

Important Files in Discovery-1 Version 6.1

Abstract

This document gives an overview of the MetaMorph/ Discovery-1 directory structure, explains how some configuration files are automatically archived and stored on your hard drive, and describes various image and configuration files used in the Discovery-1 program. The following topics are discussed:

- ◆ The Discovery-1 Directory Structure
- ◆ Automatic Back Up of Discovery-1 Configuration Files
- ◆ Discovery-1 File Formats

Instructions

The Discovery-1 Directory Structure

The Discovery-1 application is typically installed in the MM directory on the C drive - C:\MM1. Within this directory are the files needed to run Discovery-1, including the following:

- Hardware drivers files
- Software installation files
- Executable program files
- Application extensions files
- Configuration files

There are several important directories contained within the MM file tree that cannot be moved. Specifically the app, dropins, vinput, and groups sub-directories can not be erased or moved. Other directories are used for storage - kernels, look up tables (LUTs), regions, taskbars, images, and various other files. These other directories can be moved to other locations as long as you update the default paths to these folders using the Configure Default Paths command.

The MM\app subdirectory contains files that are involved in the execution of the program. For Discovery-1, this directory is MM\app\mmproc. Contained within this directory are the key files mmproc.dll, mmproc.ini, and the drop-in folder MM\app\mmproc\dropins. These file paths must be preserved for the software to execute correctly.

The MM\vinput folder contains subdirectories with drivers and applications for the cameras and acquisition boards supported by Discovery-1.

The MM\Groups folder contains subdirectories for each group (application). Each group subdirectory contains its own configuration files for dropins (dropins.ini), default directory paths (defaults.ini), custom menu setting (custom.xml), (if used) and .CFG state files. It also contains directories for each user that

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belongs to the group (if the system is set up in multi-user mode) containing user .CFG files. .CFG files contain settings for each dropin dialog box. The last settings used for each dialog box are updated every time you exit the program. If you need to set the application back to the original default settings, delete the .CFG state files and Discovery-1 will recreate them the next time you run the software.

The second section of this document, *Automatic Back Up of Discovery-1 Configuration Files*, describes how various Discovery-1 configuration files are backed up. Although it is worth backing up the entire MM file tree, it is particularly useful to have backups of these configuration files.

The Assay Directory

One important Discovery-1 directory that does not reside in the C:\MM folder is the Assay directory. All assay journals created for the Discovery-1 software should be stored in the directory path C:\Assay. Each assay should have its own subdirectory whose name will match the name of that assay. Primary journals within the subdirectory will have the same name as the subdirectory. Journals to be run before or after the assay will have the same name with "_setup" or "_post" appended to the end of the name. For example, an assay that calculates a background image is named Calculate background image.JNL and is located in C:\Assay\Calculate background image. The journals within that directory are illustrated Figure 1:

Figure 1
Sample Assay Folder



Automatic Back-Up of Discovery-1 Configuration Files

Each time you start an experiment in Discovery-1 using the Screen Acquisition command, all of the important system files are copied to a zip file in the directory path C:\backup. These files are intentionally stored away from the main MM directory as a precaution and can be restored if needed by your Universal Imaging representative. As another precaution we suggest periodically backing up the backup files in case you have computer drive problems.

By default, the back-up files include all CFG, INI, JNL, and JTB files. For more information about these file types, refer to the next section, *Discovery-1 File Formats*. The file *Discovery-1.ini*, located in the directory path C:\MM, contains settings that control the behavior of the back-up files. The two settings that are created automatically after running your first experiment are:

```
BackupUsed=1  
BackupFile01=c:\backup\2003-Sep-24.ZIP
```

The BackupUsed=1 line tells the system to create a back-up file and the BackupFile01=c:\backup\2003-Sep-24.ZIP line specifies where to store the file. Two other settings have default values that are enabled by default but not included in the *Discovery-1.ini* file:

```
BackupList="INI,CFG,JNL,JTB"  
BackupCount=10
```

The BackupList="INI,CFG,JNL,JTB" specifies that the CFG, INI, JNL, and JTB files are backed up. The BackupCount=10 specifies that the backup folder holds a total of ten backups.

