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**White Paper:**  
**TWAIN Mandatory Features**

The TWAIN Working Group  
March 29, 1999

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### Mandatory and Optional Features

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This paper is a guide for Data Source developers, trying to sort through the myriad of TWAIN Mandatory and Optional features, to determine which ones should be implemented.

The key to this document is a clear definition of Mandatory and Optional Features. If a feature is Mandatory, then it has been deemed absolutely necessary for proper operation of any imaging device. Mandatory features are an absolute must on the implementation list. Optional features are those that have been deemed useful, but not necessarily relevant to all imaging devices. That is not to say that an optional capability is not necessary for a particular imaging device to function properly. Because these optional features were defined to serve one particular niche or another, it is impossible to set a standard where they are all strictly mandatory. It is possible, however, to say that if the device serves a particular niche then there are certain optional capabilities that become 'Mandatory' in order to meet the requirements of that niche.

In this document, several niches will be identified and all the relevant features indicated. The following sections will be dealt with in order: **Basic Single Image Devices, Basic Document Feeder Type Devices, Production Quality High Speed/Volume Type Scanners, Permanent Storage/Retrieval Devices, and Portable Capture Devices.**

The following recommendations are based on the statement from Page 5.126 of the published TWAIN 1.8 Specification:

*"All Sources must implement the advertised features supported by their devices. They must make these features available to applications via the TWAIN protocol."*

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### Basic Single Image Devices

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To achieve the most basic image transfer and meet the minimum TWAIN 1.6 Compliance requirements (note: 1.6 was the last version of the TWAIN specification to dictate any new Mandatory Operations or Capabilities), a TWAIN Data Source is required to be capable of transferring to at least one single image. The following is basically an exact copy of what is found in the Data Source requirements for a TWAIN Data Source found in Chapter 5 Page 126 of the published 1.8 TWAIN Specification.

There has been an attempt to improve the layout by putting these features in the logical order of execution. An example of the most basic scanning device would be a flatbed scanner.

## **OPERATIONS**

DG\_CONTROL / DAT\_STATUS / MSG\_GET

DG\_CONTROL / DAT\_XFERGROUP / MSG\_GET

DG\_CONTROL / DAT\_IDENTITY / MSG\_GET

DG\_CONTROL / DAT\_IDENTITY / MSG\_OPENS

DG\_CONTROL / DAT\_IDENTITY / MSG\_CLOSED

DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET

DG\_CONTROL / DAT\_CAPABILITY / MSG\_GETCURRENT

DG\_CONTROL / DAT\_CAPABILITY / MSG\_GETDEFAULT

DG\_CONTROL / DAT\_CAPABILITY / MSG\_RESET

DG\_CONTROL / DAT\_CAPABILITY / MSG\_SET

DG\_CONTROL / DAT\_CAPABILITY / MSG\_QUERY\_SUPPORT

DG\_IMAGE / DAT\_IMAGE\_LAYOUT / MSG\_GET

DG\_IMAGE / DAT\_IMAGE\_LAYOUT / MSG\_GETDEFAULT

DG\_IMAGE / DAT\_IMAGE\_LAYOUT / MSG\_RESET

DG\_IMAGE / DAT\_IMAGE\_LAYOUT / MSG\_SET

DG\_CONTROL / DAT\_USERINTERFACE / MSG\_ENABLED

DG\_CONTROL / DAT\_USERINTERFACE / MSG\_DISABLED

DG\_CONTROL / DAT\_EVENT / MSG\_PROCESS\_EVENT

DG\_CONTROL / DAT\_SETUP\_MEM\_XFER / MSG\_GET

DG\_IMAGE / DAT\_IMAGE\_INFO / MSG\_GET

DG\_IMAGE / DAT\_IMAGE\_MEM\_XFER / MSG\_GET

DG\_IMAGE / DAT\_IMAGE\_NATIVE\_XFER / MSG\_GET

DG\_CONTROL / DAT\_PENDING\_XFERS / MSG\_END\_XFER

DG\_CONTROL / DAT\_PENDING\_XFERS / MSG\_GET

DG\_CONTROL / DAT\_PENDING\_XFERS / MSG\_RESET

## **CAPABILITIES**

Every Source must support all five DG\_CONTROL / DAT\_CAPABILITY operations on:

CAP\_XFERCOUNT

Every Source must support DG\_CONTROL / DAT\_CAPABILITY MSG\_GET on:

CAP\_SUPPORTEDCAPS  
CAP\_UICONTROLLABLE  
CAP\_DEVICEONLINE

Sources that supply image information must support DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT on:

ICAP\_PHYSICALHEIGHT  
ICAP\_PHYSICALWIDTH  
ICAP\_COMPRESSION  
ICAP\_PLANARCHUNKY      \*Note: Applicable to color only  
ICAP\_PIXELFLAVOR      \*Note: Applicable to bi-tonal and grayscale only

