

Product Data Sheet

Spirit 2K™

DataCine® and High-Performance Film Scanner with Bones



The Spirit 2K™ DataCine® and Film Scanner from DFT Digital Film Technology is a high-performance, high-speed film scanning solution for Digital Intermediate, Commercial, Telecine, Restoration, and Archiving applications.

With more than 350 systems shipped worldwide, in the past decade, the Spirit system has become the undisputed preference for telecine and high-speed film scanning applications. Now the Spirit 2K system offers a higher level in performance with native 2K scanning available in real time.

The Spirit 2K system is available in two basic versions: a film scanner connected to a DFT Bones open postproduction system via a high-speed Infiniband interface, which can be upgraded to a full-featured system that includes interfaces for standard- and high-definition (SD and HD) video; and a DataCine® which includes SD and HD video outputs and which can be enhanced with a Bones system, including 2K high-speed Infiniband data interfaces.

Spirit 2K Film Scanner/Bones Combination

Digital intermediate production – the motion picture workflow in which film is handled only once for scanning and then processed with a high-resolution digital clone that can be down-sampled to the appropriate output resolution – demands the highest resolution and the highest precision scanning.

The combination of the Spirit 2K film scanner and Bones system is ahead of its time, offering you the choice of 2K scanning in real time (up to 30 frames per second) depending on the selected packing format and the receiving system's capability. The Spirit 2K scanner offers unrivalled image detail, capturing that indefinable film look to perfection.

Spirit 2K DataCine

Through an internal spatial processor, the Spirit 2K DataCine supports all important digital HD/DTV and SD standards also in 4:4:4, YUV, or RGB formats, so you can rapidly output your material to tape or disk. In addition, you can upgrade the Spirit 2K DataCine at any time with a Bones system to deliver image files to a storage system.

Bones post production workflow solution



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Key Features

- Multi-film format, high-resolution, real-time film scanning
- FA 35 mm and ACA 35 mm 2-perf / 3-perf / 4-perf film formats
- Scanning head capable of native 2K scanning up to 30 fps
- Safe, continuous-motion film transport including:
 - Variable scanning speeds
 - Visible search
- Eastman Kodak-designed, high-resolution, advanced-imaging subsystem:
 - Diffuse, high-power xenon illumination system to optically suppress dust and scratches
 - Custom precision optics
 - Optical film matching for print, negative, and intermediate stocks
 - Optical gain control
- Built-in 2K image processing based on a 16-bit RGB data stream for extended black definition (EBD):
 - Automatic FPN and shading correction
 - Logarithmic masking
 - User-definable look-up tables (LUTs)
 - RGB negative matching
 - RGB primary color correction with extended color-correction mode
 - Aperture correction
- Real-time scaling engine for sizing and positioning up to 2K output resolutions
- Film Scanner version: High speed optical Infiniband data output up to 2k
 - DPX file format
 - Includes Bones Transfer application running on a Linux-based PC
 - TV-gamma, linear, logarithmic, user defined transfer characteristics in 10-bit quantization
 - Image monitoring with selectable display look-up tables and resolutions up to SXGA resolution
- DataCine version: Video output supports all major digital HD and SD formats
- TV-gamma, linear, and logarithmic transfer characteristics
 - Rotation
 - Contour correction
- Upgrade path to Spirit 4K

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4K Extension

The Spirit 2K DataCine, as well as the Spirit 2K film scanner, can be upgraded in the field to scan images at 4K native RGB resolution and speeds up to 7.5 fps, depending on the selected packing format and the receiving system's capability. This upgrade includes all the features of the Spirit 4K basic system, including 16-bit data output bit depth, and an illuminated Spirit 4K front door logo. Current options such as film-grain reduction, six-sector color correction, Infiniband data output, and Vista Vision also support 4k data processing. This capability makes the Spirit 2K system a future-proof investment.

Unmatched Color Performance

At the heart of the Spirit 2K system is the proven concept of a broad spectrum light source with a precision active-feedback loop to ensure consistency of image output, not just from moment to moment but across days, weeks, and months. Spirit DataCine users across the world have demonstrated that a color decision list can always be recalled with the confidence that it will be reproduced.

The Spirit 2K system uses a long-life 700W xenon lamp. Xenon illumination provides a broad and continuous spectrum of light across the entire visible area, with an emphasis in the critical short-wavelength blue area. The result is a consistently noise-free image right

across the color spectrum, without problems in the blue portion that trouble other film-scanning technologies.

