www.controleverything.com

National Control Devices

Who's Controlling Your World?

Phone: 417-646-5644
Fax: 417-646-8302
Email: ncdryan@aol.com

P.O. Box 455
Osceola, MO 64776

MICROCONTROLLERS

The NCD Series Preprogrammed Microcontrollers can be found in control applications all over the world. Our microcontrollers have a proven reputation for reliability and simplicity, offering an off-the-shelf solution for your OEM product.

Our extensive line of preprogrammed microcontrollers offer your corporation, university, or small business a cost competitive edge by significantly reducing design time and engineering costs.

NCD Microprocessors have been available since 1994 and our product line is always growing. With our extensive collection of CPUs already in daily operation all over the world, our product line is here to stay and to grow with all of your computer control needs.

NCD Supported CPU Families

CPU	Pins	Speed	Package
PIC12C671/672	8	INT, 4 MHz*	DIP/SOIC
PIC16C54A	18	4 MHz*	DIP/SOIC
PIC16C71	18	<=4 MHz*	DIP/SOIC
PIC16C554A	18	4 MHz*	DIP/SOIC
PIC16C62	18	<=20 MHz	DIP/SOIC
PIC16C715	18	<= 20 MHz	DIP/SOIC
PIC16C73B	28	<= 20 MHz	DIP
PIC16C74B	40	<=20 MHz	DIP
PIC16C77B	40	<=20 MHz	DIP
PIC17C42	40	<=16 MHz	DIP
PIC17C43	40	<=20 MHz	DIP
PIC17C44	40	<=20 MHz	DIP
PIC17C756	68	<=33 MHz	PLCC

INT=Internal Oscillator, *=OK to Over-clock at 8 MHz.

Preprogrammed Microcontrollers for Advanced Control Applications

Absolute Maximum Ratings

Normal Operating Conditions	*Minimum*	*Typical*	*Maximum*
V+ Supply Voltage	**3 Volts**	**5 Volts**	**6.25 Volts**
Supply Current at 4 MHz		***2 ma***	***3.6 ma***
Supply Current at 2 MHz		***.4 ma***	***.9 ma***
Supply Current at 500 KHz		***.2 ma***	***.7 ma***
Input Low Voltage Ground	***Ground***		***.15 Volts***
Input High Voltage	***.6 Volts***		***V+***
Output Low Voltage			***.5 Volts***
Output High Voltage	***V+ -.5 Volts***		
Single Pin Current Draw			***20 ma***
Current Draw from all Pins			***40 ma***

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POLICY & PRECAUTIONS

Static Sensitivity

NCD Preprogrammed microcontrollers are static sensitive. Neutralize static in your body by touching a grounded surface BEFORE handling.

Returns

NCD Preprogrammed microcontrollers cannot be returned or replaced if the original sealed packaging is broken.

Firmware Errors

While every precaution has been taken to prevent firmware errors, it is possible for minor bugs to escape our testing procedures. Unless otherwise noted, we do not accept ANY responsibility for firmware errors that may be discovered by our users. We will make every effort to update the firmware to correct the problem for future purchases. However, devices cannot be returned for refund or exchange based on firmware errors.

Firmware Upgrade Policy

We currently do not offer any price breaks for firmware upgrades of any kind.

Prototyping

DO NOT USE NCD MICROCONTROLLERS ON A BREADBOARD, DEVICE FAILURE MAY OCCUR. Breadboards often disrupt the oscillator lines resulting in unreliable operation and in most cases, device failure. Only Byte Bugs that do not rely on an external oscillator may be prototyped on a breadboard. All other devices require the use of a solder-based prototyping board. We recommend the use of IC sockets when prototyping. External crystals or resonators must be soldered as close to the oscillator lines as possible.

Monitoring

Never monitor the oscillator lines of an NCD preprogrammed microcontroller with an oscilloscope. Doing may damage the device permanently.

Technical Support

Technical support is only available via e-mail: ncdryan@aol.com

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Who's Controlling Your World?

FAMILY SELECTOR

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First Generation NCD Series

NCD Part	Processor	Description	Variations	Page
NCD101	PIC16C54A	Serial-to-Parallel Converter, Networkable	A, B	31
NCD102	PIC16C54A	Polled Parallel-to-Serial Encoder	NONE	32
NCD103	PIC16C54A	ASCII Keypad Encoder	NONE	33
NCD104	PIC16C54A	Programmable Delay Timer	A, B	34
NCD105	PIC16C54A	Programmable Pulse Stretcher	NONE	35
NCD106	PIC16C71	Dual 8-Bit A/D w/3 TTL Inputs, 4 TTL Outputs	NONE	36
NCD107	PIC16C54A	ASCII Keypad Encoder with Infrared Output	NONE	37
NCD108	PIC16C54A	BCD Programmable Pulse Stretcher	A, B	38
NCD109	PIC16C54A	Serial-to-Parallel Converter with Strobes	NONE	39
NCD110	PIC16C54A	Addressable 4-Bit Serial-to-Parallel Converter	NONE	40

Device Variations

NCD Part	A-Version Description	B-Version Description
NCD101	Requires a 22K Resistor for the RS-232 Data Input Line (Recommended Device).	Requires a True-RS-232 Receiver Chip such as a MAX232 or MC1489.
NCD104	Longest Delay Interval is 17 Minutes and 3 Seconds.	Longest Delay Interval is 17 Hours and 3 Minutes.
NCD108	Device Configured in units of Minutes and Seconds. Maximum Pulse Delay is 7 Minutes, 59 Seconds.	Device Configured in units of Hours and Minutes. Maximum Pulse Delay is 7 Hours, 59 Minutes.

Special Notes

Every device is supplied with a 4 MHz ceramic resonator. All timing chips should use a 4 MHz crystal for precise timing. It is often OK to over-clock these CPUs up to 8 MHz. Note that baud rates are doubled when over-clocked to 8 MHz and all times for above timing chips are cut in half when over-clocked at 8 MHz.

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Byte Bug Series

NCD Part	Name	E3C	Description	Page
NCD201	Anabug	No	4-Ch. 8-Bit A/D + 1 TTL Input w/2400 Baud 7-Byte Packet Output	9
NCD202	Anabug2	No	2-Channel A/D Converter + 1 TTL Input w/9600 Baud 5-Byte Packet Output	11
NCD203	Anabug3	No	2-Channel A/D Converter w/Enable & 9600 Baud 4-Byte Packet Output	13
NCD204	Anabug4	Yes	2-Channel A/D Converter, Polled 2-Way RS-232 w/9600 Baud Output	15
NCD205	AnabugXT	No	4-Channel A/D + 8-Bit Input, Up to 19.2K Baud 7-Byte Packet Output	17
NCD206	AnabugHS	No	4-Channel A/D + 8-Bit Input, Up to 48K Baud 7-Byte Packet Output	17
NCD207	Bitabug	No	5-Bit Serial to Parallel Converter with 2400 Baud Input	19
NCD208	Bitabug2	No	3-Bit Serial to Parallel Converter with 9600 Baud Input	21
NCD209	Scam	Yes	Networkable Dual Servo Driver for Remote Camera Positioning Applications	23
NCD210	Scam2	Yes	Networkable 3-Servo Driver for Remote Camera Positioning Applications	26
NCD220	Bitabug3	Yes	Networkable 3-Bit Output, 9600 Baud	28
NCD219	JoyScam	Yes	Joystick Position Encoder, Packet Generator for NCD209 SCAM Chip	30

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Special Notes

E3C Compliant Devices allow 256 Devices to share a single serial port. The device number is burned into the chip prior to shipment. Parts should be ordered with a device number of 000-255 at the end of part numbers above. If no device number is given at the time of order, chips will be burned as device 000. Most Byte Bugs require an external ceramic resonator. Those that require an external resonator are supplied with the appropriate resonator. Byte Bugs are typically developed around the PIC12C671/672 and PIC16C71/73/74 microcontroller cores.

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Advanced Function Controllers

NCD Part	Name	E3C	Description	Page
Watch for New Custom Controllers in the Coming Months.				

Special Notes

E3C Compliant Devices allow 256 Devices to share a single serial port. The device number is burned into the chip prior to shipment. Parts should be ordered with a device number of 000-255 at the end of part numbers above. If no device number is given at the time of order, chips will be burned as device 000. Most Byte Bugs do NOT require an external ceramic resonator. Those that require an external resonator are supplied with the appropriate resonator. Byte Bugs are developed around the PIC12C671/672 microcontroller core.

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Analog Control Processors

NCD Part	Name	Description	Page
NCD301	**VUM**	2x10 LED Stereo VU Meter Display Driver w/Dot/Bar/Peak Hold & Fall	28
NCD302	**VUM2**	Single Channel 20 LED VU Meter Display Driver w/Dot/Bar/Peak Hold & Fall	29

Watch for New Custom Controllers in the Coming Months.

Special Notes

E3C Compliant Devices allow 256 Devices to share a single serial port. The device number is burned into the chip prior to shipment. Parts should be ordered with a device number of 000-255 at the end of part numbers above. If no device number is given at the time of order, chips will be burned as device 000. Most Byte Bugs do NOT require an external ceramic resonator. Those that require an external resonator are supplied with the appropriate resonator. Byte Bugs are developed around the PIC12C671/672 microcontroller core.

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Replacement Microcontrollers

NCD Part	NCD Board Name	Description	Price
8SCRK	8SC	8-Bit Input Scanner Repair Kit	$12
ABTRK	ABT	ASCII Backpack Transmitter Repair Kit	$12
AKTRK	AKT	ASCII Keypad Transmitter Repair Kit	$12
AD8RK	AD8	Dual 8-Bit A/D w/TTL I/O Repair Kit	$12
NCD110	ASEL	PIC Microcontroller for ASEL	$10
GDSPRK	GDSP	GDSP 240x64 LCD Display Controller Repair Kit	$29
NCD110	IR8	PIC Microcontroller for IR8	$10
N/A	IRTR	DEVICE MUST BE RETURNED FOR REPAIR	-
LCDM	LCD	PIC Microcontroller for LCD Char. Display Controller	$10
N/A	LCDA128	DEVICE MUST BE RETURNED FOR REPAIR	-
PWM	M1	PWM Chip for M1 DC Motor Controller	$10
NCD110	M1	PIC Microcontroller for M1 RS-232 Interface	$10
NCD110	R45/R410	PIC Microcontroller for R45/R410 Relay Controller	$10
R8XM	R85/R810	PIC Microcontroller for R85/R810 Relay Controller	$20
R16XM	R16xx	PIC Microcontroller for R16 Series Relay Controllers	$40
N/A	RSB	DEVICE MUST BE REPLACED, NO REPAIRS	-
NCD110	STP	PIC Microcontroller for STP Stepper Controller	$10
GATEWAY	SV8/16	PIC Microcontroller for SVx. RS-232 Interface Chip.	$10
SVM	SV8/16	PIC Microcontroller for SVx. Servo Control Chip.	$15
VFDM	VFD	PIC Microcontroller for VFD Display Controller	$60

Special Notes

Most NCD Devices are user-repairable by simply replacing the PIC microcontroller. While we do request that you return your device for repair, we do offer you the option of repairing the device yourself by purchasing the appropriate replacement microprocessor. Antistatic precautions must be observed when replacing NCD microcontrollers.

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Who's Controlling Your World?

