# vecLib Reference Update

Performance > Vector Engines



2005-06-04

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## Introduction to vecLib Reference Update

This document summarizes the symbols that have been added to the vecLib framework. The full reference documentation notes in what version a symbol was introduced, but sometimes it's useful to see only the new symbols for a given release.

If you are not familiar with this framework you should refer to the complete framework reference documentation.

## Organization of This Document

Symbols are grouped by class or protocol for Objective-C and by header file for C. For each symbol there is a link to complete documentation, if available, and a brief description, if available.

## See Also

See "vDSP Library."

Introduction to vecLib Reference Update

## vecLib.framework

Various sub-framework APIs have been updated with new functionality.

## C Symbols

All of the header files with new symbols in vecLib.framework are listed alphabetically, with their new symbols described.

### cblas.h

A number of new functions are introduced.

#### **Functions**

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

| ATLU_DestroyThreadMemory |  |
|--------------------------|--|
| catlas_caxpby            |  |
| catlas_cset              |  |
| catlas_daxpby            |  |
| catlas_dset              |  |
| catlas_saxpby            |  |
| catlas_sset              |  |
| catlas_zaxpby            |  |
| catlas_zset              |  |

## clapack.h

A number of new functions are introduced.

#### Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

| cgelsd_ccgelsd_ccgesd_ccgesvd_cchbyvd_cchdd2_ccladiv_ccladiv_cclangb_ccl  |         |  |
|---|---------|--|
| cgesdd_cgesdd_chbyd_chbyd_chdgd_cladiv_cladiv_clangb_clangb_clangb_clangb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanbb_<  | cgelsd_ |  |
| cgesvd_            chbgvd_            chetd2_            cladiv_            cladiv_            clansd_            clansb_            clansb_            clanhb_            clanbb_            clanbb_            clantb_            clantb_            clantb_            clantb_            clantb_            clantb_            clantb_ <td>cgelss_</td> <td></td>  | cgelss_ |  |
| chbgvd_         c           chdtd2_         c           cladiv_         c           clalsd_         c           clangb_         c           clangb_         c           clangb_         c           clangb_         c           clangb_         c           clangb_         c           clanbb_         c           clanhb_         c           clanbb_   | cgesdd_ |  |
| chetd2_            cladiv_            cladiv_            clandp_            clangp_            clangt_            clanhb_            clanhp_            clanhp_            clanhs_            clansb_            clansp_            clansp_       clansp_ <tr< td=""><td>cgesvd_</td><td></td></tr<>   | cgesvd_ |  |
| cladiv_       c         clandy_       c         clangb_       c         clange_       c         clangt_       c         clanbb_       c         clanbp_       c         clansp_       c         clansp_       c         clantp_       c         clantp_ </td <td>chbgvd_</td> <td></td>   | chbgvd_ |  |
| clalsd_clansb_clangt_clanbb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanhb_clanbb_clanbb_clantb_ <td>chetd2_</td> <td></td>   | chetd2_ |  |
| clangb_<br>clangc_<br>clangt_<br>clanhb_<br>clanhb_<br>clanhb_<br>clanhp_<br>clanhp_<br>clanht_<br>clansb_<br>clansb_<br>clansp_<br>clansp_<br>clansp_<br>clansp_<br>clansb_<br>clansp_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb_<br>clansb | cladiv_ |  |
| clange_ clange_ clangt_ clangt_ clangt_ clanhb_ clanhb_ clanhb_ clanhb_ clanhb_ clanhb_ clanhb_ clanhb_ clanhb_ clanhs_ clanht_ clanht_ clanht_ clansb_ clansp_ clansp_ clansp_ clansp_ clantb_ clantb  | clalsd_ |  |
| clangt_ clangt_ clanbb_ clanbb_ clanbb_ clanhb_ clanhb_ clanhb_ clanhb_ clanhb_ clanhb_ clanhb_ clanhb_ clanbb_ clansb_ clansb  | clangb_ |  |
| clanhb_ clanhb_ clanhe_ clanhp_ clanhs_ clanhs_ clanht_ clanht_ clanhs_ clanhs_ clansb_ clansb_ clansp_ clansp_ clansb_ clantb_ clantb_ clantb_ clantb_ clantp_ clantb_ clantr_ cstegr_ cstegr  | clange_ |  |
| clanhe_ clanhp_ clanhp_ clanhs_ clanhs_ clanhs_ clanhs_ clanhs_ clansb_ clansb_ clansp_ clansy_ clansb_ clansb  | clangt_ |  |
| clanhp_ clanhs_ clanhs_ clanht_ clanht_ clanht_ clanht_ clansb_ clansp_ clansp_ clansy_ clansb_ clansb_ clantb_ clantp_ clantp_ clantp_ clantp_ clantr_ clantr_ clantr_ clantr_ clantr_ clantr_ cstegr_ cstegr_ cstegr_ clanct clantr_ cstegr_ clanct clantr_ cstegr_ clanct clantr_ cstegr_ c  | clanhb_ |  |
| clanhs_clanht_clansb_clansp_clansy_clantb_clantp_clantr_cpteqr_cstegr_dlamc3_   | clanhe_ |  |
| clanht_ clansb_ clansb_ clansp_ clansp_ clansy_ clansy_ clansy_ clansy_ clansp_ clansp_ clantb_ clantp_ clantp_ clantr_ clantr_ clantr_ clantr_ clantr_ clantr_ clantr_ cstegr_ clantfor clantfo  | clanhp_ |  |
| clansb_ clansp_ clansy_ clansy_ clansb_ clansy_ clansb_ clansy_ clantb_ clantb_ clantp_ clantp_ clantr_ cpteqr_ cstegr_ cstegr_ dlamc3_ component   | clanhs_ |  |
| clansp_<br>clansy_<br>clantb_<br>clantp_<br>clantr_<br>cpteqr_<br>cstegr_<br>dlamc3_  | clanht_ |  |
| clansy_<br>clantb_<br>clantp_<br>clantr_<br>cpteqr_<br>cstegr_<br>dlamc3_   | clansb_ |  |
| clantb_<br>clantp_<br>clantr_<br>cpteqr_<br>cstegr_<br>dlamc3_  | clansp_ |  |
| clantp_<br>clantr_<br>cpteqr_<br>cstegr_<br>dlamc3_   | clansy_ |  |
| clantr_<br>cpteqr_<br>cstegr_<br>dlamc3_  | clantb_ |  |
| cpteqr_<br>cstegr_<br>dlamc3_   | clantp_ |  |
| cstegr_<br>dlamc3_  | clantr_ |  |
| dlamc3_   | cpteqr_ |  |
|   | cstegr_ |  |
| dlamch_   | dlamc3_ |  |
|   | dlamch_ |  |

