UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

CASIO INC.

Plaintiff,

v.

PAPST LICENSING GMBH & CO. KG,
Defendant.

PAPST LICENSING GMBH & CO. KG,
Counter-Plaintiff

v.

CASIO INC. and
CASIO COMPUTER CO., LTD.

Counter-Defendants

Civil Action No. 1:06 CV 01751

Judge: Gladys Kessler

Magistrate Judge: Robinson

Next Court Deadline: Discovery Hearing, July 23, 2007

PAPST 'S MOTION TO COMPEL INTERROGATORY ANSWERS

Campbell Killefer (Bar No. 268433)
VENABLE LLP
575 7th Street, N.W.
Washington, D.C. 20004
(202) 344-4000

Jerold B. Schnayer
Joseph E. Cwik
WELSH & KATZ, LTD.
120 South Riverside Plaza,
22nd Floor
Chicago, IL 60606
(312) 655-1500

Attorneys for Papst Licensing GmbH & Co. KG

I. MOTION AND INTRODUCTION

Papst Licensing GmbH & Co. KG ("Papst"), pursuant to Fed.R.Civ.P. 37(a), moves this Court for an order compelling Casio Inc. ("Casio USA") and Casio Computer Company, Ltd. ("Casio Japan")(hereinafter collectively "Casio") to respond to Papst's first set of interrogatories served upon Casio US and Casio Japan. Casio is the party that instituted this patent infringement suit, and having done so, Casio should be prepared to spend the time that will be required to locate and provide the information properly requested by Papst. On April 20, 2007, Papst served its First Set of Interrogatories upon Casio USA and Casio Japan. (Exs. A and B.) On May 21, 2007, Casio US and Casio Japan served their initial objections and answers to the interrogatories. (Exs. C and D.) On June 22, 2007, Casio USA served its supplemental objections and answers to the interrogatories. (Ex. E).

Papst has been forced to file this Motion because Casio refuses to provide even the most basic discovery in this patent infringement case. For example, Casio refuses to identify *all* its digital cameras by name and model number even though Casio's Complaint seeks a declaration from the Court that *all* of its digital cameras do not infringe the patents-in-suit. Casio further refuses to identify those persons and companies who have relevant information concerning the design, manufacture and operation of the at-issue Casio cameras because Casio has interpreted Papst's interrogatory in an unreasonably broad sense in order to render the interrogatory "overly broad." Papst has since voluntarily narrowed its requests in order to resolve this issue, but Casio has still not provided the requested information. Casio's blanket refusal to provide unquestionably relevant information on contrived claims of overbreadth and relevance should be rejected by this Court, especially where Papst has refined its requests in discovery conferences.

II. ARGUMENT

"A request for discovery should be considered relevant if there is any possibility that the information sought may be relevant to the subject matter of the action....The objecting party bears the burden of demonstrating why a particular discovery request is improper." *Alloc, Inc. v. Unilin Beheer B.V.*, 2006 U.S. Dist. LEXIS 24148, 5-6 (D. Wis. 2006).

A. Casio USA Should Provide A Complete Response to Interrogatory No. 1

1. Casio Should Identify Each Potentially Infringing Camera and Those Technical Documents Describing How The Relevant Portions of the Cameras Operate.

Interrogatory No. 1 is directed to Casio USA's contentions of non-infringement and incorporates Instruction No. 8 (b), which requests Casio to identify each potentially infringing Casio Digital Camera and identify those documents describing the operation and/or construction of those cameras. Specifically, Instruction 8(b) of Interrogatory No. 1 states:

> b. Provide a full and complete identification and description of each Casio Digital Camera, including a full and complete identification of all documents that concern or describe the operation and/or construction of each Casio Digital Camera;

(Ex. A, p. 6).

Casio should be required to provide a "full and complete identification and description of each Casio Digital Camera" because Casio's Declaratory Judgment Complaint seeks an *unrestricted* "declaration that Casio Inc. has not infringed the '449 patent and '399 patents;" [Docket No. 1] Thus, because Casio presumably seeks a declaration of non-infringement on *all* Casio cameras, then Papst is entitled to the identification of and discovery on all Casio cameras.

This information will permit Papst to determine which specific Casio cameras exist in the first place and, then, how they operate. Once Papst obtains this information, Papst will be able to

narrow the issues in this case by determining which Casio products infringe, and which ones do not. Because the existence and identification of Casio's cameras directly relate to the infringement claims and defenses of the parties, the information is relevant and should be provided. *See,* Rule 26(b)(1) stating that "Parties may obtain discovery regarding any matter, not privileged, that is relevant to the claim or defense of any party, *including the existence, description, nature, custody, condition, and location of any books, documents, or other tangible things.*" (emphasis added); *Oppenheimer Fund, Inc. v. Sanders*, 437 U.S. 340, 351, 57 L. Ed. 2d 253, 98 S. Ct. 2380 (1978) ("The court should and ordinarily does interpret 'relevant' very broadly to mean matter that is relevant to anything that is or may become an issue in the litigation.").

Papst's request that Casio identify its documents concerning the "operation and/or construction of each Casio Digital Camera" is not "overbroad" for two reasons. First, Papst has narrowly defined the phrase "Casio Digital Camera" to mean those Casio Digital Cameras used, manufactured, sold, offered for sale, licensed or imported into the United States since October 22, 2002. (Ex. B, p. 4). Second, during discovery negotiations, Papst further narrowed its requests to the following technical aspects of the Casio Digital Cameras that directly concern the subject matter of the claim elements of claim 1 of the '399 Patent:

1. The acquisition and processing of light images by cameras including, for example, the conversion of light images into electrical signals representative of the light images.
2. The processing by a camera of electrical signals representative of light images including, for example, the conversion of analog signals representative of light images into digital electrical signals, and the transfer of those digital electrical signals to an electronic memory.
3. The operation of any computer program stored in a memory of a camera as it concerns any of the other subject matters set forth in this list.
4. The storage of information in a memory of a camera, including but not limited to external memory cards and other electronic memory intended to be attached to a camera.
5. The interconnection of a camera to a personal computer.

6. The transfer of digital electrical signals representative of light images from a camera to a personal computer including, for example, the process by which the personal computer recognizes how to communicate with and receive data from the camera.
7. The process by which a camera communicates with and transfers information to or from a personal computer.
8. The acquisition and processing of sound waves by cameras, how the sound waves are converted to digital electrical signals by the camera, how those digital electrical signals are processed and stored by the camera, and how those digital electrical signals are downloaded from the camera to a personal computer.

(Attached Exhibit F, *See also* Exhibit G, which contains examples of how the above-listed categories directly relate to the claims of the '399 patent in suit.) Therefore, because Papst significantly narrowed the universe of technical documents that Casio should identify with respect to the "operation and/or construction of each Casio Digital Camera," Casio should supplement its answers without delay.

2. Casio Should Identify Those Specific Patent Claims That It Deems Are Not Infringing.

The '399 Patent-In-Suit contains 15 individual patent claims. (Ex. H). The '449 Patent-In-Suit contains 18 individual patent claims. (Ex. I). With respect to Casio's non-infringement contentions, Casio states that will "provide information only for the first independent claims of the patents". (Ex. E, p. 2). Such a response is incomplete because it fails to address the other 31 independent and dependent claims of the patents-in-suit. Casio should be required to state its contentions for each and every claim of the patents-in-suit because Casio's own Declaratory Judgment Complaint seeks an *unrestricted* "declaration that Casio Inc. has not infringed, and is not infringing the '449 patent and '399 patents;" [Docket No. 1] Thus, because Casio presumably seeks a declaration on each and every claim of the '449 patent and '399 patent, Casio is obligated to provided its contentions on each and every patent claim. Furthermore, because Casio is in complete control of its information detailing how its cameras operate, Casio is fully capable of determining whether each of its cameras infringe each of the patent claims,

and thus should provide those contentions. Casio cannot unilaterally limit the scope of Papst's legitimate discovery in a manner self-serving for Casio.

3. Casio Should Identify Those Specific Cameras That It Deems Are Not Infringing.

Casio's responses are evasive and incomplete because they fail to specifically identify those cameras deemed to be not infringing. Instead, Casio states only that some unidentified and unknown "Casio cameras" or "Casio Digital Cameras" do not infringe. *See, e.g.,* Ex. E, pp. 2-3. It is imperative for Papst and the Court to be advised as to which of the many, if not hundreds, of cameras as to which Casio seeks a declaratory judgment. Therefore, Casio's answers should be supplemented to identify the specific Casio cameras that it believes are not infringing, and why each specific camera does not infringe. An "evasive or incomplete disclosure, answer, or response is to be treated as a failure to disclose, answer, or respond." F.R.Civ.P. 37(a)(3); *Schaap v. Executive Indus., Inc.*, 130 F.R.D. 384, 388 (N.D. Ill. 1990) (ordering defendant to reveal the facts behind its legal position, as "one of the main goals of discovery is to clarify, narrow, and sharpen the issues").

Accordingly, Casio should provide a complete answer to Interrogatory No. 1 within 10 calendar days of this Court's order. To the extent Casio may choose to answer by designating materials under Fed.R.Civ.P. 33(d), those materials should also be specifically identified by Bates Number on the documents within 10 calendar days of this Court's order.

B. Casio Japan Should Provide A Complete Response to Interrogatory No. 1

Casio Japan refuses to provide any answer whatsoever for Interrogatory No. 1 which requests the following:

> Identify any entity or person involved in the research, development, design, re-design, prototype production, testing, licensing, manufacturing, commercial production, sale, offer for sale or importation for each Casio Digital Camera used, manufactured, sold, offered for sale, licensed or imported into the United States after October 22, 2002.

(Ex. B, p. 7).

Remarkably, Casio is unwilling to provide ***any*** information responsive to this request despite the fact that this information is expressly allowed under Rule 26(b)(1) which states "Parties may obtain discovery regarding any matter, not privileged, that is relevant to the claim or defense of any party, *including...the identity and location of persons having knowledge of any discoverable matter."* Accordingly, Casio should provide a complete answer to this interrogatory within ten calendar days of this Court's order.

Casio is the party that instituted this patent infringement suit, and having done so, Casio should be prepared to spend the time that will be required to locate and provide the names of those individuals and companies possessing relevant information to this action. As the global parent company, Casio Japan also appears best suited to provide this information because it is in control of twenty-seven other Casio entities that likely possess relevant information. (Ex. J, p. 41). For example, Casio's 2006 Annual Report states that Casio Japan is in control of Yamagata Casio Co., Ltd., which is involved in the "production of digital cameras." (Id.)

Casio cannot seriously argue that the topics addressed in Interrogatory No. 1 are irrelevant. For example, courts have specifically explained why research, design and development information in patent infringement suits is relevant. *Ropak Corp. v. John W. Von Holdt*, 2006 U.S. LEXIS 19912, * 9-10 (N.D. Ill. April 17, 2006 ("documents [and information] relating to the concept, design and manufacturing of allegedly infringing products are relevant ... process documents and [information] may lead to the discovery of admissible evidence since

product features are defined during the concept, design and manufacturing process…); *Alloc*, *supra* (granting motion to compel research and development information).

Casio's finances are also relevant because Papst is entitled to compensation to account for Casio's alleged infringement and in no event less than a reasonable royalty. 35 U.S.C. § 284. Among the factors that must be considered in determining a reasonably royalty (the so-called "Georgia-Pacific" factors) are all of the sales *and* profitability information concerning the at-issue products.[1]

Despite Casio's objections, Casio's activities outside of the United States are also relevant because Casio is liable for infringing products even if they are first sold outside the United States, if there is an expectation that the products will eventually be indirectly sold to the United States market in any infringing manner. *See, Wing Shing Products, Ltd. v. Simatelex Manufactory Co., Ltd.*, 479 F.Supp.2d 388, 409 (S.D.N.Y. 2007) (defendant's knowledge that some infringing products manufactured outside of U.S. are destined for the U.S. establishes the intent element of induced infringement); *MEMC Electronic Materials, Inc. v. Mitsubishi Materials Silicon Corp.*, 420 F.3d 1369, 1379 (Fed.Cir. 2005)(Japanese manufacturer could be liable for inducement where it sold accused product to its Japanese subsidiary which in turn sold it to its American subsidiary). Therefore, because each of the topics identified in Interrogatory

[1] *See, Georgia-Pacific Corp. v. U.S. Plywood*, 318 F.Supp. 1116, 1120 (S.D.N.Y. 1970) (listing the relevant factors for determining a patent royalty, such as rates paid by the licensee for use of comparable patents; nature and scope of any license; licensor's policy and marketing program; commercial relationship between licensor and licensee; effect of selling patented specialty in promoting sales of licensee's other products; established profitability of product made under patent; utilitarian advantages of patent property over old modes or devices; nature of patented invention; extent to which infringer made use of the invention; portion of profit or selling price customary to allow for use of invention; portion of profit that should be credited to the invention, expert opinions, and amount a willing licensor would agree to pay for a license.); and *Parental Guide of Texas, Inc. v. Thomson, Inc.*, 446 F.3d 1265, 1270 (Fed. Cir. 2006) (*Georgia-Pacific* factors are proper standard for determining a reasonable royalty).

No. 1 are relevant to this suit, Casio Japan is obligated to provide the names and addresses of those people and business who have relevant information on those topics.

Accordingly, Casio Japan should provide a complete answer to Interrogatory No. 1 within 10 calendar days of this Court's order.

CONCLUSION

On June 5 and 13, 2007, counsel for Papst met and conferred with counsel for Casio to discuss the above issues in accordance with Local Civil Rule 7(m). Casio has stated that it will oppose any motion to compel. Therefore, Papst respectfully requests that this Court enter the Proposed Order attached hereto to this Motion.

Date: July 10, 2007

Respectfully submitted

Campbell Killefer (Bar No. 268433)
VENABLE LLP
575 7th Street, N.W.
Washington, D.C. 20004
(202) 344-4000

Jerold B. Schnayer
Joseph E. Cwik
WELSH & KATZ, LTD.
120 South Riverside Plaza,
22nd Floor
Chicago, IL 60606
(312) 655-1500

Attorneys for Papst Licensing GmbH & Co. KG

CERTIFICATE OF SERVICE

I hereby certify that the foregoing was served upon the following counsel for Plaintiff and Counterclaim Defendant Casio Inc. and Counterclaim Defendant Casio Computer Co., Ltd. through the Court's ECF electronic service and by regular U.S. mail, postage prepaid, this 10th day of July, 2007:

J. Kevin Fee
MORGAN, LEWIS & BOCKIUS LLP
1111 Pennsylvania Avenue, NW
Washington, D.C. 20004

Jeffrey M. Gold
Laura Krawczyk
MORGAN LEWIS & BROCKIUS LLP
101 Park Avenue
New York, New York 10178

Scott D. Stimpson
The Law Office of Scott Stimpson
Suite 1102
445 Hamilton Avenue
White Plains, NY 10601
Counsel for Casio Inc. and Casio Computer Co., Ltd.

Campbell Killefer

EXHIBIT A

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

CASIO INC.

Plaintiff,

v.

PAPST LICENSING GMBH & CO. KG
Defendant.

Civil Action No. 1:06 CV 01751

Judge: Gladys Kessler

PAPST LICENSING GMBH & CO. KG

Counter-Plaintiff

v.

CASIO INC. and
CASIO COMPUTER CO., LTD.

Counter-Defendants

PAPST LICENSING GMBH & CO. KG'S
FIRST SET OF INTERROGATORIES TO CASIO INC.

Pursuant to Rule 33 of the Federal Rules of Civil Procedure, Defendant/Counter-Plaintiff, Papst Licensing GmbH & Co. KG ("Papst"), through counsel, requests Plaintiff/Counter-Defendant, Casio Inc. ("Casio"), to respond to each of the Interrogatories below.

DEFINITIONS

1. "Plaintiff," "you," "your," and "Casio" means (a) Casio Inc., Casio Computer Co., Ltd. and all of their parent corporations, predecessor corporations, successor corporations, subsidiary corporations, affiliated or related companies, and

groups and divisions thereof; (b) Casio's present or past directors, officers, employees, agents, consultants, accountants, attorneys and independent contractors that have contractual relations with it; and (c) any person acting or purporting to act or, at the time of the stated subject matter, was acting or purporting to act for or on behalf Casio or anyone under its control, direction or instruction.

2. "Document" shall be construed in it broadest sense and shall mean all written, printed, typed, recorded, graphic, stenographic, computer-generated, computer-stored and electronically stored matter of every kind and description, however and by whomever produced, prepared, reproduced, disseminated, or made, including all originals, copies and drafts thereof and all attachments and appendices thereto, and shall also include audiovisual works and magnetic recordings of any type such as video tape recordings, slides, floppy and hard disks, audio recordings and photographic pictures or movies. A copy of any document that contains notes, sketches, annotations, highlighting, underlining or other markings, comments or modification on or of another document shall be considered a separate document.

3. "Thing" has the broadest meaning accorded that term by Federal Rule of Civil Procedure 34, and includes every kind of physical specimen or tangible item, other than a document, in Your possession, custody or control.

4. A request for a Document shall be deemed to include a request for a Thing. A request for a Thing shall be deemed to include a request for a Document.

5. "Or" is inclusive referring to any one or more of the disjoined words or phrases listed.

6. "Relating to," "relate to," "relation to," or "relating" means constituting,

discussing or referring to, analyzing, embodying, evidencing, consulting, recording, communicating, involving, describing, pertaining to, concerning, or containing, directly or indirectly in any way, the subject matter of the particular request.

7. "Communication," "communicate" or "communicating" means every manner or means of disclosure, transfer or exchange, and every disclosure, transfer or exchange of information whether orally or by document or whether face-to-face, by telephone, mail, telex, facsimile, personal delivery or otherwise.

8. The term "Lawsuit" means any type of legal action including but not limited to lawsuits filed in federal or state courts, administrative proceedings, ITC proceedings, USPTO proceedings and international cases filed in any tribunal.

9. The terms "identify" or "identity" or "identification" when used in connection with an individual means: state the individual's full name; his or her home and business addresses; his or her last known employer; his or her position, title, or job description; and if employed by You, the individual's dates and regular places of employment and general duties.

10. The terms "identify" or "identity" or "identification" when used in connection with a company, corporation, association, partnership, joint venture, or any legal entity other than a natural person means; state its full name and type of organization or entity; state the address of its principal place of business, its date and place of incorporation; and identify its officers, directors, and managing agents.

11. The terms "identify" or "identity" or "identification" when used in connection with an oral statement or discussion means: state the name of the speaker; the date of the statement; the place at which the statement was made; the person or persons to

whom the statement was addressed, if practicable, and otherwise a general description of the persons to whom the statement was addressed; the subject matter of the statement; and if the statement was memorialized in writing or mechanical or other recording, state the date and present location of said recording.

12. The terms "identify" or "identity" or "identification" when used in connection with a written document or statement means; state the name of the author, the type of document or writing, the date, the addressee, or recipient, if practicable, and otherwise a general description of the persons to whom the writing was distributed, the subject matter, and the present location. In lieu of such identification, You may attach a copy of the written containing said written statement and refer thereto in Your answer.

13. As used herein, "Casio Digital Camera" shall mean all designs, implementations, models, and versions of all Casio digital cameras capable of transferring picture information to another device, that have been used, manufactured, sold, offered for sale, licensed or imported into the United States since October 22, 2002.

14. "Patents-in-Suit" refers to United States Patent No. 6,895,449 ("the '449 patent") and United States Patent No. 6,470,399 ("the '399 patent").

INSTRUCTIONS

1. Where knowledge or information in Your possession is requested, the request extends to knowledge or information in the possession of Your agents, representatives, and attorneys. Whenever an answer to these interrogatories contains information that is not based upon Your personal knowledge, state the source and the nature of such information.

2. Answer all of the interrogatories completely. If You contend that the answer

to any interrogatory is privileged in whole or in part, state all facts supporting such privilege, and identify each person having knowledge of the factual basis on which the privilege is asserted. Answer should be made of all knowledge and information which is not privileged.

3. If You have no knowledge or information responsive to a particular interrogatory, please state such.

4. These interrogatories shall be deemed continuing and Casio shall supplement and seasonably amend its responses as required under the Federal Rules.

5. If an objection is made to any interrogatory, answer should be made of all knowledge and information to which the objection does not relate.

6. If Casio finds the meaning of any term in these interrogatories unclear, Casio shall assume a reasonable meaning, state what the assumed meaning is, and respond to the interrogatory according to the assumed meaning.

7. Unless otherwise specified, the interrogatories below are not limited to the knowledge or information in the United States. Instead, they relate to any such knowledge or information in any country.

8. The phrase "Describe in full and complete detail how each Casio Digital Camera does not infringe each of the Patents-in-Suit" shall mean:

a. Describe in full and complete detail the meaning of each term and each claim element in each claim and the basis for Casio's alleged meaning of each term and each claim element, including, but not limited to, an identification and explanation of all documents and other evidence that concerns and/or supports the interpretation of each phrase and each claim element;

b. Provide a full and complete identification and description of each Casio Digital Camera, including a full and complete identification of all documents that concern or describe the operation and/or construction of each Casio Digital Camera;

c. Provide a full and complete explanation of how any and all claim elements do not read on each Casio Digital Camera; and

d. Provide an identification of all documents and things that support in any way Casio's Complaint, Answer or Affirmative Defenses and a full and complete explanation of how they support Casio's Complaint, Answer or Affirmative Defenses.

e. Describe, for each and every claim element, whether any non-infringement is literal non-infringement and/or non-infringement under the doctrine of equivalents.

9. The phrase "Describe in full and complete detail the bases for the allegations in Casio's Complaint that the Patents-in-Suit are invalid for failing to comply with the patent laws of the United States" shall mean:

a. Describe in full and complete detail the meaning of each term and each claim element in each claim and the basis for Casio's alleged meaning of each term and each claim element, including, but not limited to, an identification and explanation of all documents and other evidence that concerns and/or supports the interpretation of each phrase and each claim element;

b. Provide a full and complete identification and description of each

alleged prior art reference, including a full and complete identification of all documents that concern or describe each prior art reference, including all documents that provide written corroboration that any actual product constituting alleged prior art was or was not on sale or sold anywhere in the world;

c. Provide a full and complete explanation of how any and all prior art reference(s), in combination or alone, read on each element of each claim of the Patents-In-Suit;

d. Provide an identification of all documents and things that support in any way Casio's Complaint, Answer or Affirmative Defenses and a full and complete explanation of how it supports Casio's Complaint, Answer or Affirmative Defenses;

e. For any invalidity assertion under 35 U.S.C. § 103, provide a full and complete explanation how each prior art reference teaches, suggests or otherwise provides a motivation to combine with any other prior art reference;

f. Provide a full and complete explanation of why the Patents-In-Suit are invalid for failing to comply with 35 U.S.C. § 112.

PAPST'S INTERROGATORIES

INTERROGATORY NO. 1: Describe in full and complete detail how each Casio Digital Camera does not infringe each of the Patents-in-Suit.

INTERROGATORY NO. 2: Describe in full and complete detail the bases for the allegations in Casio's Complaint that the Patents-in-Suit are invalid for failing to comply with the patent laws of the United States.

INTERROGATORY NO. 3: Separately with respect to each of the Patents-In-Suit, state:

(A) The dates upon which, and the circumstances under which, Casio first became aware of the Patents-In-Suit, and the persons who became aware of them;

(B) Whether Casio received legal advice at any time, including after the filing of the Complaint, that it did not infringe each of the patents in suit, or that each of the Patents-In-Suit was invalid or unenforceable and, if so, identify the date upon which, and the circumstances under which Casio obtained such legal advice, or caused any studies relating to such advice to be made, as well as any oral or written opinion of legal counsel, with respect to:

(i) the infringement or non-infringement of the Patents-In-Suit; and/or

(ii) the validity, invalidity, enforceability or unenforceability of the

Patents-In-Suit;

(C) Identify all persons having knowledge of the subject matter of Casio's response to this interrogatory, and locate and identify all documents pertaining to the subject matter of Casio's response to this interrogatory; and

(D) Identify all discussions, communications, events or documents that relate to or refer to any legal advice received by Casio with respect to:

(i) the infringement or non-infringement of the Patents-In-Suit; and/or

(ii) the validity, invalidity, enforceability or unenforceability of the Patents-In-Suit.

Dated: April 20, 2007

/s/ Joseph E. Cwik
Jerold B. Schnayer
Joseph E. Cwik
WELSH & KATZ, LTD.
120 South Riverside Plaza • 22nd Floor
Chicago, Illinois 60606
(312) 655-1500

Campbell Killefer (Bar No. 268433)
VENABLE LLP
575 7th Street, N.W.
Washington, D.C. 20004
(202) 344-4000
Attorneys for Defendant/Counter-Plaintiff, Papst Licensing GmbH & Co. KG

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing PAPST LICENSING GMBH & CO. KG'S FIRST SET OF INTERROGATORIES TO CASIO INC.was served on this the 20th day of April, 2007 upon the attorneys for Casio Inc. as follows:

VIA U.S. MAIL and E-MAIL
J. Kevin Fee
MORGAN, LEWIS & BOCKIUS LLP
1111 Pennsylvania Avenue, NW
Washington, D.C. 20004
Counsel for Casio Inc.

VIA U.S. MAIL AND E-MAIL
Scott Simpson
Jeffrey Gold
Morgan Lewis & Bockius, LLP
101 Park Avenue
New York, New York 10178

/s/ Joseph E. Cwik
Attorney for Papst Licensing GmbH & Co. KG

EXHIBIT B

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

CASIO INC.

Plaintiff,

v.

PAPST LICENSING GMBH & CO. KG
Defendant.

Civil Action No. 1:06 CV 01751

Judge: Gladys Kessler

PAPST LICENSING GMBH & CO. KG

Counter-Plaintiff

v.

CASIO INC. and
CASIO COMPUTER CO., LTD.

Counter-Defendants

PAPST LICENSING GMBH & CO. KG'S
FIRST SET OF INTERROGATORIES TO CASIO COMPUTER CO., LTD.

Pursuant to Rule 33 of the Federal Rules of Civil Procedure, Defendant/Counter-Plaintiff, Papst Licensing GmbH & Co. KG ("Papst"), through counsel, requests Plaintiff/Counter-Defendant, Casio Computer Co., Ltd. ("Casio Japan"), to respond to each of the Interrogatories below.

DEFINITIONS

1. "Counter-Defendant," "you," "your," and "Casio Japan" means (a) Casio Computer Co., Ltd., Casio Inc. and all of their parent corporations, predecessor corporations, successor corporations, subsidiary corporations, affiliated or related

companies, and groups and divisions thereof; (b) Casio Japan's present or past directors, officers, employees, agents, consultants, accountants, attorneys and independent contractors that have contractual relations with it; and (c) any person acting or purporting to act or, at the time of the stated subject matter, was acting or purporting to act for or on behalf Casio Japan or anyone under its control, direction or instruction.

2. "Document" shall be construed in it broadest sense and shall mean all written, printed, typed, recorded, graphic, stenographic, computer-generated, computer-stored and electronically stored matter of every kind and description, however and by whomever produced, prepared, reproduced, disseminated, or made, including all originals, copies and drafts thereof and all attachments and appendices thereto, and shall also include audiovisual works and magnetic recordings of any type such as video tape recordings, slides, floppy and hard disks, audio recordings and photographic pictures or movies. A copy of any document that contains notes, sketches, annotations, highlighting, underlining or other markings, comments or modification on or of another document shall be considered a separate document.

3. "Thing" has the broadest meaning accorded that term by Federal Rule of Civil Procedure 34, and includes every kind of physical specimen or tangible item, other than a document, in Your possession, custody or control.

4. A request for a Document shall be deemed to include a request for a Thing. A request for a Thing shall be deemed to include a request for a Document.

5. "Or" is inclusive referring to any one or more of the disjoined words or phrases listed.

6. "Relating to," "relate to," "relation to," or "relating" means constituting,

discussing or referring to, analyzing, embodying, evidencing, consulting, recording, communicating, involving, describing, pertaining to, concerning, or containing, directly or indirectly in any way, the subject matter of the particular request.

7. "Communication," "communicate" or "communicating" means every manner or means of disclosure, transfer or exchange, and every disclosure, transfer or exchange of information whether orally or by document or whether face-to-face, by telephone, mail, telex, facsimile, personal delivery or otherwise.

8. The term "Lawsuit" means any type of legal action including but not limited to lawsuits filed in federal or state courts, administrative proceedings, ITC proceedings, USPTO proceedings and international cases filed in any tribunal.

9. The terms "identify" or "identity" or "identification" when used in connection with an individual means: state the individual's full name; his or her home and business addresses; his or her last known employer; his or her position, title, or job description; and if employed by You, the individual's dates and regular places of employment and general duties.

10. The terms "identify" or "identity" or "identification" when used in connection with a company, corporation, association, partnership, joint venture, or any legal entity other than a natural person means; state its full name and type of organization or entity; state the address of its principal place of business, its date and place of incorporation; and identify its officers, directors, and managing agents.

11. The terms "identify" or "identity" or "identification" when used in connection with an oral statement or discussion means: state the name of the speaker; the date of the statement; the place at which the statement was made; the person or persons to

whom the statement was addressed, if practicable, and otherwise a general description of the persons to whom the statement was addressed; the subject matter of the statement; and if the statement was memorialized in writing or mechanical or other recording, state the date and present location of said recording.

12. The terms "identify" or "identity" or "identification" when used in connection with a written document or statement means; state the name of the author, the type of document or writing, the date, the addressee, or recipient, if practicable, and otherwise a general description of the persons to whom the writing was distributed, the subject matter, and the present location. In lieu of such identification, You may attach a copy of the written containing said written statement and refer thereto in Your answer.

13. As used herein, "Casio Digital Camera" shall mean all designs, implementations, models, and versions of all Casio digital cameras capable of transferring picture information to another device.

14. "Patents-in-Suit" refers to United States Patent No. 6,895,449 ("the '449 patent") and United States Patent No. 6,470,399 ("the '399 patent").

INSTRUCTIONS

1. Where knowledge or information in Your possession is requested, the request extends to knowledge or information in the possession of Your agents, representatives, and attorneys. Whenever an answer to these interrogatories contains information that is not based upon Your personal knowledge, state the source and the nature of such information.

2. Answer all of the interrogatories completely. If You contend that the answer to any interrogatory is privileged in whole or in part, state all facts supporting such privilege,

and identify each person having knowledge of the factual basis on which the privilege is asserted. Answer should be made of all knowledge and information which is not privileged.

3. If You have no knowledge or information responsive to a particular interrogatory, please state such.

4. These interrogatories shall be deemed continuing and Casio Japan shall supplement and seasonably amend its responses as required under the Federal Rules.

