

# First Steps with FRED

DPC Webinar on FRED

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June 18 2024

DISCOVER. UNDERSTAND. CONNECT.



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Canada

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# Outline

1. The LAC context for the FRED
  1. Digital Integration section
2. FRED configuration
3. Environmental Scan
  1. How are other institutions using the FRED? What can we learn from them?
4. FRED pilot project at LAC
  1. Project charter
  2. Building Capacity
  3. Initial Testing
5. A Frank Discussion About FRED

# Library and Archives Canada

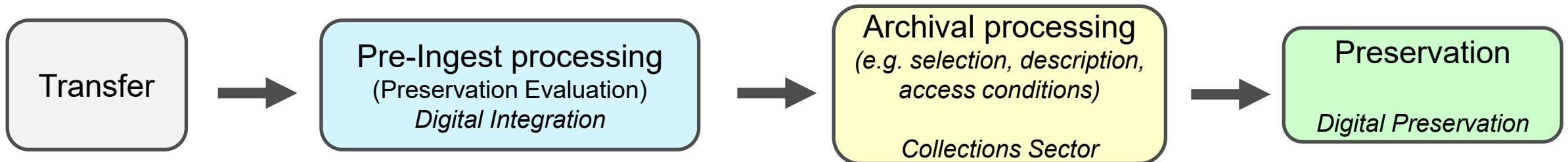
## LAC is both a National Library and a National Archives

Our [mandate](#) is:

- to **preserve** the documentary heritage of Canada for the benefit of present and future generations
- to be a source of enduring knowledge **accessible** to all, contributing to the cultural, social and economic advancement of Canada as a free and democratic society
- to facilitate in Canada co-operation among communities involved in the acquisition, preservation and diffusion of knowledge
- to serve as the continuing memory of the Government of Canada and its institutions

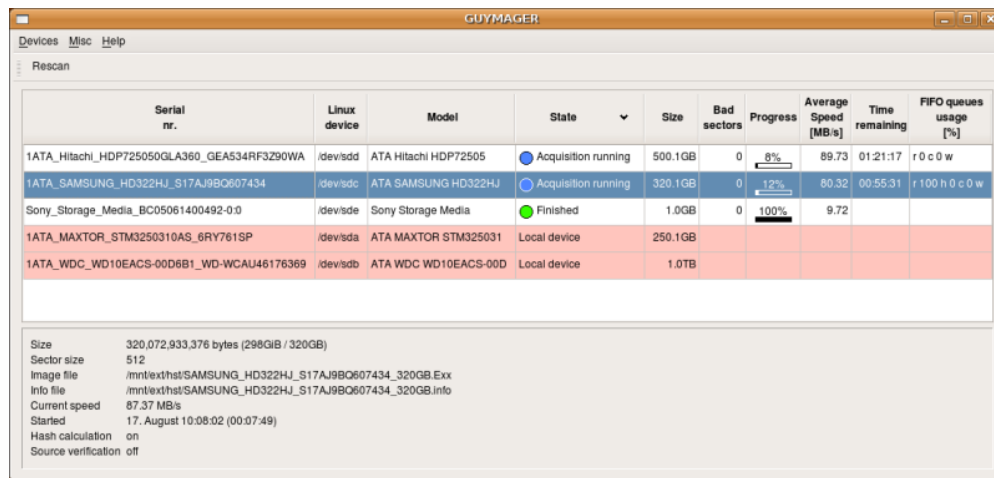


# The FRED context: Digital Integration



# LAC FRED Configuration

- BitCurator Environment with Ubuntu OS – off network!
- Disk Imaging tool: Guymager

