

A

- Abort execution button
 - diagram window, 11
- ACK, 170, 172
- ACKnowledge (ACK) lines, 170, 172
- Actual sample period, 131
- A/D conversion, 120–122
 - 1-bit resolution, 121
- Add Frame After, 56
- Add Frame Before, 56
- Addone, 302
- Add Shift Register, 62
- Advanced
 - function palette, 25
- Advanced File Functions, 193
- AI Acquire Waveform, 131–136
- AI Clear, 133
- AI Config, 133, 143, 162
- AI Continuous Scan, 148
- AI Input Utilities, 132, 134–135
- AI Read, 133
- AI Read One Scan, 138, 139f, 148
- AI Sample Channel, 136
- AI Single Scan, 137–138
- AI Start, 133, 137–138
- AI Waveform Scan, 132, 148
- ALGOrithmic Language (ALGOL)
 - history, 2
- Aliasing, 269
 - avoidance, 109
- Align objects button
 - diagram window, 12
- Am9513, 176, 178–181
 - measure pulse easy, 182–183
 - period and frequency measurements, 183–184
- Analog input, 118, 124, 130
 - data acquisition, 130–152
 - acquisition with external clock, 146–148
 - AI acquire waveform (high level VI), 131–133
 - analog input utility VIs, 148
 - buffered and nonbuffered acquisition, 139–142
 - DAQ occurrence, 148–150
 - exercises, 150–152
 - gain and channel string, 142–144
 - high-level analog input VIs, 136–137
 - intermediate-level analog input VIs, 137
 - modifying high-level VIs, 134–136
 - sampling signals, 130
 - software timing and hardware timing, 137–139
 - triggered acquisition, 144–146
 - resolution, 122
 - counter chips, 122
 - D/A conversion, 122
 - gain, 120–122
 - signal, 113–117
 - differential, 114–117
 - floating source, 113
 - nonreferenced single ended modes, 114–117
 - referenced source, 113
 - subpalette, 130f
- Analog output, 118, 124, 130
 - data acquisition, 154–168
 - analog output utility VIs, 155–158
 - exercises, 167–168
 - gain and channel string, 162–164
 - high-level, 158–159
 - intermediate-level, 159–161
 - signal generation, 154
 - single/circular-buffered waveform generation, 162
 - triggered and simultaneous AI/AO, 164–166
 - waveform generation with external clock, 166–167
 - signal range, 120
 - subpalette, 154f
- Analog signals
 - acquired, 114
 - measurement methods, 113
 - types, 113
- Analog triggering, 123, 144–145
 - digital, 144–146
 - hardware, 166
 - separate clocks, 166
 - software, 145
- Analysis
 - data, 242–285
 - deterministic data, 246–256
 - filtering operation, 253–256
 - filters, 247
 - Fourier, 246
 - Fourier transform (FT), 247
 - frequency domain data, 257–271
 - frequency response, 246
 - function palette, 25
 - impulse response, 246
 - linear system, 242–246
 - nonlinear system, 242–246
 - palette, 25
 - random data, 246–256
 - step response, 246
 - subpalette, 273–280
 - time
 - domain data, 257–271
 - technique, 260
 - AO Clear, 161
 - AO Config, 162
 - AO Continuous Gen, 155–158
 - AO Generate Waveform, 158
 - AO Start, 161
 - AO Update Channel, 158
 - AO Update Channels, 158
 - AO Wait, 161, 170
 - AO Waveform Gen, 155–158
 - AO Write One Update, 155–158
- Application
 - building
 - dynamic sub VI, 300–303
 - error handler design, 299–300
 - initial startup screen, 303–308
 - menu customization, 316–319
 - replacing local variables, 313–316
 - saving copy, 312–313

- status checking mechanism, 309–310
 - toggle switch design, 310–311
- Application builder
 - building and application, 321–323
- Application control, 301
 - function palette, 25
- A Programming Language (APL), 2
- Array, 33, 81, 88–97. *See also* One-D Array; Two-D Array
 - clusters
 - function comparison, 102–103
 - creating, 88–92
 - exercises, 103–106
 - function palette, 24
 - functions, 93–97
- Array channels, 164
- Array Constant, 97
- Array control, 23
- Array conversion, 218–220
- Array data type
 - C++ Code, 330–332
- Array limit settings, 164
- Array Max & Min, 95–96
- Array Operations, 279
- Array shell, 89
- Array Size, 93
 - 1-D array to 2-D array, 198
- Array Subset, 94. *See also* Index Array
- Array to Cluster, 97
- Array To Spreadsheet STring, 218–220
- AS
 - description, 244
- ASCII
 - description, 189–190
 - reading, 202–203
- ASCII data
 - reading, 200
- ASCII format
 - writing data, 199, 201–202
- ASCII format continuously
 - writing data, 200–201
- ASIL
 - description, 244
- Asymptotic Stability, 244
- Asymptotic Stability In Large, 244
- Attribute node, 71–76
 - boundary, 76
 - highlight execution, 76
 - History Data, 75
 - Local Variables, 320
 - local variables, 320
 - waveform chart, 78
- Autocorrelation function, 264
 - stochastic process, 248
- Autoindexing, 60–61
 - For Loop, 60–61
 - While Loop, 60–61
- Averaging, 260

