 1-7 character packname. If packname already set for job this will replace it. If PN=0, current default packname is cleared, thus causing PF requests to access normal master device {unless PN parameter specified in request}.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.2.4 Commands

All PF commands have additional parameter {PN} which can be specified. This will cause PF request to access device specified. If the device is not available in the system, message

PERMANENT FILES NOT AVAILABLE

will be issued and request aborted. Following is a list of the proper PF request formats showing the PN parameter.* For all commands where defaults are not otherwise specified, the following hold:

pw = null

un = null

pn = null

* Refer to Batch User's Reference Manual, page 5-51 for further description of PF commands.

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DOCUMENT CLASS ERS PAGE NO. II 4b Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPEND {f,p1,p2,p3,...,pi/pw,un,pn}
 APPEND FILES p1...pi to permanent file.
 Each file *pi* is appended at EOI of *p*
 p = permanent file to be appended to.
 pi = files to be appended.
 pw = file password.
 un = optional user number.
 pn = pack name.

ATTACH {f=p/un,pw,m,pn,a}
 ATTACH permanent file for direct access usage
 f = working file name
 p = permanent file name
 un = optional user number
 pw = file password
 m = mode of access

R - READ = Read only access
 W - WRITE = Write or read access
 E - EXECUTE = Execute only access.
 M - MODIFY = Modify or extend
 A - APPEND = Append or extend file
 RM - READMD = Read and allow modify
 RA - READAP = Read and allow append

a = abort if file is busy otherwise job is suspended*
 pn = pack name.

Default Values.

m = Read.

DEFINE {f=p/pw,ct,r,m,pn,s}
 DEFINE permanent file for direct access usage.
 f = working file name.
 p = permanent file name.
 pw = file password.
 ct = file category.
 r = device type file is to be assigned to
 m = mode of access allowed for semi-private or library
 pn = pack name.
 s = space desired for file.

* See User Profile Control ERS.

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 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

Default Values.

ct = private.

r = 0 {uses device with most space or device file
currently resides on}.

m = write.

s = 0

GET {f=p/pw,un,pn}

Retrieve copy of permanent file for system usage.

Indirect access files only.

f = working file name.

p = permanent file name

pw = file password

un = optional user number.

pn = pack name.

PERMIT {f,un1=m1,un2=m2,...,unn=mn/pn}

PERMIT user to access permanent file with specified mode.

f = permanent file name.

un = user number to be permitted.

m = mode of access permitted.

W - WRITE, READ, EXECUTE APPEND

R - READ, EXECUTE.

E - EXECUTE

A - APPEND.

N - NULL.

M - MODIFY.

RM - READ ALLOW MODIFICATION

RA - READ ALLOW APPEND

pn = pack name.

Default Values.

m = READ.

PURGE {p/un,pw,pn}

PURGE permanent file

p = permanent file name.

un = optional user number.

{user must have write permission}

pw = file password

pn = pack name.

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DOCUMENT CLASS ERS PAGE NO. II 48 Rev A
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

REPLACE {f=p/pw,un,pn}
REPLACE permanent file with copy of working file.
Indirect access files only.
f = working file name.
p = permanent file name
pw = file password
un = optional user number
{user must have write permission}.
pn = pack name.

SAVE {f=p/pw,ct,m,pn}
SAVE copy of working file on permanent files.
Indirect access files only.
f = working file name.
p = permanent file name.
pw = file password
ct = file category
m = mode of access
pn = pack name.

Default Values.
ct = private.
m = write.

CHANGE {f=p/pw,ct,m,pn}
CHANGE parameters of permanent file.
f = new file name
p = old file name If p not specified, name is not changed
pw = new password
ct = new file category
m = new file mode
pn = pack name file resides on

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.2.5 Macros

All PF macros have additional parameter specifying packname.*
 In addition, macros for MOUNTP, REMOVEP and PACKNAM are available. Following is the format of each of the macros available.

PERMANENT FILE ACTION MACROS.

THE FOLLOWING INFORMATION APPLIES TO ALL PERMANENT FILE ACTION MACROS.

CODE CAN BE OPTIMIZED BY PASSING ARGUMENTS VIA REGISTERS INDICATED ON THE FOLLOWING PARAMETERS.

THE FET LENGTH MAY BE-

- A. 5 WORDS IF NO SPECIAL OPTIONS ARE REQUIRED.
- B. UP TO 13 WORDS IF ANY SPECIAL OPTIONS ARE REQUIRED.

IF *pf* IS NOT SPECIFIED, (F+8) CONTAINS PERMANENT FILE NAME.(X1)

IF *un* IS NOT SPECIFIED, (F+9) CONTAINS NAME OF ALTERNATE CATALOG.(X3)

IF *pw* IS NOT SPECIFIED, (F+10) CONTAINS THE FILE PASSWORD.(X2)

IF *uc* IS NOT SPECIFIED, (F+11) CONTAINS USER CONTROL INFORMATION. BIT 59 MUST BE SET IF THIS WORD CONTAINS DATA FOR *PFM* TO PROCESS.

IF *pn* IS NOT SPECIFIED, (F+12) CONTAINS ALTERNATE PACKNAME TO SATISFY PF REQUESTS FROM.

THE ADDRESS OF THE FET MUST BE SUPPLIED VIA *F* PARAMETER. THE CALL MADE TO *PFM* WILL RECALL THE CPU WHEN THE REQUEST IS COMPLETE. IF THE USER DESIRES TO PROCESS *PFM* ERRORS THE ERROR PROCESSING BIT MUST BE SET IN THE FET. THE ERROR CODES WILL BE RETURNED IN THE CODE AND STATUS POSITION OF THE FET (WORD 0, BITS 9-17). SEE PFM DOCUMENTATION FOR ERROR CODES AND DESCRIPTIONS.

USES X - 1,2,3,4,6,7.
 B - 2.
 A - 1,2,3,4,6,7.

* Refer to Batch User's Reference Manual, page 7-7 for use of PF macros.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

PERMIT {f, pf, un, mf, pn}

f = ADDRESS OF FET.
pf = PERMANENT FILE NAME.
un = USER NUMBER TO PERMIT
m = MODE OF ACCESS PERMITTED
pn = pack name.

PURGE {f, un, pw, pn}

f = ADDRESS OF FET (PERMANENT FILE NAME)
un = OPTIONAL USER NUMBER
pw = FILE PASSWORD
pn = PACKNAME

REPLACE {f, pf, un, pw, uc, pn}

f = ADDRESS OF FET. (WORKING FILE NAME)
pf = PERMANENT FILE NAME
un = OPTIONAL USER NUMBER
pw = FILE PASSWORD
uc = USER CONTROL WORD
pn = PACKNAME

SAVE {f, pf, pw, uc, ct, m, pn}

f = ADDRESS OF FET. (WORKING FILE NAME)
pf = PERMANENT FILE NAME
pw = FILE PASSWORD
uc = USER CONTROL WORD
ct = FILE CATEGORY
m = FILE MODE
pn = PACKNAME

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. II 50.1 Rev A |
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

CHANGE {f,pf,nf,pw,uc,ct,m,pn}

- f = ADDRESS OF FET. {OLD PERMANENT FILE NAME}
- pf = OLD PERMANENT FILE NAME
- nf = NEW PERMANENT FILE NAME
- pw = NEW PASSWORD {42/7777..., 1B/0 IF NO CHANGE}
- uc = USER CONTROL INFORMATION
- ct = NEW FILE CATEGORY
- m = NEW FILE MODE
- pn = PACKNAME

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPEND {f,pf,un,pw,pn}

f = ADDRESS OF FET. {CONTAINS FILE TO BE APPENDED}
 pf = PERMANENT FILE TO BE APPENDED TO.
 un = OPTIONAL USER NUMBER
 pw = FILE PASSWORD
 pn = PACKNAME

ATTACH {p,pf,un,pw,m,pn}

f = ADDRESS OF FET. {WORKING FILE NAME}
 pf = PERMANENT FILE NAME
 un = OPTIONAL USER NUMBER
 pw = FILE PASSWORD
 m = MODE OF ACCESS DESIRED
 pn = PACKNAME

DEFINE {f,pf,pw,uc,d,ct,m,pn,s}

f = ADDRESS OF FET. {WORKING FILE NAME}
 pf = PERMANENT FILE NAME.
 pw = FILE PASSWORD.
 uc = USER CONTROL WORD.
 ct = FILE CATEGORY.
 m = MODE OF ACCESS ALLOWED TO FILE.
 d = DEVICE TYPE.
 pn = PACKNAME
 s = SPACE DESIRED.

USES X - 1,2,3,4,5,6,7.
 B - 2.
 A - 1,2,3,4,5,6,7.

GET {f,pf,un,pw,pn}

f = ADDRESS OF FET. {WORKING FILE NAME}
 pf = PERMANENT FILE NAME.
 un = OPTIONAL USER NUMBER.
 pw = FILE PASSWORD.
 pn = PACKNAME

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4.0 DEFINITIONS

The following terms are defined to fully understand the scope of this project.

4.1 Account Number {User Number}

The account number is a 7 character alphanumeric quantity which is assigned to a user for identification in the system. This parameter also defines a unique permanent file catalog area which contains a directory of all of the users permanent files. A password is optional with the account number.

4.2 User Index

The user index is a 17 bit quantity which is uniquely defined by the account number. The two parameters, account number and user index, are kept with other critical job parameters for the duration of a job or terminal session. The user index is used to uniquely describe the logical device, the catalog track on the device and the entries within the catalog track which belong to the user.* The user index is kept in every permanent file catalog entry.

* For method of determining device and catalog track from user index, refer to Operator's Guide - Chapter VII publication number 59151600, Rev. B.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. EQAA*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

4.3 Validation File

The Validation File is a three level structured file which contains all account numbers, user indexes and control information for the account numbers. This file is accessed whenever a user issues an account and/or attempts to login from a terminal. The control information describes the type of privileges the user has during operation on the system. It also places certain controls on the resources the user may utilize at any particular time.*

4.4 Master Device

The Master Device is that device which contains all the permanent file catalog entries and indirect access files for a specific user. The user's masters device must be available on the running system if permanent file access is required unless all access is to a removable device. The User Index and Family Name {see Section 4.12} uniquely describe a users Master Device. The only other area where a user may have catalog entries is on a removable device {see Section 4.14}; in which case the user must specify the packname {PN} as part of each permanent file request. Each master device is organized into 5 logical sections.

1. Allocation Information
2. Catalog Information
3. Permit Information
4. Indirect Access Files
5. Direct Access Files

* Refer to User Profile Control ERS for further definition of this file. Also refer to Chapter VIII of Operator's Guide.

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4.5 Master Device Allocation Information

The allocation area for a master device contains:

1. The Device Label - This contains information describing the device, such as family name, user mask, and the Location of Permit Information, Catalog Information, and Indirect Access Files.
2. The Track Reservation Table {TRT} is the key to allocating information on this device and to describing the physical layout of data on the device.

4.6 Catalogs

The catalogs for a master device are allocated in such a way as to contain catalog entries for a specific group of user indices. A particular catalog track may contain entries for many users, the number depending on the number of catalog tracks defined for the device {see Appendix B}. The user index provides the mechanism for differentiating between users files on a particular catalog track.

4.7 Permit Information

Every user has the capability of allowing other users to access his permanent files. This can be done by implicitly or explicitly permitting the user to access a particular file. Information describing the permission for all files on a master device is contained in the permit file. Catalog entries contain a relative sector address within this permit file for permissions that have been granted for the file.

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4.8 Indirect Access Files

The master device for a user contains all his indirect access files. These files can be accessed by commands which generate working copies for manipulation by the user.* These files are allocated on the master device on a PRU {64 CM words} basis.

4.9 Direct Access Files

Direct access files are files which can be accessed in place. A working copy is not generated so any updates or alterations made to the file are permanent when made.** A direct access file may reside on the master device or any other device within the family {see 4.12} that allows residence of this type of files. Permanent file devices not specified as master devices contain only direct access files {and possibly system information, scratch files, rollout files, etc.}. The capability to interlock direct access files, thus preventing or controlling access by other users is available to the user.

4.10 Mass Storage Table

The Mass Storage Table is a CMR table used to define the configuration of mass storage devices currently available to system users. One entry exists for each logical device containing the following information {see Appendix A for format of display of this table}:

-
- * See Batch User's Reference Manual for description of indirect access file commands - publication number 59150600, Rev. B.
** See Batch User's Reference Manual for description of Direct Access Commands - publication number 59150600, Rev. B.

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

Device Status

Number of current users

Number of catalog tracks

Device mask

Location of start of permission data

Location of start of catalog tracks

Location of start of Indirect Access Files

Interlock Status

Family Name {or Pack Name}

Device Numbers

User Number for Private Removable Device

Available Space on Device

Logical Description of Device

4.11 Device Mask

The device mask for a permanent file device defines the groups of users whose catalogs reside on the device for a particular family. The device mask consists of 8 bits. If a bit position is set in the device mask, then all user indices ending in that number have catalogs on the device.

Example

For a device mask of 261_8 the following users catalogs would reside on the device:

$$261_8 = 10110001_2$$

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 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

Bit positions 0, 4, 5, 7 are set so user indices ending in 0, 4, 5, or 7 will have the device as master device.

NOTE: Master Devices have device masks $\neq 0$

Non-Master Devices have device masks = 0.
 Removable Devices have device masks = 0.

Since every user has only one master device, the device masks for a Family must total 377B.

Example

$$UM_1 = 261$$

$$UM_2 = 116_8$$

$$\text{Total UM for both devices} = 377_8$$

4.12 Family Name

The permanent file devices available to a user are described by a unique 7 character Family Name. A family may consist of 1-63 logical devices, however, the master devices within the family must have user masks totaling 377B. Normally a system would be run with one family of permanent file devices available. Additional families can be activated on a system thus providing the ability for users associated with these additional families, to access their permanent files via an alternate system. This might be helpful if a system were to supply backup service to another system.

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PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

4.13 Device Number

The Device Number uniquely describes a device within a family. It is a 6 bit quantity that is assigned when the device is defined. All permanent files that exist on devices other than the master device {where the catalog entry resides} will have a device number in the catalog entry which indicates what alternate device within the family contains the file. Removable devices will not have device numbers.

4.14 Removable Device

A removable device is defined as a mass storage device which can be logically removed from the system and replaced with another removable device and which is intended as an auxiliary PF device to the users normal PF device. Files on removable devices are accessed by PF commands specifying the PN parameter. User has the ability to schedule the use of removable devices.

4.15 Pack Name

The Pack Name for a device specifies the unique 7 character name associated with a removable device. The packname for a removable device has no family name associated with it. A removable device is a self contained permanent file device, i.e., all files represented by the catalogs on the device reside on the device. When a user desires to access a file from a removable device the packname must be specified as part of the request. The normal algorithm for determining catalog location {i.e., user mask and family name} will be ignored

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in lieu of the packname. Any user who knows the packname may access files on a removable device.

4.16 Public Removable Device

A public removable device is one which has no user number specified with it. This device can be "mounted" or "removed" by anyone knowing the packname {and password if specified} and having validation privileges to do so. Any user may place files on a public device {provided validation controls allow}.

4.17 Private Removable Device

A removable device may be defined as a private removable device when original definition of the device is performed. A private device has a unique packname and user number associated with it. Only the user specified may place files on this device, but other users may access files as permitted by the owner {permit information resides on removable device}. A private device has only one catalog track since only one user has files on the device. Because the packname and user number uniquely define the location of the catalogs for a private device, it may be accessed via any system regardless of validation file compatibility. The only limitation being the user number of the private device must be defined to allow the user access to the system.

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4.18 Interchangeable Device

An interchangeable device is defined as any device which may be introduced or removed during system operation. An interchangeable device will contain only permanent files. No system scratch files will reside on an interchangeable device. A removable device is a special type of an interchangeable device.

4.19 Multi-Spindle File

The mechanisms are available to accommodate a file larger than one physical unit for devices defined as physically removable.* Up to 8 spindles can be included in the logical definition of one pack. The number of spindles desired for a device must be defined when the device is originally defined. Whenever the device is accessed all spindles must be available for access.

* 841, 844, 854

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPENDIX A

MST DISPLAY

The E display will display one of three categories of equipments depending on the parameters.

E or E.A.

Will display the EST entry as it currently exists in KRONOS 2.0.*

E, M.

Will display detailed status of all mass storage devices.

E, T.

Will display detailed status of all magnetic tape devices.**

These displays can be indexed if display overflows the screen by entering + or - for left screen and {or} for right screen.

* See Operator's Guide, page 2-13 for layout of this display.
** See ERS on magnetic tapes for layout of this display.

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

MST DISPLAY

E.M.

MASS STORAGE TABLES. INDEX =

NO.	STATUS BITS	CATALOGS	USERS	HOLES	DN
0.	- S	10.	.	0.	0.
	FY NAME=	MASK=			
1.	- S	10.	.	0.	0.
	FY NAME=	MASK=			
2.	- P D	20.	6.	0.	40.
	FY NAME=	MASK= 125.			
3.	- P0	20.	14.	0.	41.
	FY NAME=	MASK= 252.			
4.	-ESPOCFDINRTA-	10.	2.	0.	42.
	PK NAME= PACKNAM	MASK=	OWNER=	USERNUM.	

Where

Indicates

INDEX	Number of equipment that is first on that page.
NO.	Logical equipment number.
CATALOGS	Actual catalog tracks.
USERS	User count.
HOLES	Available PF holes.
DN	Device number.
FY NAME	Family name.
PK NAME	Pack name if removable device.
MASK	Device mask.
OWNER	User number of private pack.
STATUS BITS	
E	Release reserve with channel for device.
S	System on device.
P	Permanent files on device.
O	Catalog track overflow.
C	Check point pending.
F	Format request pending {844}.
D	Direct access files on device.
I	Initialize request pending.
N	Permanent file access not available.
R	Removable device.
T	Total permanent file interlock on device.
A	Alternate system device.

DOCUMENT CLASS ERS PAGE NO. II B-1
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPENDIX B

SYSTEM INFORMATION

This appendix will define some of the internal characteristics of the system in the area of permanent files and removable devices.

1.0 Catalog Track Allocation

Catalog tracks are assigned for a device depending on the type of device or as specified on the initialization command. {See Section 3.1.1.3 and 3.2.1.1}. This number must always be a power of 2 {i.e., 1, 2, 4, ...} up through 200_g.

The default number of catalog tracks is:

Type of Device	Default Number of Catalog Tracks
DA 6608	10
DB 6638	10
DC 863	2
DD 854	4
DE ECS	2
DF 814	100
DH 821	100
DI 844	20
DP DDP path to ECS	2
MD 841	20
Private Device	1

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. II B-2
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EO88*2.1 MACHINE SERIES 5000/CDC CYBER 72,73,74

2.0 Standard System Sector Format

Every file residing on mass storage is preceded by a PRU designated as the system sector for that file. Depending on the type of file the information in this sector will vary. For all system sectors however, the following holds true:

SYSTEM SECTOR

			3777	77
FNSS				
EQSS	FTSS			FASS
DTSS				

FNSS = FNT entry

FASS = FST address

EQSS = logical equipment number

DTSS = packed date and time

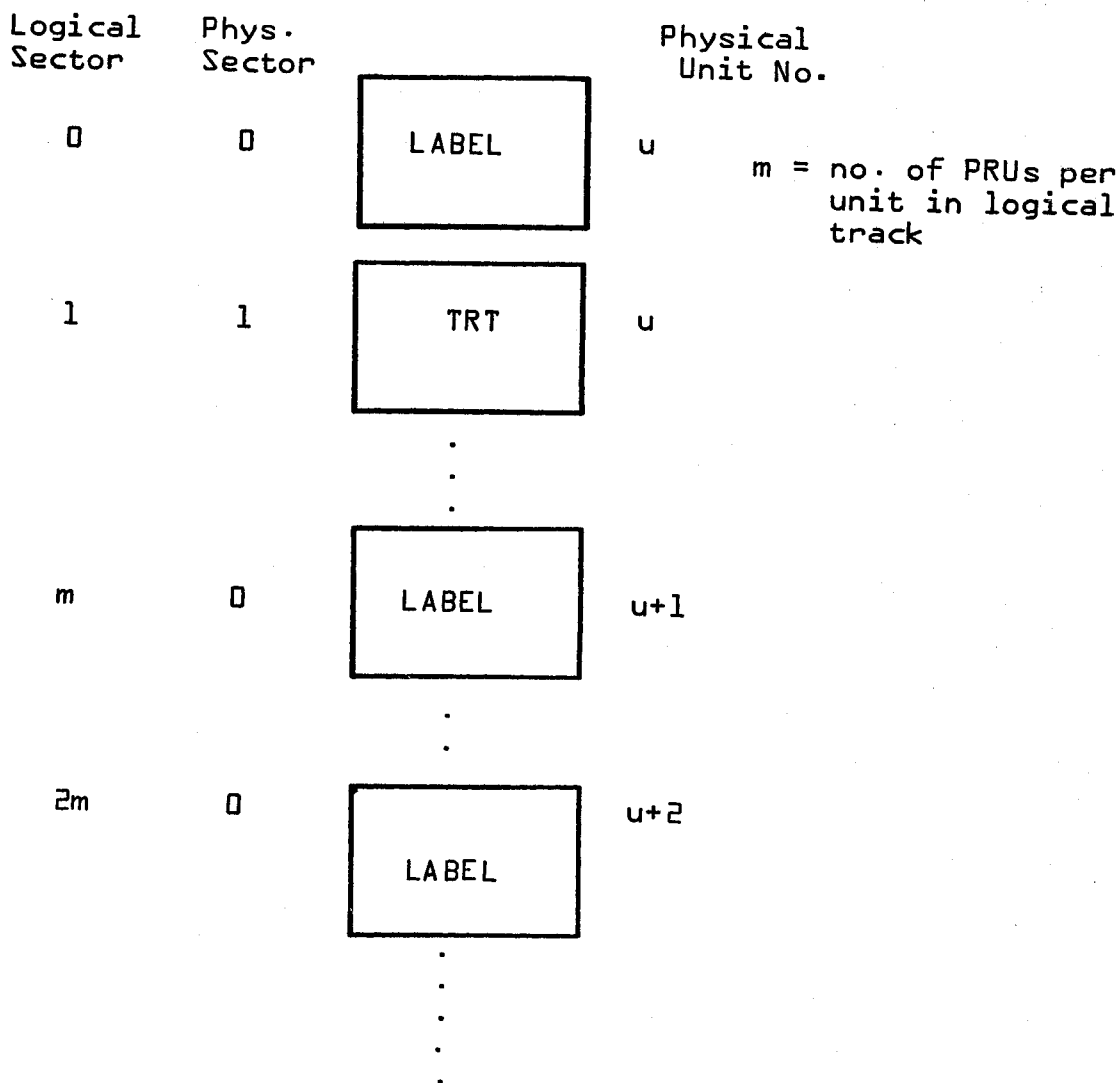
FTSS = logical track

Tags are defined in PPCOM.

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 PRODUCT NAME KRONOS 2-1
 PRODUCT MODEL NO. _____ MACHINE SERIES 6000/CDC CYBER 72,73,74

3.0 Device Label Format

On every mass storage device a label is written (usually track 0) containing information about the allocation and characteristics of the device. This label track consists of a label sector, n PRUs containing the TRT for the device (as of last checkpoint) and label sectors on the first sector of each unit of the device. The layout of the label track is:



The label has the following format.

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

DEVICE LABEL

CCSS Catalog Count	FNSS	LA	BE	LOO	0001	0500
CDSS Device Mask		E0SS	FTSS			FASS
DASS First Track of Indirect Files	DTSS	PACKED DATE AND TIME				
ALSS First Track of Catalogs {Label Track}						
PRSS First Track of Permits						
ETSS Equipment Type						
SLSS Sector Limit						
SNSS Sector Number {Logical}						
MTSS First Word of Mass Storage Table {as of Last Check Point}						
LMSS Limit of Data in Label Sector	CESS			CCSS	CDSS	
COSS Catalog Ordinal for device {for devices run under 2.0}			DASS	ALSS	PRSS	
		ETSS	SLSS	SNSS		
		COSS	WCSS			
WCSS Word Count of MST - 0 if no MST present {label written under 2.0}	ESSS					
	MTSS					
Tags Defined in COMSDSL or SYSTEXT	MSTL	.	MST	See Detail of		
		.		MST		
		.				
		.				
ESSS EST entry for device	LMSS	.				

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. II B-5
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. _____ MACHINE SERIES 6000/CDC CYBER 72,73,74

4.0 Direct Access File System Sector Format

Because data retained in the system sector for a direct access file is of concern during recovery of a device the format of this sector is described in the following table.

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

EST ENTRY

59 47 43 35 23 11 0

MSPICU	CH2	CH1	PE	NU	PS	PU	B	DEVICE TYPE	MST/10
--------	-----	-----	----	----	----	----	---	-------------	--------

Bit Position

- M = Mass Storage 59
- S = System on Device 58
- P = PF's on Device 57
- I = Interchangeable Device 56
- C = Checkpoint Request 55
- U = Device Unavailable 54
- PE = Physical Equipment 33-35
- NU = Number of Units 30-32
- PS = Select Code 27-29
- 1 = Drive
- 2 = File
- PU = First Physical Unit 24-26
- B = Device Unavailable for
 System Allocation 23

MASS STORAGE TABLE {MST}

59 47 35 23 11 0

Number of PPU Available {Minimum}	's {Minimum}	Length of TRT		Number of Available Tracks	TRTL
--------------------------------------	-----------------	------------------	--	----------------------------------	------

CONTROL DATA CORPORATION

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DOCUMENT CLASS ERS PAGE NO. II B-8 Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EO88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

MST {Continued}

59	47		35	17	0
Current Position	F	E	USLM	Maximum Sector Limit	Minimum Sector Limit

MSDL

F = Format Pack Request Pending {844 only} 47
 E = Release Reserve when Releasing Channel 46
 USLM = Unit Sector Limit for Multi Unit Device 36-45

59	0				
RESERVED FOR MASS STORAGE DRIVERS					

59	0				
RESERVED FOR MASS STORAGE DRIVERS					

59	47		35	23	11	0
First Track of Indirect Files	Label Track		First Track of Permits	Actual Number of Catalogs	System Table Track	

DEVL

59	53	4847		43	23	11	9	2	1	0		
	D	G	N	R	A	Reser-ved	Number of Holes in PRU's	Direct Access File User Count	Next Eq in Chain	U	T	I

PFIL

D = Direct Access Files may reside on device 53
 G = Initialize Request Pending 52
 N = Not Available for PF Access 51
 R = Removable Device 50
 A = Alternate System Device 48

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DOCUMENT CLASS ERS PAGE NO. II B-8.1 Rev A |
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

U = In use as chained interchangeable device 2
T = Total Device Interlock {Utility Interlock} 1
I = Device Interlock {not set = busy} 0

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. II B-9 Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

MST {Continued}

59	17	11	7	0	
Family/Pack Name	Device Number	X	0	Device Mask	PFDL

X = Catalog Tracks Continuous 11

0 = Catalog Track Overflowed 10

59	17	0	
User Number for Private Pack			PFUL

59	0
Reserved for Future Use {4 words}	

59	0
Reserved for Installation Purposes {4 words}	ISTL

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. II C-1 Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPENDIX C

DAYFILE AND OPERATOR MESSAGES

DAYFILE MESSAGES

- *BUFFER OUT OF RANGE.* = Buffer outside of field length.
- *EQNN,UNITXX LABEL CONFLICT.* = Label of device conflicts with MST parameters.
- *EQNN, PERMANENT FILE LINKAGE ERROR.* = TRT edit was unsuccessful.
- *EQNN, TRT LENGTH IS BAD.* = TRT read was unsuccessful.
- *PF LENGTH ERROR UINDEX FILENAM.* = End of linkage in TRT for D.A.F. is not an EOI sector.

DEADSTART MESSAGES

- *CATALOG RECOVERY ERROR IN CM, DATA FROM LABEL IS USED.* = Device layout parameter did not verify against the label.
- *CONFIGURATION IS IN ERROR. RECOVERY OF DEVICE IMPOSSIBLE.* = Label did not verify.
- *DEVICE DESCRIPTION ERROR IN CM, DATA FROM LABEL IS USED.* = Device mask, family name or device number did not verify.
- *DEVICE RESIDENCE CONFLICT IN CM, DATA FROM LABEL IS USED.* = Device and CM do not agree on residence.
- *EST/FNT LENGTHS CONFLICT, RECOVERY OF DEVICE IMPOSSIBLE.* = Table lengths did not verify correctly.
- *LABEL ERRORS ON UNITNN. RECOVERY OF DEVICE IMPOSSIBLE.* = No label sector found on device.
- *LENGTH OF DEVICE TRT BAD. RECOVERY OF DEVICE IMPOSSIBLE.* = Error in TRT read from mass storage to CM.
- *PERM. FILE LINKAGE ERROR. RECOVERY OF DEVICE IMPOSSIBLE.* = TRT edit resulted in error.
- *SYSTEM TABLE FILE DESTROYED. RECOVERY OF DEVICE IMPOSSIBLE.* = No system table track found.

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. II C-2 Rev A |
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

OPERATOR MESSAGES

RECOVERING PF.EQXX. TRK NNNN. = Indicates equipment and track being recovered.

DOCUMENT CLASS ERS PAGE NO. II D-1 Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPENDIX D

Permanent files created under 2.0 systems may be recovered by 2.1 systems using the following method. This method applies only to 2.0 systems updated through level 10.

To determine the permanent file definitions needed for 2.1 CMRDECK, use the following. Note the PF entry is not required for 2.1 recovery, but is included here to describe PF characteristics of PF device.

1. If the PF status was S under 2.0 use PF status D for 2.1.
2. If the PF status was D under 2.0 use PF status I for 2.1.
3. The device mask should remain the same for both systems.
4. The family name for 2.1 should be null since no family name was possible for 2.0 systems.
5. The device number for 2.1 should be the catalog ordinal of the device under 2.0 biased by 40_8 .

As an example:

If 2.0 CMRDECK was:

```
E00=DB,0N,1,0,0.
E01=DB,0N,1,0,1.
E02=MD-4,0FF,4,0,2.
E03=MD-2,0N,4,4,2.
```

```
PF=1,0N,S.
PF=2,0N,D,37?.
PF=3,0N,S.
```

Under 2.1 the CMRDECK should be:

```
E00=DB,0N,1,0,0.
E01=DB,0N,1,0,1.
E02=MD-4,0FF,4,0,2.
E03=MD-2,0N,4,4,2.
```

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. II D-2 Rev A
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

PF=1,0N,D,,,40.
PF=2,0N,I,377,,,41. } Not required unless initializing.
PF=3,0N,D,,,42.

As long as the permanent file devices are not reconfigured, either under 2.0 or 2.1, the installations can alternate between 2.0 and 2.1 systems without reloading permanent files.

NOTE: The limitations exist that no family name may be used as long as regression to 2.0 is desired. Also removable devices will not be accessible under 2.0. Also to have a device which was considered dedicated under 2.0 {PF=n,st,D,dm.}, the device should have I type residency under 2.1 and equipment status should be OFF. In the previous example, equipment 2 will contain only users catalogs and indirect access files.

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. II E-1 Rev A 1
 PRODUCT NAME KRONOS 2.1
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APPENDIX E

MDI K-DISPLAY

*** MASS STORAGE DEVICE INITIALIZATION ***

CURRENT

OPTION	VALUE	DESCRIPTION
FN	= 0	FAMILY NAME
PN	= 0	PACK NAME
UN	= 0	USER NUMBER
PW	= 0	PASSWORD
DM	= 0	DEVICE MASK
NC	= 0	CATALOG TRACKS
EQ	= 0	EST ORDINAL OF DEVICE
NU	= 1	NUMBER OF PACKS
DN	= 0	DEVICE NUMBER
PU	= 0	PHYSICAL UNIT OF PACK
OP	= 0	OPTION, 0=FULL INITIALIZE

1=INITIALIZE AND RECOVER FLAWS
 2=ENTER FLAWS
 3=FORMAT PACK {844}

RTK, STK AND TTK ENTRIES, ENTER SINGLY
 GENERAL FORMAT- XTK=A.
 WHERE, *XTK* IS-
 RTK = RESERVE TRACK
 TTK = TOGGLE TRACK
 STK = SET LOGICAL TRACK
 AND *A* = EQUIPMENT FORMAT-
 DA - T000,60,S000
 DB - P00,H00,S000
 DC - U0,600,A00000
 DD - C000,S000
 DE - A000000 = ADDR/10B
 DF - C000,S0000
 DH - C0000,S0000
 DI - C000,T00,S00
 MD - C000,S0000
 LIMIT = 20B ENTRIES.

DOCUMENT CLASS ERS PAGE NO. III i Rev A
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

1.0 SCOPE

This document describes the KRONOS 2.1 enhancements (over the KRONOS 2.0 system) in the area of permanent files and the utilities.

The basic purposes for these enhancements are:

1. Improve allocation of indirect access files.
2. Improve the usage of free space on permanent file devices.
3. Control use of permanent files.
4. Optimize catalog manipulation.
5. Provide new access modes for direct access files to allow multiple users to read a file while one user is modifying that file.
6. Provide command to alter parameters in catalog entry.
7. Provide capability to initiate procedure files that are permanent files.
8. Provide better and more reliable utilities for the installation's maintenance of the permanent file base.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

2.0 APPLICABLE DOCUMENTS

- 2.1 KRONOS 2.1 Product Objectives Document E088*2.1
- 2.2 KRONOS 2.0 Batch User's Reference Manual - 59150600 B
- 2.3 KRONOS 2.0 Time Sharing User's Reference Manual - 59151300 B
- 2.4 KRONOS 2.0 Operating Guide - 59151600 B
- 2.5 Interchangeable Device ERS

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. EOBB*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.0 DESCRIPTION

3.1 Improved Allocation of Indirect Access Files

The allocation of indirect access files is improved by the following method. Formerly PFM searched for an indirect access file hole for allocation of the file requested. The requirement was that the hole must be within two sectors of the file in order to qualify for a hole plug. This has been altered to plug the largest hole found on the catalog track and create another hole for the remaining space. This new hole is kept on the same catalog track. This new method has the advantage of requiring allocation of space on the PF device less frequently.

3.2 Improved Usage of Free Space on Permanent File Devices

Two methods are used to improve usage of free space on an indirect access file device. Both of these methods are designed to make free space available to any user's PFM request.

- 3.2.1 When an indirect access file is purged, if the hole created extends across a logical track, PFM releases this track back to the pool of available tracks for allocation by the system. This requires delinking of a track via a CPUMTR function from within the indirect access permanent file chain. This method has the advantage of making the track released available for allocation on the device, for any users access, not just those on the same catalog track.

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 PRODUCT MODEL NO. EOBB*2.1 MACHINE SERIES 6000/CDC CYBER 72-73-74

The new CPUMTR function DLKM has been added to perform this function. The format* is:

DLKM - DELINK TRACKS.

ENTPY

OR

/ DLKM / EQ / FT / NT / LT /

EQ EQUIPMENT NUMBER
 FT TRACK ONTO WHICH NT IS LINKED.
 NT TRACK TO BE LINKED TO FT.
 LT LAST TRACK IN CHAIN TO DROP.

PIT 11 OF FT MUST BE CLEAR
 ALL TRACKS FROM FT (NOT INCLUDING FT) TO LT ARE RELEASED.
 NT IS LINKED TO FT.

EXIT.

OP

/0 /

- 3.2.2 If the file being released is the last file of the indirect access chain, then the space will be released from the indirect access chain.

* See Instant KRONOS for description of CPUMTR functions.

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PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.3 Control Use of Permanent Files

Because of the characteristics of the Permanent File Subsystem, i.e., the generation of a working file; users grouped by catalog track; etc., it has been possible for users to generate and access permanent files in such a manner as to impair other user's access to their permanent files. For example: If a user accumulated a large number of files, then catalog searches for all users in his user group took that much longer. Also, a user could accumulate more space than a site wishes to allow.

As an example:

When accessing the files, it was possible to generate PFM requests in rapid succession, causing the system to continuously search the PF catalogs. An example of this would be when a user wished to access a direct access file and found it interlocked. There was nothing to prevent him from immediately retrying that request, thus, keeping PFM searching that catalog.

3.3.1 To alleviate these situations, three areas are altered.

3.3.1.1 For any particular user there are limits, as defined in the VALIDUS file, for the number of files he has in his catalog. If he attempts to exceed this limit, he will be aborted with "CATALOG OVERFLOW - FILES." message issued.

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Also, there are limits on the cumulative size of the files for a user. This is accumulated for indirect access files only. If the user attempts to exceed this, he will be aborted with message "CATALOG OVERFLOW - SIZE."

Finally, there are limits on the size of any individual indirect access file that is being placed on the device. If this size is exceeded, the message *FILE TOO LONG* will be issued and the request aborted.

3.3.1.1.1 Job Origin Controls

For each job origin type, controls may be specified which limit the users' access to permanent files. These controls are used only if individual user controls are not specified. These values may be specified in IPRDECK* or via DSD console command.** The format of the SERVICE command is:

```
SERVICE,ot,pixxxxxx
```

Options added.***

pi

FC Number of permanent files allowed. This number is rounded down to nearest 1008.

CS Cumulative size in PRU's allowed for all indirect access files. This value is multiplied by 1008 to determine limit allowed. Maximum value entered is 777777B.

* Refer to Operator's Guide, page 5-17 for description of SERVICE entry.

** Refer to Operator's Guide, page 3-9 for description of SERVICE command.

*** All numbers are octal unless otherwise specified.

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FS Size in PRU's allowed for individual indirect access permanent file. This value is rounded down to nearest 100B PRU's. Maximum value is 777777B.

3.3.1.1.2 Individual User Control

If it is desired to control specific users' permanent file access differently than that specified by origin type then the controls defined by the users' validation entries should be specified. These can be specified when defining or updating the user number via the MODVAL utility.* Three control parameters have been added to the MODVAL directives.

FC = n Number of permanent files allowed. n is a value from 0-7 which specifies the upper limit allowed.

<u>n</u>	<u>upper limit allowed**</u>
0	use job origin control
1	100
2	200
3	400
4	1000
5	5000
6	10000
7	unlimited

If FC is not specified, 0 will be assumed.

CS = n Cumulative size for all indirect access files. n is a value from 0-7 which specifies the upper limit allowed.

<u>n</u>	<u>upper limit allowed**{PRUS}</u>
0	use job origin control
1	1000

* See Operator's Guide, page 8-6 for definition of parameters that can be specified.

** These values are specified in COMSPFM and require reassembly of system to alter - all values are octal unless otherwise specified. If value is zero, no controls are enacted.

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2	2000
3	5000
4	10000
5	50000
6	100000
7	unlimited

If CS is not specified, 0 will be assumed.

FS = n Size allowed for individual indirect access permanent file. n is a value from 0-7 which specifies the upper limit allowed.

<u>n</u>	<u>upper limit allowed*{PRUS}</u>
0	use job origin control
1	10
2	20
3	30
4	40
5	50
6	60
7	unlimited

If FS is not specified, 0 will be assumed.

3.3.1.2 When a user attempts to access files that are interlocked, the system automatically suspends the job until the file becomes available. This is available for the ATTACH function only.

The ATTACH command, and control card, automatically do this and the error flag is not set if the file is busy. The user may bypass this automatic suspension, by specifying the A option on the control card.

* These values are specified in COMSPFM and require reassembly of system to alter - all values are octal unless otherwise specified.

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If this option is specified ATTACH {lfn/A,....} the system aborts the command if the file is busy.* The user calling PFM via the macros provided, can bypass this automatic suspension by specifying error processing.** If error processing is specified, the system returns control to the user with error status reflecting *FILE BUSY*.

3.3.1.3 When a user defines a direct access file, it is placed on the device with the most space available unless the request indicates a specific device type. If more than one of a device type exists, the file is placed on the one with the most space available. The *S* parameter specifies a PRU count. This indicates the amount of space desired for file. The system will place the file on a device {of type specified by *R*} with this much space available. If no device has this space available the command will be aborted with the message *REQUESTED SPACE UNAVAILABLE.*. No guarantee is made that the space currently available will be available when the user expands the file.

* See Section 3.5 for further definition of file busy situations.
** See Batch User's Reference Manual, page 7-67 for method of error processing.

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3.3.1.3.1 Format of Control Card*

```
DEFINE {lfn=pfn,lfn1=pfn1,...,lfnn=pfn / PW=password,
```

```
CT=ct, R=r, M=m, S=space, PN=packname}**
```

The S parameter is a decimal PRU count.

3.3.1.3.2 Format of Macro***

```
DEFINE {lfn, pfn, pwd, u, r, c, m, pn, s}**
```

S is PRU count desired. It may be set in FET word 9

{CF0U} right justified bits {0-23}.

* See Batch User's Reference Manual, page 5-52 for description of parameters for DEFINE command.

** See Interchangeable Device ERS for description of PN parameter.

*** See Batch User's Reference Manual, page 7-77 for description of parameters for DEFINE macro.

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3.4 Optimize Catalog Manipulation

- 3.4.1 Because more than one copy of PFM may be active, certain situations arise when the device or catalog track must be interlocked (see description on interlock, Section 4.7). PFM is modified to interlock only those areas required and only when the type of request requires it. This also allows the utilities to run concurrently with PF requests, since they can request the interlocks also. The utilities interlock the device and then wait for catalog interlocks to be available. If an utility operation is currently taking place, the user receives the message PF UTILITY ACTIVE and the command is aborted. This occurs only for PF requests issued by TELEX (i.e., OLD, LIB, GET, PURGE, PERMIT, and ATTACH) and not forced as control card requests (via batch mode X, GET.). All other PF requests (BATCH, REMOTE BATCH, SYSTEM and TELEX control card requests) go on recall and wait for utility interlocks to clear.
- 3.4.2 Former catalog search methods are modified to take advantage of an additional buffer in PFM. For all commands the catalog is searched only once to determine the action to be taken. Former methods required two passes over the catalog for certain commands.

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3.4.3 When a direct access file is purged, no hole is created, however, a "null" catalog entry is created. These null entries are used by PFM when creating a catalog entry for a new direct access file.

