

SOFTWARE LICENSE AND MAINTENANCE AGREEMENT

This Software license and maintenance agreement ("Agreement") is entered into effective as of August 4, 1997 (the "Effective Date") by and between D2 Technologies, Inc., a California corporation with offices at 104 West Anapamu Street, Santa Barbara, CA 93101 ("D2"), and Summa Four Inc., a Delaware corporation with offices at 25 Sundial Avenue, Manchester, New Hampshire 03103-7251 ("LICENSEE").

WHEREAS, D2 has previously developed certain software and designs capable of performing certain voice processing functions;

WHEREAS, LICENSEE is developing a product which requires certain software functions and designs capable of performing certain voice processing functions;

WHEREAS, D2 desires to license to LICENSEE certain of its software technology for use in connection with Licensee's products:

WHEREAS, D2 is further willing to provide certain maintenance and support services to LICENSEE in relation to such software technology;

NOW THEREFORE, in consideration of the mutual promises and covenants contained herein, the parties agree as follows:

1. DEFINITIONS

1.1 "Licensed Technology" shall mean software licensed to LICENSEE by D2 as listed in Exhibit A.

1.2 "DSP" shall mean digital signal processing.

1.3 "Runtime License Fee" shall have the meaning set forth in Article 2.2(iii).

1.4 "Specifications" shall mean D2's specifications of the Licensed Technology which are attached hereto as Exhibit A.

1.5 "Update" shall mean a new release of a software product which typically includes bug fixes and/or minor feature changes, but does not include substantial new functionality.

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1.6 "New Version" in this Agreement shall mean a new release of Licensed Technology that provides significant performance enhancements, including new releases of software product optimized for different members of the same DSP processor family which is based on the same core architecture and instruction set.

1.7 "Defect" shall mean any failure of Licensed Technology to meet the Specification as a result of a material failure (including an error or "bug" that is material) of the Licensed Technology. "Material" is defined as priority A, B, and C in Article 6.3.

1.8 "Source Code" shall mean all computer programming instructions relating to a software product in a form readable by humans and typically prepared by a programmer. Source Code includes associated procedural code, comments, utilities, tools, notes, data diagrams and related and supporting technical documentation.

1.9 "Object Code" shall mean software code resulting from the translation or processing of Source Code by a computer into machine language or intermediate code, which thus is in a form that would not be convenient to human understanding of the program logic, but which is appropriate for execution or interpretation by a computer.

1.10 "Licensed Source Code" shall mean Source Code for Licensed Technology.

1.11 "Licensee Product" shall mean the product being developed by LICENSEE as described in Exhibit B, which utilizes Licensed Technology. LICENSEE shall own all rights, title and interest in Licensee Product. D2 shall have no rights to Licensee Product.

1.12 "End User" shall mean a person or business entity that purchases, leases or otherwise properly obtains the right to use or distribute a Licensee Product directly from LICENSEE or through one or more intermediaries.

2. LICENSED TECHNOLOGY

2.1 Ownership. Subject to the rights granted to LICENSEE in this Agreement, D2 owns all right, title and interest in and to the Licensed Technology. Notwithstanding the foregoing, LICENSEE shall retain all right, title and interest in and to modifications to the Licensed Source Code made by LICENSEE pursuant to the license in Article 2.2 below, subject always to D2's ownership rights in the underlying Licensed Technology.

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2.2 License to LICENSEE.

(i) Subject to the terms and conditions of this Agreement, D2 hereby grants LICENSEE a perpetual non-exclusive, worldwide license, to use Licensed Technology in Object Code format only as an incorporated part of the Licensee Product. For this purpose, LICENSEE may also modify, create derivative works, of and reproduce and have reproduced the Licensed Technology, and to develop, use, market and distribute (directly or through third parties) Licensed Technology, or modifications or derivative works of the Licensed Technology created by or for LICENSEE.

(ii) In consideration for the right to modify, develop and completely own derivative works of the Licensed Technology set forth in Article 2.2 (i) above, LICENSEE shall pay D2 a license fee (the "Development License Fee") as set forth in Exhibit C. Final acceptance testing shall be completed by the parties according to Article 4 of this Agreement.

(iii) LICENSEE shall pay D2 a license fee ("Runtime License Fee") as set forth in Exhibit C for each copy of the Licensed Technology that LICENSEE distributes to end users directly or through third parties for such end-user's use in connection with Licensee's Product. The Runtime License Fee shall be paid by LICENSEE quarterly for Licensee Products which have been paid for by Licensee's end-user customer in the prior quarter. To the extent Licensee accepts returns or is required to provide refunds to its customers (and to the extent additional Licensee Products are delivered to customers for warranty or maintenance/support purposes), such circumstances will either entitle Licensee to obtain a credit against future Runtime License Fees owed or, in the case of warranty/maintenance or support deliveries, no Runtime License Fees shall be due at all.

(iv) LICENSEE is also granted a limited non-transferable non-exclusive license to Licensed Source Code to perform software maintenance functions according the terms set forth in Article 7 of this Agreement.

(v) D2 shall provide LICENSEE with master copies of the Licensed Technology, in Source Code and Object Code format, promptly after such software has been completed, tested and approved for release by D2 and Licensee. In any event, D2 shall deliver all Licensed Technology completely tested and approved for performance in accordance with the specifications.

2.3 End User License. LICENSEE shall ensure that all Licensed Technology distributed by LICENSEE shall be subject to a shrink-wrap agreement or other end user agreement which contains a provision substantially similar to the provision set forth in Exhibit D.

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3. ADDITIONAL TECHNOLOGY LICENSE

3.1 New Functions. In the event that LICENSEE requires any additional functionality or technology substantially different from those set forth in Exhibit A or otherwise made available by D2 to other Licensees, D2 shall license such additional functionality or technology to LICENSEE at D2's then best price to its other Licensees. Such additional technology licenses shall be subject to the same terms of this agreement except for an amendment to the product specification and price schedule of Exhibits A and C. Any other new licensing terms shall be negotiated in advance and included in said amendment.

3.2 Different Processors.

(A) "Supported Processors": If D2 offers or plans to offer all or part of Licensed Technology on a processor ("Supported Processor") different from the Texas Instruments (TI) TMS320C54x family of processors, D2 shall make available to LICENSEE such new versions of Licensed Technology under the same terms of this Agreement subject to the license fees as follows:

(i) The development license fees for any part or all of Licensed Technology for each "Supported Processor" shall be 50% of that for the TMS320C54x processor family as listed in Exhibit C.

(ii) The per-processor runtime license fees for any "Supported Processor" shall be the same as that specified in Exhibit C for the TI TMS320C54x.

(iii) The runtime license fee CAP in exhibit C shall be cumulative across the TI TMS320C54x, TMS320C55x, TMS330C6x, and other TI processors based on the same core processor architecture. For processors other than the TI processors listed in this Article 3.2A(iii) ("additional supported processors"), the runtime license fee CAP and buy-out license fee in Exhibit C shall be increased by 25% for each "additional supported processor." The CAP for Licensed Technology shall be cumulative across all "Supported Processors" (including "additional supported processors") utilized by LICENSEE. If the cumulative inflation index (according to government published Consumer Price Index) exceeds 25% from the effective date of this Agreement to the time when D2 makes available Licensed Technology for an "additional supported processor", D2 and LICENSEE agree to negotiate in good faith reasonable incremental runtime license fees for Licensed Technology used in such "additional supported processor."

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(B) "Unsupported Processors". If LICENSEE requires versions of Licensed Technology on a processor other than the "Supported Processors", D2 agrees to negotiate in good faith with LICENSEE an agreement to develop such a version of Licensed Technology. Such an agreement shall include appropriate development license fees and runtime license fees as well as special engineering

service fees.

4. ACCEPTANCE

Upon delivery of the Licensed Technology to Licensee, D2 will have tested and verified that such Licensed Technology shall perform in accordance with an acceptance specification agreed to by D2 and LICENSEE. The acceptance specification shall be completed no later than 90 days after the effective date of this Agreement and shall be attached to this agreement as Exhibit F. Upon successful completion of the acceptance testing, LICENSEE shall make the final "Development License Fee" payment described in Exhibit C LICENSEE shall, within thirty (30) days after delivery of any Licensed Technology, either accept such Licensed Technology or reject such Licensed Technology because of nonconformance with the Specifications. LICENSEE shall provide D2 with written notification of any rejection of Licensed Technology which explains the basis for such rejection. If completion of testing is precluded or delayed due to performance deficiencies, incompatibilities or other Defects in the Licensed Technology, D2 shall immediately and without any additional payment, correct such Defects.. All corrected versions of the Licensed Technology shall be subject to the acceptance procedures set forth above in this Article 4.

5. REPORTS, AUDITS

5.1 Reports. Within thirty days after the end of each calendar quarter during the term of this Agreement, LICENSEE shall provide D2 with written reports setting forth the number of LICENSEE Products containing the Licensed Technology that were licensed to end users by LICENSEE in such calendar quarter as more particularly described in Article 2.2 (iii) above.