5. If an objection is made to any interrogatory, answer should be made of all knowledge and information to which the objection does not relate.

6. If Casio Japan finds the meaning of any term in these interrogatories unclear, Casio Japan shall assume a reasonable meaning, state what the assumed meaning is, and respond to the interrogatory according to the assumed meaning.

7. Unless otherwise specified, the interrogatories below are not limited to the knowledge or information in the United States. Instead, they relate to any such knowledge or information in any country.

8. The phrase "Identify any entity or person involved in the research, development, design, re-design, prototype production, testing, licensing, manufacturing, commercial production, sale, offer for sale or importation for each Casio Digital Camera used, manufactured, sold, offered for sale, licensed or imported into the United States" shall mean:

a. For each entity or person identified, describe what each entity or individual did in the research, development, design, re-design, prototype production, testing, licensing, manufacturing, commercial production, sale, offer for sale or importation for each

Casio Digital Camera; the corresponding time period(s) in which each entity or person was involved in the research, development, design, re-design, prototype production, testing, licensing, manufacturing, commercial production, sale, offer for sale or importation for each Casio Digital Camera; and each individual's title and employer during those corresponding time period(s);

b. Identify all documents (by Bates Number) showing the identity of any entity or person involved in the research, development, design, re-design, prototype production, testing, licensing, manufacturing, commercial production, sale, offer for sale or importation for each Casio Digital Camera.

PAPST'S INTERROGATORIES

INTERROGATORY NO. 1: Identify any entity or person involved in the research, development, design, re-design, prototype production, testing, licensing, manufacturing, commercial production, sale, offer for sale or importation for each Casio Digital Camera used, manufactured, sold, offered for sale, licensed or imported into the United States after October 22, 2002.

INTERROGATORY NO. 2: Separately with respect to each of the Patents-In-Suit, state:

(A) The dates upon which, and the circumstances under which, Casio first became aware of the Patents-In-Suit, and the persons who became aware of them;

(B) Whether Casio received legal advice at any time, including after the filing of the Complaint, that it did not infringe each of the patents in suit, or that each of the Patents-In-Suit was invalid or unenforceable and, if so, identify the date upon which, and the circumstances under which Casio obtained such legal advice, or caused any studies relating to such advice to be made, as well as any oral or written opinion of legal counsel, with respect to:

(i) the infringement or non-infringement of the Patents-In-Suit; and/or

(ii) the validity, invalidity, enforceability or unenforceability of the Patents-In-Suit;

(C) Identify all persons having knowledge of the subject matter of Casio's response to this interrogatory, and locate and identify all documents pertaining to the subject matter of Casio's response to this interrogatory; and

(D) Identify all discussions, communications, events or documents that relate to or refer to any legal advice received by Casio with respect to:

(i) the infringement or non-infringement of the Patents-In-Suit; and/or

(ii) the validity, invalidity, enforceability or unenforceability of the Patents-In-Suit.

Dated: April 20, 2007

/s/ Joseph E. Cwik
Jerold B. Schnayer
Joseph E. Cwik
WELSH & KATZ, LTD.
120 South Riverside Plaza • 22nd Floor
Chicago, Illinois 60606
(312) 655-1500

Campbell Killefer (Bar No. 268433)
VENABLE LLP
575 7th Street, N.W.
Washington, D.C. 20004
(202) 344-4000
Attorneys for Defendant/Counter-Plaintiff, Papst Licensing GmbH & Co. KG

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing PAPST LICENSING GMBH & CO. KG'S FIRST SET OF INTERROGATORIES TO CASIO COMPUTER CO., LTD. was served on this the 20th day of April, 2007 upon the attorneys for Casio Inc. as follows:

VIA U.S. MAIL and E-MAIL
J. Kevin Fee
MORGAN, LEWIS & BOCKIUS LLP
1111 Pennsylvania Avenue, NW
Washington, D.C. 20004
Counsel for Casio Inc.

VIA U.S. MAIL And E-MAIL
Scott Simpson
Jeffrey Gold
Morgan Lewis & Bockius, LLP
101 Park Avenue
New York, New York 10178

/s/ Joseph E. Cwik
Attorney for Papst Licensing GmbH & Co. KG

EXHIBIT C

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

CASIO INC. Plaintiff, v. PAPST LICENSING GMBH & CO. KG Defendant.	Civil Action No. 1:06 CV 01751 Judge: Gladys Kessler Magistrate: Deborah A. Robinson
PAPST LICENSING GMBH & CO. KG Counter-Plaintiff v. CASIO INC. and CASIO COMPUTER CO., LTD. Counter-Defendants.	

CASIO INC.'S OBJECTIONS AND RESPONSES TO
PAPST LICENSING GMBH & CO. KG'S
FIRST SET OF INTERROGATORIES TO CASIO INC.

Pursuant to Rule 33 of the Federal Rules of Civil Procedure, Plaintiff /Counter-Defendant, Casio Inc., through counsel, responds to each of the Papst Licensing GmbH & Co. KG ("Papst") Interrogatories below.

GENERAL OBJECTIONS

Casio Inc. generally objects to Papst's Interrogatories and its Instructions and Definitions as follows. These objections are incorporated by reference into each specific response and specific objection below as though set forth fully therein. The assertion of the same, similar, or

additional objections in Casio Inc.'s specific objections to an individual interrogatory or the failure to assert any additional objection to an interrogatory does not waive any of the objections set forth in this section.

1. Casio Inc. objects to Papst's Interrogatories to the extent they seek to impose obligations beyond those set forth in Rules 26 and 33 of the Federal Rules of Civil Procedure and any applicable local rules. Casio Inc. will respond to Papst's Interrogatories in the manner required by the Federal Rules of Civil Procedure and applicable local rules.

2. Casio Inc. objects to Papst's Interrogatories to the extent they are overly broad, unreasonably burdensome, or seek discovery of information that is not relevant to the claims or defenses of any party to this action.

3. Casio Inc.'s answers are made without waiving or intending to waive any objections as to relevancy, materiality, privilege, or admissibility of any information in this or in any subsequent proceeding or at trial of this or any other action, on any ground. A partial answer to any interrogatory that has been objected to, in whole or in part, is not intended to be a waiver of the objection.

4. Casio Inc. objects to Papst's Interrogatories to the extent they employ imprecise specifications of the information sought, and will provide only that non-objectionable information which can reasonably be identified in each category.

5. Casio Inc. objects to Papst's Interrogatories to the extent they seek discovery of information that is protected from disclosure by the attorney-client privilege, work-product doctrine, or other applicable privilege or immunity.

6. Casio Inc. objects to Papst's Interrogatories to the extent they are vague, ambiguous, and susceptible to varying interpretations or call for a legal conclusion. Casio Inc.

will answer Papst's Interrogatories based upon its understanding of them and subject to and without waiving its objections.

7. Casio Inc. objects to Papst's Interrogatories to the extent they call for the disclosure of confidential, sensitive, or proprietary information. Such confidential, sensitive or proprietary information will be produced pursuant to the Protective Order entered in this proceeding. Casio Inc. particularly objects to production of any confidential information to Welsh & Katz, as that firm is prosecuting applications related to the patents-in-suit.

8. Casio Inc. objects to Papst's Interrogatories to the extent that the information sought is within Papst's unique knowledge or is not yet known to Casio Inc. Casio Inc. notes that discovery and its investigations are ongoing and reserves the right to supplement its responses at a later time and in accordance with applicable rules.

9. Casio Inc. objects to Papst's Interrogatories to the extent they prematurely seek information regarding experts retained by Casio Inc. Casio Inc. will serve its experts' opinions, and the materials relied upon in support of those opinions, as provided for under the Federal Rules and the Court's Scheduling Order relating to expert discovery.

10. Casio Inc. objects to Papst's Interrogatories to the extent they contain multiple subparts, each of which is counted as a separate interrogatory.

11. Casio Inc. objects to the entirety of these interrogatories, as they were not served in good faith and clearly were prepared in violation of Federal Rule of Civil Procedure 26(g). The only possible purpose for Papst serving discovery requests of this nature is to increase the expense to Casio Inc. in an attempt to force it to settle. Papst has deceptively "defined" its interrogatories to be much broader than the individual interrogatory appears. Papst is hereby put on notice that Casio Inc. intends to seek sanctions for this discovery abuse, and that these

interrogatories will be used as evidence to support Casio Inc.'s vigorous pursuit of attorney fees and costs in this litigation. Casio Inc. will respond to some portions of Papst's interrogatories, but in doing so does not in any way agree that any portion of these interrogatories were proper.

12. Neither these general objections nor the specific responses set forth below are an admission relative to the existence of any information sought, the relevance or admissibility of any response, or the truth or accuracy of any statement or characterization contained in any particular interrogatory.

13. Casio Inc. objects at this time to the production of any information relating in any way to damages or willfulness, which issues will be subject to Casio's motion to bifurcate.

OBJECTIONS TO INSTRUCTIONS AND DEFINITIONS

1. Casio Inc. objects to Papst's Instructions and Definitions to the extent they seek to impose obligations beyond those set forth in Rules 26 and 33 of the Federal Rules of Civil Procedure and any applicable local rules. Casio Inc. will respond to Papst's Interrogatories in the manner required by the Federal Rules of Civil Procedure and applicable local rules.

2. Casio Inc. objects to the definition of "Plaintiff," "you," "your," and "Casio," as overly broad, unduly burdensome, and as calling for irrelevant information not reasonably calculated to lead to the discovery of admissible evidence. Casio, Inc. will respond for Casio, Inc. only. While the shorthand term "Casio" may be used in these responses and objections, it is to be understood to refer only to Casio, Inc. and no other party to the litigation or third party.

3. Casio Inc. objects to instruction 1. Casio Inc. will provide information in its possession, custody, or control, and not otherwise, nor will Casio Inc. provide "sources" or

"nature" of information, as these requests are unduly burdensome, irrelevant, and call for information not likely to lead to admissible evidence.

4. Casio Inc. objects to instruction 2 as overly broad, unduly burdensome, and as calling for irrelevant information not reasonably calculated to lead to the discovery of admissible evidence. Casio Inc. will provide information on privileged communications as required by Federal and Local Rules, and not otherwise.

5. Casio Inc. objects to instruction 6. If a Papst interrogatory is not clear, Casio Inc. will object to it on that ground and will not guess as to what Papst might have meant.

6. Casio Inc. objects to instruction 8, as it is deceptive, and redefines the interrogatory in a way that no one could reasonably read the interrogatory. If Papst desires to serve an interrogatory as laid out in instruction 8, it must do so directly. This practice violates Federal Rule 26(g), and Casio Inc. objects on the grounds that the instruction is overbroad, unduly burdensome, calls for irrelevant information not reasonably calculated to lead to the discovery of admissible information, calls for information that is subject to the attorney client privilege, work product, or other applicable immunity, calls for disclosure of confidential information to Welsh & Katz, and calls for documents and information that are only relevant to the damages and willfulness issues, which will be subject to Casio's motion to bifurcate.

7. Casio Inc. objects to instruction 9, as it is deceptive, and redefines the interrogatory in a way that no one could reasonably read the interrogatory. If Papst desires to serve an interrogatory as laid out in instruction 9, it must do so directly. This practice violates Federal Rule 26(g), and Casio Inc. objects on the grounds that the instruction is overbroad, unduly burdensome, calls for irrelevant information not reasonably calculated to lead to the discovery of admissible information, calls for information that is subject to the attorney client

privilege, work product, or other applicable immunity, and calls for documents and information that are only relevant to the damages and willfulness issues, which will be subject to Casio's motion to bifurcate.

PAPST'S INTERROGATORIES

INTERROGATORY NO. 1: Describe in full and complete detail how each Casio Digital Camera does not infringe each of the Patents-in-Suit.

OBJECTIONS:

Casio Inc. objects to the deceptive nature in which this interrogatory was written. Stating the interrogatory in this manner, and "defining" it to be wildly overbroad and to request information not even remotely related to the request as written, is an obvious attempt to deceive Casio Inc. into inadvertently waiving objections, or dupe the Court into thinking that Papst is being reasonable in its requests. The request violates Federal Rule 26(g) as "defined" in the Papst instructions, and Papst is hereby put on notice that, in the event this interrogatory is ever brought before the Court, the full overbroad scope of what Papst seeks must be shown to the Court, including the deceptive manner in which Papst attempted to get that information.

Casio Inc. objects to the definition provided to this interrogatory, as overbroad, unduly burdensome, calling for irrelevant information not reasonably calculated to lead to the discovery of admissible information, as calling for information that is subject to the attorney client privilege, work product, or other immunity, and calls for disclosure of confidential information to Welsh & Katz. Casio will respond only by considering the actual interrogatory recited above, and will provide information only for the first independent claims of the patents as Papst has to date refused to (or has been unable to) explain how the Casio cameras supposedly infringe on these patents, and has not identified any allegedly infringed claims. Casio will only address the

claim elements that are missing, not every claim element, and Casio will provide reasonable detail on the reasons for non-infringement. All other requests are overly broad, unduly burdensome, call for information that is irrelevant and not reasonably calculated to lead to the discovery of admissible evidence.

Casio reserves its right to supplement this response as the case proceeds, including but not limited to supplementation after the Court construes the claims, or upon learning Papst's proposed constructions and contentions which, to date, Papst has been unable to provide.

Casio objects to this Interrogatory as improperly being characterized as one interrogatory because its many subparts constitute separate interrogatories. See Fed. R. Civ. P. 33(a).

Subject to its general and specific objections, Casio responds as follows.

RESPONSE

Casio's cameras do not infringe Papst's patents because Casio's cameras do not meet every claim limitation either literally or under the doctrine of equivalents when comparing the properly construed claims to the accused products. At least the following claim elements are missing from Casio's cameras. Citations in this section are to the '399 patent, but as the '449 patent has the same specification, the support can equally be found in that patent and Casio will rely on the specifications of both patents.

Interface device

No Casio Digital Camera has the required limitation of an "interface device" as that term is properly construed. Both patents teach an interface device that is separate from the transmit/receive ("T/R") device. For example, the '399 patent states at 8:23-33: "In the interface device according to the present invention, an enormous advantage is to be gained . . . in

separating the actual hardware . . . [which] allows a plurality of dissimilar device types. . . .". Similarly, at 1:55-64, the patent discusses different uses of the interface, e.g., a "large number of applications," and it refers to "any data transmit/receive devices which can be attached to the second connecting device. . . ." (7:41-43). The patents also state that "the interface device according to the present invention . . . [can be used] as an interface between a host device and almost any data transmit/receive device" ('399 patent, 7:45-49).

The patent claims also clearly require that the interface be separate from the transmit/receive device. See, for example, the language that requires connecting devices for interfacing them, and the language that requires the host to ask what type of device is "attached" to the interface, and requires the interface device to send a signal to the host "regardless of the type of the data transmit/receive device attached." Thus, the claim language itself makes the ability of a transmit/receive device to "attach" very clear, particularly when considered in light of the specification noted above.

The patents distinguish prior art devices with specific drivers for specific transmit/receive devices. See, e.g ., '399 patent at 1:20-34. They also teach that the interface must be "flexible to permit attachment of very different electrical or electronic systems to a host device by means of the interface…." Id. At 1:56-60. Every embodiment disclosed in the patents has a separate interface device, and there is inadequate support under 35 U.S.C. 112 for anything but a separate interface device.

All these teachings are inconsistent with an analysis that has the interface device be a selected group of components within the camera itself. This concept runs through both patents and there is never any indication that the applicants had anything in mind other than a separate structure for the interface.

As with all missing claim elements, it is very difficult for Casio to try to explain why there is no infringement by equivalents, as Papst has been unable to provide even a literal infringement analysis, let alone an analysis by equivalents. However, it is clear that any attempt to read this interface limitation and the related language of the claim requiring that devices "attach" to the interface would improperly vitiate this claim language. Moreover, there are clearly very substantial differences in the Casio products and the claimed structure. Indeed, the "enormous advantage" taught by the patents themselves, and the "flexible" nature of the claimed structure are completely missing in the Casio cameras. And given that prior art was distinguished on this ground, no reasonable equivalents analysis could capture the Casio cameras. Casio reserves its right to supplement this response, should Papst ever be able to provide a realistic infringement analysis.

Data transmit/receive device

No Casio Digital Camera has the required limitation of a "data transmit/receive device" ("T/R device") as that term is properly construed. A T/R device would be understood by a person of ordinary skill in the art to mean a device that transmits and receives information in the same form. Thus, the CCD identified by Papst as the T/R device could not possibly meet this limitation, as it converts light into an electrical signal – a completely different form of data.

If the patentee had meant that different types of data could be transmitted and received, the claim could have said "a transmit device and a receive device" and these could have transmitted and received different types of data. A data/transmit device is not a device for converting data from one form to another, as is the CCD of the Casio cameras.

With regard to equivalents, this required element is completely missing, and thus any attempt to capture the Casio products under the doctrine of equivalents would improperly vitiate

these claim terms in their entirety. It is clear that the Casio CCD functions in a substantially different way, and achieves a different result. Casio has no idea how Papst intends to try to use the doctrine of equivalents to eviscerate this claim limitation, or even if Papst will continue to believe the CCD meets this limitation, and so reserves its right to supplement this response should Papst ever attempt to make such an argument.

Communication between

Further, because Casio's Digital Cameras lack the required limitation that there be a communication between the lens/CCD and host, Casio does not infringe any claim of the '399 or '449 patents.

The "communication between" limitation is part of every claim of the '399 and '449 patents. When properly construed, the T/R device and host must have two-way communication, not just data transfer from one to the other. The word "between" requires two-way communication, and later language in the claims uses the words "from" and "to" showing a contrast with the "between" language used for this communication. *Cf. e.g.*, "a data request command from the host device to the type of input/output device…" and "transfer of the digital data to the host device." This language also shows that communication between the host and T/R device must be bi-directional (commands from the host and data transfer from the T/R device, i.e., if the host requests the data, the T/R device must be able to send data in response thereto). There must be an interchange or exchange of data, as claimed and as plainly taught in the specification. *See, e.g.,* the abstract ("communication between"); '399, 1:9-14 (distinguishing data acquisition and two-way communication).

The lens/CCD of the Casio cameras (which counsel for Papst has alleged to be the T/R device) never receives data from the computer, and in fact, that lens/CCD is not functional at all

when the camera is connected to the computer. The only communication with the computer is a communication between the computer and the camera memory, the computer never "communicates" with the lens/CCD.

Even if "communication between" is construed to not require two-way communication, the Casio lens/CCD combination does not communicate at all with the host computer. Rather, the lens/CCD merely sends data to the Analog to Digital ("A/D") converter, and that data is stored in the camera memory. When the camera is attached to the computer, the computer collects information directly from the camera memory. The lens/CCD is not involved in the function of communicating with the computer. The '399 patent, at column 5, lines 47-63, discusses first that data must be "acquired, and transferred to the host device," and in the very next sentence distinguishes that from communication: "The data transmit/receive device itself can also communicate actively with the host device." The communication is described as something different from an intermediate memory merely storing and then sending on data to the host, and it requires, as the claims state, actual communication between the T/R device and the host computer. See also, 6:55-68 (the host computer user reading data "from the data transmit/receive device . . ." and discussing the interface function of transferring data "from the data transmit/receive device . . . to the host device . . . ."). The patents distinguish the claimed communication between the host and T/R device from "communication between the host device and interface device" ('399 patent, at 7:14-15).

With regard to equivalents, this required element is completely missing, and thus any attempt to capture the Casio products under the doctrine of equivalents would improperly vitiate these claim terms in their entirety. Moreover, the Casio products function in a substantially different way, in that the cameras do not perform a function that is substantially the same as bi-

directional communication. Rather, communication cannot take place between the host device and the imaging portion of the camera. Casio does not know how, if at all, Papst intends to try to use the doctrine of equivalents to eviscerate this claim limitation, and so reserves its right to supplement this response should Papst ever attempt to make such an argument.

Configured by the processor and memory

Even assuming that the Casio CPU and memory are part of an "interface device" as counsel for Papst has asserted, the interpreters in that alleged interface are certainly not configured "by" the processor and memory as expressly required by the claims. The "interpreters" in that alleged interface, to the extent they can even be argued to exist, are software. This software is simply loaded into the memory. The Casio processor has nothing to do with that operation. The memory of the Casio cameras also do not "configure" this in any way, but merely store the software.

The requirement that the interface device interpreters be configured by the processor and memory is not only clear from the claim language, but also from the specification. *See, e.g.*, '399 patent, 3:36-47, 3:58-67, 4:65-5:6.

With regard to equivalents, this required element is completely missing, and thus any attempt to capture the Casio products under the doctrine of equivalents would improperly vitiate these claim terms in their entirety. Moreover, the Casio products function in a substantially different way, in that the processor and memory do nothing to configure as required by the claims, and instead software is simply loaded into the Casio cameras. The prosecution history also provides guidance. *See e.g.*, March 18, 2002 Response to Office Action. Casio has no idea how Papst intends to try to use the doctrine of equivalents to eviscerate this claim limitation, and

so reserves its right to supplement this response should Papst ever attempt to make such an argument.

Input/output device customary in a host device, regardless of the device attached

Further, no claim of the '399 patent nor the '449 patent are infringed by Casio because no Casio Digital Camera has the required limitation of an "input/output device customary in a host device," as that term is properly construed. The claims require that the first command interpreter send a signal to the host that it is an "input/output device customary in a host device." The Casio camera signals that it is a Casio camera, not a device "customary in a host device," and it does not provide this information "regardless" of "the device attached".

The patent specification clearly supports the plain and ordinary meaning. *See, e.g.,* Abstract (regardless of the device attached); '399 patent, 3:36-47; 3:59-67, 4:8-20, 4:60-5:6; 6:19-22.

The claims and the file history both require that the interface device "lie" to the host computer about the real nature of the device. Indeed, prior art was distinguished on precisely this ground during prosecution, creating an estoppel. As above, Casio cameras never lie to the host computer. Rather, the Casio cameras identify themselves as Casio cameras.

This required element is also completely missing, and thus any attempt to capture the Casio products under the doctrine of equivalents would improperly vitiate these claim terms in their entirety. Moreover, the Casio products function in a substantially different way, in that the cameras identify themselves to a host device only for the specific hardware arrangement of the camera itself and no other. This is neither substantially the same function as "regardless" of "the device attached" nor substantially the same way. Casio does not know how Papst intends to try

to use the doctrine of equivalents to eviscerate this claim limitation, and so reserves its right to supplement this response should Papst ever attempt to make such an argument.

Virtual file system

With respect specifically to the claims of the '449 patent, all require the interface device to simulate a virtual file system. A virtual file system is described, for example, in the '399 patent at 6:1-3: the interface device "simulates a hard disk with a root directory whose entries are 'virtual' and can be created for the most varied functions." Also, as described in the '449 patent at 11:1-6 and the '339 patent at 11:66-12:4: "Using the ASPI manager the interface device according to the present invention can now obtain active access to an SCSI hard disk of the host device connected to the same SCSI bus which, in contrast to the interface device, cannot be a virtual but a real SCSI mass storage device or also a further interface device according to the present invention." *See also*, '399 patent, 12:25-33, and the '449 prosecution history (e.g., 5/17/04 Notice of Allowability).

In the Casio cameras, the computer directly accesses a real file system. The system is not "virtual" in any sense of the word.

With regard to equivalents, this required element is also completely missing, and thus any attempt to capture the Casio products under the doctrine of equivalents would improperly vitiate these claim terms in their entirety. Moreover, the Casio products function in a substantially different way, in that with respect to Casio cameras, the computer directly accesses a real file system. The system is not "virtual" in any way. Casio has no idea how Papst intends to try to use the doctrine of equivalents to eviscerate this claim limitation, and so reserves its right to supplement this response should Papst ever attempt to make such an argument.

INTERROGATORY NO. 2: Describe in full and complete detail the bases for the allegations in Casio's Complaint that the Patents-in-Suit are invalid for failing to comply with the patent laws of the United States.

OBJECTIONS

Casio, Inc. objects to the deceptive nature in which this interrogatory was written. Stating the interrogatory in this manner, and "defining" it to be wildly overbroad and to request information not even remotely related to the request as written, is an obvious attempt to deceive Casio into inadvertently waiving objections, or dupe the Court into thinking that Papst is being reasonable in its requests. The request violates Federal Rule 26(g) as "defined" in the Papst instructions, and Papst is hereby put on notice that, in the event this interrogatory is ever brought before the Court, the full overbroad scope of what Papst seeks must be shown to the Court, including the deceptive manner in which Papst attempted to get that information.

Casio objects to the definition provided to this interrogatory, as overbroad, unduly burdensome, calling for irrelevant information not reasonably calculated to lead to the discovery of admissible information, as calling for information that is subject to the attorney client privilege, work product, or other immunity, calls for disclosure of confidential information to Welsh & Katz, and calls for documents and information that are only relevant to the damages and willfulness issues, which will be subject to Casio's motion to bifurcate. Casio will respond only by considering the actual interrogatory recited above, and will provide information only for the first independent claims of the patents as Papst has to date refused to (or has been unable to) explain how the Casio cameras supposedly infringe on these patents. After receiving the Papst analyses, Casio will provide reasonable detail on the reasons for its defenses. All other requests are overly broad, unduly burdensome and calls for information that is irrelevant and not reasonably calculated to lead to the discovery of admissible evidence.

Casio reserves its right to supplement this response as the case proceeds, including but not limited to supplementation after the Court construes the claims, and upon learning Papst's proposed constructions and contentions which, to date, Papst has been unable to provide.

Casio objects to this Interrogatory as improperly being characterized as one interrogatory because its many subparts constitute separate interrogatories. See Fed. R. Civ. P. 33(a).

Subject to its general and specific objections, Casio responds as follows.

RESPONSE:

The claims of the Papst patents, particularly if read broadly enough to cover any Casio camera, would be invalid under at least 35 U.S.C. sections 112, 102, and 103. Unfortunately, despite this Court's order that discovery proceed and Papst's obligation to provide this information, Papst has refused to (or been unable to) provide claim constructions and analyses as to how these patents could possibly be read broadly enough to cover the Casio cameras. If and when Papst does so, Casio will show how the Papst claim constructions cannot read on the Casio cameras without also encompassing the prior art and otherwise rendering the patents invalid.

INTERROGATORY NO. 3: Separately with respect to each of the Patents-In-Suit, state:

(A) The dates upon which, and the circumstances under which, Casio first became aware of the Patents-In-Suit, and the persons who became aware of them;

(B) Whether Casio received legal advice at any time, including after the filing of the Complaint, that it did not infringe each of the patents in suit, or that each of the Patents-In-Suit was invalid or unenforceable and, if so, identify the date upon which, and the circumstances under which Casio obtained such legal advice, or caused any studies relating to such advice to be made, as well as any oral or written opinion of legal counsel, with respect to:

(i) the infringement or non-infringement of the Patents-In-Suit; and/or

(ii) the validity, invalidity, enforceability or unenforceability of the Patents-In-Suit;

(C) Identify all persons having knowledge of the subject matter of Casio's response to this interrogatory, and locate and identify all documents pertaining to the subject matter of Casio's response to this interrogatory; and

(D) Identify all discussions, communications, events or documents that relate to or refer to any legal advice received by Casio with respect to:

(i) the infringement or non-infringement of the Patents-In-Suit; and/or

(ii) the validity, invalidity, enforceability or unenforceability of the Patents-In-Suit.

RESPONSE:

Casio objects to this Interrogatory as overly broad, unduly burdensome and not likely to lead to the discovery of admissible evidence. Casio further objects to this Interrogatory as improperly being characterized as one interrogatory, because its many subparts constitute separate interrogatories towards the presumptive 25 interrogatory limit. See Fed. R. Civ. P. 33(a). Casio further objects to this Interrogatory as seeking information protected by the attorney client privilege and/or that is attorney work product, and as calling for information that is only relevant to the damages or willfulness issues, which will be subject to a motion to bifurcate.

Subject to its general and specific objections, Casio responds that it first became aware of Papst's patents when Papst approached Casio and identified them on or about March 14, 2006 in a letter to Mr. John Clough of Casio Inc.

DATED: May 21, 2007

Jeffrey M. Gold *(pro hac vice)*
Morgan Lewis & Bockius LLP
101 Park Avenue
New York, New York 10178
(212) 309-6000

J. Kevin Fee (Bar. No. 494016)
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Avenue, NW
Washington, D.C. 20004

Scott D. Stimpson, Esq. (*pro hac vice*)
The Law Office of Scott D. Stimpson
445 Hamilton Avenue, 11th Floor
White Plains, New York 10601
(203) 258-8412

Attorneys for Plaintiff and Counter Defendant
Casio Inc. and Counter Defendant
Casio Computer Co., Ltd.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing CASIO INC.'S OBJECTIONS TO PAPST LICENSING GMBH & CO. KG'S FIRST SET OF INTERROGATORIES TO CASIO INC. was served on this, the 21st day of May, 2007, upon the attorneys for Papst as follows:

VIA U.S. MAIL and E-MAIL
Jerold B. Schnayer
Joseph E. Cwik
WELSH & KATZ, LTD.
120 South Riverside Plaza • 22nd Floor
Chicago, Illinois 60606

Campbell Killefer (Bar No. 268433)
VENABLE LLP
575 7th Street, N.W.
Washington, D.C. 20004
(202) 344-4000

Attorneys for Defendant/Counter-Plaintiff,
Papst Licensing GmbH & Co. KG

EXHIBIT D

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

CASIO INC. Plaintiff, v. PAPST LICENSING GMBH & CO. KG Defendant.	Civil Action No. 1:06 CV 01751 Judge: Gladys Kessler Magistrate: Deborah A. Robinson
PAPST LICENSING GMBH & CO. KG Counter-Plaintiff v. CASIO INC. and CASIO COMPUTER CO., LTD. Counter-Defendants.	

CASIO COMPUTER CO., LTD.'S OBJECTIONS AND RESPONSES TO PAPST LICENSING GMBH & CO. KG'S FIRST SET OF INTERROGATORIES TO CASIO COMPUTER CO., LTD.

Pursuant to Rule 33 of the Federal Rules of Civil Procedure, Plaintiff /Counter-Defendant, Casio Computer Co., Ltd. ("Casio Japan"), through counsel, responds to each of the Papst Licensing GmbH & Co. KG ("Papst") Interrogatories below.

GENERAL OBJECTIONS

Casio Japan generally objects to Papst's Interrogatories and its Instructions and Definitions as follows. These objections are incorporated by reference into each specific response and specific objection below as though set forth fully therein. The assertion of the

same, similar, or additional objections in Casio Japan's specific objections to an individual interrogatory or the failure to assert any additional objection to an interrogatory does not waive any of the objections set forth in this section.

