TWAIN Specification

Version 1.8

This document has been ratified by the TWAIN Working Group Committee as of October 22, 1998

TWAIN

Linking Images With Applications

Acknowledgments

The TWAIN Working Group acknowledges the following individuals and their respective companies for their contributions to this document. Their hard work in definition, design, editing, proofreading and discussing the evolution of the document have been invaluable.

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We also would like to thank the TWAIN Working Group Technical Committee for their opinions and contributions.

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Introduction

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The Need for Consistency

With the introduction of scanners, digital cameras, and other image acquisition devices, users eagerly discovered the value of incorporating images into their documents and other work. However, supporting the display and manipulation of this raster data placed a high cost on application developers. They needed to create user interfaces and build in device control for the wide assortment of available image devices. Once their application was prepared to support a given device, they faced the discouraging reality that devices continue to be upgraded with new capabilities and features. Application developers found themselves continually revising their product to stay current.

Developers of both the image acquisition devices and the software applications recognized the need for a standard communication between the image devices and the applications. A standard would benefit both groups as well as the users of their products. It would allow the device vendors' products to be accessed by more applications and application vendors could access data from those devices without concern for which type of device, or particular device, provided it. TWAIN was developed because of this need for consistency and simplification.

The Elements of TWAIN

TWAIN defines a standard software protocol and API (application programming interface) for communication between software applications and image acquisition devices (the source of the data).

The three key elements in TWAIN are:

- **The application software** - An application must be modified to use TWAIN.
- **The Source Manager software** - This software manages the interactions between the application and the Source. This code is provided in the TWAIN Developer's Toolkit and should be shipped for free with each TWAIN application and Source.
- **The Source software** - This software controls the image acquisition device and is written by the device developer to comply with TWAIN specifications. Traditional device drivers are now included with the Source software and do not need to be shipped by applications.

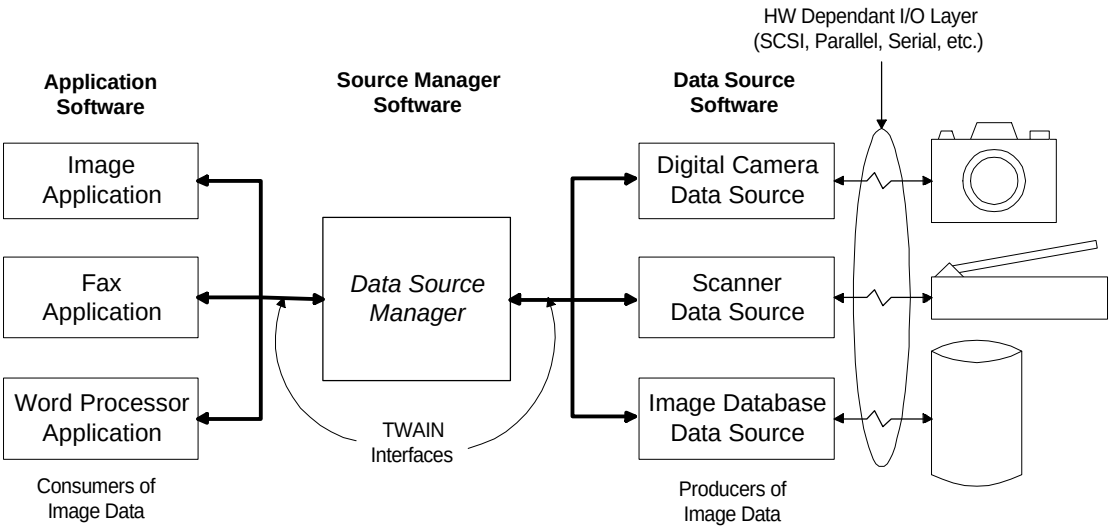

Figure 1-1. TWAIN Elements

The Benefits of Using TWAIN

For the Application Developer

- Allows you to offer users of your application a simple way to incorporate images from any compatible raster device without leaving your application.
- Saves time and dollars. If you currently provide low-level device drivers for scanners, etc., you no longer need to write, support, or ship these drivers. The TWAIN-compliant image acquisition devices will provide Source software modules that eliminate the need for you to create and ship device drivers.
- Permits your application to access data from any TWAIN-compliant image peripheral simply by modifying your application code once using the high-level TWAIN application programming interface. No customization by product is necessary. TWAIN image peripherals can include desktop scanners, hand scanners, digital cameras, frame grabbers, image databases, or any other raster image source that complies to the TWAIN protocol and API .
- Allows you to determine the features and capabilities that an image acquisition device can provide. Your application can then restrict the Source to offer only those capabilities that are compatible with your application's needs and abilities.
- Eliminates the need for your application to provide a user interface to control the image acquisition process. There is a software user interface module shipped with every TWAIN-compliant Source device to handle that process. Of course, you may provide your own user interface for acquisition, if desired.

For the Source Developer

- Increases the use and support of your product. More applications will become image consumers as a result of the ease of implementation and breadth of device integration that TWAIN provides.
- Allows you to provide a proprietary user interface for your device. This lets you present the newest features to the user without waiting for the applications to incorporate them into their interfaces.
- Saves money by reducing your implementation costs. Rather than create and support various versions of your device control software to integrate with various applications, you create just a single TWAIN-compliant Source.

For the End User

- Gives users a simple way to incorporate images into their documents. They can access the image in fewer steps because they never need to leave your application.

The Creation of TWAIN

TWAIN was created by a small group of software and hardware companies in response to the need for a proposed specification for the imaging industry. The Working Group's goal was to provide an open, multi-platform solution to interconnect the needs of raster input devices with application software. The original Working Group was comprised of representatives from five companies: Aldus, Caere, Eastman Kodak, Hewlett-Packard, and Logitech. Three other companies, Adobe, Howtek, and Software Architects also contributed significantly.

The design of TWAIN began in January, 1991. Review of the original TWAIN Developer's Toolkit occurred from April, 1991 through January, 1992. The original Toolkit was reviewed by the TWAIN Coalition. The Coalition includes approximately 300 individuals representing 200 companies who continue to influence and guide the future direction of TWAIN.

The current version of TWAIN was written by the current 11 members of the TWAIN Working Group. The members include: Adobe, Canon, Eastman Kodak Company, Fujitsu Computer Products of America, Genoa Technology, Inc., Hewlett-Packard Company, Intel Corporation, J.F.L. Peripherals, Kofax Image Products, Ricoh Corporation, and Xerox.

In May, 1998, an agreement was announced between Microsoft and the TWAIN Working Group which provided for the inclusion of the TWAIN Data Source Manager in Microsoft Windows 98 and Microsoft Windows NT 5.0.

During the creation of TWAIN, the following architecture objectives were adhered to:

- **Ease of Adoption** - Allow an application vendor to make their application TWAIN-compliant with a reasonable amount of development and testing effort. The basic features of TWAIN should be implemented just by making modest changes to the application. To take advantage of a more complete set of functionality and control capabilities, more development effort should be anticipated.
- **Extensibility** - The architecture must include the flexibility to embrace multiple windowing environments spanning various host platforms (Macintosh, Microsoft Windows, Motif, etc.) and facilitate the exchange of various data types between Source devices and destination applications. Currently, only the raster image data type is supported but suggestions for future extensions include text, facsimile, vector graphics, and others.
- **Integration** - Key elements of the TWAIN implementation "belong" in the operating system. The agreement between Microsoft and the TWAIN Working Group indicates that this integration into the operating system is beginning. TWAIN must be implemented to encourage backward compatibility (extensibility) and smooth migration into the operating system. An implementation that minimizes the use of platform-specific mechanisms will have enhanced longevity and adoptability.
- **Easy Application <-> Source Interconnect** - A straight-forward Source identification and selection mechanism will be supplied. The application will drive this mechanism through a simple API. This mechanism will also establish the data and control links between the application and Source. It will support capability and configuration communication and negotiation between the application and Source.
- **Encapsulated Human Interface** - A device-native user interface will be required in each Source. The application can optionally override this native user interface while still using the Source to control the physical device.

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Technical Overview

The TWAIN protocol and API are easiest to understand when you see the overall picture. This chapter describes:

Chapter Contents

The TWAIN Architecture

The transfer of data is made possible by three software elements that work together in TWAIN: the application, the Source Manager, and the Source.

These elements use the architecture of TWAIN to communicate. The TWAIN architecture consists of four layers:

- Application
- Protocol
- Acquisition
- Device

The TWAIN software elements occupy the layers as illustrated below. Each layer is described in the sections that follow.

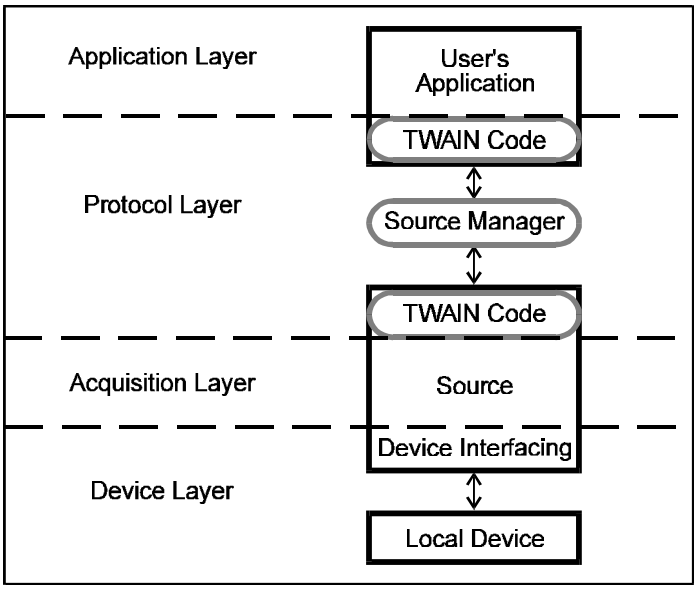

Figure 2-1. TWAIN Software Elements

Application

The user's software application executes in this layer.

TWAIN describes user interface guidelines for the application developer regarding how users access TWAIN functionality and how a particular Source is selected.

TWAIN is not concerned with how the application is implemented. TWAIN has no effect on any inter-application communication scheme that the application may use.

Protocol

The protocol is the "language" spoken and syntax used by TWAIN. It implements precise instructions and communications required for the transfer of data.

The protocol layer includes:

- The portion of application software that provides the interface between the application and TWAIN
- The TWAIN Source Manager provided by TWAIN
- The software included with the Source device to receive instructions from the Source Manager and transfer back data and Return Codes

The contents of the protocol layer are discussed in more detail in a following section called "Communication between the Elements of TWAIN."

Acquisition

Acquisition devices may be physical (like a scanner or digital camera) or logical (like an image database). The software elements written to control acquisitions are called Sources and reside primarily in this layer.

The Source transfers data for the application. It uses the format and transfer mechanism agreed upon by the Source and application.

The Source always provides a built-in user interface that controls the device(s) the Source was written to drive. An application can override this and present its own user interface for acquisition, if desired.

Device

This is the location of traditional low-level device drivers. They convert device-specific commands into hardware commands and actions specific to the particular device the driver was written to accompany. Applications that use TWAIN no longer need to ship device drivers because they are part of the Source.

TWAIN is not concerned with the device layer at all. The Source hides the device layer from the application. The Source provides the translation from TWAIN operations and interactions with the Source's user interface into the equivalent commands for the device driver that cause the device to behave as desired.

Note: The Protocol layer is the most thoroughly and rigidly defined to allow precise communications between applications and Sources. The information in this document concentrates on the Protocol and Acquisition layers.

The User Interface to TWAIN

When an application uses TWAIN to acquire data, the acquisition process may be visible to the application's users in the following three areas:

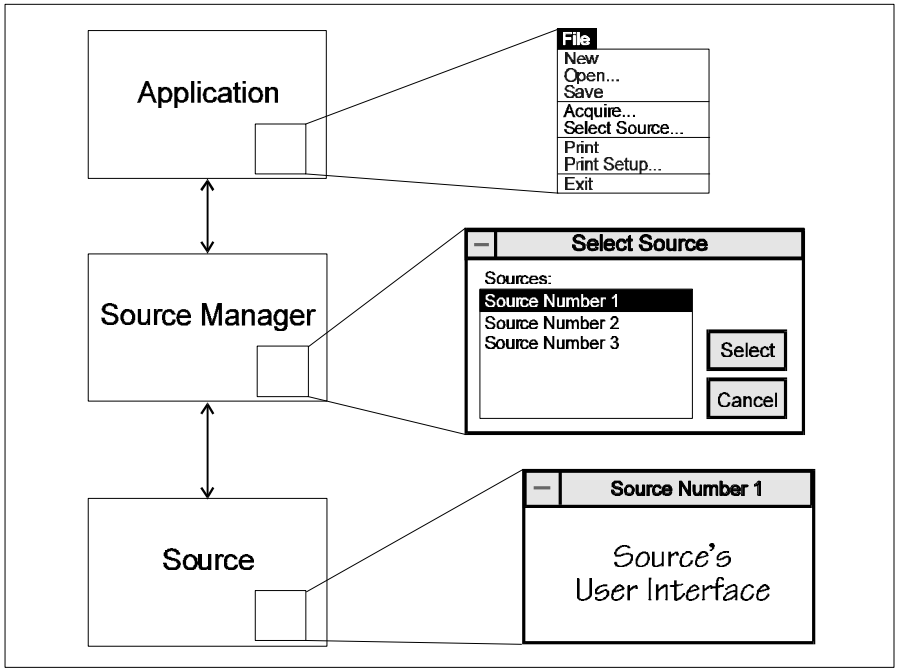

Figure 2-2. Data Acquisition Process

The Application

The user needs to select the device from which they intend to acquire the data. They also need to signal when they are ready to have the data transferred. To allow this, TWAIN strongly recommends the application developer add two options to their File menu:

- **Select Source** - to select the device
- **Acquire** - to begin the transfer process

The Source Manager

When the user chooses the Select Source option, the application requests that the Source Manager display its Select Source dialog box. This lists all available devices and allows the user to highlight and select one device. If desired, the application can write its own version of this user interface.

The Source

Every TWAIN-compliant Source provides a user interface specific to its particular device. When the application user selects the Acquire option, the **Source's User Interface** may be displayed. If desired, the application can write its own version of this interface, too.

Communication Between the Elements of TWAIN

Communication between elements of TWAIN is possible through two entry points. They are called DSM_Entry( ) and DS_Entry( ). DSM means Data Source Manager and DS means Data Source.

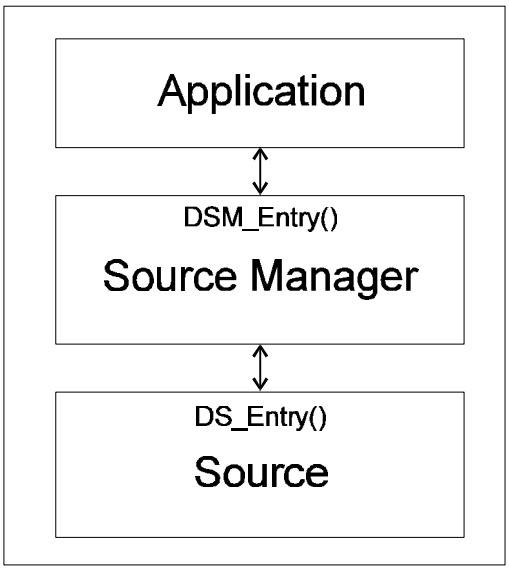

Figure 2-3. Entry Points for Communicating Between Elements

The Application

The goal of the application is to acquire data from a Source. However, applications cannot contact the Source directly. All requests for data, capability information, error information, etc. must be handled through the Source Manager.

Approximately 140 operations are defined by TWAIN. The application sends them to the Source Manager for transmission. The application specifies which element, Source Manager or Source, is the final destination for each requested operation.

The application communicates to the Source Manager through the Source Manager's only entry point, the **DSM_Entry( )** function.

The parameter list of the DSM_Entry function contains:

- An identifier structure providing information about the application that originated the function call
- The destination of this request (Source Manager or Source)
- A triplet that describes the requested operation. The triplet specifies:
  - ✓ Data Group for the Operation (DG_)
  - ✓ Data Argument Type for the Operation (DAT_)
  - ✓ Message for the Operation (MSG_)

  (These are described more in the section called "The Use of Operation Triplets" located later in this chapter.)
- A pointer field to allow the transfer of data

The function call returns a value (the Return Code) indicating the success or failure of the operation.

Written in C code form, the function call looks like this:

On Windows

```
TW_UINT16 FAR PASCAL DSM_Entry
     ( pTW_IDENTITY   pOrigin,    // source of message
       pTW_IDENTITY   pDest,      // destination of message
       TW_UINT32      DG,         // data group ID: DG_xxxx
       TW_UINT16      DAT,        // data argument type: DAT_xxxx
       TW_UINT16      MSG,        // message ID: MSG_xxxx
       TW_MEMREF      pData       // pointer to data
     );
```

On Macintosh

```
FAR PASCAL TW_UINT16 DSM_Entry
     ( pTW_IDENTITY   pOrigin,    // source of message
       pTW_IDENTITY   pDest,      // destination of message
       TW_UINT32      DG,         // data group ID: DG_xxxx
       TW_UINT16      DAT,        // data argument type: DAT_xxxx
       TW_UINT16      MSG,        // message ID: MSG_xxxx
       TW_MEMREF      pData       // pointer to data
     );
```

Note: Data type definitions are covered in Chapter 8 of this document and in the file called TWAIN.H which is shipped on the developer's disk. (It can also be downloaded from the TWAIN Working Group website.)

The Source Manager

The Source Manager provides the communication path between the application and the Source, supports the user's selection of a Source, and loads the Source for access by the application. Communications from application to Source Manager arrive in the DSM_Entry( ) entry point.

- **If the destination in the DSM_Entry call is the Source Manager** - The Source Manager processes the operation itself.
- **If the destination in the DSM_Entry call is the Source** - The Source Manager translates the parameter list of information, removes the destination parameter and calls the appropriate Source. To reach the Source, the Source Manager calls the Source's **DS_Entry( )** function. TWAIN requires each Source to have this entry point.

Written in C code form, the DS_Entry function call looks like this:

On Windows

```
TW_UINT16 FAR PASCAL DS_Entry
      (pTW_IDENTITY   pOrigin,    // source of message
       TW_UINT32      DG,         // data group ID: DG_xxxx
       TW_UINT16      DAT,        // data argument type: DAT_xxxx
       TW_UINT16      MSG,        // message ID: MSG_xxxx
       TW_MEMREF      pData       // pointer to data
      );
```

On Macintosh

```
FAR PASCAL TW_UINT16 DS_Entry
      (pTW_IDENTITY   pOrigin,    // source of message
       TW_UINT32      DG,         // data group ID: DG_xxxx
       TW_UINT16      DAT,        // data argument type: DAT_xxxx
       TW_UINT16      MSG,        // message ID: MSG_xxxx
       TW_MEMREF      pData       // pointer to data
      );
```

In addition, the Source Manager can initiate three operations that were not originated by the application. These operation triplets exist just for Source Manager to Source communications and are executed by the Source Manager while it is displaying its Select Source dialog box. The operations are used to identify the available Sources and to open or close Sources.

The implementation of the Source Manager differs between the supported systems:

On Windows

The Source Manager for Windows is a Dynamic Link Library (DLL).

The Source Manager can manage simultaneous sessions between many applications with many Sources. That is, the same instance of the Source Manager is shared by multiple applications.

On Macintosh

The Source Manager for Macintosh is a code resource.

Each application gets a private copy of the Source Manager and the Source(s) it opens. The separate instances of the Source Manager and Sources can coordinate among themselves.

The Source

The Source receives operations either from the application, via the Source Manager, or directly from the Source Manager. It processes the request and returns the appropriate Return Code (the codes are prefixed with TWRC_) indicating the results of the operation to the Source Manager. If the originator of the operation was the application, then the Return Code is passed back to the application as the return value of its DSM_Entry( ) function call. If the operation was unsuccessful, a Condition Code (the codes are prefixed with TWCC_) containing more specific information is set by the Source. Although the Condition Code is set, it is not automatically passed back. The application must invoke an operation to inquire about the contents of the Condition Code.

The implementation of the Source is the same as the implementation of the Source Manager:

On Windows

The Source is a Dynamic Link Library (DLL) so applications share the same copy of each element.

On Macintosh

The Source is implemented as a Code Resource.

Communication Flowing from Source to Application

The majority of operation requests are initiated by the application and flow to the Source Manager and Source. The Source, via the Source Manager, is able to pass back data and Return Codes.

However, there are four times when the Source needs to interrupt the application and request that an action occur. These situations are:

- **Notify the application that a data transfer is ready to occur.** The time required for a Source to prepare data for a transfer will vary. Rather than have the application wait for the preparation to be complete, the Source just notifies it when everything is ready. The MSG_XFERREADY notice is used for this purpose.
- **Request that the Source's user interface be disabled.** This notification should be sent by the Source to the application when the user clicks on the "Close" button of the Source's user interface. The MSG_CLOSEDSREQ notice is used for this purpose.
- **Notify the application that the OK button has been pressed, accepting the changes the user has made.** This is only used if the Source is opened with DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDSUIONLY. The MSG_CLOSEDSOK notice is used for this purpose.
- **A Device Event has occurred.** This notification is sent by the Source to the Application when a specific event has occurred, but only if the Application gave the Source prior instructions to pass along such events. The MSG_DEVICEEVENT notice is used for this purpose.

These notices are presented to the application in its event (or message) loop. The process used for these notifications is covered more fully in Chapter 3 in the discussion of the application's event loop.

The Use of Operation Triplets

The DSM_Entry( ) and DS_Entry( ) functions are used to communicate operations. An operation is an action that the application or Source Manager invokes. Typically, but not always, it involves using data or modifying data that is indicated by the last parameter (pData) in the function call.

Requests for actions occur in one of these ways:

From	To	Using this function
The application	The Source Manager	DSM_Entry with the pDest parameter set to NULL
The application	The Source (via the Source Manager)	DSM_Entry with the pDest parameter set to point to a valid structure that identifies the Source
The Source Manager	The Source	DS_Entry

The desired action is defined by an operation triplet passed as three parameters in the function call. Each triplet uniquely, and without ambiguity, specifies a particular action. No operation is specified by more than a single triplet. The three parameters that make up the triplet are Data Group, Data Argument Type, and Message ID. Each parameter conveys specific information.

Data Group (DG_xxxx)

Operations are divided into large categories by the Data Group identifier. There are currently only two defined in TWAIN:

- **CONTROL** (The identifier is DG_CONTROL.): These operations involve control of the TWAIN session. An example where DG_CONTROL is used as the Data Group identifier is the operation to open the Source Manager.
- **IMAGE** (The identifier is DG_IMAGE.): These operations work with image data. An example where DG_IMAGE is used as a Data Group is an operation that requests the transfer of image data.
- **AUDIO** (The identifier is DG_AUDIO): These operations work with audio data (supported by some digital cameras). An example where DG_AUDIO is used as a Data Group is an operation that requests the transfer of audio data.

Data Argument Type (DAT_xxxx)

This parameter of the triplet identifies the type of data that is being passed or operated upon. The argument type may reference a data structure or a variable. There are many data argument types. One example is DAT_IDENTITY.

The DAT_IDENTITY type is used to identify a TWAIN element such as a Source. Remember, from the earlier code example, data is typically passed or modified through the pData parameter of the DSM_Entry and DS_Entry. In this case, the pData parameter would point to a data structure of type TW_IDENTITY. Notice that the data argument type begins with DAT_xxxx and the associated data structure begins with TW_xxxx and duplicates the second part of the name. This pattern is followed consistently for most data argument types and their data structures. Any exceptions are noted on the reference pages in Chapters 7 and 8.

Message ID (MSG_xxxx)

This parameter identifies the action that the application or Source Manager wishes to have taken. There are many different messages such as MSG_GET or MSG_SET. They all begin with the prefix of MSG_.

Here are three examples of operation triplets:

The triplet the application sends to the Source Manager to open the Source Manager module is:

DG_CONTROL / DAT_PARENT / MSG_OPENDSM

The triplet that the application sends to instruct the Source Manager to display its Select Source dialog box and thus allow the user to select which Source they plan to obtain data from is:

DG_CONTROL / DAT_IDENTITY / MSG_USERSELECT

The triplet the application sends to transfer data from the Source into a file is:

DG_IMAGE / DAT_IMAGEFILEXFER / MSG_GET

The State-Based Protocol

The application, Source Manager, and Source must communicate to manage the acquisition of data. It is logical that this process must occur in a particular sequence. For example, the application cannot successfully request the transfer of data from a Source before the Source Manager is loaded and prepared to communicate the request.

To ensure the sequence is executed correctly, the TWAIN protocol defines seven states that exist in TWAIN sessions. A session is the period while an application is connected to a particular Source via the Source Manager. The period while the application is connected to the Source Manager is another unique session. At a given point in a session, the TWAIN elements of Source Manager and Source each occupy a particular state. Transitions to a new state are caused by operations requested by the application or Source. Transitions can be in the forward or backward direction. Most transitions are single-state transitions. For example, an operation moves the Source Manager from State 1 to State 2 not from State 1 to State 3. (There are situations where a two-state transition may occur. They are discussed in Chapter 3.)

When viewing the state-based protocol, it is helpful to remember:

States 1, 2, and 3

- Are occupied only by the Source Manager.
- The Source Manager never occupies a state greater than State 3.

States 4, 5, 6, and 7

- Are occupied exclusively by Sources.
- A Source never has a state less than 4 if it is open. If it is closed, it has no state.
- If an application uses multiple Sources, each connection is a separate session and each open Source “resides” in its own state without regard for what state the other Sources are in.

The State Transition Diagram looks like this:

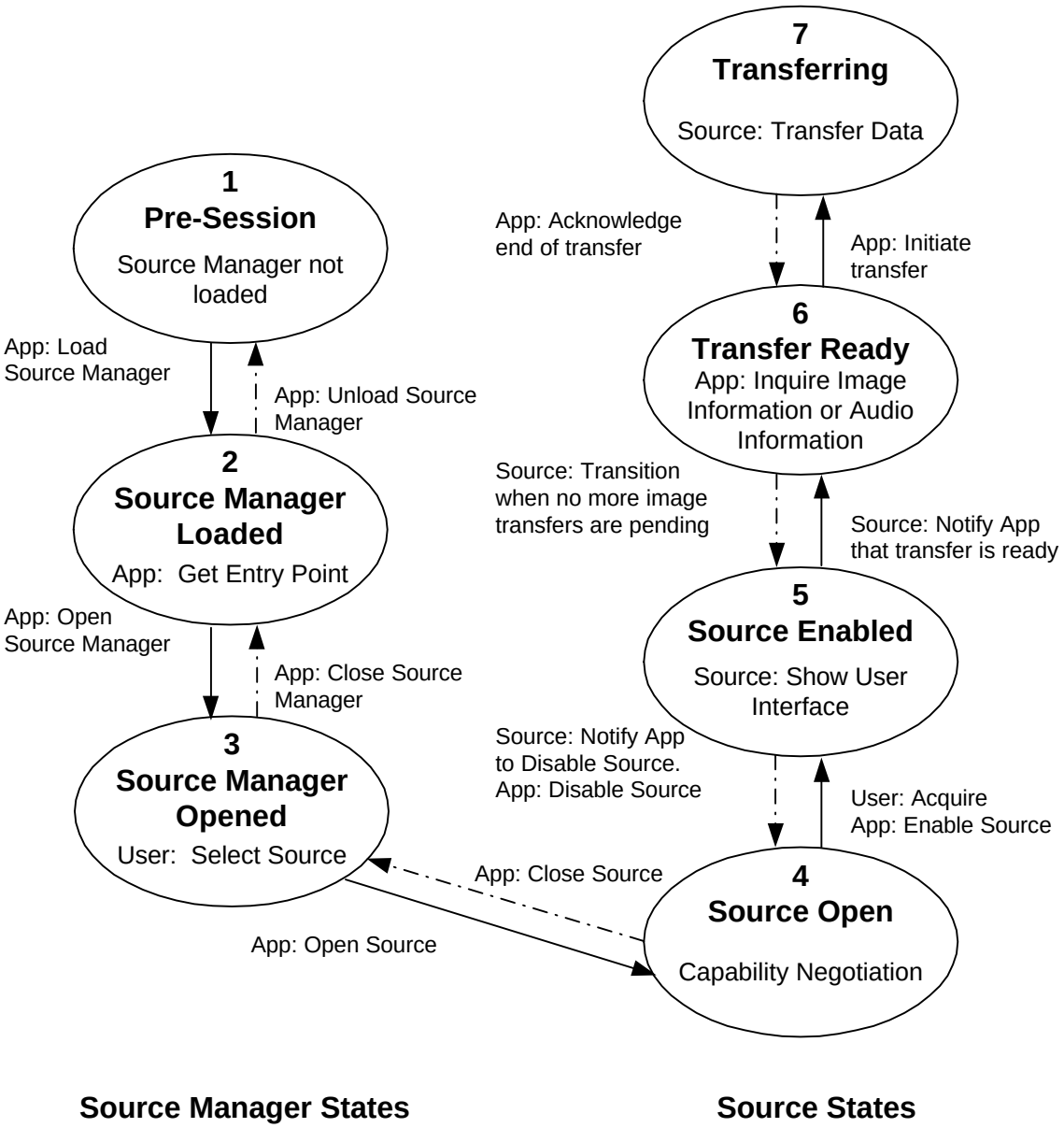

Figure 2-4. State Transition Diagram

The Description of the States

The following sections describe the states.

State 1 - Pre-Session

The Source Manager "resides" in State 1 before the application establishes a session with it.

At this point, the Source Manager code has been installed on the disk but typically is not loaded into memory yet.

The only case where the Source Manager could already be loaded and running is under Windows because the implementation is a DLL (hence, the same instance of the Source Manager can be shared by multiple applications). If that situation exists, the Source Manager will be in State 2 or 3 with the application that loaded it.

State 2 - Source Manager Loaded

The Source Manager now is loaded into memory. It is not open yet.

At this time, the Source Manager is prepared to accept other operation triplets from the application.

State 3 - Source Manager Open

The Source Manager is open and ready to manage Sources.

The Source Manager is now prepared to provide lists of Sources, to open Sources, and to close Sources.

The Source Manager will remain in State 3 for the remainder of the session until it is closed. The Source Manager refuses to be closed while the application has any Sources open.

State 4 - Source Open

The Source has been loaded and opened by the Source Manager in response to an operation from the application. It is ready to receive operations.

The Source should have verified that sufficient resources (i.e. memory, device is available, etc.) exist for it to run.

The application can inquire about the Source's capabilities (i.e. levels of resolution, support of color or black and white images, automatic document feeder available, etc.). The application can also set those capabilities to its desired settings. For example, it may restrict a Source capable of providing color images to transferring black and white only.

Note: Inquiry about a capability can occur while the Source is in States 4, 5, 6, or 7. But, an application can set a capability only in State 4 unless special permission is negotiated between the application and Source.

State 5 - Source Enabled

The Source has been enabled by an operation from the application via the Source Manager and is ready for user-enabled transfers.

If the application has allowed the Source to display its user interface, the Source will do that when it enters State 5.

State 6 - Transfer is Ready

The Source is ready to transfer one or more data items (images) to the application.

The transition from State 5 to 6 is triggered by the Source notifying the application that the transfer is ready.

Before initiating the transfer, the application must inquire information about the image (resolution, image size, etc.). If the Source supports audio, then before transferring the image, the Application must transfer all the audio snippets that are associated with the image.

It is possible for more than one image to be transferred in succession. This topic is covered thoroughly in Chapter 4.

State 7 - Transferring

The Source is transferring the image to the application.

The transfer mechanism being used was negotiated during State 4.

The transfer will either complete successfully or terminate prematurely. The Source sends the appropriate Return Code indicating the outcome.

Once the Source indicates that the transfer is complete, the application must acknowledge the end of the transfer.

Capabilities

One of TWAIN's benefits is it allows applications to easily interact with a variety of acquisition devices. Devices can provide image or audio data. For instance,

- Some devices have automatic document feeders.
- Some devices are not limited to one image but can transfer multiple images.
- Some devices support color images.
- Some devices offer a variety of halftone patterns.
- Some devices support a range of resolutions while others may offer different choices.
- Some devices allow the recording of audio data associated with an image.

Developers of applications need to be aware of a Source's capabilities and may influence the capabilities that the Source offers to the application's users. To do this, the application can perform **capability negotiation**. The application generally follows this process:

1. **Determine** if the selected Source supports a particular capability.
2. **Inquire** about the Current Value for this capability. Also, inquire about the capability's Default Value and the set of Available Values that are supported by the Source for that capability.
3. **Request** that the Source set the Current Value to the application's desired value. The Current Value will be displayed as the current selection in the Source's user interface.
4. **Limit**, if needed, the Source's Available Values to a subset of what would normally be offered. For instance, if the application wants only black and white data, it can restrict the Source to transmit only that. If a limitation effects the Source's user interface, the Source should modify the interface to reflect those changes. For example, it may gray out options that are not available because of the application's restrictions.

5. **Verify** that the new values have been accepted by the Source.

TWAIN capabilities are divided into three groups:

- **CAP_xxxx:** Capabilities whose names begin with CAP are capabilities that could apply to any general Source. Such capabilities include use of automatic document feeders, identification of the creator of the data, etc.
- **ICAP_xxxx:** Capabilities whose names begin with ICAP are capabilities that apply to image devices. The "I" stands for image. (When TWAIN is expanded to support other data transfer such as text or fax data, there will be TCAPs and FCAPs in a similar style.)
- **ACAP_xxxx:** Capabilities whose names begin with ACAP are capabilities that apply to devices that support audio. The "A" stands for audio.

Capability Containers

Capabilities exist in many varieties but all have a Default Value, Current Value, and may have other values available that can be supported if selected. To help categorize the supported values into clear structures, TWAIN defines four types of **containers** for capabilities.

Name of the Data Structure for the Container	Type of Contents
TW_ONEVALUE	A single value whose current and default values are coincident. The range of available values for this type of capability is simply this single value. For example, a capability that indicates the presence of a document feeder could be of this type.
TW_ARRAY	A rectangular array of values that describe a logical item. It is similar to the TW_ONEVALUE because the current and default values are the same and there are no other values to select from. For example, a list of the names, such as the supported capabilities list returned by the CAP_SUPPORTEDCAPS capability, would use this type of container.
TW_RANGE	Many capabilities allow users to select their current value from a range of regularly spaced values. The capability can specify the minimum and maximum acceptable values and the incremental step size between values. For example, resolution might be supported from 100 to 600 in steps of 50 (100, 150, 200, ..., 550, 600).
TW_ENUMERATION	This is the most general type because it defines a list of values from which the Current Value can be chosen. The values do not progress uniformly through a range and there is not a consistent step size between the values. For example, if a Source's resolution options did not occur in even step sizes then an enumeration would be used (for example, 150, 400, and 600).

In general, most capabilities can have more than one of these containers applied to them depending on how the particular Source implements the capability. The data structure for each of these containers is defined in Chapter 8. A complete table with all defined capabilities is located in Chapter 9. A few of the capabilities must be supported by the application and Source. The remainder of the capabilities are optional.

Capability Negotiation and Container Types

It is very important for Application and Data Source developers to note that Container types are dictated by the Data Source in all cases where a value is queried. Also the allowable container types of each capability are clearly defined in Chapter 9 of the TWAIN Specification. The only time it is appropriate for the calling Application to specify a container type is during the **MSG_SET** operation. At that time, the Application must also consider the allowable containers and types for the particular capability.

Capability Containers and String Values

The only containers that can possibly hold a string are the following:

TW_ENUMERATION
TW_ARRAY
TW_ONEVALUE

It is not possible or useful to use this type in a **TW_RANGE.** in fact there is no case where a capability has been defined in Chapter 9 of the TWAIN Specification where a **TW_RANGE** is allowed for a **TW_STRxxxx** type of value.

There are four types of TWAIN strings defined for developer use:

TW_STR32
TW_STR64
TW_STR128
TW_STR256

As of version 1.7, only the following capabilities accept strings:

CAP_AUTHOR, TW_ONEVALUE, TW_STR128
CAP_CAPTION, TW_ONEVALUE, TW_STR255
CAP_TIMEDATE, TW_ONEVALUE, TW_STR32
ICAP_HALFTONES, TW_ONEVALUE/TW_ENUMERATION/TW_ARRAY, TW_STR32

The definition of the various container types could be confusing. For example, the definition of a TW_ONEVALUE is as follows:

```
/* TWON_ONEVALUE. Container for one value. */
typedef struct {
   TW_UINT16  ItemType;
   TW_UINT32  Item;
} TW_ONEVALUE, FAR * pTW_ONEVALUE;
```

At first glance, it is tempting to try placing the string into this container by assigning “Item” to be a pointer. This is not at all consistent with the implementation of other structures in the

specification and introduces a host of problems concerning management of the memory occupied by the string. (See TW_IDENTITY for consistent TWAIN string use)

The correct and consistent method of holding a string in a TWAIN container is to ensure the string is embedded in the container itself. Either a new structure is defined within the developers code, or the added size is considered when allocating the container.

The following examples are designed to demonstrate possible methods of using TWAIN Strings in Containers. These examples are suitable for demonstration only, and require refinement to be put to real use.

Example 1:
TW_ONEVALUE structure defined for holding a TW_STR32 value

```
/* TWON_ONEVALUESTR32. Container for one value holding TW_STR32. */
typedef struct {
   TW_UINT16  ItemType;
   TW_STR32  Item;
} TW_ONEVALUESTR32, FAR * pTW_ONEVALUESTR32;
```

Note: Pay attention to two-byte structure packing when defining custom container structures.

This clearly demonstrates where the memory is allocated and where the string resides. The data source does not have to be concerned with how the string is managed locally, and the application does not have to be concerned with managing the string memory or contents.

Example 2:
TW_ONEVALUE structure allocated and filled with consideration of holding a TW_STR32 value (Windows Example)

```
HGLOBAL AllocateAndFillOneValueStr32( const pTW_STR32 pInString )
{
   DWORD dwContainerSize = 0l;
   HGLOBAL hContainer = NULL;
   pTW_ONEVALUE pOneValue = NULL;
   pTW_STR32 pString = NULL;

   assert(pInString);

   // Note: This calculation will yield a size approximately one
   // pointer larger than that required for this container
   // (sizeof(TW_UINT32)).  For simplicity the size difference
   // is negligible.  The first TW_STR32 item shall be located
   // immediately after the pEnum->DefaultIndex member.
      dwContainerSize = sizeof(TW_ONEVALUE) + sizeof(TW_STR32);
      hContainer = GlobalAlloc( GPTR, dwContainerSize );
      if(hContainer)
   {
      pOneValue = (pTW_ONEVALUE)GlobalLock(hContainer);
      if(pOneValue)
      {
         pOneValue->ItemType = TWTY_STR32;
         pString = (pTW_STR32)&pOneValue->Item;

         memcpy(pString, pInString, sizeof(TW_STR32));
```

```
            GlobalUnlock(hContainer);
            pOneValue = NULL;
            pString = NULL;
         }
      }
      return hContainer;
   }
```

Example 3: TW_ENUMERATION structure allocated with consideration of holding TW_STR32 values (Windows Example)

```
   HGLOBAL AllocateEnumerationStr32( TW_UINT32 unNumItems )
   {
      DWORD dwContainerSize = 0l;
      HGLOBAL hContainer = NULL;
      pTW_ENUMERATION pEnum = NULL;

      // Note: This calculation will yield a size approximately
      // one pointer larger than that required for this container
      // (sizeof(pTW_UINT8)).  For simplicity the size difference is
      // negligible.  The first TW_STR32 item shall be located
      // immediately after the pEnum->DefaultIndex member.

   dwContainerSize = sizeof(TW_ENUMERATION) + ( sizeof(TW_STR32) *
   unNumItems);

   hContainer = GlobalAlloc( GPTR, dwContainerSize );
      if(hContainer)
      {
         pEnum = (pTW_ENUMERATION) GlobalLock(hContainer);
         if(pEnum)
         {
            pEnum->ItemType = TWTY_STR32;
            pEnum->NumItems = unNumItems;

   GlobalUnlock(hContainer);
            pEnum = NULL;
         }
      }
      return hContainer;
   }
```

Example 4: Indexing a string from an Enumeration Container

```
   pTW_STR128 IndexStr128FromEnumeration( pTW_ENUMERATION pEnum, TW_UINT32
   unIndex)
   {
      BYTE *pBegin = (BYTE *)&pEnum->ItemList[0];
      assert(pEnum->NumItems > unIndex);
      assert(pEnum->ItemType == TWTY_STR128);

      pBegin += (unIndex * sizeof(TW_STR128));
      return (pTW_STR128)pBegin;
   }
```

Modes Available for Data Transfer

There are three different modes that can be used to transfer data from the Source to the application: native, disk file, and buffered memory. (At this time, TWAIN support for audio only allows native and disk file transfers.)

Native

Every Source must support this transfer mode. It is the default mode and is the easiest for an application to implement. However, it is restrictive (i.e. limited to the DIB or PICT formats and limited by available memory).

The format of the data is platform-specific:

- Windows: DIB (Device-Independent Bitmap)
- Macintosh: A handle to a Picture

The Source allocates a single block of memory and writes the image data into the block. It passes a pointer to the application indicating the memory location. The application is responsible for freeing the memory after the transfer.

Disk File

A Source is not required to support this transfer mode but it is recommended.

The application creates the file to be used in the transfer and ensures that it is accessible by the Source for reading and writing.

A capability exists that allows the application to determine which file formats the Source supports. The application can then specify the file format and file name to be used in the transfer.

The disk file mode is ideal when transferring large images that might encounter memory limitations with Native mode. Disk File mode is simpler to implement than the buffered mode discussed next. However, Disk File mode is a bit slower than Buffered Memory mode and the application must be able to manage the file after creation.

Buffered Memory

Every Source must support this transfer mode.

The transfer occurs through memory using one or more buffers. Memory for the buffers are allocated and deallocated by the application.

The data is transferred as an unformatted bitmap. The application must use information available during the transfer (TW_IMAGEINFO and TW_IMAGEMEMXFER) to learn about each individual buffer and be able to correctly interpret the bitmap.

If using the Native or Disk File transfer modes, the transfer is completed in one action. With the Buffered Memory mode, the application may need to loop repeatedly to obtain more than one buffer of data.

Buffered Memory transfer offers the greatest flexibility, both in data capture and control. However, it is the least simple to implement.

3

Application Implementation

This chapter provides the basic information needed to implement TWAIN at a minimum level. In this chapter, you will find information on:

Chapter Contents

Advanced topics are discussed in Chapter 4. They include how to take advantage of Sources that offer automatic feeding of multiple images.

Levels of TWAIN Implementation

Application developers can choose to implement TWAIN features in their application along a range of levels.

- **At the minimum level:** The application does not have to take advantage of capability negotiation or transfer mode selection. Using TWAIN defaults, it can just acquire a single image in the Native mode.
- **At a greater level:** The application can negotiate with the Source for desired capabilities or image characteristics and specify the transfer arrangement. This gives the application more control over the type of image it receives. To do this, developers should follow the instructions provided in this chapter and use information from Chapter 4, as well.
- **At the highest level:** An application may choose to negotiate capabilities, select transfer mode, and create/present its own user interfaces instead of using the built-in ones provided with the Source Manager and Source. Again, refer to this chapter and Chapter 4.

Installation of the Source Manager Software

For a TWAIN-compliant application or Source to work properly, a Source Manager **must** be installed on the host system. To guarantee that a Source Manager is available, ship a copy of the latest Source Manager on your product's distribution disk and provide the user with an installer or installation instructions as suggested below. To ensure that the most recent version of the Source Manager is available to you and your user on their computer, you must do the following:

1. Look for a Source Manager:
   a. **On Windows systems**: Look for the file names TWAIN.DLL, TWAIN_32.DLL, TWUNK_16.EXE, and TWUNK_32.EXE in the Windows directory (this is typically C:\Windows on Windows 3.1/95/98, and C:\Winnt on Windows NT).
   b. **On Macintosh systems**: Look for the file name "Source Manager" in the TWAIN folder. On System 6, the TWAIN folder lives in the System Folder. On System 7, the TWAIN folder lives in the Preferences folder which lives in the System Folder. (Note, the term "Source Manager" may be localized for other languages.)
2. If no Source Manager is currently installed, install the Source Manager sent out with your application.
3. If a Source Manager already exists, check the version of the installed Source Manager. If the version provided with your application is more recent, rename the existing one as follows and install the Source Manager you shipped. To rename the existing Source Manager:
   a. **On Windows systems**: Rename the four files to be TWAIN.BAK, TWAIN_32.BAK, TWUNK_16.BAK, and TWUNK_32.BAK.
   b. **On Macintosh systems**: Rename it to Source Manager Old.

How to Install the Source Manager on Microsoft Windows Systems

To allow the comparison of Source Manager versions, the Microsoft Windows Source Manager DLL has version information built into it which conforms to the Microsoft File Version Stamping specification. Application developers are strongly encouraged to take advantage of this in their installation programs. Microsoft provides the File Version Stamping Library, VER.DLL, which should be used to install the Source Manager.

VER.DLL, VER.LIB and VER.H are included in this Toolkit; VER.DLL may be freely copied and distributed with your installation program. Of course, your installation program will have to link to this DLL to use it. Documentation on the File Version Stamping Library API can be found in the Microsoft Windows 3.1 SDK. VER.DLL can be used under Windows 3.0 as well as 3.1.

The following code fragment demonstrates how the VerInstallFile( ) function provided in VER.DLL can be used to install the Source Manager into the user's Windows directory.

Note that the following example assumes that your installation floppy disk is in the A: drive and the Source Manager is in the root of the installation disk.

```
#include "windows.h"
#include "ver.h"
#include "stdio.h"

// Max file name length is based on 8 dot 3 file name convention.
#define MAXFNAMELEN 12
// Max path name length is based on GetWindowsDirectory()
// documentation.
#define MAXPATHLEN 144

VOID InstallWinSM ( VOID )
{
   DWORD  dwInstallResult;
   WORD   wTmpFileLen = MAXPATHLEN;
   WORD   wLen;

   char   szSrcDir[MAXPATHLEN];
   char   szDstDir[MAXPATHLEN];
   char   szCurDir[MAXPATHLEN];
   char   szTmpFile[MAXPATHLEN];

   wLen = GetWindowsDirectory( szDstDir, MAXPATHLEN );
   if (!wLen || wLen>MAXPATHLEN)
   {
      return;   // failure getting Windows dir
   }

   strcpy( szCurDir, szDstDir );
   strcpy( szSrcDir, "a:\\" );

   dwInstallResult = VerInstallFile( VIFF_DONTDELETEOLD,
                                     "TWAIN_32.DLL",
                                     "TWAIN_32.DLL",
                                     szSrcDir,
                                     szDstDir,
                                     szCurDir,
                                     szTmpFile,
                                     &wTmpFileLen );

   // If VerInstallFile() left a temporary copy of the new
   // file in DstDir be sure to delete it. This happens
   // when a more recent version is already installed.
   if ( dwInstallResult & VIF_TEMPFILE  &&
       ((wTmpFileLen - MAXPATHLEN) > MAXFNAMELEN) )
   {
      // when dst path is root it already ends in '\'
      if (szDstDir[wLen-1] != '\\')
      {
         strcat( szDstDir, "\\" );
      }
      strcat( szDstDir, szTmpFile );
      remove( szDstDir );
   }
}
```

You should enhance the above code so that it handles the other three files (TWAIN.DLL, TWUNK_16.EXE, and TWUNK_32.EXE), as well as fixing it to handle low memory and other error conditions, as indicated by the dwInstallResult return code. Also note that the above code does not leave a backup copy of the user's prior Source Manager on their disk, but you should do this. Copy the older versions to TWAIN.BAK, TWAIN_32.BAK, TWUNK_16.BAK, and TWUNK_32.BAK.

How to Install the Source Manager on Macintosh Systems

To perform the comparison of Source Manager versions, use the vers resource. Use the following algorithm to develop code for installing the Source Manager on the Macintosh:

```
if (there is not a Source Manager installed) or
   (if installed Source Manager is older)

   if (the current system predates 7.0)
      if (there isn't a "TWAIN" folder in the System Folder)
         Create a "TWAIN" folder in the System Folder
      copy the Source Manager into the "TWAIN" folder in System Folder
   else
      if (there isn't a "TWAIN" folder in the Preferences Folder)
         Create a "TWAIN" folder in the Preferences folder
      copy the Source Manager into the "TWAIN" folder
```

Changes Needed to Prepare for a TWAIN Session

There are three areas of the application that must be changed before a TWAIN session can even begin. The application developer must:

1. Alter the application's user interface to add Select Source and Acquire menu choices
2. Include the file called TWAIN.H in your application
3. Alter the application's event loop

Alter the Application's User Interface to Add Select Source and Acquire Options

As mentioned in the Technical Overview chapter, the application should include two menu items in its File menu: **Select Source...** and **Acquire...**. It is strongly recommended that you use these phrases since this consistency will benefit all users.

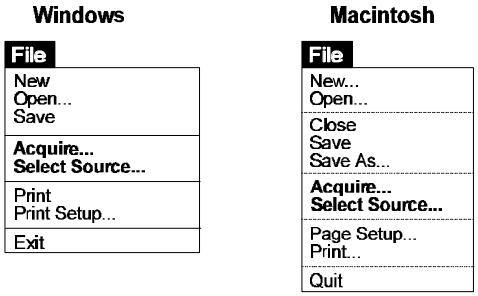

Figure 3-1. User Interface for Selecting a Source and Acquiring Options

Note the following:

When this is selected:	The application does this:
Select Source...	The application requests that the Source Manager's Select Source Dialog Box appear (or it may display its own version). After the user selects the Source they want to use, control returns to the application.
Acquire...	The application requests that the Source display its user interface. (Again, the application can create its own version of a user interface or display no user interface.)

Detailed information on the operations used by the application to successfully acquire data is provided later in this chapter in the section called "Controlling a TWAIN Session from your Application."

Include the TWAIN.H File in Your Application

The TWAIN.H file that is shipped with this TWAIN Developer's Toolkit contains all of the critical definitions needed for writing a TWAIN-compliant application or Source. Be sure to include it in your application's code and print out a copy to refer to while reading this chapter.

The TWAIN.H file contains:

Category	Prefix for each item
Data Groups	DG_
Data Argument Types	DAT_
Messages	MSG_
Capabilities	CAP_, ICAP_, or ACAP_
Return Codes	TWRC_
Condition Codes	TWCC_
Type Definitions	TW_
Structure Definitions	TW_
Entry points	These are DSM_Entry and DS_Entry

In addition, there are many constants defined in TWAIN.H which are not listed here.

Alter the Application's Event Loop

Events include activities such as key clicks, mouse events, periodic events, accelerators, etc. Every TWAIN-compliant application, whether on Macintosh or Windows, needs an event loop. (On Windows, these actions are called messages but that can be confusing because TWAIN uses the term messages to describe the third parameter of an operation triplet. Therefore, we will refer to these key clicks, etc. as events in this section generically for both Windows and Macintosh.)

During a TWAIN session, the application opens one or more Sources. However, even if several Sources are open, the application should only have one Source enabled at any given time. That is the Source from which the user is attempting to acquire data.

Altering the event loop serves three purposes:

- Passing events from the application to the Source so it can respond to them
- Notifying the application when the Source is ready to transfer data or have its user interface disabled
- Notifying the application when a device event occurs.

Event Loop Modification - Events in State 4

Please note that with TWAIN 1.8 and the addition of the DG_CONTROL / DAT_NULL / MSG_DEVICEEVENT message, it is possible to receive events after the Source has been opened but before it has been enabled (State 4). However, these events will not be sent from the Source to the Application unless the Application has negotiated for specific events using CAP_DEVICEEVENTS. Events posted in this way must use the hWnd passed to them by the DG_CONTROL / DAT_PARENT / MSG_OPENDS message. Sources are required to have all device events turned off when they are opened to support backward compatiblity with older TWAIN applications.

Event Loop Modification - Passing events (The first purpose)

While a Source is enabled, all events are sent to the application's event loop. Some of the events may belong to the application but others belong to the enabled Source. To ensure that the Source receives and processes its events, the following changes are required:

The application **must** send all events that it receives in its event loop to the Source as long as the Source is enabled. The application uses:

DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT

The TW_EVENT data structure used looks like this:

```
typedef struct {
   TW_MEMREF     pEvent;     /* Windows pMSG or MAC pEvent   */
   TW_UINT16     TWMessage;  /* TW message from Source to    */
                             /* the application              */
} TW_EVENT, FAR *pTW_EVENT;
```

The pEvent field points to the EventRecord (Macintosh) or message structure (Windows).

The Source receives the event from the Source Manager and determines if the event belongs to it.

- **If it does**, the Source processes the event. It then sets the Return Code to TWRC_DSEVENT to indicate it was a Source event. In addition, it should set the TWMessage field of the TW_EVENT structure to MSG_NULL.
- **If it does not**, the Source sets the Return Code to TWRC_NOTDSEVENT meaning it is not a Source event. In addition, it should set the TWMessage field of the TW_EVENT structure to MSG_NULL. The application receives this information from DSM_Entry and should process the event in its event loop as normal.

On Macintosh only, the application must periodically send NULL events to the Source to allow notifications from Source to application.

Event Loop Modification - Notifications from Source to application (The second and third purpose)

When the Source has data ready for a data transfer or it wishes to request that its user interface be disabled, it needs to communicate this information to the application asynchronously.

These notifications appear in the application's event loop. They are contained in the TW_EVENT.TWMessage field. The four notices of interest are:

- MSG_XFERREADY to indicate data is ready for transfer
- MSG_CLOSEDSREQ to request that the Source's user interface be disabled
- MSG_CLOSEDSOK to request that the Source's user interface be disabled (special case for use with DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDSUIONLY).
- MSG_DEVICEEVENT to report that a device event has occurred.

Therefore, the application's event loop must always check the TW_EVENT.TWMessage field following a DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT call to determine if it is the simple MSG_NULL or critical MSG_XFERREADY or MSG_CLOSEDSREQ. Information about how the application should respond to these two special notices is detailed later in this chapter in the "Controlling a TWAIN Session from your Application" section.

How to Modify the Event Loop for Microsoft Windows

This section illustrates typical modifications needed in an Microsoft Windows application to support TWAIN-connected Sources.

```
TW_EVENT   twEvent;
TW_INT16   rc;

while (GetMessage ( (LPMSG) &msg, NULL, 0, 0) )
{
      if Source is enabled
      {
            twEvent.pEvent = (TW_MEMREF)&msg;
            twEvent.TWMessage = MSG_NULL;
            rc = (*pDSM_Entry) (pAppId,
                                pSourceId,
                                DG_CONTROL,
                                DAT_EVENT,
                                MSG_PROCESSEVENT,
                               (TW_MEMREF)&twEvent);

            // check for message from Source
            switch (twEvent.TWMessage)
            {
                  case MSG_XFERREADY:
                        SetupAndTransferImage(NULL);
                        break;

                  case MSG_CLOSEDSREQ:
                        DisableAndCloseSource(NULL);
                        break;
```

```
                    case MSG_NULL:
                          // no message was returned from the source
                          break;
              }
              if (rc == TWRC_NOTDSEVENT)
              {
                    TranslateMessage( (LPMSG) &msg);
                    DispatchMessage( (LPMSG) &msg);
              }
        }
  }
```

Note: Source writers are advised to keep stack space usage to a minimum. Application writers should be also be aware that, in the Windows environment, sources run in their calling application's data space. They depend upon the application to reserve enough stack space for the source to be able to perform its various functions. For this reason, applications should define enough stack space in their linker DEF files for the sources that they might use.

How to Modify the Event Loop for Macintosh

This section illustrates typical modifications needed in a Macintosh application to support TWAIN-connected Sources.

```
TW_EVENT      twEvent;
TW_INT16      rc;
EventRecord   theEvent;
while (!Done){
      If Source is Enabled{
             //Send periodic NULL events to the Source
             twEvent.pEvent = NULL;
             twEvent.TWMessage = MSG_NULL;
             rc = (*pDSM_Entry) (pAppID,
                         pSourceID,
                         DG_CONTROL,
                         DAT_EVENT,
                         MSG_PROCESSEVENT,
                         (TW_MEMREF)&twEvent);
             //check for message from Source
             switch (twEvent.TWMessage){
                   case MSG_XFERREADY:
                         SetupImage(NULL);
                         break;
                   case MSG_CLOSEDSREQ:
                         DisableSource(NULL);
                         break;
                   case MSG_NULL:
                         //no message was returned from the Source
                         break;
             }
      }
```

```
        if (GetNextEvent(everyEvent, &theEvent) ){   //or WaitNextEvent()
               If Source is Enabled{
                      twEvent.pEvent = &theEvent;
                      twEvent.TWMessage = MSG_NULL;
                      rc = (*pDSM_Entry) (pAppID,
                             pSourceID,
                             DG_CONTROL,
                             DAT_EVENT,
                             MSG_PROCESSEVENT,
                            (TW_MEMREF)&twEvent);
                      //check for message from Source
                      switch (twEvent.TWMessage){
                            case MSG_XFERREADY:
                                  SetupImage(NULL);
                                  break;
                            case MSG_CLOSEDSREQ:
                                  DisableSource(NULL);
                                  break;
                            case MSG_NULL:
                                  //no message was returned from the Source
                                  break;
                      }
                      if (rc == TWRC_NOTDSEVENT)
                            Message=DealWithEvent(&theEvent);
               }
        } else
               Message=DealWithEvent(&theEvent);
}
```

The DSM_Entry Call and Available Operation Triplets

As described in the Technical Overview chapter, all actions that the application invokes on the Source Manager or Source are routed through the Source Manager. The application passes the request for the action to the Source Manager via the DSM_Entry function call which contains an operation triplet describing the requested action. In code form, the DSM_Entry function looks like this:

On Windows:

```
TW_UINT16 FAR PASCAL DSM_Entry
     ( pTW_IDENTITY   pOrigin,    // source of message
       pTW_IDENTITY   pDest,      // destination of message
       TW_UINT32      DG,         // data group ID: DG_xxxx
       TW_UINT16      DAT,        // data argument type: DAT_xxxx
       TW_UINT16      MSG,        // message ID: MSG_xxxx
       TW_MEMREF      pData       // pointer to data
     );
```

On Macintosh:

```
FAR PASCAL TW_UINT16 DSM_Entry
     ( pTW_IDENTITY   pOrigin,    // source of message
       pTW_IDENTITY   pDest,      // destination of message
       TW_UINT32      DG,         // data group ID: DG_xxxx
       TW_UINT16      DAT,        // data argument type: DAT_xxxx
       TW_UINT16      MSG,        // message ID: MSG_xxxx
       TW_MEMREF      pData       // pointer to data
     );
```

The DG, DAT, and MSG parameters contain the operation triplet. The parameters must follow these rules:

pOrigin

References the application's TW_IDENTITY structure. The contents of this structure must not be changed by the application from the time the connection is made with the Source Manager until it is closed.

pDest

Set to NULL if the operation's final destination is the Source Manager.

Otherwise, set to point to a valid TW_IDENTITY structure for an open Source.

DG_xxxx

Data Group of the operation. Currently, only DG_CONTROL, DG_IMAGE, and DG_AUDIO are defined. Custom Data Groups can be defined.

DAT_xxxx

Designator that uniquely identifies the type of data "object" (structure or variable) referenced by pData.

MSG_xxxx

Message specifies the action to be taken.

pData

Refers to the TW_xxxx structure or variable that will be used during the operation. Its type is specified by the DAT_xxxx. This parameter should always be typecast to TW_MEMREF when it is being referenced.

Operation Triplets - Application to Source Manager

There are nine operation triplets that can be sent from the application to be consumed by the Source Manager. They all use the DG_CONTROL data group and they use three different data argument types: DAT_IDENTITY, DAT_PARENT, and DAT_STATUS. The following table lists the data group, data argument type, and messages that make up each operation. The list is in alphabetical order not the order in which they are typically called by an application. Details about each operation are available in reference format in Chapter 7.

Control Operations from Application to Source Manager

DG_CONTROL / DAT_IDENTITY

MSG_CLOSEDS :	Prepare specified Source for unloading
MSG_GETDEFAULT :	Get identity information of the default Source
MSG_GETFIRST :	Get identity information of the first available Source
MSG_GETNEXT :	Get identity of the next available Source
MSG_OPENDS :	Load and initialize the specified Source
MSG_USERSELECT :	Present “Select Source” dialog

DG_CONTROL / DAT_PARENT

MSG_CLOSEDSM :	Prepare Source Manager for unloading
MSG_OPENDSM :	Initialize the Source Manager

DG_CONTROL / DAT_STATUS

MSG_GET :	Return Source Manager’s current Condition Code

Operation Triplets - Application to Source

The next group of operations are sent to a specific Source by the application. These operations are still passed via the Source Manager using the DSM_Entry call. The first set of triplets use the DG_CONTROL identification for their data group. These are operations that could be performed on any kind of TWAIN device. The second set of triplets use the DG_IMAGE identification for their data group which indicates these operations are specific to image data. Details about each operation are available in reference format in Chapter 7.

Control Operations from Application to Source

DG_CONTROL / DAT_CAPABILITY

MSG_GET :	Return a Capability’s valid value(s) including current and default values
MSG_GETCURRENT :	Get a Capability’s current value
MSG_GETDEFAULT :	Get a Capability’s preferred default value (Source specific)
MSG_RESET :	Change a Capability’s current value to its TWAIN-defined default (See Chapter 9)
MSG_SET :	Change a Capability’s current and/or available value(s)

DG_CONTROL / DAT_DEVICEEVENT

MSG_GET :	Get an event from the Source (issue this call only in response to a DG_CONTROL / DAT_NULL / MSG_DEVICEEVENT from the Source)

DG_CONTROL / DAT_EVENT

MSG_PROCESSEVENT : Pass an event to the Source from the application

DG_CONTROL / DAT_FILESYSTEM

MSG_AUTOMATICCAPTUREDIRECTORY : Select directory to receive automatically captured images

MSG_CHANGEDIRECTORY : Change the current domain, host, directory, or device.

MSG_COPY : Copy files

MSG_CREATEDIRECTORY : Create a directory

MSG_DELETE : Delete a file or directory

MSG_FORMATMEDIA : Format a storage device

MSG_GETCLOSE : Close a context created by a call to MSG_GETFILEFIRST

MSG_GETFIRSTFILE : Get the first file in a directory

MSG_GETINFO : Get information about the current file context

MSG_RENAME : Rename a file

DG_CONTROL / DAT_PASSTHRU / MSG_PASSTHRU

MSG_PASSTHRU : Special command for the use by Source vendors when writing diagnostic Applications

DG_CONTROL / DAT_PENDINGXFERS

MSG_ENDXFER : Application acknowledges or requests the end of data transfer

MSG_GET : Return the number of transfers the Source is ready to supply

MSG_RESET : Set the number of pending transfers to zero

DG_CONTROL / DAT_SETUPFILEXFER

MSG_GET : Return info about the file that the Source will write the acquired data into

MSG_GETDEFAULT : Return the default file transfer information

MSG_RESET : Reset current file information to default values

MSG_SET : Set file transfer information for next file transfer

DG_CONTROL / DAT_SETUPMEMXFER

MSG_GET : Return Source's preferred, minimum, and maximum transfer buffer sizes

DG_CONTROL / DAT_STATUS

MSG_GET : Return the current Condition Code from specified Source

DG_CONTROL / DAT_USERINTERFACE

MSG_DISABLEDS : Cause Source's user interface to be taken down

MSG_ENABLEDS : Cause Source to prepare to display its user interface

DG_CONTROL / DAT_XFERGROUP

MSG_GET : Return the Data Group (currently DG_IMAGE or a custom data group) for the upcoming transfer

There are five more DG_CONTROL operations for communications between the Source Manager and the Source. They are discussed in Chapter 5.

Image Operations from Application to Source

DG_IMAGE / DAT_CIECOLOR

MSG_GET : Return the CIE XYZ information for the current transfer

DG_IMAGE / DAT_GRAYRESPONSE

MSG_RESET : Reinstate identity response curve for grayscale data
MSG_SET : Source uses specified response curve on grayscale data

DG_IMAGE / DAT_IMAGEFILEXFER

MSG_GET : Initiate image acquisition using the Disk File transfer mode

DG_IMAGE / DAT_IMAGEINFO

MSG_GET : Return information that describes the image for the next transfer

DG_IMAGE / DAT_IMAGELAYOUT

MSG_GET : Describe physical layout / position of "original" image
MSG_GETDEFAULT : Default information on the layout of the image
MSG_RESET : Set layout information for the next transfer to defaults
MSG_SET : Set layout for the next image transfer

DG_IMAGE / DAT_IMAGEMEMXFER

MSG_GET : Initiate image acquisition using the Buffered Memory transfer mode

DG_IMAGE / DAT_IMAGENATIVEXFER

MSG_GET : Initiate image acquisition using the Native transfer mode

DG_IMAGE / DAT_JPEGCOMPRESSION

MSG_GET : Return JPEG compression parameters for current transfer
MSG_GETDEFAULT : Return default JPEG compression parameters
MSG_RESET : Use Source's default JPEG parameters on JPEG transfers
MSG_SET : Use specified JPEG parameters on JPEG transfers

DG_IMAGE / DAT_PALETTE8

MSG_GET : Return palette information for current transfer
MSG_GETDEFAULT : Return Source's default palette information for current pixel type
MSG_RESET : Use Source's default palette for transfer of this pixel type
MSG_SET : Use specified palette for transfers of this pixel type

DG_IMAGE / DAT_RGBRESPONSE

MSG_RESET : Use Source's default (identity) RGB response curve
MSG_SET : Use specified response curve for RGB transfers

DG_AUDIO / DAT_AUDIOFILEXFER

MSG_GET : Transfers audio data in file mode

DG_AUDIO / DAT_AUDIOINFO

MSG_GET : Gets information about the current transfer

DG_AUDIO / DAT_AUDIONATIVEXFER

MSG_GET : Transfers audio data in native mode

DSM_Entry Parameters

The parameters for the DG_xxxx, DAT_xxxx, and MSG_xxxx fields are determined by the operation triplet. The other parameters are filled as follows:

pOrigin

Refers to a copy of the application's TW_IDENTITY structure.

pDest

If the operation's destination is the Source Manager: Always holds a value of NULL. This indicates to the Source Manager that the operation is to be consumed by it not passed on to a Source.

If the operation's destination is a Source: This parameter references a copy of the Source's TW_IDENTITY structure that is maintained by the application. The application received this structure in response to the DG_CONTROL / DAT_IDENTITY / MSG_OPENDS operation sent from the application to the Source Manager. This is discussed more in the next section (Controlling a TWAIN Session from your Application - State 3 to 4).

pData

Always references a structure or variable corresponding to the TWAIN type specified by the DAT_xxxx parameter. Typically, but not always, the data argument type name corresponds to a TW_xxxx data structure name. For example, the DAT_IDENTITY argument type uses the corresponding TW_IDENTITY data structure. All data structures can be seen in the file called TWAIN.H. The application is responsible for allocating and deallocating the structure or element and assuring that pData correctly references it.

Note that there are two cases when the Source, rather than the application, allocates a structure that is used during an operation.

- One occurs during DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETCURRENT, MSG_GETDEFAULT, and MSG_RESET operations. The application still allocates **pData* but the Source allocates a structure referenced by **pData* called a "container structure".
- The other occurs during the DG_IMAGE / DAT_JPEGCOMPRESSION operations. The topic of data compression is covered in Chapter 4.

In all cases, the application still deallocates all structures.

Controlling a TWAIN Session from Your Application

In addition to the preparations discussed at the beginning of this chapter, the application must be modified to actually initiate and control a TWAIN session.

The session consists of the seven states of the TWAIN protocol as introduced in the Technical Overview. However, the application is not forced to move the session from State 1 to State 7 without stopping. For example, some applications may choose to pause in State 3 and move among the higher states (4 - 7) to repeatedly open and close Sources when acquisitions are requested by the user. Another example of session flexibility occurs when an application transfers multiple images during a session. The application will repeatedly move the session from State 6 to State 7 then back to State 6 and forward to State 7 again to transfer the next image.

For the sake of simplicity, this chapter illustrates moving the session from State 1 to State 7 and then backing it out all the way from State 7 to State 1. The diagram on the next page shows the operation triplets that are used to transition the session from one state to the next. Detailed information about each state and its associated transitions follow. The topics include:

- Load the Source Manager and Get the DSM_Entry (State 1 to 2)
- Open the Source Manager (State 2 to 3)
- Select the Source (during State 3)
- Open the Source (State 3 to 4)
- Negotiate Capabilities with the Source (during State 4)
- Request the Acquisition of Data from the Source (State 4 to 5)
- Recognize that the Data Transfer is Ready (State 5 to 6)
- Start and Perform the Transfer (State 6 to 7)
- Conclude the Transfer (State 7 to 6 to 5)
- Disconnect the TWAIN Session (State 5 to 1 in sequence)

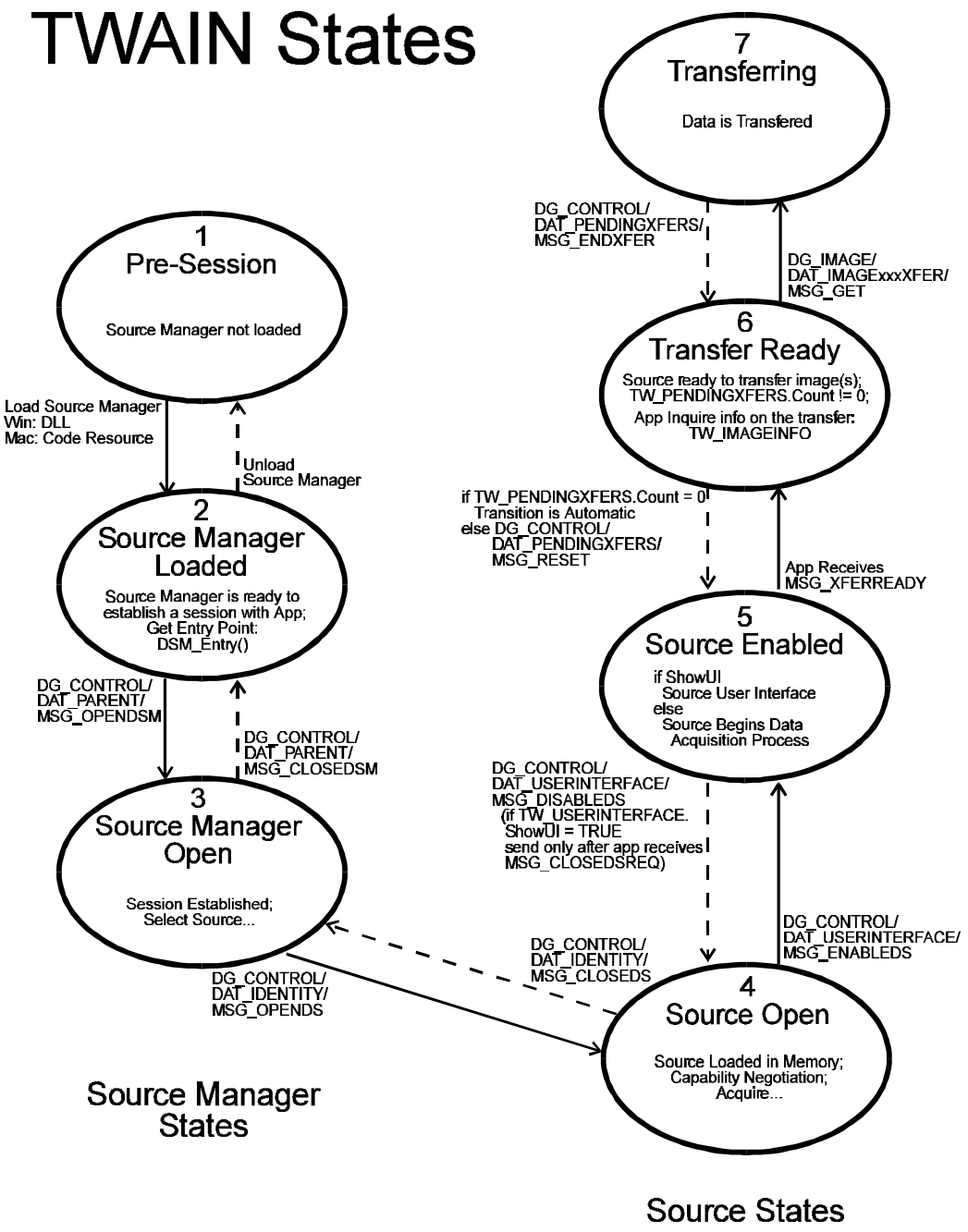

Figure 3-2. TWAIN States

State 1 to 2 - Load the Source Manager and Get the DSM_Entry

The application must load the Source Manager before it is able to call its DSM_Entry point.

Operations Used:

No TWAIN operations are used for this transition. Instead,

On Windows:

Load TWAIN.DLL using the LoadLibrary( ) routine.

Get the DSM_Entry by using the GetProcAddress( ) call.

On Macintosh:

Open the Source Manager code resource using OpenResFile( ) and GetResource( ).

Get the DSM_Entry by dereferencing the handle to the Source Manager.

On Windows:

The application can load the Source Manager by doing the following:

```
DSMENTRYPROC   pDSM_Entry;
HANDLE         hDSMLib;
char           szSMDir;
OFSTRUCT       of;
// check for the existence of the TWAIN_32.DLL file in the Windows
// directory
   GetWindowsDirectory (szSMDir, sizeof(szSMDir));
   /*** Could have been networked drive with trailing '\' ***/
   if (szSMDir [(lstrlen (szSMDir) - 1)] != '\\')
   {      lstrcat( szSMDir, "\\" );
   }
if ((OpenFile(szSMDir, &of, OF_EXIST) != -1)
{
   // load the DLL
   if (hDSMDLL = LoadLibrary(DSMName)) != NULL)
   {
      // check if library was loaded
      if (hDSMDLL >= (HANDLE)VALID_HANDLE)
      {
         if (lpDSM_Entry = (DSMENTRYPROC)GetProcAddress(hDSMDLL,
MAKEINTRESOURCE (1))) != NULL)
         {
            if (lpDSM_Entry )
               FreeLibrary(hDSMDLL);
         }
      }
   }
}
```

Note, the code appends TWAIN.DLL to the end of the Windows directory and verifies that the file exists before calling LoadLibrary( ). Applications are strongly urged to perform a dynamic run-time link to DSM_Entry( ) by calling LoadLibrary( ) rather than statically linking to TWAIN.LIB via the linker. If the TWAIN.DLL is not installed on the machine, Microsoft Windows will fail to load an application that statically links to TWAIN.LIB. If the Application has a dynamic link, however, it will be able to give users a meaningful error message, and perhaps continue with image acquisition facilities disabled.

After getting the DSM_Entry, the application must check pDSM_Entry. If it is NULL, it means that the Source Manager has not been installed on the user's machine and the application cannot provide any TWAIN services to the user. If NULL, the application must not attempt to call *pDSM_Entry as this would result in an Unrecoverable Application Error (UAE).

On Macintosh:

The Source Manager, named Source Manager, is a code resource on the Macintosh (its resource type is DSMR). Under System 6, this file resides within the TWAIN folder which lives in the System Folder. Under System 7, the TWAIN folder lives in the Preferences folder which lives in the System Folder. To access the Source Manager, the application must first load and lock down this code resource. The application must call the Source Manager (via the DSM_Entry() call) as a Pascal function.

The following code segments were written in Think "C" v5.0. Your exact coding may vary but the approach will be consistent.

The following code segment will load the Source Manager:

```
typedef PASCAL TW_UINT16(*DSMEntryFunc)(pTW_IDENTITY,
pTW_IDENTITY,
TW_UINT32,
TW_UINT16,
TW_UINT16,
TW_MEMREF);
DSMEntryFunc pDSM_Entry;
TW_INT16   SaveRes;

SaveRes=CurResFile();          /* save the current resource file  */

/* Be sure to change the working directory to the TWAIN folder    */
DSMRefNum=OpenResFile(DSMName); /* open the Source Manager file   */

DSMHandle=GetResource(DSMR_type,TWON_DSMCODEID); /* get the SM resource*/
HLock(DSMHandle);               /* lock the SM resource handle     */
pDSM_Entry=(pTW_INT16)*DSMHandle; /* get pointer to the DSM_Entry  */

/* Be sure to restore the working directory */
UseResFile(SaveRes);           /* restore current resource file */
```

After getting the DSM_Entry, application must check pDSM_Entry. If it is NULL, it means that the Source Manager has not been installed on the user's machine and the application cannot provide any TWAIN services to the user. If NULL, then application must not attempt to call *pDSM_Entry as this would result in a crash of the application.

State 2 to 3 - Open the Source Manager

The Source Manager has been loaded. The application must now open the Source Manager.

One Operation is Used:

DG_CONTROL / DAT_PARENT / MSG_OPENDSM

pOrigin

The application must allocate a structure of type TW_IDENTITY and fill in all fields except for the Id field. Once the structure is prepared, this pOrigin parameter should point at that structure.

During the MSG_OPENDSM operation, the Source Manager will fill in the Id field with a unique identifier of the application. The value of this identifier is only valid while the application is connected to the Source Manager.

The application must save the entire structure. From now on, the structure will be referred to by the pOrigin parameter to identify the application in every call the application makes to DSM_Entry( ).

The TW_IDENTITY structure is defined in the TWAIN.H file but for quick reference, it looks like this:

```
/* DAT_IDENTITY Identifies the program/library/code */
/*              resource.                           */
typedef struct {
   TW_UINT32    Id; /* Unique number for identification*/
   TW_VERSION   Version;
   TW_UINT16    ProtocolMajor;
   TW_UINT16    ProtocolMinor;
   TW_UINT32    SupportedGroups;/*Bit field OR combination */
                                /*of DG_constants found in */
                                /*the TWAIN.H file         */
   TW_STR32     Manufacturer;
   TW_STR32     ProductFamily;
   TW_STR32     ProductName;
} TW_IDENTITY, FAR *pTW_IDENTITY;
```

pDest

Set to NULL indicating the operation is intended for the Source Manager.

pData

Typically, you would expect to see this point to a structure of type TW_PARENT but this is not the case. This is an exception to the usual situation where the DAT field of the triplet identifies the data structure for pData.

- **On Windows:** pData points to the window handle (hWnd) that will act as the Source's "parent". The variable is of type TW_INT32. For 16 bit Microsoft Windows, the handle is stored in the low word of the 32 bit integer and the upper word is set to zero. If running under the WIN32 environment, this is a 32 bit window handle. The Source Manager will maintain a copy of this window handle for posting messages back to the application.
- **On Macintosh:** pData should be a 32-bit NULL value.

How to Initialize the TW_IDENTITY Structure

Here is a Windows example of code used to initialize the application's TW_IDENTITY structure.

```
TW_IDENTITY     AppID;           // App's identity structure
   AppID.Id = 0;                 // Initialize to 0 (Source Manager
                                 // will assign real value)
   AppID.Version.MajorNum = 3;   //Your app's version number
   AppID.Version.MinorNum = 5;
   AppID.Version.Language = TWLG_ENGLISH_USA;
   AppID.Version.Country  = TWCY_USA;
   lstrcpy (AppID.Version.Info, "Your App's Version String");
   AppID.ProtocolMajor = TWON_PROTOCOLMAJOR;
   AppID.ProtocolMinor = TWON_PROTOCOLMINOR;
   AppID.SupportedGroups = DG_IMAGE | DG_CONTROL;
   lstrcpy (AppID.Manufacturer, "App's Manufacturer");
   lstrcpy (AppID.ProductFamily, "App's Product Family");
   lstrcpy (AppID.ProductName, "Specific App Product Name");
```

On Windows: Using DSM_Entry to open the Source Manager

```
TW_UINT16  rc;
rc = (*pDSM_Entry) (&AppID,
                    NULL,
                    DG_CONTROL,
                    DAT_PARENT,
                    MSG_OPENDSM,
                    (TW_MEMREF) &hWnd);
```

where AppID is the TW_IDENTITY structure that the application set up to identify itself and hWnd is the application's main window handle.

On Macintosh: Using DSM_Entry to open the Source Manager

```
TW_UINT16  SaveRes;

SaveRes=CurResFile();  /* Save the current resource file */
UseResFile(DSMRefNum); /* Set Source Manager resource file as
                       /* current*/

rc = (*pDSM_Entry) (&AppID,
                    NULL,
                    DG_CONTROL,
                    DAT_PARENT,
                    MSG_OPENDSM,
                    NULL);

UseResFile(SaveRes);   /* Restore the resource file */
```

where AppID is the TW_IDENTITY structure that the application set up to identify itself. The same approach is used by the application to call the DSM_Entry( ) function throughout the remainder of the TWAIN session.

Note: Whenever your application uses a TWAIN operation, **always check the Return Code** sent back through the DSM_Entry function to be certain an operation is successful. If an operation indicates failure, use the DG_CONTROL / DAT_STATUS / MSG_GET operation to get the Condition Code that indicates the cause of failure. The application identifies who the status triplet be sent to, the Source Manager or Source, depending on which one received the original operation that failed.