5.2 Audits. LICENSEE shall maintain records of its distribution of Licensee Products containing the Licensed Technology, for a period of one year after the date on which LICENSEE distributes the Products to which such records pertain. D2 may audit such records by engaging an independent public audit firm, approved in advance by Licensee, upon thirty days written notice, provided that (i) no more than one such audit may be made in any twelve month period, (ii) D2 may only audit LICENSEE's records for a particular time period once, and (iii) D2 shall be responsible for ensuring that the auditor executes and abides by LICENSEE's confidentiality agreement.

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6. MAINTENANCE AND SUPPORT

6.1 Maintenance and Support Obligation, Fees. On the date of expiry of the Warranty period defined in Article 8.3, and on any anniversary of the expiry date, LICENSEE may in its sole discretion pay D2 a "Maintenance and Support Fee" according to Exhibit C. In return for payment of such fee, D2 shall provide LICENSEE with the maintenance and support set forth in this Article 6 for a period of twelve months (the "Contract Year"). In any event, D2 shall provide support and maintenance services to Licensee during the Warranty period in breadth and scope which is no less than the support and maintenance services described in this Article. D2 shall make available to LICENSEE the maintenance and support services according to the terms of this Article 6 for a minimum of five years after Acceptance of Licensed Technology.

6.2 Maintenance. Maintenance to be provided by D2 to LICENSEE shall include without limitation the following services;

(i) D2 shall update and maintain the Licensed Technology throughout the term of this Agreement. It is intended that D2 shall release at least 1 Update or New Version release during each 12 month calendar year. Upon the releases of any Update or New Version of the Licensed Technology (including manuals), D2 shall promptly notify and deliver to LICENSEE such Update or New Version.

(ii) D2 will initially deliver to LICENSEE one (1) copy of any Updates or New Versions to the Licensed Technology and one (1) set of corresponding manuals for each copy of the Licensed Technology for which LICENSEE has paid the appropriate development license fees and maintenance fees pursuant to Exhibit C as soon as such Updates or New Versions and corresponding manuals become available and shall maintain such Updates or New Versions throughout this agreement.

6.3 Error Correction. If D2 becomes aware of any Defect in the Licensed Technology, D2 shall promptly provide LICENSEE with written notice of such Defect. D2 shall have no obligation to actively monitor the Licensed Technology for Defects after such software has been accepted by LICENSEE. D2 shall work diligently to promptly correct Defects in accordance with the following schedule; "days" shall mean calendar days.

ERROR PRIORITY (1)	RESPONSE (2)	CLOSURE (3)
Emergency (A)	24 hours	7 days
Critical (B)	2 days	14 days

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Non-Critical (C)	30 days	Next Update or New Version
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(1) Priority:
-A- Catastrophic product or module Defects that do not have a viable detour or work around available.

-B- Defects that have been substantiated as a serious inconvenience to LICENSEE or an End User. This includes any priority A Defect for which a viable detour or work around is available.

-C- All other problems that LICENSEE and an End User can easily avoid for which there is no urgency for a resolution.

(2) Response: Response consists of providing, as appropriate, one of the following to the LICENSEE: an existing correction; A new correction; a viable detour or work around; a request for more information to complete analysis of the problem, or a plan on how the problem will be corrected.

(3) Closure: Closure consists of providing a final correction or work around of the problem including an Update and revised or new Documentation as necessary.

If D2 fails to correct Defects according to the schedule specified in this Article 6, LICENSEE shall deduct from future runtime license fees, as specified in Exhibit C, a "late fee" for each day past the deadline in the schedule of this section. The "late fee" shall equal to 50% (fifty percent) of the runtime license fees paid to D2 for the previous two calendar quarters equally divided over 180 (one hundred eighty) days. In the event LICENSEE has selected the Buy-out option in the runtime license fee schedule of Exhibit C, then the "late fee" for each day past the deadline shall be 50% (fifty percent) of the Buy-out fee equally divided over 1095 (one thousand and ninety five) days; and this "late fee" shall be paid to LICENSEE each calendar month until the error is corrected either by D2 or LICENSEE.

6.4 Support. D2 will provide the following support to LICENSEE throughout the Warranty period and for those subsequent years for which support has been purchased by Licensee:

(i) D2 will assist LICENSEE in determining if problems encountered by LICENSEE are caused by programming errors in the Licensed Technology.

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(ii) D2 will answer questions concerning the installation of Licensed Technology.

(iii) D2 will assist LICENSEE in resolving LICENSEE's problems, if any, arising from the normal usage of the Licensed Technology.

(iv) D2 shall appoint a qualified technical staff as the "Technical Contact" to co-ordinate all support and maintenance services. The "Technical Contact" shall be available to LICENSEE during D2's normal business hours; in the event that appointed "Technical Contact" is not available, a back-up "Technical Contact" shall be temporarily assigned and LICENSEE shall be notified.

6.5 Notification and Cooperation by LICENSEE. To obtain support from D2 under this Article 6, LICENSEE shall provide D2 with written notice which will contain a description of the problem for which LICENSEE is seeking support. D2 shall have no obligation to correct problems which are due to modifications to Licensed Technology performed by LICENSEE; provided, that if D2 agrees to correct such problems it shall charge its then current time and materials rates, which shall be payable by LICENSEE within thirty days after invoicing by D2. LICENSEE agrees to provide D2 with access to LICENSEE's equipment and computer systems on a temporary basis and as needed to allow D2 to reproduce, correct and verify the correction of the problem reported by LICENSEE or otherwise identified by D2.

7. LIMITED SOURCE CODE LICENSE AND PROTECTION

7.1 Source Code delivery. D2 shall, after acceptance of Licensed Technology by LICENSEE and within fifteen days after receiving such a request from LICENSEE deliver a copy of the fully commented Source Code for the then current version of the Licensed Technology and information needed for compiling and building the Licensed Technology Object Code to LICENSEE. Thereafter, D2 shall automatically deliver a copy of the fully commented Licensed Source Code for the then current version of the Licensed Technology within fifteen days after the release of any Updates or New Versions of the Licensed Technology.

7.2 Source Code Access Conditions. The following events shall constitute "Source Code Access Conditions": (i) D2's insolvency, general assignment for the benefit of creditors, or ceasing to do business, or (ii) D2's failure or inability to meet its warranty, maintenance and support obligations under Article 6, or its warranty obligations under Article 8.3, within fifteen days after written notice by LICENSEE to D2 of D2's failure to meet such obligations, or (iii) termination of this Agreement by LICENSEE pursuant to Articles 9.3 and 9.4, or (iv) as needed by LICENSEE for fault isolation.

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7.3 Use of Licensed Source Code. After "Source Code Access Conditions" is met, LICENSEE shall have the right to use, modify, reproduce and have reproduced Object Code from Licensed Source Code to develop, use, market, distribute, and to maintain and support the Licensed Technology in the Licensee Product. LICENSEE shall not have any right to develop new DSP technology or derivative DSP technology with the Licensed Source Code.

7.4 Confidentiality and security.

(A) General. LICENSEE acknowledges and agrees that the Licensed Source Code constitutes the confidential and proprietary trade secrets of D2, and that LICENSEE's protection thereof is essential to this Agreement and

a condition of LICENSEE's use and possession of the Licensed Source Code. LICENSEE shall retain in strict confidence any and all elements of the Licensed Source Code and use the Licensed Source Code only as expressly licensed herein. LICENSEE agrees that it will under no circumstances distribute or in any way disseminate or disclose the Licensed Source Code to third parties, except as expressly provided in this Article 7. LICENSEE shall be relieved of this obligation of confidentiality to the extent that such information was in the public domain at the time it was disclosed or has become in the public domain through no fault of LICENSEE.

(B) Security. LICENSEE agrees to use the Licensed Source Code under carefully controlled conditions for the purposes set forth in this Agreement, and to inform all employees who are given access to the Licensed Source Code by LICENSEE that such materials are confidential trade secrets of D2 and are licensed to LICENSEE as such. LICENSEE shall restrict access to the Licensed Source Code to those employees and Contractors of LICENSEE who have agreed to be bound by a confidentiality obligation which incorporates the protections and restrictions substantially as set forth herein, and who have a need to know in order to carry out the purposes of this Agreement. D2 shall be made a third party beneficiary of any such agreements, and shall have the right to directly enforce the terms of those agreements, and of this Agreement, insofar as such enforcement relates to the Licensed Source Code.

(C) LICENSEE agrees to notify D2 promptly in the event of any breach of its security under conditions in which it would appear that the Licensed Source Code were prejudiced or exposed to loss. LICENSEE shall, upon request of D2, take all other reasonable steps necessary to recover any compromised trade secrets disclosed to or placed in the possession of LICENSEE by virtue of this Agreement. The cost of taking such steps shall be borne solely by LICENSEE.

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(D) Remedies. LICENSEE acknowledges that any breach of any of its obligations under this Article 7 is likely to cause or threaten irreparable harm to D2, and accordingly, LICENSEE agrees that in such event, D2 shall be entitled to equitable relief to protect its interest therein, including but not limited to preliminary and permanent injunctive relief, as well as money damages.

(E) Hardware.

(i) Two (2) computers, as identified in Exhibit E, may be used as the Development Computer and Back-up Computer. The Back-up Computer may be used as the Development Computer during any time when the Development Computer is inoperative because it is malfunctioning or undergoing repair, maintenance or other modification.