| dlang  |         |  |
|--|---------|--|
| dlangt_dlangt_dlansb_dlansb_dlansb_dlansb_dlansb_dlansb_dlanst_dlansb_dlansb_dlansb_dlantb_dlansb_dlantb_dlansb_dlantb_dlansb_dlantb_dlansb_dlansb_dlansb_dlansb_dlansb_dlansb_dlansb_dlansb_dlansb_dlansb_dlansb_dlansb_dlansb_dlansb_dlansb_slans   | dlangb  |  |
| dlanhs_dlansb_dlansb_dlansb_dlansp_dlanst_dlanst_dlanst_dlanst_dlanst_dlantb_dlantb_dlantp_dlantr_dlantr_dlantr_dlantr_dlantr_dlantr_dlantr_dlansy_dlantr_slancl_dlantr_slansl_dlant   | dlange_ |  |
| dlansb_       d         dlansp_       d         dlanst_       d         dlanst_       d         dlansy_       d         dlantb_       d         dlantp_       d         dlapy2_       d         dlapy3_       d         dsecnd_       d         dsecnd_       d         ssecnd_       d         ssame_       d         ssame_       d         ssame_       d         slamch_       d         slansp_       d         slansp_       d         slansp_       d         slansp_       d   | dlangt_ |  |
| dlansp_       d         dlanst_       d         dlansy_       d         dlantb_       d         dlantp_       d         dlant_       d         dlapy3_       d         dsecnd_       d         dzsunl_       d         ssecnd_       d         ssame_       d         ssame_       d         sscsunl_       d         slanch_       d         slansp_       d         slansp_       d         slansp_       d         slansp_       d  | dlanhs_ |  |
| dlanst_       dlansy_         dlansy_       dlantb_         dlantb_       dlantp_         dlantr_       dlantr_         dlapy2_       dlantp_         dlapy3_       dlapy3_         dsecnd_       dlapy3_         dssem1_       n         1same_       n         1same_       n         scsun1_       n         slansh_       n         slansb_       n         slansb_       n         slansb_       n         slansb_       n         slansb_       n         slansb_       n  | dlansb_ |  |
| dlansy_<br>dlansy_dlantb_dlantp_dlantr_dlapy2_dlapy3_dsecnd_dzsum1_lsame_lsamen_scsum1_slamc3_slangb_slangt_slansb_slansp_   | dlansp_ |  |
| dlantb_dlantp_dlantr_dlapy2_dlapy3_dsecnd_dzsum1_lsamen_scsum1_second_slamc3_slamch_slangp_slansb_slansb_slansp_   | dlanst_ |  |
| dlantp_          dlantr_          dlapy2_          dlapy3_          dsecnd_          dzsum1_          lsame_          lsamen_          scsum1_          slame3_          slamch_          slamep_          slameb_          slangb_          slangt_          slansb_          slansp  | dlansy_ |  |
| dlantr_dlapy2_dlapy3_dsecnd_dzsum1_lsamen_scsum1_second_slamc3_slamcb_slangt_slansb_slansb_slansp  | dlantb_ |  |
| dlapy2_<br>dlapy3_<br>dsecnd_<br>dzsum1_<br>lsame_<br>lsamen_<br>scsum1_<br>second_<br>slamc3_<br>slamch_<br>slangb_<br>slangb_<br>slangt_<br>slangt_<br>slansb_<br>slansb_<br>slansp_   | dlantp_ |  |
| dlapy3_ddsecnd_<br>dsecnd_<br>dzsum1_<br>lsame_<br>lsamen_<br>scsum1_<br>second_<br>slamc3_<br>slamch_<br>slangb_<br>slange_<br>slangt_<br>slangt_<br>slansb_<br>slansb_<br>slansb_  | dlantr_ |  |
| dsecnd_<br>dzsum1_<br>lsame_<br>lsamen_<br>scsum1_<br>second_<br>slamc3_<br>slamcb_<br>slangb_<br>slange_<br>slangt_<br>slansb_<br>slansb_<br>slansb_<br>slansb_   | dlapy2_ |  |
| dzsum1_lsame_lsamen_scsum1_second_slamc3_slamb_slangb_slangb_slangb_slangb_slangb_slangb_slangb_slangb_slangb_slangb_slangb_slangb_slangb_slangb_slansb_   | dlapy3_ |  |
| lsame_       I         lsamen_       I         scsum1_       I         second_       I         slamc3_       I         slamch_       I         slamgb_       I         slangt_       I         slansb_       I   | dsecnd_ |  |
| lsamen_       Isamen_         scsum1_       Isamen_         second_       Isamc3_         slamc3_       Isamch_         slamcb_       Isamge_         slangt_       Isamsb_         slansb_       Isamsb_  | dzsum1_ |  |
| scsum1_<br>second_<br>slamc3_<br>slamch_<br>slangb_<br>slange_<br>slangt_<br>slanhs_<br>slansb_<br>slansp_   | lsame_  |  |
| second_<br>slamc3_<br>slamch_<br>slangb_<br>slange_<br>slangt_<br>slanhs_<br>slansb_<br>slansp_  | lsamen_ |  |
| slamc3_ slamc3_ slamcA_ slamch_ slamcb_ slangb_ slangt_ slangt_ slansb_ slansb_ slansb_ slansp_ slansp | scsum1_ |  |
| slamch_<br>slangb_<br>slange_<br>slangt_<br>slanhs_<br>slansb_<br>slansp_  | second_ |  |
| slangb_<br>slange_<br>slangt_<br>slanhs_<br>slansb_<br>slansp_   | slamc3_ |  |
| slange_<br>slangt_<br>slanhs_<br>slansb_<br>slansp_  | slamch_ |  |
| slangt_<br>slanhs_<br>slansb_<br>slansp_   | slangb_ |  |
| slanhs_       slansb_       slansp_  | slange_ |  |
| slansb   | slangt_ |  |
| slansp_  | slanhs_ |  |
|  | slansb_ |  |
| slanst_  | slansp_ |  |
|  | slanst_ |  |