State 3 - Select the Source

The Source Manager has just been opened and is now available to assist your application in the selection of the desired Source.

One Operation is Used:

DG_CONTROL / DAT_IDENTITY / MSG_USERSELECT

pOrigin

Points to the application's TW_IDENTITY structure. The desired data type should be specified by the application. This was done when you initialized the SupportedGroups field in your application's TW_IDENTITY structure.

This causes the Source Manager to make available for selection by the user only those Sources that can provide the requested data type(s). All other Sources are grayed out. (Note, if more than one data type were available, for example image and text, and the application wanted to accept both types of data, it would do a bit-wise OR of the types' constants and place the results into the SupportedGroups field.)

pDest

Set to NULL.

pData

Points to a structure of type TW_IDENTITY. The application must allocate this structure prior to making the call to DSM_Entry. Once the structure is allocated, the application must:

- Set the Id field to zero.
- Set the ProductName field to the null string ("\0"). (If the application wants a specific Source to be highlighted in the Select Source dialog box, other than the system default, it can enter the ProductName of that Source into the ProductName field instead of null. The system default Source and other available Sources can be determined by using the DG_CONTROL / DAT_IDENTITY / MSG_GETDEFAULT, MSG_GETFIRST and MSG_GETNEXT operations.)

Additional fields of the structure will be filled in by the Source Manager during this operation to identify the selected Source. Make sure the application keeps a copy of this updated structure after completing this call. You will use it to identify the Source from now on.

The most common approach for selecting the Source is to use the Source Manager's Select Source dialog box. This is typically displayed when the user clicks on your Select Source option. To do this:

1. The application sends a DG_CONTROL / DAT_IDENTITY / MSG_USERSELECT operation to the Source Manager to have it display its dialog box. The dialog displays a list of all Sources that are installed on the system that can provide data of the type specified by the application. It highlights the Source that is the system default unless the application requests otherwise.
2. The user selects a Source or presses the Cancel button. If no devices are available, the Select Source Dialog's Select/OK button will be grayed out and the user will have no choice but to select Cancel.
3. The application must check the Return Code of DSM_Entry to determine the user's action.
   a. **If TWRC_SUCCESS**: Their selected Source is listed in the TW_IDENTITY structure pointed to by the pData parameter and is now the default Source.
   b. **If TWRC_CANCEL**: The user either clicked Cancel intentionally or had no other choice because no devices were listed. Do not attempt to open a Source.
   c. **If TWRC_FAILURE**: Use the DG_CONTROL / DAT_STATUS / MSG_GET operation (sent to the Source Manager) to determine the cause. The most likely cause is a lack of sufficient memory.

As an alternative to using the Source Manager's Select Source dialog, the application can devise its own method for selecting a Source. For example, it could create and display its own user interface or simply select a Source without offering the user a choice. This alternative is discussed in Chapter 4.

State 3 to 4 - Open the Source

The Source Manager is open and able to help your application open a Source.

One Operation is Used:

DG_CONTROL / DAT_IDENTITY / MSG_OPENDS

pOrigin

Points to the application's TW_IDENTITY structure.

pDest

Set to NULL.

pData

Points to a structure of type TW_IDENTITY.

Typically, this points to the application's copy of the Source's TW_IDENTITY structure filled in during the MSG_USERSELECT operation previously.

However, if the application wishes to have the Source Manager simply open the default Source, it can do this by setting the TW_IDENTITY.ProductName field to "\0" (null string) and the TW_IDENTITY.Id field to zero.

During the MSG_OPENDS operation, the Source Manager assigns a unique identifier to the Source and records it in the TW_IDENTITY.Id field. Copy the resulting TW_IDENTITY structure. Once the Source is opened, the application will point to this resulting structure via the pDest parameter on every call that the application makes to DSM_Entry where the desired destination is this Source.

Note: The user is not required to take advantage of the Select Source option. They may click on the Acquire option without having selected a Source. In that case, your application should open the default Source. **The default source is either the last one used by the user or the last one installed.**

State 4 - Negotiate Capabilities with the Source

At this point, the application has a structure identifying the open Source. Operations can now be directed from the application to that Source. To receive a single image from the Source, only one capability, CAP_XFERCOUNT, must be negotiated now. All other capability negotiation is optional.

Two Operations are Used:

DG_CONTROL / DAT_CAPABILITY / MSG_GET

DG_CONTROL / DAT_CAPABILITY / MSG_SET

The parameters for each of the operations, in addition to the triplet, are these:

pOrigin

Points to the application's TW_IDENTITY structure.

pDest

Points to the desired Source's TW_IDENTITY structure. The Source Manager will receive the DSM_Entry call, recognize that the destination is a Source rather than itself, and pass the operation along to the Source via the DS_Entry function.

pData

Points to a structure of type TW_CAPABILITY.

The definition of TW_CAPABILITY is:

```
typedef struct {
  TW_UINT16   Cap;       /* ID of capability to get or set */
  TW_UINT16   ConType;   /* TWON_ONEVALUE, TWON_RANGE,     */
                         /* TWON_ENUMERATION or TWON_ARRAY */
  TW_HANDLE  hContainer; /* Handle to container of type    */
                         /* ConType                        */
} TW_CAPABILITY, FAR *pTW_CAPABILITY;
```

The Source allocates the container structure pointed to by the hContainer field when called by the MSG_GET operation. The application allocates it when calling with the MSG_SET operation. Regardless of who allocated it, the application deallocates the structure either when the operation is complete or when the application no longer needs to maintain the information.

Each operation serves a special purpose:

MSG_GET

Since Sources are not required to support all capabilities, this operation can be used to determine if a particular TWAIN-defined capability is supported by a Source. The application needs to set the Cap field of the TW_CAPABILITY structure to the identifier representing the capability of interest. The constants identifying each capability are listed in the TWAIN.H file.

If the capability is supported and the operation is successful, it returns the Current, Default, and Available values. These values reflect previous MSG_SET operations on the capability which may have altered them from the TWAIN default values for the capability.

This operation may fail due to several causes. If the capability is not supported by the Source, the Return Code will be TWRC_FAILURE and the condition code will be one of the following:

TWCC_CAPUNSUPPORTED	Capability not supported by Source
TWCC_CAPBADOPERATION	Operation not supported by capability
TWCC_CAPSEQERROR	Capability has dependency on other capability

Applications should be prepared to receive the condition code TWCC_BADCAP from Sources written prior to TWAIN 1.7, which maps to any of the three situations mentioned above.

MSG_SET

Changes the Current or Available Value(s) of the specified capability to those requested by the application. The application may choose to set just the capability's Current Value or it may specify a list of values for the Source to use as the complete set of Available Values for that capability.

Note: Source is not required to limit values based on the application's request although it is strongly recommended that they do so. If the Return Code indicates TWRC_FAILURE, check the Condition Code. A code of TWCC_BADVALUE can mean:

- The application sent an invalid value for this Source's range.
- The Source does not allow the setting of this capability.
- The Source doesn't allow the type of container used by the application to set this capability.

Capability negotiation gives the application developer power to guide the Source and control the images they receive from the Source. The negotiation typically occurs during State 4. The following material illustrates only one very basic capability and container structure. Refer to Chapter 4 for a more extensive discussion of capabilities including information on how to delay the negotiation of some capabilities beyond State 4.

Note: It is important here to once again remind application writers to always check the return code from any negotiated capabilities transactions.

Set the Capability to Specify the Number of Images the Application can Transfer

The capability that specifies how many images an application can receive during a TWAIN session is CAP_XFERCOUNT. All Sources must support this capability. Possible values for CAP_XFERCOUNT are:

Value:	**Description:**
1	Application wants to receive a single image.
greater than 1	Application wants to receive this specific number of images.
-1	Application can accept any arbitrary number of images during the session. **This is the default for this capability.**
0	This value has no legitimate meaning and the application should not set the capability to this value. If a Source receives this value during a MSG_SET operation, it should maintain the Current Value without change and return TWRC_FAILURE and TWCC_BADVALUE.

The default value allows multiple images to be transferred. The following is a simple code example illustrating the setting of a capability and specifically showing how to limit the number of images to one. Notice there are differences between the code for Windows and Macintosh applications. Both versions are included here with ifdef statements for MSWIN versus MAC.

```
TW_CAPABILITY   twCapability;
TW_INT16              count;
TW_STATUS             twStatus;
TW_UINT16             rc;
#ifdef _MSWIN_
pTW_ONEVALUE   pval;
#endif
#ifdef _MAC_
TW_HANDLE      h;
pTW_INT16      pInt16;
#endif

//-----Setup for MSG_SET for CAP_XFERCOUNT
twCapability.Cap = CAP_XFERCOUNT;
twCapability.ConType = TWON_ONEVALUE;

#ifdef _MSWIN_
twCapability.hContainer = GlobalAlloc(GHND, sizeof(TW_ONEVALUE));
pval = (pTW_ONEVALUE) GlobalLock(twCapability.hContainer);
pval->ItemType = TWTY_INT16;
pval->Item = 1;         //This app will only accept 1 image
GlobalUnlock(twCapability.hContainer);
#endif

#ifdef _MAC_
twCapability.hContainer = (TW_HANDLE)h = NewHandle(sizeof(TW_ONEVALUE));
((TW_ONEVALUE*)(*h))->ItemType = TWTY_INT16;
count = 1;         //This app will only accept 1 image
pInt16 = ((TW_ONEVALUE*)(*h))->Item;
*pInt16 = count;
#endif
```

```
//-----Set the CAP_XFERCOUNT
rc = (*pDSM_Entry) (&AppID,
                    &SourceID,
                    DG_CONTROL,
                    DAT_CAPABILITY,
                    MSG_SET,
                   (TW_MEMREF)&twCapability);

#ifdef _MSWIN_
GlobalFree((HANDLE)twContainer.hContainer);
#endif
#ifdef _MAC_
DisposHandle((HANDLE)twContainer.hContainer);
#endif

//-----Check Return Codes
//SUCCESS
if (rc == TWRC_SUCCESS)
    //the value was set
//APPROXIMATION MADE
else if (rc == TWRC_CHECKSTATUS)
    {
    //The value could not be matched exactly
    //MSG_GET to get the new current value
    twCapability.Cap = CAP_XFERCOUNT;
    twCapability.ConType = TWON_DONTCARE16;   //Source will specify
    twCapability.hContainer = NULL; //Source allocates and fills
container

    rc = (*pDSM_Entry) (&AppID,
                &SourceID,
                DG_CONTROL,
                DAT_CAPABILITY,
                MSG_GET,
               (TW_MEMREF)&twCapability);

    //remember current value
    #ifdef _MSWIN_
    pval = (pTW_ONEVALUE) GlobalLock(twCapability.hContainer);
    count = pval->Item;
    //free hContainer allocated by Source
    GlobalFree((HANDLE)twCapability.hContainer);
    #endif

    #ifdef _MAC_
    pInt16 = ((TW_ONEVALUE*)(*h))->Item;
    count = *pInt16;
    //free hContainer allocated by Source
    DisposeHandle((HANDLE)twCapability.hContainer);
    #endif
    }
```

```
//MSG_SET FAILED
else if (rc == TWRC_FAILURE)
    {
    //check Condition Code
    rc = (*pDSM_Entry) (&AppID,
                &SourceID,
                DG_CONTROL,
                DAT_STATUS,
                MSG_GET,
               (TW_MEMREF)&twStatus);
    switch (twStatus.ConditionCode)
        {
        TWCC_BADCAP:
        TWCC_CAPUNSUPPORTED:
        TWCC_CAPBADOPERATION:
        TWCC_CAPSEQERROR:
               //Source does not support setting this cap
               //All Sources must support CAP_XFERCOUNT
               break;
        TWCC_BADDEST:
               //The Source specified by pSourceID is not open
               break;
        TWCC_BADVALUE:
               //The value set was out of range for this Source
               //Use MSG_GET to determine what setting was made
               //See the TWRC_CHECKSTATUS case handled earlier
               break;
        TWCC_SEQERROR:
               //Operation invoked in invalid state
               break;
       }
    }
```

Other Capabilities

Image Type

Although not shown, the application should be aware of the Source's ICAP_PIXELTYPE and ICAP_BITDEPTH. If your application cannot accept all of the Source's Available Values, capability negotiation should be done. (Refer to Chapter 4.)

Transfer Mode

The default transfer mode is Native. That means the Source will access the largest block of memory available and use it to transfer the entire image to the application at once. If the available memory is not large enough for the transfer, then the Source should fail the transfer. The application does not need to do anything to select this transfer mode. If the application wishes to specify a different transfer mode, Disk File or Buffered Memory, further capability negotiation is required. (Refer to Chapter 4.)

State 4 to 5 - Request the Acquisition of Data from the Source

The Source device is open and capabilities have been negotiated. The application now enables the Source so it can show its user interface, if requested, and prepare to acquire data.

One Operation is Used:

DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS

pOrigin

Points to the application's TW_IDENTITY structure.

pDest

Points to the Source's TW_IDENTITY structure.

pData

Points to a structure of type TW_USERINTERFACE.

The definition of TW_USERINTERFACE is:

```
typedef struct {
  TW_BOOL    ShowUI;
  TW_BOOL    ModalUI;
  TW_HANDLE  hParent;
} TW_USERINTERFACE, FAR *pTW_USERINTERFACE;
```

Set the ShowUI field to TRUE if you want the Source to display its user interface. Otherwise, set to FALSE.

The Source will set the ModalUI field to TRUE if its user interface is modal. If the interface is modeless, the field is set to FALSE.

The application sets the hParent field differently depending on the platform on which the application runs.

- **On Windows** - The application should place a handle to the Window that is acting as the Source's parent.
- **On Macintosh** - The application sets this field to NULL.

In response to the user choosing the application's Acquire menu option, the application sends this operation to the Source to enable it. The application typically requests that the Source display the Source's user interface to assist the user in acquiring data. If the Source is told to display its user interface, it will display it when it receives the operation triplet and it will set the ModalUI field of the data structure appropriately. Modal and Modeless interfaces are discussed in Chapters 4 and 5. Sources **must** check the `ShowUI` field and return an error if they cannot support the specified mode. In other words it is unacceptable for a source to ignore a `ShowUI = FALSE` request and still activate its user interface. The application may develop its own user interface instead of using the Source's. This is discussed in Chapter 4.

Note: Once the Source is enabled via the DG_CONTROL / DAT_USERINTERFACE/ MSG_ENABLEDS operation, all events that enter the application's main event loop must be immediately forwarded to the Source. The explanation for this was given earlier in this chapter when you were instructed to modify the event loop in preparation for a TWAIN session.

State 5 to 6 - Recognize that the Data Transfer is Ready

The Source is now working with the user to arrange the transfer of the desired data. Unlike all the earlier transitions, the Source, not the application, controls the transition from State 5 to State 6.

No Operations (from the application) are Used:

This transition is not triggered by the application sending an operation. The Source causes the transition.

Remember while the Source is enabled, the application is forwarding all events in its event loop to the Source by using the DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT operation. The TW_EVENT data structure associated with this operation looks like this:

```
typedef struct {
  TW_MEMREF  pEvent;   /*Windows pMSG or MAC pEvent                    */
  TW_UINT16  TWMessage;/*TW message from the Source to the application*/
} TW_EVENT, FAR *pTW_EVENT;
```

The Source can set the TWMessage field to signal when the Source is ready to transfer data. Following each DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT operation, the application must check the TWMessage field. If it contains MSG_XFERREADY, the session is in State 6 and the Source will wait for the application to request the actual transfer of data.

State 6 to 7 - Start and Perform the Transfer

The Source indicated it is ready to transfer data. It is waiting for the application to inquire about the image details, initiate the actual transfer, and, hence, transition the session from State 6 to 7. If the initiation (DG_IMAGE / DAT_IMAGENATIVEXFER / MSG_GET) fails, the session does not transition to State 7 but remains in State 6.

Two Operations are Used:

DG_IMAGE / DAT_IMAGEINFO / MSG_GET

pOrigin

Points to the application's TW_IDENTITY structure.

pDest

Points to the Source's TW_IDENTITY structure.

pData

Points to a structure of type TW_IMAGEINFO. The definition of TW_IMAGEINFO is:

```
typedef struct {
   TW_FIX32    XResolution;
   TW_FIX32    YResolution;
   TW_INT32    ImageWidth;
   TW_INT32    ImageLength;
   TW_INT16    SamplesPerPixel;
   TW_INT16    BitsPerSample[8];
   TW_INT16    BitsPerPixel;
   TW_BOOL     Planar;
   TW_INT16    PixelType;
   TW_UINT32   Compression;
}  TW_IMAGEINFO, FAR *pTW_IMAGEINFO;
```

The Source will fill in information about the image that is to be transferred. The application uses this operation to get the information regardless of which transfer mode (Native, Disk File, or Buffered Memory) will be used to transfer the data.

DG_IMAGE / DAT_IMAGENATIVEXFER / MSG_GET

pOrigin

Points to the application's TW_IDENTITY structure.

pDest

Points to the Source's TW_IDENTITY structure.

pData

Points to a TW_UINT32 variable. This is an exception from the typical pattern.

- **On Windows:** This is a pointer to a handle variable. For 16 bit Microsoft Windows, the handle is stored in the low word of the 32-bit integer and the upper word is set to zero. If running under the WIN32 environment, this is a 32 bit window handle. The Source will set pHandle to point to a device-independent bitmap (DIB) that it allocates.
- **On Macintosh:** This is a pointer to a PicHandle. The Source will set pHandle to point to a PicHandle that the Source allocates.

In either case, the application is responsible for deallocating the memory block holding the Native-format image.

The application may want to inquire about the image data that it will be receiving. The DG_IMAGE / DAT_IMAGEINFO / MSG_GET operation allows this. Other operations, such as DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET, provide additional information. This information can be used to determine if the application actually wants to initiate the transfer.

To actually transfer the data in the Native mode, the application invokes the DG_IMAGE / DAT_IMAGENATIVEXFER / MSG_GET operation. The Native mode is the default transfer mode and will be used unless a different mode was negotiated via capabilities in State 4. For the Native mode transfer, the application only invokes this operation once per image. The Source returns the TWRC_XFERDONE value when the transfer is complete. This type of transfer cannot be aborted by the application once initiated. (Whether it can be aborted from the Source's User Interface depends on the Source.) Use of the other transfer modes, Disk File and Buffered Memory, are discussed in Chapter 4.

The following code illustrates how to get information about the image that will be transferred and how to actually perform the transfer. This code segment is continued in the next section (State 7 to 6 to 5).

```
// After receiving MSG_XFERREADY
TW_UINT16 TransferNativeImage()
{
      TW_IMAGEINFO   twImageInfo;
      TW_UINT16      rc;
      TW_UINT32      hBitmap;
      TW_BOOL        PendingXfers = TRUE;

while (PendingXfers)
{
      rc = (*pDSM_Entry)(&AppId,
                              &SourceId,
                              DG_IMAGE,
                              DAT_IMAGEINFO,
                              MSG_GET,
                             (TW_MEMREF)&twImageInfo);

      if (rc == TWRC_SUCCESS)
             Examine the image information

             // Transfer the image natively
             hBitmap = NULL;

             rc = (*pDSM_Entry)(&AppId,
                                       SourceId,
                                       DG_IMAGE,
                                       DAT_IMAGENATIVEXFER,
                                       MSG_GET,
                                      (TW_MEMREF)&HbITMAP);

             // Check the return code

             switch(rc)
             {
                    case TWRC_XFERDONE:
      // Notes: hBitmap points to a valid image Native image (DIB or
      // PICT)
      // The application is now responsible for deallocating the memory.
      // The source is currently in state 7.
      // The application must now acknowledge the end of the transfer,
      // determine if other transfers are pending and shut down the data
      // source.

                    PendingXfers = DoEndXfer();  //Function found in code
                                                 //example in next section
                           break;
```

```
                    case TWRC_CANCEL:
        // The user canceled the transfer.
        // hBitmap is an invalid handle but memory was allocated.
        // Application is responsible for deallocating the memory.
        // The source is still in state 7.
        // The application must check for pending transfers and shut down
        // the data source.
                    PendingXfers = DoEndXfer();  //Function found in code
                                                 //example in next section
                          break;
                    case TWRC_FAILURE:
        // The transfer failed for some reason.
        // hBitmap is invalid and no memory was allocated.
        // Condition code will contain more information as to the cause of
        // the failure.
        // The state transition failed, the source is in state 6.
        // The image data is still pending.
        // The application should abort the transfer.
                       DoAbortXfer(MSG_RESET); //Function in next section
                       PendingXfers = FALSE;
                       break;
              }
        }
}
//Check the return code
switch (rc)
        {
        case TWRC_XFERDONE:
              //hBitMap points to a valid Native Image (DIB or PICT)
              //The application is responsible for deallocating the memory
              //The source is in State 7
              //Acknowledge the end of the transfer
                      goto LABEL_DO_ENDXFER //found in next section
               break;
        case TWRC_CANCEL:
               //The user canceled the transfer
               //hBitMap is invalid
               //The source is in State 7
               //Acknowledge the end of the transfer
                      goto LABEL_DO_ENDXFER //found in next section
               break;
        case TWRC_FAILURE:
               //The transfer failed
               //hBitMap is invalid and no memory was allocated
               //Check Condition Code for more information
               //The state transition failed, the source is in State 6
               //The image data is still pending
               //To abort the transfer
                      goto LABEL_DO_ENDXFER //found in code example for
                                            //the next section
               break;
   }
```

State 7 to 6 to 5 - Conclude the Transfer

While the transfer occurs, the session is in State 7. When the Source indicates via the Return Code that the transfer is done (TWRC_XFERDONE) or canceled (TWRC_CANCEL), the application needs to transition the session backwards.

One Operation is Used:

DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER

pOrigin

Points to the application's TW_IDENTITY structure.

pDest

Points to the Source's TW_IDENTITY structure.

pData

Points to a structure of type TW_PENDINGXFERS.

The definition of TW_PENDINGXFERS is:

```
typedef struct {
  TW_UINT16  Count;
  TW_UINT32  Reserved;
} TW_PENDINGXFERS, FAR *pTW_PENDINGXFERS;
```

The DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER operation is sent by the application to the Source at the end of every transfer, successful or canceled, to indicate the application has received all the data it expected.

After this operation returns, the application should examine the pData->Count field to determine if there are more images waiting to be transferred. The value of pData->Count indicates the following:

Value	Description
pData->Count = 0	If zero, the Source will "automatically" transition back to State 5 without the application needing to take any additional action. **Application writers please make special note of this instance of an implied source transition.** The application should return to its main event loop and await notification from the Source (either MSG_XFERREADY or MSG_CLOSEDSREQ).
pData->Count = -1 or pData->Count > 0	The Source has more transfers available and is waiting in State 6. If the value is -1, that means the Source has another image available but it is unsure of how many more will be available. This might occur if the Source was controlling a device equipped with a document feeder and some unknown number of documents were stacked in that feeder. If the number of images is known, the Count will be a value greater than 0. Either way, the Source will remain in State 6 ready for the application to initiate another transfer. The Source will **NOT** send another MSG_XFERREADY to trigger this. The application should proceed as if it just received a MSG_XFERREADY.

If more images were pending and your application does not wish to transfer all of them, you can discard one or all pending images by doing the following:

- **To discard just the next pending image**, use the DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER operation. Then, check the Count field again to determine if there are additional images pending.
- **To discard all pending images**, use the DG_CONTROL / DAT_PENDINGXFERS / MSG_RESET operation. Following successful execution of this operation, the session will be in State 5.

The following code is a continuation of the code example started in the State 6 to 7 section. It illustrates how to conclude the transfer.

```
void DoEndXfer()
{
   TW_PENDINGXFERS      twPendingXfers;

   // If the return code from DG_IMAGE/DAT_IMAGENATIVEXFER/MSG_GET was
   // TWRC_CANCEL or TWRC_DONE

   // Acknowledge the end of the transfer
   rc = (*pDSM_Entry)(&AppId,
                                 SourceId,
                                 DG_CONTROL,
                                 DAT_PENDINGXFERS,
                                 MSG_ENDXFER,
                                 (TW_MEMREF)&twPendingXfers);

   if (rc == TWRC_SUCCESS)
   {
          // Check for additional pending xfers
          if (twPendingXfers.Count == 0)
          {
                  // Source is now in state 5. NOTE THE IMPLIED STATE
                  // TRANSITION! Disable and close the source and
                  // return to TransferNativeImage with a FALSE notifying
                  // it to not attempt further image transfers.

                  DisableAndCloseDS();
                  return(FALSE);
          }
          else
          {
                  // Source is in state 6 ready to transfer another image
                  if want to transfer this image
                  {
                         // returns to the caller, TransferNativeImage
                         // and allows the next image to transfer

                         return TRUE;
                  }
```

```
                    else if want to abort and skip over this transfer
                    {
                           // The current image will be skipped, and the
                           // next, if exists will be acquired by returning
                           // to TransferNativeImage
                           if (DoAbortXfer(MSG_ENDXFER) > 0)
                                  return(TRUE);
                           else
                                  return(FALSE);
                    }
                                  }
            }
    }
}
TW_UINT16 DoAbortXfer(TW_UINT16 AbortType)
{
      rc = (*pDSM_Entry)(&AppId,
                                     SourceId,
                                     DG_CONTROL,
                                     DAT_PENDINGXFERS,
                                     MSG_ENDXFER,
                                    (TW_MEMREF)&twPendingXfers);
      if (rc == TWRC_SUCCESS)
      {
             // If the next image is to be skipped, but subsequent images
             // are still to be acquired, the PendingXfers will receive
             // the MSG_ENDXFER, otherwise, PendingXfers will receive
             // MSG_RESET.
             rc = (*pDSM_Entry)(&AppId,
                                        SourceId,
                                        DG_CONTROL,
                                        DAT_PENDINGXFERS,
                                        AbortType,
                                       (TW_MEMREF)&twPendingXfers);
      }
}
//To abort all pending transfers:
LABEL_ABORT_ALL:
             {
                 rc = (*pDSM_Entry) (&AppID,
                        &SourceID,
                        DG_CONTROL,
                        DAT_PENDINGXFERS,
                        MSG_RESET,
                       (TW_MEMREF)&twPendingXfers);
                 if (rc == TWRC_SUCCESS)
                        //Source is now in state 5
      }
}
```

State 5 to 1 - Disconnect the TWAIN Session

Once the application has acquired all desired data from the Source, the application can disconnect the TWAIN session. To do this, the application transitions the session backwards.

In the last section, the Source transitioned to State 5 when there were no more images to transfer (TW_PENDINGXFERS.Count = 0) or the application called the DG_CONTROL / DAT_PENDINGXFERS / MSG_RESET operation to purge all remaining transfers. To back out the remainder of the session:

Three Operations (plus some platform-dependent code) are Used:

To move from State 5 to State 4

DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS

pOrigin

Points to the application's TW_IDENTITY structure.

pDest

Points to the Source's TW_IDENTITY structure.

pData

Points to a structure of type TW_USERINTERFACE.

The definition of TW_USERINTERFACE is:

```
typedef struct {
  TW_BOOL    ShowUI;
  TW_BOOL    ModalUI;
  TW_HANDLE  hParent;
} TW_USERINTERFACE, FAR *pTW_USERINTERFACE;
```

Its contents are not used.

Note the following:

- **If the Source's User Interface was displayed:** This operation causes the Source's user interface, if displayed during the transition from State 4 to 5, to be lowered. This operation is sent by the application in response to a MSG_CLOSEDSREQ from the Source. This request from the Source appears in the TWMessage field of the TW_EVENT structure. It is sent back from the DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT operation used by the application to send events to the application.
- **If the application did not have the Source's User Interface displayed:** The application invokes this command when all transfers have been completed. In addition, the application could invoke this operation to transition back to State 4 if it wanted to modify one or more of the capability settings before acquiring more data.

To move from State 4 to State 3

DG_CONTROL / DAT_IDENTITY / MSG_CLOSEDS

pOrigin

Points to the application's TW_IDENTITY structure.

pDest

Should reference a NULL value (indicates destination is Source Manager)

pData

Points to a structure of type TW_IDENTITY

This is the same TW_IDENTITY structure that you have used throughout the session to direct operation triplets to this Source.

When this operation is completed, the Source is closed. (In a more complicated scenario, if the application had more than one Source open, it must close them all before closing the Source Manager. Once all Sources are closed and the application does not plan to initiate any other TWAIN session with another Source, the Source Manager should be closed by the application.)

To move from State 3 to State 2

DG_CONTROL / DAT_PARENT / MSG_CLOSEDSM

pOrigin

Points to the application's TW_IDENTITY structure.

pDest

Should reference a NULL value (indicates destination is Source Manager)

pData

Typically, you would expect to see this point to a structure of type TW_PARENT but this is not the case. This is an exception to the usual situation where the DAT field of the triplet identifies the data structure for pData.

On Windows: pData points to the window handle (hWnd) that acted as the Source's "parent". The variable is of type TW_INT32. For 16 bit Microsoft Windows, the handle is stored in the low word of the 32 bit integer and the upper word is set to zero. If running under the WIN32 environment, this is a 32 bit window handle.

On Macintosh: pData should be a 32-bit NULL value.

To Move from State 2 to State 1

Once the Source Manager has been closed, the application must unload the DLL (on Windows) or code resource (on Macintosh) from memory before continuing.

On Windows:

Use FreeLibrary(hDSMLib); where hDSMLib is the handle to the Source Manager DLL returned from the call to LoadLibrary( ) seen earlier (in the State 1 to 2 section).

On Macintosh:

```
HUnlock(DSMHandle);  /* unlock the handle to the Source Manager */
ReleaseResource(DSMHandle);  /* release the Source Manager      */
CloseResFile(DSMRefNum);     /* close the Source Manager file   */
```

TWAIN Session Review

Applications have flexibility regarding which state they leave their TWAIN sessions in between TWAIN commands (such as Select Source and Acquire).

For example:

- An application might load the Source Manager on start-up and unload it on exit. Or, it might load the Source Manager only when it is needed (as indicated by Select Source and Acquire).
- An application might open a Source and leave it in State 4 between acquires.

The following is the simplest view of application's TWAIN flow. All TWAIN actions are initiated by a TWAIN command, either user-initiated (Select Source and Acquire) or notification from the Source (MSG_XFERREADY and MSG_CLOSEDSREQ).

Application Receives	State	Application Action
Select Source...	1 -> 2	Load Source Manager
	2 -> 3	DG_CONTROL / DAT_PARENT / MSG_OPENDSM
		DG_CONTROL / DAT_IDENTITY / MSG_USERSELECT
	3 -> 2	DG_CONTROL / DAT_PARENT / MSG_CLOSEDSM
	2 -> 1	Unload Source Manager
Acquire...	1 -> 2	Load Source Manager
	2 -> 3	DG_CONTROL / DAT_PARENT / MSG_OPENDSM
	3 -> 4	DG_CONTROL / DAT_IDENTITY / MSG_OPENDS
		Capability Negotiation
	4 -> 5	DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS
MSG_XFERREADY	6	For each pending transfer:
		DG_IMAGE / DAT_IMAGEINFO / MSG_GET
		DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET
		DG_CONTROL / DAT_CAPABILITY / MSG_GETCURRENT
	6 -> 7	DG_IMAGE / DAT_IMAGExxxxXFER / MSG_GET
	7 -> 6	DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER
	6 -> 5	Automatic transition to State 5 if TW_PENDINGXFERS.Count equals 0.
MSG_CLOSEDSREQ	5 -> 4	DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS
	4 -> 3	DG_CONTROL / DAT_IDENTITY / MSG_CLOSEDS
	3 -> 2	DG_CONTROL / DAT_PARENT / MSG_CLOSEDSM
	2 -> 1	Unload the Source Manager

Error Handling

Your application must be robust enough to recognize and handle error conditions that may occur during a TWAIN session. Every TWAIN operation triplet has a defined set of Return Codes and Conditions Codes that it may generate. These codes are listed on the reference pages for each triplet located in Chapter 7. Be sure to check the Return Code following every call to the DSM_Entry function. If it is TWRC_FAILURE, make sure your code checks the Condition Code and handles the error condition appropriately.

The following code segment illustrates the basic operations for doing this:

```
TW_STATUS    twStatus;

if (rc == TWRC_FAILURE)
       //check Condition Code
       rc = (*pDSM_Entry) (&AppID,
              &SourceID,
              DG_CONTROL,
              DAT_STATUS,
              MSG_GET,
             (TW_MEMREF)&twStatus);
       switch (twStatus.ConditionCode)
              //handle each possible Condition Code for the operation
```

Common Types of Error Conditions

Sequence Errors

The TWAIN protocol allows the invoking of specific operations only while the TWAIN session is in a particular state or states. The valid states for each operation are listed on the operation's reference pages in Chapter 7. If an operation is called from an inappropriate state, the call will return an error, TWRC_FAILURE, and set the Condition Code to TWCC_SEQERROR. Although this error should not occur if both the application and Source are behaving correctly, it is possible for the session to get out of sync.

If this error occurs, correct it by assuming the Source believes it is in State 7. The application should invoke the correct operations to back up from State 7 to State 6 and so on down the states until an operation succeeds. Then, the application can continue or terminate the session.

The following pseudo code illustrates this:

```
if (TWCC_SEQERROR)
      //  Assume State 7, start backing out from State 7 until
      //  the Condition Code != TWCC_SEQERROR
      State 7 to 6    DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER
      State 6 to 5    DG_CONTROL / DAT_PENDINGXFERS / MSG_RESET
      State 5 to 4    DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS
      State 4 to 3    DG_CONTROL / DAT_IDENTITY / MSG_CLOSEDS
```

Low Memory Errors

Another common type of error condition occurs when insufficient memory is available to perform a requested operation. The most likely times for this to occur are:

- When a Source is being opened
- When a Source is being enabled
- During a Native image transfer

Your application must check the Return Code and Condition Code (TWRC_FAILURE / TWCC_LOWMEMORY) to recognize this. Your application may be able to free up sufficient memory to continue or it must quit.

State Transition Operation Triplet Errors

Many operations normally cause state transitions. If one of these operations fails, for example, returns TWRC_FAILURE, do not make the state transition. The application must check the Return Code following every operation and update the current state only if the operation succeeds.

An implied state transition during `DG_CONTROL/DAT_PENDINGXFERS/ MSG_ENDXFER` deserves special note here. If the `Count` field of the `TW_PENDINGXFERS` structure is zero then the source will automatically transition back to State 5. Application writers should be aware of this condition and react accordingly.

Error Handling and State Transitions

It is possible that during execution of any triplet that the data source will fail unexpectedly. It is very important that applications pay attention to the TWAIN State of the data source at the time of failure. A hanging or deadlock condition will occur if the application fails to recover from error conditions with the proper state transitions. Most error handling is fairly obvious, however the following items have been mishandled in the past.

Failing Transition to State 5

A data source may fail a call to DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS unexpectedly. It is important to note that if an application requests the User Interface be suppressed, and the data source returns a code of TWRC_CHECKSTATUS, this means only that User Interface suppression was not possible. The transition to State 5 still occurred. If the application does not like this condition, then it may call MSG_DISABLEDS to close the data source without further user interaction. A return code of TWRC_FAILURE indicates that the transition to State 5 has not occurred.

Failure During State 6 or 7

It is important to be aware that when an error occurs during image transfer, a state transition to State 5 is not implicit. A call to DG_CONTROL / DAT_PENDINGXFERS / MSG_RESET or MSG_ENDXFER is required for a state transition back to State 5. If an applications calls MSG_DISABLEDS immediately after such a failure without first making the required calls to DAT_PENDINGXFERS, the resulting behavior of the data source will not be predictable. The data source should fail any call to MSG_DISABLEDS outside of State 5.

Requirements for an Application to be TWAIN-Compliant

Applications are required to support only a subset of the defined TWAIN operations. As an application advances its need to set attributes it will also need to implement a more complete set of the defined operations. This includes provision of support for more transfer mechanisms.

An application **must** support the following to be considered TWAIN-compliant:

Operations

The following six operations are consumed by the Source Manager:

DG_CONTROL / DAT_IDENTITY / MSG_CLOSEDS

DG_CONTROL / DAT_IDENTITY / MSG_OPENDS

DG_CONTROL / DAT_PARENT / MSG_CLOSEDSM

DG_CONTROL / DAT_PARENT / MSG_OPENDSM

DG_CONTROL / DAT_STATUS / MSG_GET

The following seven operations are consumed by a Source:

DG_CONTROL / DAT_CAPABILITY / MSG_GET

DG_CONTROL / DAT_CAPABILITY / MSG_SET

DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT

DG_IMAGE / DAT_IMAGENATIVEXFER / MSG_GET

DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER

DG_CONTROL / DAT_STATUS / MSG_GET

DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS

DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS

Notices

Every application must support receipt of two notices from Sources. These are:

MSG_XFERREADY indicates application can initiate transfer

MSG_CLOSEDSREQ indicates the Source needs to be disabled

Capabilities

Applications must support one capability:

CAP_XFERCOUNT Application sets the maximum number of transfers a Source is allowed to offer per session.

Applications that consume image information should support negotiation with the following capabilities:

ICAP_XFERMECH the transfer mechanism to be used for the next transfer

ICAP_UNITS unit of measure for all measured values (default is inches)

ICAP_PIXELTYPE how image data is interpreted (Color, Gray, B&W, etc.)

Source requirements for TWAIN-compliance are presented in Chapter 5.

4

Advanced Application Implementation

Using TWAIN to acquire a raster image from a device is relatively simple to implement as demonstrated in Chapter 3. However, TWAIN also allows application developers to go beyond the simple acquisition of a single image in Native (DIB or PICT) format. These more advanced topics are discussed in this chapter. They include:

Chapter Contents

Capabilities

Capabilities, and the power of an application to negotiate capabilities with the Source, give control to TWAIN-compliant applications. In Chapter 3, you saw the negotiation of one capability, CAP_XFERCOUNT. This capability was negotiated during State 4 as is always the case unless delayed negotiation is agreed to by both the application and Source. In fact, there is much more to know about capabilities.

Capability Values

Several values are used to define each capability. As seen in Chapter 9, TWAIN defines a Default Value and a set of Allowed Values for each of the capabilities. The application is not able to modify the Default Value. However, it is able to limit the values offered to a user to a subset of the Allowed Values and to select the capability's Current Value.

Default Value

When a Source is opened, the Current Values for each of its capabilities are set to the TWAIN Default Values listed in Chapter 9. If no default is defined by TWAIN, the Source will select a value for its default. An application can return a capability to its TWAIN-defined default by issuing a DG_CONTROL / DAT_CAPABILITY / MSG_RESET operation.

Although TWAIN defines defaults for many of the capabilities, a Source may have a different value that it would prefer to use as its default because it would be more efficient. For example, the Source may normally use a 0 bit in a black and white image to indicate white. However, the default for ICAP_PIXELFLAVOR is TWPF_CHOCOLATE which states that a 0 represents black. Although the TWAIN default is TWPF_CHOCOLATE, the Source's preferred default would be TWPF_VANILLA. When the application issues a DG_CONTROL / DAT_CAPABILITY / MSG_GETDEFAULT operation, the Source returns information about its preferred defaults. The Source and application may be able to negotiate a more efficient transfer based on this information.

Note that this does not imply that the TWAIN defaults should be completely disregarded. When trying to resolve the conflict between the "preferred" value of a particular data source capability and the TWAIN-specified default, it should be considered that the problem is similar to storing and restoring image attributes from session to session. It is reasonable to assume that a data source will want to store the current values for some capabilities to be restored as the current values in a future session. It is then also reasonable to expect that these restored values will be reflected as the current settings for the appropriate capabilities. While storing settings is only really useful for image attributes (the data source would not store the value of ICAP_PIXELFLAVOR, but it might store the current ICAP_RESOLUTION), it should be stated that preferred values of a data source are to be treated in the same manner.

At the time of loading the data source, all current values for the appropriate capabilities would be set to values that have either been restored from a previous session, or those that are "preferred" by the data source. This current value will remain until it has been explicitly changed by the calling application, or that application issues a MSG_RESET.

These are best illustrated using examples, since not all capabilities are suitable for preferred values, and most are not suitable to be stored and restored across multiple scanning sessions.

Example 1:
Scan Parameters are stored in one session and restored in another

1. User configures the data source User Interface with the following parameters: 4x6 inch image in 24-bit at 200 DPI X and Y resolution
2. User selects "Scan" and data source signals application to transfer.
3. Application acquires the image successfully.
4. Application disables the data source.
5. Application inquires during State 4 the current values of Frame, Pixel Type, Bit Depth, and Resolution.

6. Data source reports to each inquiry the current values that were set by the user: 4x6 inch image in 24-bit at 200 DPI X and Y resolution.
7. Application closes the data source.
8. During close procedure, the data source stores the current Frame, Pixel Type, Bit Depth and Resolution.
9. Application opens data source.
10. During open procedure, the data source restores current Frame, Pixel Type, Bit Depth and Resolution.
11. Application inquires during State 4 the current values of Frame, Pixel Type, Bit Depth, and Resolution.
12. Data source reports to each inquiry the current values that were restored from previous session: 4x6 inch image in 24-bit at 200 DPI X and Y resolution in one session.

Example 2:
Data Source represents the preferred Pixel Flavor without compromising TWAIN Defined Default value

1. Application opens data source for the first time
2. Application inquires during State 4 about the Default Pixel Flavor
3. Data source reports that the default pixel flavor is TWPF_CHOCOLATE (see Chapter 9).
4. Application inquires during State 4 about the current pixel flavor.
5. Data source reports that the current pixel flavor is TWPF_VANILLA (because this device returns data in that gender natively).
6. Application issues reset to current pixel flavor.
7. During reset operation, data source changes current value to TWPF_CHOCOLATE and prepares to invert data during transfer to accommodate the calling application request.

There is a condition where this logic falls apart. If the data source wants to return a TW_ENUMERATION to a MSG_GET request for a constrained capability, there is a chance that the Default value imposed by the TWAIN Specification (Chapter 9) will not exist within the constrained set of values. In this case, the application should consider the default value to be undefined. Common sense should dictate that the data source provide some default that is reasonable within the currently available set of values for safety (a bad index in a TW_ENUMERATION could be a disaster). When the default value is actually used (during MSG_RESET) the constraints shall be lifted, and the original default value will once again exist and be defined. (See next section on Constrained Capabilities about MSG_RESET) This is only a problem with a TW_ENUMERATION container, since it contains an index to the default.

Current Value

The application may request to set the Current Value of a capability. If the Source's user interface is displayed, the Current Value should be reflected (perhaps by highlighting). If the application sets the Current Value, it will be used for the acquire and transfer unless the user

or an automatic Source process changes it. The application can determine if changes were made by checking the Current Value during State 6.

To determine just the capability's Current Value, use DG_CONTROL / DAT_CAPABILITY / MSG_GETCURRENT. To determine both the Current Value and the Available Values, use the DG_CONTROL / DAT_CAPABILITY / MSG_GET operation. For example, you could do a MSG_GET on ICAP_PIXELTYPE and the Source might return a TW_ENUMERATION container containing TWPT_BW, TWPT_GRAY, and TWPT_RGB as Available Values.

To set the Current Value:

Use DG_CONTROL / DAT_CAPABILITY / MSG_SET and one of the following containers:

- **TWON_ONEVALUE:** Place the desired value in TW_ONEVALUE.Item.
- **TWON_ARRAY:** Place only the desired items in TW_ARRAY.ItemList.

These must be a subset of the items returned by the Source from a MSG_GET operation.

It is also possible to set Current Values using the TW_ENUMERATION and TW_RANGE containers. See the Available Values information for details.

Available Values

To limit the settings the Source can use during the acquire and transfer process, the application may be able to restrict the Available Values. The Source should not use a value outside these values. These restrictions should be reflected in the Source's user interface so unavailable values are not offered to the user.

For example, if the MSG_GET operation on ICAP_PIXELTYPE indicates the Source supports TWPT_BW, TWPT_GRAY, and TWPT_RGB images and the application only wants black and white images, it can request to limit the Available Values to black and white.

To limit the Available Values:

Use DG_CONTROL / DAT_CAPABILITY / MSG_SET and one of the following containers:

- **TWON_ENUMERATION:** Place only the desired values in the TW_ENUMERATION.ItemList field. The Current Value can also be set at this time by setting the CurrentIndex to point to the desired value in the ItemList.
- **TWON_RANGE:** Place only the desired values in the TW_RANGE fields. The current value can also be set by setting the CurrentValue field.

Note that TW_ONEVALUE and TW_ARRAY containers cannot be used to limit the Available Values.

Capability Negotiation

The negotiation process consists of three basic parts:

1. The application determines which capabilities a Source supports
2. The application sets the supported capabilities as desired
3. The application verifies that the settings were accepted by the Source

Negotiation (Part 1)
Application Determines Which Capabilities the Source Supports

Step 1

Application allocates a TW_CAPABILITY structure and fills its fields as follows:

- Cap = the CAP_ or ICAP_ name for the capability it is interested in
- ConType = TWON_DONTCARE16
- hContainer = NULL

Step 2

Application uses the TW_CAPABILITY structure in a DG_CONTROL / DAT_CAPABILITY / MSG_GET operation.

Step 3

The Source examines the Cap field to see if it supports the capability. If it does, it creates information for the application. In either case, it sets its Return Code appropriately.

Step 4

Application examines the Return Code, and maybe the Condition Code, from the operation.

If TWRC_SUCCESS then the Source does support the capability and

- The ConType field was filled by the Source with a container identifier (TWON_ARRAY, TWON_ENUMERATION, TWON_ONEVALUE, or TWON_RANGE)
- The Source allocated a container structure of ConType and referenced the hContainer field to this structure. It then filled the container with values describing the capability's Current Value, Default Value, and Available Values.

Based on the type of container and its contents (whose type is indicated by it ItemType field), the application can read the values. The application must deallocate the container.

If TWRC_FAILURE and TWCC_CAPUNSUPPORTED

- Source does not support this capability

The application can repeat this process for every capability it wants to learn about. If the application really only wants to get the Current Value for a capability, it can use the MSG_GETCURRENT operation instead. In that case, the ConType will just be TWON_ONEVALUE or TWON_ARRAY but not TWON_RANGE or TWON_ENUMERATION.

Note: The capability, CAP_SUPPORTEDCAPS, returns a list of capabilities that a Source supports. But it doesn't indicate whether the supported capabilities can be negotiated, If the Source does not support the CAP_SUPPORTEDCAPS capabilities, it returns TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Negotiation (Part 2)
The Application Sets the Supported Capability as Desired

Step 1

Application allocates a TW_CAPABILITY structure and fills its fields as follows:

- Cap = the CAP_ , ICAP_, or ACAP_name for the capability it is interested in
- ConType = TWON_ARRAY, TWON_ENUMERATION, TWON_ONEVALUE or TWON_RANGE (Refer to Chapter 9 to see each capability and what type(s) of container may be used to set a particular capability.)
- hContainer = The application must allocate a structure of type ConType and reference this field to it. (See the next step.)

Step 2

Application allocates a structure of type ConType and fills it. Based on values received from the Source during the MSG_GET, it can specify the desired Current Value and Available Values that it wants the Source to use. The application should not attempt to set the Source's Default Value, just put an appropriate constant in that field (ex. TWON_DONTCARE32).

Note: The application is responsible for deallocating the container structure when the operation is finished.

Step 3

Send the request to the Source using DG_CONTROL / DAT_CAPABILITY / MSG_SET.

Negotiation (Part 3)
The Application MUST Verify the Result of Their Request

Step 1

Even if a Source supports a particular capability, it is not required to support the setting of that capability. The application must examine the Return Code from the MSG_SET request to see what took place.

If TWRC_SUCCESS then the Source set the capability as requested.

If TWRC_CHECKSTATUS then

- The Source could not use one or more of your exact values. For instance, you asked for a value of 310 but it could only accept 100, 200, 300, or 400. Your request was within its legitimate range so it rounded it to its closest valid setting.

Use the DG_CONTROL / DAT_CAPABILITY / MSG_GET operation to determine the current and available settings at this time. This is the only way to determine if the Source's choice was acceptable to your application.

If TWRC_FAILURE / TWCC_BADVALUE then

- Either the Source is not granting your request to set or restrict the value.
- Or, your requested values were not within its range of legitimate values. It may have attempted to set the value to its closest available value.

Use the DG_CONTROL / DAT_CAPABILITY / MSG_GET operation to determine the current and available settings at this time. This is the only way to determine if your application can continue without your requested values.

You can repeat the setting and verifying processes for every capability of interest to your application. Remember, your application must deallocate all container structures.

The Most Common Capabilities

TWAIN defines over fifty capabilities. Although the number may seem overwhelming, it is easier to handle if you recognize that some of the capabilities are more commonly used. Here are some of these capabilities:

Basic Capabilities

Units

The ICAP_UNITS capability determines the unit of measure which will be used by the Source. The default is inches but centimeters, pixels, etc. are allowed. This capability's value is used when measuring several other values in capabilities and data structures including:

ICAP_PHYSICALHEIGHT,

ICAP_PHYSICALWIDTH,

ICAP_XNATIVERESOLUTION,

ICAP_YNATIVERESOLUTION,

ICAP_XRESOLUTION,

ICAP_YRESOLUTION,

TW_FRAME,

TW_IMAGEINFO.XResolution,

TW_IMAGEINFO.YResolution

Sense of the Pixel

The ICAP_PIXELFLAVOR specifies how a bit of data should be interpreted when transferred from Source to application. The default is TWPF_CHOCOLATE which means a 0 indicates black (or the darkest color). The alternative, TWPF_VANILLA, means a 0 indicates white (or the lightest color).

Resolution

The image resolution is reported in the TW_IMAGEINFO structure. To inquire or set the Source's resolution, use ICAP_XRESOLUTION and ICAP_YRESOLUTION.

Refer also to ICAP_XNATIVERESOLUTION and ICAP_YNATIVERESOLUTION.

Image Type Capabilities

Types of Pixel

The application should negotiate ICAP_PIXELTYPE and ICAP_BITDEPTH unless it can handle all pixel types at all bit depths. The allowed pixel types are: TWPT_BW, TWPT_GRAY, TWPT_RGB, TWPT_PALETTE, TWPT_CMY, TWPT_CMYK, TWPT_YUV, TWPT_YUVK, and TWPT_CIEXYZ.

Depth of the Pixels (in bits)

A pixel type such as TWPT_BW allows only 1 bit per pixel (either black or white). The other pixel types may allow a variety of bits per pixel (4-bit or 8-bit gray, 8-bit or 24-bit color). Be sure to set the ICAP_PIXELTYPE first, then set the ICAP_BITDEPTH.

Parameters for Acquiring the Image

Exposure

Several capabilities can influence this. They include ICAP_BRIGHTNESS, ICAP_CONTRAST, ICAP_SHADOW, ICAP_HIGHLIGHT, ICAP_GAMMA, and ICAP_AUTOBRIGHT.

Scaling

To instruct a Source to scale an image before transfer, refer to ICAP_XSCALING and ICAP_YSCALING.

Rotation

To instruct a Source to rotate the image before transfer, refer to ICAP_ROTATION and ICAP_ORIENTATION.

Constrained Capabilities and Message Responses

There is some confusion about how the data source should respond to various capability queries when the application has imposed constraints upon the supported values. The following guidelines should help clarify the situation.

MSG_RESET

It is known that this call resets the current value of the requested capability to the default. It must also be stated that this call will also reset any application imposed constraints upon the requested capability.

MSG_GETCURRENT, and MSG_GETDEFAULT

It is intuitive to assume that this message should not be supported by capabilities that have no Current or Default value. However, the specification says otherwise in Chapter 9 (a good example is **ICAP_SUPPORTEDCAPS**). In this case, it makes sense to simply respond to these messages in the same manner as **MSG_GET**.

It can also be assumed that it is more intuitive for a data source to respond to this capability with a **TW_ONEVALUE** container in all cases that a **TW_ONEVALUE** container is allowed.

MSG_GET

If an application has constrained the current capability, then the data source response to this message should reflect those constraints. Otherwise, this should respond with all the values that the data source supports. Of course, the number of values that can be placed in the response are restricted by the allowed containers for the particular current capability outlined in Chapter 9.

MSG_SET

As indicated in the Chapter 7 description of this capability triplet:

> *"Current Values are set when the container is a TW_ONEVALUE or TW_ARRAY. Available and Current Values are set when the container is a TW_ENUMERATION or TW_RANGE."*

To further clarify this operation, it should be stated that when an application imposes a constraint, the data source must consider the set of supported values and the set of requested constraints. The resulting set of values shall contain only the values that are shared by those supported and those requested.

A condition may arise after constraints are imposed, where the default value is no longer within the set of supported values. When using a TW_ENUMERATION, the reported default index should be changed by the data source to something that falls within the new constrained set. This is simply a precaution to ensure it is a valid index. In this case, the Default index in a TW_ENUMERATION loses meaning and should be ignored by applications, since MSG_RESET shall cause the constraints to be eliminated.

Capability Containers in Code Form

Capability information is passed between application and Source by using data structures called containers: TW_ARRAY, TW_ENUMERATION, TW_ONEVALUE, and TW_RANGE. The actions needed to create (pack) and read (unpack) containers are illustrated here in the following code segments. Containers are flexible in that they can be defined to contain one of many types of data. Only one ItemType (TWTY_xxxx) is illustrated per Container (TWON_xxxx) here. Refer to the toolkit disk for complete packing and unpacking utilities that you can use with containers.

Reading (unpacking) a Container from a MSG_GET Operation

```
//-------------------------------------------------
//Example of DG_CONTROL / DAT_CAPABILITY / MSG_GET
//-------------------------------------------------
TW_CAPABILITY   twCapability;
TW_INT16         rc;

//Setup TW_CAPABILITY Structure
   twCapability.Cap = Cap;     //Fill in capability of interest
   twCapability.ConType = TWON_DONTCARE16;
   twCapability.hContainer = NULL;
```

```
//Send the Triplet
   rc = (*pDSM_Entry)(&AppID,
                 &SourceID,
                 DG_CONTROL,
                 DAT_CAPABILITY,
                 MSG_GET,
                (TW_MEMREF)&twCapability);

//Check return code
   if (rc == TWRC_SUCCESS)
{
//Switch on Container Type
       switch (twCapability.ConType)
       {
//-----ENUMERATION
          case TWON_ENUMERATION:
          {
          pTW_ENUMERATION   pvalEnum;
          TW_UINT16         valueU16;
          TW_UINT16         index;
          pvalEnum =
(pTW_ENUMERATION)GlobalLock(twCapability.hContainer);
          NumItems = pvalEnum->NumItems;
          CurrentIndex = pvalEnum->CurrentIndex;
          DefaultIndex = pvalEnum->DefaultIndex;

          for (index = 0; index < pvalEnum->NumItems; index++)
          {
              if (pvalEnum->ItemType == TWTY_UINT16)
              {
                  valueU16 = ((TW_UINT16)(pvalEnum->ItemList[index*2]));
                  //Store Item Value
              }
          }
          GlobalUnlock(twCapability.hContainer);
          }
          break;

//-----ONEVALUE
          case TWON_ONEVALUE:
          {
          pTW_ONEVALUE      pvalOneValue;
          TW_BOOL         valueBool;

         pvalOneValue =
(pTW_ONEVALUE)GlobalLock(twCapability.hContainer);
         if (pvalOneValue->ItemType == TWTY_BOOL)
         {
               valueBool = (TW_BOOL)pvalOneValue->Item;
               //Store Item Value
         }
         GlobalUnlock(twCapability.hContainer);
         }
         break;
```

```
//-----RANGE
          case TWON_RANGE:
          {
          pTW_RANGE         pvalRange;
          pTW_FIX32         pTWFix32;
          float            valueF32;
          TW_UINT16         index;
            pvalRange = (pTW_RANGE)GlobalLock(twCapability.hContainer);
            if ((TW_UINT16)pvalRange->ItemType == TWTY_FIX32)
            {
               pTWFix32 = &(pvalRange->MinValue);
               valueF32 = FIX32ToFloat(*pTWFix32);
               //Store Item Value
               pTWFix32 = &(pvalRange->MaxValue);
               valueF32 = FIX32ToFloat(*pTWFix32);
               //Store Item Value
               pTWFix32 = &(pvalRange->StepSize);
               valueF32 = FIX32ToFloat(*pTWFix32);
               //Store Item Value
            }
            GlobalUnlock(twCapability.hContainer);
         }
         break;
//-----ARRAY
          case TWON_ARRAY:
          {
          pTW_ARRAY         pvalArray;
          TW_UINT16         valueU16;
          TW_UINT16         index;
            pvalArray = (pTW_ARRAY)GlobalLock(twCapability.hContainer);
            for (index = 0; index < pvalArray->NumItems; index++)
            {
               if (pvalArray->ItemType == TWTY_UINT16)
               {
                  valueU16 = ((TW_UINT16)(pvalArray->ItemList[index*2]));
                  //Store Item Value
               }
            }
            GlobalUnlock(twCapability.hContainer);
         }
         break;
      }   //End Switch Statement
     GlobalFree(twCapability.hContainer);
   } else {
      //Capability MSG_GET Failed check Condition Code
   }
```

```
/*********************************************************
* Fix32ToFloat
* Convert a FIX32 value into a floating point value.
*********************************************************/
float FIX32ToFloat (TW_FIX32    fix32)
{
   float    floater;

   floater = (float)fix32.Whole + (float)fix32.Frac / 65536.0;
   return floater;
}
```

Creating (packing) a Container for a MSG_SET Operation

```
//-------------------------------------------------
//Example of DG_CONTROL / DAT_CAPABILITY / MSG_SET
//-------------------------------------------------
TW_CAPABILITY   twCapability;
TW_INT16         rc;
TW_UINT32         NumberOfItems;

   twCapability.Cap = Cap;      //Insert Capability of Interest
   twCapability.ConType = Container;
      //Use TWON_ONEVALUE or TWON_ARRAY to set current value
      //Use TWON_ENUMERATION or TWON_RANGE to limit available values

   switch (twCapability.ConType)
   {
//-----ENUMERATION
      case TWON_ENUMERATION:
      {
      pTW_ENUMERATION   pvalEnum;

         //The number of Items in the ItemList
         NumberOfItems = 2;

       //Allocate memory for the container and additional ItemList
       // entries
       twCapability.hContainer = GlobalAlloc(GHND,
          (sizeof(TW_ENUMERATION) + sizeof(TW_UINT16) *
(NumberOfItems)));
       pvalEnum = (pTW_ENUMERATION)GlobalLock(twCapability.hContainer);

       pvalEnum->NumItems = 2      //Number of Items in ItemList
       pvalEnum->ItemType = TWTY_UINT16;
       ((TW_UINT16)(pvalEnum->ItemList[0])) = 1;
       ((TW_UINT16)(pvalEnum->ItemList[1])) = 2;

       GlobalUnlock(twCapability.hContainer);
    }
    break;
```

```
//-----ONEVALUE
      case TWON_ONEVALUE:
      {
      pTW_ONEVALUE      pvalOneValue;

         twCapability.hContainer = GlobalAlloc(GHND,
sizeof(TW_ONEVALUE));
         pvalOneValue =
(pTW_ONEVALUE)GlobalLock(twCapability.hContainer);

         (TW_UINT16)pvalOneValue->ItemType = TWTY_UINT16;
         (TW_UINT16)pvalOneValue->Item = 1;

         GlobalUnlock(twCapability.hContainer);
      }
      break;

//-----RANGE
      case TWON_RANGE:
      {
      pTW_RANGE         pvalRange;
      TW_FIX32         TWFix32;
      float            valueF32;

         twCapability.hContainer = GlobalAlloc(GHND, sizeof(TW_RANGE));
         pvalRange = (pTW_RANGE)GlobalLock(twCapability.hContainer);

         (TW_UINT16)pvalRange->ItemType = TWTY_FIX32;
         valueF32 = 100;
         TWFix32 = FloatToFIX32 (valueF32);
         pvalRange->MinValue = *((pTW_INT32) &TWFix32);
         valueF32 = 200;
         TWFix32 = FloatToFIX32 (valueF32);
         pvalRange->MaxValue = *((pTW_INT32) &TWFix32);

         GlobalUnlock(twCapability.hContainer);
      }
      break;

//-----ARRAY
      case TWON_ARRAY:
      {
      pTW_ARRAY         pvalArray;

         //The number of Items in the ItemList
         NumberOfItems = 2;

       //Allocate memory for the container and additional ItemList
entries
       twCapability.hContainer = GlobalAlloc(GHND,
         (sizeof(TW_ARRAY) + sizeof(TW_UINT16) * (NumberOfItems)));
       pvalArray = (pTW_ARRAY)GlobalLock(twCapability.hContainer);

         (TW_UINT16)pvalArray->ItemType = TWTY_UINT16;
         (TW_UINT16)pvalArray->NumItems = 2;
         ((TW_UINT16)(pvalArray->ItemList[0])) = 1;
         ((TW_UINT16)(pvalArray->ItemList[1])) = 2;

         GlobalUnlock(twCapability.hContainer);
      }
      break;
   }
```

```
//-----MSG_SET
   rc = (*pDSM_Entry)(&AppID,
                  &SourceID,
                  DG_CONTROL,
                  DAT_CAPABILITY,
                  MSG_SET,
                  (TW_MEMREF)&twCapability);
   GlobalFree(twCapability.hContainer);
   switch (rc)
   {
      case TWRC_SUCCESS:
         //Capability's Current or Available value was set as specified
      case TWRC_CHECKSTATUS:
        //The Source matched the specified value(s) as closely as
possible
         //Do a MSG_GET to determine the settings made
      case TWRC_FAILURE:
         //Check the Condition Code for more information
   }
/*********************************************************
* FloatToFix32
* Convert a floating point value into a FIX32.
*********************************************************/
TW_FIX32 FloatToFix32 (float floater)
{
   TW_FIX32 Fix32_value;
   TW_INT32 value = (TW_INT32) (floater * 65536.0 + 0.5);
   Fix32_value.Whole = value >> 16;
   Fix32_value.Frac = value & 0x0000ffffL;
   return (Fix32_value);
}
```

Delayed Negotiation - Negotiating Capabilities After State 4

Applications may inquire about a Source's capability values at any time during the session with the Source. However, as a rule, applications can only request to **set** a capability during State 4. The rationale behind this restriction is tied to the display of the Source's user interface when the Source is enabled. Many Sources will modify the contents of their user interface in response to some of the application's requested settings. These user interface modifications prevent the user from selecting choices that do not meet the application's requested values. The Source's user interface is never displayed in State 4 so changes can be made without the user's awareness. However, the interface may be displayed in States 5 through 7.

Some capabilities have no impact on the Source's user interface and the application may really want to set them later than State 4. To allow delayed negotiation, the application must request, during State 4, that a particular capability be able to be set later (during States 5 or 6). The Source may agree to this request or deny it. The request is negotiated by the application with the Source by using the DG_CONTROL / DAT_CAPABILITY operations on the CAP_EXTENDEDCAPS capability.

On the CAP_EXTENDEDCAPS capability, the DG_CONTROL / DAT_CAPABILITY operations:

MSG_GET

Indicates all capabilities that the Source is willing to negotiate in State 5 or 6.

MSG_SET

Specifies which capabilities the application wishes to negotiate in States 5 or 6.

MSG_GETCURRENT

Provides a list of all capabilities which the Source and application have agreed to allow to be negotiated in States 5 or 6.

As with any other capability, if the Source does not support negotiating CAP_EXTENDEDCAPS, it will return the Return Code TWRC_FAILURE with the Condition Code TWCC_CAPUNSUPPORTED.

If an application attempts to set a capability in State 5 or 6 and the Source has not previously agreed to this arrangement, the operation will fail with a Return Code of TWRC_FAILURE and a Condition Code of TWCC_SEQERROR.

If an application does not use the Source's user interface but presents its own, the application controls the state of the Source explicitly. If the application wants to set the value of any capability, it returns the Source to State 4 and does so. Therefore, an application using its own user interface will probably not need to use CAP_EXTENDEDCAPS.

Options for Transferring Data

As discussed previously, there are three modes defined by TWAIN for transferring data:

- Native
- Disk File
- Buffered Memory

A Source is required to support Native and Buffered Memory transfers.

Native Mode Transfer

The use of Native mode, the default mode, for transferring data was covered in Chapter 3. There is one potential limitation that can occur in a Native mode transfer. That is, there may not be an adequately large block of RAM available to hold the image. This situation will not be discovered until the transfer is attempted when the application issues the DG_IMAGE / DAT_IMAGENATIVEXFER / MSG_GET operation.

When the lack of memory appears, the Source may respond in one of several ways. It can:

- Simply fail the operation.
- Clip the image to make it fit in the available RAM - The Source should notify the user that the clipping operation is taking place due to limited RAM. The clipping should maintain both the aspect ratio of the selected image and the origin (upper-left).
- Interact with the user to allow them to resize the image or cancel the capture.

The Return Code / Condition Code returned from the DG_IMAGE / DAT_IMAGENATIVEXFER / MSG_GET operation may indicate one of these actions occurred.

If the Return Code is TWRC_XFERDONE:

This indicates the transfer was completed and the session is in State 7. However, it does not guarantee that the Source did not clip the image to make it fit. Even if the application issued a DG_IMAGE / DAT_IMAGEINFO / MSG_GET operation prior to the transfer to determine the image size, it cannot assume that the ImageWidth and ImageLength values returned from that operation really apply to the image that was ultimately transferred. If the dimensions of the image are important to the application, the application should always check the actual transferred image size after the transfer is completed. To do this:

1. Execute a DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER operation to move the session from State 7 to State 6 (or 5).
2. Determine the actual size of the image that was transferred:
   a. **On Windows** - Read the DIB header
   b. **On Macintosh** - Check the picFrame in the Picture

If the Return Code is TWRC_CANCEL:

The acquisition was canceled by the user. The session is in State 7. Execute a DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER operation to move the session from State 7 to State 6 (or 5).

If the Return Code is TWRC_FAILURE:

Check the Condition Code to determine the cause of the failure. The session is in State 6. No memory was allocated for the DIB or PICT. The image is still pending. If lack of memory was the cause, you can try to free additional memory or discard the pending image by executing DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER.

Disk File Mode Transfer

Determine if a Source Supports the Disk File Mode

- Use the DG_CONTROL / DAT_CAPABILITY / MSG_GET operation.
- Set the TW_CAPABILITY's Cap field to ICAP_XFERMECH.
- The Source returns information about the transfer modes it supports in the container structure pointed to by the hContainer field of the TW_CAPABILITY structure. The disk file mode is identified as TWSX_FILE. Sources are not required to support Disk File Transfer so it is important to verify its support.

After Verifying Disk File Transfer is Supported, Set Up the Transfer

During State 4:

- Set the ICAP_XFERMECH to TWSX_FILE. Use the DG_CONTROL / DAT_CAPABILITY / MSG_SET operation.
- Use the DG_CONTROL / DAT_CAPABILITY / MSG_GET operation to determine which file formats the Source can support. Set TW_CAPABILITY.Cap to ICAP_IMAGEFILEFORMAT and execute the MSG_GET. The Source returns the supported format identifiers which start with TWFF_ and may include TWFF_PICT, TWFF_BMP, TWFF_TIFF, etc. They are listed in the TWAIN.H file and in the Constants section of Chapter 8.

During States 4, 5, or 6:

To set up the transfer, the DG_CONTROL / DAT_SETUPFILEXFER operations of MSG_GET, MSG_GETDEFAULT, and MSG_SET can be used. The data structure used in the DSM_Entry call is a TW_SETUPFILEXFER structure:

```
typedef struct {
  TW_STR255   FileName; /* File to contain data       */
  TW_UINT16   Format;   /* A TWFF_xxxx constant        */
  TW_HANDLE   VRefNum;  /* Used for Macintosh only    */
} TW_SETUPFILEXFER, FAR *pTW_SETUPFILEXFER;
```

The application could use the MSG_GETDEFAULT operation to determine the default file format and filename (TWAIN.TMP in the current directory). If acceptable, the application could just use that file. However, most applications prefer to set their own values for filename and format. The MSG_SET operation allows this. It is done during State 6. To set your own filename and format, do the following:

1. Create the file specified for the transfer and close it. Be sure the Source has permission to read and write this file.
2. Allocate the required TW_SETUPFILEXFER structure. Then, fill in these fields:
   a. **FileName** - the desired file name. On Windows, be sure to include the complete path name.
   b. **Format** - the constant for the desired, and supported, format. (TWFF_xxxx). If you set it to an unsupported format, the operation returns TWRC_FAILURE / TWCC_BADVALUE and the Source resets itself to write data to its default file.
   c. **VRefNum** - On Macintosh, write the file's volume reference number. On Windows, fill the field with a TWON_DONTCARE16.
3. Invoke the DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET operation.

Execute the Transfer into the File

After the application receives the MSG_XFERREADY notice from the Source and has issued the DG_CONTROL / DAT_SETUPFILEXFER / MSG_GET operation:

Use the following operation: DG_IMAGE / DAT_IMAGEFILEXFER / MSG_GET

This operation does not have an associated data structure but just uses NULL for the pData parameter in the DSM_Entry call.

- If the application has not specified a filename (during the setup) - the Source will use either its default file or the last file information it was given.
- If the file specified by the application does not exist - the Source should create it.
- If the file exists but already has data in it - the Source should overwrite the existing data. Notice, if you are transferring multiple files and using the same file name each time, you will overwrite the data unless you copy it to a different filename between transfers.

Note: The application cannot abort a Disk File transfer once initiated. However, the Source's user interface may allow the user to cancel the transfer.

Following execution, be sure to check the Return Code:

TWRC_XFERDONE: File was written successfully. The application needs to invoke the DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER to transition the session back to State 6 (or 5) as was illustrated in Chapter 3.

TWRC_CANCEL: The user canceled the transfer. The contents of the file are undefined. Invoke DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER to transition the session back to State 6 (or 5) as was illustrated in Chapter 3.

TWRC_FAILURE
The Source remained in State 6.
The contents of the file are undefined.
The image is still pending. To discard it, use DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER.

Check the Condition Code to determine the cause of the failures. The alternatives are:

TWCC_BADDEST = Operation aimed at invalid Source

TWCC_OPERATIONERROR = Either the file existed but could not be accessed or a system error occurred during the writing

TWCC_SEQERROR = Operation invoked in invalid state (i.e. not 6)

Buffered Memory Mode Transfer

Set Capability Values for the Buffered Memory Mode, if Desired

Data is typically transferred in uncompressed format. However, if you are interested in knowing if the Source can transfer compressed data when using the buffered memory mode, perform a DG_CONTROL / DAT_CAPABILITY / MSG_GET on the ICAP_COMPRESSION. The values will include TWCP_NONE (the default) and perhaps others such as TWCP_PACKBITS, TWCP_JPEG ,etc. (See the list in the Constants section of Chapter 8.) More information on compression is available later in this chapter in the section called Transfer of Compressed Data.

Set up the Transfer

During State 4:

Set the ICAP_XFERMECH to TWSX_MEMORY by using the DG_CONTROL / DAT_CAPABILITY / MSG_SET operation.

During States 4, 5, or 6:

The DG_CONTROL / DAT_SETUPMEMXFER / MSG_GET operation is used by the application to determine what buffer sizes the Source wants to use during the transfer. The Source might have more accurate information in State 6.

The data structure used in the DSM_Entry call is a TW_SETUPMEMXFER structure:

```
typedef struct {
  TW_UINT32   MinBufSize  /* Minimum buffer size in bytes   */
  TW_UINT32   MaxBufSize  /* Maximum buffer size in bytes   */
  TW_UINT32   Preferred   /* Preferred buffer size in bytes */
} TW_SETUPMEMXFER, FAR *pTW_SETUPMEMXFER;
```

The Source will fill in the appropriate values for its device.

Buffers Used for Uncompressed Strip Transfers

- The application is responsible for allocating and deallocating all memory used during the buffered memory transfer.
- For optimal performance, create buffers of the Preferred size.
- In all cases, the size of the allocated buffers must be within the limits of MinBufSize to MaxBufSize. If outside of these limits, the Source will fail the transfer operation with a Return Code of TWRC_FAILURE / TWCC_BADVALUE.
- If using more than one buffer, all buffers must be the same size.
- Raster lines must be double-word aligned and padded with zeros is recommended .

Execute the Transfer Using Buffers

After the application receives the MSG_XFERREADY notice from the Source and has issued the DG_CONTROL / DAT_SETUPMEMXFER / MSG_GET operation:

- Allocate one or more buffers of the same size. The best size is the one indicated by the TW_SETUPMEMXFER.Preferred field. If that is impossible, be certain the buffer size is between MinBufSize and MaxBufSize.
- Allocate the TW_IMAGEMEMXFER structure. It will be used in the DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET operation.

The TW_IMAGEMEMXFER structure looks like this:

```
typedef struct {
  TW_UINT16  Compression;
  TW_UINT32  BytesPerRow;
  TW_UINT32  Columns;
  TW_UINT32  Rows;
  TW_UINT32  XOffset;
  TW_UINT32  YOffset;
  TW_UINT32  BytesWritten;
  TW_MEMORY  Memory;
} TW_IMAGEMEMXFER, FAR *pTW_IMAGEMEMXFER;
```

Fill in the TW_IMAGEMEMXFER's first field with TWON_DONTCARE16 and the following six fields with TWON_DONTCARE32.

The TW_MEMORY structure embedded in there looks like this:

```
typedef struct {
  TW_UINT32  Flags;
  TW_UINT32  Length;
  TW_MEMREF  TheMem;
} TW_MEMORY, FAR *pTW_MEMORY;
```

Fill in the TW_MEMORY structure as follows:

Memory.Flags

Place TWMF_APPOWNS bit-wise ORed with TWMF_POINTER or TWMF_HANDLE

Memory.Length

The size of the buffer in bytes

Memory.TheMem

A handle or pointer to the memory buffer allocated above (depending on which one was specified in the Flags field).

Following each buffer transfer, the Source will have filled in all the fields except Memory which it uses as a reference to the memory block for the data.

The flow of the transfer of buffers is as follows:

Step 1

Buffered Memory transfers provide no embedded header information. Therefore, the application must determine the image attributes. After receiving the MSG_XFERREADY, i.e. while in State 6, the application issues the DG_IMAGE / DAT_IMAGEINFO / MSG_GET and DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET operations to learn about the image's bitmap characteristics and the size and location of the original image on the original page (before scaling or other processing). If additional information is desired, use the DG_CONTROL / DAT_CAPABILITY / MSG_GET operation.

Step 2

The application issues DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET.

Step 3

The application checks the Return Code.

If TWRC_SUCCESS:

Examine the TW_IMAGEMEMXFER structure for information about the buffer. If you plan to reuse the buffer, copy the data to another location.

Loop back to Step 2 to get another buffer. Be sure to reinitialize the information in the TW_IMAGEMEMXFER structure (including the Memory fields), if necessary. Issue another DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET operation.

If TWRC_XFERDONE:

This is how the Source indicates it just transferred the last buffer successfully. Examine the TW_IMAGEMEMXFER structure for information about the buffer. Perhaps, copy the data to another location, as desired, then go to Step 4.

If TWRC_CANCEL:

The user aborted the transfer. The application must send a DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER as described in Chapter 3 to move from State 7 to State 6 (or 5).

If TWRC_FAILURE:

Examine the Condition Code to determine the cause and handle it.
If the failure occurred during the transfer of the first buffer, the session is in State 6. If the failure occurred on a subsequent buffer, the session is in State 7.

The contents of the buffer are invalid and the transfer of the buffer is still pending. To abort it, use DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER.

Step 4

Once the TWRC_XFERDONE has been returned, the application must send the DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER to conclude the transfer. This was described in Chapter 3 in the section called State 7 to 6 to 5 - Conclude the Transfer.

Note: The majority of Sources divide the image data into strips when using buffered transfers. A strip is a horizontal band starting at the leftmost side of the image and spanning the entire width but covering just a portion of the image length. The application can verify that strips are being used if the information returned from the Source in the TW_IMAGEMEMXFER structure's XOffset field is zero and the Columns field is equal to the value in the TW_IMAGEINFO structure's ImageWidth field.

An alternative to strips is the use of tiles although they are used by very few Sources. Refer to the TW_IMAGEMEMXFER information in Chapter 8 for an illustration of tiles.

The Image Data and Its Layout

The image which is transferred from the Source to the application has several attributes. Some attributes describe the size of the image. Some describe where the image was located on the original page. Still others might describe information such as resolution or number of bits per pixel. TWAIN provides means for the application to learn about these attributes.

Users are often able to select and modify an image's attributes through the Source's user interface. Additionally, TWAIN provides capabilities and operations that allow the application to impact these attributes prior to acquisition and transfer.

Getting Information About the Image That will be Transferred

Before the transfer occurs, while in State 6, the Source can provide information to the application about the actual image that it is about to transfer. Note, the information is lost once the transfer takes place so the application should save it, if needed. This information can be retrieved through two operations:

- DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET
- DG_IMAGE / DAT_IMAGEINFO / MSG_GET

The area of an image to be acquired will always be a rectangle called a frame. There may be one or more frames located on a page. Frames can be selected by the user or designated by the application. The TW_IMAGELAYOUT structure communicates where the image was located on the original page relative to the origin of the page. It also indicates, in its FrameNumber field, if this is the first frame, or a later frame, to be acquired from the page.

The TW_IMAGELAYOUT structure looks like this:

```
typedef struct {
   TW_FRAME      Frame;
   TW_UINT32     DocumentNumber;
   TW_UINT32     PageNumber;
   TW_UINT32     FrameNumber;
   } TW_IMAGELAYOUT, FAR *pTW_IMAGELAYOUT;
```

The TW_FRAME structure specifies the values for the Left, Right, Top, and Bottom of the frame to be acquired. Values are given in ICAP_UNITS.

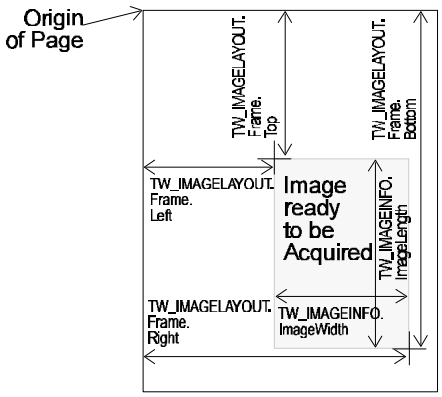

Figure 4-1. TW_FRAME Structure

The DG_IMAGE / DAT_IMAGEINFO / MSG_GET operation communicates other attributes of the image being transferred. The TW_IMAGEINFO structure looks like this:

```
typedef struct {
   TW_FIX32    XResolution;
   TW_FIX32    YResolution;
   TW_INT32    ImageWidth;
   TW_INT32    ImageLength;
   TW_INT16    SamplesPerPixel;
   TW_INT16    BitsPerSample[8];
   TW_INT16    BitsPerPixel;
   TW_BOOL     Planar;
   TW_INT16    PixelType;
   TW_UINT16   Compression;
   } TW_IMAGEINFO, FAR * pTW_IMAGEINFO;
```

Notice how the ImageWidth and ImageLength relate to the frame described by the TW_IMAGELAYOUT structure.

Changing the Image Attributes

Normally, the user will select the desired attributes. However, the application may wish to do this initially during State 4. For example, if the user interface will not be displayed, the application may wish to select the frame. The application can use a DG_IMAGE / DAT_IMAGELAYOUT / MSG_SET operation to define the area (frame) to be acquired. Although, there is no corresponding DG_IMAGE / DAT_IMAGEINFO / MSG_SET operation, the application can change those attributes by setting capabilities and the TW_IMAGELAYOUT data structure.

Here are the relationships:

TW_IMAGEINFO fields	Capability or data structure that impacts the attribute
XResolution	ICAP_XRESOLUTION
YResolution	ICAP_YRESOLUTION
ImageWidth	TW_IMAGELAYOUT.TW_FRAME.Right - TW_FRAME.Left **
ImageLength	TW_IMAGELAYOUT.TW_FRAME.Bottom - TW_FRAME.Top **
SamplesPerPixel	ICAP_PIXELTYPE (i.e. TWPT_BW has 1, TWPT_RGB has 3)
BitsPerSample	Calculated by BitsPerPixel divided by SamplesPerPixel
BitsPerPixel	ICAP_BITDEPTH
Planar	ICAP_PLANARCHUNKY
PixelType	ICAP_PIXELTYPE
Compression	ICAP_COMPRESSION

** ImageWidth and ImageLength are actually provided in pixels whereas TW_FRAME uses ICAP_UNITS.

Resolving Conflict Between ICAP_FRAMES, ICAP_SUPPORTEDSIZES, DAT_IMAGELAYOUT

Since there are several ways to negotiate the scan area, it becomes confusing when deciding what should take precedence. It is logical to assume that the last method used to set the frame will dictate the current frame. However, it may still be confusing to decide how that is represented during a MSG_GET operation for any of the three methods. The following behavior is suggested.