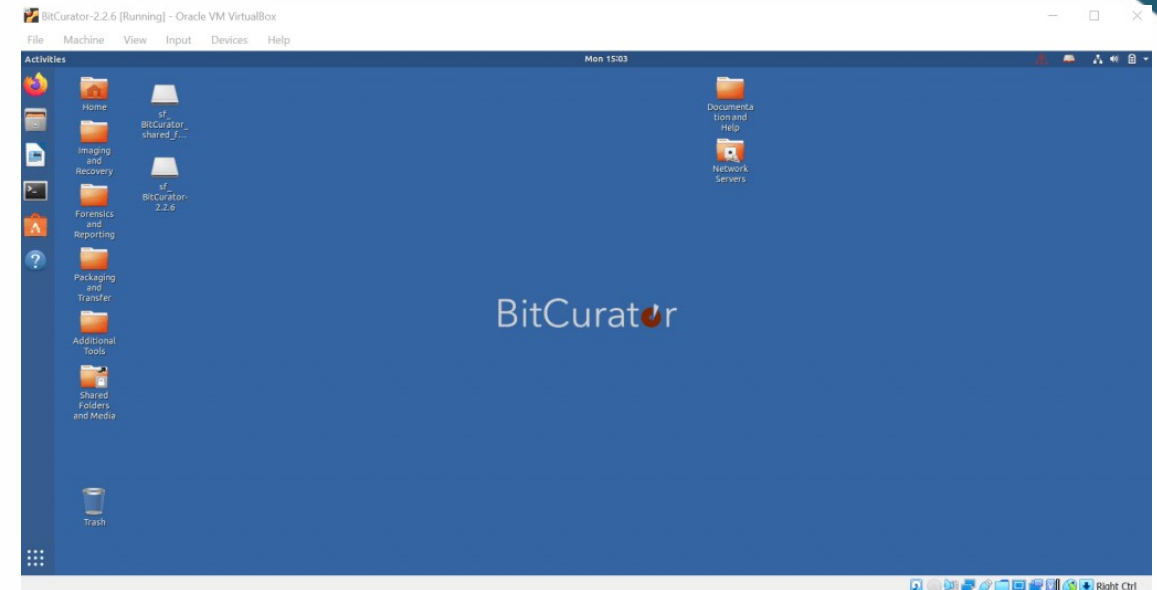


The screenshot shows the Guymager application window with a table of disk imaging progress. The table has columns for Serial nr., Linux device, Model, State, Size, Bad sectors, Progress, Average Speed [MB/s], Time remaining, and FIFO queues usage [%].

Serial nr.	Linux device	Model	State	Size	Bad sectors	Progress	Average Speed [MB/s]	Time remaining	FIFO queues usage [%]
1ATA_Hitachi_HDP725050GLA360_GEA534RF3Z90WA	/dev/sdd	ATA Hitachi HDP72505	Acquisition running	500.1GB	0	8%	89.73	01:21:17	r 0 c 0 w
1ATA_SAMSUNG_HD332HJ_S17AJ9BQ607434	/dev/sdc	ATA SAMSUNG HD332HJ	Acquisition running	320.1GB	0	12%	80.32	00:55:31	r 100 h 0 c 0 w
Sony_Storage_Media_BC05061400492-0-0	/dev/sde	Sony Storage Media	Finished	1.0GB	0	100%	9.72		
1ATA_MAXTOR_STM3250310AS_6RY761SP	/dev/sda	ATA MAXTOR STM325031	Local device	250.1GB					
1ATA_WDC_WD10EACS-00D6B1_WD-WCAU46176369	/dev/sdb	ATA WDC WD10EACS-00D	Local device	1.0TB					

Additional details shown below the table:

- Size: 320,072,933,376 bytes (298GiB / 320GB)
- Sector size: 512
- Image file: /mnt/extfst/SAMSUNG\_HD332HJ\_S17AJ9BQ607434\_320GB.Exx
- Info file: /mnt/extfst/SAMSUNG\_HD332HJ\_S17AJ9BQ607434\_320GB.info
- Current speed: 87.37 MB/s
- Started: 17. August 10:08:02 (00:07:49)
- Hash calculation: on
- Source verification: off



