

Software Installation Guide

Software Installation Guide

Release 5.1.0

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Abstract

This guide is a step-by-step description of the procedures required to install DFdiscover.

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Preface

1. Getting Help

DF/Net Research, Inc.'s Technical Support Department can be contacted Monday to Friday between 9:00 am and 5:00 pm Eastern Time via any of the following methods:

55 Head Street, Suite 403
Dundas, Ontario L9H 3H8
Telephone: (905) 522-3282
Email: <support@datafax.com>
URL: www.dfnetresearch.com

2. DFdiscover Mailing List

DF/Net Research, Inc. provides an automated email mailing list for tips, help, and interaction with other DFdiscover users.

To subscribe to the mailing list, complete the simple form found at the [DFdiscover User's Group mailing list](#) webpage. It is also possible to unsubscribe from the mailing list by visiting the same webpage.

Procedure 1. To submit a message to the mailing list

1. Subscribe to the list. Message submissions are only accepted from members of the list.
2. Create your email message.
3. Send the email message to <DFUG@datafax.com>.

3. Conventions

A number of conventions have been used throughout this document.

Any freestanding sections of code are generally shown like this:

```
# this is example code  
code = code + overhead;
```

If a line starts with # or %, this character denotes the system prompt and is not typed by the user.

Text may also have several styles:

- Emphasized words are shown as follows: *emphasized words*.
- Filenames appear in the text like so: `dummy.c`.
- Code, constants, and literals in the text appear like so: `main`.
- Variable names appear in the text like so: `nBytes`.
- Text on user interface labels or menus is shown as: **Printer name**, while buttons in user interfaces are shown as **Cancel**.
- Menus and menu items are shown as: **File** > **Exit**.

Chapter 1. Introduction

Chapters [DFdiscover Software Installation](#), [DFdiscover Acceptance Test Kit \(ATK\) Installation](#) and [Installation Completion](#) are required for new and upgrade installations. Chapters [HylaFAX Configuration](#), [DFdiscover Configuration](#), and [Integration Testing](#) are required for new installations only. Implementation of [Client Desktop Packages Installation](#) will be dependent upon the packages that are included with the release. Chapter [Study Installation](#) is required only when a new study setup is available at the time of DFdiscover installation.

Execute chapters and steps in order

All chapters and steps must be executed in document order.

1.1. Software Release

DFdiscover 2018 Version 5.1.0 is a minor release of DFdiscover 2018, having a major version number of 5, minor version number of 1 (the first minor version) and patch version number of 0 (this is not a patch). It contains everything needed for a complete installation.

1.2. Installation Worksheet

The last chapter, [DFdiscover Installation Worksheet](#), is an installation worksheet that should be completed at the same time as the installation is being performed. Use of the worksheet will confirm that no steps are missed and can subsequently be used as a part of documentation for installation qualification. If a step is not relevant or not required, mark that location of the worksheet NA (or stroke through it), rather than leaving it blank.

Procedures in the body of the guide that must be recorded on the worksheet are marked with [CC##], a cross-reference symbol (XREF), where CC is an acronym for the chapter name and ## is a sequence number for the step within the chapter.

Chapter 2. DFdiscover Software Installation

This chapter ensures that the individuals responsible for DFdiscover have been identified, the materials necessary for the install are available, configures the UNIX environment of the server, and then steps through the installation of the major version.

2.1. Staffing

A successful DFdiscover installation and subsequent properly maintained DFdiscover environment requires the commitment of personnel with different skills. It is essential that these personnel be identified in advance and be trained in the relevant aspects of DFdiscover. The following is a minimal set of job functions for which personnel must be identified. On the worksheet, record the names of one or more staff that will fill each job function. It is entirely acceptable for a single individual to perform more than one of the job functions.

- **UNIX administrator [SI50]** . This job function includes maintenance of the hardware and operating system, supervision of and planning for resources such as disk storage and printers, administration of HylaFAX and modems, supervision of cron jobs, installation of application software and any updates, backup and recovery of data, and the creation of UNIX user accounts. The primary contact is the DFdiscover administrator. Typically this job requires 0.1 FTE.
- **DFdiscover administrator [SI51]** . This job function includes registration of new studies to DFdiscover, administration of user privileges within DFdiscover, starting and stopping of study databases, and monitoring of study database consistency. Typically this job requires 0.1 FTE.
- **Study setup [SI52]** . This job function is responsible for the definition of the study database to DFdiscover which minimally includes importing of the CRFs for setup, definition of variable styles and variables, specification of visit scheduling, and entry of participating centers information. This job function may also be involved in the initial creation of CRFs.
- **Programmer [SI53]** . The programmer is responsible for creating any custom logic checks (referred to as edit checks within DFdiscover) and possibly executing them in batch, creating any study-specific reports, and defining lookup or coding tables.
- **SAS specialist [SI54]** . This job function is responsible for creating **DFsas** specification files, executing them in DFdiscover, and subsequently processing the results in SAS®. This job function may also get involved in the definition of variable names, data types, and coding, and hence may liaise with the study setup job function.
- **Data entry [SI55]** . This job function performs initial (and possibly second, or double data entry) review of received CRFs, verifying the data that was read by ICR, entering data that was not read, adding Queries where necessary, and identifying and resolving duplicates when they occur.
- **Higher-level data review [SI56]** . This job function performs additional data reviews after entry. The focus is on data quality, completeness, and consistency.

2.2. Before Installation

Before beginning installation, the following steps must be completed as they gather information necessary for the install.

- Record the full company name on the worksheet [SI00].
- Record the DFdiscover software release on the worksheet [SI01].

Release numbers are of the form X.Y.Z.

Software Release

These installation instructions are for a specific DFdiscover software release only. Confirm that the software release number on the download matches the software release number at the head of this document.

- Record today's date on the worksheet [SI02].
- Determine the name of the contact person [SI03], the server hostname [SI04], and the version of operating system on the server [SI05]. The contact person, in accordance with the *DFdiscover License Agreement*, should be the DFdiscover administrator or the DFdiscover software user consultant, and will be the primary liaison between end users and DF/Net Research, Inc..
- Confirm the name of a printer that can be accessed from the DFdiscover environment [SI08].
- Confirm that www.dfnetresearch.com can be accessed for obtaining the software release, patches and other downloads [SI09].
- Confirm that the computer that will be running the DFdiscover software is able to send email externally, for example to DF/Net Research, Inc. (<support@datafax.com>) [SI57].
- Record the telephone number of an existing, paper fax machine in the vicinity of the DFdiscover installation [SI12]. This will simplify fax send and receive testing.
- If you will be using HylaFAX for fax handling, confirm that at least one of the telephone lines for incoming and outgoing DFdiscover faxes has been installed [SI10]. Record this DFdiscover telephone number [SI11] and also whether this is a direct, outward dialing line, or whether it passes through an internal PBX (what digit(s), if any, must be dialed to pass through the PBX? [SI58]).