B

- BACK, 306f, 308
- Bandpass filter (BPF), 247
- Bandstop filter (BSF), 247
- Beginner's All-purpose Symbolic Instruction Code (BASIC)
 - history, 2
- Biased
 - random parameters, 249
- Bias resistors
 - implementing, 116
- BIBO
 - description, 244
- BIBS
 - description, 244
- Bilinear transformation method, 269
- Binary
 - description, 189–190
- Binary data
 - reading, 202–203
- Binary File VIs
 - reading or writing binary data, 189
- Binary format
 - 1-D data, 194
 - 2-D data, 196–197
 - writing data, 201–202
- Binary format continuously
 - writing, 195
- Binary hypothesis testing, 251, 252
- Binary string data, 223
- Binary string to numeric data
 - conversion, 220–223
- Blinking, 74
- Boolean, 23
 - function palette, 24
- Boolean button
 - create, 288–290
- Boolean input
 - While Loop, 51
- Boolean switches
 - mechanical actions, 70–71
- Boundary
 - Attribute Node, 76
- Bounded Input Bounded Output, 244
- Bounded Input Bounded State, 244
- Breakpoint
 - set and clear, 22
- Broken Run Arrow, 15
- Buffered acquisition
 - analog input, 139–142
- Buffered handshaking, 172–174
- Buffer size
 - input, 141, 142
- Build array, 79, 80, 95
 - bundle, 102
 - function, 296
 - XY graph, 81
- Build Cluster Array, 102
- Building
 - examples, 15–17

- Building application, 288–323
 - application builder, 321–323
 - creating efficient executables, 319–321
- Building ground, 114
- Bundle, 77, 79, 100, 266
 - build array, 102
 - data, 80
 - replace array element, 103
 - XY graph, 81
- Bundle By Name, 100–101
- Bundle Cluster Array
 - Index, 102
- Butterworth filters, 254–256, 265
- Butterworth LPF, 265
- Buttons
 - diagram window, 11–12
- Bytes At Serial Port, 233
- Byte stream type, 191–192

C

- C
 - language, 2, 30
- Calibration, 124
- Call Library Function, 297–298
- Case structure, 52–55, 134–135, 262, 299
 - analog output, 155–156
 - Local Variables, 313
 - multiple frames, 53–54
 - numeric input control, 53–54
 - string input control, 54–55
 - While Loop, 309
- Casual systems, 243–244
- C/C++ Code
 - 1-D array data type, 330–331
 - LabVIEW, 297–299
 - two-D array data type, 331–332
- Change to Array, 92
- Change to Control, 14
- Change to Element, 92
- Change to Indicator, 14
- Change to Read, 73
 - Local, 59
- Change to Write, 73
 - Local, 59
- Channel
 - vs. channels, 136
 - clock, 146–147
 - string, 131
 - analog input, 142–144
 - analog output, 162–164
- Channel Wizard, 143
- Chevyshev filters, 254–256
- CIN
 - creation, 326–329
- Circular buffered handshaking, 172–174
- Clear acquisition, 134
 - QUIT, 135
- Clear breakpoint, 22

- Clicking
 - and wiring, 18
- Clocks
 - analog triggering, 166
 - channel, 146–147
 - digital triggering, 165, 166
 - external, 146–148, 166–167
 - channel, 147
 - scan, 147–148
 - update, 166–167
 - frequency, 174
 - scan, 146–147
- Cluster, 33, 98–102
 - array
 - building, 102
 - bundle index, 102
 - function comparison, 102–103
 - control, 23
 - creating, 98–99
 - exercises, 103–106
 - function palette, 24
 - functions, 100–102
 - subpalettes, 81
 - Cluster Constant, 102
 - Cluster Order, 98
 - Cluster Size, 97
 - Cluster to Array, 97, 98
 - Code Interface Node (CIN), 297–298
 - Code Warrior Professional Release
 - LabVIEW, 326–329
 - Color
 - differentiation, 49
 - set and get, 22
 - COmmon Business Oriented Language (COBOL)
 - history, 2
 - Communication
 - function palette, 24
 - Communication steps
 - using VISA functions, 232
 - Comparison
 - function palette, 24
 - Complex FFT, 275
 - Complex Linear Algebra, 279
 - Complex Polynomial Roots, 258–259
 - Computers
 - history, 2–3
 - Concatenate Strings, 212, 296
 - Concatenating data
 - creating an array, 91
 - Conditional statements
 - and loops, 46–66
 - exercises, 63–66
 - Conditional terminal, 51, 292
 - Configuration, 124
 - Configuration File, 193
 - Connect wire, 22
 - Constant
 - array, 97
 - cluster, 102
 - creation, 47–49, 51, 73, 75
 - file, 193
 - numeric, 47