NCD201

BYTE BUGS: ANABUG

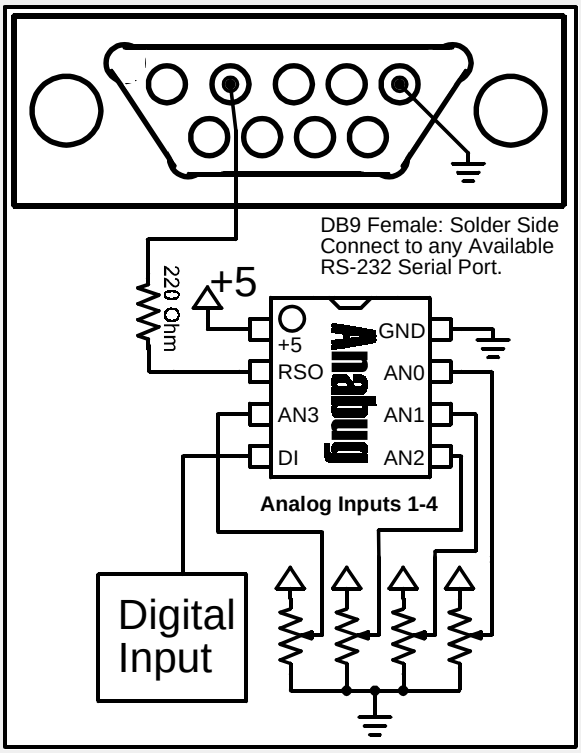
Device Description: NCD201

Anabug is a 8-pin preprogrammed microcontroller based on the PIC12C671/672 core, and is available in DIP and SOIC packages. Anabug is programmed to read four 8-bit analog inputs (0-5 volts DC) and one digital input (TTL/CMOS Compatible) and generate a packet of 7 bytes indicating the status of all inputs. Packets of data are continuously sent out the RS-232 Data Output pin (RS0) at 2400 baud.

Current Pricing in US Dollars: NCD201

Package Type	Qty 1-9	Qty 10	Qty 11-100	Qty 101-1000
DIP	DISCONTINUED	DISCONTINUED	DISCONTINUED	DISCONTINUED
SOIC	DISCONTINUED	DISCONTINUED	DISCONTINUED	DISCONTINUED

Example Device Wiring: NCD201



Anabug, shown at left, is easily connected to the serial port of your computer using only a 220 Ohm resistor. Anabug requires a regulated +5 volt power supply. Anabug has five inputs, one is a standard TTL/CMOS (0/+5 volt) input and the other four are analog inputs. Analog inputs can accept an input voltage range of 0 to 5 volts DC. Anabug is shown with its analog inputs connected to four potentiometers. When power is applied, data packets of 7 bytes will be continuously sent to the computer at 2400 baud, indicating the status of all 5 inputs.

Pin	Label	Function
1	+5	Connect to Regulated +5 Supply
2	RSO	RS-232 Data Output, 2400 bps, 8,N,1
3	AN3	Analog Input 4
4	AN2	TTL/CMOS Digital Input
5	AN2	Analog Input 3
6	AN1	Analog Input 2
7	AN0	Analog Input 1
8	GND	Power Supply Ground

Recommended Usage

This device is provided with programming examples for the following systems. If programming examples are not provided for the Basic Stamp, then it is NOT RECOMENDED for use with this device at this time. E3C Compliance allows 256 Devices to interface to a single serial port.

QBasic	*Visual Basic 6 Pro*	*Basic Stamp II*	*Basic Stamp II SX*	*E3C Compliance*
No	Yes	No	No	No

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Programmers Notes

Anabug constantly generates packets of data at 2400 baud. A packet of data consists of 7 bytes, indicating the status of all inputs. Data packets are organized as shown in the table (left). Note that data packets are sent ~ 30 times per second. A program used to decode these data packets must look for the header, store the incoming data, and only accept the data if the footer is detected as byte 7. Otherwise, the data packet should be discarded to prevent reception errors. Note that all inputs should be tied low with a 4.7K resistor to prevent channel bleed.

Byte	Value	Description
1	254	Header Byte, Begins the Packet
2	0-255	Analog Value of Input Channel 1
3	0-255	Analog Value of Input Channel 2
4	0-255	Analog Value of Input Channel 3
5	0-255	Analog Value of Input Channel 4
6	0-1	Logic Level Input Status (1=High)
7	85	Footer Byte, Concludes the Packet

Example Software Notes

Example communication software for this device was written under Visual Basic 6 Professional. Example source code can be downloaded from our web site at www.controleverything.com. If you are NOT a Visual Basic Programmer, Source code can be viewed using a text editor such as Notepad or WordPad. Source code is clearly commented for easy migration to other languages.

Programming Language	Program	Program Description
Basic Stamp II	NONE	Anabug has not been tested with the Basic Stamp II
Basic Stamp II SX	NONE	Anabug has not been tested with the Basic Stamp II SX
QBasic	NONE	Coming Soon
Visual Basic 6 Pro	BUGS.ZIP	Simple Program Graphically Displays the Status of all 5 Inputs

Important Availability Information

The Anabug will be replaced by the Anabug2 due to unreliable calibration issues with the internal oscillator. Anabug2 will require an external resonator at the sacrifice of 2 input channels. Please call us if your application absolutely requires the original Anabug.

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Who's Controlling Your World?

NCD202

BYTE BUGS: ANABUG2

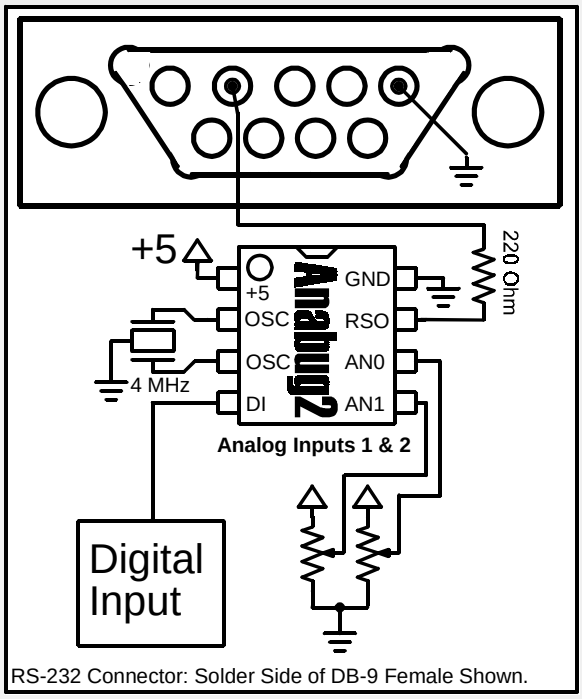
Device Description: NCD202

Anabug2 is a 8-pin preprogrammed microcontroller based on the PIC12C671/672 core, and is available in DIP and SOIC packages. Anabug2 is programmed to read two 8-bit analog inputs (0-5 volts DC) and one digital input (TTL/CMOS Compatible) and generate a packet of 5 bytes indicating the status of all inputs. Packets of data are continuously sent out the RS-232 Data Output pin (RS0) at 9600 baud.

Current Pricing in US Dollars: NCD202

Package Type	Qty 1-9	Qty 10-25	Qty 26-100	Qty 101+
DIP	**$10**	**$5.90**	**$5.10**	**MARKET PRICE**
SOIC	**$11**	**$6.90**	**$6.10**	**MARKET PRICE**

Example Device Wiring: NCD202



RS-232 Connector: Solder Side of DB-9 Female Shown.

Anabug2, shown at left, is easily connected to the serial port of your computer using only a 220 Ohm resistor. Anabug2 requires a regulated +5 volt power supply. Anabug2 has three inputs, one is a standard TTL/CMOS (0/+5 volt) input and the other two are analog inputs. Analog inputs can accept an input voltage range of 0 to 5 volts DC. Anabug2 is shown with its analog inputs connected to two potentiometers. When power is applied, data packets of 5 bytes will be continuously sent to the computer at 9600 baud, indicating the status of all three inputs.

Pin	Label	Function
1	+5	Connect to Regulated +5 Supply
2, 3	OSC	Ceramic Resonator Connection
4	DI	TTL/CMOS Digital Input
5	AN1	Analog Input 1
6	AN0	Analog Input 0
7	RSO	RS-232 Data Output, 9600 bps, 8,N,1
8	GND	Power Supply Ground

Recommended Usage

This device is provided with programming examples for the following systems. If programming examples are not provided for the Basic Stamp, then it is NOT RECOMENDED for use with this device at this time. E3C Compliance allows 256 Devices to interface to a single serial port.

QBasic	*Visual Basic 6 Pro*	*Basic Stamp II*	*Basic Stamp II SX*	*E3C Compliance*
No	Yes	No	No	No

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Who's Controlling Your World?

NCD202

PROGRAMMING ANABUG2

Programmers Notes

Anabug2 constantly generates packets of data at 9600 baud. A packet of data consists of 5 bytes, indicating the status of all inputs. Data packets are organized as shown in the table (below). Note that data packets are sent ~ 30 times per second. A program used to decode these data packets must look for the header (254), store the incoming data, and only accept the data if the footer is detected as byte 5. Otherwise, the data packet should be discarded to prevent reception errors. Note that all inputs should be tied low with a 4.7K resistor to prevent channel bleed.

Byte	Value	Description
1	254	Header Byte, Begins the Packet
2	0-255	Analog Value of Input Channel 1
3	0-255	Analog Value of Input Channel 2
4	0-1	Logic Level Input Status (1=High)
5	85	Footer Byte, Concludes the Packet

Example Software Notes

Example communication software for this device was written under Visual Basic 6 Professional. Example source code can be downloaded from our web site at www.controleverything.com. If you are NOT a Visual Basic Programmer, Source code can be viewed using a text editor such as Notepad or WordPad. Source code is clearly commented for easy migration to other languages.

Programming Language	Program	Program Description
Basic Stamp II	**NONE**	Anabug2 has not been tested with the Basic Stamp II
Basic Stamp II SX	**NONE**	Anabug2 has not been tested with the Basic Stamp II SX
QBasic	**NONE**	Coming Soon
Visual Basic 6 Pro	**BUGS.ZIP**	Simple Program Graphically Displays the Status of all 3 Inputs

Availability

The Anabug2 will replace the Anabug due to unreliable calibration issues with the internal oscillator. Anabug 2 will begin shipping on February 1, 2000.

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Who's Controlling Your World?

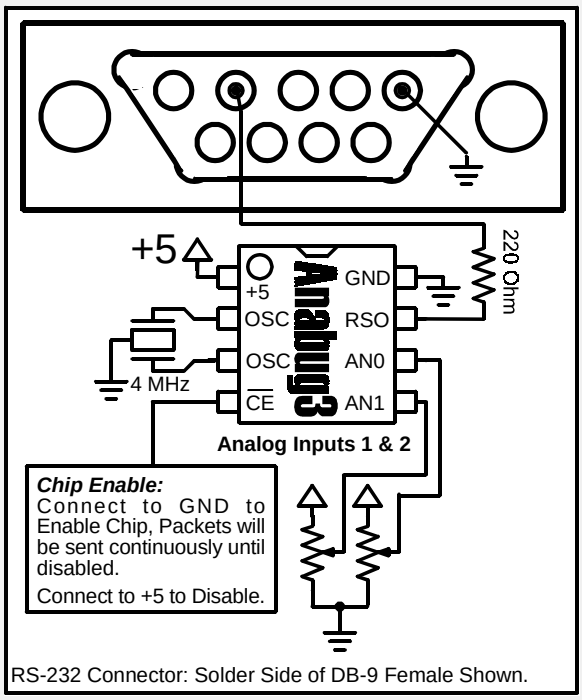
Device Description: NCD203

Anabug3 is a 8-pin preprogrammed microcontroller based on the PIC12C671/672 core, and is available in DIP and SOIC packages. Anabug3 is programmed to read two 8-bit analog inputs (0-5 volts DC) and generate a packet of 4 bytes indicating the status of both inputs. Packets of data are continuously sent out the RS-232 Data Output pin (RS0) at 9600 baud as long as the Chip Enable (CE) pin is held low. Packets are halted if CE is high. This device always generates 4-byte data packets that are not interrupted if the logic state of CE changes during packet transmission.