1. Casio Japan objects to Papst's Interrogatories to the extent they seek to impose obligations beyond those set forth in Rules 26 and 33 of the Federal Rules of Civil Procedure and any applicable local rules. Casio Japan will respond to Papst's Interrogatories in the manner required by the Federal Rules of Civil Procedure and applicable local rules.

2. Casio Japan objects to Papst's Interrogatories to the extent they are overly broad, unreasonably burdensome, or seek discovery of information that is not relevant to the claims or defenses of any party to this action.

3. Casio Japan's answers are made without waiving or intending to waive any objections as to relevancy, materiality, privilege, or admissibility of any information in this or in any subsequent proceeding or at trial of this or any other action, on any ground. A partial answer to any interrogatory that has been objected to, in whole or in part, is not intended to be a waiver of the objection.

4. Casio Japan objects to Papst's Interrogatories to the extent they employ imprecise specifications of the information sought, and will provide only that non-objectionable information which can reasonably be identified in each category.

5. Casio Japan objects to Papst's Interrogatories to the extent they seek discovery of information that is protected from disclosure by the attorney-client privilege, work-product doctrine, or other applicable privilege or immunity.

6. Casio Japan objects to Papst's Interrogatories to the extent they are vague, ambiguous, and susceptible to varying interpretations or call for a legal conclusion. Casio Japan

will answer Papst's Interrogatories based upon its understanding of them and subject to and without waiving its objections.

7. Casio Japan objects to Papst's Interrogatories to the extent they call for the disclosure of confidential, sensitive, or proprietary information. Such confidential, sensitive or proprietary information will be produced pursuant to the Protective Order entered in this proceeding. Casio Japan particularly objects to production of any confidential information to Welsh & Katz, as that firm is prosecuting applications related to the patents-in-suit.

8. Casio Japan objects to Papst's Interrogatories to the extent that the information sought is within Papst's unique knowledge or is not yet known to Casio Japan. Casio Japan notes that discovery and its investigations are ongoing and reserves the right to supplement its responses at a later time and in accordance with applicable rules.

9. Casio Japan objects to Papst's Interrogatories to the extent they prematurely seek information regarding experts retained by Casio Japan. Casio Japan will serve its experts' opinions, and the materials relied upon in support of those opinions, as provided for under the Federal Rules and the Court's Scheduling Order relating to expert discovery.

10. Casio Japan objects to Papst's Interrogatories to the extent they contain multiple subparts, each of which is counted as a separate interrogatory.

11. Casio Japan objects to the entirety of these interrogatories, as they were not served in good faith and clearly were prepared in violation of Federal Rule of Civil Procedure 26(g). The only possible purpose for Papst serving discovery requests of this nature is to increase the expense to Casio Japan in an attempt to force it to settle. Papst has deceptively "defined" its interrogatories to be much broader than the individual interrogatory appears. Papst is hereby put on notice that Casio Japan intends to seek sanctions for this discovery abuse, and that these interrogatories will be used as evidence to support Casio Japan's vigorous pursuit of

attorney fees and costs in this litigation. Casio Japan will respond to some portions of Papst's interrogatories, but in doing so does not in any way agree that any portion of these interrogatories were proper.

12. Neither these general objections nor the specific responses set forth below are an admission relative to the existence of any information sought, the relevance or admissibility of any response, or the truth or accuracy of any statement or characterization contained in any particular interrogatory.

13. Casio Japan objects at this time to the production of any information relating in any way to damages or willfulness, which issues will be subject to Casio's motion to bifurcate.

OBJECTIONS TO INSTRUCTIONS AND DEFINITIONS

1. Casio Japan objects to Papst's Instructions and Definitions to the extent they seek to impose obligations beyond those set forth in Rules 26 and 33 of the Federal Rules of Civil Procedure and any applicable local rules. Casio Japan will respond to Papst's Interrogatories in the manner required by the Federal Rules of Civil Procedure and applicable local rules.

2. Casio Japan objects to the definition of "Plaintiff," "you," "your," and "Casio Japan," as overly broad, unduly burdensome, and as calling for irrelevant information not reasonably calculated to lead to the discovery of admissible evidence. Casio Japan will respond for Casio Japan only. While the shorthand term "Casio" may be used in these responses and objections, it is to be understood to refer only to Casio Japan and no other party to the litigation or third party.

3. Casio Japan objects to definition 13 as being overbroad, unduly burdensome, and calling for irrelevant information not reasonably calculated to lead to the discovery of admissible evidence. Casio Japan will employ the same definition as Papst proposed for Casio, Inc.

4. Casio Japan objects to instruction 1. Casio Japan will provide information in its possession, custody, or control, and not otherwise, nor will Casio provide "sources" or "nature" of information, as these requests are unduly burdensome, irrelevant, and call for information not likely to lead to admissible evidence.

5. Casio Japan objects to instruction 2 as overly broad, unduly burdensome, and as calling for irrelevant information not reasonably calculated to lead to the discovery of admissible evidence. Casio Japan will provide information on privileged communications as required by Federal and Local Rules, and not otherwise.

6. Casio Japan objects to instruction 6. If a Papst interrogatory is not clear, Casio Japan will object to it on that ground and will not guess as to what Papst might have meant.

7. Casio Japan objects to instruction 8, as it is deceptive, and redefines the interrogatory in a way that no one could reasonably read the interrogatory. If Papst desires to serve an interrogatory as laid out in instruction 8, it must do so directly. This practice violates Federal Rule 26(g), and Casio objects on the grounds that the instruction is overbroad, unduly burdensome, calls for irrelevant information not reasonably calculated to lead to the discovery of admissible information, calls for information that is subject to the attorney client privilege, work product, or other applicable immunity, calls for disclosure of confidential information to Welsh & Katz, and calls for documents and information that are only relevant to the damages and willfulness issues, which will be subject to Casio's motion to bifurcate.

PAPST'S INTERROGATORIES

INTERROGATORY NO. 1: Identify any entity or person involved in the research, development, design, re-design, prototype production, testing, licensing, manufacturing, commercial production, sale, offer for sale or importation for each Casio Digital Camera used, manufactured, sold, offered for sale, licensed or imported into the United States after October 22, 2002.

OBJECTIONS:

Casio Japan objects to the deceptive nature in which this interrogatory was written. Stating the interrogatory in this manner (which is already overbroad and objectionable), and "defining" it to be wildly overbroad and to request information not even remotely related to the request as written, is an obvious attempt to deceive Casio Japan into inadvertently waiving objections, or dupe the Court into thinking that Papst is being reasonable in its requests. The request violates Federal Rule 26(g), and Papst is hereby put on notice that, in the event this interrogatory is ever brought before the Court, the full overbroad scope of what Papst seeks must be shown to the Court, including the deceptive manner in which Papst attempted to get that information.

Casio Japan objects to the definition provided to this interrogatory, as overbroad, unduly burdensome, calling for irrelevant information not reasonably calculated to lead to the discovery of admissible information, as calling for information that is subject to the attorney client privilege, work product, or other immunity, calls for disclosure of confidential information to Welsh & Katz, and calls for documents and information that are only relevant to the damages and willfulness issues, which will be subject to Casio's motion to bifurcate.

Casio Japan further objects to this Interrogatory as improperly being characterized as one interrogatory because its many subparts constitute separate interrogatories. See Fed. R. Civ. P. 33(a).

This interrogatory is so ridiculously overbroad that it was plainly not drafted in good faith and instead was drafted in violation of Rule 26(g) for the purpose of increasing the expense on Casio, in an effort to get it to settle. Papst is hereby put on notice that Casio intends to seek sanctions for the blatant discovery abuse, and that these interrogatories will be used as evidence to support Casio's vigorous pursuit of attorneys' fees and costs in the litigation.

Casio will not respond to this interrogatory and instead intends to seek sanctions for discovery abuse.

INTERROGATORY NO. 2: Separately with respect to each of the Patents-In-Suit, state:

(A) The dates upon which, and the circumstances under which, Casio first became aware of the Patents-In-Suit, and the persons who became aware of them;

(B) Whether Casio received legal advice at any time, including after the filing of the Complaint, that it did not infringe each of the patents in suit, or that each of the Patents-In-Suit was invalid or unenforceable and, if so, identify the date upon which, and the circumstances under which Casio obtained such legal advice, or caused any studies relating to such advice to be made, as well as any oral or written opinion of legal counsel, with respect to:

(i) the infringement or non-infringement of the Patents-In-Suit; and/or

(ii) the validity, invalidity, enforceability or unenforceability of the Patents-In-Suit;

(C) Identify all persons having knowledge of the subject matter of Casio's response to this interrogatory, and locate and identify all documents pertaining to the subject matter of Casio's response to this interrogatory; and

(D) Identify all discussions, communications, events or documents that relate to or refer to any legal advice received by Casio with respect to:

(i) the infringement or non-infringement of the Patents-In-Suit; and/or

(ii) the validity, invalidity, enforceability or unenforceability of the Patents-In-Suit.

OBJECTIONS:

Casio Japan objects to this Interrogatory as overly broad, unduly burdensome and not likely to lead to the discovery of admissible evidence. Casio Japan further objects to this Interrogatory as improperly being characterized as one interrogatory, because its many subparts constitute separate interrogatories towards the presumptive 25 interrogatory limit. See Fed. R. Civ. P. 33(a). Casio Japan further objects to this Interrogatory as seeking information protected by the attorney client privilege and/or that is attorney work product, and as calling for information that is only relevant to damages and willfulness issues, which will be subject to a motion to bifurcate.

RESPONSE:

Subject to its general and specific objections, Casio Japan responds that it first became aware of Papst's patents after Papst approached Casio Inc. and identified them on or about March 14, 2006 in a letter to Mr. John Clough of Casio Inc.

DATED: May 21, 2007

Jeffrey M. Gold *(pro hac vice)*
Morgan Lewis & Bockius LLP
101 Park Avenue
New York, New York 10178
(212) 309-6000

J. Kevin Fee (Bar. No. 494016)
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Avenue, NW
Washington, D.C. 20004

Scott D. Stimpson, Esq. (*pro hac vice*)
The Law Office of Scott D. Stimpson
445 Hamilton Avenue, 11th Floor
White Plains, New York 10601

Attorneys for Plaintiff and Counter Defendant
Casio Inc. and Counter Defendant
Casio Computer Co., Ltd.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing CASIO COMPUTER CO., LTD.'S OBJECTIONS TO PAPST LICENSING GMBH & CO. KG'S FIRST SET OF INTERROGATORIES TO CASIO COMPUTER CO., LTD. was served on this, the 21st day of May, 2007, upon the attorneys for Papst as follows:

VIA U.S. MAIL and E-MAIL
Jerold B. Schnayer
Joseph E. Cwik
WELSH & KATZ, LTD.
120 South Riverside Plaza • 22nd Floor
Chicago, Illinois 60606

Campbell Killefer (Bar No. 268433)
VENABLE LLP
575 7th Street, N.W.
Washington, D.C. 20004
(202) 344-4000

Attorneys for Defendant/Counter-Plaintiff,
Papst Licensing GmbH & Co. KG

EXHIBIT E

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

CASIO INC. Plaintiff, v. PAPST LICENSING GMBH & CO. KG Defendant.	Civil Action No. 1:06 CV 01751 Judge: Gladys Kessler Magistrate: Deborah A. Robinson
PAPST LICENSING GMBH & CO. KG Counter-Plaintiff v. CASIO INC. and CASIO COMPUTER CO., LTD. Counter-Defendants.	

CASIO INC.'S SUPPLEMENTAL OBJECTIONS AND RESPONSES TO PAPST LICENSING GMBH & CO. KG'S FIRST SET OF INTERROGATORIES TO CASIO INC.

Pursuant to Rule 33 of the Federal Rules of Civil Procedure, Plaintiff /Counter-Defendant, Casio Inc., through counsel, hereby provides a supplemental response to Papst's First Set of Interrogatories.

GENERAL OBJECTIONS

The General Objections and Objections to Instructions and Definitions provided in Casio's initial response to these interrogatories are incorporated by reference.

PAPST'S INTERROGATORIES

INTERROGATORY NO. 1: Describe in full and complete detail how each Casio Digital Camera does not infringe each of the Patents-in-Suit.

OBJECTIONS:

Casio Inc. objects to the deceptive nature in which this interrogatory was written. Stating the interrogatory in this manner, and "defining" it to be wildly overbroad and to request information not even remotely related to the request as written, is an obvious attempt to deceive Casio Inc. into inadvertently waiving objections, or dupe the Court into thinking that Papst is being reasonable in its requests. The request violates Federal Rule 26(g) as "defined" in the Papst instructions, and Papst is hereby put on notice that, in the event this interrogatory is ever brought before the Court, the full overbroad scope of what Papst seeks must be shown to the Court, including the deceptive manner in which Papst attempted to get that information.

Casio Inc. objects to the definition provided to this interrogatory, as overbroad, unduly burdensome, calling for irrelevant information not reasonably calculated to lead to the discovery of admissible information, as calling for information that is subject to the attorney client privilege, work product, or other immunity, and calls for disclosure of confidential information to Welsh & Katz. Casio will respond only by considering the actual interrogatory recited above, and will provide information only for the first independent claims of the patents as Papst has to date refused to (or has been unable to) explain how the Casio cameras supposedly infringe on these patents, and has not identified any allegedly infringed claims. Casio will only address the claim elements that are missing, not every claim element, and Casio will provide reasonable detail on the reasons for non-infringement. All other requests are overly broad, unduly burdensome, call for information that is irrelevant and not reasonably calculated to lead to the discovery of admissible evidence.

Casio reserves its right to supplement this response as the case proceeds, including but not limited to supplementation after the Court construes the claims, or upon learning Papst's proposed constructions and contentions which, to date, Papst has been unable to provide.

Casio objects to this Interrogatory as improperly being characterized as one interrogatory because its many subparts constitute separate interrogatories. See Fed. R. Civ. P. 33(a).

Subject to its general and specific objections, Casio responds as follows.

FIRST RESPONSE

Casio's cameras do not infringe Papst's patents because Casio's cameras do not meet every claim limitation either literally or under the doctrine of equivalents when comparing the properly construed claims to the accused products. At least the following claim elements are missing from Casio's cameras. Citations in this section are to the '399 patent, but as the '449 patent has the same specification, the support can equally be found in that patent and Casio will rely on the specifications of both patents.

Interface device

No Casio Digital Camera has the required limitation of an "interface device" as that term is properly construed. Both patents teach an interface device that is separate from the transmit/receive ("T/R") device. For example, the '399 patent states at 8:23-33: "In the interface device according to the present invention, an enormous advantage is to be gained . . . in separating the actual hardware . . . [which] allows a plurality of dissimilar device types. . . .". Similarly, at 1:55-64, the patent discusses different uses of the interface, e.g., a "large number of applications," and it refers to "any data transmit/receive devices which can be attached to the second connecting device. . . ." (7:41-43). The patents also state that "the interface device according to the present invention . . . [can be used] as an interface between a host device and almost any data transmit/receive device" ('399 patent, 7:45-49).

The patent claims also clearly require that the interface be separate from the transmit/receive device. See, for example, the language that requires connecting devices for interfacing them, and the language that requires the host to ask what type of device is "attached" to the interface, and requires the interface device to send a signal to the host "regardless of the type of the data transmit/receive device attached." Thus, the claim language itself makes the ability of a transmit/receive device to "attach" very clear, particularly when considered in light of the specification noted above.

The patents distinguish prior art devices with specific drivers for specific transmit/receive devices. See, e.g ., '399 patent at 1:20-34. They also teach that the interface must be "flexible to permit attachment of very different electrical or electronic systems to a host device by means of the interface...." Id. At 1:56-60. Every embodiment disclosed in the patents has a separate interface device, and there is inadequate support under 35 U.S.C. 112 for anything but a separate interface device.

All these teachings are inconsistent with an analysis that has the interface device be a selected group of components within the camera itself. This concept runs through both patents and there is never any indication that the applicants had anything in mind other than a separate structure for the interface.

As with all missing claim elements, it is very difficult for Casio to try to explain why there is no infringement by equivalents, as Papst has been unable to provide even a literal infringement analysis, let alone an analysis by equivalents. However, it is clear that any attempt to read this interface limitation and the related language of the claim requiring that devices "attach" to the interface would improperly vitiate this claim language. Moreover, there are clearly very substantial differences in the Casio products and the claimed structure. Indeed, the "enormous advantage" taught by the patents themselves, and the "flexible" nature of the claimed structure are completely missing in the Casio cameras. And given that prior art was distinguished on this ground, no reasonable equivalents analysis could capture the Casio cameras. Casio reserves its right to supplement this response, should Papst ever be able to provide a realistic infringement analysis.

Data transmit/receive device

No Casio Digital Camera has the required limitation of a "data transmit/receive device" ("T/R device") as that term is properly construed. A T/R device would be understood by a person of ordinary skill in the art to mean a device that transmits and receives information in the

same form. Thus, the CCD identified by Papst as the T/R device could not possibly meet this limitation, as it converts light into an electrical signal – a completely different form of data.

If the patentee had meant that different types of data could be transmitted and received, the claim could have said "a transmit device and a receive device" and these could have transmitted and received different types of data. A data/transmit device is not a device for converting data from one form to another, as is the CCD of the Casio cameras.

With regard to equivalents, this required element is completely missing, and thus any attempt to capture the Casio products under the doctrine of equivalents would improperly vitiate these claim terms in their entirety. It is clear that the Casio CCD functions in a substantially different way, and achieves a different result. Casio has no idea how Papst intends to try to use the doctrine of equivalents to eviscerate this claim limitation, or even if Papst will continue to believe the CCD meets this limitation, and so reserves its right to supplement this response should Papst ever attempt to make such an argument.

Communication between

Further, because Casio's Digital Cameras lack the required limitation that there be a communication between the lens/CCD and host, Casio does not infringe any claim of the '399 or '449 patents.

The "communication between" limitation is part of every claim of the '399 and '449 patents. When properly construed, the T/R device and host must have two-way communication, not just data transfer from one to the other. The word "between" requires two-way communication, and later language in the claims uses the words "from" and "to" showing a contrast with the "between" language used for this communication. *Cf. e.g.*, "a data request command from the host device to the type of input/output device…" and "transfer of the digital data to the host device." This language also shows that communication between the host and T/R device must be bi-directional (commands from the host and data transfer from the T/R device, i.e., if the host requests the data, the T/R device must be able to send data in response thereto). There must be an interchange or exchange of data, as claimed and as plainly taught in the specification. *See, e.g.*, the abstract ("communication between"); '399, 1:9-14 (distinguishing data acquisition and two-way communication).

The lens/CCD of the Casio cameras (which counsel for Papst has alleged to be the T/R device) never receives data from the computer, and in fact, that lens/CCD is not functional at all when the camera is connected to the computer. The only communication with the computer is a communication between the computer and the camera memory, the computer never "communicates" with the lens/CCD.

Even if "communication between" is construed to not require two-way communication, the Casio lens/CCD combination does not communicate at all with the host computer. Rather, the lens/CCD merely sends data to the Analog to Digital ("A/D") converter, and that data is stored in the camera memory. When the camera is attached to the computer, the computer collects information directly from the camera memory. The lens/CCD is not involved in the function of communicating with the computer. The '399 patent, at column 5, lines 47-63, discusses first that data must be "acquired, and transferred to the host device," and in the very next sentence distinguishes that from communication: "The data transmit/receive device itself can also communicate actively with the host device." The communication is described as something different from an intermediate memory merely storing and then sending on data to the

host, and it requires, as the claims state, actual communication between the T/R device and the host computer. See also, 6:55-68 (the host computer user reading data "from the data transmit/receive device . . ." and discussing the interface function of transferring data "from the data transmit/receive device . . . to the host device . . . ."). The patents distinguish the claimed communication between the host and T/R device from "communication between the host device and interface device" ('399 patent, at 7:14-15).

With regard to equivalents, this required element is completely missing, and thus any attempt to capture the Casio products under the doctrine of equivalents would improperly vitiate these claim terms in their entirety. Moreover, the Casio products function in a substantially different way, in that the cameras do not perform a function that is substantially the same as bi-directional communication. Rather, communication cannot take place between the host device and the imaging portion of the camera. Casio does not know how, if at all, Papst intends to try to use the doctrine of equivalents to eviscerate this claim limitation, and so reserves its right to supplement this response should Papst ever attempt to make such an argument.

Configured by the processor and memory

Even assuming that the Casio CPU and memory are part of an "interface device" as counsel for Papst has asserted, the interpreters in that alleged interface are certainly not configured "by" the processor and memory as expressly required by the claims. The "interpreters" in that alleged interface, to the extent they can even be argued to exist, are software. This software is simply loaded into the memory. The Casio processor has nothing to do with that operation. The memory of the Casio cameras also do not "configure" this in any way, but merely store the software.

The requirement that the interface device interpreters be configured by the processor and memory is not only clear from the claim language, but also from the specification. *See, e.g.*, '399 patent, 3:36-47, 3:58-67, 4:65-5:6.

With regard to equivalents, this required element is completely missing, and thus any attempt to capture the Casio products under the doctrine of equivalents would improperly vitiate these claim terms in their entirety. Moreover, the Casio products function in a substantially different way, in that the processor and memory do nothing to configure as required by the claims, and instead software is simply loaded into the Casio cameras. The prosecution history also provides guidance. *See e.g.*, March 18, 2002 Response to Office Action. Casio has no idea how Papst intends to try to use the doctrine of equivalents to eviscerate this claim limitation, and so reserves its right to supplement this response should Papst ever attempt to make such an argument.

Input/output device customary in a host device, regardless of the device attached

Further, no claim of the '399 patent nor the '449 patent are infringed by Casio because no Casio Digital Camera has the required limitation of an "input/output device customary in a host device," as that term is properly construed. The claims require that the first command interpreter send a signal to the host that it is an "input/output device customary in a host device." The Casio camera signals that it is a Casio camera, not a device "customary in a host device," and it does not provide this information "regardless" of "the device attached".

The patent specification clearly supports the plain and ordinary meaning. *See, e.g.*, Abstract (regardless of the device attached); '399 patent, 3:36-47; 3:59-67, 4:8-20, 4:60-5:6; 6:19-22.

The claims and the file history both require that the interface device "lie" to the host computer about the real nature of the device. Indeed, prior art was distinguished on precisely this ground during prosecution, creating an estoppel. As above, Casio cameras never lie to the host computer. Rather, the Casio cameras identify themselves as Casio cameras.

This required element is also completely missing, and thus any attempt to capture the Casio products under the doctrine of equivalents would improperly vitiate these claim terms in their entirety. Moreover, the Casio products function in a substantially different way, in that the cameras identify themselves to a host device only for the specific hardware arrangement of the camera itself and no other. This is neither substantially the same function as "regardless" of "the device attached" nor substantially the same way. Casio does not know how Papst intends to try to use the doctrine of equivalents to eviscerate this claim limitation, and so reserves its right to supplement this response should Papst ever attempt to make such an argument.

Virtual file system

With respect specifically to the claims of the '449 patent, all require the interface device to simulate a virtual file system. A virtual file system is described, for example, in the '399 patent at 6:1-3: the interface device "simulates a hard disk with a root directory whose entries are 'virtual' and can be created for the most varied functions." Also, as described in the '449 patent at 11:1-6 and the '339 patent at 11:66-12:4: "Using the ASPI manager the interface device according to the present invention can now obtain active access to an SCSI hard disk of the host device connected to the same SCSI bus which, in contrast to the interface device, cannot be a virtual but a real SCSI mass storage device or also a further interface device according to the present invention." *See also*, '399 patent, 12:25-33, and the '449 prosecution history (e.g., 5/17/04 Notice of Allowability).

In the Casio cameras, the computer directly accesses a real file system. The system is not "virtual" in any sense of the word.

With regard to equivalents, this required element is also completely missing, and thus any attempt to capture the Casio products under the doctrine of equivalents would improperly vitiate these claim terms in their entirety. Moreover, the Casio products function in a substantially different way, in that with respect to Casio cameras, the computer directly accesses a real file system. The system is not "virtual" in any way. Casio has no idea how Papst intends to try to use the doctrine of equivalents to eviscerate this claim limitation, and so reserves its right to supplement this response should Papst ever attempt to make such an argument.

SUPPLEMENTAL RESPONSE

All the objections and responses in our First Responses are incorporated by reference.

Casio Inc.'s proposed claim constructions were already provided above for the elements that appear to be at issue, but Casio, Inc. herein supplements those constructions in a good faith

effort to address questions of counsel for Papst, and despite Papst's refusal to provide proper claim constructions as ordered by the Court. Casio reserves its right to supplement this response as the case proceeds, including but not limited to supplementation after the Court construes the claims, or upon learning Papst's proposed constructions and contentions which, to date, Papst has been unable to provide.

Casio notes that it has not been accused of direct infringement of any claim, nor could it be because it does not make or sell the host. Despite repeated Court orders to explain how it is contending that Casio infringes, Papst has not provided any cogent theory of infringement. Papst should be precluded from advancing any infringement theory now, but to the extent that ever happens, Casio will respond and supplement as necessary.

I. Claim 1 of United States Patent 6,470,399

A. An interface device for communication between

"Interface Device" interpretation: "Interface Device" means a physically separate and distinct component different from the host device or the Data Transmit/Receive Device that is capable of regulating the electrical communications between host device and a plurality of interchangeable data transmit/receive devices.

Both patents teach an interface device that is separate from the transmit/receive ("T/R") device. For example, the '399 patent states at 8:23-33: "In the interface device according to the present invention, an enormous advantage is to be gained . . . in separating the actual hardware . . . [which] allows a plurality of dissimilar device types. . . .". Similarly, at 1:55-64, the patent discusses different uses of the interface, e.g., a "large number of applications," and it refers to "any data transmit/receive devices which can be attached to the second connecting device. . . ." (7:41-43). The patents also state that "the interface device according to the present invention . . .

[can be used] as an interface between a host device and almost any data transmit/receive device" ('399 patent, 7:45-49). See also the claims, which refer to a "multi-purpose" interface.

The patent claims also clearly require that the interface be separate from the transmit/receive device. See, for example, the language that requires connecting devices for interfacing them, and the language that requires the host to ask what type of device is "attached" to the interface, and requires the interface device to send a signal to the host "regardless of the type of the data transmit/receive device attached." Thus, the claim language itself makes the ability of a transmit/receive device to "attach" very clear, particularly when considered in light of the specification noted above.

The patents distinguish prior art devices with specific drivers for specific transmit/receive devices. *See, e.g* ., '399 patent at 1:20-34. They also teach that the interface must be "flexible to permit attachment of very different electrical or electronic systems to a host device by means of the interface...." *Id.* at 1:56-60. Every embodiment disclosed in the patents has a separate interface device, and there is inadequate support under 35 U.S.C. 112 for anything but a separate interface device. Casio also relies on the plain and ordinary meaning of these terms.

"communication between" interpretation: "Communication Between" means two-way communication directly between the host and input/output device.

The "communication between" limitation is part of every claim of the '399 and '449 patents. When properly construed, the T/R device and host must have two-way communication, not just data transfer from one to the other. The word "between" requires two-way communication, and later language in the claims uses the words "from" and "to" showing a contrast with the "between" language used for this communication. *Cf. e.g.*, "a data request command from the host device to the type of input/output device..." and "transfer of the digital

data to the host device." This language also shows that communication between the host and T/R device must be bi-directional (commands from the host and data transfer from the T/R device, i.e., if the host requests the data, the T/R device must be able to send data in response thereto). There must be an interchange or exchange of data, as claimed and as plainly taught in the specification. *See, e.g.*, the abstract ("communication between"); '399, 1:9-14 (distinguishing data acquisition and two-way communication).

The '399 patent, at column 5, lines 47-63, also discusses first that data must be "acquired, and transferred to the host device," and in the very next sentence distinguishes that from communication: "The data transmit/receive device itself can also communicate actively with the host device." The communication is described as something different from an intermediate memory merely storing and then sending on data to the host, and it requires, as the claims state, actual communication between the T/R device and the host computer. *See also*, 6:55-68 (the host computer user reading data "from the data transmit/receive device . . ." and discussing the interface function of transferring data "from the data transmit/receive device . . . to the host device . . . ."). The patents distinguish the claimed communication between the host and T/R device from "communication between the host device and interface device" ('399 patent, at 7:14-15). Casio also relies on the plain and ordinary meaning of these terms.

No Infringement

The Casio cameras are not and do not have Interface Devices as properly construed, as they have no separate interface, and they have nothing with the ability to regulate a plurality of interchangeable devices. The Casio cameras also do not have two way communications between the host device and interface device. Accordingly, these elements provide two reasons

why there is no infringement. With regard to equivalents, that has not been asserted by Papst. See also Casio's first response.

B. a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and

Interpretation : "Host Device" means a separate and distinct hardware component from the interface device or the data transmit/receive device. The host device must include software drivers for input/output devices that are connected to the interface device and "customary in a host device" (see below), and also drivers for a multipurpose interface. Casio also relies on the plain and ordinary meaning of these terms.

"customary" interpretation: The term "customary" in the context of the '399 and '449 patents is vague and unsupported for any interpretation other than for "drivers for hard disks, for graphics devices or for printer devices ... or other storage devices such as floppy disk drives, CD-ROM drives or tape drives." In any event, there is nothing in the patents that suggests that cameras would be "customary". See '399 patent col. 4, lns. 27-39. Indeed the word "camera" never appears in the patent specification at all. Casio also relies on the plain and ordinary meaning of these terms.

No Infringement

The Casio cameras do not have host devices as properly construed. They are sold as stand-alone cameras. Casio cameras also have nothing to do with any "customary" drivers for hard disks, for graphics devices or for printer devices or other storage devices such as floppy disk drives, CD-ROM drives or tape drives. With regard to equivalents, that has not been asserted by Papst. See also Casio's first response.

C. **a data transmit/receive device, the data transmit/receive device being arranged for providing analog data, comprising:**

Interpretation : "Data Transmit/Receive Device" means a distinct piece of hardware separate from an Interface Device capable of providing and/or receiving analog data directly to and/or from a host device through the separate Interface Device. The Data Transmit/Receive Device must transmit and receive information in the same form.