- Cont Acq&Chart
 - buffered, 140–141
 - hw timed, 140–141
 - immediate, 140–141
- Continuous
 - convolution relationship, 245
 - discrete time system, 245
- Control. *See also* Instrument control
 - application, 25, 301
 - array, 23
 - cluster, 23
 - code, 178
 - creation, 47–49, 51, 73
 - and data, 14
 - graph, 23
 - ICTR, 178
 - vs. indicators, 14
 - list, 23
 - numeric input, 53–54
 - palette, 23–24, 30
 - path, 23
 - Refnum, 23
 - ring, 23
 - select, 24
 - string input, 54–55
 - table, 23
 - user, 23, 290–291
 - VI, 12–15
- Conversion subpalette, 212
- Convert eol (F), 191–192
- Convolution, 109
- Counter, 124, 130
 - application, 175
 - basic concepts, 176–178
 - data acquisition, 174–184
 - exercises, 184–185
 - event and elapsed time, 181
 - period and frequency measurements, 183–184
 - pulse width measurements, 181–183
 - subpalette, 175f
 - TTL pulse generation, 178–181
- Counter chips, 122
 - comparison, 176t
- Counter operation, 118
- Counter Stop, 178
- Count terminal, 47
- Create Constant, 47–49, 51, 73
 - about arrays, 75
- Create Control, 47–49, 51, 73
- Create Indicator, 47–49, 51, 73
- Creating
 - efficient executables
 - building and application, 319–321
 - objects, 21
 - sub VI, 30–36, 41–42
- Ctrl-B
 - shortcut, 20
- Ctrl-drag
 - shortcut, 20–21
- Ctrl-E
 - shortcut, 17
- Ctrl-H

- shortcut, 20
- Ctrl-Shift
 - shortcut, 20
- Ctrl-Z
 - shortcut, 20
- Current No, 316
- Curve Fitting, 278

D

- D/A conversion, 122
- DAQ. *See also* Data Acquisition
 - STC, 176, 178–181
 - measure pulse width, 182
 - period and frequency measurements, 183–184
- Data
 - and controls, 14
- Data acquisition, 118
 - analog input, 130–152
 - exercises, 150–152
 - analog output, 154–168
 - exercises, 167–168
 - board, 114
 - maximum sampling frequency, 122
 - counters, 174–184
 - digital I/O and counters, 170–185
 - exercises, 184–185
 - function palette, 25
 - hardware, 118–119
 - system
 - board selection, 119–120
 - techniques, 108–127
 - analog input and output, 113–117
 - counter operations, 118, 122, 124
 - data acquisition hardware, 118–119
 - digital input and output, 118, 123–125
 - driver software, 118–119
 - exercises, 125–127
 - hardware specification, 110–125
 - VIx, 124–125
- Data analysis, 242–285
 - deterministic, 246–256
 - exercises, 280–285
 - filters, 253–256
 - frequency domain data analysis, 257–271
 - linear system analysis, 242–246
 - matrix representation, 271–273
 - nonlinear system analysis, 242–246
 - random, 246–256
 - stochastic, 246–256
 - subpalettes analysis, 273–280
 - time domain data analysis, 257–271
 - vector representation, 271–273
- Data display, 68–85
 - exercises, 83–85
 - intensity chart, 82–83
 - intensity graph, 82–83
 - waveform chart, 68–78
 - waveform graph, 79–81

- XY graph, 81–82
- Datalog file type
 - specify, 203–204
- Data Logging, 205–206
- Data Manipulation, 222
- Data Processed
 - Data Read, 314
 - Local Variables, 314
- Data Read
 - Data Processed, 314
- Data type bundle, 77–78
- DBL Input, 201–202
- Debugging, 15, 36, 37
- Decimate 1D Array, 97
- Decimation, 270–271
- Decorations, 23
- Default, 213–215
- Default Value, 216
- Deleting
 - objects, 21
- Derivative $x(t)$, 275
- Deterministic data analysis, 246–256
- Deterministic signals, 246–247
- Deterministic systems, 246–247
- Device number, 131
- Diagram window, 10–12
 - error handler design, 334–337
- Dialog
 - function palette, 24
- Dialog Box option, 39
- Differential, 114–117
 - measurement modes, 113
- Digital filter types, 267–270
- Digital handshaking, 170, 172–174
 - buffered, 174
- Digital input
 - immediate, 171–172
 - refers to, 118
- Digital I/O, 124, 130
 - immediate, 171–172
 - relays and switches, 170–174
 - exercises, 184–185
- Digital lines, 123–124, 170
- Digital output
 - immediate, 171–172
 - refers to, 118
- Digital port, 170
- Digital Signal Processing (DSP), 4, 274–275
- Digital triggering, 123, 144
 - analog, 144–146
 - hardware, 165
 - same clock, 166
 - separate clocks, 165
- Dimension Size, 94–95
- DIO Clear, 171
- DIO Read, 171
- DIO Single Read/Write, 171
- DIO Wait, 170
- DIO Write, 171
- Direction, 170
- Direct memory access (DMA) channels, 120, 154
- Disabled, 72