Current Pricing in US Dollars: NCD203

Package Type	Qty 1-9	Qty 10-25	Qty 26-100	Qty 101+
DIP	**$10**	**$5.90**	**$5.10**	**MARKET PRICE**
SOIC	**$11**	**$6.90**	**$6.10**	**MARKET PRICE**

Example Device Wiring: NCD203



Anabug3, shown at left, is easily connected to the serial port of your computer using only a 220 Ohm resistor. Anabug3 requires a regulated +5 volt power supply. Anabug has two analog inputs. Analog inputs can accept an input voltage range of 0 to 5 volts DC. Anabug3 is shown with its analog inputs connected to two potentiometers. When power is applied, data packets of 4 bytes will be continuously sent to the computer at 9600 baud as long as the CE line is held low. Bringing the CE line high disable packet transmission.

Pin	Label	Function
1	+5	Connect to Regulated +5 Supply
2,3	OSC	Ceramic Resonator Connection
4	CE	Chip Enable, Low to Enable Chip
5	AN1	Analog Input 2
6	AN0	Analog Input 1
7	RSO	RS-232 Data Output, 9600 bps, 8,N,1
8	GND	Ground

Recommended Usage

This device is provided with programming examples for the following systems. If programming examples are not provided for the Basic Stamp, then it is NOT RECOMENDED for use with this device at this time. E3C Compliance allows 256 Devices to interface to a single serial port.

QBasic	*Visual Basic 6 Pro*	*Basic Stamp II*	*Basic Stamp II SX*	*E3C Compliance*
No	Yes	No	No	No

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Programmers Notes

Anabug3 constantly generates packets of data at 9600 baud provided the CE line is held low. A packet of data consists of 4 bytes, indicating the status of all inputs. Data packets are organized as shown in the table (below). Note that data packets are sent ~ 40 times per second. A program used to decode these data packets must look for the header, store the incoming data, and only accept the data if the footer is detected as byte 4. Otherwise, the data packet should be discarded to prevent reception errors. Note that all inputs should be tied low with a 4.7K resistor to prevent channel

Byte	Value	Description
1	254	Header Byte, Begins the Packet
2	0-255	Analog Value of Input Channel 1
3	0-255	Analog Value of Input Channel 2
4	85	Footer Byte, Concludes the Packet

Example Software Notes

Example communication software for this device was written under Visual Basic 6 Professional. Example source code can be downloaded from our web site at www.controleverything.com. If you are NOT a Visual Basic Programmer, Source code can be viewed using a text editor such as Notepad or WordPad. Source code is clearly commented for easy migration to other languages.

Programming Language	Program	Program Description
Basic Stamp II	**NONE**	Anabug3 has not been tested with the Basic Stamp II
Basic Stamp II SX	**NONE**	Anabug3 has not been tested with the Basic Stamp II SX
QBasic	**NONE**	Coming Soon
Visual Basic 6 Pro	**BUGS.ZIP**	Simple Program Graphically Displays the Status of both Inputs

Availability

Anabug3 will begin shipping on February 1, 2000.

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NCD204

BYTE BUGS: ANABUG4

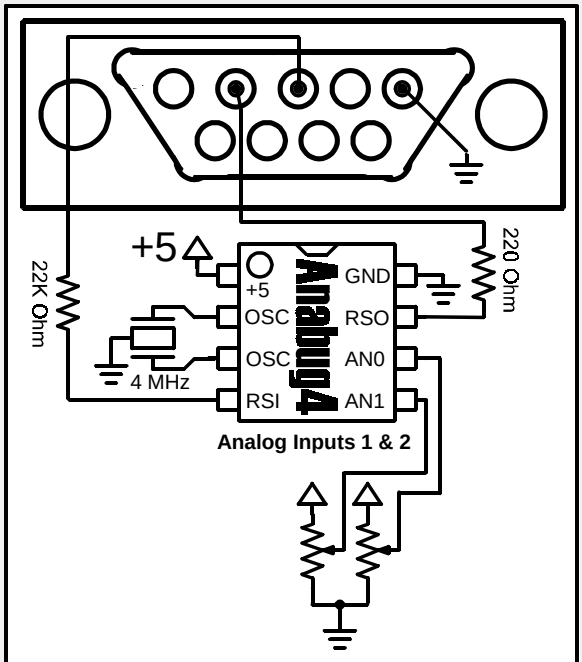
Device Description: NCD204

Anabug4 is a 8-pin preprogrammed microcontroller based on the PIC12C671/672 core, and is available in DIP and SOIC packages. Anabug4 is a polled device, programmed to read two 8-bit analog inputs (0-5 volts DC) when requested. ASCII character codes are used to issue commands to the Anabug4. Anabug4 supports commands for reading each individual channel or both channels simultaneously. Anabug4 is E3C compliant, allowing 256 devices to share a single RS-232 serial port, providing up to 512 A/D channels. E3C compliance allows other types of devices to share the same serial port as well.

Current Pricing in US Dollars: NCD204

Package Type	Qty 1-9	Qty 10-25	Qty 26-100	Qty 101+
DIP	**$10**	**$9.00**	**$8.10**	**MARKET PRICE**
SOIC	**$11**	**$10.00**	**$9.10**	**MARKET PRICE**

Example Device Wiring: NCD204



RS-232 Connector: Solder Side of DB-9 Female Shown.

Anabug4, shown at left, is easily connected to the serial port of your computer using only two resistors. Anabug4 requires a regulated +5 volt power supply. Anabug4 has two analog inputs and an RS-232 I/O port. Analog inputs can accept an input voltage range of 0 to 5 volts DC. Anabug4 is shown with its analog inputs connected to two potentiometers. When power is applied, Anabug4 waits for a command from your computer. When the appropriate command is received, Anabug4 reads one or both input channels and returns one or two bytes indicating the voltage level on the analog inputs.

Pin	Label	Function
1	+5	Connect to Regulated +5 Supply
2, 3	OSC	Ceramic Resonator Connection
4	RSI	RS-232 Data Input, 9600 bps, 8,N,1
5	AN1	Analog Input 2
6	AN0	Analog Input 1
7	RSO	RS-232 Data Output, 9600 bps, 8,N,1
8	GND	Ground

Recommended Usage

This device is provided with programming examples for the following systems. If programming examples are not provided for the Basic Stamp, then it is NOT RECOMENDED for use with this device at this time. E3C Compliance allows 256 Devices to interface to a single serial port.

QBasic	*Visual Basic 6 Pro*	*Basic Stamp II*	*Basic Stamp II SX*	*E3C Compliance*
No	Yes	No	No	Yes

National Control Devices

Who's Controlling Your World?

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Programmers Notes

Anabug4 supports nine commands for reading analog data and controlling all network functions. Anabug4 is designed to accept and generate numeric ASCII character codes from 0 to 255, easily generated and interpreted by any programming language that supports serial communications. To send a command to Anabug4, you must first send ASCII character code 254 to place the device in command mode. Once in command mode, any of the commands listed in the table below may be issued. Some E3C commands have parameters, used to control which device you are speaking to. To read analog input channel 1, ASCII character codes 254 and 0 must be received by the Anabug4. The device will then reply with an ASCII character code from 0-255 indicating the voltage on the analog input. A reply of 0 indicates 0 volts, a reply of 128 indicates 2.5 volts, a reply of 255 indicates 5 volts.

E3C compliance allows 256 devices to share a single serial port. Six commands are used to control which device you are speaking to. We do NOT recommend speaking to more than a single device at a time. Doing so would cause significant data collision problems. Therefore, commands 248 and 250 should not be used unless you have made special electrical provisions to accept data from multiple RS-232 data sources simultaneously.

Command	Parameter	Description
0	**None**	**Read A/D Channel 1, Returns 1 Byte**
1	**None**	**Read A/D Channel 2, Returns 1 Byte**
2	**None**	**Read A/D Channels 1&2, Returns 2 Bytes**
248	**None**	**E3C: Enable All Devices**
249	**None**	**E3C: Disable All Devices**
250	**0-255**	**E3C: Enable Selected Device**
251	**0-255**	**E3C: Disable Selected Device**
252	**0-255**	**E3C: Enable Selected Device, Disable All Other Devices**
253	**0-255**	**E3C: Disable Selected Device, Enable All Other Devices**

Some E3C commands require a parameter, indicating a specific device number to speak to. In most applications, E3C command 252 will be the only command you will ever need. All other commands are provided for network compliance purposes only. Command 252 is used to speak to an individual device, and turn all others off.

To send E3C command 252 to the Anabug4, send ASCII character code 254 to put the Anabug4 in command mode. Next send ASCII character code 252, followed by a third Parameter indicating which device should be active. All subsequent commands will only be acknowledged by the selected device.

Note that E3C device numbers are programmed into the chip at the time of purchase. Once programmed, they cannot be changed.

Example Software Notes

Example communication software for this device was written under Visual Basic 6 Professional. Example source code can be downloaded from our web site at www.controleverything.com. If you are NOT a Visual Basic Programmer, Source code can be viewed using a text editor such as Notepad or WordPad. Source code is clearly commented for easy migration to other languages.

Programming Language	Program	Program Description
Basic Stamp II	**NONE**	Anabug4 has not been tested with the Basic Stamp II
Basic Stamp II SX	**NONE**	Anabug4 has not been tested with the Basic Stamp II SX
QBasic	**NONE**	Coming Soon
Visual Basic 6 Pro	**BUGS.ZIP**	Simple Program Graphically Displays the Status of both Inputs

Availability

Anabug4 will begin shipping on February 1, 2000.

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Who's Controlling Your World?

NCD205
NCD206

BYTE BUGS: ANABUGXT/HS

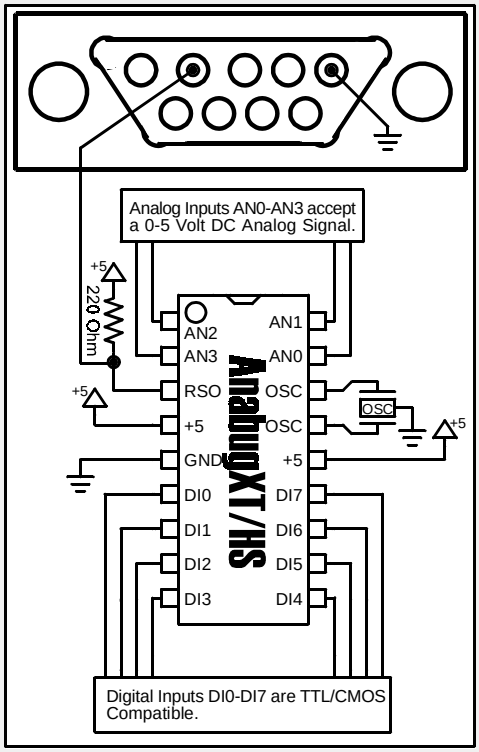
Device Description: NCD205/6

AnabugXT and AnabugHS is a 18-pin preprogrammed microcontroller based on the PIC16C71/71-HS core, and is available in a DIP and SOIC packages. AnabugXT/HS is programmed to read four 8-bit analog inputs (0-5 volts DC) and 8 digital input (TTL/CMOS Compatible) and generate a packet of 7 bytes indicating the status of all inputs. Packets of data are continuously sent out the RS-232 Data Output at a baud rate determined by speed of the resonator connected to the OSC lines of this device. The XT version works up to 8 MHz while the HS version works from 8-20 MHz.

Current Pricing in US Dollars: NCD205/6

Package Type	Qty 1-9	Qty 10-25	Qty 26-100	Qty 101+
DIP	XT: $14 HS: $15	XT: $9.90 HS: $10.90	XT: $8.10 HS: $9.10	MARKET PRICE
SOIC	XT: $15 HS: $16	XT: $10.90 HS: $11.90	XT: $9.10 HS: $10.10	MARKET PRICE

Example Device Wiring: NCD205/6



AnabugXT and AnabugHS, is easily connected to the serial port of your computer using a 4.7K Ohm resistor. All Anabugs require a regulated +5 volt power supply. AnabugXT & HS have 12 inputs, 8 are standard TTL/CMOS (0/+5 volt) inputs and the other four are 8-bit analog inputs. Analog inputs can accept an input voltage range of 0 to +5 volts DC. When power is applied, data packets of 7 bytes will be continuously sent to the computer indicating the status of all 12 inputs. The XT version is compatible with ceramic resonators up to 8 MHz, the HS version is compatible with ceramic resonators from 8-20 MHz. The baud rate of data from RSO is dependant on the speed of the ceramic resonator. The AnabugXT clocked at 8 MHz can send data at 19.2K baud. The AnabugHS clocked at 20 MHz can send data at 48K baud.