(ii) LICENSEE may at any time notify D2 in writing of any changes, such as replacements or additions, that LICENSEE wishes to make to Development and Back-up Computers for specific Licensed Source Code. D2 will prepare an amended Exhibit E as required to cover such changes, and such changes shall become effective after execution of the amended Exhibit E by LICENSEE.

(iii) Upon request, LICENSEE shall furnish to D2 a statement, certified by an authorized representative of LICENSEE, listing the location, type and serial number of all Development and Back-up Computers hereunder and stating that the use by LICENSEE of the Licensed Source Code subject to this Agreement has been reviewed and that the Licensed Source Code is being used solely on the Development Computer (or temporarily on Back-up Computer) for such Licensed Source Code in full compliance with the provisions of this Agreement.

(F) Third Party Contractors. LICENSEE may appoint a third party contractor ("Contractor") to assist the LICENSEE in LICENSEE's modification of the Licensed Source Code as authorized hereunder; provided that any such Contractor's access to and use of the Licensed Source Code shall only be permitted pursuant to a signed written agreement between LICENSEE and such Contractor giving the Contractor rights no broader than those granted LICENSEE in this Agreement, but limited to the sole purpose of assisting the LICENSEE, and including provisions incorporating the additional requirements set forth below:

(i) Any claim, demand or right of action arising on behalf of a Contractor from furnishing to it or use by it of Licensed Source Code shall be solely against LICENSEE, and LICENSEE hereby indemnifies D2 against any such claims.

(ii) Contractor shall agree to the same responsibilities and obligations and other restrictions pertaining to the use of Licensed Source Code as those undertaken by LICENSEE under this Agreement.

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(iii) Contractor may not retain any copy of the Licensed Source Code or any modification or derivative work thereof and, upon completion of the project for which Contractor was permitted access to the Licensed Source Code or termination of this Agreement, shall return or destroy (i) all copies of Licensed Source Code furnished to such Contractor or made by such Contractor and (ii) all copies of any modifications or derivative works made by such Contractor based on such Licensed Source Code copies stored in any computer memory or storage medium, and Contractor's computer shall be removed from Exhibit E if such computer was listed as a Development Computer. A writing executed by an officer of Contractor shall be provided to D2 certifying that the Contractor has returned or destroyed all copies of the Licensed Source Code in its possession or control.

(iv) Unless Contractor obtains a license for the Licensed Source Code from D2, Contractor may not acquire any ownership interest in any modification or derivative work prepared by such Contractor based upon or using Licensed Source Code licensed to LICENSEE under this Agreement.

(v) Copies of such agreements shall be provided to D2 on request; provided however, that portions of such agreements not required by this Article 7 may be deleted from such copies.

8. REPRESENTATIONS AND WARRANTIES

8.1 By Both Parties. D2 warrants that it owns all rights, title, and interests to Licensed Technology listed as Basic Services in Exhibit A. LICENSEE and D2 each individually warrants that it (i) has all right, power and authority necessary to enter into this Agreement and to grant the rights granted herein; (ii) has obtained all approvals and authorizations that it is required to obtain in connection with this Agreement; and (iii) has not entered, and will not enter, into any arrangements or agreements inconsistent with this Agreement.

8.2 Additional D2 Warranties. D2 additionally warrants that it (i) is not aware of any pending or actual litigation which is likely to have a material adverse effect on the rights or obligations of LICENSEE under this Agreement; and (ii) is not aware of any claim or any basis for any claim that Licensed Technology, or LICENSEE's use of the Licensed Technology as contemplated herein, will infringe any patents, trade secrets of other intellectual property rights belonging to any third party.

8.3 Software Warranty. D2 warrants to LICENSEE that the media upon which the Licensed Technology is delivered to LICENSEE will be free from Defects in materials and workmanship, and that Licensed Technology shall meet and perform in accordance with D2's specifications on Exhibit A. D2 shall promptly correct any

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errors in the Licensed Technology, or failures of the Licensed Technology according to the terms of Article 6 of this Agreement. D2's warranty and error correction obligations with respect to any portion of the Licensed Technology shall extend for a period (the "Warranty period") of one year commencing on acceptance of such portion of the Licensed Technology by LICENSEE.

8.4 Disclaimer of Other Warranties. THE REPRESENTATIONS AND WARRANTIES EXPRESSLY SET FORTH IN THIS ARTICLE 8 ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE. D2 SPECIFICALLY DISCLAIMS ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN CONNECTION WITH THE LICENSED TECHNOLOGY.

9. TERM AND TERMINATION.

9.1 Term. This Agreement shall become effective on the Effective Date and shall continue in effect until terminated in accordance with the provisions of this Article 9.

9.2 For Convenience. LICENSEE may terminate this Agreement upon ninety (90) days written notice.

9.3 Default. If either party defaults in the performance of any of its material obligations hereunder and if such default is not corrected within thirty (30) days after written notice thereof by the other party, then the nondefaulting party, at its option, may, in addition to any other remedies it may have, terminate this Agreement by giving written notice of termination to the defaulting party.

9.4 Survival. Articles 7.2, 7.3, 7.4, 8, 9, 10, 11, 12, 13, 14 shall survive any termination or expiration of this Agreement.

10. INDEMNIFICATION

10.1 By D2. D2 agrees to indemnify and hold LICENSEE harmless against any cost, loss, liability, or expense (including attorney's fees) arising out of any breach of D2's warranties hereunder, or out of third party claims against LICENSEE alleging that the Licensed Technology, or LICENSEE's use or distribution of the Licensed Technology as set forth in this Agreement, infringes any third party's patent, trade secret, copyright of other intellectual property right in any country, provided that LICENSEE shall (i) notify D2 promptly in writing of such claims, and (ii) give D2 sole control of the defense or settlement of such claims. D2 shall not be liable for any claims to the extent that such claims arise out of the LICENSEE's unauthorized modifications of the Licensed Technology, and not out of the Licensed Technology as delivered by D2 to LICENSEE. If the Licensed Technology, or any part thereof, is

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adjudicatively determined to be, or in either party's reasonable opinion will be, the subject of any claim, suit or proceeding for infringement of any third party's patent, copyright or trade secret in any country, or if the distribution of use of the Licensed Technology is enjoined, then D2 may, at D2's sole option and expense, (i) obtain for LICENSEE and its distributors, resellers and customers the right to distribute or use the Licensed Technology under such third party patents, trade secrets, copyrights or other intellectual property rights, or (ii) replace the Licensed Technology with other software of equivalent or superior functionality, or (iii) suitably modify the Licensed Technology to avoid such infringement. In the event that D2 is unable to carry out the options set forth in (i), (ii) and (iii) of the proceeding sentence, at the option of Licensee D2 may terminate this Agreement and refund all amounts paid by LICENSEE to D2 hereunder; provided, that such termination shall have no effect on the rights of end users to use LICENSEE products, incorporating any

Licensed Technology, which were acquired by such end users prior to such termination.

11. LIMITATION OF LIABILITY

IN NO EVENT SHALL EITHER PARTY BE LIABLE TO THE OTHER PARTY FOR LOST PROFITS OR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR SUCH OTHER PARTY, HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, ARISING OUT OF THIS AGREEMENT. THESE LIMITATIONS SHALL APPLY NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. IN NO EVENT SHALL D2'S LIABILITY HEREUNDER EXCEED THE TOTAL AMOUNT PAID OR OWED BY LICENSEE TO D2 UNDER THIS AGREEMENT.

12. CONFIDENTIALITY.

12.1 Confidential Information. As used in this Agreement, the term "Confidential Information" shall mean any information disclosed by one party to another pursuant to this Agreement which is marked as confidential or proprietary, or, if disclosed orally, is designated as confidential at the time of disclosure and is subsequently reduced to a writing which is marked as confidential or proprietary and is provided to the receiving party within thirty (30) days after such oral disclosure.

12.2 Confidentiality. Each party shall treat as confidential all Confidential Information of the other party, shall not use such Confidential Information except as set forth herein, and shall use reasonable efforts not to disclose such Confidential Information disclosed to it by the other party under this Agreement. Each party shall promptly notify the other party of any actual or suspected misuse or unauthorized disclosure of such other party's Confidential Information.

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12.3 Exception. Notwithstanding the above, neither party shall have liability to the other party with regard to any Confidential Information of such other party which the receiving party can demonstrate:

(i) was in the public domain at the time it was disclosed or has entered the public domain through no fault of the receiving party;

(ii) was known to the receiving party, at the time of disclosure, as demonstrated by files in existence at the time of disclosure;

(iii) was disclosed with the prior written approval of the disclosing party;

(iv) was, is presently or may be in the future independently developed by the receiving party without any use of the Confidential Information of any other party, as demonstrated by files created at the time of such independent development;

(v) became known to the receiving party, without restriction, from a source other than the disclosing party without breach of this Agreement by the receiving party and otherwise not in violation of the disclosing party's rights;

(vi) has been disclosed to third parties by the disclosing party without restrictions similar to those contained in this Agreement; or

(vii) is disclosed pursuant to the order or requirement of a court, administrative agency, or other governmental body; provided, however, that the receiving party shall provide prompt written notice thereof to the disclosing party to enable the disclosing party to seek a protective order or otherwise prevent or restrict such disclosure.