A Data Transmit/Receive Device limitation is part of every claim of the '399 and '449 patents. A "T/R" device would be understood by a person of ordinary skill in the art to mean a device that transmits and receives information in the same form. Moreover, if the patentee had meant that different types of data could be transmitted and received, the claim could have said "a transmit device and a receive device" and these could have transmitted and received different types of data. A data/transmit device is not a device for converting data from one form to another. Further, one of ordinary skill in the art would recognize that the claim itself requires that the data format of the communication be analog, as opposed to digital. Casio also relies on the plain and ordinary meaning of these terms.

No Infringement

Casio's digital cameras are unitary pieces of hardware without interface devices separate from data transmit/receive devices. Casio's digital cameras do not have any components that can both transmit and receive analog data, and the components alleged by Papst to meet these limitations do not transmit and receive data in the same form. With regard to equivalents, that has not been asserted by Papst. See also Casio's first response.

D. **a processor;**

Interpretation: Processor means the microprocessor of a computer capable of receiving and executing logical instructions. Casio also relies on the plain and ordinary meaning of this term.

No Infringement

Casio does not dispute that its cameras have a processor, but does not infringe due to the many other missing claim elements. See also Casio's first response.

E. a memory;

Interpretation: Memory has its ordinary meaning, and includes any memory. '399 patent col. 7, lns 23-29. Casio also relies on the plain and ordinary meaning of this term.

No Infringement

Casio does not dispute that its cameras have a memory, but does not infringe due to the many other missing claim elements. See also Casio's first response.

F. a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and

Interpretation: "First connecting device" means the component of the interface device that electrically connects the host device to the separate interface device. The first connecting device also allows direct, two way communication between the host device and the interface device.

No Infringement

Casio does not provide any host device with its digital cameras and so does not meet this element of the claim, and Papst has not asserted any indirect claims of infringement. Moreover, as Casio has no "interface device" as properly interpreted, that provides another reason why this language is not met. With regard to equivalents, that has not been asserted by Papst. See also Casio's first response.

G. a second connecting device for interfacing the interface device with the data transmit/receive device, the second connecting device including a sampling circuit for sampling the analog data provided by the data transmit/receive device and an analog-to-digital converter for converting data sampled by the sampling circuit into digital data,

Interpretation: This language means a component of the interface device that electrically connects a transmit/receive device to the separate interface device. The second connecting device also must allow direct, two way communication between a transmit/receive device and the interface device. Also, the second connecting device must include both a circuit for sampling the analog data that is provided by the data transmit/receive device and an analog-to-digital converter for converting data sampled by the sampling circuit into digital data. Casio also relies on the plain and ordinary meaning of this phrase.

No Infringement

Casio's digital cameras have no second connecting device that electrically connects a transmit/receive device to a physically separate interface device. Casio's digital cameras also have no second connecting device that allows direct, two way communication between a transmit/receive device to the separate interface device. With regard to equivalents, Papst has not asserted infringement by equivalents. See also Casio's first response.

H. wherein the interface device is configured by the processor and the memory to include a first command interpreter and a second command interpreter,

Interpretation: This phrase means that the processor and the memory built into the interface device together are responsible for the configuration of the interface device into a distinct first command interpreter and a distinct second command interpreter. First command interpreter and second command interpreter are defined elsewhere. The interface device must be configured by the processor and memory, which does not include simply downloading software into the camera from an external source.

The requirement that the interface device interpreters be configured by the processor and memory is not only clear from the claim language, but also from the specification. *See, e.g.*, '399 patent, 3:36-47, 3:58-67, 4:65-5:6.

This configuration must also create all of the functionality required as defined in the definition of the first command interpreter and second command interpreter.

No Infringement

The Casio processor and memory do not configure anything that functions as a distinct first command interpreter or a distinct second command interpreter. With regard to equivalents, Papst has not asserted infringement by equivalents. See also Casio's first response.

I. **wherein the first command interpreter is configured in such a way that the command interpreter, when receiving an inquiry from the host device as to a type of a device attached to the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is an input/output device customary in a host device,**

Interpretation: This means a structure within the interface device that is configured by the processor and memory of the interface device. The first command interpreter must be capable of sending a signal to the host device when an inquiry from the host device is received requesting the type of a device that is attached to the interface device. The signal sent to the host by the first command interpreter must "lie" to the host and tell the host that something other that what is connected to the host is connected. *See, eg.*, File History of the '399 patent. This means that regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, the host device must receive a signal that an input/output device "customary" (see response to Interrogatory No. 2) in a host device is attached to the second

connecting device of the interface device. Casio also relies on the plain and ordinary meanings of this phrase.

No Infringement

Casio's digital cameras have no structure or functionality that is configured by any interface device's processor and memory that functions as required by this claim language. Further, Casio's digital cameras never "lie" to the host computer about what is connected. With regard to equivalents, Papst has not asserted infringement by equivalents. See also Casio's first response.

J. whereupon the host device communicates with the interface device by means of the driver for the input/output device customary in a host device, and

Interpretation: This phrase means that the host device communicates with the interface device using a driver that is "customary" in a host device. The communication, through the "customary" driver must occur regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device. See the response to Interrogatory No. 2 regarding the "customary" language of the claim.

No Infringement

Casio's digital cameras do not communicate using a "customary" driver, as that term is not clear. See the response to Interrogatory No. 2. With regard to equivalents, Papst has not asserted infringement by equivalents. See also Casio's first response.

K. wherein the second command interpreter is configured to interpret a data request command from the host device to the type of input/output device signaled by the first command interpreter as a data transfer command for initiating a transfer of the digital data to the host device.

Interpretation: "Second command interpreter" means a structure or component within the interface device that is configured by the processor and memory of the interface device. This

second command interpreter must be capable receiving a data request command from a host computer in the format of a device that the first command interpreter had previously "lied" to the host computer about. This second command interpreter must be capable of understanding the data request command from the host as a data transfer command for initiating the transfer of digital data to the host device.

No Infringement

Casio's digital cameras have no structure or functionality that is configured by any interface device's processor and memory that functions as required by the term second command interpreter. With regard to equivalents, Papst has not asserted infringement by equivalents. See also Casio's first response.

II. Claim 1 of U.S. Patent No. 6,895,449

A. An interface device for communication between

"Interface Device" interpretation: "Interface Device" means a physically separate and distinct component different from the host device or the Data Transmit/Receive Device that is capable of regulating the electrical communications between host device and a plurality of interchangeable kinds of data transmit/receive devices.

Both patents teach an interface device that is separate from the transmit/receive ("T/R") device. For example, the '449 patent states at 7:23-30: "In the interface device according to the present invention, an enormous advantage is to be gained . . . in separating the actual hardware . . . [which] allows a plurality of dissimilar device types. . . .". Similarly, at 1:56-65, the patent discusses different uses of the interface, e.g., a "large number of applications," and it refers to "any data transmit/receive devices which can be attached to the second connecting device. . . ." (6:41-42). The patents also state that "the interface device according to the present invention . . .

[can be used] as an interface between a host device and almost any data transmit/receive device" ('449 patent, 6:45-49). See also the claims, which refer to a "multi-purpose" interface.

The patent claims also clearly require that the interface be separate from the transmit/receive device. See, for example, the language that requires connecting devices for interfacing them, and the language that requires the host to ask what type of device is "attached" to the interface, and requires the interface device to send a signal to the host "regardless of the type of the data transmit/receive device attached." Thus, the claim language itself makes the ability of a transmit/receive device to "attach" very clear, particularly when considered in light of the specification noted above.

The patents distinguish prior art devices with specific drivers for specific transmit/receive devices. *See, e.g* ., '449 patent at 1:21-34. They also teach that the interface must be "flexible to permit attachment of very different electrical or electronic systems to a host device by means of the interface...." *Id.* at 1:58-60. Every embodiment disclosed in the patents has a separate interface device, and there is inadequate support under 35 U.S.C. 112 for anything but a separate interface device. Casio also relies on the plain and ordinary meaning of these terms.

"communication between" interpretation: "Communication Between" means two-way communication directly between the host and input/output device.

The "communication between" limitation is part of every claim of the '399 and '449 patents. When properly construed, the T/R device and host must have two-way communication, not just data transfer from one to the other. The word "between" requires two-way communication, and later language in the claims uses the words "from" and "to" showing a contrast with the "between" language used for this communication. *Cf. e.g.*, "a data request command from the host device to the type of input/output device..." and "transfer of the digital

data to the host device." This language also shows that communication between the host and T/R device must be bi-directional (commands from the host and data transfer from the T/R device, i.e., if the host requests the data, the T/R device must be able to send data in response thereto). There must be an interchange or exchange of data, as claimed and as plainly taught in the specification. *See, e.g.,* the abstract ("communication between"); '399, 1:13-17 (distinguishing data acquisition and two-way communication).

The '449 patent, at 4:46-62, also discusses first that data must be "acquired, and transferred to the host device," and in the very next sentence distinguishes that from communication: "The data transmit/receive device itself can also communicate actively with the host device." The communication is described as something different from an intermediate memory merely storing and then sending on data to the host, and it requires, as the claims state, actual communication between the T/R device and the host computer. *See also*, 5:55-67 (the host computer user reading data "from the data transmit/receive device . . ." and discussing the interface function of transferring data "from the data transmit/receive device . . . to the host device . . . ."). The patents distinguish the claimed communication between the host and T/R device from "communication between the host device and interface device" ('449 patent, at 6:13-15). Casio also relies on the plain and ordinary meaning of these terms.

No Infringement

The Casio cameras are not and do not have Interface Devices as properly construed, as they have no separate interface, and they have nothing with the ability to regulate a plurality of interchangeable devices. The Casio cameras also do not have two way communications between the host device and interface device. Accordingly, these elements provide two reasons why there

is no infringement. With regard to equivalents, that has not been asserted by Papst. See also Casio's first response.

B. a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and

Interpretation : "Host Device" means a separate and distinct hardware component from the interface device or the data transmit/receive device. The host device must include software drivers for input/output devices that are connected to the interface device and "customary in a host device" (see below), and also drivers for a multipurpose interface. Casio also relies on the plain and ordinary meaning of these terms.

"customary" interpretation: The term "customary" in the context of the '399 and '449 patents is vague and unsupported for any interpretation other than for "drivers for hard disks, for graphics devices or for printer devices ... [or] other storage devices such as floppy disk drives, CD-ROM drives or tape drives." In any event, there is nothing in the patents that suggests that cameras would be "customary". See '449 patent 3:30-43. Indeed the word camera never appears in the patent specification at all.

No Infringement

The Casio cameras do not have host devices as properly construed. They are sold as stand-alone cameras. Casio cameras also have nothing to do with any "customary" drivers for hard disks, for graphics devices or for printer devices or other storage devices such as floppy disk drives, CD-ROM drives or tape drives. With regard to equivalents, that has not been asserted by Papst. See also Casio's first response.

C. a data transmit/receive device comprising the following features:

Interpretation : "Data Transmit/Receive Device" means a distinct piece of hardware separate from an Interface Device capable of providing and/or receiving analog data directly to and/or

from a host device through the separate Interface Device. The Data Transmit/Receive Device must transmit and receive information in the same form.

A Data Transmit/Receive Device limitation is part of every claim of the '399 and '449 patents. A "T/R" device would be understood by a person of ordinary skill in the art to mean a device that transmits and receives information in the same form. Moreover, if the patentee had meant that different types of data could be transmitted and received, the claim could have said "a transmit device and a receive device" and these could have transmitted and received different types of data. A data/transmit device is not a device for converting data from one form to another. Further, one of ordinary skill in the art would recognize that the claim itself requires that the data format of the communication be analog, as opposed to digital. Casio also relies on the plain and ordinary meaning of these terms.

No Infringement

Casio's digital cameras are unitary pieces of hardware without interface devices separate from data transmit/receive devices. Casio's digital cameras do not have any components that can both transmit and receive analog data, and the components alleged by Papst to meet these limitations do not transmit and receive data in the same form. With regard to equivalents, that has not been asserted by Papst. See also Casio's first response.

D. a processor;

Interpretation: Processor means the microprocessor of a computer capable of receiving and executing logical instructions. Casio also relies on the plain and ordinary meaning of this term.

No Infringement

Casio does not dispute that its cameras have a processor, but does not infringe due to the many other missing claim elements. See also Casio's first response.

E. a memory;

Interpretation: Memory has its ordinary meaning, and includes any memory. '449 patent, at 6:23-29. Casio also relies on the plain and ordinary meaning of this term.

No Infringement

Casio does not dispute that its cameras have a memory, but does not infringe due to the many other missing claim elements. See also Casio's first response.

F. a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and

Interpretation: "First connecting device" means the component of the interface device that electrically connects the host device to the separate interface device. The first connecting device also allows direct, two way communication between the host device and the interface device.

No Infringement

Casio does not provide any host device with its digital cameras and so does not meet this element of the claim, and Papst has not asserted any indirect claims of infringement. Moreover, as Casio has no "interface device" as properly interpreted, that provides another reason why this language is not met. With regard to equivalents, that has not been asserted by Papst. See also Casio's first response.

G. a second connecting device for interfacing the interface device with the data transmit/receive device,

Interpretation: This language means a component of the interface device that electrically connects a transmit/receive device to the separate interface device. The second connecting device also must allow direct, two way communication between a transmit/receive device and the interface device. Casio also relies on the plain and ordinary meaning of this phrase.

No Infringement

Casio's digital cameras have no second connecting device that electrically connects a transmit/receive device to a physically separate interface device. Casio's digital cameras also have no second connecting device that allows direct, two way communication between a transmit/receive device to the separate interface device. With regard to equivalents, Papst has not asserted infringement by equivalents. See also Casio's first response.

H. **wherein the interface device is configured by the processor and the memory in such a way that the interface device, when receiving an inquiry from the host device as to the type of a device attached to the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is a storage device customary in a host device,**

Interpretation: This term means that the processor and the memory built into the interface device together are responsible for the configuration of the interface device to provide the specific functionality described in the rest of the claim. This configuration must enable the interface device to be able to signal to the host that a storage device customary in the host device is attached to the interface device regardless of the type of transmit/receive device actually attached to the interface device.

The interface device must be configured by the processor and memory, which does not include simply downloading software into the camera from an external source. The requirement that the interface device interpreters be configured by the processor and memory is not only clear from the claim language, but also from the specification. *See, e.g.*, '449 patent, 4:6-10.

No Infringement

The processor in combination with the memory in Casio digital cameras do not configure anything to provide functionality to an interface device allowing a signal to be sent to a host that a storage device customary in the host device is attached to the interface device regardless of the

type of transmit/receive device actually attached to the interface device. With regard to equivalents, Papst has not asserted infringement by equivalents. See also Casio's first response.

I. whereupon the host device communicates with the interface device by means of the driver for the storage device customary in a host device, and

Interpretation: This phrase means that the host device sends messages to the interface device using a storage device driver that is "customary" in a host device. The communication, through the "customary" driver must occur regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device

The specific language "customary in a host device" is not capable of interpretation. See response to Interrogatory No. 2.

No Infringement

Casio's digital cameras can not be interpreted as customary devices, to the extent the term is definable. Casio's digital cameras are cameras and require drivers associated with cameras, not storage devices.

J. wherein the interface device is arranged for simulating a virtual file system to the host, the virtual file system including a directory structure.

"virtual file system" interpretation: A file system that is not real, but instead simulates a hard disk file system.

A virtual file system is described, for example, in the '449 patent at 4:67-5:2: the interface device "simulates a hard disk with a root directory whose entries are 'virtual' files which can be created for the most varied functions." Also, as described in the '449 patent at 11:1-6 and the '399 patent at 11:66-12:4: "Using the ASPI manager the interface device according to the present invention can now obtain active access to an SCSI hard disk of the host device connected to the same SCSI bus which, in contrast to the interface device, cannot be a

virtual but a real SCSI mass storage device or also a further interface device according to the present invention." *See also*, '449 patent, 12:25-33, and the '449 prosecution history (e.g., 5/17/04 Notice of Allowability).

No Infringement

The file system associated with photographic data in Casio's digital cameras is not virtual, but is an actual file system associated with the storage of data on the internal memory card of Casio's digital cameras.

INTERROGATORY NO. 2: Describe in full and complete detail the bases for the allegations in Casio's Complaint that the Patents-in-Suit are invalid for failing to comply with the patent laws of the United States.

OBJECTIONS

Casio, Inc. objects to the deceptive nature in which this interrogatory was written. Stating the interrogatory in this manner, and "defining" it to be wildly overbroad and to request information not even remotely related to the request as written, is an obvious attempt to deceive Casio into inadvertently waiving objections, or dupe the Court into thinking that Papst is being reasonable in its requests. The request violates Federal Rule 26(g) as "defined" in the Papst instructions, and Papst is hereby put on notice that, in the event this interrogatory is ever brought before the Court, the full overbroad scope of what Papst seeks must be shown to the Court, including the deceptive manner in which Papst attempted to get that information.

Casio objects to the definition provided to this interrogatory, as overbroad, unduly burdensome, calling for irrelevant information not reasonably calculated to lead to the discovery of admissible information, as calling for information that is subject to the attorney client privilege, work product, or other immunity, calls for disclosure of confidential information to Welsh & Katz, and calls for documents and information that are only relevant to the damages and willfulness issues, which will be subject to Casio's motion to bifurcate. Casio will respond only by considering the actual interrogatory recited above, and will provide information only for the first independent claims of the patents as Papst has to date refused to (or has been unable to) explain how the Casio cameras supposedly infringe on these patents. After receiving the Papst analyses, Casio will provide reasonable detail on the reasons for its defenses. All other requests are overly broad, unduly burdensome and calls for information that is irrelevant and not reasonably calculated to lead to the discovery of admissible evidence.

Casio reserves its right to supplement this response as the case proceeds, including but not limited to supplementation after the Court construes the claims, and upon learning Papst's proposed constructions and contentions which, to date, Papst has been unable to provide.

Casio objects to this Interrogatory as improperly being characterized as one interrogatory because its many subparts constitute separate interrogatories. See Fed. R. Civ. P. 33(a).

Subject to its general and specific objections, Casio responds as follows.

FIRST RESPONSE:

The claims of the Papst patents, particularly if read broadly enough to cover any Casio camera, would be invalid under at least 35 U.S.C. sections 112, 102, and 103. Unfortunately, despite this Court's order that discovery proceed and Papst's obligation to provide this information, Papst has refused to (or been unable to) provide claim constructions and analyses as to how these patents could possibly be read broadly enough to cover the Casio cameras. If and when Papst does so, Casio will show how the Papst claim constructions cannot read on the Casio cameras without also encompassing the prior art and otherwise rendering the patents invalid.

SUPPLEMENTAL RESPONSE

Section 112 and the Papst proposed interpretations

If any of the Papst claim constructions are seriously considered, then those terms are indefinite as the true interpretation is far different and Papst could not have particularly pointed out or distinctly claimed the invention. Further, it appears that if Papst were to sufficiently set forth its proposed claim constructions such that its claims could read on digital cameras, they would likely be refutable based on statements made during the prosecution of the Papst patents. *Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473 (Fed. Cir. 1998). Moreover, if those extremely broad interpretations are accepted, then the claims are invalid for lack of enabling disclosures and failure to satisfy the written description requirements. As none of the Papst claim constructions are correct, however, Casio simply reserves its right to argue these issues if any one or more of the interpretations is seriously considered by the Court. The support for all these arguments is found in the response and supplemental response to Interrogatory 1. That is, the patent specifications clearly teach that the Casio interpretations are correct, and if another interpretation is seriously considered then the specifications do not enable that broad scope or show that the alleged inventor was in possession of that broad scope. Please see the responses to Interrogatory 1.

Section 112 and "customary"

All the claims require that the interface device tell the personal computer that what is attached is a device "customary" in a host computer. The patent specifications and claims have no sufficient indication of the meaning of that term, of what might be included, and it provides no standard for how one would measure what is or is not "customary" to a host. Indeed, there is no standard "host" in the claims that could even serve as a basis by which to attempt to judge this "customary" language.

The specifications and prosecution history provide no guidance as to what devices might be considered "customary" in a host, and particularly in situations like the present case where there is close prior art, the claims should be properly declared invalid.

Prior Art

Casio strongly disagrees with the Papst claim analysis. The following claim charts show, however, that even if Papst could read the claims on the Casio cameras, the prior art would invalidate those claims. Papst has refused, despite multiple court orders, to provide its proposed claim interpretations, and so it is not possible to properly compare the Papst analysis to the prior art. However, for these prior art references, there is no difference from the accused cameras insofar as these patent claims are concerned. Because Papst failed to comply with the Court orders and provide its proposed interpretations, we are forced to use the Papst language attempting to apply the claim language to the Casio cameras. Casio reserves the right to supplement this response should Papst ever fulfill its discovery obligations and comply with the Court orders.

1. **Prior art against the '399 patent (priority date 3/4/97, Germany)**

a. US Patent No. 6,088,532

This patent was filed in the US on 12/29/95 and is 102(e) art (its Japanese priority application, published on 7/23/96, is 102(b) art). Figures 30-31 and Col. 22, line 15-col. 23, line 43 of the '532 patent teach an embodiment where a camera itself incorporates an interface device between a computer and a hard disk. When the "external hard disk" mode is set, the digital camera is used as an external memory for the computer. The computer first issues a standard "INQUIRY" SCSI command and the camera outputs data indicating it is now used as a hard disk. The computer can then issue other standard SCSI command such as "READ CAPACITY" and "FORMAT UNIT" to the camera to control and hard disk (see 23:30-43).

The '532 patent would invalidate by anticipation the '399 patent based on Papst's analysis as far as it can be understood, while Papst still refuses to provide claim interpretations.

See the Claim Chart Comparing the '399 patent and the '532 Patent below:

Claim 1 of the '399 Patent	US Patent No. 6,088,532 (the '532 Patent)
1. An interface device for communication between	The '532 patent includes an "interface device" that is formed by at least a portion of the CPU (included in the system control circuit **20**) and the on-chip memory **64** that are part of the camera (see Figures 2, 30 and 6:7-10).
A host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and	The '532 camera can be connected to, for example, a personal computer that utilizes drivers for a variety of input/output devices. The PC has at least one SCSI port, which is a multi-purpose interface. (see Figures 1 and 30, 22:15-32, 23: 7-10 (mentioning SCSI interface)). As for the required driver for devices "customary" in a host, Papst fails to provide that interpretation.

A data transmit/receive device, the data transmit/receive device being arranged for providing analog data, comprising:	The '532 camera includes a "data transmit/receive device" formed at least in part by a lens **12** and the diode array formed in a CCD chip **44** that converts light into analog data that is representative of an image (see Figures 2, 30 and 6:11-7:3).
A processor;	The '532 patent includes system control circuit **20** that includes a microprocessor (see 6:7-10).
A memory;	The camera also has a memory **64** for storing the digitized image data (see Fig. 30). The system control circuit **20** also includes on-chip memory that stores the programs used by the microprocessor.
A first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and	The '532 camera includes an output terminal **17**, which can be a SCSI socket that can be connected to a SCSI port of a personal computer by a SCSI cable (see Fig. 30 and 23:7-10). The '532 camera also includes a SCSI interface that is located on the camera. The "first connecting device" is formed by at least the SCSI socket, the SCSI interface on the camera, and the electrical connection between the two.
A second connecting device for interfacing the interface device with the data transmit/receive device,	The '532 camera includes a CCD chip **44** having a gates and registers block for sampling the analog data provided by the CCD as well as an analog-to-digital converter **62** and a CCD controller **47** for converting data sampled by the sampling circuit into digital data (see Figures 2, 30 and 6:66-7:42). The a/d converter, the gates and registers block, and the CCD controller form at least a portion of the "second connecting device."
the second connecting device including a sampling circuit for sampling the analog data provided by the data transmit/receive device and	The '532 camera includes a gates and registers block that forms a part of a CCD chip **44** and a CCD controller **47** that forms a part of a CCD controller chip. At least the gates and registers block and the CCD controller form at least a portion of a "sampling circuit."

An analog-to-digital converter for converting data sampled by the sampling circuit into digital data,	The '532 camera includes an a/d converter **62**. The a/d converter **62** converts the analog data supplied to it from the gates and registers block into digital data that is representative of an image (see Figures 2, 30 and 6:66-7:42).
wherein the interface device is configured by the processor and the memory to include a first command interpreter and a second command interpreter,	An instruction set is programmed into the on-chip memory of the system control circuit **20** of the '532 camera (see 6:7-10). At least a portion of the instruction set forms a "first command interpreter" and a "second command interpreter".
wherein the first command interpreter is configured in such a way that the command interpreter, when receiving an inquiry from the host device as to a type of a device attached to the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is an input/output device customary in a host device,	The output terminal **17** of the '532 camera is adapted to receive inquiry signals that the computer sends to its SCSI port to determine when something is operatively coupled thereto. The "first command interpreter" is adapted to cause the microprocessor on the '532 camera to send, after the output terminal is coupled to the PC's SCSI port, and after an inquiry signal has been received and processed, a response signal comprising data stored in the on-chip memory defined in the camera to the PC's SCSI port. (see 22:15-32, 23: 7-43). When the '532 camera is in the "external hard disk mode", the response signal contains information that, when received and processed by the PC, causes the PC to recognize that it can communicate with the "interface device" by means of a software driver for the hard disk (see 23:30-44).
whereupon the host device communicates with the interface device by means of the driver for the input/output device customary in a host device, and	When the '532 camera is in the "external hard disk mode", the instruction set stored in the on-chip memory of the '532 camera is adapted to utilize a software driver for the hard disk to communicate with the PC.
wherein the second command interpreter is configured to interpret a data request command from the host device to the type of input/output device signaled by the first command interpreter as a data transfer command for initiating a transfer of the digital data to the host device.	The output terminal 17 of the '532 camera is adapted to receive data request commands that the PC sends through the SCSI port. The "send command interpreter" is adapted to cause the microprocessor to interpret a data request command from the PC as being a command to initiate a transfer of digital data to the PC. The digital data can include digitized still pictures (see 23:30-43).

b. Casio QV-10

The Casio QV-10 camera was first on sale in the US more than one year before the earliest priority date of the '399 patent, and it is thus 102(b) art. It can be connected to a computer through the standard RS-232C interface (pp. 78 of QV-10 user manual, bates-numbered CAP-010511 - CAP-010533). When connected, a user may use the interface provided by the "QV-LINK" software to retrieve images stored in the camera's memory (pps 6, 13-14 and 18-19 of the QV-LINK Owner's manual). Thus, to the extent that Papst contends that the accused products meet the claim language, and although we are unable to compare the Papst interpretations with the prior art due to Papst's refusals to comply with the Court orders, there is not reasonable distinction between the accused cameras and this prior art insofar as these patents are concerned.

See the Claim Chart Comparing the '399 Patent and QV-10 below:

Claim 1 of the '399 Patent	Casio QV-10 Digital Camera
1. An interface device for communication between	The QV-10 camera includes an interface device that is formed by at least a portion of the CPU and the on-chip memory that are part of the camera.
a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and	The QV-10 camera can be connected to, for example, a personal computer that utilizes drivers for a variety of input/output devices. The PC has at least a RS-232C interface (pp. 78 of QV-10 user manual), which is a multi-purpose interface.
a data transmit/receive device, the data transmit/receive device being arranged for providing analog data, comprising:	The QV-10 camera includes a "data transmit/receive device" formed at least in part by a lens and the diode array formed on a CCD chip that converts light into analog data that is representative or an image.
a processor;	The QV-10 camera includes a processor (CPU).
a memory;	The QV-10 camera includes an on-chip

	memory that is located on the camera. The on-chip memory forms at least a portion of the claimed "memory."
a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and	The QV-10 camera includes a socket that can be connected to a RS-232 port of a personal computer by a cable (pp. 78 of QV-10 user manual). The "first connecting device" is formed by at least the socket, the RS-232 interface on the camera, and the electrical connections between the two.
a second connecting device for interfacing the interface device with the data transmit/receive device,	The QV-10 camera includes a CCD chip having a gates and registers block, as well as a CCD controller. At least the a/d converter, the gates and resisters block, and the CCD controller form at least a part of a "second connecting device."
the second connecting device including a sampling circuit for sampling the analog data provided by the data transmit/receive device and	The QV-10 camera includes a gates and registers block that forms a part of a CCD chip and a CCD controller that forms a part of a CCD controller chip. At least the gates and registers block and the CCD controller form at least a portion of a first "sampling circuit."
an analog-to-digital converter for converting data sampled by the sampling circuit into digital data,	The QV-10 camera includes an a/d converter that converts the analog data supplied to it from the gates and registers block into digital data that is representative of an image.
wherein the interface device is configured by the processor and the memory to include a first command interpreter and a second command interpreter,	An instruction set is programmed into the memory of the QV-10 camera. At least a portion of the instruction set forms a "first command interpreter" and a "second command interpreter".
wherein the first command interpreter is configured in such a way that the command interpreter, when receiving an inquiry from the host device as to a type of a device attached to the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is an input/output device customary in a host device,	The socket of the QV-10 camera is adapted to receive inquiry signals that the PC sends to its port to determine when something is operatively connected thereto. The "first command interpreter" is adapted to cause the processor on the QV-10 camera to send, after it is coupled to the PC's RSC-232 port, and after an inquiry signal has been received and processed, a response signal comprising data stored in the on-chip memory defined in the camera. The response signal contains information that, when received and processed by the PC, causes the PC to recognize that it

	can communicate with the "interface device" by means of a software driver for a device that stores digital images.
whereupon the host device communicates with the interface device by means of the driver for the input/output device customary in a host device, and	The computer communicates with the QV-10 camera by means of the QV-LINK driver software to allow the "interface device" to communicate with the PC.
wherein the second command interpreter is configured to interpret a data request command from the host device to the type of input/output device signaled by the first command interpreter as a data transfer command for initiating a transfer of the digital data to the host device.	A user may use the interface provided by the "QV-LINK" software to view the images stored in the QV-10 camera's memory in a directory structure and retrieve the image files (pps 6, 13-14 and 18-19 of the QV-LINK Owner's manual). The QV-10 camera includes a second command interpreter that is adapted to cause the processor of the QV-10 camera to interpret a data request command from the PC as being a command to initialize a transfer of digital data to the PC. The digital data can include digitized pictures.

c. The Kodak DCS 200

The Kodak DCS 200 camera was first on sale in the US around 1992-93 and is thus 102(b) art. It can be connected to a computer through the standard SCSI interface (pp. 5-10 through 5-11 of Kodak DCS description, bates-numbered CAP-22804-805). Like the QV-10, it needs a software driver to retrieve images stored in the camera's memory (Id.). To the extent Papst asserts that the claims cover the accused cameras, they would also cover this prior art.