| slansy_slansy_slantb_slantb_slantb_slantb_slantb_slantb_slantb_slantb_slapy2_slapy3_gelsd_slapy3_gesdd_slapy3_gesdd_slapy3_gesdd_slapy3_gesdd_slapy3_gesdd_slapy3_gesdd_slapy3_gesdd_slapy3_gesdd_slapy3_gesdd_slapy3_gesdd_slapy3_gesdd_slapy3_gesdd_slapy3_gesdd_slapy3_gesdd_slapy3_gladiv_slapy3_gladiv_slapy3_glangb_slapy3_glangb_slapy3_glangb_slapy3_glansb_slapy3_ <tr< th=""><th></th></tr<>   |        |
|--|--------|
| slantp_slantp_slantp_slantp_slapy2_slapy2_slapy3_slapy3_zgelsd_zgesd_zgesd_slapy3_zgesd_slapy3_zgesd_slapy3_zgesd_slapy3_zhdgvd_slapy3_zhdgvd_slapy3_zlaldiv_slapy3_zlaldiv_slapy3_zlandp_slapy3_<   |        |
| slantr_slapy2slapy2slapy3zgelsdgzgesddgzgesddgzhgydgzhdgvdgzhtd2gzlandbgzlangb   |        |
| slapy2_slap3 | antp_  |
| slapy3_ slapy3 | antr_  |
| zgelsd_zgesd_zgesvd_zhbgvd_zhbgvd_zhbd2_zladiv_zlansb_   | apy2_  |
| zgesd_gzgesd_gzhbgvd_gzhbgvd_gzhbd2_gzladiv_gzladiv_gzlangb_gzlangb_gzlangb_gzlangb_gzlangb_gzlangb_gzlangb_gzlangb_gzlangb_gzlangb_gzlanbb_gzla   | apy3_  |
| zgesvd_<br>zgesvd_zhogvd_<br>chogvd_zhogvd_<br>chogvd_zhogvd_<br>chogvd_zladiv_<br>chogvd_zladiv_<br>chogvd_zladiv_<br>chogvd_zlangb_<br>chogvd_zlangc_<br>chogvd_zlangc_<br>chogvd_zlangb_<br>chogvd_zlangb_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp_<br>chogvd_zlanhp   | jelsd_ |
| zhbgvd_zhbgvd_zhetd2_zladiv_zladiv_zlangb_zlangb_zlangb_zlangb_zlangb_zlangb_zlangb_zlangb_zlangb_zlangb_zlangb_zlansb_ <td>jesdd_</td>   | jesdd_ |
| zhetd2_Izhetd2_Izhadiv_Izhadiv_Izhangb_Izhangb_Izhangb_Izhangb_Izhanbb_I   | jesvd_ |
| zladiv_zladiv_zladiv_zlalsd_zlansb_zlans   | bgvd_  |
| zlalsd_zzlangb_zzlange_zzlangt_zzlanhb_zzlanhb_zzlanhb_zzlanhb_zzlanhb_zzlanhb_zzlanhb_zzlanhb_zzlanhb_zzlanhb_zzlanhb_zzlanhb_zzlanhb_zzlanbb_z   | netd2_ |
| zlangb_zlangb_zlangb_zlangb_zlangb_zlanh   | adiv_  |
| zlange_zlange_zlangt_zlangt_zlanhb_zlanhb_zlanhe_zlanhp_zlanhs_zlanhs_zlanht_zlansb_zlansp_zlans   | alsd_  |
| zlangt_zlangt_zlanhb_zlanhb_zlanhe_zlanhp_zlanhb_zlanhb_zlanht_zlansb_zlansb_zlansb_zlansb_zlansb_zlanbb_zlant   | angb_  |
| zlanhb_zlanhb_zlanhe_zlanhp_zlanhp_zlanhs_zlanht_zlanht_zlansb_zlansp_zlansy_zlantb_zlantb_zlantp_zlant   | ange_  |
| zlanhe_zlanhp_zlanhp_zlanhs_zlanht_zlanht_zlansb_zlansp_zlansy_zlansb_zlantb_zlantp_zlantp_zlantp_zlantp_zlantp_   | angt_  |
| zlanhp_zlanhs_zlanht_zlansb_zlansp_zlansy_zlantb_zlantp_zlantp_zlantp_   | anhb_  |
| zlanhs_Izlanht_Izlansb_Izlansp_Izlansy_Izlantb_Izlantp_Izlantr_I   | anhe_  |
| zlanht_zlanht_zlansb_zlansp_zlansy_zlansb_zlantb_zlantp_zlantp_zlantp_   | anhp_  |
| zlansb_<br>zlansp_<br>zlansy_<br>zlantb_<br>zlantp_<br>zlantp_   | anhs_  |
| zlansp_2zlansy_2zlantb_2zlantp_2zlantr_2   | anht_  |
| zlansy_<br>zlantb_<br>zlantp_<br>zlantr_   | ansb_  |
| zlantp_<br>zlantr_   | ansp_  |
| zlantp_ 2lantr_ 4  | ansy_  |
| zlantr_  | antb_  |
|  | antp_  |
| zpteqr_  | antr_  |
|  | oteqr_ |