12.4 Return of Confidential Information. Upon expiration or termination of this Agreement each party shall upon request promptly return all tangible Confidential Information received from the other party.

12.5 Survival of Confidentiality Obligations. This Article 12 will survive the termination of this Agreement, for any item of Confidential Information, for five (5) years after the disclosure of such Confidential Information to the receiving party under this Agreement.

13. CONFIDENTIALITY OF AGREEMENT.

D2 and LICENSEE agree that the terms and conditions of this Agreement shall be treated as confidential and shall not be disclosed to any third party without the

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prior written consent of the other party. Notwithstanding the statements above in this Article 13, any party may disclose any of the terms and conditions of this Agreement;

(i) as required by any court of other governmental body;

(ii) as otherwise required by law (including without limitation with regard to any registration statement filed by a party with the Securities and Exchange Commission);

(iii) to legal counsel of the parties;

(iv) in confidence, to accountants, banks, and financing sources, and other advisors or consultants of the parties;

(v) in connection with the enforcement of this Agreement or rights under this Agreement;

(vi) in confidence, in connection with an actual or proposed license, merger, acquisition, or similar transaction;

(vii) which have been previously disclosed in a joint press release by the parties hereto, or

(viii) in confidence, to a third party to the extent reasonable necessary to permit the consideration of a bona fide collaboration which would involve rights, obligations or limitations arising under this Agreement, provided that such collaboration is not prohibited under this Agreement.

In the event of any disclosure pursuant to (i) or (ii) above, the disclosing party shall use all reasonable efforts to obtain confidential treatment of materials so disclosed. The parties shall in good faith consult regarding the text of any proposed public announcement regarding this Agreement or the terms and conditions hereof before such announcement is actually made. Any press release to be issued in connection with the terms and conditions of this Agreement must be approved in advance by both parties.

14. EXPORT RESTRICTIONS

LICENSEE's distribution of products incorporating Licensed Technology shall be subject to all United States laws and regulations governing the license and delivery of technology and products abroad by persons subject to the jurisdiction of the United States. LICENSEE shall not export any such products without first

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obtaining all required licenses and approvals from the appropriate government agencies.

15. GENERAL

15.1 Governing Law. This Agreement shall be governed by and interpreted in accordance within the laws of the State of New York without reference to conflicts of laws provisions.

15.2 Venue. The parties agree that any litigation arising out of this Agreement shall be brought in the state courts in Delaware.

15.3 Partial Invalidity. If any provision in this Agreement shall be found or be held to be invalid or unenforceable in any jurisdiction in which this Agreement is being performed, then the meaning of said provision shall be construed, to the extent feasible, so as to render the provision enforceable, and if no feasible interpretation would save such provision, it shall be severed, solely in such jurisdiction, from the remainder of this Agreement, which shall remain in full force and effect. In such event, the parties shall negotiate, in good faith, a substitute, valid and enforceable provision, effective solely in such jurisdiction, which most nearly effects the parties' intent in entering into this Agreement.

15.4 Relationship of the Parties. D2 and LICENSEE are independent contractors under this Agreement. Nothing contained in this Agreement is intended to, nor is it to be construed so as to, constitute D2 and LICENSEE as partners or joint ventures with respect to this Agreement. Employees of any party remain employees of said party and shall at not time be considered agents of or to be obligated to render a fiduciary duty to the other party.

15.5 Modification. No alteration, amendment, waiver, cancellation or any other change in any term or condition of this Agreement shall be valid or binding on any party unless the same shall have been mutually assented to in writing by both parties.

15.6 Waiver. The failure of any party to enforce at any time any of the provisions of this Agreement, or the failure to require at any time performance by the other parties of any of the provisions of this Agreement, shall in no way be construed to be a present or future waiver of such provision, nor in any way affect the right of any party to enforce each and every such provision thereafter. The express waiver by any party of any provision, condition or requirement of this agreement shall not constitute a waiver of any future obligation to comply with such provision, condition or requirement.

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15.7 Assignment. This Agreement shall be binding upon and shall inure to the benefit of the parties hereto and their respective successors and assigns. No party may assign any of its rights, obligations or privileges (except by operation of law or other corporate reorganization) hereunder without the prior written consent of the other party, which shall not be unreasonable withheld, provided, that any party shall have the right to assign its rights, obligations and privileges hereunder to a successor in business or an acquirer of all or substantially all of its business or assets to which this Agreement pertains without obtaining the consent of the other party.

15.8 Notices. Any notice required or permitted to be given by any party under this Agreement shall be in writing, shall be addressed to the President of D2, or to the President of LICENSEE, and shall be personally delivered or set by certified or registered letter, or by telecopy confirmed by registered or certified letter, to the receiving party at its address first set forth above, or such new address as may from time to time be supplied hereunder by the receiving party. Notices will be deemed effective upon receipt.

15.9 Force Majeure. Notwithstanding anything else in this Agreement, no default, delay or failure to perform on the part of any party shall be considered a breach of this Agreement if such default, delay or failure to perform is shown to be due to causes beyond the reasonable control of the party charged with a default, including, but not limited, causes such as strikes, lockouts or other labor disputes, riots, civil disturbances, actions or inactions of governmental authorities or suppliers, epidemics, war, embargoes, were weather, fire, earthquakes, acts god, acts of the public enemy or nuclear disasters; provided, that for the duration of such force majeure the party charged with such default must continue to use all reasonable efforts to overcome such force majeure.

15.10 Entire Agreement. The terms and conditions contained in this Agreement constitute the entire agreement between the parties and supersede all previous agreements and understandings, whether oral or written, between the parties hereto with respect to the subject matter hereof.

IN WITNESS WHEREOF, the parties hereto have caused this agreement to be signed by duly authorized officers or representatives as of the date first above written.

"LICENSEE" D2 TECHNOLOGIES, INC.

BY: /s/ Dick Swee BY: /s/ David Y. Wong

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PRINT NAME: Dick Swee PRINT NAME: David Y. Wong

TITLE: VP Engineering TITLE: President

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EXHIBIT A

LICENSED TECHNOLOGY SPECIFICATION

Basic Services:

The Basics Services algorithm group shall include the following list of standard D2 products with LICENSEE required modifications as specified in the attached Specification and the Contract for Products and Services, dated August 6, 1997:

DTMF Detection and Removal Algorithm	5007-54A
Universal Tone Detection Algorithm	50030-54A
Multifrequency Tone Detection Algorithm	50028-54A
Tone Generation Algorithm	50015-54A
Voice Activity Detection and AGC	50013-54A

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Exhibit A continued.

Detailed Signal Processing Algorithm Specification

A.1 HDLC Communications

Not included as Licensed Technology.

A.2 Voice Activity Detection

Voice Activity Detection (VAD) detects voice activity, adapts to background ambient or line noise as well as the presence of echo, classifies voice activity as "early" versus "sustained", and assigns an "effort level" to the speaker that is independent of network loss.

This module is used to detect voice activity in the CP Detect state.

A.2.1 Functional requirements:

The Voice Activity Detector discriminates voice activity generated by a caller from background noise (acoustic and line noise) as well as echo and sidetones reflected back to the receive voice path. It also provides an "effort level" quantity that indicates the level of effort of the caller. The functional and performance requirements are specified to cover a wide range of applications, such as voice activated recordings (as in voice messaging), outbound call classification, digital speech interpolation (DSI), and voice conferencing.

- 1. The Voice Activity Detector classifies every block of voice data (8 ms long) as "port active" (early detect), "speaker active" (port sustained), and "not active".
- 2. It provides a measurement that approximates the level of effort exerted by the caller. Such an approximation is made by normalizing the short term RMS of the voice signal by a longer term RMS value. The "effort level" varies between -32 dB and 31 dB, and is at 0 dB when the speaker is speaking at his/her "normal" level.
- 3. The Voice Activity Detector adapts to background noise up to -24 dBm. Adaptation is 200 ms when the noise level drops, and is approximately 1000 ms when noise rises.
- 4. The Voice Activity Detector screens out sidetone or echo as speech up to an ERL of -26 dB.

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A.2.2 Performance Requirements:

The accuracy of the voice Activity detector is measured by the rate of "false detection" (i.e. classifying noise or echo as voice activity) and "clipping" (i.e. classifying voice activity as noise or echo) under different ambient noise and echo conditions. "Port active" detection under different ambient noise conditions:

- 1. No perceptible clipping at quiet to modest noise levels of -50 dBm to -40 dBm with nominal levels of speech activity (-20 dBm average power over 2 seconds of speech). No more than 5% of voice onsets is clipped for noisy conditions (noise level from -40 dBm to -30 dBm).
- 2. No more than 1% of "silence" periods is detected as speech for the modest noise condition. No more than 2% of "silence" is detected as port active for noisy conditions.
- 3. The performance goals above is met when noise levels change during the test.

