

How to print FMS's on a DICOM printer with Trophy DICOM

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1. OVERVIEW

The purpose of this document is to provide guidelines to the practitioners wishing to print their FMS examinations on a DICOM printer.

1.1 FMS

1.1.1 What is an FMS ?

The full mouth series (FMS) is a means for organizing various X-ray images associated to a patient at a point in time. The manner in which a dentist chooses to organize these images depends on the education, needs, or specialty of a particular provider. The full mouth series is used in both film and digital applications. Full mouth series mounts for film rely on a holder for developed x-ray images. The holder has various “windows” cut out to enable the user to mount each film in a specific place and view a series of films together. Digital images are arranged in the same manner, the only difference being digital images are “mounted” within a software application and viewed on a computer monitor.

An FMS generally includes 18 images. They are comprised of 14 periapical images and 4 bitewings. Each tooth is seen in multiple films. This redundancy provides the dentist information they would not have with only one image for each tooth. This is due to the fact that each image is shot at a slightly different angle thereby exposing different aspects of each tooth. An FMS is generally taken on a patient when they first see a dentist and then every 3-7 years after that depending on the period chosen by the practitioner or the patient.



1.2 DIS

1.2.1 Presentation

User-friendly and powerful, Kodak dental imaging software is a comprehensive software solution for image acquisition, viewing, enhancement, archiving, sharing and printing. The software manages images from all Kodak digital imaging solutions. Images from all sources are displayed on the same screen so the dentists can compare intraoral and extraoral radiographs and digital photographs, as well as scanned images.



1.2.2 Main functions

- Image processing tools: contrast, brightness, predefined anatomical modes (periodontics, endodontics, dentine-to-enamel junction), sharpness filter, highlight, zoom, calibrated measurements, negative video, pseudo-colors, sepia, pseudo 3-D, relief, bone density analysis, annotations and comments.
- Multiple display modes: Individual images, full-screen images and images at real size. One image comparison, operative radiology mode 4-1, two types of four-image bitewing modes and five types of full-mouth series, editor to create intraoral image presentation templates (such as custom FMS).

- Creation of contexts regroupes all of the images used during treatment (intraoral shots, panoramic shots, and video images), which can be stored, retrieved and displayed instantly.
- Copy and paste capabilities for inserting images in other applications (such as reports, letters, presentations, ...).

1.2.3 Main features and benefits

- One software for all dental imaging needs.
- All digital imaging systems can be displayed simultaneously on the same screen.
- Integrated patient database.
- Easy integration to various practice management software and specialist software (orthodontics software).
- Ergonomic and user-friendly graphic interface designed specifically for radiological diagnosis.
- Convenient and fast image search and retrieval.
- Working environment can be fully customized.
- Single or multi-user.
- Network capabilities.
- Supports all common image file formats, including JPEG, TIFF, and BMP, for image import and export.
- Software available in 23 languages.
- Windows 2000 SP4 and Windows XP SP1/SP2 compatible.

1.3 TROPHY DICOM

1.3.1 Presentation

Trophy DICOM is a patient database with DICOM functionalities, which allows the connection of any digital imaging system to a DICOM network in a hospital environment.

Through an easy-to-use graphical interface, Trophy DICOM launches the Dental Imaging Software (Windows edition) for image acquisition and manipulation. The images can then be stored on a central PACS server through Trophy DICOM, and retrieved at a later date for viewing or printing.

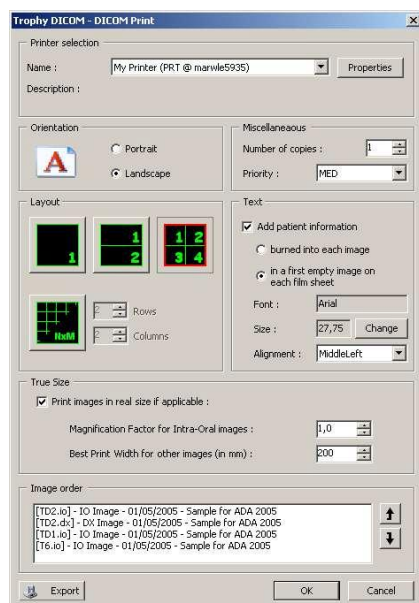


Compatible with most current DICOM PACS servers and printers, Trophy DICOM integrates and interacts with any compliant DICOM 3.0 system (PACS, RIS, printers, workstations ...). Trophy DICOM allows the exchange of patient and procedure information or images and ensures the proper integration of dental digital products into the workflow of the medical institution and the patient management environment.