3.4.4 Access to permission information is optimized to take advantage of an additional buffer.

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3.5 New Access Modes for Direct Access Files*

The access to KRONOS permanent files are enhanced to include four new modes for direct access files. These modes are:

MODIFY - Modify File

READMD - Read and Allow File Modifications

READAP - Read and Allow File Extensions

APPEND - Only Allow Extensions to File

3.5.1 MODIFY

Accessing a file in this mode allows a user to replace any information within the file {REWRITE} or add information at the end of the file. As an example, randomly rewriting a PRU within the file is permissible, but writing a PRU somewhere within the existing boundaries of the file in a mode that would release all trailing information is not. This mode has significance only for direct access files. The format of the command is:

ATTACH{lfm/M=M}

3.5.2 APPEND

This command still exists and causes an existing local file to be appended at the end of an existing indirect access file.** A mode of access exists for direct access files which allows a user to write a file only at the existing EOI. This is the append mode of access. The format of the command is:

ATTACH{lfm/M=A}

* Refer to Batch User's Reference Manual for existing modes.

** See APPEND command, Batch User's Reference Manual, page 5-53 for further description.

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3.5.3 READMD

A mode of access exists for direct access files which allows a user to specify read access to a file with the indication that another user may currently be accessing the same direct access file in MODIFY mode. This user can be assured no one will destroy the file that exists, but that other users may alter the data within the file or add to the file at EOI. This mode of access has meaning only for direct access files. The format of the command is:

```
ATTACH{lfm/M=RM}
```

3.5.4 READAP

A mode of access exists for direct access files which allows a user to specify read access to a file with the indication that another user may be currently accessing the same direct access file in APPEND mode. The user can be assured that no one will destroy the file, or alter the data that exists on the file, but that they may add data to the file at the current EOI for the file. This mode of access has meaning only for direct access files. The format of the command is:

```
ATTACH{lfm/M=RA}
```

3.5.5 Internal Characteristics

Some confusion may arise in the resulting current access mode of a direct access file when some of the modes just described are specified and the file is already active with another mode.

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This can perhaps be clarified by breaking the possibilities into three groups:

Current access write, read access desired

Current access read, read access desired

Current access read, write access desired

The following tables will describe the resulting current access associated with the direct access file for the possible combinations for these three groups. This status should not be confused with the mode the user will have when requesting access. For instance, in Table A, READMD access is desired and current access is MODIFY. Resulting current access indicates one user is modifying and at least one user is reading the file. The user requesting READMD access to the file gets read only access.

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3.5.5.1 Response to Current Access Write/Read Access Desired*

Access Desired	Current Access		
	WRITE {W}	MODIFY {M}	APPEND {A}
READ {R}	FB	FB	FB
EXECUTE {E}	FB	FB	FB
READMD {RM}	FB	MODIFY/READ	APPEND/READ
READAP {RA}	FB	FB	APPEND/READ

TABLE A

3.5.5.2 Response to Current Access Read/Read Access Desired

Access Desired	Current Access			
	READ {R}	READMD {RM}	READAP {RA}	{FREE}
READ {R}	READ	READ	READ	READ
EXECUTE {E}	READ	READ	READ	READ
READMD {RM}	READ	READMD	READAP	READMD
READAP {RA}	READ	READAP	READAP	READAP

TABLE B

3.5.5.3 Response to Current Access Read/Write Access Desired*

Access Desired	Current Access			
	READ	READMD	READAP	{FREE}
WRITE {W}	FB	FB	FB	WRITE
MODIFY {M}	FB	MODIFY/ READ	FB	MODIFY
APPEND {A}	FB	APPEND/ READ	APPEND/ READ	APPEND

TABLE C

Only one user at a time may access file in any of the write modes {W, A, M}.

* FB = File Busy

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The results from the previous tables can produce confusing results if certain operations are performed. For example:

Assume one user is accessing a file with READMD mode and another user desires READ access. The resulting mode {READ — see Table B} will prevent any other user from write access. So the sequence:

1. ATTACH{RM=DA/M=RA}

.

.

2. ATTACH{WM=DA/M=A}

may produce a "file busy" response for the second ATTACH if another user has attached the file in READ mode between control cards 1 and 2.

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3.5.6 External Characteristics for New Modes of Access

3.5.6.1 ATTACH Control Card*

For the MODE parameter the new options are:

<u>Full Parameter</u>	<u>Alternate Short Form</u>
APPEND	A APPEND ONLY ACCESS
MODIFY	M MODIFY ONLY ACCESS
READMD	RM Read and allow modification
READAP	RA Read and allow append

3.5.6.2 ATTACH MACRO**

For the mode parameter the new options are:

<u>Value</u>	<u>Mnemonic</u>	<u>Short Form</u>	<u>Description</u>
2	PTAP	A	APPEND
5	PTMD	M	Modify
6	PTRM	RM	Read allow modify
7	PTRA	RA	Read allow append

For example:

ATTACH F,X1,,,RM will request read and allow modify mode.

or

ATTACH F,X1,,,MDE

where

MDE CON PTRM will produce same.

* Refer to Batch User's Reference Manual page 5-53 for further description of ATTACH command.

** Refer to Batch User's Reference Manual page 7-79 for further description of ATTACH MACRO.

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3.5.6.3 Error Messages

Reference the Standardization ERS for error messages that can be issued when a write operation is requested in a direct access file that is attached in one of the new modes.

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3.5.6.4 Permission Modes

Permission modes can be associated with a permanent file or a user of a permanent file.

1. Permission modes of files are defined by specifying the M parameter on the SAVE or DEFINE command. This mode will have significance only to public or semi-private files. When a user accesses files, the mode of the file will designate the type of access allowed.
2. Permission mode for users of a file is meaningful only for private files. This mode is specified by issuing the PERMIT command. This mode will control the type of access an alternate user is allowed.

The following table describes the mode of access specified and the mode of access allowed.

<u>Specified</u>	<u>Allowed</u>
WRITE	WRITE, READ, APPEND, EXECUTE, MODIFY
READ	READ, EXECUTE
APPEND	APPEND
EXECUTE	EXECUTE
NULL	NEGATE ALL EXISTING PERMISSIONS
MODIFY	MODIFY, EXECUTE, READ, APPEND
READ/ALLOW MODIFY	READ, EXECUTE, READ ALLOW MODIFY
READ/ALLOW APPEND	READ, EXECUTE, APPEND, READ ALLOW APPEND

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The following list describes the type of permission necessary to perform an operation on a file in an alternate users catalog. Users accessing files in their own catalog have full {WRITE} permission.

<u>Command</u>	<u>Permission Needed</u>
GET	EXECUTE
APPEND	APPEND
REPLACE	WRITE
SAVE	Alternate Catalog access not allowed
ATTACH	Mode specified {READ is default}
DEFINE	Alternate Catalog access not allowed
PURGE	WRITE
PERMIT	-

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3.6 New Permanent File Commands

3.6.1 CHANGE

This command will allow a user to alter any of several parameters for a permanent file without retrieving and replacing the file itself.

3.6.1.1 Control Card Format

CHANGE{fn=ofn/CT=file cat., M=mode, PW=password, PN=packname}

nfn = new permanent file name

ofn = old permanent file name

If ofn omitted, then no name change will take place. The following parameters should be entered only if a change in the value associated with that parameter is desired.

CT = file category*

M = mode*

PW = new password

PN = packname. This designates file resides on this removable device.

NOTE: This command will cause modification and last access date to be updated for the file being processed.

Only the owner of the file may perform this function, (i.e., UN is illegal parameter).

* See Batch User's Reference Manual, page 5-51 for legal options for these fields.

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3.6.1.2 Macro Format

CHANGE f,pf,npf,pw,uc,ct,m,pn

f = address of FET
pf = old permanent file name
npf = new permanent file name
pw = new file password
uc = user control word
ct = new file category
m = new file mode
pn = packname*

3.6.1.3 Error Messages

{file name} NOT FOUND.* Permanent file name specified was not found in catalog.

{file name} ALREADY PERMANENT.* New permanent file name specified already exists in users permanent file catalog.

* See Interchangeable/Removable Device ERS for explanation of this parameter.

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3.6.2 PURGALL

The PURGALL command will purge all permanent files that satisfy the criteria specified by the arguments.

3.6.2.1 Control Card Format

PURGALL{CT=file cat., AD=access date, MD=modification date, CD=creation date, DN=device number, TY=type, TM=time, PN=packname}

CT = file category*

DN = device number

TY = file type

<u>Option</u>	<u>Short Form</u>	<u>Description</u>
INDIR	I	All indirect files
DIRECT	D	All direct files
ALL	A	All files

If options are not present {ALL} is default

AD = last access date

MD = last modification date

CD = creation date

} Purge all files prior to specified date

Format of date:

yymmdd

yy = year - last two digits of year

mm = month {1-12}

dd = day {1-31}

TM = time of day. This applies to date specified by AD, MD, or CD.

* See Batch User's Reference Manual, page 5-51 for legal options for these fields.

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Format of time:

hhmmss

hh = hours 0-23

mm = minutes 0-59

ss = seconds 0-59

PN = packname

The command is aborted with the message ERROR IN ARGUMENTS when one or more of the following conditions are detected:

- more than one date entered.
- no options selected.
- identifier not recognized.
- time present with no date.
- both device number and packname present.

To purge all files for a catalog enter:

PURGALL{TY=A}

CT, DN, TY, TM and either AD, MD, or CD may be entered simultaneously.

3.6.2.2 No macro will be provided for this command.

3.6.2.3 Error Messages

- * ERROR IN FILE CATEGORY.* = file category specified is not legal.
- * ERROR IN FILE TYPE.* = file type specified is not legal.
- * ERROR IN DEVICE NUMBER.* = file residency specified is not legal or not available on the system.

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- * ERROR IN DATE.* = format of date is incorrect.
- * ERROR IN TIME.* = format of time is incorrect.
- * ERROR IN PACKNAME.* = packname is more than 7 characters.

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3.7 Procedure File Processing

The CALL statement* has the capability of activating a procedure file from a permanent file, local file or system library.

3.7.1 Control Card

```
CALL {lfn,p1,p2,RENAME{f1=e1,f2=e2,...fn=en}}
CALL {lfn,p1,p2{f1=e1,f2=e2,...fn=en}}
```

lfn source file name
 lfn will be located by -
 1. Search for local file.
 2. Search system library.
 3. Attempt to retrieve indirect access file from permanent files.

pn any of the following arguments in any order.

C clear current statement file before entering.

S set next control statement to first statement.

S=ccc set next control statement to statement number ccc.

RENAME for each occurrence of the name *fn*, on source file, substitute the name *en*.

3.7.2 Terminal Command

The terminal user can initiate the CALL statement in the Batch subsystem. In any other subsystem the command *- lfn* will be translated into the CALL {lfn} statement and processed by the system. All parameters after the *-* will be compatible with the CALL statement.

* See Batch User's Reference Manual, page 4-9 for more complete description.

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3.8 PF Utilities

A majority of the enhancements to the permanent file utilities increase the reliability of the maintenance of the permanent file system and reduce the operational effort and time required to maintain archive files. All of the utilities may be called from control cards provided that the job containing the control card has "system" origin type. All of the utilities except Mass storage Device Initialization {MDI} may be invoked through the permanent file supervisor {PFS} display. The following sections describe the utility supervisor program and the permanent file utilities.

3.8.1 PFS - Permanent File Supervisor

PFS processes all permanent file utilities parameters. Then it loads the correct processing overlay. Utilities may be called from the operator's console by the following methods.*

1. X.PFS.

This method employs the following sequence of operator commands:

X.PFS.

K.uo.

K.p1.p2.....pn. where the parameters are of the form
keyword = value.

K.G0.

* See Operator's Guide, pages 7-1 and 7-2.

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 PRODUCT MODEL NO. EQ88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

The "uo" options are given in this table:

<u>Utility Options {uo}</u>	<u>Utility</u>
LD	PFLoad - Load Permanent Files.
DU	PFDump - Dump Permanent Files.
CA	PFCat - Catalog Permanent Files.
AT	PFATC - Catalog PF Archive Tape.
CP	PFCOPY - Copy PF Archive File(s) to CP.

2. X.PFutil{p1,p2,...,pn}

This method employs the operator command:

X.PFutil{p1,p2,...,pn}

where the parameters are of the form keyword = value. The "util" options are given in this table:

<u>Utility Options {util}</u>	<u>Utility</u>
LOAD	Load Device(s)
DUMP	Dump Device(s)
CAT	Catalog Device(s)
ATC	Archive File Catalog
COPY	Archive File Copy

By issuing this command, the K-display will appear for this control point with the parameters entered shown. However, since parameters were entered on the control card, no parameters may be entered via the K-display. If there is an error in parameters detected at initiation or during execution of a utility, control will be returned to PFS

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and parameters may then be entered via the K-display.

Wherever possible, parameters available for the utilities will be compatible with all utilities. For both of the above methods, the following table illustrates all possible parameters, options available for these parameters, and for which utilities they are valid entries.

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	PFL0AD	PFDUMP	PFCAT	PFATC	PFCOPY
FN = Family Name	X	X	X		
PN = Pack Name	X	X	X		
DN = Device Number	X	X	X		
T = Archive File Name	X	X		X	X
L0 = List Option					
T - Files Processed	X	X	X	X	X
C - Catalog Files	X	X		X	
E - Errors	X	X	X	X	X
S - Summary			X		
L = Output File Name	X	X	X	X	X
OP = Utility Option					
C - Creation	X	X	X	X	X
A - Last Access	X	X	X	X	X
M - Last Modification	X	X	X	X	X
I - Indirect	X	X	X	X	X
D - Direct	X	X	X	X	X
B - Before Date and Time	X	X	X	X	X
P - Purge after Dump		X			
R - Replace	X				
Q - Catalog and Permit Records					X
N - Noninitial	X				
NR = No Rewind	X	X		X	X
NU = No Unload	X	X		X	X
SF = Number of Files to Skip	X	X		X	X

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	PFL0AD	PFDUMP	PFCAT	PFATC	PFCOPY
N = Number of Files to Process	X			X	X
DT = Date	X	X	X	X	X
TM = Time	X	X	X	X	X
UI = User Index	X	X	X	X	X
PF = Permanent File Name	X	X	X	X	X
DI = Destination User Index	X				
V = Verify		X			
DD = Destination Device Number	X				
MF = Master File Name					X
UN = User Number	X	X	X		

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3.8.1.1 Dayfile Messages

None

3.8.1.2 Operator Messages

ILLEGAL FUNCTION. = illegal utility specified.

ENTERED PARAMETER IS ILLEGAL. = parameter is not in legal format.

3.8.1.3 Description of Permanent File Utility Parameters

Sections 3.8.1.3.1 through 3.8.1.3.22 describe parameters associated with the utilities which can be called by the permanent file supervisor {PFS}.

3.8.1.3.1 FN = Family Name

This parameter indicates which family is to be processed. This would not normally be entered unless more than one family were active in the system. The default is the normal system family.

3.8.1.3.2 PN = Packname

This parameter indicates which removable device is to be processed. Device must be mounted and available.* Default is no name.

* See Removable Device ERS for definition of when device is mounted and available.

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3.8.1.3.3 DN = Device Number

This parameter indicates which logical permanent file device is to be processed. This would be used only if a portion of the permanent file system were to be processed. Normally all devices in a permanent file system {or family} would be processed. The default is zero which indicates all family devices. This entry will be assumed entered in octal unless non octal digit is encountered or D radix is used.

3.8.1.3.4 T = Archive File Name

This parameter is the name of the file the utility is using to store or read the archive files. This would normally be the physical tape containing or to contain the permanent file system. This also could be a mass storage file. The default name is *TAPE*.

3.8.1.3.5 L0 = List Option

The string of characters specified by this option specifies the type of output reports desired from the permanent file utilities. The default varies with the utility.

- T - list all files processed.
- C - list all files in catalog for system.
- E - list errors.
- S - list cumulative statistics for catalog.

The options are specified as a character string. For example:

L0 = TES

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3.8.1.3.6 L = File Name of Output

This parameter specifies the file name reports are to be written on. The default is *OUTPUT*.

3.8.1.3.7 OP = Utility Options

This parameter specifies the options which control the files to be processed by the utility. Many of the options require an additional parameter to further define the selections. The default is zero.

- C - select creation date. Requires TM, DT parameters.
- A - select last access date. Requires TM, DT parameters.
- M - select last modification date. Requires TM, DT parameters.

Only one of the options C, A, or M may be selected at any time.

- I - select indirect access files.
- D - select direct access files.

Only one of the options I or D may be selected at any time.

P - Purge after dump. This option indicates to PFDUMP that those files he has dumped should be purged after the dump has completed.

B - Before date and time. This option indicates that the date and time options previously selected refer to those dates before which processing is desired. Normally the date and time options specify the dates after which all files should be processed.

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R - Select replace option. This parameter specifies to PFLoad that files encountered on tape should replace files that exist in current permanent file system. Normally, if a file exists in a permanent file system, PFLoad will skip loading of the archive file.

Q - Select leading records. This parameter specifies to PFCOPY that two header records {catalog and permit} should be included when copying file{s}.

N - Non-initial load. This parameter specifies to PFLoad that permanent files presently reside on device to be loaded. PFLoad does not load files that are already on device unless R option is specified. This only provides a check on master devices to assure that the operator intends to load to a device that already contains files.

3.8.1.3.8 NR = No Rewind Option

This parameter indicates the file being used as archive file should not be rewound before processing begins. Default is rewind.

NOTE: File must be positioned correctly as normal permanent file label will be read/written as first step.

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.8.1.3.9 NU = Select No Unload Option

This parameter specifies the file being used as archive file should not be rewound and unloaded at the completion of processing. The default is rewind and unload.

3.8.1.3.10 NR and NU may be used to generate several dumps on one archive file in the following manner.

To generate three {3} file dump tape:

PFDUMP{...NU}	Rewind before but not after processing.
PFDUMP{...NR,NU}	No rewind before or after processing.
PFDUMP{...NR}	No rewind before but unload after processing.

This same method of utilizing NR and NU options may be used by other utilities to process an archive tape which contains several dumps. Number of files option may also be used.

3.8.1.3.11 SF = Select Number of Files to Skip

This parameter specifies the number of files to skip before processing begins. The default is zero. This parameter is assumed decimal unless B radix is used.

3.8.1.3.12 N = Select Number of Files to Process

This parameter specifies the number of files on an archive tape to process. If set to zero, all files to end of information will be processed. The default for this

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parameter is zero. This parameter is assumed decimal
unless B radix is used.

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3.8.1.3.13 DT = Select Date

This parameter specifies the date to be used when C, A, or M option is selected. The default is zero.

3.8.1.3.14 TM = Select Time

This parameter specifies the time to be used when C, A, or M option is selected. The default is zero.

3.8.1.3.15 UI = Select User Index

This parameter specifies the user index for which processing is desired. This parameter can be selected in addition to any other options. The default is zero. The parameter is assumed octal unless D radix or non-octal digit is used.

3.8.1.3.16 PF = Select Permanent File Name

This parameter specifies the permanent file name for which processing is desired. This parameter is associated with the UI option and is ignored if UI is not specified. The default is no name.

3.8.1.3.17 DI = Select Destination User Index

This parameter indicates to PFLoad the user index under which the files being loaded are to reside. All files being processed will be loaded to this user index. The default is zero. The parameter is assumed octal unless D radix or non-octal digit is used.

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3.8.1.3.18 V = Select Verify

This parameter specifies to PFDUMP that verification of the file being written is desired. The default is no verify.

On full permanent file system dump, verification is done on a reel by reel basis. The verify will be a comparison between the verify file and the archive file.

On selective or partial permanent file system dumps, multi or single file dumps may be processed. The verify file will be compared to the archive file.

NOTE: If NU parameter is specified, verify will not take place. If NR parameter is specified, then archive file and verify file will be rewound and verified.

Example:

```
PFDUMP {T=A, V, NU}
```

```
PFDUMP {T=A, V, NR, NU}
```

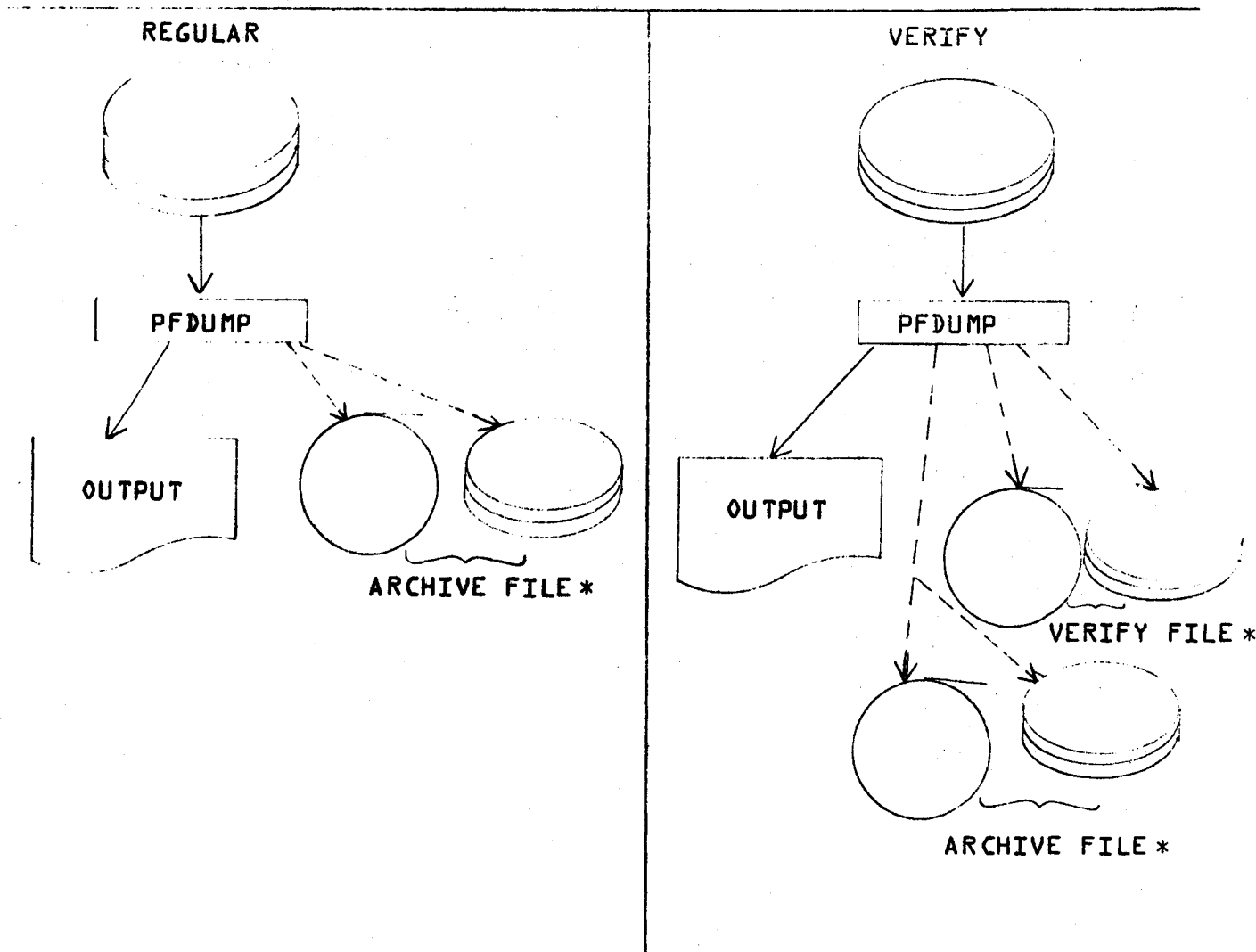
```
PFDUMP {T=A, NR, V}
```

at the completion of this step the verify will take place.

At this point in time verify will take place between the entire verify file and file A. {Just as if VERIFY{A,VER, N=0} had been issued.}

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3.8.1.3.19 By using the verify option and assigning file PFVER to tape before PFDUMP is begun, a dual write of the archive file will be performed. The following diagram shows the difference between verify and regular dump.



NOTE: This shows that archive and/or verify file may be assigned to tape or mass storage.

* Either TAPE or MASS STORAGE

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PRODUCT NAME KRONOS 2.1
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3.8.1.3.20 DD = Select Destination Device Number

This parameter specifies the device number where files are to be loaded. This would normally be used by PFL0AD when reloading a portion of the permanent file base to a different device number. The default is zero. The parameter is assumed octal unless D radix or non-octal digit is used.

3.8.1.3.21 MF = Select Master File Name

This parameter specifies to PFCOPY that all files extracted from an archive source are to be copied to this file name. Default is no name. Otherwise the archive files will be copied as individual files retaining their permanent file name.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.8.1.3.22 UN = Select User Number

This parameter specifies the user number which is associated with the Pack Name parameter. This user number must match information in the mass storage table {MST} for the specified Pack Name. Default is no name.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.8.1.4 Parameter Characteristics

Family Name {FN} 1-7 characters.

Pack Name {PN} 1-7 characters.

Device Number {DN} 2 octal digits.

Archive File Name {T} 1-7 characters.

List Option {LO} 1-7 characters.

Output File Name {L} 1-7 characters.

Utility Options {OP} 1-7 characters.

No Rewind {NR} {*NR* sets option}

No Unload {NU} {*NU* set option}

Skip Files {SF} 2 decimal digits.

Number files to process {N} 2 decimal digits.

Date {DT} b decimal digits yymmdd where yy = year, mm = month, and dd = day

Time {TM} b decimal digits hhmmss where hh = hour, mm = minute, and ss = second

User Index {UI} b octal digits.

Permanent File Name {PF} 1-7 characters.

Destination Index {DI} b octal digits.

Verify {V} {*V* sets option}

Destination Device {DD} 2 octal digits.

Master File {MF} 1-7 characters.

User Number {UN} 1-7 characters.

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PRODUCT NAME KRONOS 2.1
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3.8.2 MDI - Mass Storage Device Initialization

MDI is not under the control of the Permanent File Supervisor {PFS}. Detailed description of MDI is located in the removable device ERS.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.8.3 PFLoad - Permanent File Load

3.8.3.1 PFLoad is a permanent file utility program which loads files from an archive file onto a permanent file device. PFLoad may be called by the permanent file supervisor (see Section 3.8.1) or by a control card in the following format:

PFLoad{p1,p2,...,pn}

The parameters, described in Section 3.8.2, are in the keyword = value format.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. EO88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.8.3.2 The following parameters are valid for PLOAD.

FN = family name

PN = pack name

DN = device number

T = archive file name

LO = List Options

T - Catalog of loaded files.

C - Catalog of catalog image record.

E - Errors.

L = output file name

OP = Utility Options

C - Creation

A - Last Access

M - Last Modification

I - Indirect

D - Direct

B - Before Date and Time

R - Replace

N - Noninitial

NR No Rewind

NU No Unload

SF = n {skip n files}

N = n {number files to process}

DT = yymmdd where yy=year mm=month dd=day

TM = hhmmss where hh=hour mm=minute ss=second

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

UI = user index

PF = permanent file name

DI = destination user index

DD = destination device

UN = user number

3.8.3.3 Default Values

FN = 0

PN = no name

DN = 0

T = Tape

LO = 0

L = Output

OP = 0

NR = not set

NU = not set

SF = 0

N = 0

DT = 0

TM = 0

UI = 0

PF = no name

DI = 0

DD = 0

UN = no name

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.8.3.4 Incremental load is performed by reading the catalog image record {CIR} from the most recent selective PFDUMP {first reel of incremental load process} and placing it on a random file. Each item in the CIR represents a file at the time of the selective dump. When reading an archive file, if a match is found on the CIR, the file may be loaded and the item is cleared out of the CIR. If no match, the file is skipped because it has been either purged or previously loaded.

3.8.3.5 Noninitial load reads catalogs for files existing on permanent file system and checks archive catalog for duplicate file. If file already exists, the archive file is skipped. If not, the file is added to the catalog and the data is stored. This process may be reversed by specifying the *R* utility option {OP=R} in which case an existing file would be purged and the archive file would be added.

Each time PFLoad reads a catalog track where an archive file will reside, an index file is built containing the following information.

59	35	17	0
file name		user index	

To determine whether a file will be loaded, the following procedure will be followed.*

* Note: See Section 3.8.4.4 for example of selective dump and incremental load.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. EQ88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

1. If incremental load, the file on tape must be in the catalog image record to cause file to be a candidate for load. Otherwise, the file on tape is skipped.
2. Since many parameters can be selected for load, if a file is a candidate for load it will be checked against those parameters selected {UI, PF, UN, etc.}. If it meets these criteria it is still a candidate for load. Otherwise the file on tape is skipped.
3. A directory is built by PFL0AD containing information about all files currently in the PF system. If the file is a candidate for load {as determined in 1 and 2} that already exists in PF system, the file on tape is skipped. The only exception is if the R option is selected and the file is a candidate for load. Then the file in the PF system is purged and the file from tape is loaded. If the file is a candidate for load {as determined in 1 and 2} that does not already exist in the PF system and R is not selected, the file from tape is loaded.

3.8.3.6 Tape errors may be encountered when loading a file. This could be caused by an error when writing the tape {PFDUMP} or reading the tape. Such things as dropped records or parity errors could cause this. If tape errors are encountered they are processed by writing an EOF and the length specified in the catalog is updated to reflect the proper length of the file.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.8.3.7 Non-Fatal System Error Messages

These errors result in the file being processed to be skipped on tape and not loaded.

* CATALOG CONTROL WORD MISSING.*

Encountered other than catalog control word on initial control word of archive record.

* PERMITS PRESENT THAT SHOULD NOT BE.*

Permit block found on tape but no previous permit random index found in catalog.

* PERMITS MISSING.*

No permit block present but there was a previous permit random index in the catalog or when entire permit block not read up yet and next word is not a permit control word.

* NO DATA BLOCK.*

Encountered other than data control word when expecting data for current file.

* MISSING EOR.*

Logical EOR missing - invalid data.

* NO EOI FOR FILES.*

Next catalog found before physical EOR found for current file.

* PARITY ERROR *filename* *user index**

Parity error encountered while loading file {lfn}, file skipped.

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EO88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

* TAPE ERROR *filename* *user index**

Issued when certain of preceding errors occur, file is noted and skipped, and loading is resumed.

* TAPE PARITY ERROR.*

Parity error encountered, file name unknown, tape skipped to next EOR.

3.8.3.8 Fatal System Error Messages

These errors result in PFLOAD being aborted.

* NO USER INDEXES ON TAPE MATCH DEVICE MASK.*

* ILLEGAL CATALOG TRACK COUNT.*

* ERROR IN CATALOG IMAGE ON PFDUMP TAPE.*

* PARITY ERROR IN CATALOG IMAGE RECORD.*

* ANY LOADING TO THIS POINT*
 * INCOMPLETE - A REINITIALIZE*
 * AND RELOAD IS REQUIRED.*
 * PFLOAD ABORTED.*

* DEVICE SPECIFIED NOT FOUND.* DN specified not defined in system.

* NO PF DEVICE IN EST.* No permanent file device is specified.

3.8.3.9 Informative Operator Messages

* PFLOAD yy/mm/dd. hh.mm.ss.*

Tape label information*

* PFLOAD REEL xx DEVICE xx*

* LOADING *file name* *user index** Identification displayed of current file being loaded.

* Information from label generated by PFDUMP.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

* P. F. DEVICE *devicenumbr* LOADED.*

* WAIT FOR TOTAL INTERLOCK.* Total interlock being set or
cleared.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. EQ88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.8.3.10 Operator Messages which require action

- * NO TAPE LABEL.*
- * TAPE LABEL ID ERROR.*
- * REEL SEQUENCE ERROR.*
- * LABEL DATE ERROR.*
- * LABEL TIME ERROR.*
- * MOUNT REEL NUMBER x *
- * FORMAT ERROR.*

The action to be taken for the above situations is to make sure a dump tape is being assigned and that the proper label information being requested is in the label. This is label verification on the label generated by PFDUMP.

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3.8.4 PFDUMP - Permanent File Dump Utility

3.8.4.1 PFDUMP is a permanent file utility that copies files stored on a permanent file device to a backup storage file. Files created by PFDUMP may be reloaded by the PFLoad utility program.

3.8.4.2 Called by PFS {see Section 3.8.1} or control card in the following format:

PFDUMP{p1,p2,...,pn}

The parameters, described in Section 3.8.2, are in the keyword = value format. The following parameters are valid for PFDUMP.

FN = Family Name

PN = Pack Name

DN = Device Number

T = Archive File Name

LO = List Options

T - Tape Catalog

C - Catalog on device

E - Errors

L = Output File Name

OP = Utility Options

C - Creation

A - Last Access

M - Last Modification

I - Indirect Access

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

D - Direct Access

B - Before Date and Time

P - Purge After

NR = No Rewind

NU = No Unload

SF = Number of Files to Skip

DT = Date - yymmdd where yy=year, mm=month, dd=day

TM = Time - hhmmss where hh=hour, mm=minute, ss=second

UI = User Index

PF = Permanent File Name

V = Verify Archive File {see PFS section for description}

UN = User Number

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.8.4.3 Default Values

FN = SYSTEM

PN = no name

DN = 0

T = TAPE

LO = 0

L = OUTPUT

OP = 0

NR = not set

NU = not set

SF = 0

DT = 0

TM = 0

UI = 0

PF = no name

V = not set

UN = no name

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PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.8.4.4 If no options are selected {OP = 0 and DN = 0 or DN = Master Device} then the dump is considered a full permanent file system dump.

If any option but OP = M is selected, then the dump is considered a partial permanent file system dump.

If modification date option is selected {OP = M}, then the dump is considered a selective permanent file system dump.

Selective dumps are intended to be used for incremental load. At the beginning of each selective dump file are record{s} containing catalog images of all files active in the permanent file system when dump took place. This allows maintenance either on a device type basis or system basis. To incrementally load, the initial tape assigned must be the most recent selective dump tape. Many archive files may be loaded {selective or not} following the first selective file, properly loading any part or the whole permanent file system as desired.

Example:

Device 40 = Master Device {contains only indirect files}
Device 41 = Master Device {contains direct and indirect files}
Device 42 = Non-Master {contains direct files}

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	Monday	Tuesday	Wednesday
A.M.	"Dump A" full dumps of devices {will include files on 42}	"Dump E" selective dump of whole system {40, 41, 42}	"Dump G & H" selective dumps of 40 and 41
P.M.	"Dump B, C, & D" selective dump of 40, 41, & 42 separately	"Dump F" selective dump of 42 only.	"Dump I" selective dump of 40, 41, 42 as of current time.

Let's suppose Device 42 goes down before dump I is taken and direct access files on that device are to be loaded from archive files - first Device 42 must be initialized. Archive dump H contains the most recent CIR. It is loaded first. Only the CIR is loaded as none of the files on H are to go to Device 42. Then dumps F, E, D, and last the archive dump A are loaded. By loading the archive dumps H, F, E, D, A - in that order, the most recent copies of files on Device 42 will be reloaded and duplicate copies will be skipped (see Section 3.8.3.4).

Another method might be used if the dump of Device 42 on Tuesday, P.M. specified device number 42 with OP = 0 {PFDUMP{DN=42}}. This is not a selective dump (no CIR written), so on Wednesday when Device 42 goes down a selective dump of the whole system must be taken for all files modified in the last one second, yielding a file {Dump I} containing only a

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catalog image record to serve as the first reel of an incremental load. After dump I is taken, initialize Device 42. Then dump I is loaded followed by dump F which contains all files on Device 42 as of Tuesday, P.M. This will load copies of files as of dump F for Device 42 except those files purged since dump F.

To restore Device 41 on Tuesday, P.M. after the dump F has been taken, initialize Device 41, then incrementally load Device 41 starting with dump F. Note: Only those files will be loaded whose catalogs reside on Device 41. Then load dump E, D, C, B and A. This will restore all files residing on Device 41 and all files on other devices whose catalogs reside on Device 41.

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The following table illustrates how direct access files are selected for dumping when modification date and time are specified.

CURRENT ACCESS	MODIFICATION DATE	CATALOG AFTER REQUESTED DATE	CATALOG BEFORE REQUESTED DATE	
			SYSTEM SECTOR AFTER DATE	SYSTEM SECTOR BEFORE DATE
NONE		DUMP	DUMP	NO DUMP
READ		DUMP	DUMP	NO DUMP
WRITE		NO DUMP	NO DUMP	NO DUMP
MODIFY APPEND		DUMP	DUMP	DUMP

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3.8.4.5 Permanent file system dumps requesting a catalog image record to be generated, require an idle system. This means that PFDUMP sets the total interlock for a device before the catalog image record is generated. Permanent file device total interlock will not be cleared until the catalog image record has been completely generated, at which time the criteria of the next section is followed.

3.8.4.6 All permanent file system dumps do not require an idle system, except for the case mentioned above. However, certain restrictions are placed on users whose catalogs reside on the catalog track currently being dumped. While a catalog track is being dumped, a certain portion of the catalog track is read and a read list generated for those catalogs that are active. Upon completion of the dumping of these files and before reading more catalog entries, the catalog track interlock is cleared and a pause is taken to allow PFM to perform a function using that catalog track. The catalog track is then interlocked by PFDUMP again and more catalogs are read until done with the track.

3.8.4.7 Informative Operator Messages

* P.F. DEVICE *devicnm* DUMPED.*
* PACKNAME *pknm* DUMPED.*
*DUMPING *filename* *user index**
PFDUMP yy/mm/dd. hh.mm.ss.
* *PFDUMP REEL nn DEVICE xx*

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PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

- * * PFDUMP DEVICE MASK xxx*
- * DUMPING - DIRECT ACCESS FILES ONLY.*
- * DUMPING - INDIRECT ACCESS FILES ONLY.*
- * FILENAME xxxxxxxx USER INDEX xxxxxxx*
- * ALL FILES FOR USER INDEX xxxxxxx*
- * ACCESSED AFTER yy/mm/dd. hh.mm.ss.*
- * CREATED AFTER yy/mm/dd. hh.mm.ss.*
- * MODIFIED AFTER yy/mm/dd. hh.mm.ss.*

3.8.4.8 Operator Messages that require action

- * ASSIGN REEL NUMBER *reel number**
- * INCORRECT REEL MOUNTED*

3.8.4.9 System Error Messages that are Fatal

These errors result in PFDUMP aborting.

- * CATALOG INDEX OUT OF RANGE.*

Catalog buffer location not in buffer range.

* See Operator's Guide, pages 7-1 and 7-2.

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PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.8.4.10 System Error Messages which are Non-Fatal

* STATUS ERR *filename* *user index**

Bad ordinal or status for a direct access file - file skipped.

* INDIRECT TOO LONG *filename* *user index**

File truncated.

* INDIRECT TOO SHORT *filename* *user index**

File padded with EOF's.

* DIRECT TOO LONG *filename* *user index**

File truncated.

* DIRECT TOO SHORT *filename* *user index**

File padded with EOF's.

* DAF BUSY *filename* *user index**

File skipped.

* DAF ZERO LENGTH *filename* *user index**

File skipped.

* SYSTEM SECTOR BAD *filename* *user index**

File skipped.

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 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.8.4.11 Catalog Image Record {CIR}

59	47	35	17	0
Permanent File Name			User Index	
Device Number	Access Count	Last Access Date & Time		

There is 1 entry for each file on the catalog.

Catalog Image Record Directory

	59	29	0
HEAD	Total number of files		
TRKN	Number files on track	Random Index to Catalog Record	

HEAD - is a header indicating the total number of files on the permanent file system.

TRKN - is the table entry for one catalog track of device. There may be up to 200 of these entries.

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3.8.5 PFCAT - Catalog Permanent File Device

3.8.5.1 PFCAT is a permanent file utility program which catalogs permanent file catalog tracks and generates a report. The possible reports are:

1. Listing of catalog file with files grouped by user index.
2. Statistical report of device usage.

3.8.5.2 PFCAT may be called by the permanent file supervisor (see Section 3.8.1) or by a control card in the following format:

PFCAT{p1,p2,...,pn}

The parameters, described in Section 3.8.2, are in the keyword = value format. The following parameters are valid for PFCAT.

FN = Family Name.

PN = Pack Name.

DN = Device Number.

LO = List Options

T - Catalog of files processed by user index.

E - Errors.

S - Statistical Summary.

L = Output File Name

OP = Utility Options

C - Creation

A - Last Access

M - Last Modification

I - Indirect

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D - Direct

B - Before Date and Time

DT = Date yymmdd where yy=year, mm=month, dd=day

TM = Time hhmmss where hh=hour, mm=minute, ss=second

UI = User Index

PF = Permanent File Name

UN = User Number

3.8.5.3 Default Values are:

FN = SYSTEM

PN = no name

DN = 0

LO = 0

L = OUTPUT

OP = 0

DT = 0

TM = 0

UI = 0

PF = no name

UN = no name

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3.8.5.4 System Error Messages

* PFCAT COMPLETE.*

Catalog of permanent file device completed.

* EQUIP. NOT IN PFCAT TABLE.*

There is no entry in PFCAT's tables for the equipment type being cataloged therefore no percent device usage can be determined.

* INDEX BUFFER LIMIT.*

INDBL {Index Buffer Length} must be increased to accommodate all user indices on a catalog track.

* DEVICE ERROR.*

Not a master device.

* ILLEGAL DEVICE NUMBER.*

Device number for alternate device not defined.

* MASTER DEVICE NOT FOUND.*

Master device not defined in system.

3.8.5.5 Operator Messages

* CATALOGING *user number* *user index*.*

Identification of user number being cataloged.

* CATALOGING COMPLETED.*

Informative.

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* WRITING SUMMARY.*

Informative.

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3.8.6 PFATC - Catalog PF Archive Tape

3.8.6.1 PFATC is a permanent file utility program that catalogs archive tapes. PFATC may be called by the permanent file supervisor {see Section 3.8.1} or control card in the following format:

PFATC{p1,p2,...,pn}

The parameters, described in Section 3.8.2, are in the keyword = value format.

3.8.6.2 The following parameters are valid for PFATC.

T = Archive File Name
LO = List Options
 T - Tape Catalog
 C - Catalog of Catalog File
 E - Errors
L = Output File Name
OP = Utility Options
 C - Creation
 A - Last Access
 M - Last Modification
 I - Indirect
 D - Direct
 B - Before Date and Time
NR = No Rewind
NU = No Unload
SF = Number of Files to Skip

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N = Number of Files to Process

DT = Date yymmdd where yy=year, mm=month, dd=day

TM = Time hhmmss where hh=hour, mm=minute, ss=second

UI = User Index

PF = Permanent File Name

3.8.6.3 Default Values

T = TAPE

LO = 0

L = OUTPUT

OP = 0

NR = not set

NU = not set

SF = 0

N = 0

DT = 0

TM = 0

UI = 0

PF = no name

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3.8.6.4 System Error Messages

* PFATC ABORTED.*

If error flag is set.