See the Claim Chart Comparing the '399 Patent and Kodak DCS 200 below:

Claim 1 of the '399 Patent	Kodak DCS 200 Digital Camera
1. An interface device for communication between	The DCS200 camera includes an interface device that is formed by at least a portion of the CPU and the on-chip memory that are part of the camera.
a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and	The DCS200 camera can be connected to, for example, a personal computer that utilizes drivers for a variety of input/output devices.

	The PC has at least a SCSI (pp. 8 of Kodak DCS description), which is a multi-purpose interface.
a data transmit/receive device, the data transmit/receive device being arranged for providing analog data, comprising:	The DCS200 camera includes a "data transmit/receive device" formed at least in part by a lens and the diode array formed on a CCD chip that converts light into analog data that is representative or an image .
a processor;	The DCS 200 camera includes a processor (CPU).
a memory;	The DCS 200 camera includes an on-chip memory that is located on the camera. The on-chip memory forms at least a portion of the claimed "memory."
a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and	The DCS200 camera includes a socket that can be connected to a SCSI interface of a person computer by a cable (pp. 8 of Kodak DCS description). The "first connecting device" is formed by at least the socket, the SCSI interface on the camera, and the electrical connection between the two.
a second connecting device for interfacing the interface device with the data transmit/receive device,	The DCS200 camera includes a CCD chip having gates and registers block, as well as a CCD controller chip that includes an a/d converter and a CCD controller. At least the a/d converter, the gates and register block, and the CCD controller form at least a part of a "second connecting device." The sample circuit and the a/d converter form at least a portion of the "second connecting device."
the second connecting device including a sampling circuit for sampling the analog data provided by the data transmit/receive device and	The DCS200 camera includes a gates and registers block that forms a part of a CCD chip and a CCD controller that forms a part of a CCD controller chip. At least the gates and registers block and the CCD controller form at least a portion of a first "sampling circuit."
an analog-to-digital converter for converting data sampled by the sampling circuit into digital data,	The DCS200 camera includes an a/d converter that converts the analog data supplied to it from the gates and registers block into digital data that is representative of a image.

wherein the interface device is configured by the processor and the memory to include a first command interpreter and a second command interpreter,	An instruction set is inherently programmed into the on-chip memory of the DCS200 camera. At least a portion of the instruction set forms a "first command interpreter" and a "second command interpreter".
wherein the first command interpreter is configured in such a way that the command interpreter, when receiving an inquiry from the host device as to a type of a device attached to the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is an input/output device customary in a host device,	The socket of the DCS200 camera is adapted to receive inquiry signals that the PC sends to its port to determine when something is operatively connected thereto. The "first command interpreter" is adapted to cause the processor on the DCS200 camera to send, after it is coupled to the PC's SCSI port, and after an inquiry signal has been received and processed, a response signal comprising data stored in the on-chip memory defined in the camera. The response signal contains information that, when received and processed by the PC, causes the PC to recognize that it can communicate with the "interface device" by means of a software driver for a device that stores digital images.
whereupon the host device communicates with the interface device by means of the driver for the input/output device customary in a host device, and	The computer communicates with the DCS200 camera by means of the DCS200 driver software to allow the "interface device" to communicate with the PC.
wherein the second command interpreter is configured to interpret a data request command from the host device to the type of input/output device signaled by the first command interpreter as a data transfer command for initiating a transfer of the digital data to the host device.	A user may use the interface provided by the driver software to view the images stored in the DCS 200 camera's memory in a directory structure and retrieve the images files. The DCS200 camera inherently includes a second command interpreter that is adapted to cause the processor of the DCS200 camera to interpret a data request command from the PC as being a command to initialize a transfer of digital data to the PC. The digital data can include digitized pictures.

2. Prior art against the '449 patent (priority date 3/4/97, Germany)

The '449 patent is a continuation of the '399 patent.

a. Claim Chart Comparing the '449 patent and the '532 Patent

Claim 1 of the '449 Patent	US Patent No. 6,088,532 (the '532 Patent)
1. An interface device for communication between	The '532 patent includes an "interface device" that is formed by at least a portion of the CPU (included in the system control circuit **20**) and the on-chip memory **64** that are part of the camera (see Figures 2, 30 and 6:7-10).
a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and	The '532 camera can be connected to, for example, a personal computer that utilizes drivers for a variety of input/output devices. The PC has at least one SCSI port, which is a multi-purpose interface. (see Figures 1 and 30, 22:15-32, 23: 7-10 (mentioning SCSI interface)). As for the required driver for devices "customary" in a host, Papst fails to provide that interpretation.
a data transmit/receive device comprising the following features:	The '532 camera includes a "data transmit/receive device" formed at least in part by a lens **12** and the diode array formed in a CCD chip **44** that converts light into analog data that is representative or an image (see Figures 2, 30 and 6:11-7:3).
a processor;	The camera includes system control circuit **20** that includes a microprocessor (see 6:7-10).
a memory;	The camera also has a memory **64** for storing the digitized image data (see Fig. 30). The system control circuit **20** also includes on-chip memory that stores the programs used by the microprocessor.
a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and	The '532 camera includes an output terminal **17**, which can be a SCSI socket that can be connected to a SCSI port of a person computer

	by a SCSI cable (see Fig. 30 and 23:7-10). The '532 camera also includes a SCSI interface that is located on the camera. The "first connecting device" is formed by at least the SCSI socket, the SCSI interface on the camera, and the electrical connection between the two.
a second connecting device for interfacing the interface device with the data transmit/receive device,	The '532 camera includes a CCD chip **44** having a gates and registers block for sampling the analog data provided by the CCD as well as an analog-to-digital converter **62** and a CCD controller **47** for converting data sampled by the sampling circuit into digital data (see Figures 2, 30 and 6:66-7:42). At least, the a/d converter, the gates and registers block, and the CCD controller form at least a portion of the "second connecting device."
wherein the interface device is configured by the processor and the memory in such a way that the interface device, when receiving an inquiry from the host device as to the type of a device attached to the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is a storage device customary in a host device,	The SCSI socket of the '532 camera is adapted to receive inquiry signals that the PC sends to its SCSI port to determine when something is operatively coupled thereto. An instruction set is programmed into the on-chip memory of the camera of the '532 camera. The instruction set is adapted to cause the CPU on the camera to send, after the SCSI socket is coupled to the PC's SCSI port, and after an inquiry signal has been received and processed, a response signal comprising data stored in the on-chip memory defined in the camera and audio chip to the PC's SCSI port. When the '532 camera is in the "external hard disk mode", the response signal contains information that, when received and processed by the PC, causes the PC to recognize that it can communicate with the "interface device" by means of a software driver for a disk drive, which is an input/output device customary in a computer (see 22:15-32, 23: 7-44).
whereupon the host device communicates with the interface device by means of the driver for the storage device customary in a host device, and	When the '532 camera is in the "external hard disk mode", the instruction set stored in the on-chip memory of the '532 camera is inherently adapted to utilize a software driver for hard disk to communicate with the PC.
wherein the interface device is arranged for simulating a virtual file system to the host, the	The instruction set stored in the on-chip memory of the '532 camera is adapted to store

virtual file system including a directory structure.	pictures in a file system and a directory structure defined in its memory. The file system is "virtual" – the digitized pictures being representatives of images.

b. Claim Chart Comparing the '449 Patent and QV-10

Claim 1 of the '449 Patent	Casio QV-10 Digital Camera
1. An interface device for communication between	The QV-10 camera includes an interface device that is formed by at least a portion of the CPU and the on-chip memory that are part of the camera.
a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and	The QV-10 camera can be connected to, for example, a personal computer that utilizes drivers for a variety of input/output devices. The PC has at least a RS-232C interface (pp. 78 of QV-10 user manual), which is a multi-purpose interface.
a data transmit/receive device comprising the following features:	The QV-10 camera includes a "data transmit/receive device" formed at least in part by a lens and the diode array formed on a CCD chip that converts light into analog data that is representative or an image.
a processor;	The QV-10 camera includes a processor (CPU).
a memory;	The QV-10 camera includes an on-chip memory that is located on the camera. The on-chip memory forms at least a portion of the claimed "memory."
a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and	The QV-10 camera includes a socket that can be connected to a RS-232 port of a personal computer by a cable (pp. 78 of QV-10 user manual). The "first connecting device" is formed by at least the socket, the RS-232 interface on the camera, and the electrical connections between the two.
a second connecting device for interfacing the interface device with the data transmit/receive device,	The QV-10 camera includes a CCD chip having a gates and registers block, as well as a CCD controller chip that includes an a/d converter and a CCD controller. At least, the a/d converter, the gates and registers block, and the CCD controller form at least a portion of the "second connecting device."

wherein the interface device is configured by the processor and the memory in such a way that the interface device, when receiving an inquiry from the host device as to the type of a device attached to the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is a storage device customary in a host device,	The socket of the QV-10 camera is adapted to receive inquiry signals that the PC sends to its port to determine when something is operatively connected thereto. An instruction set is programmed into the on-chip memory of the camera. The instruction set is adapted to cause the processor on the QV-10 camera to send, after it is coupled to the PC's RSC-232 port, and after an inquiry signal has been received and processed, a response signal comprising data stored in the on-chip memory defined in the camera. The response signal contains information that, when received and processed by the PC, causes the PC to recognize that it can communicate with the "interface device" by means of a software driver for a device that stores digital images.
whereupon the host device communicates with the interface device by means of the driver for the storage device customary in a host device, and	The instruction set stored in the on-chip memory of the QV-10 camera is adapted to utilize a software driver to allow the "interface device" to communicate with the PC.
wherein the interface device is arranged for simulating a virtual file system to the host, the virtual file system including a directory structure.	The instruction set stored in the on-chip memory of the QV-10 camera is adapted to store pictures in a file system and a directory structure defined in its memory. The file system is "virtual" – the digitized pictures being representatives of images. After the socket of the QV-10 camera is coupled to a RSC-232 port on a PC, a representation of all of the digitized analog data that are stored in the memory is shown on the screen of the PC as being contained in a file folder (pps 6, 13-14 and 18-19 of the QV-LINK Owner's manual).

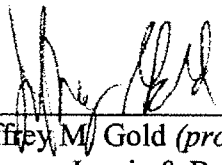
c. Claim Chart Comparing the '449 Patent and Kodak DCS 200

Claim 1 of the '449 Patent	Kodak DCS 200 Digital Camera
1. An interface device for communication between	The DCS200 camera includes an interface device that is formed by at least a portion of the CPU and the on-chip memory that are part of the camera.

a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and	The DCS200 camera can be connected to, for example, a personal computer that utilizes drivers for a variety of input/output devices. The PC has at least a SCSI (pp. 8 of Kodak DCS description), which is a multi-purpose interface.
a data transmit/receive device comprising the following features:	The DCS200 camera includes a "data transmit/receive device" formed at least in part by a lens and the diode array formed on a CCD chip that converts light into analog data that is representative or an image .
a processor;	The DCS 200 camera includes a processor (CPU).
a memory;	The DCS 200 camera includes an on-chip memory that is located on the camera. The on-chip memory forms at least a portion of the claimed "memory."
a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and	The DCS200 camera includes a socket that can be connected to a SCSI interface of a person computer by a cable (pp. 8 of Kodak DCS description). The "first connecting device" is formed by at least the socket, the SCSI interface on the camera, and the electrical connection between the two.
a second connecting device for interfacing the interface device with the data transmit/receive device,	The DCS200 camera includes a CCD chip having a gates and registers block, as well as a CCD controller chip that includes an a/d converter and a CCD controller. At least, the a/d converter, the gates and registers block, and the CCD controller form at least a portion of the "second connecting device."
wherein the interface device is configured by the processor and the memory in such a way that the interface device, when receiving an inquiry from the host device as to the type of a device attached to the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is a storage device customary in a host device,	The socket of the DSC200 camera is adapted to receive inquiry signals that the PC sends to its port to determine when something is operatively connected thereto. An instruction set is programmed into the on-chip memory of the camera. The instruction set is adapted to cause the processor on the DCS200 camera to send, after it is coupled to the PC's SCSI port, and after an inquiry signal has been received and processed, a response signal comprising data stored in the on-chip memory defined in the camera. The response signal contains

	information that, when received and processed by the PC, causes the PC to recognize that it can communicate with the "interface device" by means of a software driver for a device that stores digital images.
whereupon the host device communicates with the interface device by means of the driver for the storage device customary in a host device,	The instruction set stored in the on-chip memory of the DCS200 camera is adapted to utilize a software driver to allow the "interface device" to communicate with the PC.
and wherein the interface device is arranged for simulating a virtual file system to the host, the virtual file system including a directory structure.	The instruction set stored in the on-chip memory of the DCS200 camera is adapted to store pictures in a file system and a directory structure defined in its memory. The file system is "virtual" – the digitized pictures being representatives of images.

DATED: June 22, 2007



Jeffrey M. Gold *(pro hac vice)*
Morgan Lewis & Bockius LLP
101 Park Avenue
New York, New York 10178

J. Kevin Fee (Bar. No. 494016)
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Avenue, NW
Washington, D.C. 20004

Scott D. Stimpson, Esq. (*pro hac vice*)
The Law Office of Scott D. Stimpson
445 Hamilton Avenue, 11th Floor
White Plains, New York 10601
Tel. 203-258-8412

Attorneys for Plaintiff and Counter Defendant
Casio Inc. and Counter Defendant
Casio Computer Co., Ltd.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing CASIO INC.'S SUPPLEMENTAL OBJECTIONS AND RESPONSES TO PAPST LICENSING GMBH & CO. KG'S FIRST SET OF INTERROGATORIES TO CASIO INC. was served on this, the 22nd day of June, 2007, upon the attorneys for Papst as follows:

VIA U.S. MAIL and E-MAIL
Jerold B. Schnayer
Joseph E. Cwik
WELSH & KATZ, LTD.
120 South Riverside Plaza • 22nd Floor
Chicago, Illinois 60606

Campbell Killefer (Bar No. 268433)
VENABLE LLP
575 7th Street, N.W.
Washington, D.C. 20004
(202) 344-4000

Attorneys for Defendant/Counter-Plaintiff,
Papst Licensing GmbH & Co. KG

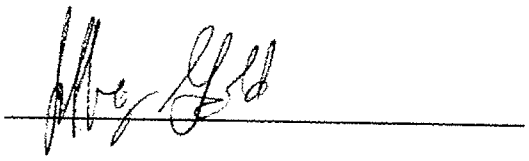


EXHIBIT F

Cwik, Joseph

From: Cwik, Joseph
Sent: Tuesday, June 12, 2007 5:09 PM
To: Scott Stimpson; Jeffrey Gold; lkrawczyk@morganlewis.com; Kevin He; jkfee@morganlewis.com
Cc: Schnayer, Jerold; Sliwinski, Cynthia; Killefer, Campbell
Subject: Insufficient Casio Discovery Responses

Scott,

We are available for a phone conference tomorrow, June 13 at 10:00 a.m. (Chicago time) 11:00 a.m. (NYC time). Also, in another good faith effort to move the discovery ball forward, we propose that Casio's initial round of discovery answers and document productions, to the extent those answers and document productions relate to technical subjects concerning Casio's digital cameras, be focused on the following technical subjects:

1. The acquisition and processing of light images by cameras including, for example, the conversion of light images into electrical signals representative of the light images.
2. The processing by a camera of electrical signals representative of light images including, for example, the conversion of analog signals representative of light images into digital electrical signals, and the transfer of those digital electrical signals to an electronic memory.
3. The operation of any computer program stored in a memory of a camera as it concerns any of the other subject matters set forth in this list.
4. The storage of information in a memory of a camera, including but not limited to external memory cards and other electronic memory intended to be attached to a camera.
5. The interconnection of a camera to a personal computer.
6. The transfer of digital electrical signals representative of light images from a camera to a personal computer including, for example, the process by which the personal computer recognizes how to communicate with and receive data from the camera.
7. The process by which a camera communicates with and transfers information to or from a personal computer.
8. The acquisition and processing of sound waves by cameras, how the sound waves are converted to digital electrical signals by the camera, how those digital electrical signals are processed and stored by the camera, and how those digital electrical signals are downloaded from the camera to a personal computer.

To the extent that any of the documents in Casio's possession relate in any way to these subjects, even if they also relate to other subjects, we expect Casio to produce those documents to us.

This proposal is not intended in any way to be a withdrawal of any Papst Licensing discovery request. Each of Papst Licensing's requests is proper and remains pending. Should Casio's production of information and documents on these topics still be insufficient, Papst Licensing reserves the right to seek additional information responsive to its requests.

Please confirm that you are available discuss tomorrow, and identify the phone number we should call into. We look forward to your response.

Regards,
Joe

Joseph E. Cwik

EXHIBIT G

Papst Document Categories and Corresponding Exemplary Claim Language

Papst Document Categories	Corresponding Exemplary Claim Language
1. The acquisition and processing of light images by cameras including, for example, the conversion of light images into electrical signals representative of the light images.	See, for example, Patent 6,470,399 Claim 1; "a data transmit/receive device, the data transmit/receive being arranged for providing analog data" The Casio Infringing Products include a first "data transmit/receive device" formed at least in part by a lens and the diode array formed in a CCD chip that converts light into analog data that is representative of an image.
2. The processing by a camera of electrical signals representative of light images including, for example, the conversion of analog signals representative of light images into digital electrical signals, and the transfer of those digital electrical signals to an electronic memory.	See, for example, Patent 6,470,399 Claim 1 "an analog-to-digital converter for converting data sampled by the sampling circuit into digital data, wherein the interface device is configured by the processor and memory…"
3. The operation of any computer program stored in a memory of a camera as it concerns any of the other subject matters set forth in this list.	See, for example, Patent 6,895,399 Claim 1 "wherein the interface device is configured by the processor and the memory to include a first command interpreter and a second command interpreter…" This claim element reads on, for example, a set of program instructions that is stored in memory of a device in accordance with the other claim elements that are executed by a processor of the device to cause the device to operate in a certain way as described later in the claim.
4. The storage of information in a memory of a camera, including but not limited to external memory cards and other electronic memory intended to be attached to a camera.	See, for example, Patent 6,895,399 Claim 1 "a memory" The Casio Infringing Products include an on-chip memory that is located on the camera and audio chip and a memory card that can be located in a socket. "wherein the interface device is configured by the processor and the memory to include a first command interpreter and a second command interpreter…" This claim element reads on, for example, a set of program instructions that is stored in memory of a device in accordance with the other claim elements that are executed by a processor of the device to cause the device to operate in a certain way as described later in the claim.

Papst Document Categories	Corresponding Exemplary Claim Language
5. The interconnection of a camera to a personal computer.	See, for example, Patent 6,470,399 Claim 1 at Col. 12 Lines 53-57 "a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and a second connecting device for interfacing the interface device with the data transmit/receive device". The Casio Infringing Products include a USB socket that can be connected to a USB port of a personal computer by a USB cable. The Casio Infringing Products also include a USB interface that is located on the camera and audio chip. The "first connecting device" is formed by at least the USB socket, the USB interface on the camera and audio chip, and the electrical connections between the two.
6. The transfer of digital electrical signals representative of light images from a camera to a personal computer including, for example, the process by which the personal computer recognizes how to communicate with and receive data from the camera.	See, for example, Patent 6,470,399 Claim 1 "the first command interpreter is configured in such a way that the command interpreter, when receiving an inquiry from the host device as to a type of a device attached to the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device which signals to the host device that it is an input/output device customary in a host device, whereupon the host device communicates with the interface device by means of the driver for the input/output device customary in a host device". "the second command interpreter is configured to interpret a data request command from the host device to the type of input/output device signaled by the first command interpreter as a data transfer command for initiating a transfer of the digital data to the host device."
7. The process by which a camera communicates with and transfers information to or from a personal computer.	See, for example, Patent 6,470,399 Claim 1 a "the first command interpreter is configured in such a way that the command interpreter, when receiving an inquiry from the host device as to a type of a device attached to the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device which signals to the host device that it is an

Papst Document Categories	Corresponding Exemplary Claim Language
	input/output device customary in a host device, whereupon the host device communicates with the interface device by means of the driver for the input/output device customary in a host device". "the second command interpreter is configured to interpret a data request command from the host device to the type of input/output device signaled by the first command interpreter as a data transfer command for initiating a transfer of the digital data to the host device."
8. The acquisition and processing of sound waves by cameras, how the sound waves are converted to digital electrical signals by the camera, how those digital electrical signals are processed and stored by the camera, and how those digital electrical signals are downloaded from the camera to a personal computer.	See, for example, Patent 6,470,399 Claim 1. All of the above citations relating to the acquisition, processing, conversion, storage and transfer of light images are repeated herein as they also apply to sound waves.

US006470399B1

EXHIBIT H

(12) **United States Patent**
Tasler

(10) **Patent No.: US 6,470,399 B1**
(45) **Date of Patent: Oct. 22, 2002**

(54) **FLEXIBLE INTERFACE FOR COMMUNICATION BETWEEN A HOST AND AN ANALOG I/O DEVICE CONNECTED TO THE INTERFACE REGARDLESS THE TYPE OF THE I/O DEVICE**

(75) Inventor: **Michael Tasler**, Würzburg (DE)

(73) Assignee: **Labortechnik Tasler GmbH**, Wuerzburg (DE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/331,002**

(22) PCT Filed: **Mar. 3, 1998**

(86) PCT No.: **PCT/EP98/01187**

§ 371 (c)(1),
(2), (4) Date: **Jun. 14, 1999**

(87) PCT Pub. No.: **WO98/39710**

PCT Pub. Date: **Sep. 11, 1998**

(30) **Foreign Application Priority Data**

Mar. 4, 1997 (DE) 197 08 755

(51) **Int. Cl.**[7] **G06F 13/14**
(52) **U.S. Cl.** **710/16**; 710/62; 710/63
(58) **Field of Search** 710/15, 16, 11, 710/12, 62, 63, 64; 703/23, 24, 25

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,291,611	A		3/1994	Davis et al.
5,297,124	A	*	3/1994	Plotkin et al. 703/25
5,430,855	A	*	7/1995	Walsh et al. 703/23
5,444,644	A		8/1995	Divjak
5,487,154	A		1/1996	Gunji
5,499,378	A	*	3/1996	McNeill et al. 703/24
5,506,692	A		4/1996	Murata
5,510,774	A		4/1996	Loncle
5,548,783	A	*	8/1996	Jones et al. 710/15
6,012,113	A	*	1/2000	Tuckner 710/64

FOREIGN PATENT DOCUMENTS

DE	195 28 889 A1	2/1997
EP	0 436 458 A2	7/1991
EP	0 685 799 A1	12/1995
JP	06301607 A	10/1994
JP	08110883 A	4/1996
WO	WO94/19746	9/1994

OTHER PUBLICATIONS

Steve Martin, "PC–based Data Acquisition in an Industrial Environment," pp. 1–3 (1990).
Payne et al., "High Speed PC–based Data Acquisition Systems," IEEE, pp. 2140–2145 (1995).
National Instruments Corporation, "Dynamic Signal Acquisition and DSP Board for the PC AT," IEEE 488 and VXIbus Control, Data Acquuisition, and Analysis, pp. 3–118–3–123, (1994).
IBM Corporation, "Communication Method between Devices through FDD Interface," IBM Technical Disclosure Bulletin, vol. 38 (No. 05), p. 245 (May, 1995).

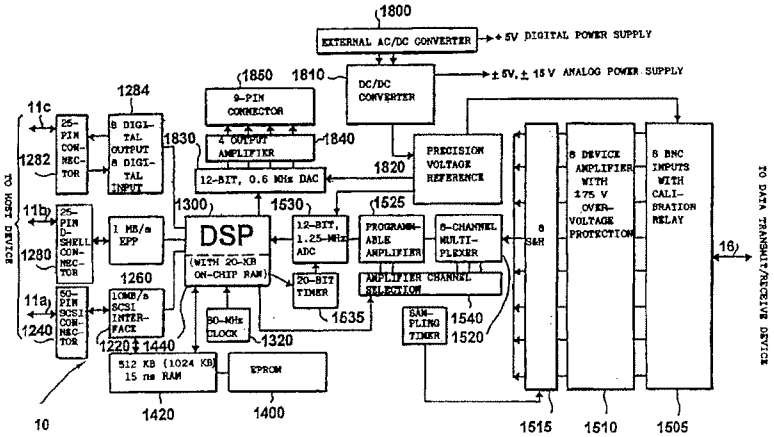
* cited by examiner

Primary Examiner—Thomas Lee
Assistant Examiner—Thuan Du
(74) *Attorney, Agent, or Firm*—Patton Boggs LLP

(57) **ABSTRACT**

An interface device **(10)** provides fast data communication between a host device with input/output interfaces and a data transmit/receive device, wherein the interface device **(10)** comprises a processor means **(13)**, a memory means **(14)**, a first connecting device **(12)** for interfacing the host device with the interface device, and a second connecting device **(15)** for interfacing the interface device **(10)** with the data transmit/receive device. The interface device **(10)** is configured by the processor means **(13)** and the memory means **(14)** in such a way that, when receiving an inquiry from the host device via the first connecting device **(12)** as to the type of a device attached to the host device, regardless of the type of the data transmit/receive device, the interface device sends a signal to the host device via the first connecting device **(12)** which signals to the host device that it is communicating with an input/output device.

15 Claims, 2 Drawing Sheets



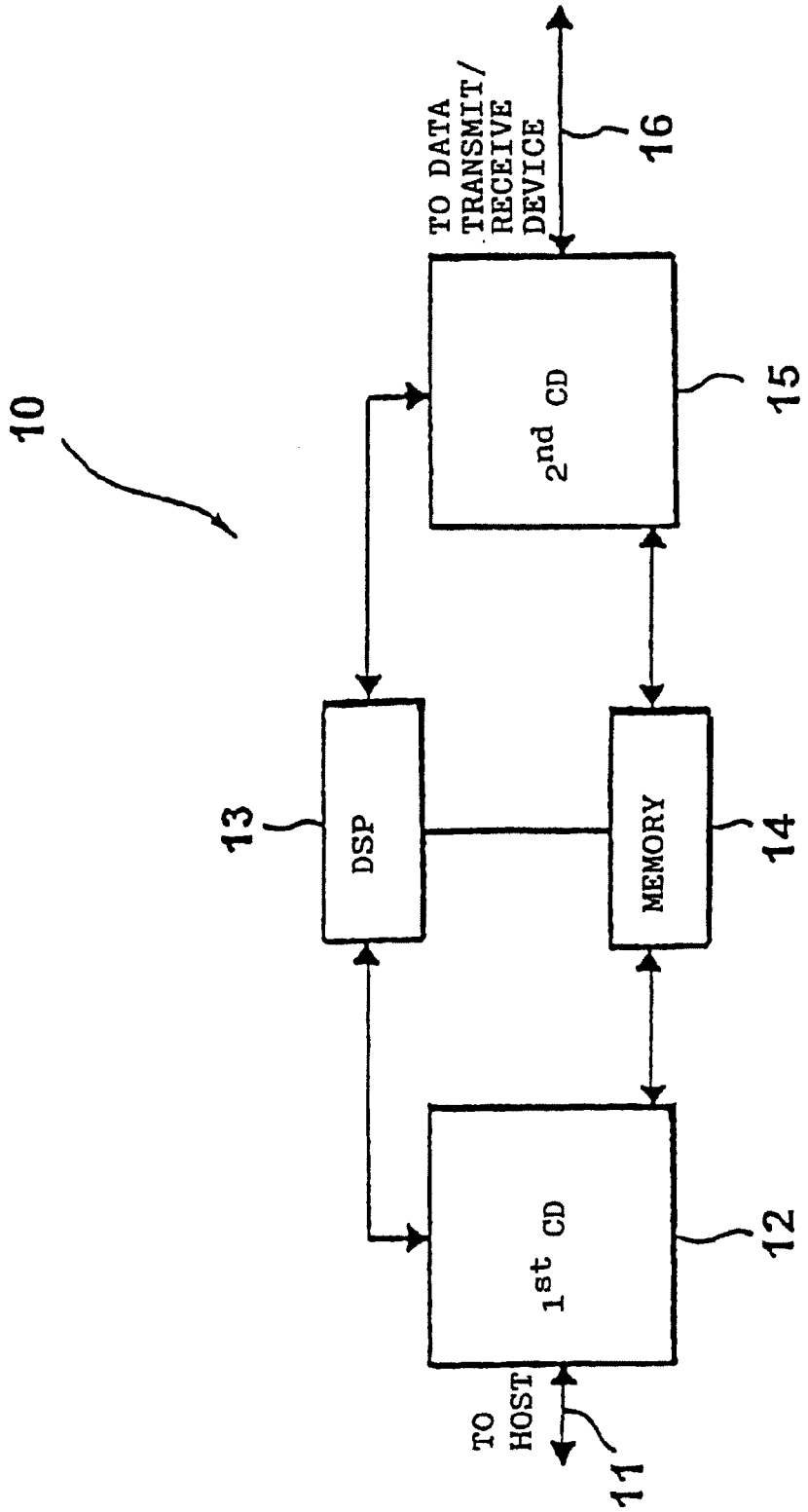

10
TO DATA TRANSMIT/ RECEIVE DEVICE
16
2nd CD
15
13
DSP
MEMORY
14
1st CD
12
TO HOST
11

FIG. 1

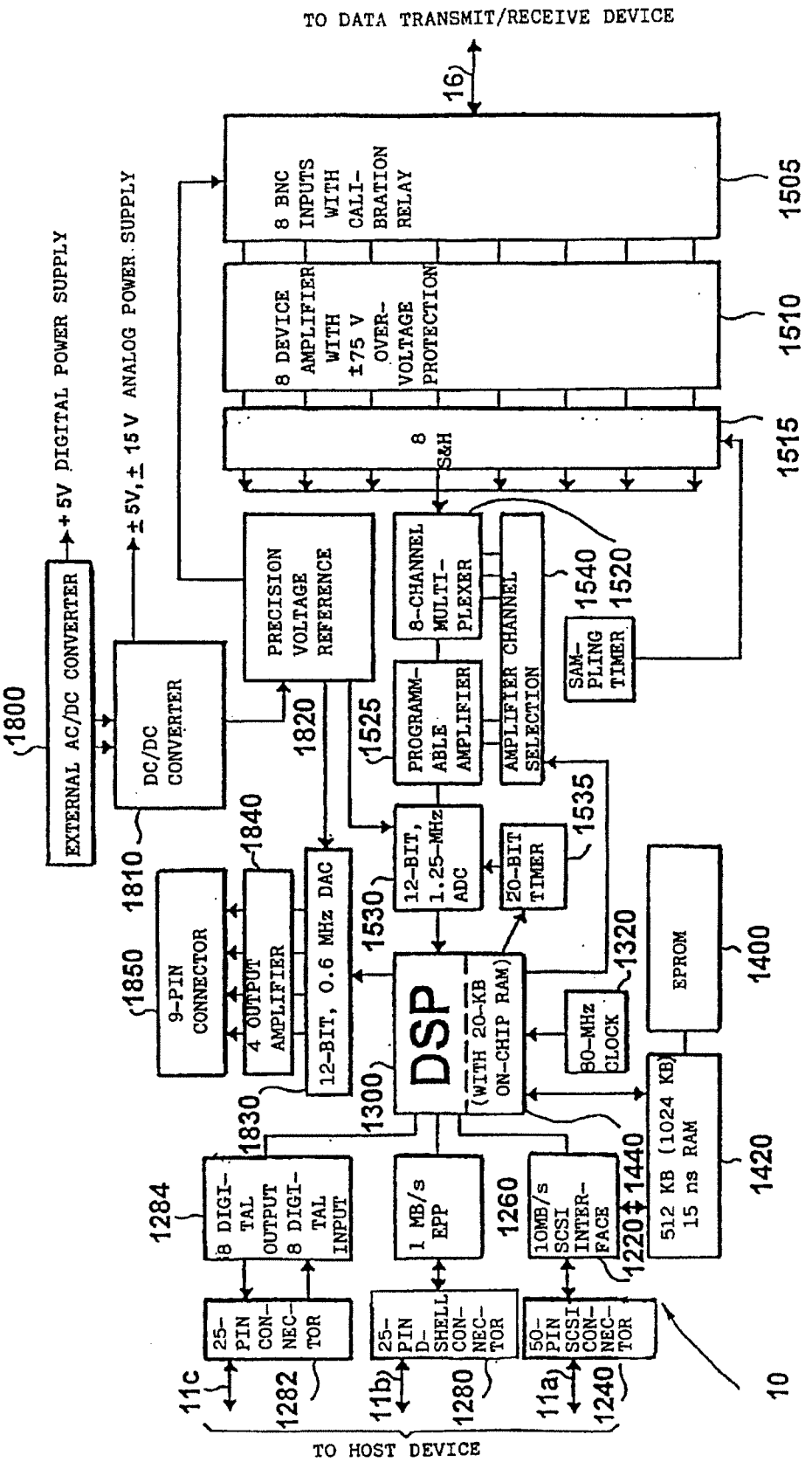

TO DATA TRANSMIT/RECEIVE DEVICE
16
8 BNC INPUTS WITH CALI-BRATION RELAY
1505
8 DEVICE AMPLIFIER WITH ±75 V OVER-VOLTAGE PROTECTION
1510
8 S&H
1515
+5V DIGITAL POWER SUPPLY
±5V, ±15 V ANALOG POWER SUPPLY
1800
EXTERNAL AC/DC CONVERTER
DC/DC CONVERTER
PRECISION VOLTAGE REFERENCE
1820
8-CHANNEL MULTI-PLEXER
PROGRAMM-ABLE AMPLIFIER
AMPLIFIER CHANNEL SELECTION
1540
1520
SAM-PLING TIMER
1525
1535
1840
1810
1850
9-PIN CONNECTOR
4 OUTPUT AMPLIFIER
12-BIT, 0.6 MHz DAC
12-BIT, 1.25-MHz ADC
20-BIT TIMER
1530
DSP
(WITH 20-KB ON-CHIP RAM)
1300
1320
80-MHz CLOCK
EPROM
1400
1830
1284
8 DIGI-TAL OUTPUT
8 DIGI-TAL INPUT
1 MB/s EPP
1260
10MB/s SCSI INTER-FACE
1220
1440
512 KB (1024 KB) 15 ns RAM
1420
25-PIN CON-NEC-TOR
1282
25-PIN D-SHELL CON-NEC-TOR
1280
50-PIN SCSI CON-NEC-TOR
1240
11c
11b
11a
10
TO HOST DEVICE

FIG.2

FLEXIBLE INTERFACE FOR COMMUNICATION BETWEEN A HOST AND AN ANALOG I/O DEVICE CONNECTED TO THE INTERFACE REGARDLESS THE TYPE OF THE I/O DEVICE

FIELD OF THE INVENTION

The present invention relates to the transfer of data and in particular to interface devices for communication between a computer or host device and a data transmit/receive device from which data is to be acquired or with which two-way communication is to take place.