2.3. Installation Materials

The following materials are required for installation:

- these installation notes [SI13]
- the super-user password for the server machine [SI14]
- the current DFdiscover software release [SI15]
- a copy of the current DFdiscover Release Notes [SI16]
- a copy of the Installation and Initialization chapter of the DFdiscover Acceptance Test Kit documentation [SI18]
- a DFdiscover License Renewal form (or email) [SI21] with a valid license and expiration date for the server host identifier.

Transcribe the values from the form/email to the worksheet: hostid [SI37], hostname [SI38], # of users [SI39], expiry date [SI40], features [SI42], password [SI41]

- a support username [SI22] and support password [SI23] that will grant access to the support section of www.dfnetresearch.com

If the first study setup is being supplied by DF/Net Research, Inc., the study setup [SI24] is also required.

2.4. Installation

The steps in this section require the DFdiscover software media from download and super-user privileges.

2.4.1. Migrate User Permissions

This section is skipped for a new installation or when upgrading from release 3.8 or later.

Important

The steps in this section are required for an upgrade installation from releases prior to 3.7-004 and *must be completed before re-starting DFdiscover for the first time.*

The steps in this section require super-user privileges.

The permissions structures have been extended significantly beginning with the 3.8 release and existing user and permission definitions must be migrated to these new structures. To assist with this migration, **DFuserdb**, has been included with the release.

To migrate existing user permissions to the new structures [SI60], execute:

```
# /opt/dfdiscover/bin/DFuserdb -migrate
```

The program creates `/opt/dfdiscover/lib/DFuserdb.log`, the new permissions structure, and archives the old files which are no longer needed, for example `/opt/dfdiscover/lib/DFperm`. After the program has run, an administrator should review the migrated user and role definitions via **DFadmin**. In particular, they may choose to assign more meaningful role names to those generated by **DFuserdb**. More information about **DFuserdb** can be found in [Programmer Guide, DFuserdb](#).

2.4.2. Linux Installation Instructions

DFdiscover 2018 is supported on Novell openSUSE version 13.2 and newer, Leap 42.1 and newer, SUSE Tumbleweed and Redhat Enterprise Linux up to version 7.2 or newer. DFdiscover is a 64-bit server application - it installs on the 64-bit versions of any of these Linux distributions. It will not run on 32-bit systems. Other Linux distributions may work, but are unsupported. Debian distributions such as Ubuntu will not work at this time. CentOS and Oracle Linux are clones of RHEL and will work as expected.

Procedure 2.1. Before you install DFdiscover

1. If this is a new installation, *DO NOT CREATE* a `datafax` user account or `/opt/dfdiscover` directory. These tasks are completed automatically by the installer. The installer also adds the DFdiscover executables to the system-wide path and installs DFdiscover as a **systemd** service.
2. If this is an upgrade of a DataFax server, there are several important changes that will be performed on your system. It is **HIGHLY** recommended that you have a complete backup or snapshot of your server prior to upgrading. Ensure that the `datafax` account is not in use as the installer moves `/opt/datafax` to `/opt/dfdiscover` and resets the `datafax` account home directory to the new file structure. The systemwide path to the software is automatically adjusted. Existing configuration files are automatically adjusted to match the new file structure.

Procedure 2.2. Installing DFdiscover

1. Download and save the software rpm, from www.dfnetresearch.com to a local hard drive. Log into your server as `root`.
2. If this is an upgrade, stop DataFax, and erase the current version.

- Stop DataFax as follows:

```
# DFshutdown -f
```

- On openSUSE, use **zypper** to remove `datafax` as follows:

```
# zypper remove datafax
```

- RHEL uses **yum** as follows:

```
# yum remove datafax
```

3. A complete installation will require approximately 1.7 Gb of free disk space for the software and documentation. The software will be installed into `/opt/dfdiscover`. Record the installation directory [SI32].

Execute the installation command appropriate for the operating system.

- On openSUSE, use **zypper**, which will automatically download and install any dependencies required:

```
# zypper --no-gpg-checks install dfdiscover-5.1-0.x86_64.rpm
```

- On RHEL, first install the epel-release repo (if you haven't already) as follows:

```
# yum install epel-release
```

Then install DFdiscover using **yum**:

```
# yum --nogpgcheck install dfdiscover-5.1-0.x86_64.rpm
```

4. Record that the Linux installation completed successfully on the worksheet [LX00].

2.4.3. Request and Install Server Certificate

Note

If you are upgrading from 3.8 or later and already have a valid certificate, you can skip this step.

If you have acquired a certificate from a commercial CA, you can skip this step.

The steps in this section require super-user privileges.

DFexplore and other DFdiscover client applications communicate with the DFdiscover server using TLS (Transport Layer Security, specifically TLS v1.2, in the same way that Internet banking sites do. TLS provides an encrypted path through the internet that prevents eavesdropping and modification of your data by third parties. Each DFdiscover client checks that it is communicating with the correct DFdiscover server by means of a certificate which encodes the DFdiscover server's name and ownership. This certificate is generated by choosing a very large random number (a key), adding organizational ownership information to it and then requesting that DF/Net Research, Inc. certify this key as authentic. When an **DFexplore** client connects to the DFdiscover server, it asks for this certificate and can then determine whether it is communicating with the correct server.

The process of generating a certificate starts with the execution of **DFserveradmin** which generates the random number and then prompts for required organizational information, including the country, state, organization name and server name. Once this information has been provided, an email is generated to `<certreq@datafax.com>`. containing a request to certify that this is an authentic DFdiscover server. DF/Net Research, Inc. processes this request and emails back a small file containing the certificate, which is then installed into the DFdiscover system. Once this step has been completed, DFdiscover and **DFexplore** can be used.