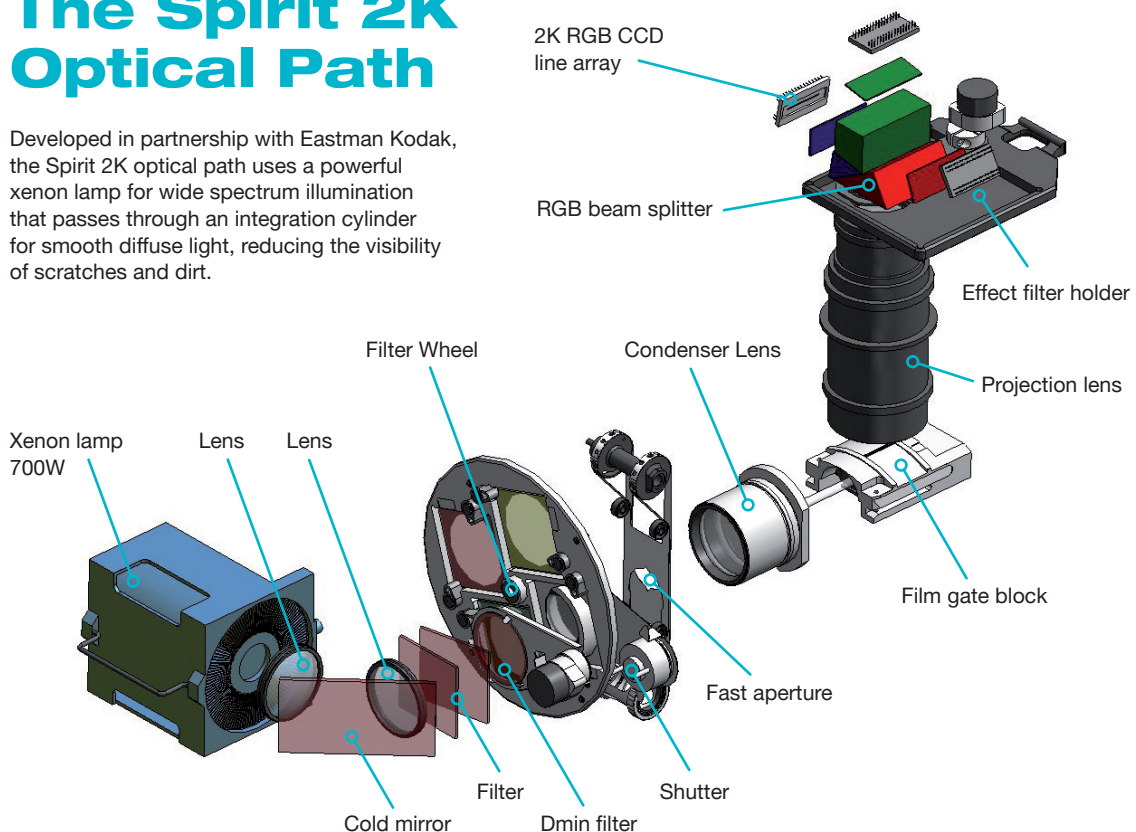
Like the original Spirit DataCine system, the xenon lamp output passes through an integration cylinder to create a highly diffuse light source. This diffuse light source has proved highly successful at minimizing the visible effects of film scratches and even some small dust particles.

In digital intermediate work, the normal practice is to scan the original camera negative to capture the best possible quality. The high blue content in the xenon light source of the Spirit 2K system is a significant aid in balancing out the orange mask of negative and intermediate stocks to achieve the most natural, most visually satisfying image quality.

The Spirit 2K system features new lens gate assemblies designed for Super 16 mm and full-aperture

The Spirit 2K Optical Path

Developed in partnership with Eastman Kodak, the Spirit 2K optical path uses a powerful xenon lamp for wide spectrum illumination that passes through an integration cylinder for smooth diffuse light, reducing the visibility of scratches and dirt.



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35 mm film that are capable of scanning the Standard and Academy versions. The optical system also includes a filter drawer to allow the use of standard camera filters for optical effects during scanning.

Effective Digital Intermediate Workflow

The Spirit 2K system brings an unmatched efficiency in creating a digital intermediate (DI) from film. The unsurpassed high scanning speeds are complimented by features to support a smooth and fast scanning process.