BACKGROUND OF THE INVENTION

Existing data acquisition systems for computers are very limited in their areas of application. Generally such systems can be classified into two groups.

In the first group host devices or computer systems are attached by means of an interface to a device whose data is to be acquired. The interfaces of this group are normally standard interfaces which, with specific driver software, can be used with a variety of host systems. An advantage of such interfaces is that they are largely independent of the host device. However, a disadvantage is that they generally require very sophisticated drivers which are prone to malfunction and which limit data transfer rates between the device connected to the interface and the host device and vice versa. Further, it is often very difficult to implement such interfaces for portable systems and they offer few possibilities for adaptation with the result that such systems offer little flexibility.

The devices from which data is to be acquired cover the entire electrical engineering spectrum. In a typical case, it is assumed that a customer who operates, for example, a diagnostic radiology system in a medical engineering environment reports a fault. A field service technician of the system manufacturer visits the customer and reads system log files generated by the diagnostic radiology system by means a portable computer or laptop for example. If the fault cannot be localized or if the fault is intermittent, it will be necessary for the service technician to read not only an error log file but also data from current operation. It is apparent that in this case fast data transfer and rapid data analysis are necessary.

Another case requiring the use of an interface could be, for example, when an electronic measuring device, e.g. a multimeter, is attached to a computer system to transfer the data measured by the multimeter to the computer. Particularly when long-term measurements or large volumes of data are involved is it necessary for the interface to support a high data transfer rate.

From these randomly chosen examples it can be seen that an interface may be put to totally different uses. It is therefore desirable that an interface be sufficiently flexible to permit attachment of very different electrical or electronic systems to a host device by means of the interface. To prevent operator error, it is also desirable that a service technician is not required to operate different interfaces in different ways for different applications but that, if possible, a universal method of operating the interface be provided for a large number of applications.

To increase the data transfer rates across an interface, the route chosen in the second group of data acquisition systems for the interface devices was to specifically match the interface very closely to individual host systems or computer systems. The advantage of this solution is that high data transfer rates are possible. However, a disadvantage is that the drivers for the interfaces of the second group are very closely matched to a single host system with the result that they generally cannot be used with other host systems or their use is very ineffective. Further, such types of interface have the disadvantage that they must be installed inside the computer casing to achieve maximum data transfer rates as they access the internal host bus system. They are therefore generally not suitable for portable host systems in the form of laptops whose minimum possible size leaves little internal space to plug in an interface card.

DESCRIPTION OF PRIOR ART

A solution to this problem is offered by the interface devices of IOtech (business address: 25971 Cannon Road, Cleveland, Ohio 44146, USA) which are suitable for laptops such as the WaveBook/512 (registered trademark). The interface devices are connected by means of a plug-in card, approximately the size of a credit card, to the PCMCIA interface which is now a standard feature in laptops. The plug-in card converts the PCMCIA interface into an interface known in the art as IEEE 1284. The said plug-in card provides a special printer interface which is enhanced as regards the data transfer rate and delivers a data transfer rate of approximately 2 MBps as compared with a rate of approx. 1 MBps for known printer interfaces. The known interface device generally consists of a driver component, a digital signal processor, a buffer and a hardware module which terminates in a connector to which the device whose data is to be acquired is attached. The driver component is attached directly to the enhanced printer interface thus permitting the known interface device to establish a connection between a computer and the device whose data is to be acquired.

In order to work with the said interface, an interface-specific driver must be installed on the host device so that the host device can communicate with the digital signal processor of the interface card. As described above, the driver must be installed on the host device. If the driver is a driver developed specifically for the host device, a high data transfer rate is achieved but the driver cannot be easily installed on a different host system. However, if the driver is a general driver which is as flexible as possible and which can be used on many host devices, compromises must be accepted with regard to the data transfer rate.

Particularly in an application for multi-tasking systems in which several different tasks such as data acquisition, data display and editing are to be performed quasi-simultaneously, each task is normally assigned a certain priority by the host system. A driver supporting a special task requests the central processing system of the host device for processor resources in order to perform its task. Depending on the particular priority assignment method and on the driver implementation, a particular share of processor resources is assigned to a special task in particular time slots. Conflicts arise if one or more drivers are implemented in such a way that they have the highest priority by default, i.e. they are incompatible, as happens in practice in many applications. It may occur that both drivers are set to highest priority which, in the worst case, can result in a system crash.

EP 0685799 A1 discloses an interface by means of which several peripheral devices can be attached to a bus. An interface is connected between the bus of a host device and various peripheral devices. The interface comprises a finite

state machine and several branches each of which is assigned to a peripheral device. Each branch comprises a data manager, cycle control, user logic and a buffer. This known interface device provides optimal matching between a host device and a specific peripheral device.

The specialist publication IBM Technical Disclosure Bulletin, Vol. 38, No. 05, page 245; "Communication Method between Devices through FDD Interface" discloses an interface which connects a host device to a peripheral device via a floppy disk drive interface. The interface consists in particular of an address generator, an MFM encoder/decoder, a serial/parallel adapter and a format signal generator. The interface makes it possible to attach not only a floppy disk drive but also a further peripheral device to the FDD host controller of a host device. The host device assumes that a floppy disk drive is always attached to its floppy disk drive controller and communication is initiated if the address is correct. However, this document contains no information as to how communication should be possible if the interface is connected to a multi-purpose interface instead of to a floppy disk drive controller.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an interface device for communication between a host device and a data transmit/receive device whose use is host device-independent and which delivers a high data transfer rate.

In accordance with a first aspect of the present invention, this object is met by an interface device for communication between a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and a data transmit/receive device comprising: a processor; a memory; a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and a second connecting device for interfacing the interface device with the data transmit/receive device, wherein the interface device is configured by the processor and the memory in such a way that the interface device, when receiving an inquiry from the host device as to the type of a device attached to the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is an input/output device customary in a host device, whereupon the host device communicates with the interface device by means of the driver for the input/output device customary in a host device.

In accordance with a second aspect of the present invention, this object is met by an interface device for communication between a host device, which comprises a multi-purpose interface and a specific driver for this interface, and a data transmit/receive device comprising: a processor; a memory; a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and a second connecting device for interfacing the interface device with the data transmit/receive device, wherein the interface device is configured using the processor and the memory in such a way that the interface device, when receiving an inquiry from the host device as to the type of a device attached at the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is an input/output device customary in a host device, whereupon the host device communicates with the interface device by means of the specific driver for the multi-purpose interface.

In accordance with a third aspect of the present invention, this object is met by a method of communication between a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and a data transmit/receive device via an interface device comprising the steps of interfacing of the host device with a first connecting device of the interface device via the multi-purpose interface of the host device; interfacing of the data transmit/receive device with a second connecting device of the interface device; inquiring by the host device at the interface device as to the type of device to which the multi-purpose interface of the host device is attached; regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, responding to the inquiry from the host device by the interface device in such a way that it is an input/output device customary in a host device, whereupon the host device communicates with the interface device by means of the usual driver for the input/output device.

The present invention is based on the finding that both a high data transfer rate and host device-independent use can be achieved if a driver for an input/output device customary in a host device, normally present in most commercially available host devices, is utilized. Drivers for input/output devices customary in a host device which are found in practically all host devices are, for example, drivers for hard disks, for graphics devices or for printer devices. As however the hard disk interfaces in common host devices which can be, for example, IBM PCs, IBM-compatible PCs, Commodore PCs, Apple computers or even workstations, are the interfaces with the highest data transfer rate, the hard disk driver is utilized in the preferred embodiment of the interface device of the present invention. Drivers for other storage devices such as floppy disk drives, CD-ROM drives or tape drives could also be utilized in order to implement the interface device according to the present invention.

As described in the following, the interface device according to the present invention is to be attached to a host device by means of a multi-purpose interface of the host device which can be implemented, for example, as an SCSI interface or as an enhanced printer interface. Multi-purpose interfaces comprise both an interface card and specific driver software for the interface card. The driver software can be designed so that it can replace the BIOS driver routines. Communication between the host device and the devices attached to the multi-purpose interface then essentially takes place by means of the specific driver software for the multi-purpose interface and no longer primarily by means of BIOS routines of the host device. Recently however drivers for multi-purpose interfaces can also already be integrated in the BIOS system of the host device as, alongside classical input/output interfaces, multi-purpose interfaces are becoming increasingly common in host devices. It is of course also possible to use BIOS routines in parallel with the specific driver software for the multi-purpose interface, if this is desired.

The interface device according to the present invention comprises a processor means, a memory means, a first connecting device for interfacing the host device with the interface device, and a second connecting device for interfacing the interface device with the data transmit/receive device. The interface device is configured by the processor means and the memory means in such a way that the interface device, when receiving an inquiry from the host

device via the first connecting device as to the type of a device attached to the host device, sends a signal, regardless of the type of the data transmit/receive device, to the host device via the first connecting device which signals to the host device that it is communicating with an input/output device. The interface device according to the present invention therefore simulates, both in terms of hardware and software, the way in which a conventional input/output device functions, preferably that of a hard disk drive. As support for hard disks is implemented as standard in all commercially available host systems, the simulation of a hard disk, for example, can provide host device-independent use. The interface device according to the present invention therefore no longer communicates with the host device or computer by means of a specially designed driver but by means of a program which is present in the BIOS system (Basic Input/Output System) and is normally precisely matched to the specific computer system on which it is installed, or by means of a specific program for the multi-purpose interface. Consequently, the interface device according to the present invention combines the advantages of both groups. On the one hand, communication between the computer and the interface takes place by means of a host device-specific BIOS program or by means of a driver program which is matched to the multi-purpose interface and which could be regarded as a "device-specific driver". On the other hand, the BIOS program or a corresponding multi-purpose interface program which operates one of the common input/output interfaces in host systems is therefore present in all host systems so that the interface device according to the present invention is host device-independent.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, preferred embodiments of the present invention will be explained in more detail with reference to the drawings enclosed, in which:

FIG. **1** shows a general block diagram of the interface device according to the present invention; and

FIG. **2** shows detailed block diagram of an interface device according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. **1** shows a general block diagram of an interface device **10** according to the present invention. A first connecting device **12** of the interface device **10** can be attached to a host device (not shown) via a host line **11**. The first connecting device is attached both to a digital signal processor **13** and to a memory means **14**. The digital signal processor **13** and the memory means **14** are also attached to a second connecting device **15** by means of bidirectional communication lines (shown for all lines by means of two directional arrows). The second connecting device can be attached by means of an output line **16** to a data transmit/receive device which is to receive data from the host device or from which data is to be read, i.e. acquired, and transferred to the host device. The data transmit/receive device itself can also communicate actively with the host device via the first and second connecting device, as described in more detail in the following.

Communication between the host system or host device and the interface device is based on known standard access commands as supported by all known operating systems (e.g. DOS, Windows, Unix). Preferably, the interface device according to the present invention simulates a hard disk with a root directory whose entries are "virtual" files which can be created for the most varied functions. When the host device system with which the interface device according to the present invention is connected is booted and a data transmit/receive device is also attached to the interface device **10**, usual BIOS routines or multi-purpose interface programs issue an instruction, known by those skilled in the art as the INQUIRY instruction, to the input/output interfaces in the host device. The digital signal processor **13** receives this inquiry instruction via the first connecting device and generates a signal which is sent to the host device (not shown) again via the first connecting device **12** and the host line **11**. This signal indicates to the host device that, for example, a hard disk drive is attached at the interface to which the INQUIRY instruction was sent. Optionally, the host device can send an instruction, known by those skilled in the art as "Test Unit Ready", to the interface device to request more precise details regarding the queried device.

Regardless of which data transmit/receive device at the output line **16** is attached to the second connecting device, the digital signal processor **13** informs the host device that it is communicating with a hard disk drive. If the host device receives the response that a drive is present, it then sends a request to the interface device **10** to read the boot sequence which, on actual hard disks, normally resides on the first sectors of the disk. The digital signal processor **13**, whose operating system in stored in the memory means **14**, responds to this instruction by sending to the host device a virtual boot sequence which, in the case of actual drives, includes the drive type, the starting position and the length of the file allocation table (FAT), the number of sectors, etc., known to those skilled in the art. Once the host device has received this data, it assumes that the interface device **10** according to a preferred embodiment of the present invention is a hard disk drive. In reply to an instruction from the host device to display the directory of the "virtual" hard disk drive simulated by the interface device **10** with respect to the host device, the digital signal processor can respond to the host device in exactly the same way as a conventional hard disk would, namely by reading on request the file allocation table or FAT on a sector specified in the boot sequence, normally the first writable sector, and transferring it to the host device, and subsequently by transferring the directory structure of the virtual hard disk. Further, it is possible that the FAT is not read until immediately prior to reading or storing the data of the "virtual" hard disk and not already at initialization.

In a preferred embodiment of the present invention, the digital signal processor **13**, which need not necessarily be implemented as a digital signal processor but may be any other kind of microprocessor, comprises a first and a second command interpreter. The first command interpreter carries out the steps described above whilst the second command interpreter carries out the read/write assignment to specific functions. If the user now wishes to read data from the data transmit/receive device via the line **16**, the host device sends a command, for example "read file xy", to the interface device. As described above, the interface device appears to the host device as a hard disk. The second command interpreter of the digital signal processor now interprets the read command of the host processor as a data transfer command, by decoding whether "xy" denotes, for example, a "real-time input" file, a "configuration" file or an executable file, whereby the same begins to transfer data from the data transmit/receive device via the second connecting device to the first connecting device and via the line **11** to the host device.

Preferably, the volume of data to be acquired by a data transmit/receive device is specified in a configuration file described in the following by the user specifying in the said configuration file that a measurement is to last, for example, five minutes. To the host device the "real-time input" file then appears as a file whose length corresponds to the anticipated volume of data in those five minutes. Those skilled in the art know that communication between a processor and a hard disk consists of the processor transferring to the hard disk the numbers of the blocks or clusters or sectors whose contents it wishes to read. By reference to the FAT the processor knows which information is contained in which block. In this case, communication between the host device and the interface device according to the present invention therefore consists of the very fast transfer of block numbers and preferably of block number ranges because a virtual "real-time input" file will not be fragmented. If the host device now wants to read the "real-time input" file, it transfers a range of block numbers to the interface device, whereupon data commences to be received via the second connecting device and data commences to be sent to the host device via the first connecting device.

In addition to the digital signal processor instruction memory, which comprises the operating system of the digital signal processor and can be implemented as an EPROM or EEPROM, the memory means **14** can have an additional buffer for purposes of synchronizing data transfer from the data transmit/receive device to the interface device **10** and data transfer from the interface device **10** to the host device.

Preferably, the buffer is implemented as a fast random access memory or RAM buffer.

Further, from the host device the user can also create a configuration file, whose entries automatically set and control various functions of the interface device **10**, on the interface device **10** which appears to the host device as a hard disk. These settings can be, for example, gain, multiplex or sampling rate settings. By creating and editing a configuration file, normally a text file which is simple to understand with little prior knowledge, users of the interface device **10** are able to perform essentially identical operator actions for almost any data transmit/receive devices which can be attached to the second connecting device via the line **16**, thus eliminating a source of error arising from users having to know many different command codes for different applications. In the case of the interface device **10** according to the present invention it is necessary for users to note the conventions of the configuration file once only in order to be able to use the interface device **10** as an interface between a host device and almost any data transmit/receive device.

As a result of the option of storing any files in agreed formats in the memory means **14** of the interface device **10**, taking into account the maximum capacity of the memory means, any enhancements or even completely new functions of the interface device **10** can be quickly implemented. Even files executable by the host device, such as batch files or executable files (BAT or EXE files), and also help files can be implemented in the interface device, thus achieving independence of the interface device **10** from any additional software (with the exception of the BIOS routines) of the host device. On the one hand, this avoids licensing and/or registration problems and, on the other hand, installation of certain routines which can be frequently used, for example an FFT routine to examine acquired time-domain data in the frequency domain, is rendered unnecessary as the EXE files are already installed on the interface device **10** and appear in the virtual root directory, by means of which the host device can access all programs stored on the interface device **10**.

In a preferred embodiment of the present invention in which the interface device **10** simulates a hard disk to the host device, the interface device is automatically detected and readied for operation when the host system is powered up or booted. This corresponds to the plug-and-play standard which is currently finding increasingly widespread use. The user is no longer responsible for installing the interface device **10** on the host device by means of specific drivers which must also be loaded; instead the interface device **10** is automatically readied for operation when the host system is booted.

For persons skilled in the art it is however obvious that the interface device **10** is not necessarily signed on when the computer system is powered up but that a special BIOS routine or a driver for a multi-purpose interface can also be started on the host device during current operation of the computer system in order to sign on or mount the interface device **10** as an additional hard disk. This embodiment is suitable for larger workstation systems which are essentially never powered down as they perform, e.g. mail functions or monitor processes which run continuously, for example, in multi-tasking environments.

In the interface device according to the present invention an enormous advantage is to be gained, as apparent in the embodiment described in the following, in separating the actual hardware required to attach the interface device **10** to the data transmit/receive device from the communication unit, which is implemented by the digital signal processor **13**, the memory means **14** and the first connecting device **12**, as this allows a plurality of dissimilar device types to be operated in parallel in identical manner. Accordingly, many interface devices **10** can be connected to a host device which then sees many different "virtual" hard disks. In addition, any modification of the specific hardware symbolized by the second connecting device **15** can be implemented essentially without changing the operation of the interface device according to the present invention. Further, an experienced user can intervene at any time on any level of the existing second connecting device by making use of the above mentioned option of creating a configuration file or adding or storing new program sections for the second connecting device.

An important advantage of the interface device **10** of the present invention is that it also permits extremely high data transfer rates by using, for data interchange, the host device-own BIOS routines which are optimized for each host device by the host device manufacturer or BIOS system manufacturer, or by using driver programs which are normally optimized and included by the manufacturers of multi-purpose interfaces. Furthermore, due to the simulation of a virtual mass storage device, the data is managed and made available in such a way that it can be transferred directly to other storage media, e.g. to an actual hard disk of the host device without, as it were, intervention of the host device processor. The only limitation to long-term data transfer at high speed is therefore imposed exclusively by the speed and the size of the mass storage device of the host device. This is the case as the digital signal processor **13** already formats the data read by the data transmit/receive device via the second connecting device **15** into block sizes suitable for a hard disk of the host device, whereby the data transfer speed is limited only by the mechanical latency of the hard disk system of the host device. At this point, it should be noted that normally data flow from a host device must be formatted in blocks to permit writing to a hard disk and subsequent reading from a hard disk, as known by those skilled in the art.

The said data transfer rate can be increased further by setting up a direct memory access (DMA) or RAM drive in the host system. As those skilled in the art know, the setting up of a RAM drive requires processor resources of the host device, with the result that the advantage of writing the data to a hard disk drive of the host device essentially without the need for processor resources is lost.

As described above, a data buffer can be implemented in the memory means **14** to permit independence in terms of time of the data transmit/receive device attached to the second connecting device from the host device attached to the first connecting device. This guarantees error-free operation of the interface device **10** even for time-critical applications in multi-tasking host systems.

FIG. **2** shows a detailed block diagram of an interface device **10** according to the present invention.

A digital signal processor (DSP) **1300** is, in a manner of speaking, the heart of the interface device **10**. The DSP can be any DSP but preferably has a 20-MB on-chip random access memory (RAM). Certain instruction sets, for example, can be stored in the RAM already integrated in the DSP. An 80-MHz clock generator is attached to the DSP **1300** in order to synchronize the DSP. The DSP implements a fast Fourier transformation (FFT) in real time and also optional data compression of the data to be transferred from the data transmit/receive device to the host device in order to achieve greater efficiency and to permit interoperation with host devices which have a smaller memory.

In the preferred embodiment of the interface device **10** shown in FIG. **2**, the first connecting device **12** of FIG. **1** contains the following components: an SCSI interface **1220** and a 50-pin SCSI connector **1240** for attachment to an SCSI interface present on most host devices or laptops. The SCSI (small computer system interface) interface **1220** translates the data received via the SCSI connector **1240** into data understood by the DSP **1300**, as known by those skilled in the art. Further, the first connecting device **12** comprises an EPP (enhanced parallel port) with a data transfer rate of approx. 1 MBps which delivers a more moderate data transfer rate of 1 MBps by comparison to the data transfer rate of 10 MBps of the SCSI interface. The EPP **1260** is connected to a 25-pin D-shell connector **1280** to permit attachment to a printer interface of a host device for example. Optionally, the first connecting device **12** also comprises a 25-pin connector **1282** which permits the attachment of 8 digital outputs and 8 digital inputs **1284** at a host device.

Preferably, the second connecting device comprises 8 BNC inputs with the calibration relay **1505**, a block **1510** with 8 device amplifiers with an overvoltage protection of ±75 V, this block being connected in turn to 8 sample/hold (S&H) circuits **1515**. The calibration relays are relays which permit controlled changeover between a test voltage and a calibration reference voltage. Each sample/hold circuit is connected to a corresponding input of an 8-channel multiplexer **1520** which feeds its output signals via a programmable amplifier **1525** into an analog/digital converter (ADC) with 12 bit and 1.25 MHz **1530** and to the DSP **1300**. The ADC **1530** is controlled by means of a 20-bit timer **1535**, as known by persons skilled in the art. The programmable amplifier **1525** and the 8-channel multiplexer **1520** are controlled via an amplifier channel selection circuit **1540** which is in turn controlled by the DSP **1300**.

The complete interface device **10** is supplied with power by an external AC/DC converter **1800** which delivers a digital supply voltage of ±5 V and is attached to a DC/DC converter **1810** which can deliver analog supply voltages of ±5 V and ±15 V as required for the interface device **10**. Further, the DC/DC converter controls a precision voltage reference **1820** which controls the 8 BNC inputs **1505** and the ADC **1530** as well as a digital/analog converter (DAC) **1830** which permits, via an output amplifier block with 4 output amplifiers **1840** and a 9-pin connector **1850**, analog output direct from the DSP **1300** to an output device, e.g. printer device or monitor device, which can be attached via the 9-pin connector **1850**, thus providing the option of monitoring the data transferred to the host device or also, for example, of viewing an FFT to obtain rapid and comprehensive data analysis without using processor time of the host device.

In FIG. **2** the memory means **14** of FIG. **1** is implemented by an EPROM **1400** which, in a preferred embodiment of the present invention, contains the operating system of the digital signal processor **1300**. A random access memory with an access time of 15 ns and a size of 512 KB or optionally 1024 KB **1420** serves as a data buffer to achieve independence in terms of time of the output line **16** from the output lines **11***a*, **11***b* and **11***c* to the data transmit/receive device and to the host device respectively. As described above, in a preferred embodiment of the present invention the digital signal processor **1300** already contains a 20-KB on-chip RAM **1440** which can store certain instruction sets, functions and also smaller application software units.

The connection, symbolized by the line **16**, of the interface device **10** to any data transmit/receive device implements, by means of the blocks 1505–1535, an analog input with a sampling rate of 1.25 MHz and quantization of 12 bits. There are 8 channels with an overvoltage protection of ±75 V. By means of the programmable amplifier **1525** the channels can be programmed independently of each other in voltage ranges up to a maximum of ±10 V. Unused channels can be grounded internally to reduce channel intermodulation. The block **1515** is implemented as a monolithic high-precision, high-speed sample/hold amplifier for simultaneous sampling of all channels. The precision voltage reference **1820** provides a high-precision, temperature-compensated monolithic energy gap voltage reference for auto-calibration of each channel and each gain. Further, offset fine adjustment for each channel is implemented by the same.

The blocks **1830**, **1840** and **1850** implement a direct analog output for the digital signal processor **1300**, and the DAC **1830** provides a data transfer rate of 625 kHz and a quantization of 12 bits. The block **1840** comprises 4 channels with a common output latch.

Further, the interface device **10** comprises a digital input/output device implemented by the blocks **1284** and **1282**. Here there are 8 digital inputs, 8 digital outputs with a common latch, and the digital port can be attached preferably to a side panel of the interface device **10** so that the port itself can easily be accessed.

The digital signal processor **1300** provides on-board digital data processing. In particular, it is a high-performance DSP with a clock speed of 80 MHz and a 20-bit timer **1535**.

As described above, the first connecting device **12** comprises the SCSI interface **1220** with a peak transfer rate of 10 MBps. An optional PCMCIA-to-SCSI adapter permits high-speed communication with laptop computers which are desirable and in widespread use, particularly by mobile service technicians. The EPP **1260** with its associated connector **1280** permits data transfer at a more moderate rate.

As described above, the interface device **10** is supplied with power by means of an external AC/DC adapter which

has a universal power input (85–264 VAC, 47–63 Hz). Interference suppression complies with the standards EN **55022**, curve B and FFC, Class B). Further, it is also in accordance with international safety regulations (TÜV, UL, CSA). The interface device **10** is externally shielded and achieves a value of 55 dB at 30–60 MHz and a value of approximately 40 dB at 1 GHz, and therefore complies with the MILSTD 285-1 standard.

As described above, communication between the host device and the multi-purpose interface can take place not only via drivers for input/output device customary in a host device which reside in the BIOS system of the host device but also via specific interface drivers which, in the case of SCSI interfaces, are known as multi-purpose interface ASPI (advanced SCSI programming interface) drivers. This ASPI driver, which can also be referred to as an ASPI manager, is specific to a special SCSI host adapter, i.e. to a special multi-purpose interface, and is normally included by the manufacturer of the multi-purpose interface. Generally speaking, this multi-purpose interface driver has the task of moving precisely specified SCSI commands from the host system program to the host system SCSI adapter. For this reason, the command set is almost identical to that of the SCSI interface itself. Essentially, only status and reset commands for the host adapter have been added.

The ASPI driver can be used if the hard disk was not already addressable at boot time or if the SCSI-related BIOS routines of the host computer were still disabled. Here too, the steps needed to initialize the interface device, preferably as a virtual hard disk, are similar to the steps taken when initializing at boot time.

In general terms, the ASPI manager comprises two sides. One side is the proprietary, hardware-oriented side. It is responsible for converting all commands into a form required by the corresponding multi-purpose interface. The hardware-oriented side of the ASPI driver is therefore matched to a very specific type of multi-purpose interface or SCSI interface. The other side is known as the user software side. This side is totally independent of the proprietary operating characteristics of the SCSI adapter and is therefore identical for all SCSI interfaces. This permits SCSI programming which is however independent of the individual SCSI adapter types.