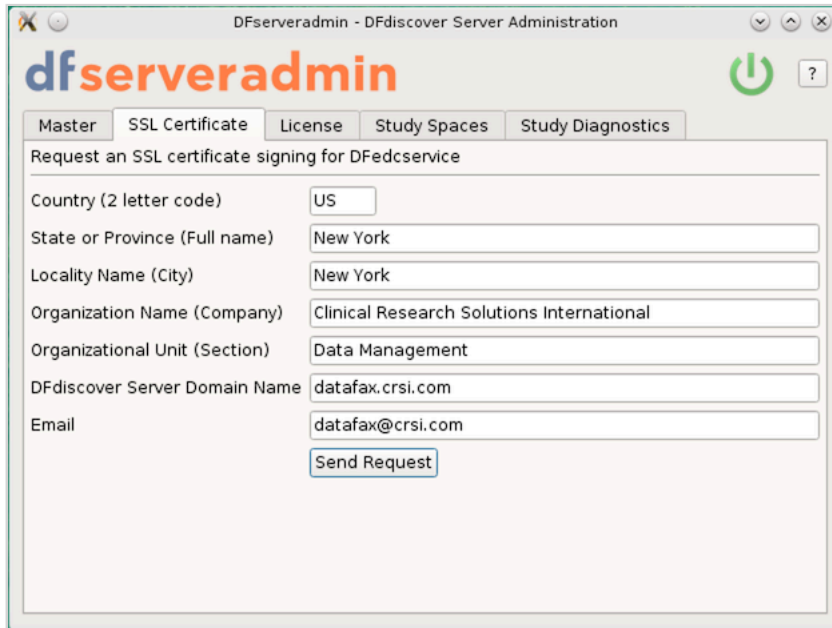
Procedure 2.3. Request Server Certificate

1. Log in as super-user.

2. Use DFserveradmin to create the certificate request [CI01]

The certificate request is created with the **DFserveradmin** program. Click [Request an SSL certificate signing for DFedcservice](#) and enter the appropriate values for each of the fields.

Figure 2.1. Typical certificate request dialog



The screenshot shows a window titled "DFserveradmin - DFdiscover Server Administration". The window has a tabbed interface with "SSL Certificate" selected. The main content area is titled "Request an SSL certificate signing for DFedcservice". It contains the following fields and values:

Country (2 letter code)	US
State or Province (Full name)	New York
Locality Name (City)	New York
Organization Name (Company)	Clinical Research Solutions International
Organizational Unit (Section)	Data Management
DFdiscover Server Domain Name	datafax.crsi.com
Email	datafax@crsi.com

A "Send Request" button is located at the bottom of the form.

Once you have entered the required data, click [Send Request](#) to submit the certificate signing request to DF/Net Research, Inc..

Outgoing email

The certificate signing request is emailed to DF/Net Research, Inc. from the machine where the **DFserveradmin** program was executed. This machine must be able to send email to the internet (in other words, outside of any corporate intranet). If that is not possible, the files `/tmp/cert.csr.txt` and `/tmp/cert.csr` can be transferred (use binary mode if doing this via ftp) to another machine and sent as attachments in an email to `<certreq@datafax.com>`.

3. Wait for the certificate

This is the end of the procedure for generating a certificate request. You can expect an email with a signed certificate within 24 hours on business days.

In the interim, it is still possible to proceed as **DFserveradmin** also generates a self-signed certificate that is valid for 10 days.

Procedure 2.4. Install Server Certificate

1. Determine install location

The server certificate must be installed in the location referenced by the `certificate` keyword in the `/opt/dfdiscover/lib/DFedcservice.cf` file. For example, this `DFedcservice.cf` file:

```
master localhost
```

```
key /opt/discover/lib/edckey.pem
certificate /opt/discover/lib/edccert.pem
documentroot /opt/discover/edcdocs
```

identifies `/opt/discover/lib/edccert.pem` as the location of the server certificate.

2. Save the signed certificate [CI02]

The signed certificate will be emailed back to the email address that was specified as the `Email Address` in the certificate request procedure. Typically it will appear as a small (~1KB) attachment named `edccert.pem`.

Save the attachment to the filename identified in the first step. If `DFcertReq` also generated a self-signed certificate, that certificate will be overwritten by this permanent, signed certificate.

This is the end of the steps necessary to request and install a server certificate.

2.4.4. Request and Install DFdiscover License

The process of requesting and installing a DFdiscover license is described in this section.

DFdiscover is licensed on an annual basis for a specified maximum number of simultaneous users working on a uniquely identified DFdiscover server. Each license is unique to the combination of server identifier, features, expiry date, and number of licensed users. If any of these values changes, the existing license becomes invalid and a new license is required. Please note that if you are upgrading an existing DataFax server you will need to request a replacement license as the old license will no longer work once DFdiscover is installed.¹

Procedure 2.5. Request DFdiscover License

1. Determine server identifier

The unique server identifier [LI01] can be determined with the `DFhostid` command, as in:

```
# /opt/dfdiscover/bin/DFhostid
SG8D-QM2L-V8TK-PFB5-DDEG
```

The output is a 20 character/digit identifier displayed in 5 blocks of 4. Note that the identifier will never contain any of 0 (zero), 1 (one), I (capital i), or O (capital o).

2. Forward server identifier to DF/Net Research, Inc.

Contact DF/Net Research, Inc. via telephone or email and provide them with this unique server identifier. Using the server identifier, and other license information including the expiry date, the number of licenses purchased, and any additional licensed features (such as web services or large study numbers), DF/Net Research, Inc. will generate a unique license. The license information will be emailed to the DFdiscover administrator.

3. Install DFdiscover License

The license will arrive in the body of an email message and have the following appearance:

```
hostid SG8D-QM2L-V8TK-PFB5-DDEG
hostname <replace_with_your_hostname>
nclients 12
expiration 20181231
```

¹ DFdiscover employs a floating license mechanism based on a unique host identifier, which requires one machine on the network to act as the central DFdiscover server. Choose a machine that is reliable (infrequently down) and is accessible by all potential DFdiscover client machines. If another server replaces the selected server in the future, a new license must be requested from DF/Net Research, Inc..

```
password          2SQG-PGVG-BVXY-87BU-YYBL
```

features DFWS,LS

Save the license [LI03] to the file `/opt/dfdiscover/work/license` (note the license will always be stored in this location, it is not customizable).

4. Update hostname in DFdiscover License [LI04]

In the installed license, the value for the `hostname` keyword must be updated. Edit the saved license and replace `<replace_with_your_hostname>` with the actual hostname of the server (this can be the fully qualified name or the nickname). Be careful to use the correct name and spell it correctly - if the hostname is inaccurate, DFdiscover will not start. Save the changes to the license file.

2.4.5. Migrate pre-2014 studies

This step is applicable **only** if you have studies that were created in pre-2014 versions of DataFAX. It must be performed by super-user.

DFdiscover requires that studies from pre-2014.0.0 DataFAX installations be migrated using the **DFmigrate** program to take advantage of new features. **DFmigrate** will determine which steps need to be taken based on the version of DFdiscover that the study is from. These changes may include moving edit checks to an `ecsrc` directory and moving the lookup tables into a `lut` directory.