"Speaker active" detection under different ambient noise conditions:

- 1. Speech activity that lasts more than tsUSTAIN is detected as "Sustained" or "Speaker Active".
- 2. The clipping requirements is better than "Port Activity" detection. Fewer than 0.5% of onsets/hour (2.5 per hour) for modest noise condition (-45 dBm) and fewer than 2% (10 per hour) for high noise condition (-35 dBm) have perceptible clipping.
- 3. False detection performance (i.e., detecting noise as "speaker active") exceeds those of "port activity" due to tsUSTAIN criteria. No more than 1% (36 seconds per hour) of noise segments is misclassified as "sustained" for modest noise conditions, and no more than 2% (72 seconds per hour) of "silence" is detected as port active for noisy conditions.

"Port active" and "Speaker active" detection in the presence of echo:

- 1. Less than 1% of residual echo is detected as "port active" - (i.e. 36 sec. per hour) during normal operation of canceller.
- 2. Less than 0.1 % (i.e. 3.6 sec per hour) of residual echo is detected as "speaker active" or "port sustained" during normal operation of canceller.
- 3. Clipping of input speech in the presence of echo is no higher than clipping in the presence of modest to high level of noise.

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A.3 DTMF Detection

A.3.1 Functional requirements:

Table A-1 specifies the nominal frequencies for the DTMF digits that must be detected.

Nominal High Group Frequencies (Hz)				
	1209	1336	1477	1633
Nominal	697	1	2	3
				A

Low Group	770	4	5	6	B
Frequencies	852	7	8	9	C
(Hz)	941	*	0	#	D

Table A-1: Nominal DTMF Frequencies

1. Detect the presence of all 16 DTMF digits that are produced by different phones on the market under a broad range of network conditions.
2. DTMF digit information is provided as soon as the minimum duration is met. This information is called leading edge detection. This allows the earliest possible response to the digit, such as stopping voice output.
3. The trailing edge of a DTMF digit must be detected. This allows the system to delay any response (such as playing out voice) to the digit until the user has released the DTMF key. The criteria selected for trailing edge detection will debounce DTMF digits.
4. The DSP reports leading and trailing edge in the 8 ms block that they are detected. DTMF events are not buffered.

A.3.2 Performance requirements:

Table A-2 consists of performance requirements taken from EIA-464A and Bellcore TR-TSY-000181. Also shown is D2's DTMF performance requirements, which is a superset of the EIA and Bellcore requirements.

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Requirement			
Characteristic	Bellcore	EIA/TIA-464A	D2
Frequency Deviation	+/-1.5% must accept; +/-3.5% must reject	+/-1.5% must accept; +/-3.5% must reject	Configurable choice of four sets of must accept/must reject: +/-2.0% accept to +/-3.0% reject; +/-2.5% accept to +/-3.5% reject; +/-3.0% accept to +/-4.0% reject; +/-3.5% accept to +/-4.5% reject.
Minimum Tone Duration	40 ms must accept; 23 ms must reject	40 ms must accept	Configurable from 24 to 80 ms
Minimum Interdigital Interval	40 ms	40 ms	Configurable from 24 to 80 ms
Minimum Cycle Time	93 ms	93 ms	Configurable from 48 to 160 ms
Accept Levels	0 to -36 dBm must accept, -55 dBm must reject	0 to -25 dBm must accept	0 dBm to configurable minimum (-25 to -45 dBm range)
Twist (ratio of high group power to low)	-8 to +4 dB	-8 to +4 dB	Separately configurable positive and negative twists: +/- 4, 6, 8, 10, and 12 dB
Bellcore talkoff tape	Fewer than 670 total talkoffs; fewer than 330 talkoffs of digits 0-9; fewer than 170 talkoffs of signals * and #.	-	Fewer than 20 talkoffs (with default configuration of 2.5% to 3.5% frequency deviation; 40 msec min tone duration; +/- 8 dB twists; -45 dBm min accept level)
Mitel talkoff tape	-	-	0 talkoffs (with default configuration)
SNR	23 dB	15 dB	15 dB
Impulse Noise	Fewer than 14 missed or split digits in Bellcore Impulse Noise Tape No. 201	Fewer than 10 errors in 10,000 tones for EIA test #1; fewer than 500 errors in 10,000 tones for test #2	Pass both Bellcore and EIA/TIA-464A impulse noise requirements

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Echo	16 dB Signal-to-Echo ratio at 20 ms; 24 dB at 45 ms	10 dB Signal-to-Echo ratio at 20 ms	Pass both Bellcore and EIA/TIA-464A echo requirements
Dial Tone	DTMF Detection in the presence of dial tone at -15 dBm per dial tone frequency	DTMF Detection in the presence of dial tone at -16 dBm per dial tone frequency	Pass both Bellcore and EIA/TIA-464A requirements for detection of DTMF digits in the presence of dial tone

TABLE A-2: DTMF Performance Requirements

Other performance requirements:

1. A leading edge of DTMF digit is signaled during the block in which the minimum duration is met, and the trailing edge is signaled during the block in which the minimum debounce interval is met.
2. Talk-down: DTMF detection must work reliably in the presence of echo (for the maximum allowable output voice level) and with varying levels of DTMF signals (due to network loss). D2's DTMF detector combined with the echo must meet the performance requirements of Figure A-1 in the presence echo generated by playing pause-removed voice (male and female) at -18 dBm ASL (averaged over 3 seconds) over a telephone circuit with 15 dB echo return loss (ERL).

INSERT GRAPH

Figure A-1: DTMF Talk-down Acceptance Curve

3. Debounce test: Long tones (generated by "hard" key presses) must not be detected as multiple tones in the presence of echo interference or line noise. Combined with the echo canceller, the DTMF detector is required to reliably "debounce" all DTMF digits above -18 dBm in the presence of voice levels below -15 dBm (ASL) and a telephone circuit with echo return loss (ERL) of 15 dB.

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4. Double-talk talk-off: Many voice processing hardware or semiconductor manufacturers significantly degrade the "talk-off" performance of their detector in the presence of voice echo or sidetone to achieve a high level of talk-down performance. This strategy is acceptable in a pure digit-in-voice-out scenario, but for voice conferencing or voice recognition applications, voice could be present in the both the transmit and receive path. In such cases, the DTMF detector must be very robust against "talk-off" in double-talk situations. The talk-off requirements for D2's DTMF detector under double-talk is fewer than 66 talkoffs for the Bellcore talk-off tape.

A.4 Tone Generation

The tone generation module can be programmed to generate any single, dual or amplitude modulated tone required to meet international telecommunications specifications. This functionality is provided by the GENF module, which produces the sum or product of two independently generated sine waves as its output. Each sine wave can be individually parameterized.

A.4.1 Functional requirements:

The GENF module is designed to generate a wide range of DTMF, Call Progress Signals, MF R1/R2, and miscellaneous tones. In order to meet or exceed international telecommunication specifications, GENF must meet or exceed the following functional requirements.

1. Independent arguments shall be supplied for each frequency for dual tones that GENF generates. Single tones are generated by specifying that one of the dual tone's frequencies is 0 Hz.
2. Independent arguments shall be supplied for the carrier and modulation frequencies for amplitude modulated tones that GENF generates.
3. Arguments shall be supplied that allow the frequency of a tone to be set in the range of 0 to 4000 Hz in 1 Hz units.
4. Arguments shall be supplied that allow the output power to be set in the range of +3 to -50 dBm in 0.5 dB steps.
5. Arguments shall be supplied that allow an amplitude modulated tone's modulation percentage to be set in the range of 0 to 300% in 1% units.
6. The tone duration (make time) shall be specified in 1 ms units. Tone durations shall be specified in the range of 0 to 8191 ms.

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7. An unlimited tone duration shall be specified by setting the make duration to -1.
8. The silence duration between tones (break time) shall be specified in 1 ms units. Silence durations shall be specified in the range of 0 to 8191 ms.
9. An unlimited silence duration shall be specified by setting the make duration to -1 and setting both frequencies of a dual tone to 0 Hz.
10. The GENF module shall allow tones to be generated that meet or exceed EIA/TIA-464 requirement for DTMF and call progress tone generation.
11. The GENF module shall allow tones to be generated that meet or exceed CCITT Blue Book Volume VI Fascicle VI.4 recommendations Q.310-Q.490 requirements for MF R1 and R2 tone generation.
12. The GENF module shall generate tones with one to three unique cadence pairs (on/off pairs).

A.4.2 Performance Requirements

1. Frequency accuracy shall exceed 1 Hz.
2. Level accuracy shall exceed 0.5 dB.
3. Timing information shall exceed 1 ms accuracy.

A.5 Universal Tone Detector

A.5.1 Overview

The Universal Tone Detector (UTD) is a high configurable tone detector. By changing parameters, this algorithm can classify a wide range of single and dual tone call progress signals generated in a wide variety of countries.

A.5.2 General

Since different tones need different detection heuristics, and tones may have multiple specifications, each tone is tagged with a tone category identifier.

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Tone Category	Call Progress Signal
1	Modem
2	FAX CNG
3	Audible Ringback
4	Busy
5	Reorder or Congestion
6	Number Unobtainable
7	SIT
8	Dial tone
9	Unknown Tone

Table A-3: Tone Categories

In addition to specifying a tone category, the parameters include a value that is returned to the application when the tone is detected. This parameter need not be unique. This allows multiple specifications to report the same tone event to the application. UTD is table driven. Using this approach, the tone detector searches parameter tables for a matching tone. When a tone matches, the tone code determines the heuristics necessary to completely classify the tone. Also, the tones must be specified in a way that a set of parameters corresponds to either a single tone, a dual tone, or an amplitude modulated tone.