1.3.2 Main functions

- The DICOM gateway for all dental digital imaging systems.
- Ergonomic and user-friendly graphical interface.
- Connection to different DICOM servers for patient image and data storage and retrieval.
- DICOM printing functionality.
- Local archive and SQL patient database.
- Single or multi-user network capabilities.
- Easy integration with the Dental Imaging Software (DIS) for diagnostic purposes.

Print SCU module



The Print service class allows the user to print images on a DICOM printer connected to the network, for both grayscale or color images. Once the connection between Trophy DICOM and the printer is set up user-defined templates can be used.

Trophy DICOM provides the user with the ability to define several print parameters when printing images. All current printing and configuration parameters setup by the user in a print session are kept into the Trophy DICOM Patient Database for the next print session.

The same physical DICOM Printer may be configured within Trophy DICOM as many time as necessary for different print session parameters.



Printing FMS's through Trophy DICOM is not directly supported. Indeed Trophy DICOM follows the Digital Imaging and Communications in Medicine (DICOM) comprehensive set of standards for handling, storing, printing and transmitting information in medical imaging. It includes a file format definition and a network communications protocol. This protocol is an application protocol, it uses TCP/IP to communicate between systems. DICOM files can be exchanged between two entities that have the capability to receive the information – image and patient data – in DICOM format.

DICOM was developed to enable integration of scanners, servers, workstations, printers and network hardware into a Picture Archiving and Communication System (PACS). The different machines, servers and workstations come with DICOM Conformance Statements that clearly state the DICOM classes supported by them. DICOM has been widely adopted by hospitals and is making inroads in dentists' offices.

The same format is used for all uses, including network and file usage. DICOM differs from other data formats in that it groups information together into a data set. That is, a panoramic X-Ray for instance actually contains the patient ID within it, so that the image is never mistakenly separated from the patient information. DICOM files consist of a header with standardized as well as free-form fields and a body of image data.

The DICOM standard committee has not yet defined a set of rules for printing FMS's in a standardized form.

2. PRINTING AN FMS WITH DIS AND TROPHY DICOM

2.1 MAIN STATEMENT

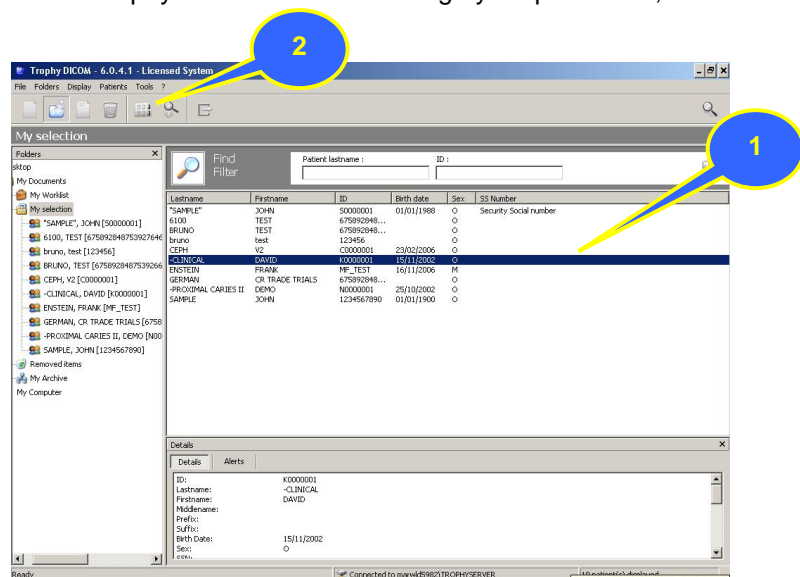
Printing an FMS (or any other type of image) on a DICOM printer requires the add-on software module Trophy DICOM. Trophy DICOM replaces the KDIS Patient File application, and must be used as the patient file manager. It will be used as the basic patient file module, and is required in order to be able to use any of the DICOM modules including DICOM print.