Pin	Label	Function
1, 2, 17,18	AN0-AN3	0-5 Volt DC Analog Input Channels
3	RSO	RS-232 Data Output
4, 14	+5	Connect to Regulated +5 Supply
5	GND	Ground
6 - 13	DI0-DI7	TTL/CMOS Digital Inputs
15, 16	OSC	Ceramic Resonator Options: XT: <=8MHz, HS: 8-20 MHz

Recommended Usage

This device is provided with programming examples for the following systems. If programming examples are not provided for the Basic Stamp, then it is NOT RECOMENDED for use with this device at this time. E3C Compliance allows 256 Devices to interface to a single serial port.

QBasic	*Visual Basic 6 Pro*	*Basic Stamp II*	*Basic Stamp II SX*	*E3C Compliance*
No	Yes	No	No	No

National Control Devices

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Baud Rate Selector Guide

Baud Rate	Clock Speed	DigiKey Part www.digikey.com	Notes	NCD Device
1200	500 KHz	X922-ND	Requires Caps, See Microchip Data Sheet	Anabug XT
2400	1000 KHz	X926-ND	Requires Caps, See Microchip Data Sheet	Anabug XT
4800	2 MHz	PX200-ND		Anabug XT
9600	4 MHz	X902-ND		Anabug XT
14.4K	6 MHz	X904-ND		Anabug XT
19.2K	8 MHz	X905-ND	XT Version can be overclocked to 8 MHz.	Anabug XT/HS
24K	10 MHz	X906-ND		Anabug HS
28.8K	12 MHz	X907-ND		Anabug HS
38.4K	16 MHz	X908-ND		Anabug HS
48K	20 MHz	X909-ND		Anabug HS

Anabug XT and HS versions provide versatile baud rate selection by simply changing the resonator connected to the OSC pins of this device. Simply purchase the resonator of your choice from DigiKey using the provided part numbers. The XT version includes a 4 MHz ceramic resonator, the HS version includes a 16 MHz ceramic resonator. Please see the Microchip data sheets for additional information.

Programmers Notes

AnabugXT & HS constantly generates packets of data. A packet of data consists of 7 bytes, indicating the status of all 12 inputs. Data packets are organized as shown in the table. A program used to decode these data packets must look for the header, 254, store the incoming data (bytes 2-6), and only accept the data packet if the footer byte (85) is detected as byte 7. Otherwise, the data packet should be discarded to prevent reception errors. Note that all inputs should be tied low with a 4.7K resistor to prevent channel bleed.

Byte	Value	Description
1	254	Header Byte, Begins the Packet
2	0-255	Analog Value of Input Channel 1
3	0-255	Analog Value of Input Channel 2
4	0-255	Analog Value of Input Channel 3
5	0-255	Analog Value of Input Channel 4
6	0-255	Logic Status of 8-Bit Input Port
7	85	Footer Byte, Concludes the Packet

Example Software Notes

Example communication software for this device was written under Visual Basic 6 Professional. Example source code can be downloaded from our web site at www.controleverything.com. If you are NOT a Visual Basic Programmer, Source code can be viewed using a text editor such as Notepad or WordPad. Source code is clearly commented for easy migration to other languages.

Programming Language	Program	Program Description
Basic Stamp II	**NONE**	AnabugXT/HS has not been tested with the Basic Stamp II
Basic Stamp II SX	**NONE**	AnabugXT/HS has not been tested with the Basic Stamp II SX
QBasic	**NONE**	Coming Soon
Visual Basic 6 Pro	**BUGS.ZIP**	Simple Program Graphically Displays the Status of all 12 Inputs

Availability

The AnabugXT and AnabugHS will begin shipping February 1, 2000.

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Who's Controlling Your World?

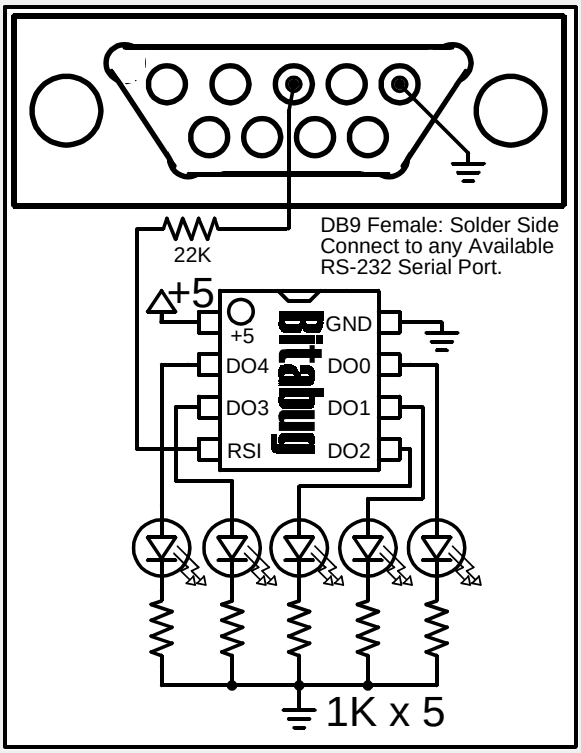
Device Description: NCD207

Bitabug is a 8-pin preprogrammed microcontroller based on the PIC12C671/672 core, and is available in DIP and SOIC packages. Bitabug is programmed as a 5-bit serial-to-parallel converter, and will only respond to incoming ASCII character codes in the range of 0 to 31. All other incoming ASCII character codes are ignored.

Current Pricing in US Dollars: NCD207

Package Type	Qty 1-9	Qty 10	Qty 11-100	Qty 101-1000
DIP	**DISCONTINUED**	**DISCONTINUED**	**DISCONTINUED**	**DISCONTINUED**
SOIC	**DISCONTINUED**	**DISCONTINUED**	**DISCONTINUED**	**DISCONTINUED**

Example Device Wiring: NCD207



Bitabug, shown at left, is easily connected to the serial port of your computer using only a 22K Ohm resistor. Bitabug requires a regulated +5 volt power supply. Bitabug has five TTL/CMOS (0/+5 volt) outputs, which are driven under computer control. Bitabug is shown with its digital outputs connected to five LEDs. When power is applied, Bitabug waits for ASCII character codes 0 to 31, the equivalent binary pattern is immediately latched to its outputs. ASCII character codes above 31 are ignored by the Bitabug.

Pin	Label	Function
1	+5	Connect to Regulated +5 Supply
2	OSC	Ceramic Resonator Connection
3	OSC	Ceramic Resonator Connection
4	CE	Chip Enable, Low to Enable Chip
5	AN1	Analog Input 2
6	AN0	Analog Input 1
7	RSI	RS-232 Data Input, 2400 bps, 8,N,1
8	GND	Ground

Recommended Usage

This device is provided with programming examples for the following systems. If programming examples are not provided for the Basic Stamp, then it is NOT RECOMENDED for use with this device at this time. E3C Compliance allows 256 Devices to interface to a single serial port.

QBasic	*Visual Basic 6 Pro*	*Basic Stamp II*	*Basic Stamp II SX*	*E3C Compliance*
Compatible	Yes	Compatible	Compatible	No

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Programmers Notes

Bitabug acts as serial-to-parallel converter responding only to ASCII character codes 0 to 31. Bitabug only responds to data at 2400 baud. No other programming information is required to implement this device.

Example Software Notes

Example communication software for this device was written under Visual Basic 6 Professional. Example source code can be downloaded from our web site at www.controleverything.com. If you are NOT a Visual Basic Programmer, Source code can be viewed using a text editor such as Notepad or WordPad. Source code is clearly commented for easy migration to other languages.

Programming Language	Program	Program Description
Basic Stamp II	**NONE**	Bitabug has not been tested with the Basic Stamp II
Basic Stamp II SX	**NONE**	Bitabug has not been tested with the Basic Stamp II SX
QBasic	**NONE**	Coming Soon
Visual Basic 6 Pro	**BUGS.ZIP**	Simple Program Graphically Controls the Status of all 5 Outputs

Availability

The Bitabug will be replaced by the Bitabug2 due to unreliable calibration issues with the internal oscillator. Bitabug2 will require an external resonator at the sacrifice of 2 outputs. Please call us if your application absolutely requires the original Bitabug.

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Who's Controlling Your World?

NCD208

BYTE BUGS: BITABUG2

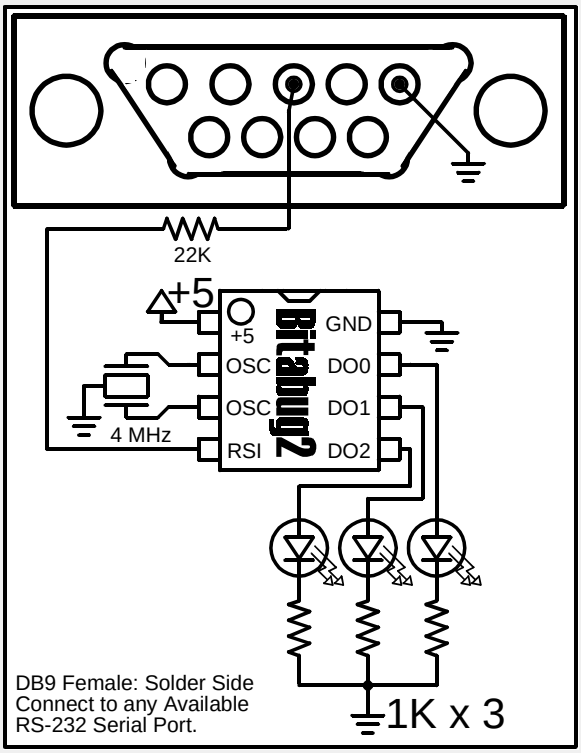
Device Description: NCD208

Bitabug2 is a 8-pin preprogrammed microcontroller based on the PIC12C671/672 core, and is available in DIP and SOIC packages. Bitabug2 was designed to replace the original Bitabug, which cannot be produced in OEM quantities. Bitabug2 is programmed as a 3-bit serial-to-parallel converter, and will only respond to incoming ASCII character codes in the range of 0 to 7. All other incoming ASCII character codes are ignored.

Current Pricing in US Dollars: NCD208

Package Type	Qty 1-9	Qty 10-25	Qty 26-100	Qty 101+
DIP	**$10**	**$5.90**	**$5.10**	**MARKET PRICE**
SOIC	**$11**	**$6.90**	**$6.10**	**MARKET PRICE**

Example Device Wiring: NCD208



Bitabug2, shown at left, is easily connected to the serial port of your computer using only a 22K Ohm resistor. Bitabug2 requires a regulated +5 volt power supply. Bitabug2 has three TTL/CMOS (0/+5 volt) outputs, which are driven under computer control. Bitabug2 is shown with its digital outputs connected to three LEDs. When power is applied, Bitabug2 waits for ASCII character codes 0 to 7, the equivalent binary pattern is immediately latched to its outputs. ASCII character codes above 7 are ignored by the Bitabug2.

Pin	Label	Function
1	+5	Connect to Regulated +5 Supply
2, 3	OSC	4 MHz Ceramic Resonator
4	RSI	RS-232 Data Input, 9600 bps, 8,N,1
5	DO2	Digital Output 3
6	DO1	Digital Output 2
7	DO0	Digital Output 1
8	GND	Ground

Recommended Usage

This device is provided with programming examples for the following systems. If programming examples are not provided for the Basic Stamp, then it is NOT RECOMENDED for use with this device at this time. E3C Compliance allows 256 Devices to interface to a single serial port.