Code	Tone Type
0	Single Tone
1	Dual Tone
2	Modulated Tone

Table A-4: Call Progress Tone Types

A.5.3 General Functional Requirements

UTD functionally combines a single tone detector and a dual/modulated tone detector into a single module. UTD combines the results of these detectors into a single result. UTD has the following requirements.

1. The DSP shall indicate that the first ringback has started after at least 400 ms of ringback like signal has been processed, as long as no other tone type is early detected. If more than one type of tone is early detected, the first ringback reporting shall be delayed until either cadence information disqualifies the other types, or tone precedence is used as a 'tie-breaker'.

2. The DSP shall indicate ringback has stopped when ringback is no longer detected.
3. The DSP shall indicate a busy tone has been detected after the requisite number of make and break intervals have been processed, and no other tone category is still a candidate for detection.
4. The DSP shall indicate a reorder tone has been detected after the requisite number of make and break intervals have been processed, and no other tone category is still a candidate for detection.
5. The DSP shall indicate a number unobtainable tone has been detected after the requisite number of make and break intervals have been processed, and no other tone category is still a candidate for detection.
6. In the event that more than one tone is a candidate for detection, detection is delayed until all characteristics that may disqualify any of the candidates are tested (for example, waiting for multiple cadence pairs to occur). If there is still more than one potential tone after all differentiating features have been exhausted, then the tone with the highest precedence is detected. Also, if the tone ceases prior to singling out one candidate tone, then the tone with the highest precedence is detected. Precedence is shown in Table A-3.
7. The DSP shall supply an early detect flag. This flag shall be valid after the detector has processed no more than 72 ms of a tone. If more than one tone category is early detected, then the early detect flag shall indicate the tone category with the highest precedence.
8. The DSP shall indicate that a modem has been detected if a single tone falls within the specified frequencies for modem tones, the minimum make interval has been exceeded while the average tone power is in excess of the minimum power requirement, and no other tone category is still a candidate for detection.
9. The DSP shall indicate that a FAX CNG tone has been detected if a single tone falls within the specified frequencies for a CNG tone, the requisite number of on/off cadences have been processed, and no other tone category is still a candidate for detection.
10. The DSP shall indicate that a SIT tone has been detected if at least two of the three segments of possible SIT tones have been detected for at least the minimum interval in excess of the minimum power requirement.

11. The DSP shall indicate that an Unknown tone has been detected when it has been determined that a tone has been detected that falls within the specified frequencies for an Unknown tone, the minimum duration has been exceeded, and the tone does not match and other category tones.

A.5.3.1 TONE DETECTOR PERFORMANCE REQUIREMENTS

A.5.3.1.1 Single Tones

There are four types of parameters that shall be used to control single tone detection. The variation of each parameter shall be limited by the constraints listed in Table A-5.

	Minimum	Maximum
Frequency	300 Hz	3300 Hz
Bandwidth	0 Hz	1800 Hz
Duration	100 msec	32760 msec
Minimum Power Level	-45 dBm	3 dBm

Table A-5: Single Tone Detection Constraints

The frequency detection range shall be specified the Frequency and Bandwidth parameters. Figure A-2 shows the relationship of these parameters. Note that the bandwidth specification is symmetric about the center frequency. The Frequency and Bandwidth parameters define a "must detect" range. The detector shall not use frequency criteria to reject any tones which are within the range specified Frequency/Bandwidth parameters. Tones whose frequencies are outside but close to frequency range may be detected.

INSERT GRAPH

Figure A-2: Frequency Domain Representation of tone parameters for a Single Tone

If the Power Level of the detected parameter is greater than the minimum power specified by the parameters, the signal shall not be rejected by Power Level heuristics. Duration parameters are used to set the allowable duration of a tone. Minimum and maximum tone durations may be specified (make durations). Also, minimum and maximum silence durations between tones may be specified.

A.5.3.1.2 Dual Tones

Dual tones are created by summing two sinusoids. Since each tone can be isolated in the frequency domain, dual tones are specified as a pair of single tones. Parameters for each tone of a dual pair use the same constraints as single tones. Namely, frequency1 is the center frequency of the lower tone, and bandwidth1 specifies its frequency tolerance. The same is true for frequency2 and bandwidth2 for the high tone. Figure A-3 shows the definition of the frequency and bandwidth parameters for a dual tone.

INSERT GRAPH

Figure A-3: Frequency Domain Representation of Tone Parameters for a Dual Tone

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Not all dual tones are detectable by UTD. A dual tone shall be detected only when the difference between the two component frequencies is greater than 10 Hz and less than 230Hz.

A.5.3.1.3 Amplitude Modulated Tones

Amplitude modulated tones are created by multiplying two sinusoids. When analyzed in the frequency domain, a modulated tone looks like three tones. Figure A-4 shows the frequency spectrum for a modulated tone.

The tone whose frequency is the average of the other tones is the carrier. The other two tones can be referred to as side lobes. For amplitude modulated tones, frequency1 and bandwidth1 specify the low sidelobe and its tolerance, while frequency2 and bandwidth2 specify the high sidelobe and its tolerance.

INSERT GRAPH

Figure A-4: Frequency Domain Representation of Tone Parameters for an Amplitude Modulated Tone

As with dual tones, not all modulated tones will be detected by UTD. Modulated tones shall be detected if the difference between the carrier frequency and the sidelobes is between 10 Hz and 230 Hz.

A.5.3.1.4 Precedence

By assigning a detection precedence to the classification process, tone frequency ranges can overlap. When a tone's parameters fall into a range shared by two or more signals, the signal is classified as the one with the highest precedence.

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Precedence Call Progress Signal

1	Modem
2	FAX CNG
3	Audible Ringback
4	Busy
5	Reorder or Congestion
6	Number Unobtainable
7	SIT
8	Dial Tone
9	Unknown Tone

Table A-6: Tone Detection Precedence

Table A-6 shows the precedence of typical tones that the UTD module detects. Modem signals have the highest precedence, and Unknown tones have the lowest. Therefore, the frequency range of unknown tones can safely overlap the other tone ranges without causing tones to be misclassified. If the range for Unknown tones is allowed to be the maximum range allowed by the detector, any detected tone that is unclassified would be designated as Unknown.

A.5.3.1.5 North American Call Progress Signal Detection

Functional Requirements:

The tables below specify the frequencies, power levels, and cadence of the Bellcore and EIA-464A call progress tones.

Name	Frequency (Hz)				Power Level (dBm)	
	350	440	480	620	Per Frequency	Combined
Audible Ring		X	X		-22.5 +/- 1.5	
Busy			X	X	-27 +/- 1.5	
Dial Tone	X	X			-17.5 to -15	-13 to -14.5
Intercept		X		X	-20 +/- 1.5	
Reorder			X	X	-27 +/- 1.5	

Table A-7: Call Progress Tone Frequency and Power Requirements

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Audible ring (ring-back)	repetition of the tone on for 0.8 to 2.2 seconds, and off for 2.7 to 4.4 seconds
Busy	repetition of the tone on for 0.5+/-0.05 seconds, and off for 0.5 +/-0.05 seconds
Dial	steady uninterrupted
Intercept	repetition of an alternating sequence, of the two frequencies each being on for 0.16 to 0.30 seconds with a total cycle time of 0.5 +/-0.05 seconds
Reorder (fast busy)	repetition of the tone on for 0.25+/-0.025 seconds, and off for 0.25+/-0.025 seconds

Table A-8: Call Progress Tone Cadence

Performance Requirements:

1. Frequency Deviation: Even though the generator is required to meet a frequency tolerance per tone of +/-0.5%, the detector needs to allow for a wider frequency tolerance due to variations in generators and line distortions. The CP detector detects all tones whose component frequencies deviate less than 1% from nominal.
2. Twist: The CP detector detects all tones whose twist is less than +/-4 dB.
3. Dynamic Range: The CP detector exhibits a minimum dynamic range of 25 dB.
4. Cadence: The CP detector must detect call progress tones whose cadence is within +/-10%.
5. Talkoff: The CP detector makes no false detections in 12 hours of testing with voice at -15 to -18 dBm ASL.

A.5.3.1.6 FAX CNG Tone Detection

The standard connection protocol for automatic connection of a FAX modem requires that the calling FAX modem generate a calling tone (CNG). Hence for incoming calls, the EVP software has to detect a CNG signal. When CNG is detected, EVP alerts the Core Processor to redirect the call to a FAX machine or a FAX modem embedded within the call processing system.

Functional Requirements:

Detect the presence of the FAX calling tone (CNG). A CNG signal is defined as follows.

INSERT GRAPH

Figure A-5: Fax calling tone (CNG)

- a) The CNG tone is within 38 Hz of nominal frequency.
- b) The timing tolerance of a CNG tone is +/-15%.
- c) The power of a CNG tone is between 0 and -43 dBm.