2.2 MINIMUM SOFTWARE VERSIONS

- DIS 6.13
- Trophy DICOM 6.0.4.1

2.3 STEPS TO REPRODUCE

2.3.1 Trophy DICOM: browse through your patient list, select and open DIS



Actions:

- Launch Trophy DICOM
- Search through your patient file database
- Select the appropriate patient
- "Process selected patient"

This will open DIS as the imaging application through which image acquisitions will be carried out, and the FMS template organized.

Figure 1: Trophy DICOM patient browser main screen

2.3.2 DIS: carry out image acquisitions and create your FMS template

Intra-oral images may be either of DR or CR type. The method for acquiring images differs from one image type to the other. This section will not detail how to acquire an image depending on the type of equipment connected to DIS and assumes that the user is familiar in the way of acquiring images and in the manner of organizing an FMS template within DIS.

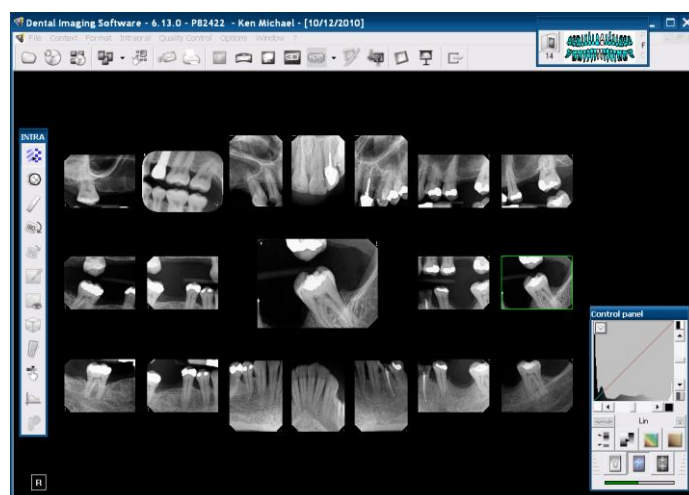
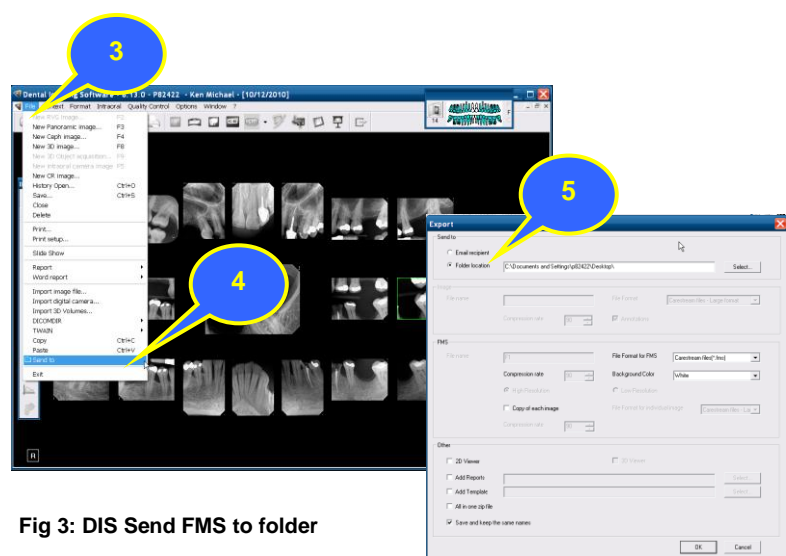


Figure 2: KDIS main screen with FMS template

2.3.3 DIS: export your FMS template as a single image

An FMS can be sent to a folder or by email. When sending to a folder, two modes are proposed:

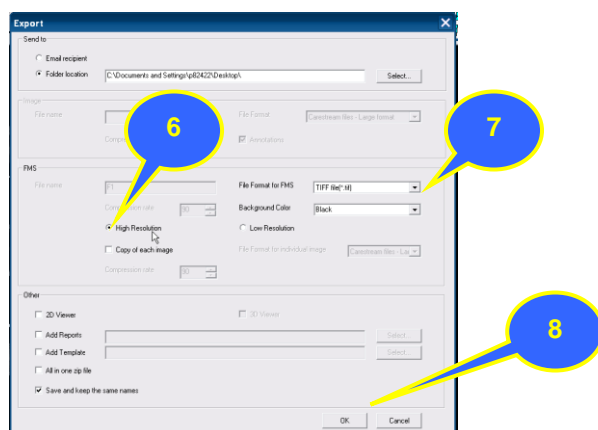
- High Resolution creates an 8 MB image.
- Low Resolution creates a 3.5 MB image.