Note: Frame extents are only limited by ICAP_PHYSICALWIDTH and ICAP_PHYSICALHEIGHT. Setting ICAP_SUPPORTEDSIZES does NOT imply a new extent limitation. TWSS_xxxx sizes are simply predefined fixed frame sizes.

- **If the frame is set in DAT_IMAGELAYOUT**
  - ✓ ICAP_FRAMES shall respond to MSG_GETCURRENT with the dimensions of the frame set in the DAT_IMAGELAYOUT call.
  - ✓ ICAP_SUPPORTEDSIZES shall respond to MSG_GETCURRENT with TWSS_NONE
- **If the current frame is set from ICAP_FRAMES**
  - ✓ DAT_IMAGELAYOUT shall respond with the dimensions of the current frame set in ICAP_FRAMES
  - ✓ ICAP_SUPPORTEDSIZES shall respond to MSG_GETCURRENT with TWSS_NONE
- **If the current fixed frame is set from ICAP_SUPPORTEDSIZES**
  - ✓ DAT_IMAGELAYOUT shall respond to MSG_GET with the dimensions of the fixed frame specified in ICAP_SUPPORTEDSIZES
  - ✓ ICAP_FRAMES shall respond to MSG_GETCURRENT with the dimensions of the fixed frame specified in ICAP_SUPPORTEDSIZES

ICAP_ROTATION, ICAP_ORIENTATION Affect on ICAP_FRAMES, DAT_IMAGELAYOUT, DAT_IMAGEINFO

There is considerable confusion when trying to resolve the affect of Rotation and Orientation on the current frames and image layout. After careful consideration of the specification it has been concluded that ICAP_ROTATION and ICAP_ORIENTATION shall be applied after considering ICAP_FRAMES and DAT_IMAGELAYOUT.

Obviously a change in orientation will have an effect on the output image dimensions, so these must be reflected in DAT_IMAGEINFO during State 6. The resulting image dimensions shall be reported by the data source after considering the affect of the rotation on the current frame.

ICAP_ORIENTATION and ICAP_ROTATION are additive. The original frame is modified by ICAP_ORIENTATION as it is downloaded to the device by the Source, and represents the orientation of the paper being scanned. ICAP_ROTATION is then applied to the captured image to yield the final framing information that is reported to the Application in State 6 or 7. One possible reason for combining these two values is to use them to cancel each other out. For instance, some scanners with automatic document feeders may receive a performance benefit from describing an ICAP_ORIENTATION of TWOR_LANDSCAPE in combination with an ICAP_ROTATION of 90 degrees. This would allow the user to feed images in a

landscape orientation (which lets them feed faster), while rotating the captured images back to portrait (which is the way the user wants to view them).

Transfer of Multiple Images

Chapter 3 discussed the transfer of a single image. Transferring multiple images simply requires looping through the single-image transfer process repeatedly whenever more images are available. Two classes of issues arise when considering multiple image transfer under TWAIN:

- What state transitions are allowable when a session is at an inter-image boundary?
- What facilities are available to support the operation of a document feeder? This includes issues related to high-performance scanning.

This section starts with a review of the single-image transfer process. This is followed by a discussion of options available to an application once the transfer of a single image is complete. Finally, document feeder issues are presented.

To briefly review the single-image transfer process:

- The application enables the Source and the session moves from State 4 to State 5.
- The Source sends the application a MSG_XFERREADY when an image is ready for transfer.
- The application uses DG_IMAGE / DAT_IMAGEINFO / MSG_GET and DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET to get information about the image about to be transferred.
- The application initiates the transfer using a DG_CONTROL / DAT_IMAGExxxxFER / MSG_GET operation. The transfer occurs.
- Following a successful transfer, the Source returns TWRC_XFERDONE.
- The application sends the DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER operation to acknowledge the end of the transfer and learn the number of pending transfers.

If the intent behind transferring a single image is to simply flush it from the Source (for example, an application may want to scan only every other page from a stack placed in a scanner with a document feeder), the following operation suffices:

- Issue a CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER operation. As with normal image transfer, this operation tells the Source that the application has completed acquisition of the current image, and the Source responds by reporting the number of pending transfers.

Preparing for Multiple Image Transfer

The DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER operation issued by the application at the end of every image transfer performs two important functions:

- It returns a count of pending transfers (in TW_PENDINGXFERS.Count)
- It transitions the session to State 6 (Transfer Ready) if the count of pending transfers is nonzero, or to State 5 (Source Enabled) if the count is zero. Recall that the count returned is a positive value if the Source knows the number of images available for acquisition. If the Source does not know the number of images available, the count returned us -1. The latter situation can occur if, for example, a document feeder is in use. Note that not knowing the number of images available includes the possibility that no further images are available; see the description of DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER for more on this.

We have just seen that after the MSG_ENDXFER operation is issued following an image transfer, the session is either in State 6 or State 5; that is, the session is still very much in an active state. If the session is in State 6 (i.e. “an image is available”), the application takes one of two actions so as to eventually transition the session to State 5 (i.e. “Source is ready to acquire an image, though none is available”):

- It continues to perform the single-image transfer process outlined earlier until no more images are available, or
- It issues a DG_CONTROL / DAT_PENDINGXFERS / MSG_RESET to flush all pending transfers from the Source.

Once the session is back in State 5, the application has to decide whether to stay in State 5 or transition down to State 4 (“Source is open, and ready for capability negotiation”.) Two scenarios are possible here.

In one scenario, the application lets the Source control further state transitions. If the Source sends it a MSG_XFERREADY, the application restarts the multiple image transfer loop described above. If the Source sends it a MSG_CLOSEDSREQ (e.g. because the user activated the “Done” trigger on the UI displayed by the Source), the application sends back a DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS, thereby putting the session in State 4.

In the other scenario, the application directly controls session state transitions. For example, the application may want to shut down the current session as soon as the current batch of images have been transferred. In this case, the application issues a DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS as soon as the pending transfers count reaches zero.

It should be noted that there is no “right”, “wrong” or “preferred” scenario for an application to follow when deciding what to do once all images in the current set have been transferred. If an application wants to let the user control the termination of a session explicitly, it may well wait for the Source to send it a MSG_CLOSEDSREQ. On the other hand, the application may have a strong sense of what constitutes a session; for example, it may want to terminate a scan session as soon as a blank page is transferred. In such a case, the application will want to control the condition under which the MSG_DISABLEDS is sent.

Use of a Document Feeder

The term document feeder can refer to a physical device's automatic document feeder, such as might be available with a scanner, or to the logical feeding ability of an image database. Both input mechanisms apply although the following text uses the physical feeder for its discussion. The topics covered in this section are:

- Controlling whether to scan pages from the document feeder or the platen
- Detecting whether or not paper is ready for scanning
- Controlling scan lookahead

Note that these concepts are applicable to scanners that do not have feeders; see the discussion below for details.

Selecting the Document Feeder

Sometimes the use of a document feeder actually alters how the image is acquired. For instance, a scanner may move its light bar over a piece of paper if the paper is placed on a platen. When a document feeder is used, however, the same scanner might hold the light bar stable and scan the moving paper. To prepare for such variations the application and Source can explicitly agree to use the document feeder. The negotiation for this action must occur during State 4 **before** the Source is enabled using the following capability.

CAP_FEEDERENABLED

Determine if a Source has a document feeder available and, if so, select that option.

- To determine if this capability is supported, use a DG_CONTROL / DAT_CAPABILITY / MSG_GET operation. TWRC_FAILURE / TWCC_CAPUNSUPPORTED indicates this Source does not have the ability to select the document feeder.
- If supported, use the DG_CONTROL / DAT_CAPABILITY / MSG_SET operation during State 4.
- Set TW_CAPABILITY.Cap to CAP_FEEDERENABLED.
- Create a container of type TW_ONEVALUE and set it to TRUE. Reference TW_CAPABILITY.hContainer to the container.
- Execute the MSG_SET operation and check the Return Code.

  If TWRC_SUCCESS then the feeder is available and your request to use it was accepted. The application can now set other document feeder capabilities.

  If TWRC_FAILURE and TWCC_CAPUNSUPPORTED, TWCC_CAPBADOPERATION, or TWCC_BADVALUE then this Source does not have a document feeder capability or does not allow it to be selected explicitly.

Note: If an application wanted to prevent the user from using a feeder, the application should use a MSG_SET operation to set the CAP_FEEDERENABLED capability to FALSE.

Detecting Whether an Image is Ready for Acquisition

Having an image ready for acquisition in the Source device is independent of having a selectable document feeder. There are three possibilities here:

- The Source cannot tell whether an image is available,
- An image is available for acquisition, or
- No image is available for acquisition

These cases can be detected by first determining whether a Source can tell that image data is available for acquisition (case 1. vs. cases 2. and 3.) and then determining whether image data is available (case 2. vs. case 3.)The capabilities used to do so are as follows:

CAP_PAPERDETECTABLE

First, determine if the Source can tell that documents are loaded.

- To check if a Source can detect documents, use the DG_CONTROL / DAT_CAPABILITY / MSG_GET operation.
- Set the TW_CAPABILITY.Cap field to CAP_PAPERDETECTABLE.
- The Source returns TWRC_SUCCESS with the hContainer structure's value set to TRUE if it can detect a loaded document that is ready for acquisition. If the result code is TWRC_FAILURE with TWCC_CAPUNSUPPORTED or TWCC_BADVALUE, then the Source cannot detect that paper is loaded.

Note: CAP_PAPERDETECTABLE can be used independently of CAP_FEEDERENABLED. Also, an automatic document feeder need not be present for a Source to support this capability; e.g. a scanner that can detect paper on its platen should return TRUE.

The application cannot set this capability. The Source is simply reporting on a condition.

CAP_FEEDERLOADED

Next, determine if there are documents loaded in the feeder.

- To check if pages are present, use the DG_CONTROL / DAT_CAPABILITY / MSG_GET operation.
- Set the TW_CAPABILITY.Cap field to CAP_FEEDERLOADED.
- The Source returns TRUE if there are documents loaded. The information is in the container structure pointed to by the hContainer field of the TW_CAPABILITY structure.

Note: Neither CAP_FEEDERENABLED nor CAP_PAPERDETECTABLE need be TRUE to use this capability. A FALSE indication from this capability simply indicates that the feeder is not loaded or that the Source's feeder cannot tell. For a definitive answer, be sure to check CAP_PAPERDETECTABLE.

Controlling Scan Lookahead

With low-end scanners there is usually ample time for the CPU handling the image acquisition to process incoming image data on-the-fly or in the scan delay between pages. However, with higher performance scanners the CPU image processing time for a given page can become a significant fraction of the scan time. This problem can be alleviated if the scanner can scan ahead image data that the CPU has yet to acquire. This data can be buffered in scanner-local memory, or stored in main memory by the Source via a DMA operation while the CPU processes the current image.

Scan look-ahead is not always desirable, however. This is because the decision to continue a scan may be determined by the results of previously scanned images. For example, a scanning application may decide to stop a scan whenever it sees a blank page. If scan look-ahead were always enabled, one or more pages past the blank page may be scanned and transferred to the scanner's output bin. Such behavior may be incorrect from the point of view of the application's design

We have argued that the ability to control scan look-ahead is highly desirable. However, a single "enable scan look-ahead" command is insufficient to capture the richness of function provided by some scanners. In particular, TWAIN's model of document feeding has each image (e.g., sheet of paper) transition through a three stage process.

1. **Image is in input bin.** This action is taken by the user (for example, by placing a stack of paper into an auto-feeder.)
2. **Image is ready for scan.** This action causes the next available image to be placed at the start of the scan area. Set the CAP_AUTOFEED capability(described below)to automatically feed images to the start of the scan area.
3. **Image is scanned.** This action actually causes the image to be scanned. For example, the DG_IMAGE/DAT_IMAGEMEMXFER/MSG_GET operation initiates image transfer to an application via buffered memory. TWAIN allows a Source to pre-fetch images into Source-local memory (even before the application requests them) by setting the CAP_AUTOSCAN capability.

CAP_AUTOFEED

Enable the Source's automatic document feeding process.

- Use DG_CONTROL / DAT_CAPABILITY / MSG_SET.
- Set the TW_CAPABILITY.Cap field to CAP_AUTOFEED and set the capability to TRUE.
- When set to TRUE, the behavior of the Source is to eject one page and feed the next page after all frames on the first page are acquired. This automatic feeding process will continue whenever there is image data ready for acquisition (and the Source is in an enabled state). CAP_FEEDERLOADED is TRUE showing that pages are in the document feeder.

Note: CAP_FEEDERENABLED must be set to TRUE to use this capability. If not, the Source should return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

CAP_AUTOSCAN

Enable the Source's automatic document scanning process.

- Use DG_CONTROL / DAT_CAPABILITY / MSG_SET.
- Set the TW_CAPABILITY.Cap field to CAP_AUTOSCAN and set the capability to TRUE.
- When set to TRUE, the behavior of the Source is to eject one page and scan the next page after all frames on the first page are acquired. This automatic scanning process will continue whenever there is image data ready for acquisition (and the Source is in an enabled state.

Note: Setting CAP_AUTOSCAN to TRUE implicitly sets CAP_AUTOFEED to TRUE also.

When your application uses automatic document feeding:

- Set CAP_XFERCOUNT to -1 indicating your application can accept multiple images.
- Expect the Source to return the TW_PENDINGXFERS.Count as -1. It indicates the Source has more images to transfer but it is not sure how many.
- Using automatic document feeding does not change the process of transferring multiple documents described earlier and in Chapter 3.

Control of the Document Feeding by the Application

In addition to automatic document feeding, TWAIN provides an option for an application to manually control the feeding of documents. This is only possible if the Source agrees to negotiate the following capabilities during States 5 and 6 by use of CAP_EXTENDEDCAPS. If CAP_AUTOFEED is set to TRUE, it can impact the way the Source responds to the following capabilities as indicated below.

CAP_FEEDPAGE

- If the application sets this capability to TRUE, the Source will eject the current page (if any) and feed the next page.
- To work as described requires that CAP_FEEDERENABLED and CAP_FEEDERLOADED be TRUE.
- If CAP_AUTOFEED is TRUE, the action is the still the same.
- The page ejected corresponds to the image that the application is acquiring (or is about to acquire). Therefore, if CAP_AUTOSCAN is TRUE and one or more pages have been scanned speculatively, the page ejected may correspond to a page that has already been scanned into Source-local buffers.

CAP_CLEARPAGE

- If the application sets this capability to TRUE, the Source will eject the current page and leave the feeder acquire area empty (that is, with no image ready to acquire).
- To work as described, this requires that CAP_FEEDERENABLED be TRUE and there be a paper in the feeder acquire area to begin with.
- If CAP_AUTOFEED is TRUE, the next page will advance to the acquire area.
- If CAP_AUTOSCAN is TRUE, setting this capability returns TWRC_FAILURE with TWCC_BADVALUE.

CAP_REWINDPAGE

- If the application sets this capability to TRUE, the Source will return the current page to the input area and return the last page from the output area into the acquisition area.
- To work as described requires that CAP_FEEDERENABLED be TRUE.
- If CAP_AUTOFEED is TRUE, the normal automatic feeding will continue after all frames of this page are acquired.
- The page rewound corresponds to the image that the application is acquiring. Therefore, if CAP_AUTOSCAN is TRUE and one or more pages have been scanned speculatively, the page rewound may correspond to a page that has already been scanned into Source-local buffers.

Transfer of Compressed Data

When using the Buffered Memory mode for transferring images, some Sources may support the transfer of data in a compressed format.

To determine if a Source supports transfer of compressed data and to set the capability

1. Use the DG_CONTROL / DAT_CAPABILITY / MSG_GET operation.
2. Set the TW_CAPABILITY.Cap field to ICAP_COMPRESSION.
3. The Source returns information about the compression schemes they support in the container structure pointed to by the hContainer field of TW_CAPABILITY. The identifiers for the compression alternatives all begin with TWCP_, such as TWCP_PACKBITS, and can be seen in the Constants section of Chapter 8 and in the TWAIN.H file.
4. If you wish to negotiate for the transfer to use one of the compression schemes shown, use the DG_CONTROL / DAT_CAPABILITY / MSG_SET operation.

The TW_IMAGEMEMXFER structure is used with the DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET operation. The structure looks like this:

```
typedef struct {
  TW_UINT16   Compression; /* A TWCP_xxxx constant */
  TW_UINT32   BytesPerRow;
  TW_UINT32   Columns;
  TW_UINT32   Rows;
  TW_UINT32   XOffset;
  TW_UINT32   YOffset;
  TW_UINT32   BytesWritten;
  TW_MEMORY   Memory;
} TW_IMAGEMEMXFER, FAR *pTW_IMAGEMEMXFER;
```

When compressed strips of data are transferred:

- The BytesPerRow field will be set to 0. The Columns, Rows, XOffset, and YOffset fields will contain TWON_DONTCARE32 indicating the fields hold invalid values. (The original image height and width are available by using the DG_IMAGE / DAT_IMAGEINFO / MSG_GET operation during State 6 prior to the transfer.)
- Transfer buffers are always completely filled by the Source. For compressed data, it is very likely that at least one partial line will be written into the buffer.
- The application is responsible for deallocating the buffers.

When compressed, tiled data are transferred:

- All fields in the structure contain valid data. BytesPerRow, Columns, Rows, XOffset, and YOffset all describe the uncompressed tile. Compression and BytesWritten describe the compressed tile.
- In this case, unlike with compressed, strip data transfer, the Source allocates the transfer buffers. This allows the Source to create buffers of differing sizes so that complete, compressed tiles can be transferred to the application intact (not split between sequential buffers). Under these conditions, the application should set the fields of the TW_MEMORY structure so Flags is TWMF_DSOWNS, Length is TWON_DONTCARE32 and TheMem is NULL. The Source must assume that the application will keep the previous buffer rather than releasing it. Therefore, the Source must allocate a new buffer for each transfer.
- The application is responsible for deallocating the buffers.
- Finally, the application cannot assume that the tiles will be transferred in any particular, logical order.

JPEG Compression

TWAIN supports transfer of several forms of compressed data. JPEG compression is one of them. The JPEG compression algorithm provides compression ratios in the range of 10:1 to 25:1 for grayscale and full-color images, often without causing visible loss of image quality. This compression, which is created by the application of a series of “perceptual” filters, is achieved in three stages:

Color Space Transformation and Component Subsampling (Color Images Only, Not for Grayscale)

The human eye is far more sensitive to light intensity (luminance) than it is to light frequency (chrominance, or “color”) since it has, on average, 100 million detectors for brightness (the “rods”) but only about 6 million detectors for color (the “cones”). Substantial image compression can be achieved simply by converting a color image into a more efficient luminance/chrominance color space and then subsampling the chrominance components.

This conversion is provided for by the TW_JPEGCOMPRESSION structure. By specifying the TW_JPEGCOMPRESSION.ColorSpace = TWPT_YUV, Source RGB data is converted into more space-efficient YUV data (better known as CCIR 601-1 or YCbCr). TW_JPEGCOMPRESSION.SubSampling specifies the ratio of luminance to chrominance samples in the resulting YUV data stream, and a typical choice calls for two luminance samples for every chrominance sample. This type of subsampling is specified by entering 0x21102110 into the TW_JPEGCOMPRESSION.SubSampling field. A larger ratio of four luminance samples for every chrominance sample is represented by 0x41104110. To sample two luminance values for every chrominance sample in both the horizontal and vertical axes, use a value of 0x21102110.

Application of the Discrete Cosine Transform (DCT) and Quantization

The original components (with or without color space conversion) are next mathematically converted into a spatial frequency representation using the DCT and then filtered with quantization matrices (each frequency component is divided by its corresponding member in a quantization matrix). The quantization matrices are specified by TW_JPEGCOMPRESSION.QuantTable[] and up to four quantization matrices may be defined for up to four different original components. TW_JPEGCOMPRESSION.QuantMap[] maps the particular original component to its respective quantization matrix.

Note: Defaults are provided for the quantization map and tables are suggested in Section K of the JPEG Draft International Standard, version 10918-1 are used as the default tables for QuantTable, HuffmanDC, and HuffmanAC by TWAIN. The default tables are selected by putting NULL into each of the TW_JPEGCOMPRESSION.QuantTable[] entries.

Huffman encoding

The resulting coefficients from the DCT and quantization steps are further compressed in one final stage using a loss-less compression algorithm called Huffman encoding. Application developers can provide Huffman tables, though typically the default tables—selected by writing NULL into TW_JPEGCOMPRESSION.HuffmanDC[] and TW_JPEGCOMPRESSION.HuffmanAC[]—yield very good results.

The algorithm optionally supports the use of restart marker codes. The purpose of these markers is to allow random access to strips of compressed data in JPEG data stream. They are more fully described in the JPEG specification.

See Chapter 8 for the definition of the TW_JPEGCOMPRESSION data structure. Example data structures are shown below for RGB image compression and grayscale image compression:

```
/* RGB image compression - YUV conversion and 2:1:1 chrominance */
   /* subsampling                                                 */

   typedef struct TW_JPEGCOMPRESSION  myJPEG;

   myJPEG.ColorSpace       = TWPT_YUV;        // convert RGB to YUV
   myJPEG.SubSampling      = 0x21102110;      // 2 Y for each U, V
   myJPEG.NumComponents    = 3;               // Y, U, V
   myJPEG.RestartFrequency = 0;               // No restart markers
   myJPEG.QuantMap[0]      = 0;               // Y component uses table0
   myJPEG.QuantMap[1]      = 1;               // U component uses table 1
   myJPEG.QuantMap[2]      = 1;               // V component uses table 1
   myJPEG.QuantTable[0]    = NULL;            // select defaults for quant
                                              // tables
   myJPEG.QuantTable[1]    = NULL;            //
   myJPEG.QuantTable[2]    = NULL;            //
   myJPEG.HuffmanMap[0]    = 0;               // Y component uses DC & AC
                                              // table 0
   myJPEG.HuffmanMap[1]    = 1;               // U component uses DC & AC
                                              // table 1
   myJPEG.HuffmanMap[2]    = 1;               // V component uses DC & AC
                                              // table 1
   myJPEG.HuffmanDC[0]     = NULL;            // select default for Huffman
                                              // tables
   myJPEG.HuffmanDC[1]     = NULL;            //
   myJPEG.HuffmanAC[0]     = NULL;            //
   myJPEG.HuffmanAC[1]     = NULL;            //

   /* Grayscale image compression - no color space conversion or  */
   /* subsampling                                                 */

   typedef struct TW_JPEGCOMPRESSION  myJPEG;

   myJPEG.ColorSpace       = TWPT_GRAY;       // Grayscale data
   myJPEG.SubSampling      = 0x10001000;      // no chrominance components
   myJPEG.NumComponents    = 1;               // Grayscale
   myJPEG.RestartFrequency = 0;               // No restart markers
   myJPEG.QuantMap[0]      = 0;               // select default for quant
                                              // map
   myJPEG.QuantTable[0]    = NULL;            //
   myJPEG.HuffmanMap[0]    = 0;               // select default for Huffman
                                              // tables
   myJPEG.HuffmanDC[0]     = NULL;            //
   myJPEG.HuffmanAC[0]     = NULL;            //
```

The resulting compressed images from these examples will be compatible with the JPEG File Interchange Format (JFIF version 1.1) and will therefore be usable by a variety of applications that are JFIF-aware.

Alternative User Interfaces

Alternatives to Using the Source Manager's Select Source Dialog

TWAIN ships its Source Manager code to act as the communication vehicle between application and Source. One of the services the Source Manager provides is locating all available Sources that meet the application's requirements and presenting those to the user for selection.

It is recommended that the application use this approach. However, the application is not required to use this service. Two alternatives exist:

- The application can develop and present its own custom selection interface to the user. This is presented in response to the user choosing **Select Source...** from its menu.
- Or, if the application is dedicated to control of a specific Source, the application can transparently select the Source. In this case, the application does not functionally need to have a Select Source... option in the menu but a grayed-out one should be displayed for consistency with all other TWAIN-compliant applications.

Displaying a custom selection interface:

1. Use the DG_CONTROL / DAT_IDENTITY / MSG_GETFIRST operation to have the Source Manager locate the first Source available. The name of the Source is contained in the TW_IDENTITY.ProductName field. Save the TW_IDENTITY structure.
2. Use the DG_CONTROL / DAT_IDENTITY / MSG_GETNEXT to have the Source Manager locate the next Source. Repeatedly use this operation until it returns TWRC_ENDOFLIST indicating no more Sources are available. Save the TW_IDENTITY structure.
3. Use the ProductName information to display the choices to the user. Once they have made their selection, use the saved TW_IDENTITY structure and the DG_CONTROL / DAT_IDENTITY / MSG_OPENDS operation to have the Source Manager open the desired Source. (Note, using this approach, as opposed to the MSG_USERSELECT operation, the Source Manager does not update the system default Source information to reflect your choice.)

Transparently selecting a Source:

If the application wants to open the system default Source , use the DG_CONTROL / DAT_IDENTITY / MSG_GETDEFAULT operation to have the Source Manager locate the default Source and fill the TW_IDENTITY structure with information about it. The name of the Source is contained in the TW_IDENTITY.ProductName field. Save the TW_IDENTITY structure.

OR

If you know the ProductName of the Source you wish to use and it is not the system default Source, use the DG_CONTROL / DAT_IDENTITY / MSG_GETFIRST and DG_CONTROL / DAT_IDENTITY / MSG_GETNEXT operations to have the Source Manager locate each Source. You must continue looking at Sources until you verify that the desired Source is available. Save the TW_IDENTITY structure when you locate the Source you want. If the Return Code TWRC_ENDOFLIST appears before the desired Source is located, it is not available.

Use the saved TW_IDENTITY structure and the DG_CONTROL / DAT_IDENTITY / MSG_OPENDS operation to have the Source Manager open the desired Source. (Note, using this approach, rather than MSG_USERSELECT, the Source Manager does not update the system default Source information to reflect your choice.)

Alternatives to Using the Source's User Interface

Just as with the Source Manager's Select Source dialog, the application may ask to not use the Source's user interface. Certain types of applications may not want to have the Source's user interface displayed. An example of this can be seen in some text recognition packages that wish to negotiate a few capabilities (i.e. pixel type, resolution, page size) and then proceed directly to acquiring and transferring the data.

To Enable the Source without Displaying its User Interface

- Use the DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS operation.
- Set the ShowUI field of the TW_USERINTERFACE structure to FALSE.
- When the command is received and accepted (TWRC_SUCCESS), the Source does not display a user interface but is armed to begin capturing data. For example, in a flatbed scanner, the light bar will light and begin to move. A handheld scanner will be armed and ready to acquire data when the "go" button is pressed on the scanner. Other devices may respond differently but they all will either begin acquisition immediately or be armed to begin acquiring data as soon as the user interacts with the device.

Capability Negotiation is Essential when the Source's User Interface is not Displayed

- Since the Source's user interface is not displayed, the Source will not be giving the user the opportunity to select the information to be acquired, etc. Unless default values are acceptable, current values for all image acquisition and control parameters must be negotiated before the Source is enabled, i.e. while the session is in State 4.

When TW_USERINTERFACE.ShowUI is set to FALSE:

- The application is still required to pass all events to the Source (via the DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT operation) while the Source is enabled.
- The Source must display the minimum possible user interface containing only those controls required to make the device useful in context. In general, this means that no user interface is displayed, however certain devices may still require a trigger to initiate the scan.
- The Source still displays a progress indicator during the acquisition. The application can suppress this by setting CAP_INDICATORS to FALSE, if the Source allows this.
- The Source still displays errors and other messages related to the operation of its device. This cannot be turned off.
- The Source still sends the application a MSG_XFERREADY notice when the data is ready to be transferred.
- The Source may or may not send a MSG_CLOSEDSREQ to the application asking to be closed since this is often user-initiated. Therefore, after the Source has returned to State 5 (following the DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER operation and the TW_PENDINGXFERS.Count = 0), the application can send the DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS operation.

Note: Some Sources may display the UI even when ShowUI is set to FALSE. An application can determine whether ShowUI can be set by interrogating the CAP_UICONTROLLABLE capability. If CAP_UICONTROLLABLE returns FALSE but the ShowUI input value is set to FALSE in an activation of DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS, the enable DS operation returns TWRC_CHECKSTATUS but displays the UI regardless. Therefore, an application that requires that the UI be disabled should interrogate CAP_UICONTROLLABLE before issuing MSG_ENABLEDS.

Modal Versus Modeless User Interfaces

The Source Manager's user interface is a modal interface but the Source may provide a modeless or modal interface. Here are the differences:

Modeless

When a Source uses a modeless user interface, although the Source's interface is displayed, the user is still able to access the application by clicking on the application's window and making it active.

The user is expected to click on a Close button on the Source's user interface when they are ready for that display to go away. The application must NOT automatically close a modeless Source after the first (or any subsequent) transfer, even if the application is only interested in receiving a single transfer. If the application closes the Source before the user requests it, the user is likely to become confused about why the window disappeared. Wait until the user indicates the desire to close the Source's window and the Source sends this request (MSG_CLOSEDSREQ) to the application before closing the Source.

Modal

A Source using a modal user interface prevents the user from accessing other windows.

For Windows only, if the interface is application modal, the user cannot access other applications but can still access system utilities. If the interface is system modal (which is rare), the user cannot access anything else at an application or system level. A system modal dialog might be used to display a serious error message, like a UAE.

If using a modal interface, the Source can perform only one acquire during a session although there may be multiple frames per acquisition. The Source will send a close request to the application following the completion of the data transfer. Again, the application waits to receive this request.

The Source indicates if it is using a modeless or modal interface after the application enables it using the DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS operation. The data structure used in the operation (TW_USERINTERFACE) contains a field, ShowUI, which is set by the application to indicate whether the Source should display its user interface. If the application requests the user interface be shown, the Source sets the ModalUI field to indicate if its user interface is modal (TRUE) or modeless (FALSE).

When requested by the Source, the application uses the DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS operation to remove the Source's user interface.

Grayscale and Color Information for an Image

There are operation triplets in TWAIN that allow the application developer to interact with and influence the grayscale or color aspect of the images that a Source transfers to the application. The following operations provide these abilities:

CIE Color Descriptors

DG_IMAGE / DAT_CIECOLOR / MSG_GET

Grayscale Changes

DG_IMAGE / DAT_GRAYRESPONSE / MSG_RESET
DG_IMAGE / DAT_GRAYRESPONSE / MSG_SET

Palette Color Data

DG_IMAGE / DAT_PALETTE8 / MSG_GET
DG_IMAGE / DAT_PALETTE8 / MSG_GETDEFAULT
DG_IMAGE / DAT_PALETTE8 / MSG_RESET
DG_IMAGE / DAT_PALETTE8 / MSG_SET

RGB Response Curve Data

DG_IMAGE / DAT_RGBRESPONSE / MSG_RESET
DG_IMAGE / DAT_RGBRESPONSE / MSG_RESET

CIE Color Descriptors

The CIE XYZ approach is a method for storing color data which simplifies doing mathematical manipulations on the data. (The topic of CIE XYZ color space is discussed thoroughly in Appendix A.)

If your application wishes to receive the image data in this format:

1. You must ensure that the Source is able to provide data in CIE XYZ format. To check this, use the DG_CONTROL / DAT_CAPABILITY / MSG_GET operation and get information on the ICAP_PIXELTYPE. If TWPT_CIEXYZ is returned as one of the supported types, the Source can provide data in CIE XYZ format.
2. After verifying that the Source supports it, the application can specify that data transfers should use the CIE XYZ format by invoking a DG_CONTROL / DAT_CAPABILITY / MSG_SET operation on the ICAP_PIXELTYPE. Use a TW_ONEVALUE container whose value is TWPT_CIEXYZ.

To determine the parameters that were used by the Source in converting the color data into the CIE XYZ format, use the DG_IMAGE / DAT_CIECOLOR / MSG_GET operation following the transfer of the image.

Grayscale Changes

(The grayscale operations assume that the application has instructed the Source to provide grayscale data by setting its ICAP_PIXELTYPE to TWPT_GRAY and the Source is capable of this.)

The application can request that the Source apply a transfer curve to its grayscale data prior to transferring the data to the application. To do this, the application uses the DG_IMAGE / DAT_GRAYRESPONSE / MSG_SET operation. The desired transfer curve information is placed by the application within the TW_GRAYRESPONSE structure (the actual array is of type TW_ELEMENT8). The application must be certain to check the Return Code following this request. If the Return Code is TWRC_FAILURE and the Condition Code shows TWCC_BADPROTOCOL, this indicates the Source does not support grayscale response curves (despite supporting grayscale data).

If the Source allows the application to set the grayscale transfer curve, there must be a way to reset the curve to its original non-altered value. Therefore, the Source must have an "identity response curve" which does not alter grayscale data but transfers it exactly as acquired. When the application sends the DG_IMAGE / DAT_GRAYRESPONSE / MSG_RESET operation, the Source resets the grayscale response curve to its identity response curve.

Palette Color Data

(The palette8 operations assume that the application has instructed the Source to use the TWPT_PALETTE type for its ICAP_PIXELTYPE and that the Source has accepted this.)

The DAT_PALETTE8 operations allow the application to inquire about a Source's support for palette color data and to set up a palette color transfer. The operations are specialized for 8-bit data, whether grayscale or color (8-bit or 24-bit). The MSG_GET operation allows the application to learn what palette was used by the Source during the image acquisition. The application should always execute this operation immediately after an image transfer rather than before because the Source may optimize the palette during the acquisition process. Some Sources may allow an application to define the palette to be used during image acquisition via the MSG_SET operation. Be sure to check the Return Code to verify that it is TWRC_SUCCESS following a MSG_SET operation. That is the only way to be certain that your requested palette will actually be used during subsequent palette transfers.

RGB Response Curve Data

(The RGB Response curve operations assume that the application has instructed the Source to provide RGB data by setting its ICAP_PIXELTYPE to TWPT_RGB and the Source is capable of this.)

The application can request that the Source apply a transfer curve to its RGB data prior to transferring the data to the application. To do this, the application uses the DG_IMAGE / DAT_RGBRESPONSE / MSG_SET operation. The desired transfer curve information is placed by the application within the TW_RGBRESPONSE structure (the actual array is of type TW_ELEMENT8). The application must be certain to check the Return Code following this request. If the Return Code is TWRC_FAILURE and the Condition Code shows TWCC_BADPROTOCOL, this indicates the Source does not support RGB response curves (despite supporting RGB data).

If the Source allows the application to set the RGB response curve, there must be a way to reset the curve to its original non-altered value. Therefore, the Source must have an “identity response curve” which does not alter RGB data but transfers it exactly as acquired. When the application sends the DG_IMAGE / DAT_RGBRESPONSE / MSG_RESET operation, the Source resets the RGB response curve to its identity response curve.

Contrast, Brightness, and Shadow Values

There is considerable confusion about what is the appropriate way to present these actual features for a particular device. Anyone who has attempted to support these capabilities knows that the recommended ranges do not accurately reflect the capabilities of real world devices. Data source developers have tried many different methods of getting the correct response for their data source, and not all are consistent.

By providing a meaningful step size, or by providing a different container, a data source can provide the application with enough information to accurately model the actual ability of the device. For an application that wishes to present a custom User Interface for this type of capability, it is not really useful to the user if it provides 2000 steps from -1000 to +1000, especially if the device really only supports a small number of levels.

Since both data source developers and application developers read the same specification, it can be assumed that it is not acceptable to provide values that do not fit within the documented ranges for these types of capabilities.

The following suggestion is an example of how to follow the specification, and provide the most accurate values for the particular data source.

Example 1: ICAP_BRIGHTNESS Supporting Only Three Levels

The specification requirement stated in Chapter 9 is as follows:

> *"Source should normalize the values into the range. Make sure that a '0' value is available as the Current Value when the Source starts up. If the Source's ± range is asymmetric about the '0' value, set range maxima to ±1000 and scale homogeneously from the '0' value in each direction. This will yield a positive range whose step size differs from the negative range's step size."*

Note: It should be expanded in this statement that for a step size that differs in the negative and positive range, a TW_ENUMERATION container must be used. A TW_RANGE container is not suitable for representing a non-linear step size).

Assume the actual device simply supports the options normal, lighten, and darken. These can fit into the constraints by mapping actual values to required values:

Normal = 0
Lighten = -1000
Darken = 1000

These values can be placed in a TW_RANGE container with a step size of 1000, or into a TW_ENUMERATION containing only the 3 values. { -1000, 0, 1000 }, the current and default values are 0.

5

Source Implementation

Companies that produce image-acquisition devices, and wish to gain the benefits of being TWAIN-compliant, must develop TWAIN-compliant Source software to drive their device. The Source software is the interface between TWAIN's Source Manager and the company's physical (or logical) device. To write effective Source software, the developer must be familiar with the application's expectations as discussed in the other chapters of this document. This chapter discusses:

Chapter Contents

The Structure of a Source

The following sections describe the structure of a source.

On Windows

Implementation

The Source is implemented as a Dynamic Link Library (DLL). Sources should link to TWAIN.LIB at link time. The Source will not run stand-alone. The DLL typically runs within the (first) calling application's heap although DLLs may be able to allocate their own heap and stack space. There is only one copy of the DLL's code and data loaded at run-time, even if more than one application accesses the Source. For more information regarding DLLs on Win32s, Windows95, and Windows NT please refer to Microsoft documents.

Naming and Location

The DLL's file name must end with a .DS extension. The Source Manager recursively searches for your Source in the TWAIN sub-directory of the Windows directory (typically C:\WINDOWS on Windows 95/98, or C:\WINNT on Windows NT). To reduce the chance for naming collisions, each Source should create a sub-directory beneath TWAIN, giving it a name relevant to their product. The Source DLLs are placed there. Supporting files may be placed there as well, but since this is a system directory which may only be modifiable by the System Administrator, Sources must not write any information into this directory after the installation.

Entry Points and Segment Attributes

Every Source is required to have a single entry point called DS_Entry (see Chapter 6). For 16-bit sources only, in order to speed up the Source Manager's ability to identify Sources, the Source entry point DS_Entry( ) and the code to respond to the DG_CONTROL / DAT_IDENTITY / MSG_GET operation must reside in a segment marked as PRELOAD. All other segments should be marked as LOADONCALL (with the exception of any interrupt handler that may exist in the Source which needs to be in a FIXED code segment).

Resources

- **Version Information** - The Microsoft VER.DLL is included with the TWAIN toolkit for use by your installation program, if you have one, to validate the version of the currently installed Source Manager. Sources should be marked with the Version information capability defined in Microsoft Windows 3.1. To do this, you can use the resource compiler from the version 3.1 SDK. VER.DLL and the version stamping are also compatible with Microsoft Windows version 3.0.
- **Icon Id** - Future versions of the TWAIN Source Manager may display the list of available Sources using a combination of the ProductName (in the Source's TW_IDENTITY structure) and an Icon (as the Macintosh version currently does). Therefore, it is recommended that you add this icon into your Source resource file today. This will allow your Source to be immediately compatible with any upcoming changes. The icon should be identified using TWON_ICONID from the TWAIN.H file.

General Notes

- **GlobalNotify -** Microsoft Windows allows only one GlobalNotify handler per task. As the Source resides in the application heap, the Source should **not** use the GMEM_NOTIFY flag on the memory blocks allocated as this may disrupt the correct behavior of the application that uses GlobalNotify.
- **Windows Exit Procedure (WEP) -** During the WEP, the Source is being unloaded by Microsoft Windows. The Source should make sure all the resources it allocated and owns get released whether or not the Source was terminated properly.

On Macintosh

Implementation

A Source on a Macintosh is implemented as a Code Resource. The Source will not run stand-alone. The Source's code will exist and run within the calling application's heap. A separate copy of the Source's code will be made for each application that opens the Source. Macintosh development books such as *Inside Macintosh* describe the special requirements for developing Code Resources.

A Source can communicate between various running copies of itself through its resource file. If a Source must enforce a maximum number of applications that the device it controls can support, for instance, it can maintain the number of current connects within the Source's resource fork. If the maximum number of connects is exceeded when a new application tries to open a new copy of the Source, the Source should display an appropriate error message to the user and then return TWRC_FAILURE with a Condition Code of TWCC_MAXCONNECTIONS. This gives each running copy visibility of the total number of connections. Other information that needs to be communicated between instances of the Source can use this same method.

Naming and Location

The type for a Source is DSRC. The Source Manager will recursively search for files of this type in the TWAIN folder. The creator is vendor-dependent.

Under System 6.x, Sources are located within the TWAIN folder which resides within the System Folder. It is recommended that each Source file, along with any other files it may require, be installed into a uniquely named folder within the TWAIN folder. Placing your files within a specially named folder will limit the chances of name collisions of the Source's support files (or the Source itself) with the names of other Sources and Source-support files already installed. The Source Manager will recursively search out all Sources within the TWAIN folder.

Under System 7, the TWAIN folder is located within the Preferences folder (which resides within the System Folder). All Sources should be located within the Preferences folder per the rules of the preceding paragraph. The Source Manager can sense the version of the operating system and will look in the correct folder.

Entry Point

The entry point for the code resource, DS_Entry, **must** be the first address in the resource and **must** have the format described in Chapter 6.

Resources

- **Version Information -** The Macintosh Source Manager will keep its version information in it **vers** resource. The application can read this resource for Source Manager information. The resource ID of this resource is in the constant TWON_DSMID (see the TWAIN.H file).
- **Code Resources -** The initial code resource that will be loaded by the Source Manager must have a resource type of DSRC. This resource must have a resource ID defined in the constant TWON_DSRCID (see the TWAIN.H file). The first address in this resource must be DS_Entry, or must call it directly.
- **ICN# Resource** - The icon that is displayed by the Source Manager in the Select Source... dialog is an ICN# resource with a resource ID defined in the constant TWON_ICONID (see the TWAIN.H file).

Operation Triplets

In Chapter 3, we introduced all of the triplets that an application can send to the Source Manager or ultimately to a Source. There are several other triplet operations which do not originate from the application. Instead, they originate from the Source Manager or Source and are introduced in this chapter. All defined operation triplets are listed in detail in Chapter 7.

Triplets from the Source Manager to the Source

There are three operation triplets that are originated by the Source Manager. They are:

DG_CONTROL / DAT_IDENTITY

MSG_GET	Returns the Source's identity structure
MSG_OPENDS	Opens and initializes the Source
MSG_CLOSEDS	Closes and unloads the Source

The DG_CONTROL / DAT_IDENTITY / MSG_GET operation is used by the Source Manager to identify available Sources. It may send this operation to the Source **at any time** and the Source **must be prepared** to respond informatively to it. That means, the Source must be able to return its identity structure before being opened by the Source Manager (with the MSG_OPENDS command). The Source's initially loaded code segment must be able to perform this function without loading any additional code segments. This allows quick identification of all available Sources and is the only operation a Source must support before it is formally opened.

The TW_IDENTITY structure looks like this:

```
typedef struct {
      TW_UINT32     Id;
      TW_VERSION    Version;
      TW_UINT16     ProtocolMajor;
      TW_UINT16     ProtocolMinor;
      TW_UINT32     SupportedGroups;
      TW_STR32      Manufacturer;
      TW_STR32      ProductFamily;
      TW_STR32      ProductName;
} TW_IDENTITY, FAR *pTW_IDENTITY;
```

The ProductName field in the Source's TW_IDENTITY structure should uniquely identify the Source. This string will be placed in the Source Manager's Select Source... dialog for the user. (The file name of the Source should also approximate the ProductName, if possible, to add clarity for the user at installation time.) Fill in all fields except the Id field which will be assigned by the Source Manager. The unique Id number that identifies your Source during its current session will be passed to your Source when it is opened by the MSG_OPENDS operation. Sources on Windows must save this TW_IDENTITY.Id information for use when sending notifications from the Source to the application.

Sources and the Event Loop

Handling Events

On both Windows and Macintosh, when a Source is enabled (i.e. States 5, 6, and 7), the application must pass all events (messages) to the Source. Since the Source runs subservient to the application, this ensures that the Source will receive all events for its window. The event will be passed in the TW_EVENT data structure that is referenced by a DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT command.

Note: Starting with TWAIN 1.8, it is now possible for events to be managed in State 4 only to support CAP_DEVICEEVENTS. This is a fundamental change from previous TWAIN behavior that has been added to allow the Source to notify the Application of important changes in the state of the Source even while in State 4. Note also that the default value for CAP_DEVICEEVENTS (if supported) must be an empty TW_ARRAY, indicating the event reporting is turned off. This is essential to allow backward compatibility with pre-1.8 Applications.

Routing all messages to all connected Sources while they are enabled places a burden on the application and creates a potential performance bottleneck. Therefore, the Source must process the incoming events as quickly as possible. The Source should examine each incoming operation before doing anything else. Only one operation's message field says MSG_PROCESSEVENT so always look at the message field first. If it indicates MSG_PROCESSEVENT then:

Immediately determine if the event belongs to the Source.

If it does

Set the Return Code for the operation to TWRC_DSEVENT
Set the TWMessage field to MSG_NULL
Process the event

Else

Set the Return Code to TWRC_NOTDSEVENT
Set the TWMessage field to MSG_NULL
Return to the application immediately

If the Source developer fails to process events with this high priority, the user may see degraded performance whenever the Source is frontmost which reflects poorly on the Source.

On Windows, the code fragment looks like the following:

```
TW_UINT16 CALLBACK DS_Entry(pTW_IDENTITY pSrc,
                                        TW_UINT32 DG,
                                        TW_UINT16 DAT,
                                        TW_UINT16 MSG,
                                        TW_MEMREF pData)
{
    TWMSG     twMsg;
    TW_UINT16 twRc;
    // Valid states: 5 - 7.  As soon as the application has enabled the
    // Source it must being sending the Source events.  This allows the
    // Source to receive events to update its user interface and to
    // return messages to the application. The app sends down ALL
    // message, the Source decides which ones apply to it.
if (MSG == MSG_PROCESSEVENT)
    {
          if (hImageDlg && IsDialogMessage(hImageDlg,
(LPMSG)(((pTW_EVENT)pData)->pEvent)))
        {
             twRc = TWRC_DSEVENT;

            // The source should, for proper form, return a MSG_NULL for
            // all Windows messages processed by the Data Source

            ((pTW_EVENT)pData)->TWMessage = MSG_NULL;
        }
```

```
        else
        {
                  // notify the application that the source did not
                  // consume this message
                  twRc = TWRC_NOTDSEVENT;
          ((pTW_EVENT)pData)->TWMessage = MSG_NULL;
        }
             }
             else
             {
          // This is a Twain message, process accordingly.
          // The remainder of the Source's code follows...
             }
return twRc;
}
```

The Windows IsDialogMessage( ) call is used in this example. Sources can also use other Windows calls such as TranslateAccelerator( ) and TranslateMDISYSAccel( ).

Communicating to the Application

As explained in Chapter 3, there are four instances where the Source must originate and transmit a notice to the application:

- **When it has data ready to transfer (MSG_XFERREADY)**

  The Source must send this message when the user clicks the "GO" button on the Source's user interface or when the application sends a DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS operation with ShowUI = FALSE. The Source will transition from State 5 to State 6. The application should now perform their inquiries regarding TW_IMAGEINFO and capabilities. Then, the application issues a DG_IMAGE / DAT_IMAGExxxxXFER / MSG_GET operation to begin the transfer process. Typically, though it is not required, it is at this time that a flatbed scanner (for example) will begin **simultaneously** to acquire and transfer the data using the specified transfer mode.

- **When it needs to have its user interface disabled (MSG_CLOSEDSREQ)**

  Typically, the Source will send this only when the user clicks on the "CLOSE" button on the Source's user interface or when an error occurs which is serious enough to require terminating the session with the application. The Source should be in (or transition to) State 5. The application should respond by sending a DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS operation to transition the session back to State 4.

- **When the user has pressed the OK button in a Source's dialog that was brought up with DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDSUIONLY (MSG_CLOSEDSOK).**

  Applications should use this event as the indicator that the user has set all the desired attributes from the Source's GUI.

When the Source needs to report a Device Event. Note that the application must explicitly request the Source to supply Device Events (MSG_DEVICEEVENT). Sources must only provide those Device Events requested by a Source through the CAP_DEVICEEVENT capability. The default for this capability when the Source starts up is an empty TW_ARRAY, indicating that no Device Events are being reported. Applications that turn on Device Events must issue a DG_CONTROL / DAT_DEVICEEVENT / MSG_GET command as soon as possible after receiving a Device Event.

These notices are sent differently on Windows versus Macintosh systems.

On Windows

The Source creates a call to DSM_Entry (the entry point in the Source Manager) and fills the destination with the TW_IDENTITY structure of the application. The Source uses one of the following triplets:

DG_CONTROL / DAT_NULL / MSG_XFERREADY
DG_CONTROL / DAT_NULL / MSG_CLOSEDSREQ

The Source Manager, on Windows, recognizes the notice and makes sure the message is received correctly by the application.

On Macintosh

The Source on Macintosh does not use the operations described above. Instead, it uses a TW_EVENT structure to send its notice to the application. The TW_EVENT structure is created by the application and sent to the Source as data in a DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT operation.

Normally, the Source places MSG_NULL in the TW_EVENT.TWMessage field. To relay the notice, the Source places one of the following in the TWMessage field:

MSG_XFERREADY
MSG_CLOSEDSREQ

The application examines that field when the DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT operation concludes and recognizes these two special notices from the Source.

User Interface Guidelines

Each TWAIN-compliant Source provides a user interface to assist the user in acquiring data from their device. Although each device has its own unique needs, the following guidelines are provided to increase consistency among TWAIN-compliant devices.

Displaying the User Interface

The application issues DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS to transition the session from State 4 to 5.

The TW_USERINTERFACE data structure contains these fields:

- **ShowUI** - If set to TRUE, the Source displays its user interface.
  If FALSE, the application will be providing its own.
- **hParent** - Used by Sources on Windows only. It indicates the application's window handle. This is to be designated as the Source's parent for the dialog so it is a proper child of its parent application.
- **ModalUI** - To be set by the Source to TRUE or FALSE.

Sources are not required to allow themselves to be enabled without showing their user interface (ShowUI = FALSE) but it is strongly recommended that they allow this. If your Source cannot be used without its user interface, it should enable showing the user interface (just as if ShowUI = TRUE) and return TWRC_CHECKSTATUS. All Sources, however, must report whether or not they honor ShowUI set to FALSE via the CAP_UICONTROLLABLE capability. This allows applications to know whether the Source-supplied user interface can be suppressed before it is displayed.

When the user interface is disabled (by DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS), a pointer to a TW_USERINTERFACE is included in the pData parameter.

Modal versus Modeless Interfaces

As stated in Chapter 4, the Source's user interface may be modal or modeless. The modeless approach gives the user more control and is recommended whenever practical. Refer to the information following this table for specifics about Windows and Macintosh implementation.

Error and Device Control Indicators

The Source knows what is happening with the device it controls. Therefore, the Source is responsible for determining when and what information regarding errors and device controls (ex. "place paper in document feeder") should be presented to the user. Error information should be placed by the Source on top of either the application's or Source's user interface. Do not present error messages regarding capability negotiation to the user since this should be transparent.

Progress Indicators

The Source should display appropriate progress indicators for the user regarding the acquisition and/or transfer processes. The Source must provide this information regardless of whether or not its user interface is displayed (ShowUI equals TRUE or FALSE). To suppress the indicators when the user interface is not displayed, the application should negotiate the CAP_INDICATORS capability to be FALSE.

Impact of Capability Negotiation

If the Source has agreed to limit the Available Values and/or to set the Current Value, the interface should reflect the negotiation. However, if a capability has not been negotiated by the application, the interface should not be modified (don't gray out a control because it wasn't negotiated.)

Advanced Topics

If a Source can acquire from more than one device, the Source should allow the user to choose which device they wish to acquire from. Provide the user with a selection dialog that is similar to the one presented by the Source Manager's Select Source... dialog.

Implementing Modal and Modeless User Interfaces

On Windows

You cannot use the modal dialog creation call DialogBox( ) to create the Source's user interface main window. To allow event processing by both the application and the Source, this call cannot be used. Modal user interfaces in Source are not inherently bad, however. If a modal user interface makes sense for your Source, use either the CreateDialog( ) or CreateWindow( ) call.

Modal (App Modal)

It is recommended that the Source's main user interface window be created with a modeless mechanism. Source writers can still decide to make their user interface behave modally if they choose. It is even appropriate for a very simple "click and go" interface to be implemented this way.

This is done by first specifying the application's window handle (hWndParent) as the parent window when creating the Source's dialog/window and second by enabling/disabling the parent window during the MSG_ENABLEDS / MSG_DISABLEDS operations. Use EnableWindow(hWndParent, FALSE) to disable the application window and EnableWindow(hWndParent, TRUE) to re-enable it.

Modeless

If implementing a modeless user interface, specify NULL as the parent window handle when creating the Source's dialog/window. Also, it is suggested that you call BringWindowToTop( ) whenever a second request is made by the same application or another application requesting access to a Source that supports multiple application connections.

On Macintosh

It is recommended that the Source's main user interface window be created with a modeless mechanism. Source writers can still decide to make their user interface behave modally if they choose. It is even appropriate for a very simple "click and go" interface to be implemented this way.

Capability Negotiation

Capability negotiation is a critical area for a Source because it allows the application to understand and influence the images that it receives from your Source.

Inquiries From the Application

While the Source is open but not yet enabled (from DG_CONTROL / DAT_IDENTITY / MSG_OPENDS until DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS), the application can inquire the values of all supported capabilities, and request to set those values.

Once the Source is enabled, the application may only **inquire** about capabilities. An attempt to set a capability should fail with TWRC_FAILURE and TWCC_SEQERROR (unless CAP_EXTENDEDCAPS was negotiated).

Responding to Inquiries

Sources must be able to respond to capability inquiries with current values at any time the Source is open (i.e. from MSG_OPENDS until MSG_CLOSEDS or before posting a MSG_CLOSEDSREQ).

A Source should respond with information to any capability that applies to your device. Only if a capability has no match with your device's features should you respond with TWRC_FAILURE / TWCC_BADCAP.

Refer to Chapter 9 for the complete list of TWAIN-defined capabilities.

Responding to Requests to Set Capabilities

If the requested value is invalid or the Source does not support the capability, then return TWRC_FAILURE / TWCC_CAPUNSUPPORTED. If the requested operation (MSG_SET, MSG_RESET, etc.) is not supported, then return TWRC_FAILURE / TWCC_CAPBADOPERATION. If the capability is unavailable because of a dependency on another capability (i.e., ICAP_CCITTKFACTOR is not available unless ICAP_COMPRESSION is TWCP_GROUP32D), then return TWCC_CAPSEQERROR.

If the request was fulfilled, return TWRC_SUCCESS.

If the requested value is close to an acceptable value but doesn't match exactly, set it as closely as possible and then return TWRC_CHECKSTATUS.

Memory Allocation

The TW_CAPABILITY structure used in capability negotiation is both allocated and deallocated by the application. The Container structure pointed to by the hContainer field in TW_CAPABILITY is allocated by the Source for "get" operations (MSG_GET, MSG_GETCURRENT, MSG_GETDEFAULT, MSG_RESET) and by the application for the MSG_SET operation. Regardless of which one allocates the container, the application is responsible for deallocating it when it is done with it.

Limitations Imposed by the Negotiation

If a Source agrees to allow an application to restrict a capability, it is critical that the Source abide by that agreement. If at all possible, the Source's user interface should reflect the agreement and not offer invalid options. The Source should never transfer data that violates the agreement reached during capability negotiation. In that situation, the Source can decide to fail the transfer or somehow adjust the values.

Data Transfers

Transfer Modes

All Sources must support Native and Buffered Memory data transfers. It is strongly suggested that they support Disk File mode, too. The default mode is Native. To select one of the other modes, the application must negotiate the ICAP_XFERMECH capability (whose default is TWSX_NATIVE). Sources must support negotiation of this capability. The native format for Microsoft Windows is DIB. For Macintosh, the native format is a PICT. The version of PICT to be transferred is the latest version available on the machine on which the application is running (usually PICT II for machines running 32-bit/color QuickDraw and PICT I for machines running black and white QuickDraw).

Initiating a Transfer

Transfers are initiated by the application (using the DG_IMAGE / DAT_IMAGExxxxFER / MSG_GET operations). A successful transfer transitions the session to State 7. If the transfer fails, the Source returns TWRC_FAILURE with the appropriate Condition Code and remains in State 6.

Concluding a Successful Transfer

To signal that the transfer is complete (i.e. the file is completed or the last buffer filled), the Source should return TWRC_XFERDONE. In response, the application must send a DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER operation. Only then may the Source transition from State 7 back to State 6 or to State 5 if no more images are ready to be transferred.

If more images are pending transfer, the Source must wait in State 6 until the application either requests the transfer or aborts the transfers. The Source may not "time-out" on any TWAIN transaction.

Aborting a Transfer

Either the application or Source can originate the termination of a transfer (although the application cannot do this in the middle of a Native or Disk File mode transfer). The Source generally terminates the transfer if the user cancels the transfer or a device error occurs which the Source determines is fatal to the transfer or the connection with the application. If the user canceled the transfer, the Source should return TWRC_CANCEL to signal the premature termination. The session remains in State 7 until the application sends the DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER operation. If the Source aborts the transfer, it returns TWRC_FAILURE and the session typically remains in State 6. (If the failure occurs during the second buffer, or a later buffer, of a Buffered Memory transfer, the session remains in State 7.)

Native Mode Transfers

On Native mode transfers, the data parameter in the DSM_Entry call is a pointer to a variable of type TW_UINT32.

On Windows

The low word of this 32-bit integer is a handle variable to a DIB (Device Independent Bitmap) located in memory.

On Macintosh

This 32-bit integer is a handle to a Picture (a PicHandle). It is a Quick Draw picture located in memory.

Native transfers require the data to be transferred to a single large block of RAM. Therefore, they always face the risk of having an inadequate amount of RAM available to perform the transfer successfully.

If inadequate memory prevents the transfer, the Source has these options:

- Fail the transfer operation- Return TWRC_FAILURE / TWCC_LOWMEMORY
- Allow the user to clip the data to fit into available memory - Return TWRC_XFERDONE
- Allow the user to cancel the operation - Return TWRC_CANCEL

If the operation fails, the session remains in State 6. If the operation is canceled, the session remains in State 7 awaiting the DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER or MSG_RESET from the application. The application can return the session to State 4 and attempt to renegotiate the transfer mechanism (ICAP_XFERMECH) to Disk File or Buffered Memory mode.

The Source cannot be interrupted by the application when it is acquiring an image through Native Mode Transfer. The Source's user interface may allow the user to abort the transfer, but the application will not be able to do so even if the application presents its own acquisition user interface.

Disk File Mode Transfers

The Source selects a default file format and file name (typically, TWAIN.TMP in the current directory). It reports this information to the application in response to the DG_CONTROL / DAT_SETUPFILEXFER / MSG_GET operation.

The application may determine all of the Source's supported file formats by using the ICAP_IMAGEFILEFORMAT capability. Based on this information, the application can request a particular file format and define its own choice of file name for the transfer. The desired file format and file name will be communicated to the Source in a DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET operation.

When the Source receives the DG_IMAGE / DAT_IMAGEFILEXFER / MSG_GET operation, it should transfer the data into the designated file. The following conditions may exist:

Condition	How to Handle
No file name and/or file format was specified by the application during setup	Use either the Source's default file name or the last file information given to the Source by the application. Create the file.
The application specified a file but failed to create it	Create the application's defined file.
The application's specified file exists but has data in it	Overwrite the existing data.

The Source cannot be interrupted by the application when it is acquiring a file. The Source's user interface may allow the user to abort the transfer, but the application will not be able to do so even if the application presents its own acquisition user interface.

Buffered Memory Mode Transfers

When the Source transfers strips of data, the application allocates and deallocates buffers used for a Buffered Memory mode transfer. However, the Source must recommend appropriate sizes for those buffers and should check that the application has followed its recommendations.

When the Source transfers tiles of data, the Source allocates the buffers. The application is responsible for deallocating the memory.

To determine the Source's recommendations for buffer sizes, the application performs a DG_CONTROL / DAT_SETUPMEMXFER / MSG_GET operation. The Source fills in the MinBufSize, MaxBufSize, and Preferred fields to communicate its buffer recommendations. Buffers must be double-word aligned and padded with zeros per raster line.

When an application issues a DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET operation, check the TW_IMAGEMEMXFER.Memory.Length field to determine the size of the buffer being presented to you. If it does not fit the recommendations, fail the operation with TWRC_FAILURE / TWCC_BADVALUE.

If the buffer is an appropriate size, fill in the required information.

- Sources must write one or more complete lines of image data (the full width of a strip or tile) into the buffer. Partial lines of image data are not allowed. If some of the buffer is unused, fill it in with zeros. Additionally, each line must be aligned to a 32-bit boundary. Return TWRC_SUCCESS after each successful buffer except for the last one (return TWRC_XFERDONE after that one).
- If the Source is transferring data whose bit depth is not 8 bits, it should fill the buffer without padding the data. If a 5-bit device wants the application to interpret its data as 8-bit data, it should report that it is supplying 8-bit data, make the valid data bits the most significant bits in the data byte, and pad the least significant bits with bits of whichever sense is "lightest". Otherwise, the Source should pack the data bits together. For a 5-bit R-G-B device, that means the data for the green channel should immediately follow the last bit of the red channel. The application is responsible for "unpacking" the data. The Source reports how many bits it is providing per pixel in the BitsPerPixel field of the TW_IMAGEINFO data structure.

Error Handling

Operation Triplet and State Verification

- Sources support all defined TWAIN triplets. A Source must verify every operation triplet they receive. If the operation is not recognized, the Source should return TWRC_FAILURE and TWCC_BADPROTOCOL.
- Sources must also maintain an awareness of what state their session is in. If an application invokes an operation that is invalid in the current state, the Source should fail the operation and return TWRC_FAILURE and TWCC_SEQERROR. Valid states for each operation are listed in Chapter 7.
- Anytime a Source fails an operation that would normally cause the session to transition to another state, the session should not transition but should remain in the original state.
- Each triplet operation has its own set of valid Return and Condition Codes as listed in Chapter 7. The Source must return a valid Return Code and set a valid Condition Code, if applicable, following every operation.
- All Return Codes and Condition Codes in the Source should be cleared upon the next call to DS_Entry( ). Clearing is delayed when a DG_CONTROL / DAT_STATUS / MSG_GET operation is received. In this case, the Source will fill the TW_STATUS structure with the current condition information and then clear that information.
- If an application attempts to connect to a Source that only supports single connection (or a multiply-connected Source that can't establish any new connections), the Source should respond with TWRC_FAILURE and TWCC_MAXCONNECTIONS.

- For Windows Sources only, the DLL implementation makes it possible to be connected to more than one application. Unless the operation request is to open the Source, the Source must verify the application originating an operation is currently connected to the Source. To do this:
  - ✓ The Source must maintain a list containing the Id value for each connected application. (The Id value comes from the application's TW_IDENTITY structure which is referenced by the pOrigin parameter in the DS_Entry( ) call.)
  - ✓ The Source should check the TW_IDENTITY.Id information of the application sending the operation and verify that it appears in the Source's list of connected applications.
- For Windows only, if connected to multiple applications, the Source is responsible for maintaining a separate, current Condition Code for each application it is connected to. The Source writer should also maintain a temporary, and separate, Condition Code for any application that is attempting to establish a connection with the Source. This is true both for Sources that support only a single connection or have reached the maximum connections.

Unrecoverable Error Situations

The Source is solely responsible for determining whether an error condition within the Source is recoverable or not. The Source must determine when, and what, error condition information to present to the user. The application relies on the Source to specify when a failure occurs. If a Source is in an unrecoverable error situation, it may send a MSG_CLOSEDSREQ to the application to request to have its user interface disabled and have an opportunity to begin again.

DAT_EVENT Handling Errors

One of the most common problems between a data source and application is the management of DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT. The symptoms are not immediately obvious, so it is worth mentioning them to assist new developers in quickly identifying and solving the problem.

Cannot use TAB or Keyboard Shortcuts to Navigate TWAIN Dialog

The cause of this can be one of two things. Either the application is not forwarding all messages to TWAIN through the DAT_EVENT mechanism, or the data source is not properly processing the DAT_EVENT messages. (Windows: calling IsDialogMessage for each forwarded message with TWAIN Dialog handle)

TWAIN Dialog Box Combo Boxes cannot be opened, Edit boxes produce multiple chars per keystroke

This case is caused by processing TWAIN Dialog Messages twice. Either the data source has not returned the proper return code in response to DAT_EVENT calls (Windows: TWRC_DSEVENT when IsDialogMessage returns TRUE), or the application is ignoring the return code.

This is not a problem when data source operates through TWAIN Thunker

Problems with the application handling of these messages are not often detected if the data source is operating through the TWAIN Thunking mechanism. This is because the Thunker process has a separate Window and Message pump that properly dispatch DAT_EVENT messages to the data source. Any mistake in application handling will pass without notice since all DAT_EVENT calls will return TWRC_NOTDSEVENT. (with the exception of important messages such as MSG_XFERREADY.)

Problem seems erratic, keyboard shortcuts and Tab key work for Message Boxes, but not TWAIN Dialog

This observation often further confuses the issue. In Windows, a standard Message box is Modal, and operates from a local message pump until the user closes it. All messages are properly dispatched to the message box since it does not rely on the application message pump. The TWAIN Dialog is slightly different since it is implemented Modeless. There is no easy way to duplicate Modal behavior for the TWAIN Dialog.

Memory Management

Windows Specifics

A single copy of the Source Manager and Source(s) services all applications wishing to access TWAIN functionality. If the Source can connect to more than one application, it will probably need to maintain a separate execution frame for each connected application. The Source does not have unlimited memory available to it so be conservative in its use.

It is valid for an application to open a Source and leave it open between several acquires. Therefore, Sources should minimize the time and resources required to load and remain open (in State 4). Also, Sources should allow a reasonable number of connections to ensure they can handle more than one application using the Source in this manner (leaving it open between acquires).

Macintosh Specifics

Each application that loads the Source Manager has a private copy of the Source Manager running within that application's heap space. Each Source that is connected runs as a private copy within the application's heap. It is important for the Source writer to recognize that their Source will be running in the memory frame of the host application, not in its own frame. Therefore, the Source should be conscientious with allocation and deallocation of memory.

General Guidelines

The following are some general guidelines:

- Check, when the Source is launched, to assure that enough memory space is available for adequate execution.
- Always verify that allocations were successful.
- Work with relocatable objects whenever possible - the heap you fragment is not your own.
- Deallocate temporary memory objects as soon as they are no longer needed.
- Maintain as small a non-operating memory footprint as can prudently be done - the Source will be “compatible” with more applications on more machines.
- Clean up after yourself. When about to be closed, deallocate all locally allocated RAM, eliminate any other objects on the heap, and prepare as appropriate to terminate.

Local Variables

The Source may allocate and maintain local variables and buffers. Remember that you are borrowing RAM from the application so be efficient about how much RAM is allocated simultaneously.

Instances Where the Source Allocates Memory

In general, the application allocates all necessary structures and passes them to the Source. There are a few exceptions to this rule:

- The Source must create the container, pointed to by the hContainer field, needed to hold capability information on DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETCURRENT, MSG_GETDEFAULT, or MSG_RESET operations. The application deallocates the container.
- The Source allocates the buffer for Native mode data transfers. The application deallocates the buffer.
- Normally, the application creates the buffers used in a Buffered Memory transfer (DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET). However, if the Source is transferring tiled data, rather than strips of data, it is responsible for allocating the buffers. The application deallocates the buffers.

See the DG_IMAGE / DAT_JPEGCOMPRESSION operations.

Requirements to be a TWAIN-Compliant Source

Requirements

TWAIN-compliant Sources **must** support the following:

Operations

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_EVENT / MSG_PROCESSEVENT

DG_CONTROL / DAT_IDENTITY / MSG_GET
DG_CONTROL / DAT_IDENTITY / MSG_OPENDS
DG_CONTROL / DAT_IDENTITY / MSG_CLOSEDS

DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER
DG_CONTROL / DAT_PENDINGXFERS / MSG_GET
DG_CONTROL / DAT_PENDINGXFERS / MSG_RESET

DG_CONTROL / DAT_SETUPMEMXFER / MSG_GET

DG_CONTROL / DAT_STATUS / MSG_GET

DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS
DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS

DG_CONTROL / DAT_XFERGROUP / MSG_GET

DG_IMAGE / DAT_IMAGEINFO / MSG_GET

DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET
DG_IMAGE / DAT_IMAGELAYOUT / MSG_GETDEFAULT
DG_IMAGE / DAT_IMAGELAYOUT / MSG_RESET
DG_IMAGE / DAT_IMAGELAYOUT / MSG_SET

DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET

DG_IMAGE / DAT_IMAGENATIVEXFER / MSG_GET

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

Sources that supply image information must support DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETCURRENT, MSG_GETDEFAULTon:

ICAP_COMPRESSION
ICAP_PLANARCHUNKY
ICAP_PHYSICALHEIGHT
ICAP_PHYSICALWIDTH
ICAP_PIXELFLAVOR

Sources that supply image information must support DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETCURRENT, MSG_GETDEFAULT, MSG_RESET and MSG_SET on:

ICAP_BITDEPTH
ICAP_BITORDER
ICAP_PIXELTYPE
ICAP_UNITS
ICAP_XFERMECH
ICAP_XRESOLUTION
ICAP_YRESOLUTION

All Sources must implement the advertised features supported by their devices. They must make these features available to applications via the TWAIN protocol. For example, a Source that's connected to a device that has an ADF must support DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETCURRENT, MSG_GETDEFAULT on:

CAP_FEEDERENABLED
CAP_FEEDERLOADED

and DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETCURRENT, MSG_GETDEFAULT, MSG_RESET and MSG_SET on:

CAP_AUTOFEED

If the ADF also supports ejecting and rewinding of pages then the Source should also support DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETCURRENT, MSG_GETDEFAULT, MSG_RESET and MSG_SET on:

CAP_CLEARPAGE
CAP_REWINDPAGE

Other Topics

Custom Operations

Manufacturers may add custom operations to their Sources. These can also be made known to application manufacturers. This mechanism allows an application to access functionality not normally available from a generic TWAIN Source.

One use of this mechanism might be to implement device-specific diagnostics for a hardware diagnostic program. These custom operations should be used sparingly and never in place of pre-defined TWAIN operations.

Custom operations are defined by specifying special values for Data Groups (DGs), Data Argument Types (DATs), Messages (MSGs), and Capabilities (CAPs). The following areas have been reserved for custom definitions:

Data Groups	**Top 8 bit flags (bits 24 - 31) in the DG identifiers reserved for custom use.**
DATs	Designators with values greater than 8000 hex.
Messages	Designators with values greater than 8000 hex.
Capabilities	Designators with values greater than 8000 hex.

The responsibility for naming and managing the use of custom designators lies wholly upon the TWAIN element originating the designator and the element consuming it. Prior to interpreting a custom designator, the consuming element must check the originating element's ProductName string from its TW_IDENTITY structure. Since custom operation numbers may overlap, this is the only way to insure against confusion.

Networking

If a Source supports connection to a remote device over a network, the Source is responsible for hiding the network dependencies of that device's operation from the application. The Source Manager does not know anything about networks.

In a networking situation, the Source will probably be built in two segments: One running on the machine local to the application, the other running remotely across the network. Sources are required to handle all the network interfacing with remote devices (real or logical) through local Source "stubs" that understand how to access both the network and the remote Source while interacting logically with the Source Manager.

The segment running on the local machine will probably be a "stub" Source. That is, the local stub will translate all operations received from the application and Source Manager into a form the remote source understands (that is, not necessarily TWAIN-defined operations). The stub also:

- Converts the information returned from the remote source into TWAIN-compliant results
- Handles local memory management for data copies and data transferring
- Isolates the network from the Source Manager and application
- Manages the connection with the remote Source
- Provides any needed code to handle local hardware (such as interface hardware)
- Provides the local user interface to control the remote Source

6

Entry Points and Triplet Components

Chapter Contents

Entry Points

TWAIN has two entry points:

- **DSM_Entry( )** - located in the Source Manager and typically called by applications, with the following exceptions where a Windows Source calls the Source Manager to communicate with an Application:

  DG_CONTROL / DAT_NULL / MSG_XFERREADY
  DG_CONTROL / DAT_NULL / MSG_CLOSEDSREQ
  DG_CONTROL / DAT_NULL / MSG_CLOSEDSOK
  DG_CONTROL / DAT_NULL / MSG_DEVICEEVENT

- **DS_Entry( )** - located in the Source and called only by the Source Manager.

Programming Basics

- Upon entry, the parameters must be ordered on the stack in Pascal form. Be sure that your code expects this ordering rather than the reverse order that C uses.
- The keyword FAR is included in the entry point syntax to accommodate the Windows/DOS segmented addressing scheme. It has no value for Macintosh or UNIX systems so the TWAIN.H file simply defines FAR as an empty value for Macintosh and UNIX.

Declaration of DSM_Entry( )

Written in C code form, the declaration looks like this:

On Windows

```
TW_UINT16 FAR PASCAL DSM_Entry
     ( pTW_IDENTITY   pOrigin,    // source of message
       pTW_IDENTITY   pDest,      // destination of message
       TW_UINT32      DG,         // data group ID: DG_xxxx
       TW_UINT16      DAT,        // data argument type: DAT_xxxx
       TW_UINT16      MSG,        // message ID: MSG_xxxx
       TW_MEMREF      pData       // pointer to data
     );
```

On Macintosh

```
FAR PASCAL TW_UINT16 DSM_Entry
     ( pTW_IDENTITY   pOrigin,    // source of message
       pTW_IDENTITY   pDest,      // destination of message
       TW_UINT32      DG,         // data group ID: DG_xxxx
       TW_UINT16      DAT,        // data argument type: DAT_xxxx
       TW_UINT16      MSG,        // message ID: MSG_xxxx
       TW_MEMREF      pData       // pointer to data
     );
```

Parameters of DSM_Entry( )

pOrigin

This points to a TW_IDENTITY structure, allocated by the application, that describes the application making the call. One of the fields in this structure, called Id, is an arbitrary and unique identifier assigned by the Source Manager to tag the application as a unique TWAIN entity. The Source Manager maintains a copy of the application's identity structure, so the application must not modify that structure unless it first breaks its connection with the Source Manager, then reconnects to cause the Source Manager to store the new, modified identity.

pDest

This is set either to NULL if the application is aiming the operation at the Source Manager or to the TW_IDENTITY structure of the Source that the application is attempting to reach. The application allocated the space for the Source's identity structure when it decided which Source was to be connected. The Source's TW_IDENTITY.Id is also uniquely set by the Source Manager when the Source is opened and should not be modified by the Source. The application should not count on the value of this field being consistent from one session to the next because the Source Manager reallocates these numbers every time it is opened. The Source Manager keeps a copy of the Source's identity structure as should the application and the Source.

DG

The Data Group of the operation triplet. Currently, only DG_CONTROL, DG_IMAGE, and DG_AUDIO are defined.

DAT

The Data Argument Type of the operation triplet. A complete list appears later in this chapter.

MSG

The Message of the operation triplet. A complete list appears later in this chapter.

pData

The pData parameter is of type TW_MEMREF and is a pointer to the data (a variable or, more typically, a structure) that will be used according to the action specified by the operation triplet.

Declaration of DS_Entry( )

DS_Entry is only called by the Source Manager. Written in C code form, the declaration looks like this:

On Windows

```
TW_UINT16 FAR PASCAL DS_Entry
     ( pTW_IDENTITY   pOrigin,    // source of message
       TW_UINT32      DG,         // data group ID: DG_xxxx
       TW_UINT16      DAT,        // data argument type: DAT_xxxx
       TW_UINT16      MSG,        // message ID: MSG_xxxx
       TW_MEMREF      pData       // pointer to data
     );
```

On Macintosh

```
FAR PASCAL TW_UINT16 DS_Entry
     ( pTW_IDENTITY   pOrigin,    // source of message
       TW_UINT32      DG,         // data group ID: DG_xxxx
       TW_UINT16      DAT,        // data argument type: DAT_xxxx
       TW_UINT16      MSG,        // message ID: MSG_xxxx
       TW_MEMREF      pData       // pointer to data
     );
```

Data Groups

TWAIN operations can be broadly classified into three data groups:

Control Oriented (DG_CONTROL)

Controls the TWAIN session. Consumed by both Source Manager and Source. It is always available, no matter what the current setting of DG_CONTROL / DAT_XFERGROUP.

Image Data Oriented (DG_IMAGE)

Indicates the kind of data to be transferred. Change between DG_AUDIO and DG_IMAGE as needed using DG_CONTROL / DAT_XFERGROUP / MSG_SET. The default at startup is for a Source to be ready to transfer DG_IMAGE data.

Audio Data Oriented (DG_AUDIO)

Indicates the kind of data to be transferred. Change between DG_AUDIO and DG_IMAGE as needed using DG_CONTROL / DAT_XFERGROUP / MSG_SET.

Currently, only image and audio data are supported but this could be expanded to include text, etc. This has several future implications. If more than one data type exists, an application and a Source will need to decide what type(s) of data the Source can, and will be allowed to, produce before a transfer can occur. Further, if multiple transfers are being generated from a single acquisition—such as when image and text are intermixed and captured from the same page—it must be unambiguous which type of data is being returned from each data transfer.

Programming Basics

Note the following:

- Data Group designators are 32-bit, unsigned values. The actual values that are assigned are powers of two (bit flags) so that the DGs can be easily masked.
- There are 24 DGs designated as “reserved” for pre-defined DGs . Four are currently in use. The top 8 bits are reserved for custom DGs.

Data Argument Types

Data Argument Types, or DATs, are used to allow programmatic identification of the TWAIN type for the structure of status variable referenced by the entry point parameter pData. pData will always point to a variable or data structure defined by TWAIN. If the consuming application or Source switches (cases, etc.) on the DAT specified in the formal parameter list of the entry point call, it can handle the form of the referenced data correctly.

Table 6-1. Data Argument Types

Data Type	Used by	Associated structure or type
DAT_NULL	ANY DG	Null structure. No data required for the operation
DAT_CUSTOMBASE	n/a	Not a DAT in itself, but the baseline a Source must use when creating a custom DAT.
DAT_AUDIOFILEXFER	DG_AUDIO	Operates on null data. Filename / Format already negotiated.
DAT_AUDIONATIVEXFER	DG_AUDIO	TW_UINT32
		On Windows - low word = WAV handle
		On Macintosh - audio handle
DAT_CAPABILITY	DG_CONTROL	TW_CAPABILITY structure
DAT_EVENT	DG_CONTROL	TW_EVENT structure
DAT_FILESYSTEM	DG_CONTROL	TW_FILESYSTEM structure
DAT_IDENTITY	DG_CONTROL	TW_IDENTITY structure
DAT_PARENT	DG_CONTROL	TW_INT32
		On Windows - low word=Window handle
		On Macintosh - Set to NULL
DAT_PASSTHRU	DG_CONTROL	TW_PASSTHRU structure
DAT_PENDINGXFERS	DG_CONTROL	TW_PENDINGXFERS structure
DAT_SETUPFILEXFER	DG_CONTROL	TW_SETUPFILEXFER structure
DAT_SETUPMEMXFER	DG_CONTROL	TW_SETUPMEMXFER structure
DAT_STATUS	DG_CONTROL	TW_STATUS structure
DAT_USERINTERFACE	DG_CONTROL	TW_USERINTERFACE structure
DAT_XFERGROUP	DG_CONTROL	TW_UINT32
		A DG designator describing data to be transferred (currently only image data is supported)
DAT_CIECOLOR	DG_IMAGE	TW_CIECOLOR structure
DAT_GRAYRESPONSE	DG_IMAGE	TW_GRAYRESPONSE structure

DAT_IMAGEFILEXFER	DG_IMAGE	Operates on NULL data. Filename/Format already negotiated
DAT_IMAGEINFO	DG_IMAGE	TW_IMAGEINFO structure
DAT_IMAGELAYOUT	DG_IMAGE	TW_IMAGELAYOUT structure
DAT_IMAGEMEMXFER	DG_IMAGE	TW_IMAGEMEMXFER structure
DAT_IMAGENATIVEXFER	DG_IMAGE	TW_UINT32; On Windows - low word=DIB handle On Macintosh - PicHandle
DAT_JPEGCOMPRESSION	DG_IMAGE	TW_JPEGCOMPRESSION structure
DAT_PALETTE8	DG_IMAGE	TW_PALETTE8 structure
DAT_RGBRESPONSE	DG_IMAGE	TW_RGBRESPONSE structure

Messages

A Message, or MSG, is used to communicate between TWAIN elements what action is to be taken upon a particular piece of data, or for a data-less operation, what action to perform. If an application wants to make anything happen in, or inquire any information from, a Source or the Source Manager, it must make a call to DSM_Entry( ) with the proper MSG as one parameter of the operation triplet. The data to be acted upon is also specified in the parameter list of this call.

