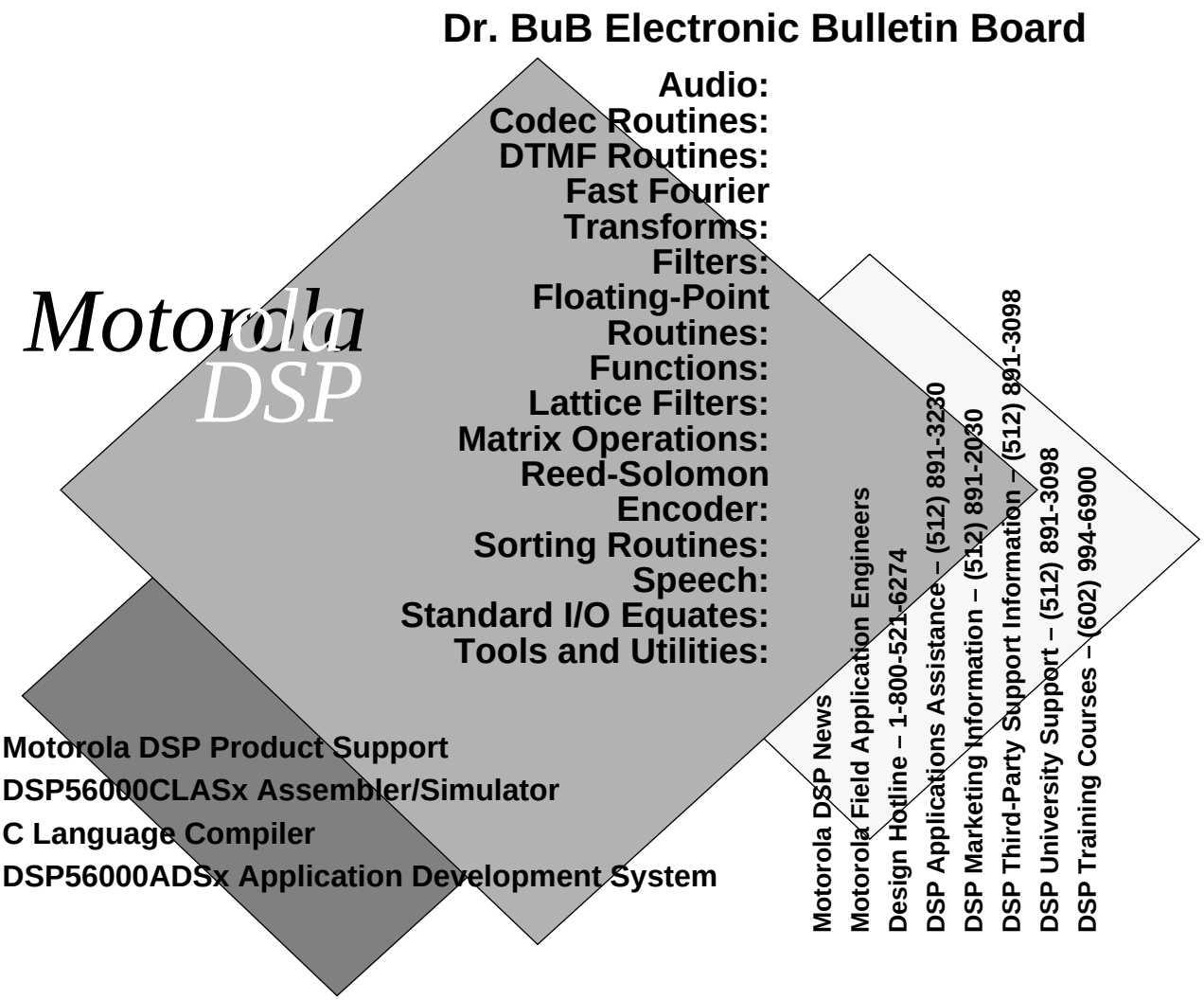
SECTION 11
ADDITIONAL SUPPORT



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11.1 USER SUPPORT

User support from the conception of a design through completion is available from Motorola and third-party companies as shown in the following list:

	Motorola	Third Party
Design	Data Sheets Application Notes Application Bulletins Software Examples	Data Acquisition Packages Filter Design Packages Operating System Software Simulator
Prototyping	Assembler Linker C Compiler Simulator Application Development System (ADS) In-Circuit Emulator Cable for ADS	Logic Analyzer with DSP56000/DSP56001 ROM Packages In-Circuit Emulators Data Acquisition Cards DSP Development System Cards Operating System Software Debug Software
Design Verification	Application Development System (ADS) In-Circuit Emulator Simulator	Data Acquisition Packages Logic Analyzer with DSP56000/DSP56001 ROM Packages Data Acquisition Cards DSP Development System Cards Application-Specific Development Tools Debug Software

The following is a partial list of the support available for the DSP56000/DSP56001. Additional information can be obtained through Dr. BuB or the appropriate support telephone service.

11.2 MOTOROLA DSP PRODUCT SUPPORT

- DSP56000CLASx Design-In Software Package which includes:
  - Relocatable Macro Assembler
  - Linker
  - Simulator (simulates single or multiple DSP56K processors))
  - Librarian
- DSP56KCCx GNU C Compiler
- DSP56000/DSP56001 Applications Development System (ADS)
- Support Integrated Circuits
- DSP Bulletin Board (Dr. BuB)
- Motorola DSP Newsletter
- Motorola Field Application Engineers (FAEs)
  See your local telephone directory for the Motorola Semiconductor Sector sales office telephone number.
- Design Hotline
- Applications Assistance
- Marketing Information
- Third-Party Support Information
- University Support Information

11.2.1 DSP56000CLASx Assembler/Simulator

The Macro Cross Assembler and Simulator run on:

1. IBM™ PCs (-386 or higher) under DOS 2.x and 3.x
2. Macintosh™ II under MAC OS 4.1 or later
3. SUN-4™ under UNIX™ BSD 4.2
4. NeXT™ under Mach

11.2.2 Macro Cross Assembler Features:

- Production of relocatable object modules compatible with linker program when in relocatable mode
- Production of absolute files compatible with simulator program when in absolute mode
- Supports full instruction set, memory spaces, and parallel data transfer fields of

the DSP56K family of processors

- Modular programming features: local labels, sections, and external definition/reference directives
- Nested macro processing capability with support for macro libraries
- Complex expression evaluation including boolean operators
- Built-in functions for data conversion, string comparison, and common transcendental math functions
- Directives to define circular and bit-reversed buffers
- Extensive error checking and reporting

11.2.3 Simulator Features:

- Simulation of all DSP56K family members
- Simulation of multiple DSP56Ks
- Linkable object code modules:
  - –Nondisplay simulator library
  - –Display simulator library
- C language source code for:
  - –Screen management functions
  - –Terminal I/O functions
  - –Simulation examples
- Single stepping through object programs
- Up to 99 conditional or unconditional breakpoints
- Program patching using a single-line assembler/disassembler
- Instruction, clock cycle, and histogram counters
- Session and/or command logging for later reference
- ASCII input/output files for peripherals
- Help-file and help-line display of simulator commands
- Loading and saving of files to/from simulator memory
- Macro command definition and execution
- Display enable/disable of registers and memory
- Hexadecimal/decimal/binary calculator

11.2.4 DSP56KCCx Language Compiler Features:

- GNU - ANSI Standard
- Structures/Unions
- Floating Point

- In-line assembler language code compatibility
- Full Function preprocessor for:
  - –Macro definition/expansion
  - –File Inclusion
  - –Conditional compilation
- Full error detection and reporting

11.3 DSP56KADSx APPLICATION DEVELOPMENT SYSTEM

11.3.1 DSP56KADS Application Development System Hardware Features:

- Processor speed independent
- Multiple (up to 8) application development module (ADM) support with programmable ADM addresses
- 8K/32Kx24 user-configurable RAM for DSP56K code development
- 1Kx24 monitor ROM expandable to 4Kx24
- 96-pin Euro-card connector making all DSP56K pins accessible
- In-circuit emulation capabilities when used with the DSP56KEMULTRCABL cable
- Separate berg pin connectors for alternate accessing of serial or host/DMA ports
- ADM can be used in stand-alone configuration
- No external power supply needed when connected to a host platform