Performance Requirements:

- 1. The detector does not miss any CNG signals on a prerecorded tape containing 50 CNG tone samples collected from 5 different FAX machines.
- 2. The detector does not miss any CNG signals from the same FAX machines connected to a local CO with a noise level of less than -45 dBm.
- 3. The detector misses less than 0.5% of CNG signals (generated at -10 dBm) when compressed voice is output at a level of -15 dBm or less (average over 3 seconds) into a network whose ERL is greater than 15 dB.
- 4. The detector does not falsely detect more than 1 CNG tone per 5 hours of voice (based on Bellcore recorded talk radio voice tapes.)

A.5.3.1.7 Modem Tone Specification

All answering modems that conform to the ITU V.25 answering sequence present a 2100 Hz tone 1.8 to 2.5 seconds after answering the telephone line. Figure A-6 and Figure A-7 show the timing of the answering tone (ANS). In Figure A-6, the 2100 Hz

tone reverses phase every [tau] intervals. These phase reversals disconnect echo cancellers and echo suppressors from the network. According to ITU G.164, phase reversal shall be accomplished such that the phase is within 180 +/-10 degrees in 1 ms and that the amplitude of the 2100 Hz tone is not more than 3 dB below its steady state value for more than 400 msec.

INSERT GRAPH

Figure A-6: Timing for Answering Modem with Phase Reversal

A timing diagram for an answering modem without phase reversal is shown in Figure A- 7. The timing is identical with that of phase reversing tone except for the reversal timing.

INSERT GRAPH

Figure A-7: Timing for Answering Modem without Phase Reversal

Table A-9 contains the nominal frequency, power, and duration requirements for

	Minimum	Maximum	Unit
Frequency	2085	2115	Hz
Duration	2.6	4.0	seconds
Power	-18.0	-6.0	dBm0

generating modem tones as derived from V.25 and G.164.

Table A-9: Modem Tone Generation Requirements

Performance Requirements:

1. The detector does not miss any modem answer tone on a pre-recorded tape containing 50 modem answer tone samples collected from 5 different data modems.
2. The detector does not miss any modem answer tone signals from the same data modem connected via a local CO with a noise level of less than -45 dBm.
3. The detector does not miss more than 0.5% of modem answer tones (generated at -10 dBm) when compressed voice is played at a level of -15 dBm (ASL) or lower into a network connection with ERL greater than 15 dB.
4. The detector does not falsely detect the presence of a modem answer tone more than once per 5 hours of voice (using Bellcore recorded talk radio voice tapes).
5. There is no talkdown performance requirement. The near end is always silent and does not interfere with far end modem ANS signals.
6. There shall be fewer than 1 talkoff in 5 hours of call classification when the detector is programmed with the recommended parameters. Assuming that each call is resolved within an average time of 10 seconds, there shall be less than 1 talkoff in 1800 calls.

A.5.3.1.8 Three Tone Sequences

Most countries that generate Special Information Tones (SIT) use a three tone sequence. SIT sequences are generated by various central offices or common carrier switching points to indicate a problem with the dialed call. A SIT tone sequence generally precedes a recorded voice announcement such as "the number you have dialed is no longer in service..." and is provided specifically for the purpose of detection of the problem type by an automated device.

There are two popular types of SIT sequences. The first type is used mainly in Europe. It consists of a sequence of three tones of identical durations. The second type is the one used in North America. There are several North American SIT sequences that are encoded using various combinations of frequency and duration for each of the three tones. The encoding has been standardized by Bellcore.

Performance Requirements:

1. The UTD shall handle both types of sequences.
2. There is no talkdown performance requirement. The near end is always silent and does not interfere with far end SIT signals.

3. There shall be fewer than 1 talkoff in 5 hours of voice when the detector is programmed with the recommended parameters. Assuming that each voice call is has an average of 2 seconds of voice, there shall be fewer than 1 talkoff in 9000 calls.

A.5.3.1.9 Unknown Tone

Any single tone, dual tone, amplitude modulated tone or single tone sequence that is not classified as a CP, SIT, CNG or modem ANS tone, shall be reported as an unknown tone.

Performance Requirements:

1. Talkdown performance requirement [TBD]
2. There shall be fewer than 1 talkoff in 5 hours of voice when the detector is programmed with the recommended parameters (minimum tone duration 400 ms). Assuming that each voice call is has an average of 2 seconds of voice, there shall be fewer than 1 talkoff in 9000 calls.

A.6 Multifrequency Tone Detection (MFD)

The MFD algorithm module detects the presence of R1, R2 Forward, and R2 Backward Multi frequency (MF) tones under a broad range of network conditions and under international telecommunications specifications.

A.6.1 Functional requirements:

Table A-10, Table A-11, and Table A-12 specify the nominal frequencies for the MF digits that must be detected.

- - - - -

F1 (Hz)	F2 (Hz)
---------	---------

	900	1100	1300	1500	1700
700	1	2	4	7	Spare
900	--	3	5	8	Spare
1100	--	--	6	9	KP
1300	--	--	--	0	Spare
1500	--	--	--	--	ST

Table A-10: Nominal MF R1 Frequencies and corresponding digit definitions

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F1 (Hz)	1500	1620	F2 (Hz) 1740	1860	1980
1380	1	2	4	7	11
1500	--	3	5	8	12
1620	--	--	6	9	13
1740	--	--	--	10	14
1860	--	--	--	--	15

Table A-11: Nominal MF R2 Forward Frequencies and corresponding combination numbers

F1 (Hz)	1020	900	F2 (Hz) 780	660	540
1140	1	2	4	7	11
1020	--	3	5	8	12
900	--	--	6	9	13
780	--	--	--	10	14
660	--	--	--	--	15

Table A-12: Nominal MF R2 Backward Frequencies and corresponding combination numbers

1. Be configurable to detect either R1, R2 forward, or R2 backward MF digits on a per-call basis.
2. Detect the presence of all 15 R1, 15 R2 Forward, and 15 R2 Backward digits under a broad range of network conditions.
3. MF digit information is provided as soon as the minimum duration is met. This information is called leading edge detection. This allows the earliest possible response to the digit, such as in compelled signaling.
4. The trailing edge of a MF digit must be detected. This allows the system to delay any response (such as in compelled signaling) to the digit until it is removed. The criteria selected for trailing edge detection will debounce MF digits.
5. The DSP reports leading and trailing edge in the 8 ms block that they are detected. MF events are not buffered.

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A.6.2 R1 Detection Performance requirements:

Table A- 13 consists of MF R1 tone detection performance requirements taken from CCITT/ITU Q310-Q331 and Bellcore TR-NWT-000506. Also shown is D2's MF R1 performance requirements, which is a superset of the CCITT and Bellcore requirements.

Requirement			
Characteristic	Bellcore	CCITT/ITU	D2
Frequency Deviation	+/- (1.5% + 5 Hz) must accept	+/-1.5% must accept	Configurable choice of three sets of must accept frequency tolerance: +/- (1.5% + 5 Hz), +/- (1.5% + 10 Hz), +/- (1.5% + 15 Hz)
Tone Duration	KP signal >= 54 ms must accept; All others: >=30 ms must accept; / =30 ms must reject	>=30 ms must accept must reject	Minimum duration is Can be configured for

steps, from 28 ms up.

Minimum Interdigital Interval	Must accept interdigital intervals ≥ 25 ms. Must bridge interdigital intervals	Must accept interdigital intervals ≥ 20 ms	Minimum interdigital interval is configurable in 4 ms steps. Can be configured for ≥ 20 ms	
Minimum Cycle Time	Up to 10 pulses per second (100 ms cycle)	-	> 10 pulses per second (time)
Accept Levels	0 to -25 dBm must accept	-	Minimum power is configurable from -25	frequency
Twist (ratio of high group power to low)	accept	accept	accept	accept
SNR (white noise)	20 dB	-	20 dB	
Impulse Noise	Fewer than 14 missed or split digits in Bellcore Impulse Noise Tape No. 201	-	Fewer than 14 missed or split digits in Bellcore Impulse Noise Tape No. 201	

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Disturbing Frequencies	Detection in the presence of 2A-B and 2B-A modulation products 28 dB below each frequency component level of the signals.	-	Detection in the presence of 2A-B and 2B-A modulating products 28 dB below each frequency component level of the signals
------------------------	---	---	--

Table A-13: MFD R1 Detection Performance Requirements

A.6.3 R2 Detection Performance Requirements

Table A- 14 shows the MF R2 tone detection performance requirements taken from CCITT/ITU Q400-490. The MFD module is required to pass all CCITT/ITU requirements.