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The zip files are named by date and a new backup will be created for each day an experiment is run, up to the amount specified in the BackupCount=x line. If you run multiple experiments on the same day, the same zip file will be overwritten each time. After you reach the number of backup defined in the BackupCount=x line, the system will delete the oldest file so that there will always be ten days of backup files in the backup directory. For more information about the automatic backup procedure in Discovery-1, consult your UIC representative.

Discovery-1 File Formats

The Discovery-1 application uses several file types that contain information about your screening data - including journals, assays, and images. The following file types are discussed in this section:

- ◆ HTD - Plate configuration files
- ◆ TIFF - Tagged Image File Format files. The standard for Discovery-1 is a 16 bit TIF (over 65000 gray values possible)
- ◆ HTS - Screening Acquisition State files
- ◆ CFG - Dropins configuration files
- ◆ CAL - Objective Calibration files
- ◆ XML - Hardware settings files
- ◆ JNL - Journal files
- ◆ JTB - Journal Taskbar files
- ◆ INI - Configuration files
- ◆ Discovery-1.TXT - Optional hardware communication log file

HTD Files

All completed plates not stored directly into the database have an HTD file associated with them. HTD files are index, or "header," files that contain the plate description and plate parameters that you entered in the Screen Acquisition dialog box before running the experiment. They contain the following information:

- Description of the experiment
- What wells and sites were acquired
- What wavelengths were acquired

The file is used by the Review Screen Data command to display the images from the plate.

A sample HTD file is shown below:

```
"HTSInfoFile", Version 1.0
"Description", "Sample Acquisition"
"PlateType", 2
"XWells", 12
"YWells", 8
"WellsSelection1", TRUE, TRUE, FALSE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE,
FALSE
"WellsSelection2", TRUE, TRUE, FALSE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE,
FALSE
"WellsSelection3", TRUE, TRUE, FALSE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE,
FALSE
"Sites", TRUE
"XSites", 2
"YSites", 2
"SiteSelection1", TRUE, TRUE"SiteSelection2", TRUE, TRUE
```