# Environmental Scan

- University of Manitoba Libraries
  - Acquired the FRED in 2018 - uses the FRED with FTK Imager.
- New York Public Library
  - Uses FRED for disk imaging with FTK as part of a Digital Archives Lab.
- Dalhousie University Library
  - Uses the FRED & FTK Imager for data acquisition in a Digital Forensics Lab.
- The Getty – Institutional Records and Archives
  - Uses the FRED with disk imaging tools and FTK post-processing.
- Princeton University Library & Special Collections
  - Uses the FRED with a Bitcurator Environment as a primary workstation along with the KryoFlux.
  - “Tell Us about Your Digital Archives Workstation”: A Survey and Case Study (escholarship.org)

# Environmental Scan

Institutions, such as the University of Manitoba Libraries, who seek to preserve their digital heritage and collections can use FRED to ensure that they are preserving an authentic, bit for bit copy of a digital record for access and preservation purposes.

With built-in **write-blockers and disk imaging software**, archivists... are now able to examine a variety of records stored on various storage media, including flash drives, SATA drives, IDE drives, SD cards, etc. **The storage media can be connected to FRED via an array of ports you will not usually find on a computer today.** From there, an authentic copy of the records can be created by disk imaging the media, which reproduces the entire contents of the media, including files that were deleted.

*From <<https://libguides.lib.umanitoba.ca/researchservices/rsdsblog/Have-you-Heard-About-FRED>>*

Technical woes aside, **the best part about our new FRED/KryoFlux/BitCurator set-up is that it allows us to access data from floppy disks that were previously inaccessible due to damage and obscure formatting.**

*From <<https://blogs.princeton.edu/techsvs/2017/10/03/digital-archives-workstation-update-kryoflux-fred-and-bitcurator-walk-into-a-bar/>>*

# FRED pilot project: Project Charter

## Benefits to the project

- Iterative approach & narrow scope – focused on tackling existing issues with extracting data off floppy disks using FRED & Disk Imaging.
- Defined action items and stakeholders
- Timelines documented
- Risks assessed and considered
- Sign off from management and assigned staff – accountability & prioritization

### CHARTRE DE PROJET / PROJECT CHARTER

<b>Nom du projet et numéro dans SharePoint / Project Name and Project Number in SharePoint:</b> FRED workstation and pre-ingest processing	<b>Gestionnaire du projet / Project Manager:</b> Julienne Pascoe (Digital Archivist, Digital Integration)
<b>Date de début du projet / Start Date:</b> Q4, Fiscal year 2022/23	<b>Date de fin du projet / Completion Date:</b> Q4, Fiscal year 2023/24.
<b>Buts du projet / Project Goals:</b> Evaluate the FRED for use in Digital Integration (DI) workflows and data transfer procedures, with specific application to the extraction of data off legacy carriers. This project will focus on how the FRED can be leveraged to read and extract content from legacy carriers that have not had successful transfer using current DI workflows and hardware.	<b>Étendu / Scope:</b> <ul style="list-style-type: none"> <li>- Testing will be limited to the FRED and its capacity to extract content from legacy carriers using disk imaging and write-blockers. Legacy carriers that have had issues with data transfer will be selected for this purpose – to see if the FRED can be used to troubleshoot these issues.</li> <li>- While BitCurator and Ubuntu OS are installed on the FRED – this project will be limited to testing the specific functionality of the FRED with regards to our established use cases.</li> <li>- This project will not include testing the FRED and its software for functionality that extends beyond DI.</li> </ul>
<b>Livrables / Deliverables:</b> <ol style="list-style-type: none"> <li>1. FRED inventory of peripherals and software</li> <li>2. Functional Requirements for DI tool analysis</li> <li>3. Final report and presentation including recommendations on operational usage of FRED for pre-ingest processing of legacy carriers.</li> </ol>	<b>Partenaires / Stakeholders:</b> <ul style="list-style-type: none"> <li>- Digital Integration (DI)</li> <li>- Digital Preservation (DP) – DP will be a recipient of the outputs of pre-ingest processes and any change to this process potentially has an affect downstream on DP.</li> </ul>
<b>Plan d'action / Action Plan:</b> <ul style="list-style-type: none"> <li>- Set up FRED with BitCurator and Ubuntu OS.</li> <li>- Capacity building and knowledge of usage of FRED – review manual as well as conduct research on usage of FRED in archival workflows. (develop some FRED expertise).</li> <li>- Capacity building: Attend Digital Forensics with FRED training course.</li> <li>- Complete inventory of peripherals and software</li> <li>- Develop functional requirements for tool testing. Includes reviewing the DANING Tool Selection Factors and developing a list of factors to use in DI tool assessment. From this list, I will draw out specific metrics that will be used for evaluating the FRED.</li> <li>- Review &amp; select legacy carriers that would be relevant to testing FRED's capacity for disk imaging.</li> <li>- Conduct tests on FRED.</li> <li>- Compile report and analysis of outcomes of testing.</li> <li>- Final presentation of report to stakeholders.</li> </ul>	<b>Dates / Milestones:</b> <p>FY 2022/23 Q4. Attend Bitcurator – capacity building</p> <p>FY 2023/24 Q1. Set up FRED. Q1 – Q2. Background research and compile resources on FRED. Q3. Complete functional requirements for DI tool testing / Establish metrics for testing. Q2. Project Charter completed Q2. Complete inventory of peripherals. Q3. Attend Digital Forensics with FRED training course. Q3. Select &amp; order legacy carriers Q3 – Q4. Conduct tests on FRED Q4. Final Report and presentation</p>