3.8.6.5 Operator Messages

*CATALOGING *filename* *user index**

Identification of current file being loaded.

* MOUNT REEL NUMBER n*

Reel *n* of series of archive files should be assigned in order to proceed.

WRONG REEL MOUNTED.

Reel mounted is not next sequential reel in series if archive tapes being cataloged.

NO TAPE LABEL.

No valid PF label found at beginning of reel.

* PARITY ERR *filename* *user index**

Parity error on file *filename*.

* TAPE PARITY ERROR.*

Parity error detected reading archive file.

* CATALOGING COMPLETED.*

PFATC complete.

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3.8.7 PFCOPY - Copy Archive File Utility

3.8.7.1 PFCOPY is a permanent file utility program that extracts files from an archive file and copies them to one or more files.

3.8.7.2 PFCOPY may be called by the permanent file supervisor (see Section 3.8.1) or a control card in the following format:

PFCOPY{p1,p2,...,pn}

The parameters, described in Section 3.8.2, are in the keyword = value format. The following parameters are valid for PFCOPY.

T = Archive File Name

LO = List Options

T - Tape Catalog

E - Errors

L = Output File Name

OP = Utility Options

C - Creation

A - Last Access

M - Last Modification

I - Indirect

D - Direct

B - Before Date and Time

Q - Precede with catalog and permit records

NR = No Rewind

NU = No Unload

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SF = Number of Files to Skip

N = Number of Files to Process

DT = Date yymmdd where yy=year, mm=month, dd=day

TM = Time hhmmss where hh=hour, mm=minute, ss=second

UI = User Index

PF = Permanent File Name

MF = Master File Name

3.8.7.3 Default Values

T = TAPE

LO = 0

L = OUTPUT

OP = 0

NR = not set

NU = not set

SF = 0

N = 0

DT = 0

TM = 0

UI = 0

PF = no name

MF = no name

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3.8.7.4 Operator Messages

* END OF COPY.*

Program complete.

*READING *filename* *user index**

*COPYING *filename* *user index**

3.8.7.5 Dayfile Messages - System Errors

* TAPE PARITY ERROR.*

Parity error encountered, file name unknown, tape skipped to end-of-file {PHYS. EOR}.

* PARITY ERR *filename* *user index**

Parity error on file *filename*, file is skipped and execution resumed.

* CATALOG CONTROL WORD MISSING.*

Catalog control word expected but not found.

* ASSIGN REEL NUMBER n *

Archive tape number *n* needed to be assigned to job.

* INCORRECT REEL REASSIGN.*

Reel assigned is not proper reel in sequence.

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* PFCOPY ABORTED.*

PFCOPY has encountered CP error.

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3.9 PF Utilities General Information

3.9.1 Low Core Retrieval Functions

It is necessary in terms of time and space to add a function to the system to retrieve central memory resident information for CPU programs. Such information as the equipment status table pointer {ESTP}, the equipment status table entries {EST}, and the mass storage tables {MST} are required by PFLoad, PFDump and PFCAT to successfully process a system of permanent files as opposed to singular devices. This also eliminates more special functions which would have to be added to PFU. This feature will be available to system origin users.

3.9.2 Catalog Image Entry Information

Format	59	47	35	17	0
	Permanent File Name			User Index	
	Device Number	Access Count	Access Date & Time		

The first word of the entry describes the file uniquely in the system. The second word contains device number {direct access files only}, access count, and last access date and time. When a file is loaded, this information is placed in the catalog of the file as it is the most current information available for that file. No other information can be changed over dumps and loads without modification date and time being updated.

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Catalog image records are separated by a physical EOR on the archive file. This provides some protection due to parity errors in reading the catalog image record. When a parity error is detected in reading a CIR the message is issued:

PARITY ERROR IN CATALOG IMAGE - dn, ct.

and the operator may enter K.GO. or K.STOP. to indicate whether to continue the load process.

dn = device number

ct = catalog track {relative to the start of catalog tracks}

If he continues, files on this catalog track will be skipped, and processing will continue with the next CIR. If he does not wish to continue, the program will abort.

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4.0 DEFINITIONS*

4.1 Indirect Access File

Refer to Time Sharing User's Manual {page 5-1}.

4.2 Direct Access File

Refer to Time Sharing User's Manual {page 5-1}.

4.3 Catalog Track

Every permanent file in the system contains a catalog entry specifying the characteristics of the file, access information about the file and the location of the file. The catalog entries are grouped together on catalog tracks on the permanent file device. The length of the catalog entry is 8 words. The end of a catalog track is indicated by an EOI on the device. All catalog entries for a user reside on one catalog track. All catalog tracks are linked in the Track Reservation Table and appear as one logical chain. When a catalog track exceeds a logical track, another track is allocated at the end of the catalog chain and the catalog track is linked on mass storage to the continuation catalog track.

* Refer to Interchangeable Device ERS for additional definitions that may be helpful in this ERS.

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4.4 User Group

Catalog tracks are allocated such that each track contains a specific user group consisting of a group of user indices.* The number of catalog tracks allocated for a device specifies the user indexes within a user group. When permanent files are accessed, the user index specifies the catalog track and device which contains the users catalog entries. PFM will search only this catalog track to satisfy the PF request.

4.5 Indirect Access File Holes

Because the system allocated mass storage space on a logical track basis, PFM must do some of its own allocation to handle the sector by sector allocation required for indirect access files. They are allocated in this manner because experience indicated the average file size for most terminal users to be somewhat less than a logical track.** All the indirect files for a device are represented within the system by one logical track chain. Catalog entries point to specific areas within this chain which contain the indirect access file. Whenever a file is purged, the only indication of the space being available for allocation is the "deleted" catalog entry. The space cannot be released for system allocation unless it is greater than a logical track in size. This "deleted" catalog entry represents an indirect

* Refer to Operator's Guide, page 7-1 for further description of user index.

** Logical track size varies with device type. i.e., 808=50 sectors, 841-4=128 sectors, etc.

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access file hole. A catalog track then, contains not only catalog entries for a user group, but also pointers to holes within the indirect access file chain created by PF activity of this user group.

4.6 Dedicated Device

A dedicated device is a mass storage device which is dedicated to the allocation of indirect access files and catalog entries. No direct access permanent files may reside on this type of device.

4.7 Interlock

Because several PFM requests may be in process simultaneously, some interlocks are necessary to insure that requests on the same file or catalog track do not overlap. As an example, consider the following: User A retrieved file X, user B purged file X, user C saves file Y which is placed in the hole where file X resided. If user A's request {generation of a working copy of X} was not completed before user's C request was completed and no interlock was performed, user A might end up with some data from file Y. Several types of interlocks are necessary for permanent file access.

4.7.1 Device Interlock

There are certain situations when the entire device should be interlocked to insure a particular operation will be successfully performed. An example of this might be a full dump of permanent files.

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4.7.2 Catalog Interlock

Because all requests for a user must search a particular catalog track the type of problem specified above can be avoided by interlocking the catalog track. This prevents the problem of overlapping requests on the same file while at the same time allow users of another user group {catalog track} to access their files.

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APPENDIX A

PERMANENT FILE UTILITY K-DISPLAYS

{LEFT AND RIGHT DISPLAYS}

PF Utilities Left K-Display

*** PERMANENT FILE UTILITY OPTIONS ***

<u>OPTION</u>	<u>CURRENT VALUE</u>	<u>DESCRIPTION</u>
UT	= 0	UTILITY DESIRED
FN	= UNDEFINED	FAMILY NAME
PN	= 0	PACK NAME
DN	= 0	DEVICE NUMBER
T	= TAPE	ARCHIVE FILE NAME
LO	= 0	LIST OPTION
L	= OUTPUT	OUTPUT FILE NAME
OP	= 0	UTILITY OPTION
NR	= 0	NO REWIND
NU	= 0	NO UNLOAD
SF	= 0	SKIP FILES
N	= 0	NUMBER OF FILES TO PROCESS
DT	= 0	DATE YYMMDD
TM	= 0	TIME HHMMSS
UI	= 0	USER INDEX
PF	= 0	PERMANENT FILE NAME
MF	= 0	MASTER FILE NAME
UN	= 0	USER NUMBER
V	= 0	VERIFY ARCHIVE FILE
DI	= 0	DESTINATION UI
DD	= 0	DESTINATION DEVICE NUMBER
	DATE YY/MM/DD. TIME HH.MM.SS.	
	REEL N	
	FILE NAME	USER INDEX

{Message line}

{1st Error line}

{2nd Error line}

{Entered parameters}

The message line is used to display status messages such as LOADING filename userin, CATALOGING filename userin, etc. The error lines are used to display error messages or operation requests. Two lines are provided to facilitate error message plus action to be taken.

* This name will be derived from the system as the family for the current P.F. System.

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PF Utilities Right K-Display

*** PERMANENT FILE UTILITY OPTION DESCRIPTION ***

<u>OPTION</u>	<u>DESCRIPTION</u>
UT *UTILITY*	*LD* - PFLOAD *DU* - PFDUMP *CA* - PFCA T *AT* - PFATC *CP* - PFCOPY
LO *LIST OPTION*	T - TAPE CATALOGS C - PERMANENT FILE DEVICE CATALOGS E - ERRORS S - SUMMARY
OP *UTILITY OPTIONS*	C - CREATION* A - LAST ACCESS* M - LAST MODIFICATION* I - INDIRECT ACCESS** D - DIRECT ACCESS** B - BEFORE P - PURGE AFTER DUMP R - REPLACE N - NONINITIAL LOAD Q - ADD CATALOG AND PERMIT RECOVERY

NOTE: OPTIONS ENTERED AS FOLLOWS:

K.LO = TCS

OR

K.OP = CIBP

* ONLY ONE TYPE OF DATE MAY BE SPECIFIED.

** ONLY ONE ACCESS OPTION MAY BE SPECIFIED.

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1.0 SCOPE

1.1 This specification defines the external features of the interactive communications subsystem of the KRONOS 2.1 Operating System.

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2.0 APPLICABLE DOCUMENTS

KRONOS 2.1 Product Objectives Document

KRONOS 2.0 Batch User's Reference Manual

KRONOS 2.0 Time Sharing User's Manual

KRONOS 2.1 Transaction Subsystem Standardization ERS

KRONOS 2.1 User Profile Control ERS

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3.0 DESCRIPTION

3.1 Time Sharing Communication Enhancements

Enhancements which provide new features and more flexibility to the communications subsystem are as follows:

Extensive control of the terminal by an Interactive CPU program.

Support of a wider variety of terminals.

Provision for future enhancements.

3.1.1 Terminal Protocol

Terminal protocol is defined to be that series of operations which the computer must perform to successfully operate the terminal. The terminal subsystem will provide for 2 protocols. The protocols provided will support terminals as follows:

ASCII code terminals such as

TELETYPE Models 33, 35, 37, and 38
CDC 713
MEMOREX 1240

Correspondence code terminals such as

IBM 2741
NOVAR 541
DATEL 30

NOTE: Operation of correspondence code terminals requires a QSE to the 6676 or 6671 multiplexer. A QSE is also required for line speeds other than ten characters per second.

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3.1.1.1 Terminal Identification

The terminal network file {see KRONOS Transaction Subsystem Standardization ERS} can designate certain ports for identification of the terminal type by the first character received. Thus, on these ports, the user must initiate his terminal session by depressing the key on his terminal specified by the ID Code in Appendix A. A correspondence code terminal must be used on such a port.

3.1.2 Code Conversion

To provide for the usage of printing elements which differ from the standard for the terminal, the terminal system will include 4 translation tables, listed in Appendix C, and the facility for 28 additional ones. A translation table may be selected in one of the following ways.

The terminal identification codes as above {3.1.1.1}.

A system command {TERM}. {See Section 3.1.6}

A parameter defined in the user validation file. {See User Profile Control ERS}

3.1.3 Input Processing

3.1.3.1 Input Control Characters

Certain terminal codes are used to provide control of the input from the terminal. These codes are recognized in normal and ASCII input conversion modes only {see Section

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3.1.3.2 and 3.1.3.3}. The following list defines the control operations, and the associated terminal codes are listed in Appendix A.

RETURN

Terminate current input line with END OF LINE code.

DELETE

Discard current input line. The system responds with the message *DEL*.

BACKSPACE

Discard previous character entered.

STEXT

Begin text mode entry for creation or editing of the user's Primary file.

ETEXT

Terminate text mode.

NOTE: STEXT and ETEXT are recognized only when source input is allowed.

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3.1.3.2 Normal Input Code Conversion

The normal input conversion selected when the user is logged into the system converts input data to 6 bit internal code {see Appendix C}. Lower case alphabetic characters are converted to upper case. All characters not defined in the 6 bit internal code and the line feed are ignored. Also, the input control codes {see Section 3.1.3.1} are not translated.

3.1.3.3 ASCII Input Code Conversion

The ASCII input conversion may be selected by user command {ASCII}. This action causes the driver to translate all characters to the 6/12 bit* internal codes {see Appendix C}. The LINE FEED and ASCII-DEL codes are ignored, and the input control codes {see Section 3.1.3.1} are recognized but not translated.

3.1.3.4 Transparent Input Code Conversion

The transparent input conversion may be selected by an interactive program {see Section 3.1.4.3}. This mode causes the driver to translate as in the ASCII mode but no characters are ignored. In addition, no Input Control Characters are processed; rather, all characters are passed to the program as data. INTERRUPT is passed as a NULL followed by an END OF LINE. RETURN is passed as an END OF LINE.

* NOTE: 6/12 bit codes refers to the escape code convention which allows an extended character set {more than 62 characters}. Internal display code characters are preceded by 76 or 74 octal codes to indicate extended characters. {See Appendix C.}

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3.1.3.5 Binary Input Conversion

Binary input conversion may be selected by user command {BINARY} or by an interactive program {see Section 3.1.6 or 3.1.4.3}. This input mode packs the 8 bits of data as the bottom 8 bits of a 12 bit byte, with the upper bit {11} being set. The user specifies a character count and/or a termination code to define the END OF LINE. The exhaustion of the character count or the occurrence of the terminator code will cause the END OF LINE to be set. The line is preceded by the binary output control byte {0007} which indicates that the data is binary.

Example

TTY input:

BINARY,5

ABCD (CR)

Source file:

1st cm word

0007	4101	4102	4303	4104
------	------	------	------	------

2nd cm word

4215	0000	0000	0000	0000
------	------	------	------	------

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3.1.3.6 Interrupts

The INTERRUPT key from the terminal is indistinguishable from a character of all zeros due to the design of the 667X multiplexers. This key is defined in Appendix A.

The processing of INTERRUPT is dependent upon the particular activity in process at the time of the entry. The processing is described in Appendix B.

The actions are summarized below:

During output - acts the same as "I" key.*

Empty input line - interrupt running program.

{If a program is in execution, INTERRUPT acts the same as the "I" key during output.}

Non-empty input line -

- a. Normal input conversion mode - ignore INTERRUPT.
- b. ASCII input conversion mode - translate INTERRUPT to NULL.
- c. Transparent input conversion mode - translate INTERRUPT to NULL followed by an END OF LINE.
- d. Binary input mode - store at least one zero code {4000 octal in a byte} and possibly one or two extraneous characters.

* See Time Sharing Users Manual for description of "I" key.

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3.1.4 Output Processing

3.1.4.1 Normal Output Conversion

The normal mode of output conversion is to translate all 6/12 internal codes to the correct code for the terminal.

3.1.4.2 Binary Output Conversion

Binary output is initiated upon the detection of the INITIATE BINARY OUTPUT control code {see Section 3.1.4.3}. The binary output mode continues until an END OF LINE control code is detected.

3.1.4.3 Output Control Codes

Any output data for a terminal may contain output control bytes. An output control byte is a 12 bit byte right justified at bit positions 0, 12, 24, 36, and 48 of a CM word, with the upper 6 bits set to 0. Such a byte exercises certain control over terminal activity. An output control code which changes terminal input mode {0003, 0005, or 0006} will prevent the question mark normally output from being sent to the terminal. The control codes are summarized below.

0000 END OF LINE

This control byte causes the terminal to be positioned to the beginning of the next line. The remainder of the word in which the END OF LINE occurs is discarded.

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0001 END OF BLOCK

0002 END OF BLOCK {for compatibility with KRONOS 2.0}

This control byte is used to terminate output before the end of the data buffer is reached. The remainder of the output data is discarded. A user program may replace the last END OF LINE byte with this code to prevent the terminal from being positioned to the next line.

0003 AUTO INPUT

This control byte is intended to be used by TELEX for auto mode input, but may be output by a user program. The word in which the control byte occurs is used as the first n characters of the input line. n must be even and less than 9.

0004 LOG OFF USER

This control byte disconnects the user's telephone lines.

0005 SET TRANSPARENT INPUT

This control byte sets transparent input for the next input request.

0006 SET BINARY INPUT

This control byte sets binary input for the next input request. The control byte must be the first byte of a word. The next 2 bytes are the termination conditions as follows:

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The first byte {byte 1} is the maximum number of characters to be received before the input is terminated. If the value is 0, 1 is assumed.

The second control byte {byte 2} is a termination code. When a character is received from the terminal which matches the bottom 8 bits of this byte, the input operation is terminated. If bit 11 of this byte is set, no termination character is assumed.

A maximum of 150 binary coded characters can be input as data to an interactive program.

0007 INITIATE BINARY OUTPUT

This control byte initiates binary output.

EXAMPLE:

The ASCII codes ABCDEFG may be output by writing the following CM words to the terminal output file (see Appendix C):

1st cm word	0007	4101	4102	4303	4104
2nd cm word	4305	4306	4107	0000	0000

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3.1.4.4 Special Processing of Internal Codes for Output

END OF LINE for ASCII terminals

- {1} Issue CR to terminal.
- {2} Issue LF to terminal.
- {3} If the user has not specified a delay character count by the "ROUT" command {see Section 3.1.6} or by the VALIDUS file parameter {see the User Profile Control ERS}, set $n = 2$. Otherwise, set $n =$ user specified delay count.
- {4} If terminal is not in tape mode, issue n NULL codes. Otherwise, issue n DEL codes.

RETURN for ASCII terminals

- {1} Issue CR to terminal.
- {2} If user has not specified a delay count, set $n = 3$. Otherwise, set $n =$ user specified delay count.
- {3} If terminal is not in tape mode, issue n NULL codes. Otherwise, issue n DEL codes.

END OF LINE for Correspondence code terminals

- {1} Issue NL to terminal.
- {2} Issue LC to terminal.
- {3} Issue n IL codes to terminal, where $n =$ character count of line divided by 8.

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RETURN for Correspondence code terminals

Issue n BS codes to terminal, where n is the number of characters on the current line. Backspacing to beginning of line is necessary because a RETURN causes paper advance as well as carriage return on correspondence terminals.

LINE FEED for Correspondence code terminals

- {1} Issue LF to terminal.
- {2} Issue IL to terminal.

3.1.5 User Processing of Terminal Interrupts

Interactive user programs may override the terminal subsystem control of interrupts by means of a system request. The interrupt override provides the user program with notification when the terminal user enters an interrupt. The user program may select either of the following 2 methods for notification of terminal interrupt:

sets the low order bit in a program specified address within the user's program.

OR

copies the program registers to a program specified address within the user's program and changes the program address to the specified address plus twenty octal.

For further explanation see Appendix B.

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3.1.5.1 INTERRUPT on Input Request

No data is passed to the program and the input file status is set to END OF INFORMATION and the program is notified of the interrupt.

3.1.5.2 INTERRUPT During Output

All currently accumulated output is discarded and the user program is notified. If the program has issued an input request at the time output is interrupted, operation is the same as INTERRUPT on input except that current output is discarded.

3.1.5.3 Interrupt During Program Execution

The user program is notified of the interrupt.

3.1.6 New Terminal Commands

APL,t,www

Selects the APL {A Programming Language} interactive interpreter. The interpreter selects transparent input {see Section 3.1.4.3} for all input and disable terminal control {see Appendix B}. The optional parameter t specifies the terminal type as described in Appendix A and the optional parameter www specifies the workspace to be loaded. www is defaulted to APLLIBS. For further information, see the APL Reference Manual.

BINARY,nnnn,ccc

Select binary input mode for source data to be stored on Primary file. The character count is specified by nnnn and a

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termination character by ccc. nnnn may be from 1 to 4095. ccc is specified in octal and must include all 8 bits to be received from the terminal.

EXAMPLE:

BINARY,20,207

When 20 binary characters have been entered or the ASCII character BEL {a 207 octal code, even parity}, the binary input will be terminated.

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FULL

Enter ECHOPLEX mode. Each character received from the terminal will be echoed back to the terminal just as it is received. This mode is effective only for ASCII terminals that are capable of supporting full duplex.

HALF

Clear ECHOPLEX mode.

ROUT,nn

Set character count delay after RETURN to nn. nn may be from 0 to 29. If n is null, a standard delay count will be set.

TERM,t

Set terminal type to t where t is the terminal type as described in Appendix A.

TEXT

Enter TEXT mode. {equivalent to STEXT code as received from terminal}.

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4.0 GLOSSARY

The names of characters used in this specification are capitalized {denoting that it is a name} and are defined in Appendix A, Appendix C, or this glossary. This glossary defines special internal code names; Appendix A defines control key names for most terminals {usually the name is the same as found on the terminal key caps}; and Appendix C cross references the terminal codes and internal codes and defines the code and key names.

The following table defines the names of special internal codes.

Name	Action	Internal Octal Code
END OF LINE	Termination of a message Implies NEW LINE {see Section 3.1.4.3}	0000*
LINE FEED	Position to next line	67
NEW LINE	Position to start of next line	7676
NULL	Output a nonprint character {this allows a user program to position the terminal print mechanism at an odd column} On input	xx00* 7655
RETURN	Position to start of line	66

* Code must be byte aligned in central memory word (i.e., the 12 bits must be positioned in a 60 bit central memory word so that the right most bit of the 12 bit byte is in bit position 0, 12, 24, 36, or 48 of the central memory word).

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Appendix A

Table of terminal types and associated control keys.

	ASCII Compatible	MEMOREX 1240 with APL print	Correspondence with Std. print	Correspondence with APL print
Type {3}	TTY	MEMAPL	COR	CORAPL
ID Code	T	M	Attn	A followed by Attn
RETURN	CR	CR	RETURN	RETURN
DELETE	ESC	ESC	Attn {1}	Attn {1}
BKSP	UNDERLINE	UNDERLINE	BKSP	BKSP
STEXT	STX	STX	none, enter TEXT command	none, enter TEXT command
ETEXT	ETX	ETX	Attn {2}	Attn {2}
INTERRUPT	BREAK	BREAK	Attn {2}	Attn {2}

{1} Non-empty input line.

{2} Empty input line.

{3} Used with TERM,t command {3.1.b}

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APPENDIX B

Terminal Control

Very often programmers who write terminal application programs have a need to allow a program to "lock out" the terminal user during certain critical processes such as data base update. By locking out the terminal operator the program can prevent any of the normal terminal control commands from being processed by the system {TELEX}. This appendix will describe how terminal control normally works and how the feature to disable terminal control will effect the user at the terminal.

When a user has successfully logged into the KRONOS system, the terminal can be in any of three modes. The mode that the terminal is in, controls the way the system processes terminal entries.

These three modes are:

Command Mode

Text Entry Mode

Program Control Mode

Command Mode

When the terminal is in command mode the normal terminal commands are accepted. These commands include subsystem designation, PF commands, terminal control {AUTO, ASCII}, job initiation {RUN}, etc.*

* See Time Sharing User's Manual for complete description.

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Whenever one of these commands causes output to the terminal, whether it be a message, report, or diagnostic, the terminal can be considered under program control until the terminal ready indication is completed {READY in all subsystems but Batch which is /}. Any lines preceded by numeric characters are considered text and are accumulated in a file to be sorted later according to the line numbers.

Text Entry Mode

When the user desires to enter text, this can be done by entering the command "TEXT" or the STEXT key. In text mode all characters entered are considered data except ETEXT.

Program Control Mode

In the previous two modes the entries entered are pre-defined by the system {except for the content of the text}. The capability also exists to write programs in BASIC and FORTRAN which generate messages to the terminal and accept data from the terminal. In this mode, the terminal can be in any of three states:

- Job Awaiting Input
- Job Currently Outputting
- Job Currently Executing

In this mode only certain terminal entries are recognized and all others are either illegal or passed as data to the controlling program. The entries that are recognized from terminals are:

an INTERRUPT or the commands STATUS or STOP.

The state of the terminal controls how these entries are processed.

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Job Awaiting Input

Whenever a program requests input from the terminal {by reading file INPUT} the system outputs a "?" at the terminal unless an output control byte which changes input mode is detected first. The command STOP will cause the program to be terminated and the terminal will be placed in COMMAND mode. All other entries are passed as data to the executing program. A RETURN is passed as the end of line indicator {except in binary mode} and, if no data is entered, a null input line is passed into the program. {See Batch User's Manual, Chapter 7 for exact indication in programs data area}.

Job Currently Outputting

When the program generates output {by writing to the terminal output file} this is printed at the terminal whenever the program buffers require emptying {either because they are full or EOR, EOF is written}.

While the terminal is printing, the terminal operator can enter 3 keys which will be recognized by the system.*

S key causes program control to be terminated and the terminal to return to command mode {same as STOP in INPUT state}.

INTERRUPT causes the same action as I key.

* NOTE: Some correspondence code terminals will not allow any input except INTERRUPT during output or execution.

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I key* causes output to be suspended and the terminal is placed in suspended mode where the system will recognize:

The 'P' key causing return to program control discarding any output generated. NOTE: More output may be generated by the program but all data in program buffer when it was emptied previous to entry of the I key will be discarded.

The 'carriage return' causing output to be continued and program control to continue normally. Part of the current line of output may be lost when terminal output is suspended.

T, nnnn resets time limit to nnnn and continues job. This is meaningful only if job has been suspended with message TIME LIMIT issued to terminal. Any other character causes program control to be terminated and the terminal to be returned to command mode.

Job Currently Executing

While the job is executing, the only entries recognized are:

STOP to cause program termination and the terminal to return to command mode.

INTERRUPT causes the same action as the I key during output.

STATUS to cause system to list pertinent information about the program currently executing.

* Reference Time Sharing User's Manual, page 7-3.

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The preceding explanations describe the terminal users ability to control normal program execution. This allows the user to exercise control over the program during all phases of execution. As previously mentioned, certain applications may desire to prevent this total terminal control during critical processes. This is provided by user processing of interrupts, referred to as the Disable Terminal Control feature. The following describes how this feature can be used and the effect it has on the previously described situations at the terminal.

This control is activated by the program and therefore has meaning only while the terminal is in program control mode. The program can select either of two methods for being notified that the terminal user has attempted to terminate the program. He may specify an interrupt address to be used for either of the following:

1) The location specified by the interrupt address within the users program will be set to a one. The program can then check this location periodically to see if terminal control has been attempted.

Or

2) The program operating registers will be copied to the 20 octal words starting at the specified interrupt address and the program address will be changed to the specified address plus 20 octal. A system request has been provided to restore the operating registers so that normal program processing can be restarted after the special interrupt processing has been completed.

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Once notification has been given when an interrupt address is specified, the interrupt address will be cleared and the program will not be notified of an attempted interrupt until the user program reselects an interrupt address.

If no interrupt address is specified when DTC {Disable Terminal Control} is selected, no notification of attempted terminal control will be given to the program.

A macro has been provided for COMPASS programs to utilize the DTC feature.

When the user program has activated DTC the following will occur for the three states of program control mode when the terminal user attempts control to terminal operation.

Job Awaiting Input

Control may be attempted by entering "STOP" except in binary input mode. No data will be passed to the program but the INPUT file status will be set to END OF INFORMATION and the program will be notified of attempted control if an interrupt address is specified.

Job Currently Outputting

The program will be notified of attempted control if an interrupt address is specified. If the program has issued an input request before terminal control is attempted, the action taken is the same as for the job awaiting input.

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Job Currently Executing

Terminal control may be attempted by entering "STOP" or INTERRUPT. In either case the program will be notified if an interrupt address is specified. Otherwise the attempt will be ignored.

The program terminal control statement may be released by three methods:

1. A system command issued by the program {a macro exist for this function}.
2. Program terminates and terminal is returned to command mode.
3. Terminal is logged out or disconnected {if disconnected user may recover, but program terminal control will no longer be active}.

The macro provided for DTC is defined below:

DISTC st,addr,INT

st = ON activates program terminal control

= OFF deactivates program terminal control

addr = {optional, valid only if ST = ON} specifies the interrupt address when terminal control is attempted.

INT = if specified, indicates to change the program address to addr +20 octal when terminal control is attempted.

= if not specified and addr is specified, indicates to set the contents of address addr to one when terminal control is attempted.

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PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPENDIX C

TRANSLATION TABLES

The following information is necessary to be able to use binary mode input and output to terminals.

All ASCII hexadecimal codes are listed as seven bit codes. The eighth bit is a parity bit for most ASCII terminals and will be a one or zero depending on the parity of the terminal.

All lxx correspondence octal codes are actually xx codes, but are only sent when the terminal is in upper case. The communications driver sets the proper case when translating characters.

All correspondence codes are listed as six bit codes. A seventh and eighth are actually sent by the driver. The seventh bit is character parity (normally odd) and the eighth bit is always set in order to interface to the required QSE in the multiplexer.

EXAMPLE

The command from a TTY:

BINARY,20,341.

will cause input to the primary file until 20 characters have been input or an "a" is input.

EXAMPLE

When a NOVAR 5-41 terminal is in lower case and "AAAa" is to be printed in binary mode by the user program, the program must output the following codes:

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1st CM Word 0007 4234 4371 4371 4371

2nd CM Word 4337 4371 0000 0000 0000

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

ASCII Terminal Code Conversion Table
 Indexed by ASCII Code

ASCII Hexadecimal	Internal Octal	Name	Character Description
00	7655	NUL	FIRST CHARACTER OF A BREAK
01	7646	SOH	START OF HEADING
02	7660	STX	START OF TEXT
03	7636	ETX	END OF TEXT
04	7653	EOT	END OF TRANSMISSION
05	7410	ENQ	ENQUIRY
06	7664	ACK	ACKNOWLEDGE
07	7634	BEL	BELL
08	7651	BS	BACKSPACE
09	7652	HT	HORIZONTAL TAB
0A	67	LF	LINE FEED
0B	7645	VT	VERTICAL TAB
0C	7656	FF	FORM FEED
0D	66	CR	CARRIAGE RETURN
0E	7657	SO	SHIFT OUT
0F	7650	SI	SHIFT IN
10	7633	DLE	DATA LINK ESCAPE
11	7405	DC1	DEVICE CONTROL 1 (X-ON)
12	7635	DC2	DEVICE CONTROL 2
13	7406	DC3	DEVICE CONTROL 3 (X-OFF)
14	7637	DC4	DEVICE CONTROL 4 (STOP)
15	7640	NAK	NEGATIVE ACKNOWLEDGE
16	7641	SYN	SYNCHRONOUS IDLE
17	7642	ETB	END OF TRANSMISSION BLOCK
18	7643	CAN	CANCEL
19	7644	EM	END OF MEDIUM
1A	7663	SUB	SUBSTITUTE
1B	7677	ESC	ESCAPE
1C	7672	FS	FILE SEPARATOR
1D	7654	GS	GROUP SEPARATOR
1E	7673	RS	RECORD SEPARATOR
1F	7675	US	UNIT SEPARATOR
20	55		SPACE
21	7647	EX	EXCLAMATION POINT
22	60	QU	QUOTATION MARKS
23	71	NM	NUMBER SIGN
24	53	\$	DOLLAR SIGN
25	7402	PC	PERCENT
26	65	AM	AMPERSAND
27	64	AP	APOSTROPHE
28	51	(OPENING PARENTHESIS
29	52)	CLOSING PARENTHESIS
2A	47	*	ASTERISK
2B	45	+	PLUS

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DOCUMENT CLASS ERS PAGE NO. IV C-3
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EDBB*2.1 MACHINE SERIES EDDD/CDC CYBER 72,73,74

ASCII Terminal Code Conversion Table
 Indexed by ASCII Code

ASCII Hexadecimal	Internal Octal	Name	Character Description
2C	56	,	COMMA
2D	46	-	HYPHEN (MINUS)
2E	57	.	PERIOD
2F	50	/	SLANT
30	33	0	
31	34	1	
32	35	2	
33	36	3	
34	37	4	
35	40	5	
36	41	6	
37	42	7	
38	43	8	
39	44	9	
3A	63	CL	COLON
3B	77	SC	SEMICOLON
3C	72	LT	LESS THAN
3D	54	=	EQUALS
3E	73	GT	GREATER THAN
3F	75	QU	QUESTION MARK
40	7401	AT	COMMERCIAL AT
41	01	A	
42	02	B	
43	03	C	
44	04	D	
45	05	E	
46	06	F	
47	07	G	
48	10	H	
49	11	I	
4A	12	J	
4B	13	K	
4C	14	L	
4D	15	M	
4E	16	N	
4F	17	O	
50	20	P	
51	21	Q	
52	22	R	
53	23	S	
54	24	T	
55	25	U	
56	26	V	
57	27	W	

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DOCUMENT CLASS ERS PAGE NO. IV C-4
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EO88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

ASCII Terminal Code Conversion Table
 Indexed by ASCII Code

ASCII Hexadecimal	Internal Octal	Name	Character Description
58	30	X	
59	31	Y	
5A	32	Z	
5B	61	OB	OPENING BRACKET
5C	7666	RS	REVERSE SLANT
5D	62	CB	CLOSING BRACKET
5E	70	CF	CIRCUMFLEX
5F	7404	UL	UNDERLINE
60	7403	GV	GRAVE ACCENT
61	7601	A	LC
62	7602	B	LC
63	7603	C	LC
64	7604	D	LC
65	7605	E	LC
66	7606	F	LC
67	7607	G	LC
68	7610	H	LC
69	7611	I	LC
6A	7612	J	LC
6B	7613	K	LC
6C	7614	L	LC
6D	7615	M	LC
6E	7616	N	LC
6F	7617	O	LC
70	7620	P	LC
71	7621	Q	LC
72	7622	R	LC
73	7623	S	LC
74	7624	T	LC
75	7625	U	LC
76	7626	V	LC
77	7627	W	LC
78	7630	X	LC
79	7631	Y	LC
7A	7632	Z	LC
7B	7661	LB	OPENING BRACE
7C	7667	VL	VERTICAL LINE
7D	7662	CB	CLOSING BRACE
7E	7670	TL	TILDE (OVERLINE)
7F	7410	DEL	DELETE

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DOCUMENT CLASS ERS PAGE NO. IV C-5
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

ASCII Terminal Code Conversion Table Indexed
 by Internal Display

Internal Octal	ASCII Hexadecimal	Name	Character Description
00		NULL	
01	41	A	
02	42	B	
03	43	C	
04	44	D	
05	45	E	
06	46	F	
07	47	G	
10	48	H	
11	49	I	
12	4A	J	
13	4B	K	
14	4C	L	
15	4D	M	
16	4E	N	
17	4F	O	
20	50	P	
21	51	Q	
22	52	R	
23	53	S	
24	54	T	
25	55	U	
26	56	V	
27	57	W	
30	58	X	
31	59	Y	
32	5A	Z	
33	30	0	
34	31	1	
35	32	2	
36	33	3	
37	34	4	
40	35	5	
41	36	6	
42	37	7	
43	38	8	
44	39	9	
45	2B	+	PLUS
46	2D	-	HYPHEN (MINUS)
47	2A	*	ASTERISK
50	2F	/	SLANT
51	28	(OPENING PARENTHESES
52	29)	CLOSING PARENTHESES
53	24	\$	DOLLAR SIGN

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DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-6
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

ASCII Terminal Code Conversion Table Indexed
 by Internal Display

Internal Octal	ASCII Hexadecimal	Name	Character Description
54	3D	=	EQUALS
55	20		SPACE
56	2C	,	COMMA
57	2E	.	PERIOD
60	22	QM	QUOTATION MARKS
61	5B	OB	OPENING BRACKET
62	5D	CB	CLOSING BRACKET
63	3A	CL	COLON
64	27	AP	APOSTROPHE
65	26	AM	AMPERSAND
66	0D	CR	CARRIAGE RETURN
67	0A	LF	LINE FEED
70	5E	CF	CIRCUMFLEX
71	23	NM	NUMBER SIGN
72	3C	LT	LESS THAN
73	3E	GT	GREATER THAN
74			ESCAPE 2
75	3F	QU	QUESTION MARK
76			ESCAPE 1
77	3B	SC	SEMICOLON
7600		NULL	
7601	61	A	LC
7602	62	B	LC
7603	63	C	LC
7604	64	D	LC
7605	65	E	LC
7606	66	F	LC
7607	67	G	LC
7610	68	H	LC
7611	69	I	LC
7612	6A	J	LC
7613	6B	K	LC
7614	6C	L	LC
7615	6D	M	LC
7616	6E	N	LC
7617	6F	O	LC
7620	70	P	LC
7621	71	Q	LC
7622	72	R	LC
7623	73	S	LC
7624	74	T	LC
7625	75	U	LC
7626	76	V	LC
7627	77	W	LC

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DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-7
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

ASCII Terminal Code Conversion Table Indexed
 by Internal Display

Internal Octal	ASCII Hexadecimal	Name	Character Description
7630	78	X	LC
7631	79	Y	LC
7632	7A	Z	LC
7633	10	DLE	DATA LINK ESCAPE
7634	07	BEL	BELL
7635	12	DC2	DEVICE CONTROL 2
7636	03	ETX	END OF TEXT
7637	14	DC4	DEVICE CONTROL 4 (STOP)
7640	15	NAK	NEGATIVE ACKNOWLEDGE
7641	16	SYN	SYNCHRONOUS IDLE
7642	17	ETB	END OF TRANSMISSION BLOCK
7643	18	CAN	CANCEL
7644	19	EM	END OF MEDIUM
7645	0B	VT	VERTICAL TAB
7646	01	SOH	START OF HEADING
7647	21	EX	EXCLAMATION POINT
7650	0F	SI	SHIFT IN
7651	08	BS	BACKSPACE
7652	09	HT	HORIZONTAL TAB
7653	04	EOT	END OF TRANSMISSION
7654	1D	GS	GROUP SEPARATOR
7655	00	NUL	NULL
7656	0C	FF	FORM FEED
7657	0E	SO	SHIFT OUT
7660	02	STX	START OF TEXT
7661	7B	LB	OPENING BRACE
7662	7D	RB	CLOSING BRACE
7663	1A	SUB	SUBSTITUTE
7664	06	ACK	ACKNOWLEDGE
7665	26	AM	AMPERSAND
7666	5C	RS	REVERSE SLANT
7667	7C	VL	VERTICAL LINE
7670	7E	TL	TILDE (OVERLINE)
7671	23	NM	NUMBER SIGN
7672	1C	FS	FILE SEPARATOR
7673	1E	RS	RECORD SEPARATOR
7674	7F	DEL	DELETE
7675	1F	US	UNIT SEPARATOR
7676		NL	NEW LINE
7677	1B	ESC	ESCAPE
7400		NULL	
7401	40	AT	COMMERCIAL AT
7402	25	PC	PERCENT
7403	60	GV	GRAVE ACCENT

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DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-8
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

ASCII Terminal Code Conversion Table Indexed
by Internal Display

Internal Octal	ASCII Hexadecimal	Name	Character Description
7404	5F	UL	UNDERLINE
7405	11	DC1	DEVICE CONTROL 1 (X-ON)
7406	13	DC3	DEVICE CONTROL 3 (X-OFF)
7407	05	ENQ	ENQUIRY

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DOCUMENT CLASS ERS PAGE NO. IV C-9
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

Correspondence Terminal Code Conversion Table
 Indexed by Correspondence Code

Correspondence Octal	Internal Octal	Name	Character Description
00	55		SPACE
01	62		1/2
02	7624	T	LC
03	7612	J	LC
04	37	4	
05	7617	O	LC
06	7614	L	LC
07	50	/	
10	40	5	
11	64	AP	APOSTROPHE
12	7605	E	LC
13	7620	P	LC
14		NULL	
15		NULL	
16		NULL	
17		NULL	
20	35	2	
21	57	.	
22	7616	N	LC
23	54	=	
24	7632	Z	LC
25		NULL	
26		NULL	
27		NULL	
30	41	6	
31	7611	I	LC
32	7613	K	LC
33	7621	Q	LC
34		UC	UPPER CASE SHIFT
35	7651	BS	BACKSPACE
36		NULL	
37		LC	LOWER CASE SHIFT
40	34	1	
41	7615	M	LC
42	7630	X	LC
43	7607	G	LC
44	33	0	
45	7623	S	LC
46	7610	H	LC
47	7631	Y	LC
50	42	7	
51	7622	R	LC
52	7604	D	LC
53	77	SC	SEMI-COLON

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-10
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EO88*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence Terminal Code Conversion Table
 Indexed by Correspondence Code

Correspondence Octal	Internal Octal	Name	Character	Description
54		NULL		
55	7676	NL	NEW LINE	
56	67	LF	LINE FEED	
57	7652	HT	TAB	
60	36	3		
61	7626	V	LC	
62	7625	U	LC	
63	7606	F	LC	
64	44	9		
65	7627	W	LC	
66	7602	B	LC	
67	46	-		
70	43	8		
71	7601	A	LC	
72	7603	C	LC	
73	56	,		
74	55	EOT	END OF TRANSMISSION	
75	7655	NUL	IDLE	
76		NULL		
77		CD		
100*	55		SPACE	
101	61		1/4	
102	24	T		
103	12	J		
104	53	\$		
105	17	O		
106	14	L		
107	75	QU	QUESTION	
110	7402	PC	PER-CENT	
111	60	DQ	DIARESIS	
112	05	E		
113	20	P		
114		NULL		
115		NULL		
116		NULL		
117		NULL		
120	7401	AT	COMMERCIAL AT	
121	7657	.		
122	16	N		
123	45	+		
124	32	Z		
125		NULL		
126		NULL		
127		NULL		

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IVC-11
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EQ88*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence Terminal Code Conversion Table
 Indexed by Correspondence Code

Correspondence Octal	Internal Octal	Name	Character Description
130	7667	CT	CENT
131	11	I	
132	13	K	
133	21	Q	
134		UC	UPPER CASE SHIFT
135	7651	BS	BACKSPACE
136		NULL	
137		LC	LOWER CASE SHIFT
140	7670		+/-
141	15	M	
142	30	X	
143	07	G	
144	52)	
145	23	S	
146	10	H	
147	31	Y	
150	65	AM	AMPERSAND
151	22	R	
152	04	D	
153	63	CL	COLON
154		NULL	
155	7676	NL	NEW LINE
156	67	LF	LINE FEED
157	7652	HT	TAB
160	71	NM	NUMBER
161	26	V	
162	25	U	
163	06	F	
164	51	(
165	27	W	
166	02	B	
167	7404	UL	UNDERLINE
170	47	*	
171	01	A	
172	03	C	
173	7656	,	
174	55	EOT	END OF TRANSMISSION
175	7655	NUL	IDLE
176		NULL	
177		CD	

* NOTE: All lxx correspondence octal codes are upper case print.