A MSG is always associated with a Data Group (DG) identifier and a Data Argument Type (DAT) identifier in an operation triplet. This operation unambiguously specifies what action is to be taken on what data. Refer to Chapter 7 for the list of defined operation triplets.

Table 6-2. Messages

Message ID	Valid DAT(s)	Description of Specified Action
MSG_AUTOMATICCAPTURED DIRECTORY	DAT_FILESYSTEM	Place to store images acquired during automatic capture
MSG_CHANGEDIRECTORY	DAT_FILESYSTEM	Change device, domain, host, or image directory
MSG_CLOSEDS	DAT_IDENTITY	Close the specified Source
MSG_CLOSEDSM	DAT_PARENT	Close the Source Manager
MSG_CLOSEDSREQ	DAT_NULL	Source requests for application to close Source

MSG_COPY	DAT_FILESYSTEM	Copy images across storage devices
MSG_CREATEDIRECTORY	DAT_FILESYSTEM	Create an image directory
MSG_CUSTOMBASE	n/a	Not a message in itself, but the baseline a Source must use when creating a custom message
MSG_DELETE	DAT_FILESYSTEM	Delete an image or an image directory
MSG_DEVICEEVENT	DAT_NULL	Report an event from the Source to the Source Manager
MSG_DISABLEDS	DAT_USERINTERFACE	Disable data transfer in the Source
MSG_ENABLEDS	DAT_USERINTERFACE	Enable data transfer in the Source
MSG_ENDXFER	DAT_PENDINGXFERS	Application tells Source that transfer is over
MSG_FORMATMEDIA	DAT_FILESYSTEM	Format a storage device
MSG_GET	various DATs	Get all Available Values including Current & Default
MSG_GETCLOSE	DAT_FILESYSTEM	Close a file context created by MSG_GETFIRSTFILE
MSG_GETCURRENT	various DATs	Get Current value
MSG_GETDEFAULT	various DATs	Get Source's preferred default value
MSG_GETFIRST	DAT_IDENTITY	Get first element from a "list"
MSG_GETFIRSTFILE	DAT_FILESYSTEM	Get the first file in a directory
MSG_GETINFO	DAT_FILESYSTEM	Get information about the current file
MSG_GETNEXT	DAT_IDENTITY	Get next element from a "list"
MSG_GETNEXTFILE	DAT_FILESYSTEM	Get the next file in a directory
MSG_NULL	None	No action to be taken
MSG_OPENDS	DAT_IDENTITY	Open and Initialize the specified Source
MSG_OPENDSM	DAT_PARENT	Open the Source Manager
MSG_PASSTHRU	DAT_PASSTHRU	For use by Source Vendors only
MSG_PROCESSEVENT	DAT_EVENT	Tells Source to check if event/message belongs to it
MSG_RENAME	DAT_FILESYSTEM	Rename an image or an image directory
MSG_RESET	various DATs	Return specified item to power-on (TWAIN default) condition
MSG_SET	various DATs	Set one or more values
MSG_USERSELECT	DAT_IDENTITY	Presents dialog of all Sources to select from
MSG_XFERREADY	DAT_NULL	The Source has data ready for transfer to the application

Custom Components of Triplets

Custom Data Groups

A manufacturer may choose to implement custom data descriptors that require a new Data Group. This would be needed if someone decides to extend TWAIN to, say, satellite telemetry.

- The top 8 bits of every DG_xxxx identifier are reserved for use as custom DGs. Custom DG identifiers must use one of the upper 8 bits of the DG_xxxx identifier. Remember, DGs are bit flags.
- The originator of the custom DG must fill the ProductName field in the application or Source's TW_IDENTITY structure with a uniquely descriptive name. The consumer will look at this field to determine whose custom DG is being used.
- TWAIN provides no formal allocation (or vendor-specific "identifier blocks") for custom data group identifiers nor does it do any coordination to avoid collisions.
- The DG_CUSTOMBASE value resides in the TWAIN.H file. All custom IDs must be numerically greater than this base. A similar custom base "address" is defined for Data Argument Types, Messages, Capabilities, Return Codes, and Condition Codes. The only difference in concept is that DGs are the only designators defined as bit flags. All other custom values can be any integer value larger than the xxxx_CUSTOMBASE defined for that type of designator.

Custom Data Argument Types

DAT_CUSTOMBASE is defined in the TWAIN.H file to allow a Source vendor to define "custom" DATs for their particular device(s). The application can recognize the Source by checking the TW_IDENTITY.ProductName and the TW_IDENTITY.TW_VERSION structure. If an application is aware that this particular Source offers custom DATs, it can use them. No changes to TWAIN or the Source Manager are required to support such identifiers (or the data structures which they imply).

Refer to the TWAIN.H file for the value of DAT_CUSTOMBASE for custom DATs. All custom values must be numerically greater than this constant.

Custom Messages

As with the DATs, MSG_CUSTOMBASE is included in TWAIN.H so that the Source writer can create custom messages specific to their Source. If the applications understand these custom messages, actions beyond those defined in this specification can be performed through the normal TWAIN mechanism. No modifications to TWAIN or the Source Manager are required.

Remember that the consumer of these custom values will look in your TW_IDENTITY.ProductName field to clarify what the identifier's value means—there is no other protection for overlapping custom definitions. Refer to the TWAIN.H file for the value of MSG_CUSTOMBASE for custom Messages. All custom values must be numerically greater than this value.

7

Operation Triplets

Chapter Contents

An Overview of the Triplets

From Application to Source Manager (Control Information)

Data Group	Data Argument Type	Message	Page #
DG_CONTROL	DAT_IDENTITY	MSG_CLOSEDS	7-174
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DG_CONTROL	DAT_CUSTOMDSDATA	MSG_GET	7-158
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DG_CONTROL	DAT_PASSTHRU	MSG_PASSTHRU	7-195
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DG_CONTROL	DAT_SETUPFILEXFER	MSG_GET	7-202
		MSG_GETDEFAULT	7-203
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DG_CONTROL	DAT_SETUPMEMXFER	MSG_GET	7-207
DG_CONTROL	DAT_STATUS	MSG_GET	7-208
DG_CONTROL	DAT_USERINTERFACE	MSG_DISABLEDS	7-210
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DG_CONTROL	DAT_XFERGROUP	MSG_GET	7-215

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Data Group	Data Argument Type	Message	Page #
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DG_IMAGE	DAT_IMAGELAYOUT	MSG_GET	7-226
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DG_IMAGE	DAT_IMAGEMEMXFER	MSG_GET	7-232
DG_IMAGE	DAT_IMAGENATIVEXFER	MSG_GET	7-234
DG_IMAGE	DAT_JPEGCOMPRESSION	MSG_GET	7-237
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Data Group	Data Argument Type	Message	Page #
DG_AUDIO	DAT_AUDIOFILEXFER	MSG_GET	7-142
DG_AUDIO	DAT_AUDIOINFO	MSG_GET	7-143
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From Source Manager to Source (Control Information)

Data Group	Data Argument Type	Message	Page #
DG_CONTROL	DAT_IDENTITY	MSG_CLOSEDS	7-174
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From Source to Application (Control Information via the Source Manager)

(Used by Windows Sources only)

Data Group	Data Argument Type	Message	Page #
DG_CONTROL	DAT_NULL	MSG_CLOSEDSOK	
		MSG_CLOSEDSREQ	7-188
		MSG_DEVICEEVENT	7-190
		MSG_XFERREADY	7-191

Format of the Operation Triplet Descriptions

The following pages describe the operation triplets. They are all included and are arranged in alphabetical order using the Data Group, Data Argument Type, and Message identifier list.

There are three operations that are duplicated because that have a different originator and/or destination in each case. They are:

- DG_CONTROL / DAT_IDENTITY / MSG_CLOSEDS
  - ✓ from Application to Source Manager
  - ✓ from Source Manager to Source
- DG_CONTROL / DAT_IDENTITY / MSG_OPENDS
  - ✓ from Application to Source Manager
  - ✓ from Source Manager to Source
- DG_CONTROL / DAT_STATUS / MSG_GET
  - ✓ from Application to Source Manager
  - ✓ from Application to Source

The format of each page is:

Triplet - The Concise DG / DAT / MSG Information

Call

Actual format of the routine call (parameter list) for the operation. Identification of the data structure used for the pData parameter is included.

Valid States

The states in which the application, Source Manager, or Source may legally invoke the operation.

Description

General description of the operation.

Origin of the Operation (Application, Source Manager or, Source)

The action(s) the application, Source Manager, or Source should take before invoking the operation.

Destination of the Operation (Source Manager or Source)

The action that the destination element (Source Manager or Source) of the operation will take.

Return Codes

The Return Codes and Condition Codes that are defined and valid for this operation.

See Also

Lists other related operation triplets, capabilities, constants, etc.

Operation Triplets

DG_AUDIO / DAT_AUDIOFILEXFER / MSG_GET

Call

```
DSM_Entry (pOrigin, pDest, DG_AUDIO, DAT_AUDIOFILEXFER, MSG_GET, NULL);
```

Valid States

6 (transitions to state 7)

Description

(Similar operation to DAT_IMAGEFILEXFER).

This operation is used to initiate the transfer of audio from the Source to the application via the disk-file transfer mechanism. It causes the transfer to begin.

No special set up or action required. Application should have already invoked the DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET operation unless the Source's default transfer format and file name (typically, TWAINAUD.TMP) are acceptable to the application. The application need only invoke this operation once per image transferred.

Source should acquire the audio data, format it, create any appropriate header information, and write everything into the file specified by the previous DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET operation, and close the file.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL.
   TWCC_SEQERROR - not state 6.
```

See Also

ACAP_XFERMECH

DG_AUDIO / DAT_AUDIOINFO / MSG_GET

Call

```
DSM_Entry (pOrigin, pDest, DG_AUDIO, DAT_AUDIOINFO, MSG_GET,
    pSourceAudioInfo);
```

pSourceAudioInfo = A pointer to a TW_AUDIOINFO structure

Valid States

6 and 7

Description

Used to get the information of the current audio data ready to transfer. (Similar operation to DAT_IMAGEINFO)

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
    TWCC_BADPROTOCOL
    TWCC_SEQERROR
```

See Also

DG_AUDIO / DAT_AUDIONATIVEXFER / MSG_GET

Call

```
DSM_Entry (pOrigin, pDest, DG_AUDIO, DAT_AUDIONATIVEXFER, MSG_GET, pHandle);
```

pHandle = A pointer to a variable of type TW_UINT32

On Windows - This 32 bit integer is a handle variable to WAV data located in memory.

On Macintosh - This 32-bit integer is a handle to AIFF data

Valid States

6 (transitions to state 7)

Description

(Similar operation to DAT_IMAGENATIVEXFER).

Causes the transfer of an audioÆs data from the Source to the application, via the Native transfer mechanism, to begin. The resulting data is stored in main memory in a single block. The data is stored in AIFF format on the Macintosh and as a WAV format under Microsoft Windows. The size of the audio snippet that can be transferred is limited to the size of the memory block that can be allocated by the Source.

Note: This is the default transfer mechanism. All Sources support this mechanism if DG_AUDIO is supported. The Source will use this mechanism unless the application explicitly negotiates a different transfer mechanism with ACAP_XFERMECH.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
    TWCC_BADPROTOCOL.
    TWCC_SEQERROR - not state 6.
```

See Also

ACAP_XFERMECH

DG_CONTROL / DAT_CAPABILITY / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_CAPABILITY, MSG_GET, pCapability);
```

pCapability = A pointer to a TW_CAPABILITY structure.

Valid States

4 through 7

Description

Returns the Source's Current, Default and Available Values for a specified capability.

These values reflect previous MSG_SET operations on the capability, or Source's automatic changes. (See MSG_SET).

Note: This operation does not change the Current or Available Values of the capability.

Application

Set the pCapability fields as follows:

```
pCapability->Cap = the CAP_xxxx or ACAP_xxxx or ICAP_xxxx identifier
pCapability->ConType = TWON_DONTCARE16
pCapability->hContainer = NULL
```

The Source will allocate the memory for the necessary container structure but the application must free it when the operation is complete and the application no longer needs to maintain the information.

Use MSG_GET:

- As the first step in negotiation of a capability's Available Values.
- To check the results if a MSG_SET returns TWRC_CHECKSTATUS.
- To check the Available, Current and Default Values with one command.

This operation may fail for a low memory condition. Either recover from a TWCC_LOWMEMORY failure by freeing memory for the Source to use so it can continue, or terminating the acquisition and notifying the user of the low memory problem.

Source

If the application requests this operation on a capability your Source does not recognize (and you're sure you've implemented all the capabilities that you're required to), disregard the operation, but return TWRC_FAILURE with TWCC_BADCAP.

If you support the capability, fill in the fields listed below and allocate the container structure and place its handle into pCapability->hContainer. The container should be referenced by a "handle" of type TW_HANDLE.

Fill the fields in pCapability as follows:

```
pCapability->ConType = TWON_ARRAY,
TWON_ONEVALUE,
TWON_ENUMERATION, or
TWON_RANGE

pCapability->hContainer = TW_HANDLE referencing a container of ConType
```

Set ConType to the container type your Source uses for this capability. For container types of TWON_ARRAY and TWON_ONEVALUE provide the Current Value. For container types TWON_ENUMERATION and TWON_RANGE provide the Current, Default and Available Values.

This is a memory allocation operation. It is possible for this operation to fail due to a low memory condition. Be sure to verify that the allocation is successful. If it is not, attempt to reduce the amount of memory occupied by the Source. If the allocation cannot be made, return TWRC_FAILURE with TWCC_LOWMEMORY to the application and set the pCapability->hContainer handle to NULL.

Note that the Source **must** be able to respond to an inquiry about any of its capabilities at **any time** that the Source is open.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
  TWCC_BADCAP        /* Unknown capability--Source does not */
                     /* does not recognize this capability  */
  TWCC_BADDEST       /* No such Source in session with      */
                     /* application                         */
  TWCC_LOWMEMORY     /* Not enough memory to complete the   */
                     /* operation                           */
  TWCC_SEQERROR      /* Operation invoked in invalid state  */
```

See Also

DG_CONTROL / DAT_CAPABILITY / MSG_GETCURRENT, MSG_GETDEFAULT, MSG_RESET, and MSG_SET

Capability Constants (in Chapter 8)

Capability Containers: TW_ONEVALUE, TW_ENUMERATION, TW_RANGE, TW_ARRAY (in Chapter 8)

Listing of all capabilities (in Chapter 9)

DG_CONTROL / DAT_CAPABILITY / MSG_GETCURRENT

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_CAPABILITY, MSG_GETCURRENT,
pCapability);
```

pCapability = A pointer to a TW_CAPABILITY structure.

Valid States

4 through 7

Description

Returns the Source's Current Value for the specified capability.

The Current Value reflects previous MSG_SET operations on the capability, or Source's automatic changes. (See MSG_SET).

Note: This operation does not change the Current Values of the capability.

Application

Set the pCapability fields as follows:

```
pCapability->Cap = the CAP_xxxx or ACAP_xxxx or ICAP_xxxx identifier
pCapability->ConType = TWON_DONTCARE16
pCapability->hContainer = NULL
```

The Source will allocate the memory for the necessary container structure but the application must free it when the operation is complete and the application no longer needs to maintain the information.

Use MSG_GETCURRENT:

- To check the Source's power-on Current Values (see Chapter 9 for TWAIN-defined defaults for each capability).
- To check just the Current Value (in place of using MSG_GET).
- In State 6 to determine the settings. They could have been set by the user (if TW_USERINTERFACE.ShowUI = TRUE) or be the results of automatic processes used by the Source.

This operation may fail for a low memory condition. Either recover from a TWCC_LOWMEMORY failure by freeing memory for the Source to use so it can continue, or terminating the acquisition and notifying the user of the low memory problem.

Source

If the application requests this operation on a capability your Source does not recognize (and you're sure you've implemented all the capabilities that you're required to), disregard the operation, but return TWRC_FAILURE with TWCC_BADCAP.

If you support the capability, fill in the fields listed below and allocate the container structure and place its handle into pCapability->hContainer. The container should be referenced by a "handle" of type TW_HANDLE.

Fill the fields in pCapability as follows:

```
pCapability->ConType = TWON_ARRAY or TWON_ONEVALUE
pCapability->hContainer = TW_HANDLE referencing a container of ConType
```

Set ConType to the container type that matches the type for this capability. Fill the fields in the container structure with the Current Value of the capability.

This is a memory allocation operation. It is possible for this operation to fail due to a low memory condition. Be sure to verify that the allocation is successful. If it is not, attempt to reduce the amount of memory occupied by the Source. If the allocation cannot be made, return TWRC_FAILURE with TWCC_LOWMEMORY to the application and set the pCapability->hContainer handle to NULL.

Note that the Source **must** be able to respond to an inquiry about any of its capabilities at **any time** that the Source is open.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
  TWCC_BADCAP         /* unknown capability--Source does not  */
                      /* recognize this capability            */
  TWCC_BADDEST        /* No such Source in-session with       */
                      /* application                          */
  TWCC_LOWMEMORY      /* Not enough memory to complete the    */
                      /* operation                            */
  TWCC_SEQERROR       /* Operation invoked in invalid  state  */
```

See Also

DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETDEFAULT, MSG_RESET, and MSG_SET

Capability Constants (in Chapter 8)

Capability Containers: TW_ONEVALUE, TW_ENUMERATION, TW_RANGE, TW_ARRAY (in Chapter 8)

Listing of all capabilities (in Chapter 9)

DG_CONTROL / DAT_CAPABILITY / MSG_GETDEFAULT

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_CAPABILITY, MSG_GETDEFAULT,
pCapability);
```

pCapability = A pointer to a TW_CAPABILITY structure.

Valid States

4 through 7

Description

Returns the Source's Default Value. This is the Source's preferred default value.

The Source's Default Value cannot be changed.

Application

Set the pCapability fields as follows:

```
pCapability->Cap = the CAP_xxxx or ACAP_xxxx or ICAP_xxxx identifier
pCapability->ConType = TWON_DONTCARE16
pCapability->hContainer = NULL
```

The Source will allocate the memory for the necessary container structure but the application must free it when the operation is complete and the application no longer needs to maintain the information.

Use MSG_GETDEFAULT:

- To check the Source's preferred Values. Using the Source's preferred default as the Current Value may increase performance in some Sources.

This operation may fail for a low memory condition. Either recover from a TWCC_LOWMEMORY failure by freeing memory for the Source to use so it can continue, or terminating the acquisition and notifying the user of the low memory problem.

Source

If the application requests this operation on a capability your Source does not recognize (and you are sure you have implemented all the capabilities that you're required to), disregard the operation, but return TWRC_FAILURE with TWCC_BADCAP.

If you support the capability, fill in the fields listed below and allocate the container structure and place its handle into pCapability->hContainer. The container should be referenced by a "handle" of type TW_HANDLE.

Fill the fields in pCapability as follows:

```
pCapability->ConType = TWON_ARRAY or TWON_ONEVALUE
pCapability->hContainer = TW_HANDLE referencing a container of ConType
```

Set ConType to the container type that matches for this capability. Fill the fields in the container with the Default Value of this capability.

The Default Value is the preferred value for the Source. This value is used as the power-on value for capabilities if TWAIN does not specify a default.

This is a memory allocation operation. It is possible for this operation to fail due to a low memory condition. Be sure to verify that the allocation is successful. If it is not, attempt to reduce the amount of memory occupied by the Source. If the allocation cannot be made return TWRC_FAILURE with TWCC_LOWMEMORY to the application and set the pCapability->hContainer handle to NULL.

Note that the Source **must** be able to respond to an inquiry about any of its capabilities at **any time** that the Source is open.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
  TWCC_BADCAP         /* unknown capability--Source does not */
                      /* recognize this capability           */
  TWCC_BADDEST        /* No such Source in-session with      */
                      /* application                         */
  TWCC_LOWMEMORY      /* Not enough memory to complete the   */
                      /* operation                           */
  TWCC_SEQERROR       /* Operation invoked in invalid state  */
```

See Also

DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETCURRENT, MSG_RESET, and MSG_SET

Capability Constants (in Chapter 8)

Capability Containers: TW_ONEVALUE, TW_ENUMERATION, TW_RANGE, TW_ARRAY (in Chapter 8)

Listing of all capabilities (in Chapter 9)

DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_CAPABILITY, MSG_GETDEFAULT,
pCapability);
```

pCapability = A pointer to a TW_CAPABILITY structure.

Valid States

4 through 7

Description

Returns the Source's support status of this capability.

Application

Set the pCapability fields as follows:

```
pCapability->Cap = the CAP_xxxx or ACAP_xxxx or ICAP_xxxx identifier
pCapability->ConType = TWON_ONEVALUE
pCapability->hContainer = NULL
```

The Source will allocate the memory for the necessary container structure but the application must free it when the operation is complete and the application no longer needs to maintain the information.

Use MSG_QUERYSUPPORT:

- To check the whether the Source supports a particular operation on the capability.

This operation may fail for a low memory condition. Either recover from a TWCC_LOWMEMORY failure by freeing memory for the Source to use so it can continue, or terminating the acquisition and notifying the user of the low memory problem.

Source

If the application requests this operation on a capability your Source does not recognize (and you're sure you've implemented all the capabilities that you're required to), do not disregard the operation, but fill out the TWON_ONEVALUE container with

Fill the fields in pCapability as follows:

```
pCapability->ConType = TWON_ONEVALUE
pCapability->hContainer = TW_HANDLE referencing a container of type
TW_ONEVALUE.
```

Fill the fields in TW_ONVALUE as follows:

ItemType = TWTW_INT32;

Item = Bit pattern representing the set of operation that are supported by the Data Source on this capability (TWQC_GET, TWQC_SET, TWQC_GETDEFAULT, TWQC_RESET);

This is a memory allocation operation. It is possible for this operation to fail due to a low memory condition. Be sure to verify that the allocation is successful. If it is not, attempt to reduce the amount of memory occupied by the Source. If the allocation cannot be made return TWRC_FAILURE with TWCC_LOWMEMORY to the application and set the pCapability->hContainer handle to NULL.

Note that the Source **must** be able to respond to an inquiry about any of its capabilities at **any time** that the Source is open.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
TWCC_BADDEST          /* No such Source in-session with      */
                      /* application                         */
TWCC_LOWMEMORY        /* Not enough memory to complete the   */
                      /* operation                           */
```

See Also

DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETCURRENT, MSG_RESET, and MSG_SET

Capability Constants (in Chapter 8)

Capability Container: TW_ONEVALUE (in Chapter 8).

Listing of all capabilities (in Chapter 9)

DG_CONTROL / DAT_CAPABILITY / MSG_RESET

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_CAPABILITY, MSG_RESET,
pCapability);
```

pCapability = A pointer to a TW_CAPABILITY structure.

Valid States

4 only

Description

Change the Current Value of the specified capability back to its power-on value and return the new Current Value.

The power-on value is the Current Value the Source started with when it entered State 4 after a DG_CONTROL / DAT_IDENTITY / MSG_OPENDS. These values are listed as TWAIN defaults (in Chapter 9). If "no default" is specified, the Source uses it preferred default value (returned from MSG_GETDEFAULT).

Application

Set the pCapability fields as follows:

```
pCapability->Cap = the CAP_xxxx or ACAP_xxxx or ICAP_xxxx identifier
pCapability->ConType = TWON_DONTCARE16
pCapability->hContainer = NULL
```

The Source will allocate the memory for the necessary container structure but the application must free it when the operation is complete and the application no longer needs to maintain the information.

Use MSG_RESET:

- To set the Current Value of the specified capability to the Source's mandatory or preferred value, and to remove any constants from the allowed values supported by the Source.

This operation may fail for a low memory condition. Either recover from a TWCC_LOWMEMORY failure by freeing memory for the Source to use so it can continue, or terminating the acquisition and notifying the user of the low memory problem.

Source

If the application requests this operation on a capability your Source does not recognize (and you're sure you've implemented all the capabilities that you're required to), disregard the operation, but return TWRC_FAILURE with TWCC_BADCAP.

If you support the capability, reset the Current Value of the capability back to its power-on value. This value must also match the TWAIN default listed in Chapter 9.

Also return the new Current Value (just like in a MSG_GETCURRENT). Fill in the fields listed below and allocate the container structure and place its handle into pCapability->hContainer. The container should be referenced by a "handle" of type TW_HANDLE.

Fill the fields in pCapability as follows:

```
pCapability->ConType = TWON_ARRAY or TWON_ONEVALUE
pCapability->hContainer = TW_HANDLE referencing a container of ConType
```

Set ConType to the container type that matches the type for this capability. Fill the fields in the container structure with the Current Value of the capability (after resetting it as stated above).

This is a memory allocation operation. It is possible for this operation to fail due to a low memory condition. Be sure to verify that the allocation is successful. If it is not, attempt to reduce the amount of memory occupied by the Source. If the allocation cannot be made return TWRC_FAILURE with TWCC_LOWMEMORY to the application and set the pCapability->hContainer handle to NULL.

Note that this operation is **only** valid in State 4, unless CAP_EXTENDEDCAPS was negotiated. Any attempt to invoke it in any other state should be disregarded, though the Source should return TWRC_FAILURE with TWCC_SEQERROR.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
  TWCC_BADCAP        /* unknown capability--Source does not  */
                     /* recognize this capability            */
  TWCC_BADDEST       /* No such Source in-session with       */
                     /* application                          */
  TWCC_LOWMEMORY     /* Not enough memory to complete the    */
                     /* operation                            */
  TWCC_SEQERROR      /* Operation invoked in invalid state   */
```

See Also

DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETCURRENT, MSG_GETDEFAULT, and MSG_SET

Capability Constants (in Chapter 8)

Capability Containers: TW_ONEVALUE, TW_ENUMERATION, TW_RANGE, TW_ARRAY (in Chapter 8)

Listing of all capabilities (in Chapter 9)

DG_CONTROL / DAT_CAPABILITY / MSG_SET

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_CAPABILITY, MSG_SET, pCapability);
```

pCapability = A pointer to a TW_CAPABILITY structure.

Valid States

4 only (During State 4, applications can also negotiate with Sources for permission to set the value(s) of specific capabilities in States 5 and 6 through CAP_EXTENDEDCAPS.)

Description

Changes the Current Value(s) and Available Values of the specified capability to those specified by the application.

Current Values are set when the container is a TW_ONEVALUE or TW_ARRAY. Available and Current Values are set when the container is a TW_ENUMERATION or TW_RANGE.

Note: Sources are not required to allow restriction of their Available Values, however, this is strongly recommended.

Application

An application will use the setting of a capability's Current and Available Values differently depending on how the Source was enabled (DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS).

If TW_USERINTERFACE.ShowUI = TRUE

- In State 4, set the Current Value to be displayed to the user as the current value. This value will be used for acquiring the image unless changed by the user or an automatic process (such as ICAP_AUTOBRIGHT).
- In State 4, set the Available Values to restrict the settings displayed to the user and available for use by the Source.
- In State 6, get the Current Value which was chosen by the user or automatic process. This is the setting used in the upcoming transfer.

If TW_USERINTERFACE.ShowUI = FALSE

- In State 4, set the Current Value to the setting that will be used to acquire images (unless automatic settings are set to TRUE, for example: ICAP_AUTOBRIGHT).
- In State 6, get the Current Value which was chosen by any automatic processes. This is the setting used in the upcoming transfer.

If possible, use the same container type in a MSG_SET that the Source returned from a MSG_GET. Allocate the container structure. This is where you will place the value(s) you wish to have the Source set. Store the handle into pCapability->hContainer. The container must be referenced by a "handle" of type TW_HANDLE.

Set the following:

```
pCapability->ConType = TWON_ARRAY,
                       TWON_ONEVALUE,
                       TWON_ENUMERATION, or
                       TWON_RANGE

pCapability->Cap     =  CAP_xxxx designator of
                        capability of interest

pCapability->hContainer = TW_HANDLE referencing a
                          container of ConType
```

Place the value(s) that you wish the Source to use in the container. If successful, these values will supersede any previous negotiations for this capability.

The application must free the container it allocated when the operation is complete and the application no longer needs to maintain the information.

Source

Return TWRC_FAILURE / TWCC_BADCAP:

- If the application requests this operation on a capability your Source does not recognize (and you're sure you've implemented all the capabilities that you're required to). Disregard the operation.

Return TWRC_FAILURE / TWCC_BADVALUE:

- If the application requests that a value be set that lies outside the supported range of values for the capability (smaller than your minimum value or larger than your maximum value). Set the value to that which most closely approximates the requested value.
- If the application sends a container that you do not support, or do not support in a MSG_SET.
- If the application attempts to set the Available Values and the Source does not support restriction of this capability's Available Values.

Return TWRC_CHECKSTATUS:

- If the application requests one or more values that lie within the supported range of values (but that value does not exactly match one of the supported values), set the value to the nearest supported value. The application should then do a MSG_GET to check these values.

Return TWRC_FAILURE / TWCC_SEQERROR:

- If the application sends the MSG_SET outside of State 4 and the capability has not been negotiated in CAP_EXTENDEDCAPS.

If the request is acceptable, use the container structure referenced by pCapability->hContainer to set the Current and Available Values for the capability. If the container type is TWON_ONEVALUE or TWON_ARRAY, set the Current Value for the capability to that value. If the container type is TWON_RANGE or TWON_ENUMERATION, the Source will **optionally** limit the Available Values for the capability to match those provided by the application, masking all other internal values so that the user cannot select them. Though this behavior is not mandatory, it is strongly encouraged.

Important Note: Sources should accommodate requests to limit Available Values. In the interest of adoptability for the breadth of Source manufacturers, such accommodation is not required. It is recommended, however, that the Sources do so, and that the Source's user interface be modified (from its power-on state, and when the user interface is raised) to reflect any limitation of choices implied by the newly negotiated settings.

For example, if an application can only accept black and white image data, it tells the Source of this limitation by doing a MSG_SET on ICAP_PIXELTYPE with a TW_ENUMERATION or TW_RANGE container containing only TWPT_BW (black and white).

If the Source disregards this negotiated value and fails to modify its user interface, the user may select to acquire a color image. Either the user's selection would fail (for reasons unclear to the user) or the transfer would fail (also for unclear reasons for the user). The Source should strive to prevent such situations.

Return Codes

```
TWRC_SUCCESS
TWRC_CHECKSTATUS      /* capability value(s) could not be */
                      /* matched exactly                  */

TWRC_FAILURE
   TWCC_BADCAP        /* unknown capability--Source does  */
                      /* not recognize this capability    */
   TWCC_BADDEST       /* No such Source in-session with   */
                      /* application                      */
   TWCC_BADVALUE      /* illegal value(s)--outside        */
                      /* Source's range for capability    */
   TWCC_SEQERROR      /* Operation invoked in invalid     */
                      /* state                            */
```

See Also

DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETCURRENT, MSG_GETDEFAULT, and MSG_RESET

Capability Constants (in Chapter 8)

Capability Containers: TW_ONEVALUE, TW_ENUMERATION, TW_RANGE, TW_ARRAY (in Chapter 8)

Listing of all capabilities (in Chapter 9)

DG_CONTROL / DAT_CUSTOMDSDATA / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_CUSTOMDSDATA,
MSG_GET, pCustomData);
```

pCustomData = A pointer to a TW_CUSTOMDSDATA structure.

Valid States

4 only

Description

This operation is used by the application to query the data source for its current settings, e.g. DPI, paper size, color format. The sources settings will be returned in a TW_CUSTOMDSDATA structure. The actual format of the data in this structure is data source dependent and not defined by TWAIN.

Application

pDest references the sources identity structure. pCustomData points to a TW_CUSTOMDSDATA structure.

Source

Fills the pCustomData pointer with source specific settings. If supported, CAP_ENABLEDSUIONLY and CAP_CUSTOMDSDATA are required.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
    TWCC_SEQERROR
```

See Also

Capability CAP_CUSTOMDSDATA

DG_CONTROL / DAT_CUSTOMDSDATA / MSG_SET

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_CUSTOMDSDATA,
MSG_SET, pCustomData);
```

pCustomData = A pointer to a TW_CUSTOMDSDATA structure.

Valid States

4 only

Description

This operation is used by the application to set the current settings for a data source to a previous state as defined by the data contained in the pCustomData data structure. The actual format of the data in this structure is data source dependent and not defined by TWAIN.

Application

pDest references the sources identity structure. pCustomData points to a TW_CUSTOMDSDATA structure.

Source

Changes its current settings to the values specified in the pCustomData structure.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
    TWCC_SEQERROR
```

See Also

Capability CAP_CUSTOMDSDATA

DG_CONTROL / DAT_DEVICEEVENT / MSG_GET

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_DEVICEEVENT, MSG_GET,
   pSourceDeviceEvent);
```

pSourceDeviceEvent = A pointer to a TW_DEVICEEVENT structure

Valid States

4 through 7

Description

Upon receiving a DG_CONTROL / DAT_NULL / MSG_DEVICEEVENT from the Source, the Application must immediately make this call to obtain the event information.

Sources must queue the data for each event so that it is available for this call.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL - capability not supported.
   TWCC_SEQERROR - no events in the queue, or not in States 4 through 7.
```

See Also

DG_CONTROL / DAT_NULL / MSG_DEVICEEVENT
CAP_DEVICEEVENT

DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_EVENT, MSG_PROCESSEVENT, pEvent);
```

pEvent = A pointer to a TW_EVENT structure.

Valid States

5 through 7

Description

This operation supports the distribution of events from the application to Sources so that the Source can maintain its user interface and return messages to the application. Once the application has enabled the Source, it **must immediately** begin sending to the Source all events that enter the application's main event loop. This allows the Source to update its user interface in real-time and to return messages to the application which cause state transitions. Even if the application overrides the Source's user interface, it must forward all events once the Source has been enabled. The Source will tell the application whether or not each event belongs to the Source.

Note: Events only need to be forwarded to the Source while it is enabled.

The Source should be structured such that identification of the event's "owner" is handled before doing anything else. Further, the Source should return **immediately** if the Source isn't the owner. This convention should minimize performance concerns for the application (remember, these events are only sent while a Source is enabled—that is, just before and just after the transfer is taking place).

Application

Make pEvent->pEvent point to the EventRecord (on Macintosh) or message structure (on Windows).

Note: On return, the application should check the Return Code from DSM_Entry() for TWRC_DSEVENT or TWRC_NOTDSEVENT. If TWRC_DSEVENT is returned, the application should not process the event—it was consumed by the Source. If TWRC_NOTDSEVENT is returned, the application should process the event as it normally would.

With either of these Return Codes, the application should also check the pEvent->TWMessage and switch on the result. This is the mechanism used by the Source to notify the application that a data transfer is ready or that it should close the Source. The Source can return one of the following messages:

```
MSG_XFERREADY   /* Source has one or more images */
                /* ready to transfer             */
MSG_CLOSEDSREQ  /* Source wants to be closed,    */
                /* usually initiated by a        */
                /* user-generated event          */
MSG_NULL        /* no message for application    */
```

Source

Process this operation **immediately** and return to the application **immediately** if the event doesn't belong to you. Be aware that the application will be sending thousands of messages to you. Consider in-line processing and global flags to speed implementation.

Return Codes

```
TWRC_DSEVENT         /* Source consumed event--application*/
                     /* should not process it     */
TWRC_NOTDSEVENT      /* Event belongs to application -  */
                     /* process as usual              */
TWRC_FAILURE
    TWCC_BADDEST     /* No such Source in-session      */
                     /* with application               */
    TWCC_SEQERROR    /* Operation invoked in invalid   */
                     /* state                          */
```

See Also

DG_CONTROL / DAT_NULL / MSG_CLOSEDSREQ
DG_CONTROL / DAT_NULL / MSG_XFERREADY

Event loop information (in Chapter 3)

DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_FILESYSTEM,
   MSG_CHANGEDIRECTORY, pSourceFileSystem);
```

pSourceFileSystem = A pointer to a TW_FILESYSTEM structure

Valid States

4 only

Description

This operation selects the current device within the Source (camera, storage, etc). If the device is a TWFT_DOMAIN, then this command enters a directory that can contain TWFT_HOST files. If the device is a TWFT_HOST, then this command enters a directory that can contain TWFT_DIRECTORY files. If the device is a TWFT_DIRECTORY, then this command enters a directory that can contain TWFT_DIRECTORY or TWFT_IMAGE files.

Sources can support part or all of the storage hierarchy that is one of the following:

/Domain/Host/Directory/
/Host/Directory/…
/Directory/…
(Storage not supported)

It is permitted to mix domain, host, and directory names in the root file system of the Source. To help resolve any potential name conflict, Applications should set TW_FILESYSTEM-> FileType to the appropriate value for the topmost file. If this is not done and there is a name conflict, the Source's default behavior must be to use the file of type TWFT_DIRECTORY or TWFT_HOST, in that order.

For example, consider two files named "abc" in the root of a Source:

/abc/123 (abc is a domain)
/abc/789 (abc is a directory)

Change directory to the first one by setting FileType to TWFT_DOMAIN, or to the second one by setting FileType to TWFT_DIRECTORY. The FileType for each will be discovered while browsing the directory using DAT_GETFILEFIRST and DAT_GETFILENEXT. If the FileType is not specified, then the Source must change to the "/abc/789" directory.

Example:

A Source supports two devices: "/Camera" and "/Disk". If an application changes directory to /Camera, then it can negotiate imaging parameters and transfer images in a traditional fashion. If an application changes directory to "/Disk/abc/xyz", then it cannot negotiate imaging parameters (the images have already been captured); all it can do is browse the directory tree and transfer the images it finds.

The Application sets the new current working directory by placing in the InputName field an absolute or relative path. The Source returns the absolute path and name of the new directory in the OutputName field. The special filename dot "." can be used to retrieve the name of the current directory. The special filename dot-dot ".." can be used to change to the parent directory. Refer to the section on File Systems for more information.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL - capability not supported.
   TWCC_DENIED - operation denied (device not ready).
   TWCC_FILENOTFOUND - specified InputName does not exist.
   TWCC_SEQERROR - not state 4.
```

See Also

DG_CONTROL / DAT_FILESYSTEM / MSG_COPY
DG_CONTROL / DAT_FILESYSTEM / MSG_CREATEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE
DG_CONTROL / DAT_FILESYSTEM / MSG_FORMATMEDIA
DG_CONTROL / DAT_FILESYSTEM / MSG_GETCLOSE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO
DG_CONTROL / DAT_FILESYSTEM / MSG_GETNEXTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_RENAME

DG_CONTROL / DAT_FILESYSTEM / MSG_COPY

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_FILESYSTEM,
   MSG_COPY, pSourceFileSystem);
```

pSourceFileSystem = A pointer to a TW_FILESYSTEM structure

Valid States

4 only

Description

This operation copies a file or directory. Absolute and relative pathnames are supported. A file may not be overwritten with this command. If an Application wishes to do this, it must first delete the unwanted file and then reissue the Copy command.

The Application specifies the path and name of the entry to be copied in InputName. The Application specifies the new patch and name in OutputName.

It is not permitted to copy files into the root directory.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL - capability not supported.
   TWCC_DENIED - file cannot be deleted (root file, or protected
                 by Source).
   TWCC_FILEEXISTS - specified OutputName already exists.
   TWCC_FILENOTFOUND - InputName not found or OutputName invalid.
   TWCC_SEQERROR - not state 4.
```

See Also

DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_CREATEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE
DG_CONTROL / DAT_FILESYSTEM / MSG_FORMATMEDIA
DG_CONTROL / DAT_FILESYSTEM / MSG_GETCLOSE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO
DG_CONTROL / DAT_FILESYSTEM / MSG_GETNEXTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_RENAME

DG_CONTROL / DAT_FILESYSTEM / MSG_CREATEDIRECTORY

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_FILESYSTEM,
   MSG_CREATEDIRECTORY, pSourceFileSystem);
```

pSourceFileSystem = A pointer to a TW_FILESYSTEM structure

Valid States

4 only

Description

This operation creates a new directory within the current directory. Pathnames are not allowed, only the name of the new directory can be specified.

Example:

"abc" is valid.
"/Disk/abc" is not valid.

The Application specifies the name of the new directory in InputName.

On success, the Source returns the absolute path and name of the new directory in OutputName.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL - capability not supported.
   TWCC_DENIED - cannot create directory in current directory,
                 directories may not be created in root, or the
                 Source may opt to prevent the creation of new
                 directories in some instances, for instance if
                 the new directory would be too deep in the tree.
   TWCC_FILEEXISTS - the specified InputName already exists.
   TWCC_SEQERROR - not state 4.
```

See Also

DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_COPY
DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE
DG_CONTROL / DAT_FILESYSTEM / MSG_FORMATMEDIA
DG_CONTROL / DAT_FILESYSTEM / MSG_GETCLOSE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO
DG_CONTROL / DAT_FILESYSTEM / MSG_GETNEXTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_RENAME

DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_FILESYSTEM,
   MSG_DELETE, pSourceFileSystem);
```

pSourceFileSystem = A pointer to a TW_FILESYSTEM structure

Valid States

4 only

Description

This operation deletes a file or directory on the device. Pathnames are not allowed, only the name of the file or directory to be deleted can be specified. Recursive deletion can be specified by setting the pSourceFileSystem->Recursive to TRUE.

Example:

"abc" is valid.
"/Disk/abc" is not valid.

The Application specifies the name of the entry to be deleted in InputName. There is no return in OutputName on success.

The Application cannot delete entries in the root directory. The Application cannot delete directories unless they are empty.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL - capability not supported.
   TWCC_DENIED - file cannot be deleted (root file, or protected
                 by Source).
   TWCC_FILENOTFOUND - filename not found.
   TWCC_NOTEMPTY - directory is not empty, and cannot be deleted.
   TWCC_SEQERROR - not state 4.
```

See Also

DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_CREATEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_FORMATMEDIA
DG_CONTROL / DAT_FILESYSTEM / MSG_GETCLOSE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO
DG_CONTROL / DAT_FILESYSTEM / MSG_GETNEXTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_RENAME

DG_CONTROL / DAT_FILESYSTEM / MSG_FORMATMEDIA

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_FILESYSTEM,
   MSG_FORMATMEDIA, pSourceFileSystem);
```

pSourceFileSystem = A pointer to a TW_FILESYSTEM structure

Valid States

4 only

Description

This operation formats the specified storage. This operation destroys all images and sub-directories under the selected device. Use with caution.

The Application specifies the name of the device to be deleted in InputName. There is no data returned by this call.

The Application cannot format the root directory. Sources may opt to protect their media from this command, so Applications must check return and condition codes.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL - capability not supported.
   TWCC_DENIED - format denied (root directory, or protected by Source).
   TWCC_FILENOTFOUND - filename not found.
   TWCC_SEQERROR - not state 4.
```

See Also

DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_CREATEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETCLOSE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO
DG_CONTROL / DAT_FILESYSTEM / MSG_GETNEXTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_RENAME

DG_CONTROL / DAT_FILESYSTEM / MSG_GETCLOSE

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_FILESYSTEM,
   MSG_GETCLOSE, pSourceFileSystem);
```

pSourceFileSystem = A pointer to a TW_FILESYSTEM structure

Valid States

4 through 6

Description

The operation frees the Context field in pSourceFileSystem.

Every call to DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE must be matched by a call to MSG_GETCLOSE to release the Context field in the pSourceFileSystem structure.

An Application may (erroneously) issue this operation at any time (even if a MSG_GETFIRSTFILE has not been issued yet). Sources must protect themselves from such uses. See the section on File Systems for more information on why and how this must be done.

Return Codes

```
TWRC_SUCCESS
   TWRC_FAILURE
   TWCC_BADPROTOCOL - capability not supported.
   TWCC_SEQERROR - not state 4, 5 or 6.
```

See Also

DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_CREATEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE
DG_CONTROL / DAT_FILESYSTEM / MSG_FORMATMEDIA
DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO
DG_CONTROL / DAT_FILESYSTEM / MSG_GETNEXTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_RENAME

DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_FILESYSTEM,
   MSG_GETFIRSTFILE, pSourceFileSystem);
```

pSourceFileSystem = A pointer to a TW_FILESYSTEM structure

Valid States

4 through 6

Description

This operation gets the first filename in a directory, and returns information about that file (the same information that can be retrieved with MSG_GETINFO).

The Source positions the Context to point to the first filename. InputName is ignored. OutputName contains the absolute path and name of the file. If the Application enables the Source at this time, and the PendingXfers.Count is non-zero, the Application will immediately receive a MSG_XFERREADY, and the current image will be transferred.

Applications must not assume any ordering of the files delivered by the Source, with one exception: if MSG_GETFIRSTFILE is issued in the root directory, then the operation must return a TWFT_CAMERA device.

NB: "." and ".." are NEVER reported by this command.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL - capability not supported.
   TWCC_DENIED - file exists, but information about it has not
                 been returned.
   TWCC_FILENOTFOUND - directory is empty.
   TWCC_SEQERROR - not state 4, 5 or 6.
```

See Also

DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_CREATEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE
DG_CONTROL / DAT_FILESYSTEM / MSG_FORMATMEDIA
DG_CONTROL / DAT_FILESYSTEM / MSG_GETCLOSE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO
DG_CONTROL / DAT_FILESYSTEM / MSG_GETNEXTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_RENAME

DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_FILESYSTEM,
   MSG_GETINFO, pSourceFileSystem);
```

pSourceFileSystem = A pointer to a TW_FILESYSTEM structure

Valid States

4 through 7

Description

This operation fills the information fields in pSourceFileSystem.

InputName contains the absolute or relative path and filename of the requested file. OutputName returns the absolute path to the file.

Example *InputName*:

"abc" is valid.
"/Disk/abc" is valid.
The empty string "" returns information about the current file (if any).
"." returns information about the current directory.
".." returns information about the parent directory.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL - capability not supported.
   TWCC_DENIED -  - file exists, but information about it has not
                    been returned.
   TWCC_FILENOTFOUND - specified file does not exist.
   TWCC_SEQERROR - not state 4 - 7, or no current file.
```

See Also

DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_CREATEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE
DG_CONTROL / DAT_FILESYSTEM / MSG_FORMATMEDIA
DG_CONTROL / DAT_FILESYSTEM / MSG_GETCLOSE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_RENAME

DG_CONTROL / DAT_FILESYSTEM / MSG_GETNEXTFILE

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_FILESYSTEM,
   MSG_GETNEXTFILE, pSourceFileSystem);
```

pSourceFileSystem = A pointer to a TW_FILESYSTEM structure

Valid States

4 through 6

Description

This operation gets the next filename in a directory, and returns information about that file (the same information that can be retrieved with MSG_GETINFO).

The Source positions the Context to point to the next filename. InputName is ignored. OutputName contains the absolute path and name of the file. If the Application enables the Source at this time, and the PendingXfers.Count is non-zero, the Application will immediately receive a MSG_XFERREADY, and the current image will be transferred.

A call to MSG_GETFIRSTFILE must be issued on a given directory before the first call to MSG_GETNEXTFILE.

NB: The "." and ".." entries are NEVER reported by this command

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL - capability not supported.
   TWCC_DENIED - file exists, but information about it has not
                 been returned.
   TWCC_FILENOTFOUND - directory is empty.
   TWCC_SEQERROR - not state 4, 5 or 6, or invalid context (must issue
                   MSG_GETFILEFIRST before calling MSG_GETNEXTFILE).
```

See Also

DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_CREATEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE
DG_CONTROL / DAT_FILESYSTEM / MSG_FORMATMEDIA
DG_CONTROL / DAT_FILESYSTEM / MSG_GETCLOSE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO
DG_CONTROL / DAT_FILESYSTEM / MSG_RENAME

DG_CONTROL / DAT_FILESYSTEM / MSG_RENAME

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_FILESYSTEM,
   MSG_RENAME, pSourceFileSystem);
```

pSourceFileSystem = A pointer to a TW_FILESYSTEM structure

Valid States

4 only

Description

This operation renames (and optionally moves) a file or directory. Absolute and relative path names are supported. A file may not be overwritten with this command. If an Application wishes to do this it must first delete the unwanted file, then issue the rename command.

The Application specifies the path and name of the entry to be renamed in InputName. The Application specifies the new path and name in OutputName.

Filenames in the root directory cannot be moved or renamed.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL - capability not supported.
   TWCC_DENIED - file cannot be deleted (root file, or protected
                 by Source).
   TWCC_FILEEXISTS - specified OutputName already exists.
   TWCC_FILENOTFOUND - InputName not found or OutputName invalid.
   TWCC_SEQERROR - not state 4.
```

See Also

DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_CREATEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE
DG_CONTROL / DAT_FILESYSTEM / MSG_FORMATMEDIA
DG_CONTROL / DAT_FILESYSTEM / MSG_GETCLOSE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO
DG_CONTROL / DAT_FILESYSTEM / MSG_GETNEXTFILE

DG_CONTROL / DAT_IDENTITY / MSG_CLOSEDS *(from Application to Source Manager)*

Call

```
DSM_Entry(pOrigin, NULL, DG_CONTROL, DAT_IDENTITY, MSG_CLOSEDS,
pSourceIdentity);
```

pSourceIdentity = A pointer to a TW_IDENTITY structure.

Valid States

4 only (Transitions to State 3, if successful)

Description

When an application is finished with a Source, it must formally close the session between them using this operation. This is necessary in case the Source only supports connection with a single application (many desktop scanners will behave this way). A Source such as this cannot be accessed by other applications until its current session is terminated.

Application

Reference pSourceIdentity to the application's copy of the TW_IDENTITY structure for the Source whose session is to be ended. The application needs to unload the Source from memory after it is closed. The process for unloading the Source is similar to that used to unload the Source Manager.

Source Manager

On Macintosh only—Closes the Source and removes it from memory, following receipt of TWRC_SUCCESS from the Source.

On Windows only—Checks its internal counter to see whether any other applications are accessing the specified Source. If so, the Source Manager takes no other action. If the closing application is the last to be accessing this Source, the Source Manager closes the Source (forwards this triplet to it) and removes it from memory, following receipt of TWRC_SUCCESS from the Source.

Upon receiving the request from the Source Manager, the Source immediately prepares to terminate execution.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_SEQERROR     /* Operation invoked in invalid state */
```

See Also

DG_CONTROL / DAT_IDENTITY / MSG_OPENDS

DG_CONTROL / DAT_IDENTITY / MSG_CLOSEDS

(from Source Manager to Source)

Call

```
DS_Entry(pOrigin, DG_CONTROL, DAT_IDENTITY, MSG_CLOSEDS, pSourceIdentity);
```

pSourceIdentity = A pointer to a TW_IDENTITY structure.

Valid States

4 only (Transitions Source back to the “loaded but not open” State - approximately State 3.5)

Description

Closes the Source so it can be unloaded from memory. The Source responds by doing its shutdown and clean-up activities needed to ensure the heap will be “clean” after the Source is unloaded. Under Windows, the Source will only be unloaded if the connection with the last application accessing it is about to be broken. The Source will know this by its internal “connect count” that should be maintained by any Source that supports multiple application connects.

Source Manager

pSourceIdentity is filled from a previous MSG_OPENDS operation.

Source

Perform all necessary housekeeping in anticipation of being unloaded. Be sure to dispose of any memory buffers that the Source has allocated locally, or that may have become the Source’s responsibility during the course of the TWAIN session. The Source exists in a shared memory environment. It is therefore critical that all remnants of the Source, except the entry point (initial) code, be removed as the Source prepares to be unloaded.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_OPERATIONERROR   /* Internal Source error; */
                         /* handled by the Source  */
```

See Also

DG_CONTROL / DAT_IDENTITY / MSG_OPENDS

DG_CONTROL / DAT_IDENTITY / MSG_GET

(from Source Manager to Source)

Call

```
DS_Entry(pOrigin, DG_CONTROL, DAT_IDENTITY, MSG_GET, pSourceIdentity);
```

pSourceIdentity = A pointer to a TW_IDENTITY structure.

Valid States

3 through 7 (Yes, the Source must be able to return the identity before it is opened.)

Description

This operation triplet is generated only by the Source Manager and is sent to the Source. It returns the identity structure for the Source.

Source Manager

No special set up or action required.

Source

Fills in all fields of pSourceIdentity except the Id field which is only modified by the Source Manager. This structure was allocated by either the application or the Source Manager depending on which one initiated the MSG_OPENDS operation for the Source.

Note: Sources should locate the code that handles initialization of the Source (responding to MSG_OPENDS) and identification (DAT_IDENTITY / MSG_GET) in the segment first loaded when the DLL/code resource is invoked. Responding to the identification operation should not cause any other segments to be loaded. Code to handle all other operations and to support the user interface should be located in code segments that will be loaded upon demand. Remember, the Source is a "guest" of the application and needs to be sensitive to use of available memory and other system resources. The Source Manager's perceived performance may be adversely affected unless the Source efficiently handles identification requests.

Return Codes

```
TWRC_SUCCESS       /* This operation must succeed. */
```

DG_CONTROL / DAT_IDENTITY / MSG_GETDEFAULT

Call

```
DSM_Entry(pOrigin, NULL, DG_CONTROL, DAT_IDENTITY, MSG_GETDEFAULT,
pSourceIdentity);
```

pSourceIdentity = A pointer to a TW_IDENTITY structure.

Valid States

3 through 7

Description

Gets the identification information of the system default Source.

Application

No special set up or action required.

Source Manager

Fills the structure pointed to by pSourceIdentity with identifying information about the system default Source.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_NODS          /* no Sources found matching       */
                      /* application's SupportedGroups   */
   TWCC_LOWMEMORY     /* not enough memory to perform    */
                      /* this operation                  */
```

See Also

DG_CONTROL / DAT_IDENTITY / MSG_GETFIRST
DG_CONTROL / DAT_IDENTITY / MSG_GETNEXT
DG_CONTROL / DAT_IDENTITY / MSG_OPENDS
DG_CONTROL / DAT_IDENTITY / MSG_USERSELECT

DG_CONTROL / DAT_IDENTITY / MSG_GETFIRST

Call

```
DSM_Entry(pOrigin, NULL, DG_CONTROL, DAT_IDENTITY, MSG_GETFIRST,
pSourceIdentity);
```

pSourceIdentity = A pointer to a TW_IDENTITY structure.

Valid States

3 through 7

Description

The application may obtain a list of all Sources that are currently available on the system which match the application's supported groups (DGs, that the application specified in the SupportedGroups field of its TW_IDENTITY structure). To obtain the complete list of all available Sources requires invocation of a series of operations. The first operation uses MSG_GETFIRST to find the first Source on "the list" (whichever Source the Source Manager finds first). All the following operations use DG_CONTROL / DAT_IDENTITY / MSG_GETNEXT to get the identity information, one at a time, of all remaining Sources.

Note: The application must invoke the MSG_GETFIRST operation before a MSG_GETNEXT operation. If the MSG_GETNEXT is invoked first, the Source Manager will fail the operation (TWRC_ENDOFLIST).

If the application wants to cause a specific Source to be opened, one whose ProductName the application knows, it must first establish the existence of the Source using the MSG_GETFIRST/MSG_GETNEXT operations. Once the application has verified that the Source is available, it can request that the Source Manager open the Source using DG_CONTROL / DAT_IDENTITY / MSG_OPENDS. The application must not execute this operation without first verifying the existence of the Source because the results may be unpredictable.

Application

No special set up or action required.

Source Manager

Fills the TW_IDENTITY structure pointed to by pSourceIdentity with the identity information of the first Source found by the Source Manager within the TWAIN directory/folder.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_NODS           /* No Sources can be found      */
   TWCC_LOWMEMORY      /* Not enough memory to perform */
                       /* this operation               */
```

See Also

DG_CONTROL / DAT_IDENTITY / MSG_GETDEFAULT
DG_CONTROL / DAT_IDENTITY / MSG_GETNEXT
DG_CONTROL / DAT_IDENTITY / MSG_OPENDS
DG_CONTROL / DAT_IDENTITY / MSG_USERSELECT

DG_CONTROL / DAT_IDENTITY / MSG_GETNEXT

Call

```
DSM_Entry(pOrigin, NULL, DG_CONTROL, DAT_IDENTITY, MSG_GETNEXT,
pSourceIdentity);
```

pSourceIdentity = A pointer to a TW_IDENTITY structure.

Valid States

3 through 7

Description

The application may obtain a list of all Sources that are currently available on the system which match the application's supported groups (DGs, that the application specified in the SupportedGroups field of its TW_IDENTITY structure). To obtain the complete list of all available Sources requires invocation of a series of operations. The first operation uses DG_CONTROL / DAT_IDENTITY / MSG_GETFIRST to find the first Source on "the list" (whichever Source the Source Manager finds first). All the following operations use MSG_GETNEXT to get the identity information, one at a time, of all remaining Sources.

Note: The application must invoke the MSG_GETFIRST operation before a MSG_GETNEXT operation. If the MSG_GETNEXT is invoked first, the Source Manager will fail the operation (TWRC_ENDOFLIST).

If the application wants to cause a specific Source to be opened, one whose ProductName the application knows, it must first establish the existence of the Source using the MSG_GETFIRST/MSG_GETNEXT operations. Once the application has verified that the Source is available, it can request that the Source Manager open the Source using DG_CONTROL / DAT_IDENTITY / MSG_OPENDS. The application must not execute this operation without first verifying the existence of the Source because the results may be unpredictable.

Application

No special set up or action required.

Source Manager

Fills the TW_IDENTITY structure pointed to by pSourceIdentity with the identity information of the next Source found by the Source Manager within the TWAIN directory/folder.

Return Codes

```
TWRC_SUCCESS
TWRC_ENDOFLIST        /* after MSG_GETNEXT if no more */
                      /* Sources                      */
TWRC_FAILURE
   TWCC_LOWMEMORY     /* not enough memory to perform */
                      /* this operation               */
```

See Also

DG_CONTROL / DAT_IDENTITY / MSG_GETDEFAULT
DG_CONTROL / DAT_IDENTITY / MSG_GETFIRST
DG_CONTROL / DAT_IDENTITY / MSG_OPENDS
DG_CONTROL / DAT_IDENTITY / MSG_USERSELECT

DG_CONTROL / DAT_IDENTITY / MSG_OPENDS *(from Application to Source Manager)*

Call

```
DSM_Entry(pOrigin, NULL, DG_CONTROL, DAT_IDENTITY, MSG_OPENDS,
pSourceIdentity);
```

pSourceIdentity = A pointer to a TW_IDENTITY structure.

Valid States

3 only (Transitions to State 4, if successful)

Description

Loads the specified Source into main memory and causes its initialization.

Application

The application may specify any available Source's TW_IDENTITY structure in pSourceIdentity. That structure may have been obtained using a MSG_GETFIRST, MSG_GETNEXT, or MSG_USERSELECT operation. If the session with the Source Manager was closed since the identity structure being used was obtained, the application must set the Id field to 0. This will cause the Source Manager to issue the Source a new Id. The application can have the Source Manager open the default Source by setting the ProductName field to "\0" (Null string) and the Id field to zero.

Source Manager

Opens the Source specified by pSourceIdentity and creates a unique Id value for this Source (under Microsoft Windows, this assumes that the Source hadn't already been opened by another application). This value is recorded in pSourceIdentity->Id. The Source Manager passes the triplet on to the Source to have the remaining fields in pSourceIdentity filled in.

Upon receiving the request from the Source Manager, the Source fills in all the fields in pSourceIdentity except for Id. If an application tries to connect to a Source that is already connected to its maximum number of applications, the Source returns TWRC_FAILURE/TWCC_MAXCONNECTIONS.

Warning: The Source and application **must** not assume that the value written into pSourceIdentity.Id will remain constant between sessions. This value is used internally by the Source Manager to uniquely identify applications and Sources and to manage the connections between them. During a different session, this value may still be valid but might be assigned to a different application or Source! Don't use this value directly.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_LOWMEMORY        /* not enough memory to */
                         /* open the Source      */
   TWCC_MAXCONNECTIONS   /* Source cannot support*/
                         /* another connection   */
   TWCC_NODS             /* specified Source was */
                         /* not found            */
   TWCC_OPERATIONERROR   /* internal Source error;*/
                         /* handled by the Source */
```

See Also

DG_CONTROL / DAT_IDENTITY / MSG_CLOSEDS
DG_CONTROL / DAT_IDENTITY / MSG_GET
DG_CONTROL / DAT_IDENTITY / MSG_GETDEFAULT
DG_CONTROL / DAT_IDENTITY / MSG_GETFIRST
DG_CONTROL / DAT_IDENTITY / MSG_GETNEXT
DG_CONTROL / DAT_IDENTITY / MSG_USERSELECT

DG_CONTROL / DAT_IDENTITY / MSG_OPENDS *(from Source Manager to Source)*

Call

```
DS_Entry(pOrigin, DG_CONTROL, DAT_IDENTITY, MSG_OPENDS, pSourceIdentity);
```

pSourceIdentity = A pointer to a TW_IDENTITY structure.

Valid States

Source is loaded but not yet open (approximately State 3.5, session transitions to State 4, if successful).

Description

Opens the Source for operation.

Source Manager

pSourceIdentity is filled in from a previous DG_CONTROL / DAT_IDENTITY / MSG_GET and the Id field should be filled in by the Source Manager.

Source

Initializes any needed internal structures, performs necessary checks, and loads all resources needed for normal operation.

Windows only: Source should record a copy of *pOrigin, the application's TW_IDENTITY structure, whose Id field maintains a unique number identifying the application that is calling. Sources that support only a single connection should examine pOrigin->Id for each operation to verify they are being called by the application they acknowledge being connected with. All requests from other applications should fail (TWRC_FAILURE / TWCC_MAXCONNECTIONS). The Source is responsible for managing this, not the Source Manager (the Source Manager does not know in advance how many connections the Source will support).

Macintosh Note: Since the Source(s) and the Source Manager connected to a particular application live within that application's heap space, and are not shared with any other application, the discussion about multiply-connected Sources and verifying which application is invoking an operation is not relevant. A Source or Source Manager on the Macintosh can only be connected to a single application, though multiple copies of a Source or the Source Manager may be active on the same host simultaneously. These instances simply exist in different applications' heaps. If the instances need to communicate with one another, they might use a special resource file or may use the program's resource file on disk. The Source Manager manages its various instances in this way.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_LOWMEMORY         /* not enough memory to  */
                          /* open the Source       */
   TWCC_MAXCONNECTIONS    /* Source cannot support */
                          /* another connection    */
   TWCC_OPERATIONERROR    /* internal Source error;*/
                          /* handled by the Source */
```

See Also

DG_CONTROL / DAT_IDENTITY / MSG_CLOSEDS
DG_CONTROL / DAT_IDENTITY / MSG_GET

DG_CONTROL / DAT_IDENTITY / MSG_USERSELECT

Call

```
DSM_Entry(pOrigin, NULL, DG_CONTROL, DAT_IDENTITY, MSG_USERSELECT,
pSourceIdentity);
```

pSourceIdentity = A pointer to a TW_IDENTITY structure.

Valid States

3 through 7

Description

This operation should be invoked when the user chooses **Select Source...** from the application's **File** menu (or an equivalent user action). This operation causes the Source Manager to display the Select Source dialog. This dialog allows the user to pick which Source will be used during subsequent **Acquire** operations. The Source selected becomes the system default Source. This default persists until a different Source is selected by the user. The system default Source may be overridden by an application (the override is local to only that application). Only Sources that can supply data matching one or more of the application's SupportedGroups (from the application's identity structure) will be selectable. All others will be unavailable for selection.

Application

If the application wants a particular Source, other than the system default, to be highlighted in the Select Source dialog, it should set the ProductName field of the structure pointed to by pSourceIdentity to the ProductName of that Source. This information should have been obtained from an earlier operation using DG_CONTROL / DAT_IDENTITY / MSG_GETFIRST, MSG_GETNEXT, or MSG_USERSELECT. Otherwise, the application should set the ProductName field in pSourceIdentity to the null string ("\0"). In either case, the application should set the Id field in pSourceIdentity to zero.

If the Source Manager can't find a Source whose ProductName matches that specified by the application, it will select the system default Source (the default that matches the SupportedGroups of the application). This is not considered to be an error condition. No error will be reported. The application should check the ProductName field of pSourceIdentity following this operation to verify that the Source it wanted was opened.

Source Manager

The Source Manager displays the Select Source dialog and allows the user to select a Source. When the user clicks the "OK" button ("Select" button in the Microsoft Windows Source Manager) in the Select Source dialog, the system default Source (maintained by the Source Manager) will be changed to the selected Source. This Source's identifying information will be written into pSourceIdentity.

The “Select” button (“OK” button in the Macintosh Source Manager) will be grayed out if there are no Sources available matching the SupportedGroups specified in the application’s identity structure, pOrigin. The user must click the “Cancel” button to exit the Select Source dialog. The application cannot discern from this Return Code whether the user simply canceled the selection or there were no Sources for the user to select. If the application really wants to know whether any Sources are available that match the specified SupportedGroups it can invoke a MSG_GETFIRST operation and check for a successful result.

It copies the TW_IDENTITY structure of the selected Source into pSourceIdentity.

Suggestion for Source Developers: The string written in the Source’s TW_IDENTITY.ProductName field should clearly and unambiguously identify your product or the Source to the user (if the Source can be used to control more than one device). ProductName contains the string that will be placed in the Select Source dialog (accompanied, on the Macintosh, with an icon from the Source’s resource file representing the Source). It is further suggested that the Source’s disk file name approximate the ProductName to assist the user in equating the two.

Return Codes

```
TWRC_SUCCESS
TWRC_CANCEL         /* User clicked cancel button - maybe there   */
                    /* were no Sources                            */
TWRC_FAILURE
   TWCC_LOWMEMORY   /* not enough memory to perform this  */
                    /* operation                          */
```

See Also

DG_CONTROL / DAT_IDENTITY / MSG_GETDEFAULT
DG_CONTROL / DAT_IDENTITY / MSG_GETFIRST
DG_CONTROL / DAT_IDENTITY / MSG_GETNEXT
DG_CONTROL / DAT_IDENTITY / MSG_OPENDS

DG_CONTROL / DAT_NULL / MSG_CLOSEDSREQ *(from Source to Application - Windows only)*

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_NULL, MSG_CLOSEDSREQ, NULL);
```

This operation requires no data (NULL).

Valid States

5 through 7 (This operation causes the session to transition to State 5.)

Description

While the Source is enabled, the application is sending all events / messages to the Source. The Source will use one of these events / messages to indicate to the application that it needs to be closed.

On Windows, the Source sends this DG_CONTROL / DAT_NULL / MSG_CLOSEDSREQ to the Source Manager to cause the Source Manager to post a private message to the application's event / message loop. This guarantees that the application will have an event / message to pass to the Source Manager so it will be able to communicate the Source's Close request back to the application.

On Macintosh, the application simply sends Null events to the Source periodically to ensure it has a communication carrier when needed. Therefore, this operation is not used on a Macintosh implementation.

Source (on Windows only)

Source creates this triplet with NULL data and sends it to the Source Manager via the Source Manager's DSM_Entry point.

pDest is the TW_IDENTITY structure of the application.

Source Manager (on Windows only)

Upon receiving this triplet, the Source Manager posts a private message to the application's event / message loop. Since the application is forwarding all events / messages to the Source while the Source is enabled, this creates a communication device needed by the Source. When this private message is received by the Source Manager (via the DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT operation), the Source Manager will insert a MSG_CLOSEDSREQ into the TWMessage field on behalf of the Source.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_SEQERROR    /* Operation invoked in invalid state */
   TWCC_BADDEST     /* No such application in session with*/
                    /* Source                             */
```

See Also

DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT
DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS

DG_CONTROL / DAT_NULL / MSG_DEVICEEVENT *(from Source to Application)*

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_NULL, MSG_DEVICEEVENT, NULL);
```

This operation requires no data (NULL)

Valid States

4 through 7

Description

When enabled the source sends this message to the Application to alert it that some event has taken place. Upon receiving this message, the Application must immediately issue a call to DG_CONTROL / DAT_DEVICEEVENT / MSG_GET to obtain the event information.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_SEQERROR - operation invoked in invalid state.
   TWCC_BADDEST - no such application in session with Source.
```

See Also

DG_CONTROL / DAT_DEVICEEVENT / MSG_GET

Capability - CAP_DEVICEEVENT

DG_CONTROL / DAT_NULL / MSG_XFERREADY *(from Source to Application - applies to Windows only)*

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_NULL, MSG_XFERREADY, NULL);
```

This operation requires no data (NULL).

Valid States

5 only (This operation causes the transition to State 6.)

Description

While the Source is enabled, the application is sending all events / messages to the Source. The Source will use one of these events / messages to indicate to the application that the data is ready to be transferred.

On Windows, the Source sends this DG_CONTROL / DAT_NULL / MSG_XFERREADY to the Source Manager to cause the Source Manager to post a private message to the application's event / message loop. This guarantees that the application will have an event / message to pass to the Source and the Source will be able to communicate its "transfer ready" announcement back to the application.

On Macintosh, the application simply sends Null events to the Source periodically to ensure it has a communication carrier when needed. Therefore, this operation is not used on a Macintosh implementation.

Source (on Windows only)

Source creates this triplet with NULL data and sends it to the Source Manager via the Source Manager's DSM_Entry point.

pDest is the TW_IDENTITY structure of the application.

Source Manager

Upon receiving this triplet, the Source Manager posts a private message to the application's event / message loop. Since the application is forwarding all events / messages to the Source while the Source is enabled, this creates a communication device needed by the Source. When this private message is received by the Source Manager (via the DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT operation), the Source Manager will insert the MSG_XFERREADY into the TWMessage field on behalf of the Source.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_SEQERROR     /* Operation invoked in invalid state */
   TWCC_BADDEST      /* No such application in session with*/
                     /* Source                             */
```

See Also

DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT
DG_IMAGE / DAT_IMAGEFILEXFER / MSG_GET
DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET
DG_IMAGE / DAT_IMAGENATIVEXFER / MSG_GET

DG_CONTROL / DAT_PARENT / MSG_CLOSEDSM

Call

```
DSM_Entry(pOrigin, NULL, DG_CONTROL, DAT_PARENT, MSG_CLOSEDSM, pParent);
```

On Windows - pParent = points to the window handle (hWnd) that will act as the Source's "parent". The variable is of type TW_INT32 and the low word of this variable must contain the window handle.

On Macintosh - pParent = should be a 32-bit NULL value.

Valid States

3 **only** (causes transition back to State 2, if successful)

Description

When the application has closed all the Sources it had previously opened, and is finished with the Source Manager (the application plans to initiate no other TWAIN sessions), it must close the Source Manager. The application should unload the Source Manager DLL or code resource after the Source Manager is closed—unless the application has immediate plans to use the Source Manager again.

Application

References the same pParent parameter that was used during the "open Source Manager" operation. If the operation returns TWRC_SUCCESS, the application should unload the Source Manager from memory.

Source Manager

Does any housekeeping needed to prepare for being unloaded from memory. This housekeeping is transparent to the application.

Windows only—If the Source Manager is open to at least one other application, it will clean up just activities relative to the closing application, then return TWRC_SUCCESS. The application will attempt to unload the Source Manager DLL. Windows will tell the application that the unload was successful, but the Source Manager will remain active and connected to the other application(s).

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_SEQERROR      /* Operation invoked in invalid state */
```

See Also

DG_CONTROL / DAT_PARENT / MSG_OPENDSM

DG_CONTROL / DAT_PARENT / MSG_OPENDSM

Call

```
DSM_Entry(pOrigin, NULL, DG_CONTROL, DAT_PARENT, MSG_OPENDSM, pParent);
```

On Windows - pParent = points to the window handle (hWnd) that will act as the Source's "parent". The variable is of type TW_INT32 and the low word of this variable must contain the window handle.

On Macintosh - pParent = should be a 32-bit NULL value.

Valid States

2 **only** (causes transition to State 3, if successful)

Description

Causes the Source Manager to initialize itself. This operation **must** be executed before any other operations will be accepted by the Source Manager.

Application

Windows only—The application should set the pParent parameter to point to a window handle (hWnd) of an open window that will remain open until the Source Manager is closed. If application can't open the Source Manager DLL, Windows displays an error box (this error box can be disabled by a prior call to SetErrorMode (SET_NOOPENFILEERRORBOX)).

Macintosh only—Set pParent to NULL.

Source Manager

Initializes and prepares itself for subsequent operations. Maintains a copy of pParent.

Windows only—If Source Manager is already open, Source Manager won't reinitialize but will retain a copy of pParent.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_LOWMEMORY      /* not enough memory to perform */
                       /* this operation               */
   TWCC_SEQERROR       /* Operation invoked in invalid */
                       /* state                        */
```

See Also

DG_CONTROL / DAT_PARENT / MSG_CLOSEDSM

DG_CONTROL / DAT_PASSTHRU / MSG_PASSTHRU

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_PASSTHRU,MSG_PASSTHRU,
   pSourcePassthru);
```

pSourcePassthru = A pointer to a TW_PASSTHRU structure

Valid States

4 through 7

Description

PASSTHRU is intended for the use of Source writers writing diagnostic applications. It allows raw communication with the currently selected device in the Source.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL - capability not supported.
   TWCC_SEQERROR - command could not be completed in this state.
```

See Also

CAP_PASSTHRU

DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_PENDINGXFERS, MSG_ENDXFER,
   pPendingXfers);
```

pPendingXfers = A pointer to a TW_PENDINGXFERS structure

Valid States

6 and 7

When DAT_XFERGROUP is set to DG_IMAGE:

(Transitions to State 5 if this was the last transfer (pPendingXfers->Count == 0). Transitions to State 6 if there are more transfers pending (pPendingXfers->Count != 0). To abort all remaining transfers and transition from State 6 to State 5, use DG_CONTROL / DAT_PENDINGXFERS / MSG_RESET.

When DAT_XFERGROUP is set to DG_AUDIO:

Transitions to State 6 no matter what the value of pPendingXfers->Count.

Description

This triplet is used to cancel or terminate a transfer. Issued in state 6, this triplet cancels the next pending transfer, discards the transfer data, and decrements the pending transfers count. In state 7, this triplet terminates the current transfer. If any data has not been transferred (this is only possible during a memory transfer) that data is discarded.

The application can use this operation to cancel the next pending transfer (Source writers take note of this). For example, after the application checks TW_IMAGEINFO (or TW_AUDIOINFO, if transferring audio snippets), it may decide to not transfer the next image. The operation must be sent prior to the beginning of the transfer, otherwise the Source will simply abort the current transfer. The Source decrements the number of pending transfers.

Application

The application must invoke this operation at the end of every transfer to signal the Source that the application has received all the data it expected. The application should send this after receiving a TWRC_XFERDONE or TWRC_CANCEL.

No special set up or action required. Be sure to correctly track which state the Source will be in as a result of your action. Be aware of the value in pPendingXfers->Count both before and after the operation. Invoking this operation causes the loss of data that your user may not expect to be lost. Be very careful and prudent when using this operation.

Source

Option #1) Fill pPendingXfers->Count with the number of transfers the Source is ready to supply to the application, upon demand. If pPendingXfers->Count > 0 (or equals -1),

transition to State 6 and await initiation of the next transfer by the application. If pPendingXfers->Count == 0, transition all the way back to State 5 and await the next acquisition.

Option #2) Preempt the acquired data that is next in line for transfer to the application (pending transfers can be thought of as being pushed onto a FIFO queue as acquired and popped off the queue when transferred). Decrement pPendingXfers->Count. If already acquired, discard the data for the preempted transfer. Update pPendingXfers->Count with the new number of pending transfers. If this value is indeterminate, leave the value in this field at -1. Note: -1 is not a valid value for the number of audio snippets.

Option #3) Cancel the current transfer. Discard any local buffers or data involved in the transfer. Prepare the Source and the device for the next transfer. Decrement pPendingXfers->Count (donÆt decrement if already zero or -1). If there is a transfer pending, return to State 6 and prepare the Source to begin the next transfer. If no transfer is pending, return to State 5 and await initiation of the next acquisition from the application or the user. Note: when DAT_XFERGROUP is set to DG_AUDIO, the Source will not go lower than State 2 based on the value of pPendingXfers->Count.

Note: If a Source supports simultaneous connections to more than one application, the Source should maintain a separate pPendingXfers structure for each application it is in-session with.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST  /* No such Source in-session with application */
   TWCC_SEQERROR /* Operation invoked in invalid state         */
```

See Also

DG_AUDIO / DAT_AUDIOFILEXFER / MSG_GET
DG_AUDIO / DAT_AUDIONATIVEXFER / MSG_GET
DG_CONTROL / DAT_PENDINGXFERS / MSG_GET
DG_CONTROL / DAT_PENDINGXFERS / MSG_RESET
DG_CONTROL / DAT_XFERGROUP / MSG_SET
DG_IMAGE / DAT_IMAGEFILEXFER / MSG_GET
DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET
DG_IMAGE / DAT_IMAGENATIVEXFER / MSG_GET

Capability - CAP_XFERCOUNT

DG_CONTROL / DAT_PENDINGXFERS / MSG_GET

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_PENDINGXFERS,
   MSG_GET, pPendingXfers);
```

pPendingXfers = A pointer to a TW_PENDINGXFERS structure

Valid States

4 through 7

Description

Returns the number of transfers the Source is ready to supply to the application, upon demand. If DAT_XFERGROUP is set to DG_IMAGE, this is the number of images. If DAT_XFERGROUP is set to DG_AUDIO, this is the number of audio snippets for the current image. If there is no current image, this call must return TWRC_FAILURE / TWCC_SEQERROR.

Application

No special set up or action required.

Source

Fill pPendingXfers->Count with the number of transfers the Source is ready to supply to the application, upon demand. This value should reflect the number of complete data blocks that have already been acquired or are in the process of being acquired.

When DAT_XFERGROUP is set to DG_IMAGE:

If the Source is not sure how many transfers are pending, but is sure that the number is at least one, set pPendingXfers->Count to -1. A Source connected to a device with an automatic document feeder that cannot determine the number of pages in the feeder, or how many selections the user may make on each page, would respond in this way. A Source providing access to a series of images from a video camera or a data base may also respond this way.

When DAT_XFERGROUP is set to DG_AUDIO:

-1 is not a valid value for pPendingXfers->Count.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST   /* No such Source in-session with application */
   TWCC_SEQERROR  /* Operation invoked in invalid state         */
```

See Also

DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER
DG_CONTROL / DAT_PENDINGXFERS / MSG_RESET
DG_CONTROL / DAT_XFERGROUP / MSG_SET

Capability - CAP_XFERCOUNT

DG_CONTROL / DAT_PENDINGXFERS / MSG_RESET

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_PENDINGXFERS,
   MSG_RESET, pPendingXfers);
```

pPendingXfers = A pointer to a TW_PENDINGXFERS structure

Valid States

When DAT_XFERGROUP is set to DG_IMAGE:

6 only (Transitions to State 5, if successful)

When DAT_XFERGROUP is set to DG_AUDIO:

6 only (State remains at 6)

Description

Sets the number of pending transfers in the Source to zero.

Application

When DAT_XFERGROUP is set to DG_IMAGE:

No special set up or action required. Be aware of the state transition caused by this operation. Invoking this operation causes the loss of data that your user may not expect to be lost. Be very careful and prudent when using this operation. The application may need to use this operation if an error occurs within the application that necessitates breaking off all TWAIN sessions. This will get the application, Source Manager, and Source back to State 5 together.

When DAT_XFERGROUP is set to DG_AUDIO:

The available audio snippets are discarded, but the Source remains in State 6.

Source

Set pPendingXfers->Count to zero. Discard any local buffers or data involved in any of the pending transfers.

When DAT_XFERGROUP is set to DG_IMAGE:

Return to State 5 and await initiation of the next acquisition from the application or the user.

When DAT_XFERGROUP is set to DG_AUDIO:

Remain in State 6.

Note: If a Source supports simultaneous sessions with more than one application, the Source should maintain a separate pPendingXfers structure for each application it is in-session with.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST   /* No such Source in-session with application */
   TWCC_SEQERROR  /* Operation invoked in invalid state         */
```

See Also

DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER
DG_CONTROL / DAT_PENDINGXFERS / MSG_GET
DG_CONTROL / DAT_XFERGROUP / MSG_SET

Capability - CAP_XFERCOUNT

DG_CONTROL / DAT_SETUPFILEXFER / MSG_GET

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_SETUPFILEXFER,
   MSG_GET, pSetupFile);
```

pSetupFile = A pointer to a TW_SETUPFILEXFER structure

Valid States

4 through 6

Description

Returns information about the file into which the Source has or will put the acquired DG_IMAGE or DG_AUDIO data.

Application

No special set up or action required.

Source

Set the following:

```
pSetupFile->Format = format of destination file
       (DG_IMAGE Constants: TWFF_TIFF, TWFF_PICT, TWFF_BMP, etc.)
       (DG_AUDIO Constants: TWAF_WAV, TWAF_AIFF, TWAF_AU, etc.)
pSetupFile->FileName = name of file
       (on Windows, include the complete path name)
pSetupFile->VRefNum = volume reference number
       (Macintosh only)
```

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST     /* No such Source in-session with application */
   TWCC_BADPROTOCOL /* Source does not support file transfer      */
   TWCC_SEQERROR    /* Operation invoked in invalid state         */
```

See Also

DG_CONTROL / DAT_SETUPFILEXFER / MSG_GETDEFAULT
DG_CONTROL / DAT_SETUPFILEXFER / MSG_RESET
DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET
DG_IMAGE / DAT_IMAGEFILEXFER / MSG_GET

Capabilities - ICAP_XFERMECH, ICAP_IMAGEFILEFORMAT, ACAP_XFERMECH, ACAP_AUDIOFILEFORMAT

DG_CONTROL / DAT_SETUPFILEXFER / MSG_GETDEFAULT

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_SETUPFILEXFER,
   MSG_GETDEFAULT, pSetupFile);
```

pSetupFile = A pointer to a TW_SETUPFILEXFER structure

Valid States

4 through 6

Description

Returns information for the default DG_IMAGE or DG_AUDIO file.

Application

No special set up or action required.

Source

Set the following:

```
pSetupFile->Format = format of destination file
      (DG_IMAGE Constants: TWFF_TIFF, TWFF_PICT, TWFF_BMP, etc.)
      (DG_AUDIO Constants: TWAF_WAV, TWAF_AIFF, TWAF_AU, etc.)
pSetupFile->FileName = name of file
      (on Windows, include the complete path name)
pSetupFile->VRefNum = volume reference number
      (Macintosh only)
```

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST     /* No such Source in-session with application */
   TWCC_BADPROTOCOL /* Source does not support file transfer      */
   TWCC_SEQERROR    /* Operation invoked in invalid state         */
```

See Also

DG_CONTROL / DAT_SETUPFILEXFER / MSG_GET
DG_CONTROL / DAT_SETUPFILEXFER / MSG_RESET
DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET
DG_IMAGE / DAT_IMAGEFILEXFER / MSG_GET

Capabilities - ICAP_XFERMECH, ICAP_IMAGEFILEFORMAT, ACAP_XFERMECH, ACAP_AUDIOFILEFORMAT

DG_CONTROL / DAT_SETUPFILEXFER / MSG_RESET

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_SETUPFILEXFER,
   MSG_RESET, pSetupFile);
```

pSetupFile = A pointer to a TW_SETUPFILEXFER structure

Valid States

4 only

Description

Resets the current file information to the DG_IMAGE or DG_AUDIO default file information and returns that default information..

Application

No special set up or action required.

Source

Set the following:

```
pSetupFile->Format = format of destination file
       (DG_IMAGE Constants: TWFF_TIFF, TWFF_PICT, TWFF_BMP, etc.)
       (DG_AUDIO Constants: TWAF_WAV, TWAF_AIFF, TWAF_AU, etc.)
pSetupFile->FileName = name of file
       (on Windows, include the complete path name)
pSetupFile->VRefNum = volume reference number
       (Macintosh only)
```

Note: VRefNum should be set to reflect the default file only if it already exists). Otherwise, set this field to NULL.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST     /* No such Source in-session with application */
   TWCC_BADPROTOCOL /* Source does not support file transfer      */
   TWCC_SEQERROR    /* Operation invoked in invalid state         */
```

See Also

DG_CONTROL / DAT_SETUPFILEXFER / MSG_GET
DG_CONTROL / DAT_SETUPFILEXFER / MSG_GETDEFAULT
DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET
DG_IMAGE / DAT_IMAGEFILEXFER / MSG_GET

Capabilities - ICAP_XFERMECH, ICAP_IMAGEFILEFORMAT, ACAP_XFERMECH, ACAP_AUDIOFILEFORMAT

DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET

Call

```
DSM_Entry (pOrigin, pDest, DG_CONTROL, DAT_SETUPFILEXFER,
   MSG_SET, pSetupFile);
```

pSetupFile = A pointer to a TW_SETUPFILEXFER structure

Valid States

4 through 6

Description

Sets the file transfer information for the next file transfer. The application is responsible for verifying that the specified file name is valid and that the file either does not currently exist (in which case, the Source is to create the file), or that the existing file is available for opening and read / write operations. The application should also assure that the file format it is requesting can be provided by the Source (otherwise, the Source will generate a TWRC_FAILURE / TWCC_BADVALUE error).