zstegr\_

### vDSP.h

Many new functions are introduced to provide new functionality.

#### Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

| vDSP_acor           |   |
|---------------------|---|
| vDSP_acorD          | Autocorrelation with automatic selection of domain. |
| vDSP_acorf          |   |
| vDSP_acorfD         | Frequency-domain autocorrelation.                   |
| vDSP_acort          |   |
| vDSP_acortD         | Time-domain autocorrelation.                        |
| vDSP_blkman         |   |
| vDSP_blkmanD        |   |
| vDSP_blkman_window  | Creates a Blackman window.                          |
| vDSP_blkman_windowD | Creates a Blackman window.                          |
| vDSP_ccor           |   |
| vDSP_ccorD          |   |
| vDSP_ccorf          |   |
| vDSP_ccorfD         |   |
| vDSP_ccort          |   |
| vDSP_ccortD         |   |
| vDSP_deq22          | Difference equation, 2 poles, 2 zeros.              |
| vDSP_deq22D         | Difference equation, 2 poles, 2 zeros.              |
| vDSP_desamp         | Convolution with decimation.                        |
| vDSP_desampD        | Convolution with decimation.                        |
| vDSP_hamm           |   |

| vDSP_hammD        |                                      |
|-------------------|--------------------------------------|
| vDSP_hamm_window  | Creates a Hamming window.            |
| vDSP_hamm_windowD | Creates a Hamming window.            |
| vDSP_hann         |                                      |
| vDSP_hannD        |                                      |
| vDSP_hann_window  | Creates a Hanning window.            |
| vDSP_hann_windowD | Creates a Hanning window.            |
| vDSP_maxmgv       | Vector maximum magnitude.            |
| vDSP_maxmgvD      | Vector maximum magnitude.            |
| vDSP_maxmgvi      | Vector maximum magnitude with index. |
| vDSP_maxmgviD     | Vector maximum magnitude with index. |
| vDSP_maxv         | Vector maximum value.                |
| vDSP_maxvD        | Vector maximum value.                |
| vDSP_maxvi        | Vector maximum value with index.     |
| vDSP_maxviD       | Vector maximum value with index.     |
| vDSP_meamgv       | Vector mean magnitude.               |
| vDSP_meamgvD      | Vector mean magnitude.               |
| vDSP_meanv        | Vector mean value.                   |
| vDSP_meanvD       | Vector mean value.                   |
| vDSP_measqv       | Vector mean square value.            |
| vDSP_measqvD      | Vector mean square value.            |
| vDSP_minmgv       | Vector minimum magnitude.            |
| vDSP_minmgvD      | Vector minimum magnitude.            |
| vDSP_minmgvi      | Vector minimum magnitude with index. |
| vDSP_minmgviD     | Vector minimum magnitude with index. |
| vDSP_minv         | Vector minimum value.                |
| vDSP_minvD        | Vector minimum value.                |
| vDSP_minvi        | Vector minimum value with index.     |