# FRED pilot project: Capacity building

## Welcome to DANNG!

Digital Archival traNsfer, iNgest, and packagiNg Group

### Mission

DANNG strives to demystify digital archival imaging, transfer, ingest, and packaging methods and make these concepts more accessible for the cultural heritage community. We focus on resources that help practitioners evaluate options and make informed decisions for their workflows. [Here is some additional information on how we got started.](#)

## DANNG resources

1. [Disk imaging decision factors](#)
2. [Tool factors for assessment](#)

## Disk Imaging Decision Factors

This document was written in tandem with the [DANNG Digital Archives Technical Glossary](#). Glossary terms (and synonyms) will be bolded the first time they are introduced in this document.

- [Disclaimer](#)
- [Introduction](#)
  - [Definition of Disk Image](#)
  - [Audience](#)
  - [Assumptions](#)
- [Factor: Type or condition of the storage device](#)
- [Factor: Compatibility of the storage device or content](#)
- [Factor: Expected access to content](#)
- [Factor: Retention of important contextual information](#)
- [Factor: Processing workflow](#)
- [Appendix](#)
- [Endnotes](#)
- [Acknowledgements](#)

# FRED pilot project: Capacity building

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1. Disk imaging decision factors
2. Tool factors for assessment

## Tool Selection Factors

- [Introduction](#)
- [Factor: Documentation, support, and maintenance](#)
- [Factor: Developer, vendor, license, and cost](#)
- [Factor: Extensibility](#)
- [Factor: Inputs](#)
- [Factor: Installation requirements and processes](#)
- [Factor: Interface](#)
- [Factor: Lists compatible hardware](#)
- [Factor: Logging](#)
- [Factor: Output formats available](#)
- [Factor: Tool impacts](#)
- [Appendix A: Applying the Tool Selection Factors through narrative profiles](#)
- [Appendix B: Tool inputs as compound input sets](#)
- [Appendix C: \(Some\) tools and \(their\) purposes](#)
- [Appendix D: Log file samples](#)
- [Acknowledgements](#)

# FRED pilot project: Tool Evaluation

AutoSave 98% Copy of Functional\_Requirements\_Tools - Read-Only UNCLASSIFIED • Last Modified: 2023-11-08