Application

Set the following:

```
pSetupFile->Format = format of destination file
        (DG_IMAGE Constants: TWFF_TIFF, TWFF_PICT, TWFF_BMP, etc.)
        (DG_AUDIO Constants: TWAF_WAV, TWAF_AIFF, TWAF_AU, etc.)
pSetupFile->FileName = name of file
        (on Windows, include the complete path name)
pSetupFile->VRefNum = volume reference number
        (Macintosh only)
```

Note: ICAP_XFERMECH or ACAP_XFERMECH (depending on the value of DAT_XFERGROUP) must have been set to TWSX_FILE during previous capability negotiation.

Source

Use the specified file format and file name information to transfer the next file to the application. If any part of the information being set is wrong or missing, use the SourceÆs default file (TWAIN.TMP in the current directory for DG_IMAGE data, or TWAIN.AUD in the current directory for DG_AUDIO data) and return TWRC_FAILURE with TWCC_BADVALUE. If the format and file name are OK, but a file error occurs when trying to open the file (other than "file does not existö), return TWCC_BADVALUE and set up to use the default file. If the specified file does not exit, create it. If the file exists and has data in it, overwrite the existing data starting with the first byte of the file.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST     /* No such Source in-session with application */
   TWCC_BADPROTOCOL /* Source does not support file transfer      */
   TWCC_BADVALUE    /* Source cannot comply with one of the       */
                    /* settings                                   */
   TWCC_SEQERROR    /* Operation invoked in invalid state         */
```

See Also

DG_CONTROL / DAT_SETUPFILEXFER / MSG_GET
DG_CONTROL / DAT_SETUPFILEXFER / MSG_GETDEFAULT
DG_CONTROL / DAT_SETUPFILEXFER / MSG_RESET
DG_IMAGE / DAT_IMAGEFILEXFER / MSG_GET

Capabilities - ICAP_XFERMECH, ICAP_IMAGEFILEFORMAT,
ACAP_XFERMECH, ACAP_AUDIOFILEFORMAT

DG_CONTROL / DAT_SETUPMEMXFER / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_SETUPMEMXFER, MSG_GET, pSetupMem);
```

pSetupMem = A pointer to a TW_SETUPMEMXFER structure.

Valid States

4 through 6

Description

Returns the Source's preferred, minimum, and maximum allocation sizes for transfer memory buffers. The application using buffered memory transfers must use a buffer size between MinBufSize and MaxBufSize in their TW_IMAGEMEMXFER.Memory.Length when using the DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET operation. Sources may return a more efficient preferred value in State 6 after the image size, etc. has been specified.

Application

No special set up or action required.

Source

Set the following:

pSetupMem->MinBufSize = minimum usable buffer size, in bytes

pSetupMem->MaxBufSize = maximum usable buffer size, in bytes (-1 means an indeterminately large buffer is acceptable)

pSetupMem->Preferred = preferred transfer buffer size, in bytes

If the Source doesn't care about the size of any of these specifications, set the field(s) to TWON_DONTCARE32. This signals the application that any value for that field is OK with the Source.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST     /* No such Source in-session with */
                    /* application                    */
   TWCC_SEQERROR    /* Operation invoked in invalid   */
                    /* state                          */
```

See Also

DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET

Capabilities - ICAP_COMPRESSION, ICAP_XFERMECH

DG_CONTROL / DAT_STATUS / MSG_GET

(from Application to Source Manager)

Call

```
DSM_Entry(pOrigin, NULL, DG_CONTROL, DAT_STATUS, MSG_GET, pSourceStatus);
```

pSourceStatus = A pointer to a TW_STATUS structure.

Valid States

2 through 7

Description

Returns the current Condition Code for the Source Manager.

Application

NULL references the operation to the Source Manager.

Source Manager

Fills pSourceStatus->ConditionCode with its current Condition Code. Then, it will clear its internal Condition Code so you cannot issue a status inquiry twice for the same error (the information is lost after the first request).

Return Codes

```
TWRC_SUCCESS       /* This operation must succeed     */
TWRC_FAILURE
   TWCC_BADDEST    /* No such Source in-session with */
                   /* application                    */
```

See Also

Return Codes and Condition Codes (Chapter 10)

DG_CONTROL / DAT_STATUS / MSG_GET *(from Application to Source)*

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_STATUS, MSG_GET, pSourceStatus);
```

pSourceStatus = A pointer to a TW_STATUS structure.

Valid States

4 through 7

Description

Returns the current Condition Code for the specified Source.

Application

pDest references a copy of the targeted Source's identity structure.

Source

Fills pSourceStatus->ConditionCode with its current Condition Code. Then, it will clear its internal Condition Code so you cannot issue a status inquiry twice for the same error (the information is lost after the first request).

Return Codes

```
TWRC_SUCCESS        /* This operation must succeed     */
TWRC_FAILURE
   TWCC_BADDEST     /* No such Source in-session with */
                    /* application                    */
```

See Also

Return Codes and Condition Codes (Chapter 10)

DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_USERINTERFACE, MSG_DISABLEDS,
pUserInterface);
```

pUserInterface = A pointer to a TW_USERINTERFACE structure.

Valid States

5 only (Transitions to State 4, if successful)

Description

This operation causes the Source's user interface, if displayed during the DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS operation, to be lowered. The Source is returned to State 4, where capability negotiation can again occur. The application can invoke this operation either because it wants to shut down the current session, or in response to the Source "posting" a MSG_CLOSEDSREQ event to it. Rarely, the application may need to close the Source because an error condition was detected.

Application

References the same pUserInterface structure as during the MSG_ENABLEDS operation. This implies that the application keep a copy of this structure locally as long as the Source is enabled.

If the application did not display the Source's built-in user interface, it will most likely invoke this operation either when all transfers have been completed or aborted (TW_PENDINGXFERS.Count = 0).

Source

If the Source's user interface is displayed, it should be lowered. The Source returns to State 4 and is again available for capability negotiation.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST       /* No such Source in-session */
                      /* with application          */
   TWCC_SEQERROR      /* Operation invoked in      */
                      /* invalid state             */
```

See Also

DG_CONTROL / DAT_NULL / MSG_CLOSEDSREQ
DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS

Event loop information (in Chapter 3)

DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_USERINTERFACE, MSG_ENABLEDS,
pUserInterface);
```

pUserInterface = A pointer to a TW_USERINTERFACE structure

Valid States

4 only (Transitions to State 5, if successful)

Description

This operation causes three responses in the Source:

- Places the Source into a "ready to acquire" condition. If the application raises the Source's user interface (see #2, below), the Source will wait to assert MSG_XFERREADY until the "GO" button in its user interface or on the device is clicked. If the application bypasses the Source's user interface, this operation causes the Source to become immediately "armed". That is, the Source should assert MSG_XFERREADY as soon as it has data to transfer.
- The application can choose to raise the Source's built-in user interface, or not, using this operation. The application signals the Source's user interface should be displayed by setting pUserInterface->ShowUI to TRUE. If the application does not want the Source's user interface to be displayed, or wants to replace the Source's user interface with one of its own, it sets pUserInterface->ShowUI to FALSE. If activated, the Source's user interface will remain displayed until it is closed by the user or explicitly disabled by the application (see Note).
- Terminates Source's acceptance of "set capability" requests from the application. Capabilities can only be negotiated in State 4 (unless special arrangements are made using the CAP_EXTENDEDCAPS capability). Values of capabilities can still be inquired in States 5 through 7.

Note: Once the Source is enabled, the application **must** begin sending the Source every event that enters the application's main event loop. The application must continue to send the Source events until it disables (MSG_DISABLEDS) the Source. This is true even if the application chooses not to use the Source's built-in user interface.

Application

Set pUserInterface->ShowUI to TRUE to display the Source's built-in user interface, or to FALSE to place the Source in an "armed" condition so that it is immediately prepared to acquire data for transfer. Set ShowUI to FALSE only if bypassing the Source's built-in user interface—that is, only if the application is prepared to handle all user interaction necessary to acquire data from the selected Source.

Sources are not required to be enabled without showing their User Interface (i.e. TW_USERINTERFACE.ShowUI = FALSE). If a Source does not support ShowUI = FALSE, they will continue to be enabled just as if ShowUI = TRUE, but return TWRC_CHECKSTATUS. The application can check for this Return Code and continue knowing the Source's User Interface is being displayed.

Watch the value of pUserInterface->ModalUI after the operation has completed to see if the Source's user interface is modal or modeless.

The application must maintain a local copy of pUserInterface while the Source is enabled.

Windows only—The application should place a handle (hWnd) to the window acting as the Source's parent into pUserInterface->hParent.

Macintosh only—Set pUserInterface->hParent to NULL.

Note: Application should establish that the Source can supply compatible ICAP_PIXELTYPEs and ICAP_BITDEPTHs prior to enabling the Source. The application **must** verify that the Source can supply data of a type it can consume. If this operation fails, the application should notify the user that the device and application are incompatible due to data type mismatch. If the application diligently sets SupportedGroups in its identity structure before it tries to open the Source, the Source Manager will, in the Select Source dialog or through the MSG_GETFIRST/MSG_GETNEXT mechanism, filter out the Sources that don't match these SupportedGroups.

Source

If pUserInterface->ShowUI is TRUE, the Source should display its user interface and wait for the user to initiate an acquisition. If pUserInterface->ShowUI is FALSE, the Source should immediately begin acquiring data based on its current configuration (a device that requires the user to push a button on the device, such as a hand-scanner, will be "armed" by this operation and will assert MSG_XFERREADY as soon as the Source has data ready for transfer). The Source should fail any attempt to set a capability value (TWRC_FAILURE / TWCC_SEQERROR) until it returns to State 4 (unless an exception approval exists via a CAP_EXTENDEDCAPS agreement).

Set pUserInterface->ModalUI to TRUE if your built-in user interface is modal. Otherwise, set it to FALSE.

Note: While the Source's user interface is raised, the Source is responsible for presenting the user with appropriate progress indicators regarding the acquisition and transfer processes unless the application has set CAP_INDICATORS to FALSE. The Source must also report errors to the user (without regard for the settings of CAP_INDICATORS and ShowUI, i.e. they may be set to FALSE and errors still must be reported).

It is strongly recommended that all Sources support being enabled without their User Interface if the application requests (TW_USERINTERFACE.ShowUI = FALSE). But if your Source cannot be used without its User Interface, it should enable showing the Source User Interface (just as if ShowUI = TRUE) but return TWRC_CHECKSTATUS. All Sources, however, must support the CAP_UICONTROLLABLE. This capability reports whether or not a Source allows ShowUI = FALSE. An application can use this capability to know whether the Source-supplied user interface can be suppressed before it is displayed.

Return Codes

```
TWRC_SUCCESS
TWRC_CHECKSTATUS            /* Source cannot enable     */
                            /* without User Interface   */
                            /* so it enabled with the   */
                            /* User Interface.          */
TWRC_FAILURE
   TWCC_BADDEST             /* No such Source in-session */
                            /* with application          */
   TWCC_LOWMEMORY           /* Not enough memory to open */
                            /* the Source                */
   TWCC_OPERATIONERROR      /* Internal Source error;    */
                            /* handled by the Source     */
   TWCC_SEQERROR            /* Operation invoked in      */
                            /* invalid state             */
```

See Also

DG_CONTROL / DAT_NULL / MSG_CLOSEDSREQ
DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS

Capability - CAP_INDICATORS

Event loop information (in Chapter 3)

DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDSUIONLY

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_USERINTERFACE,
MSG_ENABLEDSUIONLY, pUserInterface);
```

pUserInterface = A pointer to a TW_USERINTERFACE structure.

Valid States

4 only (transitions to State 5, if successful)

Description

This operation is very similar to DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS operation except that no image transfer will take place. This operation is used by applications that wish to display the source user interface to allow the user to manipulate the sources current settings for DPI, paper size, etc. but not acquire an image. The ShowUI member of the TW_USERINTERFACE structure is ignored since this operations only purpose is to display the source UI. The other members of the TW_USERINTERFACE structure have the same meaning as in the DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS operation.

This operation has the following effects.

1. The source transitions from state 4 to state 5. The source will display its user interface dialog but will not have a scan button (unless its only purpose is to preview the image).
2. The application must begin sending the Source every event that enters the applications main event loop. This mechanism is the same as in the MSG_ENABLEDS operation.
3. When the user hits OK or cancel from the source user interface dialog the source will transition back to state 4 and return either MSG_CLOSEDSOK or MSG_CLOSEDSREQ in the TWMessage field of the TW_EVENT structure that the application has passed along to the source.

DG_CONTROL / DAT_XFERGROUP / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_CONTROL, DAT_XFERGROUP, MSG_GET, pXferGroup);
```

pXferGroup = A pointer to a TW_UINT32 value.

Valid States

4 through 6

Description

Returns the Data Group (the type of data) for the upcoming transfer. The Source is required to only supply one of the DGs specified in the SupportedGroups field of pOrigin.

Application

Should have previously (during a DG_CONTROL / DAT_PARENT / MSG_OPENDSM) set pOrigin. SupportedGroups to reflect the DGs the application is interested in receiving from a Source. Since DG_xxxx identifiers are bit flags, the application can perform a bitwise OR of DG_xxxx constants of interest to build the SupportedGroups field (this is appropriate when more kinds of data than DG_IMAGE are available).

Note: Version 1.x of the Toolkit defines DG_IMAGE as the sole Data Group (DG_CONTROL is masked from any processing of SupportedGroups). Future versions of TWAIN may define support for other DGs.

Source

Set pXferGroup to the DG_xxxx constant that identifies the type of data that is ready for transfer from the Source (DG_IMAGE is the only non-custom Data Group defined in TWAIN version 1.x).

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST       /* No such Source in-session with */
                      /* application                    */
   TWCC_SEQERROR      /* Operation invoked in invalid   */
                      /* state                          */
```

DG_IMAGE / DAT_CIECOLOR / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_CIECOLOR,
          MSG_GET, pCIEColor);
```

pCIEColor = A pointer to a TW_CIECOLOR structure.

Valid States

4 through 6

Description

Background - The DAT_CIECOLOR data argument type is used to communicate the parametrics for performing a transformation from any arbitrary set of tri-stimulus values into CIE XYZ color space. Color data stored in this format is more readily manipulated mathematically than some other spaces. See Appendix A for more information about the definitions and data structures used to describe CIE color data within TWAIN.

This operation causes the Source to report the currently active parameters to be used in converting acquired color data into CIE XYZ.

Application

Prior to invoking this operation, the application should establish that the Source can provide data in CIE XYZ form. This can be determined by invoking a MSG_GET on ICAP_PIXELTYPE. If TWPT_CIEXYZ is one of the supported types, then these operations are valid. The application can specify that transfers should use the CIE XYZ space by invoking a MSG_SET operation on ICAP_PIXELTYPE using a TW_ONEVALUE container structure whose value is TWPT_CIEXYZ.

No special set up is required. Invoking this operation following the transfer (after the Source is back in State 6) will guarantee that the exact parameters used to convert the image are reported.

Source

Fill pCIEColor with the current values applied in any conversion of image data to CIE XYZ. If no values have been set by the application, fill the structure with either the values calculated for this image or the Source's default values, whichever most accurately reflect the state of the Source.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL      /* Source does not support the  */
                         /* CIE descriptors              */
   TWCC_SEQERROR         /* Operation invoked in invalid */
                         /* state                        */
```

See Also

Capability - ICAP_PIXELTYPE

Appendix A

DG_IMAGE / DAT_EXTIMAGEINFO / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_EXTIMAGEINFO,
MSG_GET,pExtImageInfo);
```

pExtImageInfo = A pointer to a TW_EXTIMAGEINFO structure.

Valid States

7 only, after receiving TWRC_XFERDONE

Description

This operation is used by the application to query the data source for extended image attributes, .e.g. bar codes found on a page. The extended image information will be returned in a TW_EXTIMAGEINFO structure.

Application

To query extended image information, set the pExtImageInfo fields as follows:

The Application will allocate memory for the necessary container structure, the source will fill the values, and then application will free it up.

pExtImageInfo->NumInfos = Desired number of information;
pExtImageInfo->Info[0].InfoID = TWEI_xxxx;
pExtImageInfo->Info[1].InfoID = TWEI_xxxx;

Source

If the application requests information that the Source does not recognize, the Source should put TWRC_INFONOTSUPPORTED in the RetCode field of TW_INFO structure.

pExtImageInfo->Info[0].RetCode = TWRC_INFONOTSUPPORTED;

If you support the capability, fill in the fields allocating extra memory if necessary. For example, for TWEI_BARCODEX:

pExtImageInfo->Info[0].RetCode = TWRC_SUCCESS;
pExtImageInfo->Info[0].ItemType = TWTY_UINT32;
pExtImageInfo->Info[0].NumItems = 1;
pExtImageInfo->Info[0].Item = 20;

For TWEI_FORMTEMPLATEMATCH:

pExtImageInfo->Info[0].RetCode = TWRC_SUCCESS;
pExtImageInfo->Info[0].ItemType = TWTY_STR255;
pExtImageInfo->Info[0].NumItems = 1;

For handle (Application set TWMF_HANDLE),

pExtImageInfo->Info[0].Item = GlobalAlloc(GHND, sizeof(TW_STR255));

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL /* Source does not support extended image          */
                    /* information                                     */
   TWCC_SEQERROR    /* Not State 7, or in State 7 but TWRC_XFERDONE    */
                    /* has not been received yet                       */
```

See Also

Capability ICAP_EXTIMAGEINFO
The section *Extended Image Information Definitions* in Chapter 8

DG_IMAGE / DAT_GRAYRESPONSE / MSG_RESET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_GRAYRESPONSE, MSG_RESET, pResponse);
```

pResponse = A pointer to a TW_GRAYRESPONSE structure.

Valid States

4 only

Description

Background - The two DAT_GRAYRESPONSE operations allow the application to specify a transfer curve that the Source should apply to the grayscale it acquires. This curve should be applied to the data prior to transfer. The Source should maintain an “identity response curve” to be used when it is MSG_RESET.

The MSG_RESET operation causes the Source to use its “identity response curve.” The identity curve causes no change in the values of the captured data when it is applied.

Application

No special action.

Source

Apply the identity response curve to all future grayscale transfers. This means that the Source will transfer the grayscale data exactly as acquired.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL      /* Source does not support      */
                         /* grayscale response curves    */
   TWCC_SEQERROR         /* Operation invoked in invalid */
                         /* state                        */
```

See Also

DG_IMAGE / DAT_GRAYRESPONSE / MSG_SET

Capability - ICAP_PIXELTYPE

DG_IMAGE / DAT_GRAYRESPONSE / MSG_SET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_GRAYRESPONSE, MSG_SET, pResponse);
```

pResponse = A pointer to a TW_GRAYRESPONSE structure.

Valid States

4 only

Description

Background - The two DAT_GRAYRESPONSE operations allow the application to specify a transfer curve that the Source should apply to the grayscale it acquires. This curve should be applied to the data prior to transfer. The Source should maintain an “identity response curve” to be used when it is MSG_RESET. This identity curve should cause no change in the values of the data it is applied to.

This operation causes the Source to transform any grayscale data according to the response curve specified.

Application

All three elements of the response curve for any given index should hold the same value (the curve is stored in a TW_ELEMENT8 which contains three “channels” of data). The Source may not support this operation. The application should be diligent to examine the return code from this operation.

Source

Apply the specified response curve to all future grayscale transfers. The transformation should be applied before the data is transferred.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL      /* Source does not support      */
                         /* grayscale response curves    */
   TWCC_SEQERROR         /* Operation invoked in invalid */
                         /* state                        */
```

See Also

DG_IMAGE / DAT_GRAYRESPONSE / MSG_RESET

Capability - ICAP_PIXELTYPE

DG_IMAGE / DAT_IMAGEFILEXFER / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_IMAGEFILEXFER, MSG_GET, NULL);
```

This operation acts on NULL data. File information can be set with the DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET operation.

Valid States

6 only (Transitions to State 7, if successful. Remains in State 7 until MSG_ENDXFER operation.)

Description

This operation is used to initiate the transfer of an image from the Source to the application via the disk-file transfer mechanism. It causes the transfer to begin.

Application

No special set up or action required. Application should have already invoked the DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET operation unless the Source's default transfer format and file name (typically, TWAIN.TMP) are acceptable to the application. The application need only invoke this operation once per image transferred.

Notes: If the application is planning to receive multiple images from the Source while using the Source's default file name, the application should plan to pause between transfers and copy the file just written. The Source will overwrite the file unless it is instructed to write to a different file.

Applications can specify a unique file for each transfer using DAT_SETUPFILEXFER / MSG_SET in State 6 or 5 (and 4, of course).

Source

Acquire the image data, format it, create any appropriate header information, and write everything into the file specified by the previous DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET operation, and close the file.

Handling Possible File Conditions:

- If the application did not set conditions up using the DAT_SETUPFILEXFER / MSG_SET operation during this session, use your own default file name, file format, and location for the created file.
- If the specified file already exists, overwrite the file in place.
- If the specified file does not exist, create the file.
- If the specified file exists and cannot be accessed, or a system error occurs while writing the file, report the error to the user and return TWRC_FAILURE with TWCC_OPERATIONERROR. Stay in State 6. The file contents are invalid. The image whose transfer failed is still a pending transfer so do not decrement TW_PENDINGXFERS.Count.
- If the file is written successfully, return TWRC_XFERDONE.
- If the user cancels the transfer, return TWRC_CANCEL.

Return Codes

```
TWRC_XFERDONE
TWRC_CANCEL
TWRC_FAILURE
   TWCC_BADDEST           /* No such Source in-session */
                          /* with application          */
   TWCC_OPERATIONERROR    /* Failure in the Source --  */
                          /* transfer invalid          */
   TWCC_SEQERROR          /* Operation invoked in      */
                          /* invalid state             */
```

See Also

DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET
DG_IMAGE / DAT_IMAGEINFO / MSG_GET
DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET,

Capabilities - ICAP_XFERMECH, ICAP_IMAGEFILEFORMAT

DG_IMAGE / DAT_IMAGEINFO / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_IMAGEINFO, MSG_GET,pImageInfo);
```

pImageInfo = A pointer to a TW_IMAGEINFO structure.

Valid States

6 and 7 (State 7 only after receiving TWRC_XFERDONE)

Description

When called in State 6, this operation provides to the application general image description information about the image about to be transferred.

When called in State 7, this operation provides the Application with specific image description information about the current image that has just been transferred. It is important during a Memory transfer to call this triplet only after TWRC_XFERDONE is received, since that is the only time the Source will know all the final image information.

The same data structure type is used regardless of the mechanism used to transfer the image (Native, Disk File, or Buffered Memory transfer).

Application

The Application can use this operation to check the parameters of the image before initiating the transfer during State 6, or to clarify image parameters during State 7 after the transfer is complete.

Applications may inform Sources that they accept -1 value for ImageHeight/ImageWidth by setting the ICAP_UNDEFINEDIMAGESIZE capability to TRUE.

Should the Application decide to invoke any Source features that allow the image description information to change during scanning (such as ICAP_UNDEFINEDIMAGESIZE) and still wish to transfer in Buffered memory mode, a DG_CONTROL/DAT_IMAGEINFO/MSG_GET call must be made in State 7 after receiving TWRC_XFERDONE to properly interpret the image data. This is not the default behavior of the Source.

Note that the speed at which the Application supplies buffers may determine the scanning speed.

Source

During State 6 - Fills in all fields in pImageInfo. All fields are filled in as you would expect with the following exceptions:

XResolution or YResolution

Set to -1 if the device creates data with no inherent resolution (such as a digital camera).

ImageWidth

Set to -1 if the image width to be acquired is unknown (such as when using a hand-held scanner and dragging left-to-right) , and the Application has set ICAP_UNDEFINEDIMAGESIZE to TRUE. In this case the Source must transfer the image in tiles.

ImageLength

ImageLength—Set to -1 if the image length to be acquired is unknown (such as when using a hand-held scanner and dragging top-to-bottom), and the Application has set ICAP_UNDEFINEDIMAGESIZE to TRUE.

During State 7 - Fills in all fields in pImageInfo. All fields are filled in as during State 6, except ImageWidth and ImageLength MUST be valid. Source shall return TWRC_SEQERROR if call is made before TWRC_XFERDONE is sent.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST     /* No such Source in-session with */
                    /* application                    */
   TWCC_SEQERROR    /* Operation invoked in invalid   */
                    /* state                          */
```

See Also

DG_IMAGE / DAT_IMAGEFILEXFER / MSG_GET
DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET
DG_IMAGE / DAT_IMAGENATIVEXFER / MSG_GET

Capabilities - ICAP_BITDEPTH, ICAP_COMPRESSION, ICAP_PIXELTYPE, ICAP_PLANARCHUNKY, ICAP_XRESOLUTION, ICAP_YRESOLUTION

DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_IMAGELAYOUT, MSG_GET, pImageLayout);
```

pImageLayout = A pointer to a TW_IMAGELAYOUT structure.

Valid States

4 through 6

Description

The DAT_IMAGELAYOUT operations control information on the physical layout of the image on the acquisition platform of the Source (e.g. the glass of a flatbed scanner, the size of a photograph, etc.).

The MSG_GET operation describes both the size and placement of the image on the original "page". The coordinates on the original page and the extents of the image are expressed in the unit of measure currently negotiated for ICAP_UNITS (default is inches).

The outline of the image is expressed by a "frame." The Left, Top, Right, and Bottom edges of the frame are stored in pImageLayout->Frame. These values place the frame within the original page. All measurements are relative to the page's "upper-left" corner. Define "upper-left" by how the image would appear on the computer's screen before any rotation or other position transform is applied to the image data. This origin point will be apparent for most Sources (although folks working with satellites or radio telescopes may be at a bit of a loss).

Finally pImageLayout optionally includes information about which frame on the page, which page within a document, and which document the image belongs to. These fields were included mostly for future versions which could merge more than one type of data. A more immediate use might be for an application that needs to keep track of which frame on the page an image came from while acquiring from a Source that can supply more than one image from the same page at the same time. The information in this structure always describes the current image. To set multiple frames for any page simultaneously, reference ICAP_FRAMES.

Application

No special set up or action required, unless the current units of measure are unacceptable. In that case, the application must re-negotiate ICAP_UNITS prior to invoking this operation. Remember to do this in State 4—the only state wherein capabilities can be set or reset.

Beyond supplying possibly interesting position information on the image to be transferred, the application can use this structure to constrain the final size of the image and to relate the image within a series of pages or documents (see the DG_IMAGE / DAT_IMAGELAYOUT / MSG_SET operation).

Source

Fill all fields of pImageLayout. Most Sources will set FrameNumber, PageNumber, and DocumentNumber to 1.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST        /* No such Source in-session    */
                       /* with application             */
   TWCC_SEQERROR       /* Operation invoked in invalid */
                       /* state                        */
```

See Also

DG_IMAGE / DAT_IMAGELAYOUT / MSG_GETDEFAULT
DG_IMAGE / DAT_IMAGELAYOUT / MSG_RESET
DG_IMAGE / DAT_IMAGELAYOUT / MSG_SET

Capabilities - Many such as ICAP_FRAMES, ICAP_MAXFRAMES, ICAP_UNITS

DG_IMAGE / DAT_IMAGELAYOUT / MSG_GETDEFAULT

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_IMAGELAYOUT, MSG_GETDEFAULT,
pImageLayout);
```

pImageLayout = A pointer to a TW_IMAGELAYOUT structure.

Valid States

4 through 6

Description

The DAT_IMAGELAYOUT operations control information on the physical layout of the image on the acquisition platform of the Source (e.g. the glass of a flatbed scanner, the size of a photograph, etc.).

This operation returns the default information on the layout of an image. This is the size and position of the image that will be acquired from the Source if the acquisition is started with the Source (and the device it is controlling) in its power-on state (for instance, most flatbed scanners will capture the entire bed).

Application

No special set up or action required.

Source

Fill in all fields of pImageLayout with the device's power-on origin and extents. Most Sources will set FrameNumber, PageNumber, and DocumentNumber to 1.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST        /* No such Source in-session    */
                       /* with application             */
   TWCC_SEQERROR       /* Operation invoked in invalid */
                       /* state                        */
```

See Also

DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET
DG_IMAGE / DAT_IMAGELAYOUT / MSG_GETDEFAULT
DG_IMAGE / DAT_IMAGELAYOUT / MSG_SET

Capabilities - ICAP_FRAMES, ICAP_MAXFRAMES, ICAP_UNITS

DG_IMAGE / DAT_IMAGELAYOUT / MSG_RESET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_IMAGELAYOUT, MSG_RESET,
pImageLayout);
```

pImageLayout = A pointer to a TW_IMAGELAYOUT structure.

Valid States

4 only

Description

The DAT_IMAGELAYOUT operations control information on the physical layout of the image on the acquisition platform of the Source (e.g. the glass of a flatbed scanner, the size of a photograph, etc.).

This operation sets the image layout information for the next transfer to its default settings.

Application

No special set up or action required. Ascertain the current settings of ICAP_ORIENTATION, ICAP_PHYSICALWIDTH, and ICAP_PHYSICALHEIGHT if you don't already know this device's power-on default values.

Source

Reset all the fields of the structure pointed at by pImageLayout to the device's power-on origin and extents. There is an implied resetting of ICAP_ORIENTATION, ICAP_PHYSICALWIDTH, and ICAP_PHYSICALHEIGHT to the device's power-on default values.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADDEST      /* No such Source in-session    */
                     /* with application             */
   TWCC_SEQERROR     /* Operation invoked in invalid */
                     /* state                        */
```

See Also

DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET
DG_IMAGE / DAT_IMAGELAYOUT / MSG_GETDEFAULT
DG_IMAGE / DAT_IMAGELAYOUT / MSG_SET

Capabilities - ICAP_FRAMES, ICAP_MAXFRAMES, ICAP_UNITS

DG_IMAGE / DAT_IMAGELAYOUT / MSG_SET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_IMAGELAYOUT, MSG_SET, pImageLayout);
```

pImageLayout = A pointer to a TW_IMAGELAYOUT structure.

Valid States

4 only

Description

The DAT_IMAGELAYOUT operations control information on the physical layout of the image on the acquisition platform of the Source (e.g. the glass of a flatbed scanner, the size of a photograph, etc.).

This operation sets the layout for the next image transfer. This allows the application to specify the physical area to be acquired during the next image transfer (for instance, a frame-based application would pass to the Source the size of the frame the user selected within the application—the helpful Source would present a selection region already sized to match the layout frame size).

If the application and Source have negotiated one or more frames through ICAP_FRAMES, the frame set with this operation will only persist until the transfer following this one. Otherwise, the frame will persist as the current frame for the remainder of the session (unless superseded by negotiation on ICAP_FRAMES or another operation on DAT_IMAGELAYOUT overrides it).

The application writer should note that setting these values is a request. The Source should first try to match the requested values exactly. Failing that, it should approximate the requested values as closely as it can—extents of the approximated frame should at least equal the requested extents unless the device cannot comply. The Source should return TWRC_CHECKSTATUS if the actual values set in pImageLayout->Frame are greater than or equal to the requested values in both extents. If one or both of the requested values exceed the Source's available values, the Source should return TWRC_FAILURE with TWCC_BADVALUE. The application should check for these return codes and perform a MSG_GET to verify that the values set by the Source are acceptable. The application may choose to cancel the transfer if Source could not set the layout information closely enough to the requested values.

Application

Fill in all fields of pImageLayout. Especially important is the Frame field whose values are expressed in ICAP_UNITS. If the application doesn't care about one or more of the other fields, be sure to set them to -1 to prevent confusion. If the application only cares about the extents of the Frame, and not about the origin on the page, set the Frame.Top and Frame.Left to zero. Otherwise, the application can specify the location on the page where the Source should begin acquiring the image, in addition to the extents of the acquired image.

Source

Use the values in pImageLayout as the Source's current image layout information. If you are unable to set the device exactly to the values requested in the Frame field, set them as closely as possible, always snapping to a value that will result in a larger frame, and return TWRC_CHECKSTATUS to the application.

If the application has set Frame.Top and Frame.Left to a non-zero value , set the origin for the image to be acquired accordingly. If possible, the Source should consider reflecting these settings in the user interface when it is raised. For instance, if your Source presents a pre-scan image, consider showing the selection region in the proper location and with the proper size suggested by the settings from this operation.

If the requested values exceed the maximum size the Source can acquire, set the pImageLayout->Frame values used within the Source to the largest extent possible within the axis of the offending value. Return TWRC_FAILURE with TWCC_BADVALUE.

Return Codes

```
TWRC_SUCCESS
TWRC_CHECKSTATUS     /* Source approximated the requested*/
                     /* values                           */
TWRC_FAILURE
   TWCC_BADDEST      /* No such Source in-session       */
                     /* with application                */
   TWCC_BADVALUE     /* Specified Layout values illegal */
                     /* for Source                      */
   TWCC_SEQERROR     /* Operation invoked in invalid    */
                     /* state                           */
```

See Also

DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET
DG_IMAGE / DAT_IMAGELAYOUT / MSG_GETDEFAULT
DG_IMAGE / DAT_IMAGELAYOUT / MSG_RESET

Capabilities - ICAP_FRAMES, ICAP_MAXFRAMES, ICAP_UNITS

DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_IMAGEMEMXFER, MSG_GET,
pImageMemXfer);
```

pImageMemXfer = A pointer to a TW_IMAGEMEMXFER structure.

Valid States

6 and 7 (Transitions to State 7, if successful. Remains in State 7 until MSG_ENDXFER operation.)

Description

This operation is used to initiate the transfer of an image from the Source to the application via the Buffered Memory transfer mechanism.

This operation supports the transfer of successive blocks of image data (in strips or, optionally, tiles) from the Source into one or more main memory transfer buffers. These buffers (for strips) are allocated and owned by the application. For tiled transfers, the source allocates the buffers. The application should repeatedly invoke this operation while TWRC_SUCCESS is returned by the Source.

Application

The application will allocate one or more memory buffers to contain the data being transferred from the Source. The application may allocate enough buffer space to contain the entire image being transferred or, more commonly, use the transfer buffer(s) as a temporary holding area while the complete image is assembled elsewhere (on disk, for instance).

The size of the allocated buffer(s) should be homogeneous (don't change buffer sizes during transfer). The size the application selects should be based on the information returned by the Source from the DG_CONTROL / DAT_SETUPMEMXFER / MSG_GET operation. The application should do its best to allocate transfer buffers of the size "preferred" by the Source. This will enhance the chances for superior transfer performance. The buffer size must be between MinBufSize and MaxBufSize as reported by the Source. Further, the buffers must contain an even number of bytes. Memory buffers must be double-word aligned and should be padded with zeros at the end of each raster line.

If the application sets up buffers that are either too small or too large, the Source will fail the operation returning TWRC_FAILURE/TWCC_BADVALUE.

Once the buffers have been set up, the application should fill pImageMemXfer->Memory.Length with the actual size (in bytes) of each memory buffer (which are, of course, all the same size).

Windows only—The buffers should be allocated in global memory.

Source

Prior to writing the first buffer, check pImageMemXfer->Memory.Length for the size of the buffer(s) the application has allocated. If the size lies outside the maximum or minimum buffer size communicated to the application during the DG_CONTROL /

DAT_SETUPMEMXFER / MSG_GET operation, return TWRC_FAILURE/TWCC_BADVALUE and remain in State 6.

If the buffer is of an acceptable size, fill in all fields of pImageMemXfer except pImageMemXfer->Memory. The Source must write the data block into the buffer referenced by pImageMemXfer->Memory.TheMem. Store the actual number of bytes written into the buffer in pImageMemXfer->BytesWritten. Compressed and tiled data effects how the Source fills in these values.

Return TWRC_SUCCESS after successfully writing each buffer. Return TWRC_CANCEL if the Source needs to terminate the transfer before the last buffer is written (as when the user aborts the transfer from the Source's user interface). Return TWRC_XFERDONE to signal that the last buffer has been written. Following completion of the transfer, either after all the data has been written or the transfer has been canceled, remain in State 7 until explicitly transitioned back to State 6 by the application (DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER).

If TWRC_FAILURE occurred on the first buffer, the session remains in State 6. If failing on a subsequent buffer, the session remains in State 7. The strip whose transfer failed is still pending.

Notes on Memory Usage: Following a canceled transfer, the Source should dispose of the image that was being transferred and assure that any temporary variable and local buffer allocations are eliminated. The Source should be wary of allocating large temporary buffers or variables. Doing so may disrupt or even disable the transfer process. The application should be aware of the possible needs of the Source to allocate such space, however, and consider allocating all large blocks of RAM needed to support the transfer prior to invoking this operation. This may be especially important for devices that create image transfers of indeterminate size—such as hand-held scanners.

Return Codes

```
TWRC_SUCCESS                /* Source done transferring       */
                            /* the specified block            */
TWRC_XFERDONE               /* Source done transferring       */
                            /* the specified image            */
TWRC_CANCEL                 /* User aborted the transfer from */
                            /* the Source                     */
TWRC_FAILURE
   TWCC_BADDEST             /* No such Source in-session */
                            /*with application           */
   TWCC_BADVALUE            /* Size of buffer did not    */
                            /* match TW_SETUPMEMXFER     */
   TWCC_OPERATIONERROR      /* Failure in the Source--   */
                            /* transfer invalid          */
   TWCC_SEQERROR            /* Operation invoked in      */
                            /* invalid state             */
```

See Also

DG_CONTROL / DAT_SETUPMEMXFER / MSG_GET
DG_IMAGE / DAT_IMAGEINFO / MSG_GET
DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET

Capabilities - ICAP_COMPRESSION, ICAP_TILES, ICAP_XFERMECH

DG_IMAGE / DAT_IMAGENATIVEXFER / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_IMAGENATIVEXFER, MSG_GET, pHandle);
```

pHandle = A pointer to a variable of type TW_UINT32.

Windows - This 32 bit integer is a handle variable to a DIB (Device Independent Bitmap) located in memory.

Macintosh - This 32-bit integer is a handle to a Picture (a PicHandle). It is a QuickDraw picture located in memory.

Valid States

6 only (Transitions to State 7, if successful. Remains in State 7 until MSG_ENDXFER operation).

Description

Causes the transfer of an image's data from the Source to the application, via the Native transfer mechanism, to begin. The resulting data is stored in main memory in a single block. The data is stored in Picture (PICT) format on the Macintosh and as a device-independent bitmap (DIB) under Microsoft Windows. The size of the image that can be transferred is limited to the size of the memory block that can be allocated by the Source.

Note: This is the default transfer mechanism. All Source's support this mechanism. The Source will use this mechanism unless the application explicitly negotiates a different transfer mechanism with ICAP_XFERMECH.

Application

The application need only invoke this operation once per image. The Source allocates the largest block available and transfers the image into it. If the image is too large to fit, the Source may resize the image. Read the DIB header or check the picFrame in the Picture to determine if this happened. The application is responsible for deallocating the memory block holding the Native-format image.

Windows only—Set pHandle pointing to a handle to a device-independent bit map (DIB) in memory. The Source will allocate the image buffer and return the handle to the address specified..

Macintosh only—Set pHandle pointing to a handle to a Picture in memory. The Source will allocate the image buffer at the memory location referenced by the handle.

Note: This odd combination of pointer and handle to reference the image data block was used to assure that the allocated memory object would be relocatable under Microsoft Windows, Macintosh, and UNIX. A handle was required for this task on both the Macintosh and under Microsoft Windows; though pointers are inherently relocatable under UNIX. Rather than disturb the entry points convention that the data object is always referenced by a pointer, it was decided to have that pointer reference the relocatable handle. A handle in UNIX is typecast to a pointer.

Source

Allocate a single block of memory to hold the image data and write the image data into it using the appropriate format for the operating environment. The source must assure that the allocated block will be accessible to the application. Place the handle of the allocated block in the TW_UINT32 pointed to by pHandle.

Microsoft Windows: Format the data block as a DIB. Use GlobalAlloc or equivalent under windows. Under 16 bit Microsoft Windows, place the handle in the low word of the TW_UINT32. The following assignment will work in either Win16 or Win32:

```
(HGLOBAL FAR *) pHandle = hDIB;
```

See the Windows SDK documentation under Structures: BIMAPINFO, BITMAPINFOHEADER, RGBQUAD. See also “DIBs and their use” by Ron Gery, in the Microsoft Development Library (MSDN CD).

Notes:

- Do not use BITMAPCOREINFO or BIMAPCOREHEADER as these are for OS/2 compatibility only.
- Always follow the BITMAPINFOHEADER with the color table and only save 1, 4, or 8 bit DIBs
- Color table entries are RGBQUADs, which are stored in memory as BGR not RGB.
- For 24 bit color DIBs, the “pixels” are also stored in BGR order, not RGB.
- DIBs are stored ‘upside-down’ - the first pixel in the DIB is the lower-left corner of the image, and the last pixel is the upper-right corner.
- DIBs can be larger than 64K, but be careful, a 24 bit pixel can straddle a 64K boundary!
- Pixels in 1, 4, and 8 bit DIBs are “always” color table indices, you must index through the color table to determine the color value of a pixel.

Macintosh: Format the data block as a PICT, preferably using standard system calls.

Microsoft Windows and Macintosh: If the allocation fails, it is recommended that you allow the user the option to re-size the image to fit within available memory or to cancel the transfer (assuming that the Source user interface is displayed). If the user chooses to cancel the transfer, return TWRC_CANCEL. If the user wants to re-size the image, the Source might choose to blindly crop the image, clip a selection region to the maximum supported size for the current memory configuration, or allow the user to re-acquire the image altogether. The user will usually feel more in control if you provide one or both of the last two options, but the first may make the most sense for your Source.

If the allocation fails and the image cannot be clipped, return TWRC_FAILURE and remain in State 6. Set the pHandle to NULL. The image whose transfer failed is still pending transfer. Do not decrement TW_PENDINGXFERS.Count.

Return Codes

```
TWRC_XFERDONE            /* Source done transferring the */
                         /* specified block              */
TWRC_CANCEL              /* User aborted the transfer    */
                         /* within the Source            */
TWRC_FAILURE
   TWCC_BADDEST          /* No such Source in session */
                         /* with application          */
   TWCC_LOWMEMORY        /* Not enough memory for     */
                         /* image--cannot crop to fit */
   TWCC_OPERATIONERROR   /* Failure in the Source--   */
                         /* transfer invalid          */
   TWCC_SEQERROR         /* Operation invoked in      */
                         /* invalid state             */
```

See Also

DG_IMAGE / DAT_IMAGEINFO / MSG_GET
DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET

Capability - ICAP_XFERMECH

DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_JPEGCOMPRESSION, MSG_GET,
pCompData);
```

pCompData = A pointer to a TW_JPEGCOMPRESSION structure.

Valid States

4 through 6

Description

Causes the Source to return the parameters that will be used during the compression of data using the JPEG algorithms.

All the information that is reported by the MSG_GET operation will be available in the header portion of the JPEG data. Transferring JPEG-compressed data through memory buffers is slightly different than other types of buffered transfers. The difference is that the JPEG-compressed image data will be prefaced by a block of uncompressed information—the JPEG header. This header information contains all the information that is returned from the MSG_GET operation. The compressed image information follows the header. The Source should return the header information in the first transfer. The compressed image data will then follow in the second through the final buffer. If the application is allocating the buffers, it should assure that the buffer size for transfer of the header is large enough to contain the complete header.

Application

The application allocates the TW_JPEGCOMPRESSION structure.

Source

Fill pCompData with the parameters that will be applied to the next JPEG-compression operation. The Source must allocate memory for the contents of the pointer fields pointed to within the structure (i.e. QuantTable, HuffmanDC, and HuffmanAC).

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL       /* Source does not support JPEG */
                          /* data compression             */
   TWCC_SEQERROR          /* Operation invoked in invalid */
                          /* state                        */
```

See Also

DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_GETDEFAULT
DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_RESET
DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_SET

Capability - ICAP_COMPRESSION

DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_GETDEFAULT

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_JPEGCOMPRESSION, MSG_GETDEFAULT,
pCompData);
```

pCompData = A pointer to a TW_JPEGCOMPRESSION structure.

Valid States

4 through 6

Description

Causes the Source to return the power-on default values applied to JPEG-compressed data transfers.

Application

The application allocates the TW_JPEGCOMPRESSION structure.

Source

Fill in pCompData with the power-on default values. The Source must allocate memory for the contents of the pointer fields pointed to within the structure (i.e. QuantTable, HuffmanDC and HuffmanAC). The Source should maintain meaningful default values.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL        /* Source does not support JPEG */
                           /* data compression             */
   TWCC_SEQERROR           /* Operation invoked in invalid */
                           /* state                        */
```

See Also

DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_GET
DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_RESET
DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_SET

Capability - ICAP_COMPRESSION

DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_RESET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_JPEGCOMPRESSION, MSG_RESET,
pCompData);
```

pCompData = A pointer to a TW_JPEGCOMPRESSION structure.

Valid States

4 only

Description

Return the Source to using its power-on default values for JPEG-compressed transfers.

Application

No special action. May want to perform a MSG_GETDEFAULT if you're curious what the new values might be.

Source

Use your power-on default values for all future JPEG-compressed transfers. The Source should maintain meaningful default values for all parameters.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL       /* Source does not support JPEG */
                          /* data compression             */
   TWCC_SEQERROR          /* Operation invoked in invalid */
                          /* state                        */
```

See Also

DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_GET
DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_GETDEFAULT
DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_SET

Capability - ICAP_COMPRESSION

DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_SET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_JPEGCOMPRESSION, MSG_SET,
pCompData);
```

pCompData = A pointer to a TW_JPEGCOMPRESSION structure.

Valid States

4 only

Description

Allows the application to configure the compression parameters to be used on all future JPEG-compressed transfers during the current session. The application should have already established that the requested values are supported by the Source.

Application

Fill pCompData. Write TWON_DONTCARE16 into the numeric fields that don't matter to the application. Write NULL into the table fields that should use the default tables as defined by the JPEG specification.

Source

Adopt the requested values for use with all future JPEG-compressed transfers. If a value does not exactly match an available value, match the value as closely as possible and return TWRC_CHECKSTATUS. If the value is beyond the range of available values, clip to the nearest value and return TWRC_FAILURE/TWCC_BADVALUE.

Return Codes

```
TWRC_SUCCESS
TWRC_CHECKSTATUS
TWRC_FAILURE
   TWCC_BADPROTOCOL         /* Source does not support JPEG */
                            /* data compression             */
   TWCC_BADVALUE            /* illegal value specified      */
   TWCC_SEQERROR            /* Operation invoked in invalid */
                            /* state                        */
```

See Also

DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_GET
DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_GETDEFAULT
DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_RESET

Capability - ICAP_COMPRESSION

DG_IMAGE / DAT_PALETTE8 / MSG_GET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_PALETTE8, MSG_GET, pPalette);
```

pPalette = A pointer to a TW_PALETTE8 structure.

Valid States

4 through 6

Description

This operation causes the Source to report its current palette information. The application should assure that the Source can provide palette information by invoking a MSG_GET operation on ICAP_PIXELTYPE and checking for TWPT_PALETTE. If this pixel type has not been established as the type to be used for future acquisitions, the Source should respond with its default palette.

To assure that the palette information is wholly accurate, the application should invoke this operation immediately after completion of the image transfer. The Source may perform palette optimization during acquisition of the data and the palette it reports before the transfer will differ from the one available afterwards.

(In general, the DAT_PALETTE8 operations are specialized to deal with 8-bit data, whether grayscale or color (8-bit or 24-bit). Most current devices provide data with this bit depth. These operations allow the application to inquire a Source's support for palette color data and set up a palette color transfer. See Chapter 8 for the definitions and data structures used to describe palette color data within TWAIN.)

Application

The application should allocate the pPalette structure for the Source.

Source

Fill pPalette with the current palette. If no palette has been specified or calculated, use the Source's default palette (which may coincidentally be the current or default system palette).

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL          /* Source does not support      */
                             /* palette color transfers      */
   TWCC_SEQERROR             /* Operation invoked in invalid */
                             /* state                        */
```

See Also

DG_IMAGE / DAT_PALETTE8 / MSG_GETDEFAULT
DG_IMAGE / DAT_PALETTE8 / MSG_RESET
DG_IMAGE / DAT_PALETTE8 / MSG_SET

Capability - ICAP_PIXELTYPE

DG_IMAGE / DAT_PALETTE8 / MSG_GETDEFAULT

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_PALETTE8, MSG_GETDEFAULT, pPalette);
```

pPalette = A pointer to a TW_PALETTE8 structure.

Valid States

4 through 6

Description

This operation causes the Source to report its power-on default palette.

Application

The application should allocate the pPalette structure for the Source.

Source

Fill pPalette with the default palette.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL        /* Source does not support      */
                           /* palette color transfers      */
   TWCC_SEQERROR           /* Operation invoked in invalid */
                           /* state                        */
```

See Also

DG_IMAGE / DAT_PALETTE8 / MSG_GET
DG_IMAGE / DAT_PALETTE8 / MSG_RESET
DG_IMAGE / DAT_PALETTE8 / MSG_SET

Capability - ICAP_PIXELTYPE

DG_IMAGE / DAT_PALETTE8 / MSG_RESET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_PALETTE8, MSG_RESET, pPalette);
```

pPalette = A pointer to a TW_PALETTE8 structure.

Valid States

4 only

Description

This operation causes the Source to dispose of any current palette it has and to use its default palette for the next palette transfer. A Source that always performs palette optimization may not use the default palette for the next transfer, but should dispose of its current palette and adopt the default palette for the moment, anyway. The application can check the actual palette information by invoking a MSG_GET operation immediately following the image transfer.

Application

The application should allocate the pPalette structure for the Source.

Source

Fill pPalette with the default palette and use the default palette for the next palette transfer.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL          /* Source does not support      */
                             /* palette color transfers      */
   TWCC_SEQERROR             /* Operation invoked in invalid */
                             /* state                        */
```

See Also

DG_IMAGE / DAT_PALETTE8 / MSG_GET
DG_IMAGE / DAT_PALETTE8 / MSG_GETDEFAULT
DG_IMAGE / DAT_PALETTE8 / MSG_SET

Capability - ICAP_PIXELTYPE

DG_IMAGE / DAT_PALETTE8 / MSG_SET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_PALETTE8, MSG_SET, pPalette);
```

pPalette = A pointer to a TW_PALETTE8 structure.

Valid States

4 only

Description

This operation requests that the Source adopt the specified palette for use with all subsequent palette transfers. The application should be careful to supply a palette that matches the bit depth of the Source. The Source is not required to adopt this palette. The application should be careful to check the return value from this operation.

Application

Fill pPalette with the desired palette. If writing grayscale information, write the same data into the Channel1, Channel2, and Channel3 fields of the Colors array. If NumColors != 256, fill the unused array elements with minimum ("black") values.

Source

The Source should not return TWRC_SUCCESS unless it will actually use the requested palette. The Source should not modify the palette in any way until the transfer is complete. The palette should be used for all remaining palette transfers for the duration of the session.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL          /* Source does not support      */
                             /* palette color transfers      */
   TWCC_SEQERROR             /* Operation invoked in invalid */
                             /* state                        */
```

See Also

DG_IMAGE / DAT_PALETTE8 / MSG_GET
DG_IMAGE / DAT_PALETTE8 / MSG_GETDEFAULT
DG_IMAGE / DAT_PALETTE8 / MSG_RESET

Capability - ICAP_PIXELTYPE

DG_IMAGE / DAT_RGBRESPONSE / MSG_RESET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_RGBRESPONSE, MSG_RESET, pResponse);
```

pResponse = A pointer to a TW_RGBRESPONSE structure.

Valid States

4 only

Description

Causes the Source to use its "identity" response curves for future RGB transfers. The identity curve causes no change in the values of the captured data when it is applied. (Note that resetting the curves for RGB data **does not** reset any MSG_SET curves for other pixel types).

Note: The DAT_RGBRESPONSE operations allow the application to specify the transfer curves that the Source should apply to the RGB data it acquires. The Source should not support these operations unless it can provide data of pixel type TWPT_RGB. The Source need not maintain actual "identity response curves" for use with the MSG_RESET operation—once reset, the Source should transfer the RGB data as acquired from the Source. The application should be sure that the Source supports these operations before invoking them. The operations should only be invoked when the active pixel type is RGB (TWPT_RGB). See Chapter 8 for information about the definitions and data structures used to describe the RGB response curve within TWAIN.

Application

No special action.

Source

Apply the identity response curve to all future RGB transfers. This means that the Source will transfer the RGB data exactly as acquired from the device.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL          /* Source does not support RGB  */
                             /* response curves              */
   TWCC_BADVALUE             /* Current pixel type is not    */
                             /* TWPT_RGB                     */
   TWCC_SEQERROR             /* Operation invoked in invalid */
                             /* state                        */
```

See Also

DG_IMAGE / DAT_RGBRESPONSE / MSG_SET

Capability - ICAP_PIXELTYPE

DG_IMAGE / DAT_RGBRESPONSE / MSG_SET

Call

```
DSM_Entry(pOrigin, pDest, DG_IMAGE, DAT_RGBRESPONSE, MSG_SET, pResponse);
```

pResponse = A pointer to a TW_RGBRESPONSE structure.

Valid States

4 only

Description

Causes the Source to transform any RGB data according to the response curves specified by the application.

Application

Fill all three elements of the response curve with the response curve data you want the Source to apply to future RGB transfers. The application should consider writing the same values into each element of the same index to minimize color shift problems.

The Source may not support this operation. The application should ensure that the current pixel type is TWPT_RGB and examine the return code from this operation.

Source

Apply the specified response curves to all future RGB transfers.

Return Codes

```
TWRC_SUCCESS
TWRC_FAILURE
   TWCC_BADPROTOCOL          /* Source does not support color */
                             /* response curves               */
   TWCC_BADVALUE             /* Current pixel type is not RGB */
   TWCC_SEQERROR             /* Operation invoked in invalid  */
                             /* state                         */
```

See Also

DG_IMAGE / DAT_RGBRESPONSE / MSG_RESET

Capability - ICAP_PIXELTYPE

8

Data Types and Data Structures

Chapter Contents

TWAIN defines a large number of data types and structures. These are all defined in the TWAIN.H file that is shipped as part of this toolkit. The file is written in C so you will need to modify the syntax if you develop your application or Source in some other language.

Naming Conventions

Data Structures, Variables, Pointers and Handles

Data structures referenced by pData parameter in DSM_Entry calls

Are prefixed by TW_ and followed by a descriptive name, in upper case. The name typically matches the call's DAT parameter.

Example: TW_USERINTERFACE

Fields in data structures (not containing pointers or handles)

Typically, begin with a capital letter followed by mixed upper and lower case letters.

Example: The MinBufSize, MaxBufSize, and Preferred fields in which are in the TW_SETUPMEMXFER structure.

Fields in data structures that contain pointers or handles

Name starts with lower case "p" or "h" for pointer or handle followed by a typical field name with initial capital then mixed case characters.

Example: pData, hContainer

Constants and Types

General-use constants

Are prefixed by TWON_ followed by the description of the constant's meaning.

Example: TWON_ICONID, TWON_ARRAY

Specific-use constants

Are prefixed with TWxx_ where xx are two letters identifying the group to which the constant belongs.

Example: TWTY_INT16, TWTY_STR32 are constants of the group "TW Types"

Common data types

Rather than use the int, char, long, etc. types with their variations between compilers, TWAIN defines a group of types that are used to cast each data item used by the protocol. Types are prefixed and named exactly the same as TWAIN data structures, TW_ followed by a descriptive name, all in upper case characters.

Example: TW_UINT32, TW_HANDLE

Custom Constants

Applications and Sources may define their own private (custom) constant identifiers for any existing constant group by assigning the constant a value greater than or equal to 256. They may also define any new desired custom constant group. The consuming entity should check the originating entity's TW_IDENTITY.ProductName when encountering a constant value greater than or equal to 256 to see whether it can be recognized as a custom constant. Sources and applications should not assume that all entities will have such error checking built in, however.

The following are operation identifiers:

Data Groups	Prefixed with DG_
Data Argument Types	Prefixed with DAT_
Messages	Prefixed with MSG_
Return codes	Prefixed with TWRC_
Condition codes	Prefixed with TWCC_
General capabilities	Prefixed with CAP_
Image-specific capabilities	Prefixed with ICAP_
Audio-specific capabilities	Prefixed with ACAP_

As a general note, whenever the application or the Source allocates a TWAIN data structure, it should fill all the fields it is instructed to fill and write the default value (if one is specified) into any field it is not filling. If no default is specified, fill the field with the appropriate TWON_DONTCARExx constant where xx describes the size of the field in bits (bytes, in the case of strings). The TWON_ constants are described at the end of this chapter and defined in the TWAIN.H file.

Some fields return a value of -1 when the data to be returned is ambiguous or unknown. Applications and Sources must look for these special cases, especially when allocating memory. Examples of Fields with -1 values are found in TW_PENDINGXFERS (Count), TW_SETUPMEMXFER (MaxBufSize) and TW_IMAGEINFO (ImageWidth and ImageLength).

The remainder of this chapter lists the defined data types and data structures. Most of the constants are also listed. However, refer to the TWAIN.H file for more explanation about each constant and to see the lengthy list of country constants which are not duplicated here.

Platform Dependent Definitions and Typedefs

On Windows

```
typedef HANDLE          TW_HANDLE;
typedef LPVOID          TW_MEMREF;
```

On Macintosh

```
#define PASCAL          pascal
#define FAR
typedef Handle          TW_HANDLE;
typedef char            *TW_MEMREF;
```

On UNIX

```
#define PASCAL          pascal
typedef unsigned char   *TW_HANDLE;
typedef unsigned char   *TW_MEMREF;
```

Definitions of Common Types

String types

```
typedef char    TW_STR32[34],     FAR *pTW_STR32;
typedef char    TW_STR64[66],     FAR *pTW_STR64;
typedef char    TW_STR128[130],   FAR *pTW_STR128;
typedef char    TW_STR255[256],   FAR *pTW_STR255;
```

On Windows: These include room for the strings and a NULL character.

On Macintosh: These include room for a length byte followed by the string.

Note: he TW_STR255 must hold less than 256 characters so the length fits in the first byte on Macintosh.

Numeric types

```
typedef char              TW_INT8     FAR *pTW_INT8;
typedef short             TW_INT16    FAR *pTW_INT16;
typedef long              TW_INT32    FAR *pTW_INT32;
typedef unsigned char     TW_UINT8    FAR *pTW_UINT8;
typedef unsigned short    TW_UINT16   FAR *pTW_UINT16;
typedef unsigned long     TW_UINT32   FAR *pTW_UINT32;
typedef unsigned short    TW_BOOL     FAR *pTW_BOOL;
```

Fixed point structure type

```
typedef struct {
        TW_INT16        Whole;
        TW_UINT16       Frac;
} TW_FIX32,     FAR *pTW_FIX32;
```

Note: In cases where the data type is smaller than TW_UINT32, the data should reside in the lower word.

Data Structure Definitions

This section provides descriptions of the data structure definitions.

TW_ARRAY

```
typedef struct {
   TW_UINT16       ItemType;
   TW_UINT32       NumItems;
   TW_UINT8        ItemList[1];
} TW_ARRAY, FAR * pTW_ARRAY;
```

Used by

TW_CAPABILITY structure (when ConType field specifies TWON_ARRAY)

Description

This structure stores a group of associated individual values which, when taken as a whole, describes a single “value” for a capability. The values need have no relationship to one another aside from being used to describe the same “value” of the capability. Such an array of values is useful to describe the CAP_SUPPORTEDCAPS list. This structure is used as a member of TW_CAPABILITY structures. Since this structure does not, therefore, exist “stand-alone” it is identified by a TWON_xxxx constant rather than a DAT_xxxx. This structure is related in function and purpose to TW_ENUMERATION, TW_ONEVALUE, and TW_RANGE.

Field Descriptions

ItemType	The type of items in the array. The type is indicated by the constant held in this field. The constant is of the kind TWTY_xxxx. All items in the array have the same size.
NumItems	How many items are in the array.
ItemList[1]	This is the array. One value resides within each element of the array. Space for the array is not allocated inside this structure. The ItemList value is simply a placeholder for the start of the actual array, which must be allocated when the container is allocated . Remember to typecast the allocated array, as well as references to the elements of the array, to the type indicated by the constant in ItemType.

TW_AUDIOINFO

```
typedef struct {
   TW_STR255      Name;
   TW_UINT32      Reserved;
} TW_AUDIOINFO, FAR * pTW_AUDIOINFO;
```

Used by

The DG_AUDIO / DAT_AUDIOINFO / MSG_GET operation

Description

Field Descriptions

Name	Name of audio data
Reserved	Reserved space

TW_CAPABILITY

```
typedef struct {
   TW_UINT16       Cap;
   TW_UINT16       ConType;
   TW_HANDLE       hContainer;
} TW_CAPABILITY, FAR * pTW_CAPABILITY;
```

Used by

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

Description

Used by an application either to get information about, or control the setting of a capability. The first field identifies the capability being negotiated (e.g., ICAP_BRIGHTNESS). The second specifies the format of the container (e.g., TWON_ONEVALUE). The third is a handle (HGLOBAL under Microsoft Windows) to the container itself.

The application always sets the Cap field. On MSG_SET, the application also sets the ConType and hContainer fields. On MSG_RESET, MSG_GET, MSG_GETCURRENT, and MSG_GETDEFAULT, the source fills in the ConType and hContainer fields.

It is always the application's responsibility to free the container when it is no longer needed. On a MSG_GET, MSG_GETCURRENT, or MSG_GETDEFAULT, the source allocates the container but ownership passes to the application. On a MSG_SET, the application provides the container either by allocating it or by re-using a container created earlier.

On a MSG_SET, the Source must not modify the container and it must copy any data that it wishes to retain.

Field Descriptions

Cap	The numeric designator of the capability (of the form CAP_xxxx, ICAP_xxxx, or ACAP_xxxx). e.g. ICAP_BRIGHTNESS. A list of these can be found in Chapter 9 and in the TWAIN.H file.
ConType	The type of the container referenced by hContainer. The container structure will be one of four types: TWON_ARRAY, TWON_ENUMERATION, TWON_ONEVALUE, or TWON_RANGE. One of these values, which types the container, should be entered into this field by whichever TWAIN entity fills in the container. When the application wants to set (MSG_SET) the Source's capability, the application must fill in this field. When the application wants to get (MSG_GET) capability information from the Source, the Source must fill in this field.
hContainer	References the container structure where detailed information about the capability is stored. When the application wants to set (MSG_SET) the Source's capability, the application must provide the hContainer. When the application wants to get (MSG_GET) the Source's capability information, the Source must allocate the space for the container. In either case, the application must release this space.

TW_CIECOLOR

```
typedef struct {
   TW_UINT16           ColorSpace
   TW_INT16            LowEndian;
   TW_INT16            DeviceDependent;
   TW_INT32            VersionNumber;
   TW_TRANSFORMSTAGE   StageABC;
   TW_TRANSFORMSTAGE   StageLMN;
   TW_CIEPOINT         WhitePoint;
   TW_CIEPOINT         BlackPoint;
   TW_CIEPOINT         WhitePaper;
   TW_CIEPOINT         BlackInk;
   TW_FIX32            Samples[1];
} TW_CIECOLOR, FAR *  pTW_CIECOLOR;
```

Used by

DG_IMAGE / DAT_CIECOLOR / MSG_GET

Description

Defines the mapping from an RGB color space device into CIE 1931 (XYZ) color space. For more in-depth information, please reference the PostScript Language Reference Manual, Second Edition, pp. 173-193. Note that the field names do not follow the conventions used elsewhere within TWAIN. This breach allows the identifiers shown here to exactly match those described in Appendix A, which was not written specifically for this Toolkit. Please also note that ColorSpace has been redefined from its form in Appendix A to use TWPT_xxxx constants defined in the TWAIN.H file.

This structure closely parallels the TCIEBasedColorSpace structure definition in Appendix A. Note that the field names are slightly different and that two new fields have been added (WhitePaper and BlackInk) to describe the reflective characteristics of the page from which the image was acquired.

If the Source can provide TWPT_CIEXYZ, it must support all operations on this structure.

Field Descriptions

ColorSpace	Defines the original color space that was transformed into CIE XYZ. Use a constant of type TWPT_xxxx. This value is not set-able by the application. Application should write TWON_DONTCARE16 into this on a MSG_SET.
LowEndian	Used to indicate which data byte is taken first. If zero, then high byte is first. If non-zero, then low byte is first.
DeviceDependent	If non-zero then color data is device-dependent and only ColorSpace is valid in this structure.
VersionNumber	Version of the color space descriptor specification used to define the transform data. The current version is zero.
StageABC	Describes parametrics for the first stage transformation of the Postscript Level 2 CIE color space transform process.
StageLMN	Describes parametrics for the first stage transformation of the Postscript Level 2 CIE color space transform process.
WhitePoint	Values that specify the CIE 1931 (XYZ space) tri-stimulus value of the diffused white point.
BlackPoint	Values that specify the CIE 1931 (XYZ space) tri-stimulus value of the diffused black point.
WhitePaper	Values that specify the CIE 1931 (XYZ space) tri-stimulus value of ink-less “paper” from which the image was acquired.
BlackInk	Values that specify the CIE 1931 (XYZ space) tri-stimulus value of solid black ink on the “paper” from which the image was acquired.
Samples[1]	Optional table look-up values used by the decode function. Samples are ordered sequentially and end-to-end as A, B, C, L, M, and N.

TW_CIEPOINT

```
typedef struct {
   TW_FIX32       X;
   TW_FIX32       Y;
   TW_FIX32       Z;
} TW_CIEPOINT, FAR * pTW_CIEPOINT;
```

Used by

Embedded in the TW_CIECOLOR structure

Description

Defines a CIE XYZ space tri-stimulus value. This structure parallels the TCIEPoint structure definition in Appendix A.

Field Descriptions

X First tri-stimulus value of the CIE space representation.

Y Second tri-stimulus value of the CIE space representation.

Z Third tri-stimulus value of the CIE space representation.

TW_CUSTOMDSDATA

```
typedef struct {
   TW_UINT32        InfoLength;      /* Length (in bytes) of data */
   TW_UINT8         InfoData[1];     /* Array (Length) bytes long */
} TW_CUSTOMDSDATA, FAR *pTW_CUSTOMDSDATA;
```

Used by

DG_CONTROL / DAT_CUSTOMDSDATA / MSG_GET
DG_CONTROL / DAT_CUSTOMDSDATA / MSG_SET

Description

Allows for a data source and application to pass custom data to each other.

The format of the data contained in InfoData will be data source specific and will not be defined by the TWAIN API. This structure will be used by an application to query the data source for it's current settings, and to archive them to disk. Although the format for this custom data is not defined by TWAIN, source implementers are encouraged to use a ASCII representation for the custom data to be used for settings archival. A Windows INI style format would be easy to implement and allow for additional features to be added without breaking backwards compatibility.

It is also recommended that source vendors embed basic source revision and vendor ID information in the InfoData body so they can determine if the structure being based to the data source is correct.

Field Descriptions

InfoLength	Length, in bytes, of data
InfoData[1]	Array (length) bytes long

TW_DECODEFUNCTION

```
typedef struct {
   TW_FIX32       StartIn;
   TW_FIX32       BreakIn;
   TW_FIX32       EndIn;
   TW_FIX32       StartOut;
   TW_FIX32       BreakOut;
   TW_FIX32       EndOut;
   TW_FIX32       Gamma;
   TW_FIX32       SampleCount;
} TW_DECODEFUNCTION, FAR * pTW_DECODEFUNCTION;
```

Used by

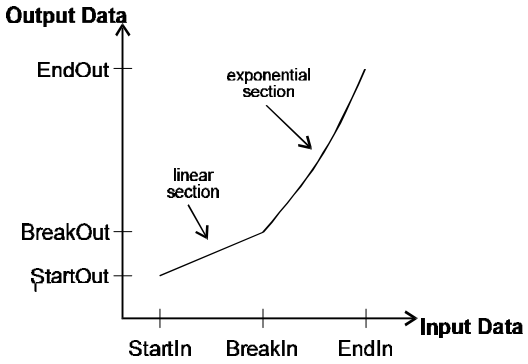
Embedded in the TW_TRANSFORMSTAGE structure that is embedded in the TW_CIECOLOR structure

Description

Defines the parameters used for channel-specific transformation. The transform can be described either as an extended form of the gamma function or as a table look-up with linear interpolation. This structure parallels the TDecodeFunction structure definition in Appendix A.

Field Descriptions

StartIn	Starting input value of the extended gamma function. Defines the minimum input value of channel data.
BreakIn	Ending input value of the extended gamma function. Defines the maximum input value of channel data.
EndIn	The input value at which the transform switches from linear transformation/interpolation to gamma transformation.
StartOut	Starting output value of the extended gamma function. Defines the minimum output value of channel data.
BreakOut	Ending output value of the extended gamma function. Defines the maximum output value of channel data.
EndOut	The output value at which the transform switches from linear transformation/interpolation to gamma transformation.
Gamma	Constant value. The exponential used in the gamma function.
SampleCount	The number of samples in the look-up table. Includes the values of StartIn and EndIn. Zero-based index (actually, number of samples - 1). If zero, use extended gamma, otherwise use table look-up.



Extended Gamma Parameters

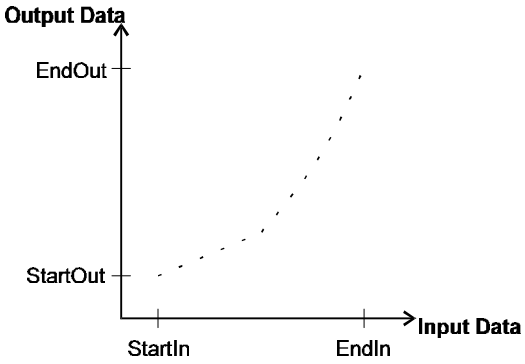


Table Look-up Parameters

TW_DEVICEEVENT

```
typedef struct {
   TW_UINT32      Event;
   TW_STR255      DeviceName;
   TW_UINT32      BatteryMinutes;         // Battery Minutes Remaining
   TW_INT16       BatteryPercentage;      // Battery Percentage Remaining
   TW_INT32       PowerSupply;            // Power Supply
   TW_FIX32       XResolution;            // Resolution
   TW_FIX32       YResolution;            // Resolution
   TW_UINT32      FlashUsed2;             // Flash Used2
   TW_UINT32      AutomaticCapture;       // Automatic Capture
   TW_UINT32      TimeBeforeFirstCapture; // Automatic Capture
   TW_UINT32      TimeBetweenCaptures;    // Automatic Capture
} TW_DEVICEEVENT, FAR * pTW_DEVICEEVENT;
```

Used by

DG_CONTROL / DAT_DEVICEEVENT / MSG_GET

Description

Provides information about the Event that was raised by the Source. The Source should only fill in those fields applicable to the Event. The Application must only read those fields applicable to the Event.

Field Descriptions

Event	One of the TWDE_xxxx values. Defines the event that has taken place.
DeviceName	The name of the device that generated the event.

Valid for TWDE_BATTERYCHECK only

BatteryMinutes	Minutes of battery power remaining.
BatteryPercentage	Percentage of battery power remaining.

Valid for TWDE_POWERSUPPLY only

PowerSupply	Current power supply in use.

Valid for TWDE_RESOLUTION only

XResolution	Current X Resolution.
YResolution	Current Y Resolution.

Valid for TWDE_FLASHUSED2 only

FlashUsed2	Current flash setting.

Valid for TWDE_AUTOMATICCAPTURE only

AutomaticCapture	Number of images camera will capture.
TimeBeforeFirstCapture	Number of seconds before first capture.
TimeBetweenCaptures	Hundredths of a second between captures.

TW_ELEMENT8

```
typedef struct {
   TW_UINT8       Index;
   TW_UINT8       Channel1;
   TW_UINT8       Channel2;
   TW_UINT8       Channel3;
 } TW_ELEMENT8, FAR * pTW_ELEMENT8;
```

Used by

Embedded in the TW_GRAYRESPONSE, TW_PALETTE8 and TW_RGBRESPONSE structures

Description

This structure holds the tri-stimulus color palette information for TW_PALETTE8 structures. The order of the channels shall match their alphabetic representation. That is, for RGB data, R shall be channel 1. For CMY data, C shall be channel 1. This allows the application and Source to maintain consistency. Grayscale data will have the same values entered in all three channels.

Field Descriptions

Index	Value used to index into the color table. Especially useful on the Macintosh.
Channel1	First tri-stimulus value (e.g. Red).
Channel2	Second tri-stimulus value (e.g. Green).
Channel3	Third tri-stimulus value (e.g. Blue).

TW_ENUMERATION

```
typedef struct {
  TW_UINT16      ItemType;
  TW_UINT32      NumItems;
  TW_UINT32      CurrentIndex;
  TW_UINT32      DefaultIndex;
  TW_UINT8       ItemList[1];
} TW_ENUMERATION, FAR * pTW_ENUMERATION;
```

Used by

TW_CAPABILITY structure (when ConType field specifies TWON_ENUMERATION)

Description

Stores a group of individual values describing a capability. The values are ordered from lowest to highest values, but the step size between each value is probably not uniform. Such a list would be useful to describe the discreet resolutions of a capture device supporting, say, 75, 150, 300, 400, and 800 dots per inch.

This structure is related in function and purpose to TW_ARRAY, TW_ONEVALUE, and TW_RANGE.

Field Descriptions

ItemType	The type of items in the enumerated list. The type is indicated by the constant held in this field. The constant is of the kind TWTY_xxxx. All items in the array have the same size.
NumItems	How many items are in the enumeration.
CurrentIndex	The item number, or index (zero-based) into ItemList[], of the “current” value for the capability.
DefaultIndex	The item number, or index (zero-based) into ItemList[], of the “power-on” value for the capability.
ItemList[1]	The enumerated list: one value resides within each array element. Space for the list is not allocated inside this structure. The ItemList value is simply a placeholder for the start of the actual array, which must be allocated when the container is allocated. Remember to typecast the allocation to ItemType, as well as references to the elements of the array.

TW_EVENT

```
typedef struct {
   TW_MEMREF      pEvent;
   TW_UINT16      TWMessage;
TW_EVENT, FAR * pTW_EVENT;
```

Used by

DG_CONTROL / DAT_EVENT / MSG_PROCESSEVENT

Description

Used to pass application events / messages from the application to the Source. The Source is responsible for examining the event / message, deciding if it belongs to the Source, and returning an appropriate return code to indicate whether or not the Source owns the event / message. This process is covered in more detail in the Event Loop section of Chapter 3.

Field Descriptions

pEvent — A pointer to the event / message to be examined by the Source.

Under Microsoft Windows, pEvent is a pMSG (pointer to a Microsoft Windows MSG struct). That is, the message the application received from GetMessage().

On the Macintosh, pEvent is a pointer to an EventRecord.

TWMessage — Any message (MSG_xxxx) the Source needs to send to the application in response to processing the event / message. The messages currently defined for this purpose are MSG_NULL, MSG_XFERREADY and MSG_CLOSEDSREQ.

TW_EXTIMAGEINFO

```
typedef struct {
      TW_UINT32        NumInfos;
      TW_INFO          Info[1];
} TW_EXTIMAGEINFO, FAR * pTW_ EXTIMAGEINFO;
```

Used by

DG_IMAGE / DAT_EXTIMAGEINFO / MSG_GET

Description

This structure is used to pass extended image information from the data source to application at the end of State 7. The application creates this structure at the end of State 7, when it receives XFERDONE. Application fills NumInfos for Number information it needs, and array of extended information attributes in Infos[ ] array. Application, then, sends it down to the source using the above operation triplet. The data source then examines each Info, and fills the rest of data with information allocating memory when necessary.

Field Descriptions

NumInfos	Number of information that application is requesting. This is filled by the application. If positive, then the application is requesting specific extended image information. The application should allocate memory and fill in the attribute tag for image information.
Info[1]	Array of information. See TW_INFO structure.

TW_FILESYSTEM