- Disable Indexing, 93
- Discrete Fourier transform (DFT), 261, 263
- Discrete time Fourier transform (DTFT), 261, 264
- Discrete time system
 - continuous, 245
- Display
 - data, 68–85
 - Input Voltage, 13
- DMA channels, 154
- Documentation, 37
- Driver software, 118–119
- Dummy input, 305
- Duty cycle
 - TTL pulse, 175
- DYMAmic MOdels (DYMANO), 2
- Dynamic sub VI load and unload
 - building and application, 300–303

E

- Easy VISA Find Resources, 235
- Easy VISA Read, 235
- Easy VISA Serial Write & Read, 235
- Easy VISA Write, 235
- Easy VISA Write & Read, 235
- Edit Format String, 215
- Edit Icon, 35
- Edit text, 22
- Eigendecomposition, 272–273
- Eigenfilters, 254–256
- Elapsed time counting, 181
- Enable Indexing, 93
- Ensemble averaging, 260
- Error handler design, 334–337
 - building and application, 299–300
- Event counting, 181
- Execution option, 37
- External
 - AI Config, 163
- External channel clock, 147
- External scan clock, 147–148
- External update clock, 166–167
- Extract Numbers, 237

F

- Fast Fourier Transform (FFT) chips, 12
- FHT, 275
- FIFO buffer, 137–140
- File Constants, 193
- File input and output (file I/O), 187–210
 - exercises, 208–210
 - high-level, 189–190
 - intermediate-level, 190–193
 - subpalettes, 193
- Filtering operation
 - data analysis, 253–256

- Filtering process, 246
 - Filters, 276–277
 - analysis, 247, 253–256
 - bandpass, 247
 - bandstop, 247
 - Butterworth, 254–256, 265
 - categorize, 267–269
 - Chevyshev, 254–256
 - digital
 - G programming, 267
 - types, 267–270
 - eigen, 254–256
 - highpass, 247
 - Kalman, 253–256
 - kinds, 253–256
 - linear prediction, 254–256
 - lowpass, 110, 247
 - Wiener, 253–256
 - Finite Impulse Response (FIR)
 - filter design method, 268
 - type, 267–269
 - Floating signal sources, 115f
 - Floating source, 113
 - For Loop, 46–49
 - array, 90–91
 - autoindexing and shift register, 60–62
 - color data types, 49
 - creating inputs, 47–49
 - helps, 50, 61
 - sequence structure, 55–57
 - shift register, 62
 - Write File, 200–201
 - Format and append, 213–215
 - Format and strip, 213–215
 - Format into string, 215–218
 - Format string inputs, 213–215
 - Formula node, 59–60
 - FORmular TRANslation (FORTRAN), 30
 - history, 2–3
 - Fourier analysis, 246
 - Fourier series (FS) expansion, 261
 - Fourier transform (FT), 109, 110, 261–262
 - analysis, 247
 - impulse train, 108f
 - Frequency domain data analysis, 257–271
 - Frequency measurements
 - counters
 - high, 183–184
 - low, 184
 - high frequency signals, 183–184
 - low frequency signals, 184
 - Frequency response analysis, 246
 - Frequency transformation method, 269
 - Front panel, 10–12
 - data, 208
 - error handler design, 334–337
 - Function comparison, 102–103
 - Function palette, 24–25, 31
 - advanced, 25
 - analysis, 25
 - application control, 25
 - array, 24
 - Boolean, 24
 - cluster, 24
 - communication, 24
 - comparison, 24
 - data acquisition, 25
 - dialog, 24
 - file input and output (file I/O), 24
 - instrument drivers, 25
 - instrument I/O, 24
 - numeric, 24
 - select a VI, 25
 - string, 24
 - time, 24
 - tutorial, 25
 - user libraries, 25
- ## G
- G
 - language, 3
 - characteristics, 10–12
 - programming, 4, 232
 - case study, 4–5
 - digital filters, 267
 - Gain
 - vs. input signal range, 120–121
 - string
 - analog input, 142–144
 - analog output, 162–164
 - GATE
 - definition, 175
 - Gauge, 34
 - Gaussian distribution, 251
 - Gaussian white noise, 247
 - Generalized movements, 248
 - General Purpose Interface Bus. *See* GPIB
 - General Purpose Simulation System (GPSS), 2
 - Generate Continuous Sinewave, 159
 - Generate Occurrence, 292–295
 - Get color, 22
 - Global variable, 57–59
 - Global variables, 296, 313
 - Local Variables, 320
 - GPIB, 228–229
 - function, 232–233
 - Read, 232
 - Status, 233
 - Write, 233
 - Graph control, 23
 - Graphical language, 1–7
 - Graphical programming language LabVIEW
 - description, 3–4
 - Ground, 114
 - loop, 116

