

Product Data Sheet

Spirit HD[®]

DataCine[®] and High-Performance Film Scanner with Bones



The Spirit HD[®] DataCine[®] 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, the Spirit DataCine[®] family has been the undisputed preference for telecine and high-speed, film-scanning applications for more than a decade.

Adding to this already-rich family is our Spirit HD system which provides a new entry point in terms of price but shares the benefits in terms of real-time speed and image quality that have made the Spirit 2K and Spirit 4K[®] DataCine system so successful.

The Spirit HD is an ideal choice delivering images for TV broadcasting, high-end commercials and the production of dailies for feature films. It can scan standard- and high-definition (SD and HD) formats in 4:2:2 and 4:4:4 color resolutions. It offers HD/DTV and SD signals via single- or dual-link SDI interfaces, and data

outputs for input into digital intermediate postproduction projects up to a 1920x1080 resolution. And it has gates available for both 35 mm and 16 mm film.

Because it shares its optical and mechanical components with the Spirit 4K high-performance film scanner and DataCine, you can upgrade the Spirit HD to a full Spirit 4K system on site with a minimum of downtime.

There are two basic versions of the Spirit HD: a traditional realtime video based telecine and a scanner that can deliver data (DPX) images to a central storage system via our Bones[™] ingest station at up to 30 frames per second (fps). Most important, the Spirit HD system achieves these speeds with no degradation of quality or resolution; it never produces less than the finest images possible at the highest speeds.

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



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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 2048 scanning up to 30 fps
- Safe, continuous-motion film transport including:
 - Variable scanning speed
 - 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 12-bit RGB image data:
 - 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 1920x1080 output resolutions
- Film Scanner version: High speed optical Infiniband data output up to 1920x1080
 - DPX file format
 - Including 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, and linear transfer characteristics
 - Rotation
 - Contour correction
- Upgrade path to Spirit 2K and Spirit 4K

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Spirit HD DataCine

Through an internal spatial processor, the Spirit HD 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 HD DataCine at any time with a Bones system to deliver image files to a storage system.

2K and 4K Extension

The Spirit HD DataCine, as well as the Spirit HD Film Scanner, can be upgraded in the field to scan images at either 2k or 4k native RGB resolution and speeds of up to 30 fps for 2K and 7.5 fps for 4K, depending on the selected packing format and the receiving system's capability.

The 2K upgrade offers all the features of the Spirit 2K basic unit, including 16-bit internal processing, Cineon printing density (CPD) support on the video output, extended black definition (EBD), and our graphical control panel (GCP).

The 4K upgrade includes all the features of the Spirit 4K basic unit and extends the 2K upgrade to include 4K data, 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 VistaVision film also support 4K data processing.

These upgrades make the Spirit HD system a future-proof investment.