QBasic	*Visual Basic 6 Pro*	*Basic Stamp II*	*Basic Stamp II SX*	*E3C Compliance*
Compatible	Yes	Compatible	Compatible	No

National Control Devices

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Programmers Notes

Bitabug2 acts as serial-to-parallel converter responding only to ASCII character codes 0 to 7. Bitabug2 only responds to data at 9600 baud. No other programming information is required to implement this device.

Example Software Notes

Example communication software for this device was written under Visual Basic 6 Professional. Example source code can be downloaded from our web site at www.controleverything.com. If you are NOT a Visual Basic Programmer, Source code can be viewed using a text editor such as Notepad or WordPad. Source code is clearly commented for easy migration to other languages.

Programming Language	Program	Program Description
Basic Stamp II	**NONE**	Bitabug2 has not been tested with the Basic Stamp II
Basic Stamp II SX	**NONE**	Bitabug2 has not been tested with the Basic Stamp II SX
QBasic	**NONE**	Coming Soon
Visual Basic 6 Pro	**BUGS.ZIP**	Simple Program Graphically Controls the Status of all 3 Outputs

Availability

Bitabug2 will begin shipping February 1, 2000.

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Who's Controlling Your World?

NCD209

BYTE BUGS: SCAM

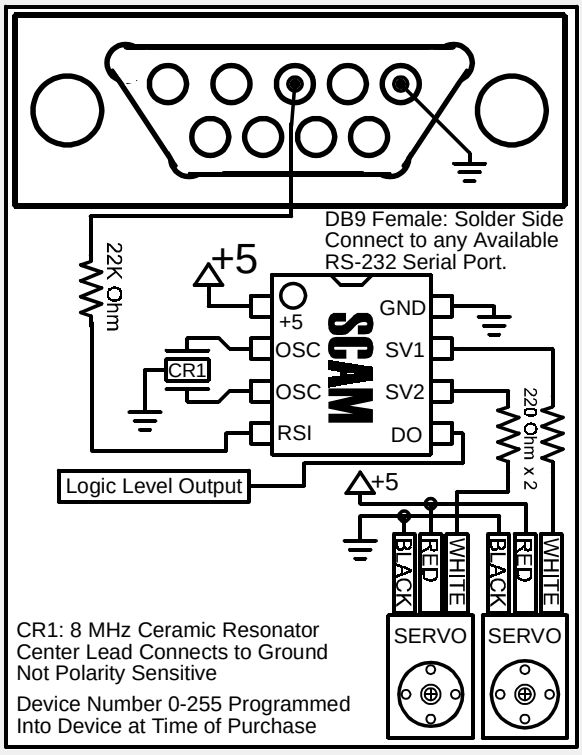
Device Description: NCD209

SCAM is a 8-pin preprogrammed microcontroller based on the PIC12C671/672 core, and is available in DIP and SOIC packages. SCAM is programmed to position two hobby servo motors and control a single logic-level output. SCAM accepts RS-232 commands at 9600 baud and is E3C compliant, allowing user-control of 256 different SCAM chips or other devices using a single RS-232 serial port.

Current Pricing in US Dollars: NCD209

Package Type	Qty 1-9	Qty 10-25	Qty 26-100	Qty 101+
DIP	**$10**	**$9.00**	**$8.10**	**MARKET PRICE**
SOIC	**$11**	**$10.00**	**$9.10**	**MARKET PRICE**

Example Device Wiring: NCD209



SCAM, shown at left, is easily connected to the serial port of your computer using only a 22K Ohm resistor. SCAM requires a regulated +5 volt power supply. SCAM has a single logic-level output (TTL/CMOS 0/+5 volt), and two servo motor outputs. A 220 Ohm current limiting resistor should be connected between the output of the chip and servo motor as show in the diagram. An 8 MHz ceramic resonator is connected to the OSC lines of the SCAM chip. When power if first applied, both motors are centered, and the processor waits for command packets while controlling the servos. The program within this CPU uses a time share algorithm for accepting commands and controlling the servo motors and the logic-level output. Because of this, it is possible for command packets to be missed. While infrequent, it may be necessary to duplicate the transmission of some commands before a reaction can be realized.

Pin	Label	Function
1	+5	Connect to Regulated +5 Supply
2,3	OSC	8 MHz Ceramic Resonator Connection
4	RSI	RS-232 Data Input, 9600 bps, 8,N,1
5	DO	TTL/CMOS Logic Level Output Bit
6	SV2	Servo Motor Control Output 2
7	SV1	Servo Motor Control Output 1
8	GND	Ground

Recommended Usage

This device is provided with programming examples for the following systems. If programming examples are not provided for the Basic Stamp, then it is NOT RECOMENDED for use with this device at this time. E3C Compliance allows 256 Devices to interface to a single serial port.

QBasic	*Visual Basic 6 Pro*	*Basic Stamp II*	*Basic Stamp II SX*	*E3C Compliance*
Compatible	Yes	Compatible	Compatible	Yes

National Control Devices

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Programmers Notes

The SCAM chip supports eleven commands for controlling two servo motors, a logic level output, and all network communication functions. The SCAM chip is designed to accept ASCII character codes as commands, easily generated by any programming language that supports serial communications. To send a command to the SCAM chip, you must first send ASCII character code 254 to place the device in command mode. Once in command mode, any of the commands listed in the table below may be issued. Some E3C commands have parameters, used to control which device you are speaking to. To set the position of servo motor 1, ASCII character codes 254 and 1 must be received by the SCAM chip, a Parameter is also required (0-255) to set the position of the Servo motor. To conclude transmission to the SCAM chip, a terminator byte, 85, must be received by the SCAM chip. You do NOT need to send ASCII character code 85 to terminate an E3C command (Commands 248-253).

Similarly, Command 2 is used to control the position of Servo motor 2. Command 0 is used to control the position of BOTH servo motors. Commands 3 and 4 set the status of the AUX output bit. The program within this CPU uses a time share algorithm for accepting commands and controlling the servo motors and the logic-level output. Because of this, it is possible for command packets to be missed. While infrequent, it may be necessary to duplicate the transmission of some commands before a reaction can be realized.

Command	Parameter	Description
0	**0-255, 0-255**	**Set Both Servo Positions: Servo1, Servo2 Send TWO Parameters for This Command**
1	**0-255**	**Set Servo 1 Position**
2	**0-255**	**Set Servo 2 Position**
3	**None**	**Turn ON Aux Data Output Bit**
4	**None**	**Turn OFF Aux Data Output Bit**
248	**None**	**E3C: Enable All Devices**
249	**None**	**E3C: Disable All Devices**
250	**0-255**	**E3C: Enable Selected Device**
251	**0-255**	**E3C: Disable Selected Device**
252	**0-255**	**E3C: Enable Selected Device, Disable All Other Devices**
253	**0-255**	**E3C: Disable Selected Device, Enable All Other Devices**

E3C compliance allows 256 devices to share a single serial port. Some E3C commands require a parameter, indicating a specific device number to speak to. In most applications, E3C command 252 will be the only command you will ever need. All other commands are provided for network compliance purposes only. Command 252 is used to speak to an individual device, and turn all others off.

To send E3C command 252 to the SCAM chip, send ASCII character code 254 to put the SCAM chip in command mode. Next send ASCII character code 252, followed by a third parameter indicating which device should be active. All subsequent commands will only be acknowledged by the selected device.

Note that E3C device numbers are programmed into the chip at the time of purchase. Once programmed, they cannot be changed.

Example Software Notes

Example communication software for this device was written under Visual Basic 6 Professional. Example source code can be downloaded from our web site at www.controleverything.com. If you are NOT a Visual Basic Programmer, Source code can be viewed using a text editor such as Notepad or WordPad. Source code is clearly commented for easy migration to other languages.

Programming Language	Program	Program Description
Basic Stamp II	**NONE**	SCAM has not been tested with the Basic Stamp II
Basic Stamp II SX	**NONE**	SCAM has not been tested with the Basic Stamp II SX
QBasic	**NONE**	Coming Soon
Visual Basic 6 Pro	**BUGS.ZIP**	Simple Program Graphically Displays the Status of Servos and TTL.

Availability

SCAM will begin shipping February 1, 2000.

National Control Devices

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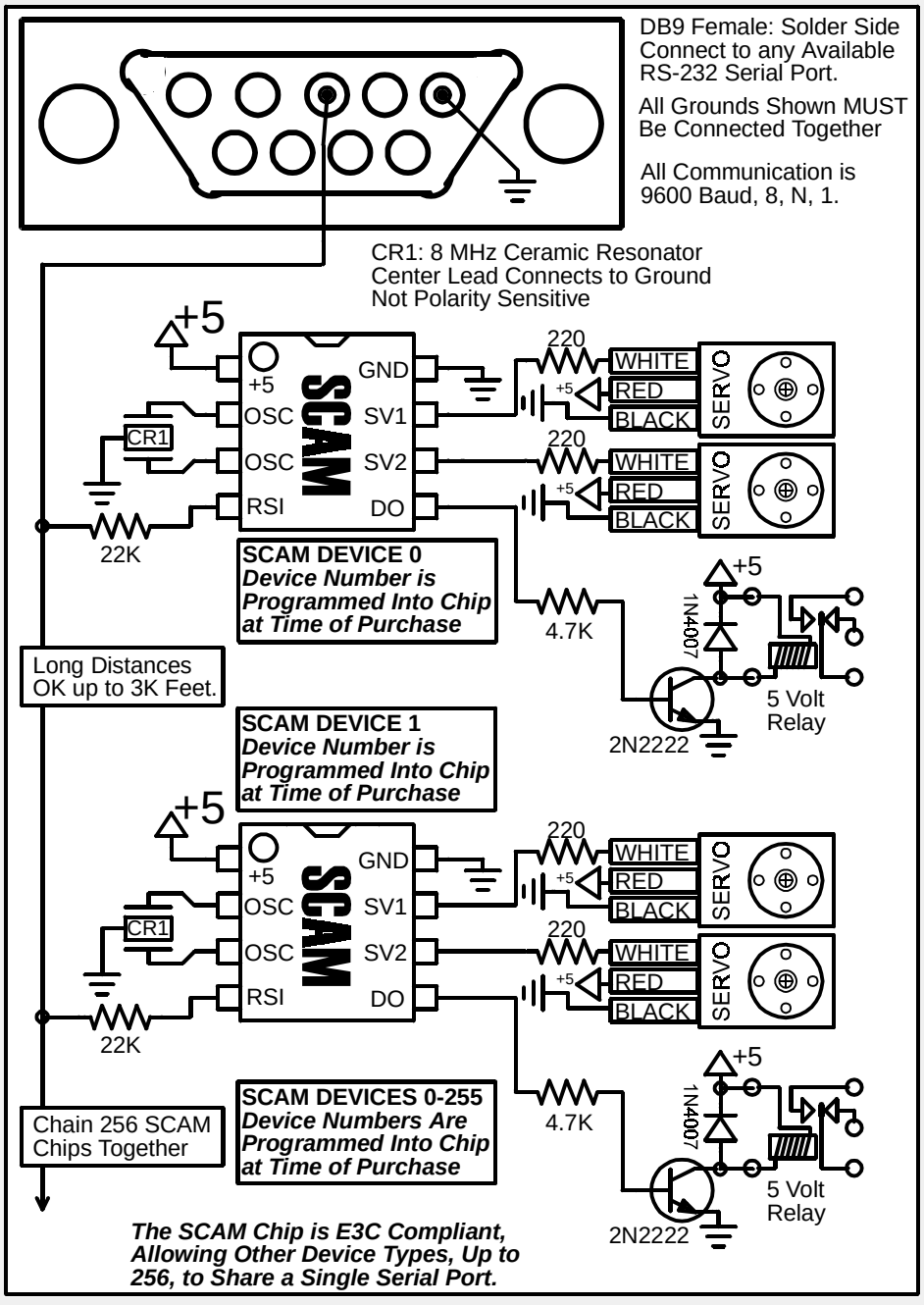
NCD209

APPLICATION SCAM

Application Notes

The SCAM chip was designed to provide users with an easy way to control multiple hobby servo motors for camera positioning applications. The Servo CAMera (SCAM) can easily be integrated into large scale security system and is perfect for home/ office security monitoring needs. Complete plans for this project can be found in the Feb. 2000 issue of Nuts & Volts magazine. In the diagram below, two SCAM chips are connected to a single RS-232 serial port.