H

- Handshake source, 174
- Handshaking, 230
 - digital, 170, 172–174
 - hardware, 230
 - nonbuffered and buffered, 172–174
 - nonbuffered and simple, 172–174
 - software, 230
- Hardware handshaking (HSWHS), 230
- Hardware specification, 110–125
 - A/D conversion, 120–122
 - analog input resolution, 120–122
 - data acquisition Vlx, 124–125
 - digital lines, 123–124
 - input and output analog signal range, 120
 - maximum update rates, 122–123
 - ports, 123–124
 - sampling frequency, 122–123
 - triggering capability, 123
- Hardware-timed continuous acquisition, 142
 - buffered, 140f, 141f, 142
 - nonbuffered, 142, 142f
- Hardware timing
 - analog input, 137–139
- Helps
 - case structure, 53
 - local variables, 57
 - For Loop, 50, 61
 - text creation
 - sub VI, 36
 - While Loop, 50
 - wiring inputs, 49
- Hermitian matrices, 272–273
- High-level
 - file I/O VIs, 189–190
- Highlight execution, 36
 - Attribute Node, 76
 - button
 - diagram window, 11
- High limit, 131
- Highpass filter (HPF), 247
- History Data, 73
 - Attribute Node, 75
- Hypothesis testing, 250–253

I

- ICTR Control, 178
- IEEE-488, 228–229
- I16 Input, 201–202
- Immediate digital input, 171–172
- Immediate digital output, 171–172
- Impulse function
 - defined, 245
- Impulse invariant transformation method, 269
- Impulse response analysis, 246
- Impulse sampling scheme, 109
- Impulse signal

- FT, 265
- Impulse train, 109
 - Fourier transform, 108f
- Index. *See also* Autoindexing
 - array, 93
 - bundle cluster, 102
 - unbundle, 103
- Indexing
 - disable, 93
 - enable, 93
- Indicators
 - change to, 14
 - vs. controls, 14
 - creation, 47–49, 51, 73
 - VI, 12–15
- Infinite Impulse REsponse (IIR)
 - filter design
 - methods, 269
 - type, 267–269
- Initialize Array, 95
 - Memory Issue, 103
- Initial startup screen
 - building and application, 303–308
- Input. *See also* AI; Analog input; Digital I/O; DIO
 - generation count, 161, 162
 - iteration, 277
 - number of buffer iterations, 156–158, 160–161
 - reference source, 162
 - scaled data
 - analog output utility, 158
 - scan rate, 138
 - signal range vs. gain, 120–121
 - source
 - floating, 116
 - string, 216
 - update rate, 160–161
 - values to generate, 164
 - voltage, 12–15
- Input Buffer Full (IBF), 172
- Institute of Electronics and Electrical Engineers, 228–229
- Instrumentation amplifiers, 114
- Instrument control, 228–239
 - exercises, 238–239
 - GPIB function, 232–233
 - GPIB (IEEE-488), 228–229
 - instruments, 237–238
 - RS-232, 229–231
 - RS-423, 229–231
 - RS-449, 229–231
 - serial communication, 235–237
 - VIs, 233–234
 - string data, 237–238
 - VI functions, 234–235
 - VISA, 231–232, 234–235
- Instrument drivers
 - function palette, 25
- Instrument I/O
 - function palette, 24
- Instruments, 237–238
- Integral x, 259, 275
- Intensity chart, 82–83

- Intensity graph, 82–83
- Interleave 1D Array, 97
- Intermediate-level
 - file I/O VI, 190–193
- Internal
 - AI Config, 163
- Internet
 - and LabVIEW 1, 4
- Interpolate 1D Array, 96
- Interpolation, 270–271
- Invalid record, 208
- Invariant resolution, 121
- Iteration
 - analog output, 155–156
 - buffered
 - inputs, 156–158, 160–161
 - input, 134, 277
 - terminal, 47, 172

K

- Kalman filters, 253–256
- Key Focus, 74
- Knob, 34

L

- LabVIEW 1, 3
 - case study, 4–5
 - Code Warrior Professional Release, 326–329
 - features, 4
 - and Internet, 4
 - levels, 3–4
 - toolkits, 4
- Languages
 - history, 2–3
- Latch When Released, 70–71
- Linear Algebra, 279
- Linear prediction filters, 254–256
- Linear system
 - analysis, 242–246
 - defined, 243
- Line mode, 191–192
- List control, 23
- List Errors, 15
- LISt Processing (LISP), 2
- Local variables, 57–59, 296, 313
 - Attribute Nodes, 320
 - Case structures, 313
 - Data Processed, 314
 - Global Variables, 320
 - While Loop, 57–59
- Loop
 - and case structure, 24
 - ground, 116
- Loops, 46–51. *See also* For Loop; While Loop
 - and conditional statements, 46–66