11.3.2 DSP56KADSx Application Development System Software Features:

- Single/multiple stepping through DSP56K object programs
- Up to 99 conditional or unconditional breakpoints
- Program patching using a single-line assembler/disassembler
- Session and/or command logging for later reference
- Loading and saving files to/from ADM memory
- Macro command definition and execution
- Display enable/disable of registers and memory
- Debug commands supporting multiple ADMs
- Hexadecimal/decimal/binary calculator
- Host operating system commands from within ADS user interface program
- Multiple OS I/O file access from DSP56K object programs
- Fully compatible with the DSP56KCLASx design-in software package
- On-line help screens for each command and DSP56K register

11.3.3 Support Integrated Circuits:

- 8Kx24 Static RAM – MC56824
- DSP56ADC16 16-bit, sigma-delta 100-kHz analog-to-digital converter
- DSP56401 AES/EBU processor
- DSP56200 FIR filter

11.4 Dr. BuB ELECTRONIC BULLETIN BOARD

Dr. BuB is an electronic bulletin board which provides free source code for a large variety of topics that can be used to develop applications with Motorola DSP products. The software library contains files including FFTs, FIR filters, IIR filters, lattice filters, matrix algebra routines, companding routines, floating-point routines, and others. In addition, the latest product information and documentation (including information on new products and improvements to existing products) is posted. Questions about Motorola DSP products posted on Dr. BuB are answered promptly. Access to Dr. BuB is through calling **(512) 891-3771** using a modem set to **8 data bits, no parity, and 1 stop bit**. Dr. BuB will automatically set the data transfer rate to match your modem (9600, 4800, 2400, 1200 or 300 BPS).

A partial list of the software available on Dr. BuB follows.

Document ID	Version	Synopsis	Size
Audio:			
rvb1.asm	1.0	Easy-to-read reverberation routine	17056
rvb2.asm	1.0	Same as RVB1.ASM but optimized	15442
stereo.hlp	1.0	Help file for STEREO.ASM	620
dge.asm	1.0	Digital Graphic Equalizer code from	14880
Codec Routines:			
loglin.asm	1.0	Companded CODEC to linear PCM data conversion	4572
loglin.hlp		Help for loglin.asm	1479
loglint.asm	1.0	Test program for loglin.asm	2184
loglint.hlp		Help for loglint.asm	1993
linlog.asm	1.1	Linear PCM to companded CODEC data conversion	4847
linlog.hlp		Help for linlog.asm	1714
DTMF Routines:			
clear.cmd	1.0	Explained in read.me file	119
data.lod	1.0		421
det.asm	1.0	Subroutine used in IIR DTMF	5923
dtmf.asm	1.0	Main routine used in IIR DTMF	10685
dtmf.mem	1.0	Memory for DTMF routine	48
dtmfmstr.asm	1.0	Main routine for multichannel DTMF	7409
dtmfmstr.mem	1.0	Memory for multichannel DTMF routine	41
dtmftwo.asm	1.0		10256
ex56.bat	1.0		94
genxd.lod	1.0	Data file	183
genyd.lod	1.0	Data file	180
goertzel.asm	1.0	Goertzel routine	4393
goertzel.lnk	1.0	Link file for Goertzel routine	6954
goertzel.lst	1.0	List file for Goertzel routine	11600
load.cmd	1.0		46
tstgoert.mem	1.0	Memory for Goertzel routine	384