Each SCAM chip has a different device number burned into the chip at the time of purchase. This device number allows 256 SCAM chips to share a single serial port. When ordering, you MUST specify a device number from 0-255.



Control 256 Relays & 512 Servos from a Single RS-232 Serial Port

National Control Devices

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Who's Controlling Your World?

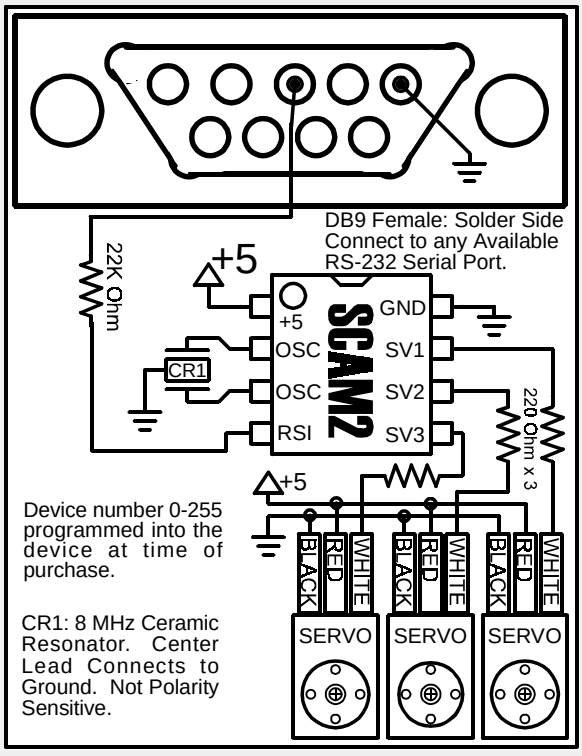
Device Description: NCD210

SCAM2 is a 8-pin preprogrammed microcontroller based on the PIC12C671/672 core, and is available in DIP and SOIC packages. SCAM2 is programmed to position three hobby servo motors using a command-based communication protocol. SCAM2 accepts RS-232 commands at 9600 baud and is E3C compliant, allowing user-control of 256 different SCAM2 chips or other devices using a single RS-232 serial port.

Current Pricing in US Dollars: NCD210

Package Type	Qty 1-9	Qty 10-25	Qty 26-100	Qty 101+
DIP	**$10**	**$9.00**	**$8.10**	**MARKET PRICE**
SOIC	**$11**	**$10.00**	**$9.10**	**MARKET PRICE**

Example Device Wiring: NCD210



SCAM2, shown at left, is easily connected to the serial port of your computer using only a 22K Ohm resistor. SCAM2 requires a regulated +5 volt power supply. SCAM2 has two servo motor outputs. A 220 Ohm current limiting resistor should be connected between the output of the chip and servo motor as show in the diagram. An 8 MHz ceramic resonator is connected to the OSC lines of the SCAM2 chip. When power if first applied, all three motors are centered, and the processor waits for command packets while controlling the servos. The program within this CPU uses a time share algorithm for accepting commands and positioning the servo motors. Because of this, it is possible for command packets to be missed. While infrequent, it may be necessary to duplicate the transmission of some commands before a reaction can be realized.

Pin	Label	Function
1	+5	Connect to Regulated +5 Supply
2,3	OSC	8 MHz Ceramic Resonator Connection
4	RSI	RS-232 Data Input, 9600 bps, 8,N,1
5	SV3	Servo Motor Control Output 3
6	SV2	Servo Motor Control Output 2
7	SV1	Servo Motor Control Output 1
8	GND	Ground

Recommended Usage

This device is provided with programming examples for the following systems. If programming examples are not provided for the Basic Stamp, then it is NOT RECOMENDED for use with this device at this time. E3C Compliance allows 256 Devices to interface to a single serial port.

QBasic	*Visual Basic 6 Pro*	*Basic Stamp II*	*Basic Stamp II SX*	*E3C Compliance*
Compatible	Yes	Compatible	Compatible	Yes

National Control Devices

Who's Controlling Your World?

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Osceola, MO 64776

Programmers Notes

The SCAM2 chip supports eleven commands for controlling three servo motors, a logic level output, and all network communication functions. The SCAM2 chip is designed to accept ASCII character codes as commands, easily generated by any programming language that supports serial communications. To send a command to the SCAM2 chip, you must first send ASCII character code 254 to place the device in command mode. Once in command mode, any of the commands listed in the table below may be issued. Some E3C commands have parameters, used to control which device you are speaking to. To set the position of servo motor 1, ASCII character codes 254 and 1 must be received by the SCAM2 chip, a Parameter is also required (0-255) to set the position of the Servo motor. To conclude communication to the SCAM2 chip, a terminator byte, 85, must be received. You do NOT need to send ASCII character code 85 to terminate an E3C command (Commands 248-253). Similarly, Command 2 & 3 is used to control the position of Servo motors 2 & 3 respectively. Command 0 is used to control the position of ALL THREE servo motors, and requires 3 parameters (one for each motor).

The program within this CPU uses a time share algorithm for accepting commands and controlling the servo motors. Because of this, it is possible for command packets to be missed. While infrequent, it may be necessary to duplicate the transmission of some commands before a reaction can be realized.

Command	Parameter	Description
0	**0-255, 0-255, 0-255**	**Set Positions of ALL 3 Servos. Send THREE Parameters for This Command.**
1	**0-255**	**Set Servo 1 Position**
2	**0-255**	**Set Servo 2 Position**
3	**0-255**	**Set Servo 3 Position**
248	**None**	**E3C: Enable All Devices**
249	**None**	**E3C: Disable All Devices**
250	**0-255**	**E3C: Enable Selected Device**
251	**0-255**	**E3C: Disable Selected Device**
252	**0-255**	**E3C: Enable Selected Device, Disable All Other Devices**
253	**0-255**	**E3C: Disable Selected Device, Enable All Other Devices**

E3C compliance allows 256 devices to share a single serial port. Some E3C commands require a parameter, indicating a specific device number to speak to. In most applications, E3C command 252 will be the only command you will ever need. All other commands are provided for network compliance purposes only. Command 252 is used to speak to an individual device, and turn all others off.

To send E3C command 252 to the SCAM chip, send ASCII character code 254 to put the SCAM chip in command mode. Next send ASCII character code 252, followed by a third parameter indicating which device should be active. All subsequent commands will only be acknowledged by the selected device.

Note that E3C device numbers are programmed into the chip at the time of purchase. Once programmed, they cannot be changed.

Example Software Notes

Example communication software for this device was written under Visual Basic 6 Professional. Example source code can be downloaded from our web site at www.controleverything.com. If you are NOT a Visual Basic Programmer, Source code can be viewed using a text editor such as Notepad or WordPad. Source code is clearly commented for easy migration to other languages.

Programming Language	Program	Program Description
Basic Stamp II	**NONE**	SCAM2 has not been tested with the Basic Stamp II
Basic Stamp II SX	**NONE**	SCAM2 has not been tested with the Basic Stamp II SX
QBasic	**NONE**	Coming Soon
Visual Basic 6 Pro	**BUGS.ZIP**	Simple Program Graphically Displays the Status of all three servos.

Availability

SCAM2 will begin shipping February 1, 2000.

National Control Devices

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Who's Controlling Your World?

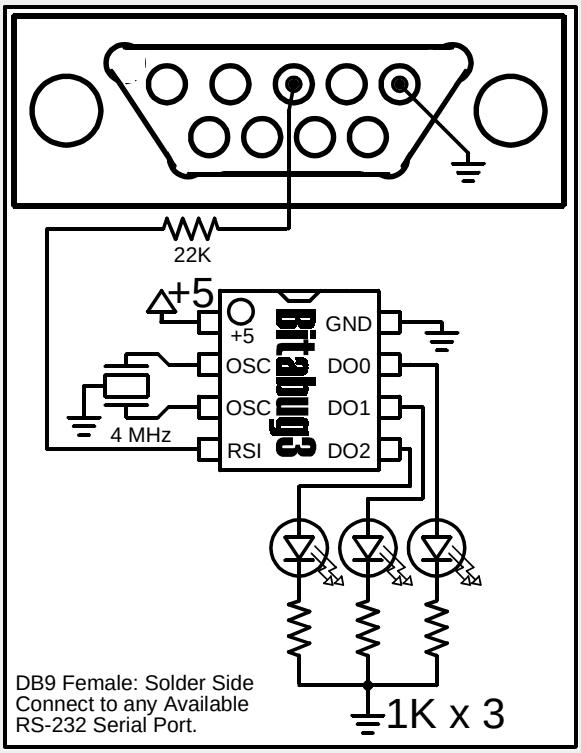
Device Description: NCD220

Bitabug3 is a 8-pin preprogrammed microcontroller based on the PIC12C671/672 core, and is available in DIP and SOIC packages. Bitabug3 was designed to provide 3 TTL outputs from an RS-232 serial port. Bitabug3 is an enhancement of Bitabug2 by adding E3C compliance, allowing 256 devices to share a single RS-232 serial port. Bitabug3 does not act as a 3-bit serial to parallel converter like the Bitabug2. Instead, output lines are completely command driven using simple E3C structured commands. Unlike the Bitabug2, Bitabug3 uses a command set for controlling each output individually or all outputs simultaneously. A customer-selected E3C device number of 0-255 must be programmed into the chip at the time of purchase.

Current Pricing in US Dollars: NCD220

Package Type	Qty 1-9	Qty 10-25	Qty 26-100	Qty 101+
DIP	**$10**	**$9.00**	**$8.10**	**MARKET PRICE**
SOIC	**$11**	**$10.00**	**$9.10**	**MARKET PRICE**

Example Device Wiring: NCD211



Bitabug3, shown at left, is easily connected to the serial port of your computer using only a 22K Ohm resistor. Bitabug3 requires a regulated +5 volt power supply. Bitabug3 has three TTL/CMOS (0/+5 volt) outputs, which are driven under computer control. Bitabug3 is shown with its digital outputs connected to three LEDs. When power is applied, Bitabug3 waits for E3C compliant commands for controlling the outputs on up to 256 chips. Note that an E3C device number of 0-255 must be programmed into the chip at the time of purchase.

Pin	Label	Function
1	+5	Connect to Regulated +5 Supply
2, 3	OSC	4 MHz Ceramic Resonator
4	RSI	RS-232 Data Input, 9600 bps, 8,N,1
5	DO2	Digital Output 3
6	DO1	Digital Output 2
7	DO0	Digital Output 1
8	GND	Ground

Recommended Usage

This device is provided with programming examples for the following systems. If programming examples are not provided for the Basic Stamp, then it is NOT RECOMENDED for use with this device at this time. E3C Compliance allows 256 Devices to interface to a single serial port.

QBasic	*Visual Basic 6 Pro*	*Basic Stamp II*	*Basic Stamp II SX*	*E3C Compliance*
Compatible	Yes	Compatible	Compatible	Yes

National Control Devices

Who's Controlling Your World?

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Programmers Notes

Bitabug3 supports 13 commands for controlling 3 TTL outputs bits and controlling all network functions. Bitabug3 is designed to accept numeric ASCII character codes from 0 to 255, easily generated by any programming language that supports serial communications. To send a command to Bitabug3, you must first send ASCII character code 254 to place the device in command mode. Once in command mode, any of the commands listed in the table below may be issued. Some E3C commands have parameters, used to control which device you are speaking to. To turn on output DO1, ASCII character codes 254 and 4 must be received by the Bitabug3. To turn off output DO1, send ASCII character codes 254 and 1. It is also possible to set all three outputs bits by sending ASCII character codes 254, 6, and a value from 0 to 7. 0 turns all outputs off, 7 turns all outputs on, every number in between is written to the outputs in its binary equivalent value.