- exercises, 63–66
- Low limit, 131
- Lowpass filter (LPF), 110, 247

M

- Macintosh
 - CIN and Code Warrior, 326–332
- Match Pattern, 202
- Matrix rank, 273
- Matrix representation
 - aspects, 273
 - data, 271–273
- Maximum likelihood estimate (MLE), 249
- Maximum sampling frequency
 - data acquisition board, 122
- Measurement, 276
- Measurement
 - modes
 - types, 113–117
 - pulse width, 177f, 181–183
 - reference point, 113
- Memory issue, 103
 - Initialize Array, 103
- Memory management, 295–297
- Menu customization
 - building and application, 316–319
- Menu ring, 37
- Metrowerks Code Warrior, 326–329
- MIDI (musical instrument digital interface), 123
- Minimal sampling rate, 108, 109
- Minimax method
 - FIR filter design, 269
- Mode
 - line, 191–192
 - measurement types, 113–117
 - update, 76–77
- Moving averaging, 260
- Multiple channel data
 - waveform charts, 77–78
 - waveform graph, 80–81
- Multiplexor, 114

N

- NI-TIO-ASIC, 176
- No change
 - AI Config, 162–163
- Node. *See also* Attribute node
 - Code Interface, 297–298
 - formula, 59–60
 - Property
 - While Loop, 308
 - setup
 - sub VI, 40–41
- Nonbuffered acquisition
 - analog input, 139–142

- Nonbuffered handshaking, 172–174
- Noncasual systems, 243–244
- Nonlinear system analysis, 242–246
- Nonreferenced single ended (NRSE), 113
 - modes, 114–117
- Number of buffer iteration
 - inputs, 156–158, 160–161
- Number of samples, 131
- Numeric, 23
 - Constant, 47
 - function palette, 24
 - Integration, 258–259
 - subpalette, 30
- Nyquist frequency, 108
- Nyquist rate, 108
- Nyquist sampling theorem, 270

O

- Objects
 - creating and deleting, 21
 - definition, 14
 - pop-up, 22
 - VI, 12–15
- Occurrences, 291–295
- Offset past match, 202
- One-bit resolution
 - A/D conversion, 121
- One-D Array, 97
 - Interleave, 97
 - Interpolate, 96
 - Reverse, 95
 - Rotate, 95
 - Search, 95, 97
 - Sort, 95
 - Split, 96
 - Threshold, 96
- One-D array
 - data type
 - C++ Code, 330–331
 - Decimate, 97
- One-D binary data
 - reading, 194
 - continuously, 196
- One-D data
 - writing, 194
- Opcode, 138
- Open/Create/Replace File, 190–192
- Operate
 - pull-down menu, 205–206
- Operate value, 22
- Operational (OP) amplifiers, 114
- Option settings
 - sub VI, 37–40
- Orthogonality, 254–256
- OUT
 - definition, 175
- Output. *See also* Analog output; AO; Digital I/O; DIO
 - number, 213–215

- string, 213–215
- Output Buffer Full (OBF) lines, 172

P

- Palette
 - advanced, 25
 - analysis, 25
 - application control, 25
 - array, 24
 - cluster, 24
 - control, 23–24
 - controls, 30
 - customization, 288–291
 - data acquisition, 25
 - dialog, 24
 - file input and output (file I/O), 24
 - instrument drivers, 25
 - instrument I/O, 24
 - time, 24
 - tool, 22
- Parallel port, 236–237
- Parse Arithmetic Expression, 238
- Parse Postfix Expression, 238
- Parse String, 237
- PASCAL, 30
- Path control, 23
- Patterns, 33
- Pause button
 - diagram window, 11
- Period measurements
 - counters
 - high-frequency signals, 183–184
 - low-frequency signals, 184
 - high frequency signals, 183–184
 - low frequency signals, 184
- Plot Area Size, 75
- Point generation, 118
- Point of reference, 115f
- Ports, 123–124
- Port width, 170
- Position, 22, 74
- Power Macintosh
 - CIN and Code Warrior, 326–332
- Power spectrum, 264
- Pretrigger scan, 146
- Probability, 278–279
 - density function, 248
 - of detection, 252
 - of false alarm, 252
- Probe data, 22, 36
- Process Data, 314–315
- Programming languages
 - history, 3
 - list, 2
- Property Node
 - While Loop, 308
- Pulse generation
 - Single TTL, 178–179

- Pulse train, 112f
- Pulse train
 - generation
 - continuous TTL, 179
 - finite TTL, 179–180
- Pulse width measurements, 177f, 181–183
 - counters, 181–183