```
typedef struct {
   // DG_CONTROL / DAT_FILESYSTEM / MSG_xxxx fields…
   TW_STR255    InputName;
   TW_STR255    OutputName;
   TW_MEMREF    Context;
   // DG_CONTROL / DAT_FILESYSTEM / MSG_COPY
   // DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE field…
   int          Recursive;
   // DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO fields…
   TW_INT32     FileType;
   TW_UINT32    Size;
   TW_STR32     CreateTimeDate;
   TW_STR32     ModifiedTimeDate;
   TW_UINT32    FreeSpace;
   TW_INT32     NewImageSize;
   TW_UINT32    NumberOfFiles;
   TW_UINT32    NumberOfSnippets;
   TW_UINT32    DeviceGroupMask;
   char         Reserved[512];
} TW_FILESYSTEM, FAR * pTW_FILESYSTEM;
```

Used by

DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_COPY
DG_CONTROL / DAT_FILESYSTEM / MSG_CREATEDIRECTORY
DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE
DG_CONTROL / DAT_FILESYSTEM / MSG_FORMATMEDIA
DG_CONTROL / DAT_FILESYSTEM / MSG_GETCLOSE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO
DG_CONTROL / DAT_FILESYSTEM / MSG_GETNEXTFILE
DG_CONTROL / DAT_FILESYSTEM / MSG_RENAME

Description

Provides information about the currently selected device.

Field Descriptions

InputName	The name of the input or source file.
OutputName	The result of an operation or the name of a destination file.
Context	A pointer to Source specific data used to remember state information, such as the current directory.

MSG_GETINFO / MSG_GETFILEFIRST / MSG_DELETE

Recursive	When set to TRUE recursively apply the operation. (ex: deletes all subdirectories in the directory being deleted; or copies all sub-directories in the directory being copied.

MSG_GETINFO / MSG_GETFILEFIRST / MSG_GETFILENEXT

FileType	One of the TWFS_xxxx values.
Size	TWFT_DIRECTORY - Total size of media in bytes. TWFT_IMAGE - Size of image in bytes. TWFT_xxxx - All other file types return a value of 0.
CreateTimeDate	The create date of the file, in the form "YYYY/MM/DD HH:mm:SS:sss" where YYYY is the year, MM is the numerical month, DD is the numerical day, HH is the hour, mm is the minute, SS is the second, and sss is the millisecond.
ModifyTimeDate	Last date the file was modified. Same format as *CreateTimeDate*.
FreeSpace	The bytes of free space left on the current device.
NewImageSize	An estimate of the amount of space a new image would take up, based on image layout, resolution and compression. Dividing this value into the *FreeSpace* will yield the approximate number of images that the Device has room for.
NumberOfFiles	TWFT_IMAGE - Return 0 TWFT_xxxx - Return number of TWFT_IMAGE files on the file system including those in all sub-directories.
NumberOfSnippets	The number of audio snippets associated with a file of type TWFY_IMAGE.
DeviceGroupMask	A set of bits, with each bit uniquely identifying a device of type TWFY_CAMERA and any associated TWFY_CAMERATOP and/or TWFY_CAMERABOTTOM devices. See the article on File Systems in Appendix A of this specification for more information.
Reserved	Space reserved for future expansion of this structure.

TW_FIX32

```
typedef struct {
   TW_INT16       Whole;
   TW_UINT16      Frac;
} TW_FIX32, FAR * pTW_FIX32;
```

Used by

Embedded in the TW_CIECOLOR, TW_CIEPOINT, TW_DECODEFUNCTION, TW_FRAME, TW_IMAGEINFO, and TW_TRANSFORMSTAGE structures.

Used in TW_ARRAY, TW_ENUMERATION, TW_ONEVALUE, and TW_RANGE structures when ItemType is TWTY_FIX32.

Description

Stores a Fixed point number in two parts, a whole and a fractional part. The Whole part carries the sign for the number. The Fractional part is unsigned.

Field Descriptions

Whole	The Whole part of the floating point number. This number is signed.
Frac	The Fractional part of the floating point number. This number is unsigned.

The following functions convert TW_FIX32 to float and float to TW_FIX32:

```
/*********************************************************
* FloatToFix32
* Convert a floating point value into a FIX32.
*********************************************************/

TW_FIX32 FloatToFix32 (float floater)
{
   TW_FIX32 Fix32_value;
   TW_INT32 value = (TW_INT32) (floater * 65536.0 + 0.5);
   Fix32_value.Whole = value >> 16;
   Fix32_value.Frac = value & 0x0000ffffL;
   return (Fix32_value);
}
/*********************************************************
* Fix32ToFloat
* Convert a FIX32 value into a floating point value.
*********************************************************/

float FIX32ToFloat (TW_FIX32 fix32)
{
   float     floater;

   floater = (float) fix32.Whole + (float) fix32.Frac / 65536.0;

   return floater;
}
```

TW_FRAME

```
typedef struct {
   TW_FIX32       Left;
   TW_FIX32       Top;
   TW_FIX32       Right;
   TW_FIX32       Bottom;
} TW_FRAME, FAR * pTW_FRAME;
```

Used by

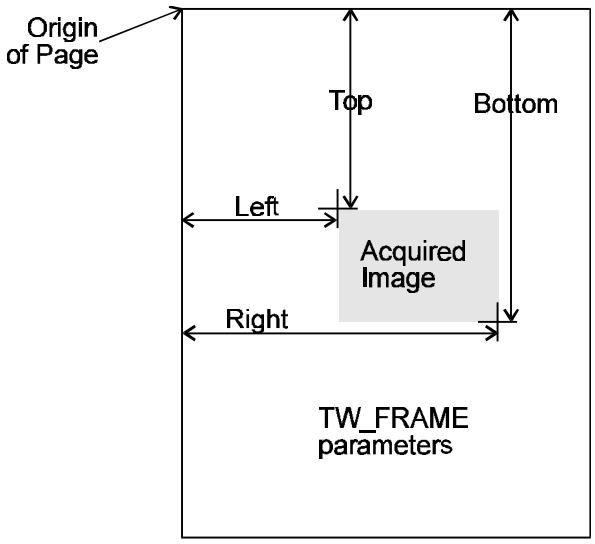
Embedded in the TW_IMAGELAYOUT structure

Description

Defines a frame rectangle in ICAP_UNITS coordinates.

Field Descriptions

Left	Value of the left-most edge of the rectangle (in ICAP_UNITS).
Top	Value of the top-most edge of the rectangle (in ICAP_UNITS).
Right	Value of the right-most edge of the rectangle (in ICAP_UNITS).
Bottom	Value of the bottom-most edge of the rectangle (in ICAP_UNITS).



Frame Parameters

TW_GRAYRESPONSE

```
typedef struct {
   TW_ELEMENT8       Response[1];
} TW_GRAYRESPONSE, FAR * pTW_GRAYRESPONSE;
```

Used by

DG_IMAGE / DAT_GRAYRESPONSE / MSG_RESET
DG_IMAGE / DAT_GRAYRESPONSE / MSG_SET

Description

This structure is used by the application to specify a set of mapping values to be applied to grayscale data. Use this structure for grayscale data whose bit depth is up to and including 8-bits. This structure can only be used if TW_IMAGEINFO.PixelType is TWPT_GRAY. The number of elements in the array is determined by TW_IMAGEINFO.BitsPerPixel—the number of elements is 2 raised to the power of TW_IMAGEINFO.BitsPerPixel.

This structure is primarily intended for use by applications that bypass the Source's built-in user interface.

Field Descriptions

Response[1]	Transfer curve descriptors. All three channels must contain the same value for every entry.

TW_HANDLE

On Windows:

```
typedef HANDLE           TW_HANDLE;
```

On Macintosh:

```
typedef Handle           TW_HANDLE;
```

On Unix:

```
typedef unsigned char   *TW_HANDLE;
```

Used by

Embedded in the TW_CAPABILITY and TW_USERINTERFACE structures

Description

The typedef of Handles are defined by the operating system. TWAIN defines TW_HANDLE to be the handle type supported by the operating system.

Field Descriptions

See definitions above

TW_IDENTITY

```
typedef struct {
   TW_UINT32       Id;
   TW_VERSION      Version;
   TW_UINT16       ProtocolMajor;
   TW_UINT16       ProtocolMinor;
   TW_UINT32       SupportedGroups;
   TW_STR32        Manufacturer;
   TW_STR32        ProductFamily;
   TW_STR32        ProductName;
} TW_IDENTITY, FAR * pTW_IDENTITY;
```

Used by

A large number of the operations because it identifies the application and the Source

Description

Provides identification information about a TWAIN entity. Used to maintain consistent communication between entities.

Field Descriptions

Id	A unique, internal identifier for the TWAIN entity. This field is only filled by the Source Manager. Neither an application nor a Source should fill this field. The Source uses the contents of this field to "identify" which application is invoking the operation sent to the Source.
Version	A TW_VERSION structure identifying the TWAIN entity.
ProtocolMajor	Major number of latest TWAIN version that this element supports (see TWON_PROTOCOLMAJOR).
ProtocolMinor	Minor number of latest TWAIN version that this element supports (see TWON_PROTOCOLMINOR).
SupportedGroups	1. The application will normally set this field to specify which Data Group(s) it wants the Source Manager to sort Sources by when presenting the Select Source dialog, or returning a list of available Sources. The application sets this prior to invoking a MSG_USERSELECT operation. 2. The application may also set this field to specify which Data Group(s) it wants the Source to be able to acquire and transfer. The application must do this prior to sending the Source its MSG_ENABLEDS operation. 3. The Source must set this field to specify which Data Group(s) it can acquire. It will do this in response to a MSG_OPENDS.
Manufacturer	String identifying the manufacturer of the application or Source. e.g. "Aldus".
ProductFamily	Tells an application that performs device-specific operations which product family the Source supports. This is useful when a new Source has been released and the application doesn't know about the particular Source but still wants to perform Custom operations with it. e.g. "ScanMan".
ProductName	A string uniquely identifying the Source. This is the string that will be displayed to the user at Source select-time. This string must uniquely identify your Source for the user, and should identify the application unambiguously for Sources that care. e.g. "ScanJet IIc".

TW_IMAGEINFO

```
typedef struct {
   TW_FIX32       XResolution;
   TW_FIX32       YResolution;
   TW_INT32       ImageWidth;
   TW_INT32       ImageLength;
   TW_INT16       SamplesPerPixel;
   TW_INT16       BitsPerSample[8];
   TW_INT16       BitsPerPixel;
   TW_BOOL        Planar;
   TW_INT16       PixelType;
   TW_UINT16      Compression;
} TW_IMAGEINFO, FAR * pTW_IMAGEINFO;
```

Used by

The DG_IMAGE / DAT_IMAGEINFO / MSG_GET operation

Description

Describes the “real” image data, that is, the complete image being transferred between the Source and application. The Source may transfer the data in a different format--the information may be transferred in “strips” or “tiles” in either compressed or uncompressed form. See the TW_IMAGEMEMXFER structure for more information.

The term “sample” is referred to a number of times in this structure. It holds the same meaning as in the TIFF specification. A sample is a contiguous body of image data that can be categorized by the channel or “ink color” it was captured to describe. In an R-G-B (Red-Green-Blue) image, such as on your TV or computer’s CRT, each color channel is composed of a specific color. There are 3 samples in an R-G-B; Red, Green, and Blue. A C-Y-M-K image has 4 samples. A Grayscale or Black and White image has a single sample.

Note: The value -1 in ImageWidth and ImageLength are special cases. It is possible for a Source to not know either its Width or Length. Applications need to consider this when allocating memory or otherwise dealing with the size of the Image.

Field Descriptions

XResolution	The number of pixels per ICAP_UNITS in the horizontal direction. The current unit is assumed to be "inches" unless it has been otherwise negotiated between the application and Source.
YResolution	The number of pixels per ICAP_UNITS in the vertical direction.
ImageWidth	How wide, in pixels, the entire image to be transferred is. If the Source doesn't know, set this field to -1 (hand scanners may do this). --1 can only be used if the application has set ICAP_UNDEFINEDIMAGESIZE to TRUE.
ImageLength	How tall/long, in pixels, the image to be transferred is. If the Source doesn't know, set this field to -1 (hand scanners may do this). -1 can only be used if the application has set ICAP_UNDEFINEDIMAGESIZE to TRUE.
SamplesPerPixel	The number of samples being returned. For R-G-B, this field would be set to 3. For C-M-Y-K, 4. For Grayscale or Black and White, 1.
BitsPerSample[8]	For each sample, the number of bits of information. 24-bit R-G-B will typically have 8 bits of information in each sample (8+8+8). Some 8-bit color is sampled at 3 bits Red, 3 bits Green, and 2 bits Blue. Such a scheme would put 3, 3, and 2 into the first 3 elements of this array. The supplied array allows up to 8 samples. Samples are not limited to 8 bits. However, both the application and Source must simultaneously support sample sizes greater than 8 bits per color.
BitsPerPixel	The number of bits in each image pixel (or bit depth). This value is invariant across the image. 24-bit R-G-B has BitsPerPixel = 24. 40-bit C-M-Y-K has BitsPerPixel=40. 8-bit Grayscale has BitsPerPixel = 8. Black and White has BitsPerPixel = 1.
Planar	If SamplesPerPixel > 1, indicates whether the samples follow one another on a pixel-by-pixel basis (R-G-B-R-G-B-R-G-B...) as is common with a one-pass scanner or all the pixels for each sample are grouped together (complete group of R, complete group of G, complete group of B) as is common with a three-pass scanner. If the pixel-by-pixel method (also known as "chunky") is used, the Source should set Planar = FALSE. If the grouped method (also called "planar") is used, the Source should set Planar = TRUE.
PixelType	This is the highest categorization for how the data being transferred should be interpreted by the application. This is how the application can tell if the data is Black and White, Grayscale, or Color. Currently, the only color type defined is "tri-stimulus", or color described by three characteristics. Most popular color description methods use tri-stimulus descriptors. For simplicity, the constant used to identify tri-stimulus color is called TWPT_RBG, for R-G-B color. There is no default for this value. Fill this field with the appropriate TWPT_xxxx constant.
Compression	The compression method used to process the data being transferred. Default is no compression. Fill this field with the appropriate TWCP_xxxx constant.

TW_IMAGELAYOUT

```
typedef struct {
   TW_FRAME       Frame;
   TW_UINT32      DocumentNumber;
   TW_UINT32      PageNumber;
   TW_UINT32      FrameNumber;
} TW_IMAGELAYOUT, FAR * pTW_IMAGELAYOUT;
```

Used by

DG_IMAGE / DAT_IMAGELAYOUT / MSG_GET
DG_IMAGE / DAT_IMAGELAYOUT / MSG_GETDEFAULT
DG_IMAGE / DAT_IMAGELAYOUT / MSG_RESET
DG_IMAGE / DAT_IMAGELAYOUT / MSG_SET

Description

Involves information about the original size of the acquired image and its position on the original "page" relative to the "page's" upper-left corner. **Default measurements are in inches** (units of measure can be changed by negotiating the ICAP_UNITS capability). This information may be used by the application to relate the acquired (and perhaps processed image) to the original. Further, the application can, using this structure, set the size of the image it wants acquired.

Another attribute of this structure is the included frame, page, and document indexing information. Most Sources and applications, at least at first, will likely set all these fields to one. For Sources that can acquire more than one frame from a page in a single acquisition, the FrameNumber field will be handy. Sources that can acquire more than one page from a document feeder will use PageNumber and DocumentNumber. These fields will be especially useful for forms-processing applications and other applications with similar document tracking requirements.

Field Descriptions

Frame	Defines the Left, Top, Right, and Bottom coordinates (in ICAP_UNITS) of the rectangle enclosing the original image on the original "page". If the application isn't interested in setting the origin of the image, set both Top and Left to zero. The Source will fill in the actual values following the acquisition. See also TW_FRAME.
DocumentNumber	The document number, assigned by the Source, that the acquired data originated on. Useful for grouping pages together. Usually a physical representation, this could just as well be a logical construct. Initial value is 1. Increment when a new document is placed into the document feeder (usually tell this has happened when the feeder empties). Reset when no longer acquiring from the feeder.
PageNumber	The page which the acquired data was captured from. Useful for grouping Frames together that are in some way related, usually Source. Usually a physical representation, this could just as well be a logical construct. Initial value is 1. Increment for each page fed from a page feeder. Reset when a new document is placed into the feeder.
FrameNumber	Usually a chronological index of the acquired frame. These frames are related to one another in some way; usually they were acquired from the same page. The Source assigns these values. Initial value is 1. Reset when a new page is acquired from.

TW_IMAGEMEMXFER

```
typedef struct {
   TW_UINT16       Compression;
   TW_UINT32       BytesPerRow;
   TW_UINT32       Columns;
   TW_UINT32       Rows;
   TW_UINT32       XOffset;
   TW_UINT32       YOffset;
   TW_UINT32       BytesWritten;
   TW_MEMORY       Memory;
} TW_IMAGEMEMXFER, FAR * pTW_IMAGEMEMXFER;
```

Used by

DG_IMAGE / DAT_IMAGEMEMXFER / MSG_GET

Description

Describes the form of the acquired data being passed from the Source to the application. When used in combination with a TW_IMAGEINFO structure, the application can correctly interpret the image.

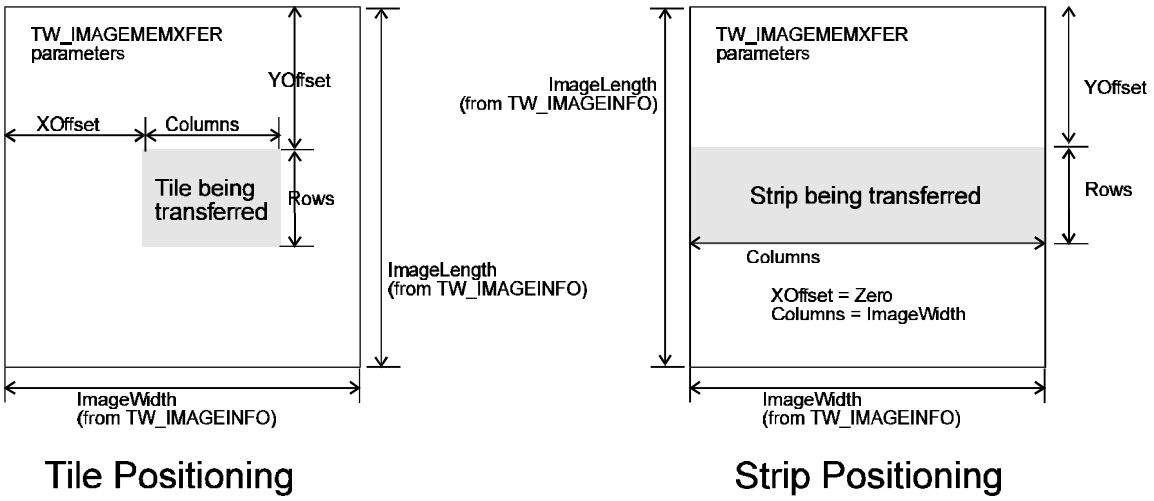
This structure allows transfer of “chunks” from the acquired data. These portions may be either “strips” or “tiles.” Strips are tiles whose width matches that of the full image. Strips are always passed sequentially, from “top” to “bottom”. A tile’s position does not necessarily follow that of the previously passed tile. Most Sources will transfer strips.

Note: The application should remember what corner was contained in the first tile of a plane. When the opposite corner is delivered, the plane is complete. The dimensions of the memory transfers may vary.

Data may be passed either compressed or uncompressed. All Sources must pass uncompressed data. Sources are not required to support compressed data transfers. Compressed data transfers, and how the values are entered into the fields of this structure, are described in Chapter 4.

Following is a picture of some of the fields from a TW_IMAGEMEMXFER structure. **The large outline shows the entire image which was selected to be transferred.** The smaller rectangle shows the particular portion being described by this TW_IMAGEMEMXFER structure.

Note: Remember that for a “strip” transfer XOffset = 0, and Columns = TW_IMAGEINFO.ImageWidth.



Field Descriptions

Compression	The compression method used to process the data being transferred. Write the constant (TWCP_xxxx) that precisely describes the type of compression used for the buffer. This may be different from the method reported in the TW_IMAGEINFO structure (if the user selected a different method before the actual transfer began, for instance). This is unlikely, but possible. The application can optionally abort the acquisition if the value in this field differs from the TW_IMAGEINFO value. Default is no compression (TWCP_NONE) and most transfers will probably be uncompressed. See the list of constants in the TWAIN.H file.
BytesPerRow	The number of uncompressed bytes in each row of the piece of the image being described in this buffer.
Columns	The number of uncompressed columns (in pixels) in this buffer.
Rows	The number or uncompressed rows (in pixels) in this buffer.
XOffset	How far, in pixels, the left edge of the piece of the image being described by this structure is inset from the “left” side of the original image. If the Source is transferring in “strips”, this value will equal zero. If the Source is transferring in “tiles”, this value will often be non-zero.
YOffset	Same idea as XOffset, but the measure is in pixels from the “top” of the original image to the upper edge of this piece.
BytesWritten	The number of bytes written into the transfer buffer. This field must always be filled in correctly, whether compressed or uncompressed data is being transferred.
Memory	A structure of type TW_MEMORY describing who must dispose of the buffer, the actual size of the buffer, in bytes, and where the buffer is located in memory.

TW_INFO

```
typedef struct {
      TW_UINT16        InfoID;
      TW_UINT16        ItemType;
      TW_UINT16        NumItems;
      TW_UINT16        CondCode;
      TW_UINT32        Item;
   } TW_INFO, FAR * pTW_ INFO;
```

Used by

Within TW_EXTIMAGEINFO structure.

Description

This structure is used to pass specific information between the data source and the application.

Field Descriptions

InfoID	Tag identifying an information. For TW_EXTIMAGEINFO, the information ID is defined as IACAP_xxxx. (Please refer to Extended Image capabilities).
ItemType	Item data type. It is one of TWTY_xxxx value.
NumItems	Number of items for this field.
CondCode	This is condition code of availability of data for extended image attribute requested. Following is the list of possible condition codes: TWRC_INFONOTSUPPORTED TWRC_DATANOTAVAILABLE
Item	Data Item. For anything that is <= 4 bytes, it is actual data. Otherwise it is a handle to data location. If < 4 bytes, it is 4 byte aligned.

Following is the list of added return codes.

TWRC_INFONOTSUPPORTED	Requested information is not supported.
TWRC_DATANOTAVAILABLE	Requested information is supported, but some unknown reason, information is not available.

TW_JPEGCOMPRESSION

```
typedef struct {
   TW_UINT16       ColorSpace;
   TW_UINT32       SubSampling;
   TW_UINT16       NumComponents;
   TW_UINT16       RestartFrequency;
   TW_UINT16       QuantMap[4]Manufacturer;
   TW_MEMORY       QuantTable[4];
   TW_UINT16       HuffmanMap[4];
   TW_MEMORY       HuffmanDC[2];
   TW_MEMORY       HuffmanAC[2];
} TW_JPEGCOMPRESSION, FAR * pTW_JPEGCOMPRESSION;
```

Used by

DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_GET
DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_GETDEFAULT
DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_RESET
DG_IMAGE / DAT_JPEGCOMPRESSION / MSG_SET

Description

Describes the information necessary to transfer a JPEG-compressed image during a buffered transfer. Images compressed in this fashion will be compatible with the JPEG File Interchange Format, version 1.1. For more information on JPEG and TWAIN, see Chapter 4. The TWAIN JPEG implementation is based on the JPEG Draft International Standard, version 10918-1. The sample tables found in Section K of the JPEG Draft International Standard, version 10918-1 are used as the default tables for QuantTable, HuffmanDC, and HuffmanAC.

Field Descriptions

ColorSpace	One of the TWPT_xxxx values. Defines the color space in which the compressed components are stored. Only spaces supported by the Source for ICAP_JPEGPIXELTYPE are valid.
SubSampling	Encodes the horizontal and vertical subsampling in the form ABCDEFGH, where ABCD are the high-order four nibbles which represent the horizontal subsampling and EFGH are the low-order four nibbles which represent the vertical subsampling. Each nibble may have a value of 0, 1, 2, 3, or 4. However, max(A,B,C,D) * max(E,F,G,H) must be less than or equal to 10. Subsampling is irrelevant for single component images. Therefore, the corresponding nibbles should be set to 1. e.g. To indicate subsampling two Y for each U and V in a YUV space image, where the same subsampling occurs in both horizontal and vertical axes, this field would hold 0x21102110. For a grayscale image, this field would hold 0x10001000. A CMYK image could hold 0x11111111.
NumComponents	Number of color components in the image to be compressed.
RestartFrequency	Number of MDUs (Minimum Data Units) between restart markers. Default is 0, indicating that no restart markers are used. An MDU is defined for interleaved data (i.e. R-G-B, Y-U-V, etc.) as a minimum complete set of 8x8 component blocks.
QuantMap[4]	Mapping of components to Quantization tables.
QuantTable[4]	Quantization tables.
HuffmanMap[4]	Mapping of components to Huffman tables. Null entries signify selection of the default tables.
HuffmanDC[2]	DC Huffman tables. Null entries signify selection of the default tables.
HuffmanAC[2]	AC Huffman tables. Null entries signify selection of the default tables.

TW_MEMORY

```
typedef struct {
   TW_UINT32      Flags;
   TW_UINT32      Length;
   TW_MEMREF      TheMem;
} TW_MEMORY, FAR * pTW_MEMORY;
```

Used by

Embedded in the TW_IMAGEMEMXFER and TW_JPEGCOMPRESSION structures

Description

Provides information for managing memory buffers. Memory for transfer buffers is allocated by the application--the Source is asked to fill these buffers. This structure keeps straight which entity is responsible for deallocation.

Field Descriptions

Flags — Encodes which entity releases the buffer and how the buffer is referenced. The ownership flags must be used:

- when transferring Buffered Memory data as tiles
- when transferring Buffered Memory that is compressed
- in the TW_JPEGCOMPRESSION structure

When transferring Buffered Memory data as uncompressed strips, the application allocates the buffers and is responsible for setting the ownership flags.

This field is used to identify how the memory is to be referenced. The memory is always referenced by a Handle on the Macintosh and a Pointer under UNIX. It is referenced by a Handle or a pointer under Microsoft Windows.

Use TWMF_xxxx constants, bit-wise OR'd together to fill this field.

Flag Constants:

TWMF_APPOWNS	0x1
TWMF_DSMOWNS	0x2
TWMF_DSOWNS	0x4
TWMF_POINTER	0x8
TWMF_HANDLE	0x10

Length — The size of the buffer in bytes. Should always be an even number and word-aligned.

TheMem — Reference to the buffer. May be a Pointer or a Handle (see Flags field to make this determination). You must typecast this field before referencing it in your code.

TW_MEMREF

On Windows:

```
typedef LPVOID     TW_MEMREF;
```

On Macintosh:

```
typedef char       *TW_MEMREF;
```

On Unix:

```
typedef unsigned charEMREF;
```

Used by

Embedded in the TW_EVENT and TW_MEMORY structures

Description

Memory references are specific to each operating system. TWAIN defines TW_MEMREF to be the memory reference type supported by the operating system.

Field Descriptions

See definitions above

TW_ONEVALUE

```
typedef struct {
   TW_UINT16      ItemType;
   TW_UINT32      Item;
} TW_ONEVALUE, FAR * pTW_ONEVALUE;
```

Used by

TW_CAPABILITY structure (when ConType field specifies TWON_ONEVALUE)

Description

Stores a single value (item) which describes a capability. This structure is currently used only in a TW_CAPABILITY structure. Such a value would be useful to describe the current value of the device's contrast, or to set a specific contrast value. This structure is related in function and purpose to TW_ARRAY, TW_ENUMERATION, and TW_RANGE.

Note that in cases where the data type is TW_UINT16, the data should reside in the lower word.

Field Descriptions

ItemType	The type of the item. The type is indicated by the constant held in this field. The constant is of the kind TWTY_xxxx.
Item	The value.

TW_PALETTE8

```
typedef struct {
   TW_UINT16      NumColors;
   TW_UINT16      PaletteType;
   TW_ELEMENT8    Colors[256];
} TW_PALETTE8, FAR * pTW_PALETTE8;
```

Used by

DG_IMAGE / DAT_PALETTE8 / MSG_GET
DG_IMAGE / DAT_PALETTE8 / MSG_GETDEFAULT
DG_IMAGE / DAT_PALETTE8 / MSG_RESET
DG_IMAGE / DAT_PALETTE8 / MSG_SET

Description

This structure holds the color palette information for buffered memory transfers of type ICAP_PIXELTYPE = TWPT_PALETTE.

Field Descriptions

NumColors	Number of colors in the color table; maximum index into the color table should be one less than this (since color table indexes are zero-based).
PaletteType	TWPA_xxxx constant specifying the type of palette.
Colors[256]	Array of palette values.

TW_PASSTHRU

```
typedef struct {
    TW_MEMREF       pCommand;
    TW_UINT32       CommandBytes;
    TW_INT32        Direction;
    TW_MEMREF       pData;
    TW_UINT32       DataBytes;
    TW_UINT32       DataBytesXfered;
} TW_PASSTHRU, FAR * pTW_PASSTHRU;
```

Used by

DG_CONTROL / DAT_PASSTHRU / MSG_PASSTHRU

Description

Used to bypass the TWAIN protocol when communicating with a device. All memory must be allocated and freed by the Application. Use of this feature is limited to Source writers who require a standard entry point for specialized Applications, such as diagnostics.

Field Descriptions

pCommand	Pointer to Command buffer.
CommandBytes	Number of bytes in Command buffer.
Direction	One of the TWDR_xxxx values. Defines the direction of data flow.
pData	Pointer to Data buffer.
DataBytes	Number of bytes in Data buffer.
DataBytesXfered	Number of bytes successfully transferred.

TW_PENDINGXFERS

```
typedef struct {
   TW_UINT16 Count;
   union {
           TW_UINT32 EOJ;
           TW_UINT32 Reserved;
   };
} TW_PENDINGXFERS, FAR *pTW_PENDINGXFERS;
```

Used by

DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER
DG_CONTROL / DAT_PENDINGXFERS / MSG_GET
DG_CONTROL / DAT_PENDINGXFERS / MSG_RESET

Description

This structure tells the application how many more complete transfers the Source currently has available. The application should MSG_GET this structure at the conclusion of a transfer to confirm the Source's current state. If the Source has more transfers pending it will remain in State 6 awaiting initiation of the next transfer by the application.

If it has no more image transfers pending, it will place zero into the Count and will have automatically transitioned to State 5 (audio transfers will remain in State 6, even when the Count goes to zero).

If the Source knows there are more transfers pending but is unsure of the actual number, it should place -1 into Count (for example, with document feeders or continuous video sources). Otherwise, the Source should place the actual number of pending transfers into Count.

Field Descriptions

Count — When DAT_XFERGROUP is set to DG_IMAGE

The number of complete transfers a Source has available for the application it is connected to. If no more transfers are available, set to zero. If an unknown and non-zero number of transfers are available, set to -1.

When DAT_XFERGROUP is set to DG_AUDIO

The number of complete audio snippet transfers for a given image a Source has available for the application it is connected to. If no more transfers are available, set to zero. –1 is not a valid value.

EOJ — The application should check this field if the CAP_JOBCONTROL is set to other than TWJC_NULL. If the EOJ is not 0, the application should expect more data from the driver according to CAP_JOBCONTROL settings.

Reserved — Maintained so as not to cause compile time errors for pre-1.7 code.

TW_RANGE

```
typedef struct {
   TW_UINT16      ItemType;
   TW_UINT32      MinValue;
   TW_UINT32      MaxValue;
   TW_UINT32      StepSize;
   TW_UINT32      DefaultValue;
   TW_UINT32      CurrentValue;
} TW_RANGE, FAR * pTW_RANGE;
```

Used by

TW_CAPABILITY structure (when ConType field specifies TWON_RANGE)

Description

Stores a range of individual values describing a capability. The values are uniformly distributed between a minimum and a maximum value. The step size between each value is constant. Such a value is useful when describing such capabilities as the resolutions of a device which supports discreet, uniform steps between each value, such as 50 through 300 dots per inch in steps of 2 dots per inch (50, 52, 54, ..., 296, 298, 300). This structure is related in function and purpose to TW_ARRAY, TW_ENUMERATION, and TW_ONEVALUE.

Field Descriptions

ItemType	The type of items in the list. The type is indicated by the constant held in this field. The constant is of the kind TWTY_xxxx. All items in the list have the same size/type.
MinValue	The least positive/most negative value of the range.
MaxValue	The most positive/least negative value of the range.
StepSize	The delta between two adjacent values of the range. e.g. Item2 - Item1 = StepSize;
DefaultValue	The device's "power-on" value for the capability. If the application is performing a MSG_SET operation and isn't sure what the default value is, set this field to TWON_DONTCARE32.
CurrentValue	The value to which the device (or its user interface) is currently set to for the capability.

TW_RGBRESPONSE

```
typedef struct {
   ELEMENT8      Response[1];
} TW_RGBRESPONSE, FAR * pTW_RGBRESPONSE;
```

Used by

DG_IMAGE / DAT_RGBRESPONSE / MSG_RESET
DG_IMAGE / DAT_RGBRESPONSE / MSG_SET

Description

This structure is used by the application to specify a set of mapping values to be applied to RGB color data. Use this structure for RGB data whose bit depth is up to, and including, 8-bits. The number of elements in the array is determined by TW_IMAGEINFO.BitsPerPixel—the number of elements is 2 raised to the power of TW_IMAGEINFO.BitsPerPixel.

This structure is primarily intended for use by applications that bypass the Source's built-in user interface.

Field Descriptions

Response[1] Transfer curve descriptors. To minimize color shift problems, writing the same values into each channel is desirable.

TW_SETUPFILEXFER

```
typedef struct {
   TW_STR255      FileName;
   TW_UINT16      Format;
   TW_INT16       VRefNum;
} TW_SETUPFILEXFER, FAR * pTW_SETUPFILEXFER;
```

Used by

DG_CONTROL / DAT_SETUPFILEXFER / MSG_GET
DG_CONTROL / DAT_SETUPFILEXFER / MSG_GETDEFAULT
DG_CONTROL / DAT_SETUPFILEXFER / MSG_RESET
DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET

Description

Describes the file format and file specification information for a transfer through a disk file.

Field Descriptions

FileName	A complete file specifier to the target file. On Windows, be sure to include the complete pathname.
Format	The format of the file the Source is to fill. Fill with the correct constant—as negotiated with the Source—of type TWFF_xxxx.
VRefNum	The volume reference number for the file. This applies to Macintosh only. On Windows, fill the field with TWON_DONTCARE16.

TW_SETUPMEMXFER

```
typedef struct {
   TW_UINT32      MinBufSize;
   TW_UINT32      MaxBufSize;
   TW_UINT32      Preferred;
} TW_SETUPMEMXFER, FAR * pTW_SETUPMEMXFER;
```

Used by

DG_CONTROL / DAT_SETUPMEMXFER / MSG_GET

Description

Provides the application information about the Source's requirements and preferences regarding allocation of transfer buffer(s). The best applications will allocate buffers of the Preferred size. An application should never allocate a buffer smaller than MinBufSize. Some Sources may not be able to fill a buffer larger than MaxBufSize so a larger allocation is a waste of RAM (digital cameras or frame grabbers fit this category).

Sources should fill out all three fields as accurately as possible. If a Source can fill an indeterminately large buffer (hand scanners might do this), put a -1 in MaxBufSize.

Field Descriptions

MinBufSize	The size of the smallest transfer buffer, in bytes, that a Source can be successful with. This will typically be the number of bytes in an uncompressed row in the block to be transferred. An application should never allocate a buffer smaller than this.
MaxBufSize	The size of the largest transfer buffer, in bytes, that a Source can fill. If a Source can fill an arbitrarily large buffer, it might set this field to negative 1 to indicate this (a hand-held scanner might do this, depending on how long its cord is). Other Sources, such as frame grabbers, cannot fill a buffer larger than a certain size. Allocation of a transfer buffer larger than this value is wasteful.
Preferred	The size of the optimum transfer buffer, in bytes. A smart application will allocate transfer buffers of this size, if possible. Buffers of this size will optimize the Source's performance. Sources should be careful to put reasonable values in this field. Buffers that are 10's of kbytes will be easier for applications to allocate than buffers that are 100's or 1000's of kbytes.

TW_STATUS

```
typedef struct {
   TW_UINT16      ConditionCode;
   TW_UINT16      Reserved;
} TW_STATUS, FAR * pTW_STATUS;
```

Used by

DG_CONTROL / DAT_STATUS / MSG_GET

Description

Used to describe the status of a Source. To ask the Source to fill in this structure, the application sends:

DG_CONTROL / DAT_STATUS / MSG_GET

with a pointer to a TW_STATUS structure. This is typically done in response to a Return Code other than TWRC_SUCCESS and should always be done in response to a Return Code of TWRC_CHECKSTATUS. In such a case, the Source has something it needs the application to know about.

Field Descriptions

ConditionCode	The TWCC_xxxx code (Condition Code) being returned to the application.
Reserved	Reserved for future use.

TW_TRANSFORMSTAGE

```
typedef struct {
   TW_DECODEFUNCTION      Decode[3];
   TW_FIX32               Mix[3][3];
} TW_TRANSFORMSTAGE, FAR * pTW_TRANSFORMSTAGE;
```

Used by

Embedded in the TW_CIECOLOR structure

Description

Specifies the parametrics used for either the ABC or LMN transform stages. This structure parallels the TTransformStage structure definition in Appendix A.

Field Descriptions

Decode[3]	Channel-specific transform parameters.
Mix[3][3]	3x3 matrix that specifies how channels are mixed in

TW_USERINTERFACE

```
typedef struct {
   TW_BOOL        ShowUI;
   TW_BOOL        ModalUI;
   TW_HANDLE      hParent;
} TW_USERINTERFACE, FAR * pTW_USERINTERFACE;
```

Used by

DG_CONTROL / DAT_USERINTERFACE / MSG_DISABLEDS
DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS

Description

This structure is used to handle the user interface coordination between an application and a Source.

Field Descriptions

ShowUI — Set to TRUE by the application if the Source should activate its built-in user interface. Otherwise, set to FALSE. Note that not all sources support ShowUI = FALSE. See the description of DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS for more information.

ModalUI — Set to TRUE by the Source if the Source's built-in user interface behaves modally. This is described in Chapter 4 of this Toolkit.

hParent — Microsoft Windows only: Application's window handle. The Source designates the hWnd as its parent when creating the Source dialog.

NOTE: Window handle allows Source's user interface to be a proper child of the parent application.

TW_VERSION