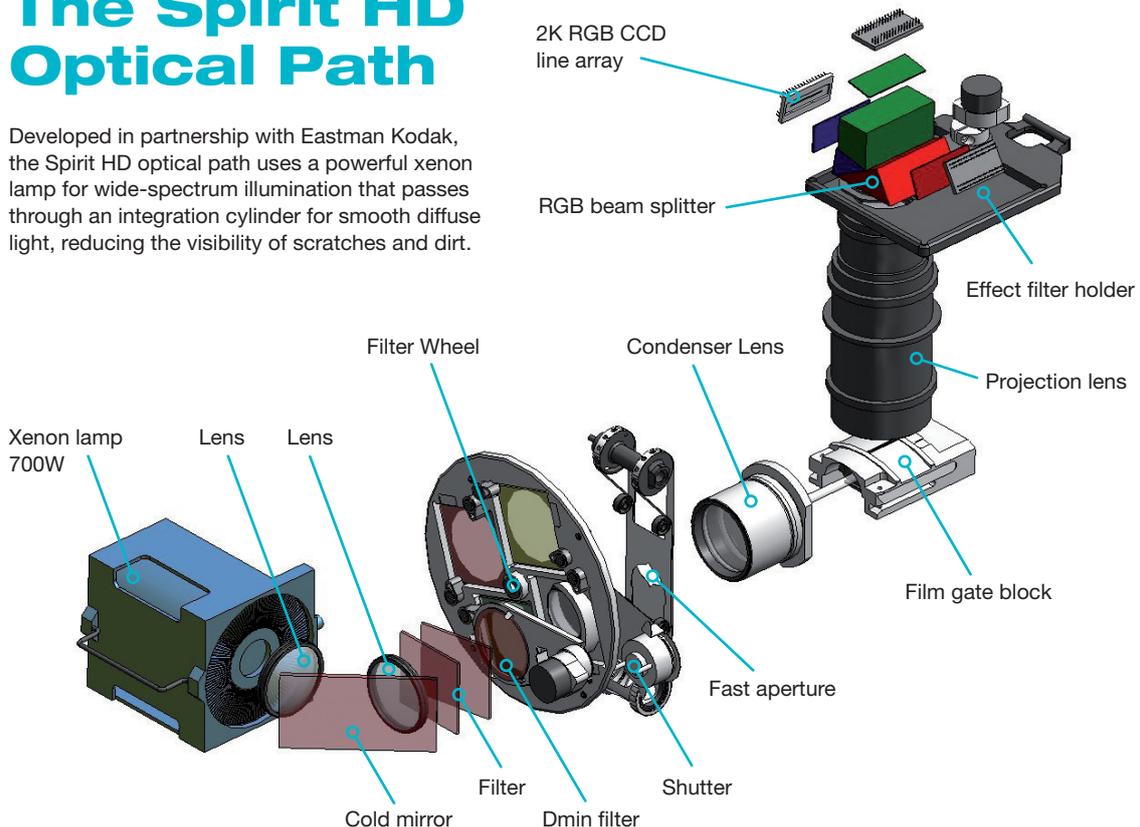
Unmatched Color Performance

At the heart of the Spirit HD system is the proven concept of a broad spectrum light source with a precise, active-feedback loop to ensure the 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 HD system uses a long-life 700W xenon lamp. Xenon illumination provides a broad and conti-

The Spirit HD Optical Path

Developed in partnership with Eastman Kodak, the Spirit HD 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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nuous 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 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 HD 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 HD system features new lens gate assemblies designed for Super 16 mm and full-aperture 35 mm film that are capable of scanning the Standard and Academy versions. The optical system also includes a filter drawer to support standard camera filters for optical effects during scanning.

Effective Digital Intermediate Workflow

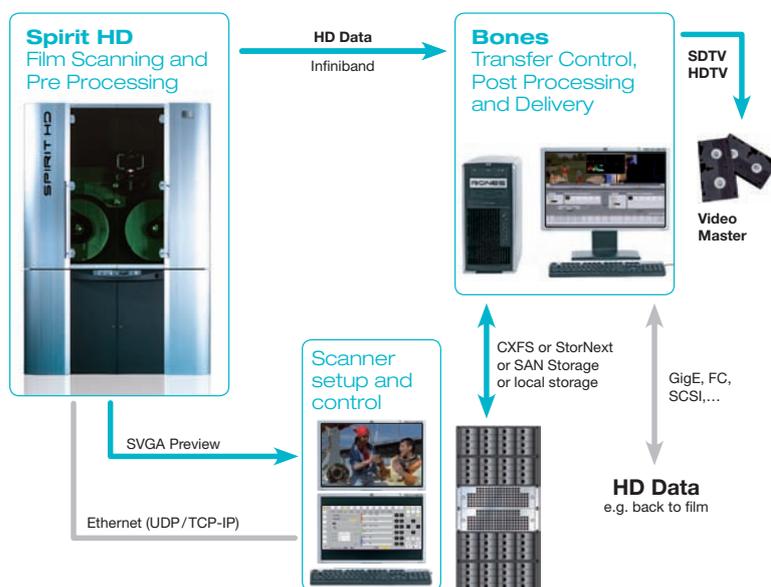
The Spirit HD system brings an unmatched efficiency in creating a digital intermediate product from film. Its unsurpassed high scanning speeds are complimented by features to support a smooth and fast scanning process.

The Spirit HD platform includes a special set of scanner menus for our software GCP. These menus hide typical telecine controls and restrict control to those functions required for a digital-intermediate 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 HD 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 HD 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 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.

Spirit HD Data Application with Bones



The Spirit HD Film Scanner scans film in 2k resolution, post processes and converts it into SD or HD DPX output files, and is controlled by the software GCP and the Bones workstation. Bones processes the HD data into the desired output format – Data, SD, or HD. You can add processing such as six-sector color correction or grain reduction, as well as video output to make use of the Spirit HD system's ability to directly output video signals.

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The PrinterLights option of the Spirit HD 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 HD 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 digital intermediate feature set with an event-list option for scene-by-scene corrections and the Bones system's pull-list support for list-controlled transfers based on frame count, timecode, or keycode.

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 scans in HDTV output resolution. The output from the CCDs is passed through low-noise pre-amplifiers prior to 12-bit analog-to-digital conversion. After processing, the digital signal within the Spirit HD system is available in a 10-bit format at the video or data outputs.