| vDSP_minviD  | Vector minimum value with index.                             |
|--------------|--|
| vDSP_mmov    | The contents of a submatrix are copied to another submatrix. |
| vDSP_mmovD   | The contents of a submatrix are copied to another submatrix. |
| vDSP_mvessq  | Vector mean of signed squares.                               |
| vDSP_mvessqD | Vector mean of signed squares.                               |
| vDSP_nzcros  | Find zero crossings.   |
| vDSP_nzcrosD | Find zero crossings.   |
| vDSP_polar   | Rectangular to polar conversion.                             |
| vDSP_polarD  | Rectangular to polar conversion.                             |
| vDSP_rect    | Polar to rectangular conversion.                             |
| vDSP_rectD   | Polar to rectangular conversion.                             |
| vDSP_rmsqv   | Vector root-mean-square.                                     |
| vDSP_rmsqvD  | Vector root-mean-square.                                     |
| vDSP_svdiv   | Divide scalar by vector.                                     |
| vDSP_svdivD  | Divide scalar by vector.                                     |
| vDSP_sve     | Vector sum.  |
| vDSP_sveD    | Vector sum.  |
| vDSP_svemg   | Vector sum of magnitudes.                                    |
| vDSP_svemgD  | Vector sum of magnitudes.                                    |
| vDSP_svesq   | Vector sum of squares.                                       |
| vDSP_svesqD  | Vector sum of squares.                                       |
| vDSP_svs     | Vector sum of signed squares.                                |
| vDSP_svsD    | Vector sum of signed squares.                                |
| vDSP_vaam    | Vector add, add, and multiply.                               |
| vDSP_vaamD   | Vector add, add, and multiply.                               |
| vDSP_vabs    | Vector absolute values.                                      |
| vDSP_vabsD   | Vector absolute values.                                      |
| vDSP_vabsi   | Integer vector absolute values.                              |

| vDSP_vasbm   | Vector add, subtract, and multiply.                  |
|--------------|--|
| vDSP_vasbmD  | Vector add, subtract, and multiply.                  |
| vDSP_vasm    | Vector add and scalar multiply.                      |
| vDSP_vasmD   | Vector add and scalar multiply.                      |
| vDSP_vavlin  | Vector linear average.                               |
| vDSP_vavlinD | Vector linear average.                               |
| vDSP_vclip   | Vector clip.   |
| vDSP_vclipD  | Vector clip.   |
| vDSP_vclipc  | Vector clip and count.                               |
| vDSP_vclipcD | Vector clip and count.                               |
| vDSP_vclr    | Vector clear.  |
| vDSP_vclrD   | Vector clear.  |
| vDSP_vcmprs  | Vector compress.                                     |
| vDSP_vcmprsD | Vector compress.                                     |
| vDSP_vdbcon  | Vector convert power or amplitude to decibels.       |
| vDSP_vdbconD | Vector convert power or amplitude to decibels.       |
| vDSP_vdist   | Vector distance.                                     |
| vDSP_vdistD  | Vector distance.                                     |
| vDSP_vdiv    | Vector divide.                                       |
| vDSP_vdivD   | Vector divide.                                       |
| vDSP_vdivi   | Vector divide.                                       |
| vDSP_vdpsp   | Vector convert double-precision to single-precision. |
| vDSP_venvlp  | Vector envelope.                                     |
| vDSP_venvlpD | Vector envelope.                                     |
| vDSP_veqvi   | Vector equivalence, 32-bit logical.                  |
| vDSP_vfill   | Vector fill.   |
| vDSP_vfillD  | Vector fill.   |
| vDSP_vfilli  | Integer vector fill.                                 |

|                | 1 |
|----------------|---|
| vDSP_vfix16    |   |
| vDSP_vfix16D   |   |
| vDSP_vfix32    |   |
| vDSP_vfix32D   |   |
| vDSP_vfix8     |   |
| vDSP_vfix8D    |   |
| vDSP_vfixr16   |   |
| vDSP_vfixr16D  |   |
| vDSP_vfixr32   |   |
| vDSP_vfixr32D  |   |
| vDSP_vfixr8    |   |
| vDSP_vfixr8D   |   |
| vDSP_vfixru16  |   |
| vDSP_vfixru16D |   |
| vDSP_vfixru32  |   |
| vDSP_vfixru32D |   |
| vDSP_vfixru8   |   |
| vDSP_vfixru8D  |   |
| vDSP_vfixu16   |   |
| vDSP_vfixu16D  |   |
| vDSP_vfixu32   |   |
| vDSP_vfixu32D  |   |
| vDSP_vfixu8    |   |
| vDSP_vfixu8D   |   |
| vDSP_vflt16    |   |
| vDSP_vflt16D   |   |
| vDSP_vflt32    |   |
| vDSP_vflt32D   |   |
| L              | 1 |