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```
"Waves", TRUE
"NWavelengths", 2
"WaveName1", "DAPI"
"WaveName2", "FITC"
"EndFile"
```

Table 1 contains comments for each element of the sample HTS file:

Note: The bolded text represents the variables used by the Review Screen Data command to display the experiment.

Table 1
Sample Discovery-1 HTD File

Line	Comment
HTSInfoFile", Version 1.0	The version number of HTD file format.
"Sample Acquisition"	A description of the plate.
"PlateType", 2	The plate format (6 well = 5, 12 well = 6, 24 well = 7, 48 well = 1, 96 well = 2, 384 wells = 3, 1536 well = 4, custom = 8).
"XWells", 12	This value determines the number of columns.
"YWells", 8	This value determines the number of rows.
"WellsSelection1", TRUE, TRUE, FALSE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, FALSE	These values determine which wells/array elements were acquired. In this example the third and the last column were not acquired. In this example there would be eight lines WellsSelection1 – WellsSelection8.
"WellsSelection2", TRUE, TRUE, FALSE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, FALSE	
"WellsSelection3", TRUE, TRUE, FALSE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, FALSE	This value determines whether there are multiple sites per well.
"Sites", TRUE	This value determines whether there are multiple sites per well.
"XSites", 2	The range of X sites per well – this line is not needed if Sites = False.
"YSites", 2	The range of Y sites per well – this line is not needed if Sites = False.
"SiteSelection1", TRUE, TRUE	These values determine which sites were acquired. This line is not needed if Sites = False.
"SiteSelection2", TRUE, TRUE	These values determine which sites were acquired. This line is not needed if Sites = False.
"Waves", TRUE	This value determines whether there are multiple wavelengths used.

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"NWavelengths", 2	This should be 1 if Waves = False.
"WaveName1", "DAPI"	The name of the wavelength used.
"WaveName2", "FITC"	The name of the second wavelength used. If there is only one wavelength, this line will not exist.

TIFF and STK Files

Discovery-1 uses an extended version of the standard TIFF 6.0 format as its basic image storage type. The extended version adds approved tags used for information specific to Universal Imaging Corporation's applications.

For multi-plane Stack file images, the Discovery-1 defines a proprietary image format called the STK format. The STK format is a modified TIFF 6.0 file that is designed to hold multiple planes and the header data for these planes.

Single image files are stored as standard 16-bit TIFF files. If the preference is turned on to save using LZW compression (A loss-less form of compression) the images will be saved using LZW-TIFF format. The image files will be named using the following rules:

- The basic filename structure is: **Experimentname_wellname_snumber of site_wnumber of wavelength.TIF**.
- All well names are listed as one or two letters followed by at least two digits. For 26 rows or less, the row part of the well number is represented A-Z. If you wanted to do an experiment with more than 26 rows (a 1536 well plate or a custom plate) the naming convention would then be Aa, Ab, Ac, Ad, Ba, Bb. You can label up to 104 rows in this way. The column part of the well number is at least 2 digits (i.e. single digits are padded with leading zeros).
- If there is only 1 site per well leave out _s#.
- If there is only one wavelength leave out _w#.

For example, an image from an experiment named NFkB101200a, at well B7, at site 3, using wavelength #4 would be named:

NFkB101200a_B07_s3_w4.TIF

If there were only 1 wavelength and one site per well the image file would be named:

NFkB101200a_B07.TIF

Note: For more information on the image file formats, refer to the Discovery-1 Tech Note D10243 The Discovery-1 Software STK and TIFF File Formats.

HTS State Files

HTS State files contain saved hardware settings from the Screen Acquisition dialog box to be used when running an experiment. Acquisition settings, hardware settings, and even image window display settings are stored in this file. When loading settings from an HTS state file you are given the option to load some or all of the settings, as shown in Figure 2:

Figure 2
Load Screen Acquisition State Dialog Box



Most often you will want to load the acquisition and display settings but not the hardware settings. This is especially true if the state file comes from another system or the same system prior to any modification.

When working with the database version of the software, State files can be loaded from files on the hard drive or from the database itself. The database version of Screen Acquisition cannot save state files on the hard drive.

Universal Imaging recommends backing up your .HTS file periodically so that your settings are retained. The default location of the .HTS files varies depending on how your system administrator configured the application.

CFG files

Configuration (.CFG) files contain settings for each dropin installed on the Discovery-1 system. Every Group set-up in the Meta Imaging Series Administrator, as well as any User created in multi-user mode, will have a set of .CFG files. The .CFG files contain the last used settings for dialog boxes within each dropin. For example, the **IMA.cfg** file contains all of the settings for the Integrated Morphometry and Analysis dialog box. This includes the dialog position, measurements, classifiers, and the type of data displayed in the right hand side of the dialog. These .CFG files are saved and overwritten with the current settings every time the software is exited.

Note: You can force a save of these files without exiting the application by selecting Exit on the File menu while holding down the [Ctrl] and [Shift] keys. Saving these settings prevents loss of settings in case the system was to crash for any reason.

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MMPROC.CFG

The most important .CFG file to back up is **mmproc.cfg**. In version 6.1 the mmproc.CFG file contains the magnification and illumination settings. If this file is lost for any reason these settings will have to be recreated. Once you have configured magnification and illumination settings we suggest using the [Ctrl] + [Shift] Exit (see above) to force saving of the cfg files. The mmproc.cfg file can also be used to transfer the settings to another Discovery-1 group or user by copying the file to the appropriate directory.

CAL files

X, Y calibrations are stored in a Calibration (.CAL) file. These files contain the conversion between pixels to microns for every objective of the Discovery-1 system.

A Calibration file is created, saved or loaded using the Calibrate Distances command in the Measure menu. Calibrations should be made with binning set to 1x1 using a stage micrometer or a spatial grid. Calibrations must use units of microns or millimeters (*mms*, *millimeters*, *ums*, *microns*, or *micrometers*). The procedure for calibrating X, Y is documented in the on-line help for the Calibrate Distances dialog box.

A sample CAL file is shown below:

```
"Calibrate Distances", Version 4.5
"04x Plan Apo: z=140: p=1: a=1000", 100, 410, 1000, 87, 391, 1000, "um", 0
"10x Plan Apo: z=-20: p=2: a=300", 16, 486, 600, 11, 470, 600, "um", 0
"20x Plan Fluor: z=40: p=3: a=150", 15, 494, 300, 9, 473, 300, "um", 1
"40x Plan Fluor: z=-40: p=4: a=75", 17, 492, 150, 7, 471, 150, "um", 1
"60x Plan Fluor: z=0: p=5: a=50", 16, 491, 100, 8, 473, 100, "um", 1
```

The first line of the text file is the function name and the major and minor version numbers. Table 2 displays the format for all the other lines:

Table 2
Sample Discovery-1 CAL File

Line	
Value	Comment
"10x Plan Apo: z=-20: p=2: a=300", 16, 486, 600, 11, 470, 600, "um", 0	
"10x Plan Apo: z=-20: p=2: a=300"	Calibration Name ²
16	Region Left
486	Region Right
600	Calibrated Width
11	Region Top
470	Region Bottom
600	Calibrated Height
"um"	Calibrated Units
0	Calibration Type (0=Rectangle, 1=Line, 2=Manual Editing)

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XML Hardware Configuration Files

When system hardware is installed using the Meta Imaging Series Administrator, the following XML file is created:

C:\MM\Hardware\masterhwprofile.xml

This file contains all of the settings for the hardware on your system. Individual hardware settings are found in two subfolders under C:\MM\Hardware - Offline and Default. The Offline folder contains no hardware devices and is used for non-acquisition/analysis only systems. The Default folder contains the default settings created during installation. Other hardware settings can be created to customize the setup (for example, a hardware setting with a robot and without a robot). Each hardware setting has the following files:

- **hwprofile.xml** - The hardware information for this setting
- **Devices.ini** - The camera drivers to use for this hardware setting

Hardware Notes:

- The Screen Acquisition function will not appear in the Apps menu unless a Stage Device is installed using the Meta Imaging Series Administrator and configured using the Stage command in the Devices menu of Discovery-1. The Stage must be calibrated in units of microns or millimeters (mms, millimeters, ums, microns, or micrometers) or you will receive an error message when you attempt to acquire a plate.
- In order to use one or more Z-motors or focusing devices, they must be enabled and configured in the Meta Imaging Series Administrator. Calibration of the Z-motor(s) should be in units of microns or millimeters (mms, millimeters, ums, microns, or micrometers) or you will receive an error message.

JNL Files

JNL or journal files are a form of macro / scripting language. Discovery-1 journals are powerful tools that combine and automate commands used in the application. Journals are created and maintained using the tools in the Journal toolbar or menu. The default location of Journal (.JNL) files is C:\MM\app\mmproc\JOURNALS however to use journals as assays they must be stored in C:\Assay\Name of Assay and the journal must be named "name of assay.jnl". More information about this subject is available in the Discovery-1 User's manual and other documentation.

JTB Files

Journal Taskbar files (.JTB) contain settings associated with user-created taskbars. Taskbars are used to access frequently used groups of related journals or commands from the Discovery-1 desktop. You can mix and match journals, commands, or taskbars within the same taskbar. The default location of .JTB files is C:\MM\TASKBARS. There is no reason to edit these files directly. Instead, use the Edit Taskbar command to open, edit, and save JTB files.

INI Files

.INI files are configuration files used by Discovery-1 that contain default settings for your system. These settings include default files paths, installed dropins, acquisition devices, and other settings. .INI file are located throughout the C:\MM directory.

discovery1.TXT

The discovery1.txt file contains a log of commands sent between the Discovery-1 system and its various hardware components. Due to its size, this file is not generated by default and should only be enabled

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when requested by a Universal Imaging Corporation representative to obtain diagnostic information. The discovery1.TXT log file is enabled from the **HTS Controller** Settings dialog box in the Meta Imaging Series Administrator. When enabled, the file is saved to C:\discovery1.txt.

¹ If you have upgraded from version 5.0 to version 6.1 it is possible that the upgrade to Discovery-1 has been installed in C:\MM61 or a folder with a similar name. If this is the case, all references to C:\MM should be translated to C:\MM61.

² If the calibration file is from version 5.0 the calibration name will contain parameters that were meaningful in version 5.0 but are no longer used in version 6.1.