Sources that supply image information must support DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on:

ICAP\_BITORDER  
ICAP\_XFERMECH  
ICAP\_UNITS  
ICAP\_XRESOLUTION  
ICAP\_YRESOLUTION  
ICAP\_PIXELTYPE  
ICAP\_BITDEPTH

Further to these requirements, the following behavior is highly recommended:

If a Source supports TWPT\_BW for ICAP\_PIXELTYPE, the Sources must support DG\_CONTROL / DAT\_CAPABILITY, MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on:  
ICAP\_BITDEPTHREDUCTION  
ICAP\_PIXELFLAVOR

If a Source supports ICAP\_BITDEPTHREDUCTION and a value of TWBR\_HALFTONE then it must respond to DG\_CONTROL / DAT\_CAPABILITY,

MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and  
MSG\_SET on:  
ICAP\_HALFTONES

If a Source supports ICAP\_BITDEPTHREDUCTION and a value of  
TWBR\_CUSTHALFTONE then it must respond to DG\_CONTROL /  
DAT\_CAPABILITY, MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT,  
MSG\_RESET and MSG\_SET on:  
ICAP\_CUSTHALFTONE

If a Source supports ICAP\_BITDEPTHREDUCTION and a value of  
TWBR\_THRESHOLD, and the threshold values are adjustable, then it must respond to  
DG\_CONTROL / DAT\_CAPABILITY, MSG\_GET, MSG\_GETCURRENT,  
MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on:  
ICAP\_THRESHOLD

The following operations and capabilities are trivial to implement and highly  
recommended for all scanners:

DG\_CONTROL / DAT\_SETUPFILEXFER / MSG\_GET, MSG\_SET  
DG\_IMAGE / DAT\_IMAGEFILEXFER / MSG\_GET

CAP\_INDICATORS  
CAP\_LANGUAGE  
CAP\_REAQUIREALLOWED  
CAP\_DEVICETIMEDATE  
CAP\_SERIALNUMBER

ICAP\_IMAGEFILEFORMAT  
ICAP\_MAXFRAMES  
ICAP\_FRAMES  
ICAP\_SUPPORTEDSIZES

ICAP\_MINIMUMHEIGHT  
ICAP\_MINIMUMWIDTH  
ICAP\_XNATIVERESOLUTION  
ICAP\_YNATIVERESOLUTION  
ICAP\_XSCALING  
ICAP\_YSCALING  
ICAP\_UNDEFINEDIMAGESIZE  
ICAP\_TILES  
ICAP\_LAMPSTATE  
ICAP\_LIGHTPATH  
ICAP\_LIGHTSOURCE  
ICAP\_NOISEFILTER  
ICAP\_AUTOBRIGHT

ICAP\_BRIGHTNESS  
ICAP\_CONTRAST  
ICAP\_HIGHLIGHT  
ICAP\_SHADOW  
ICAP\_ROTATION  
ICAP\_GAMMA  
ICAP\_FILTER

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## Basic Document Feeder Type Devices

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Basic document feeder devices are those that have paper trays to hold one or more documents for transfer. Unique aspects of a document feeder include the ability to transfer more than one image, the typical inability to re-scan the same page twice, and the fact that if there is no paper loaded, it is usually impossible to scan.

If the Source has a document feeder attachment then the Source must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT on the following capabilities:

CAP\_FEEDERENABLED  
CAP\_PAPERDETECTABLE  
CAP\_AUTOFEED

If the Source reports TRUE to CAP\_PAPERDETECTABLE then it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT on the following capabilities:

CAP\_FEEDERLOADED

If the Source allows FALSE for CAP\_AUTOFEED then it must provide advanced paper handling support though the following capabilities:

CAP\_FEEDPAGE  
CAP\_CLEARPAGE  
CAP\_REWINDPAGE

Support for the advanced paper handling capabilities implies that MSG\_SET can be called during states other than 4 and therefore the advanced handling capabilities must be listed in the following capability:

CAP\_EXTENDEDCAPS

The following capabilities are highly recommended for these types of devices:

CAP\_FEEDERALIGNMENT  
CAP\_FEEDERORDER  
CAP\_PAPERBINDING  
CAP\_REAQCUIREALLOWED

The following capabilities are recommended for any document fed device that can fit standard paper sizes in any input orientation (cap – orientation refers to the input orientation of paper):

- CAP\_SUPPORTEDSIZES
- CAP\_ORIENTATION

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## **Production Quality High Speed/Volume Type Scanners**

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Production Quality High Speed/Volume scanners have greater demands on TWAIN. With diverse features like bar code reading, imprinting and compressions, they require much more attention to detail. Production drivers should be prepared to serve applications that wish to achieve complete programmatic control of all typical and custom features and this requires a VERY robust TWAIN implementation.