The Spirit 2K platform includes a special set of scanner menus for the graphical control panel (GCP). These menus hide typical telecine controls and restrict control to those functions required for a DI transfer. This capability reduces the risk of setting the wrong parameters during transfers, which are not supervised by a colorist.

The AutoFocus option of the Spirit 2K system automates the focus adjustment process and centers the focus corridor on the film emulsion. It offers a fast, easy, and accurate way of focusing at the beginning of the scanning process.

The matching process can be automated by the AutoDmin option of the Spirit 2K system. It automatically neutralizes the color differences in the most transparent part of the film (Dmin) and sets it to the correct value for a DI transfer. In a current-settings mode the AutoDmin correction is based on density range (Dmax)

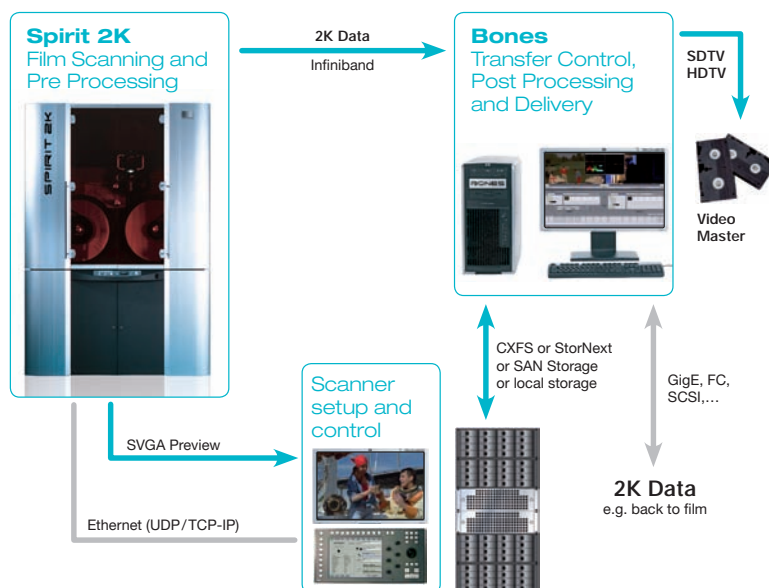
settings taken from film stock or TK memories or from a user-defined Matching Lift adjustment. In a densities-settings mode you can preset the Dmax in a range of 0.1 to 3.5 densities.

The PrinterLights option of the Spirit 2K system allows you to generate and store settings for numerous film stocks. Based on these film stocks and a display calibrated to a print look, color correction can be performed in printer light steps and respective feedback can be given to a director of photography.

The PrinterLights option implements the functional part of a digital Hazeltine into the Spirit 2K system. It includes the generation and storage of color-matching settings for various film stocks as a reference for the subsequent printer-lights definition in R, G, B, and master.

You can augment this special DI feature set with an event-list option for scene-by-scene corrections and the Bones system pull list support for list-controlled transfers based on frame count, timecode, or keycode.

Spirit 2K Data Application with Bones



The combination of the Spirit 2K film scanner and Bones open post-production system scans film in 2K resolution, which is then stored on disk using the Bones Transfer and Bones Mover applications. In the diagram below, the Spirit 2K system is set up with a graphical control panel (GCP), which is part of the basic scanner unit. The 2K data is then post processed via the Bones system and formatted into the desired output format: data, SD, or HD.

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Signal Processing

From the lens gate, the light modulated with the film image goes to a beam splitter where it is divided optically into red, green, and blue components. Each color path has its own CCD sensor with 2,048 pixels for native 2K scanning.

The output from the CCDs is passed through low-noise pre-amplifiers prior to analog-to-digital conversion. After processing, the digital signal within the Spirit 2K system is available in a 10-bit format at the video or data outputs.

The internal spatial processor allows you to re-size and crop an image as necessary.

The Spirit 2K system includes standard primary (RGB) color correction which can be controlled with a DFT GCP. As well, you can control a Spirit 2K system using, for example, a DaVinci telecine controller. You can also install a DFT Scream Plus Grain Manager and a 4K/2K six-sector color processor in the internal signal path of the Spirit 2K system for complete control over the texture and the color of the image output.