E3C compliance allows 256 devices to share a single serial port. Six commands are used to select which devices are active. Some E3C commands require a parameter, indicating a specific device number to speak to. In most applications, E3C command 252 will be the only command you will ever need. Command 252 is used to speak to an individual device, and turn all others off. This is what we call the "device selector" command. It is used to select a device from 0-255.

Command	Parameter	Description
0, 1, 2	**None**	**Turn Off Outputs 1, 2, & 3 respectively.**
3, 4, 5	**None**	**Turn On Outputs 1, 2, & 3 respectively.**
6	**0-7**	**Write Byte (0-7) to all outputs at once.**
248	**None**	**E3C: Enable All Devices**
249	**None**	**E3C: Disable All Devices**
250	**0-255**	**E3C: Enable Selected Device**
251	**0-255**	**E3C: Disable Selected Device**
252	**0-255**	**E3C: Enable Selected Device, Disable All Other Devices**
253	**0-255**	**E3C: Disable Selected Device, Enable All Other Devices**

Note that E3C device numbers are programmed into the chip at the time of purchase. Once programmed, they cannot be changed.

To send E3C command 252 to the Bitabug3, send ASCII character code 254 to put the Bitabug3 in command mode. Next send ASCII character code 252, followed by a third Parameter indicating which device should be active. All subsequent commands will only be acknowledged by the selected device.

Other E3C commands allow you to control multiple devices simultaneously. Any E3C compliant devices may share a single serial port in any combination.

Example Software Notes

Example communication software for this device was written under Visual Basic 6 Professional. Example source code can be downloaded from our web site at www.controleverything.com. If you are NOT a Visual Basic Programmer, Source code can be viewed using a text editor such as Notepad or WordPad. Source code is clearly commented for easy migration to other languages.

Programming Language	Program	Program Description
Basic Stamp II	**NONE**	Bitabug3 is compatible with the Basic Stamp II
Basic Stamp II SX	**NONE**	Bitabug3 is compatible with the Basic Stamp II SX
Visual Basic 6 Pro	**BUGS.ZIP**	Simple Program Graphically Controls the Status of all 3 Outputs

Availability

Bitabug3 will begin shipping March 1, 2000.

National Control Devices

Who's Controlling Your World?

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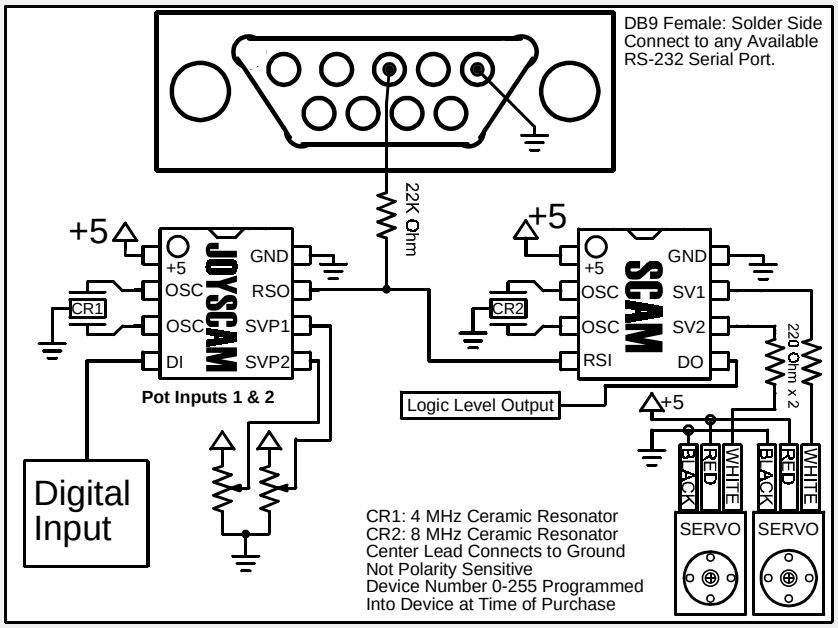
Device Description: NCD219

NCD212 (JOYSCAM) is a 18-pin preprogrammed microcontroller based on the PIC12C672 core, and is available in DIP and SOIC packages. The JSCAM chip encodes position information from an analog joystick and outputs data packets that are readable by the SCAM chip (ND209), effectively providing a joystick interface for the SCAM chip. Optionally, a computer or Basic Stamp can be used to select which SCAM chip is receiving joystick data packets, as shown in the diagram below.

Current Pricing in US Dollars: NCD219

Package Type	Qty 1-9	Qty 10-25	Qty 26-100	Qty 101+
DIP	**$10**	**$5.90**	**$5.10**	**MARKET PRICE**
SOIC	**$11**	**$6.90**	**$6.10**	**MARKET PRICE**

Example Device Wiring: NCD219



The JOYSCAM chip is used to send joystick-generated data packets to the SCAM chip as shown in the diagram. Optionally, a computer can be connected for selecting which SCAM chip will be controlled by the JOYSCAM chip.

Pin	Label	Function
1	+5	+5 Volt Regulated Power Supply
2, 3	OSC	4 MHz Ceramic Resonator
4	DI	Digital Input
5	SVP2	Potentiometer Input for Controlling Servo Motor 2
6	SVP1	Potentiometer Input for Controlling Servo Motor 1
7	RSO	RS-232 Data Packet Output for SCAM Chip
8	GND	Power Supply Ground

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Who's Controlling Your World?

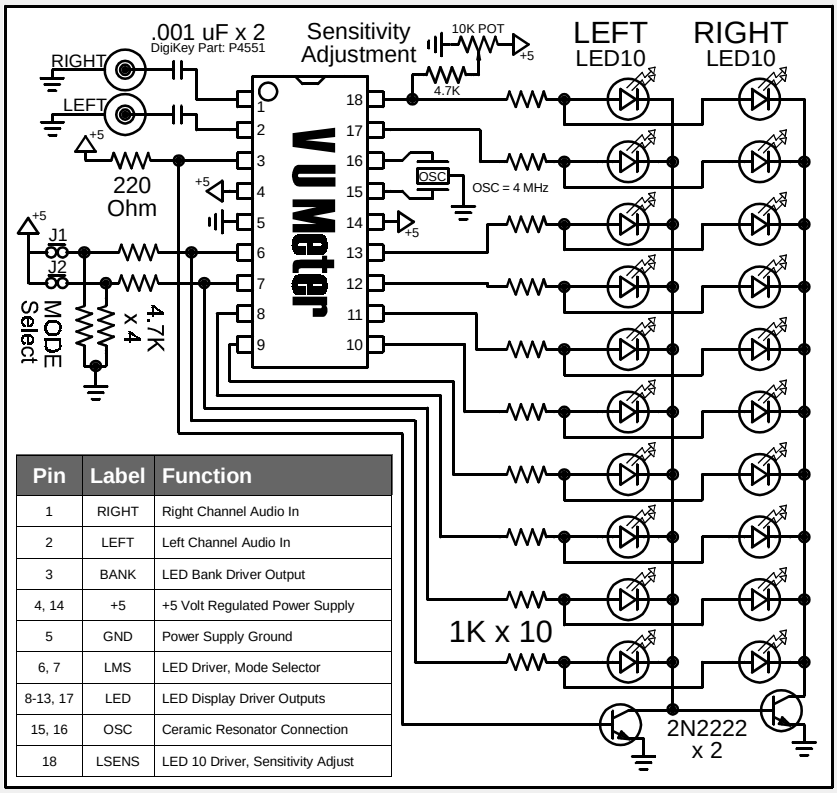
Device Description: NCD301

NCD301 (VUM) is a 18-pin preprogrammed microcontroller based on the PIC16C715 core, and is available in DIP and SOIC packages. VUM is a Stereo LED VU Meter Display Driver capable of driving 2 banks of 10 LEDs. The VUM chip supports 3 user-selectable display patterns: Dot, Bar, and Peak Hold & Fall. In Dot mode, an LED for each channel bounces up and down based on the level of the incoming signal. In Bar mode, a bar graph raises and lowers. In Peak Hold and Fall Mode (default), an LED stays lit, indicating the peak for each channel. The LED then falls off the bottoms of the display unless it is "Pushed" back up by the incoming signal. The VUM chip is unparalleled in capabilities and simplicity, and offers aggressive pricing in OEM quantities.

Current Pricing in US Dollars: NCD301

Package Type	Qty 1-9	Qty 10-25	Qty 26-99	Qty 100+
DIP	**$16**	**$13**	**$10**	**MARKET PRICE**
SOIC	**$17**	**$14**	**$11**	**MARKET PRICE**

Example Device Wiring: NCD301



Pin	Label	Function
1	RIGHT	Right Channel Audio In
2	LEFT	Left Channel Audio In
3	BANK	LED Bank Driver Output
4, 14	+5	+5 Volt Regulated Power Supply
5	GND	Power Supply Ground
6, 7	LMS	LED Driver, Mode Selector
8-13, 17	LED	LED Display Driver Outputs
15, 16	OSC	Ceramic Resonator Connection
18	LSENS	LED 10 Driver, Sensitivity Adjust

J1	J2	Display Mode
Removed	Removed	Bar with Peak Hold and Fall
Installed	Removed	DOT Mode
Removed	Installed	BAR Mode
Installed	Installed	Bar with Peak Hold and Fall

The VUM Chip, shown at left, drives 2 banks of 10 LEDs. The BANK output rapidly pulses, selecting which bank of 10 LEDs is driven by use of two 2N2222 transistors. The BANK output is an open collector signal and MUST be tied high with a 220 Ohm resistor as shown in the schematic. Bank switching is extremely fast and is visually undetectable. An internal math scaler is adjusted by the Sensitivity Adjustment potentiometer, mathematically adjusting the response scale of the LEDs. The VU Meter chip, as shown, should only be used with line level audio signals (+/- 5 Volts MAX), and should not be connected to the Speaker Output of a stereo system without additional protection electronics. Jumpers J1 and J2 select the Dot/Bar/Peak Hold display mode of the VUM chip. Display MODE is set when power is first applied to the chip. During operation, changing these jumpers will have no effect until the next time power is applied. The default display mode shows a bar graph that raises from the bottom of the display to the top based on the level of the incoming audio signal. The peak level is held by a single LED, which begins to fall soon after the incoming signal falls. Subsequent incoming signals may "Push" the peak hold LED up the scale. The VU Chip is not strictly limited to audio applications. It is ideally suited for gauges in industrial and automotive applications, battery monitoring circuits, as well as simple temperature and light level monitoring.

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Who's Controlling Your World?