| vDSP_vflt8    |   |
|---------------|---|
| vDSP_vflt8D   |   |
| vDSP_vfltu16  |   |
| vDSP_vfltu16D |   |
| vDSP_vfltu32  |   |
| vDSP_vfltu32D |   |
| vDSP_vfltu8   |   |
| vDSP_vfltu8D  |   |
| vDSP_vfrac    | Vector truncate to fraction.                            |
| vDSP_vfracD   | Vector truncate to fraction.                            |
| vDSP_vgathr   | Vector gather.  |
| vDSP_vgathrD  | Vector gather.  |
| vDSP_vgathra  | Vector gather, absolute pointers.                       |
| vDSP_vgathraD | Vector gather, absolute pointers.                       |
| vDSP_vgen     | Vector tapered ramp.                                    |
| vDSP_vgenD    | Vector tapered ramp.                                    |
| vDSP_vgenp    | Vector generate by extrapolation and interpolation.     |
| vDSP_vgenpD   | Vector generate by extrapolation and interpolation.     |
| vDSP_viclip   | Vector inverted clip.                                   |
| vDSP_viclipD  | Vector inverted clip.                                   |
| vDSP_vindex   | Vector index.   |
| vDSP_vindexD  | Vector index.   |
| vDSP_vintb    | Vector linear interpolation between vectors.            |
| vDSP_vintbD   | Vector linear interpolation between vectors.            |
| vDSP_vlim     | Vector test limit.                                      |
| vDSP_vlimD    | Vector test limit.                                      |
| vDSP_vlint    | Vector linear interpolation between neighboring values. |
| vDSP_vlintD   | Vector linear interpolation between neighboring values. |

| vDSP_vma     | Vector multiply and add.                 |
|--------------|--|
| vDSP_vmaD    | Vector multiply and add.                 |
| vDSP_vmax    | Vector maxima.                           |
| vDSP_vmaxD   | Vector maxima.                           |
| vDSP_vmaxmg  | Vector maximum magnitudes.               |
| vDSP_vmaxmgD | Vector maximum magnitudes.               |
| vDSP_vmin    | Vector minima.                           |
| vDSP_vminD   | Vector minima.                           |
| vDSP_vminmg  | Vector minimum magnitudes.               |
| vDSP_vminmgD | Vector minimum magnitudes.               |
| vDSP_vmma    | Vector multiply, multiply, and add.      |
| vDSP_vmmaD   | Vector multiply, multiply, and add.      |
| vDSP_vmmsb   | Vector multiply, multiply, and subtract. |
| vDSP_vmmsbD  | Vector multiply, multiply, and subtract. |
| vDSP_vmsa    | Vector multiply and scalar add.          |
| vDSP_vmsaD   | Vector multiply and scalar add.          |
| vDSP_vmsb    | Vector multiply and subtract.            |
| vDSP_vmsbD   | Vector multiply and subtract.            |
| vDSP_vnabs   | Vector negative absolute value.          |
| vDSP_vnabsD  | Vector negative absolute value.          |
| vDSP_vneg    | Vector negative value.                   |
| vDSP_vnegD   | Vector negative value.                   |
| vDSP_vpoly   | Vector polynomial.                       |
| vDSP_vpolyD  | Vector polynomial.                       |
| vDSP_vpythg  | Vector pythagoras.                       |
| vDSP_vpythgD | Vector pythagoras.                       |
| vDSP_vqint   | Vector quadratic interpolation.          |
| vDSP_vqintD  | Vector quadratic interpolation.          |

| vDSP_vramp   | Build ramped vector.                        |
|--------------|---|
| vDSP_vrampD  | Build ramped vector.                        |
| vDSP_vrsum   | Vector running sum integration.             |
| vDSP_vrsumD  | Vector running sum integration.             |
| vDSP_vrvrs   | Vector reverse order, in place.             |
| vDSP_vrvrsD  | Vector reverse order, in place.             |
| vDSP_vsadd   | Vector scalar add.                          |
| vDSP_vsaddD  | Vector scalar add.                          |
| vDSP_vsaddi  | Integer vector scalar add.                  |
| vDSP_vsbm    | Vector subtract and multiply.               |
| vDSP_vsbmD   | Vector subtract and multiply.               |
| vDSP_vsbsbm  | Vector subtract, subtract, and multiply.    |
| vDSP_vsbsbmD | Vector subtract, subtract, and multiply.    |
| vDSP_vsbsm   | Vector subtract and scalar multiply.        |
| vDSP_vsbsmD  | Vector subtract and scalar multiply.        |
| vDSP_vsdiv   | Vector scalar divide.                       |
| vDSP_vsdivD  | Vector scalar divide.                       |
| vDSP_vsdivi  | Integer vector scalar divide.               |
| vDSP_vsimps  | Simpson integration.                        |
| vDSP_vsimpsD | Simpson integration.                        |
| vDSP_vsma    | Vector scalar multiply and vector add.      |
| vDSP_vsmaD   | Vector scalar multiply and vector add.      |
| vDSP_vsmsa   | Vector scalar multiply and scalar add.      |
| vDSP_vsmsaD  | Vector scalar multiply and scalar add.      |
| vDSP_vsmsb   | Vector scalar multiply and vector subtract. |
| vDSP_vsmsbD  | Vector scalar multiply and vector subtract. |
| vDSP_vsort   | Vector in-place sort.                       |
| vDSP_vsortD  | Vector in-place sort.                       |