HD and SD Video outputs

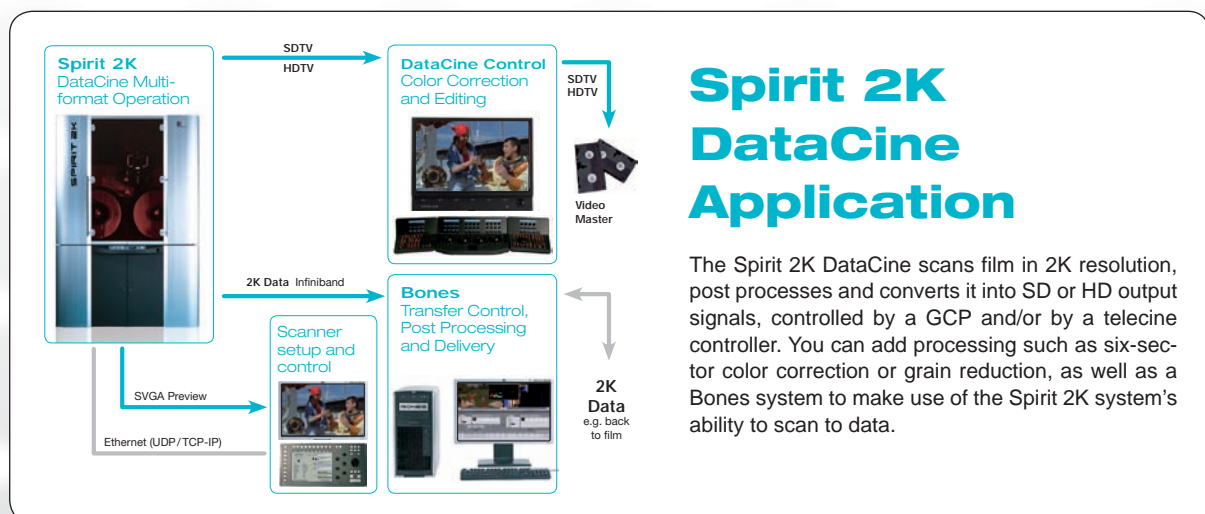
For quickly outputting film materials to video, the Spirit 2K DataCine system includes video output interfaces (optional on the Spirit 2K film scanner and Bones system combination).

The system's native 2K scan is converted to the selected video standard. You can then perform real-time continuous X-Y pan and zoom, anamorphic unsqueeze 2:1, independent X and Y sizing, format presets, digital output blanking, and continuous 360° image rotation. You can add these processing functions to the combined Spirit 2K film scanner and Bones system to provide complete multi-format functionality.

High-Speed Infiniband Interface

Scanning film at 2K resolution requires a high-speed data interface. With practical transfer rates in excess of 500 MB/s, the Infiniband interface has no problem handling real-time 2K resolution depending on the selected packing format and the receiving system's capability.

In addition, the Infiniband interface comes with an SXGA output that you can calibrate to monitor a high-resolution scan without a dedicated workstation. The Bones workstation provides an interface to external graphics and compositing systems.



Specifications

Mechanical Dimensions	- Dimensions: 1,390 mm (54.73 in.) wide, 1,981 mm (78.00 in.) high, 915 mm (36.03 in.) deep - Weight: Approximately 550 kg (1,212 lbs.)
Electrical AC Power Supply	3-phase AC power recommended: 3X 400V at 50 Hz or 3X 208V at 60 Hz
Electrical Power Consumption	Approximately 3.5 kVA, typically
Film Size Format	- Full aperture (Super) 35 mm, Academy 35 mm - 2-perf, 3-perf, 4-perf - 8-perf/VistaVision (option) - S16 mm or 16 mm (option)
Film Transport	Direct servo-controlled capstan drive
Fixed Speeds	- 25, 12.5, 6.25 fps at 625 lines/50 Hz - 29.97, 23.98, 17.98, 11.99, 5.99 fps at 525 lines/59.94 Hz - 30, 24, 18, 12, 6 fps at HDTV/60 Hz - 29.97, 23.98, 17.98, 11.99, 5.99 fps at HDTV/59.94 Hz - 25, 12.5, 6.25 fps at HDTV/50 Hz in forward and reverse
Select-a-Speed	2.00 to 30.00 fps in forward and reverse, (35 mm 4-perf film)
Stop Mode	Frame accurate with full-quality color processing in stop; single frame step forward and reverse with full resolution
Variable Visible Search	With full picture size: - 16 mm 5 fps – 150 fps (upper limit adjustable to 600 fps) - 35 mm 4-perf 2 fps – 75 fps (upper-limit adjustable to 240 fps)
Picture Stability	Better or equal $\pm 10 \mu\text{m}$ (35 mm, 16mm) measured with DFT test tools
Framing Adjustment	$\pm 60\%$ of total frame height
Film Capacity	- Up to 1200m (3,937 ft.) on spools - Up to 900m (2,952 ft.) on cores
Control Interface	Ethernet UDP/IP or TCP/IP for all Spirit 2K functions
Light Source	700W xenon lamp
Optical Matching Filters	Print, negative, and intermediate
Focus	- Remote manual mechanical focus control - Automatic mechanical focus control (option)
CCD Pickup Device	Linear CCD sensor with RGB beam splitter and 2K resolution
Scanned Pixel Size on	- $\sim 12.17 \mu\text{m} \times 12.17 \mu\text{m}$ (35 mm 4-perf) - $\sim 6.11 \mu\text{m} \times 6.11 \mu\text{m}$ (16 mm)
White Shading	Automatic correction to $\leq 1\%$ at 100% linear signal, static
Signal/Noise Ratio	Red, green, blue better than 55 dB (unweighted, CRT gamma)
Masking	Logarithmic (masking)
Aperture Correction	Horizontal and vertical -4 dB to +12 dB at peaking frequency, peak frequency adjustable

