

# APPENDIX C

## ADDITIONAL 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:

	<b>Motorola</b>	<b>Third Party</b>
<b>Design</b>	<ul style="list-style-type: none"> <li>Data Sheets</li> <li>Application Notes</li> <li>Application Bulletins</li> <li>Software Examples</li> <li>Simulator</li> </ul>	<ul style="list-style-type: none"> <li>Data Acquisition Packages</li> <li>Filter Design Packages</li> <li>Operating System Software</li> </ul>
<b>Prototyping</b>	<ul style="list-style-type: none"> <li>Assembler</li> <li>Linker</li> <li>C Compiler</li> <li>Simulator</li> <li>Application Development System (ADS)</li> <li>In-Circuit Emulator</li> <li>Cable for ADS</li> </ul>	<ul style="list-style-type: none"> <li>Logic Analyzer with DSP56000/DSP56001 ROM Packages</li> <li>In-Circuit Emulators</li> <li>Data Acquisition Cards</li> <li>DSP Development System Cards</li> <li>Operating System Software</li> <li>Debug Software</li> </ul>
<b>Design Verification</b>	<ul style="list-style-type: none"> <li>Application Development System (ADS)</li> <li>In-Circuit Emulator</li> <li>Simulator</li> </ul>	<ul style="list-style-type: none"> <li>Data Acquisition Packages</li> <li>Logic Analyzer with DSP56000/DSP56001 ROM Packages</li> <li>Data Acquisition Cards</li> <li>DSP Development System Cards</li> <li>Application-Specific Development Tools</li> <li>Debug Software</li> </ul>

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.

## Motorola DSP Product Support

- DSP56000CLASx Design-In Software Package which includes:
  - Relocatable Macro Assembler
  - Linker
  - Simulator (simulates single or multiple DSP56000/DSP56001s)
  - Librarian
- DSP56KCCx Full Kernighan and Ritchie C Compiler
- DSP320to56001 Translator Software
- 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

## DSP56000CLASx Assembler/Simulator

The macro cross assembler and simulator run on:

1. IBM™ PCs (386 or better)
2. Macintosh™ under MAC OS 4.1 or later
3. SUN-4™ under UNIX™ BSD 4.2

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IBM is a trademark of International Business Machines.  
 Macintosh is a trademark of Apple Computer, Inc.  
 SUN-4 is a trademark of SUN Microsystems, Inc.  
 UNIX is a registered trademark of AT&T Bell Laboratories.

**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 DSP56000/DSP56001
- 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

**Simulator Features:**

- Simulation of all DSP56001 (default) or DSP56000
- Simulation of multiple DSP56000/DSP56001s
- 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

## **C Language Compiler**

### **DSP56KCCx Language Compiler Features:**

- Full Kernighan and Ritchie C
- 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

## **DSP320to56001 Translator**

### **DSP320to56001 Translator Features:**

- Translates any TMS32010 linked object code to DSP56001 source assembler code
- Two modes of operation:
  - Translates to DSP56001 source assembler code for optimization and assembly using DSP56000CLASx
  - Translates and runs “as is” directly and immediately on the DSP56000ADSx
- C language DSP320to56001 source code is provided in addition to IBM PC/XT/AT object code to allow:
  - User modification for TMS32020 or TMS320C25 translation
  - User compilation to accommodate different host platforms

## **DSP56000ADSx Application Development System**

### **DSP56000ADS Application Development System Hardware Features:**

- Full-speed 20.48 MHz operation (upgradeable to 27 MHz)
- Multiple application development module (ADM) support with programmable ADM addresses
- 8K/32Kx24 user-configurable RAM for DSP56000/DSP56001 code development
- 1Kx24 monitor ROM expandable to 4Kx24
- 96-pin Euro-card connector making all DSP56001 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

**DSP56000ADSx Application Development System Software Features:**

- Single/multiple stepping through DSP56000/DSP56001 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 DSP56000/DSP56001 object programs
- Fully compatible with the DSP56000CLASx design-in software package
- On-line help screens for each command and DSP56000/DSP56001 register

**Support Integrated Circuits:**

- 8Kx24 Static RAM
- DSP56ADC16 16-bit, 100-kHz analog-to-digital converter

**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, a software debug monitor, 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. The following phone numbers provide access to Dr. BuB:

(212A – 300/1200 Baud) . . . . . (512) 891-DSP1

(V.22 – 1200 Baud) . . . . . (512) 891-DSP2

(V.22bis – 2400 Baud) . . . . . (512) 891-DSP3

Format: 7 data bits, even parity, 1 stop bit

User ID=guest

The following is a partial list of the software available on Dr. BuB.