Actions:

- “File”
- “Send to”
- “Folder”

Fig 3: DIS Send FMS to folder



Actions:

- Select “High Resolution”
- Select “TIFF file”
- “OK”

Fig 4: KDIS Save FMS to folder

2.3.4 DIS: import and save the image file

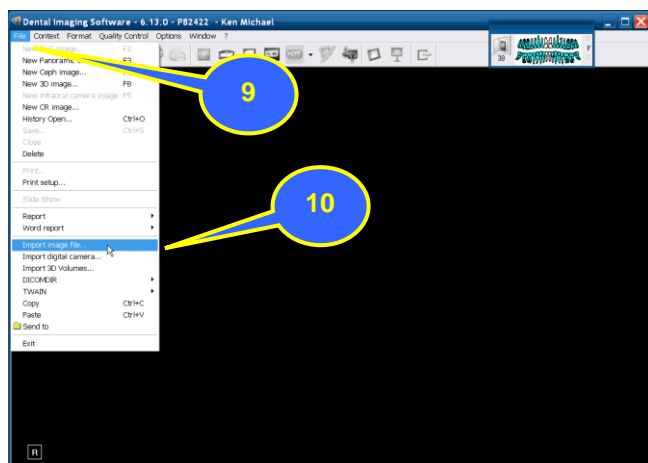


Fig 5: DIS Import an image file

Actions:

- "File"
- "Import image file"

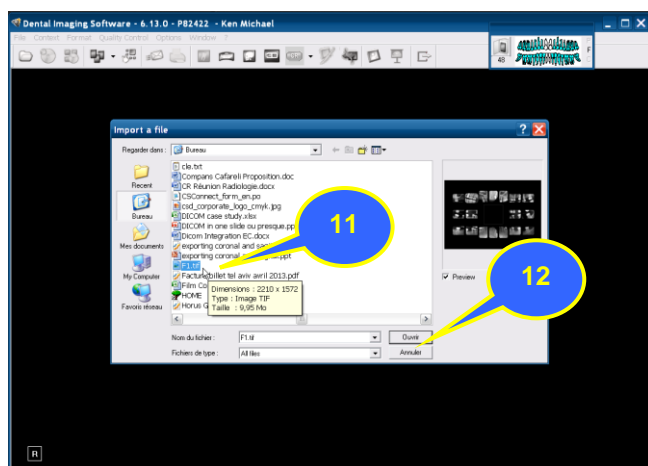


Fig 6: DIS Select the image file for import

Actions:

- Select the saved image file
- "Open"

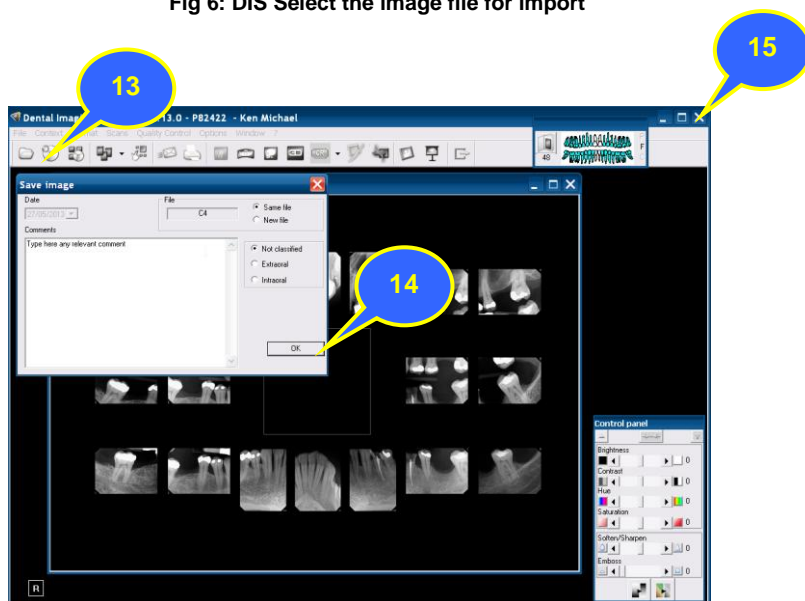


Fig7: KDIS Save the imported image file

Actions:

- "Save"
- "OK"
- "Exit" KDIS

2.3.5 Trophy DICOM: print the FMS

The image file will be immediately recognized by Trophy DICOM as a secondary capture image, or “SC” type. Browse through the patient file, select the newly imported image and print it.