Q

- Quick Scale 1D, 279
- QUIT, 292–295
 - clear acquisition, 135

R

- Random data analysis, 246–256
- Random parameter estimation, 249–250
- Random variable (RV), 247–248
- Read Characters From File, 288–289
- Read Data, 314–315
- Read File, 190–192
- Read From Spreadsheet File, 288–289
- Read Lines From File, 288–289
- Real FFT, 275, 298f
- Reentrant Execution option, 39
- Referenced grounded source, 113
- Referenced single ended (RSE), 113
- Referenced source, 113, 164
 - type, 115f
- Refnum, 190
 - control, 23
- Relays
 - digital I/O, 170–174
 - exercises, 184–185
- Remaining String, 216, 218
- Replace array element, 93
 - bundle, 103
- Replacing local variables
 - building and application, 313–316
- Report Program Generator (RPG), 2
- Representation, 48
- REQest (REQ), 170, 172
- Reshape Array, 94–95
 - 1-D array to 2-D array, 198
- Resistance Temperature Detector (RTD), 59–60
- Resistors
 - bias implementing, 116
- Resolution, 122
- Reverse 1D Array, 95
- Reverse logic
 - serial communication, 230
- Rewrite, 37
- Right-click method, 48, 51
- Ring control, 23
- Ritchie, D.M., 2
- Rotate 1D Array, 95

- Round-robin scanning, 147
- RS-232, 229–231
- RS-423, 229–231
- RS-449, 229–231
- Run button, 35, 53
 - diagram window, 11
- Run continuously button
 - diagram window, 11
- Run When Opened, 305

S

- Sample frequency, 109, 131
- Sample number, 131
- Sample rate, 131
 - conversion types, 270
- Sampling theorem, 108–112
- Saving, 34
 - building and application, 312–313
 - methods, 203–208
- Scan clock, 146–147
- Scan from string, 215–218
- Scope Chart, 76
- Scroll window, 22
- Search 1D Array, 95, 97
- Security settings
 - sub VI, 36–37
- Select, 22
- Select a VI
 - function palette, 25
- Select control, 24
- Sequence Local, 56–57
- Sequence structure, 55–57, 305
 - disabled, 72
- Serial communication
 - handshaking, 230
 - parallel port, 236–237
 - reverse logic, 230
 - testing, 235–236
 - VIs, 233–234
- Serial Port Init, 234
- Serial Port Read, 233
- Serial Port Write, 233
- Set breakpoint, 22
- Set color, 22
- Set Occurrence, 292–295
- Setup
 - sub VI, 40–41
- Shift register, 60, 62–63
 - For Loop, 62
 - While Loop, 62
- Shortcuts, 17, 20–21
- Show Connector, 32–33
- Signal, 247
 - measurement mode
 - selection algorithm, 117
 - reconstruction, 109, 111f
 - source, 113
 - nature, 113

- Signal Conditioning, 124
- Signal Generation, 274
- Signal-to-noise ratio (SNR), 117
- Simple handshaking, 172–174
 - buffered, 172–174
 - digital input, 173
 - digital output, 173–174
- Simultaneous AI/AO
 - analog output, 164–166
- Single/circular-buffered waveform generation
 - analog output, 162
- SISL
 - description, 244
- Size, 22
- Software handshaking (SWHS), 230
- Software-timed data acquisition, 137
- Software timing
 - analog input, 137–139
- Sort 1D Array, 95
- SOURCE
 - definition, 175
- Source element, 100–101
- Space bar
 - shortcut, 20
- Spectral density, 264
- Spectrum baseband
 - extraction, 110
- Spectrum overlapping, 109
- Split 1D Array, 96
- Spreadsheet string, 218–220
- Spreadsheet String To Array, 218–220
- Stability In the Sense of Lyapunov, 244
- Statistical characteristics
 - stochastic process, 248
- Statistics, 278–279
- Status checking mechanism
 - building and application, 309–310
- Step into, 36
 - button
 - diagram window, 11
- Step out, 36
 - button
 - diagram window, 12
- Step over button
 - diagram window, 12
- Step response analysis, 246
- Stochastic data
 - analysis, 246–256
 - processing, 247–249
 - hypothesis testing, 250
- Strict-sense stationary (SSS) processes, 248
- String, 131
 - binary data, 223
 - concatenate, 212, 296
 - controls, 23
 - data, 237–238
 - instrument control, 237–238
 - format, 215–218
 - inputs, 213–215
 - function palette, 24
 - gain and channel
 - analog input, 142–144
 - analog output, 162–164
 - input, 201–202, 213–215
 - input control
 - case structure, 54–55
 - Length, 212
 - manipulation, 212–225
 - array conversion, 218–220
 - binary string to numeric data, 220–223
 - exercises, 223–225
 - format and append, 213–215
 - format and strip, 213–215
 - format into string, 215–218
 - scan from string, 215–218
 - spreadsheet string, 218–220
 - Parse, 237
 - Remaining, 216, 218
 - spreadsheet, 218–220
 - subpalette, 212
 - Subset, 212
- StriNg Oriented symBOLic Language (SNOBOL), 2
- String To Byte Array, 220–223
- Strip Chart, 76
- STroBe (STB), 172
- Structure
 - loops and case, 24
 - subpalette
 - items, 46
 - VI, 9–27
 - exercises, 25–27
- Subpalette
 - analog
 - input, 130f
 - output, 154f
 - analysis, 273–280
 - cluster, 81
 - conversion, 212
 - counter, 175f
 - data analysis, 273–280
 - file input and output, 193
 - selection, 34
 - string, 212
 - structure items, 46
- Subroutine
 - concept, 30
- Sub VI, 29–43
 - creation, 30–36, 41–42
 - definition, 30
 - error handler design, 334–337
 - exercises, 42–43
 - help text creation, 36
 - node setup, 40–41
 - option settings, 37–40
 - security settings, 36–37
- Sweep Chart, 76
- Switches
 - devices, 170
 - digital I/O, 170–174
 - exercises, 184–185
- Symmetric matrices, 272–273
- System
 - characteristics, 242–244