Document ID	Version	Synopsis	Size
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**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

**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 Macro	1029
sinewave.hlp		Help 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 3727 (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

Document ID	Version	Synopsis	Size
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	1.2	Discrete Cosine Transform using FFT	5471
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
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
<b>Filters:</b>			
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

Document ID	Version	Synopsis	Size
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
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
<b>Floating-Point Routines:</b>			
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

Document ID	Version	Synopsis	Size
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
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
<b>Functions:</b>			
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
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

Document ID	Version	Synopsis	Size
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
<b>Matrix Operations:</b>			
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
<b>Reed-Solomon Encoder:</b>			
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
table1.asm	1.0	Include file for R-S coder	7971
table2.asm	1.0	Include file for R-S coder	4011
<b>Sorting Routines:</b>			
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

Document ID	Version	Synopsis	Size
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**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

**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

**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.

**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.

**Design Help Line – 1-800-521-6274**

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

**Applications Assistance – (512) 891-3230**

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

**Sales Information**

Sales information, including brochures, application notes, manuals, price quotes, etc., for Motorola DSP-related products is available by calling your local Motorola field office or dealer.

**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**.

**University Support – (512) 891-3098**

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

**Training Courses – (602) 897-3665**

There are two DSP56000 Family training courses available:

1. Introduction to the DSP56000/DSP56001 (MTTA5) is a 4.5-hour audio-tape course on the DSP56000/DSP56001 architecture and programming.
2. Introduction to the DSP56000/DSP56001 (MTT31) is a four-day instructor-led course and laboratory which covers the details of the DSP56000/DSP56001 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.

### 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  
New York, NY: McGraw-Hill Company, Inc., 1988

**THEORY AND APPLICATION OF DIGITAL SIGNAL PROCESSING**

Rabiner, Lawrence R., Gold and Bernard  
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1975

**Digital Audio and Filters:**

**ADAPTIVE FILTER AND EQUALIZERS**

B. Mulgrew and C. Cowan  
Higham, MA: Kluwer Academic Publishers, 1988

**ADAPTIVE SIGNAL PROCESSING**

B. Widrow and S. D. Stearns  
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1985

**ART OF DIGITAL AUDIO, THE**

John Watkinson  
Stoneham, MA: Focal Press, 1988

**DESIGNING DIGITAL FILTERS**

Charles S. Williams  
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1986

**DIGITAL AUDIO SIGNAL PROCESSING AN ANTHOLOGY**

John Strawn  
William Kaufmann, Inc., 1985

**DIGITAL CODING OF WAVEFORMS**

N. S. Jayant and Peter Noll  
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1984

**DIGITAL FILTERS: ANALYSIS AND DESIGN**

Andreas Antoniou  
New York, NY: McGraw-Hill Company, Inc., 1979

**DIGITAL FILTERS AND SIGNAL PROCESSING**

Leland B. Jackson  
Higham, MA: Kluwer Academic Publishers, 1986

**DIGITAL SIGNAL PROCESSING**

Richard A. Roberts and Clifford T. Mullis  
New York, NY: Addison-Welsey Publishing Company, Inc., 1987

**INTRODUCTION TO DIGITAL SIGNAL PROCESSING**

Roman Kuc  
New York, NY: McGraw-Hill Company, Inc., 1988

**INTRODUCTION TO ADAPTIVE FILTERS**

Simon Haykin  
New York, NY: MacMillan Publishing Company, 1984

**MUSICAL APPLICATIONS OF MICROPROCESSORS (Second Edition)**

H. Chamberlin  
Hasbrouck Heights, NJ: Hayden Book Co., 1985

**Controls:**

**ADAPTIVE CONTROL**

K. Astrom and B. Wittenmark  
New York, NY: Addison-Welsey Publishing Company, Inc., 1989

**ADAPTIVE FILTERING PREDICTION & CONTROL**

G. Goodwin and K. Sin  
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1984

**AUTOMATIC CONTROL SYSTEMS**

B. C. Kuo  
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1987

**COMPUTER CONTROLLED SYSTEMS: THEORY & DESIGN**

K. Astrom and B. Wittenmark  
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1984

**DIGITAL CONTROL SYSTEMS**

B. C. Kuo  
New York, NY: Holt, Reinholt, and Winston, Inc., 1980

**DIGITAL CONTROL SYSTEM ANALYSIS & DESIGN**

C. Phillips and H. Nagle  
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1984

**ISSUES IN THE IMPLEMENTATION OF DIGITAL FEEDBACK COMPENSATORS**

P. Moroney  
Cambridge, MA: The MIT Press, 1983

**Graphics:**

CGM AND CGI

D. B. Arnold and P. R. Bono  
New York, NY: Springer-Verlag, 1988

COMPUTER GRAPHICS (Second Edition)  
D. Hearn and M. Pauline Baker  
Englewood Cliffs, NJ: Prentice-Hall, Inc., 1986

FUNDAMENTALS OF INTERACTIVE COMPUTER GRAPHICS  
J. D. Foley and A. Van Dam  
Reading MA: Addison-Wesley Publishing Company Inc., 1984

GEOMETRIC MODELING  
Michael E. Morteson  
New York, NY: John Wiley and Sons, Inc.

GKS THEORY AND PRACTICE  
P. R. Bono and I. Herman (Eds.)  
New York, NY: Springer-Verlag, 1987

ILLUMINATION AND COLOR IN COMPUTER GENERATED IMAGERY  
Roy Hall  
New York, NY: Springer-Verlag

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