Document ID	Version	Synopsis	Size
sub.asm	1.0	Subroutine linked for use in IIR DTMF	2491
read.me	1.0	Instructions	738
Fast Fourier Transforms:			
sincos.asm	1.2	Sine-Cosine Table Generator for FFTs	1185
sincos.hlp		Help for sincos.asm	887
sinewave.asm	1.1	Full-Cycle Sine wave Table Generator Generator Macro	1029
sinewave.hlp		for sinewave.asm	1395
fftr2a.asm	1.1	Radix 2, In-Place, DIT FFT (smallest)	3386
fftr2a.hlp		Help for fftr2a.asm	2693
fftr2at.asm	1.1	Test Program for FFTs (fftr2a.asm)	999
fftr2at.hlp		Help for fftr2at.asm	563
fftr2b.asm	1.1	Radix 2, In-Place, DIT FFT (faster)	4290
fftr2b.hlp		Help for fftr2b.asm	3680
fftr2c.asm	1.2	Radix 2, In-Place, DIT FFT (even faster)	5991
fftr2c.hlp		Help for fftr2c.asm	3231
fftr2d.asm	1.0	Radix 2, In-Place, DIT FFT (using DSP56001 sine-cosine ROM tables)	3727
fftr2d.hlp		Help for fftr2d.asm	3457
fftr2dt.asm	1.0	Test program for fftr2d.asm	1287
fftr2dt.hlp		Help for fftr2dt.asm	614
fftr2e.asm	1.0	1024 Point, Non-In-Place, FFT (3.39ms)	8976
fftr2e.hlp		Help for fftr2e.asm	5011
fftr2et.asm	1.0	Test program for fftr2e.asm	984
fftr2et.hlp		Help for fftr2et.asm	408
dct1.asm	1.1	Discrete Cosine Transform using FFT	5493
dct1.hlp	1.1	Help file for dct1.asm	970
fftr2cc.asm	1.0	Radix 2, In-place Decimation-in-time complex FFT macro	6524
fftr2cc.hlp	1.0	Help file for fftr2cc.asm	3533
fftr2cn.asm	1.0	Radix 2, Decimation-in-time Complex FFT macro with normally ordered input/output	6584

Document ID	Version	Synopsis	Size
fftr2cn.hlp	1.0	Help file for fftr2cn.asm	2468
fftr2en.asm	1.0	1024 point, not-in-place, complex FFT macro with normally ordered input/output	9723
fftr2en.hlp	1.0	Help file for fftr2en.asm	4886
dhit1.asm	1.0	Routine to compute Hilbert transform in the frequency domain	1851
dhit1.hlp	1.0	Help file for dhit1.asm	1007
fftr2bf.asm	1.0	Radix-2, decimation-in-time FFT with block floating point	13526
fftr2bf.hlp	1.0	Help file for fftr2bf.asm	1578
fftr2aa.asm	1.0	FFT program for automatic scaling	3172
Filters:			
fir.asm	1.0	Direct Form FIR Filter	545
fir.hlp		Help for fir.asm	2161
firt.asm	1.0	Test program for fir.asm	1164
iir1.asm	1.0	Direct Form Second Order All Pole IIR Filter	656
iir1.hlp		Help for iir1.asm	1786
iir1t.asm	1.0	Test program for iir1.asm	1157
iir2.asm	1.0	Direct Form Second Order All Pole IIR Filter with Scaling	801
iir2.hlp		Help for iir2.asm	2286
iir2t.asm	1.0	Test program for iir2.asm	1311
iir3.asm	1.0	Direct Form Arbitrary Order All Pole IIR Filter	776
iir3.hlp		Help for iir3.asm	2605
iir3t.asm	1.0	Test program for iir3.asm	1309
iir4.asm	1.0	Second Order Direct Canonic IIR Filter (Biquad IIR Filter)	713
iir4.hlp		Help for iir4.asm	2255
iir4t.asm	1.0	Test program for iir4.asm	1202
iir5.asm	1.0	Second Order Direct Canonic IIR Filter with Scaling (Biquad IIR Filter)	842
iir5.hlp		Help for iir5.asm	2803

Document ID	Version	Synopsis	Size
iir5t.asm	1.0	Test program for iir5.asm	1289
iir6.asm	1.0	Arbitrary Order Direct Canonic IIR Filter	923
iir6.hlp		Help for iir6.asm	3020
iir6t.asm	1.0	Test program for iir6.asm	1377
iir7.asm	1.0	Cascaded Biquad IIR Filters	900
iir7.hlp		Help for iir7.asm	3947
iir7t.asm	1.0	Test program for iir7.asm	1432
lms.hlp	1.0	LMS Adaptive Filter Algorithm	5818
transiir.asm	1.0	Implements the transposed IIR filter	1981
transiir.hlp	1.0	Help file for transiir.asm	974