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Digital Color Correction	- RGB matching - Automatic Dmin (option) - PrinterLights (option) - RGB primary control (lift, gamma, and gain)
Image Resolution	- 256 – 2048 horizontal pixels - 256 – 1562 vertical lines (35 mm 4-perf) - Adjustable and presets
Image Functions	Continuous image rotation - 360° for 16mm and 2-/3-/4-perf - 20° for 8-perf 35mm
Contour Correction	- Spirit 2K DataCine or video option - 12 dB to +8 dB, at peaking frequency, peak frequency adjustable
625/525 Functions (Spirit 2K DataCine or video option)	
TV standards	- 625/50, 525/59.94, 2:1 interlace CCIR 601, CCIR 656 - 4:4:4 or 4:2:2 or 8:4:4 10-bit digital
Display formats	4:3 and 16:9 full screen and horizontal/vertical letterbox
Zoom range	Typical area magnification 0.1X to 16X
625/525 resolution	35 mm: not more than 3 dB down at 400 lines (5 MHz) in center and corner (film losses not taken into account)
Digital video out	- CCIR link A/B, serial 2x2 BNC - TV gamma, logarithmic or linear characteristic
HDTV Functions (Spirit 2K DataCine or video option)	
TV standards/2:1 interlace	1920x1080/50, 60, and 59.94 Hz
TV standards/progressive	- 1280x720 / 60, 59.94 and 50 Hz - 1920x1080 / 30, 29.97, 25, 24, and 23.98 Hz
TV standards/segmented frame	1920x1080/24 and 23.98 Hz
Display formats:	16:9 full screen and horizontal/vertical letterbox
X-Y zoom	Typical area magnification 0.05X to 9X
HDTV resolution	Not more than 3 dB down at 24 MHz in center and corner for 35 mm 3-perf/4-perf and 16 mm (film losses not taken into account)

Specifications continued...

Digital video out	<ul style="list-style-type: none"> - CCIR Link A/B, serial 2x2 BNC - 4:2:2 Y, Cb, Cr or 4:4:4 Y, Cb, Cr, or R, G, B - 10-bit per pixel - TV gamma, logarithmic or linear characteristic
External reference	BNC input for tri-level sync
Data Output Functions (Spirit 2K film scanner/Bones, 4K/2K Bones Data option)	
File format	DPX according to SMPTE 268M-1994
Transfer characteristics	TV gamma, linear, logarithmic, user defined output
Image monitoring	<ul style="list-style-type: none"> - Display characteristics selectable via display look-up tables - Resolution presets up to 1280x1024 (SXGA) - Connector mini D-sub 15-pin
Components and packing	<ul style="list-style-type: none"> - 3X 10-bit, RGB filled to 32-bit with padding at bits 0 and 1 - 4X 8-bit, RGBA packed to 32-bit, Alpha (A) = space ("0") - 3X 10-bit, Y-only filled to 32-bit with padding at bits 30 and 31
Bones Workstation The Bones workstation is offered with Infiniband data interface but without any disk storage. For operation with the Bones Transfer application at least one disk array is required. The Bones Workstation is supplied with Bones Framework, Bones Transfer, and Bones Mover licenses.	
System performance*	
Related film speed	- Up to 24 frames/s at 2K (2048x1556/3X 10-bit RGB filled to 32 bits)
Waveform monitoring test points	Color signals at the output of several processing stages
Display	<ul style="list-style-type: none"> - Parade or superimposed waveform - Vector, image, and mixed mode
Signal format	1280x1024, SXGA/75 Hz
WFM controls	Test point, display, signal format
Connector	Mini D-sub 15-pin analog output to a SXGA monitor (monitor not included)
*Note: The achievable data transfer speed depends on the overall system performance and might be subject to variations. Parameters such as the connected storage, the connections between storage and host and the type of file system are of major impact.	