| vDSP_vsorti   | Vector integer in-place sort.                        |
|---------------|--|
| vDSP_vsortiD  | Vector integer in-place sort.                        |
| vDSP_vspdp    | Vector convert single-precision to double-precision. |
| vDSP_vswap    | Vector swap.   |
| vDSP_vswapD   | Vector swap.   |
| vDSP_vswsum   | Vector sliding window sum.                           |
| vDSP_vswsumD  | Vector sliding window sum.                           |
| vDSP_vtabi    | Vector interpolation, table lookup.                  |
| vDSP_vtabiD   | Vector interpolation, table lookup.                  |
| vDSP_vthr     | Vector threshold.                                    |
| vDSP_vthrD    | Vector threshold.                                    |
| vDSP_vthres   | Vector threshold with zero fill.                     |
| vDSP_vthresD  | Vector threshold with zero fill.                     |
| vDSP_vthrsc   | Vector threshold with signed constant.               |
| vDSP_vthrscD  | Vector threshold with signed constant.               |
| vDSP_vtmerg   | Vector tapered merge of two vectors.                 |
| vDSP_vtmergD  | Vector tapered merge of two vectors.                 |
| vDSP_vtrapz   | Vector trapezoidal integration.                      |
| vDSP_vtrapzD  | Vector trapezoidal integration.                      |
| vDSP_wiener   | Wiener-Levinson general convolution.                 |
| vDSP_wienerD  | Wiener-Levinson general convolution.                 |
| vDSP_zaspec   | Computes an accumulating autospectrum.               |
| vDSP_zaspecD  | Computes an accumulating autospectrum.               |
| vDSP_zcoher   | Coherence function of two signals.                   |
| vDSP_zcoherD  | Coherence function of two signals.                   |
| vDSP_zcspec   | Accumulating cross-spectrum on two complex vectors.  |
| vDSP_zcspecD  | Accumulating cross-spectrum on two complex vectors.  |
| vDSP_zrdesamp | Complex/real downsample with anti-aliasing.          |

| vDSP_zrdesampD | Complex/real downsample with anti-aliasing.                                  |
|----------------|--|
| vDSP_zrvdiv    | Divides complex vector A by real vector B and leaves the result in vector C. |
| vDSP_zrvdivD   | Divides complex vector A by real vector B and leaves the result in vector C. |
| vDSP_ztrans    | Transfer function.   |
| vDSP_ztransD   | Transfer function.   |
| vDSP_ztransD   | Transfer function.   |
| vDSP_zvabs     | Complex vector absolute value.   |
| vDSP_zvabsD    | Complex vector absolute value.   |
| vDSP_zvcmul    | Complex vector conjugate and multiply.                                       |
| vDSP_zvcmulD   | Complex vector conjugate and multiply.                                       |
| vDSP_zvconj    | Complex vector conjugate.  |
| vDSP_zvconjD   | Complex vector conjugate.  |
| vDSP_zvdiv     | Complex vector divide.   |
| vDSP_zvdivD    | Complex vector divide.   |
| vDSP_zvfill    | Complex vector fill.   |
| vDSP_zvfillD   | Complex vector fill.   |
| vDSP_zvmags    | Complex vector magnitudes squared.   |
| vDSP_zvmagsD   | Complex vector magnitudes squared.   |
| vDSP_zvmgsa    | Complex vector magnitudes square and add.                                    |
| vDSP_zvmgsaD   | Complex vector magnitudes square and add.                                    |
| vDSP_zvmov     | Complex vector move.   |
| vDSP_zvmovD    | Complex vector move.   |
| vDSP_zvneg     | Complex vector negate.   |
| vDSP_zvnegD    | Complex vector negate.   |
| vDSP_zvphas    | Complex vector phase.  |
| vDSP_zvphasD   | Complex vector phase.  |
| vDSP_zvsma     | Complex vector scalar multiply and add.                                      |

| vDSP_zvsmaD  | Complex vector scalar multiply and add.    |
|--------------|--|
| vDSP_zvzsml  | Complex vector multiply by complex scalar. |
| vDSP_zvzsm1D | Complex vector multiply by complex scalar. |

#### Data Types and Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

FFTSetupD

### vForce.h

A number of new functions are introduced.

#### Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

| vvacos   | For each double-precision array element, sets y to the arccosine of x.                 |
|----------|--|
| vvacosf  | For each single-precision array element, sets y to the arccosine of x.                 |
| vvacosh  | For each double-precision array element, sets y to the inverse hyperbolic cosine of x. |
| vvacoshf | For each single-precision array element, sets y to the inverse hyperbolic cosine of x. |
| vvasin   | For each double-precision array element, sets y to the arcsine of x.                   |
| vvasinf  | For each single-precision array element, sets y to the arcsine of x.                   |
| vvasinh  | For each double-precision array element, sets y to the inverse hyperbolic sine of x.   |
| vvasinhf | For each single-precision array element, sets y to the inverse hyperbolic sine of x.   |
| vvatan   | For each double-precision array element, sets y to the arctangent of x.                |
| vvatan2  | For each double-precision array element, sets z to the arctangent of y/x.              |
| vvatan2f | For each single-precision array element, sets z to the arctangent of y/x.              |
| vvatanf  | For each single-precision array element, sets y to the arctangent of x.                |
|          |  |

| vvatanh    | For each double-precision array element, sets y to the inverse hyperbolic tangent of x.   |
|------------|---|
| vvatanhf   | For each single-precision array element, sets y to the inverse hyperbolic tangent of x.   |
| vvceil     | For each double-precision array element, sets y to the ceiling of x.  |
| vvceilf    | For each single-precision array element, sets y to the ceiling of x.  |
| VVCOS      | For each double-precision array element, sets y to the cosine of x.   |
| vvcosf     | For each single-precision array element, sets y to the cosine of x.   |
| vvcosh     | For each double-precision array element, sets y to the hyperbolic cosine of x.  |
| vvcoshf    | For each single-precision array element, sets y to the hyperbolic cosine of x.  |
| vvcosisin  | For each double-precision array element, sets the real part of C to the sine of x and the imaginary part of C to the cosine of x. |
| vvcosisinf | For each single-precision array element, sets the real part of C to the sine of x and the imaginary part of C to the cosine of x. |
| vvdiv      | For each double-precision array element, sets z to y/x.   |
| vvdivf     | For each single-precision array element, sets z to y/x.   |
| vvexp      | For each double-precision array element, sets y to the exponential of x.  |
| vvexpf     | For each single-precision array element, sets y to the exponential of x.  |
| vvfloor    | For each double-precision array element, sets y to the floor of x.  |
| vvfloorf   | For each single-precision array element, sets y to the floor of x.  |
| vvint      | For each double-precision array element, sets y to the integer truncation of x.   |
| vvintf     | For each single-precision array element, sets y to the integer truncation of x.   |
| vvlog      | For each double-precision array element, sets y to the natural logarithm of x.  |
| vvlog10    | For each double-precision array element, sets y to the base 10 logarithm of x.  |
| vvlog10f   | For each single-precision array element, sets y to the base 10 logarithm of x.  |
| vvlogf     | For each single-precision array element, sets y to the natural logarithm of x.  |
| vvnint     | For each double-precision array element, sets y to the nearest integer to x.  |
| vvnintf    | For each single-precision array element, sets y to the nearest integer to x.  |
| vvpow      | For each double-precision array element, sets z to x raised to the power of y.  |
| vvpowf     | For each single-precision array element, sets z to x raised to the power of y.  |

| vvrec     | For each double-precision array element, sets y to the reciprocal of y.                    |
|-----------|--|
| vvrecf    | For each single-precision array element, sets y to the reciprocal of y.                    |
| vvrsqrt   | For each double-precision array element, sets y to the reciprocal of the square root of x. |
| vvrsqrtf  | For each single-precision array element, sets y to the reciprocal of the square root of x. |
| vvsin     | For each double-precision array element, sets y to the sine of x.                          |
| vvsincos  | For each double-precision array element, sets z to the sine of x and y to the cosine of x. |
| vvsincosf | For each single-precision array element, sets z to the sine of x and y to the cosine of x. |
| vvsinf    | For each single-precision array element, sets y to the sine of x.                          |
| vvsinh    | For each double-precision array element, sets y to the hyperbolic sine of x.               |
| vvsinhf   | For each single-precision array element, sets y to the hyperbolic sine of x.               |
| vvsqrt    | For each double-precision array element, sets y to the square root of x.                   |
| vvsqrtf   | For each single-precision array element, sets y to the square root of x.                   |
| vvtan     | For each double-precision array element, sets y to the tangent of x.                       |
| vvtanf    | For each single-precision array element, sets y to the tangent of x.                       |
| vvtanh    | For each double-precision array element, sets y to the hyperbolic tangent of x.            |
| vvtanhf   | For each single-precision array element, sets y to the hyperbolic tangent of x.            |

vecLib.framework

## **Document Revision History**

This table describes the changes to vecLib Reference Update.

| Date       | Notes   |
|------------|---|
| 2005-06-04 | New document that summarizes the symbols added to the vecLib framework in Mac OS X v10.4. |

Document Revision History