Floating-Point Routines:

fpdef.hlp	2.0	Storage format and arithmetic representation definition	10600
fpcalls.hlp	2.1	Subroutine calling conventions	11876
fplist.asm	2.0	Test file that lists all subroutines	1601
fprevs.hlp	2.0	Latest revisions of floating-point lib	1799
fpinit.asm	2.0	Library initialization subroutine	2329
fpadd.asm	2.0	Floating point add	3860
fpsub.asm	2.1	Floating point subtract	3072
fpcmp.asm	2.1	Floating point compare	2605
fpmpy.asm	2.0	Floating point multiply	2250
fpmac.asm	2.1	Floating point multiply-accumulate	2712
fpdiv.asm	2.0	Floating point divide	3835
fpsqrt.asm	2.0	Floating point square root	2873
fpneg.asm	2.0	Floating point negate	2026
fpabs.asm	2.0	Floating point absolute value	1953
fpscale.asm	2.0	Floating point scaling	2127
fpfix.asm	2.0	Floating to fixed point conversion	3953
fpfloat.asm	2.0	Fixed to floating point conversion	2053
fpceil.asm	2.0	Floating point CEIL subroutine	1771

Document ID	Version	Synopsis	Size
fpfloor.asm	2.0	Floating point FLOOR subroutine	2119
durbin.asm	1.0	Solution for LPC coefficients	5615
durbin.hlp	1.0	Help file for DURBIN.ASM	2904
fpfrac.asm	2.0	Floating point FRACTION subroutine	1862
Functions:			
log2.asm	1.0	Log base 2 by polynomial approximation	1118
log2.hlp		Help for log2.asm	719
log2t.asm	1.0	Test program for log2.asm	1018
log2nrm.asm	1.0	Normalizing base 2 logarithm macro	2262
log2nrm.hlp		Help for log2nrm.asm	676
log2nrmt.asm	1.0	Test program for log2nrm.asm	1084
exp2.asm	1.0	Exponential base 2 by polynomial approximation	926
exp2.hlp		Help for exp2.asm	759
exp2t.asm	1.0	Test program for exp2.asm	1019
sqrt1.asm	1.0	Square Root by polynomial approximation, 7 bit accuracy	991
sqrt1.hlp		Help for sqrt1.asm	779
sqrt1t.asm	1.0	Test program for sqrt1.asm	1065
sqrt2.asm	1.0	Square Root by polynomial approximation, 10 bit accuracy	899
sqrt2.hlp		Help for sqrt2.asm	776
sqrt2t.asm	1.0	Test program for sqrt2.asm	1031
sqrt3.asm	1.0	Full precision Square Root Macro	1388
sqrt3.hlp		Help for sqrt3.asm	794
sqrt3t.asm	1.0	Test program for sqrt3.asm	1053
tli.asm	1.1	Linear table lookup/interpolation routine for function generation	3253
tli.hlp	1.1	Help for tli.asm	1510
bingray.asm	1.0	Binary to Gray code conversion macro	601
bingrayt.asm	1.0	Test program for bingray.asm	991
rand1.asm	1.1	Pseudo Random Sequence Generator	2446