In contrast to communication between the host device and the interface device according to the present invention on the basis of a BIOS driver, the use of such an ASPI driver for communication between the host device and the interface device according to the present invention allows various further possibilities of the SCSI multi-purpose interface to be exploited. In the case described above, the interface device which preferably signs on and behaves as a virtual hard disk is detected by the BIOS driver of the host computer at boot time and is configured as a hard disk. This step does not however support active requests sent by the interface device to the host computer. If however the virtual hard disk wishes to write data actively to, for example, a hard disk of the host computer or wishes to initiate communication with the processor of the host computer, the host computer must recognize the request of the virtual hard disk and tolerate a further issuer of instructions on its bus. If the interface device behaves solely like a virtual hard disk, it would always receive and never issue commands. The BIOS has no objections to an additional issuer of commands that actively wishes to place data on the bus of the host device but the BIOS does not support the host device in recognizing corresponding requests of the interface device or in granting the interface device permission to access the bus.

Using the ASPI manager the interface device according to the present invention can now obtain active access to an SCSI hard disk of the host device connected to the same SCSI bus which, in contrast to the interface device, cannot be a virtual but a real SCSI mass storage device or also a further interface device according to the present invention. Thereupon, the interface device according to the present invention can write the desired data to the SCSI hard disk of the host computer totally independently of the host computer or can communicate with the same in some other manner. The interface device according to the present invention therefore initially behaves passively as a virtual hard disk and then, as required and using the driver software for the multi-purpose interface, actively on the same SCSI bus. This means however that the interface device according to the present invention, using a driver software for the multi-purpose interface which comprises the BIOS routines customary in host devices and simultaneously provides the option of active participation, can, regardless of the type of the data transmit/receive device attached to the second connecting device, behave initially as a virtual and at the same time passive hard disk but can, as required, participate actively on the bus so as to be able to initiate communication directly with other SCSI hard disks of the host device by bypassing the processor of the host device.

Using a standard interface of a host device, the interface device according to the present invention permits communication with any host device. By simulating an input/output device to the host device and, in a preferred embodiment, by simulating a virtual mass storage device, the interface device **10** is automatically supported by all known host systems without any additional sophisticated driver software. The simulation of a freely definable file structure on the "virtual" hard disk provides simple operation and expansion options and, through the implementation of any programs, independence from special software implemented on the host device. Help files included on the interface device **10** and plug-and-play support ensure ease of use even in portable, flexible host devices. Despite the very simple user interface, experienced users are free at any time to intervene in the functions of the interface device **10** on system level. The interface device **10** thus provides a universal solution which can cover the entire spectrum of possible data transmit/receive devices.

What is claimed is:

1. An interface device for communication between a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and a data transmit/receive device, the data transmit/receive device being arranged for providing analog data, comprising:

a processor;

a memory;

a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and

a second connecting device for interfacing the interface device with the data transmit/receive device, the second connecting device including a sampling circuit for sampling the analog data provided by the data transmit/receive device and an analog-to-digital converter for converting data sampled by the sampling circuit into digital data,

wherein the interface device is configured by the processor and the memory to include a first command interpreter and a second command interpreter,

wherein the first command interpreter is configured in such a way that the command interpreter, when receiving an inquiry from the host device as to a type of a device attached to the multi-purpose interface of the

host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is an input/output device customary in a host device, whereupon the host device communicates with the interface device by means of the driver for the input/output device customary in a host device, and

wherein the second command interpreter is configured to interpret a data request command from the host device to the type of input/output device signaled by the first command interpreter as a data transfer command for initiating a transfer of the digital data to the host device.

2. An interface device according to claim **1**,

wherein the drivers for input/output drivers customary in a host device comprise a hard disk driver, and the signal indicates to the host device that the host device is communicating with a hard disk.

3. An interface device according to claim **1**,

wherein the memory means comprises a buffer to buffer data to be transferred between the data transmit/receive device and the host device.

4. An interface device according to claim **1**,

wherein the multi-purpose interface of the host device is an SCSI interface and the first connecting device also comprises an SCSI interface.

5. An interface device according to claim **1**,

wherein the processor is a digital signal processor.

6. An interface device according to claim **2**,

wherein the data to be transferred from the data transmit/receive device to the host device in the interface device is formatted in a suitable format for a hard disk present in the host device.

7. An interface device according to claim **2**,

which further comprises a root directory and virtual files which are present on the signaled hard disk drive and which can be accessed from the host device.

8. An interface device according to claim **7**,

wherein the virtual files comprise a configuration file in text format which are stored in the memory means and using which the user can configure the interface device for a specific data transmit/receive device.

9. An interface device according to claim **7**,

wherein the virtual files comprise batch files or executable files for the microprocessor means which are stored in the interface device in order to perform data processing, independently of the host device, of data received via the second connecting device.

10. An interface device according to claim **7**,

wherein the virtual files comprise batch files or executable files for the host device which are stored in the interface device.

11. An interface device for communication between a host device, which comprises a multi-purpose interface and a specific driver for this interface, and a data transmit/receive device, the data transmit/receive device being arranged for providing analog data, comprising:

a processor;

a memory;

a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and

a second connecting device for interfacing the interface device with the data transmit/receive device, the second connecting device including a sampling circuit for sampling the analog data provided by the data transmit/receive device and an analog-to-digital converter for converting data sampled by the sampling circuit into digital data,

where the interface device is configured using the processor and the memory to include a first command interpreter and a second command interpreter,

wherein the first command interpreter is configured in such a way that the interface device, when receiving an inquiry from the host device as to the type of a device attached at the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is an input/output device customary in a host device, whereupon the host device communicates with the interface device by means of the specific driver for the multi-purpose interface, and

wherein the second command interpreter is configured to interpret a data request command from the host device to the type of input/output device signaled by the first command interpreter as a data transfer command for initiating a transfer of the digital data to the host device.

12. An interface device according to claim **11**, wherein in addition to the first connecting device of the interface device, there is a further input/output device at the multi-purpose interface of the host device, and wherein the interface device can communicate directly with said further input/output device via the specific driver for the multi-purpose interface.

13. An interface device according to claim **11**,

wherein the multi-purpose interface is an SCSI interface, and wherein the specific driver for the multi-purpose interface is an ASPI manager.

14. A method of communication between a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and a data transmit/receive device, the data transmit/receive device being arranged for providing analog data, via an interface device, comprising:

interfacing of the host device with a first connecting device of the interface device via the multi-purpose interface of the host device;

interfacing of the data transmit/receive device with a second connecting device of the interface device, the second connecting device including a sampling circuit for sampling the analog data provided by the data/transmit/receive device and an analog-to-digital converter for converting data sampled by the sampling circuit into digital data;

inquiring by the host device at the interface device as to the type of device to which the multi-purpose interface of the host device is attached;

regardless of the type of the data transmit/receive data attached to the second connecting device of the interface device, responding to the inquiry from the host device by the interface device in such a way that it is an input/output device customary in a host device, whereupon the host device communicates with the interface device by means of the usual driver for the input/output device, and

interpreting a data request command from the host device to the type of input/output device customary in the host device as a data transfer command for initiating a transfer of the digital data to the host device.

15. A method according to claim **14**,

wherein the drivers for input/output devices customary in a host device comprise a driver for a storage device and in particular for a hard disk drive.

* * * * *

EXHIBIT I

US006895449B2

(12) **United States Patent**
Tasler

(10) **Patent No.: US 6,895,449 B2**
(45) **Date of Patent: May 17, 2005**

(54) **FLEXIBLE INTERFACE FOR COMMUNICATION BETWEEN A HOST AND AN ANALOG I/O DEVICE CONNECTED TO THE INTERFACE REGARDLESS THE TYPE OF THE I/O DEVICE**

(75) Inventor: **Michael Tasler**, Wuerzburg (DE)

(73) Assignee: **Labortechnik Tasler GmbH**, Wuerzburg (DE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 369 days.

(21) Appl. No.: **10/219,105**

(22) Filed: **Aug. 15, 2002**

(65) **Prior Publication Data**

US 2002/0199037 A1 Dec. 26, 2002

Related U.S. Application Data

(62) Division of application No. 09/331,002, filed on Jun. 14, 1999.

(30) **Foreign Application Priority Data**

Mar. 4, 1997 (DE) 197 08 755
Mar. 3, 1998 (EP) PCT/EP98/01187

(51) **Int. Cl.**[7] **G06F 13/14**
(52) **U.S. Cl.** **710/16**; 710/8; 710/64; 709/220
(58) **Field of Search** 710/8, 16, 64, 710/11, 12, 15, 62, 63; 703/23, 24, 25; 709/220, 222

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,548,783	A *	8/1996	Jones et al.	710/16
5,596,628	A *	1/1997	Klein	379/93.11
5,628,030	A *	5/1997	Tuckner	710/64
6,012,113	A *	1/2000	Tuckner	710/64
6,266,711	B1 *	7/2001	Ishikawa et al.	710/8
6,363,081	B1 *	3/2002	Gase	370/466
6,725,293	B1 *	4/2004	Nakayama et al.	710/36
6,728,844	B2 *	4/2004	Sanada et al.	711/152

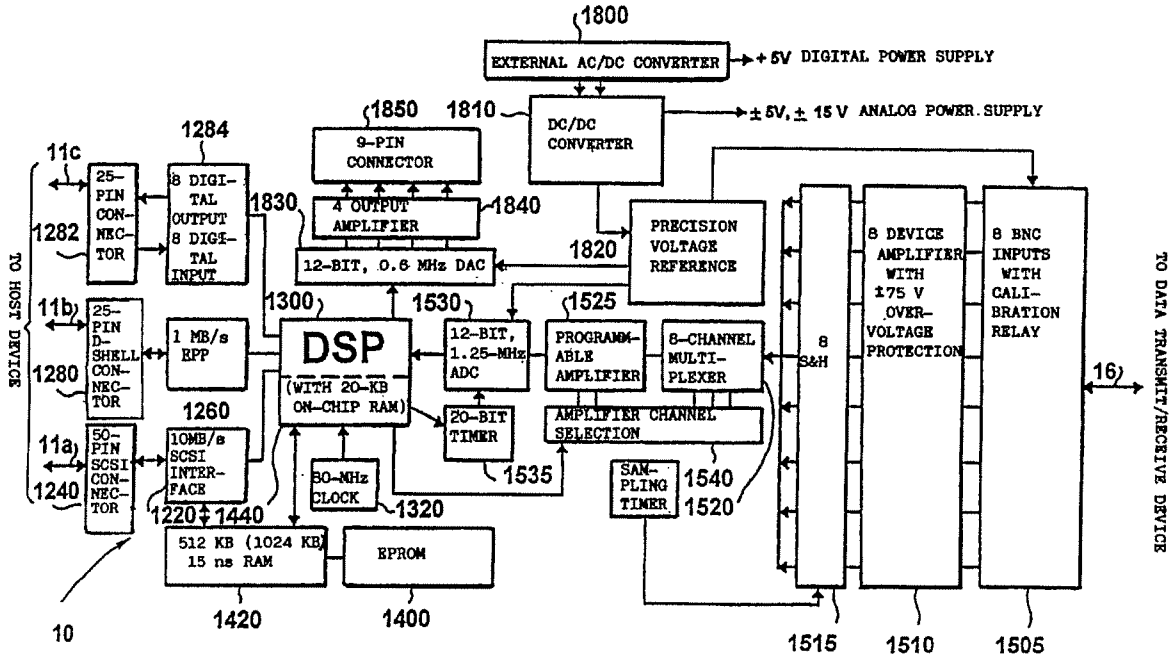
* cited by examiner

Primary Examiner—Jeffrey Gaffin
Assistant Examiner—Harold Kim
(74) *Attorney, Agent, or Firm*—Glenn Patent Group; Michael A. Glenn

(57) **ABSTRACT**

An interface device **(10)** provides fast data communication between a host device with input/output interfaces and a data transmit/receive device, wherein the interface device **(10)** comprises a processor means **(13)**, a memory means **(14)**, a first connecting device **(12)** for interfacing the host device with the interface device, and a second connecting device **(15)** for interfacing the interface device **(10)** with the data transmit/receive device. The interface device **(10)** is configured by the processor means **(13)** and the memory means **(14)** in such a way that, when receiving an inquiry from the host device via the first connecting device **(12)** as to the type of a device attached to the host device, regardless of the type of the data transmit/receive device, the interface device sends a signal to the host device via the first connecting device **(12)** which signals to the host device that it is communicating with an input/output device.

18 Claims, 2 Drawing Sheets



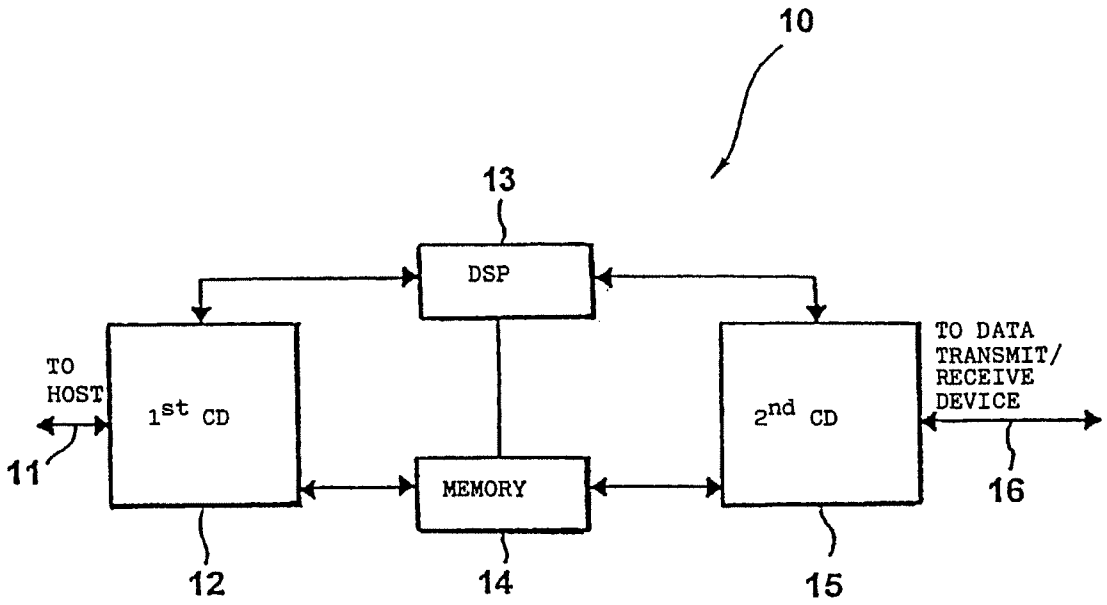

10
13
DSP
TO HOST
1st CD
2nd CD
TO DATA TRANSMIT/ RECEIVE DEVICE
MEMORY
11
12
14
15
16

FIG. 1

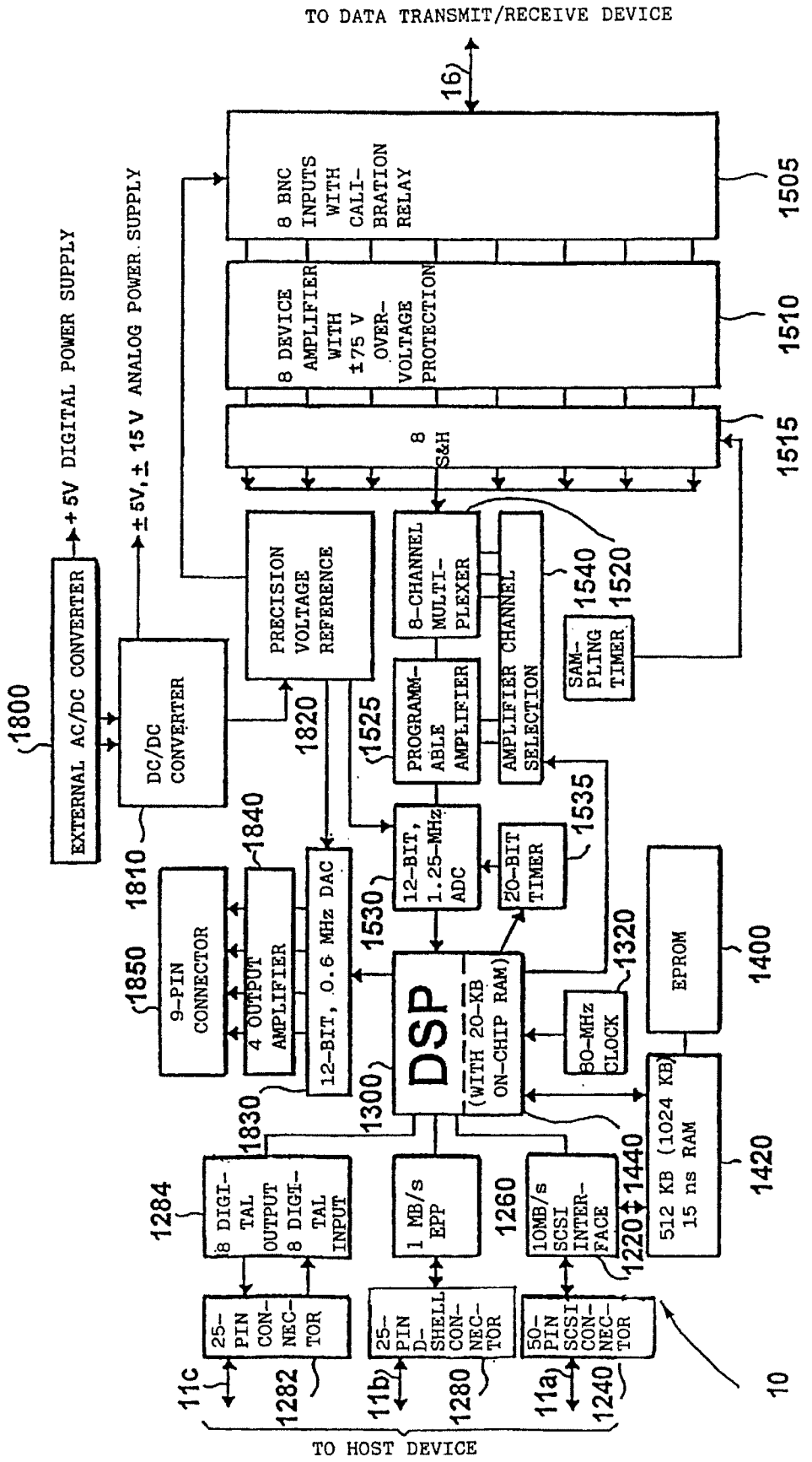

TO DATA TRANSMIT/RECEIVE DEVICE
16
8 BNC INPUTS WITH CALI-BRATION RELAY
1505
8 DEVICE AMPLIFIER WITH ±75 V OVER-VOLTAGE PROTECTION
1510
8 S&H
1515
+5V DIGITAL POWER SUPPLY
±5V, ±15V ANALOG POWER SUPPLY
EXTERNAL AC/DC CONVERTER
1800
DC/DC CONVERTER
PRECISION VOLTAGE REFERENCE
1820
8-CHANNEL MULTI-PLEXER
PROGRAMM-ABLE AMPLIFIER
1525
AMPLIFIER CHANNEL SELECTION
1540
1520
SAM-PLING TIMER
1810
1840
9-PIN CONNECTOR
1850
4 OUTPUT AMPLIFIER
12-BIT, 0.6 MHz DAC
12-BIT, 1.25-MHz ADC
1530
20-BIT TIMER
1535
DSP
(WITH 20-KB ON-CHIP RAM)
1300
80-MHz CLOCK
1320
EPROM
1400
512 KB (1024 KB) 15 ns RAM
1420
1830
1284
8 DIGI-TAL OUTPUT 8 DIGI-TAL INPUT
1 MB/s EPP
1260
10MB/s SCSI INTER-FACE
1220
1440
25-PIN CON-NEC-TOR
1282
25-PIN D-SHELL CON-NEC-TOR
1280
50-PIN SCSI CON-NEC-TOR
1240
11c
11b
11a
10
TO HOST DEVICE

FIG.2

FLEXIBLE INTERFACE FOR COMMUNICATION BETWEEN A HOST AND AN ANALOG I/O DEVICE CONNECTED TO THE INTERFACE REGARDLESS THE TYPE OF THE I/O DEVICE

RELATED APPLICATIONS

This application is a divisional application of copending application Ser. No. 09/331,002 filed Jun. 14, 1999.

DESCRIPTION

The present invention relates to the transfer of data and in particular to interface devices for communication between a computer or host device and a data transmit/receive device from which data is to be acquired or with which two-way communication is to take place.

Existing data acquisition systems for computers are very limited in their areas of application. Generally such systems can be classified into two groups.

In the first group host devices or computer systems are attached by means of an interface to a device whose data is to be acquired. The interfaces of this group are normally standard interfaces which, with specific driver software, can be used with a variety of host systems. An advantage of such interfaces is that they are largely independent of the host device. However, a disadvantage is that they generally require very sophisticated drivers which are prone to malfunction and which limit data transfer rates between the device connected to the interface and the host device and vice versa. Further, it is often very difficult to implement such interfaces for portable systems and they offer few possibilities for adaptation with the result that such systems offer little flexibility.

The devices from which data is to be acquired cover the entire electrical engineering spectrum. In a typical case, it is assumed that a customer who operates, for example, a diagnostic radiology system in a medical engineering environment reports a fault. A field service technician of the system manufacturer visits the customer and reads system log files generated by the diagnostic radiology system by means a portable computer or laptop for example. If the fault cannot be localized or if the fault is intermittent, it will be necessary for the service technician to read not only an error log file but also data from current operation. It is apparent that in this case fast data transfer and rapid data analysis are necessary.

Another case requiring the use of an interface could be, for example, when an electronic measuring device, e.g. a multimeter, is attached to a computer system to transfer the data measured by the multimeter to the computer. Particularly when long-term measurements or large volumes of data are involved is it necessary for the interface to support a high data transfer rate.

From these randomly chosen examples it can be seen that an interface may be put to totally different uses. It is therefore desirable that an interface be sufficiently flexible to permit attachment of very different electrical or electronic systems to a host device by means of the interface. To prevent operator error, it is also desirable that a service technician is not required to operate different interfaces in different ways for different applications but that, if possible, a universal method of operating the interface be provided for a large number of applications.

To increase the data transfer rates across an interface, the route chosen in the second group of data acquisition systems

for the interface devices was to specifically match the interface very closely to individual host systems or computer systems. The advantage of this solution is that high data transfer rates are possible. However, a disadvantage is that the drivers for the interfaces of the second group are very closely matched to a single host system with the result that they generally cannot be used with other host systems or their use is very ineffective. Further, such types of interface have the disadvantage that they must be installed inside the computer casing to achieve maximum data transfer rates as they access the internal host bus system. They are therefore generally not suitable for portable host systems in the form of laptops whose minimum possible size leaves little internal space to plug in an interface card.

A solution to this problem is offered by the interface devices of IOtech (business address: 25971 Cannon Road, Cleveland, Ohio 44146, USA) which are suitable for laptops such as the WaveBook/512 (registered trademark). The interface devices are connected by means of a plug-in card, approximately the size of a credit card, to the PCMCIA interface which is now a standard feature in laptops. The plug-in card converts the PCMCIA interface into an interface known in the art as IEEE 1284. The said plug-in card provides a special printer interface which is enhanced as regards the data transfer rate and delivers a data transfer rate of approximately 2 MBps as compared with a rate of approx. 1 MBps for known printer interfaces. The known interface device generally consists of a driver component, a digital signal processor, a buffer and a hardware module which terminates in a connector to which the device whose data is to be acquired is attached. The driver component is attached directly to the enhanced printer interface thus permitting the known interface device to establish a connection between a computer and the device whose data is to be acquired.

In order to work with the said interface, an interface-specific driver must be installed on the host device so that the host device can communicate with the digital signal processor of the interface card. As described above, the driver must be installed on the host device. If the driver is a driver developed specifically for the host device, a high data transfer rate is achieved but the driver cannot be easily installed on a different host system. However, if the driver is a general driver which is as flexible as possible and which can be used on many host devices, compromises must be accepted with regard to the data transfer rate.

Particularly in an application for multi-tasking systems in which several different tasks such as data acquisition, data display and editing are to be performed quasi-simultaneously, each task is normally assigned a certain priority by the host system. A driver supporting a special task requests the central processing system of the host device for processor resources in order to perform its task. Depending on the particular priority assignment method and on the driver implementation, a particular share of processor resources is assigned to a special task in particular time slots. Conflicts arise if one or more drivers are implemented in such a way that they have the highest priority by default, i.e. they are incompatible, as happens in practice in many applications. It may occur that both drivers are set to highest priority which, in the worst case, can result in a system crash.

EP 0685799 A1 discloses an interface by means of which several peripheral devices can be attached to a bus. An interface is connected between the bus of a host device and various peripheral devices. The interface comprises a finite state machine and several branches each of which is assigned to a peripheral device. Each branch comprises a

data manager, cycle control, user logic and a buffer. This known interface device provides optimal matching between a host device and a specific peripheral device.

The specialist publication IBM Technical Disclosure Bulletin, Vol. 38, No. 05, page 245; "Communication Method between Devices through FDD Interface" discloses an interface which connects a host device to a peripheral device via a floppy disk drive interface. The interface consists in particular of an address generator, an MFM encoder/decoder, a serial/parallel adapter and a format signal generator. The interface makes it possible to attach not only a floppy disk drive but also a further peripheral device to the FDD host controller of a host device. The host device assumes that a floppy disk drive is always attached to its floppy disk drive controller and communication is initiated if the address is correct. However, this document contains no information as to how communication should be possible if the interface is connected to a multi-purpose interface instead of to a floppy disk drive controller.

It is the object of the present invention to provide an interface device for communication between a host device and a data transmit/receive device whose use is host device-independent and which delivers a high data transfer rate.

This object is achieved by an interface device according to claim **1** or **12** and by a method according to claim **15**.

The present invention is based on the finding that both a high data transfer rate and host device-independent use can be achieved if a driver for an input/output device customary in a host device, normally present in most commercially available host devices, is utilized. Drivers for input/output devices customary in a host device which are found in practically all host devices are, for example, drivers for hard disks, for graphics devices or for printer devices. As however the hard disk interfaces in common host devices which can be, for example, IBM PCs, IBM-compatible PCs, Commodore PCs, Apple computers or even workstations, are the interfaces with the highest data transfer rate, the hard disk driver is utilized in the preferred embodiment of the interface device of the present invention. Drivers for other storage devices such as floppy disk drives, CD-ROM drives or tape drives could also be utilized in order to implement the interface device according to the present invention.

As described in the following, the interface device according to the present invention is to be attached to a host device by means of a multi-purpose interface of the host device which can be implemented, for example, as an SCSI interface or as an enhanced printer interface. Multi-purpose interfaces comprise both an interface card and specific driver software for the interface card. The driver software can be designed so that it can replace the BIOS driver routines. Communication between the host device and the devices attached to the multi-purpose interface then essentially takes place by means of the specific driver software for the multi-purpose interface and no longer primarily by means of BIOS routines of the host device. Recently however drivers for multi-purpose interfaces can also already be integrated in the BIOS system of the host device as, alongside classical input/output interfaces, multi-purpose interfaces are becoming increasingly common in host devices. It is of course also possible to use BIOS routines in parallel with the specific driver software for the multi-purpose interface, if this is desired.

The interface device according to the present invention comprises a processor means, a memory means, a first connecting device for interfacing the host device with the interface device, and a second connecting device for interfacing the interface device with the data transmit/receive device. The interface device is configured by the processor means and the memory means in such a way that the interface device, when receiving an inquiry from the host device via the first connecting device as to the type of a device attached to the host device, sends a signal, regardless of the type of the data transmit/receive device, to the host device via the first connecting device which signals to the host device that it is communicating with an input/output device. The interface device according to the present invention therefore simulates, both in terms of hardware and software, the way in which a conventional input/output device functions, preferably that of a hard disk drive. As support for hard disks is implemented as standard in all commercially available host systems, the simulation of a hard disk, for example, can provide host device-independent use. The interface device according to the present invention therefore no longer communicates with the host device or computer by means of a specially designed driver but by means of a program which is present in the BIOS system (Basic Input/Output System) and is normally precisely matched to the specific computer system on which it is installed, or by means of a specific program for the multi-purpose interface. Consequently, the interface device according to the present invention combines the advantages of both groups. On the one hand, communication between the computer and the interface takes place by means of a host device-specific BIOS program or by means of a driver program which is matched to the multi-purpose interface and which could be regarded as a "device-specific driver". On the other hand, the BIOS program or a corresponding multi-purpose interface program which operates one of the common input/output interfaces in host systems is therefore present in all host systems so that the interface device according to the present invention is host device-independent.

In the following, preferred embodiments of the present invention will be explained in more detail with reference to the drawings enclosed, in which:

FIG. **1** shows a general block diagram of the interface device according to the present invention; and

FIG. **2** shows a detailed block diagram of an interface device according to a preferred embodiment of the present invention.

FIG. **1** shows a general block diagram of an interface device **10** according to the present invention. A first connecting device **12** of the interface device **10** can be attached to a host device (not shown) via a host line **11**. The first connecting device is attached both to a digital signal processor **13** and to a memory means **14**. The digital signal processor **13** and the memory means **14** are also attached to a second connecting device **15** by means of bi-directional communication lines (shown for all lines by means of two directional arrows). The second connecting device can be attached by means of an output line **16** to a data transmit/receive device which is to receive data from the host device or from which data is to be read, i.e. acquired, and transferred to the host device. The data transmit/receive device itself can also communicate actively with the host device via the first and second connecting device, as described in more detail in the following.

Communication between the host system or host device and the interface device is based on known standard access commands as supported by all known operating systems (e.g. DOS, Windows, Unix). Preferably, the interface device according to the present invention simulates a hard disk with

a root directory whose entries are "virtual" files which can be created for the most varied functions. When the host device system with which the interface device according to the present invention is connected is booted and a data transmit/receive device is also attached to the interface device **10**, usual BIOS routines or multi-purpose interface programs issue an instruction, known by those skilled in the art as the INQUIRY instruction, to the input/output interfaces in the host device. The digital signal processor **13** receives this inquiry instruction via the first connecting device and generates a signal which is sent to the host device (not shown) again via the first connecting device **12** and the host line **11**. This signal indicates to the host device that, for example, a hard disk drive is attached at the interface to which the INQUIRY instruction was sent. Optionally, the host device can send an instruction, known by those skilled in the art as "Test Unit Ready", to the interface device to request more precise details regarding the queried device.