If the Data Source has internal image buffering to allow transfer of multiple images ahead of retrieval, then it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on the following capabilities:

- CAP\_AUTOSCAN
- CAP\_MAXBATCHBUFFERS
- CAP\_CLEARBUFFERS

If the Data Source supports any kind of internal re-orientation or automatic sizing then it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on the following capability:

- ICAP\_UNDEFINEDIMAGESIZE

If ICAP\_UNDEFINEDIMAGESIZE can be set to TRUE then it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on the following appropriate capabilities:

- ICAP\_AUTOMATICBORDERDETECTION
- ICAP\_AUTOMATICDESKEW
- ICAP\_AUTOMATICROTATE
- ICAP\_FLIPROTATION
- ICAP\_OVERSCAN

If ICAP\_UNDEFINEDIMAGESIZE can be set to TRUE while ICAP\_XFERMECH is set to TWSX\_MEMORY, the Data Source must also support the following operation in State 7 after receiving TWRC\_XFERDONE:

- DG\_IMAGE / DAT\_IMAGEINFO / MSG\_GET

If the Data Source has any control over a Printer or Endorser type device, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on the following capability:

- ICAP\_PRINTERENABLED
- ICAP\_PRINTER

If the Data Source has control over what is printed through any of the TWAIN defined Printer Modes, it must respond DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on the following capability:

- ICAP\_PRINTERMODE

Depending on what ICAP\_PRINTERMODE values are supported, the source must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on the following appropriate capabilities:

- CAP\_PRINTERINDEX
- CAP\_PRINTERSTRING
- CAP\_PRINTERSUFFIX

If the Data Source supports internal image compression, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on the following capability:

- ICAP\_COMPRESSION

If the Data Source supports ICAP\_COMPRESSION and the value TWCP\_JPEG, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on the following capability:

- ICAP\_JPEGPIXELTYPE

If the Data Source supports ICAP\_COMPRESSION and one of the CCITT values such as: TWCP\_GROUP31D, TWCP\_GROUP31DEOL, TWCP\_GROUP32D, or TWCP\_GROUP4, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on the following appropriate capabilities:

- ICAP\_BITORDERCODES
- ICAP\_CCITTKFACTOR (only relevant to TWCP\_GROUP32D)
- ICAP\_PIXELFLAVORCODES
- ICAP\_TIMEFILL

If a Data Source supports any of the following Extended Image attributes, it must respond to DG\_CONTROL / DAT\_EXTIMAGEINFO / MSG\_GET during State 7, after successful return of TWRC\_XFERDONE by filling in the appropriate supported TWEL\_X values.



If a Data Source supports control over Patch Code detection, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on the following capabilities:

- ICAP\_PATCHCODEDETECTIONENABLED
- ICAP\_SUPPORTEDPATCHCODETYPES
- CAP\_JOBCONTROL

\*Note: Source must also fill in the extended EOJ field of the TW\_PENDINGXFERS structure when CAP\_JOBCONTROL is enabled. See DG\_CONTROL / DAT\_PENDINGXFERS / MSG\_ENDXFER

If a Data Source supports refinement of any Patch Code search parameters, it must respond DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET for the following appropriate capabilities:

- ICAP\_PATCHCODESEARCHPRIORITIES
- ICAP\_PATCHCODEMAXRETRIES
- ICAP\_PATCHCODETIMEOUT
- ICAP\_PATCHCODESEARCHMODE

If a Data Source supports control over Bar Code detection, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET on the following capabilities:

- ICAP\_BARCODEDETECTIONENABLED
- ICAP\_SUPPORTEDBARCODETYPES

If a Data Source supports refinement of any Bar Code search parameters, it must respond DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET for the applicable following capabilities:

- ICAP\_BARCODESEARCHPRIORITIES
- ICAP\_BARCODEMAXRETRIES
- ICAP\_BARCODETIMEOUT
- ICAP\_BARCODESEARCHMODE

If a Data Source supports control of audible alarms, it must respond DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET for the applicable following capability:

- CAP\_ALARMS

If a Data Source supports audible alarms and has control over the volume, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET for the following capability:

- CAP\_ALARMVOLUME

The following Operations and Capabilities are highly recommended for this class of Data Source:

DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET - CAP\_ENABLEDSUIONLY  
DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET - CAP\_CUSTOMDSDATA  
DG\_CONTROL / DAT\_USERINTERFACE / MSG\_ENABLEDSUIONLY  
DG\_CONTROL / DAT\_CUSTOMDSDATA / MSG\_GET  
DG\_CONTROL / DAT\_CUSTOMDSDATA / MSG\_SET  
DG\_CONTROL / DAT\_EVENT / MSG\_CLOSEDOK – (output triplet)

Note: see ‘Permanent Storage/Retrieval Devices’, a Data Source may want to implement DAT\_FILESYSTEM in order to allow applications to index particular camera’s within a production scanner.