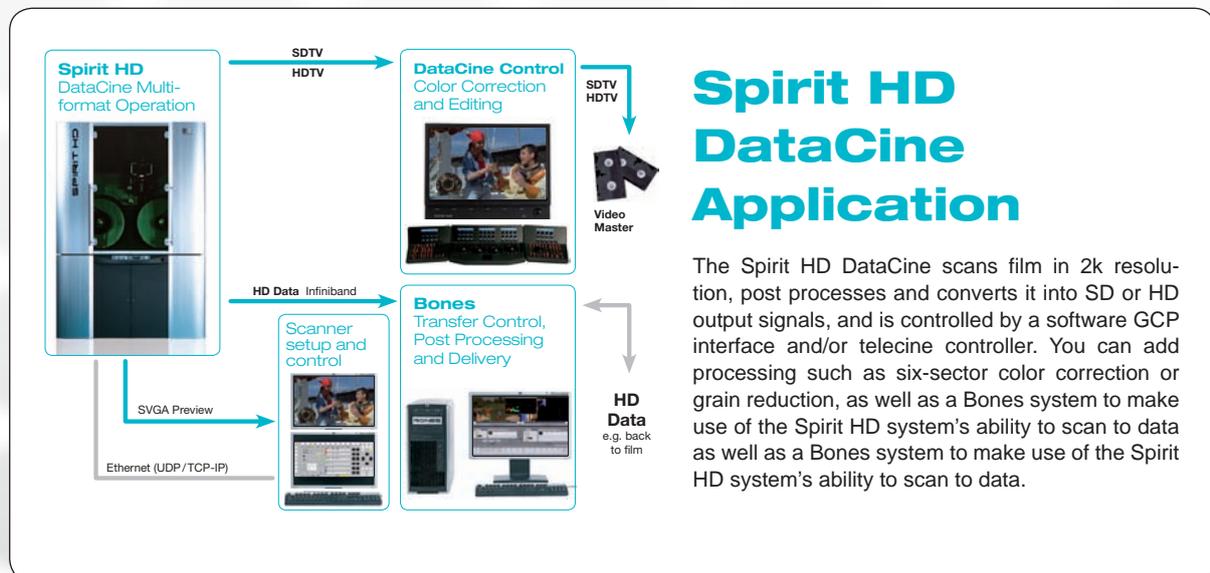
The internal spatial processor of the Spirit HD system lets you resize and crop an image as necessary. It includes standard primary (RGB) color correction, which can be controlled with GCP software installed on a PC or with the optional Graphical Control Panel. As well, you can control a Spirit HD system using, for instance, 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 HD 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 HD DataCine system includes video output interfaces (optional on the Spirit HD film scanner and Bones system combination). The 2K scan is converted to the selected video standard. You can 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 HD film scanner and Bones system to provide complete multi-format functionality.

High-Speed Infiniband Interface

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



Spirit HD DataCine Application

The Spirit HD DataCine scans film in 2k resolution, post processes and converts it into SD or HD output signals, and is controlled by a software GCP interface and/or telecine controller. You can add processing such as six-sector color correction or grain reduction, as well as a Bones system to make use of the Spirit HD system's ability to scan to data as well as a Bones system to make use of the Spirit HD system's ability to scan to data.

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	- Local control panel (film deck) - Ethernet UDP/IP or TCP/IP Interface for all Spirit HD functions - GCP software (requires Linux PC with 10Base-T interface/cable, SUSE V7.1 or RedHat RHEL 3 and higher operating system, 256 MB of available RAM, 50 MB of available hard-disk space, CD ROM drive) - Graphical Control Panel (GCP, option)
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 Film	- $\sim 12.17 \mu\text{m} \times 12.17 \mu\text{m}$ (35 mm 4-perf) - $\sim 6.11 \mu\text{m} \times 6.11 \mu\text{m}$ (16 mm)

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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
Digital Color Correction	- RGB matching - Automatic Dmin (option) - PrinterLights (option) - RGB primary control (lift, gamma, and gain)
Image Resolution	- 256 – 1920 horizontal pixels - 256 – 1080 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 HD DataCine or video option)	-12 dB to +8 dB, at peaking frequency, peak frequency adjustable
625/525 Functions (Spirit HD 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

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Specifications continued...

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)
Digital video out	- 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 or linear characteristic
External reference	BNC input for tri-level sync
Data Output Functions (Spirit HD 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	- Display characteristics selectable via display look-up tables - Resolution presets 1280x1024 (SXGA), 1024x768 (XGA), 800x600 (SVGA), 640x480 (VGA) - Connector mini D-sub 15-pin
Components and packing	- 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 30 fps at HD (1920x1080/3X 10-bit RGB filled to 32 bits)
*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

Ordering Information

000129560710	SFS HD100 B-IB	Spirit HD Film Scanner/ Bones combination High-resolution, fast HD film scanner with Bones workstation
000129560810	SDC HD100	Spirit HD DataCine High-resolution, fast HD film scanner with digital HDTV and SDTV interfaces
000129761010	SDC U HDT2	Spirit HD to 2K upgrade
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 the European community)
000129536150	41/21-B-IB-O	Spirit 4K/2K/HD 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

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000128761510	S4K-VVO	VistaVision, 35 mm 8-perf film format
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
000129652010	GCP1-201	GCP Upgrade kit
000128761710	S2K-AF	Spirit 2K/HD AutoFocus option
000128761810	S2K-AD	Spirit 2K/HD AutoDmin option
000128761910	S4K/2K-PL	Spirit HD/2K/4K 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 LUTer 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.

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