Procedure 2.6. Upgrading all Studies

- To upgrade all studies on your system, as super-user run:

```
# /opt/dfdiscover/utils/DFmigrate -a
```

The following shows example output from this command:

```
*****
DFmigrate: Study 254 - /opt/studies/val254 - Thu Apr 19 15:04:33 2018
*****
Step 1: Updating DFserver.cf
-----
File Converted: /opt/studies/val254/lib/DFserver.cf
Step 2: Converting DFsetup
-----
File Converted: /opt/studies/val254/lib/DFsetup
File Converted: /opt/studies/val254/lib/DFschema
File Converted: /opt/studies/val254/lib/DFschema.stl
File Converted: /opt/studies/val254/lib/DFtips

Step 3: Moving Lookup Tables to lut directory
-----
Following lookup table files moved from study's lib to lut dir:
aecodes.lut
drugs.lut
investigators.lut

Step 4: Moving Edit Checks code to ecsrc directory
-----
DFedits already exist in ecsrc directory.
```

```
Step 5: Converting postscript to png and old tiffs to png
-----
WARNING: PNG files already exist for plates: 1-11, 20.

Study migration was successful.

~~~~~
DONE:
Migration has been performed on the following study: 254
Please review dfmigrate_errors for any migration errors
or warnings and/or manual steps that may be required.
~~~~~
#
```

In some cases (as in the example above), the background images used by **DFprintdb** will not be automatically converted. If you use **DFprintdb** and get a conversion error, you will need to re-import the backgrounds from the original PostScript® or PDF file using **DFsetup**.

Record that the pre-2014 studies migration completed successfully on the worksheet [\[MG00\]](#).

2.5. Installation Completed

Congratulations! You have installed DFdiscover on your system. There are additional steps to be followed to ensure that your DFdiscover system is up-to-date and also to configure the various components. These are outlined in the following chapters.

3.1. HylaFAX Configuration

This chapter covers the configuration of HylaFAX for sending and receiving faxes. If your installation will be using Protus (MyFax) you can skip this section.

Upgrade installation

These steps are required for a new installation only. If this is an upgrade install, execute

```
# /etc/init.d/hylafax start
```

then skip to [DFdiscover Configuration](#).

3.2. Preparatory Steps

This section initializes the available modems for use with HylaFAX.

3.3. Modem Definition

1. Identify Serial Ports

Determine which serial port(s) the fax modems will be connected to. You can configure HylaFAX to run on as many serial ports as are available and have fax modems for. A standard two-port machine uses the port names `/dev/term/a` and `/dev/term/b`. Record the names on the worksheet [\[HC03\]](#).

2. Disable Port Services [\[HC04\]](#)

To prevent contention between the operating system's port services and HylaFAX, disable port services on the ports selected for use with HylaFAX. This can be easily accomplished using **smc**. For each selected port, disable the port service by ensuring that the toggle next to **Service Enable** is cleared.

3.4. HylaFAX Configuration

HylaFAX is configured with the **faxsetup** program. This program can be found in the `/opt/hylafax/bin` directory.

Procedure 3.1. faxsetup and faxaddmodem

1. Execute faxsetup [\[HC05\]](#)

Start **faxsetup** from a shell prompt:

```
# /opt/hylafax/sbin/faxsetup
```

The program leads you through the steps of initializing the HylaFAX environment. It is described completely in the HylaFAX document, [Server Setup and Basic Configuration](#).

Note

Messages from **faxsetup** indicating that `/bin/vgetty` or `/bin/egetty` do not exist can be safely ignored.

Except for the items in the following list, all of the defaults are correct and need only be acknowledged by pressing `Enter` at each prompt. The defaults that may need to be changed are:

- `FaxMaster`: the value must be `datafax` in installations where DFdiscover and HylaFAX co-exist on the same server (typical); otherwise, `datafax@machine` where `machine` is the hostname of the DFdiscover server.
- `Country Code`: in North America, enter 1; elsewhere, enter the local country code
- `Area Code`: the value must be the local area code

When `faxsetup` completes, it asks to configure modems. Respond `y` to invoke `faxaddmodem` automatically.

2. Execute `faxaddmodem` [HC06]

`faxaddmodem` is invoked automatically by the termination step of `faxsetup`, or it can be invoked manually with the command:

```
# /opt/hylafax/sbin/faxaddmodem
```

a. Specify device name

`faxaddmodem` requires the device name of the serial port to configure and asks for this information when the program starts. The device name in the response is the same as the real device name, without the leading `/dev/`.

Example 3.1. Device name for `faxaddmodem`

For the system device named `/dev/term/a` supply the name `term/a` as the requested name. Similarly, `/dev/tty0p0` becomes `tty0p0`.

b. Accept defaults

The program is well described in the *Server Setup and Basic Configuration* document.

Again, most of the default options for the `faxaddmodem` program are correct.

c. Customize area code, fax number, and sender id

You will need to specify the area code, fax number, and sender identification string. Typically, the fax number and sender identification string are the same. Be careful not to use non-digit symbols in the sender id as some receiving machines will not like it. The recommended settings, for example, might be:

```
Area code [""]? 905
Phone number of fax modem [+1.999.555.1212]? +1.905.555.1212
Local id string (for TSI/SIG) ["DFdiscover"]? "1 905 555 1212"
```

d. Ensure modem is correctly cabled and powered on

After confirming the server configuration parameters, `faxaddmodem` will attempt to communicate with the modem and then prompt for more configuration parameters. The modem must be cabled to the serial port and powered on at this point. The program determines an appropriate speed to converse with the modem and then interrogates it further. You can safely ignore the

```
hmmm, your modem seems to be hung
```

message.

e. **Optional configuration for dial-prefix and adaptive answer**

Finally, the modem configuration parameters are presented for confirmation. To specify a dial-prefix for outgoing calls, such as 9, and/or to disable adaptive answer, respond **no** to the confirmation.

To indicate that a dial-prefix is required for outgoing calls, the following setting must be changed:

```
Command for dialing [ATDT%s]? ATDT9,%s
```

and to disable adaptive answer, the next setting must also be changed [\[HC07\]](#):

```
Command for setting up adaptive-answer [AT+FAA=1]? AT+FAA=0
```

For all of the other settings, the default is fine.

f. **Repeat for next modem**

As necessary, repeat **faxaddmodem** for each additional modem.

After all of the modems have been defined using **faxaddmodem**, `inittab` entries must be made to spawn processes that monitor the modems.

Procedure 3.2. Create `inittab` entry for each serial port

1. **Edit `/etc/inittab`**

Use your favorite text editor to edit this file. The new entries will be added at the end of the file.