Technical specifications are subject to change without notice

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Ordering Information

000129560610	SFS 2101 B-IB	Spirit 2K Film Scanner/ Bones combination High-resolution, fast 2K film scanner with Bones workstation
000129560210	SDC 2100	Spirit 2K DataCine High-resolution, fast 2K film scanner with digital HDTV and SDTV interfaces
000128560610	SDC-U2T4	Spirit 2K to 4K upgrade
000129708210	FH 7082.1	Power configuration 240V/400V for three-phase power supply
000129708110	FH 7081.1	Power configuration 115V/208V for three-phase power supply
000129705210	FH 7052.1	Power terminal unit 230V/1-P, 208V/2-P power configuration either for 230V single phase or 208V/twophase
000129692900	FD 0709.1	Reel drive set (DIN specs.) c/with spindles of 9 mm diameter (EU)
000129692800	FD 0708.1	Reel drive set (ANSI specs.) c/with spindles of 8 mm diameter (US)
000128220110	4K S16 LGA	Super 16 mm lens gate assembly for scanning of 16 mm and Super 16 mm film
000128220510	4K 35 GB	35 mm film gate with Academy projection aperture for format adaptation in the FA 35 mm lens gate assembly
000128220210	4K 16 GB	16 mm film gate for 16 mm film format adaptation in the Super 16 mm lens gate assembly
000128712910	FH 7129	Audio scanner, Comopt 16/35 mm (Available for all countries except European Community)
000129536150	41/21-B-IB-O	4K/2K Bones data option, optical data output, SXGA preview output, Bones workstation incl. display; Framework, Transfer, Mover software; and data input interface.
000129536130	41/21-VIDEO-O	Spirit 4K/2K/HD video option, SDTV and HDTV format processing incl. rotation and digital outputs
000128761510	S4K-VVO	VistaVision, 35 mm 8-perf film format

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000129760610	41/21-6SC-O	4K/2K/HD six-sector color processor
000129760410	41/21-GRAIN-O	Scream Plus Grain Manager
000128655110	GCP-EVL	Event list function for GCP
000128761710	S2K-AF	Spirit 2K/HD auto-focus option
000128761810	S2K-AD	Spirit 2K/HD AutoDmins option
000128761910	S4K/2K-PL	Spirit 4K/2K/HD Printer-Lights option
000129760010	41/21-ROT-O	Spirit 4K2KHD Data Rotation Option

Technical Support Services & Training

	SpiritHD/2K/4K-SP	Spirit HD/2K/4K on-site StartPro commissioning and brief product overview
	SpiritHD/2K/4K-Bones-SP	Spirit HD/2K/4K Film Scanner/Bones on-site StartPro commissioning
	SpiritHD/2K/4K-OST	3-day Spirit HD/2K/4K on-site operational training

Unparalleled Engineering and Quality

The DFT Digital Film Technology engineering, research and development, sales and support team is known for their excellence in technology, design, quality, and customer service with products such as the SCANITY™ Film Scanner, Spirit DataCine and Scanner family, Shadow telecine, Bones and Bones Dailies software solutions, Scream Plus grain manager, as well as the LUTher color space converter.

Technical Support Services & Training

The DFT Digital Film Technology Technical Support Services & Training team offers complete service solutions that enhance your return on DFT products and global system solutions.

Advanced training and proactive support reduce down time, and keep your equipment and staff performing at optimum productivity.

The pre-packaged suite of DFT Services provides support throughout the entire process:

- Commissioning support
- On-site repair and maintenance services
- Hotline 24 hours a day, 7 days a week
- Comprehensive software and hardware support
- Advanced exchange hardware support
- Hands-on training classes

The worldwide, experienced DFT Digital Film Technology Technical Support Services & Training experts can assist you with customized solutions.

Headquarters



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