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-12 Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EQ88*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence Terminal Code Conversion Table
 Indexed by Internal Code

Internal Octal	Correspondence Octal	Name	Character Description
00		NULL	
01	171	A	
02	166	B	
03	172	C	
04	152	D	
05	112	E	
06	163	F	
07	143	G	
10	146	H	
11	131	I	
12	103	J	
13	132	K	
14	106	L	
15	141	M	
16	122	N	
17	105	O	
20	113	P	
21	133	Q	
22	151	R	
23	145	S	
24	102	T	
25	162	U	
26	161	V	
27	165	W	
30	142	X	
31	147	Y	
32	124	Z	
33	44	0	
34	40	1	
35	20	2	
36	60	3	
37	04	4	
40	10	5	
41	30	6	
42	50	7	
43	70	8	
44	64	9	
45	123	+	
46	67	-	
47	170	*	
50	07	/	
51	164	(
52	144)	
53	104	\$	

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-13
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence Terminal Code Conversion Table
 Indexed by Internal Code

Internal Octal	Correspondence Octal	Name	Character Description
54	23	=	
55	00		SPACE
56	73	,	
57	21	.	
60	111	DQ	DIARESIS
61	101		1/4
62	01		1/2
63	153	CL	COLON
64	11	AP	APOSTROPHE
65	150	AM	AMPERSAND
66		CR	CARRIAGE RETURN
67	5b	LF	LINE FEED
70		NULL	
71	160	NM	NUMBER
72		NULL	
73		NULL	
74		NULL	
75	107	QU	QUESTION
76		NULL	
77	53	SC	SEMICOLON
7600		NULL	
7601	71	A	LC
7602	66	B	LC
7603	72	C	LC
7604	52	D	LC
7605	12	E	LC
7606	63	F	LC
7607	43	G	LC
7610	46	H	LC
7611	31	I	LC
7612	03	J	LC
7613	32	K	LC
7614	06	L	LC
7615	41	M	LC
7616	22	N	LC
7617	05	O	LC
7620	13	P	LC
7621	33	Q	LC
7622	51	R	LC
7623	45	S	LC
7624	02	T	LC
7625	62	U	LC
7626	61	V	LC
7627	65	W	LC

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-14
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence Terminal Code Conversion Table
 Indexed by Internal Code

Internal Octal	Correspondence Octal	Name	Character Description
7630	42	X	LC
7631	47	Y	LC
7632	24	Z	LC
7633		NULL	
7634		NULL	
7635		NULL	
7636		NULL	
7637		NULL	
7640		NULL	
7641		NULL	
7642		NULL	
7643		NULL	
7644		NULL	
7645		NULL	
7646		NULL	
7647		NULL	
7650		NULL	
7651	35	BS	BACKSPACE
7652	57	HT	TAB
7653		NULL	
7654		NULL	
7655	75	NUL	IDLE
7656	173	'	
7657	121	.	
7660		NULL	
7661		NULL	
7662		NULL	
7663		NULL	
7664		NULL	
7665		NULL	
7666		NULL	
7667	130	CT	CENT
7670	140		+/-
7671		NULL	
7672		NULL	
7673		NULL	
7674		NULL	
7675		NULL	
7676	55	NL	NEW LINE (CR/LF)
7677		NULL	
7400		NULL	
7401	20	AT	COMMERCIAL AT
7402	10	PC	PER-CENT
7403		NULL	

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-15 Rev A
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence Terminal Code Conversion Table
Indexed by Internal Code

Internal Octal	Correspondence Octal	Name	Character Description
7404	67	UL	UNDERLINE
7405		NULL	
7406		NULL	
7407		NULL	

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-16
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence APL Terminal Conversion Code Table
 Indexed by Correspondence APL Code

Correspondence Octal	Internal Octal	Name	Character Description
00	55		SPACE
01	7661	IS	SPECIFICATION ARROW
02	24	T	
03	12	J	
04	37	4	
05	17	O	
06	14	L	
07	50	/	
10	40	5	
11	62	CB	CLOSE BRACKET
12	05	E	
13	20	P	
14		NULL	
15		NULL	
16		NULL	
17		NULL	
20	35	2	
21	57	.	
22	16	N	
23	65	ML	MULTIPLICATION
24	32	Z	
25		NULL	
26		NULL	
27		NULL	
30	41	6	
31	11	I	
32	13	K	
33	21	Q	
34		UC	UPPER CASE SHIFT
35	7651	BS	BACKSPACE
36		NULL	
37		LC	LOWER CASE SHIFT
40	34	1	
41	15	M	
42	30	X	
43	07	G	
44	33	0	
45	23	S	
46	10	H	
47	31	Y	
50	42	7	
51	22	R	
52	04	D	
53	61	OB	OPEN BRACKET

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-17
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence APL Terminal Conversion Code Table
 Indexed by Correspondence APL Code

Correspondence Octal	Internal Octal	Name	Character Description
54		NULL	
55	7676	NL	NEW LINE
56	67	LF	LINE FEED
57	7652	HT	TAB
60	36	3	
61	26	V	
62	25	U	
63	06	F	
64	44	9	
65	27	W	
66	02	B	
67	45	+	
70	43	8	
71	01	A	
72	03	C	
73	56	,	
74	55	EOT	END OF TRANSMISSION
75	7655	NUL	IDLE
76		NULL	
77		CD	
100	55		SPACE
101	7662	GO	BRANCH ARROW
102	7670	TL	TILDE
103	7612	NL	NULL OPERATOR
104	7613	LE	LESS THAN OR EQUAL
105	7617	CI	CIRCLE
106	7614	QD	QUAD
107	7666	BN	REVERSE SLANT
110	54	=	
111	52)	
112	7605	EP	EPSILON
113	47	*	
114		NULL	
115		NULL	
116		NULL	
117		NULL	
120	70	NG	NEGATION
121	63	CL	COLON
122	7616	RP	REPRESENTATION
123	7402	DV	DIVIDE
124	7632		
125		NULL	
126		NULL	
127		NULL	

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-18
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EQ88*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence APL Terminal Conversion Code Table
 Indexed by Correspondence APL Code

Correspondence Octal	Internal Octal	Name	Character Description
130	7620	GE	GREATER THAN OR EQUAL
131	7611	IO	IOTA
132	64	QT	QUOTE
133	75	QU	QUESTION
134		UC	UPPER CASE SHIFT
135	7651	BS	BACKSPACE
136		NULL	
137		LC	LOWER CASE SHIFT
140	60	DQ	DIARESIS
141	7667	MD	MODULUS
142	7630	ID	IMBED
143	7607	DL	DEL
144	7401	AN	AND
145	7623	MX	MAXIMUM
146	7610	DT	DELTA
147	7631	TA	TAKE
150	73	GT	GREATER THAN
151	7622	RO	RHO
152	7604	MN	MINIMUM
153	51	(
154		NULL	
155	7676	NL	NEW LINE
156	67	LF	LINE FEED
157	7652	HT	TAB
160	72	LT	LESS THAN
161	7626	UN	UNION
162	7625	DR	DROP
163	7606	UL	UNDER LINE
164	7403	OR	OR
165	7627	OM	OMEGA
166	7602	EV	EVALUATION
167	46	-	
170	71	NE	NOT EQUAL
171	53	AL	ALPHA
172	7603	IX	INTERSECTION
173	77	SC	SEMICOLON
174	55	EOT	END OF TRANSMISSION
175	7655	IL	IDLE
176		NULL	
177		CD	

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-19 Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence APL Terminal Conversion Code Table
 Indexed by Internal Code

Internal Octal	Correspondence Octal	Name	Character Description
00		NULL	
01	71	A	
02	66	B	
03	72	C	
04	52	D	
05	12	E	
06	63	F	
07	43	G	
10	46	H	
11	31	I	
12	03	J	
13	32	K	
14	06	L	
15	41	M	
16	22	N	
17	05	O	
20	13	P	
21	33	Q	
22	51	R	
23	45	S	
24	02	T	
25	62	U	
26	61	V	
27	65	W	
30	42	X	
31	47	Y	
32	24	Z	
33	44	0	
34	40	1	
35	20	2	
36	60	3	
37	04	4	
40	10	5	
41	30	6	
42	50	7	
43	70	8	
44	64	9	
45	67	+	
46	167	-	
47	113	*	
50	07	/	
51	153	(
52	111)	
53	171	AL	ALPHA

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-20
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence APL Terminal Conversion Code Table
 Indexed by Internal Code

Internal Octal	Correspondence Octal	Name	Character Description
54	110	=	
55	00		SPACE
56	73	,	
57	21	.	
60	140	DQ	DIARESIS
61	53	OB	OPEN BRACKET
62	11	CB	CLOSE BRACKET
63	121	CL	COLON
64	132	QT	QUOTE
65	23	ML	MULTIPLY
66		CR	CARRIAGE RETURN
67	56	LF	LINE FEED
70	120	NG	NEGATION
71	170	NE	NOT EQUAL
72	160	LT	LESS THAN
73	150	GT	GREATER THAN
74		NULL	
75	133	QU	QUESTION
76		NULL	
77	173	SC	SEMICOLON
7600		NULL	
7601	171	AL	ALPHA
7602	166	EV	EVALUATION
7603	172	IX	INTERSECTION
7604	152	MN	MINIMUM
7605	112	EP	EPSILON
7606	163	UL	UNDERLINE
7607	143	DL	DEL
7610	146	DT	DELTA
7611	131	IO	IOTA
7612	103	NL	NULL OPERATOR
7613	104	LE	LESS THAN OR EQUAL
7614	106	QD	QUAD
7615	141	MD	MODULUS
7616	122	RP	REPRESENTATION
7617	105	CI	CIRCLE
7620	130	GE	GREATER THAN OR EQUAL
7621	133	QU	QUESTION
7622	151	RO	RHO
7623	145	MX	MAXIMUM
7624	102	TL	TILDE
7625	162	DR	DROP
7626	161	UN	UNION
7627	165	OM	OMEGA

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-21
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence APL Terminal Conversion Code Table
 Indexed by Internal Code

Internal Octal	Correspondence Octal	Name	Character Description
7630	142	ID	IMBED
7631	147	TA	TAKE
7632	124	SB	SUBSET
7633		NULL	
7634		NULL	
7635		NULL	
7636		NULL	
7637		NULL	
7640		NULL	
7641		NULL	
7642		NULL	
7643		NULL	
7644		NULL	
7645		NULL	
7646		NULL	
7647		NULL	
7650		NULL	
7651	35	BS	BACKSPACE
7652	157	HT	TAB
7653		NULL	
7654		NULL	
7655	75	NUL	IDLE
7656		NULL	
7657		NULL	
7660		NULL	
7661	01	IS	SPECIFICATION ARROW
7662	101	GO	BRANCH ARROW
7663		NULL	
7664		NULL	
7665		NULL	
7666	107	BN	REVERSE SLANT
7667	141	MD	MODULUS
7670	102	TL	TILDE
7671		NULL	
7672		NULL	
7673		NULL	
7674		NULL	
7675		NULL	
7676	55	NL	NEW LINE
7677		NULL	
7400		NULL	
7401	144	AN	AND
7402	123	DV	DIVIDE
7403	164	OR	OR

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-22
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Correspondence APL Terminal Conversion Code Table
Indexed by Internal Code

Internal Octal	Correspondence Octal	Name	Character Description
7404		NULL	
7405		NULL	
7406		NULL	
7407		NULL	

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-23 Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Memorex APL Code Conversion Table Indexed
 by Memorex APL Code

Memorex Hexadecimal	Internal Octal	Name	Character Description
00	7655	NUL	FIRST CHARACTER OF A BREAK
01	7646	SOH	START OF HEADING
02	7660	STX	START OF TEXT
03	7636	ETX	END OF TEXT
04	7653	EOT	END OF TRANSMISSION
05	7410	ENQ	ENQUIRY
06	7664	ACK	ACKNOWLEDGE
07	7634	BEL	BELL
08	7651	BS	BACKSPACE
09	7652	HT	HORIZONTAL TAB
0A	67	LF	LINE FEED
0B	7645	VT	VERTICAL TAB
0C	7656	FF	FORM FEED
0D	66	CR	CARRIAGE RETURN
0E	7657	SO	SHIFT OUT
0F	7650	SI	SHIFT IN
10	7633	DLE	DATA LINK ESCAPE
11	7405	DC1	DEVICE CONTROL 1 (X-ON)
12	7635	DC2	DEVICE CONTROL 2
13	7406	DC3	DEVICE CONTROL 3 (X-OFF)
14	7637	DC4	DEVICE CONTROL 4 (STOP)
15	7640	NAK	NEGATIVE ACKNOWLEDGE
16	7641	SYN	SYNCHRONOUS IDLE
17	7642	ETB	END OF TRANSMISSION BLOCK
18	7643	CAN	CANCEL
19	7644	EM	END OF MEDIUM
1A	7663	SUB	SUBSTITUTE
1B	7677	ESC	ESCAPE
1C	7672	FS	FILE SEPARATOR
1D	7654	GS	GROUP SEPARATOR
1E	7673	RS	RECORD SEPARATOR
1F	7675	US	UNIT SEPARATOR
20	55		SPACE
21	60	DQ	DIARESIS
22	70	NG	NEGATION
23	72	LT	LESS THAN
24	7620	LE	LESS THAN OR EQUAL
25	54	=	EQUAL
26	7621	GE	GREATER THAN OR EQUAL
27	73	GT	GREATER THAN
28	7624	NE	NOT EQUAL
29	7647	OR	OR
2A	52	)	CLOSING PARENTHESIS
2B	51	(	OPENING PARENTHESIS

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-24
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000 CDC/CYBER 72,73,74

Memorex APL Code Conversion Table Indexed
 by Memorex APL Code

Memorex Hexadecimal	Internal Octal	Name	Character Description
2C	56	,	COMMA
2D	45	+	PLUS
2E	57	.	PERIOD
2F	50	/	SLANT
30	33	0	
31	34	1	
32	35	2	
33	36	3	
34	37	4	
35	40	5	
36	41	6	
37	42	7	
38	43	8	
39	44	9	
3A	62	CB	CLOSE BRACKET
3B	61	OB	OPEN BRACKET
3C	77	SC	SEMICOLON
3D	46	-	MINUS
3E	63	CL	COLON
3F	7666	BN	REVERSE SLANT
40	7613	IS	SPECIFICATION ARROW
41	7601	AL	ALPHA
42	7602	EV	EVALUATION
43	7603	IX	INTERSECTION
44	7604	MN	MINIMUM
45	7605	EP	EPSILON
46	7404	UL	UNDERLINE
47	7607	DL	DEL
48	7610	DT	DELTA
49	7611	IO	IOTA
4A	7612	NL	NULL OPERATOR
4B	64	QT	QUOTE
4C	7614	QD	QUAD
4D	7667	MD	MODULUS
4E	7616	RP	REPRESENTATION
4F	7617	CI	CIRCLE
50	47	*	ASTERISK
51	75	QU	QUESTION
52	7622	RO	RHO
53	7623	MX	MAXIMUM
54	7670	TL	TILDE
55	7625	DR	DROP
56	7626	UN	UNION
57	7627	OM	OMEGA

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-25
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EQ88*2.1 MACHINE SERIES 6000 CDC CYBER 72,73,74

Memorex APL Code Conversion Table Indexed
 by Memorex APL Code

Memorex Hexadecimal	Internal Octal	Name	Character Description
58	7630	ID	IMBED
59	7631	TA	TAKE
5A	7632	SB	SUBSET
5B	65	ML	MULTIPLICATION
5C	7615	GO	BRANCH ARROW
5D	7403		NOT EQUIVALENCE
5E	71	CT	CENT
5F	7606	AN	AND
60	60	LB	OPENING BRACE
61	01	A	
62	02	B	
63	03	C	
64	04	D	
65	05	E	
66	06	F	
67	07	G	
68	10	H	
69	11	I	
6A	12	J	
6B	13	K	
6C	14	L	
6D	15	M	
6E	16	N	
6F	17	O	
70	20	P	
71	21	Q	
72	22	R	
73	23	S	
74	24	T	
75	25	U	
76	26	V	
77	27	W	
78	30	X	
79	31	Y	
7A	32	Z	
7B	7402	DV	DIVIDE
7C	7662	RB	CLOSING BRACE
7D	7401		EQUIVALENCE
7E	53	\$	DOLLAR SIGN
7F	7410	DEL	DELETE

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-26
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EO88*2.1 MACHINE SERIES 6000 CDC CYBER 72,73,74

Memorex APL Code Conversion Table Indexed
 by Internal Display Code

Internal Octal	Memorex Hexadecimal	Name	Character Description
00		NULL	
01	61	A	
02	62	B	
03	63	C	
04	64	D	
05	65	E	
06	66	F	
07	67	G	
10	68	H	
11	69	I	
12	6A	J	
13	6B	K	
14	6C	L	
15	6D	M	
16	6E	N	
17	6F	O	
20	70	P	
21	71	Q	
22	72	R	
23	73	S	
24	74	T	
25	75	U	
26	76	V	
27	77	W	
30	78	X	
31	79	Y	
32	7A	Z	
33	30	0	
34	31	1	
35	32	2	
36	33	3	
37	34	4	
40	35	5	
41	36	6	
42	37	7	
43	38	8	
44	39	9	
45	2D	+	PLUS
46	3D	-	HYPHEN (MINUS)
47	50	*	ASTERISK
50	2F	/	SLANT
51	2B	(	OPENING PARENTHESIS
52	2A	)	CLOSING PARENTHESIS
53	7E	\$	DOLLAR SIGN

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. IV C-27 Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000 CDC CYBER 72,73,74

Memorex APL Code Conversion Table Indexed
 by Internal Display Code

Internal Octal	Memorex Hexadecimal	Name	Character Description
54	25	=	EQUALS
55	20		SPACE
56	2C	,	COMMA
57	2E	.	PERIOD
60	21	DQ	DIARESIS
61	3B	OB	OPENING BRACKET
62	3A	CB	CLOSING BRACKET
63	3E	CL	COLON
64	4B	QT	QUOTE
65	5C	ML	MULTIPLY
66	0D	CR	CARRIAGE RETURN
67	0A	LF	LINE FEED
70	22	NG	NEGATION
71	5E	CT	CENT
72	23	LT	LESS THAN
73	27	GT	GREATER THAN
74		NULL	
75	51	QU	QUESTION MARK
76		NULL	
77	3C	SC	SEMICOLON
7600		NULL	
7601	41	AL	ALPHA
7602	42	EV	EVALUATION
7603	43	IX	INTERSECTION
7604	44	MN	MINIMUM
7605	45	EP	EPSILON
7606	5F	AN	AND
7607	47	DL	DEL
7610	48	DT	DELTA
7611	49	IO	IOTA
7612	4A	NL	NULL OPERATOR
7613	40	IS	SPECIFICATION ARROW
7614	4C	QD	QUAD
7615	5C	GO	BRANCH ARROW
7616	4E	RP	REPRESENTATION
7617	4F	CI	CIRCLE
7620	24	LE	LESS THAN OR EQUAL
7621	26	GE	GREATER THAN OR EQUAL
7622	52	RO	RHO
7623	53	MX	MAXIMUM
7624	28	NE	NOT EQUAL
7625	55	DR	DROP
7626	56	UN	UNION
7627	57	OM	OMEGA

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Memorex APL Code Conversion Table Indexed
 by Internal Display Code

Internal Octal	Memorex Hexadecimal	Name	Character Description
7630	58	ID	IMBED
7631	59	TA	TAKF
7632	5A	SB	SUBSET
7633	10	DLE	DATA LINK ESCAPE
7634	07	BEL	BELL
7635	12	DC2	DEVICE CONTROL 2
7636	03	ETX	END OF TEXT
7637	14	DC4	DEVICE CONTROL 4 (STOP)
7640	15	NAK	NEGATIVE ACKNOWLEDGE
7641	16	SYN	SYNCHRONOUS IDLE
7642	17	ETB	END OF TRANSMISSION BLOCK
7643	18	CAN	CANCEL
7644	19	EM	END OF MEDIUM
7645	0B	VT	VERTICAL TAB
7646	01	SOH	START OF HEADING
7647	29	OR	OR
7650	0F	SI	SHIFT IN
7651	08	BS	BACKSPACE
7652	09	HT	HORIZONTAL TAB
7653	04	EOT	END OF TRANSMISSION
7654	1D	GS	GROUP SEPARATOR
7655	00	NUL	NULL
7656	0C	FF	FORM FEED
7657	0E	SO	SHIFT OUT
7660	02	STX	START OF TEXT
7661	60	LB	OPENING BRACE
7662	7C	RB	CLOSING BRACE
7663	1A	SUB	SUBSTITUTE
7664	06	ACK	ACKNOWLEDGE
7665			
7666	3F	BN	REVERSE SLANT
7667	4D	MD	MODULUS
7670	54	TL	TILDE
7671			
7672	1C	FS	FILE SEPARATOR
7673	1E	RS	RECORD SEPARATOR
7674	7F	DEL	DELETE
7675	1F	US	UNIT SEPARATOR
7676		NL	NEW LINE
7677	1B	ESC	ESCAPE
7400		NULL	
7401	7D		EQUIVALENCE
7402	7B	DV	DIVIDE
7403	5D		NOT EQUIVALENCE

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Memorex APL Code Conversion Table Indexed
by Internal Display Code

Internal Octal	Memorex Hexadecimal	Name	Character Description
7404	46	UL	UNDERLINE
7405	11	DC1	DEVICE CONTROL 1 (X-ON)
7406	13	DC3	DEVICE CONTROL 3 (X-OFF)
7407	05	ENQ	ENQUIRY

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1.0 SCOPE

1.1 This specification provides the characteristics of the User Profile Control feature. This includes the system feature to control processing of special system jobs and also the individual modules being developed as special system jobs. These modules include PROFILE, CHARGE and PROJECT* which maintain and interrogate PROFILO. PROFILO contains information which can be used to control the resouces of a user. The other module is MODVAL, which maintains VALIDUS. VALIDUS contains information used in validating a users use of the system.

* PROJECT will be released only if time and resources allow.

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2.0 APPLICABLE DOCUMENTS

2.1 POD - KRONOS Version 2.1

KRONOS V2.0 - Batch User's Reference Manual

KRONOS V2.0 - Time-Sharing User's Manual

KRONOS V2.0 - Operator's Guide

KRONOS V2.0 - Installation Handbook

KRONOS V2.0 - Instant KRONOS

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3.0 DESCRIPTION

System capabilities described in this section deal with the problems that arise in validating user controls. System security must be maintained during validation while users, who are normally prevented from accessing system resources such as those required for validation, are processed. The system insures that no user is allowed to access files containing system access only information. Jobs to interface these files {example - PROFILE} are run under special system control. These jobs can be interactive when necessary. The system provides total memory security for these jobs. Restrictions from individual user validations do not prevent access to the user profile control features. The special system jobs performing these functions execute under their own controls, and the user's validation controls are restored in the users control point upon completion of the task.

This section also describes a set of system modules which maintain the special system files. These modules interface to the special system job feature to take advantage of the security and other capabilities it provides.

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3.1 Processing of Special System Jobs

Special system jobs are validated by system LIBDECK entries and identified by special {SSJ=} entry points assembled within them. When the system recognizes such jobs, the user's validation parameters are stored within his field length at the address specified by the SSJ= entry point. {The special system jobs are designed to allow expansion of the storage area to a full control point area of information, 2000 words}. Validation parameters are then entered in the control point area to allow the special system job to access the system files and resources necessary to perform its functions. Upon job completion or job abort, the system replaces the user's original validation controls and insures that all files requiring security are returned. Normal system processing of the user resumes with no information from the special system job's field length available to any user.

The following features are provided to reduce system overhead in processing such jobs.

3.1.1 Fast Attach

The catalog searching and the system sector reading and writing involved in accessing direct access files places a burden on the system when used heavily. To alleviate this, the interlock of certain special permanent files is done through the File Name Table rather than mass storage. The interlocks are similar to those done for direct access files in their system sectors.*

* Refer to the PFM and Utilities Enhancements ERS Section 3.5.

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System sector information will still be used to allow file recovery if central memory is destroyed. Programs will access these special files through *PFM* with the ATTACH macro.

3.1.2 Timed/Event Rollout

The timed/event rollout feature allows jobs to access system resources as they become available. Through use of the ROLLOUT macro, the user may request to be rolled out until an event occurs or for a fixed period of time. If the desired event does not occur within the specified time period, the job will be scheduled to roll-in for further processing anyway.

To determine when a specified event has occurred, a system event table is maintained in low core. System programs can make entries in this table to indicate occurrence of events. The job scheduler compares the requested event with the system events recorded in this table to determine if any matches have occurred. If a match occurs, the job scheduler initiates roll-in. If no one is waiting for the system events they are cleared from the table.

Specifying a time, with all event rollouts, insures that the job will rollin even if the event is lost or never occurs. Because the user may rollin for two different reasons, it is the users responsibility to verify whether the event desired actually occurred.

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ROLLOUT - call format.

ROLLOUT addr

Entry - If addr is not specified, rollout job. If addr is present, rollout job for time/event described at RA+addr.

	59	29	11	0
addr	/0	/evd	/rtp	/

Where:

rtp = rollout time period in job scheduler delay intervals {0 ≤ rtp ≤ 7777B}. If rtp = 0 the job rolls out for a time determined by the system to insure that the job will roll in if the event he is waiting for is lost or never occurs.

evd = event descriptor.

If evd is non-zero, the event descriptor and rollout time period, rtp, are placed in the control point area {UPCW}. When the job rolls out it will wait for the occurrence of the event in evd or the specified time period {rtp} to elapse before becoming eligible for rollin.

If evd = 0, event is taken from control point area and only the rollout time period is taken from RA + addr. This option allows the user to rollout waiting for events that the system specifies.

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If $evd = 7700XXB$, extended timed rollout is made. {Assume the job scheduler delay is 1 second}. Since the maximum time rtp can specify is approximately 1 hour and 8 minutes, the extended time rollout allows the user to roll out for any length of time. This is a strict time rollout with no event dependency. Job rolls out for $\{7777*XX + rtp\}B$ seconds.

Programming Note:

It is possible for the central program to get the CPU before the rollout flag is detected by the system. In cases where it is necessary that the calling program know that the rollout has occurred, he should interrogate the *UPCW* word of the control point area. The lower thirty bits of *UPCW* = 0 indicate that the job has rolled out and either the event required has occurred or the time period has elapsed.

EXAMPLES:

1. Attempted attach results in file busy. Assume error processing is set. Upon restarting the job, use of the rollout macro with $evd = 0$ will rollout for time specified by *rtp* waiting for the event - file ready to be accessed. {ORP enters this event in the system event table when the file becomes not busy}. PFM stored the descriptor for this event in the control point area {UPCW} when it found the file busy but it did not set the rollout flag, allowing the user to choose whether

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to rollout immediately or to process some other function
first.

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2. Job Dependency.

Suppose that before JOB1 continues processing that he wants JOB2 {a system origin type job} to execute a certain function. Assume JOB1 uses the rollout macro with evd = 1300 and rtp = 600. The rollout flag will be set for JOB1 to rollout for 600 seconds or until event 1300 takes place. Before the 600 seconds has elapsed, suppose JOB2 makes the macro call - EESET 1300,* entering the event 1300 in the system event table. JOB1 will then be scheduled for rollin to resume processing. If 600 seconds elapse because event 1300 has not occurred for the event was cleared from the table before JOB1 rolled out}, JOB1 will be scheduled for rollin.

3.2 Following are the specifications for the special system file maintenance modules being developed as special system jobs.

3.2.1 SFS - Special System File Supervisor

SFS provides macros and a function processor for a set of routines common to all of the system file processors. The routines perform basic table management, data manipulation and I/O processing for the special system file processors, which process tree structured files. SFS must be loaded as a 01,00 overlay to one of the system file processors.

* See the KRONOS 2.1 Internal Maintenance Specification for detail on this macro.

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3.2.1.1 SFS is designed to process tree-structured files of a given format. The functions are designed to process many levels of tree structure, however, table space is only allocated for a three-level tree structured file {3 directory levels + 1 data level}.

The first word of each record on the file is the control word containing sufficient information to describe the data within the record. The second word is not used for most records {level-0, record 1, word 2 contains file creation and update dates, and a 24 bit field to be used by the processor program}. The third word contains the linkage {random address pointer} to the next logical block on that level, if one is present. The remaining words in the record are directory entries for directory level records. A total of 63 words {60 words of entries + 3 control words} can be used in each record in the directory levels. For the data level, the control word should be compatible with the control words for directory levels. The remainder can be any length and format desired. Because of this flexible format, the processor program must handle I/O of the data-level record. However, if the data-level is constructed similar to the directory-level records, SFS functions can be used to perform the I/O. The information in all levels is maintained in collated sequence.

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The control word format is as follows:

59 _ _ _ _ 47 _ _ _ _ 35 _ _ _ _ 23 _ _ _ _ 11 _ _ _ _ 0
 /dl _ _ _ _ /wir _ _ _ _ /wpe _ _ _ _ /noe _ _ _ _ /fwad _ _ _ _ /

dl = data level.

wir = words in record.

wpe = words per entry.

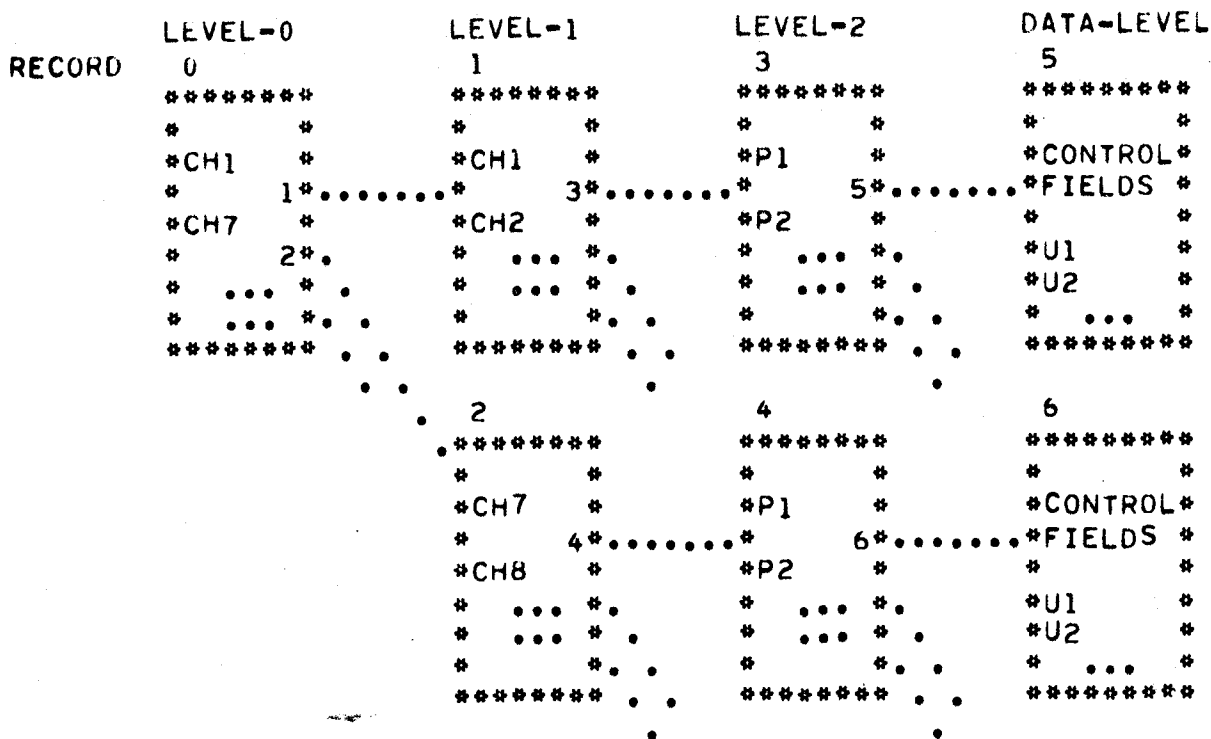
noe = number of entries

fwad = first word address of data entries.

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This diagram depicts an example of a tree-structured file of the type processed by SFS functions. {This particular example is the same as the layout of the PROFIL0 file.}

TREE-STRUCTURE FILE LAYOUT.



- CHN = Primary entries. {Charge number for PROFIL0}
- PN = Secondary entries related to specific primary entry. {Project number for PROFIL0.}
- UN = Tertiary entries related to specific secondary entry. {Control fields and user numbers for PROFIL0.}

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3.2.2 PROFILO - Special System File

The PROFILO file contains information required to validate a users request for access to charge numbers {and project numbers}. Because the nature of the information contained on PROFILO warrants secrecy, programs that access the file must be run as special system jobs to avail themselves of the security provided by that feature. PROFILO will reside at the system user index as a direct access permanent file.

Through the UPC feature, three levels of job accounting are available:

1. by user number,
2. by charge number,
3. by project number.

UPC provides for mandatory charge number and project number validation of user by specifying the CCNR bit in the access word {VALIDUS control information} associated with each user number. Unless this bit is set, a user is not allowed to do anything within the system until his charge number has been validated. The validated charge and project numbers are written to the accounting dayfile along with the current contents of the accounting accumulators {these are not reset}. Once a user is validated to proceed within the system, he may change his charge number or project number simply by issuing a new CHARGE command. The CHARGE command is also available to users who are not restricted by the CCNR bit; however,

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the parameters will still be validated. {For a description of the CHARGE command refer to Section 3.2.2.2}.

3.2.2.1 PROFILE - Project Profile Manager

PROFILE provides creation, modification and inquiry capability for the project profile file PROFIL0. PROFIL0 contains information required to validate a user's request for use of charge numbers {and project numbers}.

Control card call

PROFILE{p1=f1,p2=f2,...,pn=fn}

where pi and fi can be the following:

pi

fi

I = Input data for OP=C or OP=U options.

Default is INPUT.

L = File to receive output.

Default is OUTPUT.

P = Project profile file.

Default is PROFIL0.

S = File to receive PROFIL0 source data for OP=S.

Default is SOURCE.

OP = Option can be any of the following:

C = Create, process input file and create a PROFIL0 file. {Section 3.2.2.1.1.1}

U = Update, update file specified by P option with data on input file* {Section 3.2.2.1.1.2}.

* These options can be run from other than system origin, but only by the designated master user of the specified charge number.

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- I = Inquire, writes requested information to output file.* {Section 3.2.2.1.1.3}
- R = Restructure, the new or rebuilt PROFIL0 file will replace the PROFIL0 file. {Section 3.2.2.1.1.4}
- S = Return PROFIL0 file to source format and place on file specified by the S option. {Section 3.2.2.1.1.5}
- K = K-display option, all other options are cleared and instructions must be entered via the K-display. {Section 3.2.2.1.1.6}
- T = Timesharing update, same as U but suppress preliminary instructions.* {Section 3.2.2.1.4.1}
- L = List option, lists selected portions of the PROFIL0 file determined by the L0 parameter.* {Section 3.2.2.1.1.7}

Default is U.

CN = Charge number for inquire.

PN = Project number for inquire.

CN and PN can only be entered for inquire. If these parameters are required and are not entered on the control card, then the input file is read for them.

L0 = can be any of the following:

F = Full file list of the whole PROFIL0 file.

* These options can be run from other than system origin, but only by the designated master user of the specified charge number.

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- C = Charge number list of the whole PROFIL0 file.
P = Project number list of the whole PROFIL0 file.
FM = Full file list of everything accessible on the
PROFIL0 file by the master user.*
CM = Charge number list of all charge numbers
accessible on the PROFIL0 file by the master
user.*
PM = Project number list of all project numbers
accessible on the PROFIL0 file by the master
user.*

Default is F.

If no parameters are specified on the control card, the
option is selected as K if from system origin. Only the
U, T, I and L OP options can be selected by jobs which have
non-system origin type origin types.

* These options can be run from other than system origin, but only
by the designated master user of the specified charge number.

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3.2.2.1.1 OP Options

3.2.2.1.1.1 Create Option

The create option can be performed from system origin type jobs only. Directives {described in 3.2.2.1.2} are read from the specified input file and are processed to create entries on the PROFIL0 file. Duplicate charge numbers or duplicate project numbers per charge number entry are invalid during a create run and are flagged as errors. Default values are set for all control values not entered for a project number. {For default values see Section 3.2.2.1.2.}

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3.2.2.1.1.2 The update option can be performed from input file directives. Input file directives are identical to those for the create option {see Section 3.2.2.1.2}. When directives are entered for an existing project number for a charge number, the control values are changed according to the directives. If the project number and/or charge number is not found, they are considered new ones and are added to the PROFIL0 file.

3.2.2.1.1.3 The inquire option requires either the PN and/or CN parameters from the control card, or the project number and/or charge number directives from the input file. If an inquiry is performed on a charge number only {no project number present}, all project numbers for that charge number are listed on the output file. If the project number is included, the control values and all validated user numbers for that project number are written to the output file.

Following are examples of the two types of inquire outputs.

Charge number only inquire:

VALIDATED PROJECT NUMBERS ARE -
 PR01 PR02
 XXXX

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Charge number/project number inquire:

CONTROLS FOR PROJECT NUMBER PR02
 CREATE = 72/04/11. CP = 200
 MODDED = 72/04/12. AP = 10
 TI = 08.00.00. CT = 100
 TO = 12.00.00 AT = 5

USER NUMBERS VALID TO USE PR02
 USERABC USER123

- 3.2.2.1.1.4 The function of the reformat option is to rebuild the PROFIL0 file in order to discard any deleted entries and to reconstruct the directory to reduce file accesses when attempting to retrieve data from the file.
- 3.2.2.1.1.5 The source option provides for the PROFIL0 file to be converted back to source format {directive images} on an input file {SOURCE}. This input file can then be used in a create {or update} run at some future time.
- 3.2.2.1.1.6 The K-display option allows direct interaction {from the console} for inquire and update type operations. All directives are now entered via the K-display, instead of on the input file. The control values for a project number are displayed for K-display operations. The other output normally retrieved for the inquire option is discarded when that type of operation is performed from the K-display. {K-display usage is described in the KRONOS Operator's Guide.}

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The K-display option can only be initiated from system origin type jobs. The call can be of two types:

1. PROFILE.
2. PROFILE{OP=K}

This form would normally be used if other parameters needed to be included with the call.

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PROFILO K-DISPLAY {Left Screen Only}

PROFILO

CREATED 72/06/06. LAST MOD 72/06/08.

ALL INPUT DIRECTIVES ARE THE SAME AS THE REGULAR UPDATE DIRECTIVES. THE FOLLOWING COMMANDS ARE ALSO PROVIDED.

- /CN - BEGIN ACTION ON CHARGE NUMBER *CN*
- END - TERMINATES INPUT OF DIRECTIVES FOR THE SELECTED CHARGE NUMBER, AND UPDATES PROFILO IF SO DIRECTED.
- DROP - TERMINATES INPUT OF DIRECTIVES FOR THE SELECTED CHARGE NUMBER, AND PREVENTS ANY UPDATE OF INFORMATION FOR THE CURRENT PROJECT NUMBER.
- STOP - END OF PROCESSING.

CHARGE NUMBER	ABCCHARGEN
PROJECT NUMBER	PROJECTNUMBER1234567
MASTER USER	USERABC
CREATED	72/06/06.
LAST MOD	72/06/08.

OPT	VALUE	DESCRIPTION
TI =	0800	TIME IN - 4 CHARS NUMERIC
TO =	1700	TIME OUT - 4 CHARS NUMERIC
CP =	10000	CP TIME
AP =	563	ACCUMULATED CP TIME
CT =	100	CONNECT TIME
AT =	47	ACCUMULATED CONNECT TIME

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3.2.2.1.1.7 The list option provides a variety of options for listing the information contained on the PROFIL0 file. The available options are designated via the L0 parameter. The F, C and P options provide selective information from the entire PROFIL0 file; however, these listings may only be obtained from system origin. The FM, CM and PM options provide the same type of information as the previous options; however, the information provided is limited to only that information designated as accessible by this master user. This master user is defined as the account number under which the job is currently being executed. Examples of all list options are provided in Appendix C.

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3.2.2.1.2 Input Directives

The input stream is divided into charge number entries. Each charge number entry contains the charge number and directives for that charge number. The first card of each new charge number entry must begin with a slash {/} in column 1. The next 1-10 characters must be the charge number terminated by a separator. Valid separators consist of all special characters plus end of line or end of card. Directives may follow the separator. All data within a charge number entry is free format to column 72, however, directives cannot be split between cards or lines. All blanks are ignored.

Each directive must be separated from the other directives by one of the separators denoted above; however, an equal {=} cannot be used to separate directives. Directives consist of an identifier followed by a data field. The identifier and data field must be separated by an equal {=}.

All directives relative to a charge number must appear within the charge number entry. This implies charge numbers may not appear more than once in the input stream. The data items within the charge number blocks should be grouped in project number entries.

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3.2.2.1.2.1 Example Input Stream

```

/CHNUMBER01
MU=USERAAA
PN=PROJECTNUMBER001
  TI=1200D
  TO=1700D
  CP=7777B
  UN=USERAAB
  UN=USERAAC
PN=PROJECTNUMBER002
  CP=3777B
  UN=USERAAC
/CHNUMBER02
MU=USERABA
PN=PROJECTNUMBER001
  CT=100D
  UN=USERAAB
  UN=USERABC
  UN=USERABD
PN=PROJECTNUMBER004
/-ETC.-

```

} PROJECT ENTRY } CHARGE ENTRY

} PROJECT ENTRY } CHARGE ENTRY

} PROJECT ENTRY } CHARGE ENTRY

Numeric data is assumed decimal unless followed by one of the radix characters, D [= decimal] or B [= binary or octal].

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3.2.2.1.2.1 Data Identifiers

<u>Keyword</u>	<u>Data</u>
----------------	-------------

MU = Master user number which has the ability to inquire about or update data within the charge number record. The master user number has implied permission to use any of the project numbers defined for that charge number.