Document ID	Version	Synopsis	Size
rand1.hlp		Help for rand1.asm	704
Lattice Filters:			
latfir1.asm	1.0	Lattice FIR Filter Macro	1156
latfir1.hlp		Help for latfir1.asm	6327
latfir1t.asm	1.0	Test program for latfir1.asm	1424
latfir2.asm	1.0	Lattice FIR Filter Macro (modified modulo count)	1174
latfir2.hlp		Help for latfir2.asm	1295
latfir2t.asm	1.0	Test program for latfir2.asm	1423
latiir.asm	1.0	Lattice IIR Filter Macro	1257
latiir.hlp		Help for latiir.asm	6402
latiirt.asm	1.0	Test program for latiir.asm	1407
latgen.asm	1.0	Generalized Lattice FIR/IIR Filter Macro	1334
latgen.hlp		Help for latgen.asm	5485
latgent.asm	1.0	Test program for latgen.asm	1269
latnrm.asm	1.0	Normalized Lattice IIR Filter Macro	1407
latnrm.hlp		Help for latnrm.asm	7475
latnrmt.asm	1.0	Test program for latnrm.asm	1595
Matrix Operations:			
matmul1.asm	1.0	[1x3][3x3]=[1x3] Matrix Multiplication	1817
matmul1.hlp		Help for matmul1.asm	527
matmul2.asm	1.0	General Matrix Multiplication, C=AB	2650
matmul2.hlp		Help for matmul2.asm	780
matmul3.asm	1.0	General Matrix Multiply-Accumulate, C=AB+Q	2815
matmul3.hlp	1.0	Help for matmul3.asm	865
Reed-Solomon Encoder:			
readme.rs	1.0	Instructions for Reed-Solomon coding	5200
rscd.asm	1.0	Reed-Solomon coder for DSP56000 simulator	5822
newc.c	1.0	Reed-Solomon coder coded in C	4075

Document ID	Version	Synopsis	Size
table1.asm	1.0	Include file for R-S coder	7971
table2.asm	1.0	Include file for R-S coder	4011
Sorting Routines:			
sort1.asm	1.0	Array Sort by Straight Selection	1312
sort1.hlp		Help for sort1.asm	1908
sort1t.asm	1.0	Test program for sort1.asm	689
sort2.asm	1.1	Array Sort by Heapsort Method	2183
sort2.hlp		Help for sort2.asm	2004
sort2t.asm	1.0	Test program for sort2.asm	700
Speech:			
lgsol1.asm	2.0	Leroux-Gueguen solution for PARCOR (LPC) coefficients	4861
lgsol1.hlp		Help for lgsol1.asm	3971
durbin1.asm	1.2	Durbin Solution for PARCOR (LPC) coefficients	6360
durbin1.hlp		Help for durbin1.asm	3616
adpcm.asm	1.0	32 kbps CCITT ADPCM Speech Coder	120512
adpcm.hlp	1.0	Help file for adpcm.asm	14817
adpcmns.asm	1.0	Nonstandard ADPCM source code	54733
adpcmns.hlp	1.0	Help file for adpcmns.asm	9952
Standard I/O Equates:			
ioequ.asm	1.1	Motorola Standard I/O Equate File	8774
ioequlc.asm	1.1	Lower Case Version of ioequ.asm	8788
intequ.asm	1.0	Standard Interrupt Equate File	1082
intequlc.asm	1.0	Lower Case Version of intequ.asm	1082
Tools and Utilities:			
srec.c	4.10	Utility to convert DSP56000 OMF format to SREC.	38975
srec.doc	4.10	Manual page for srec.c.	7951
srec.h	4.10	Include file for srec.c	3472

Document ID	Version	Synopsis	Size
srec.exe	4.10	Srec executable for IBM PC	22065
sloader.asm	1.1	Serial loader from the SCI port for the DSP56001	3986
sloader.hlp	1.1	Help for sloader.asm	2598
sloader.p	1.1	Serial loader s-record file for download to EPROM	736
parity.asm	1.0	Parity calculation of a 24-bit number in accumulator A	1641
parity.hlp	1.0	Help for parity.asm	936
parityt.asm	1.0	Test program for parity.asm	685
parityt.hlp	1.0	Help for parityt.asm	259
dspbug		Ordering information for free debug monitor for DSP56000/DSP56001	882

The following is a list of current DSP56200 related software:

p1	1.0	Information on 56200 Filter Software	6343
p2	1.0	Interrupt Driven Adaptive Filter Flowchart.	10916
p3	1.0	“C” code implementation of p2	25795
p4	1.0	Polled I/O Adaptive Filter Flowchart	10361
p5	1.0	“C” code implementation of p4	24806
p6	1.1	Interrupt Driven Dual FIR Filter Flowchart.	9535
p7	1.0	“C” code implementation of p6	28489
p8	1.0	Polled I/O Dual FIR Filter Flowchart	9656
p9	1.0	“C” code implementation of p8	28525

11.5 MOTOROLA DSP NEWS

The Motorola DSP News is a quarterly newsletter providing information on new products, application briefs, questions and answers, DSP product information, third-party product news, etc. This newsletter is free and is available upon request by calling the marketing information phone number listed below.