T

- Tab key
 - shortcut, 20
- Table controls, 23
- Task ID, 190
- Terminal, 33
 - creation, 32
 - iteration, 172
 - record, 208
- Text editor, 22, 53
- Text setting button
 - diagram window, 12
- Thermocouple, 59–60
- Threshold 1D Array, 96
- Time
 - analysis technique, 260
 - domain data analysis, 257–271
 - function palette, 24
 - stamp, 208
- Time system
 - continuous, 245
- Tool palette, 22, 33
- Transpose
 - data matrix, 79
 - two-D Array, 79, 92, 95
- Triggered AI/AO
 - analog output, 164–166
- Triggering methods
 - parameters, 145–146, 145f
- TTL pulse, 175
 - generation
 - continuous, 179
 - finite, 179–181
 - single, 178–179
- Tutorial
 - function palette, 25
- Two-D array data type
 - C++ Code, 331–332
- Two-D binary data
 - continuous
 - reading, 190
 - writing, 190
 - reading, 197–198
- Two-D data
 - writing, 196–197
- Type Cast, 222–223

U

- Unbiased
 - random parameters, 249
- Unbundle, 100, 208
 - index array, 103
 - by name, 100
- Unsigned byte array, 222
- Update mode, 76–77
- Update rate, 123
 - inputs, 160–161

- User controls, 23, 290–291
- User libraries, 290–291
 - function palette, 25
- User Monitor System, 292

V

- Vector representation
 - data, 271–273
- Vertical Fill Slide, 16
- Virtual Instrumentation. *See* VI (Virtual Instrumentation)
- Virtual Instrument Software Architecture. *See* VISA
- VISA, 231–232, 234–235. *See also* Easy VISA
- VISA Clear, 234
- VISA Close, 234
- VISA Open, 234
- VISA Read, 234
- VISA Write, 234
- VISA Write & Read
 - Easy, 235
- Visible, 72
- VI (Virtual Instrumentation), 3–4
 - functions, 234–235
 - server functions, 301
 - structure, 9–27
 - exercises, 25–27
 - sub (*See* Sub VI)
- Voltage, 113
- Voltmeter, 12–15

W

- Wait (ms), 48, 51, 137
- Wait on Occurrence, 292–295
- Wait Until Next ms Multiple, 137
- Waveform, 131
 - charts, 68–78
 - attribute node, 71–76
 - multiple channel data, 77–78
 - update mode, 76–77
 - waveform graphs, 79
 - generation, 118
 - technique, 154
 - graph, 79–81
 - multiple channel data, 80–81
 - vs. waveform charts, 79
- Waveform charts
 - multiple channel data, 77–78
- While Loop, 49–51, 55–57, 190
 - AI acquire waveform, 134
 - array, 90–91
 - Attribute Node, 75–76
 - autoindexing, 60–61
 - autoindexing and shift register, 60–62
 - Boolean input, 51
 - boundary, 56

- Case structure, 309
 - helps, 50
 - local variables, 57–59
 - Property Node, 308
 - shift register, 62
 - simultaneous, 291–295
 - waveform chart, 68–70, 78
- White noise, 247
- Wide-sensory stationary (WSS) processes, 248, 264
- Wiener filters, 253–256
- Wiener-Hopf equation
 - principle, 254–256
- Windowing
 - process, 268
 - types, 268
- Window options, 37
- Windows, 277–278
- Wire tool, 22
- Wiring technique, 10–12, 17–21
 - steps, 32
- Write Characters To File, 288–289
- Write File, 192–193
- Write To Spreadsheet File, 48, 288–289
- Writing technique, 17

X

- X Scale Info, 75
- XY graph, 81–82

Y

- Y Scale Info, 75

Z

- Zero Padding, 282