1-7 alphanumeric characters.

1 entry per charge number records.

This user number is that which is specified on an ACCOUNT card or when logging in.

PN = Project number.

1-20 alphanumeric characters.

UN = User number validated to use this project number. If no user numbers are specified for a project number, then all user numbers are allowed to use it.

1-7 alphanumeric characters.

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Keyword Data

TI = Time of day {expressed in military time
notation} before which the validated user
can not use this project number.*

4 numeric digits + radix.

Maximum value is 2400D.

TO = Time of day {expressed in military time
notation} after which the validated user can
not use this project number.*

4 numeric digits + radix.

Maximum value is 2400D.

* Refer to Section 3.2.2.2 for use of these control fields by CHARGE.

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CP = Total amount of central processor time {in CP seconds}

this project number is allowed to accumulate.*

1-10 numeric digits + radix.

{Default = 1008}

AP = Central processor time {in CP seconds} this project

number has accumulated.**

1-10 numeric digits + radix.

CT = Total amount of accumulated time {in seconds} users are

allowed to be connected to this project number.*

1-10 numeric digits + radix.

{Default = 1008}

AT = Connect time {in seconds} this project number has

accumulated.**

1-10 numeric digits + radix.

DC = Delete charge number. {Update directive only}

DP = Delete project number. {Update directive only}

DU = Delete user number. {Update directive only}

Default on all directives is zero unless specified otherwise.

-
- * Refer to Section 3.2.2.2 for use of these control fields by CHARGE.
 - ** Refer to Section 3.2.2.3 for use of these control fields by PROJECT.

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3.2.2.1.3 Error Messages

3.2.2.1.3.1 System Error Messages

* DATA BASE ERROR.*

Format of attached PROFIL0 file is in error {bad control word}.

* LEVEL-3 DATA BASE ERROR.*

Format of file on data-level is in error {bad control word}.

3.2.2.1.3.2 Dayfile Messages

* ERROR IN PROFILE ARGUMENTS.*

Error on control card.

* NO INPUT FILE.*

No directives present.

* PROFILE ABORTED.*

Error flag set at control point.

* DIRECTIVE ERRORS.*

Examine output file for reason error occurred. {See Section 3.2.2.1.3.3}

* ILLEGAL PROFILE INQUIRE.*

User not allowed to access control information for charge number supplied.

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* PROFILO CREATED.*

Creation run complete.

* PROFILO UPDATED.*

Update run complete.

* INQUIRY COMPLETE.*

Inquire run complete.

* REFORMAT COMPLETE.*

Reformat complete.

* PROFILO TO SOURCE.*

Source run complete.

* LIST COMPLETE.*

List of PROFILO complete.

3.2.2.1.3.3 Diagnostics to Output File

**** ERROR IN CHARGE NUMBER

Format error in charge number {not 1-10 alphanumeric characters}.

Action Taken:

That charge number entry is disregarded and PROFILO skips to next charge number entry in the input stream.

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DIVISION

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**** DUPLICATE CHARGE NUMBERS

This error can only occur during the "create" run. Two charge number entries referring to the same charge number are found.*

* Two charge number entries with the same charge number are legal during "update" runs.

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Action Taken:

All charge number entries after the first one with that charge number are disregarded, all other charge number entries {that do not contain duplicate charge numbers} are processed normally.

**** DIRECTIVE ERROR

This error can only occur during the "create" run, a delete directive {DC, DP or DU} was encountered during a "create" run.

Action Taken:

The delete directive is ignored, all other directives are processed.

**** DUPLICATE PROJECT NUMBER

This error can only occur during a "create" run, two or more project number entries within a charge number entry refer to the same project number. It is illegal to enter the same project number more than once for a particular charge number during a create run.

Action Taken:

All duplicate project number entries after the first one are disregarded, all other project number entries {that do not contain duplicate project numbers} are applied normally.

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**** DUPLICATE USER NUMBER

This error occurs when the same user number {UN} directive appears more than once within a project number or an update attempts to add a user number that already exists under that project number.

Action Taken:

The entire project number entry containing the duplicate user number is disregarded.

**** ERROR IN IDENTIFIER

This error occurs when an unrecognized directive identifier is encountered.

Action Taken:

The action taken is dependent upon the position of the error within the entry.

1. If the error occurs within a project number entry, the entire project number entry containing the error is disregarded.
2. If the error is in a directive that occurs {within the the change number entry} after the change number but prior to the first project number {usually an error in the MU, DC, DP or first PN directive}, only the erroneous directive is disregarded. However, if the error is made on the first PN directive, the entire project number entry will eventually be disregarded

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because the subsequent directives for that project number entry will be treated as project number entry directives that precede the first PN directive and be ignored.

3. If the error occurs in any PN directive but the first one, it is treated as an error within the preceding project number entry. Both the project number entry for the erroneous project number and the preceding project number's entry are disregarded.

**** USER NOT VALID TO UPDATE

This error can only occur during an "update" run when the user number of the person attempting the PROFILE update run is not the master user number for that charge number entry.

Action Taken:

That charge number entry is disregarded and PROFILE skips to the next charge number entry in the input stream.

**** MULTIPLE MASTER USER NUMBER

This error can only occur during a "create" run when more than one MU directive is encountered within a charge number entry.

Action Taken:

All master user number directives after the first one are disregarded.

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*** ERROR IN NUMERIC DATA

This error occurs when non-numeric data or numeric data exceeding the maximum limit for that value is encountered. All directives with numeric data limitations occur as project number directives.

Action Taken:

The entire project number entry containing the directive with the numeric data error is disregarded.

*** ERROR IN PROJECT NUMBER

This error occurs when the data field of the PN directive contains a format error {not 1-20 alphanumeric characters}.

Action Taken:

The project number entry associated with the erroneous project number is disregarded.

*** ERROR IN USER NUMBER

This error occurs when the data field of the UN directive contains a format error {not 1-7 alphanumeric characters or asterisk {*}}.

Action Taken:

The entire project number entry containing the bad UN directive is disregarded.

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**** ERROR IN MASTER USER NUMBER

This error occurs when the data field of the MU directive contains a format error {not 1-7 alphanumeric characters or asterisk [*]}.

Action Taken:

Entire charge entry is disregarded and PROFILE skips to next charge entry.

3.2.2.1.4 PROFILE Execution from a Terminal

PROFILE provides three options for a timesharing user to use to communicate with the PROFILE file. These options are update {OP=U}, inquire {OP=I}, and list {OP=L}. In order to use these options, the user must be the designated master user of the charge number to be acted upon. {OP=U is the default option for timesharing.}

3.2.2.1.4.1 Update from a Terminal

The timesharing user can initiate an update by issuing the command PROFILE. {This command is available only under the BATCH subsystem.} Once initiated, a block of data is output to the terminal describing the format of directives to be input by the user. The user is then queried for a charge number. The user enters

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directives, a line at a time. To terminate input, a blank line is entered.

The block of directive information output to the terminal is as follows:

FOLLOWING ARE THE VALID INPUT DIRECTIVES
 FOR UPDATE -
 PN = PROJECT NUMBER
 UN = USER NUMBER
 TI = TIME IN
 TO = TIME OUT
 CP = MAXIMUM CENTRAL PROCESSOR TIME
 AP = ACCUMULATED CENTRAL PROCESSOR TIME
 CT = MAXIMUM CONNECT TIME
 AT = ACCUMULATED CONNECT TIME
 DC = CHARGE NUMBER TO DELETE
 DP = PROJECT NUMBER TO DELETE
 DU = USER NUMBER TO DELETE
 A BLANK INPUT LINE TERMINATES THE
 UPDATING OF THE GIVEN CHARGE NUMBER.

The timesharing user can suppress this block from being output by specifying the control card option OP=T. The T option is exactly the same as the U option, except T suppresses output of the above block.

3.2.2.1.4.2 Inquire from a Terminal

The timesharing user can request information on valid charge numbers and project numbers by issuing the command PROFILE,OP=I,CN=xxx,PN=yyy. If either the charge number or project number is not entered on the control card, the system requests the user to enter them. If no project number is entered, then

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all valid project numbers, for the entered charge number, are output to the terminal. If both charge number and project number are entered, then the control values and all valid user numbers, for that project number, are output to the terminal.

If a charge number is required and one has not been supplied, PROFILE outputs

ENTER CHARGE NUMBER

to the terminal and then waits for the user to type in a 1-10 character charge number. If a null line is entered, it is treated as End-of-File.

If a project number is required and one has not been supplied, PROFILE outputs

ENTER PROJECT NUMBER

to the terminal and waits for the user to type in a 1-20 character project number. If a null line is entered, it indicates end of processing for the current charge number.

If no project numbers are given for a charge number, then all valid project numbers for the current charge number are output. PROFILE then requests the next charge number. For each project number provided, the control information for that project number is output to the terminal.

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3.2.2.1.4.3 List from a Terminal

See Section 3.2.2.1.1.7 for a description of the list options available to the master user.

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3.2.2.2 CHARGE

CHARGE provides validation of the entry of a user's charge and project numbers against system resources used. A call to CHARGE will be required for the use of the system unless a bit {CCNR} in the user's access word is set {refer to Chapter 8 in the KRONOS 2.0 Operator's Guide for an explanation of the access word}.

Validation consists of several steps:

1. The user profile validation file {PROFIL0} is searched for the charge and project number combination. If found,
2. The validation project record is checked for a list of user numbers that may use it. If any of the following three conditions are met:
 - a. no list is provided
 - b. the user is on the list
 - c. the user is the master userthen,
3. The validation record is checked for remaining:
 - a. CPU time
 - b. Connect timeif both values are greater than zero,
4. The time of day is checked for a value that is within limits specified for this record.

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If the validation process fails for any of the above checks, the user's job is aborted and an appropriate error message issued to the dayfile {refer to Section 3.2.2.2.5 for specific error messages}. If the user is at a terminal, this message is returned to the terminal. If validation is successful, the following events occur:

1. Accounting information for all system resources used is written to the accounting dayfile {refer to Appendix B for message formats}. Values indicated for resources are cumulative.
2. The charge and project numbers are written to the account file {see Section 3.2.2.2.4 for message format}.

3.2.2.2.1 Terminal Usage

When a user logs in at a teletype, the account number he enters and is validated for may have an associated access word that indicates that he is required to enter a charge number and project number. If this is the case, the user will not be allowed to enter any TELEX commands except CHARGE, LOGIN, HELLO, GOODBYE, and BYE, until he has entered a valid charge number and project number.

The message:

TERMINAL NNNN

RECOVER/SYSTEM:

appears at the terminal.

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DOCUMENT CLASS ERS PAGE NO. V 35.1 Rev B1
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

If the user is not required to enter a charge number,
then the following message appears at the terminal:

RECOVER/CHARGE:

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If the user is validated {through the account number} that he must enter a charge number and he does not, the message:

CHARGE REQUIRED

will be returned to the terminal. When valid charge and project numbers have been entered and valid response returned the user may begin his normal teletype session.

The user can enter another valid CHARGE command at any time during the session. The terminal CHARGE command activates the charge program which performs validation and issues accounting messages as described above.

3.2.2.2.2 Batch Usage

When a batch job enters the system, the second card is expected to be an account card and is validated. If the user's validation control indicates CHARGE is required, the card immediately following the account card must be a CHARGE card. Also, on any subsequent account card, if job profile validation is required, a CHARGE control card must follow. Subsequent CHARGE calls may appear in the control card stream. If the batch user is not required to have a charge control card, he also may enter a charge control card anywhere in his control card record after his first account card. In any case, the charge and project numbers must be valid as described by the validation procedure {3.2.2.2}.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

* DATA BASE ERROR.*

Error in validation file structure detected. Contact an on-site analyst immediately.

* CHARGE ABORTED.*

External job abort.

* ILLEGAL CONTROL CARD.*

No terminator was found on control card.

* CHARGE FILE BUSY.*

File is not available for charge purposes. Wait and try again.

* NO CPU TIME AVAILABLE.*

Central processor time allowed under this project number has been expended.

* NO CONNECT TIME AVAILABLE.*

TTY connect time allowed under this project number has been expended.

* CHARGE ILLEGAL AT THIS HOUR.*

This project number cannot be used at this time of day.

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3.2.2.3 PROJECT*

Usage of certain machine resources {currently CPU and connect time} by CHARGE and PROJECT number is accumulated in the user profile control file {PROFIL0}. Since the overhead of dynamically updating these resources would be excessive, a routine, PROJECT, is provided to scan the accounting dayfile from the point PROFIL0 was last updated and update all project records.

Resource usage is traced by scanning the accounting dayfile. One pass is made. During this pass, information pertinent to any job which might validly use charge and project numbers is recorded by PROJECT. This includes information such as job name, account number, charge and project numbers, accumulated value and last dayfile value for all resources to be charged. As PROJECT accumulates data, it updates the user profile validation file {PROFIL0}.

So that a dynamic recording of system resources may be approached, PROJECT saves accumulated data of incompletd jobs and records their position of the account file at the end of a scan. This data is retained on a permanent file {PROVARE} under the system account number. All data for completed jobs is written to the validation file. On the next scan of this account file, data already accumulated will be recovered and the account file will be positioned to the previous stopping point before the scan continues.

* PROJECT will be provided only if time and resources allow.

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PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.2.3.1 Control Card Call {System Origin Type Only}

PROJECT{P=accfile}

accfile = Local file to scan for accounting dayfile messages. If none is specified, the system accounting dayfile will be accessed.

3.2.2.3.2 Error Messages

* ACCOUNT FILE ERROR.*

An illegal entry was found in the accounting dayfile.

* PROJECT ABORT.*

Abnormal program termination was caused externally - by operator drop or illegal system request.

* DATA BASE ERROR.*

Bad information was encountered on user profile validation file {PROFIL0}. Contact an analyst immediately.

* TABLE OVERFLOW.*

An attempt was made to expand managed tables beyond a predefined field length limit. Currently 600008.

* ERROR IN ARGUMENTS.*

An illegal parameter was encountered on the control card.

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* JOB INFORMATION FILE BAD.*

Invalid information was found on the job save file
{PROVARE}.

{PFM Error Message}

PROJECT will issue any PFM error messages returned.

* JOB TABLE ERROR.*

An error has occurred in managed table processing.
Contact an analyst immediately.

* ILLEGAL CONTROL CARD.*

A call was made from other than system origin.

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3.2.3 VALIDUS - Special System File

To understand this section, the reader should be familiar with Chapter 8 of the KRONOS 2.0 Operator's Guide.

Information contained in the VALIDUS file is basically the same as in KRONOS 2.0. Two additional bits {CCNR, CSTP} exist in the access word. When not set, CCNR requires the user to enter valid charge and project numbers before he can access the system (refer to Section 3.2.2). CSTP allows the user to access special transaction functions. Three fields have been added to those available under KRONOS 2.0 which contain additional permanent file controls. Resources which can be controlled and their associated directive identifiers include number of indirect access files {FC}, total number of sectors allocated for indirect access files space {CS}, and number of sectors allocated to any single indirect access file {FS}. Four fields have been added to describe the terminal which is normally used — even or odd parity {PA}, number of rubouts {R0}, half or full duplex {PX}, and terminal type {TT}. The internal structure of the VALIDUS file conforms to a structure which allows access through the routines provided by the Special System File Supervisor, SFS (refer to Section 3.2.1). The file structure is illustrated in the accompanying diagram. Because the nature of the information contained in VALIDUS warrants secrecy, programs that access the file must run as special system jobs. VALIDUS will reside at the system user index as a direct access permanent file.

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3.2.3.1 MODVAL

MODVAL interfaces the System File Supervisor {SFS}. Since MODVAL runs as a special system job, the system commands, PASSWOR and LIMITS, are processed directly by MODVAL {see Sections 3.2.3.2 and 3.2.3.3}. The following sections describe external feature modifications:

3.2.3.1.1 MODVAL Usage

The information displayed on the console screens differs slightly from that provided in KRONOS 2.0. The new format is illustrated on the following pages. The "initial" screen contains instructions for the use of the END, STOP and DROP commands in addition to information currently displayed, and it appears on the right screen at all times.

The left screen operates as under the KRONOS 2.0 system.

In addition to the KRONOS 2.0 options on the initial display {I, C, U and D}, the slash {/} has been added and is similar to the U option except that, if the account number is not found, a new account number will be created automatically. It is possible under this option to switch control directly from one account number to another without returning to the initial screen. The format is similar to the first card of a MODVAL input directive record:

```
/ACCNUMB CR
```

If the slash {/} directive is used exclusively, data entry is compatible with batch input processing.

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VALIDUS

CREATED 72/05/01.

UPDATED 72/06/05.

INPUT DIRECTIVES ARE THE SAME AS BATCH INPUT DIRECTIVES.
 THE FOLLOWING DIRECTIVES ARE ALSO PROVIDED —

/AN - TERMINATE INPUT FOR PRESENT ACCOUNT
 NUMBER IF ANY AND UPDATE VALIDUS FILE.
 INITIATE ACTION ON ACCOUNT NUMBER *AN*.
 I,AN - INQUIRE OPTION. THIS DISPLAY ONLY.
 C,AN - CREATE OPTION. THIS DISPLAY ONLY.
 U,AN - UPDATE OPTION. THIS DISPLAY ONLY.
 D,AN - DELETE OPTION. THIS DISPLAY ONLY.
 END - COMPLETE UPDATE OR INQUIRE OF ACTIVE USER.
 FROM THIS DISPLAY, END RUN.
 DROP - TERMINATE INPUT FOR ACTIVE USER.
 STOP - TERMINATE INPUT FOR ACTIVE USER. IF ANY,
 END RUN.
 AN = 1-7 CHARACTER ACCOUNT NUMBER.

DATA ENTRY FORMAT IS OF THE FORM MT=XX, PR=XX, TL=XXXX,
 ETC. ALL NUMERIC FIELDS ARE ASSUMED TO BE DECIMAL
 UNLESS A POST-RADIX IS SPECIFIED. FOR EXAMPLE —

ACCESS WORD IDENTIFIERS 4000B STARTING AT BIT 0 ARE —
 CPWC CTPC CLPF CSPF CSOF CASF CAND CCNR CSTP

CREATING PGMMODS.

INITIAL DISPLAY

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ACCOUNT PGMMODS

CREATED 72/07/08. UPDATED 72/07/08.

FIELD	TYPE	CONTENTS
PASSWORD	0-7 CHARACTERS	PW = ABCDE
USER INDEX	1-377777B	UI = 117B
ANSWER BACK	0-10 CHARACTERS	AB = AAAAA BBBBB CCCCC DDDDD
MAG TAPES	0-63	MT = 6
REMOVABLE PACKS	0-63	RP = 3
TIME LIMIT	0-511	TL = 100
JOB PRIORITY	0-63	PR = 30
CENTRAL MEMORY	0-4000B	CM = 1000B IN 100s
NUMBER OF FILES	0-192	NF = 30
MASS STORAGE	0-2048	MS = 100
DEFERRED BATCH	0-63	DB = 10
INDIRECT FILES	0-777777B	FC = SYSTEM
INDIRECT SPACE	0-777777B	CS = 5000
INDIRECT SIZE	0-777777B	FS = UNLIMITED
TERMINAL PARITY	3-4 CHARACTERS	PA = EVEN
NUMBER OF RUBOUTS	0-37B	RO = SYSTEM
TRANSMISSION	4 CHARACTERS	PX = HALF
TERMINAL TYPE	3-6 CHARACTERS	TT = TTY
PROJECT NUMBER	0-10 CHARACTERS	PN = 310032
ACCESS WORD	3-4 CHARACTERS	AW = 000000000000000000131

SECOND DISPLAY

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3.2.3.1.2 I - Option

The I-Option can no longer be used to update an account record. Processing will always proceed as if a "DROP" command had terminated data entry for that account number. The "U" option or the "/" option must be used to update existing records. The "STOP" command will not only terminate entry for an active account number without a VALIDUS update, but will always complete and terminate the MODVAL session entirely.

3.2.3.1.3 MODVAL Utility Functions

In addition to the files listed, the following file names may be changed with the identifiers U and L:

VALINDEX

File that contains available user indices for the VALIDUS file being manipulated. This file is built by MODVAL and must be present as a local file for U and R options.

OUTPUT

File to receive list output.

3.2.3.1.4 File Creation {OP=C}

In addition to the present separator characters, end-of-card or end-of-line will be recognized. Thus, if an input directive occurs last on a card, no comma {,} or other separator character need follow it. For example:

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/ROBERTR, AW=CSPF

AW=CLPF

is legal. Note, however, that it is no longer acceptable to lap data from card to card. For example:

/ROBERTR, AW=CSPF,AW=
CLPF.

is illegal.

Values provided for the UI identifier will not be checked for duplication if they are greater than 377700 octal {system assembly constant AUIMX}. Likewise, values provided, when the UI identifier is not used for an account number, will not extend beyond this value.

3.2.3.1.5 Restructure Option {OP=R}

Permanent files for deleted users are not purged from the system until the restructure option is selected and all users having that user index have been deleted. The user indices purged are listed by MODVAL, however, no attempt is made to list users who were assigned those indices. No files under user indices above 377700 octal are purged.

3.2.3.1.6 Error and Informative Messages

The following three sections describe dayfile and output file messages, most of which are substantially different from those issued by MODVAL under KRONOS 2.0.

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PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.3.1.b.1 Dayfile Error Messages

* DATA BASE ERROR.*

A control word in the validation file is in error. If the problem persists, consult an analyst.

* SYSTEM ERROR.*

Indicates an internal malfunction due to either software or hardware. Consult an analyst immediately.

* ERROR IN PASSWOR ARGUMENTS.*

Invalid control card arguments. Correct and rerun.

* ERROR IN MODVAL ARGUMENTS.*

Invalid control card arguments. Correct and re-run.

* MODVAL ABORTED.*

Control point error flag is set. Consult dayfile listing for reason.

* DIRECTIVE ERRORS.*

Errors were encountered on the input file for either create or update modes. Consult the output file for specific errors.

* ILLEGAL CONTROL CARD.*

User is not validated to change password.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.3.1.6.2 Error Messages to Output File

Corrective action is governed by the severity of the errors. The job may be re-run or the new validation file corrected at the user's discretion.

*** ERROR IN ACCOUNT NUMBER.

Illegal data was encountered where account number was expected.

Action Taken:

That account number entry is disregarded and *MODVAL* skips to the next account entry.

*** DUPLICATE ACCOUNT NUMBER.

That account number has been entered previously. Occurs only from create run.

Action Taken:

The first entry is used.

*** ERROR IN IDENTIFIER.

Illegal parameter identifier encountered.

Action Taken:

That account number entry is disregarded. {From K-Display, only that line of input is disregarded.}

CONTROL DATA CORPORATION

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. EOBB*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

**** ERROR IN NUMERIC DATA.

Can indicate any of the following conditions:

1. Numeric data not numeric.
2. Data exceeds maximum.
3. No data present.

Action Taken:

That account number entry is disregarded. {From K-Display, only that line of input is disregarded.}

**** ERROR IN ALPHANUMERIC DATA.

Can indicate:

1. No data present.
2. Data for *AW* identifier unrecognized.
3. Number of characters exceeds maximum allowed.

Action Taken:

That account number entry is disregarded. {From K-Display, only that line of input is disregarded.}

**** USER INDEX PREVIOUSLY DEFINED.

No more than one account number can be assigned to any user index with the "UI" keyword.

Action Taken:

That account number entry is disregarded unless the CV parameter is selected. Then the duplication is flagged on the output file and processing continues normally.

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. V 52
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

**** NO USER INDICES AVAILABLE.

No more user indices are available for automatic assignment. The FUI directive must be used to specify user indices.

Action Taken:

That account number entry is disregarded. {From K-display, only that line of input is disregarded.}

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.3.1.6.3 Informative Messages

* CREATION COMPLETE.*

Self explanatory.

* UPDATE COMPLETE.*

Self explanatory.

* REFORMAT COMPLETE.*

Self explanatory.

* CONVERSION TO SOURCE COMPLETE.*

Self explanatory.

* INQUIRY COMPLETE.*

Self explanatory.

* CATALOG COMPLETE.*

A list run is complete.

* nnn USER INDICES PURGED.*

All files under nnn user indices were purged via the reformat option. System origin only.

* LEVEL-1 INDEX BLOCKS LINKED.*

If account file can be reformatted to eliminate block linkage, searches will be faster —

1. For account numbers residing in linked blocks.
2. For non-existent account numbers which would have resided in linked blocks.

CONTROL DATA CORPORATION

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DOCUMENT CLASS ERS PAGE NO. V 54
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

* CREATING account.*

User number "account" is being created.

* UPDATING account.*

User Number "account" is being updated.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.3.1.6.4 K-Display Operator Messages

*** FORMAT ERROR.

Entry is unrecognizable.

Action Taken:

That line of input is disregarded.

* INQUIRING account.*

An inquire operation is in progress for user "account".

* DELETING account.*

User "account" is being deleted from the VALIDUS file.

* account CREATED.*

User "account" has been created.

* account UPDATED.*

User "account" has been updated.

* account INQUIRED.*

User "account" has been queried.

* account DELETED.*

User "account" has been deleted from the VALIDUS file.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.3.1.7 VALIDUS File Conversion

An additional control card parameter {CV} has been added that suppresses automatic creation of system and library user indices, and allows creation of two account numbers having the same user index during a create run. This allows source output from KRONOS 2.0 MODVAL to be used as input for a creation run under KRONOS 2.1 MODVAL. Thus, to convert a KRONOS 2.0 validation file to KRONOS 2.1 format, one would return his VALIDUS file to source format using a copy of KRONOS 2.0 MODVAL and use the source file as input to a KRONOS 2.1 MODVAL. Since MODVAL no longer allows input directives to overlap cards {see Section 3.2.3.1.4}, a user who wishes to work with a file that contains such input directives, should use it to create a dummy VALIDUS which is then returned to source under KRONOS 2.0 MODVAL. This will provide a source input which KRONOS 2.1 MODVAL can read.

The CV parameter can also be used with the KRONOS 2.1 MODVAL to suppress KRONOS 2.1 type identifiers during a conversion to source run to allow conversion from 2.1 to 2.0 format via a source input file.

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PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.3.1.8 Additional Control Card Parameters

Several additional capabilities have been added to MODVAL for KRONOS 2.1.

3.2.3.1.8.1 CV Parameter

Refer to the previous section for a description of this parameter.

3.2.3.1.8.2 D Parameter

If specified, MODVAL will not abort when directive errors are detected.

3.2.3.1.8.3 OP Parameter

Three new options have been provided.

3.2.3.1.8.3.1 OP = Z, Card Update Option

Directives following the terminator on the MODVAL control card are processed similarly to the U option. However, the system validation file is updated. This option clears all others {except K-display} and requires system origin type to run.

3.2.3.1.8.3.2 OP = I, Inquire Option

Validation fields are listed from the system validation file for the account specified by the last account card or by terminal login. This option identifier must occur alone. An example of output generated appears as follows:

DOCUMENT CLASS ERS PAGE NO. V 58
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

PROFILE 65 72/08/25. 72/08/25.

AB = 1
 AB = 1
 AB = 1
 AB = 1
 MT = 41
 RP = 41
 TL = 777781
 PR = 7081
 CM = 100081
 NF = 201
 MS = 1001
 PN = 1
 DB = 101
 FC = SYSTEM1
 CS = SYSTEM1
 FS = SYSTEM1
 PA = EVEN 1
 RO = 311
 PX = HALF 1
 TT = TTY 1
 AW = 0000000000000000001??

3.2.3.1.8.3.3 OP = L, List Option

Catalog and list validation file entries by account number or user index {order is specified by the L0 parameter}. Account number, user index, creation and last modification dates will be listed. Normally the system validation file is cataloged, although the L0 = L parameter can be used to specify a local file. When the system file is cataloged, this option requires system origin type to run. The L option identifier must occur alone. An example of output generated appears as follows:

DOCUMENT CLASS ERS PAGE NO. V 59
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

ACCOUNT NUMBER	USER INDEX	CREATION DATE	LAST MOD DATE
ROBERTR	1	72/08/25.	72/08/25.
WHOOPEE	2	72/08/25.	72/08/25.
WARDELL	3	72/08/25.	72/08/25.
LIBRARY	377776	72/08/25.	72/08/25.
SYSTEMX	377777	72/08/25.	72/08/25.

3.2.3.1.8.4 L0 Parameter

This parameter can be used to specify list options which can be any of the following:

L0 = E, list errors only {used with OP = C, U, or Z}.

L0 = A, sort by account number {used with OP = L}.

L0 = N, sort by user index {used with OP = L}.

L0 = L, catalog local file {used with OP = L}.

L0 = AL and L0 = NL are valid. Omitting the L0 parameter is equivalent to L0 = A {list all directives, or sort the system file by account number}. Selecting L0 with no letters is equivalent to L0 = EN {list only errors, or sort the system file by account number}.

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 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.3.1.9 Additional Input Directives

Three identifiers have been added to those available under KRONOS 2.0 which manipulate permanent file controls {FC, CS, FS}. An entered value of zero {0} indicates that the system will use a predetermined value for the user's origin type. An entered value greater than a system defined value indicates that no limit will be imposed. For further information, refer to the Permanent File Manager ERS. Data fields for these identifiers can be any decimal or octal {D or B post radix may be used, no radix indicates decimal} value from 0 to 777777B. Each identifier should occur only once per account number record.

<u>Identifier</u>	<u>Data</u>
FC	= File count. Maximum number of indirect access permanent files.
CS	= Cumulative space. Maximum number of sectors allowed for all indirect access permanent files.
FS	= File size. Maximum number of sectors allowed for any single indirect access permanent file.

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

Four identifiers have been added which manipulate fields describing the user's terminal.

<u>Identifier</u>	<u>Data</u>
-------------------	-------------

PX	= Transmission Mode. Terminal operates in full or half duplex mode. Only one entry should occur per account number record. The following values are available:										
	<table border="1"> <thead> <tr> <th><u>Value</u></th> <th><u>Explanation</u></th> </tr> </thead> <tbody> <tr> <td>FULL</td> <td>System enters echoplex mode automatically.</td> </tr> <tr> <td>HALF</td> <td>System does not enter echoplex mode automatically.</td> </tr> </tbody> </table>	<u>Value</u>	<u>Explanation</u>	FULL	System enters echoplex mode automatically.	HALF	System does not enter echoplex mode automatically.				
<u>Value</u>	<u>Explanation</u>										
FULL	System enters echoplex mode automatically.										
HALF	System does not enter echoplex mode automatically.										
R0	= Rubout count. Character count delay associated with the user's terminal. A value of 37B denotes that the system will use the default number for the user's terminal type. One value from 0 to 37B may be entered for each account number record.										
PA	= Terminal parity. Terminal operates with even or odd parity. One of the following two values may be entered for each account number record:										
	EVEN										
	ODD										
TT	= Terminal type. One of the following values may be specified for each account number:										
	<table border="1"> <thead> <tr> <th><u>Value</u></th> <th><u>Explanation</u></th> </tr> </thead> <tbody> <tr> <td>TTY</td> <td>Teletype or other ASCII compatible terminal.</td> </tr> <tr> <td>MEMAPL</td> <td>MEMOREX 1240 with APL print.</td> </tr> <tr> <td>COR</td> <td>Correspondence with standard print.</td> </tr> <tr> <td>CORAPL</td> <td>Correspondence with APL print.</td> </tr> </tbody> </table>	<u>Value</u>	<u>Explanation</u>	TTY	Teletype or other ASCII compatible terminal.	MEMAPL	MEMOREX 1240 with APL print.	COR	Correspondence with standard print.	CORAPL	Correspondence with APL print.
<u>Value</u>	<u>Explanation</u>										
TTY	Teletype or other ASCII compatible terminal.										
MEMAPL	MEMOREX 1240 with APL print.										
COR	Correspondence with standard print.										
CORAPL	Correspondence with APL print.										

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.3.2 PASSWOR Control Card

MODVAL will process the PASSWOR control card directly at the user's terminal or batch job via the special system access feature described in Section 3.1.

3.2.3.2.1 Control Card Call

PASSWOR {oldpw,newpw}

Change user account password *oldpw* to *newpw*.

User previously must have either:

1. Logged in on a terminal.
2. Issued an account card.

to provide an account number which is validated to change password.

3.2.3.2.2 Error Messages

* ERROR IN PASSWOR ARGUMENTS.*

Invalid control card arguments. Correct and re-run.

* ILLEGAL CONTROL CARD.*

User is not permitted to change password. Must acquire such validation.

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PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

3.2.3.3 LIMITS Control Card

MODVAL will process the LIMITS control card directly at the user's terminal or batch job via the special system access feature described in Section 3.1.

3.2.3.3.1 Control Card Call

LIMITS.

The LIMITS call is identical to the OP=I option in MODVAL. See Section 3.2.3.1.8.3.2 for definition of response to this call.

3.2.3.3.2 Error Messages

* ERROR IN LIMITS ARGUMENTS.*

Invalid control card arguments. This call has no arguments associated with it.

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PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

4.0 DEFINITIONS

SPECIAL SYSTEM JOB

A job initiated by a user at his control point which gets special treatment by the system in that it executes with the benefits of file security, memory security, and access to resources and system functions without restrictions from individual user validations.

TREE-STRUCTURE

Ordered data which consists of primary entries, each of which has an array of related secondary entries, each of which has an array of related tertiary entries, etc. until arriving at the data which provides the desired controls. {Example in Section 3.2.1.1.}

LEVELS

The hierarchical relationship of data on a tree-structured file.

LINKAGE

Random address {pointers} joining together all records of similar data to enable processing to proceed from one record within a level to the next.

SPECIAL SYSTEM FILES

Files which contain data {normally privileged information warranting secrecy} that is necessary in controlling various aspects of system activity. These files are maintained as

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direct access permanent files under the system user index {377777B}. Access to these files is achieved via the *SFM* ASYF function.* Due to this method of access, these files can only be accessed by special system jobs.

DIRECTIVES

The defined list of identifiers and associated data fields which serve as input commands to a processor to direct the processor in creating or updating a special system file. The identifier portion uniquely identifies the specific control field within the file to be set with the contents of the data field.

ENTRY

A group of input directives which pertain to a data item of a given level.

CHARGE NUMBER

The primary entry on the PROFIL0 file which is the basic identifier used for accounting purposes. A charge number may be valid to use for many users and one user may be validated to use many charge numbers. Each charge number may have several associated project numbers defined for it. {1-10 alphanumeric characters.}

* See the KRONOS 2.1 Internal Maintenance Specification for detail on this function.

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PROJECT NUMBER

The secondary entry on the PROFIL0 file which provides sub-charge accounting. {1-20 alphanumeric characters.}

USER {OR ACCOUNT} NUMBER

Refer to Interchangeable Device ERS for definition.

USER INDEX

Refer to Interchangeable Device ERS for definition.

MASTER USER

The user number which has permission to inquire and update control values for a given charge number on the PROFIL0 file.

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PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

UPC - APPENDIX A

List of manuals in which documentation may be affected:

PROFILE

BURM

Chapter 5, System Utility Control Cards Section

Operator's Guide

Chapter 8, Utility Operation; Appendix B, Operator Messages

Installation Handbook

Chapter 3, Something in conjunction with VALIDUS

Instant KRONOS

Control Card Chapter - System control card formats

CHARGE

KRONOS 2.0 Time-Sharing User's Reference Manual

Page 7-2 Recovery

Page 4-5 CHARGE Command

Page 2-2, 6-3 to 6-7 Log In Procedure

Page 9-1 Disclaimer on Account Card

KRONOS 2.0 Batch User's Reference Manual

Page 5-2 CHARGE Control Card

Page 3-7 JOB INITIATION AND VALIDATION

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KRONOS 2.0 Operator's Guide

Page 3-6, 5-17 Disable Validation

Page 8-7 *CCNR* - validation required user access bit

PROJECT

KRONOS 2.0 Batch User's Reference Manual

Page 5-64 Control Card

KRONOS 2.0 Operator's Guide

Page 8-10 Utility Operation

MODVAL

KRONOS 2.0 Batch User's Reference Manual

Page 5-63 Control Card

KRONOS 2.0 Operator's Guide

Page 8-1 thru 8-10 Utility Operation

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 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPENDIX C

PROFILE LIST OPTION EXAMPLES

EXAMPLE 1. Full File List

PROFILO FULL FILE LIST OF FULL FILE. PAGE 1
 CHARGE NUMBER MASTER USER 72/10/02. 00.26.56.

- 1. CHARGNULL1 NULL
- 2. CHARGNULL2
- 3. CHARG0001 PROFILE

CONTROLS FOR PROJECT NUMBER PN10
 CREATE = 72/10/02. CP = 64
 MODDED = 72/10/02. AP = 0
 TI = 00.00.00. CT = 64
 TO = 00.00.00. AT = 0

CONTROLS FOR PROJECT NUMBER PN11
 CREATE = 72/10/02. CP = 64
 MODDED = 72/10/02. AP = 0
 TI = 00.00.00. CT = 64
 TO = 00.00.00. AT = 0

CONTROLS FOR PROJECT NUMBER PN12
 CREATE = 72/10/02. CP = 64
 MODDED = 72/10/02. AP = 0
 TI = 17.00.00. CT = 64
 TO = 24.00.00. AT = 0

USER NUMBERS VALID TO USE PN12
 USER1 USER2

CONTROLS FOR PROJECT NUMBER PROJECTNUM0001
 CREATE = 72/10/02. CP = 64
 MODDED = 72/10/02. AP = 2048
 TI = 08.00.00. CT = 200
 TO = 17.00.00. AT = 20000

USER NUMBERS VALID TO USE PROJECTNUM0001
 ABCUSER USERA 1234567

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DIVISION

DOCUMENT CLASS ERS PAGE NO. V C-2 Rev A
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

4. CHARG0002 PROFILE

CONTROLS FOR PROJECT NUMBER PN20

CREATE =	72/10/02.	CP =	64
MODDED =	72/10/02.	AP =	0
TI =	00.00.00.	CT =	64
TO =	00.00.00.	AT =	0

CONTROLS FOR PROJECT NUMBER PN21

CREATE =	72/10/02.	CP =	64
MODDED =	72/10/02.	AP =	0
TI =	06.40.00.	CT =	64
TO =	07.04.00.	AT =	0

CONTROL DATA CORPORATION

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DOCUMENT CLASS ERS PAGE NO. V C-3 Rev A 1
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. EDBB*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

EXAMPLE 2. Full File Charge Number List

PROFILO CHARGE NUMBER LIST OF FULL FILE. PAGE 1
 CHARGE NUMBER MASTER USER 72/10/02. 00.27.11.

1. CHARGNULL1 NULL
2. CHARGNULL2
3. CHARG0001 PROFILE
4. CHARG0002 PROFILE
5. CHARG0003 PROFILE

EXAMPLE 3. Full File Project Number List

PROFILO PROJECT NUMBER LIST OF FULL FILE. PAGE 1
 CHARGE NUMBER MASTER USER 72/10/02. 00.27.06.

1. CHARGNULL1 NULL
2. CHARGNULL2
3. CHARG0001 PROFILE

VALIDATED PROJECT NUMBERS ARE -

PN10 PN11
 PN12 PROJECTNUM0001

4. CHARG0002 PROFILE

VALIDATED PROJECT NUMBERS ARE -

PN20 PN21
 PN22 PROJECTNUM0002

5. CHARG0003 PROFILE

VALIDATED PROJECT NUMBERS ARE -
 PROJECTNUM0003

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DOCUMENT CLASS ERS PAGE NO. V C-4 Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

EXAMPLE 4. Master User Full File List

PROFILE,OP=L,L0=FM

PROFILO FULL FILE LIST OF MASTER USER PROFILE
 CHARGE NUMBER 72/10/02. 00.35.38.

1. CHARG0001

CONTROLS FOR PROJECT NUMBER PN10
 CREATE = 72/10/02. CP = 64
 MODDED = 72/10/02. AP = 0
 TI = 00.00.00 CT = 64
 TO = 00.00.00 AT = 0

CONTROLS FOR PROJECT NUMBER PN11
 CREATE = 72/10/02. CP = 64
 MODDED = 72/10/02. AP = 0
 TI = 00.00.00. CT = 64
 TO = 00.00.00. AT = 0

CONTROLS FOR PROJECT NUMBER PN12
 CREATE = 72/10/02. CP = 64
 MODDED = 72/10/02. AP = 0
 TI = 17.00.00. CT = 64
 TO = 24.00.00. AT = 0

USER NUMBERS VALID TO USE PN12
 USER1 USER2

CONTROLS FOR PROJECT NUMBER PROJECTNUM0001
 CREATE = 72/10/02. CP = 64
 MODDED = 72/10/02. AP = 2048
 TI = 08.00.00. CT = 200
 TO = 17.00.00. AT = 20000

USER NUMBERS VALID TO USE PROJECTNUM0001
 ABCUSER USERA 1234567

2. CHARG0002

CONTROLS FOR PROJECT NUMBER PN20
 CREATE = 72/10/02. CP = 64
 MODDED = 72/10/02. AP = 0
 TI = 00.00.00. CT = 64
 TO = 00.00.00. AT = 0

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. V C-5 Rev A |
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

CONTROLS FOR PROJECT NUMBER PN21
CREATE = 72/10/02. CP = 64
MODDED = 72/10/02. AP = 0
TI = 06.40.00. CT = 64
TO = 07.04.00. AT = 0

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. V C-6 Rev A
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. E088*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

EXAMPLE 5. Master User Charge Number List

/PROFILE,OP=L,LO=CM

PROFILO CHARGE NUMBER LIST OF MASTER USER	PROFILE
CHARGE NUMBER	72/10/02. 00.33.38.
1. CHARG0001	
2. CHARG0002	
3. CHARG0003	

LIST COMPLETE.

EXAMPLE 6. Master User Project Number List

PROFILE,OP=L,LO=PM

PROFILO PROJECT NUMBER LIST OF MASTER USER	PROFILE
CHARGE NUMBER	72/10/02. 00.34.19.
1. CHARG0001	

VALIDATED PROJECT NUMBERS ARE -	
PN10	PN11
PN12	PROJECTNUM0001

2. CHARG0002

VALIDATED PROJECT NUMBERS ARE -	
PN20	PN21
PN22	PROJECTNUM0002

3. CHARG0003

VALIDATED PROJECT NUMBERS ARE -	
PROJECTNUM0003	

LIST COMPLETE.