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## Permanent Storage/Retrieval Devices

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Permanent storage/retrieval devices are unique in that more than one image is stored and the dimensions and bit depth may vary from image to image. These devices could be just a database of images, or a PCMCIA card from a Digital Camera. Such devices need features for browsing the available images, retrieve properties and select sets of images for transfer.

If a Data Source supports Permanent Storage/Retrieval of Images, it must respond to the appropriate operations and capabilities:

DG\_CONTROL / DAT\_FILESYSTEM / MSG\_COPY, MSG\_DELETE,  
MSG\_CREATEDIRECTORY, MSG\_AUTOMATICCAPTURED,  
MSG\_FORMATMEDIA, MSG\_GETFIRSTFILE, MSG\_GETINFO,  
MSG\_GETNEXTFILE, MSG\_RENAME

DG\_CONTROL/DAT\_CAPABILITY/ MSG\_GET, MSG\_GETCURRENT,  
MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET for the following appropriate capabilities:

ICAP\_IMAGEDATASET

If a Data Source supports some Annotation about the Images stored in permanent storage, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETDEFAULT, MSG\_GETCURRENT, MSG\_SET, MSG\_RESET for the following appropriate capabilities:

CAP\_AUTHOR  
CAP\_CAPTION  
CAP\_TIMEDATE

If a Data Source supports a flash, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETDEFAULT, MSG\_GETCURRENT, MSG\_SET, MSG\_RESET for the following capability:  
ICAP\_FLASHUSED2 – Note: replaces ICAP\_FLASHUSED with more functionality.

If the Data Source supports Audio Snippets to be associated with an image, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETDEFAULT, MSG\_GETCURRENT, MSG\_SET, MSG\_RESET for the following capabilities:  
ACAP\_XFERMECH  
ACAP\_AUDIOFILEFORMAT

If the Data Source supports transfer of Audio snippets, it must also support DG\_CONTROL / DAT\_XFERGROUP / MSG\_SET with a value of DG\_AUDIO and the following operations:  
DG\_AUDIO/DAT\_AUDIOFILEXFER/MSG\_GET  
DG\_AUDIO/DAT\_AUDIONATIVEXFER/MSG\_GET

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## Portable Capture Devices

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Portable capture devices are very similar to permanent storage and retrieval devices in that they typically store a number of images, however they differ in that they often have real time capture opportunities and limitations related to battery life and lenses. Examples of such devices would be Digital Camera's and Camcorders.

If a Data Source supports Power Management, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET for the following appropriate capabilities:  
CAP\_BATTERYMINUTES  
CAP\_BATTERYPERCENTAGE  
CAP\_POWERSAVETIME  
CAP\_POWERSUPPLY

If a Data Source supports Asynchronous Device Events, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET for the following capability:  
CAP\_DEVICEEVENT

If the Data Source supports a Stream of Images for implementing a Live Preview, it must respond to DG\_CONTROL / DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT for the following capability:  
CAP\_CAMERAPREVIEWUI

If the Data Source supports Automatic Capture, it must respond to DAT\_CAPABILITY / MSG\_GET, MSG\_GETCURRENT, MSG\_GETDEFAULT, MSG\_RESET and MSG\_SET for the following appropriate capabilities:

CAP\_AUTOMATICCAPTURE  
CAP\_TIMEBEFOREFIRSTCAPTURE  
CAP\_TIMEBETWEENCAPTURES

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## Further Specific Considerations

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Finally, there are a few specifics about implementation that must be addressed. Different kinds of scanners provide their own unique problems, and leave the developer with more confusing decisions to make. Consider a Digital Camera, Video Camera, or Capture Card. It is tempting to call these devices 'dimensionless'.

Before making that decision, first consider the burden this puts on the calling application. Not only does it have to be ready to negotiate with conventional scanners, it now must consider a scanner that has no conventional features. It is highly recommended that all Data Sources provide reasonable dimensions, considering the intended output and design of the device. Digital Cameras can consider mapping to classic photograph sizes, or perform some calculation based on the aperture size.

For example: Microfilm scanners work on tiny frames, but it would be completely useless to map the physical attributes of the TWAIN Data Source to such a small size. If the intended output or the original data was 11x17, then 11x17 is the actual ICAP\_PHYSICALWIDTH and ICAP\_PHYSICALHEIGHT reported for that TWAIN Data Source.

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