11.6 MOTOROLA FIELD APPLICATION ENGINEERS

Information and assistance for DSP applications is available through the local Motorola field office. See your local telephone directory for telephone numbers or call (512)891-2030.

11.7 DESIGN HOTLINE– 1-800-521-6274

This is the Motorola number for information about any Motorola product.

11.8 DSP HELP LINE – (512) 891-3230

Design assistance for specific DSP applications is available by calling this number.

11.9 MARKETING INFORMATION– (512) 891-2030

Marketing information, including brochures, application notes, manuals, price quotes, etc., for Motorola DSP-related products is available by calling this number.

11.10 THIRD-PARTY SUPPORT INFORMATION – (512) 891-3098

Information about third-party manufacturers who use and support Motorola DSP products is available by calling this number. Third-party support includes:

Filter design software
Logic analyzer support
Boards for VME, IBM-PC/XT/AT, MACII boards
Development systems
Data conversion cards
Operating system software
Debug software

Additional information is available on Dr. BuB and in DSP News.

11.11 UNIVERSITY SUPPORT – (512) 891-3098

Information concerning university support programs and university discounts for all Motorola DSP products is available by calling this number.

11.12 TRAINING COURSES – (602) 897-3665 or (800) 521-6274

There are two DSP56000 Family training courses available:

1. Introduction to the DSP5600X (MTTA5) is a 4.5-hour audio-tape course on the DSP56K Family architecture and programming.

2. Introduction to the DSP5600X (MTT31) is a four-day instructor-led course and laboratory which covers the details of the DSP5600X architecture and programming.

Additional information is available by writing to:

Motorola SPS Training and Technical Operations
Mail Drop EL524
P. O. Box 21007
Phoenix, Arizona 85036

or by calling the number above. A technical training catalog is available which describes these courses and gives the current training schedule and prices.

11.13 REFERENCE BOOKS AND MANUALS

A list of DSP-related books is included here as an aid for the engineer who is new to the field of DSP. This is a partial list of DSP references intended to help the new user find useful information in some of the many areas of DSP applications. Many of the books could be included in several categories but are not repeated.

General DSP:

ADVANCED TOPICS IN SIGNAL PROCESSING
Jae S. Lim and Alan V. Oppenheim
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1988

APPLICATIONS OF DIGITAL SIGNAL PROCESSING
A. V. Oppenheim
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1978

DISCRETE-TIME SIGNAL PROCESSING
A. V. Oppenheim and R. W. Schafer
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1989

DIGITAL PROCESSING OF SIGNALS THEORY AND PRACTICE
Maurice Bellanger
New York, NY: John Wiley and Sons, 1984

DIGITAL SIGNAL PROCESSING
Alan V. Oppenheim and Ronald W. Schafer
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1975

DIGITAL SIGNAL PROCESSING: A SYSTEM DESIGN APPROACH
David J. DeFatta, Joseph G. Lucas, and William S. Hodgkiss
New York, NY: John Wiley and Sons, 1988

FOUNDATIONS OF DIGITAL SIGNAL PROCESSING AND DATA ANALYSIS
J. A. Cadzow
New York, NY: MacMillan Publishing Company, 1987

HANDBOOK OF DIGITAL SIGNAL PROCESSING
D. F. Elliott
San Diego, CA: Academic Press, Inc., 1987

INTRODUCTION TO DIGITAL SIGNAL PROCESSING
John G. Proakis and Dimitris G. Manolakis
New York, NY: Macmillan Publishing Company, 1988

MULTIRATE DIGITAL SIGNAL PROCESSING
R. E. Crochiere and L. R. Rabiner
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1983

SIGNAL PROCESSING ALGORITHMS
S. Stearns and R. Davis
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1988

SIGNAL PROCESSING HANDBOOK
C.H. Chen
New York, NY: Marcel Dekker, Inc., 1988

SIGNAL PROCESSING – THE MODERN APPROACH
James V. Candy
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