DOCUMENT CLASS ERS PAGE NO. V D-1 Rev B |
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPENDIX D

DSD AND DIS COMMANDS
FOR USING TIMED/EVENT ROLLOUT

- A. In all DSD file displays the timed/event rollout files will be displayed as *TEFT* file types. In addition, the @ display has all *TEFT* rollout files flagged by **.
- B. The DSD command, ROLLIN,XX. may be used to roll in a TEFT job.
- C. For a job at control point n, the DSD command
n.ROLLOUT,XXXX.
will roll the job out for XXXX seconds.
- D. The command to roll a job out for a time period may also be used under DIS as follows:
ROLLOUT,XXXX.
- E. An additional CMRDECK entry is also provided which may be utilized to vary the length of the system event table used for timed/event processing. The default length of the table is 6 CM words. The format of the entry is:
STL=xxxx.
where
xxxx = the desired length.

DOCUMENT CLASS ERS PAGE NO. V E-1 Rev B1
 PRODUCT NAME KRONOS 2.1
 PRODUCT MODEL NO. ED88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

APPENDIX E

DESCRIPTION OF SPECIAL ENTRY POINTS

The following special entry points will be available in KRONOS 2.1 for ABS SYSTEM PROGRAMS. The routines SYSEDIT and LAJ process these entry points.

Entry Point	Description
ARG=	Suppress argument passing.
DMP=	Dump previous job before load.
RFL=	Automatic field length assignment.
RID=	Return files of specified ID on job termination.
SDM=	Suppress control card dayfile message.
SSJ=	Define job as special system job.
VAW=	Reload job from specified file.

ARG=

Used for jobs that wish to do their own control card programs argument processing. Control card parameters are not passed to RA+ARGR if ARG= is present.

DMP=

Any job with DMP= > 0 causes the field length program and exchange package of the previous program job to be dumped to a file before loading the job with the DMP= entry point. When the DMP= program does an END, the field length and exchange package from the dump file are reloaded. If 0 < DMP= ≤ 100B, the full field length of the previous program will be dumped to the file. If DMP= > 100B,

CONTROL DATA CORPORATION

DIVISION

DOCUMENT CLASS ERS PAGE NO. V E-2 Rev B1
PRODUCT NAME KRONOS 2.1
PRODUCT MODEL NO. EQ88*2.1 MACHINE SERIES 6000/CDC CYBER 72,73,74

only the amount of field length specified by the value of DMP= will be dumped. In neither case will executing field length be reduced from that of the preceding program.

RFL=

When a program with an RFL= is loaded from the system, the program's field length is set to the value of RFL= {rounded to the next higher 100B words}.

RID=

Upon job completion of a program with RID= entry point, all files with ID's equal to the RID= value are returned before the next program is loaded. The range of values for RID= is one to seventy-seven octal.

Example:

If the program contains ENTRY RID=, RID= EQU 20B, and SETID FILE, 20B then the file specified at FET address FILE will be automatically returned upon completion of the RID= program.

SDM=

For programs with SDM= entry points, no dayfile message is generated on the control card call. The program should issue his own message. An example of the use of this is in PFILES. Many PFM control cards require the specification of a password that should not appear in the dayfile. When ATTACH,A/PW=KEY. is issued, PFILES using the SDM= entry point can strip off the password and issue the dayfile message - ATTACH,A/PW=*****.

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SSJ=

Programs with SSJ= entry points are defined as special system jobs. The address specified by the SSJ= entry point determines the start of a parameter area where the user accounting control words are temporarily stored to allow the special system job access beyond the user's validation. When the special system job completes or aborts the user's validation parameters are retrieved from the parameter area within the special system job's field length and restored in the control point area. All local files created by the special system job are returned before normal control card processing is resumed.

NOTE:

Requirements for proper specification of special system jobs:

1. An RFL= entry point must precede the SSJ= entry point to allow SYSEdit to validate that the parameter area will fit within the special system job's field length.
2. All programs that wish to run as special system jobs must be specified in LIBDECK or in SYSEdit input. The following is the format of the entry in both cases:

```
*SSJ      NAM1,NAM2,....,NAMN
```

This allows programs NAM1, NAM2,...., and NAMN to run as special system jobs if they contain SSJ= entry points.

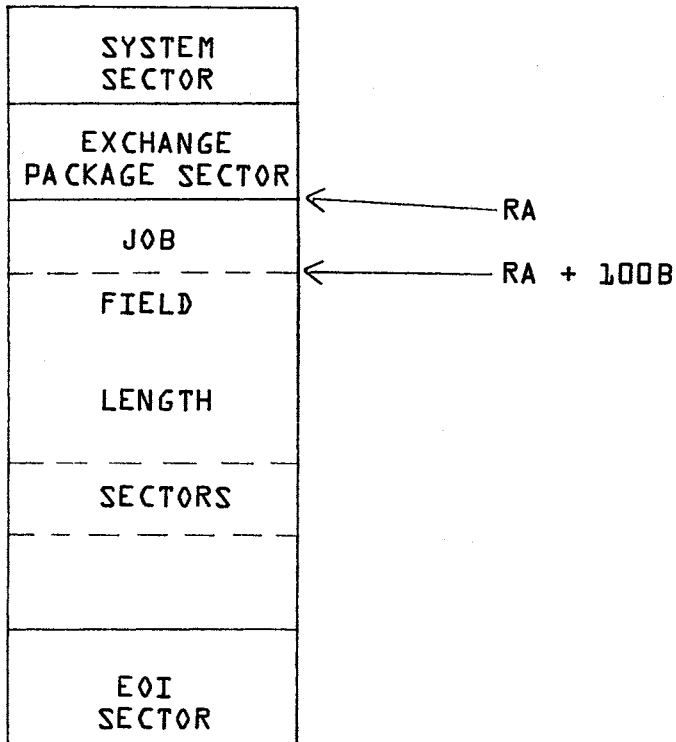
3. The common deck COMSSSJ should be used to determine parameter area length and for any references to specific words within the parameter area.

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If {1.} and {2.} are not present, the SSJ= entry point will merely be added as another normal entry point for the program and no special system job processing will be done for that program.

VAW=

Upon completion of a program with a VAW= entry point, the system will load the next program from the file specified at RA+CCDR. The reload file should be formatted exactly like the dump file created by use of DMP= entry points. The file format is:



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The exchange package will be replaced from this file and program execution will start from the P address specified in the exchange package.

Example:

RESTART will use this entry point to begin execution for checkpointed programs.

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1.0 SCOPE

1.1 This specification provides the characteristics of the 844 support feature. The 844 can be used in any of the following manners:

1. System Device
2. Permanent File Device
3. Shared Device
4. Swapping Device
5. Removable Pack
6. Scratch Device {for local files}

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2.0 APPLICABLE DOCUMENTS

2.1 POD - KRONOS Version 2.1

POD - 844 Disk Storage Subsystem/6000/7000 {I048*1.0}

ERS - 844 Disk Storage Subsystem/6000/7000 {I048*1.0}

Programming Standard No. 1.87.005, System Error Recovery for Rotating Mass Storage

Proposed Standard for Engineering File content

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3.0 DESCRIPTION

3.1 Support of the 7054/844 subsystem consists of a driver that will drive from one to eight 844 units as one mass storage device. Also provided will be system modifications for handling any modules necessary for preloading the firmware into the buffer controller.

3.2 The 844 driver will be similar to all other mass storage drivers provided in the operating system. Addressing will be performed at a 2:1 interlace. The addressing algorithm provides access to 93.8 percent of the device. The driver will have a minimal transfer rate of 42.0 thousand CM words per second and an average transfer rate of 44.0 thousand CM words per second. The average latency of the disk is 8.3 milli-seconds. Equipment type for the driver will be *DI* and the driver will be called *bDI*.

3.2.1 System Error Messages

DIxx, Nyy, STnnnn, Un Cnnnn Tnn Snn.

xx = Equipment number

yy = Number of times operation attempted

STnnnn = Status

Un = Unit

Cnnnn = Cylinder

Tnn = Track

Snn = Sector

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DIXX, sssssssssssssssssssssssss

DIXX, sssssssssssssssssssssssss

xx = Equipment number

s - s = 144 bits of detail status

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3.3 Routines involved with deadstarting the system will provide interpretation of CMR deck entries to properly define the 844 equipment in the running system. These routines will also handle the preloading of the firmware into the 844 Buffer Controller. {The firmware is loaded on all levels of deadstarting.}*

3.4 In order to format {write headers on} an 844 pack, one of the two following methods must be used.**

3.4.1 The following CMRDECK command extension is provided to allow formatting of a pack during deadstart. This method must be used if the pack is to be used as part of the running system.

INITIALIZE,eq,r,F.

eq = EST ordinal of equipment containing pack to be formatted.

3.4.2 To format a pack while the system is running, option four {4} of MDI {Mass Storage Device Initialization} must be exercised. {Refer to the Removable Device ERS for detailed explanation of this method.}

* Any future modifications to the firmware will not be supported by the KRONOS development group.

** The format of an entire pack requires a minimum of 5 minutes.

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3.5 The following table represents capabilities provided by the 7054/844 subsystem and the level of support given to these:

<u>CAPABILITY</u>	<u>LEVEL OF SUPPORT</u>	
	<u>S</u>	<u>N</u>
1. 1:1 Interlace		X
2. 2:1 Interlace	X	
3. Seek Overlap		X
4. Write Verify		X
5. Read Checkword		X
6. Dual Access		X
7. System Function to Format Pack	X	
8. Buffer Controller Firmware Load	X	
9. Support 1-8 packs as 1 device	X	
10. Error Correction {READ}	X	
11. Additional Error Status	X	
{Provided thru Detailed Status}		
12. Address Field Correction		X
S - Will Support		
N - Will Not Support		
13. Auto Dump of Buffer Controller		X

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4.0 DEFINITIONS

4.1 Buffer Controller

The processor that provides the guiding source of intelligence for the disk storage subsystem. The PPU software communicates with the subsystem software that is executed by the buffer controller when a disk I/O operation is desired.

4.2 Disk Storage Subsystem {7054/844}

The hardware configuration consisting of a buffer controller, 4096 {16 bit} words of memory, the associated coupler to the higher level processor and the associated hardware which drives from one to eight CDC 844 disk storage units. The coupler connects an I/O data channel associated with a higher level processor.

4.3 Driver

This is a PPU program which can be called as an overlay to an executing PPU program. It contains the addressing algorithm necessary for converting logical disk addresses to physical disk addresses. It also issues the necessary external function codes for communicating with the buffer controller in order to perform I/O. The driver also contains routines to attempt any error recovery and to issue appropriate error messages to the system error log.

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4.4 Firmware

The software which must be preloaded into the buffer controller to drive the hardware and also to enable it to communicate with the higher level processor.

4.5 2:1 Interlace {Half-Tracking}

The method of assigning successive logical addresses to separated physical addresses to allow the higher level processor to transfer the data to/from central memory and do any other required tasks before accessing the disk again without losing revolutions.

4.6 Latency

The time required to locate the beginning of a particular storage location. Average latency is normally the time required to make one half revolution of the disk.

4.7 Transfer Rate

The amount of data that can be transferred from the disk to the PPU and on into central memory in a given amount of time.

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844 ERS - APPENDIX A

List of manual references requiring documentation changes or additions:

INSTANT:

Chapter 3 — Mass Storage Data Organization

Chapter 6 — External Function Codes

OPERATOR'S GUIDE:

Chapter 1 — System Configuration

Chapter 2 — Equipment Status {E} Display

Chapter 5 — Equipment Configuration Commands

Appendix B — Operator Messages

BURM:

7-78 — Define Command

5-11 — Assign Card

INSTALLATION HANDBOOK:

2-9 — CMR Deck Entries

2-10 — RTK Entry

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APPENDIX B - ADDRESSING ALGORITHM

7054/844-n MULTIPLE DISK DRIVE

KRONOS accesses the 7054 and n 844's as a single device.

n may range from one to eight.

Equipment Type = DI

Sectors/Track = 107

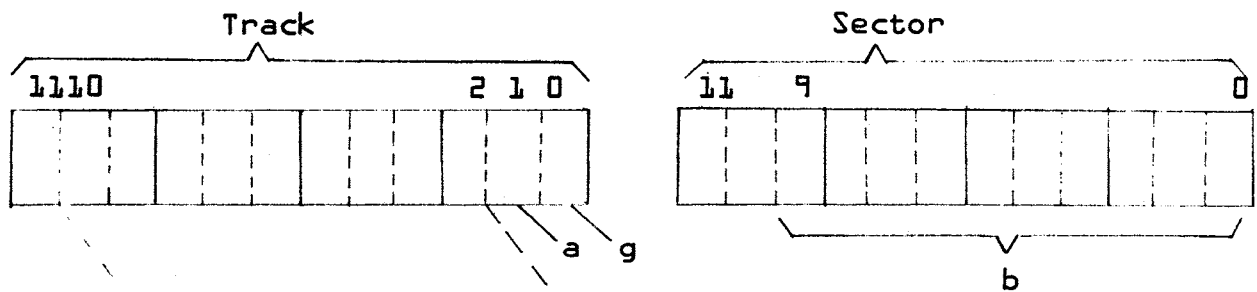
Tracks/Device = 1616

Words/Device = 11,066,368*n

Maximum Data Rate = 46.1K words/sec.

Address Mapping:

LOGICAL



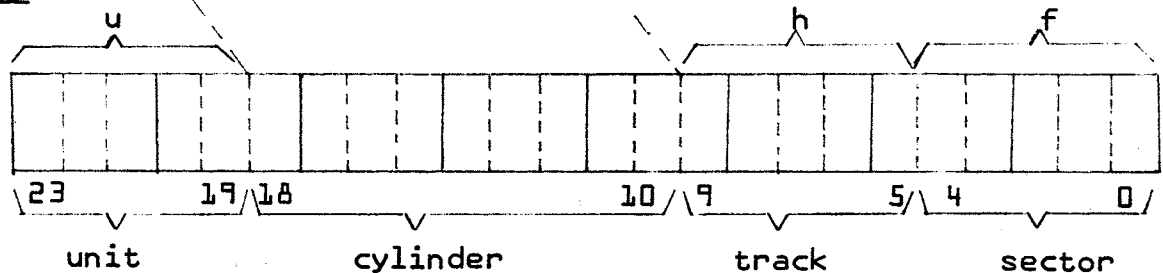
$$b/153_8 = u + c \text{ {remainder}}$$

$$a + 2c = d$$

$$d/30_8 = e + f \text{ {remainder}}$$

$$e + \{g*11_8\} = h$$

PHYSICAL




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
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7054/844 CYLINDER 0 CROSS-SECTION

Physical Track Number	Physical Sector Number																						
	0	1	2	3	4	5	6	7	8	19	20	21	22	23
0	0-0	2-0	0-1	2-1	0-2	2-2	0-3	2-3														0-11	2-11
1	0-12	2-12																					
2																							
3																							
4																							
5																							
6																							
7																							
8																		0-106	0-107				
9	1-0	3-0	1-1	3-1	1-2	3-2	1-3	3-3														1-11	3-11
10	1-12	3-12																					
11																							
12																							
13																							
14																							
15																							
16																							
17																		1-106	1-107				
18																		3-106	3-107				

 = Unused Disk space

 = a - logical track number
 b - logical sector number

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1.0 SCOPE

1.1 This specification provides the external characteristics of the expanded features in KRONOS 2.1 associated with CYBER Hardware Support.

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2.0 APPLICABLE DOCUMENTS

2.1 KRONOS Version 2.1 Product Objectives Document.

V2.0 Batch User's Reference Manual

V2.0 Time-Sharing User's Manual

V2.0 KRONOS Instant

V2.0 Operator's Guide

V2.0 Installation Handbook

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3.0 DESCRIPTION

3.1 KRONOS 2.1 will make use of the CYBER distributive data path feature when available. The DDP will be used for data transfers between PPU's and ECS. The only external change involved with this will be the addition of two optional parameters on the EST entry for ECS. Also, it will be possible to enter the device type as "DP". The format of the entry will be as follows:

EQxx= DE, st, sz, ca, cb.

EQxx= DP, st, sz, ca, cb. {optional form}

Where:

xx = Equipment Ordinal

DE = ECS

DP = Distributive Data Path

st = Status {ON, OFF or NA}

sz = ECS words available/1000B

The additional parameters ca and cb specify one or two DDP channels. When the DDP is available, the driver in use will be called bDP and the device type in the EST will be "DP".

3.2 ECS will be used for storage moves in KRONOS 2.1 whenever available. This will be done automatically if ECS is available. If an ECS parity error is encountered during storage move, the following will take place:

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1. Move will be completed with normal move code.
2. All future moves, until the next deadstart, will be done without the use of ECS.
3. The message *ECS OFF.* will be displayed at the system control point.

The area in ECS reserved for moving is part of the label track for the device.

3.3 The alternate devices library capability will provide the following capabilities:

1. It will be possible to place copies of ABS, OVL and PP type routines on devices other than the system device(s). If an attempt is made to place any other program type on an alternate device, the message *ILLEGAL CM/AD RESIDENCE, MUST BE PP, OVL, OR ABS.* is written to output and the run aborted.
2. Only one alternate device per routine will be allowed. When the alternate device is specified for a routine, this copy will always be used; except in some cases of error recovery.
3. An unrecoverable error on any alternate device for PPU routines will cause all accesses for loading of PPU routines to revert to the system device. An unrecoverable error in the case of a CPU routine will cause subsequent accesses from the system device for that routine only.
4. The LIBDECK directives to SYSEEDIT for selecting alternate devices will be as follows:

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*AD, n, ty1/rec1, ty2/rec2, ... tyn/recn

where n is the equipment ordinal or the device type of the alternate device. The record type is specified as *ty* and *rec* is the record name. If the equipment does not exist, the entry will be ignored with no error indication. Once routines have been placed on alternate devices, additional SYSEdit's may delete the access to these, but the space on the alternate device will not be released.

5. An alternate system device is defined at deadstart {CMRDECK time} with the entry:

$$ASR=D_1, D_2, \dots, D_n.$$

D_i is the alternate device equipment ordinal with the following restrictions:

- a. must be mass storage
 - b. $0 \leq i \leq 208$
 - c. may not be system device
 - d. may not be removable pack device.
- b. In the case of ECS being an alternate device, all CPU routines residing there will be loaded directly by central monitor. This is accomplished by a new central monitor function *LCEM*.

The major areas of use for this feature are:

1. Place selected routines in ECS for very fast access.
2. Placing PPU routines on perhaps an 841, for example, where latency is better even though the system is on an 808.

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3.4 The dual access capabilities of the 841 and 821 will be supported by KRONOS 2.1. {844 support of dual access is dependent on some hardware changes.} In order to utilize this feature, the dual access option in the hardware and dual 3553's are needed. The EST entry for dual access is as follows:

EQxx= dt, st, en, un, ca, cb.

Where:

xx = Equipment ordinal

dt = Device type

st = ON, OFF or NA

en = Hardware equipment number

un = Unit number

ca = First channel

cb = Second channel {cannot be 0}

This is exactly the same as the standard EST entry currently except for the addition of a second channel parameter.

An "R" parameter may be given as the last parameter on a mass storage EST entry. The second channel parameter on the EST entry for dual access forces the "R" option to be set whether or not it has been specified. If this parameter is set, then a release function will be performed any time a channel is dropped. The actual release is issued from *MTR*. If this parameter is set, it is necessary that all equipment on the specified channel have the same release code. In the case of a 3553, this means that any other device connected to the channel must be capable of accepting a "0" function.

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4.0 DEFINITIONS

4.1 Distributive Data Path

The Distributive Data Path {DDP} provides a new path of data flow between ECS and the rest of the system. The DDP consists of a 480-bit buffer register attached to a channel. Options allow expanding a DDP to four registers. Each register connects to a standard input/output channel for maximum overlap of data transfer. This arrangement allows up to four PPU's to transfer data to ECS at nearly the maximum data rate of the PPU's.

4.2 Label Track

The label track, which resides on mass storage devices, is used to preserve system tables and other necessary information that is dependent on the usage of the device. The label track may be used by the system and recovery to maintain status of information on the device or to recover the system.

4.3 Dual Access

Dual access provides two simultaneous data streams to mass storage units. The second access requires a separate controller and data channel.

4.4 Latency

The time required to locate the beginning of a particular mass storage location. Average latency is normally the time required to make one half revolution of the disk.

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1.0 SCOPE

- 1.1 This specification provides the characteristics for the KRONOS 2.1/SCOPE 3.4 Product Set Interface feature.

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2.0 APPLICABLE DOCUMENTS

2.1 SCOPE 3.4 Reference Manual

KRONOS 2.1 P.O.D.

SCOPE 3.4 LOADER Reference Manual

6000 Record Manager Reference Manual {6RM}

COBOL 4.0 Reference Manual

FORTRAN 4.0 Extended Reference Manual

SORT/MERGE 4.0 Reference Manual

KRONOS 2.0 Batch User's Reference Manual

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3.0 DESCRIPTION

KRONOS 2.1/SCOPE 3.4 PRODUCT SET INTERFACE consists of interfaces to LRM and to the KRONOS loader {LINK} from either the SCOPE 3.4 Product Set or the Product Set user. The interface to LRM is via the program FILE and indirectly through the LDSET control card via the FILES option. The interface to the loader {LINK} is through the LDSET control card and its associated directives and through the LDSET loader table generated by the SCOPE 3.4 Product Set.

The integration of the SCOPE 3.4 product set also requires the integration of COMPASS 3.0, since the product sets make use of several new features offered by the new version of COMPASS. This necessitates additional modifications to the loader {LINK} to recognize new XFILL and XLINK tables and to process the conditional relocation designator.

3.1 The File program is called by the control card - FILE - and it allows the user to pre-store the File Information Table {FIT} in the file ZZZZDF from the information supplied on the control card. See LRM Reference Manual and LRM ERS.

3.1.1 Format of control card*

FILE{[fn [=axxxxxxx]][,keyword=option]...}

[] denotes optional.

* This control card is compatible with the same control card in SCOPE 3.4.

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lfn - Name of FIT.

axxxxxxx - Optional new name for FIT. Allows a file to be requested by a new name without assembly.

keyword = option - Correspond to FILE macro parameters: they may appear in any order.**

** Refer to BRM Reference Manual Version 1.0 on the FILE control card.

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3.1.2 Example

FILE{TAPE1,F0=IS,BT=C,RT=F}

Entries will be made in the file ZZZZDF for the FIT TAPE1 defining the file type as indexed sequential {IS}, the block type as character count {C} and the record type as fixed length {F}.

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3.2 The LDSET control card provides the user control of a variety of load operations. Options specified through LDSET apply for the current load only. A loader completion statement {name call, EXECUTE, or NOGO} terminates their effect. Each LDSET Control Card can be used to set several options or several LDSET Control Cards can be used. LDSET is legal in only the following types of load sequences:

1. LDSET
LOAD.
EXECUTE.
2. LDSET.
LOAD.
NOGO.

3.2.1 Format of control card

LDSET {option₁,option₂,....,option_n}

Each option is specified in one of the following forms:

Key

Key = param

Key = param₁/param₂/...../param_n

3.2.1.1 LIB = libname₁/libname₂/...../libname_n - optional

libraries to be used in the following load. These libraries will follow those on the LOAD or LINK statement but will precede both the alternate library specified by the LIBRARY statement and the particular default compiler library in the order of satisfying externals. Each use of LIB causes the

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specified names to be added to the end of the set of libraries specified on the previous LIB. The entire set of libraries is processed sequentially and is not checked for duplicates.

LIB with no parameters nullifies the effect of all previous LIB = libname₁/.../libname_n statements.

3.2.1.2 MAP = p option

This option directs generation of the load map. Sub parameters control the degree of the map produced. For specification of the p options reference the MAP statement specification in the KRONOS 2.0 BATCH USER'S REFERENCE MANUAL.

3.2.1.3 PRESET = p option

The preset option specifies the values to which unused core in the CM field length is set prior to execution of the loaded program. During the loading process, the loader presets core including blank common, the same as a SETCORE followed by LOAD would be processed. After the loaded program has been relocated to its execution location in core, all core after the loaded program up to the execution field length specified on the job card is preset to the value - p -. The default value of PRESET is NONE.

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<u>p</u> =	<u>Octal Value</u>
NONE	No presetting
ZERO	0000 0000 0000 0000 0000
ONES	7777 7777 7777 7777 7777
INDEF	1777 0000 0000 0000 0000
INF	3777 0000 0000 0000 0000
NGINDEF	6000 0000 0000 0000 0000
NGINF	4000 0000 0000 0000 0000
ALTZERO	2525 2525 2525 2525 2525
ALTONES	5252 5252 5252 5252 5252

3.2.1.4 ERR = p option

The ERR option selects one of three methods of handling load errors. If no ERR option is specified, the default value is FATAL.

p = ALL	Program is aborted for FATAL and NON FATAL errors.
p = FATAL	Program is aborted for FATAL errors only.
p = NONE	For this option, the loading process continues if possible. If the completion statement is EXECUTE, normal program execution is initiated, including passing of execution parameters, field length adjustment, and core presetting. This is contingent upon a transfer address having been encountered prior to occurrence of the fatal error. If no transfer address has been encountered, the job is aborted.

3.2.1.5 REWIND and NOREWIND option

The REWIND/NOREWIND options alter the default option for re-winding of the load file prior to loading. If these options

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are not specified the default procedure is to rewind the load file except if the load file is defined as *INPUT*.

3.2.1.6 USEP = pname₁/pname₂/.../pname_n

The USEP option causes the indicated program names {object modules} to be loaded regardless of whether or not they are needed to satisfy external references. If the loader is unable to find an object module name in the libraries searched, it flags a non-fatal error.

3.2.1.7 USE = eptname₁/eptname₂/.../eptname_n

The USE option forces the loading of object modules to assure that specified entry points are included in the load. The loader loads the modules on the next occasion it satisfies externals.

If the loader is unable to find an entry point name in the libraries searched, it flags a non-fatal error.

3.2.1.8 FILES = lfn₁/lfn₂/.../lfn_n

The FILES option is available to the Record Manager users to assure that the necessary BRM library programs for the processing of the specified files are loaded. Since the Record Manager processes four different file types, the FILES option is used to avoid the excessive use of core by loading only those BRM programs that are needed for the file types of the files specified. lfn is the logical file name and is also

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the symbolic address of the FIT for the file in the user's program. At load time the loader searches the first record of the file ZZZZDF for a matching lfn. In this record, a maximum of 63 lfn's are allowed at one word per entry. If the lfn was defined in a FILE control card call, an entry for the lfn will exist.

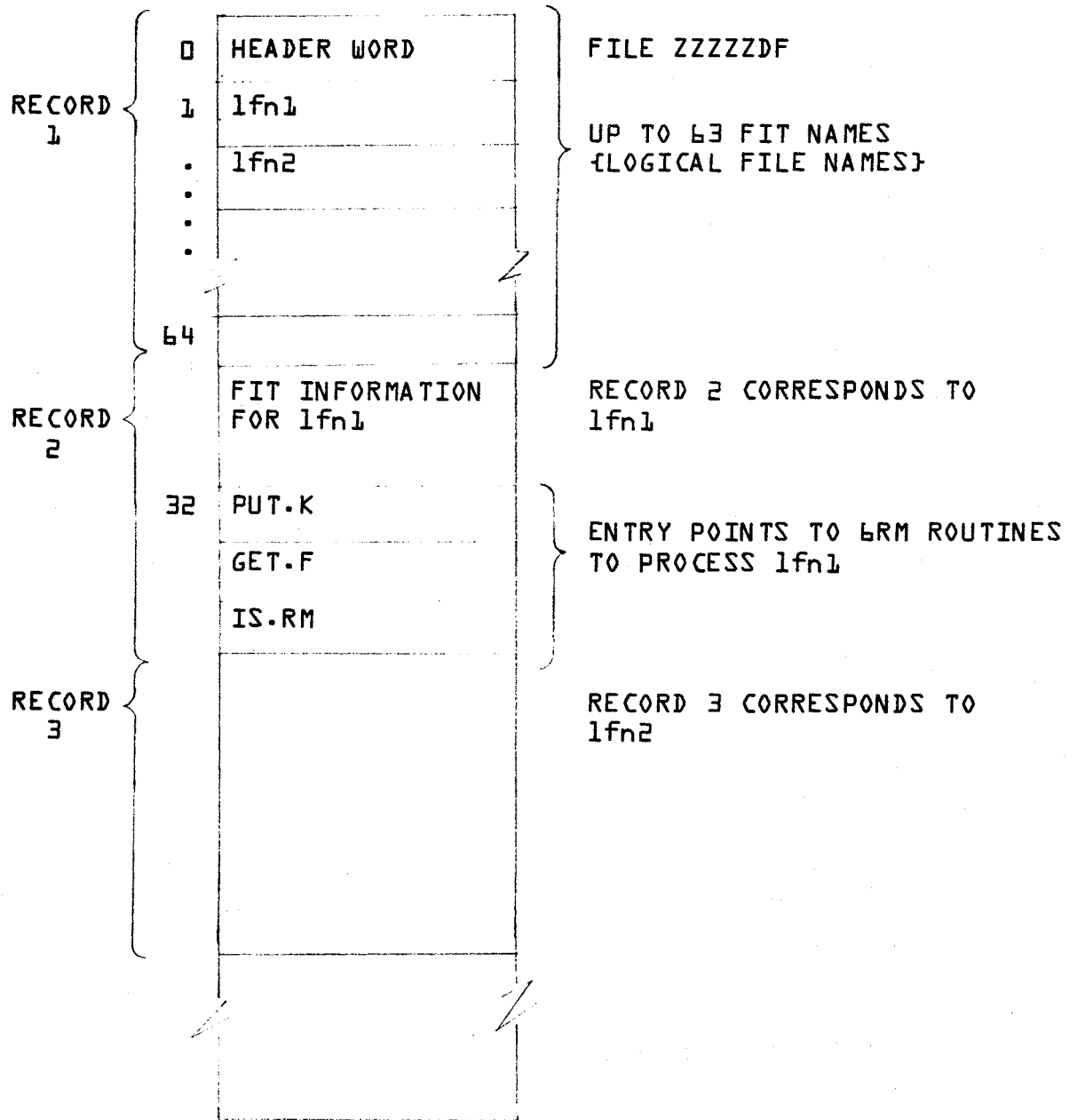
The following records contain FIT information and entry points to bRM I/O routines. The relative location of an FIT record from record two corresponds to the relative location of its entry in the first record. When the proper FIT record is found the entry points to the bRM I/O routines are read starting from word 32 of the record and are added to the USE table {reference USE - 3.2.1.7}.

The following shows the structure of the file ZZZZDF:

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3.2.1.9 SUBST = pair₁/pair₂/...../pair_n

pair_t - Pair of entry point names in the form:

eptname₁-eptname₂

The SUBST option changes external references to entry point names to other entry point names. This feature can be used to cause loading of object modules other than those that would normally be loaded.

As a result of SUBST, a reference to external eptname₁ becomes a reference to external eptname₂. See Example 4.

3.2.1.10 OMIT = eptname₁/eptname₂/...../eptname

The OMIT option directs that the specified entry point names are to remain unsatisfied, regardless of whether or not the module containing these entry point names is loaded. The specified entry point names are processed the same as other unsatisfied names but do not result in errors. Some modules containing these entry point names may be loaded to satisfy other externals, but the specified entry points are not linked.

An OMIT request takes effect from the time encountered until the end of load or until superseded by a USE, e.g., OMIT{XYZ} later followed by USE{XYZ}. See Example 5.

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3.2.2 Examples:

3.2.2.1 Example 1

```
LIBRARY{LIB1}  
LDSET{LIB=LIB2/LIB3}  
LOAD{B,LIB4}  
EXECUTE{TEST}
```

During load completion the libraries are searched in the following order.

```
LIB4  
LIB2  
LIB3  
LIB1  
DEFAULT SYSTEM LIB
```

3.2.2.2 Example 2

```
LDSET{USE=ENT1/ENT2/ENT3}
```

None of these entry points are necessary to satisfy externals. If PROG A contains entry point ENT1 and PROG B contains entry points ENT2 and ENT3, then these two programs will be loaded on the following load sequence. PROG A and PROG B will be only loaded once, if they are necessary to satisfy externals. Non-fatal errors will be generated if ENT1, ENT2 and/or ENT3 cannot be found.

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3.2.2.3 Example 3

```
LDSET {FILES=TAPE1/TAPE2}
```

TAPE1 is an Indexed Sequential {IS} file. TAPE2 is a Word Addressable {WA} file. If PROGA uses TAPE1 and TAPE2, the following load sequence of PROGA will load the Record Manager routines that processes IS and WA file types.

3.2.2.4 Example 4

```
LDSET{SUBST=MEAT-BEANS/CORN-RICE/PEAS-RICE}
```

```
LGO.
```

This sequence causes any references to MEAT to be treated as references to BEANS and any references to either CORN or PEAS as references to RICE.

3.2.2.5 Example 5

```
LOAD{FILE1}
```

```
LDSET{OMIT=TAN}
```

```
FILE2.
```

The linking of any external references to TAN is not inhibited during the loading of FILE1. However, any references to TAN loaded subsequent to the OMIT request remain unsatisfied.

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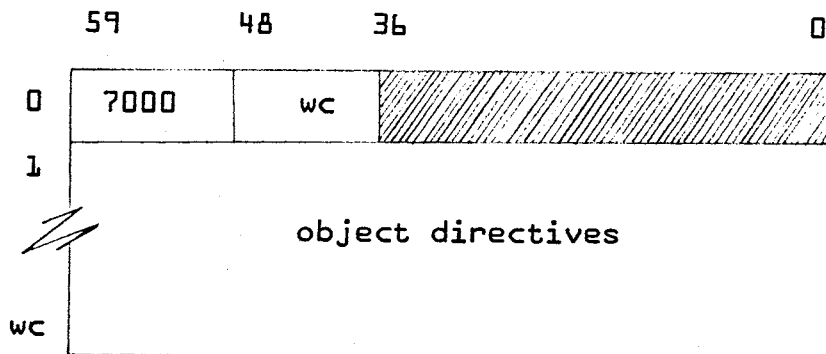
| 3.3 Binary Table Formats

| 3.3.1 LDSET Table {7000}

Several compilers of the SCOPE 3.4 Product Set generate an LDSET Table automatically with the other loader tables. The object directives of the LDSET table are equivalent to the options of the LDSET Control Card.

The LDSET table follows the PIDL table and precedes all others in the loading sequence.

The table format is as follows:



Each object directive begins with, or consists of a header word with the same general format as a table header word. The object directives, and the names of the LDSET directive options to which they correspond are described below. Any or all of them may be present in any order.

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3.3.1.1 LIB {0010}

	59	48	36	0
FORM 1:	0010	0000		

The above form clears the set of libraries specified from previous LDSET Control Cards.

	59	48	36	18	0
FORM 2:	0010	wc			
	library name ₁				
	library name ₂				


The above library names will be added to those specified on the last previous LDSET Control Card. Libraries will be searched in the following order:

1. Libraries specified on the LINK or LOAD statement.
2. Libraries specified on LDSET statements.
3. Libraries specified in LDSET table.
4. Alternate library.
5. Default system library.

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| 3.3.1.4 ERR {0013}

ERR specifies the severity that causes the loader to abort.

59	48	36	18	0
0013	0000		p	

p Severity


0 ALL

1 FATAL

2 NONE

| 3.3.1.5 REWIND/NOREWIN {0014}

REWIND/NOREWIN specifies the default initial position for all files to be read by the loader. This table directive corresponds to the LDSET option for REWIND/NOREWIN. See Section 3.2.1.5.

59	48	36	18	0
0014	0000		p	

p Position

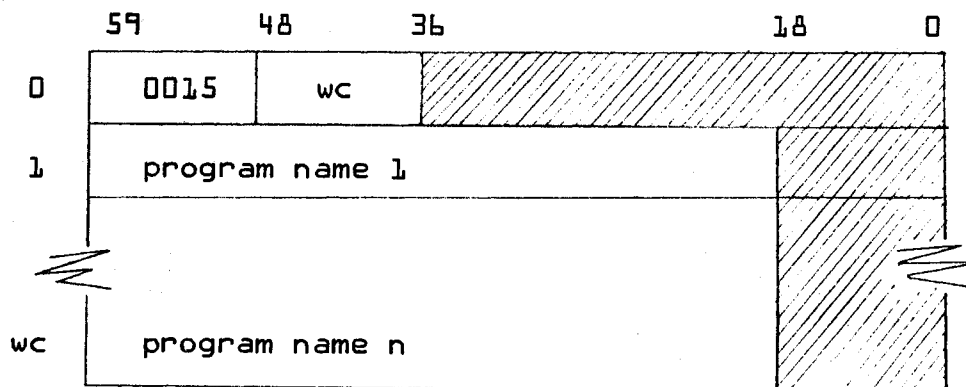
0 REWIND

1 NOREWIND

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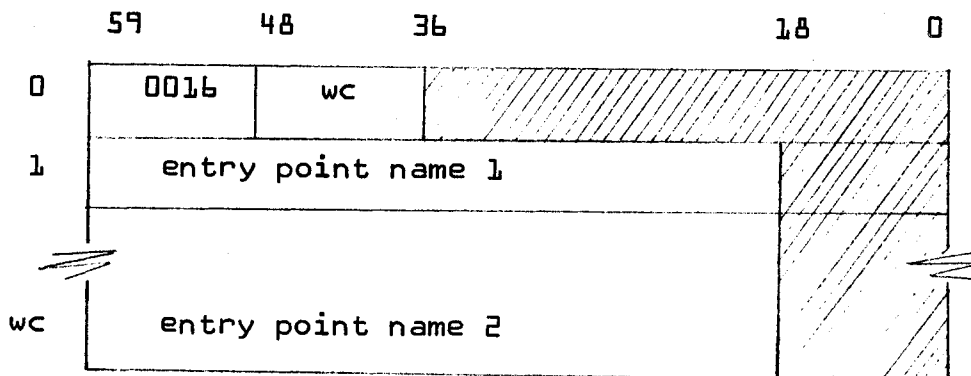
3.3.1.6 USEP {0015}

USEP supplies program names to be loaded even if their entry point names are not needed to satisfy external references.



3.3.1.7 USE {0016}

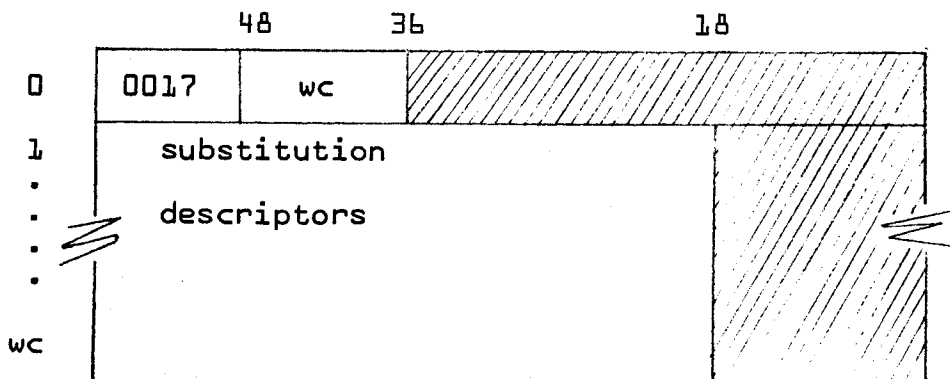
USE supplies entry point names to be treated as external references to be satisfied by entry point definitions, even if they are not referenced by a LINK loader table.



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3.3.1.8 SUBST {0017}

SUBST supplies entry point names to be used in place of external names appearing in all subsequent LINK tables.



Each substitution descriptor is two words with the following format.

external name referenced	
entry point name to be used instead	

3.3.1.9 OMIT {0020}

OMIT supplies names to be equated to $*+400000_8$, where * is the location of the word containing the reference, when they occur as follows: in previous LINK loader tables if they have not been defined by ENTR loader tables, and unconditionally in all subsequent LINK loader tables.

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	48	36	18
0	0020	wc	
1	external name		
2	external name		
.			
.			
wc			

3.3.2 XFILL Table {4100}

The XFILL table serves the same purpose as the FILL table, but with most of the restrictions eliminated. The table format is as follows:

	59	48	36	21	12	00
0	4100	wc		cr		
1	relocation descriptors					
.						
.						
wc						

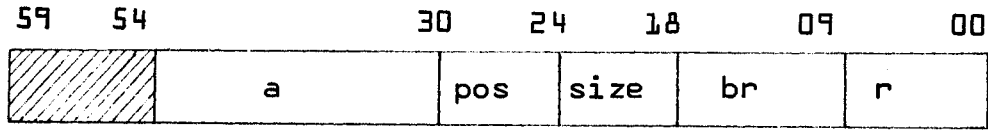
cr Conditional relocation designator: The XFILL table is ignored if cr refers to a common block that was first declared by an earlier subprogram.

