

UNITED STATES GEOLOGICAL SURVEY

UNDELETE

A Program to Recover
Deleted RSX-11 Disk Files

User's Manual and
Installation Guide

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Abstract

Undelete is a non-privileged utility program for the in-place restoration of accidentally deleted disk files for the DEC PDP-11 RSX-family operating systems. Files are restored based on a user-specified search pattern, which provides a flexible means of wild card matching by character or by field within a file specification. A dry run option is available to identify candidates for restoration without actually modifying the disk file structure.

1.0 Introduction

Undelete is a non-privileged utility program for the in-place restoration of accidentally deleted disk files. It operates by scanning through the index file looking for deleted file headers that match its search criteria, and, with the assistance of the standard RSX-11 Volume Verification Utility utility (VFY), undoing the deletion operation.

Since it is always risky tampering with the on-disk structure on a live system, Undelete should be considered a last resort to recover files that would be too costly or impossible to recover any other way. It has, however, been used to recover an entire system disk deleted with a PIP wild card specification, and also to recover an entire directory on the system disk while the system was running.

2.0 Search Patterns

Files to be recovered are specified using a search pattern of the form:

[group,member]name.type;version

What looks like a User File Directory (UFD) specification is really the file owner's User Identification Code (UIC), since the file header contains only ownership information, with no back links to the directory which points to the file. In most cases the UFD and file owner's UIC will be the same, so the confusion should be minimal.

The rules for constructing the search pattern are:

1. A question mark or asterisk will match any single character.
2. Stem searches are performed for the file name and type fields (i.e., the file name FILE is transformed to FILE????? for searching).
3. For the numeric fields, leading zeroes are prepended for searching if at least one of the specified characters is a digit (e.g., [?0,*] is transformed to [0?0,???) for the owning UIC field).

4. Any unspecified or null fields default to a wild card search (e.g., [100,] is equivalent to [100,*], etc.).

NOTE

The special version numbers, 0 and -1, are not supported.

For example:

1. To recover all the .FTN files owned by [100,2], specify the search pattern [100,2]*.FTN.
2. To recover all files beginning with BP2 owned by any account, you may simply specify BP2.
3. To recover all files owned by [1,54] and [3,54], specify the search pattern [0?,54] (on the assumption that we won't find much in the other directories with single digit group numbers). Note that [?,54] will not work in this case, since it will be treated as [???,054] instead of [00?,054].

Whenever a matched file header is found, its file I.D. is printed, along with a PIP-like listing of the file owner, file specification, size and creation date. This information will be helpful in returning the file to the proper directory (usually the owner's UFD).

3.0 Recovery Procedure

The procedure to follow is:

1. Log on to a privileged account, if necessary, preferably on a hardcopy terminal.
2. Immediately halt all activity on the disk selected for file recovery and dismount it.
3. Allocate the disk to yourself and mount it with the index file unlocked.
4. Run Undelete and provide the name of the disk and the search pattern. Take the dry run option first (with the disk write locked, if you wish) to make sure the proper files will be recovered.
5. Run the VFY update and lost file scan options with the scratch files directed to another disk. The listing file may get rather lengthy if lots of disk blocks were deleted, so you may want to send the listing to another disk or NL:.
6. Rename the recovered files from [1,3] to their proper directories.

Warning

Recover all files before renaming, or copy them to another medium one directory at a time. If the UFD is not large enough to hold all the directory entries, it will be extended to accomodate the new directory entries, which could write over one of the files yet to be recovered.

7. If there are extra recovered files that you want to delete, be sure to rebuild the volume bit map again to take care of doubly allocated disk blocks before returning it to service.

Warning

The version numbers that VFY uses to place these lost files into [1,3] may not be the same as the ones the files had originally. Be sure to examine the creation date or the contents of the files themselves before deciding which files to keep and which to purge.

8. Always verify the disk one last time before putting it back on-line!
9. When you are satisfied everything is OK, return the disk back to its original state (PUBLIC, /-UNL, etc.).

4.0 MCR and DCL Command Summary

The appropriate MCR and DCL commands to perform the above steps are:

MCR	DCL
>ASN ddnn:=SY:	\$ Set Default ddnn:[1,3]
>SET /UIC=[1,3]	
>DMO ddnn:[/DEV]	\$ Dismount ddnn: [/System]
>ALL ddnn:	\$ Allocate ddnn:
>MOU ddnn:.../UNL	\$ Mount ddnn: ... /Unlock
>RUN Undelete	\$ Run Undelete
: (repeat as necessary)	: (repeat as necessary)
>VFY TI:,LB:=ddnn:/UP	\$ MCR VFY TI:,LB:=ddnn:/UP
>VFY TI:,LB:=ddnn:/LO	\$ MCR VFY TI:,LB:=ddnn:/LO
>PIP badfile.typ;ver/DE	\$ Delete badfile.typ;ver
: (repeat as necessary)	: (repeat as necessary)
>PIP [g,m]/RE=goodfile.typ	\$ Rename goodfile.typ [g,m]*.*
: (repeat as necessary)	: (repeat as necessary)
>VFY TI:,LB:=ddnn:/RE	\$ MCR VFY TI:,LB:=ddnn:/RE
>VFY TI:,LB:=ddnn:/UP	\$ MCR VFY TI:,LB:=ddnn:/UP

```

>VFY TI:,LB:=ddnn:          $ MCR VFY TI:,LB:=ddnn:
>DMO ddnn:                  $ Dismount      ddnn:
>DEA ddnn:                  $ Deallocate   ddnn:
>MOU ddnn:...               $ Mount        ddnn: ...