```
typedef struct {
   TW_UINT16      MajorNum;
   TW_UINT16      MinorNum;
   TW_UINT16      Language;
   TW_UINT16      Country;
   TW_STR32       Info;
} TW_VERSION, FAR * pTW_VERSION;
```

Used by

This is embedded in the TW_IDENTITY data structure

Description

A general way to describe the version of software that is running.

Field Descriptions

MajorNum	This refers to your application or Source's major revision number. e.g. The "2" in "version 2.01".
MinorNum	The incremental revision number of your application or Source. e.g. The "1" in "version 2.1".
Language	The primary language for your Source or application. e.g. TWLG_GER.
Country	The primary country where your Source or application is intended to be distributed. e.g. Germany.
Info	General information string - fill in as needed. e.g. "1.0b3 Beta release".

Extended Image Information Definitions

The following extended image attribute capabilities have been defined. If a data source wishes to create additional custom image attribute capabilities, it should define its TWEI_CUSTOM*xxx* identifiers with a base starting ID of TWEI_CUSTOM+(*x*) where *x* is a unique positive number defined by the data source.

For all extended image attributes see: DG_IMAGE / DAT_EXTIMAGEINFO / MSG_GET

Bar Code Recognition

TWEI_BARCODECOUNT

Description Returns the number of bar codes found on the document image. A value of 0 means the bar code engine was enabled but that no bar codes were found. A value of -1 means the bar code engine was not enabled.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_BARCODECONFIDENCE

Description: This number reflects the degree of certainty the bar code engine has in the accuracy of the information obtained from the scanned image and ranges from 0 (no confidence) to 100 (supreme confidence). The Source may return a value of -1 if it does not support confidence reporting.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_BARCODEROTATION

Description: The bar code's orientation on the scanned image is described in reference to a Western-style interpretation of the image.

Value Type: TW_UINT32

Allowed Values:

TWBCOR_ROT0	Normal reading orientation
TWBCOR_ROT90	Rotated 90 degrees clockwise
TWBCOR_ROT180	Rotated 180 degrees clockwise
TWBCOR_ROT270	Rotated 270 degrees clockwise
TWBCOR_ROTX	The orientation is not known.

TWEI_BARCODETEXTLENGTH

Description: The number of ASCII characters derived from the bar code.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_BARCODETEXT

Description: The text of a bar code found on a page.

Value Type: TW_HANDLE

Allowed Values: Any handle to a string

TWEI_BARCODEX

Description: The X coordinate of a bar code found on a page.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_BARCODEY

Description: The Y coordinate of a bar code found on a page.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _BARCODETYPE

Description: The type of bar code found on a page.

Value Type: TW_UINT32

Allowed Values:

TWBT_3OF9	0
TWBT_2OF5INTERLEAVED	1
TWBT_2OF5NONINTERLEAVED	2
TWBT_CODE93	3
TWBT_CODE128	4
TWBT_UCC128	5
TWBT_CODABAR	6
TWBT_UPCA	7
TWBT_UPCE	8
TWBT_EAN8	9
TWBT_EAN13	10
TWBT_POSTNET	11
TWBT_PDF417	12

Shaded Area Detection and Removal

TWEI _DESHADECOUNT

Description: Returns the number of shaded regions found and erased in the document image. A value of 0 means the deshade engine was enabled but that no regions were processed. A value of -1 means the deshade engine was not enabled.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _DESHADETOP

Description: The top coordinate of a shaded region found on a page.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _DESHADELEFT

Description: The left coordinate of a shaded region found on a page.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _DESHADEHEIGHT

Description: The height of a shaded region found on a page.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _DESHADEWIDTH

Description: The width of a shaded region found on a page.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _DESHADESIZE

Description: The width of the dots within the shade region.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_DESHADEBLACKCOUNTOLD

Description: The total number of black pixels in the region prior to deshading. If this value is unknown the Source returns -1.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_ DESHADEBLACKCOUNTNEW

Description: The total number of black pixels in the region after deshading. If this value is unknown the Source returns -1.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_ DESHADEBLACKRLMIN

Description: The shortest black pixel run-length in the region prior to deshading. If this value is unknown the Source returns -1.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_ DESHADEBLACKRLMAX

Description: The longest black pixel run-length in the region prior to deshading. If this value is unknown the Source returns -1.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_ DESHADEWHITECOUNTOLD

Description: The total number of white pixels in the region prior to deshading. If this value is unknown the Source returns -1.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_ DESHADEWHITECOUNTNEW

Description: The total number of white pixels in the region after deshading. If this value is unknown the Source returns -1.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_ DESHADEWHITERLMIN

Description: The shortest white pixel run-length in the region prior to deshading. If this value is unknown the Source returns -1.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_ DESHADEWHITERLAVE

Description: The average length of all white pixel run-lengths in the region prior to deshading. If this value is unknown the Source returns -1.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_ DESHADEWHITERLMAX

Description: The longest white pixel run-length in the region prior to deshading. If this value is unknown the Source returns -1.

Value Type: TW_UINT32

Allowed Values: >=0

Speckle Removal

TWEI _SPECKLESREMOVED

Description: The number of speckles removed from the image when de-speckle is enabled.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _BLACKSPECKLESREMOVED

Description: The number of black speckles removed from the image when despeckle is enabled.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _WHITESPECKLESREMOVED

Description: The number of white speckles removed (black speckles added) from the image when despeckle is enabled.

Value Type: TW_UINT32

Allowed Values: >=0

Horizontal Line Detection and Removal

TWEI _HORZLINECOUNT

Description: Returns the number of horizontal lines found and erased in the document image. A value of 0 means the line removal engine was enabled but that no lines were found. A value of -1 means the line engine was not enabled.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _HORZLINEXCOORD

Description: The x coordinate of a horizontal line detected in the image.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _HORZLINEYCOORD

Description: The y coordinate of a horizontal line detected in the image.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _HORZLINELENGTH

Description: The length of a horizontal line detected in the image.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _HORZLINETHICKNESS

Description: The thickness (height) of a horizontal line detected in the image.

Value Type: TW_UINT32

Allowed Values: >=0

Vertical Line Detection and Removal

TWEI _VERTLINECOUNT

Description: Returns the number of vertical lines found and erased in the document image. A value of 0 means the line removal engine was enabled but that no lines were found. A value of -1 means the line engine was not enabled.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _VERTLINEXCOORD

Description: The x coordinate of a vertical line detected in the image.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _VERTLINEYCOORD

Description: The y coordinate of a vertical line detected in the image.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI _VERTLINELENGTH

Description: The length of a vertical line detected in the image.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_VERTLINETHICKNESS

Description: The thickness (width) of a vertical line detected in the image.

Value Type: TW_UINT32

Allowed Values: >=0

Patch Code Detection (Job Separation)

TWEI_PATCHCODE

Description: The patch code detected.

Value Type: TW_UINT32

Allowed Values:

TWPCH_PATCH1	1
TWPCH_PATCH2	2
TWPCH_PATCH3	3
TWPCH_PATCH4	4
TWPCH_PATCH6	5
TWPCH_PATCHT	6

Skew detection and Removal

TWEI_DESKEWSTATUS

Description: Returns the status of the deskew operation.

Value Type: TW_UINT32

Allowed Values:

TWDSK_SUCCESS	Image successfully deskewed
TWDSK_REPORTONLY	Deskew information only
TWDSK_FAIL	Deskew failed
TWDSK_DISABLED	Deskew engine not enabled

TWEI_SKEWORIGINALANGLE

Description: The amount of skew in the original image.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_SKEWFINALANGLE

Description: The amount of skew in the deskewed image. This number may not be zero.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_SKEWCONFIDENCE

Description: This number reflects the degree of certainty the deskew engine has in the accuracy of the deskewing of the current image and ranges from 0 (no confidence) to 100 (supreme confidence). The Source may return a value of -1 if it does not support confidence reporting.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_SKEWWINDOWX1

Description: This is the X image coordinate of the upper left corner of the virtual deskewed image. It may be negative indicating the deskewed corner is not represented by actual pixels.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_SKEWWINDOWY1

Description: The Y image coordinate of the upper left corner of the virtual deskewed image. It may be negative indicating the deskewed corner is not represented by actual pixels.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_SKEWWINDOWX2

Description: The X image coordinate of the upper right corner of the virtual deskewed image.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_SKEWWINDOWY2

Description: The Y image coordinate of the upper right corner of the virtual deskewed image.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_SKEWWINDOWX3

Description: This is the X image coordinate of the lower left corner of the virtual deskewed image. It may be negative indicating the deskewed corner is not represented by actual pixels.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_SKEWWINDOWY3

Description: The Y image coordinate of the lower left corner of the virtual deskewed image.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_SKEWWINDOWX4

Description: The X image coordinate of the lower right corner of the virtual deskewed image.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_SKEWWINDOWY4

Description: The Y image coordinate of the lower right corner of the deskewed image.

Value Type: TW_UINT32

Allowed Values: >=0

Endorsed / Imprinted Text

TWEI_ENDORSEDTEXT

Description: The text that was endorsed on the paper by the scanner.

Value Type: TW_STR255

Allowed Values: Any string

Forms Recognition

TWEI_FORMCONFIDENCE

Description: The confidence that the specified form was detected. This is an array property with a confidence factor for each form In the data set with 0 meaning no match and 100 meaning absolute certainty. Typically values over 70 imply a good form match with the template.

Value Type: TW_UINT32

Allowed Values: 0 to 100

TWEI_FORMTEMPLATEMATCH

Description: The array of file names for the master forms matched against a form. If multi-page master forms are used, the associated page numbers are contained in the FORMTEMPLATEPAGEMATCH capability array.

Value Type: TW_STR255

Allowed Values: Any string

TWEI_FORMTEMPLATEPAGEMATCH

Description: An array containing the number of the page from a multi-page master form matched against a form image. It is useful when matching a form image against the pages of a multi-page master form. The file name of the master form is contained in the FORMTEMPLATEMATCH capability.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_FORMHORZDOCOFFSET

Description: An array containing the perceived horizontal offsets of the form image being matched against a set of master forms. This is useful for page registration once the form has been recognized.

Value Type: TW_UINT32

Allowed Values: >=0

TWEI_FORMVERTDOCOFFSET

Description: An array containing the perceived vertical offsets of the form image being matched against a set of master forms. This is useful for page registration once the form has been recognized.

Value Type: TW_UINT32

Allowed Values: >= 0

Data Argument Types that Don't Have Associated TW_Structures

Most of the DAT_xxxx components of the TWAIN operation triplets have a corresponding data structure whose name begins with TW_ and then uses the same suffix as the DAT_ name. However, the following do not use that pattern.

DAT_IMAGEFILEXFER

Acts on NULL data.

DAT_IMAGENATIVEXFER

Uses a TW_UINT32 variable.

- **On Windows:** In Win 3.1, the low word of this 32-bit integer is a handle variable to a DIB (Device Independent Bitmap) located in memory. For Win 95 the handles fill the entire field.
- **On Macintosh:** This 32-bit integer is a handle to a Picture (a PicHandle). It is a QuickDraw picture located in memory.

DAT_NULL

Used by the Source to signal the need for an event to announce MSG_XFERREADY or MSG_CLOSEDSREQ. (Used on Windows only)

DAT_PARENT

Used by the DG_CONTROL / DAT_PARENT / MSG_OPENDSM and MSG_CLOSEDSM operations.

- **On Windows:** They act on a variable of type TW_INT32. Prior to the operation, the application must write, a window handle to the application's window that acts as the "parent" for the Source's user interface. In Win 3.1 this would be in the low word, in Win 95 it will fill the entire field. (This must be done whether or not the Source's user interface will be used. The Source Manager uses this window handle to signal the application when data is ready for transfer (MSG_XFERREADY) or the Source needs to be closed (MSG_CLOSEDSREQ)).
- **On Macintosh:** These act on NULL data.

DAT_XFERGROUP

Used by the DG_CONTROL / DAT_XFERGROUP / MSG_GET operation. The data acted on by this operation is a variable of type TW_UINT32. (The same as a DG_xxxx designator.) The value of this variable is indeterminate prior to the operation. Following the operation, a single bit is set indicating the Data Group of the transfer.

Constants

Generic Constants

Constants	(defined as)	(values)
	TWON_PROTOCOLMINOR	0
	TWON_PROTOCOLMAJOR	1
	TWON_ARRAY	3
	TWON_ENUMERATION	4
	TWON_ONEVALUE	5
	TWON_RANGE	6
	TWON_ICONID	962
	TWON_DSMID	461
	TWON_DSMCODEID	63
	TWON_DONTCARE8	0xff
	TWON_DONTCARE16	0xffff
	TWON_DONTCARE32	0xffffffff
Flags used in TW_MEMORY		
	TWMF_APPOWNS	0x1
	TWMF_DSMOWNS	0x2
	TWMF_DSOWNS	0x4
	TWMF_POINTER	0x8
	TWMF_HANDLE	0x10
Palette types for TW_PALETTE8		
	TWPA_RGB	0
	TWPA_GRAY	1
	TWPA_CMY	2
Events for TW_DEVICEEVENT		
	TWDE_AUTOMATICCAPTURE	0
	TWDE_CHECKBATTERY	1
	TWDE_CHECKFLASH	2
	TWDE_CHECKPOWERSUPPLY	3
	TWDE_CHECKRESOLUTION	4
	TWDE_DEVICEADDED	5
	TWDE_DEVICEOFFLINE	6
	TWDE_DEVICEREADY	7
	TWDE_DEVICEREMOVED	8
	TWDE_PAPERDOUBLEFEED	9
	TWDE_PAPERJAM	10

File Types for TW_FILESYSTEM

TWFT_CAMERA	0
TWFT_CAMERATOP	1
TWFT_CAMERABOTTOM	2
TWFT_CAMERAPREVIEW	3
TWFT_DOMAIN	4
TWFT_HOST	5
TWFT_DIRECTORY	6
TWFT_IMAGE	7
TWFT_UNKNOWN	8

ItemTypes for Capability Container structures

TWTY_INT8	0x0000
TWTY_INT16	0x0001
TWTY_INT32	0x0002
TWTY_UINT8	0x0003
TWTY_UINT16	0x0004
TWTY_UINT32	0x0005
TWTY_BOOL	0x0006
TWTY_FIX32	0x0007
TWTY_FRAME	0x0008
TWTY_STR32	0x0009
TWTY_STR64	0x000a
TWTY_STR128	0x000b
TWTY_STR255	0x000c

Capability Constants

CAP_CLEARBUFFERS

TWCB_AUTO	0
TWCB_CLEAR	1
TWCB_NOCLEAR	2

CAP_POWERSUPPLY

TWPS_EXTERNAL	0
TWPS_BATTERY	1

ICAP_BITDEPTHREDUCTION values	**(defined as)**
TWBR_THRESHOLD	0
TWBR_HALFTONES	1
TWBR_CUSTHALFTONE	2
TWBR_DIFFUSION	3

ICAP_BITORDER values

TWBO_LSBFIRST	0
TWBO_MSBFIRST	1

ICAP_COMPRESSION values

TWCP_NONE	0
TWCP_PACKBITS	1
TWCP_GROUP31D	2
TWCP_GROUP31DEOL	3
TWCP_GROUP32D	4
TWCP_GROUP34	5
TWCP_JPEG	6
TWCP_LZW	7
TWCP_JBIG	8
TWCP_PNG	9
TWCP_RLE4	10
TWCP_RLE8	11
TWCP_BITFIELDS	12

ICAP_FILTER values

TWFT_RED	0
TWFT_GREEN	1
TWFT_BLUE	2
TWFT_NONE	3
TWFT_WHITE	4
TWFT_CYAN	5
TWFT_MAGENTA	6
TWFT_YELLOW	7
TWFT_BLACK	8

ICAP_FLASHUSED2

TWFL_NONE	0
TWFL_OFF	1
TWFL_ON	2
TWFL_AUTO	3
TWFL_REDEYE	4

ICAP_IMAGEFILEFORMAT values

TWFF_TIFF	0
TWFF_PICT	1
TWFF_BMP	2
TWFF_XBM	3
TWFF_JFIF	4
TWFF_FPX	5
TWFF_TIFFMULTI	6
TWFF_PNG	7
TWFF_SPIFF	8
TWFF_EXIF	9

ICAP_IMAGEFILTER

TWIF_NONE	0
TWIF_AUTO	1
TWIF_LOWPASS	2
TWIF_BANDPASS	3
TWIF_HIGHPASS	4

ICAP_LIGHTPATH values

TWLP_REFLECTIVE	0
TWLP_TRANSMISSIVE	1

ICAP_LIGHTSOURCE values

TWLS_RED	0
TWLS_GREEN	1
TWLS_BLUE	2
TWLS_NONE	3
TWLS_WHITE	4
TWLS_UV	5
TWLS_IR	6

ICAP_NOISEFILTER

TWNF_NONE	0
TWNF_AUTO	1
TWNF_LONEPIXEL	2
TWNF_MAJORITYRULE	3

ICAP_ORIENTATION values

TWOR_ROT0	0
TWOR_ROT90	1
TWOR_ROT180	2
TWOR_ROT270	3
TWOR_PORTRAIT	TWOR_ROT0
TWOR_LANDSCAPE	TWOR_ROT270

ICAP_OVERSCAN

TWOV_NONE	0
TWOV_AUTO	1
TWOV_TOPBOTTOM	2
TWOV_LEFTRIGHT	3
TWOV_ALL	4

ICAP_PLANARCHUNKY values

TWPC_CHUNKY	0
TWPC_PLANAR	1

ICAP_PIXELFLAVOR values

TWPF_CHOCOLATE	0
TWPF_VANILLA	1

ICAP_PIXELTYPE values

TWPT_BW	0
TWPT_GRAY	1
TWPT_RGB	2
TWPT_PALETTE	3
TWPT_CMY	4
TWPT_CMYK	5
TWPT_YUV	6
TWPT_YUVK	7
TWPT_CIEXYZ	8
TWPT_LAB	9

ICAP_SUPPORTEDSIZES values

TWSS_NONE	0
TWSS_A4LETTER	1
TWSS_B5LETTER	2
TWSS_USLETTER	3
TWSS_USLEGAL	4
TWSS_A5	5
TWSS_B4	6
TWSS_B6	7
// removed	8
TWSS_USLEDGER	9
TWSS_USEXECUTIVE	10
TWSS_A3	11
TWSS_B3	12
TWSS_A6	13
TWSS_C4	14
TWSS_C5	15
TWSS_C6	16
// 1.8 Additions	
TWSS_4A0	17
TWSS_2A0	18
TWSS_A0	19
TWSS_A1	20
TWSS_A2	21
TWSS_A4	TWSS_A4LETTER
TWSS_A7	22
TWSS_A8	23
TWSS_A9	24
TWSS_A10	25
TWSS_ISOB0	26
TWSS_ISOB1	27
TWSS_ISOB2	28
TWSS_ISOB3	TWSS_B3
TWSS_ISOB4	TWSS_B4
TWSS_ISOB5	29
TWSS_ISOB6	TWSS_B6
TWSS_ISOB7	30
TWSS_ISOB8	31
TWSS_ISOB9	32
TWSS_ISOB10	33
TWSS_JISB0	34

TWSS_JISB1	35
TWSS_JISB2	36
TWSS_JISB3	37
TWSS_JISB4	38
TWSS_JISB5	TWSS_B5LETTER
TWSS_JISB6	39
TWSS_JISB7	40
TWSS_JISB8	41
TWSS_JISB9	42
TWSS_JISB10	43
TWSS_C0	44
TWSS_C1	45
TWSS_C2	46
TWSS_C3	47
TWSS_C7	48
TWSS_C8	49
TWSS_C9	50
TWSS_C10	51
TWSS_USEXECUTIVE	52
TWSS_BUSINESSCARD	53

ICAP_XFERMECH values

TWSX_NATIVE	0
TWSX_FILE	1
TWSX_MEMORY	2

ICAP_UNITS values

TWUN_INCHES	0
TWUN_CENTIMETERS	1
TWUN_PICAS	2
TWUN_POINTS	3
TWUN_TWIPS	4
TWUN_PIXELS	5

Language Constants

Language	**(defined as)**
TWLG_USERLOCALE	-1
TWLG_DAN	0
TWLG_DUT	1
TWLG_ENG	2
TWLG_FCF	3
TWLG_FIN	4
TWLG_FRN	5
TWLG_GER	6
TWLG_ICE	7
TWLG_ITN	8
TWLG_NOR	9
TWLG_POR	10
TWLG_SPA	11
TWLG_SWE	12
TWLG_USA	13
TWLG_AFRIKAANS	14

TWLG_ALBANIA	15
TWLG_ARABIC	16
TWLG_ARABIC_ALGERIA	17
TWLG_ARABIC_BAHRAIN	18
TWLG_ARABIC_EGYPT	19
TWLG_ARABIC_IRAQ	20
TWLG_ARABIC_JORDAN	21
TWLG_ARABIC_KUWAIT	22
TWLG_ARABIC_LEBANON	23
TWLG_ARABIC_LIBYA	24
TWLG_ARABIC_MOROCCO	25
TWLG_ARABIC_OMAN	26
TWLG_ARABIC_QATAR	27
TWLG_ARABIC_SAUDIARABIA	28
TWLG_ARABIC_SYRIA	29
TWLG_ARABIC_TUNISIA	30
TWLG_ARABIC_UAE	31
TWLG_ARABIC_YEMEN	32
TWLG_BASQUE	33
TWLG_BYELORUSSIAN	34
TWLG_BULGARIAN	35
TWLG_CATALAN	36
TWLG_CHINESE	37
TWLG_CHINESE_HONGKONG	38
TWLG_CHINESE_PRC	39
TWLG_CHINESE_SINGAPORE	40
TWLG_CHINESE_SIMPLIFIED	41
TWLG_CHINESE_TAIWAN	42
TWLG_CHINESE_TRADITIONAL	43
TWLG_CROATIA	44
TWLG_CZECH	45
TWLG_DANISH	TWLG_DAN
TWLG_DUTCH	TWLG_DUT
TWLG_DUTCH_BELGIAN	46
TWLG_ENGLISH	TWLG_ENG
TWLG_ENGLISH_AUSTRALIAN	47
TWLG_ENGLISH_CANADIAN	48
TWLG_ENGLISH_IRELAND	49
TWLG_ENGLISH_NEWZEALAND	50
TWLG_ENGLISH_SOUTHAFRICA	51
TWLG_ENGLISH_UK	52
TWLG_ENGLISH_USA	TWLG_USA
TWLG_ESTONIAN	53
TWLG_FAEROESE	54
TWLG_FARSI	55
TWLG_FINNISH	TWLG_FIN
TWLG_FRENCH	TWLG_FRN
TWLG_FRENCH_BELGIAN	56
TWLG_FRENCH_CANADIAN	TWLG_FCF
TWLG_FRENCH_LUXEMBOURG	57
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9

Capabilities

Chapter Contents

Overview

Sources may support a large number of capabilities but are required to support very few. To determine if a capability is supported by a Source, the application can query the Source using a DG_CONTROL / DAT_CAPABILITY / MSG_GET, MSG_GETCURRENT, or MSG_GETDEFAULT operation. The application specifies the particular capability by storing its identifier in the Cap field of the TW_CAPABILITY structure. This is the structure pointed to by the pData parameter in the DSM_Entry( ) call.

DG_CONTROL / DAT_CAPABILITY operations for capability negotiation include:

MSG_GET	Returns the available settings for this capability, as well as the Current and Default settings (if the container is TW_ENUMERATION or TW_RANGE).
MSG_GETCURRENT	Returns the Current setting for this capability.
MSG_GETDEFAULT	Returns the value of the Source's preferred Default values.
MSG_RESET	Returns the capability to its TWAIN Default (power-on) condition (i.e. all previous negotiation is ignored).
MSG_SET	Allows the application to set the Current value of a capability or even to restrict the available values to some subset of the Source's power-on set of values. Sources are strongly encouraged to allow the application to set as many of its capabilities as possible, and further to reflect these changes in the Source's user interface. This will ensure that the user can only select images with characteristics that are useful to the consuming application.

Required Capabilities

The list of required capabilities can be found in Chapter 5.

Sources must implement and make available to TWAIN applications the advertised features of the devices they support. This is especially true in "no-UI mode." Thus, when a capability is listed as required by none, a Source must still support it if its device supports it.

Capabilities in Categories of Functionality

Asynchronous Device Events

CAP_DEVICEEVENT	MSG_SET selects which events the application wants the source to report; MSG_RESET returns the preferred settings of the source.

Audible Alarms

CAP_ALARMS	Turns specific audible alarms on and off.
CAP_ALARMVOLUME	Controls the volume of a device's audible alarm.

Audio

ACAP_AUDIOFILEFORMAT	Informs application which audio file formats the source can generate.
ACAP_XFERMECH	Allows application and source to identify which audio transfer mechanisms they have in common.

Automatic Adjustments

ICAP_AUTOMATICBORDERDETECTION	Turns automatic border detection on and off.
ICAP_AUTOMATICDESKEW	Turns automatic skew correction on and off.
ICAP_AUTODISCARDBLANKPAGES	
ICAP_AUTOMATICROTATE	When TRUE, depends on source to automatically rotate the image.
ICAP_FLIPROTATION	Orients images that flip orientation every other image.

Automatic Capture

CAP_AUTOMATICCAPTURE	Specifies the number of images to automatically capture.
CAP_TIMEBEFOREFIRSTCAPTURE	Selects the number of seconds before the first picture taken.
CAP_TIMEBETWEENCAPTURES	Selects the hundredths of a second to wait between pictures taken.

Automatic Scanning

CAP_AUTOSCAN	Enables the source's automatic document scanning process.
CAP_CLEARBUFFERS	MSG_GET reports presence of data in scanner's buffers; MSG_SET clears the buffers.
CAP_MAXBATCHBUFFERS	Describes the number of pages that the scanner can buffer when CAP_AUTOSCAN is enabled.

Bar Code Detection Search Parameters

ICAP_BARCODEDETECTIONENABLED	Turns bar code detection on and off.
ICAP_SUPPORTEDBARCODETYPES	Provides a list of bar code types that can be detected by current data source.
ICAP_BARCODEMAXSEARCHPRIORITIES	Specifies the maximum number of supported search priorities.
ICAP_BARCODESEARCHPRIORITIES	A prioritized list of bar code types dictating the order in which they will be sought.
ICAP_BARCODESEARCHMODE	Restricts bar code searching to certain orientations, or prioritizes one orientation over another.
ICAP_BARCODEMAXRETRIES	Restricts the number of times a search will be retried if no bar codes are found.
ICAP_BARCODETIMEOUT	Restricts the total time spent on searching for bar codes on a page.

Capability Negotiation Parameters

CAP_EXTENDEDCAPS	Capabilities negotiated in States 5 & 6
CAP_SUPPORTEDCAPS	Inquire Source's capabilities valid for MSG_GET

Color

ICAP_FILTER	Color characteristics of the subtractive filter applied to the image data
ICAP_GAMMA	Gamma correction value for the image data
ICAP_PLANARCHUNKY	Color data format - Planar or Chunky

Compression

ICAP_BITORDERCODES	CCITT Compression
ICAP_CCITTKFACTOR	CCITT Compression
ICAP_COMPRESSION	Compression method for Buffered Memory Transfers
ICAP_JPEGPIXELTYPE	JPEG Compression
ICAP_PIXELFLAVORCODES	CCITT Compression
ICAP_TIMEFILL	CCITT Compression

Device Parameters

CAP_DEVICEONLINE	Determines if hardware is on and ready
CAP_DEVICETIMEDATE	Date and time of a device's clock.
CAP_SERIALNUMBER	The serial number of the currently selected source device.
ICAP_EXPOSURETIME	Exposure time used to capture the image, in seconds
ICAP_FLASHUSED2	For devices that support a flash, MSG_SET selects the flash to be used; MSG_GET reports the current setting.
ICAP_IMAGEFILTER	For devices that support image filtering, selects the algorithm to be used.
ICAP_LAMPSTATE	Is the lamp on?
ICAP_LIGHTPATH	Image was captured transmissively or reflectively
ICAP_LIGHTSOURCE	Describes the color characteristic of the light source used to acquire the image
ICAP_NOISEFILTER	For devices that support noise filtering, selects the algorithm to be used.
ICAP_OVERSCAN	For devices that support overscanning, controls whether additional rows or columns are appended to the image.
ICAP_PHYSICALHEIGHT	Maximum height Source can acquire (in ICAP_UNITS)
ICAP_PHYSICALWIDTH	Maximum width Source can acquire (in ICAP_UNITS)
ICAP_UNITS	Unit of measure (inches, centimeters, etc.)
ICAP_ZOOMFACTOR	With MSG_GET, returns all camera supported lens zooming range.

Imprinter/Endorser Functionality

CAP_PRINTER	MSG_GET returns current list of available printer devices; MSG_SET selects the device for negotiation.
CAP_PRINTERENABLED	Turns the current CAP_PRINTER device on or off.
CAP_PRINTERINDEX	Starting number for the CAP_PRINTER device.
CAP_PRINTERMODE	Specifies appropriate current CAP_PRINTER device mode.
CAP_PRINTERSTRING	String(s) to be used in the string component when CAP_PRINTER device is enabled.
CAP_PRINTERSUFFIX	String to be used as current CAP_PRINTER device's suffix.

Image Information

CAP_AUTHOR	Author of acquired image (may include a copyright string)
CAP_CAPTION	General note about acquired image
CAP_TIMEDATE	Date and Time the image was acquired (entered State 7)

Image Parameters for Acquire

ICAP_AUTOBRIGHT	Enable Source's Auto-brightness function
ICAP_BRIGHTNESS	Source brightness values
ICAP_CONTRAST	Source contrast values
ICAP_HIGHLIGHT	Lightest highlight, values lighter than this value will be set to this value
ICAP_ORIENTATION	Defines which edge of the paper is the top: Portrait or Landscape
ICAP_ROTATION	Source can, or should, rotate image this number of degrees
ICAP_SHADOW	Darkest shadow, values darker than this value will be set to this value
ICAP_XSCALING	Source Scaling value (1.0 = 100%) for x-axis
ICAP_YSCALING	Source Scaling value (1.0 = 100%) for y-axis

Image Type

ICAP_BITDEPTH	Pixel bit depth for Current value of ICAP_PIXELTYPE
ICAP_BITDEPTHREDUCTION	Allows a choice of the reduction method for bit depth loss
ICAP_BITORDER	Specifies how the bytes in an image are filled by the Source
ICAP_CUSTHALFTONE	Square-cell halftone (dithering) matrix to be used
ICAP_HALFTONES	Source halftone patterns
ICAP_PIXELFLAVOR	Sense of the pixel whose numeric value is zero
ICAP_PIXELTYPE	The type of pixel data (B/W, gray, color, etc.)
ICAP_THRESHOLD	Specifies the dividing line between black and white values

Language Support

CAP_LANGUAGE	Allows application and source to identify which languages they have in common.

Pages

ICAP_FRAMES	Size and location of frames on page
ICAP_MAXFRAMES	Maximum number of frames possible per page
ICAP_SUPPORTEDSIZES	Fixed frame sizes for typical page sizes

Paper Handling

CAP_AUTOFEED	MSG_SET to TRUE to enable Source's automatic feeding
CAP_CLEARPAGE	MSG_SET to TRUE to eject current page and leave acquire area empty
CAP_FEEDERALIGNMENT	If TRUE, feeder is centered; FALSE if it is free-floating.
CAP_FEEDERENABLED	If TRUE, Source's feeder is available
CAP_FEEDERLOADED	If TRUE, Source has documents loaded in feeder (MSG_GET only)
CAP_FEEDERORDER	Specifies whether feeder starts with top of first or last page.
CAP_FEEDPAGE	MSG_SET to TRUE to eject current page and feed next page
CAP_PAPERBINDING	
CAP_PAPERDETECTABLE	Determines whether source can detect documents on the ADF or flatbed.
CAP_REACQUIREALLOWED	Indicates whether the physical hardware is capable of acquiring multiple images of the same page without changes to the physical registration of that page.
CAP_REWINDPAGE	MSG_SET to TRUE to do a reverse feed

Patch Code Detection

ICAP_PATCHCODEDETECTIONENABLED	Turns patch code detection on and off.
ICAP_SUPPORTEDPATCHCODETYPES	List of patch code types that can be detected by current data source.
ICAP_PATCHCODEMAXSEARCHPRIORITIES	Maximum number of search priorities.
ICAP_PATCHCODESEARCHPRIORITIES	List of patch code types dictating the order in which patch codes will be sought.
ICAP_PATCHCODESEARCHMODE	Restricts patch code searching to certain orientations, or prioritizes one orientation over another.
ICAP_PATCHCODEMAXRETRIES	Restricts the number of times a search will be retried if none are found on a page.
ICAP_PATCHCODETIMEOUT	Restricts total time for searching for a patch code on a page.

Power Monitoring

CAP_BATTERYMINUTES	The minutes of battery power remaining on a device.
CAP_BATTERYPERCENTAGE	With MSG_GET, indicates battery power status.
CAP_POWERSAVETIME	With MSG_SET, sets the camera power down timer in seconds; with MSG_GET, returns the current setting of the power down time.
CAP_POWERSUPPLY	MSG_GET reports the kinds of power available; MSG_GETCURRENT reports the current power supply to use.

Resolution

ICAP_XNATIVERESOLUTION	Native optical resolution of device for x-axis
ICAP_XRESOLUTION	Current / Available optical resolutions for x-axis
ICAP_YNATIVERESOLUTION	Native optical resolution of device for y-axis
ICAP_YRESOLUTION	Current / Available optical resolutions for y-axis

Transfers

CAP_XFERCOUNT	Number of images the application is willing to accept this session
ICAP_COMPRESSION	Buffered Memory transfer compression schemes
ICAP_IMAGEFILEFORMAT	File formats for file transfers
ICAP_TILES	Tiled image data
ICAP_XFERMECH	Transfer mechanism - used to learn options and set-up for upcoming transfer
ICAP_UNDEFINEDIMAGESIZE	The application will accept undefined image size

User Interface

CAP_CAMERAPREVIEWUI	Queries the source for UI support for preview mode.
CAP_ENABLEDSUIONLY	Queries an application to see if it implements the new user interface settings dialog.
CAP_INDICATORS	Use the Source's progress indicator? (valid only when ShowUI==FALSE)
CAP_UICONTROLLABLE	Indicates that Source supports acquisitions with UI disabled

The Capability Listings

The following section lists descriptions of all TWAIN capabilities in alphabetical order. The format of each capability entry is:

NAME OF CAPABILITY

Description

Description of the capability

Application

(Optional) Information for the application

Source

(Optional) Information for the Source

Values

Type:	Data structure for the capability.
Default Value:	The value the Source must use as the Current value when entering State 4 (following DG_CONTROL / DAT_IDENTITY / MSG_OPENDS). This is the value the Source resets the Current value to when it receives a MSG_RESET operation. The Source reports its preferred Default value when it receives a MSG_GETDEFAULT. The Source's preferred value may be different from the TWAIN Default value.
Allowed Values:	Definition of the values allowed for this capability.
Container for MSG_GET	Acceptable containers for use on MSG_GET operations.
Container for MSG_SET	Acceptable containers for use on MSG_SET operations.

Required By

If a Source or application is required to support the capability.

Source Required Operations

Operations the Source is required to support.

See Also

Associated capabilities and data structures.

ACAP_AUDIOFILEFORMAT

Description

Informs the application which audio file formats the Source can generate (MSG_GET). Tells the Source which audio file formats the application can handle (MSG_SET).

Application

Use this ACAP to determine which formats are available for audio file transfers, but use the DG_CONTROL / DAT_SETUPAUDIOFILEXFER / MSG_SET operation to specify the format to be used for a particular acquisition.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL /DAT_CAPABILITY/ MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16
Default Value:	TWAF_WAV (Windows) TWAF_AIFF (Macintosh)
Allowed Values:	TWAF_WAV 0 TWAF_AIFF 1 TWAF_AU 3 TWAF_SND 4
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

DG_CONTROL / DAT_SETUPAUDIOFILEXFER / MSG_SET
DG_AUDIO /DAT_AUDIOFILEXFER / MSG_GET

ACAP_XFERMECH

Description

Allows the Application and Source to identify which audio transfer mechanisms they have in common.

Application

The current setting of ACAP_XFERMECH must match the constant used by the application to specify the audio transfer mechanism when starting the transfer using the triplet: DG_AUDIO / DAT_AUDIOxxxxXFER / MSG_GET.

Values

Type:	TW_UINT16	
Default Value:	TWSX_NATIVE	
Allowed Values:	TWSX_NATIVE	0
	TWSX_FILE	1
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE	

Required By

All Audio Sources

Source Required Operations

MSG_GET / CURRENT / DEFAULT,
MSG_SET / RESET

See Also

DG_AUDIO / DAT_AUDIOxxxxXFER / MSG_GET

CAP_ALARMS

Description

Turns specific audible alarms on and off.

Application

Note that an application may opt to turn off all alarms by issuing a MSG_SET with no data. Therefore, an application should also be prepared to receive an empty array from a Source with an MSG_GET. (i.e., pTW_ARRAY->NumItems == 0)

The easiest way to test for allowed values is to try to set them all with MSG_SET. If not all are allowed, the Source will return TWCC_CHECKSTATUS with those values that it supports.

Source

It is worth noting that the alarms do not have to be present in the device for a Source to make use of this capability. If the device is capable of alerting the Source to these various kinds of conditions, but is unable to generate the alarms, itself; then the Source may opt to generate them on its behalf.

TWAL_ALARM is a catchall for alarms not explicitly listed. It is also used where a device only provides control over a single, multi-use alarm. For instance, if a device beeps for both jams and bar-codes, but doesn't allow independent control of the alarms, then it should report TWAL_ALARM to cover them, and not TWAL_BARCODE, TWAL_JAM.

TWAL_FEEDERERROR covers paper handling errors such as jams, double-feeds, skewing and the like; conditions that most likely stop scanning.

TWAL_FEEDERWARNING covers non-fatal events, such as feeder empty.

TWAL_DOUBLEFEED, TWAL_JAM and TWALSKEW cover paper handling errors.

TWAL_BARCODE and TWAL_PATCHCODE generate alarms when an image with this kind of data is recognized.

TWAL_POWER generates alarms for any changes in power to the device.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	No default	
Allowed Values:	TWAL_ALARM	0
	TWAL_FEEDERERROR	1
	TWAL_FEEDERWARNING	2
	TWAL_BARCODE	3
	TWAL_DOUBLEFEED	4
	TWAL_JAM	5
	TWAL_PATCHCODE	6
	TWAL_POWER	7
	TWAL_SKEW	8
Container for MSG_GET:	TW_ARRAY	
Container for MSG_SET:	TW_ARRAY	

Required By

None

Source Required Operations

None

See Also

CAP_ALARMVOLUME

CAP_ALARMVOLUME

Description

The volume of a device's audible alarm. Note that this control affects the volume of all alarms; no specific volume control for individual types of alarms is provided.

Application

Take note of the range step, some Sources may only offer a step of 100, which turns the alarm on or off.

Source

If 0, the audible alarm is turned off. All other values control the volume of the alarm.

Windows only - If the alarm is managed in the Source, as opposed to the device, then it should be consistent with the control panel Accessibility Options (i.e., the user should get visual notification if that is the current setting for the desktop).

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_INT32
Default Value:	No default
Allowed Values:	0 - 100
Container for MSG_GET:	TW_ONEVALUE, TW_RANGE
Container for MSG_SET:	TW_ONEVALUE, TW_RANGE

Required By

None

Source Required Operations

None

See Also

CAP_ALARMS

CAP_AUTHOR

Description

The name or other identifying information about the Author of the image. It may include a copyright string.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_STR128
Default Value:	"\0"
Allowed Values:	Any string
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

CAP_CAPTION
CAP_TIMEDATE

CAP_AUTOFEED

Description

If TRUE, the Source will automatically feed the next page from the document feeder after the number of frames negotiated for capture from each page are acquired. CAP_FEEDERENABLED must be TRUE to use this capability.

Application

Set the capability to TRUE to enable the Source's automatic feed process, or FALSE to disable it. After the completion of each transfer, check TW_PENDINGXFERS. Count to determine if the Source has more images to transfer. A -1 means there are more images to transfer but the exact number is not known.

CAP_FEEDERLOADED indicates whether the Source's feeder is loaded. (The automatic feed process continues whenever this capability is TRUE.)

Source

If CAP_FEEDERENABLED equals FALSE, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED (capability is not supported in current settings).

If it is supported, return TWRC_SUCCESS and enable the device's automatic feed process: After all frames negotiated for capture from each page are acquired, put the current document in the output area and advance the next document from the input area to the feeder image acquisition area. If the feeder input area is empty, the automatic feeding process is suspended but should continue when the feeder is reloaded.

Values

Type:	TW_BOOL
Default Value:	No Default
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

All Sources with Feeder Devices

Source Required Operations

MSG_GET/CURRENT/DEFAULT,
MSG_SET/RESET

See Also

CAP_CLEARPAGE
CAP_FEEDERENABLED
CAP_FEEDERLOADED
CAP_FEEDPAGE
CAP_REWINDPAGE

CAP_AUTOMATICCAPTURE

Description

The number of images to automatically capture. This does *not* refer to the number of images to be sent to the Application, use CAP_XFERCOUNT for that.

Source

If 0, Automatic Capture is disabled If 1 or greater, that number of images is captured by the device.

Automatic capture implies that the device is capable of capturing images without the presence of the Application. This means that it must be possible for the Application to close the Source and reopen it later, after the images have been captured.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_INT32
Default Value:	0
Allowed Values:	0 or greater
Container for MSG_GET:	TW_ONEVALUE, TW_RANGE
Container for MSG_SET:	TW_ONEVALUE, TW_RANGE

Required By

None

Source Required Operations

None

See Also

CAP_TIMEBEFOREFIRSTCAPTURE
CAP_TIMEBETWEENCAPTURES
CAP_XFERCOUNT

DG_CONTROL / DAT_FILESYSTEM / MSG_AUTOMATICCAPTUREDIRECTORY

CAP_AUTOSCAN

Description

This capability is intended to boost the performance of a Source. The fundamental assumption behind AutoScan is that the device is able to capture the number of images indicated by the value of CAP_XFERCOUNT without waiting for the Application to request the image transfers. This is only possible if the device has internal buffers capable of caching the images it captures.

The default behavior is undefined, because some high volume devices are incapable of anything but CAP_AUTOSCAN being equal to TRUE. However, if a Source supports FALSE, it should use it as the mandatory default, since this best describes the behavior of pre-1.8 TWAIN Applications.

Application

The application should check the TW_PENDINGXFERS.Count, and continue to scan until it becomes 0.

When AutoScan is set to TRUE, the Application should not rely on just the paper sensors (for example, CAP_FEEDERLOADED) to determine if there are images to be transferred. The latency between the Source and the Application makes it very likely that at the time the sensor reports FALSE, there may be more than one image waiting for the transfer inside of the device's buffers. Applications should use the TW_PENDINGXFERS.Count returned from DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER to determine whether or not there are more images to be transferred.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_BOOL
Default Value:	No default
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

CAP_AUTOFEED
CAP_CLEARBUFFERS
CAP_MAXBATCHBUFFERS

CAP_BATTERYMINUTES

Description

The minutes of battery power remaining to the device.

Source

-2 indicates that the available power is infinite.

-1 indicates that the device cannot report the remaining battery power.

0 and greater indicates the minutes of battery life remaining.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_INT32
Default Value:	No default
Allowed Values:	-2, -1, 0, and greater
Container for MSG_GET:	TW_ONEVALUE, TW_RANGE
Container for MSG_SET:	MSG_SET not allowed

Required By

None

Source Required Operations

None

See Also

CAP_POWERSUPPLY,
CAP_BATTERYPERCENTAGE

CAP_BATTERYPERCENTAGE

Description

When used with MSG_GET, return the percentage of battery power level on camera. If -1 is returned, it indicates that the battery is not present.

Application

Use this capability with MSG_GET to indicate to the user about the battery power status. It is recommended to use CAP_POWERSUPPLY to identify the power source first.

Source

-2 indicates that the available power is infinite.

-1 indicates that the device cannot report the remaining battery power.

0 to 100 indicates the percentage of battery life remaining.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_INT16
Default Value:	None
Allowed Values:	-2, -1, 0 to 100.
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	Not allowed

Required By

None. Highly recommended for digital cameras that are equipped with batteries.

Source Required Operations

MSG_GET

See Also

CAP_POWERSUPPLY,
CAP_BATTERYMINUTES

CAP_CAMERAPREVIEWUI

Description

This capability queries the Source for UI support for preview mode. If TRUE, the Source supports preview UI.

Application

Use this capability to query the preview UI support by the Source. However, the application can choose to use the Source's UI or not even if the Source supports it.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_BOOL
Default Value:	None
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	Not allowed.

Required By

None. Highly recommended for digital cameras.

Source Required Operations

MSG_GET

CAP_CAPTION

Description

A general note about the acquired image.

Source

If not supported, the Source should return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_STR255
Default Value:	"\0"
Allowed Values:	Any string
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

CAP_AUTHOR
CAP_TIMEDATE

CAP_CLEARBUFFERS

Description

MSG_GET reports the presence of data in the scanner's buffers. MSG_SET with a value of TWCB_CLEAR immediately clears the buffers.

Source

MSG_SET: TWCB_AUTO causes the Source to automatically clear the buffers when it transitions from state 4 to state 5, or from state 5 to state 4.

MSG_SET: TWCB_CLEAR causes the Source to immediately clear its buffers.

MSG_SET: TWCB_NOCLEAR causes the Source to preserve images in the buffers. If the Source transitions from state 4 to state 5 with images in its buffer, it will immediately report MSG_XFERREADY, and deliver those images before any new images scanned by the user.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	TWCB_AUTO	
Allowed Values:	TWCB_AUTO	0
	TWCB_CLEAR	1
	TWCB_NOCLEAR	2
Container for MSG_GET:	TW_ONEVALUE	
Container for MSG_SET:	TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

CAP_AUTOSCAN
CAP_MAXBATCHBUFFERS

CAP_CLEARPAGE

Description

If TRUE, the Source will eject the current page being acquired from and will leave the feeder acquire area empty.

If CAP_AUTOFEED is TRUE, a fresh page will be advanced.

CAP_FEEDERENABLED must equal TRUE to use this capability.

This capability must have been negotiated as an extended capability to be used in States 5 and 6.

Application

Do a MSG_SET on this capability to advance the document in the feeder acquire area to the output area and abort all transfers pending on this page.

This capability is used in States 5 and 6 by applications controlling the Source's feeder (usually without the Source user interface).

This capability can also be used while CAP_AUTOFEED equals TRUE to abort all remaining transfers on this page and continue with the next page.

Source

If CAP_FEEDERENABLED equals FALSE, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED (capability is not supported in current settings).

If supported, advance the document in the feeder-acquire area to the output area and abort all pending transfers from this page.

The Source will perform this action once whenever the capability is MSG_SET to TRUE. The Source should then revert the Current value to FALSE.

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

CAP_AUTOFEED
CAP_EXTENDEDCAPS
CAP_FEEDERENABLED
CAP_FEEDERLOADED
CAP_FEEDPAGE
CAP_REWINDPAGE

CAP_CUSTOMDSDATA

Description

Allows the application to query the data source to see if it supports the new operation triplets DG_CONTROL / DAT_CUSTOMDSDATA / MSG_GET and DG_CONTROL / DAT_CUSTOMDSDATA / MSG_SET.

If TRUE, the source will support the DG_CONTROL / DAT_CUSTOMDSDATA / MSG_GET message.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	Set not allowed

Required By

None

Source Required Operations

None

See Also

DG_CONTROL / DAT_CUSTOMDSDATA / MSG_GET

CAP_DEVICEEVENT

Description

MSG_SET selects which events the Application wants the Source to report. MSG_GET gets the current setting. MSG_RESET resets the capability to the empty array (no events set).

TWDE_CHECKAUTOMATICCAPTURE:	The automatic capture settings on the device have been changed by the user.
TWDE_CHECKBATTERY:	The status of the battery has changed.
TWDE_CHECKFLASH:	The flash setting on the device has been changed by the user.
TWDE_CHECKPOWERSUPPLY:	The power supply has been changed (for instance, the user may have just connected AC to a device that was running on battery power).
TWDE_CHECKRESOLUTION:	The x/y resolution setting on the device has been changed by the user.
TWDE_DEVICEADDED:	The user has added a device (for instance a memory card in a digital camera).
TWDE_DEVICEOFFLINE:	A device has become unavailable, but has not been removed.
TWDE_DEVICEREADY:	The device is ready to capture an image.
TWDE_DEVICEREMOVED:	The user has removed a device.
TWDE_IMAGECAPTURED:	The user has captured an image to the device's internal storage.
TWDE_IMAGEDELETED:	The user has removed an image from the device's internal storage.
TWDE_PAPERDOUBLEFEED:	Two or more sheets of paper have been fed together.
TWDE_PAPERJAM:	The device's document feeder has jammed.
TWDE_LAMPFAILURE:	The device's light source has failed.
TWDE_CHECKDEVICEONLINE:	The device has been turned off and on.
TWDE_POWERSAVE:	The device has powered down to save energy.
TWDE_POWERSAVENOTIFY:	The device is about to power down to save energy.
TWDE_CUSTOMEVENTS:	Baseline for events specific to a given Source.

Application

Set all values and process the TWRC_FAILURE / TWCC_CHECKSTATUS (if returned) to identify those items supported by the Source.

Source

The startup default must be an empty array. Generate TWRC_FAILURE / TWCC_CHECKSTATUS and remove unsupported events when an Application requests events not supported by the Source.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Please note that the actions of an Application must never directly generate a device event. For instance, if the user deletes an image using the controls on the device, then the Source should generate an event. If, however, an Application deletes an image in the device (using DG_CONTROL / DAT_FILESYSTEM / MSG_DELETE), then the Source must not generate an event.

Values

Type:	TW_UINT16	
Default Value:	(empty array)	
Allowed Values:	TWDE_CHECKAUTOMATICCAPTURE	0
	TWDE_CHECKBATTERY	1
	TWDE_CHECKFLASH	2
	TWDE_CHECKPOWERSUPPLY	3
	TWDE_CHECKRESOLUTION	4
	TWDE_DEVICEADDED	5
	TWDE_DEVICEOFFLINE	6
	TWDE_DEVICEREADY	7
	TWDE_DEVICEREMOVED	8
	TWDE_IMAGECAPTURED	9
	TWDE_IMAGEDELETED	10
	TWDE_PAPERDOUBLEFEED	11
	TWDE_PAPERJAM	12
	TWDE_LAMPFAILURE	13
	TWDE_POWERDOWNNOTIFY	14
	TWDE_CUSTOMEVENTS	0x8000
Container for MSG_GET:	TW_ARRAY	
Container for MSG_SET:	TW_ARRAY	

Required By

None

Source Required Operations

None

See Also

DG_CONTROL / DAT_NULL / MSG_DEVICEEVENT
DG_CONTROL / DAT_DEVICEEVENT / MSG_GET

Device Events Article

CAP_DEVICEONLINE

Description

If TRUE, the physical hardware (e.g., scanner, digital camera, image database, etc.) that represents the image source is attached, powered on, and communicating.

Application

This capability can be issued at any time to determine the availability of the image source hardware.

Source

The receipt of this capability request should trigger a test of the status of the physical link to the image source. The source should not assume that the link is still active since the last transaction, but should issue a transaction that actively tests this condition.

Values

Type:	TW_BOOL
Default Value:	None
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

All image Sources

Source Required Operations

MSG_GET / CURRENT / DEFAULT

CAP_DEVICETIMEDATE

Description

The date and time of the device's clock.

Managed in the form "YYYY/MM/DD HH:mm:SS:sss" where YYYY is the year, MM is the numerical month, DD is the numerical day, HH is the hour, mm is the minute, SS is the second, and sss is the millisecond.

Source

The internal date and time of the device. Be sure to leave the space between the ending of the date and the beginning of the time fields. All fields must be specified for MSG_SET.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL /DAT_CAPABILITY/ MSG_QUERYSUPPORT)

Values

Type:	TW_STR32
Default Value:	No Default
Allowed Values:	Any date
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_TIMEDATE

CAP_DUPLEX

Description

This indicates whether the scanner supports duplex. If so, it further indicates whether one-path or two-path duplex is supported.

Application

Application can send MSG_GET to find out whether the scanner supports duplex.

Source

Source should determine level of duplex support returning the values accordingly.

Values

Type:	TW_UINT16
Default Value:	TWDX_NONE
Allowed Values:	TWDX_NONE TWDX_1PASSDUPLEX TWDX_2PASSDUPLEX
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	Not allowed.

Required By

None

Source Required Operations

See Also

CAP_DUPLEXENABLED

CAP_DUPLEXENABLED

Description

The user can set the duplex option to be TRUE or FALSE. If TRUE, the scanner scans both sides of a paper; otherwise, the scanner will scan only one side of the image.

Application

Application should send MSG_GET to determine if the duplex option is enabled or not.

Source

Source should return TRUE or FALSE based on the level of duplex support; otherwise, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

See Also

CAP_DUPLEX

CAP_ENABLEDSUIONLY

Description

Allows an application to query a source to see if it implements the new user interface settings dialog. If a source reports that it has the capability CAP_ENABLEDSUIONLY, then it must implement the operation triplet DG_CONTROL/ DAT_USERINTERFACE/ MSG_ENABLEDSUIONLY to display the source user interface without acquiring an image.

If TRUE, the source will support the DG_CONTROL/ DAT_USERINTERFACE /MSG_ENABLEDSUIONLY message.

Source

If not supported, return TWRC_FAILURE/ TWCC_CAPUNSUPPORTED.

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	Set not allowed

Required By

None.

Source Required Operations

None

See Also

DG_CONTROL/DAT_USERINTERFACE/MSG_ENABLEDSUIONLY

CAP_ENDORSER

Description

Allows the application to specify the starting endorser / imprinter number. All other endorser/ imprinter properties should be handled through the data source's user interface.

The user can set the starting number for the endorser.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT32
Default Value:	0
Allowed Values:	Any value
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

See Also

None

CAP_EXTENDEDCAPS

Description

Allows the application and Source to negotiate capabilities to be used in States 5 and 6.

Application

MSG_GETCURRENT provides a list of all capabilities which the Source and application have agreed to negotiate in States 5 and 6.

MSG_GET provides a list of all capabilities the Source is willing to negotiate in States 5 and 6.

MSG_SET specifies which capabilities the application wants to negotiate in States 5 and 6.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16
Default Value:	No Default
Allowed Values:	Any *x*CAP_*xxxx*
Container for MSG_GET:	TW_ARRAY
Container for MSG_SET:	TW_ARRAY

Required By

None

Source Required Operations

None

See Also

CAP_SUPPORTEDCAPS

CAP_FEEDERALIGNMENT

Description

Helps the Application determine any special actions it may need to take when negotiating frames with the Source.

TWFA_NONE:	The alignment is free-floating. Applications should assume that the origin for frames is on the left.
TWFA_LEFT:	The alignment is to the left.
TWFA_CENTER:	The alignment is centered. This means that the paper will be fed in the middle of the ICAP_PHYSICALWIDTH of the device. If this is set, then the Application should calculate any frames with a left offset of zero.
TWFA_RIGHT:	The alignment is to the right.

Application

The Application can use this to determine if it must center the framing information sent to the Source. With some Sources it might be possible for the Application to select whether the paper is center fed or not.

Source

Use this capability to report the state of the feeder.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWFA_NONE	0
	TWFA_LEFT	1
	TWFA_CENTER	2
	TWFA_RIGHT	3
Container for MSG_GET:	TW_ONEVALUE	
Container for MSG_SET:	TW_ONEVALUE, if supported	

Required By

None

Source Required Operations

None

CAP_FEEDERENABLED

Description

If TRUE, Source must acquire data from the document feeder acquire area and other feeder capabilities can be used. If FALSE, Source must acquire data from the non-feeder acquire area and no other feeder capabilities can be used.

Application

The application should MSG_SET this capability to TRUE before attempting to use any other feeder capabilities. This sets the current acquire area to the feeder area (it may not be a different physical area on some Sources).

The application can MSG_SET this capability to FALSE to use the Source's non-feeder acquisition area and disallow the further use of feeder capabilities.

Source

This setting should reflect the current acquire area:

If TRUE, feeder acquire area should be used

If FALSE, use non-feeder acquire area

Usually, the feeder acquire area and non-feeder acquire area of the Source will be the same. For example, a flatbed scanner may feed a page onto the flatbed platen then scanning always takes place from the platen.

The counter example is a flatbed scanner that moves the scan bar over the platen when CAP_FEEDERENABLED is FALSE, but moves the paper over the scan bar when it is TRUE.

Default Support Guidelines for Sources

- Flatbed scanner (without an optional ADF installed) - Default to FALSE. Do not allow setting to TRUE (return TWRC_FAILURE / TWCC_BADVALUE) but support the capability (never return TWRC_FAILURE / TWCC_CAPUNSUPPORTED).
- A device that uses the same acquire area for feeder and non-feeder, and has a feeder installed - Default to TRUE and allow settings to TRUE or FALSE (meaning allow or don't allow other feeder capabilities).
- A device that operates differently when acquiring from the feeder and non-feeder areas (for example, physical pages sizes are different) - Default to preferred area and allow setting to either TRUE or FALSE.
- A sheet feed scanner or image database - Default to TRUE (meaning there is only one acquire area - the feeder area) and do not allow setting to FALSE (return TWRC_FAILURE / TWCC_BADVALUE).
- A handheld scanner would not support this capability (return TWRC_FAILURE / TWCC_CAPUNSUPPORTED).

Values

Type:	TW_BOOL
Default Value:	No Default
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

All Sources with feeder devices

Source Required Operations

MSG_GET/CURRENT/DEFAULT

See Also

CAP_AUTOFEED
CAP_CLEARPAGE
CAP_FEEDERLOADED
CAP_FEEDPAGE
CAP_REWINDPAGE

CAP_FEEDERLOADED

Description

Reflect whether there are documents loaded in the Source's feeder.

Application

Used by application to inquire whether there are documents loaded in the Source's feeder.

CAP_FEEDERENABLED must equal TRUE to use this capability.

Source

If CAP_FEEDERENABLED equals FALSE, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED (capability is not supported in current settings).

If CAP_FEEDERENABLED equals TRUE, return the status of the feeder (documents loaded = TRUE; no documents loaded = FALSE).

The Source is responsible for reporting instructions to users on using the device. This includes instructing the user to place documents in the feeder when CAP_FEEDERLOADED equals FALSE and the application has requested a feed page (manually or automatically).

Values

Type:	TW_BOOL
Default Value:	No Default
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

All Sources with feeder devices

Source Required Operations

MSG_GET/CURRENT/DEFAULT

See Also

CAP_AUTOFEED
CAP_CLEARPAGE
CAP_FEEDERENABLED
CAP_FEEDPAGE
CAP_REWINDPAGE

CAP_FEEDERORDER

Description

TWFO_FIRSTPAGEFIRST if the feeder starts with the top of the first page.
TWFO_LASTPAGEFIRST is the feeder starts with the top of the last page.

Application

An Application can use this to determine if it should reorganize the stream of images received from a Source.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWFO_FIRSTPAGEFIRST	0
	TWFO_LASTPAGEFIRST	1
Container for MSG_GET:	TW_ONEVALUE	
Container for MSG_SET:	TW_ONEVALUE, if supported	

Required By

None

Source Required Operations

None

See Also

CAP_FEEDERENABLED

CAP_FEEDPAGE

Description

If TRUE, the Source will eject the current page and advance the next page in the document feeder into the feeder acquire area.

If CAP_AUTOFEED is TRUE, the same action just described will occur and CAP_AUTOFEED will remain active.

CAP_FEEDERENABLED must equal TRUE to use this capability.

This capability must have been negotiated as an extended capability to be used in States 5 and 6.

Application

Do a MSG_SET to TRUE on this capability to advance the next document in the feeder to the feeder acquire area.

This capability is used in States 5 and 6 by applications controlling the Source's feeder (usually without the Source's user interface).

This capability can also be used while CAP_AUTOFEED equals TRUE to abort all remaining transfers on this page and continue with the next page.

Source

If CAP_FEEDERENABLED equals FALSE, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED (capability is not supported in current settings).

If supported, advance the document in the feeder-acquire area to the output area and abort all pending transfers from this page.

Advance the next page in the input area to the feeder acquire area. If there are no documents in the input area, return: TWRC_FAILURE / TWCC_BADVALUE.

The Source will perform this action once whenever the capability is MSG_SET to TRUE. The Source should then revert the Current value to FALSE.

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

CAP_AUTOFEED
CAP_CLEARPAGE
CAP_EXTENDEDCAPS
CAP_FEEDERENABLED
CAP_FEEDERLOADED
CAP_REWINDPAGE

CAP_INDICATORS

Description

If TRUE, the Source will display a progress indicator during acquisition and transfer, regardless of whether the Source's user interface is active. If FALSE, the progress indicator will be suppressed if the Source's user interface is inactive.

The Source will continue to display device-specific instructions and error messages even with the Source user interface and progress indicators turned off.

Application

If the application plans to enable the Source with TW_USERINTERFACE. ShowUI = FALSE, it can also suppress the Source's progress indicator by using this capability.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_BOOL
Default Value:	TRUE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS

CAP_JOBCONTROL

Description

Allows multiple jobs in batch mode. The application can decide how the job can be processed, according to the flags listed below.

TWJC_NONE	No job control.
TWJC_JSIC	Detect and include job separator and continue scanning.
TWJC_JSIS	Detect and include job separator and stop scanning.
TWJC_JSXC	Detect and exclude job separator and continue scanning.
TWJC_JSXS	Detect and exclude job separator and stop scanning.

If application selects options other than none, it should check the JCL field of the new PENDINGXFERS data.

To distinguish between jobs, a job separator sheet containing patch code can be inserted. If the application knows the how to save different jobs, the TWJC_JSIC or TWJC_JSXC can be used. When this job separator is detected, the application will give a separate name for each job. If the application does not know how to save different jobs, it can use TWJC_JSIS or TWJC_JSXS to stop scanning and ask the user for different job name.

Source

If not supported, return TWRC_FAILURE/ TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16
Default Value:	TWJC_NONE
Allowed Values:	TWJC_NONE TWJC_JSIC TWJC_JSIS TWJC_JSXC TWJC_JSXS
Container for MSG_GET:	TW_ONEVALUE/ TW_ENUMERATION
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

MSG_PENDINGXFER

CAP_LANGUAGE

Description

Allows Application and Source to identify which languages they have in common for the exchange of string data, and to select the language of the internal UI.

Note: Since the TWLG_xxxx codes include language and country data, there is no separate capability for selecting the country.

Application

In multi-lingual environments, it is the responsibility of the Application to recall the last selected language for a given User.

Source

The current value of this setting specifies the language used by the Source (and possibly the device). The Source must first default to the Application's current language. If that fails then it must default to the User's Locale (c.f., the Win32 call GetLocaleInfo()). If that fails then the Source should make the best choice it can, preferably using a common secondary language (i.e., English, French…).

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Note:

- TWLG_ARABIC_UAE is for the United Arabic Emirates.
- TWLG_CHINESE_PRC is for the People's Republic of China

Values

Type:	TW_UINT16	
Default Value:	**In order of priority:** 1) appIdentity->Version.Language 2) TWLG_USERLOCALE 3) Source's choice	
Allowed Values:	TWLG_USERLOCALE	-1
	// pre 1.8 values…	
	TWLG_DAN	0
	TWLG_DUT	1
	TWLG_ENG	2
	TWLG_FCF	3
	TWLG_FIN	4
	TWLG_FRN	5
	TWLG_GER	6
	TWLG_ICE	7

TWLG_ITN	8
TWLG_NOR	9
TWLG_POR	10
TWLG_SPA	11
TWLG_SWE	12
TWLG_USA	13
// 1.8 should use these…	
TWLG_AFRIKAANS	14
TWLG_ALBANIA	15
TWLG_ARABIC	16
TWLG_ARABIC_ALGERIA	17
TWLG_ARABIC_BAHRAIN	18
TWLG_ARABIC_EGYPT	19
TWLG_ARABIC_IRAQ	20
TWLG_ARABIC_JORDAN	21
TWLG_ARABIC_KUWAIT	22
TWLG_ARABIC_LEBANON	23
TWLG_ARABIC_LIBYA	24
TWLG_ARABIC_MOROCCO	25
TWLG_ARABIC_OMAN	26
TWLG_ARABIC_QATAR	27
TWLG_ARABIC_SAUDIARABIA	28
TWLG_ARABIC_SYRIA	29
TWLG_ARABIC_TUNISIA	30
TWLG_ARABIC_UAE	31
TWLG_ARABIC_YEMEN	32
TWLG_BASQUE	33
TWLG_BYELORUSSIAN	34
TWLG_BULGARIAN	35
TWLG_CATALAN	36
TWLG_CHINESE	37
TWLG_CHINESE_HONGKONG	38
TWLG_CHINESE_PRC	39
TWLG_CHINESE_SINGAPORE	40
TWLG_CHINESE_SIMPLIFIED	41
TWLG_CHINESE_TAIWAN	42
TWLG_CHINESE_TRADITIONAL	43
TWLG_CROATIA	44
TWLG_CZECH	45
TWLG_DANISH	TWLG_DAN
TWLG_DUTCH	TWLG_DUT
TWLG_DUTCH_BELGIAN	46
TWLG_ENGLISH	TWLG_ENG
TWLG_ENGLISH_AUSTRALIAN	47
TWLG_ENGLISH_CANADIAN	48
TWLG_ENGLISH_IRELAND	49
TWLG_ENGLISH_NEWZEALAND	50
TWLG_ENGLISH_SOUTHAFRICA	51
TWLG_ENGLISH_UK	52
TWLG_ENGLISH_USA	TWLG_USA
TWLG_ESTONIAN	53

TWLG_FAEROESE	54
TWLG_FARSI	55
TWLG_FINNISH	TWLG_FIN
TWLG_FRENCH	TWLG_FRN
TWLG_FRENCH_BELGIAN	56
TWLG_FRENCH_CANADIAN	TWLG_FCF
TWLG_FRENCH_LUXEMBOURG	57
TWLG_FRENCH_SWISS	58
TWLG_GERMAN	TWLG_GER
TWLG_GERMAN_AUSTRIAN	59
TWLG_GERMAN_LUXEMBOURG	60
TWLG_GERMAN_LIECHTENSTEIN	61
TWLG_GERMAN_SWISS	62
TWLG_GREEK	63
TWLG_HEBREW	64
TWLG_HUNGARIAN	65
TWLG_ICELANDIC	TWLG_ICE
TWLG_INDONESIAN	66
TWLG_ITALIAN	TWLG_ITN
TWLG_ITALIAN_SWISS	67
TWLG_JAPANESE	68
TWLG_KOREAN	69
TWLG_KOREAN_JOHAB	70
TWLG_LATVIAN	71
TWLG_LITHUANIAN	72
TWLG_NORWEGIAN	TWLG_NOR
TWLG_NORWEGIAN_BOKMAL	73
TWLG_NORWEGIAN_NYNORSK	74
TWLG_POLISH	75
TWLG_PORTUGUESE	TWLG_POR
TWLG_PORTUGUESE_BRAZIL	76
TWLG_ROMANIAN	77
TWLG_RUSSIAN	78
TWLG_SERBIAN_LATIN	79
TWLG_SLOVAK	80
TWLG_SLOVENIAN	81
TWLG_SPANISH	TWLG_SPA
TWLG_SPANISH_MEXICAN	82
TWLG_SPANISH_MODERN	83
TWLG_SWEDISH	TWLG_SWE
TWLG_THAI	84
TWLG_TURKISH	85
TWLG_UKRANIAN	86
TWLG_ASSAMESE	87
TWLG_BENGALI	88
TWLG_BIHARI	89
TWLG_BODO	90
TWLG_DOGRI	91
TWLG_GUJARATI	92
TWLG_HARYANVI	93
TWLG_HINDI	94

TWLG_KANNADA	95
TWLG_KASHMIRI	96
TWLG_MALAYALAM	97
TWLG_MARATHI	98
TWLG_MARWARI	99
TWLG_MEGHALAYAN	100
TWLG_MIZO	101
TWLG_NAGA	102
TWLG_ORISSI	103
TWLG_PUNJABI	104
TWLG_PUSHTU	105
TWLG_SERBIAN_CYRILLIC	106
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TWLG_TRIPURI	111
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Container for MSG_GET: TW_ENUMERATION, TW_ONEVALUE

Container for MSG_SET: TW_ENUMERATION, TW_ONEVALUE

Required By

None

Source Required Operations

None

CAP_MAXBATCHBUFFERS

Description

Describes the number of pages that the scanner can buffer when CAP_AUTOSCAN is enabled.

Application

MSG_GET returns the supported values

MSG_SET sets the current number pages to be buffered (if the Source allows this to be set)

Source

If supported, report the maximum batch buffer settings during MSG_GET. If MSG_SET is supported, limit batch buffers to the requested value for future transfers.

If not supported, return TWRC_FAILURE/ TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT32
Default Value:	No Default
Allowed Values:	1 to 2^{32} –1
Container for MSG_GET:	TW_ONEVALUE TW_ENUMERATION TW_RANGE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

CAP_AUTOSCAN
CAP_CLEARBUFFERS

CAP_REACQUIREALLOWED

Description

Indicates whether the physical hardware (e.g. scanner, digital camera) is capable of acquiring multiple images of the same page without changes to the physical registration of that page.

Application

Use this capability to enable or disable modes of operation where multiple image acquisitions of the page are required. Examples: preview mode, automated image analysis mode.

Source

If supported, return TRUE if the device is capable of capturing the page image multiple times without refeeding the page or otherwise causing physical registration changes. Return FALSE otherwise.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Support Guidelines for Sources

- A flat bed scanner that can retain the page on the platen and moves the scan bar past the page would return TRUE.
- A sheet-fed scanner that physically moves the page past the scan bar would return FALSE.
- A hand held scanner would return FALSE.

Values

Type:	TW_BOOL
Default Value:	No Default
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

None

Source Required Operations

None

See Also

CAP_AUTOFEED
CAP_CLEARPAGE
CAP_FEEDERENABLED
CAP_FEEDPAGE
CAP_REWINDPAGE

CAP_PAPERDETECTABLE

Description

This capability determines whether the device has a paper sensor that can detect documents on the ADF or Flatbed.

Application

If the source returns FALSE, the application should not rely on values such as CAP_FEEDERLOADED, and continue as if the paper is loaded.

Source

If supported, the source is responsible for detecting whether document is loaded or not.

If not supported, return TWRC_FAILURE/ TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL/DAT_CAPABILITY/MSG_QUERYSUPPORT)

Values

Type:	TW_BOOL
Default Value:	TRUE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

None

Source Required Operations

None

See Also

CAP_FEEDERLOADED

CAP_POWERSAVETIME

Description

When used with MSG_SET, set the camera power down timer in seconds. When used with MSG_GET, return the current setting of the power down time.

Application

Use this capability with MSG_SET to set the user selected camera power down time, when no activity is detected by the camera. The default value of -1 means no power down, power is always on.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_INT32
Default Value:	-1
Allowed Values:	>= -1
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None. Highly recommended for digital cameras. MSG_GET, MSG_SET, MSG_RESET

Source Required Operations

CAP_POWERSUPPLY

Description

MSG_GET reports the kinds of power available to the device. MSG_GETCURRENT reports the current power supply in use.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16
Default Value:	No default
Allowed Values:	TWPS_EXTERNAL TWPS_BATTERY
Container for MSG_GET:	TW_ENUMERATION, TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

None

Source Required Operations

None

CAP_PRINTER

Description

MSG_GET returns the current list of available printer devices, along with the one currently being used for negotiation. MSG_SET selects the current device for negotiation, and optionally constrains the list. MSG_RESET restores all the available devices (useful after MSG_SET has been used to constrain the list).

Top / Bottom refer to duplex devices, and indicate if the printer is writing on the top or the bottom of the sheet of paper. Simplex devices use the top settings.

Before / After indicates whether printing occurs before or after the sheet of paper has been scanned.

Application

Use this capability to determine which printers are available for negotiation, and to select a specific printer prior to negotiation.

Source

Imprinters are used to print data on documents at the time of scanning, and may be used for any purpose. Endorsers are more specific in nature, stamping some kind of proof of scanning on the document. Applications may opt to use imprinters for endorsing documents.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWPR_IMPRINTERTOPBEFORE	0
	TWPR_IMPRINTERTOPAFTER	1
	TWPR_IMPRINTERBOTTOMBEFORE	2
	TWPR_IMPRINTERBOTTOMAFTER	3
	TWPR_ENDORSERTOPBEFORE	4
	TWPR_ENDORSERTOPAFTER	5
	TWPR_ENDORSERBOTTOMBEFORE	6
	TWPR_ENDORSERBOTTOMAFTER	7
Container for MSG_GET:	TW_ENUMERATION, TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION, TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

CAP_PRINTERENABLED
CAP_PRINTERINDEX
CAP_PRINTERMODE
CAP_PRINTERSTRING
CAP_PRINTERSUFFIX

CAP_PRINTERENABLED

Description

Turns the current CAP_PRINTER device on or off.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

CAP_PRINTER
CAP_PRINTERINDEX
CAP_PRINTERMODE
CAP_PRINTERSTRING
CAP_PRINTERSUFFIX

CAP_PRINTERINDEX

Description

The User can set the starting number for the current CAP_PRINTER device.

Source

This value allows the user to set the starting page number for the current CAP_PRINTER device.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT32
Default Value:	0
Allowed Values:	Any values.
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

See Also

CAP_PRINTER
CAP_PRINTERENABLED
CAP_PRINTERMODE
CAP_PRINTERSTRING
CAP_PRINTERSUFFIX

CAP_PRINTERMODE

Description

Specifies the appropriate current CAP_PRINTER device mode.

Note:

- TWPM_SINGLESTRING specifies that the printed text will consist of a single string.
- TWPM _MULTISTRING specifies that the printed text will consist of an enumerated list of strings to be printed in order.
- TWPM _COMPOUNDSTRING specifies that the printed string will consist of a compound of a String followed by a value followed by a suffix string.

Application

Negotiate this capability to specify the mode of printing to use when the current CAP_PRINTER device is enabled.

Source

If supported, use the specified mode for future image acquisitions.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16
Default Value:	TWPM_SINGLESTRING
Allowed Values:	TWPM_SINGLESTRING TWPM_MULTISTRING TWPM_COMPOUNDSTRING
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

CAP_PRINTER
CAP_PRINTERENABLED
CAP_PRINTERINDEX
CAP_PRINTERSTRING
CAP_PRINTERSUFFIX

CAP_PRINTERSTRING

Description

Specifies the string(s) that are to be used in the string component when the current CAP_PRINTER device is enabled.

Application

Negotiate this capability to specify the string or strings to be used for printing (depending on printer mode). Use enumeration to print multiple lines of text, one line per string in the enumerated list. Be sure to check the status codes if attempting multiple lines, since not all devices support this feature.

Source

If supported, use the specified string for printing during future acquisitions.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_STR255
Default Value:	No Default
Allowed Values:	Any string
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

CAP_PRINTER
CAP_PRINTERENABLED
CAP_PRINTERINDEX
CAP_PRINTERMODE
CAP_PRINTERSUFFIX

CAP_PRINTERSUFFIX

Description

Specifies the string that shall be used as the current CAP_PRINTER device's suffix.

Application

Negotiate this capability to specify the string that is used as the suffix for printing if TWPM_COMPOUNDSTRING is used.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_STR255
Default Value:	No Default
Allowed Values:	Any string
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

CAP_PRINTER
CAP_PRINTERENABLED
CAP_PRINTERINDEX
CAP_PRINTERMODE
CAP_PRINTERSTRING

CAP_REWINDPAGE

Description

If TRUE, the Source will return the current page to the input side of the document feeder and feed the last page from the output side of the feeder back into the acquisition area.

If CAP_AUTOFEED is TRUE, automatic feeding will continue after all negotiated frames from this page are acquired.

CAP_FEEDERENABLED must equal TRUE to use this capability.

This capability must have been negotiated as an extended capability to be used in States 5 and 6.

Application

This capability is used in States 5 and 6 by applications controlling the Source's feeder (usually without the Source's user interface).

If CAP_AUTOFEED is TRUE, the normal automatic feeding will continue after all frames of this page are acquired.

Source

If CAP_FEEDERENABLED equals FALSE, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED (capability is not supported in current settings).

If there are no documents in the output area, return: TWRC_FAILURE / TWCC_BADVALUE.

The Source will perform this action once whenever the capability is MSG_SET to TRUE. The Source should then revert the Current value to FALSE.

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

CAP_AUTOFEED
CAP_CLEARPAGE
CAP_EXTENDEDCAPS
CAP_FEEDERENABLED
CAP_FEEDERLOADED
CAP_FEEDPAGE

CAP_SERIALNUMBER

Description

A string containing the serial number of the currently selected device in the Source. Multiple devices may all report the same serial number.

Application

The value is device specific, Applications should not attempt to parse the information.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_STR255
Default Value:	No default
Allowed Values:	Any value
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

None

Source Required Operations

None

CAP_SUPPORTEDCAPS

Description

Returns a list of all the capabilities for which the Source will answer inquiries. Does not indicate which capabilities the Source will allow to be set by the application. Some capabilities can only be set if certain setup work has been done so the Source cannot globally answer which capabilities are "set-able."

Values

Type:	TW_UINT16
Default Value:	No Default
Allowed Values:	Any "get-able" capability
Container for MSG_GET:	TW_ARRAY
Container for MSG_SET:	MSG_SET not allowed

Required By

All Sources.

Source Required Operations

MSG_GET/CURRENT/DEFAULT

See Also

CAP_EXTENDEDCAPS

CAP_TIMEBEFOREFIRSTCAPTURE

Description

For automatic capture, this value selects the number of milliseconds before the first picture is to be taken, or the first image is to be scanned.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_INT32
Default Value:	0
Allowed Values:	0 or greater
Container for MSG_GET:	TW_ONEVALUE, TW_RANGE
Container for MSG_SET:	TW_ONEVALUE, TW_RANGE

Required By

None

Source Required Operations

None

See Also

CAP_AUTOMATICCAPTURE
CAP_TIMEBETWEENCAPTURES
CAP_XFERCOUNT

CAP_TIMEBETWEENCAPTURES

Description

For automatic capture, this value selects the milliseconds to wait between pictures taken, or images scanned.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_INT32
Default Value:	0
Allowed Values:	0 or greater
Container for MSG_GET:	TW_ONEVALUE, TW_RANGE
Container for MSG_SET:	TW_ONEVALUE, TW_RANGE

Required By

None

Source Required Operations

None

See Also

CAP_AUTOMATICCAPTURE
CAP_TIMEBEFOREFIRSTCAPTURE
CAP_XFERCOUNT

CAP_TIMEDATE

Description

The date and time the image was acquired.

Note: CAP_TIMEDATE does not return the *exact* time the image was acquired; rather, it returns the *closest available approximation* of the time the physical phenomena represented by the image was recorded. If the application needs the exact time of acquisition, the application should generate that value itself during the image acquisition procedure.

Stored in the form "YYYY/MM/DD HH:mm:SS.sss" where YYYY is the year, MM is the numerical month, DD is the numerical day, HH is the hour, mm is the minute, SS is the second, and sss is the millisecond.

This capability must be negotiated during State 7 before the call to the DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER triplet. It must also be listed in the CAP_EXTENDEDCAPS capability by the data source.

Source

The time and date when the image was originally acquired (when the Source entered State 7).

Be sure to leave the space between the ending of the date and beginning of the time fields. Pad the unused characters after the string with zeros.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_STR32
Default Value:	No Default
Allowed Values:	Any date
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

None

Source Required Operations

None

See Also

CAP_AUTHOR
CAP_CAPTION

CAP_THUMBNAILSENABLED

Description

Allows an application to request the delivery of thumbnail representations for the set of images that are to be delivered.

Setting CAP_THUMBNAILSENABLED to TRUE turns on thumbnail mode. Images transferred thereafter will be sent at thumbnail size (exact thumbnail size is determined by the Data Source). Setting this capability to FALSE turns thumbnail mode off and returns full size images.

Application

A successful set of this capability to TRUE will cause the Source to deliver image thumbnails during normal data transfer operations. This mode remains in effect until this capability is set back to FALSE.

Source

A successful set of this capability to TRUE should enable the delivery of thumbnail images during normal data transfer. Setting this capability to FALSE will disable thumbnail delivery.

If not supported, return TWRC_FAILURE/ TWCC_CAPUNSUPPORTED.

Values

Type:	TW_BOOL
Default Value:	FALSE (do not deliver thumbnails).
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

All Image Store Data Sources.

Source Required Operations

MSG_GET, MSG_SET, MSG_GETCURRENT, MSG_RESET

See Also

ICAP_IMAGEDATASET

CAP_UICONTROLLABLE

Description

If TRUE, indicates that this Source supports acquisition with the UI disabled; i.e., TW_USERINTERFACE's ShowUI field can be set to FALSE. If FALSE, indicates that this Source can only support acquisition with the UI enabled.

Source

This capability was introduced in TWAIN 1.6. All Sources compliant with TWAIN 1.6 and above must support this capability. Sources that are not TWAIN 1.6-compliant may return TWRC_FAILURE / TWCC_BADCAP if they do not support this capability.

Application

A return value of TWRC_FAILURE / TWCC_CAPUNSUPPORTED indicates that the Source in use is not TWAIN 1.6-compliant. Therefore, the Source may ignore TW_USERINTERFACE's ShowUI field when MSG_ENABLEDS is issued. See the description of DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS for more details.

Values

Type:	TW_BOOL
Default Value:	No Default
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

All Sources.

See Also

CAP_INDICATORS
DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS

CAP_XFERCOUNT

Description

The application is willing to accept this number of images.

Application

Set this capability to the number of images you are willing to transfer per session. Common values are:

1 Application wishes to transfer only one image this session

-1 Application is willing to transfer multiple images

Source

If the application limits the number of images it is willing to receive, the Source should not make more transfers available than the specified number.

Values

Type:	TW_INT16
Default Value:	-1
Allowed Values:	-1 to 2^{15}
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

All Sources and applications

Source Required Operations

MSG_GET/CURRENT/DEFAULT,
MSG_SET/RESET

See Also

TW_PENDINGXFERS.Count

ICAP_AUTOMATICBORDERDETECTION

Description

Turns automatic border detection on and off.

Application

Negotiate this capability to determine the state of the AutoBorder detection.

ICAP_UNDEFINEDIMAGESIZE must be enabled for this feature to work.

Source

If supported, enable or disable automatic border detection according to the value specified. Default to FALSE for backward compatibility. For this capability to be enabled, ICAP_UNDEFINEDIMAGESIZE must be enabled.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_UNDEFINEDIMAGESIZE
ICAP_AUTOMATICDESKEW

ICAP_AUTOBRIGHT

Description

TRUE enables and FALSE disables the Source's Auto-brightness function (if any).

Source

If TRUE, apply auto-brightness function to acquired image before transfer.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_BRIGHTNESS

ICAP_AUTOMATICDESKEW

Description

Turns automatic deskew correction on and off.

Application

Negotiate this capability to enable or disable Automatic deskew.

Source

If supported, enable or disable the Automatic deskew feature according to the value specified for future transfers. Default to FALSE for backward compatibility. Some Sources may require ICAP_UNDEFINEDIMAGESIZE to be enabled.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_AUTOMATICBORDERDETECTION
ICAP_AUTOMATICROTATE
ICAP_UNDEFINEDIMAGESIZE

ICAP_AUTOMATICROTATE

Description

When TRUE this capability depends on intelligent features within the Source to automatically rotate the image to the correct position.

Application

If this capability is set to TRUE, then it must be assumed that no other correction is required (deskew, rotation, etc…); the Source is guaranteeing that it will deliver images in the correct orientation.

Source

There are no criteria for how this automatic rotation is determined. A Source may use a field of text, or some distinguishing non-text field, such as a barcode or a logo, or it may rely on form recognition to help rotate the document.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_AUTOMATICDESKEW
ICAP_ORIENTATION
ICAP_ROTATION

ICAP_BARCODEDETECTIONENABLED

Description

Turns bar code detection on and off.

Source

Support this capability if the scanner supports any Bar code recognition. If the device allows this feature to be turned off, then default to off. If the device does not support disabling this feature, report TRUE and disallow attempts to set FALSE.

If not supported, return TWRC_FAILURE/ TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_BOOL
Default Value:	No Default
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_SUPPORTEDBARCODETYPES
ICAP_SUPPORTEDPATCHCODETYPES
ICAP_BARCODEMAXSEARCHPRIORITIES
ICAP_BARCODESEARCHPRIORITIES
ICAP_BARCODESEARCHMODE
ICAP_BARCODEMAXRETRIES
ICAP_BARCODETIMEOUT

ICAP_BARCODEMAXRETRIES

Description

Restricts the number of times a search will be retried if none are found on each page.

Application

Refine this capability to limit the number of times the bar code search algorithm is retried on a page that contains no bar codes.

Source

If supported, limit the number of retries the value specified.

If not supported, return TWRC_FAILURE/ TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT32
Default Value:	No Default
Allowed Values:	1 to 2^{32} –1
Container for MSG_GET:	TW_ENUMERATION TW_RANGE TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_BARCODEDETECTIONENABLED
ICAP_SUPPORTEDBARCODETYPES
ICAP_SUPPORTEDPATCHCODETYPES
ICAP_BARCODEMAXSEARCHPRIORITIES
ICAP_BARCODESEARCHPRIORITIES
ICAP_BARCODESEARCHMODE
ICAP_BARCODETIMEOUT

ICAP_BARCODEMAXSEARCHPRIORITIES

Description

The maximum number of supported search priorities.

Application

Query this value to determine how many bar code detection priorities can be set.

Set this value to limit the number of priorities to speed the detection process.

Source

If bar code searches can be prioritized, report the maximum number of priorities allowed for a search.

If not supported, return TWRC_FAILURE/ TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT32
Default Value:	No Default
Allowed Values:	1 to 2^{32} –1
Container for MSG_GET:	TW_ENUMERATION TW_RANGE TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_BARCODEDETECTIONENABLED
ICAP_SUPPORTEDBARCODETYPES
ICAP_SUPPORTEDPATCHCODETYPES
ICAP_BARCODESEARCHPRIORITIES
ICAP_BARCODESEARCHMODE
ICAP_BARCODEMAXRETRIES
ICAP_BARCODETIMEOUT

ICAP_BARCODESEARCHMODE

Description

Restricts bar code searching to certain orientations, or prioritizes one orientation over the other.

Application

Negotiate this capability if the orientation of bar codes is already known to the application. Refinement of this capability can speed the bar code search.

Source

If set then apply the specified refinements to future bar code searches.

If not supported, return TWRC_FAILURE/ TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWBD_HORZ	0
	TWBD_VERT	1
	TWBD_HORZVERT	2
	TWBD_VERTHORZ	3
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

ICAP_BARCODEDETECTIONENABLED
ICAP_SUPPORTEDBARCODETYPES
ICAP_SUPPORTEDPATCHCODETYPES
ICAP_BARCODEMAXSEARCHPRIORITIES
ICAP_BARCODESEARCHPRIORITIES
ICAP_BARCODEMAXRETRIES
ICAP_BARCODETIMEOUT

ICAP_BARCODESEARCHPRIORITIES

Description

A prioritized list of bar code types dictating the order in which bar codes will be sought.

Application

Set this capability to specify the order and priority for bar code searching. Refining the priorities to only the bar code types of interest to the application can speed the search process.

Source

If this type of search refinement is supported, then report the current values.

If set, then limit future searches to the specified bar codes in the specified priority order.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWBT_3OF9	0
	TWBT_2OF5INTERLEAVED	1
	TWBT_2OF5NONINTERLEAVED	2
	TWBT_CODE93	3
	TWBT_CODE128	4
	TWBT_UCC128	5
	TWBT_CODABAR	6
	TWBT_UPCA	7
	TWBT_UPCE	8
	TWBT_EAN8	9
	TWBT_EAN13	10
	TWBT_POSTNET	11
	TWBT_PDF417	12
	TWBT_2OF5INDUSTRIAL	13
	TWBT_2OF5MATRIX	14
	TWBT_2OF5DATALOGIC	15
	TWBT_2OF5IATA	16
	TWBT_3OF9FULLASCII	17
	TWBT_CODABARWITHSTARTSTOP	18
	TWBT_MAXICODE	19
Container for MSG_GET:	TW_ ARRAY	
Container for MSG_SET:	TW_ ARRAY	

Required By

None

Source Required Operations

None

See Also

ICAP_BARCODEDETECTIONENABLED
ICAP_SUPPORTEDBARCODETYPES
ICAP_SUPPORTEDPATCHCODETYPES
ICAP_BARCODEMAXSEARCHPRIORITIES
ICAP_BARCODESEARCHMODE
ICAP_BARCODEMAXRETRIES
ICAP_BARCODETIMEOUT

ICAP_BARCODETIMEOUT

Description

Restricts the total time spent on searching for a bar code on each page.

Application

Refine this value to tune the length of time the search algorithm is allowed to execute before giving up.

Source

If supported, limit the duration of a bar code search to the value specified.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT).

Values

Type:	TW_UINT32
Default Value:	No Default
Allowed Values:	1 to 2^{32} –1
Container for MSG_GET:	TW_ENUMERATION TW_RANGE TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_BARCODEDETECTIONENABLED
ICAP_SUPPORTEDBARCODETYPES
ICAP_SUPPORTEDPATCHCODETYPES
ICAP_BARCODEMAXSEARCHPRIORITIES
ICAP_BARCODESEARCHPRIORITIES
ICAP_BARCODESEARCHMODE
ICAP_BARCODEMAXRETRIES

ICAP_BITDEPTH

Description

Specifies the pixel bit depths for the Current value of ICAP_PIXELTYPE. For example, when using ICAP_PIXELTYPE = TWPT_GRAY, this capability specifies whether this is 8-bit gray or 4-bit gray.

This depth applies to all the data channels (for instance, the R, G, and B channels will all have this same bit depth for RGB data).

Application

The application should loop through all the ICAP_PIXELTYPEs it is interested in and negotiate the ICAP_BITDEPTH(s) for each.

For all allowed settings of ICAP_PIXELTYPE

- Set ICAP_PIXELTYPE
- Set ICAP_BITDEPTH for the current ICAP_PIXELTYPE

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If the bit depth in a MSG_SET is not supported for the current ICAP_PIXELTYPE setting, return TWRC_FAILURE / TWCC_BADVALUE.

Values

Type:	TW_UINT16
Default Value:	No Default
Allowed Values:	>=1
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE

Required By

All Image Sources

Source Required Operations

MSG_GET/CURRENT/DEFAULT

See Also

ICAP_PIXELTYPE

ICAP_BITDEPTHREDUCTION

Description

Specifies the Reduction Method the Source should use to reduce the bit depth of the data. Most commonly used with ICAP_PIXELTYPE = TWPT_BW to reduce gray data to black and white.

Application

Set the capability to the reduction method to be used in future acquisitions

Also select the Halftone or Threshold to be used.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWBR_THRESHOLD	0
	TWBR_HALFTONES	1
	TWBR_CUSTHALFTONE	2
	TWBR_DIFFUSION	3
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

ICAP_CUSTHALFTONE
ICAP_HALFTONES
ICAP_PIXELTYPE
ICAP_THRESHOLD

ICAP_BITORDER

Description

Specifies how the bytes in an image are filled by the Source. TWBO_MSBFIRST indicates that the leftmost bit in the byte (usually bit 7) is the byte's Most Significant Bit.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	TWBO_MSBFIRST	
Allowed Values:	TWBO_LSBFIRST	0
	TWBO_MSBFIRST	1
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ONEVALUE	

Required By

All Image Sources

Source Required Operations

MSG_GET/CURRENT/DEFAULT

See Also

ICAP_BITORDERCODES

ICAP_BITORDERCODES

Description

Used for CCITT data compression only. Indicates the bit order representation of the stored compressed codes.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	TWBO_LSBFIRST	
Allowed Values:	TWBO_LSBFIRST	0
	TWBO_MSBFIRST	1
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

ICAP_COMPRESSION

ICAP_BRIGHTNESS

Description

The brightness values available within the Source.

Application

The application can use this capability to inquire, set, or restrict the values for BRIGHTNESS used in the Source.

Source

Source should normalize the values into the range. Make sure that a '0' value is available as the Current Value when the Source starts up. If the Source's ± range is asymmetric about the '0' value, set range maxima to ±1000 and scale homogeneously from the '0' value in each direction. This will yield a positive range whose step size differs from the negative range's step size.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	0
Allowed Values:	-1000 to +1000
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE

Required By

None

Source Required Operations

None

See Also

ICAP_AUTOBRIGHT
ICAP_CONTRAST

ICAP_CCITTKFACTOR

Description

Used for CCITT Group 3 2-dimensional compression. The 'K' factor indicates how often the new compression baseline should be re-established. A value of 2 or 4 is common in facsimile communication. A value of zero in this field will indicate an infinite K factor—the baseline is only calculated at the beginning of the transfer.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values:

Type:	TW_UINT16
Default Value:	4
Allowed Values:	0 to 2^{16}
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_COMPRESSION

ICAP_COMPRESSION

Description

Allows the application and Source to identify which compression schemes they have in common for Buffered Memory and File transfers.

Note for File transfers:

Since only certain file formats support compression, this capability must be negotiated after setting the desired file format with ICAP_IMAGEFILEFORMAT.

TWCP_NONE	All Sources must support this.
TWCP_PACKBITS	Macintosh PackBits format, (can be used with TIFF or PICT)
TWCP_GROUP31D, TWCP_GROUP31DEOL, TWCP_GROUP32D, TWCP_GROUP4	Are all from the CCITT specification (now ITU), intended for document images (can be used with TIFF).
TWCP_JPEG	Intended for the compression of color photographs (can be used with TIFF, JFIF or SPIFF).
TWCP_LZW	A compression licensed by UNISYS (can be used with TIFF).
TWCP_JBIG	Intended for bitonal and grayscale document images (can be used with TIFF or SPIFF).
TWCP_PNG	This compression can only be used if ICAP_IMAGEFILEFORMAT is set to TWFF_PNG.
TWCP_RLE4, TWCP_RLE8, TWCP_BITFIELDS	These compressions can only be used if ICAP_IMAGEFILEFORMAT is set to TWFF_BMP.

Application

Applications must not assume that a Source can provide compressed Buffered Memory or File transfers, because many cannot. The application should use MSG_SET on a TW_ONEVALUE container to specify the compression type for future transfers.

Source

The current value of this setting specifies the compression method to be used in future transfers. If the image transfer mechanism is changed, then the allowed list must be modified to reflect the supported values. If the current value is not available on the new allowed list, then the Source must change it to its preferred value.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	TWCP_NONE	
Allowed Values:	TWCP_NONE	0
	TWCP_PACKBITS	1
	TWCP_GROUP31D	2
	TWCP_GROUP31DEOL	3
	TWCP_GROUP32D	4
	TWCP_GROUP4	5
	TWCP_JPEG	6
	TWCP_LZW	7
	TWCP_JBIG	8
	TWCP_PNG	9
	TWCP_RLE4	10
	TWCP_RLE8	11
	TWCP_BITFIELDS	12
Container for MSG_GET:	TW_ENUMERATION, TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION, TW_ONEVALUE	

Required By

All Image Sources.

Source Required Operations

MSG_GET / CURRENT / DEFAULT

See Also

DG_CONTROL / DAT_IMAGEMEMXFER / MSG_GET
DG_CONTROL / DAT_IMAGEFILEXFER / MSG_GET

CAP_XFERMECH
ICAP_IMAGEFILEFORMAT

ICAP_CONTRAST

Description

The contrast values available within the Source.

Application

The application can use this capability to inquire, set or restrict the values for CONTRAST used in the Source.

Source

Scale the values available internally into a homogeneous range between -1000 and 1000. Make sure that a '0' value is available as the Current value when the Source starts up. If the Source's ± range is asymmetric about the '0' value, set range maxima to ±1000 and scale homogeneously from the '0' value in each direction. This will yield a positive range whose step size differs from the negative range's step size.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	0
Allowed Values:	-1000 to +1000
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE

Required By

None

Source Required Operations

None

See Also

ICAP_BRIGHTNESS

ICAP_CUSTHALFTONE

Description

Specifies the square-cell halftone (dithering) matrix the Source should use to halftone the image.

Application

The application should also set ICAP_BITDEPTHREDUCTION to TWBR_CUSTHALFTONE to use this capability.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT8
Default Value:	No Default
Allowed Values:	Any rectangular array
Container for MSG_GET:	TW_ARRAY
Container for MSG_SET:	TW_ARRAY

Required By

None

Source Required Operations

None

See Also

ICAP_BITDEPTHREDUCTION

ICAP_EXPOSURETIME

Description

Specifies the exposure time used to capture the image, in seconds.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	No Default
Allowed Values:	>0
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE

Required By

None

Source Required Operations

None

See Also

ICAP_FLASHUSED2
ICAP_LAMPSTATE
ICAP_LIGHTPATH
ICAP_LIGHTSOURCE

ICAP_EXTIMAGEINFO

Description

Allows the application to query the data source to see if it supports the new operation triplet DG_IMAGE/ DAT_EXTIMAGEINFO/ MSG_GET.

If TRUE, the source will support the DG_IMAGE/DAT_EXTIMAGEINFO/MSG_GET message.

Note: The TWAIN API allows for an application to query the results of many advanced device/manufacturer operations. The responsibility of configuring and setting up each advanced operation lies with the device's data source user interface. Since the configuration of advanced device/manufacturer-specific operations varies from manufacturer to manufacturer, placing the responsibility for setup and configuration of advanced operations allows the application to remain device independent.

Source

If not supported, return TWRC_FAILURE/ TWCC_CAPUNSUPPORTED.

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

DG_IMAGE/ DAT_EXTIMAGEINFO/ MSG_GET

ICAP_FILTER

Description

Describes the color characteristic of the subtractive filter applied to the image data. Multiple filters may be applied to a single acquisition.

Source

If the Source only supports application of a single filter during an acquisition and multiple filters are specified by the application, set the current filter to the first one requested and return TWRC_CHECKSTATUS.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWFT_RED	0
	TWFT_GREEN	1
	TWFT_BLUE	2
	TWFT_NONE	3
	TWFT_WHITE	4
	TWFT_CYAN	5
	TWFT_MAGENTA	6
	TWFT_YELLOW	7
	TWFT_BLACK	8
Container for MSG_GET:	TW_ARRAY TW_ONEVALUE	
Container for MSG_SET:	TW_ARRAY TW_ONEVALUE	

Required By

None

Source Required Operations

None

ICAP_FLASHUSED

Description

Specifies whether or not the image was acquired using a flash.

Application

Note that an image with flash may have a different color composition than an image without flash.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_BOOL
Default Value:	No Default
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_EXPOSURETIME
ICAP_FLASHUSED2
ICAP_LAMPSTATE
ICAP_LIGHTPATH
ICAP_LIGHTSOURCE

ICAP_FLASHUSED2

Description

For devices that support flash. MSG_SET selects the flash to be used (if any). MSG_GET reports the current setting. This capability replaces ICAP_FLASHUSED, which is only able to negotiate the flash being on or off.

Application

Note that an image with flash may have a different color composition than an image without flash.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	TWFL_NONE	
Allowed Values:	TWFL_NONE	0
	TWFL_OFF	1
	TWFL_ON	2
	TWFL_AUTO	3
	TWFL_REDEYE	4
Container for MSG_GET:	TW_ENUMERATION, TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION, TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

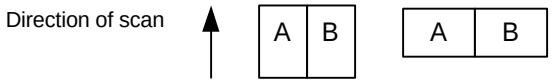
ICAP_FLASHUSED

ICAP_FLIPROTATION

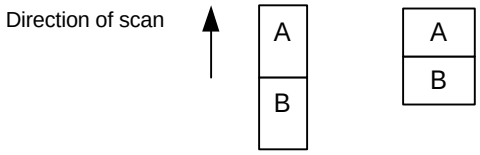
Description

Flip rotation is used to properly orient images that flip orientation every other image.

TWFR_BOOK — The images to be scanned are viewed in book form, flipping each page from left to right or right to left.



TWFR_FANFOLD — The images to be scanned are viewed in fanfold paper style, flipping each page up or down.



On duplex paper, the As are all located on the top, and the Bs are all located on the bottom. If ICAP_FLIPROTATION is set to TWFR_BOOK, and fanfold paper is scanned, then every B image will be upside down. Setting the capability to TWFR_FANFOLD instructs the Source to rotate the B images 180 degrees around the x-axis.

Because this capability is described to act upon every other image, it will work correctly in simplex mode, assuming that every other simplex image is flipped in the manner described above.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	TWFR_BOOK	
Allowed Values:	TWFR_BOOK	0
	TWFR_FANFOLD	1
Container for MSG_GET:	TW_ONEVALUE	
Container for MSG_SET:	TW_ONEVALUE	

Required By

None

Source Required Operations

None

ICAP_FRAMES

Description

The list of frames the Source will acquire on each page.

Application

MSG_GET returns the size and location of all the frames the Source will acquire image data from when acquiring from each page.

MSG_GETCURRENT returns the size and location of the next frame to be acquired.

MSG_SET allows the application to specify the frames and their locations to be used to acquire from future pages.

This ICAP is most useful if the Source supports simultaneous acquisition from multiple frames. Use ICAP_MAXFRAMES to establish this ability.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FRAME
Default Value:	No Default
Allowed Values:	Device dependent
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_MAXFRAMES
ICAP_SUPPORTEDSIZES
TW_IMAGELAYOUT

ICAP_GAMMA

Description

Gamma correction value for the image data.

Application

Do not use with TW_CIECOLOR, TW_GRAYRESPONSE, or TW_RGBRESPONSE data.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	2.2
Allowed Values:	Any value
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

ICAP_HALFTONES

Description

A list of names of the halftone patterns available within the Source.

Application

The application may not rename any halftone pattern.

The application should also set ICAP_BITDEPTHREDUCTION to use this capability.

Values

Type:	TW_STR32
Default Value:	No Default
Allowed Values:	Any halftone name
Container for MSG_GET:	TW_ARRAY (for backwards compatibility with 1.0 only) TW_ENUMERATION TW_ONEVALUE
Container for MSG_SET:	TW_ARRAY (for backwards compatibility with 1.0 only) TW_ENUMERATION TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_CUSTHALFTONE
ICAP_BITDEPTHREDUCTION
ICAP_THRESHOLD

ICAP_HIGHLIGHT

Description

Specifies which value in an image should be interpreted as the lightest “highlight.” All values “lighter” than this value will be clipped to this value. Whether lighter values are smaller or larger can be determined by examining the Current value of ICAP_PIXELFLAVOR.

Source

If more or less than 8 bits are used to describe the image, the actual data values should be normalized to fit within the 0-255 range. The normalization need not result in a homogeneous distribution if the original distribution was not homogeneous.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	255
Allowed Values:	0 to 255
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE

Required By

None

Source Required Operations

None

See Also

ICAP_SHADOW

ICAP_IMAGEDATASET

Description

Gets or sets the image indices that will be delivered during the standard image transfer done in States 6 and 7. Indices are assumed to start at 1, so a TW_ONEVALUE container sets an implied range from 1 to the number specified. TW_RANGE returns are useful for those cases where the images are contiguous (5 .. 36). TW_ARRAY returns should be used were index values are discontinuous (as could be the case where the user previously set such a data set). See the note in the Values section below.

Application

A MSG_RESET operation should always be done before a MSG_GET if the application wishes to get the complete list of available images. A MSG_SET operation will define the number and order of images delivered during States 6 and 7.

Source

For MSG_GET, if a contiguous range of images are available starting from the first index (e.g., 1 .. 36) it is recommended that the TW_ONEVALUE container is used specifying just the total number of available images (e.g., 36).

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT32
Default Value:	Entire range or set of available images
Allowed Values:	0 to 2^{32} -1 (for MSG_GET) 1 to 2^{32} -1 (for MSG_SET)
Container for MSG_GET:	TW_ONEVALUE TW_RANGE (see note below) TW_ARRAY (see note below)
Container for MSG_SET:	TW_ONEVALUE TW_RANGE TW_ARRAY

Note: These container types are supported for the returning discontinuous indices that have been previously set by the application. It is highly recommended that for a initialized or reset *Image Store* device, the TW_ONEVALUE container be the only one returned by the MSG_GET operation. In other words, the data source should not expose the details of the internal memory management of the Image Store device by claiming that it has a hole in its storage locations due to user deletions. For example, a camera that currently has data for pictures 1 to 10 should report that it has 10 images available. If the user later deletes pictures 5, 7, and 9, it should now report that it has 7 images available (i.e., 1 to 7), and not claim that it has pictures 1, 2, 3, 4, 6, 8, and 10 available. To do so would expose the internal memory management constraints of the device and serves little use but to confuse the user.

Required By

All *Image Store* Data Sources.

Source Required Operations

MSG_GET, MSG_SET, MSG_RESET

ICAP_IMAGEFILEFORMAT

Description

Informs the application which file formats the Source can generate (MSG_GET). Tells the Source which file formats the application can handle (MSG_SET).

TWFF_TIFF	Used for document imaging
TWFF_PICT	Native Macintosh format
TWFF_BMP	Native Microsoft format
TWFF_XBM	Used for document imaging
TWFF_JFIF	Wrapper for JPEG images
TWFF_FPX	FlashPix, used with digital cameras
TWFF_TIFFMULTI	Multi-page TIFF files
TWFF_PNG	An image format standard intended for use on the web, replaces GIF
TWFF_SPIFF	A standard from JPEG, intended to replace JFIF, also supports JBIG
TWFF_EXIF	

Application

Use this ICAP to determine which formats are available for file transfers, and set the context for other capability negotiations such as ICAP_COMPRESSION.

Be sure to use the DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET operation to specify the format to be used for a particular acquisition.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL /DAT_CAPABILITY/ MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	TWFF_BMP (Windows) TWFF_PICT (Macintosh)	
Allowed Values:	TWFF_TIFF	0
	TWFF_PICT	1
	TWFF_BMP	2
	TWFF_XBM	3
	TWFF_JFIF	4
	TWFF_FPX	5
	TWFF_TIFFMULTI	6
	TWFF_PNG	7

	TWFF_SPIFF	8
	TWFF_EXIF	9

Container for MSG_GET: TW_ENUMERATION, TW_ONEVALUE

Container for MSG_SET: TW_ENUMERATION, TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

DG_CONTROL / DAT_SETUPFILEXFER / MSG_SET
DG_IMAGE / DAT_IMAGEFILEXFER / MSG_GET

ICAP_COMPRESSION

ICAP_IMAGEFILTER

Description

For devices that support image enhancement filtering. This capability selects the algorithm used to improve the quality of the image.

Application

TWIF_LOWPASS is good for halftone images.

TWIF_BANDPASS is good for improving text.

TWIF_HIGHPASS is good for improving fine lines.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	TWIF_NONE	
Allowed Values:	TWIF_NONE	0
	TWIF_AUTO	1
	TWIF_LOWPASS	2
	TWIF_BANDPASS	3
	TWIF_HIGHPASS	4
Container for MSG_GET:	TW_ENUMERATION, TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION, TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

ICAP_JPEGPIXELTYPE

Description

Allows the application and Source to agree upon a common set of color descriptors that are made available by the Source. This ICAP is only useful for JPEG-compressed buffered memory image transfers.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWPT_BW	0
	TWPT_GRAY	1
	TWPT_RGB	2
	TWPT_PALETTE	3
	TWPT_CMY	4
	TWPT_CMYK	5
	TWPT_YUV	6
	TWPT_YUVK	7
	TWPT_CIEXYZ	8
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

ICAP_COMPRESSION

ICAP_LAMPSTATE

Description

TRUE means the lamp is currently, or should be set to ON. Sources may not support MSG_SET operations.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_BOOL
Default Value:	No Default
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_EXPOSURETIME
ICAP_FLASHUSED2
ICAP_LIGHTPATH
ICAP_LIGHTSOURCE

ICAP_LIGHTPATH

Description

Describes whether the image was captured transmissively or reflectively.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWLP_REFLECTIVE	0
	TWLP_TRANSMISSIVE	1
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

ICAP_EXPOSURETIME
ICAP_FLASHUSED2
ICAP_LAMPSTATE
ICAP_LIGHTSOURCE

ICAP_LIGHTSOURCE

Description

Describes the general color characteristic of the light source used to acquire the image.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWLS_RED	0
	TWLS_GREEN	1
	TWLS_BLUE	2
	TWLS_NONE	3
	TWLS_WHITE	4
	TWLS_UV	5
	TWLS_IR	6
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

ICAP_EXPOSURETIME
ICAP_FLASHUSED2
ICAP_LAMPSTATE
ICAP_LIGHTPATH

ICAP_MAXFRAMES

Description

The maximum number of frames the Source can provide or the application can accept per page.

This is a bounding capability only. It does not establish current or future behavior.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16
Default Value:	No Default
Allowed Values:	1 to 2^{16}
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_FRAMES
TW_IMAGELAYOUT

ICAP_MINIMUMHEIGHT

Description

Allows the source to define the minimum height (Y-axis) that the source can acquire.

Application

Source

The minimum height that the device can scan. This may be different depending on the value of CAP_FEEDERENABLED.

Values

Type:	TW_FIX32
Default Value:	No Default
Allowed Values:	0 to 32767 in ICAP_UNITS
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

None

Source Required Operations

See Also

CAP_FEEDERENABLED
ICAP_PHYSICALHEIGHT
ICAP_UNITS

ICAP_MINIMUMWIDTH

Description

Allows the source to define theminimum width (X-axis) that the source can acquire.

Source

The minimum width that the device can scan. This may be different depending on the value of CAP_FEEDERENABLED.

Values

Type:	TW_FIX32
Default Value:	No Default
Allowed Values:	0 to 32767 in ICAP_UNITS
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

None

Source Required Operations

See Also

CAP_FEEDERENABLED
ICAP_PHYSICALWIDTH
ICAP_UNITS

ICAP_NOISEFILTER

Description

For devices that support noise filtering. This capability selects the algorithm used to remove noise.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	TWNF_NONE	
Allowed Values:	TWNF_NONE	0
	TWNF_AUTO	1
	TWNF_LONEPIXEL	2
	TWNF_MAJORITYRULE	3
Container for MSG_GET:	TW_ENUMERATION, TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION, TW_ONEVALUE	

Required By

None

Source Required Operations

None

ICAP_ORIENTATION

Description

Defines which edge of the "paper" the image's "top" is aligned with. This information is used to adjust the frames to match the scanning orientation of the paper. For instance, if an ICAP_SUPPORTEDSIZE of TWSS_ISOA4 has been negotiated, and ICAP_ORIENTATION is set to TWOR_LANDSCAPE, then the Source must rotate the frame it downloads to the scanner to reflect the orientation of the paper. Please note that setting ICAP_ORIENTATION does not affect the values reported by ICAP_FRAMES; it just causes the Source to use them in a different way.

The upper-left of the image is defined as the location where both the primary and secondary scans originate. (The X axis is the primary scan direction and the Y axis is the secondary scan direction.) For a flatbed scanner, the light bar moves in the secondary scan direction. For a handheld scanner, the scanner is drug in the secondary scan direction. For a digital camera, the secondary direction is the vertical axis when the viewed image is considered upright.

Application

If one pivots the image about its center, then orienting the image in TWOR_LANDSCAPE has the effect of rotating the original image 90 degrees to the "left." TWOR_PORTRAIT mode does not rotate the image. The image may be oriented along any of the four axes located 90 degrees from the unrotated image. Note that:

TWOR_ROT0 == TWOR_PORTRAIT and TWOR_ROT270 == TWOR_LANDSCAPE.

Source

The Source is responsible for rotating the image if it allows this capacity to be set.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	TWOR_PORTRAIT	
Allowed Values:	TWOR_ROT0	0
	TWOR_ROT90	1
	TWOR_ROT180	2
	TWOR_ROT270	3
	TWOR_PORTRAIT	(equals TWOR_ROT0)
	TWOR_LANDSCAPE	(equals TWOR_ROT270)
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

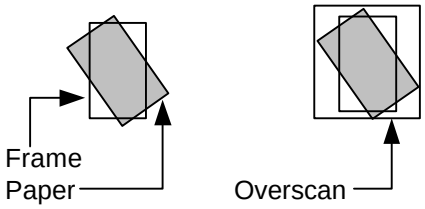
ICAP_ROTATION

ICAP_OVERSCAN

Description

Overscan is used to scan outside of the boundaries described by ICAP_FRAMES, and is used to help acquire image data that may be lost because of skewing.

Consider the following:



This is primarily of use for transport scanners which rely on edge detection to begin scanning. If overscan is supported, then the device is capable of scanning in the inter-document gap to get the skewed image information.

Application

Use this capability, if available, to help software processing images for deskew and border removal.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	TWOV_NONE	
Allowed Values:	TWOV_NONE	0
	TWOV_AUTO	1
	TWOV_TOPBOTTOM	2
	TWOV_LEFTRIGHT	3
	TWOV_ALL	4
Container for MSG_GET:	TW_ENUMERATION, TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION, TW_ONEVALUE	

Required By

None

Source Required Operations

None

ICAP_PATCHCODEDETECTIONENABLED

Description

Turns patch code detection on and off.

Source

Support this capability if the scanner supports any patch code recognition. If the device allows this feature to be turned off, then default to off. If the device does not support disabling this feature, report TRUE and disallow attempts to set FALSE.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_BOOL
Default Value:	No Default
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_SUPPORTEDPATCHCODETYPES
ICAP_PATCHCODEMAXSEARCHPRIORITIES
ICAP_PATCHCODESEARCHPRIORITIES
ICAP_PATCHCODESEARCHMODE
ICAP_PATCHCODEMAXRETRIES
ICAP_PATCHCODETIMEOUT

ICAP_PATCHCODEMAXRETRIES

Description

Restricts the number of times a search will be retried if none are found on each page.

Application

Refine this capability to limit the number of times the patch code search algorithm is retried on a page that contains no patch codes.

Source

If supported, limit the number of retries the value specified.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT32
Default Value:	No Default
Allowed Values:	1 to 2^{32} –1
Container for MSG_GET:	TW_ENUMERATION TW_RANGE TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_PATCHCODEDETECTIONENABLED
ICAP_SUPPORTEDPATCHCODETYPES
ICAP_PATCHCODEMAXSEARCHPRIORITIES
ICAP_PATCHCODESEARCHPRIORITIES
ICAP_PATCHCODESEARCHMODE
ICAP_PATCHCODETIMEOUT

ICAP_PATCHCODEMAXSEARCHPRIORITIES

Description

The maximum number of supported search priorities.

Application

Query this value to determine how many patch code detection priorities can be set.

Source

Set this value to limit the number of priorities to speed the detection process.

If patch code searches can be prioritized, report the maximum number of priorities allowed for a search.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT32
Default Value:	No Default
Allowed Values:	1 to 2^{32} –1
Container for MSG_GET:	TW_ENUMERATION TW_RANGE TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_PATCHCODEDETECTIONENABLED
ICAP_SUPPORTEDPATCHCODETYPES
ICAP_PATCHCODESEARCHPRIORITIES
ICAP_PATCHCODESEARCHMODE
ICAP_PATCHCODEMAXRETRIES
ICAP_PATCHCODETIMEOUT

ICAP_PATCHCODESEARCHMODE

Description

Restricts patch code searching to certain orientations, or prioritizes one orientation over the other.

Application

Negotiate this capability if the orientation of patch codes is already known to the application. Refinement of this capability can speed the patch code search.

Source

If set then apply the specified refinements to future patch code searches.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWBD_HORZ	0
	TWBD_VERT	1
	TWBD_HORZVERT	2
	TWBD_VERTHORZ	3
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

ICAP_PATCHCODEDETECTIONENABLED
ICAP_SUPPORTEDPATCHCODETYPES
ICAP_PATCHCODEMAXSEARCHPRIORITIES
ICAP_PATCHCODESEARCHPRIORITIES
ICAP_PATCHCODEMAXRETRIES
ICAP_PATCHCODETIMEOUT

ICAP_PATCHCODESEARCHPRIORITIES

Description

A prioritized list of patch code types dictating the order in which patch codes will be sought.

Application

Set this capability to specify the order and priority for patch code searching. Refining the priorities to only the patch code types of interest to the application can speed the search process.

Source

If this type of search refinement is supported, then report the current values.

If set, then limit future searches to the specified patch codes in the specified priority order.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16
Default Value:	No Default
Allowed Values:	TWPCH_PATCH1 TWPCH_PATCH2 TWPCH_PATCH3 TWPCH_PATCH4 TWPCH_PATCH6 TWPCH_PATCHT
Container for MSG_GET:	TW_ARRAY
Container for MSG_SET:	TW_ ARRAY

Required By

None

Source Required Operations

None

See Also

ICAP_PATCHCODEDETECTIONENABLED
ICAP_SUPPORTEDPATCHCODETYPES
ICAP_PATCHCODEMAXSEARCHPRIORITIES
ICAP_PATCHCODESEARCHMODE
ICAP_PATCHCODEMAXRETRIES
ICAP_PATCHCODETIMEOUT

ICAP_PATCHCODETIMEOUT

Description

Restricts the total time spent on searching for a patch code on each page.

Application

Refine this value to tune the length of time the search algorithm is allowed to execute before giving up.

Source

If supported, limit the duration of a patch code search to the value specified.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT32
Default Value:	No Default
Allowed Values:	1 to 2^{32} –1
Container for MSG_GET:	TW_ENUMERATION TW_RANGE TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_PATCHCODEDETECTIONENABLED
ICAP_SUPPORTEDPATCHCODETYPES
ICAP_PATCHCODEMAXSEARCHPRIORITIES
ICAP_PATCHCODESEARCHPRIORITIES
ICAP_PATCHCODESEARCHMODE
ICAP_PATCHCODEMAXRETRIES

ICAP_PHYSICALHEIGHT

Description

The maximum physical height (Y-axis) the Source can acquire (measured in units of ICAP_UNITS).

Source

For a flatbed scanner, the scannable height of the platen. For a handheld scanner, the maximum length of a scan.

For dimensionless devices, such as digital cameras, this ICAP is meaningless for all values of ICAP_UNITS other than TWUN_PIXELS. If the device is dimensionless, the Source should return a value of zero if ICAP_UNITS does not equal TWUN_PIXELS. This tells the application to inquire with TWUN_PIXELS.

Note: The physical acquired area may be different depending on the setting of CAP_FEEDERENABLED (if the Source has separate feeder and non-feeder acquire areas).

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	No Default
Allowed Values:	0 to 65535 in ICAP_UNITS
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

All Image Sources

Source Required Operations

MSG_GET / CURRENT / DEFAULT

See Also

CAP_FEEDERENABLED
ICAP_UNITS

ICAP_PHYSICALWIDTH

Description

The maximum physical width (X-axis) the Source can acquire (measured in units of ICAP_UNITS).

Source

For a flatbed scanner, the scannable width of the platen. For a handheld scanner, the maximum width of a scan.

For dimensionless devices, such as digital cameras, this ICAP is meaningless for all values of ICAP_UNITS other than TWUN_PIXELS. If the device is dimensionless, the Source should return a value of zero if ICAP_UNITS does not equal TWUN_PIXELS. This tells the application to inquire with TWUN_PIXELS. The Source should then reply with its X-axis pixel count.

Note: The physical acquired area may be different depending on the setting of CAP_FEEDERENABLED (if the Source has separate feeder and non-feeder acquire areas).

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	No Default
Allowed Values:	0 to 65535 in ICAP_UNITS
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

All Image Sources

Source Required Operations

MSG_GET/CURRENT/DEFAULT

See Also

CAP_FEEDERENABLED
ICAP_UNITS

ICAP_PIXELFLAVOR

Description

Sense of the pixel whose numeric value is zero (minimum data value). For example, consider a black and white image:

```
If ICAP_PIXELTYPE is TWPT_BW then
  If ICAP_PIXELFLAVOR is TWPF_CHOCOLATE
     then Black = 0
  Else if ICAP_PIXELFLAVOR is TWPF_VANILLA
     then White = 0
```

Application

Sources may prefer a different value depending on ICAP_PIXELTYPE. Set ICAP_PIXELTYPE and do a MSG_GETDEFAULT to determine the Source's preferences.

Source

TWPF_CHOCOLATE means this pixel represents the darkest data value that can be generated by the device (the darkest available optical value may measure greater than 0).

TWPF_VANILLA means this pixel represents the lightest data value that can be generated by the device (the lightest available optical value may measure greater than 0).

Values

Type:	TW_UINT16	
Default Value:	TWPF_CHOCOLATE	
Allowed Values:	TWPF_CHOCOLATE	0
	TWPF_VANILLA	1
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ONEVALUE	

Required By

All Image Sources

Source Required Operations

MSG_GET / CURRENT / DEFAULT,
MSG_SET / RESET

See Also

ICAP_PIXELTYPE

ICAP_PIXELFLAVORCODES

Description

Used only for CCITT data compression. Specifies whether the compressed codes' pixel "sense" will be inverted from the Current value of ICAP_PIXELFLAVOR prior to transfer.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	TWPF_CHOCOLATE	
Allowed Values:	TWPF_CHOCOLATE	0
	TWPF_VANILLA	1
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ONEVALUE	

Required By

None

Source Required Operations

None

See Also

ICAP_COMPRESSION

ICAP_PIXELTYPE

Description

The type of pixel data that a Source is capable of acquiring (for example, black and white, gray, RGB, etc.).

Application

- MSG_GET returns a list of all pixel types available from the Source.
- MSG_SET on a TW_ENUMERATION structure requests that the Source restrict the available pixel types to the enumerated list.
- MSG_SET on a TW_ONEVALUE container specifies the only pixel type the application can accept.

If the application plans to transfer data through any mechanism other than Native and cannot handle all possible ICAP_PIXELTYPEs, it **must** support negotiation of this ICAP.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWPT_BW	0
	TWPT_GRAY	1
	TWPT_RGB	2
	TWPT_PALETTE	3
	TWPT_CMY	4
	TWPT_CMYK	5
	TWPT_YUV	6
	TWPT_YUVK	7
	TWPT_CIEXYZ	8
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE	

Required By

All Image Sources

Source Required Operations

MSG_GET/CURRENT/DEFAULT,
MSG_SET/RESET

See Also

ICAP_BITDEPTH
ICAP_BITDEPTHREDUCTION

ICAP_PLANARCHUNKY

Description

Allows the application and Source to identify which color data formats are available. There are two options, “planar” and “chunky.”

For example, planar RGB data is transferred with the entire red plane of data first, followed by the entire green plane, followed by the entire blue plane (typical for three-pass scanners). “Chunky” mode repetitively interlaces a pixel from each plane until all the data is transferred (R-G-B-R-G-B…) (typical for one-pass scanners).

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWPC_CHUNKY	0
	TWPC_PLANAR	1
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE	

Required By

All Image Sources

Source Required Operations

MSG_GET / CURRENT / DEFAULT

See Also

TW_IMAGEINFO.Planar

ICAP_ROTATION

Description

How the Source can/should rotate the scanned image data prior to transfer. This doesn't use ICAP_UNITS. It is always measured in degrees. Any applied value is additive with any rotation specified in ICAP_ORIENTATION.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	0
Allowed Values:	+/- 360 degrees
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_ORIENTATION

ICAP_SHADOW

Description

Specifies which value in an image should be interpreted as the darkest “shadow.” All values “darker” than this value will be clipped to this value.

Application

Whether darker values are smaller or larger can be determined by examining the Current value of ICAP_PIXELFLAVOR.

Source

If more or less than 8 bits are used to describe the image, the actual data values should be normalized to fit within the 0-255 range. The normalization need not result in a homogeneous distribution if the original distribution was not homogeneous.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	0
Allowed Values:	0 to 255
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE

Required By

None

Source Required Operations

None

See Also

ICAP_PIXELFLAVOR

ICAP_SUPPORTEDBARCODETYPES

Description

Provides a list of bar code types that can be detected by the current Data Source.

Application

Query this capability to determine if the Data Source can detect bar codes that are appropriate to the particular application.

Source

If bar code detection is supported, report all the bar code types that can be detected.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16	
Default Value:	No Default	
Allowed Values:	TWBT_3OF9	0
	TWBT_2OF5INTERLEAVED	1
	TWBT_2OF5NONINTERLEAVED	2
	TWBT_CODE93	3
	TWBT_CODE128	4
	TWBT_UCC128	5
	TWBT_CODABAR	6
	TWBT_UPCA	7
	TWBT_UPCE	8
	TWBT_EAN8	9
	TWBT_EAN13	10
	TWBT_POSTNET	11
	TWBT_PDF417	12
	TWBT_2OF5INDUSTRIAL	13
	TWBT_2OF5MATRIX	14
	TWBT_2OF5DATALOGIC	15
	TWBT_2OF5IATA	16
	TWBT_3OF9FULLASCII	17
	TWBT_CODABARWITHSTARTSTOP	18
	TWBT_MAXICODE	19
Container for MSG_GET:	TW_ARRAY	
Container for MSG_SET:	MSG_SET not allowed	

Required By

None

Source Required Operations

None

See Also

ICAP_BARCODEDETECTIONENABLED
ICAP_SUPPORTEDPATCHCODETYPES
ICAP_BARCODEMAXSEARCHPRIORITIES
ICAP_BARCODESEARCHPRIORITIES
ICAP_BARCODESEARCHMODE
ICAP_BARCODEMAXRETRIES
ICAP_BARCODETIMEOUT

ICAP_SUPPORTEDPATCHCODETYPES

Description

A list of patch code types that may be detected by the current Data Source.

Application

Query this capability to determine if the Data Source can detect patch codes that are appropriate to the Application.

Source

If patch code detection is supported, report all the possible patch code types that might be detected.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL / DAT_CAPABILITY / MSG_QUERYSUPPORT)

Values

Type:	TW_UINT16
Default Value:	No Default
Allowed Values:	TWPCH_PATCH1 TWPCH_PATCH2 TWPCH_PATCH3 TWPCH_PATCH4 TWPCH_PATCH6 TWPCH_PATCHT
Container for MSG_GET:	TW_ARRAY TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

None

Source Required Operations

None

See Also

ICAP_PATCHCODEDETECTIONENABLED
ICAP_PATCHCODEMAXSEARCHPRIORITIES
ICAP_PATCHCODESEARCHPRIORITIES
ICAP_PATCHCODESEARCHMODE
ICAP_PATCHCODEMAXRETRIES
ICAP_PATCHCODETIMEOUT

ICAP_SUPPORTEDSIZES

Description

For devices that support fixed frame sizes. Defined sizes match typical page sizes. This specifies the size(s) the Source can/should use to acquire image data.

(*) Constant should not be used in Sources or Applications using TWAIN 1.8 or higher. For instance, use TWSS_A4 instead of TWSS_A4LETTER (note that the values are the same, the reason for the new constants is to improve naming clarification and consistency).

Note: TWSS_B has been removed from the specification.

Source

The frame size selected by using this capability should be reflected in the TW_IMAGELAYOUT structure information.

If the Source cannot acquire the exact frame size specified by the application, it should provide the closest possible size (preferably acquiring an image that is larger than the requested frame in both axes).

For devices that support physical dimensions TWSS_NONE indicates that the maximum image size supported by the device is to be used. Devices that do not support physical dimensions should not support this capability.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL /DAT_CAPABILITY/ MSG_QUERYSUPPORT)

Values

Type: TW_UINT16

Default Value: No Default

Allowed Values:

TWSS_NONE	0
*TWSS_A4LETTER	1
*TWSS_B5LETTER	2
TWSS_USLETTER	3
TWSS_USLEGAL	4
TWSS_A5	5
*TWSS_B4	6
*TWSS_B6	7
TWSS_USLEDGER	9
TWSS_USEXECUTIVE	10
TWSS_A3	11
*TWSS_B3	12
*TWSS_A6	13
TWSS_C4	14

TWSS_C5	15
TWSS_C6	16
// 1.8 Additions	
TWSS_4A0	17
TWSS_2A0	18
TWSS_A0	19
TWSS_A1	20
TWSS_A2	21
TWSS_A4	TWSS_A4LETTER
TWSS_A7	22
TWSS_A8	23
TWSS_A9	24
TWSS_A10	25
TWSS_ISOB0	26
TWSS_ISOB1	27
TWSS_ISOB2	28
TWSS_ISOB3	TWSS_B3
TWSS_ISOB4	TWSS_B4
TWSS_ISOB5	29
TWSS_ISOB6	TWSS_B6
TWSS_ISOB7	30
TWSS_ISOB8	31
TWSS_ISOB9	32
TWSS_ISOB10	33
TWSS_JISB0	34
TWSS_JISB1	35
TWSS_JISB2	36
TWSS_JISB3	37
TWSS_JISB4	38
TWSS_JISB5	TWSS_B5LETTER
TWSS_JISB6	39
TWSS_JISB7	40
TWSS_JISB8	41
TWSS_JISB9	42
TWSS_JISB10	43
TWSS_C0	44
TWSS_C1	45
TWSS_C2	46
TWSS_C3	47
TWSS_C7	48
TWSS_C8	49
TWSS_C9	50
TWSS_C10	51
TWSS_USSTATEMENT	52
TWSS_BUSINESSCARD	53

Container for MSG_GET: TW_ENUMERATION, TW_ONEVALUE

Container for MSG_SET: TW_ENUMERATION, TW_ONEVALUE

Required By

All Image Sources that support fixed frame sizes.

Source Required Operations

MSG_GET / CURRENT / DEFAULT, MSG_SET / RESET

See Also

ICAP_FRAMES
TW_IMAGEINFO
TW_IMAGELAYOUT

ICAP_THRESHOLD

Description

Specifies the dividing line between black and white. This is the value the Source will use to threshold, if needed, when ICAP_PIXELTYPE = TWPT_BW.

The value is normalized so there are no units of measure associated with this ICAP.

Application

Application will typically set ICAP_BITDEPTHREDUCTION to TWBR_THRESHOLD to use this capability.

Source

Source should fit available values linearly into the defined range such that the lowest available value equals 0 and the highest equals 255.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	128
Allowed Values:	0 to 255
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE

Required By

None

Source Required Operations

None

See Also

ICAP_BITDEPTHREDUCTION

ICAP_TILES

Description

This is used with buffered memory transfers. If TRUE, Source can provide application with tiled image data.

Application

If set to TRUE, the application expects the Source to supply tiled data for the upcoming transfer(s). This persists until the application sets it to FALSE. If the application sets it to FALSE, Source will supply strip data.

Source

If Source can supply tiled data and application does not set this ICAP, Source may or may not supply tiled data at its discretion.

In State 6, ICAP_TILES should reflect whether tiles or strips will be used in the upcoming transfer.

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_BOOL
Default Value:	No Default
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

TW_IMAGEMEMXFER

ICAP_TIMEFILL

Description

Used only with CCITT data compression. Specifies the minimum number of words of compressed codes (compressed data) to be transmitted per line.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16
Default Value:	1
Allowed Values:	1 to 2^{16}
Container for MSG_GET:	TW_ONEVALUE TW_RANGE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

ICAP_COMPRESSION

ICAP_UNDEFINEDIMAGESIZE

Description

If TRUE the Source will issue a MSG_XFERRDY before starting the scan.

Note: The Source may need to scan the image before initiating the transfer. This is the case if the scanned image is rotated or merged with another scanned image.

Application

Used by the application to notify the Source that the application accepts -1 as the image width or -length in the TW_IMAGEINFO structure.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_BOOL
Default Value:	FALSE
Allowed Values:	TRUE or FALSE
Container for MSG_GET:	TW_ONEVALUE
Container for MSG_SET:	TW_ONEVALUE

Required By

None

Source Required Operations

None

See Also

TW_IMAGEINFO

ICAP_UNITS

Description

Unless a quantity is dimensionless or uses a specified unit of measure, ICAP_UNITS determines the unit of measure for all quantities.

Application

Applications should be able to handle TWUN_PIXELS if they want to support data transfers from “dimensionless” devices such as digital cameras.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_UINT16	
Default Value:	TWUN_INCHES	
Allowed Values:	TWUN_INCHES	0
	TWUN_CENTIMETERS	1
	TWUN_PICAS	2
	TWUN_POINTS	3
	TWUN_TWIPS	4
	TWUN_PIXELS	5
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE	

Required By

All Image Sources

Source Required Operations

MSG_GET/CURRENT/DEFAULT,
MSG_SET/RESET

See Also

ICAP_FRAMES
DAT_IMAGELAYOUT

ICAP_XFERMECH

Description

Allows the application and Source to identify which transfer mechanisms they have in common.

Application

The current setting of ICAP_XFERMECH must match the constant used by the application to specify the transfer mechanism when starting the transfer using the triplet: DG_IMAGE / DAT_IMAGExxxxXFER / MSG_GET.

Values

Type:	TW_UINT16	
Default Value:	TWSX_NATIVE	
Allowed Values:	TWSX_NATIVE	0
	TWSX_FILE	1
	TWSX_MEMORY	2
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE	
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE	

Required By

All Image Sources

Source Required Operations

MSG_GET/CURRENT/DEFAULT,
MSG_SET/RESET

See Also

DG_IMAGE / DAT_IMAGExxxxXFER / MSG_GET

ICAP_XNATIVERESOLUTION

Description

The native optical resolution along the X-axis of the device being controlled by the Source. Most devices will respond with a single value (TW_ONEVALUE).

This is NOT a list of all resolutions that can be generated by the device. Rather, this is the resolution of the device's optics. Measured in units of pixels per unit as defined by ICAP_UNITS (pixels per TWUN_PIXELS yields dimensionless data).

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	No Default
Allowed Values:	>0
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

None

Source Required Operations

None

See Also

ICAP_UNITS
ICAP_XRESOLUTION
ICAP_YNATIVERESOLUTION

ICAP_XRESOLUTION

Description

All the X-axis resolutions the Source can provide.

Measured in units of pixels per unit as defined by ICAP_UNITS (pixels per TWUN_PIXELS yields dimensionless data). That is, when the units are TWUN_PIXELS, both ICAP_XRESOLUTION and ICAP_YRESOLUTION shall report 1 pixel/pixel. Some data sources like to report the actual number of pixels that the device reports, but that response is more appropriate in ICAP_PHYSICALHEIGHT and ICAP_PHYSICALWIDTH.

Application

Setting this value will restrict the various resolutions that will be available to the user during acquisition.

Applications will want to ensure that the values set for this ICAP match those set for ICAP_YRESOLUTION.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	No Default
Allowed Values:	>0
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE

Required By

All Image Sources

Source Required Operations

MSG_GET/CURRENT/DEFAULT,
MSG_SET/RESET

See Also

ICAP_UNITS
ICAP_XNATIVERESOLUTION
ICAP_YRESOLUTION

ICAP_XSCALING

Description

All the X-axis scaling values available. A value of '1.0' is equivalent to 100% scaling. Do not use values less than or equal to zero.

Application

Applications will want to ensure that the values set for this ICAP match those set for ICAP_YSCALING. There are no units inherent with this data as it is normalized to 1.0 being "unscaled."

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	1.0
Allowed Values:	> 0
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE

Required By

None

Source Required Operations

None

See Also

ICAP_YSCALING

ICAP_YNATIVERESOLUTION

Description

The native optical resolution along the Y-axis of the device being controlled by the Source.

Measured in units of pixels per unit as defined by ICAP_UNITS (pixels per TWUN_PIXELS yields dimensionless data).

Application

Most devices will respond with a single value (TW_ONEVALUE). This is NOT a list of all resolutions that can be generated by the device. Rather, this is the resolution of the device's optics

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	No Default
Allowed Values:	> 0
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE
Container for MSG_SET:	MSG_SET not allowed

Required By

None

Source Required Operations

None

See Also

ICAP_UNITS
ICAP_XNATIVERESOLUTION
ICAP_YRESOLUTION

ICAP_YRESOLUTION

Description

All the Y-axis resolutions the Source can provide.

Measured in units of pixels per unit as defined by ICAP_UNITS (pixels per TWUN_PIXELS yields dimensionless data). That is, when the units are TWUN_PIXELS, both ICAP_XRESOLUTION and ICAP_YRESOLUTION shall report 1 pixel/pixel. Some data sources like to report the actual number of pixels that the device reports, but that response is more appropriate in ICAP_PHYSICALHEIGHT and ICAP_PHYSICALWIDTH.

Application

Setting this value will restrict the various resolutions that will be available to the user during acquisition.

Applications will want to ensure that the values set for this ICAP match those set for ICAP_XRESOLUTION.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	No Default
Allowed Values:	> 0
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE

Required By

All Image Sources

Source Required Operations

MSG_GET/CURRENT/DEFAULT,
MSG_SET/RESET

See Also

ICAP_UNITS
ICAP_XRESOLUTION
ICAP_YNATIVERESOLUTION

ICAP_YSCALING

Description

All the Y-axis scaling values available. A value of '1.0' is equivalent to 100% scaling. Do not use values less than or equal to zero.

There are no units inherent with this data as it is normalized to 1.0 being "unscaled."

Application

Applications will want to ensure that the values set for this ICAP match those set for ICAP_XSCALING.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

Values

Type:	TW_FIX32
Default Value:	1.0
Allowed Values:	> 0
Container for MSG_GET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE
Container for MSG_SET:	TW_ENUMERATION TW_ONEVALUE TW_RANGE

Required By

None

Source Required Operations

None

See Also

ICAP_XSCALING

ICAP_ZOOMFACTOR

Description

When used with MSG_GET, return all camera supported lens zooming range.

Application

Use this capability with MSG_SET to select one of the lens zooming value that the Source supports.

Source

If not supported, return TWRC_FAILURE / TWCC_CAPUNSUPPORTED.

If Operation is not supported, return TWRC_FAILURE, TWCC_CAPBADOPERATION. (See DG_CONTROL /DAT_CAPABILITY/ MSG_QUERYSUPPORT)

Values

Type:	TW_INT16
Default Value:	0
Allowed Values:	Source dependent.
Container for MSG_GET:	TW_ENUMERATION, TW_ONEVALUE, TW_RANGE
Container for MSG_SET:	TW_ONEVALUE

Required By

None. Highly recommended for digital cameras that are equipped with zoom lenses.

Source Required Operations

MSG_GET, MSG_SET,
MSG_GETCURRENT,
MSG_RESET

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Return Codes and Condition Codes

Chapter Contents

An Overview of Return Codes and Condition Codes

The TWAIN protocol defines no dynamic messaging system through which the application might determine, in real-time, what is happening in either the Source Manager or a Source. Neither does the protocol implement the native messaging systems built into the operating environments that TWAIN is defined to operate under (Microsoft Windows and Macintosh). This decision was made due to issues regarding platform specificity and higher-than-desired implementation costs.

Instead, for each call the application makes to DSM_Entry( ), whether aimed at the Source Manager or a Source, the Source Manager returns an appropriate Return Code (TWRC_xxxx). The Return Code may have originated from the Source if that is where the original operation was destined.

To get more specific status information, the application can use the DG_CONTROL / DAT_STATUS / MSG_GET operation to inquire the complimentary Condition Code (TWCC_xxxx) from the Source Manager or Source (whichever one originated the Return Code).

The application should always check the Return Code. If the Return Code is TWRC_FAILURE, it should also check the Condition Code. This is especially important during capability negotiation.

There are very few, if any, catastrophic error conditions for the application to worry about. Usually, the application will only have to “recover” from low memory errors caused from allocations in the Source. Most error conditions are handled by the Source Manager or, most typically, by the Source (often involving interaction with the user). If the Source fails in a way that is unrecoverable, it will ask to have its user interface disabled by sending the MSG_CLOSEDSREQ to the application’s event loop.

Currently Defined Return Codes

The following are the currently defined return codes:

TWRC_CANCEL	Abort transfer or the Cancel button was pressed.
TWRC_CHECKSTATUS	Partially successful operation; request further information.
TWRC_DSEVENT	Event (or Windows message) belongs to this Source.
TWRC_ENDOFLIST	No more Sources found after MSG_GETNEXT.
TWRC_FAILURE	Operation failed - get the Condition Code for more information.
TWRC_NOTDSEVENT	Event (or Windows message) does not belong to this Source.
TWRC_SUCCESS	Operation was successful.
TWRC_XFERDONE	All data has been transferred.

Currently Defined Condition Codes

The following are the currently defined condition codes:

TWCC_BADCAP*	Capability not supported by Source or operation (get, set) is not supported on capability, or capability had dependencies on other capabilities and cannot be operated upon at this time (Obsolete, see TWCC_CAPUNSUPPORTED, TWCC_BAPBADOPERATION, and TWCC_CAPSEQERROR).
TWCC_BADDEST	Unknown destination in DSM_Entry.
TWCC_BADPROTOCOL	Unrecognized operation triplet.
TWCC_BADVALUE	Data parameter out of supported range.
TWCC_BUMMER	General failure. Unload Source immediately.
TWCC_CAPUNSUPPORTED*	Capability not supported by Source.
TWCC_CAPBADOPERATION*	Operation (i.e., Get or Set) not supported on capability.
TWCC_CAPSEQERROR*	Capability has dependencies on other capabilities and cannot be operated upon at this time.
TWCC_DENIED	File System operation is denied (file is protected).
TWCC_DOUBLEFEED	Transfer failed because of a feeder error
TWCC_FILEEXISTS	Operation failed because file already exists.
TWCC_FILENOTFOUND	File not found.
TWCC_LOWMEMORY	Not enough memory to complete operation.
TWCC_MAXCONNECTIONS	Source is connected to maximum supported number of applications.
TWCC_NODS	Source Manager unable to find the specified Source.
TWCC_NOTEMPTY	Operation failed because directory is not empty.
TWCC_OPERATIONERROR	Source or Source Manager reported an error to the user and handled the error; no application action required.
TWCC_PAPERJAM	Transfer failed because of a feeder error
TWCC_SEQERROR	Illegal operation for current Source Manager or Source state.
TWCC_SUCCESS	Operation worked.

* TWCC_BADCAP has been replaced with three new condition codes that more clearly specify the reason for a capability operation failure. For backwards compatibility applications should also accept TWCC_BADCAP and treat it as a general capability operation failure. No 1.6 Image Data Sources should return this condition code, but use the new ones instead.

Custom Return and Condition Codes

Although probably not necessary or desirable, it is possible to create custom Return Codes and Condition Codes. Refer to the TWAIN.H file for the value of TWRC_CUSTOMBASE for custom Return Codes and TWCC_CUSTOMBASE for custom Condition Codes. All custom values must be numerically greater than these base values. Remember that the consumer of these custom values will look in your TW_IDENTITY.ProductName field to clarify what the identifier's value means. There is no other protection against overlapping custom definitions.

A

TWAIN Articles

Contents

The articles in this appendix provide additional information about some of the features described in this specification.

Device Events

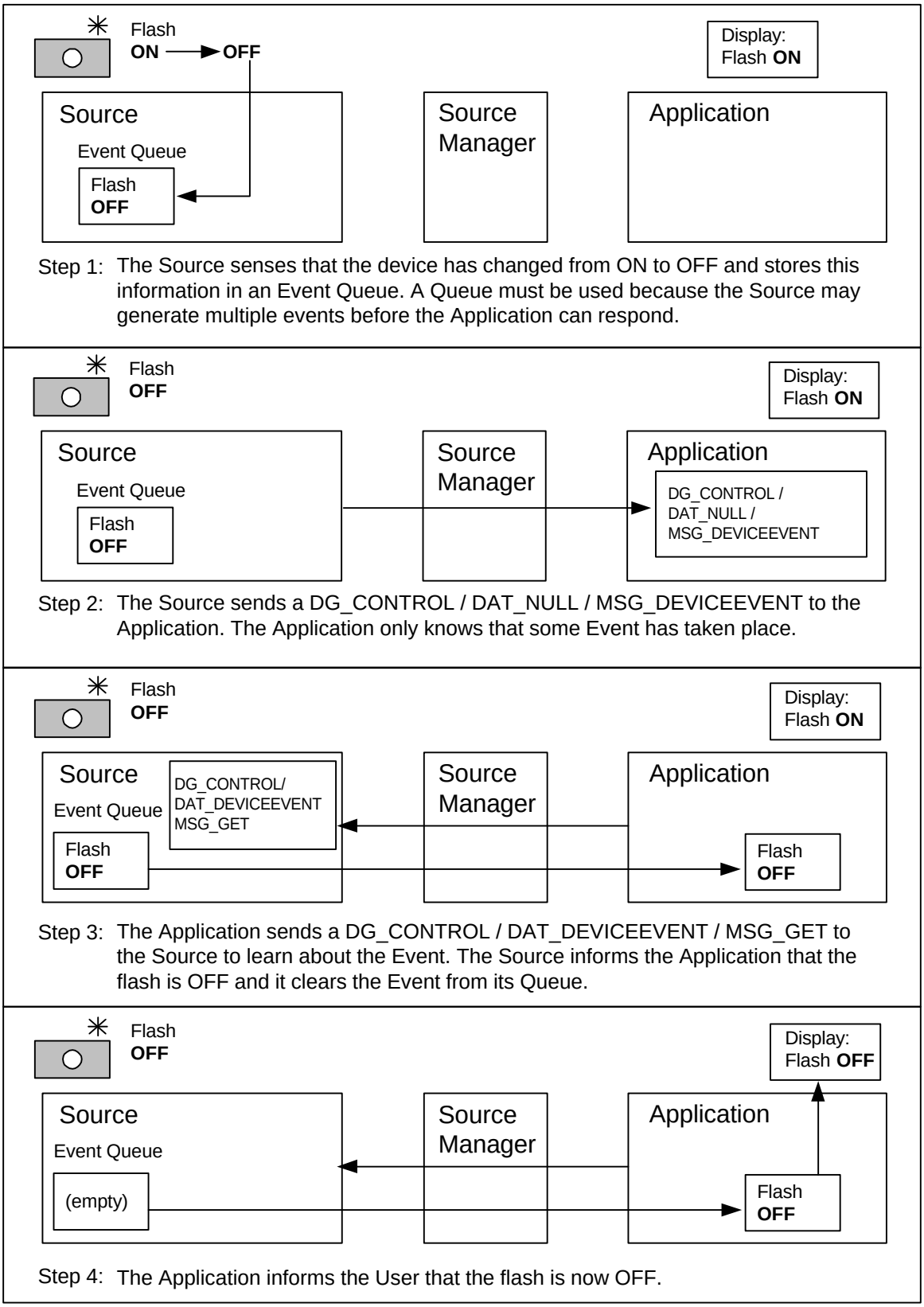
TWAIN 1.8 expands upon asynchronous event notification. Previous versions provided the DG_CONTROL / DAT_NULL messages: MSG_CLOSEDSOK, MSG_CLOSEDSREQ and MSG_XFERREADY to permit the Source to alert the Application that it needed to exit, or that an image was ready to be processed. With the addition of Digital Cameras, and the burgeoning interest in Push Technologies, it has become desirable to enhance TWAIN in this area.

An event begins when the Source needs to alert the Application to some change that has occurred within the device. For example, the owner of a Digital Camera (which is tethered to a host machine) has changed the setting for flash from on to off. The Source wants to alert the Application of this change: first, it records the event in a FIFO queue; second, it sends a DG_CONTROL / DAT_NULL / DAT_DEVICEEVENT to the Source Manager, which forwards the message to the Application.

The Application receives the DG_CONTROL / DAT_NULL / DAT_DEVICEEVENT, and immediately issues a DG_CONTROL / DAT_DEVICEEVENT / MSG_GET request to the Source. The Source delivers the information about the event, and pops it off the queue. The process concludes with the Application examining the information and acting upon it, in this case by alerting the user that the flash setting on the camera has been changed.

Notes:

- Sources must start up in a mode with device events turned off (an empty array for CAP_DEVICEEVENTS), this is for the benefit of pre-1.8 applications which may not be able to process this new event.
- Device events are never generated by an Application setting a value within a Source (such as Application changing ICAP_FLASHUSED2). Device events are only generated in response to some outside change within the Source or the Device (such as the User changing the flash setting on the camera).
- Sources must maintain an internal Event Queue, so that they can report each and every device event to the Application in the order of their occurrence.
- Device events are supported in State 4. Windows Sources must use the main window handle supplied with the DG_CONTROL / DAT_PARENT / MSG_OPENDS if they issue device events in State 4. In States 5 through 7 Sources must use the pTW_USERINTERFACE->hParent supplied in the DG_CONTROL / DAT_USERINTERFACE / MSG_ENABLEDS triplet.
- Since device events may occur in State 4, Applications that enable them using CAP_DEVICEEVENTS must be ready to receive and process them.
- When the Application receives a device event, it must immediately collect the information about it. The Application must not issue the DG_CONTROL / DAT_DEVICEEVENT / MSG_GET, except when it has received a DG_CONTROL / DAT_NULL / DAT_DEVICEEVENT message.
- The Application must process events without User intervention, this is to prevent situations where the device event queue builds up because a User is not responding to the system.
- Applications may sometimes fail to respond to a Source's device events. A maximum queue size should be selected so that the Source does not exhaust memory. If the queue fills, the Source must do the following:
  - ✓ Turns off device events (resets CAP_DEVICEEVENT to an empty array).
  - ✓ Refuse to set CAP_DEVICEEVENT until the queue is emptied, return TWCC_SEQERROR.
  - ✓ Process DG_CONTROL / DAT_DEVICEEVENT / MSG_GET requests for each item on the device event queue.
  - ✓ After the last device event is read by the Application, return TWRC_FAILURE / TWCC_DEVICEEVENTOVERFLOW for the next call to DG_CONTROL / DAT_DEVICEEVENT / MSG_GET.
  - ✓ After TWCC_DEVICEEVENTOVERFLOW has been reported, permit the Source to set CAP_DEVICEEVENT again.



Device Events

This section details the various event types and how Sources and Applications should make use of them.

TWDE_CHECKAUTOMATICCAPTURE

The automatic capture settings on the device have been changed.

TWDE_CHECKBATTERY

Status of the battery has changed. Sources will report BatteryMinutes or BatteryPercentage depending on which capabilities say they support.

TWDE_CHECKDEVICEONLINE

The device has been powered off. If an Application receives this device event, it should call CAP_DEVICEONLINE to verify the state of the Source, and then proceed as seems appropriate.

TWDE_CHECKFLASH

The flash setting on the device has been changed.

TWDE_CHECKPOWERSUPPLY

The power supply has changed, for example this event would be generated if AC was removed from a device, putting it on battery. Scanners may also provide this event to notify that a power on reset has taken place, indicating that the device has been power cycled.

TWDE_CHECKRESOLUTION

The resolution on the device has changed.

TWDE_DEVICEADDED

A device has been added to the Source. See DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY and DG_CONTROL / DAT_FILESYSTEM / MSG_GETINFO to get more information about the new device.

TWDE_DEVICEOFFLINE

A device has become unavailable. This is different from TWDC_DEVICEREMOVED, since the device is assumed to be connected.

TWDE_DEVICEREADY

A device is ready to capture another image. Applications should be careful when negotiating this event, especially in situations where images are gathered quickly, as with automatic capture.

TWDE_DEVICEREMOVED

A device has been removed from the Source. This is different from TWDE_DEVICEOFFLINE. As soon as this event is received an Application should re-negotiate its current device, since that may have been the one that was removed. Sources must default to the TWFY_CAMERA device if the current device is removed.

TWDE_PAPERDOUBLEFEED

Report double feeds to the Application. Because of the asynchronous nature of device events there may still be images waiting to be transferred, applications need to decide if they want to recover these images or discard them.

TWDE_PAPERJAM

Report paper jams to the Application. Because of the asynchronous nature of device events there may still be images waiting to be transferred, applications need to decide if they want to recover these images or discard them.

Supported Sizes

Typical uses for ICAP_SUPPORTEDSIZES include, but are not limited to the following:

A0, A1	technical drawings, posters
A2, A3	drawings, diagrams, large tables
A4	letters, magazines, forms, catalogs, laser printer and copying machine output
A5	note pads
A6	postcards
B5, A5, B6, A6	books
C4, C5, C6	envelopes for A4 letters: unfolded (C4), folded once (C5), folded twice (C6)
B4, A3	newspapers, supported by most copying machines in addition to A4

The following table details the physical dimensions associated with ICAP_SUPPORTEDSIZES. Multiply millimeters by 0.03937 to get the approximate inches. Multiply inches by 25.4 to get the approximate millimeters.

ICAP_SUPPORTEDSIZES	Description
TWSS_NONE	Images will match the maximum scanning dimensions of the device. This setting is only applicable to devices that have fixed measurable dimensions, such as most scanners. Devices that do not support physical dimensions should not support ICAP_SUPPORTEDSIZES.
TWSS_A4LETTER TWSS_B5LETTER TWSS_B3 TWSS_B4 TWSS_B6	These values are preserved for backward compatibility. TWAIN 1.8+ enabled Applications should not use these settings.
TWSS_B	This value is obsolete, and no longer supported by the specification. Do not use it.
TWSS_USLETTER	8.5” x 11.0” (216mm x 280mm)
TWSS_USLEGAL	8.5” x 14.0” (216mm x 356mm)
TWSS_USLEDGER	11.0” x 17.0” (280mm x 432mm)
TWSS_USEXECUTIVE	7.25” x 10.5” (184mm x 267mm)
TWSS_USSTATEMENT	5.5” x 8.5” (140mm x 216mm)

TWSS_BUSINESSCARD	90mm	x	55mm
TWSS_4A0	1682mm	x	2378mm
TWSS_2A0	1189mm	x	1682mm
TWSS_A0	841mm	x	1189mm
TWSS_A1	594mm	x	841mm
TWSS_A2	420mm	x	594mm
TWSS_A3	297mm	x	420mm
TWSS_A4	210mm	x	297mm
TWSS_A5	148mm	x	210mm
TWSS_A6	105mm	x	148mm
TWSS_A7	74mm	x	105mm
TWSS_A8	52mm	x	74mm
TWSS_A9	37mm	x	52mm
TWSS_A10	26mm	x	37mm
TWSS_ISOB0	1000mm	x	1414mm
TWSS_ISOB1	707mm	x	1000mm
TWSS_ISOB2	500mm	x	707mm
TWSS_ISOB3	353mm	x	500mm
TWSS_ISOB4	250mm	x	353mm
TWSS_ISOB5	176mm	x	250mm
TWSS_ISOB6	125mm	x	176mm
TWSS_ISOB7	88mm	x	125mm
TWSS_ISOB8	62mm	x	88mm
TWSS_ISOB9	44mm	x	62mm
TWSS_ISOB10	31mm	x	44mm
TWSS_JISB0	1030mm	x	1456mm
TWSS_JISB1	728mm	x	1030mm
TWSS_JISB2	515mm	x	728mm
TWSS_JISB3	364mm	x	515mm
TWSS_JISB4	257mm	x	364mm
TWSS_JISB5	182mm	x	257mm
TWSS_JISB6	128mm	x	182mm
TWSS_JISB7	91mm	x	128mm
TWSS_JISB8	64mm	x	91mm
TWSS_JISB9	45mm	x	64mm
TWSS_JISB10	32mm	x	45mm

TWSS_C0	917mm	x	1297mm
TWSS_C1	648mm	x	917mm
TWSS_C2	458mm	x	648mm
TWSS_C3	324mm	x	458mm
TWSS_C4	229mm	x	324mm
TWSS_C5	162mm	x	229mm
TWSS_C6	114mm	x	162mm
TWSS_C7	81mm	x	114mm
TWSS_C8	57mm	x	81mm
TWSS_C9	40mm	x	57mm
TWSS_C10	28mm	x	40mm

Automatic Capture

Automatic image capture is intended for Digital Cameras, although there may be opportunities for other kinds of devices. The intention is to allow an Application to control when pictures are taken, how many pictures are taken, and the interval of time between picture taking. All that is required is that the device be able to perform capture on command from the Source, the timing control and storage of pictures may reside in the Source or the device; the Application does not care.

There are three capabilities needed to control automatic capture:

- CAP_AUTOMATICCAPTURE
- CAP_TIMEBEFOREFIRSTCAPTURE
- CAP_TIMEBETWEENCAPTURES

And one triplet:

- DG_CONTROL / DAT_FILESYSTEM / MSG_AUTOMATICCAPTUREDIRECTORY

CAP_AUTOMATICCAPTURE selects the number of images to be captured. A value of zero (0), the default, disables it. CAP_TIMEBEFOREFIRSTCAPTURE selects how many milliseconds are to pass before the first picture is taken by the device. If this value is 0, then picture taking begins immediately. CAP_TIMEBETWEENCAPTURES selects the milliseconds of elapsed time between pictures. If this value is 0, then the pictures are taken as fast as the device can go.

DG_CONTROL / DAT_FILESYSTEM / MSG_AUTOMATICCAPTUREDIRECTORY selects the directory that will receive the images as they are captured.

Automatic capture expects the device (or Source) to manage the storage of images until the Application is ready to collect them. Applications may choose to retrieve images as they are captured by the Source (using the DAT_FILESYSTEM triplets to browse the storage directory), but must realize that this may affect the performance of the device.

The nature of automatic capture suggests that an Application should be able to disconnect from a Source and expect that if it returns after CAP_TIMEBEFOREFIRSTCAPTURE has passed, there may be images available for it to collect. Because of this Sources should remember their automatic capture settings from session to session, so that a Source starting up does not inadvertently clear them.

Applications need to remember that since the capture of images may occur outside of their control that the settings may be changed directly on the device by the user, resulting in alternations in any of the automatic capture settings. Applications that cannot support this uncertainty should clear the Source's automatic capture settings prior to shutdown (and after notifying the User).

Camera Preview

Some digital cameras offer a way to preview the intended shot through either a continuous flow of low-resolution frames or streaming video. TWAIN exposes two methods for a Source to present this information to an Application, both in association with the TWFY_CAMERAPREVIEW device.

The TWFY_CAMERAPREVIEW Device

Sources that wish to provide access to their preview camera must do so through DAT_FILESYSTEM. A minimum configuration includes a single TWFY_CAMERA and a single TWFY_CAMERAPREVIEW. The Application discovers what devices are available by using the DAT_FILESYSTEM commands MSG_GETFIRSTFILE and MSG_GETNEXTFILE. It can then switch from the startup default TWFY_CAMERA to the TWFY_CAMERAPREVIEW using the MSG_CHANGEDIRECTORY command.

Performance

It is important when taking a picture from preview mode that the switch from TWFY_CAMERAPREVIEW to TWFY_CAMERA happens as quickly as possible. Applications can minimize the switch over time by negotiating the settings of the TWFY_CAMERA before changing to the TWFY_CAMERAPREVIEW device to collect real-time images.

Sources can help by optimizing their communication with the TWFY_CAMERA, perhaps downloading its values when the user sends MSG_ENABLEDS to the TWFY_CAMERAPREVIEW device so that when the switch back occurs all that needs to happen is a command sent to the camera to take a picture.

Another matter of importance is the transfer mechanism. If the camera is capable of sending a run of continuous snapshots to the application (as opposed to real video streaming), then it is recommended that the TWFY_CAMERAPREVIEW device only support an ICAP_XFERMECH of TWSX_NATIVE.

Entering Preview Mode

An application should do the following before entering preview mode.

1. The application sends MSG_OPENDS to the Source.
2. The application determines that the Source TWFY_CAMERAPREVIEW device.
3. The user / application negotiates values for the TWFY_CAMERA device.
4. The user / application decides to enter preview mode. The application uses MSG_CHANGEDIRECTORY to change to the TWFY_CAMERAPREVIEW device.
5. The application uses MSG_ENABLEDS to enter preview mode. Note that the value of ShowUI should depend on which of the next two sections the application decides to use to control the Source (GUI mode or programmatic).

Previewing with the Source's GUI (ShowUI == TRUE)

If the application relies solely on the Source's GUI for its control of the camera, then it shouldn't have to worry about preview mode issues, since it is hoped that a Source that supports preview will provide access to it from its GUI. This section is concerned with a more limited area, where an application has opted to control the Source programmatically, except for the use of preview. One reason an application might need to do this is to provide preview support for cameras that output streaming video. TWAIN does not have a mechanism for handling this kind of data, so if the only way that a TWAIN application will be able to show this kind of preview data, is if the Source provides a GUI that can show it.

If the Source has CAP_CAMERAPREVIEWUI set to TRUE, then it is possible for the application to use this to preview the images coming from the camera. In this mode the application does not have to concern itself with the kind of data that the Source is providing, since the Source takes the responsibility of displaying the preview images to the user. However, the application does have to wait for the triggers that indicates that the user wishes to take a picture, or that they wish to exit from preview mode. To help standardize this behavior, the preview GUI should be able to indicate two things.

1. **Take a picture** – if the user selects to take a picture, perhaps by pressing a button labeled CAPTURE, then the Source should send the DAT_NULL command MSG_CLOSEDSOK back to the application.
2. **Cancel preview** – if the user decides to exit from preview mode, then the Source should send the DAT_NULL command MSG_CLOSEDSREQ back to the application. The application should then send MSG_DISABLEDS to the Source, change back to the TWFY_CAMERA device, and resume its programmatic control of the Source.

Previewing under Programmatic Control (ShowUI == FALSE):

TWAIN provides programmatic support for TWFY_CAMERAPREVIEW devices that operate by taking a continuous flow of low-resolution snapshots. An application learns that a Source is capable of this by changing to TWFY_CAMERAPREVIEW and testing ICAP_XFERMECH. If the capability is supported, then the TWFY_CAMERAPREVIEW device is capable of transferring these low-resolution images fast enough to simulate real-time video. The way the application obtains these images is similar to how scanners work. The application sets CAP_XFERCOUNT to –1 and enables the Source. The Source sends a MSG_XFERREADY to the application, and the application begins transferring and displaying the low-resolution images as fast as it can. These steps are repeated to aid understanding…

1. The application negotiates any capabilities with the TWFY_CAMERAPREVIEW device, including setting CAP_XFERCOUNT to –1, indicating that the application wishes to receive an unlimited number of images.
2. The application send MSG_ENABLEDS (ShowUI == FALSE) to the Source.
3. The Source sends back MSG_XFERREADY and transitions to State 6.
4. The application uses MSG_IMAGENATIVEXFER to transfer the image and the Source transitions to State 7.
5. The application displays the image.
6. The application uses DAT_PENDINGXFERS / MSG_ENDXFER to transition the Source to State 6. The application needs to pay attention to the TW_PENDINGXFERS.Count, but it is expected that it should remain at –1.
7. Go to step (4).

As long as the application and Source are looping from steps (4) through (7) the application should be displaying a continuous run of snapshots.

Since the application is in complete control, it is implementation dependent on how the user indicates that a picture should be taken. However, once the decision to take a picture is made, the steps to do it are as follows…

Taking a Picture:

The application should do the following when it is told to take a picture while in preview mode.

1. The application sends DAT_PENDINGXFERS / MSG_ENDXFER to the Source, transitioning from State 7 to State 6 (if necessary).
2. The application sends DAT_PENDINGXFERS / MSG_RESET to the Source, transitioning from State 6 to State 5.
3. The application sends MSG_DISABLEDS to the Source, transitioning from State 5 to State 4.
4. The application uses MSG_CHANGEDIRECTORY to switch from the TWFY_CAMERAPREVIEW device to the TWFY_CAMERA device.
5. The application uses MSG_ENABLEDS (ShowUI == FALSE) to enable the TWFY|_CAMERA device.
6. The application sends one of the MSG_IMAGExxxxXFER commands to the Source.
7. The source takes the full resolution picture and transfers it back to the application

File System

This section consists of the following:

- Overview
- Rules for path and file names
- File system components
- Rule for root directory
- Rules for image directory
- File Types
- DAT_FILESYSTEM operations
- Thumbnails and Sound snippets
- Context variable
- Condition Codes

Note: The term 'camera' is used generically in the specification to describe a device that captures an image, and is not limited to just devices that employ a camera to accomplish this.

Overview

Digital cameras and some scanners have the ability to capture images to their own local storage. When Automatic Capturing is being used an Application need not collect the captured images until long after their acquisition. A file system is a good representation for the storage of images (since it is a model that is familiar to most programmers), so TWAIN exposes a simple file system interface that Applications may browse through in a random fashion.

There is also a need in TWAIN to expose multiple devices through a single Source. Single pass duplex scanners have multiple cameras that accept different settings. Digital cameras come with disks and memory expansion cards, and many are able to provide a stream of preview images. The file system offers a way for a Source to maintain in its root directory a list of the devices available to an Application.

Rules for path and file names

There are two main grouping of files supported by TWAIN; devices, which are associated with real-time capture, which accept image capture settings, and which are of the form:

/DeviceName

And image path and file names, which are images on local storage which have been previously captured by the device, and which are of the form (bracketed items are optional):

[/DomainName] [/HostName] /TopDirectory [/Sub-Directory…] /ImageFile

1. A filename consists of any characters *except*: NUL (0), either of the slashes '/' or '\' and the colon ':'.
2. Sources should at a minimum support the characters: "A-Z a-z 0-9 _ ."
3. The file system should not be case sensitive, though it may show upper and lowercase.
4. Applications should take into consideration that internationalized Sources may construct filenames from characters within UNICODE.
5. The forward slash '/' and backward slash '\' may be used interchangeably in the creation of path names. Sources and Applications must support the use of both slashes. (ex: /abc\xyz).
6. Multiple adjacent slashes reduce to a single slash. (ex: ///\\abc///xyz == /abc/xyz).
7. The root directory is designated as a solitary slash (ex: / or \).
8. The MSG_CHANGEDIRECTORY and MSG_AUTOMATICCAPTUREDIRECTORY operations are the only ones that accepts absolute or relative directory paths. All other operations occur within the current directory.
9. MSG_CHANGEDIRECTORY and MSG_AUTOMATICCAPTUREDIRECTORY can use dot '.' to address the current directory (ex: ./abc).
10. MSG_CHANGEDIRECTORY and MSG_AUTOMATICCAPTUREDIRECTORY can use dot-dot '..' to address the parent directory (ex: ../abc).
11. In the root directory a MSG_CHANGEDIRECTORY or AUTOMATICCAPTUREDIRECTORY to dot-dot '..' is the same as dot '.' (ex: /. == /..).

Examples:

\Camera is the same as /Camera
//Camera is the same as /Camera
./Camera is the same as /Camera
../Camera is the same as /Camera

File System components

A file system consists of the following.

1. A root directory.
2. A camera device (TWFY_CAMERA), which must be the default device when the Source starts.
3. Zero or more additional devices (TWFY_CAMERATOP, TWFY_CAMERATOP, TWFY_CAMERAPREVIEW).
4. It is possible for a Source to support multiples of a given device type, for instance a scanner may support two devices of type TWFY_CAMERA, both with a supporting TWFY_CAMERATOP and TWFY_CAMERABOTTOM. Use pTW_FILESYSTEM->DeviceGroupMask to uniquely identify a camera or to group it with its associated top and bottom cameras. For example:

Name	Type	Group
/camera_1	TWFY_CAMERA	0x0001
/camera_1_top	TWFY_CAMERATOP	0x0001
/camera_1_bottom	TWFY_CAMERABOTTOM	0x0001
/camera_2	TWFY_CAMERA	0x0002
/camera_2_top	TWFY_CAMERATOP	0x0002
/camera_2_bottom	TWFY_CAMERABOTTOM	0x0002

5. Zero or more directories for storing images (on memory cards, disks, etc…). These are organized in a hierarchical structure that permits, but does not require the ability to browse in a network:

   A TWFY_DOMAIN directory contains only TWFY_HOST directories

   A TWFY_HOST directory contains only TWFY_DIRECTORY directories

   A TWFY_DIRECTORY contains TWFY_IMAGE files and/or TWFY_DIRECTORY directories.

   Sources that provide image storage must provide at least one TWFY_DIRECTORY. TWFY_DOMAIN and TWFY_HOST are optional.

Rules for root directory

1. The root directory can only contain devices or directories, not images.
2. The application cannot create, delete, copy into or rename files in the root directory.
3. Files in a directory are not ordered in any fashion (for instance, an Application may not assume that they are alphabetically sorted). There is one exception to this rule: when an Application issues a DG_CONTROL / DAT_FILESYSTEM / MSG_GETFIRSTFILE on the root directory, the Source must return a TWFY_CAMERA device. This device is the designated default capture camera. If an Application begins capability negotiation, or image capture *without* accessing DAT_FILESYSTEM, then this is the device that will be used.

Rules for image directory

1. A TWFY_DIRECTORY can contain 0 or more TWFY_DIRECTORYs (sub-directories).
2. Can contain 0 or more TWFY_IMAGE (image files).
3. May be fully accessible, read or write protected.
4. May be created or deleted by an Application, given that it is not in the root directory, and that it is not protected by the Source.

Context variable:

The reason for the Context variable is that it allows for unconditional mingling of DAT_FILESYSTEM operations. If there was no Context variable, then Applications would be more limited in the order of operations that could be performed. For instance, the recursive directory walk in the code sample would be much harder to accomplish without a Context to help the Source identify the current directory being accessed by a call to MSG_GETNEXTFILE.

This value is provided solely for the benefit of Source writers. When MSG_GETFIRSTFILE is called, the Source should record the current directory and the current file and store those values internally, using Context as a reference to their location. The nature or value of the Context is dependent on the implementation of the Source, Applications must never attempt to use or modify the Context. A call to MSG_GETINFO must use this Context to identify the file being reported. Calls to any of the file transfer methods (MSG_IMAGENATIVEXFER, MSG_IMAGEFILEXFER, MSG_IMAGEMEMXFER, MSG_AUDIONATIVEXFER, MSG_AUDIOFILEXFER) must use this Context to determine the data being sent to the Application. A call to MSG_GETNEXTFILE must use this Context to help obtain the next file from the directory (this will result in a change in the context as it references the new file). And, finally, a call to MSG_GETCLOSE releases the memory in the Source associated with this Context.

Condition Codes:

These are some condition codes that apply specifically to file system operations:

TWCC_DENIED	File system operation is denied. A Source should report this condition code if an attempt is made to access a protected file. Examples of such protection include: any attempt to delete, rename or copy into the root directory; protected files that are on the network; and any file that the Source feels it needs to protect.
TWCC_FILEEXISTS	The operation failed because the file already exists. A Source should report this condition code if an attempt is made to create a sub-directory with a name that already exists in the targeted directory; or if an attempt is made to copy or rename over an existing file or directory.
TWCC_FILENOTFOUND	The file was not found. This can occur for a variety of reasons: attempts to change directory to a path that does not exist; attempts to delete, rename or copy files that do not exist; as the condition code from MSG_GETFIRSTFILE for an empty directory; or MSG_GETNEXTFILE when it finds no more files in the current directory; and, finally, from MSG_GETINFO if it is requested to provide information on a file that has been deleted.
TWCC_NOTEMPTY	Operation failed because the directory is not empty. This condition code is used by the Source if an attempt is made with the Recursion flag set to FALSE to delete a non-empty directory.

File Types

The DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY operation is used to make either a device or a directory current. If a camera device is the target, then all capability negotiation is with that device and all images come from that device, until a new MSG_CHANGEDIRECTORY command is issued. If an image directory is selected then the current device is set to be the root level directory name (i.e., changing to /abc/mno/xyz means that the current device is /abc).

TWFY_CAMERA

Every TWAIN file system must support at least one camera, which must be the default device on startup. This is for compatibility with pre 1.8 applications as well as post 1.8 applications that do not choose to make use of the file system. On single pass duplex scanners, this camera device is used to simultaneously set values for the top and bottom cameras. During the capturing of images (in duplex mode) it sends a stream of images in the order: TOP, BOTTOM, TOP…

TWFY_CAMERATOP / TWFY_CAMERABOTTOM

Single pass duplex scanners may opt to provide independent access to the top and bottom cameras. A device with one of these file types controls the settings for the specified camera. If this device is the current device at the time image capture commences, then only images from that camera will be passed to the Application. This means that even if a device is set for duplex scanning, if the current device has a file type of TWFY_CAMERATOP, then only top images will be passed to the Application.

TWFY_CAMERAPREVIEW

A logical device that performs camera live preview functionality. When implementing the Source for this logical device, related capabilities must be negotiated to perform preview specific functions. Among them, ICAP_XRESOLUTION and ICAP_YRESOLUTION must be implemented to specify the preview image sizes. Other capabilities may be available in some sources, such as ICAP_ZOOMFACTOR and ICAP_FLASHUSED2.

TWFY_DIRECTORY — At the root directory level files of this type should correspond to a physical piece of hardware (a memory card or a disk). The root directory is only allowed to contain devices. Sub-directories may only contain image files or more sub-directories. Access to files and directories is controlled by the Source, so Applications should check all operations and watch out for condition codes such as TWCC_DENIED.

TWFY_IMAGE — Any directory, except root, may contain image files. The DAT_FILESYSTEM messages MSG_GETFIRSTFILE and MSG_GETNEXTFILE select the current image. Once an image has been selected, it may be transferred in the same fashion used to acquire images from a camera. Note: this file type is reserved for full resolution images, see the section on Thumbnails for information on how to acquire them.

DAT_FILESYSTEM Operations

MSG_AUTOMATICCAPTUREDIRECTORY

Selects the directory to be used to store images acquired by automatic capture.

MSG_CHANGEDIRECTORY

Selects the device or image subdirectory. Use this to select between direct camera (scanner) control, and browsing of stored images. All capabilities negotiated and triplet operations are with the current device (directory), until this value is changed by the Application.

MSG_COPY — Copies the specified file from one directory to another. If the Recursive flag is TRUE and the file type specified is TWFY_DIRECTORY then that directory and all the files and directories under it are copied. The Application cannot copy files into the root directory.

MSG_CREATEDIRECTORY

Creates a new image subdirectory. The Application cannot create files in the root directory.

MSG_DELETE — Deletes the specified file. If the Recursive flag is TRUE and the file type specified is TWFY_DIRECTORY, then all the files under that directory are deleted. The Application cannot delete files in the root directory.

MSG_FORMATMEDIA — Formats the currently selected storage device. Use with caution.

MSG_GETCLOSE	Closes the Context created by MSG_GETFIRSTFILE.
MSG_GETFIRSTFILE	Creates a Context that points to the first file in a directory. This Context is used by MSG_GETINFO, MSG_GETNEXTFILE, MSG_GETCLOSE; and for files of type TWFY_IMAGE all image transfer related operations performed in states 6 and 7 use the image pointed to by this Context (i.e., DAT_IMAGEINFO, DAT_IMAGEMEMXFER, etc…).
MSG_GETINFO	Returns information about a device, directory or image file.
MSG_GETNEXTFILE	Updates the Context to point to the next file in the directory.
MSG_RENAME	Renames a directory or an image file. If the directories differ, then it moves the file as well, creating it in the new location and deleting it from the old location. Files in the root directory cannot be renamed by the Application.

Thumbnails and Sound snippets

TWAIN is primary concerned with the acquisition of images, so the file system does not contain thumbnail files or sound files, since these kinds of data are expected to be associated with image files. This simplifies an Application's browsing of the file system, since it need only concern itself with one type of data file (TWFY_IMAGE), and does not have to trace associated data files.

Sources must filter out non-image files, if the device stores thumbnail and sound data independent of the image files. For instance, if a device stores the following files:

IMAGE001.TIF
IMAGE001_THUMBNAIL.TIF
IMAGE001_SOUND.WAV

The file system must only report the existence of IMAGE001.TIF

An Application obtains the thumbnail for an image by setting ICAP_THUMBNAILSENABLED to TRUE; the same filename is used for both the full resolution and thumbnail versions of an image. By setting ICAP_THUMBNAILSENABLED, the Application decides which version of the image it receives.

Sound snippets are also associated with image files, unlike thumbnails it is possible for a single image file to own several sound snippets. An Application can get the number of snippets that an image owns, and then, during image transfer, the Application has the option to transfer any number of those snippets. It is also possible to collect the snippets for an image without transferring the image data.

Sample Recursive Directory Walk

The following is a sample recursive directory walk.

```
// This Application function walks through all the files in a Source's
// file system, counting the file types file system, counting the file
// types it finds.  It is intended only as a sample, error checking is
// omitted to simplify the code.

typedef struct {
   int Devices;
   int Directories;
   int Images;

} t_Counters;

TW_UINT16 DirectoryWalk(TW_FILESYSTEM *fsArg, t_Counters *Counters)
{
   TW_UINT16 rc;  TW_FILESYSTEM fs;

   // Caller has set fsArg->InputFile to some value, such as "/"…
   rc = (*DS_Entry) (&app,&src,DG_CONTROL,DAT_FILESYSTEM,
      MSG_CHANGEDIRECTORY, fsArg);


   // We do GETFIRSTFILE first in each new directory, GETNEXTFILE for all
   // subsequent calls…
   for (rc = (*DS_Entry)(&app,&src,DG_CONTROL,DAT_FILESYSTEM,
      MSG_GETFIRSTFILE,&fs);
       rc == TWRC_SUCCESS;
      rc = (*DS_Entry)(&app,&src,DG_CONTROL,DAT_FILESYSTEM
         ,MSG_GETNEXTFILE,&fs)) {


         // Count the appropriate file type…
         switch (fs.FileType) {
             default:  Counters->Devices += 1;  break;
             case TWFY_IMAGE:  Counters->Images  += 1;  break;
             case TWFY_DOMAIN:
             case TWFY_HOST:
             case TWFY_DIRECTORY:
                  Counters->Directories += 1;
                 // Recursively step into this directory, looking for
more
                 // stuff…
                  rc = DirectoryWalk(&fs,&Counters);
                  if (rc != TWRC_SUCCESS) {
                     rc =
(*DS_Entry)(&app,&src,DG_CONTROL,DAT_FILESYSTEM,
                       MSG_GETCLOSE,&fs);
                     return(rc);
                  }
                  break;
         }
   }
```

```
   // Cleanup and return…
   rc =
(*DS_Entry)(&app,&src,DG_CONTROL,DAT_FILESYSTEM,MSG_GETCLOSE,&fs);
   return(TWRC_SUCCESS);
}

// Using this function…
TW_UINT16 rc;
TW_FILESYTEM fs;
t_Counters Counters;
memset(&fs,0,sizeof(fs));
memset(&Counters,0,sizeof(Counters));
strcpy(fs.InputFile,"/"); // start at root…
rc = DirectoryWalk(&fs,&Counters);
```

Internationalization

A TWAIN Source can easily be internationalized despite its 8-bit character interface. A well designed Source should automatically match the locale of the application calling it; passing localized data through the API, and displaying appropriate language text in its user interface. Developers have the option of using UNICODE or MultiByte encodings, the 8-bit interface is not an obstacle to Applications or Sources.

When an Application calls DG_CONTROL / DAT_IDENTITY / MSG_OPENDS, it provides to the Source its TW_IDENTITY data. Internationalized Sources should check the appIdentity->Version.Language field, and attempt to match the Application's language (returning the same value in the dsIdentity structure). If the Source is incapable of matching the language, then it should attempt to match the User's current locale (on Win32 do this using the LOCALE_USER_DEFAULT value returned by the GetLocaleInfo() call). In most cases the Application locale and the User locale will be the same, and the Source will have to select the best language it can. For instance, if the Application requested Swiss French, and the Source only has French, then it should offer that. Otherwise, it should resort to some common secondary language, such as English.

Please note that DG_CONTROL / DAT_IDENTITY / MSG_OPENDS is the very first opportunity that an Application and Source have to negotiate language. DG_CONTROL / DAT_IDENTITY / MSG_GET, when invoked in state 3, does not provide an appIdentity. Sources should default to the LOCALE_USER_DEFAULT in this instance.

As mentioned above, the TWAIN interface assumes 8-bit characters, this prevents the direct passing of UNICODE data between Sources and Applications, but it does not hinder indirect means that convert data into MultiByte encodings. The remainder of this section shows one way of allowing Sources and Applications to communicate, without worrying about whether they are UNICODE or MultiByte enabled. The best example to illustrate this is to consider a Source and Application, both UNICODE enabled, communicating through the TWAIN interface.

To pass UNICODE string data from the Source to the Application, the Source must convert UNICODE to MultiByte, using the appropriate Code-Page (which is specific to a given set of locales). When the Application receives the data, it converts from MultiByte back to UNICODE. The process is the same when sending string data from the Application to the Source. The process depends on the Application and Source using the same Code-Page for their conversion. The Win32 functions required to perform the conversions are WideCharToMultiByte and MultiByteToWideChar. The only limitation to watch out for is the size of the various strings provided by TWAIN. At all times the MultiByte data must fit within the strings described by the interface, and Source and Application writers need to pay close attention to it.

```
int WideCharToMultiByte(
UINT CodePage,              // code page
DWORD dwFlags,              // performance and mapping flags
LPCWSTR lpWideCharStr,      // address of wide-character string
int cchWideChar,            // number of characters in string
LPSTR lpMultiByteStr,       // address of buffer for new string
int cchMultiByte,           // size of buffer
LPCSTR lpDefaultChar,       // address of default for unmappable characters
LPBOOL lpUsedDefaultChar    // address of flag set when default char. used
);
```

```
int MultiByteToWideChar(
UINT CodePage,              // code page
DWORD dwFlags,              // character-type options
LPCSTR lpMultiByteStr,      // address of string to map
int cchMultiByte,           // number of characters in string
LPWSTR lpWideCharStr,       // address of wide-character buffer
int cchWideChar             // size of buffer
);
```

These functions are fully described in the online Microsoft Visual C++ documentation. This section does not attempt to duplicate that information, but does show how Source and Application may cooperate when using them to transmit localized data through the TWAIN interface.

TWAIN CAP_LANGUAGE Code to ANSI Code-Page Table

```
// This array maps TWAIN CAP_LANGUAGE codes to the appropriate ANSI Code-
// Page.  There is no mechanism for converting to the OEM Code-Page, nor
// should one be needed, since the upper 128 bytes in the OEM pages
mostly
// contain line art characters used by MS-DOS.
// Note:  the index in the comment field is just an index into the array,
// it does not correspond to the TWAIN constant for a given TWLG field…
//

#define AnsiCodePageElements 88
int AnsiCodePage[AnsiCodePageElements] = {
   1252,       //   0     TWLG_DANISH             (TWLG_DAN)
   1252,       //   1     TWLG_DUTCH            (TWLG_DUT)
   1252,       //   2     TWLG_ENGLISH          (TWLG_ENG)
   1252,       //   3     TWLG_FRENCH_CANADIAN (TWLG_FCF)
   1252,       //   4     TWLG_FINNISH          (TWLG_FIN)
   1252,       //   5     TWLG_FRENCH           (TWLG_FRN)
   1252,       //   6     TWLG_GERMAN           (TWLG_GER)
   1252,       //   7     TWLG_ICELANDIC        (TWLG_ICE)
   1252,       //   8     TWLG_ITALIAN          (TWLG_ITN)
   1252,       //   9     TWLG_NORWEGIAN        (TWLG_NOR)
   1250,       //  10     TWLG_PORTUGUESE       (TWLG_POR)
   1252,       //  11     TWLG_SPANISH          (TWLG_SPA)
   1252,       //  12     TWLG_SWEDISH          (TWLG_SWE)
   1252,       //  13     TWLG_ENGLISH_USA      (TWLG_USA)
   1252,       //  14     TWLG_AFRIKAANS
   1250,       //  15     TWLG_ALBANIA
   1256,       //  16     TWLG_ARABIC
   1256,       //  17     TWLG_ARABIC_ALGERIA
   1256,       //  18     TWLG_ARABIC_BAHRAIN
   1256,       //  19     TWLG_ARABIC_EGYPT
   1256,       //  20     TWLG_ARABIC_IRAQ
   1256,       //  21     TWLG_ARABIC_JORDAN
   1256,       //  22     TWLG_ARABIC_KUWAIT
   1256,       //  23     TWLG_ARABIC_LEBANON
   1256,       //  24     TWLG_ARABIC_LIBYA
   1256,       //  25     TWLG_ARABIC_MOROCCO
   1256,       //  26     TWLG_ARABIC_OMAN
   1256,       //  27     TWLG_ARABIC_QATAR
   1256,       //  28     TWLG_ARABIC_SAUDIARABIA
   1256,       //  29     TWLG_ARABIC_SYRIA
   1256,       //  30     TWLG_ARABIC_TUNISIA
   1256,       //  31     TWLG_ARABIC_UAE   /* United Arabic Emirates */
   1256,       //  32     TWLG_ARABIC_YEMEN
   1252,       //  33     TWLG_BASQUE
   1251,       //  34     TWLG_BYELORUSSIAN
   1251,       //  35     TWLG_BULGARIAN
   1252,       //  36     TWLG_CATALAN
    936,       //  37     TWLG_CHINESE
    950,       //  38     TWLG_CHINESE_HONGKONG
    936,       //  39     TWLG_CHINESE_PRC /* People's Republic of China
*/
    936,       //  40     TWLG_CHINESE_SINGAPORE
    936,       //  41     TWLG_CHINESE_SIMPLIFIED
    950,       //  42     TWLG_CHINESE_TAIWAN
```

```
 950,       //  43     TWLG_CHINESE_TRADITIONAL
1250,       //  44     TWLG_CROATIA
1250,       //  45     TWLG_CZECH
1252,       //  46     TWLG_DUTCH_BELGIAN
1252,       //  47     TWLG_ENGLISH_AUSTRALIAN
1252,       //  48     TWLG_ENGLISH_CANADIAN
1252,       //  49     TWLG_ENGLISH_IRELAND
1252,       //  50     TWLG_ENGLISH_NEWZEALAND
1252,       //  51     TWLG_ENGLISH_SOUTHAFRICA
1252,       //  52     TWLG_ENGLISH_UK
1257,       //  53     TWLG_ESTONIAN
1250,       //  54     TWLG_FAEROESE
1256,       //  55     TWLG_FARSI
1252,       //  56     TWLG_FRENCH_BELGIAN
1252,       //  57     TWLG_FRENCH_LUXEMBOURG
1252,       //  58     TWLG_FRENCH_SWISS
1252,       //  59     TWLG_GERMAN_AUSTRIAN
1252,       //  60     TWLG_GERMAN_LUXEMBOURG
1252,       //  61     TWLG_GERMAN_LIECHTENSTEIN
1252,       //  62     TWLG_GERMAN_SWISS
1253,       //  63     TWLG_GREEK
1255,       //  64     TWLG_HEBREW
1250,       //  65     TWLG_HUNGARIAN
1252,       //  66     TWLG_INDONESIAN
1252,       //  67     TWLG_ITALIAN_SWISS
 932,       //  68     TWLG_JAPANESE
 949,       //  69     TWLG_KOREAN
1361,       //  70     TWLG_KOREAN_JOHAB
1257,       //  71     TWLG_LATVIAN
1257,       //  72     TWLG_LITHUANIAN
1252,       //  73     TWLG_NORWEGIAN_BOKMAL
1252,       //  74     TWLG_NORWEGIAN_NYNORSK
1250,       //  75     TWLG_POLISH
1252,       //  76     TWLG_PORTUGUESE_BRAZIL
1250,       //  77     TWLG_ROMANIAN
1251,       //  78     TWLG_RUSSIAN
1250,       //  79     TWLG_SERBIAN_LATIN
1250,       //  80     TWLG_SLOVAK
1250,       //  81     TWLG_SLOVENIAN
1252,       //  82     TWLG_SPANISH_MEXICAN
1252,       //  83     TWLG_SPANISH_MODERN
 874,       //  84     TWLG_THAI
1254,       //  85     TWLG_TURKISH
1251,       //  86     TWLG_UKRANIAN
};
```

Sample Converting from WideChar to MultiByte

The following is a sample of converting from WideChar to MultiByte.

```
// This function converts _TCHAR* strings to MultiByte, using the
// appropriate code page.  If the build is ANSI or MBCS, then no
// conversion is needed, the _tcsncpy() function is used.
// If the build is UNICODE, then the Code-Page is determined, and used to
// convert the string to MultiByte using the WideCharToMultiByte()
// function…
//

int CopyTCharToMultibyte
    (char *dst,
    const int sizeof_dst,
    const _TCHAR *src,
    const int twain_language_code)
{

#ifndef _UNICODE
    // MultiByte string copy…
    _tcsncpy(dst,src,sizeof_dst);
    dst[sizeof_dst-1] = 0;
    return(strlen(dst));

#else
    int cp;
    int len;
    _TCHAR cp_str[16];
    if (twain_language_code >= AnsiCodePageElements) {
          // Whoops, don't have one of those…
          return(-1);
    } else if (twain_language_code >= 0) {
          // Lookup the code page…
          cp = AnsiCodePage[twain_language_code];
    } else {
          // Get the User's code page…
          GetLocaleInfo
             (LOCALE_USER_DEFAULT,
             LOCALE_IDEFAULTANSICODEPAGE,
             cp_str,
             sizeof(cp_str));
          cp = _ttoi(cp_str);
    }
    if (IsValidCodePage(cp) == 0) {
          // That code page isn't installed on this system…
          return(-1);
    }
```

```
    len = WideCharToMultiByte(
      cp,          // code page
      0,           // performance and mapping flags
      src,         // address of wide-character string
      -1,          // number of characters in string
      dst,         // address of buffer for new string
      sizeof_dst,  // size of buffer (in characters)
      NULL,        // address of default for unmappable characters
      NULL         // address of flag set when default char. used
    );

#endif
}
```

Sample Converting from MultiByte to WideChar

The following is a sample of converting from MuliByte to WideChar.

```
// This function converts multibyte strings to _TCHAR* strings, using
// the appropriate code page.
// If the build is ANSI or MBCS, then no conversion is needed, the
// _tcsncpy() function is used.  If the build is UNICODE, then the
// Code-Page is determined, and used to convert the string to
// _TCHAR* using the MultiByteToWideChar() function…
//
int CopyMultibyteToTChar
    (_TCHAR *dst,
    const int sizeof_dst,
    const char *src,
    const int twain_language_code)
{
#ifndef _UNICODE
    // MultiByte string copy…
    _tcsncpy(dst,src,sizeof_dst);
    dst[sizeof_dst-1] = 0;
    return(strlen(dst));
#else
    int cp;
    int len;
    _TCHAR cp_str[16];
    if (twain_language_code >= AnsiCodePageElements) {
          // Whoops, don't have one of those…
          return(-1);
    } else if (twain_language_code >= 0) {
          // Lookup the code page…
          cp = AnsiCodePage[twain_language_code];
    } else {
          // Get the User's code page…
          GetLocaleInfo
            (LOCALE_USER_DEFAULT,
            LOCALE_IDEFAULTANSICODEPAGE,
            cp_str,
            sizeof(cp_str));
          cp = _ttoi(cp_str);
    }
    if (IsValidCodePage(cp) == 0) {
```

```
            // That code page isn't installed on this system…
            return(-1);
        }
        len = MultiByteToWideChar(
          cp,                       // code page
          0,                        // performance and mapping flags
          src,                      // address of wide-character string
          -1,                       // number of characters in string
          dst,                      // address of buffer for new string
          sizeof_dst/sizeof(_TCHAR)     // size of buffer (in characters)
        );
        return(len);
    #endif
    }
```

Sample Use of the Conversion Functions

The following are examples of UNICODE application and UNICODE source.

UNICODE Application

```
int             sts;
int             twain_language_code;
_TCHAR          Author[128];
pTW_ONEVALUE    pvalOneValue;
. . .
// the Application has queried the Source as to what languages it
supports
//and selected TWLG_JAPANESE, storing it in twain_language_code…
. . .
// CAP_AUTHOR is queried, and a value is received…
. . .
// Convert CAP_AUTHOR string to UNICODE…
sts = CopyMultiByteToTChar
         (Author,
         sizeof(Author),
         (char*)&pvalOneValue->Item,
         twain_language_code)
if (sts < 0) {
        // Error…
. . .
}
```

UNICODE Source

```
. . .
int             sts;
int             source_language_code;
_TCHAR          SourceAuthor[128];
pTW_ONEVALUE    pvalOneValue;
. . .
// the Source has been told to use TWLG_JAPANESE, it stores this value
// in source_language_code …
. . .
// CAP_AUTHOR is queried by the Application…
// The Source keeps the value in SourceAuthor…
. . .
// Convert CAP_AUTHOR string to multibyte…
         sts = CopyTCharToMultibyte
         ((char*)&pvalOneValue->Item,
         sizeof(TW_STR128),
         SourceAuthor,
         source_language_code)
if (sts < 0) {
         // Error…
         . . .
}
. . .
// The Source returns the value to the Application…
```

Audio Snippets

Digital Cameras have the ability to acquire audio snippets along with an image. To support this TWAIN 1.8 provides a new data group, DG_AUDIO. Because TWAIN is image-centric, DG_AUDIO operations are dependent on an image context, audio snippets must be associated with an image. When a Source enters into state 6, the Application can opt to transfer any and all audio snippets. The steps required to obtain audio snippets deliberately parallel the steps required to transfer images, to reduce the effort to learn how to access this new kind of data.

The following Data Argument Types (DATs) are supported by DG_AUDIO:

DAT_AUDIOFILEXFER	transfer audio in file format
DAT_AUDIOINFO	info about an audio snippet
DAT_AUDIONATIVEXFER	transfer audio in native format

The following DG_CONTROL (DATs) are supported when DAT_XFERGROUP is set to DG_AUDIO, DATs not mentioned in this list must return TWRC_FAILURE / TWCC_BADPROTOCOL:

DAT_CAPABILITY	no changes to its operation
DAT_EVENT	no changes to its operation
DAT_IDENTITY	no changes to its operation
DAT_NULL	no changes to its operation
DAT_PASSTHRU	no changes to its operation
DAT_PENDINGXFERS	reports number of snippets remaining to be transferred, MSG_ENDXFER and MSG_RESET do not cause the Source to drop to State 5.
DAT_SETUPFILEXFER	selects the audio file format
DAT_STATUS	no changes to its operation
DAT_USERINTERFACE	no changes to its operation
DAT_XFERGROUP	MSG_SET, MSG_GETDEFAULT and MSG_GETCURRENT added to allow switching between data groups. The default value for MSG_GETDEFAULT must be DG_IMAGE. And when the Source starts up, MSG_GETCURRENT must report DG_IMAGE as the current data group, to maintain compatibility with pre-TWAIN 1.8 Applications.

The following capabilities support audio; all capabilities are negotiable at all times (at least in state 4), independent of the current setting of DAT_XFERGROUP:

ACAP_AUDIOFILEFORMAT	negotiate available audio file formats
ACAP_XFERMECH	negotiate audio snippet transfer mechanism

Collecting Audio Snippets

The transfer of an audio snippet was designed to be used when an Application is browsing through a selection of stored images. There is nothing to prevent the transfer of audio when an image is captured in real-time, though TWAIN does require that any audio snippets be transferred before the image is transferred.

A typical transfer may occur in the following way: An Application is browsing through storage managed by the TWAIN Source using MSG_GETFILEFIRST / MSG_GETFILENEXT (see DAT_FILESYSTEM), and finds an image that it wants to work with. The Application enters state 6 by calling DG_CONTROL / DAT_IDENTITY / MSG_ENABLEDS. If the Application wants to find out if there are any audio snippets associated with the image, it can call DG_AUDIO / DAT_AUDIOINFO / MSG_GET. In this example it finds in the TW_AUDIOINFO structure that this image file has three audio snippets associated with it. The Application wants the second audio snippet, so it calls DG_CONTROL / DAT_XFERGROUP / MSG_SET and sets the data group to DG_AUDIO. This call changes the context of the Source, it is now set up to transfer audio data. One effect of this is that a call to DG__CONTROL / DAT_PENDINGXFERS / MSG_GET will report the number of audio snippets (for this image) that remain to be transferred. Because the Application wants the second audio snippet, it must discard the first one, and does this by making a call to DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER. The snippet that it wants is now available to be transferred, and it does this with a call to DG_AUDIO /

DAT_AUDIONATIVEXFER / MSG_GET. The Source moves up into state 7. The Application ends the transfer with a call to DG_CONTROL / DAT_PENDINGXFERS / MSG_ENDXFER.

Because the Application only wanted the second audio snippet, it can return to DG_IMAGE by making a call to DG_CONTROL / DAT_XFERGROUP / MSG_SET. Once this is done, all other commands work in a traditional TWAIN fashion. The Application can opt to transfer or discard the image, even though it did not transfer all of the audio snippets.

There is one more thing to note, if the Application had read the third audio snippet, or if it had issued the DG_CONTROL / DAT_PENDINGXFERS / MSG_RESET command while in DG_AUDIO, the state of the Source would remain at state 6. TWAIN works this way because it is image-centric, the only way to transition from state 6 to state 5 is when it is determined that there are no more images to transfer.

Notes

1. TWAIN 1.8 supports native and file transfers of audio snippets. Buffered mode transfers are not supported, because TWAIN does not have the necessary infrastructure to describe audio data, and it was decided that adding that structure in this release would be overly complex, and probably incomplete.
2. As a general rule, even though many operations are possible with DAT_XFERGROUP set to DG_AUDIO, Applications are encouraged to only change to DG_AUDIO for the length of time it takes to collect an audio snippet, and to stay in DG_IMAGE mode at all other times.
3. Though TWAIN is image-centric, it is possible to envision a TWAIN Source that is only capable of supporting DG_AUDIO. The TWAIN Working Group feels that any such notion is a bad idea, and encourages anyone thinking of doing this to pick on some other API.

How to use the Preview Device

Application switch to the preview logical device

1. The application first tries to switch to the preview logical device using the DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY triplet with TWFY_CAMERAPREVIEW set in InputName field of TW_FILENAME structure. If the returned value is TW_SUCCESS, the application can proceed.
2. After the application successfully switches to the preview device, all subsequent capability negotiation is with the preview device.
3. The application queries the Source with capability CAP_CAMERAPREVIEWUI. If it returns SUCCESS, then the Source is able to assume the responsibility of displaying preview images. The application can choose to use the Source's UI or not when it issues the MSG_ENABLEDS. If the application uses the Source's UI, it will do nothing but wait to issue MSG_DISABLEDS, or wait for a MSG_CLOSEDSREQ from the Source to stop the preview mode. If the application does not use the Source's UI or the Source does not provide a UI, then the application should follow the following steps.

Setting up environments for Preview Mode

4. The application starts negotiation on the Preview size using the ICAP_XRESOLUTION and ICAP_YRESOLUTION capabilities with MSG_GET first. With the returned supported sizes from the Source, the application can set the selected preview sizes using the ICAP_XRESOLUTION and ICAP_YRESOLUTION capabilities with MSG_SET. These two capabilities should be linked through ICAP_XYRESOLUTIONLINKED.
5. Optionally, the application can negotiate the zoom lens value, camera flash state during previewing, etc, with available capabilities such as ICAP_ZOOMFACTOR, ICAP_FLASHUSED2. If application queries for capabilities that are not related to preview device, Source will return TWRC_FAILURE.

Start getting and displaying Preview Thumbnails

6. The application can use the automatic capture feature with CAP_XFERCOUNT to -1 (Application is willing to transfer multiple images).
7. Application issues MSG_ENABLEDS to move to state 5. Upon receiving this message, the Source should start capturing images[1].
8. Source issues MSG_XFERREADY, indicating that an image is present, and state moves to 6.

[1] The Source takes a picture as soon as it receives MSG_ENABLEDS and each time it receives MSG_ENDXFER

LOOP:

9. Application issues DAT_IMAGENATIVEXFER to get image and goes to state 7.
10. Application issues MSG_ENDXFER to return to state 6, and it displays the image. Then if it wants the next preview image, examines pTW_PENDINGXFERS->Count to verify that there is another image, and it goes to LOOP. Source, upon receiving the MSG_ENDXFER message, takes the next picture and returns -1 in the pTW_PENDINGXFERS->Count.

END LOOP

11. If the application wants to end preview mode, it issues DAT_PENDINGXFERS / MSG_RESET. This forces the Source to go to state 5 (CAP_XFERCOUNT is set to 0). If the Source is unable to deliver preview images, it sets pTW_PENDINGXFERS->Count to 0 in reply to the application's MSG_ENDXFER command, and returns to state 5.
12. The application can then issue MSG_DISABLEDS, which returns it to state 4, and now the application can use DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY to change directory to the camera device to take a full resolution picture.

How to take a snapshot from preview scene

1. The application could provide a button or menu item for the user to take a snapshot from the preview scene, for example, a "Take Picture" button. In response to this, the application should use the triplet DG_CONTROL / DAT_FILESYSTEM / MSG_CHANGEDIRECTORY with TWFS_CAMERA set in the TW_FILENAME structure to stop the preview mode.
2. Subsequently, the application can use the automatic capture feature with CAP_XFERCOUNT to 1, CAP_TIMEBEFOREFIRSTCAPTURE to 0 and CAP_AUTOMATICCAPTURE set to 1 to initiate the capture of preview snapshot.
3. When the Source receives the CAP_AUTOMATICCAPTURE, it should capture the preview snapshot, and inform the application with MSG_XFERREADY when it is ready to transfer.
4. After receiving the MSG_XFERREADY, the application should use one of the three standard image transfer methods to transfer the captured image from the Source to the application.
5. At the end of this operation, the application has the option of going back to the preview thumbnail loop.

Imprinter / Endorser

Scanners intended for document imaging sometimes include accessories that let the scanner print data on the documents as it scans them. TWAIN provides basic functionality to negotiate capabilities for imprinter / endorser devices. An imprinter is a general term for any document-printing device. An endorser is more specialized, and is primarily intended as proof of scanning. In addition to the type of printing device, TWAIN offers ways to locate the printer on the scanning path: top or bottom of the sheet of paper, before or after the paper has been scanned. It is the responsibility of the Source to provide the available combinations to the Application. It is the responsibility of the Application to enable the printers that it wants to use, and to establish seed values prior to scanning.

This is a context sensitive scheme, Applications use CAP_PRINTER to discover what printers are available to the Source, and to select each of those printers for negotiation.

CAP_PRINTERENABLED determines whether or not a given printer will be used when scanning begins; a value of TRUE indicates that it will be used, a value of FALSE that it will not be used. Applications must enable a printer before negotiating the seed values.

CAP_INDEX describes an index that counts by ones for every image seen by a given printer.

CAP_PRINTERMODE selects one of three options: print one line of text from CAP_PRINTERSTRING, or multiple lines from CAP_PRINTERSTRING, or a compound string constructed (in order) from CAP_PRINTERSTRING, CAP_PRINTERINDEX and CAP_PRINTERSUFFIX.

CAP_PRINTERSTRING specifies the base message to be printed. For compound strings, the CAP_PRINTERSTRING serves as the prefix to the CAP_PRINTERINDEX.

CAP_PRINTERSUFFIX is only available for compound strings, and describes the text (if any) that is to follow the CAP_PRINTERINDEX.

Example of Use:

Consider a Source that supports two CAP_PRINTERs:

TWPR_IMPRINTERTOPBEFORE
TWPR_IMPRINTERBOTTOMBEFORE

The Application then:

- uses CAP_PRINTER to discover the two printers
- sets CAP_PRINTER to TWPR_IMPRINTERTOPBEFORE
  - ✓ sets CAP_PRINTERENABLED to TRUE (turning this printer on)
  - ✓ sets CAP_PRINTERMODE to TWPM_SINGLESTRING
  - ✓ sets CAP_PRINTERSTRING to a string containing today's date
- sets CAP_PRINTER to TWPR_IMPRINTERBOTTOMBEFORE
  - ✓ sets CAP_PRINTERENABLED to TRUE (turning this printer off)

Note that the value of CAP_PRINTER is not important at the time of scanning, it is the other capabilities that control the imprinter, like CAP_PRINTERENABLED; CAP_PRINTER only selects the current printer under negotiation.

B

TWAIN Technical Support

Chapter Contents

E-Mail Support

Developers who are connected to AppleLink and the WWW or Internet have access to TWAIN support groups. The support groups can answer your TWAIN development or marketing questions. There are two support groups: the TWAIN Working Group and the TWAIN Developers distribution.

- The TWAIN Working Group is read by Technical, Marketing and Support representatives from the Working Group companies. You can contact this group via e-mail at twain-wg@twain.org.
- The TWAIN Developers distribution includes TWAIN developers who want to keep up on TWAIN or offer advice to other developers. This distribution includes the TWAIN Working Group. It is the best place to get support because both the Working Group and other developers can respond. You can contact this group via e-mail at twain@twain.org.

TWAIN developers are encouraged to participate on the TWAIN Developer distribution list . All developers responding to questions posted to this distribution should Cc the distribution. The TWAIN Working Group also uses this distribution as a means to communicate with developers. For example, we use the distribution when posting the latest news about TWAIN, asking questions we may have about implementations, and requesting review of any Technical Notes which are under development. Technical Notes provide the mechanism for distributing updated information and corrections to errors that may occur in this document.

Worldwide Web

Developers connected to the WWW can also get on-line information and updates. There is an on-line version of the Developers' matrix with connections to those implementers with WWW pages. In addition, this manual is available as a readable file.

The WWW address is: **http://www.twain.org/**

Information by Fax

From Hewlett-Packard

A short informational white paper on TWAIN and a TWAIN Developer's Toolkit Order Form are available using Hewlett-Packard's fax back system, HP FIRST. To receive these documents call from a touch tone phone or fax machine and the information will be faxed to you.

Phone Numbers:

Inside the US or Canada	800 333-1917
Other locations	08 344-4809

The Document Number is:

3130	TWAIN Toolkit Order Form

Ordering Information

Outside the US and Canada, the TWAIN toolkit is available using the order form available by fax (see above).