2. **Add entry for each serial port**

For each modem that was defined with **faxaddmodem**, a record must be added. The format of each record is:

```
fx0:234:respawn:/opt/hylafax/lib/fax/faxgetty tty0p0
```

The first column can contain any unique identifier string that is **at most three characters in length** and it must be different for each modem, e.g. `fx0`, `fx1`, `fx2`, etc. The argument to the last field of the record must be the same name of the device that was used when **faxaddmodem** was run.

Example 3.2. `inittab` entry for serial port `/dev/term/a`

```
fx1:234:respawn:/opt/hylafax/lib/fax/faxgetty term/a
```

3. **Save file**

Save the changes made to `/etc/inittab` and exit the editor [\[HC08\]](#).

4. **Restart the system `init` process**

This process always has the process id of 1 and it is most easily restarted with the command:

```
# kill -1 1
```

The configuration of HylaFAX is complete.

3.5. Starting HylaFAX

The DFdiscover software installation includes a script that gracefully starts HylaFAX after the computer is booted, and conversely, gracefully halts HylaFAX before the computer is halted.

The script can be found in `/opt/dfdiscover/init.d/hylafax`. So that the script is available to the system when it boots or halts, it must be installed in a known system location.

1. To install the HylaFAX startup script; [HC09]

```
# cp /opt/dfdiscover/init.d/hylafax /etc/init.d/hylafax
# ln -s /etc/init.d/hylafax /etc/rc3.d/S99hylafax
# ln -s /etc/init.d/hylafax /etc/rc1.d/K20hylafax
```

2. With the script in place, start HylaFAX [HC10]

```
# /etc/init.d/hylafax stop
# /etc/init.d/hylafax start
```

3.6. Confirm HylaFAX status

At this point, HylaFAX should be running and its status can be examined with the `faxstat` command. Type:

```
# /opt/hylafax/bin/faxstat -a
```

The output from the command will show the HylaFAX scheduler executing followed by one record for each defined modem [HC11].

Example 3.3. Output from faxstat for a system with a single modem

```
# /opt/hylafax/bin/faxstat -a
HylaFAX scheduler on purgatory: Running
Modem term/a (+1.905.555.1212): Running and idle
```

3.7. Periodic Maintenance

HylaFAX generates a significant amount of log information that can be useful debugging information should the need arise. The log information also records per fax details such as sender identification, duration of call, number of pages, and quality of transmission. This log information needs to be managed intelligently. HylaFAX provides two periodic maintenance scripts, `faxqclean` and `faxcron` that serve this purpose.

`faxqclean` should be configured to run once per day [HC12] while `faxcron` should run once per week [HC13]. The simplest way to achieve this is with the UNIX `cron` facility. The `cron` entries, for super-user, should look like:

```
0 1 * * * /opt/hylafax/sbin/faxqclean
0 2 * * 1 sh /opt/hylafax/sbin/faxcron | mail root
```

As super-user, add the **cron** entries.

For additional information, review [General Tweaking and Customization Hints](#).

Chapter 4. DFdiscover Configuration

Upgrade installation

These steps are required for a new installation only. If this is an upgrade install, execute

```
# systemctl start dfdiscover.service
```

to restart DFdiscover. Then complete [Define DFdiscover capable printer](#) and skip to [Study Installation](#).

This chapter completes the configuration of DFdiscover. After completing these steps, DFdiscover will be operational.

4.1. Define DFdiscover capable printer

DFdiscover is able to print to printers that are either local to the server or networked. The printers must already be configured and named on the DFdiscover server, which is typically a UNIX administration issue. Given the set of printer names which are known to the system, that complete set, or a subset thereof, needs to be configured in DFdiscover. This is done by creating the file `/opt/dfdiscover/lib/DFprinters`.

Procedure 4.1. Define DFdiscover printers

1. **Edit, or create, `/opt/dfdiscover/lib/DFprinters`**

Use your favorite editor to edit this file.

2. **Add default printer name first**

Of all of the printers that have been identified as being DFdiscover capable, identify the one that will be the default, and add that printer name as the first line of the file. The order that the names appear in the file dictates the order in which they are displayed in any DFdiscover print dialog.

3. **Add additional printers, if any**

Each additional printer name should be added, one per line, following the default printer name.

4. **Save file**

Save the changes made to `/opt/dfdiscover/lib/DFprinters` and exit the editor [\[DF10\]](#).

4.2. Start DFdiscover

It's time to start the DFdiscover services [\[DF12\]](#). Before doing so confirm that a valid DFdiscover license is installed in `/opt/dfdiscover/work/license`.

To start the DFdiscover services, type:

```
% /opt/dfdiscover/bin/DFbootstrap
```

The output will be similar to the following:

```
DFmaster.rpcd: your software license expires in 365 days
1. Checking state of incoming daemons...
```

```

2. Checking /opt/dfdiscover/work/.dfincoming_work...
   0 stale incoming entries obsoleted

3. Checking /opt/dfdiscover/incoming...
   0 faxes awaiting processing.
DFmaster.rpcd: started.
Done.

```

The DFdiscover services have now been started - continue with the next section. If an error prevents the DFdiscover services from starting, it is essential to fix the problem before continuing - the steps in the remaining sections will fail.

The remaining steps in this chapter must be executed by user `datafax`. Exit the super-user shell and become user `datafax`.

4.3. (Re-)configure DFdiscover Master

Start the DFdiscover system administration application with the command:

```
% DFadmin
```

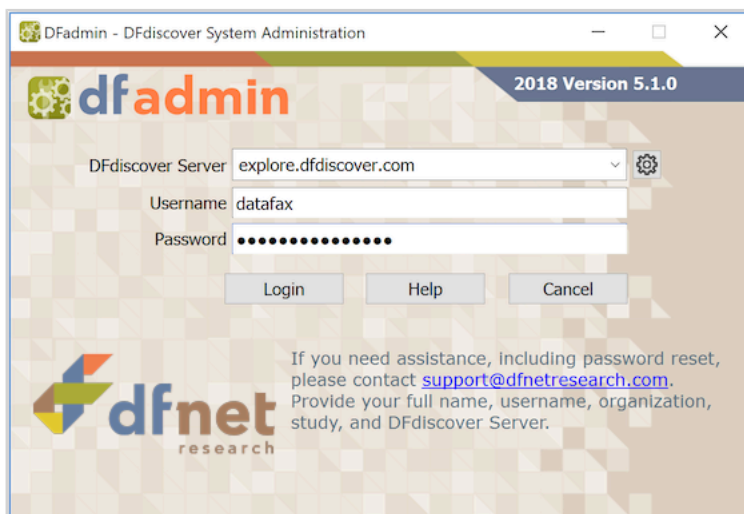
The system administration application is used to configure the DFdiscover master process.