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Characteristic	CCITT/ITU Requirement	CCITT/ITU Requirement	
Frequency Deviation	± 10 Hz must accept	Configurable choice of three sets of must accept frequency tolerance: ± 10 Hz ± 15 Hz ± 20 Hz	
Tone Duration	Must reject signals		
Minimum response time for R2 compelled signaling	detect delay + generate delay delay + generate delay	detect delay + generate delay detect delay + decision	detect delay + decision delay +
Accept Levels	-5 dBm0 to -31.5 dBm0 must detect; -38.5 dBm0 must reject	Minimum power is configurable from -25 dBm to -45 dBm per frequency	
Twist (ratio of high group power to low)	20 ddB twist must reject	adjacent frequencies; non-adjacent frequencies; 20 dB twist must reject	for adjacent frequencies; for non-adjacent frequencies

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Disturbing Frequencies	<p>Must not falsely detect due to any one or more valid R2 frequencies at -55 dBm per frequency.</p> <p>In the presence of a valid R2 tone, no missed detections and no false detections due to any of the remaining frequencies at 20 dB below the highest of the MF tone pair.</p> <p>Must not falsely detect due to:</p> <ol style="list-style-type: none"> Any 1 or 2 pure sine waves, each at -38.5 dBm0, 300-3400 Hz. Any 1 or 2 pure sine waves, each at -42 dBm, 300-3400 Hz. Forward detector: Any 2 pure sine waves, each at -5 dBm, 330-1150 Hz or 2130-3400 Hz. Backward detector: Any 2 pure sine waves, each at -5 dBm, 1300-3400 Hz. 	<p>Must not falsely detect due to any one or more valid R2 frequencies at -55 dBm per frequency.</p> <p>In the presence of a valid R2 tone, no missed detections and no false detections due to any of the remaining frequencies at 20 dB below the highest of the MF tone pair. Must not falsely detect due to:</p> <ol style="list-style-type: none"> Any 1 or 2 pure sine waves, each at -38.5 dBm0, 300-3400 Hz. Any 1 or 2 pure sine waves, each at -42 dBm, 300-3400 Hz. Forward detector: Any 2 pure sine waves, each at -5 dBm, 330-1150 Hz or 2130-3400 Hz. Backward detector: Any 2 pure sine waves, each at -5 dBm, 1300-3400 Hz.
Transmitted signal interference	Must not falsely detect due to generation of outgoing MF digits.	Must not falsely detect due to generation of outgoing MF digits.

Table A-14: MFD R2 Detection Performance Requirements

A.7 MFcR2 compelled signaling

In order to pass the CCITT requirements for compelled signal timing, the following additional requirements are made on the MFD detector:

- The MFD detector shall detect the leading edge of an R2 digit after processing no more than 24 ms of the digit.
- The MFD detector shall detect the trailing edge of an R2 digit after processing no more than 16 ms of the silence following the digit.

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EXHIBIT B

LICENSEE PRODUCT DESCRIPTION

Service Resource Module (SRM) for high density programmable switching systems.

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EXHIBIT C

DEVELOPMENT, MAINTENANCE, AND RUNTIME LICENSE FEE SCHEDULE

DEVELOPMENT LICENSE FEES: LICENSED TECHNOLOGY FOR THE BASIC SERVICES SPECIFIED IN EXHIBIT A

Development license fees are specified in PO #104962.

50% of which has already been paid to D2 and the final 50% to be paid upon the delivery and acceptance of the Licensed Technology for Basic Services by Licensee in accordance with Article 4 of this Agreement.

MAINTENANCE FEES: LICENSED TECHNOLOGY FOR THE BASIC SERVICES SPECIFIED IN EXHIBIT A

The Maintenance Fee after the expiry of the Warranty period shall be \$20,000 per year, starting from the date after the Warranty period (Contract Year),

In the event that during the four consecutive calendar quarters which begin immediately after the start of a Contract Year, LICENSEE completes payments to D2 of one hundred thousand dollars in Runtime License Fees under this Agreement, D2 will apply a credit equaling to 100% of the Maintenance Fee against the Runtime License Fees of that Contract Year.

RUNTIME LICENSE FEES: LICENSED TECHNOLOGY FOR BASIC SERVICES SPECIFIED IN EXHIBIT A AND SIMPLE CONFERENCING TECHNOLOGY

A runtime license fee shall be paid for each SRM in the Licensee Product (Exhibit B) which contains the Licensed Technology for Basic Services and simple conferencing which does not require network echo cancellation technology (Exhibit A) sold by LICENSEE. Licensee Products which do not run the Licensed Technology are not subject to runtime license fees.

The runtime license fee is based on the number of ports of service that a customer can expect the SRM to provide. As such, this runtime license fee calculation may be used for an SRM with any number of DSP processors (DSPs), with any MIPS

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performance rating, as long as it is from the TI TMS320C54x, TMS320C55x, or TMS320C6x processor family.

$$\text{Fee per SRM} = \text{Fee per Port} * \text{DSPs per SRM} * \text{Average Ports per DSP}$$

Where:

Fee_per_SRM is the runtime license fee for each SRM.
 Fee_per_Port is on Table 1.
 DSPs_per_SRM is the number of DSPs on each SRM.
 Average Ports per DSP is defined below.

total quantity of processors licensed	Fee_per_port
1-5,000	\$2.00
5,001 - 25,000	\$1.00
25,001 - 50,000	\$0.75
5,001 - 75,000	\$0.50
> 75,000	\$0.00

Table 1. Fee per port

If LICENSEE commits to purchase licenses for a minimum of 10,000 processors for the first year after first customer shipments, the fee_per_port will be reduced for \$1.00 for the first 5,000 processors.

The SRM will provide 5 Basic Services and simple conferencing (which does not require network echo cancellation):

1. DTG -- Digital Tone Generation (static channels and outpulsing)
2. CPA -- Call Progress Analysis (with Voice Activity Detection)
3. - DRC -- DTMF Detection
4. MFCR(1) -- Multifrequency Reception (1)
5. MFCR2 -- Multifrequency Reception and Transmission, Compelled R2

To determine the Average ports per DSP, the completed software will be tested in a heavily-loaded VCO/20 to determine the maximum number of ports that a single DSP processor performing each of the Basic Services can reliably satisfy. This

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maximum will be documented in Table 2 below, and will be encoded in software, to prevent a customer from exceeding it.

This maximum will vary depending on the DSP processor speed, so a separate measurement will have to be done for SRMs containing faster processors. Due to system limitations, this number will never exceed 63.

The number of ports supported for each of the Basic Services, per DSP processor, will be averaged (arithmetic mean) to create an average number of ports per DSP (Average_Ports_per_DSP). Because of the computational simplicity of the DTG Service, it will not be included in this calculation:

$$\text{Average Ports per DSP} = (\#CPA + \#DRC + \#MFR1 + \#MFCR2) / 4$$

Service	Predicted	Measured	Included in
---------	-----------	----------	-------------

	Maximum # Ports	Maximum # Ports	Average?
DTG	63	To be measured	Not included
CPA	30	To be measured	Included
DRC	30	To be measured	Included
MFR1	30	To be measured	Included
MFCR2	30	To be measured	Included

TABLE 2. MEASURED PERFORMANCE OF SERVICES

CAP: The runtime license fees is fully paid up after it reaches the CAP, which is the cumulative runtime license fees paid by LICENSEE for the first 75,000 processors as specified in Table 1 above. The CAP is cumulative across the Texas Instruments TMS320C54x, TMS320CSSx, and TMS320C6x, and other TI processors based on the same core processor architecture.

BUYOUT OPTION: Within the Warranty period, LICENSEE may elect to pay D2 a sum of \$1,400,000 as a one time paid-up runtime license fees for the Basic Services specified in Exhibit A.

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EXHIBIT D

MODEL LICENSEE AGREEMENT FOR LICENSEE PRODUCT

SOFTWARE LICENSE

Licensed Technology incorporated in LICENSEE Product, together with Updates and New Versions thereof, are provided to LICENSEE's Customer under a non-exclusive worldwide license subject to the following terms:

1. LICENSEE's Customer shall have the right to distribute copies of the Licensed Technology to end users in Object Code form either directly or indirectly through others for use in connection with the LICENSEE Product. LICENSEE's Customer shall require that such end users agree to protect D2's and LICENSEE's intellectual property rights in the Licensed Technology as set forth in this LICENSEE's Customer Agreement.
2. LICENSEE's Customer shall have the right to reproduce the Licensed Technology for distribution and make a reasonable number of copies of the Licensed Technology for backup or archival purposes.
3. LICENSEE's Customer shall not have the right to modify, reverse engineer, decompile or derive Source Code from the Licensed Technology, nor shall LICENSEE's Customer permit any third party to do so. LICENSEE's Customer shall not have the right to disclose the Licensed Technology except as permitted herein.
4. LICENSEE's Customer shall have the right to transfer a licensed copy of the Licensed Technology to a third party provided LICENSEE's Customer does not retain any copies of such licensed copy and the third party agrees to abide by the terms and conditions of this LICENSEE's Customer Agreement. All Licensed Technology must be transferred upon a change in title of any hardware in which it was installed.
5. LICENSEE's Customer agrees that D2 or LICENSEE retain the entire right and title to Licensed Technology.
6. The provisions of this Article (paragraphs 1 through 6 preceding) shall survive the termination or expiration of this LICENSEE's Customer Agreement.

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EXHIBIT E

1. Development and Back-up Computers

	Computer Manufacturer and Model	Serial Number	Dev/Backup
(1)	--	--	
(2)	--	--	
(3)	--	--	
1. FORMAT OF Licensed Software Media

(1)	--	--
(2)	--	--
(3)	--	--

Date:

EXHIBIT F

Acceptance Test Specification

To be provided by D2 and LICENSEE within 90 days of effective date of this Agreement.