File Home Insert Draw Page Layout Formulas Data Review View Automate Help

Clipboard Font Alignment Number Styles

READ-ONLY We opened this workbook read-only from the server. Edit Workbook

B9 Some tools are capable of working with a variety of media and their associated hardware (e.g., floppy drives, optical drives), and some are designed for sp

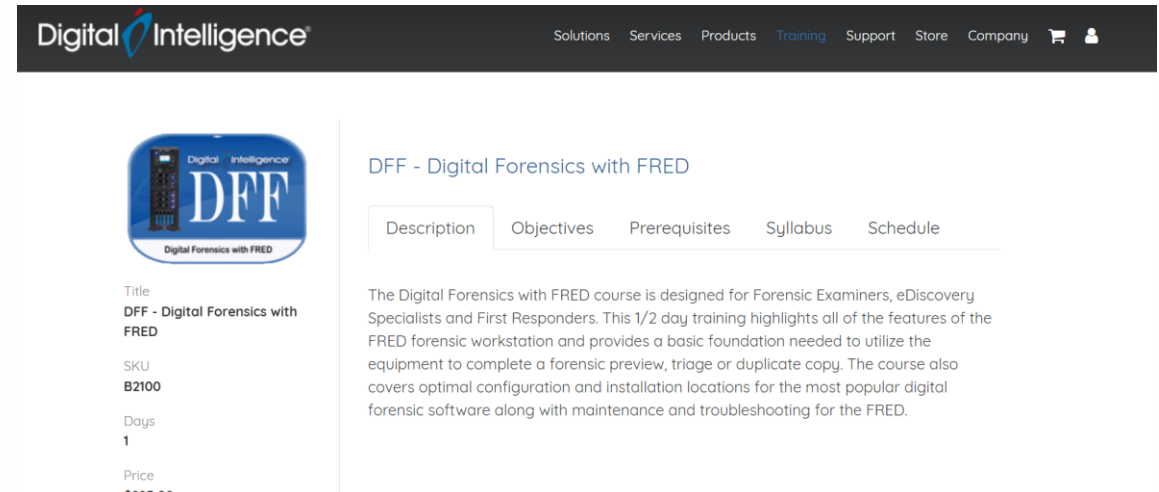
1	A	B	C
	Tool Selection Factors	Description	Questions
2	Documentation and Support	A tool might have limited documentation, meaning that if you encounter unexpected behavior, it might be difficult to troubleshoot what went wrong. Tool documentation that is updated and complete can make your work much smoother, but there are cases where an under-documented tool is the best fit for your particular workflow and needs.	How complete and up-to-date is the documentation for the tool? What is the level of support provided by the vendor? What is the user community for the tool? What level of support is required by the tool?
3	Documentation and Support: Maintenance	The level of maintenance may also factor into your decision. Some tools are no longer maintained or actively developed, which can pose problems if, for example, security issues are discovered. Unmaintained tools might not be compatible with current input standards and may not produce outputs that align with current standards.	Has the tool been recently updated and when was the last update?
4	Developer, vendor, license and cost	Understanding who develops the tool, licensing implications, and costs (subscription models, one time fees, upgrade costs, etc.).	Who develops the tool? Does it require a license and if so what are the limitations imposed by the license? What is the cost or pricing model of the tool? Does this include support or is support provided by a user community?
5	Extensibility	Whether and how you can extend the functionality of the tool. Examples include: direct modification of source code, plugin architecture, tool outputs that are interoperable and can be used directly in other tools.	Are there any options for extending or customizing the functionality of the tool?
6	Inputs	Different tools are compatible with different types of inputs. Thinking about the kinds of media and devices you're working with will help you identify the tools that may be appropriate for different use cases. Some inputs may require additional hardware (e.g., disk drives) or peripherals (e.g., cables) in order for you to use them.	Any there any inputs required for the software to function?
7	Installation requirements and processes	Installation requirements and processes are often key factors in determining whether a tool will work for your situation and whether it is worth your time or money to set it up.	What OS requirements does the tool have? Are there specific hardware that is requirement for installation? Does the tool require administrative privileges?
8	Interface	A tool's interface provides the means of interacting with and passing commands to the tool. Often abbreviated, the three types of interfaces are graphical user interface (GUI), command line interface (CLI), and application programming interface (API). Tools may have more than one interface with overlapping and/or unique functionality between interfaces. Selecting a tool with an interface that matches your skill set and objectives is critical for a successful outcome.	What type of user interface does the tool have?