Procedure 4.2. Configure DFdiscover Master [DF06]

1. Login to the DFdiscover administration application

If this is the first time that the administration application is used, enter the nickname or fully qualified name for the licensed DFdiscover server in the **Server** field. The **Login Name** is `datafax` and the **Password** is `passwd` (this is a one-time password that must immediately be changed after authentication). Click **Login**.

Figure 4.1. Typical login dialog appearance



2. Click **master** to display the **Master** dialog

A complete description of the dialog and the meaning of the individual fields can be found in *DFadmin System Administrator Guide*, *DFadmin - Master* *DFadmin - Master*. Complete the fields as follows.

a. **Bootstrap Slave Hosts**

The default value for this field is the hostname of the DFdiscover server. If the default is not filled in, enter the hostname. Multiple hostnames (comma-delimited) are only required when multiple DFdiscover servers are available.

b. **Default Printer**

The value of this field is the name of a local printer. Typically, this should be the same default printer defined in [\[DF10\]](#).

Study-specific printers are defined at study creation time.

3. **Select File > Save to save the changes**

The values specified in the dialog are saved.

4.4. Configure Incoming and Outgoing Processes

Incoming and outgoing fax processing is handled by third-party software: DFdiscover can work with either HylaFAX or the Protus fax service. DFdiscover communicates with the fax software or service by means of inbound and outbound processes that are configured using **DFadmin**.

At this point configure an incoming daemon [\[DF08\]](#) and configure an outgoing daemon [\[DF09\]](#). A complete description of the configuration process can be found in *DFadmin System Administrator Guide, DFadmin - Traffic* [DFadmin - Traffic](#).

4.5. Configuration Complete

DFdiscover configuration is now complete. Take this opportunity to update the worksheet. The next chapter describes several optional integration tests that should be completed to demonstrate that the installation is operating in the expected manner.

Chapter 5. Integration Testing

The integration tests described in this chapter are recommended but not required. Their purpose is to demonstrate that incoming and outgoing faxing is operational, and that printing is correctly defined.

5.1. Receiving Faxes

The purpose of this test is to demonstrate that an incoming fax can be received by DFdiscover, that it is properly archived, and that it can be viewed in DFexplore.

Procedure 5.1. To demonstrate incoming fax operation

1. Fax a non-DFdiscover page from a plain paper machine

The purpose of this test is not to demonstrate that a CRF can be recognized as a study CRF, and so a simple cover page of any type is preferred. Fax the page from a traditional fax machine to the number that DFdiscover will receive faxes on [IN01].

2. Monitor the fax modem status lights (HylaFAX only)

During fax reception, various lights on the modem will flash or be illuminated. On Multitech modems the OH (off-hook) light will be on during the fax reception and the RD (receive data) light will be flashing indicating that information is being received from the sending fax machine. When transmission is complete some of these lights will go out.

3. Confirm fax archival

Within 30 seconds (5 minutes for Protus fax service users) of the end of transmission, DFdiscover will create a new directory under the directory previously defined as the **Archive Directory** by [Configure Incoming and Outgoing Processes](#). The directory name is 4-digits where the first two digits are the year within the century and the last two digits are the week within the year. The contents of the directory will be a single file with a 4-digit name, generally 0001. Confirm that the directory and file are present [IN02].

Example 5.1. Confirmation of fax archival

In this case, the first fax was received on November 14, 2015 (the 46th week of 15). The archive directory was defined as `/opt/dfdiscover/archive`.

```
% cd /opt/dfdiscover/archive
% ls
1546
% cd 1546
% ls
0001
```

4. View the fax in DFexplore

Fax pages that are not barcoded as DFdiscover CRFs will be routed to a holding directory for subsequent manual identification.

Start DFexplore with the command:

```
% /opt/dfdiscover/bin/DFexplore
```

Authentication is required. Then click `Image Router` and confirm that the faxed page or pages are present [\[IN03\]](#).

5. Print the page from DFExplore

Choose `Print` from the `Page` menu. In the Print dialog, select the Printer to which you want to print the page and choose `Print` to print the current page.

Confirm that the fax page prints successfully [\[IN04\]](#).

Completion of this section demonstrates that DFdiscover is able to receive faxes and process them.

5.2. Printing from DFdiscover

The purpose of this test is to demonstrate that the previous editing done in [Define DFdiscover capable printer](#) was successful.

Procedure 5.2. Print a plain text file

1. Identify a plain text file

Any text file will work for this test. The file should not be too large - the purpose of the test is to print a text file, not print hundreds of pages of text. A good default file is `/etc/passwd`.

2. Print the file

From a shell prompt, issue the command:

```
% /opt/dfdiscover/lib/DFprint_filter /etc/passwd
```

possibly substituting `/etc/passwd` with the name of the file that you chose to print.

3. Confirm that the text file printed properly [\[IN05\]](#).

5.3. Faxing from DFdiscover

The purpose of this test is to demonstrate proper operation of the previously defined outgoing daemon.

This test will require the fax number of a local paper fax machine to be used as the fax destination.

Procedure 5.3. Fax a plain text file

1. Identify a plain text file

Any text file will work for this test. The file should not be too large - the purpose of the test is to fax a text file, not fax hundreds of pages of text. A good default file is `/etc/passwd`.

2. Fax the file

From a shell prompt, issue the command:

```
% DFsendfax /etc/passwd faxnumber
```

where `faxnumber` is the fax number of the local paper fax machine.

Depending upon the **Polling Interval** previously specified in the outgoing daemon configuration, it may take up to 60 seconds for DFdiscover to pass the queued fax to HylaFAX or the Protus fax service.

3. Confirm that the fax was sent successfully

Wait for a few minutes and confirm that the sent fax has arrived at the destination [\[IN06\]](#).

Chapter 6. Study Installation

This chapter is optional, and generally will not be executed at the time of DFdiscover installation.

The study installation steps described in this chapter will only apply to DFdiscover installations where a new study is ready to be installed at the same time.

6.1. A DFdiscover study

To DFdiscover, a study definition comprises a parent directory and several sub-directories that hold study specific configuration information. As a result of this structure, a study definition can be easily transported by moving the parent directory to a new location. Everything that is needed by the study is contained within that parent directory.

6.2. Installing the study

Become super-user

The steps in this section must be executed by super-user.

Studies that are created by DF/Net Research, Inc. are typically distributed via download link, as a UNIX **tar** file. The procedure described here assumes this structure. Studies that are transported from other vendors or from affiliates within a company may be structured differently. This procedure may need to be modified to fit those specific conventions.