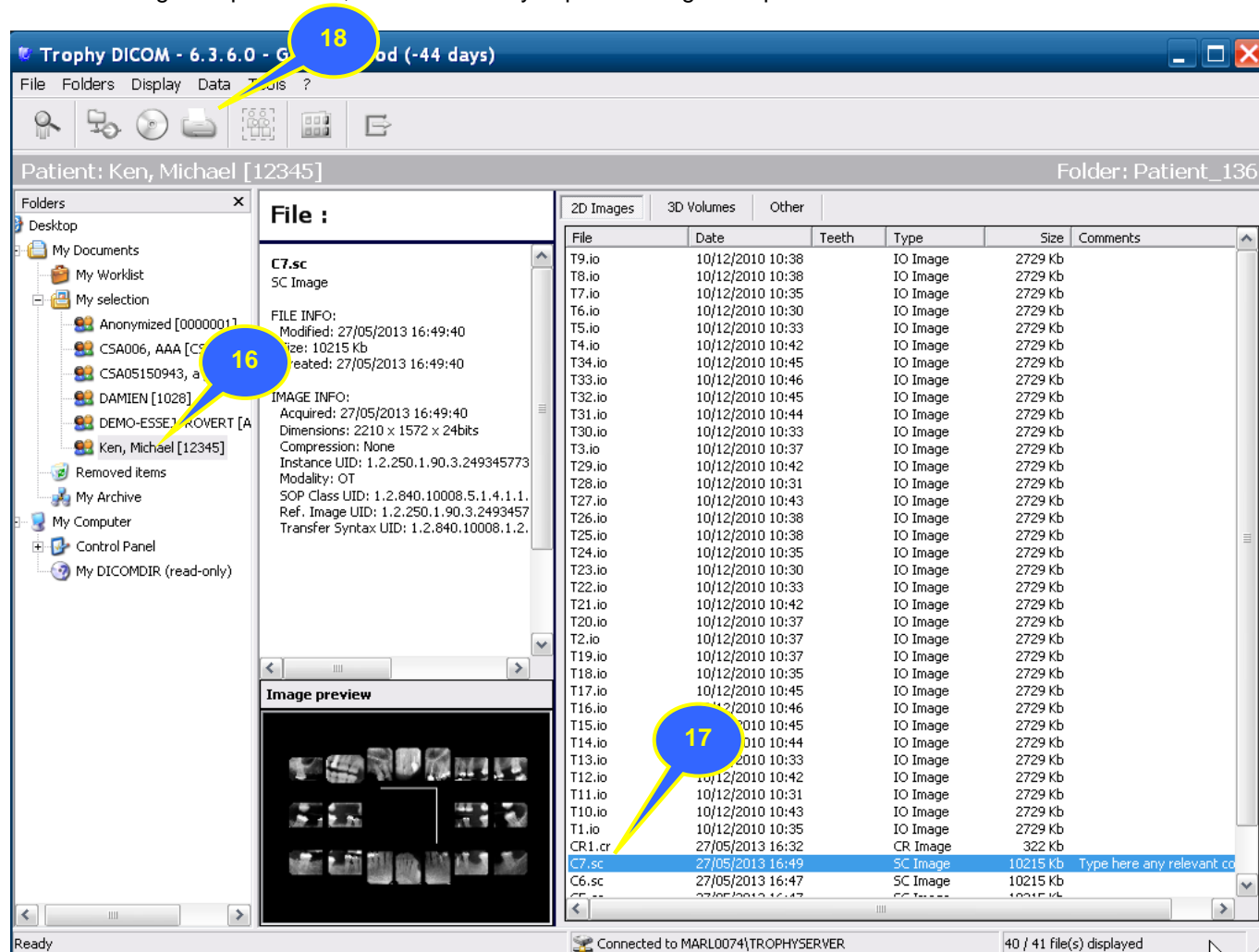


Fig 8: Trophy DICOM print FMS image

Actions:

- Select the appropriate patient file
- Select the newly imported FMS image
- “Print selected image”