Factor	Assessment
Documentation and Support	FRED is a product developed by Digital Intelligence. There is documentation that comes with the workstation (manuals), as well as online courses that the company runs. However in terms of a community to connect with for troubleshooting or guidance there does not appear to be much of one around this product. All FRED workstations include a standard 36 month warranty and lifetime technical support, which you can submit tickets for online. There are also a variety of Knowledgebase support documents on their website and various short tutorials. Our warranty has expired, but it should be noted that certain parts may have extended warranties that can be replaced for free - it is best to contact the
Documentation and Support: Maintenance	FRED was recently set up by IT at LAC. A consideration is how often it will need to be updated and if IT is available for this work (or DP might help?). A DI staff member has also recently undergone training that included basic maintenance and updating of hardware.
Developer, vendor, license and cost	The vendor is Digital Intelligence and the cost to procure the machine was roughly \$10,000 - a one time fee. As it is a piece of hardware there isn't any licensing required, but the software that it uses might have licensing restrictions. Future considerations is whether this type of machine will be implemented in our workflows and additional tools/hardware required to support this implementation at scale.
Extensibility	This is a piece of hardware and thus allows for a certain amount of different configurations. For the requirements of digital forensics, the workstation can be optimized in many different ways to provide disk imaging and transfer of data without altering the content. This can include dual-partitions for Windows & Ubuntu OS, or selecting either OS for our requirements.
Inputs	The FRED is dependent on the peripherals used to attach carriers to the workstation for data transfer. It comes with a variety of peripherals for data transfer but that does not extend to floppies (Kryoflux is the recommended legacy floppy readers for forensics). In addition the FRED comes with specialized inputs in the UltraBay that are write-blockable for devices to be attached to. Some of the peripherals also have write-blockable features.
Installation requirements and processes	The FRED requires an OS for installation - this can be either Windows or Ubuntu. It is currently set up with Ubuntu and BitCurator. The hardware does require administrative privileges to use and this has been granted to DI.
Interface	The FRED is a workstation and as such the interface depends on the various tools that are being used on the FRED. That said some knowledge of command line may be useful for working with the Ubuntu OS & BitCurator environment that is installed.

# FRED pilot project: Capacity building

## Digital Intelligence DFF – Digital Forensics with FRED course

- Overview of the FRED
- How to Operate
- Basic Maintenance
- Troubleshooting & Updating
- Hands-on demo with FTK Imager



The screenshot shows the Digital Intelligence website interface. At the top, there is a navigation bar with the company logo and links for Solutions, Services, Products, Training, Support, Store, and Company. Below the navigation bar, the main content area features a product card for the 'DFF - Digital Forensics with FRED' course. The card includes a product image, a title, SKU (B2100), duration (1 day), and price (\$105.00). To the right of the product card, there is a detailed description of the course, which is designed for Forensic Examiners, eDiscovery Specialists, and First Responders. The description highlights that the course covers the features of the FRED forensic workstation, provides a foundation for utilizing the equipment for forensic preview, triage, or duplicate copy, and also covers optimal configuration and installation locations for popular digital forensic software, along with maintenance and troubleshooting for the FRED.