```

Replace the elipses above with the mount options appropriate to your system, such as /OVR/PUB/ACP=UNIQUE for MCR or the equivalent DCL options /Override:Identification/System/Processor:Unique. Also, include the /PUB or /System option on the initial dismount command for public volumes, as is shown below.

5.0 Sample Run

In the sample printout below, the user response to Undelete's prompts are underlined. Any output messages from the RSX utilities or commands is not reproduced. (This is only a sample, not an copy of an actual restoration.)

```

$ Set Default DR3:[1,3]
$ Dismount     DR3: /System
$ Allocate     DR3:
$ Mount        DR3: /Override:Identification/Processor:Unique
$ Run Undelete

```

Do you want a dry run (no disk modifications attempted) [Y/N,CR=Y]? N

Enter disk name (ddnn:) DR3:

```

Index file bitmap size (H.IBSZ):      10 (      8.)
Maximum number of files (H.FMAX):    74075 (30781.)

```

Enter search pattern ([grp,mem]name.typ;version,CR=all) Undelete.*

Search pattern: [???,???]UNDELETE?..???;???????

(21433,	141):	[100,001]UNDELETE .DOC;000056	156.	05-JUN-86 15:21
(22741,	66):	[100,001]UNDELETE .TMP;000001	51.	05-JUN-86 15:21
(36247,	15):	[100,001]UNDELETE .DOC;000035	51.	04-JUN-86 14:42
(36616,	11):	[100,001]UNDELETE .TMP;000001	41.	04-JUN-86 14:42
(36730,	2):	[100,001]UNDELETE .TMP;000001	64.	04-JUN-86 13:22
(36772,	2):	[100,001]UNDELETE .TMP;000001	48.	04-JUN-86 16:13
(36773,	2):	[100,001]UNDELETE .DOC;000037	59.	04-JUN-86 16:14

Total of 7. files recovered.

You must run the VFY utility to complete the recovery of the disk:

```

VFY>TI:,LB:=DR3:/UP
VFY>TI:,LB:=DR3:/LO

```

```

$ MCR VFY TI:,LB:=DR3:/UP
$ MCR VFY TI:,LB:=DR3:/LO
$ Delete Undelete.tmp;*
$ Purge Undelete.doc

```

```
$ Rename Undelete.doc [100,307]
$ MCR VFY TI:,LB:=DR3:/RE
$ MCR VFY TI:,LB:=DR3:/UP
$ MCR VFY TI:,LB:=DR3:
$ Dismount      DR3:
$ Deallocate    DR3:
$ Mount         DR3: /System/Override:Identification/Processor:Unique
```

6.0 Acknowledgements

I would like to thank Jon Berger for the circumstances that necessitated writing Undelete, Richard Sipura for inspiring me to update it and finally write it up, and to my reviewers, Tim MacDonald and Gary Maxwell.

7.0 References

1. IAS/RXS-11 I/O Operations Reference Manual (Order No. AA-M176A-TC), Appendix A, "File Descriptor Block", Appendix E, "Index File Format", and Appendix F, "File Header Block Format".
2. RSX-11M/M-PLUS Utilities Manual (Order No. AA-L681A-TC), Chapter 9, "File Structure Verification Utility (VFY)".
3. Baker, Lawrence M., 1986, Undelete: A Program to Recover Deleted RSX-11 Disk Files, Program Logic Manual: U. S. Geological Survey Open-File Report 86-418, 30 p.

APPENDIX A

Installation Guide

Undelete is a non-privileged program written in PDP-11 Fortran-77 (it needs 32-bit integer arithmetic). The supplied task image should run under any RSX-family operating system (it is built for an RSX-11M system without floating point hardware). Undelete does not use the MCR get command line feature so there is no reason to install Undelete permanently.

The files required to re-compile Undelete are:

Fortran-77 source module:

Undelete.ftn

Include files:

IdxDef.ftn	Index file offset definitions
HomDef.ftn	Home block offset definitions
HdrDef.ftn	File header block offset definitions

To re-compile:

MCR	DCL
>F77 Undelete,Undelete/-sp=Undelete	\$ Fortran/F77 Undelete /List

To re-task build:

MCR	DCL
>TKB Undelete,Undelete/-sp=Undelete	\$ Link Undelete /Map
or	
>FTB Undelete,Undelete/-sp=Undelete	\$ Link/Fast Undelete /Map

assuming that the Fortran-77 OTS has been merged into the system object library file, LB:[1,1]SysLib.olb. (The supplied command file, Undelete.cmd, will re-compile and re-task build the program using FTB if it is installed; otherwise it uses TKB.)

Undelete uses QIOs to manipulate the index file and normal Fortran Read

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and Write statements for terminal I/O, so either the FCS or the RMS version of the Fortran-77 OTS can be used. Only one active file is actually needed: the terminal on unit 5. See the comments in the code (labelled "NOTE") and the discussion in the Program Logic Manual for possible modifications. (There should not be any required to run on an RSX-11M V3.1 system, on an RSX-11M-Plus V2.1 system, or on a VAX/VMS system in compatibility mode.)