Procedure 6.1. Study Installation

1. Pre-requisite: Create a parent directory for all studies

Generally, (but this is not a requirement) all DFdiscover studies exist under a common parent directory on the DFdiscover server. This directory is typically `/opt/studies`. Create the parent directory, if necessary [\[SS01\]](#):

```
# mkdir -p /opt/studies
```

and update the ownership of the directory so that it is owned by `datafax` and group `studies`:

```
# chown -R datafax /opt/studies
# chgrp -R studies /opt/studies
```

2. Obtain the study tar image

The remaining steps assume that the study tar image is available as `/tmp/study.tar` [\[SS02\]](#).

3. Create a study folder and extract the contents of the tar image

A study setup from DF/Net Research, Inc. will be rooted at the study directory and is easily extracted with **tar**. Create the study folder and extract the tar image contents with commands similar to this [\[SS03\]](#):

```
# cd /opt/studies
# mkdir newstudy
# cd newstudy
# tar xpf /tmp/study.tar
```

Example 6.1. Extracting study proto123

```
# cd /opt/studies
# mkdir proto123
# cd proto123
# pwd
/opt/studies/proto123
# tar xpf /tmp/study.tar
bkgd/...
bkgd/...
...
#
```

4. Update the file permissions and ownership of the extracted study

The owner and group permissions of the extracted study must be updated to reflect the ids for user `datafax` and group `studies` present on the installed system. Update the permissions with the **chown** and **chgrp** commands [SS04].

Example 6.2. Updating ownership and permissions

```
# cd /opt/studies
# chown -R datafax proto123
# chgrp -R studies proto123
```

5. Register the study to DFdiscover

The local DFdiscover installation must now be made aware of the new study. This is accomplished by registering a new study with DFdiscover as described in *DFadmin System Administrator Guide, StudyAddingAdding a New Study* [SS05].

Chapter 7. DFdiscover Acceptance Test Kit (ATK) Installation

Performance of the procedure in this chapter is not required for the installation, but is highly recommended.

The DFdiscover Acceptance Test Kit is an important part of installation qualification. It allows the end-user to demonstrate that DFdiscover works in a manner that is in accordance with a known set of results.

The installation materials include a printed copy of the Installation and Initialization chapter of the DFdiscover Acceptance Test Kit documentation. These instructions represent the first of seventeen modules in the ATK, and are required for initialization [\[AT01\]](#). A complete description of the remaining modules in the ATK is available after successful completion of the first module. In general, completion of all seventeen modules of the ATK requires one 8-hour day [\[AT02\]](#).

Chapter 8. Client Desktop Packages Installation

DFdiscover includes a number of tools which are available for Windows 8/10 and OS X v10.11 or later. These can be obtained from www.dfnetresearch.com.

The current Windows 8/10 packages are:

- `DFdiscover_5_1_0.msi`, containing **DFexplore**, **DFsetup**, **DFadmin**, **DFbarcode**, **DFATK** and several command-line tools.
- `DFexplore_5_1_0.msi`, containing only **DFexplore**.
- `DFsend_5_1_0.msi`, containing only **DFsend**.

The current OS X v10.11 or later packages are:

- `DFdiscover5.1.0.pkg`, containing **DFexplore**, **DFsetup**, **DFadmin**, **DFbarcode**, **DFATK** and several command-line tools.
- `DFexplore5.1.0.pkg`, containing only **DFexplore**.
- `DFsend5.1.0.pkg`, containing only **DFsend**.

8.1. Windows client packages installation [PK01]

8.1.1. Requirements

Installation and proper operation of the Windows client tools requires Windows 8/10.

8.1.2. Installation

The Windows client tools are distributed as Windows `msi` installer files.

1. Locate the desired client package `msi`

The file can be found on www.dfnetresearch.com in [software releases support website](#).

2. Install from the desired client package

Double-click the desired client package file. Installation begins automatically and behaves similar to other Windows setup programs. The installer will add icons to the Desktop as well as entries in the **Start Programs** menu.

Note

Installation must be performed on the local drive of each Windows machine that is to run the client tools.

8.2. DFdiscover barcoding plug-in for FrameMaker® installation [PK02]

8.2.1. Requirements

Installation and proper operation of the DFdiscover Barcode plug-in requires:

1. FrameMaker 10 or greater,
2. Windows 8/10

8.2.2. Installation

Note

Installation must be performed on the local drive of each machine that is running FrameMaker®, or on the shared drive if FrameMaker® was installed on a shared drive.

The plug-in is distributed as `barcodet.dll`, a Windows DLL. The file can be found on www.dfnetresearch.com in [software releases support website](#).

The DLL must be copied to the `fminit` directory below the FrameMaker® product installation directory. Use the same name for the copied file. For example:

```
C:\copy "barcodet.dll" "C:\Program Files\Adobe\Framemaker\fminit\barcodet.dll"
```

8.2.3. FrameMaker® Configuration

The FrameMaker® installation directory, typically `C:\Program Files\Adobe\Framemaker` or `C:\Users\username\AppData\Roaming\Adobe\Framemaker\13\` (where 13 is the version number), contains a `product.ini` file, typically `maker.ini` or `imaker.ini` or `fmsgml.ini`, depending upon the FrameMaker® version. The `[APIClients]` section of this file lists the clients to load when FrameMaker® starts. Each client description is on a separate line and cannot contain line breaks. A default FrameMaker® installation will already have an `[APIClients]` section that ends with:

```
Mailer=Standard, Send Mail API Client, fminit\mailer.dll  
WordCount=DocReport,Count the number of words in the document, fminit\wordcnt.dll  
BookUtils=Standard, Book Utilities, fminit\bookutils.dll
```

Edit the `maker.ini` file with a text editor, locate the `[APIClients]` section of the file, and add the following text on a new line at the end of the section:

```
DFdiscover=Standard, DFdiscover Barcode Tool, fminit\barcodet.dll, all
```

Save and exit the `maker.ini` file. Configuration is complete.

This procedure needs to be repeated on each computer that will use FrameMaker® to create CRFs for DFdiscover studies.

Chapter 9. Installation Completion

The installation and configuration of DFdiscover is now complete.

Procedure 9.1. There are a few important items that are worth repeating

1. **Collect together all installation materials and store them in a safe place [CL01]**

If necessary, consult [Installation Materials](#) for the complete list.

2. **Were all required items completed without error [CL02]?**

If there are outstanding items that need input from DF/Net Research, Inc., see [Getting Help](#).

3. **Subscribe to the DFdiscover mailing list [CL03]**

To review the instructions on how to complete this step, see [DFdiscover Mailing List](#).

4. **Sign the completed worksheet [CL04]**

The worksheet is an important piece of documentation. Sign it and store it a safe location for future reference.