Digital Intelligence Solutions Services Products Training Support Store Company

### DFF - Digital Forensics with FRED

Description Objectives Prerequisites Syllabus Schedule

Title  
DFF - Digital Forensics with FRED

SKU  
B2100

Days  
1

Price  
\$105.00

The Digital Forensics with FRED course is designed for Forensic Examiners, eDiscovery Specialists and First Responders. This 1/2 day training highlights all of the features of the FRED forensic workstation and provides a basic foundation needed to utilize the equipment to complete a forensic preview, triage or duplicate copy. The course also covers optimal configuration and installation locations for the most popular digital forensic software along with maintenance and troubleshooting for the FRED.

# FRED pilot project: initial testing

1. Iterative testing model
2. Identify physical carriers
3. Develop testing metrics and documentation
4. Troubleshooting errors
5. Envisioning and documenting/mapping how this process would fit in with our requirements

	A	B	C	D	E	F
1	Registration	Carrier #	Selection criteria	Notes: Initial reading of carrier	Extraction1: Disk imaging (Guymager)	Comments
2	Last		2 DI could not read but DP did extract the content			
3	Last		No - error - could not read during safecopy transfer or manual copy/paste. This was not sent to DP per archivist's instructions			
4	Last		9 Yes - with one error during safecopy: A:\S.wpd (Could not read from source file. [1785]). Attempted manual copy/paste which did not work either. DP could not read this file either.	Read all the files including the one that had an error for both DI & DP. Will be interesting to see if this file (S.wpd) gets copied over via the disk image (also test regular copy and paste) since it could not be copied by either myself or DP		
5	Last		22 DI had errors with this one (could not read any of the files) - DP did not	Success! The floppy reader has been plugged into the UltraBay write protector and this has read all 9 files. These were the same 9 files that were extracted by DP (however in my initial work I was not able to see or extract these files). TODO - test again on XP machine.	Selected MD5 checksums and validate during transfer. Disk image copying took 2 mins. Outputted file: E01 format and .info file format	
6	Last		32 Notes indicate faulty disk - DI could not read - did not send to DP			
7	Last		38 DI had errors with a resource fork file - DP did not.			
8	Last		41 Both DI & DP had errors extracting content - 3 errors			
9	Last		43 Both DI & DP had errors extracting content ( 1 file that could not be read - 2 Last families Adelaide 1968.jpg)			
10	Last		12 This floppy disk did not have any errors but I was using it to test the floppy disk readers. Had no luck with readers.	The disk did not show up as a mounted drive except in Guymager for disk imaging. I was able to disk image it and extract the content		
11	Manley		55 Tally indicated 627 files. Both DI and DP only extracted 374 files successfully.	First attempt to connect CD reader to UltraBay did not work (with either this CD or a non-problematic CD) - attempt to connect via one of the other FRED USB ports did work for both CDs. The disk showed up via the OS browser. The Properties is showing 374 items.	Disk imaging successfully copied over 371 files - stated 11259 bad sectors. These were replaced with zeroes.	
12	Manley		10 DI - zero luck getting files off carrier. DP some luck (120 files - flagged red by LDFR?)	OS reads the mounted CD drive - reports 267 items plus 1 'album.exe' of 1.9MB. This is already more than DI was able to read and more than DP		
13	Manley		61 DI - only 5 out of 370 files. DP - 131 files.			
14	Manley					

# A Frank Discussion about FRED

- Next steps – more testing and analysis!
- Key Challenges
  - People
    - Resourcing, changes in staff, and operational constraints.
  - Technical
    - Configuration challenges
    - Learning curve & many factors to assess
    - Troubleshooting errors in using new technology
  - Few resources in the field for this type of work
    - Digital forensics & FRED community spaces for exchange.
    - What are the resources available? Vendor, colleagues, community.

## Library and Archives Canada

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**Our website: [www.library-archives.canada.ca](http://www.library-archives.canada.ca)**

**Search our collection: [www.collectionscanada.gc.ca](http://www.collectionscanada.gc.ca)**

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TY: 613-992-6969 or 1-866-299-1699 | Fax: 613-995-6274

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