Regardless of which data transmit/receive device at the output line **16** is attached to the second connecting device, the digital signal processor **13** informs the host device that it is communicating with a hard disk drive. If the host device receives the response that a drive is present, it then sends a request to the interface device **10** to read the boot sequence which, on actual hard disks, normally resides on the first sectors of the disk. The digital signal processor **13**, whose operating system in stored in the memory means **14**, responds to this instruction by sending to the host device a virtual boot sequence which, in the case of actual drives, includes the drive type, the starting position and the length of the file allocation table (FAT), the number of sectors, etc., known to those skilled in the art. Once the host device has received this data, it assumes that the interface device **10** according to a preferred embodiment of the present invention is a hard disk drive. In reply to an instruction from the host device to display the directory of the "virtual" hard disk drive simulated by the interface device **10** with respect to the host device, the digital signal processor can respond to the host device in exactly the same way as a conventional hard disk would, namely by reading on request the file allocation table or FAT on a sector specified in the boot sequence, normally the first writable sector, and transferring it to the host device, and subsequently by transferring the directory structure of the virtual hard disk. Further, it is possible that the FAT is not read until immediately prior to reading or storing the data of the "virtual" hard disk and not already at initialization.

In a preferred embodiment of the present invention, the digital signal processor **13**, which need not necessarily be implemented as a digital signal processor but may be any other kind of microprocessor, comprises a first and a second command interpreter. The first command interpreter carries out the steps described above whilst the second command interpreter carries out the read/write assignment to specific functions. If the user now wishes to read data from the data transmit/receive device via the line **16**, the host device sends a command, for example "read file xy", to the interface device. As described above, the interface device appears to the host device as a hard disk. The second command interpreter of the digital signal processor now interprets the read command of the host processor as a data transfer command, by decoding whether "xy" denotes, for example, a "real-time input" file, a "configuration" file or an executable file, whereby the same begins to transfer data from the data transmit/receive device via the second connecting device to the first connecting device and via the line **11** to the host device.

Preferably, the volume of data to be acquired by a data transmit/receive device is specified in a configuration file described in the following by the user specifying in the said configuration file that a measurement is to last, for example, five minutes. To the host device the "real-time input" file then appears as a file whose length corresponds to the anticipated volume of data in those five minutes. Those skilled in the art know that communication between a processor and a hard disk consists of the processor transferring to the hard disk the numbers of the blocks or clusters or sectors whose contents it wishes to read. By reference to the FAT the processor knows which information is contained in which block. In this case, communication between the host device and the interface device according to the present invention therefore consists of the very fast transfer of block numbers and preferably of block number ranges because a virtual "real-time input" file will not be fragmented. If the host device now wants to read the "real-time input" file, it transfers a range of block numbers to the interface device, whereupon data commences to be received via the second connecting device and data commences to be sent to the host device via the first connecting device.

In addition to the digital signal processor instruction memory, which comprises the operating system of the digital signal processor and can be implemented as an EPROM or EEPROM, the memory means **14** can have an additional buffer for purposes of synchronizing data transfer from the data transmit/receive device to the interface device **10** and data transfer from the interface device **10** to the host device.

Preferably, the buffer is implemented as a fast random access memory or RAM buffer.

Further, from the host device the user can also create a configuration file, whose entries automatically set and control various functions of the interface device **10**, on the interface device **10** which appears to the host device as a hard disk. These settings can be, for example, gain, multiplex or sampling rate settings. By creating and editing a configuration file, normally a text file which is simple to understand with little prior knowledge, users of the interface device **10** are able to perform essentially identical operator actions for almost any data transmit/receive devices which can be attached to the second connecting device via the line **16**, thus eliminating a source of error arising from users having to know many different command codes for different applications. In the case of the interface device **10** according to the present invention it is necessary for users to note the conventions of the configuration file once only in order to be able to use the interface device **10** as an interface between a host device and almost any data transmit/receive device.

As a result of the option of storing any files in agreed formats in the memory means **14** of the interface device **10**, taking into account the maximum capacity of the memory means, any enhancements or even completely new functions of the interface device **10** can be quickly implemented. Even files executable by the host device, such as batch files or executable files (BAT or EXE files), and also help files can be implemented in the interface device, thus achieving independence of the interface device **10** from any additional software (with the exception of the BIOS routines) of the host device. On the one hand, this avoids licensing and/or registration problems and, on the other hand, installation of certain routines which can be frequently used, for example an FFT routine to examine acquired time-domain data in the frequency domain, is rendered unnecessary as the EXE files are already installed on the interface device **10** and appear in the virtual root directory, by means of which the host device can access all programs stored on the interface device **10**.

In a preferred embodiment of the present invention in which the interface device **10** simulates a hard disk to the host device, the interface device is automatically detected and readied for operation when the host system is powered up or booted. This corresponds to the plug-and-play standard which is currently finding increasingly widespread use. The user is no longer responsible for installing the interface device **10** on the host device by means of specific drivers which must also be loaded; instead the interface device **10** is automatically readied for operation when the host system is booted.

For persons skilled in the art it is however obvious that the interface device **10** is not necessarily signed on when the computer system is powered up but that a special BIOS routine or a driver for a multi-purpose interface can also be started on the host device during current operation of the computer system in order to sign on or mount the interface device **10** as an additional hard disk. This embodiment is suitable for larger workstation systems which are essentially never powered down as they perform, e.g. mail functions or monitor processes which run continuously, for example, in multi-tasking environments.

In the interface device according to the present invention an enormous advantage is to be gained, as apparent in the embodiment described in the following, in separating the actual hardware required to attach the interface device **10** to the data transmit/receive device from the communication unit, which is implemented by the digital signal processor **13**, the memory means **14** and the first connecting device **12**, as this allows a plurality of dissimilar device types to be operated in parallel in identical manner. Accordingly, many interface devices **10** can be connected to a host device which then sees many different "virtual" hard disks. In addition, any modification of the specific hardware symbolized by the second connecting device **15** can be implemented essentially without changing the operation of the interface device according to the present invention. Further, an experienced user can intervene at any time on any level of the existing second connecting device by making use of the above mentioned option of creating a configuration file or adding or storing new program sections for the second connecting device.

An important advantage of the interface device **10** of the present invention is that it also permits extremely high data transfer rates by using, for data interchange, the host device-own BIOS routines which are optimized for each host device by the host device manufacturer or BIOS system manufacturer, or by using driver programs which are normally optimized and included by the manufacturers of multi-purpose interfaces. Furthermore, due to the simulation of a virtual mass storage device, the data is managed and made available in such a way that it can be transferred directly to other storage media, e.g. to an actual hard disk of the host device without, as it were, intervention of the host device processor. The only limitation to long-term data transfer at high speed is therefore imposed exclusively by the speed and the size of the mass storage device of the host device. This is the case as the digital signal processor **13** already formats the data read by the data transmit/receive device via the second connecting device **15** into block sizes suitable for a hard disk of the host device, whereby the data transfer speed is limited only by the mechanical latency of the hard disk system of the host device. At this point, it should be noted that normally data flow from a host device must be formatted in blocks to permit writing to a hard disk and subsequent reading from a hard disk, as known by those skilled in the art.

The said data transfer rate can be increased further by setting up a direct memory access (DMA) or RAM drive in the host system. As those skilled in the art know, the setting up of a RAM drive requires processor resources of the host device, with the result that the advantage of writing the data to a hard disk drive of the host device essentially without the need for processor resources is lost.

As described above, a data buffer can be implemented in the memory means **14** to permit independence in terms of time of the data transmit/receive device attached to the second connecting device from the host device attached to the first connecting device. This guarantees error-free operation of the interface device **10** even for time-critical applications in multi-tasking host systems.

FIG. **2** shows a detailed block diagram of an interface device **10** according to the present invention.

A digital signal processor (DSP) **1300** is, in a manner of speaking, the heart of the interface device **10**. The DSP can be any DSP but preferably has a 20-MB on-chip random access memory (RAM). Certain instruction sets, for example, can be stored in the RAM already integrated in the DSP. An 80-MHz clock generator is attached to the DSP **1300** in order to synchronize the DSP. The DSP implements a fast Fourier transformation (FFT) in real time and also optional data compression of the data to be transferred from the data transmit/receive device to the host device in order to achieve greater efficiency and to permit interoperation with host devices which have a smaller memory.

In the preferred embodiment of the interface device **10** shown in FIG. **2**, the first connecting device **12** of FIG. **1** contains the following components: an SCSI interface **1220** and a 50-pin SCSI connector **1240** for attachment to an SCSI interface present on most host devices or laptops. The SCSI (small computer system interface) interface **1220** translates the data received via the SCSI connector **1240** into data understood by the DSP **1300**, as known by those skilled in the art. Further, the first connecting device **12** comprises an EPP (enhanced parallel port) with a data transfer rate of approx. 1 MBps which delivers a more moderate data transfer rate of 1 MBps by comparison to the data transfer rate of 10 MBps of the SCSI interface. The EPP **1260** is connected to a 25-pin D-shell connector **1280** to permit attachment to a printer interface of a host device for example. Optionally, the first connecting device **12** also comprises a 25-pin connector **1282** which permits the attachment of 8 digital outputs and 8 digital inputs **1284** at a host device.

Preferably, the second connecting device comprises 8 BNC inputs with the calibration relay **1505**, a block **1510** with 8 device amplifiers with an overvoltage protection of ±75 V, this block being connected in turn to 8 sample/hold (S&H) circuits **1515**. The calibration relays are relays which permit controlled changeover between a test voltage and a calibration reference voltage. Each sample/hold circuit is connected to a corresponding input of an 8-channel multiplexer **1520** which feeds its output signals via a programmable amplifier **1525** into an analog/digital converter (ADC) with 12 bit and 1.25 MHz **1530** and to the DSP **1300**. The ADC **1530** is controlled by means of a 20-bit timer **1535**, as known by persons skilled in the art. The programmable amplifier **1525** and the 8-channel multiplexer **1520** are controlled via an amplifier channel selection circuit **1540** which is in turn controlled by the DSP **1300**.

The complete interface device **10** is supplied with power by an external AC/DC converter **1800** which delivers a digital supply voltage of ±5 V and is attached to a DC/DC

converter **1810** which can deliver analog supply voltages of ±5 V and ±15 V as required for the interface device **10**. Further, the DC/DC converter controls a precision voltage reference **1820** which controls the 8 BNC inputs **1505** and the ADC **1530** as well as a digital/analog converter (DAC) **1830** which permits, via an output amplifier block with 4 output amplifiers **1840** and a 9-pin connector **1850**, analog output direct from the DSP **1300** to an output device, e.g. printer device or monitor device, which can be attached via the 9-pin connector **1850**, thus providing the option of monitoring the data transferred to the host device or also, for example, of viewing an FFT to obtain rapid and comprehensive data analysis without using processor time of the host device.

In FIG. **2** the memory means **14** of FIG. **1** is implemented by an EPROM **1400** which, in a preferred embodiment of the present invention, contains the operating system of the digital signal processor **1300**. A random access memory with an access time of 15 ns and a size of 512 KB or optionally 1024 KB **1420** serves as a data buffer to achieve independence in terms of time of the output line **16** from the output lines **11***a*, **11***b* and **11***c* to the data transmit/receive device and to the host device respectively. As described above, in a preferred embodiment of the present invention the digital signal processor **1300** already contains a 20-KB on-chip RAM **1440** which can store certain instruction sets, functions and also smaller application software units.

The connection, symbolized by the line **16**, of the interface device **10** to any data transmit/receive device implements, by means of the blocks **1505–1535**, an analog input with a sampling rate of 1.25 MHz and quantization of 12 bits. There are 8 channels with an overvoltage protection of ±75 V. By means of the programmable amplifier **1525** the channels can be programmed independently of each other in voltage ranges up to a maximum of ±10 V. Unused channels can be grounded internally to reduce channel intermodulation. The block **1515** is implemented as a monolithic high-precision, high-speed sample/hold amplifier for simultaneous sampling of all channels. The precision voltage reference **1820** provides a high-precision, temperature-compensated monolithic energy gap voltage reference for auto-calibration of each channel and each gain. Further, offset fine adjustment for each channel is implemented by the same.

The blocks **1830**, **1840** and **1850** implement a direct analog output for the digital signal processor **1300**, and the DAC **1830** provides a data transfer rate of 625 kHz and a quantization of 12 bits. The block **1840** comprises 4 channels with a common output latch.

Further, the interface device **10** comprises a digital input/output device implemented by the blocks **1284** and **1282**. Here there are 8 digital inputs, 8 digital outputs with a common latch, and the digital port can be attached preferably to a side panel of the interface device **10** so that the port itself can easily be accessed.

The digital signal processor **1300** provides on-board digital data processing. In particular, it is a high-performance DSP with a clock speed of 80 MHz and a 20-bit timer **1535**.

As described above, the first connecting device **12** comprises the SCSI interface **1220** with a peak transfer rate of 10 MBps. An optional PCMCIA-to-SCSI adapter permits high-speed communication with laptop computers which are desirable and in widespread use, particularly by mobile service technicians. The EPP **1260** with its associated connector **1280** permits data transfer at a more moderate rate.

As described above, the interface device **10** is supplied with power by means of an external AC/DC adapter which has a universal power input (85–264 VAC, 47–63 Hz). Interference suppression complies with the standards EN 55022, curve B and FFC, Class B). Further, it is also in accordance with international safety regulations (TÜV, UL, CSA). The interface device **10** is externally shielded and achieves a value of 55 dB at 30–60 MHz and a value of approximately 40 dB at 1 GHz, and therefore complies with the MILSTD 285-1 standard.

As described above, communication between the host device and the multi-purpose interface can take place not only via drivers for input/output device customary in a host device which reside in the BIOS system of the host device but also via specific interface drivers which, in the case of SCSI interfaces, are known as multi-purpose interface ASPI (advanced SCSI programming interface) drivers. This ASPI driver, which can also be referred to as an ASPI manager, is specific to a special SCSI host adapter, i.e. to a special multi-purpose interface, and is normally included by the manufacturer of the multi-purpose interface. Generally speaking, this multi-purpose interface driver has the task of moving precisely specified SCSI commands from the host system program to the host system SCSI adapter. For this reason, the command set is almost identical to that of the SCSI interface itself. Essentially, only status and reset commands for the host adapter have been added.

The ASPI driver can be used if the hard disk was not already addressable at boot time or if the SCSI-related BIOS routines of the host computer were still disabled. Here too, the steps needed to initialize the interface device, preferably as a virtual hard disk, are similar to the steps taken when initializing at boot time.

In general terms, the ASPI manager comprises two sides. One side is the proprietary, hardware-oriented side. It is responsible for converting all commands into a form required by the corresponding multi-purpose interface. The hardware-oriented side of the ASPI driver is therefore matched to a very specific type of multi-purpose interface or SCSI interface. The other side is known as the user software side. This side is totally independent of the proprietary operating characteristics of the SCSI adapter and is therefore identical for all SCSI interfaces. This permits SCSI programming which is however independent of the individual SCSI adapter types.

In contrast to communication between the host device and the interface device according to the present invention on the basis of a BIOS driver, the use of such an ASPI driver for communication between the host device and the interface device according to the present invention allows various further possibilities of the SCSI multi-purpose interface to be exploited. In the case described above, the interface device which preferably signs on and behaves as a virtual hard disk is detected by the BIOS driver of the host computer at boot time and is configured as a hard disk. This step does not however support active requests sent by the interface device to the host computer. If however the virtual hard disk wishes to write data actively to, for example, a hard disk of the host computer or wishes to initiate communication with the processor of the host computer, the host computer must recognize the request of the virtual hard disk and tolerate a further issuer of instructions on its bus. If the interface device behaves solely like a virtual hard disk, it would always receive and never issue commands. The BIOS has no objections to an additional issuer of commands that actively wishes to place data on the bus of the host device but the BIOS does not support the host device in recognizing corresponding requests of the interface device or in granting the interface device permission to access the bus.

Using the ASPI manager the interface device according to the present invention can now obtain active access to an SCSI hard disk of the host device connected to the same SCSI bus which, in contrast to the interface device, cannot be a virtual but a real SCSI mass storage device or also a further interface device according to the present invention. Thereupon, the interface device according to the present invention can write the desired data to the SCSI hard disk of the host computer totally independently of the host computer or can communicate with the same in some other manner. The interface device according to the present invention therefore initially behaves passively as a virtual hard disk and then, as required and using the driver software for the multi-purpose interface, actively on the same SCSI bus. This means however that the interface device according to the present invention, using a driver software for the multi-purpose interface which comprises the BIOS routines customary in host devices and simultaneously provides the option of active participation, can, regardless of the type of the data transmit/receive device attached to the second connecting device, behave initially as a virtual and at the same time passive hard disk but can, as required, participate actively on the bus so as to be able to initiate communication directly with other SCSI hard disks of the host device by bypassing the processor of the host device.

Using a standard interface of a host device, the interface device according to the present invention permits communication with any host device. By simulating an input/output device to the host device and, in a preferred embodiment, by simulating a virtual mass storage device, the interface device **10** is automatically supported by all known host systems without any additional sophisticated driver software. The simulation of a freely definable file structure on the "virtual" hard disk provides simple operation and expansion options and, through the implementation of any programs, independence from special software implemented on the host device. Help files included on the interface device **10** and plug-and-play support ensure ease of use even in portable, flexible host devices. Despite the very simple user interface, experienced users are free at any time to intervene in the functions of the interface device **10** on system level. The interface device **10** thus provides a universal solution which can cover the entire spectrum of possible data transmit/receive devices.

What is claimed is:

1. An interface device for communication between a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and a data transmit/receive device comprising the following features:

a processor;

a memory;

a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and

a second connecting device for interfacing the interface device with the data transmit/receive device,

wherein the interface device is configured by the processor and the memory in such a way that the interface device, when receiving an inquiry from the host device as to the type of a device attached to the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is a storage device customary in a host device, whereupon the host device communicates with the interface device by means of the driver for the storage device customary in a host device, and

wherein the interface device is arranged for simulating a virtual file system to the host, the virtual file system including a directory structure.

2. An interface device in accordance with claim **1**, in which the directory structure has a configuration file for setting and controlling functions of the interface device or an executable or a batch file for conducting a routine stored in the memory or a data file used for transferring data from the data transmit/receive device to the host device or a help file for giving help on handling the interface device.

3. An interface device in accordance with claim **2** wherein the configuration file is a text file.

4. An interface device in accordance with claim **2** wherein the executable file includes a Fast Fourier Transform routine for transforming data acquired by the second connecting device into the frequency domain and for examining frequency domain data.

5. An interface device in accordance with claim **2** wherein the executable file includes a data compression routine for compressing data to be transmitted from the data transmit/receive device to the host device.

6. An interface device in accordance with claim **1** wherein, in response to a request from the host to read a boot sequence, the processor is arranged to send a virtual boot sequence to the host.

7. An interface device in accordance with claim **6** wherein the virtual boot sequence includes a starting position and a length of a file allocation table, an indication of a type of the storage device or a number of sectors of the storage device.

8. An interface device in accordance with claim **7** wherein, in response to a request from the host to display a directory of the storage device, a processor is arranged for transferring the file allocation table and the directory structure to the host.

9. An interface device in accordance with claim **1** wherein the file allocation table and the directory structure is transferred to the host in response to a request from the host to read data from or store data to the storage device.

10. An interface device in accordance with claim **1** wherein the directory structure includes a data file for transferring data from the data transmit/receive device to the host device wherein the processor is arranged to interpret a request from the host to read the data file as a request for a data transfer from the data transmit/receive device to the host, so that data is transmitted from the second connecting device to the first connecting device and to the host.

11. An interface device in accordance with claim **10** wherein the directory structure further includes a configuration file for specifying a time period for a measurement by the data transmit/receive device, wherein the interface device is arranged for simulating a length of the data file to the host that corresponds to an anticipated volume of data produced by the data transmit/receive device in the specified time period.

12. An interface device in accordance with claim **1** wherein the file allocation table includes information on numbers of blocks occupied by the data file wherein the interface device is arranged for receiving block numbers or a block number range from the host when the host wants to read the data file, and wherein the interface device is arranged to start a data transfer to the host, when the block numbers or the block number range is received from the host.

13. An interface device in accordance with claim **12** wherein the processor is arranged for formatting the data

acquired by the second connecting device into blocks having a predetermined size, the predetermined size being suited for the storage device.

14. An interface device in accordance with claim **1** wherein the functions are gain, multiplex or synchronization settings of the second connecting device.

15. An interface device in accordance with claim **1** wherein the storage device is a hard disk.

16. An interface device in accordance with claim **1** wherein the memory has a data buffer for permitting independence in terms of time of the data transmit/receive device attachable to the second connecting device from the host device attachable to the first connecting device.

17. An interface device for communication between a host device, which comprises a multi-purpose interface and a specific driver for this interface, and a data transmit/receive device comprising the following features:

a processor;

a memory;

a first connecting device for interfacing the host device with the interface device via the multi-purpose interface of the host device; and

a second connecting device for interfacing the interface device with the data transmit/receive device,

where the interface device is configured using the processor and the memory in such a way that the interface device, when receiving an inquiry from the host device as to the type of a device attached at the multi-purpose interface of the host device, sends a signal, regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, to the host device which signals to the host device that it is a storage device customary in a host device, whereupon the host device communicates with the interface device by means of the specific driver for the multi-purpose interface, and

wherein the interface device is arranged for simulating a virtual file system to the host, the virtual file system including a file allocation table and a directory structure.

18. A method of communication between a host device, which comprises drivers for input/output devices customary in a host device and a multi-purpose interface, and a data transmit/receive device via an interface device comprising the following steps:

interfacing of the host device with a first connecting device of the interface device via the multi-purpose interface of the host device;

interfacing of the data transmit/receive device with a second connecting device of the interface device;

inquiring by the host device at the interface device as to the type of device to which the multi-purpose interface of the host device is attached;

regardless of the type of the data transmit/receive device attached to the second connecting device of the interface device, responding to the inquiry from the host device by the interface device in such a way that it is a storage device customary in a host device, whereupon the host device communicates with the interface device by means of the usual driver for the storage device, and

wherein the interface device is arranged for simulating a virtual file system to the host, the virtual file system including a file allocation table and a directory structure.

* * * * *

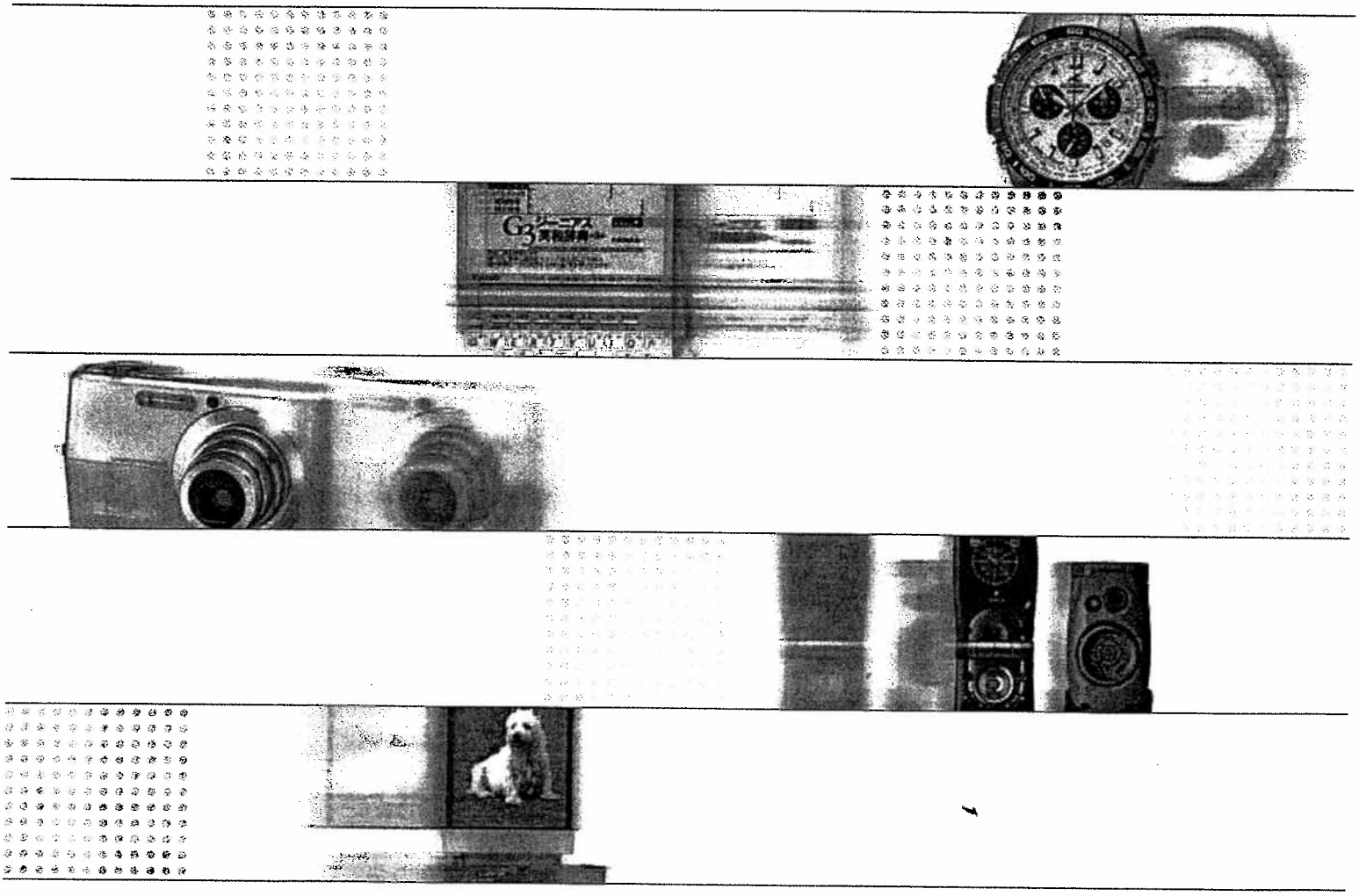
EXHIBIT J

CASIO

Annual Report 2006

For the year ended March 31, 2006

Toward ultimate evolution beyond imagination



Principal Subsidiaries

(As of March 31, 2006)

Overseas Subsidiaries

Europe

- *Casio Europe GmbH*
  Germany
  Sales of Casio products
- *Casio Electronics Co., Ltd.*
  U.K.
  Sales of Casio products
- *Casio France S.A.*
  France
  Sales of Casio products

Asia

- *Casio Computer (Hong Kong) Ltd.*
  Hong Kong
  Production of electronic calculators
- *Casio Korea Co., Ltd.*
  The Republic of Korea
  Production of electronic timepieces
- *Casio Taiwan Ltd.*
  Taiwan
  Production of timepiece cases
- *Casio Singapore Pte., Ltd.*
  Singapore
  Production of electronic components and sales of Casio products
- *Casio India Co., Pvt. Ltd.*
  India
  Production and sales of electronic calculators and electronic timepieces
- *Casio Electronic Technology (Zhongshan) Co., Ltd.*
  The People's Republic of China
  Production and sales of electronic calculators, electronic dictionaries and electronic musical instruments
- *Casio Electronics (Shenzhen) Co., Ltd.*
  The People's Republic of China
  Production of electronic timepieces
- *Casio Electronics (Guangzhou) Co., Ltd.*
  The People's Republic of China
  Production and sales of electronic timepieces
- *Casio (Thailand) Co., Ltd.*
  Thailand
  Production of electronic timepieces
- *Casio (Shanghai) Co., Ltd.*
  The People's Republic of China
  Sales of Casio products
- *Taiwan Casio Marketing Co., Ltd.*
  Taiwan
  Sales of Casio products

North America

- *Casio, Inc.*
  U.S.A.
  Sales of Casio products
- *Casio Canada Ltd.*
  Canada
  Sales of Casio products
- *Casio Holdings, Inc.*
  U.S.A.
  Holding company

Domestic Subsidiaries

- *Yamagata Casio Co., Ltd.*
  Production of digital cameras, electronic timepieces, and cellular phones
- *Casio Micronics Co., Ltd.*
  Production and sales of electronic components
- *Casio Electronic Manufacturing Co., Ltd.*
  Production of page printers
- *Kochi Casio Co., Ltd.*
  Production of LCDs
- *Kofu Casio Co., Ltd.*
  Production of handy terminals, system equipments, and LCDs
- *Casio Hitachi Mobile Communications Co., Ltd.*
  Development, design, and production of cellular phones
- *Casio Techno Co., Ltd.*
  Customer service for Casio products
- *Casio Information Systems Co., Ltd.*
  Sales of system equipment
- *Casio Electronic Devices Co., Ltd.*
  Sales of electronic components
- *CCP Co., Ltd.*
  Production and sales of toys and home appliances

(56 consolidated subsidiaries and 4 equity-method affiliates)

* On April 1, 2006, Casio Taiwan Ltd. and Taiwan Casio Marketing Co., Ltd. merged to form Casio Taiwan Co., Ltd.

Directors and Corporate Auditors

(As of June 29, 2006) *Corporate officers

Chairman and Representative Director
Toshio Kashio

President and CEO
Kazuo Kashio*

Executive Vice President and Representative Director
Yukio Kashio*

Managing Directors
Yozo Suzuki*
Akinori Takagi*
Yoshio Ono*
Fumitsune Murakami*

Directors
Tadashi Takasu*
Atsushi Mawatari*
Kouichi Takeichi*
Akira Kashio*
Susumu Takashima*

Corporate Auditors
Takeshi Honda
Yoshinobu Yamada
Hironori Daitoku

Corporate Officers
Naomitsu Satoh
Tomimoto Umeda
Eiichi Takeuchi
Harunori Fukase
Isamu Shimozato
Ichiro Ohno
Yuichi Masuda
Osamu Ohno
Atsushi Yazawa

Corporate Data

(As of March 31, 2006)

Established: June 1957
Paid-in Capital: ¥41,549 million
Employees: 12,673
Home Page Address: http://world.casio.com/

Domestic Offices

Head Office
6-2, Hon-machi 1-chome,
Shibuya-ku, Tokyo 151-8543

Accounting Department
Tel: (03) 5334-4852

R&D Centers

Hamura Research & Development Center
3-2-1, Sakae-cho,
Hamura City, Tokyo 205-8555
Tel: (042) 579-7111

Hachioji Research & Development Center
2951-5, Ishikawa-cho,
Hachioji City, Tokyo 192-8556
Tel: (042) 639-5111

Overseas Offices

Casio, Inc.
570 Mt. Pleasant Avenue,
Dover, New Jersey 07801,
United States
Tel: 973-361-5400

Casio Europe GmbH
Bornbarch 10,
22848 Norderstedt, Germany
Tel: 040-528-65-0