Finally, thank you for choosing DFdiscover and DF/Net Research, Inc.!

Chapter 10. DFdiscover Installation Worksheet

Use this worksheet as a permanent record of the installation's progress. When completed, sign and date this worksheet and store it together with any other installation qualification (IQ) materials.

Most of the entries in the worksheet require only a checkmark indicating that the step was completed. Some entries require the value of a parameter to be recorded. It is important to record these parameter values as they are assigned because in some cases they are referenced by subsequent steps.

10.1. DFdiscover Software Installation

10.1.1. Staffing

XREF	Parameter	Value
[SI50]	UNIX administrator	
[SI51]	DFdiscover administrator	
[SI52]	Study setup	
[SI53]	Programmer	
[SI54]	SAS specialist	
[SI55]	Data entry	
[SI56]	Higher-level data review	

10.1.2. Before Installation

XREF	Parameter	Value
[SI00]	Company Name	
[SI01]	DFdiscover software release	5.1.0
[SI02]	Date	
[SI03]	Contact Person	
[SI04]	Server Hostname	
[SI05]	Server Operating System	

XREF	Description	Completed?
[SI08]	the name of a printer that can be accessed from the DFdiscover environment	
[SI09]	www.dfnetresearch.com can be accessed	
[SI57]	send email externally, for example to DF/Net Research, Inc. (<support@datafax.com>)	
[SI12]	telephone number of an existing, paper fax machine	

Cross the following section out if your installation will not be using HylaFAX to send and receive faxes.

XREF	Parameter	Value
[SI10]	at least one of the telephone lines for incoming and outgoing DFdiscover faxes has been installed	
[SI11]	DFdiscover telephone number	
[SI58]	digit(s), if any, must be dialed to pass through the PBX?	

10.1.3. Installation Materials

XREF	Parameter	Value
[SI13]	installation notes	
[SI14]	super-user password	
[SI15]	current DFdiscover software release	
[SI16]	current DFdiscover Release Notes	
[SI18]	Installation and Initialization chapter of the DFdiscover Acceptance Test Kit documentation	
[SI21]	DFdiscover License Renewal form	

XREF	Parameter	Value
[SI37]	hostid	
[SI38]	hostname	
[SI39]	# of users	
[SI40]	expiry date	
[SI42]	features	
[SI41]	password	
[SI22]	support username	
[SI23]	support password	

XREF	Description	Completed?
[SI24]	study setup	

10.1.4. Installation for Linux Systems

XREF	Parameter	Value
[SI32]	installation directory	
[LX00]	Linux installation completed successfully	

10.1.5. Migrate User Permissions (upgrade install, from versions older than 3.8, only)

If you are not upgrading from a version older than 3.8, cross out this section.

XREF	Description	Completed?
[SI60]	migrate existing user permissions to the new structures	

10.1.6. Request and Install Server Certificate

XREF	Description	Completed?
[CI01]	Use <code>DFserveradmin</code> to create the certificate request	
[CI02]	Save the signed certificate	

10.1.7. Request and Install DFdiscover License

XREF	Parameter	Value
[LI01]	server identifier	
[LI03]	Save the license	
[LI04]	Update hostname in DFdiscover License	

10.1.8. Migration of pre-2014 studies

If you do not have any pre-2014 studies to migrate, cross out this section.

XREF	Parameter	Value
[MG00]	pre-2014 studies migration completed successfully	

10.2. HylaFAX Configuration

If you are not using HylaFAX for fax transmissions, cross out these sections.

10.2.1. Preparatory Steps

XREF	Parameter	Value
[HC03]	Identify Serial Ports	

XREF	Description	Completed?
[HC04]	Disable Port Services	

10.2.2. HylaFAX Configuration

XREF	Description	Completed?
[HC05]	Execute <code>faxsetup</code>	
[HC06]	Execute <code>faxaddmodem</code>	
[HC07]	disable adaptive answer	

XREF	Description	Completed?
[HC08]	Create inittab entry	

10.2.3. Starting HylaFAX

XREF	Description	Completed?
[HC09]	install the HylaFAX startup script	
[HC10]	start HylaFAX	

10.2.4. Confirm HylaFAX status

XREF	Description	Completed?
[HC11]	HylaFAX scheduler executing followed by one record for each defined modem	

10.2.5. Periodic Maintenance

XREF	Description	Completed?
[HC12]	<code>faxqclean</code> should be configured to run once per day	
[HC13]	<code>faxcron</code> should run once per week	

10.3. DFdiscover Configuration

XREF	Description	Completed?
[DF10]	Define DFdiscover printers	

10.4. Start DFdiscover

XREF	Description	Completed?
[DF12]	start the DFdiscover services	

10.5. (Re-)configure DFdiscover Master

XREF	Description	Completed?
[DF06]	Configure DFdiscover Master	

10.6. Configure Incoming and Outgoing Daemons

XREF	Description	Completed?
[DF08]	configure an incoming daemon	

XREF	Description	Completed?
[DF09]	configure an outgoing daemon	

10.7. Integration Testing

10.7.1. Receiving Faxes

XREF	Description	Completed?
[IN01]	Fax a non-DFdiscover page	
[IN02]	Confirm fax archival	
[IN03]	View the fax in DFexplore	
[IN04]	Print the page from DFexplore	

10.7.2. Printing from DFdiscover

XREF	Description	Completed?
[IN05]	Print a plain text file	

10.7.3. Faxing from DFdiscover

XREF	Description	Completed?
[IN06]	Fax a plain text file	

10.8. Study Installation

10.8.1. Installing the study

XREF	Description	Completed?
[SS01]	Create a parent directory for all studies	
[SS02]	Obtain the study tar image	
[SS03]	Create a study folder and extract the contents of the tar image	
[SS04]	Update the file permissions and ownership	
[SS05]	Register the study to DFdiscover	

10.9. DFdiscover Acceptance Test Kit (ATK) Installation

XREF	Description	Completed?
[AT01]	the first of seventeen modules	
[AT02]	completion of all seventeen modules	

10.10. Client Desktop Package Installation

XREF	Description	Completed?
[PK01]	Windows client packages	
[PK02]	DFdiscover barcoding plug-in for FrameMaker®	

10.11. Installation Completion

XREF	Description	Completed?
[CL01]	Collect together all installation materials	
[CL02]	all required items completed without error	
[CL03]	Subscribe to the DFdiscover mailing list	
[CL04]	Sign the completed worksheet	

10.12. Completion Sign-off

Vendor representative.

Name:	
Title:	
Signature:	
Date:	

Client representative.

Name:	
Title:	
Signature:	
Date:	

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A.1.16. c3.js

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A.1.17. d3.js

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