Each relocation descriptor is one 60-bit word and specifies the relocation of one address field in a previously-loaded text word. The relocation descriptor format is as follows:

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- a Relative address of text word; may be as large as 7777777₈
- pos Bit position of the low-order bit of the address field in the text word
- size Address field length in bits
- br Base address designator for relocation quantity
- r Relocation base designator for text word address; R cannot be 2 {negative program relocation} and cannot refer to a blank common block

The relocation quantity is determined from BR as follows:

<u>br</u>	<u>relocation quantity</u>
000	0
001	p
002	-p
003	c ₁
004	c ₂
.	.
.	.
.	.
777 ₈	c ₅₀₉

- p Origin of the subprogram CM/SCM local block
- c_i Origin of the ith common block listed in the subprogram PIDL table

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The relocation quantity is added to the content of the address field in bit positions {pos+size-1} through {pos} in the previously loaded text word whose location is given by r and a. In doing the addition, the relocation quantity is lengthened to 60 bits by sign extension and then shortened to the length of the field to be modified by simple truncation of the bits at the left end. The relocation quantity is then added to the field to be modified as if in a register of the same length as the field to be modified, with end-around carry; i.e., the addend and augend are treated as having a sign bit and {size-1} magnitude bits. Since address fields cannot cross word boundaries, the following restrictions must be satisfied:

$$0 \leq \text{pos} \leq 59$$

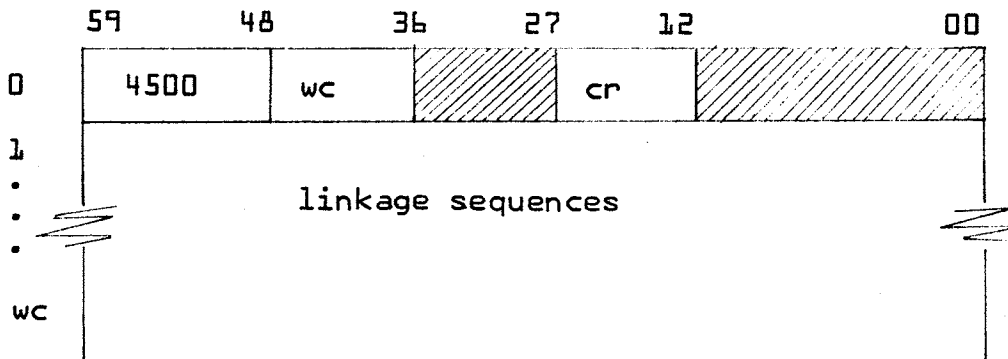
$$1 \leq \text{size} \leq 60$$

$$1 \leq \text{pos} + \text{size} \leq 60$$

3.3.3 XLINK Table {4500}

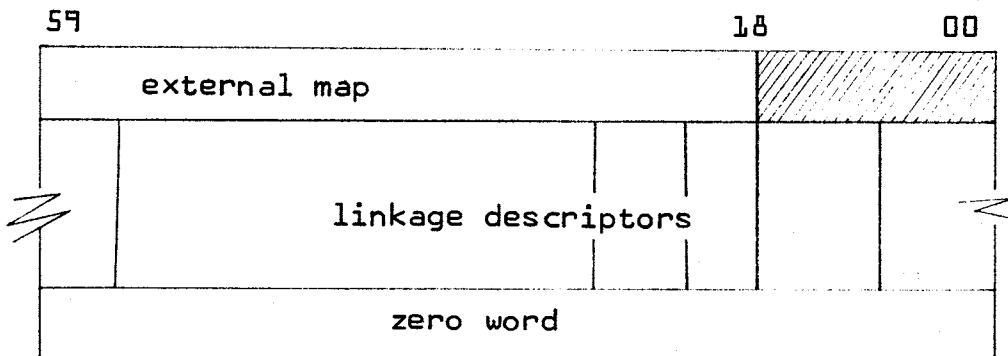
The XLINK table serves the same purpose as the LINK table, but with most of the restrictions eliminated. The table format is as follows:

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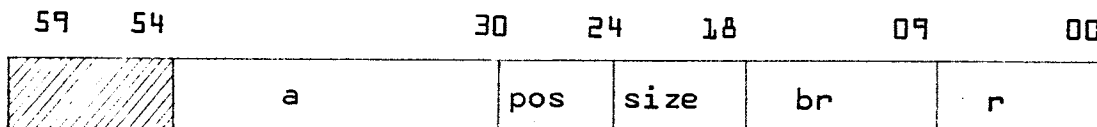
cr Same as in the XFILL Table {3.3.2}.

Each linkage sequence is one or more words with the following format:



The all-zero word terminating the linkage sequence may be omitted for the last {or only} linkage sequence in the XLINK table. The first character of the external name may be any character code except 55_g {blank} or 00 {colon}.

Each linkage descriptor is one word with the following format:



a, pos, size, r Same as in the XFILL table

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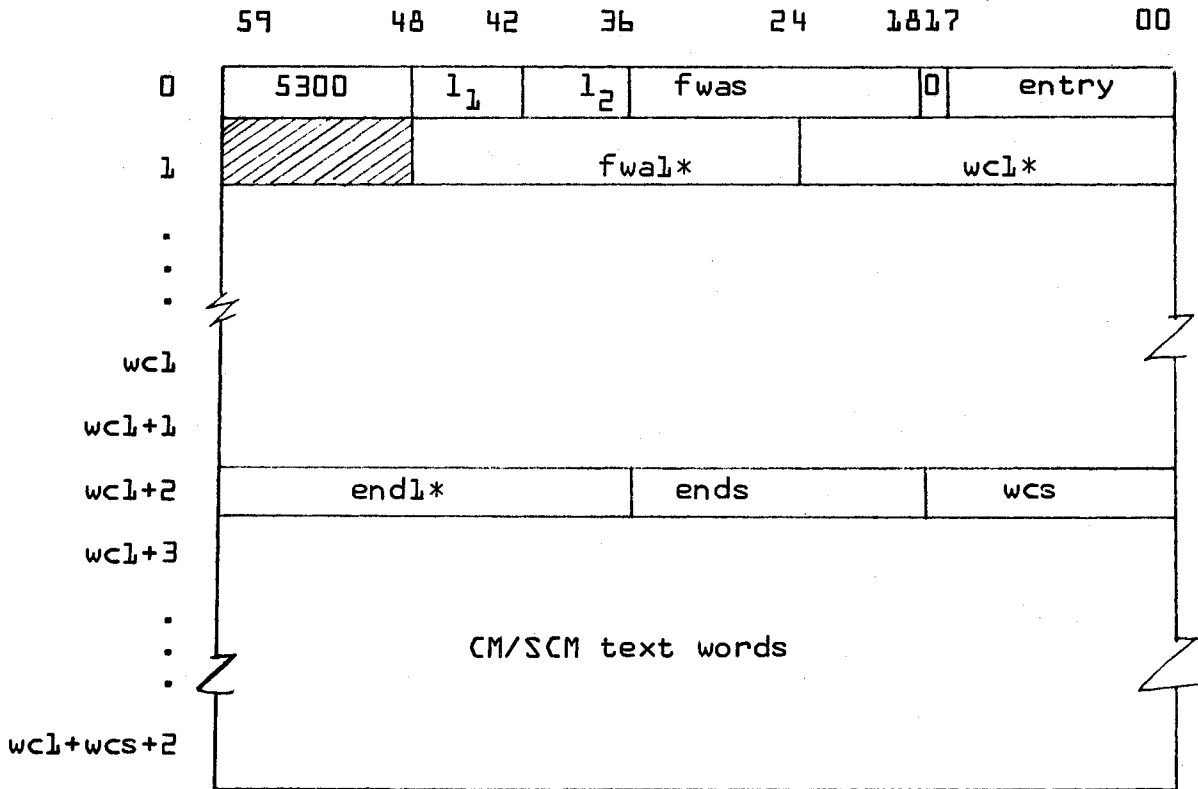
The value of the external name, defined by an ENTR table in some other subprogram, is added to the content of an address field in a previously-loaded text word. In doing the addition, the relocation quantity is, in effect, lengthened to 60 bits by sign extension and then shortened to the length of the field to be modified by simple truncation of the bits at the left end. The relocation quantity is then added to the field to be modified as if in a register the same length as that field, with end-around carry; i.e., the addend and the augend are treated as having a sign bit and {size - 1} magnitude bits.

3.3.4 ACPM {5300}

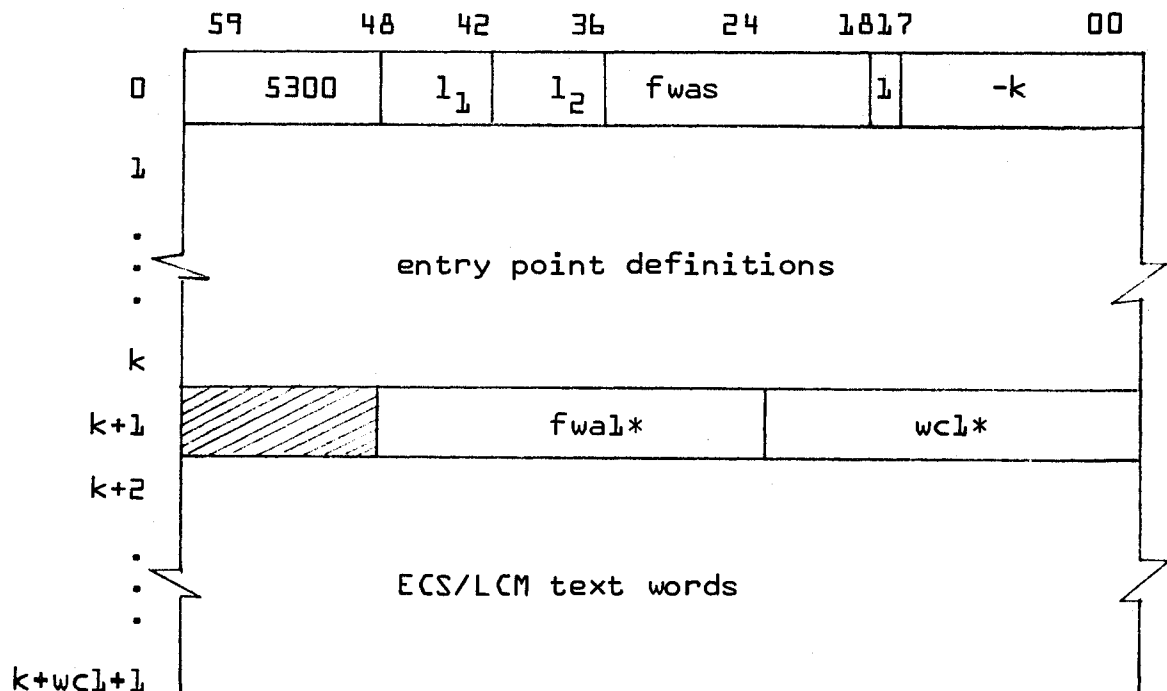
The ACPM table contains the absolute CM/SCM image of a central processor program or overlay with one unnamed entry point or one or more named entry points. It may also contain an absolute ECS/LCM image. The ACPM table may have either of two formats:

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Format 1 {one unnamed entry point}:



Format 2 {one or more named entry points}:



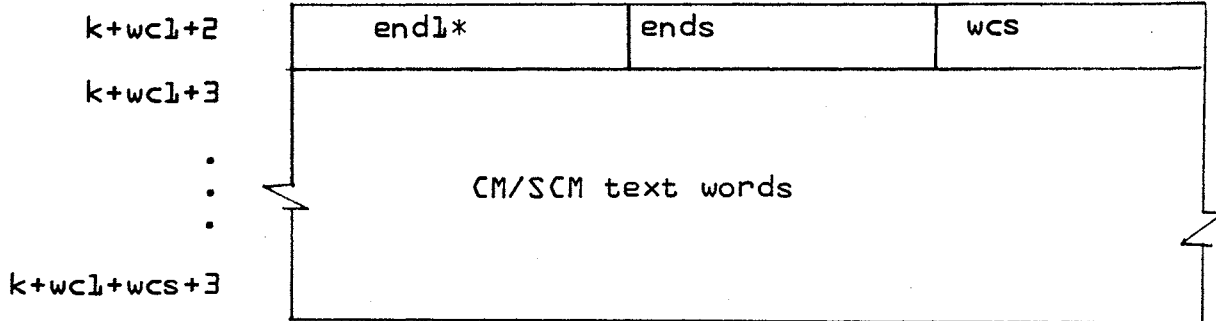
* Under KRONOS 2.1 the overlay loader LDR will skip these fields. The LINK loader will default these fields to zero during overlay generation.
 AA 3777 Also, the 5300 table is only generated for a level 0,0 overlay. PRINTED IN U.S.A.

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Format 2 Continued



- l_1 l_2 Must be zeros at present
- fwas Address of the word in CM/SCM into which the table header word is to be loaded. For Format 1, the first CM/SCM text word is loaded at address fwas + 1. For Format 2, the first entry point definition is loaded at address fwas + 1, and the first CM/SCM text word at fwas + k + 1.
- entry Address at which execution of the program or overlay is to begin
- k Number of entry point definitions; the complement of k is stored in the table to distinguish Format 2 from Format 1.
- entry point definitions Same as in the ABS table
- fwal* Address of the word in ECS/LCM to which the first ECS/LCM text word {if any} is to be loaded
- w₁* Number of ECS/LCM text words; may be zero.
- end₁* Greatest address, plus one, of the fixed ECS/LCM area used by this program; if end₁ = 0, end₁ = origin 1 + w₁ is assumed.
- w₃ Number of CM/SCM text words; if w₃ = 0, the CM/SCM text words comprise all that remains of the ACPM table, which is terminated by an end of section {short PRU or W flag record}.

* Under KRONOS 2.1 the overlay loader LDR will skip these fields. The LINK loader will default these fields to zero during overlay generation. Also, the 5300 table is only generated for a level 0, 0 overlay.

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ends and end1 are the origins of the CM/SCM and ECS/LCM areas that may be used for dynamic storage allocation. ends must not be less than $fwas + k + wcs$ and must not exceed the CM/SCM field length at execution time. Similarly, end1 must not be less than $fwal + wcl$ and must not exceed the ECS/LCM field length at execution time.

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Format of the header word must be:

59	47	35	23	11	0
Zeros	List Length	Length Return	{Reserved}	Zeros	a

list length = Number of words, excluding this header word, to be used for return information; must be set by user to other than 0

length return = Number of status words returned; set by KRONOS when list is complete

a = a must be set to 0 before issuing a STATUS call

The header word is also the auto recall reply word: when bit "a" becomes 1, the request is complete.

When Function = 1, one word of information is returned for each public rotating mass storage device available. Format is:

59	47	35	23	17	11	0
0	Status	Device Type	EST Ordinal	Chan	Eq	Available PRU's

status = 9 bit binary field:

- 000 - Not available, off, not in use
- 040 - Unloaded pack
- 120 - KRONOS System Routines
- 140 - KRONOS System Routines on Pack
- 620 - Contains Permanent Files
- 640 - Pack with Permanent Files
- 700 - KRONOS System and Permanent Files
- 740 - KRONOS System and Permanent Files on Pack

device type = Hardware mnemonic in SCOPE 3.4 display code:

- AA 6603 disk
- AB 6638 disk
- AC 6603-II disk
- AD 865 drum
- AF 814 disk file

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AL 821 multiple disk drive
 AM 841 disk file
 AP 854 disk drive

EST ordinal = Position of entry for device in equipment status table {12-bit binary field}

chan = Channel number by which device can be accessed

eq = Equipment {controller} number to which device is connected

PRU's = Number of PRU's, divided by 100 octal, of space remaining on the device; value of 7777 indicates at least 262,100 PRU's available

When Function = 2, the user places, before the call, a list of file names {left justified, zero filled} in every third word of the list area. If the file exists, the file name will be replaced by a three word SCOPE 3.4 format entry from the file name table {FNT}. If the file does not exist, the file name will be zeroed out. The format of the SCOPE 3.4 FNT entry passed to the user is:

59 54 47 35 23 1716 11 0

FILE NAME				CONTROL POINT	ZERO
EST ORDINAL		FIRST TRACK	CURRENT TRACK	ZERO	CURRENT SECTOR
ZERO		ZERO	ID CODE	PERMANENT FILE PERMISSIONS	CODE AND STATUS

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3.4.2 SDA/SIS Message Generator Function {MSD}

Returns a message to a user's area associated with a message code passed by the user. The call to MSD is as follows:

59	35	17	0
MSD	MESSAGE CODE	RETURN ADDRESS	

MESSAGE CODE = Number associated with message to be returned

RETURN ADDRESS = Address to return message to beginning at Return Address + 1.

Upon completion of the message transfer, MSD will return at Return Address the following:

59	47	35	23	0
MESSAGE CODE	MESSAGE SIZE-1	MESSAGE SIZE		1

3.4.3 ALTER FILE Function {PFE}

PFE alters the requested file to have an EOI recorded at the current position of the file. PFE allows support of the SCOPE 3.4 ALTER macro in the SCOPE 3.4 product set. Format of the call to PFE is:

59	17	0
PFEP	FDB Address	

The parameter word set up by the user at the FDB address has the format:

59	17	8	5	10
FILE NAME	RETURN CODE	0	F	C

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RETURN CODE = When the *RT* parameter is defined in the ALTER macro call {SCOPE 3.4 System Programmer's Guide}, the following codes will be returned.

- 000 - function successful
- 003 - unknown LFN
- 025 - file unavailable

0 = The following options are available to the user:

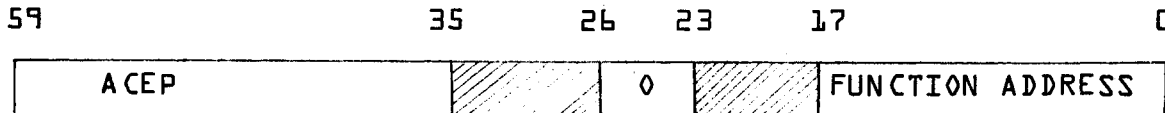
- Bit 8 - No recall {illegal in KRONOS 2.1}
- Bit 7 - not used
- Bit 6 - Return code to user

F = Function code for alter. Bits 2-5 = 0111.

C = Completion bit. Set when function is complete.

3.4.4 ADVANCE/BACKSPACE Control Card Function {ACE}

Provides the SCOPE 3.4 compatibility for reading/backspacing a control card. This function is provided to ensure the SCOPE 3.4 product set compatibility. ACE reads/backspaces next/previous control card into RA + 70B - RA + 77B with the option to place the control card in the dayfile and/or the crack and store the control card parameters in SCOPE 3.4 or KRONOS 2.1 format and place in RA + 2 - RA + 53B. Format of the call to ACE is:



0 = Option available

- X01 - Crack parameters in KRONOS 2.1 format
- X10 - Crack parameters in SCOPE 3.4 format
- 1XX - Issue control card to dayfile

FUNCTION ADDRESS = Address containing the function for ACE to perform. The format is:

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FUNCTION = 0100 - Read next control card
 = 0040 - Backspace to previous control card

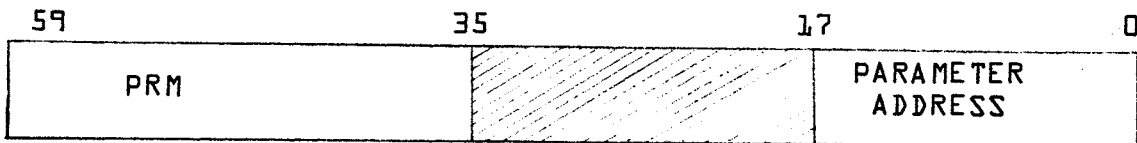
Whenever the function is completed, the completion bit {bit 0} is set.

If a read function is issued and the pointer is at the end of the control card record, an EOR status {Bit 4 set in the function code} is returned and RA + 70B - RA + 77B is cleared. If a backspace function is issued and the pointer is at the beginning of the control card record, the pointer is not changed and an EOR status is returned.

3.4.5 PERMISSION Checking Function {PRM}

Provides SCOPE 3.4 product compatibility to allow the checking of file permissions. PRM will check for a file and, if found, will map the KRONOS 2.1 permission flags into SCOPE 3.4 permission bits and return the information to the user.

Format of the call to PRM is:



PARAMETER ADDRESS = Address containing the file to search for and to return information to.
 Format of the parameter is:

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59	17	13	8	0
FILE NAME	[Hatched]	CODE	[Hatched]	C

CODE = A 5-bit code returned to the user defining the permissions associated with the file. The rightmost 4 bits are the permission bits with the following octal codes:

01 - Read
 02 - Extend
 04 - Modify
 10 - Control

The leftmost bit is the permanent file bit. If set, the file is a direct access or indirect access with controls. If not set, the file is either an indirect file without control or a non-permanent file.

Any file whose KRONOS 2.1 WRITE LOCKOUT and/or EXECUTE ONLY bits are set, will return a READ only permission to the user.

C = Completion bit. Set when function is completed.

3.4.6 Error Messages

The error messages can be broken down into those messages issued by the main routine of SFP and those issued by each of the functions contained in SFP.

3.4.6.1 SFP Main Routine Error Messages

XXX NOT IN PP LIB. - PP package XXX not in PP library.

XXX NOT IN PP LIB - CALLED BY XXX. - PP package XXX not in PP library and was called by program YYY.

SFP ILLEGAL CALL. - SFP was called directly.

SFP/XXX PARAMETER ERROR. - Parameter address contained in the call to SFP function XXX was out-of-bounds.

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SFP/XXX ILLEGAL FUNCTION. - Function number contained in the call to SFP function XXX was undefined.

SFP/XXX NO AUTO RECALL. - Required auto-recall parameter not set on call to SFP function XXX.

3.4.6.2 STATUS Function {STS}

None.

3.4.6.3 SDA/SIS Message Generator Function {MSD}

None.

3.4.6.4 ALTER File Function {PFE}

SFP/PFE ILLEGAL ALTER FUNCTION. - A function code other than the ALTER function contained in call to PFE.

3.4.6.5 ADVANCE/BACKSPACE Control Card Function {ACE}

SFP/ACE FUNCTION CODE UNDEFINED. - Function code in call to ACE was not a READ or BACKSPACE.

3.4.6.6 PERMISSION Checking Function {PRM}

None.

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3.5 PROGRAM RECOVERY

The program recovery capability of SCOPE 3.4 is under KRONOS 2.1 to provide support of the SCOPE 3.4 products under KRONOS 2.1 through the use of the RECOVER macro contained in the SCOPE ACTCOM carried under KRONOS 2.1.

3.5.1 RECOVER Function

The RECOVER macro allows a user program to gain control at the time that normal or abnormal job termination procedures would otherwise occur. Initialization of RECOVER at the beginning of a program establishes the conditions under which control is to be regained and specifies the address of user recovery code. If the stated condition occurs during program execution, control returns to the user code. RECOVER macro expansion calls the SETUP. subroutine.

RECOVER is concerned with conditions that affect job execution. The conditions under which KRONOS will return control to the user, and the octal values that will select them in the call to RECOVER, are:

Arithmetic mode error	001
PP call error	002
Time limit	004
Operator drop	010
System abort	020
CP abort	040
Normal termination	100

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Conditions can be combined as desired, with octal values up to 177 allowed in the flag field of the call to RECOVER.

At least five seconds of central processor time always will be available for user code execution. RECOVER makes the exchange jump package and RA + 1 contents available to the program if user recovery code is executed, and gives the user the option of having normal or abnormal job termination output.

Initialization of RECOVER within code at the beginning of a program results in an entry in a stack of requests for PP program RPV. Only one set of recovery conditions can exist within RPV, but RECOVER allows up to five user and system sets of flags and code for each program. The last RECOVER initialization will receive control first.

A checksum of the user recovery code can be requested during initialization. If flagged conditions subsequently occur, RECOVER will again checksum the code before returning control to it. This gives some assurance of user code integrity before it is executed.

RECOVER is initialized from a COMPASS program with:

RECOVER name, flags, checksum

name Address of code to be executed if flagged conditions occur; a return jump will be made to this location

flags Octal value for conditions under which recovery code is to be executed, as outlined above; default is 77

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checksum Last word address of recovery code to be
 checksummed; 0 if no checksum

If one of the flagged conditions occurs, the address of the exchange jump package will be in register B1 and the RA address in B3. Register A1 will contain the address of the list of the parameters passed in B1-B3. Register B2 will contain a 0; if the recovery code sets B2 to a non-zero value, or if the code contains an ENDRUN macro or an RA + 1 request for END, normal job termination procedures will follow. Otherwise, abnormal job termination procedures will follow recovery code execution.

If a program calling RECOVER contains overlays, both the call to RECOVER and the user recovery code should be a part of the level 0,0 code.

The exchange jump package returned by RECOVER is in the format shown with the Dump discussion, with the system error code that caused recovery code execution in bits 0-17 of the first word. If the P register shows zero in the package because a mode error occurred, bits 31-47 of RA + 0 will contain the P register value. System error codes that may be returned are:

Normal termination	0
Requested time limit exceeded	1
Arithmetic mode error	2
PPU abort	3
CPU abort	4

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PP call error	5
Operator dropped job	6
Program stop	7
File limit	10
Track limit	11
Mag tape limit	12
System abort	13

Both the FORTRAN and FORTRAN Extended languages contain RECOVR subroutines as detailed in their respective manuals.

3.5.2 RPV Function

RPV is the PPU portion of the RECOVR CP/PP package and is contained as a function in the PP program SFP. RPV should never be called directly, but utilize the CP portion for all program recovery work.

3.5.3 RECOVR Error Messages

RECOVR - TOO MANY RECOVERY REQUESTS. - More than 5 recovery initializations occurred without a recovery being processed.

RECOVR - BAD CHECKSUM. - The post-recovery checksum of users recovery routine does not equal the pre-recovery checksum.

RECOVR - BAD ARGUMENT LIST. - Illegal parameters in pre-recovery initialization call.

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3.5.4 RPV Error Messages

SFP/RPV INITIALIZATION ERROR. - If entry to RPV initialization without the Error Exit Return Address set.

REPRIEVE ABORTED BAD CHECKSUM. - Post-recovery checksum of RECOVR routine does not match pre-recovery checksum.

REPRIEVE ABORTED-VALIDATION TL. - Current time limit +5 seconds exceeds time that user has been validated for.

JOB REPRIEVED. - The job has been successfully reprieved.

REPRIEVE ABORTED SYSTEM ERROR. - Error condition unknown to RPV.

REPRIEVE ROUTINE NOT IN FL. - The RECOVR CP routine not in users field length.

SFP/RPV CANNOT RESTORE PREVIOUS ERROR. - RPV cannot restore the error that caused the initial termination.

{PREVIOUS ERROR CONDITION RESET.} - RPV has restored the error condition that caused the termination.

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3.6 Error Statuses

3.6.1 LDSET Errors:

1. *CANNOT PROCESS FILES REQUEST - 1ST RECORD OF ZZZZDF TO BIG.*
2. *CANNOT PROCESS FILES REQUEST - ZZZZDB TOO SHORT.*
3. *LDSET CONTROL CARD ERROR.*
4. *ERROR IN LDSET OPTION.*
5. *NO TERMINATOR ON LDSET STATEMENT.*

3.6.2 For errors related to the LRM FILE statement, see 6000/7000 Record Manager Reference Manual, Version 1.0.

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4.0 DEFINITIONS

Unsatisfied External

An external reference for which the loader has not yet loaded a module containing the matching entry point.

Transfer Symbol

Name of the entry point that specifies where execution is to begin.

Program Name

Also referred to as ident name or deck name, it is the name contained in the loader PRFX table at the beginning of each module. A program name is 1-7 characters; colons are illegal.

Object Module

Often referred to as a relocatable subprogram, this is the basic program unit produced by a compiler or assembler. COMPASS normally produces an object module from source statements delineated by IDENT and END. In FORTRAN, the corresponding beginning statements are PROGRAM, SUBROUTINE, BLOCK DATA, or FUNCTION. The corresponding end statement is END.

An object module consists of several loader tables that define blocks, their contents, and address relocation information.

Core Image

Also referred to as the loaded program or an absolute program, this is the final image produced by the load operation. For a

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control-statement-initiated load, the core image is the entire job field length from RA{S} + 100_g through RA{S} + field length - 1.

For a user-call-initiated load operation, the core image occupies only that portion of the field length specified by the user as being available.

Core Image Module

Often referred to as an overlay. It can be saved on a file for subsequent reloading and execution.

Program Block

The block within an object module that usually contains executable code. It is automatically declared for each object module {though it may be zero-length}. It is local to the module; that is, it can be accessed from other modules only through use of external symbols. Data placed in a program block always comes from its own object module.

Entry Point

A location within a block that can be referenced from object modules that do not declare the block. Each entry point has a unique name associated with it. The loader is given a list of entry points in a loader table. A block can contain any number of entry points.

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The loader accepts an entry point name that is 1 to 7 characters; colons are illegal.

Some language processors may produce entry point names under more restricted formats due to their own requirements.

External Reference

A reference in one object module to an entry point in a block not declared by that module. Throughout the loading process, externals are matched to entry points {this is also referred to as satisfying externals}; that is, addresses referencing externals are supplied with the correct address. In some cases, for SCOPE 3.4, this process is inhibited {e.g., OMIT request}; the external reference then remains unsatisfied.

Library File

A collection of core image modules and/or object modules that can be accessed by the loader through a directory. For library generation, see the KRONOS 2.0 Batch User's Reference Manual.

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1.0 SCOPE

1.1 This specification provides the characteristics of a text editor for time-sharing users.

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2.0 APPLICABLE DOCUMENTS

2.1 KRONOS Version 2.1 Product Objectives Document.

V2.0 Batch User's Reference Manual

V2.0 Time-Sharing User's Manual

V2.0 Edit Reference Manual

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3.0 DESCRIPTION

Text Editor allows the time-sharing user to edit a data file.

The data file being manipulated is a single record file, herein referred to as the text or edit file. During editing, the search pointer identifies the line of the text file to be examined first. The search-pointer can be moved forward and backward to specify a new line.

- 3.1 Editing operations are broken down into three categories: line commands, string commands and auxiliary commands. The basic structure of a command is:

COMMAND: /phrase/ ; n

A /phrase/ is the command component which specifies a character string of interest.* It may be of a simple form /p1/, or complex /p1/, /p2/. One restriction is that /p1/ and /p2/ must each be contained in a single line, though not necessarily the same line.

The command component "n" is a specifier which indicates the number of lines the command will affect or the number of times the command will act on the presence of /phrase/.*

The specifier is generally an unsigned integer constant. If omitted, unity is assumed. If n=*, the specifier is set to 131000 which implies all or in some cases last.

* Certain AUXILIARY commands deviate from these definitions.

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The editor communicates with the user in command and text modes. Certain commands require the user to make text available which will be added or substituted in the edit file. This is accomplished by posting a request to ENTER TEXT.

The user responds by typing in a pre-delimiter, followed by a stream of new text and post-delimiter. When post-delimiter is encountered, editor replies with READY. Data is copied to a scratch file named SCR. The user may access data already written to SCR by hitting carriage return {CR} only. If the contents of the string buffer {scratch file SCR2} are desired as replacement text, the user types in "¶" followed by CR. Other commands obtain replacement text from the complex form of /phrase/, wherein /p2/ is used.

The editing package described herein contains a number of new commands which have no counterpart in the KRONOS 2.0 editor. The format of these new commands is detailed following the description of the individual command. Additional information on other commands may be found in the V2.0 Edit Reference Manual {document 59150700 Rev. B} on the page number noted.

3.1.1 Line Commands

A line command is one whose basic unit of operation is the line. That is, any execution of a line command causes an entire line to be affected. An abbreviated form of the command word is noted in parenthesis.

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The search-pointer is unaltered for all line commands except FIND. The FIND command will cause the search-pointer to remain set at its newly found position. All commands are executed for one or more lines depending on the specifier, represented by n in the discussion of individual commands which follows.

3.1.1.1 ADD {A} Page 2-8

One or more lines of text are to be added to the edit file. The one or more lines are entered as described above in response to the editor request ENTER TEXT. The new text is added after the nth line or after each of the first n lines containing /p1/.

3.1.1.2 BLANK {B} Page 2-10

One or more lines of text in the edit file are replaced by blank lines. Lines blanked are the first n lines or the first n lines containing /phrase/. If /phrase/ extends over more than one line, all lines associated with /phrase/ will be blanked.

3.1.1.3 CHANGE {C} Page 2-6

One or more lines of text in the edit file are deleted and replaced by text entered in response to the editor request ENTER TEXT. If /phrase/ extends over more than one line, all lines associated with /phrase/ will be deleted and replaced by the text entered. Note that the replacement

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text may be more, less or equal to the text deleted.

3.1.1.4 DELETE {D} Page 2-9

One or more lines from the edit file are to be deleted. All lines of a multi-line /phrase/ will be deleted. If a line is deleted at which the search-pointer is set, the search-pointer moves to the next remaining line closer to the upper bound.

3.1.1.5 EXTRACT {E}

This command causes one or more lines from the edit file to be copied to the string buffer {Scratch File SCR2} following the last entry to the buffer. The edit file is unaltered. If n lines containing /phrase/ cannot be found, the copy is not performed. Valid forms of the command are:

EXTRACT;n

Transfers n lines from the edit file to the string buffer. The copy begins at the current value of the search-pointer. {If n=*, all lines to the end of file are transferred.}

EXTRACT:/p1/;n

The nth line containing /p1/ is copied to the string buffer.

EXTRACT:/p1/,/p2/;n

Text is written to the string buffer beginning with the nth line containing /p1/. The copy terminates when a line containing /p2/ has been transferred.

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3.1.1.6 FIND {F}

Lists the nth line or the nth line containing /phrase/.

The search-pointer is set to the nth line or to the nth line containing /phrase/. If n is set to a value greater than what exists between current file position and EOF, the search-pointer is set to EOF or to the last occurrence of /phrase/. The search-pointer is unaltered if /phrase/ cannot be found. Valid forms of the command are:

FIND;n

Advances the search-pointer n lines and lists the line denoted by the new value of the search-pointer.

FIND:/p1/;n

Advances the search-pointer from its current position to the nth line containing /p1/, and lists the line.

FIND:/p1/;/p2/;n

Same as above with the exception that if phrase denoted by /p1/;/p2/ is multi-line, all lines associated with /p1/;/p2/ are listed.

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3.1.1.7 LIST {L} Page 2-2

Functions the same as FIND except that the search-pointer is unaltered, and n lines containing /phrase/ are listed.

3.1.1.8 NUMBER {N}

Counts the number of lines or the number of lines containing /phrase/ from the search-pointer to end of file. Valid forms of the command are:

NUMBER

Returns to the user a line count from current file position to EOF.

NUMBER:/phrase/

Counts the number of lines containing /phrase/ and returns this value to the user. /phrase/ may be of a simple form /p1/ or complex /p1/,/p2/.

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3.1.2 String Commands

One main difference between line and string commands is the search mechanism employed to process /phrase/ for $n > 1$.

For a line command, as each occurrence of /phrase/ is processed, the search for the next occurrence begins with the next line. With string commands, the search for the next occurrence of /phrase/ begins with the next character in the current line.

The search-pointer is unaltered for all string commands except FINDS. All string commands with /phrase/ as a null function are processed as if they were a line command. Otherwise they are implemented in the following way.

3.1.2.1 ADDS {AS} Page 2-8

A character string is added to the edit file immediately following each occurrence of /p1/.

3.1.2.2 BLANKS {BS} Page 2-11

One or more occurrences of /phrase/ are replaced by blanks.

3.1.2.3 CHANGES {CS} Page 2-7

One or more occurrences of /phrase/ in the edit file are deleted and replaced by a character string entered in response to the editor request ENTER TEXT. If the replacement string is shorter than /phrase/, the line or lines containing /phrase/ are shifted to the left creating as many lines as necessary. Any completely blank lines

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generated are deleted. If the replacement string is longer than /phrase/ the last line containing /phrase/ is right shifted the number of excessive characters.

3.1.2.4 DELETES {DS} Page 2-9

One or more occurrences of /phrase/ are deleted from the edit file. The affected lines are shifted to the left to close the gap left by the deleted character string. Any completely blank lines generated are discarded.

3.1.2.5 EXTRACTS {ES}

Causes the nth occurrence of /phrase/ to be copied to the string buffer following the last entry written to scratch file SCR2. Valid forms of the command are:

EXTRACTS;n

Same as EXTRACT;n.

EXTRACTS:/p1;/n

Character string denoted by /p1/ is written to the string buffer.

EXTRACTS:/p1/,/p2;/n

The nth occurrence of character string /p1/,/p2/ is copied to the string buffer. If n occurrences of /phrase/ cannot be found, the transfer is not performed.

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3.1.2.6 FINDS {FS}

Lists the nth occurrence of /phrase/ and sets the search-pointer to that line. If /phrase/ is multi-line, the search-pointer is set to the line containing /p1/. If n is greater than the number of occurrences of /phrase/, action is taken on the last occurrence of /phrase/. Valid forms of the command are:

FINDS:n

Same as FIND:n.

FINDS:/p1/in

Advances the search-pointer to the line containing the nth occurrence of /p1/ and lists the phrase.

FINDS:/p1/,/p2/in

Same as above except that character string denoted by /p1/,/p2/ is listed.

3.1.2.7 INSERTS {IS}

Same as ADDS except that text to be inserted is imbedded within the command. Insert action begins at the current search-pointer value and inserts as many times as indicated by the specifier. Format of the command is:

INSERTS:/p1/,/p2/in

The character string denoted by /p2/ is inserted immediately after each of n occurrences of /p1/.

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3.1.2.8 LISTS {LS} Page 2-2

Causes one or more occurrences of /phrase/ to be listed.

3.1.2.9 NUMBERS {NS}

Counts the number of occurrences of /phrase/ from the search-pointer to end of file. Valid forms of the command are:

NUMBERS

Same as NUMBER.

NUMBERS:/phrase/

Counts the number of occurrences of /phrase/ and returns this value to the user. /phrase/ may be of the simple form /p1/ or complex /p1/,/p2/.

3.1.2.10 REPLACES {RS}

Same as CHANGES except that replacement text is imbedded within the command. Substitute actions begin at the current search-pointer value and substitutes as many times as indicated by n. Valid forms of the command are:

REPLACES:/p1/in

Same as DELETES:/p1/in.

REPLACES:/p1/,/p2/in

Each of n occurrences of character string /p1/ is replaced with phrase /p2/.

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3.1.3 Auxiliary Commands

This category includes all commands which do not subscribe to the peculiarities of either line or string operations. Note that certain of these have no abbreviated form, while other (notably MERGE and TAB) assume different information in /phrase/ and specifier fields.

3.1.3.1 ALIGN {AL} Page 2-12

Use to eliminate unwanted blanks within a file. Text is lined up by word, sentence and paragraph. A word is defined as a set of characters between spaces. A sentence is a group of words ending with a period. A paragraph is defined as an indented sentence.

3.1.3.2 CLEAR {CL} Page 2-4

Returns scratch file SCR2 (also referred to as the string buffer) for subsequent use with EXTRACT operations. Specifier and/or /phrase/ are not required, and if present are ignored.

3.1.3.3 DEFTAB {DT}

Defines a TAB character to be used while structuring lines from data entered in response to an ENTER TEXT request. When defining a TAB character, the simple form of /phrase/ must be used, and contain only one character. A previous definition will be cleared if /phrase/ is omitted. This specifier, if present, is ignored. Valid forms of the command

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are:

DEFTAB

Clears tab character definition.

DEFTAB:/p1/

Defines character p1 as a tab character.

3.1.3.4 END Page 2-14

This command terminates an editing session.

3.1.3.5 LENGTH

Sets the maximum number of lines to be processed in the edit file, and resets the search-pointer to the first line. The line limit is contained in the specifier n. If n=*, the original processing boundaries are restored; i.e., B0I and EOF. The purpose of this command is to reduce overhead by temporarily changing the length of the edit file to a size at which editing operations are directed. Valid forms of the command are:

LENGTH;n

Truncates the edit file at line n. All data beyond line n is copied to a scratch file SCR3.

LENGTH;*

Restores edit file to its original length. The contents of scratch file SCR3 is appended to the edit file.

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3.1.3.6 LINE {LN}

Lists the number of the line at which the file is currently positioned (i.e., the value of the search pointer).

3.1.3.7 LISTAB {LT}

Lists the columns at which tab stops are set.

3.1.3.8 MERGE {M}

Merges a file into the edit file. The syntax of this command deviates from normal in that the name of the file to be merged is passed in /phrase/. If merging is to occur relative to a specific character string, the complex form of /phrase/ must be used. In this case the character string of interest is found in /p2/. The file is merged with the edit file after the nth line or after the line containing the nth occurrence of the string specified in /p2/. If the merge file is not local, an attempt is made to retrieve it as an indirect access permanent file. Valid forms of the command are:

MERGE:/lfn/in

The contents of file lfn are merged into the edit file. Merging takes place after the nth line (relative to the search-pointer).

MERGE:/lfn/,/p2/in

The contents of file lfn are merged into the edit file after the nth line containing /p2/. Merging takes place only if n lines containing /p2/ are found.

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3.1.3.9 RESET {R} Page 2-4

This command brings the search-pointer back to the first line of the edit file.

3.1.3.10 SET {S} Page 2-3

Sets the search-pointer within the edit file. If specifier is *, then the search-pointer is set to EOF. Otherwise the search-pointer is set to n lines beyond the current setting, or to the nth line containing /pl/.

3.1.3.11 TAB {T}

Set tab stops according to the contents of /phrase/, which contains less than or equal to seven tab values. Default tab columns are 11, 18, 30, 40 and 50 (see DEFTAB). Format of the command is:

TAB:/t₁...t_n/

Sets tab stops at columns t_i.

3.1.3.12 WIDTH {W}

Defines a column at which point line assembly will terminate when executing the ALIGN command. Definition is taken from the specifier field and must be less than or equal to 136.

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3.1.4 Teletype Messages

3.1.4.1 Error Messages

These messages indicate a condition exists such that a command cannot be processed.

3.1.4.1.1 PHRASE NOT FOUND.

The character string specified in /phrase/ was not found.

3.1.4.1.2 ILLEGAL COMMAND.

Command word is invalid.

3.1.4.1.3 cmd SYNTAX ERROR.

Either /phrase/ and/or specifier is illegal with command cmd.

3.1.4.1.4 ILLEGAL FILE NAME.

File name passed with MERGE command or when invoking the Editor is illegal.

3.1.4.1.5 MERGE ERROR, SECONDARY FILE EMPTY.

File to be merged with edit file is empty.

3.1.4.1.6 RESERVED FILE NAME.

File name passed with MERGE command or when invoking the Editor is reserved for use by the Editor. Reserved file names are:

INPUT
OUTPUT
SCR

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SCR1
SCR2
SCR3
SCR4
SCR5

3.1.4.1.7 CONTROL CARD ERROR.

More than one parameter was passed when calling the
Editor.

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3.1.4.2 Informative Messages and Diagnostics

3.1.4.2.1 BEGIN TEXT EDITING.

Issued when initialization of Editor is complete, and awaiting the first command.

3.1.4.2.2 ENTER TEXT FILE NAME.

Issued when text file name not passed with Editor call.

3.1.4.2.3 ENTER TEXT.

New or replacement text is required to process ADD {ADDS} or CHANGE {CHANGES} commands.

3.1.4.2.4 m OCCURRENCES OF PHRASE FOUND.

Passed when some, but not "n", occurrences of /phrase/ were found and processed.

3.1.4.2.5 m LINES TO EOF.

Line count message issued by NUMBER command processor.

3.1.4.2.6 - END OF FILE -

Edit file is currently positioned at end of information {EOI}.

3.1.4.2.7 TAB STOPS t_1 $t_2 \dots t_n$

Message issued by LISTAB processor.

3.1.4.2.8 READY

Issued when input of new or replacement text is complete. This indicates that the EDITOR is ready to accept the next command.

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3.1.4.2.9 FILE AT LINE NUMBER XXXXXX.

Message passed by LINE command processor. XXXXXX is the current value of the search pointer.

3.1.4.2.10 END TEXT EDITING

The last word{s} in editing.

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1.0 SCOPE

- 1.1 These specifications provide the characteristics of the Checkpoint/Restart feature.

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2.0 APPLICABLE DOCUMENTS

2.1 KRONOS Version 2.1 Product Objectives Document

SCOPE 3.4 Reference Manual

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3.0 DESCRIPTION

3.1 Introduction

There exists at any time the possibility of system or job failure. For some jobs it becomes more advantageous to accept the overhead of checkpoint procedures than to run the risk of losing the entire job output.

To checkpoint a job is to save enough information during the job to be able to restart it from some intermediate point of execution.

3.2 General Description

Checkpoint temporarily stops execution of a job and captures the total environment of the job and its resources onto a file. Restart can then rebuild the job at a later time from this file. The elements of the job's environment must be under the control of the job itself in order for the Checkpoint/Restart facility to produce the desired results.

The Checkpoint/Restart facility may be called either by a control card statement, COMPASS macro, or other language specification. The data representing the environment of the job may be written to a tape file, or one or two mass storage files.

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The following information is recorded:

- Job Control Information - including exchange package, job name and internal flags.
- User memory
- Names, file positions, and if specified, contents and related information of all tape files assigned to the job.
- Names, file positions, and if specified, contents and related information of all local files attached to the job including:

Sequential mass storage files

Random mass storage files

Direct access permanent files {see Appendix A}

Common files

Library files

The programmer is allowed the option to select which files are to be copied. In the case of tape, common, library and some direct access files, he may select whether or not the contents of each file will be copied. Execute only files will not be copied, however. Direct access files that are not read only will be treated like local mass storage files and the contents recorded {see Appendix A}. Restart will restore the job's environment from this checkpoint area.

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3.3 User Control of the Checkpoint Operation

Most of the characteristics of a checkpoint data file are specified by Checkpoint/Restart. The file, however, is local to the job and certain options may be selected by the user. These include labels**, media and mode.

3.3.1 Media and Modes of Output

The media of the output is the destination of the data and may be tape or mass storage file.

The mode of writing the output can be selected as extend by writing at end of information, rewrite at beginning of information, or by writing alternately on two checkpoint files.

3.3.2 Checkpoint Output Specification

The user may specify both the media and the mode of the file by REQUEST statements or macros. The request statements may be used to specify either mass storage or tape. An additional CK parameter identifies the file as the checkpoint destination file and specifies mode. For example:

Control Card Call*

REQUEST{file,CK}

or

REQUEST{file,CB}

* See Batch User's Reference Manual and Tape Labels, 65X Support ERS for additional request card parameters.

** The user is responsible for handling all tape label requests. See Tape Labels, 65X Support ERS.

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A comment may be added to specify that a mass storage or tape file is required.

REQUEST{file,CK} TAPE FILE.

- file Name of file required.
- CK Extend file by writing new checkpoint data at end of information. May be tape or mass storage.
- CB Rewrite new data at beginning of information. May be tape or mass storage.

Macro Call

REQUEST addr

addr = FET address.

{addr+1} = MS or MT, left justified, to indicate a mass storage or tape file.

{addr+?} = Checkpoint ID, left justified.

76B - Write at end of information.

75B - Write at beginning of information.

If two files with CB specified are present, checkpoint will alternate by writing first on one file and then the other.

More than two checkpoint files or two files with CK specified will cause a program abort.

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3.3.2.1 Additional Provisions

If the user wishes to write checkpoints on alternate files, both files must be specified as checkpoint files; otherwise, the checkpoint operation will write at the B0I on the one specified file.

The user is responsible for making his checkpoint file{s} permanent if he desires that they be permanent. If a tape file is not specified and the user desires that the checkpoint file{s} be permanent, he must either define the file{s} to be direct access before the checkpoint, or save them afterwards. Checkpoint considers the file to be local and will not make it permanent.

A direct access file used as checkpoint output must have WRITE permission. For example, to checkpoint to a new direct access file called FILE, the following sequence of control cards could be used:

```
DEFINE{FILE/M=W}  
REQUEST{FILE,CK}  
CKP.
```

{The CKP control card is described in Section 3.4.}

3.3.2.2 Default Checkpoint Output

If no file has been specified, a file with the name CCCCCC will be written.

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3.4 Checkpoint/Restart Requests

3.4.1 Execute Checkpoint

The CKP control card statement, an operator command, or the CHECKPT macro may be used to request a checkpoint.

The general control card formats are:

CKP.

CKP{ $lf_n_1, lf_n_2, \dots, lf_n_n$ }

where

lf_n_i = names of files to be checkpointed.

The first form implies that all files local to the job will be checkpointed. The second form designates the set of files to be checkpointed {INPUT, OUTPUT, PUNCH, PUNCHB and LG0 will always be included}. The information saved for each file depends on the file type and is discussed in Section 3.5.

An operator may enter the DSD commands:

n.CKP.

to specify a checkpoint where:

n = Control point of job to be checkpointed.

The result of this command is the same as for the comparable control card.

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The macro format is:

CHECKPT param,sp

where:

param = address of parameter list

sp = 0 checkpoint all files {default}.

≠ 0 checkpoint only files specified on list.

	59	17	11	0
Param + 0		n		
Param + 1	lfn ₁	f ₁		
Param + 2	lfn ₂	f ₂		
Param + n	lfn _n	f _n		

n = number of lfn entries in list — maximum is 77 {octal}.

{n = 0 overrides sp ≠ 0.}

lfn_i = local file name left justified.

f_i = octal number specifying manner in which lfn is to be processed {type of copy}.

- 0 The file is copied from beginning of information to present position. Restart will position the file at the latter point.
- 1 The file is copied from its present position to end of information. The file is positioned at the former point.
- 2 Entire file is copied. The file is positioned at its position at checkpoint time.
- 3 The last operation on the file determines how the file is copied.

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- 4 Information table on file is copied, but file itself is not copied {default for tape, common, library and direct access {read only and execute} files. {The information table contains FNT/FST information as well as copy type and the random address.} File will be retrieved at restart and positioned at its position at checkpoint time. If file is local and assigned to mass storage and has copy type 4 specified, RESTART will assume that it is an indirect access file and will do a GET.

If $n = 0$, all mass storage files will be copied to the checkpoint file in the manner determined by the last operation {i.e., read or write}.

If $n \neq 0$, all mass storage files named in the list will be copied as noted by the f flags; however, system mass storage files {INPUT, OUTPUT, LG0, PUNCH, and PUNCHB} will be copied as determined by the last operation on each files as follows:

f = 0 if file was written.

f = 1 if file was read and EOI was set.

f = 2 if file was read and EOI was not set.

If $sp = 0$, but $n \neq 0$, the list will be used to determine copy types, but all files will be checkpointed.

Checkpoints are numbered consecutively beginning at {1} for each checkpoint file. A file with CK mode specified will consist of checkpoints 1 to n, where n is the number of the last checkpoint taken in that series. A checkpoint file with CB mode specified will consist of checkpoint n where n is the consecutive number of the last checkpoint written to that file. The user should note that if alternate files are specified,

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each file will be processed individually for checkpoints 1 to n. That is, both files may contain a checkpoint b ($n = b$), but they will be differentiated by date and time; the earlier one being used for the next checkpoint.

For example, file ABC may contain checkpoint 4 taken on 72/07/30 at 14.05.00. and file DEF may contain checkpoint 4 taken on 72/07/30 at 15.15.00. Thus, ABC contains the seventh checkpoint of the series and DEF, the eighth. The next checkpoint will write the data to file ABC as checkpoint 5 of that file and ninth in the series.

3.4.2 Restart

The Restart control statement is used to resume a job from the contents of a checkpoint file.

The control card format is:

```
RESTART{file,n,RI,NA,FC}
```

where:

file = checkpoint file name - must be present.

n = number of the checkpoint from which to restart. If not specified, 1 is assumed. If $n = *$, the last available checkpoint on "file" is used.

RI = If this parameter is present, the INPUT file on checkpoint file is not to be restored. The INPUT file of the RESTART job at its current position is used by the restarted job.

NA = No abort option. Restart will abort if all files needed are not available unless the NA option is present. Also, if NA is present, a read parity error will result in the RESTART of checkpoint $n-1$ if it is available.

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FC = File check option. If this parameter is set, RESTART will check to see if each file is already present, and will not replace the file if it is there. This allows the user to restart with one or more files changed.

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3.5 File Processing

3.5.1 Non-Permanent Mass Storage Files

The following information is recorded for each local mass storage file included in the checkpoint:

- name
- all job related information for the file. This will include file position, description, and status.
- contents of the file if specified.

3.5.2 Tape Files

The following information is recorded for tapes assigned to the job:

- name
- all job related information including file position, description and status.
- contents of file if specified. {At restart time, RESTART will request a tape of the same name. The information will then be copied to that tape and repositioned.}

3.5.3 Permanent Files

The following information will be recorded for permanent files:

- local file name
- all job related information, including file position, description, status and access mode.
- contents of the file unless read only direct access or execute only file {see Appendix A}.

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3.5.4 Restrictions

Random files must have copy type 2 {entire file} specified in the parameter list or they will be copied as per last status. Also, a maximum of 200 {octal} files will be checkpointed.

Restarting jobs which created or purged permanent files since the selected checkpoint may not produce proper results. A restart may be rendered useless if any of the permanent files have been changed or deleted outside of the job. The user must also insure that any tape files, common files and/or permanent files needed are available for the RESTART. RESTART cannot correctly process permanent, common, or library files that have been renamed since the last checkpoint. Execute only files will not be checkpointed and this will cause RESTART to abort when it cannot retrieve these files {see Appendix A}. The user can overcome this by using the NA and FC options on RESTART and retrieving the files himself. If FC is not selected, all files present at restart time will be rewound and then copied to. The user should avoid having read only or execute only {or any with write lockout set} files at his control point or restart will abort attempting to write to those files.

Files CCCCCC, CCCCCI, CCCCCO and CCCCCM are used by checkpoint and should not be used by the user.

All files copied by RESTART will be made local files. See Appendix B for an example of how direct access permanent files may be handled.

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3.6 Checkpoint Examples

For COMPASS users:

```
CHECKPT PARAM
.
.
.
PARAM DATA 0
```

All mass storage files would be processed {sp = 0, n = 0} at checkpoint.

For FORTRAN {RUN} users:

```
DATA variable/0/
.
.
.
CALL CHEKPTR {variable}
```

or

```
variable = 0
CALL CHEKPTR {variable}
```

For FORTRAN EXTENDED users:

```
DATA variable/0/
.
.
.
CALL CHEKPTX {variable}
```

or

```
variable = 0
CALL CKEKPTX {variable}
```

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For COBOL users:

RERUN ON lfn_1 EVERY END OF n RECORDS OF lfn_2

This will cause a checkpoint file to be written to file $*lfn_1*$ after n records of $*lfn_2*$ are processed. {See COBOL 4.0 Reference Manual.}

For the preceding examples, checkpoint processing is performed for all mass storage files as described in the first example where $sp = 0$, $n = 0$.

Selected files may be processed in the manner shown in the following example:

```

DIMENSION KPARAM {4}
KPARAM {1} = 30000B           {Indicates 3 files on list}
KPARAM {2} = 5LTAPE .OR. 200000B {Specifies file with copy type 2}
KPARAM {3} = 6LTAPE23 .OR. 100000B {Specifies file with copy type 1}
KPARAM {4} = 5LTAPE3         {Specifies file with copy type 0}
.
.
.
CALL CHEKPTR {KPARAM,1}     FORTRAN {RUN}
or CALL CHEKPTX {KPARAM,1}  FORTRAN EXTENDED

```


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3.7 Messages

3.7.1 Dayfile Messages

* CHECKPOINT FILE ERROR.*

Format error or illegal checkpoint file detected. {Issued by
CHKPT or RESTART.}

* CHECKPOINT nn COMPLETE.*

Checkpoint number nn has been completed. {Issued by CHKPT.}

* CHECKPOINT NOT FOUND.*

The specified checkpoint number was not found. {Issued by
RESTART.}

* CKP REQUEST.*

A checkpoint has been initiated. {Issued by CHKPT.}

* ERROR IN ARGUMENTS.*

Incorrect parameters were encountered. {Issued by RESTART or
CHKPT.}

* ERROR - FILE{S} NOT PROCESSED.*

Address errors were encountered on the file{s} during preset,
therefore they were not checkpointed. {Issued by CHKPT.}

* FILE ERROR - name.*

An illegal address was encountered on file *name*; therefore
it was not repositioned. {Issued by RESTART or CHKPT.}

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* jobname RESTARTED FROM yy/mm/dd hh.mm.ss.*

Job 'jobname' has been restarted from checkpoint on given date.

{Issued by RESTART.}

* name NOT FOUND.*

File 'name' could not be found or retrieved at restart time.

{Issued by RESTART.}

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4.0 DEFINITIONS

4.1 ALTERNATE WRITE

Method of checkpointing in which the Checkpoint file is written first to file A and then, during the next checkpoint, it is written to file B and so on, switching from A to B and back at each successive checkpoint.

4.2 CCCCCCC

Default Checkpoint file name. The user should not use this name.

4.3 CHECKPOINT

Procedure of saving all pertinent information from a job in order to be able to continue from that point at a later time. {See RESTART.}

4.4 COPY TYPE

Manner in which a file is processed. It depends on the last operation {read or write} performed on the file unless set by the user in his file list.

4.5 DIRECT ACCESS FILE

A permanent file which the user has direct use of; that is, the file is not copied to his job.

4.6 MEDIA

Destination of the checkpoint data and may be tape or mass storage.

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4.7 MODE

Manner of writing the checkpoint data. Can be write at B0I or
write at E0I.

4.8 RESTART

Procedure of rebuilding a job's environment from a Checkpoint
file in order to continue that job.

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APPENDIX A

DIRECT ACCESS PF PROCESSING

Table of access modes and checkpoint procedure for direct access files
 {see Section 3.4.1 for f definitions}.

MODE	DEFAULT	USER OPTION
READ ONLY	NOT COPIED {f=4}	ANY TYPE OF COPY {f=1, 2, 3 or 4}
EXECUTE ONLY	NOT COPIED {f=4}	NONE
APPEND ONLY	COPIED {f=3}	ANY TYPE OF COPY {f=1, 2, 3 or 4}*
WRITE	COPIED {f=3}	ANY TYPE OF COPY {f=1, 2, 3 or 4}*
MODIFY	COPIED {f=3}	ANY TYPE OF COPY {f=1, 2, 3 or 4}*
READ and APPEND	COPIED {f=3}	ANY TYPE OF COPY {f=1, 2, 3 or 4}*
READ and MODIFY	COPIED {f=3}	ANY TYPE OF COPY {f=1, 2, 3 or 4}*

* If f=4 is selected, the user must retrieve the file himself at RESTART time and select the NA and FC options on RESTART {see Section 3.4.2}.

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APPENDIX B

RESTARTING DIRECT ACCESS FILES

All files copied by RESTART will be made local to the restarted job. Therefore, the user must take certain steps to insure that his direct access files will not be lost.

For example:

Job A has direct access files X, Y and Z attached to the job. Job A is then checkpointed and X, Y and Z are copied to file *CHECK*. To retain these files as direct access files, the restart job would contain the following sequence of control statements:

```
PURGE{X,Y,Z}
```

```
DEFINE{X,Y,Z}
```

```
RESTART{CHECK,*}
```

Thus, RESTART will restart the job from the last checkpoint on file *CHECK*, and will copy X, Y and Z to their respective newly defined files.

Direct access files that are not to be copied will be attached in the mode specified by control bits in the FNT for each file. If the mode thus specified is not recognized, the file will be attached in read mode.

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1.0 SCOPE

These specifications describe the external characteristics of those new or modified features incorporated into the KRONOS 2.1 operating system to standardize the KRONOS Transaction Subsystem.

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2.0 APPLICABLE DOCUMENTS

KRONOS Version 2.1 Product Objectives Document

KRONOS 2.0 Batch User's Reference Manual {publication number
59150600}

KRONOS 2.0 Instant Manual {publication number 59152100}

KRONOS 2.0 Operating Guide {publication number 59151600}

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3.0 DESCRIPTION

3.1 Terminal Network Description

In order to provide a description of the KRONOS terminal network, two programs are provided:

COMCRTN which reads and interprets a set of network description directives.

VALNET which validates a terminal network description file. Terminals in the network are assigned various attributes by providing the system a record of coded card images that is interpreted by common deck COMCRTN. These descriptions are ultimately used by TELEX, TRANEX, and the Stimulators.

3.1.1 Common Deck COMCRTN

COMCRTN provides common logic to process a caller provided record of terminal descriptions. Entry is via location ATD. ATD reads and interprets cards to describe a single terminal and forms a table based on information found.

3.1.1.1 Terminal Description Format

Terminal network description consists of a set of directive cards describing each terminal in the network. Cards may be up to 90 columns, but only columns 1 through 72 are examined by ATD. Any card containing an asterisk {*} in column 1 is considered a comment card and is ignored.

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Terminals are grouped into sets by the multiplexer through which they communicate with the system. Each set is introduced by a mux definition in the following format:

```
//muxtype,p1=n,p2=n
```

where muxtype is a multiplexer type designation and p1 and p2 specify various attributes of the mux.

A terminal is considered to belong to the mux set begun with the preceding mux definition statement.

Each terminal description is begun by a terminal name directive in the format:

```
/namenam
```

where namenam is a user-assigned terminal name. The slash {/} is mandatory and must immediately precede the terminal name which may be any 1 to 7 alphanumeric characters.

Following the terminal name and separated by commas are various arguments describing terminal characteristics in the form:

```
/namenam,p1=aaaa,p2=nnnnn,...
```

where namenam is the assigned terminal name and pi is an attribute mnemonic that is to be assigned a value of aaaa or nnnnn.

In the following argument descriptions, alphanumeric argument values are denoted by "aaa" and numeric argument values by "nnn". Numeric values may be specified in either octal

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or decimal base by including a "B" or "D" radix symbol immediately after the number. In the absence of a radix symbol, decimal base is assumed. Each terminal description may span several cards and spaces between arguments are ignored. If errors occur in a description, ATD exits with a flag value in X1. After ATD is entered for the next description, it skips characters until a "/" is encountered and then begins anew.

The description file is expected to be properly positioned upon entry to ATD.

Programs that use COMCRTN may place further restrictions upon argument values than those stated below. It is best to consult appropriate documentation for those programs before writing terminal descriptions.

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3.1.1.2 Table Format

After each terminal description has been assembled, ATD returns to the caller. Terminal description argument values reside in the following locations:

TN. Terminal Name.
1-7 left justified, zero fill, characters.

DB. Data Base Name.*
2 left justified characters.

IS. Initial ON/OFF Status.*
Binary 0 or 1. {1 = OFF}

LS. Line Speed in characters per second.
Binary value from 1-3777B.

PC. Polling Code.
24 bit binary value.

PN. Port Number.
Packed floating point format value. Coefficient is the port number from 0-63. If exponent is nonzero, a range of ports with identical terminals is defined. In this case, the exponent is the number of ports in the range - 1.

RS. Data Base Read Security.*
3 bit binary value.

TT. Terminal Type.
Binary value defined by symbol in common deck *COMSNET*. If bit 11 is set, terminal is a KTS terminal.

UA. User Arguments.*
24 bit binary value.

US. Data Base Update Security.*
3 bit binary value.

MT. Multiplexer Type.
Binary value symbolized in common deck *COMSNET*.

CH. Multiplexer Channel.
Packed floating point format value. Exponent is zero, coefficient is channel.

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E0. Multiplexer Equipment Number.
Packed floating point format value. Exponent is
zero, coefficient is equipment.

* KTS Terminal Argument.

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3.1.1.3 Interface Requirements

ENTRY

{X5} = Address of FET for description file.

{A0} = Address of a word that describes a table that COMCRTN may use to store terminal names. Word format:

	47	29
{A0}	0	LENGTH
		FWA

where:

LENGTH = maximum length table may attain.

FWA = first word address of table.

{B1} = 1.

EXIT

{B1} = 1.

{X1} ≠ 0 if error encountered in description file.

If {X1} ≠ 0, then:

{X2} = Address of error message. {C* format}

{X4} = Card number of offending card. If {X4} = 0, no description cards were found in the record. If {X4} < 0, this is not an error, but end of record was encountered.

{X0} = address of card string buffer.

DOES NOT USE

A - 0.

X - 5.

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CALLS

CI0=-,DXB,RDS=.

REQUIRES

Common deck COMSNET.

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3.1.1.4 Network Description Argument Specification

3.1.1.4.1 Multiplexer Description Argument Formats

Example of multiplexer description:

```
//bb7b,CH=1,EQ=4.
```

The field "muxtype" mentioned above has been assigned a value of "bb7b" and the "p1" and "p2" arguments are used to define the mux channel and equipment numbers.

3.1.1.4.1.1 Multiplexer Type

```
//aaaa
```

** Mandatory to initiate a set of terminal descriptions.

Describe multiplexer of type aaaa. aaaa may be:

```
bb7b for a bb7b multiplexer
```

```
bb7l for a bb7l multiplexer
```

3.1.1.4.1.2 Multiplexer Channel

```
CH=nn.
```

** Mandatory argument on multiplexer description.

Declares the multiplexer channel. nn may range from 0 to 13 and 20 to 33 octal.

3.1.1.4.1.3 Multiplexer Equipment Number

```
EQ=n.
```

** Mandatory argument on multiplexer description.

Declares the multiplexer equipment number. n may range from 0 to 7.

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3.1.1.4.2 Terminal Description Argument Format

Example of time-sharing terminal description.

```
/XXX,LS=10,PN=1,TT=AB.
```

Example of KTS terminal description.

```
/C02001A,DB=LC,IS=0N,LS=15,PC=20B,PN=3,RS=4,TT=*NIX,  
UA=015700B,US=4.
```

Here, the field "namenam" mentioned above is used to assign names "XXX" and "C02001A" to specific terminals. The arguments "p1", "p2", etc., are used to describe the attributes of these specific terminals.

3.1.1.4.2.1 Terminal Name

```
/aaaaaaa
```

** Mandatory to describe a terminal.

Defines the terminal name aaaaaaa. aaaaaaa may consist of 7 or less alphanumeric characters.

3.1.1.4.2.2 Data Base Name

```
DB=aa.
```

** KTS terminal argument.

Declares the data base to be used by terminal. aa may be any legal 2 character data base name.

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3.1.1.4.2.3 Initial Status

IS=aaa.

** KTS terminal argument.

Declares the terminals initial on/off status. aaa may be "ON" or "OFF". Default value is "ON".

3.1.1.4.2.4 Line Speed

LS=nnnn.

Declares the terminal line speed {character rate}. nnnn is in characters per second and values may range from 1 to 2047.

3.1.1.4.2.5 Polling Code

PC=nnnnnnnn.

Defines the terminal polling code. nnnnnnnn may range from 0 to 16777215 {24 bits}.

3.1.1.4.2.6 Port Number

PN=n.

** Mandatory argument.

Declares the port number of this terminals line. n may range from 0 to 63 if multiplexer is a 6676, and may range from 0 to 15 if multiplexer is a 6671.

3.1.1.4.2.7 Port Range Limit

PL=n.

Defines the limit of a range of ports for a set of

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identical terminals. n may range from the previous declared port number "PN" + 1 to 63 for a 6676 multiplexer, or to 15 for a 6671 mux. The "PN" argument must appear previous to the "PL" argument.

3.1.1.4.2.8 Data Base Read Security

RS=n.

** KTS terminal argument.

Declares the data base read security. n may range from 0 to 7. Default value is 0.

3.1.1.4.2.9 Terminal Type

TT=aaaaaaaa.

Declares the terminal type. aaaaaaaaa may be any one of the following:

- AB Terminal will be identified by answerback.
- ID Terminal will be identified by terminal operator entry.
- NIX "CYBERLOAN" NIXDORF terminal.

If any one of the above terminal type mnemonics is prefixed by "*", it is defined as belonging to the KTS terminal network. For example:

TT=*NIX

declares a KTS NIXDORF terminal.

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3.1.1.4.2.10 User Argument

UA=nnnnnn.

** KTS terminal argument.

Defines the contents of the user argument area. nnnnnn may range from 0 to 16777215 {24 bits}. Default value is 0.

3.1.1.4.2.11 Data Base Update Security

US=n.

** KTS terminal argument.

Declares the data base update security. n may range from 0 to 7. Default value is 0.

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3.1.2 VALNET

VALNET is a control card callable program that may be used to validate the syntax and logic of a terminal network description.

VALNET reads a terminal network description written as a series of directives defined by the common deck *COMCRTN*. Errors in network description are diagnosed and error messages are placed on a list file. If no errors are encountered, no listing is produced.

3.1.2.1 Control Card Call

VALNET{p1,p2,p3}

where pi may be:

P Terminal network description file name.

P File *COMPILE*.
 P=fn File *fn*.
 ABSENT File *NETWORK*.

L File to receive list of errors.

L File *LIST*.
 L=fn File *fn*.
 L=0 No list.
 ABSENT File *OUTPUT*.

NR Do not rewind description file before reading.

NR Do not rewind.
 ABSENT Rewind first.

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3.1.2.2 Listable Output

Each error encountered produces 2 lines of listing. The lines consist of:

1. The input line containing the error.

This may be only near the bad line if the error is one of omission. That is, if line 3 describes terminal "A", and line 4 describes terminal "B", then if no port number was defined for terminal "A", this is not diagnosed until the "/B" directive is encountered, therefore line 4 is listed along with an appropriate diagnostic message.

2. Card number of offending card.

This is subject to the same exceptions as noted above in item 1.

3. A diagnostic message explaining the error.

For example:

```
/TERM1,TT=WHAT,PN=3.  
CARD 53 UNKNOWN TERMINAL TYPE.
```

List lines are formatted for printing on a 72 column device except for those input lines that exceed this length.

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3.1.2.3 Dayfile Messages Issued

* NO DESCRIPTIONS FOUND.*

No mux/terminal descriptions were found on the description record.

* FILE NAME CONFLICT.*

The *P* file name is the same as the *L* file name.

* TERMINAL DESCRIPTION ERRORS.*

Errors were found in the terminal descriptions. Consult listing for diagnostic messages.

* VALNET ARGUMENT ERROR.*

The VALNET control card contains unknown or incorrectly used arguments.

* VALNET COMPLETE.*

All descriptions have been validated as correct.

* TABLE OVERFLOW.*

Not enough storage was available to hold all terminal description table entries.

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3.2 CPU Time Limit Handling

CPU time limit may be expressed in seconds. KRONOS 2.0 rounds this time limit up to the next higher multiple of 8 seconds. KRONOS 2.1 will not round up. This gives system users better control over CPU time. Time limit setting to a precision of one second may be done via the job card, the SETTLE card or the SETTLE COMPASS macro. All other external features are the same as KRONOS 2.0.

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3.3 Sub-Control Points

The sub-control point feature allows a program executing at a normal system control point to supervise the execution of several independent sub-programs. This executive program controls the exchange packages and memory of the sub-programs. Each sub-program is assigned an exchange package and some subset of the executive's field length. Because of this exchange package control, the sub-programs are not subject to traditional constraints placed on overlays in regard to execution address. Sub-programs may be loaded and moved at will by the executive since all sub-program addresses are relative to the reference address {RA} as specified in the exchange package.

3.3.1 Sub-Control Point Execution

3.3.1.1 XJP Request

The XJP system RA+1 request is used to initiate the execution of a sub-control point.

Format of RA+1 request:

BIT				
WORD	59	42	36	18
RA+1	XJP		time	addr

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Where:

time = CPU time limit {in milli-seconds} for sub-control point execution.

addr = address of sub-control point exchange package.

After the XJP request is honored, the sub-control point will execute until:

1. It requests system action via the execution of a central exchange jump instruction.
2. The time limit as specified in the XJP request is exceeded.
3. It causes a hardware error condition like a reference to an address that is out of its field length.

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3.3.1.2 Reply from CPUMTR after XJP request.

In any of the above cases, the executive program is restarted and the following information is returned:

{X1} = Milliseconds of CPU time used before sub-control point executed.

{X6} = 12/ 20008+EF,48/ RA of sub-control point.
Where EF is an error flag caused by the sub-control point. EF may be: 0 {if no error}; TLET {CPU time limit exceeded}; ARET {arithmetic error}; PSET {program stop}.

{X7} = Milliseconds of CPU time used by sub-control point.

If an error is encountered during processing of the *XJP* request, certain values may have already been altered by CPUMTR. These include:

RA and RAX in the sub-control point exchange package.
X2, X6, and X7 of the requesting program.

XJP requests should always be issued with auto-recall when not using the central exchange instruction.

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3.3.2 Constraints

1. The sub-control point exchange package must be entirely contained within the field length of the executive program.
2. The sub-control point RA is specified by the executive as relative to its own reference address.
3. The sub-control point field length {FL} must be entirely contained within the FL of the executive and must be greater than zero.
4. No requests are honored by the operating system from sub-control points. Upon detection of such a request, the executive program is restarted to process the request.

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3.3.3 XCHNGE macro.

The XCHNGE COMPASS macro is used to form an XJP RA+1 request and therefore initiate execution of a sub-control point. The macro definition resides in the common deck COMCMAC.

Macro call format:

XCHNGE addr,time

where:

addr = address of sub-control point exchange package.

time = CPU time limit in milli-seconds for sub-control point execution.

XCHNGE forms the XJP request and calls the system - provided subroutine SYS= to enter the request.

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3.4 Inter-Control Point Communication

With this capability, certain programs may send blocks of data to cooperating sub-systems.

3.4.1 Definition of Receiving Buffers

To enable receipt of such data blocks, a sub-system must set word ICAW in its control point area thusly:

BIT					
WORD	59	47	29	17	0
ICAW	b10	ba0	b11	ba1	

where:

- b10 = length of receiving buffer 0.
- ba0 = address of receiving buffer 0.
- b11 = length of receiving buffer 1.
- ba1 = address of receiving buffer 1.

As can be seen from the above format, a maximum of two separate buffers may be defined. Blocks of length 1 through the maximum length defined for the buffer {b10 or b11} may be transferred to each buffer. Any request to transfer more words than allowed is rejected. A buffer is considered full or busy if the first word is non-zero. Transfer requests are rejected if the buffer is full.

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3.4.2 Inter-Control Point Data Transfer

3.4.2.1 SIC Request

Any program possessing a queue priority greater than MXPS or having user access bit "CSTP" set may request CPUMTR to transfer data to a specific sub-system. This request is in the form of the SIC RA+1 requests as follows:

BIT					
WORD	59	42	36	18	0
RA+1	SIC	r	buff	stat	

r = 20B if auto recall selected.

buff = address of buffer to be transferred to sub-system.

stat = address of status word in format:

BIT					
WORD	59	48	42	30	0
STAT	0	bn	sqp	0	

bn = buffer number of sub-system to transfer to.

sqp = destination sub-system queue priority.

A block starting at buff will be transferred to the indicated subsystem. Block length is specified in bits 0-17 of the first word of the block {buff}. Length includes this first word. This request is honored only from jobs with queue priority > MXPS or those having access bit "CSTP" set. A request from any other job is treated as a PP call.

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3.4.2.2 Reply from CPUMTR in Response to SIC Request

BIT					
WORD	59	48	42	30	0
STAT	0	bn	sqp	reply	

- reply = 1 if transfer completed successfully.
- 3 if destination sub-system is not present in the system.
- 5 if sub-system buffer is full, sub-system being moved, or sub-system job is advancing.
- 7 if block length is specified in the first word is larger than that permitted by the sub-system.
- 11 if destination buffer is undefined by sub-system.

If auto-recall is selected and condition 5 above is present, the calling program is placed in recall status until the condition ends.

If, during processing of a transfer request, it is found that the sub-system's buffer extends past its field length, the sub-system is aborted with error type SYET.

3.4.3 Limitations

No more than 64 words may be transferred.

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3.5 CI0 Changes

This effort revolves around: 1} attaining greater compatibility with SCOPE 3.4 in the area of CI0 interface; 2} incorporation of mass storage error status return. Generally, this involves:

- merging the OPEN and CLOSE functions into CI0.
- increasing CI0s use of end-of-record, level 17 as a pseudonym for end-of-file.
- changing CI0s method of handling mass storage errors so as to provide status information to the user and to reduce the need for operator intervention.
- updating several other programs for proper interface.

In order to more centralize circular mass storage input/output, the overlays 2RD, 2WD, and 2PD will be removed from the system. Their functions will be performed by overlays local to CI0. Also, the programs OPE and CLO will be removed because CI0 will perform all of their functions. Only those areas that involve visible changes to the KRONOS 2.0 CI0 are documented below.

3.5.1 File Environment Table {FET}

3.5.1.1 Detail Error Status Field.

If user error processing is in effect and after a mass storage error occurs, certain information is returned to bits 0-11 of FET+b. See section on error processing.

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3.5.1.2 Index Length Field.

Random index area length is specified in bits 18-35 of FET+7.

3.5.2 Dayfile Error Messages.

Most messages have been changed from previous versions of CI0. Those messages below that are marked with an asterisk are associated with a memory dump of the FET. All errors result in job abort. Below is a complete list of CI0 error messages. In these messages, fff represents the file name as given in the FET and nnn represents the FET address.

"FET ADDRESS OUT OF RANGE AT nnn."

FET extends past FL.

* "BLOCK LENGTH ERROR ON FILE fff AT nnn."

block length as specified during a "WRITECW" operation is greater than 500B.

* "BUFFER ARGUMENT ERROR ON fff AT nnn."

A buffer pointer does not conform to these constraints:

FIRST \leq IN

FIRST \leq OUT

OUT $<$ LIMIT \leq FL

* "DEVICE ERROR ON FILE fff AT nnn."

An unrecovered error occurred on the mass storage device containing the file.

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"I/O ON EXECUTE-ONLY FILE fff AT nnn."

An attempt was made to read, write, or position an execute-only file. "RETURN" is the only allowed function.

"ILLEGAL FILE NAME fff AT nnn."

The file name contains a non-alphanumeric character.

"I/O SEQUENCE ERROR ON FILE fff AT nnn."

Multiple concurrent functions were attempted on a single file.

"ILLEGAL EXTENSION OF fff AT nnn."

The function would result in lengthening of a file that has extend lock-out.

"ILLEGAL MODIFICATION OF fff AT nnn."

EITHER: The function would result in shortening a modify-only file. -OR-
The file has modify lock-out.

* "ILLEGAL I/O REQUEST ON FILE fff AT nnn."

The function code is unrecognized.

"WRITE ON READ-ONLY FILE fff AT nnn."

A write was attempted on a file with write lock-out.

* "RANDOM ADDRESS NOT ON FILE fff AT nnn."

The random address exceeds the number of addresses on the file.

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* "REQUEST UNDEFINED ON DEVICE, fff AT nnn."

The function cannot be performed on the device upon which the file resides.

* "INDEX ADDRESS OUT OF RANGE FOR fff AT nnn."

Random address return address is \geq FL.

"M.T. NOT AVAILABLE ON FILE fff AT nnn."

The magnetic tape executive is not executing.

3.5.3 Functions changed.

3.5.3.1 READSKP.

If the status and code fields in the FET contain 74002X then, after the buffer is filled, CI0 will skip to the next end-of-file instead of to end-of-record. Previous versions of KRONOS only skipped to end-of-record. The macro format is:

READSKP file,lev,recall.

where:

Lev is 17B if skip to EOF

3.5.3.2 READEI.

The function code for READEI is 600. This replaces the old 200 code.

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3.5.3.3 Forward skips.

SKIPF, SKIPFF, and SKIPEI all operate via the 240 code. File skips are specified by placing 74B in bits 14-17 of FET+0. Termination status as indicated below is always returned.

Condition Status

- EOR 02X
- EOF 03X
- EOI 103X

3.5.3.4 Backward skips.

SKIPB and SKIPFB both operate via the 640 code. File skips are specified by placing 74B in bits 14-17 of FET+0.

3.5.3.5 OPEN processing.

The OPEN types REEL, REELNR, and NR have been added to the macro. NR means 'no rewind' and uses code 120. REEL {340} and REELNR {300} are intended for use with magnetic tape files. See the KRONOS 2.1 Tape ERS for details. If REEL or REELNR is used for a mass storage file, the function is treated as READ or READNR. If type is not specified in the macro, ALTER is assumed for details on ALTER type. The macro forms a call to CI0=; Therefore, the common deck COMCOPE will be removed.

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The random index on a file that is to be OPENed is expected to be the last record before EOI. No EOFs may intervene.

The random file bit in the FET {FET+1, bit 47} will be cleared during OPEN if one of the following conditions exist:

- the last record before EOI is empty.
- index area address is < 2.

If the index areas is too small to accommodate the entire index record, the excess data is skipped.

OPE may still be called in an RA+1 request, but OPE is changed to CIO by the system.

3.5.3.b CLOSE processing.

A CLOSE macro will be added as specified below:

CLOSE file, type, recall

where:

file = address of FET for file.

type = NR for no rewind

UNLOAD for unload

RETURN for return

absent for rewind

recall = present if auto recall desired

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The 174 close function {RETURN} is new and functions like UNLOAD for mass storage files.

CL0 may still be called in an RA+1 request, but CL0 is changed to CI0 by the system.

A random index is written at EOI only if the file is random, has been written upon since the last OPEN and an index area is specified in the FET.

A CLOSER macro will be added for closing magnetic tape reels. Macro format:

CLOSER file,type,recall

where:

file = address FET for file

type = NR for no rewind

UNLOAD for unload

absent for rewind

See the KRONOS 2.1 magnetic tape ERS for details of operation.

3.5.3.7 UNLOAD.

UNLOAD is identical to REWIND for mass storage files.

3.5.3.8 Buffer pointers after position operation.

Only REWIND and UNLOAD cause IN and OUT to be set equal to FIRST.

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3.5.4 Functions added.

3.5.4.1 RPHRLS - read PRUs with list. - code 230.

This function operates in the same way as READLS except that each address in the list specifies a single PRU instead of a record. (see p. 7-48 of KRONOS 2.0 Reference Manual Rev. C for explanation of READLS). After the single PRU specified by each list entry is placed in the buffer, the list position is advanced.

Macro format -

RPHRLS file, recall

where:

file = FET address

recall = if present, auto-recall

3.5.4.2 READCW - read non-stop with control words - code 200.

In this function each physical record is bounded by control words. This allows end-of-records and end-of-files to be read and detected without recalling CI0 for the next sequential read. Reading normally terminates if the buffer becomes full or if EOI is detected. If the request is made with 74 in bits 14-17 of FET+0, reading will stop after detecting an EOF.

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PRU format:

59	54	47	36	23	0
/	/ PRU	SIZE	/	/	/ BYTE COUNT /
/	... FIRST OF {BYTE COUNT}/5 DATA WORDS ...				/
/				/
/	EOR-EOF	/			/

PRU SIZE Number of 60 bit words in each PRU on device.

BYTE COUNT Number of 12 bit data bytes in this PRU.

EOR-EOF If byte count is < 500B, this is an end-of-record or end-of-file. If EOR-EOF is zero, PRU is an end-of-record; If 17B, PRU is an end-of-file.

READCW may not be used with unit record devices.

Macro format:

READCW file, lev, recall

where:

file = FET address

lev = termination level - 17B if stop at EOF, else zero or absent.

recall if present indicates auto-recall desired.

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3.5.4.3 WRITECW - write non-stop with control words - code 204.

This function is the companion to READCW. PRUs are supplied to CI0 in the format specified for READCW. It should be noted that data written using this method is stored in the device in the same format as if it had been written with any other write function.

WRITECW may not be used with unit record devices or line printers.

Macro format:

WRITECW file, recall

where:

file = FET address

recall - if '*', place WRITECW code in FET, but do not recall CI0.

- if present but not '*', select auto-recall

3.5.4.4 Magnetic tape functions.

Three magnetic tape functions are recognized by CI0:

READN {260} read 'S' or 'L' tape non-stop

WRITEN {264} write 'S' or 'L' tape non-stop

POSMF {110} position multi file set

These functions may be used only for magnetic tape files.

Macro formats:

READN file, recall

WRITEN file, recall

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POSMF file, recall

where:

file - FET address

recall if present indicates auto-recall desired.

See the KRONOS 2.1 Magnetic Tape ERS for details on use.

3.5.5 RETURN OF UNRECOVERABLE MASS STORAGE ERROR STATUS.

Whenever a mass storage device returns an error status or the device driver detects an error, an error status is placed in the status field of the FET. If the user error processing bit is set in the FET {EP bit} and the FET length is greater than 5, further "detail" status is returned to the user; if not set, a message is issued to the dayfile and the job is aborted.

Error Status {STATUS field}

004 parity error.

022 other error.

Detail error status {bits 0-11 of FET+b} {only if 'EP' bit is set}:

X001 parity error.

X002 address error.

X003 device status error.

X004 bbb1 function reject.

X005 device reserved.

X006 device not ready.

4007 track limit. {device full}

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After an error {with 'EP' set}, the file is positioned at the offending PRU. If the operation was a read and the system has verified that the proper PRU was read {although it probably contains bad data}, then *X* above is 0 and the data is placed in the buffer and IN adjusted accordingly; otherwise *X* is 4. If the file is random, CRI is set as usual.

3.5.b File status as kept in FST, byte 4.

The file status is encoded as follows:

bit 0 = 0 if file busy
 bit 1 = 1 if last operation was a write
 bits 2-3 if last operation was read:
 0 = incomplete {buffer full}
 1 = EOR encountered
 2 = EOF encountered
 3 = EOI encountered
 if last operation was position or write:
 0 = incomplete {buffer exhausted, no EOR/EOF}
 1 = complete
 bit 6 = 1 if file has been written upon.
 bit 7 = 1 if file has been written upon since it was last opened.
 bit 8 = 1 if file has been opened

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The previous function code is no longer held in the FST. This means that when using the STATUS macro, those bits in the FST, byte 4 {as explained above} will be returned to the FET instead of the previous function code as was returned in KRONOS 2.0.

3.5.7 Miscellaneous CI0 related changes

3.5.7.1 Read common deck status return.

All read common decks will return, in X1, -2 if EOI status was detected in the FET.

3.5.7.2 Provisions for flexibility in continuous writes.

In order that continuous writes other than WRITE may be maintained when using the write common decks, certain macros and the common decks will be altered as follows:

- in the WRITE, REWRITE, WRITEN, and WRITECW macros, if the recall argument is '*' then place the appropriate function code in the FET but do not call CI0, any other value specifies auto-recall.
- if the symbol 'WRIF#' is defined, the write common decks will re-issue the previous write code for a file when they determine that a write is required. If the symbol is not defined, a WRITE will be requested.