NCD302

ACPS: VUMETER2

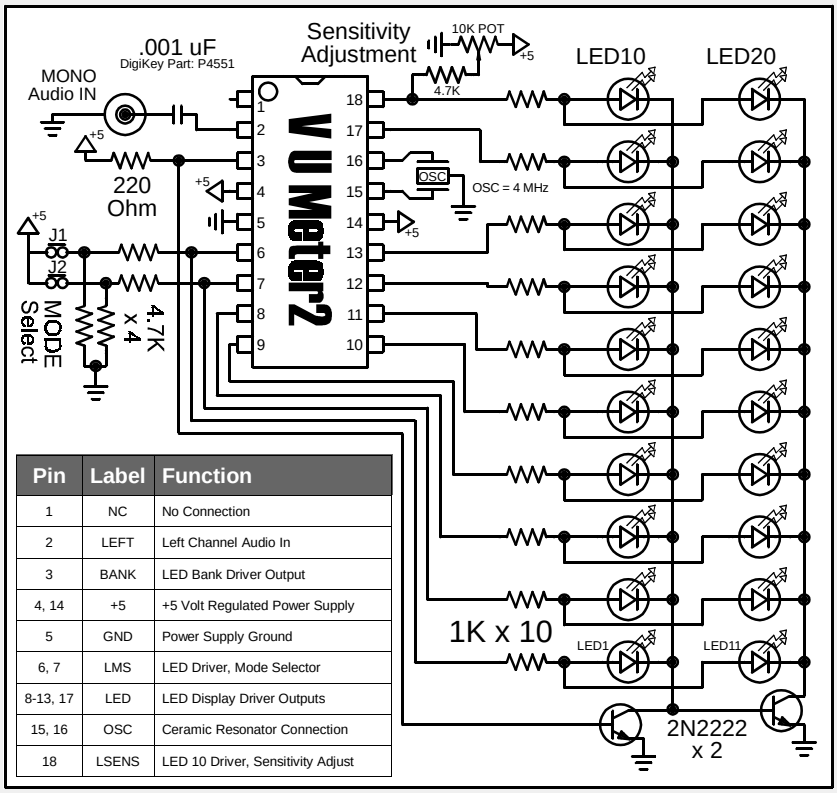
Device Description: NCD302

NCD302 (VUM2) is a 18-pin preprogrammed microcontroller based on the PIC16C715 core, and is available in DIP and SOIC packages. VUM2 is a single channel 20 LED VU Meter Display Driver capable of driving 20 LEDs. The VUM2 chip supports 3 user-selectable display patterns: Dot, Bar, and Peak Hold & Fall. In Dot mode, an LED for each channel bounces up and down based on the level of the incoming signal. In Bar mode, a bar graph raises and lowers. In Peak Hold and Fall Mode (default), an LED stays lit, indicating the peak for each channel. The LED then falls off the bottoms of the display unless it is "Pushed" back up by the incoming signal. The VUM chip is unparalleled in capabilities and simplicity, and offers aggressive pricing in OEM quantities.

Current Pricing in US Dollars: NCD302

Package Type	Qty 1-9	Qty 10-25	Qty 26-99	Qty 100+
DIP	**$16**	**$13**	**$10**	**MARKET PRICE**
SOIC	**$17**	**$14**	**$11**	**MARKET PRICE**

Example Device Wiring: NCD302



Pin	Label	Function
1	NC	No Connection
2	LEFT	Left Channel Audio In
3	BANK	LED Bank Driver Output
4, 14	+5	+5 Volt Regulated Power Supply
5	GND	Power Supply Ground
6, 7	LMS	LED Driver, Mode Selector
8-13, 17	LED	LED Display Driver Outputs
15, 16	OSC	Ceramic Resonator Connection
18	LSENS	LED 10 Driver, Sensitivity Adjust

J1	J2	Display Mode
Removed	Removed	Bar with Peak Hold and Fall
Installed	Removed	DOT Mode
Removed	Installed	BAR Mode
Installed	Installed	Bar with Peak Hold and Fall

The VUM2 Chip, shown at left, drives 20 LEDs separated into two banks based on the signal strength of a single input. The VUM2 is electrically identical to the NCD301 (VUM) chip with the exception of PIN 1, which is not used on this device. The BANK output rapidly pulses, selecting which bank of 10 LEDs is driven by use of two 2N2222 transistors. The BANK output is an open collector signal and MUST be tied high with a 220 Ohm resistor as shown in the schematic. Bank switching is extremely fast and is visually undetectable. An internal math scaler is adjusted by the Sensitivity Adjustment potentiometer, mathematically adjusting the response scale of the LEDs. The VU Meter chip, as shown, should only be used with line level audio signals (+/- 5 Volts MAX), and should not be connected to the Speaker Output of a stereo system without additional protection electronics. Jumpers J1 and J2 select the Dot/Bar/Peak Hold display mode of the VUM chip. Display MODE is set when power is first applied to the chip. During operation, changing these jumpers will have no effect until the next time power is applied. The default display mode shows a bar graph that raises from the bottom of the display to the top based on the level of the incoming audio signal. The peak level is held by a single LED, which begins to fall soon after the incoming signal falls. Subsequent incoming signals may "Push" the peak hold LED up the scale. The VU Chip is not strictly limited to audio applications. It is ideally suited for gauges in industrial and automotive applications, battery monitoring circuits, as well as simple temperature and light level monitoring.

Order Form

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Item	Qty	Part	Description	Price	Total
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$7.00 Minimum Shipping Charge. Actual Shipping Costs will be Added to Total. Contact Us for Quote.

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Industrial customers choose NCD preprogrammed micros because they are always available, always reliable, and always the most powerful.

Prices include ceramic resonator.

1-25/$10 ea.
26-99/$8.50 ea.
100-up/call for current pricing.

Addressable Serial-to-Parallel Converter

The NCD-101 series preprogrammed microcontrollers were designed to perform high-speed serial-to-parallel conversion from a standard RS-232 data source. Baud rate is determined by the speed of the ceramic resonator attached to the microcontroller.

Up to 7 NCD-101 can be attached to a single RS-232 serial port providing a total 56 individually addressable output bits. The NAME jumpers N1, N2, and N3 determine its address on the serial port. When all name jumpers are installed, the NCD-101 performs a raw serial-to-parallel conversion.

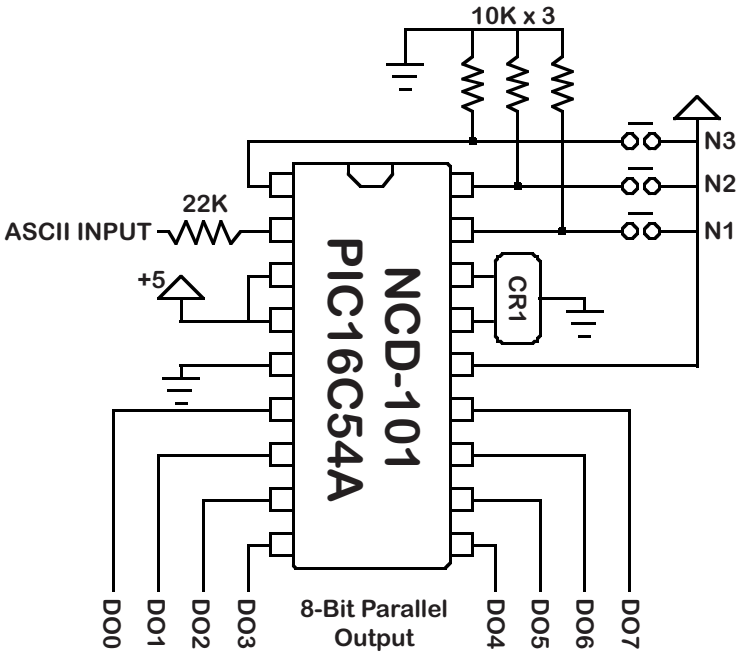
The NCD-101 offers three command modes for communication. These commands can be issued from any terminal program using 8 data bits and 1 stop bit.

Turn a Pin ON:
Format: <NAME>N<PIN NUMBER><RETURN>
Example: 0N3<RETURN>
Action: Tell NCD-101 named 0 to turn on pin 3.

Turn a Pin OFF:
Format: <NAME>F<PIN NUMBER><RETURN>
Example: 6F3<RETURN>
Action: Tell NCD-101 named 6 to turn off pin 3.

Output a BYTE:
Format: <NAME>F<PIN NUMBER><RETURN>
Example: 3P1<RETURN>
Action: Tell NCD-101 named 3 to send byte 1.

Example: 3P0<RETURN>
Action: Tell NCD-101 named 3 to send byte 0.



CR1	BAUD
4 MHz	9600
2 MHz	4800
1 MHz	2400
500 KHz	1200

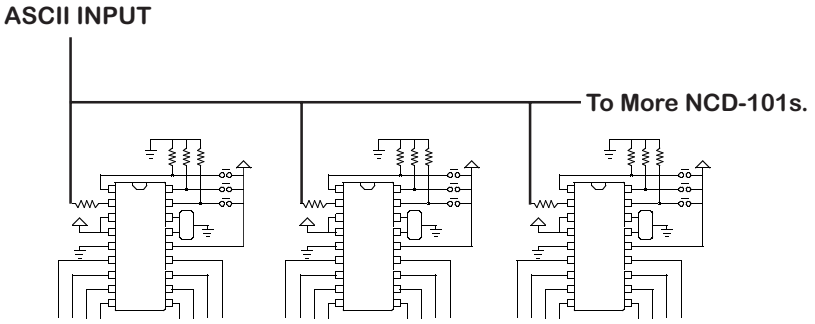
CR1 is a ceramic resonator. Using different ceramic resonators changes the speed in which the microprocessor functions. A crystal can be used to substitute the ceramic resonator.

Crystals are considered more reliable in terms of their timing characteristics, but greater accuracy is NOT needed in this application. Ceramic resonators work with 100% reliability, have built-in capacitors, and require less board space.

NAME	N3	N2	N1
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
NONE	1	1	1

1 - Install Jumper
0 - Remove Jumper

Example below shows how easy it is to chain several NCD-101s to a single RS-232 serial port. Note that RS-232 ground MUST share the ground of the circuit. Also note that each NCD-101 should be set to a different name.



Example Shows 24 Output Bits from a Single RS-232 Serial Port.

Contact Ryan Sheldon at (404) 244-2432, Cellular: (404) 307-5386, or e-mail ncdryan@aol.com

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Prices include ceramic resonator.

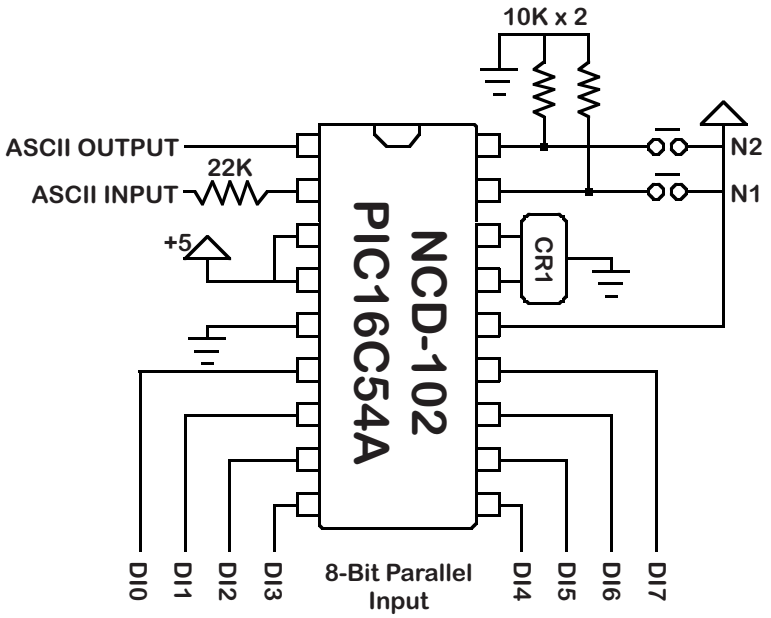
1-25/$10 ea.
26-99/$8.50 ea.
100-up/call for current pricing.

Addressable Parallel-to-Serial Encoder

The NCD-102 series preprogrammed microcontrollers were designed to perform high-speed parallel-to-serial encoding from a standard RS-232 data source. Baud rate is determined by the speed of the ceramic resonator attached to the microcontroller.

Up to 4 NCD-102 can be attached to a single RS-232 serial port providing a total 32 input bits. The NCD-102 is a polled device operating in a "speak when spoken to" mode. The NAME jumpers N1 and N2 determine its identity on the serial port. When a valid name and carriage return is received, the NCD-102 reads the current status of the 8 inputs and replies with a byte of data.

Turn a Pin ON:
Format: <NAME><RETURN>
Example: A<RETURN>
Action: Tell NCD-102 named A to read inputs. Will reply with a byte of data.



NAME	N2	N1
A	0	0
B	0	1
C	1	0
D	1	1

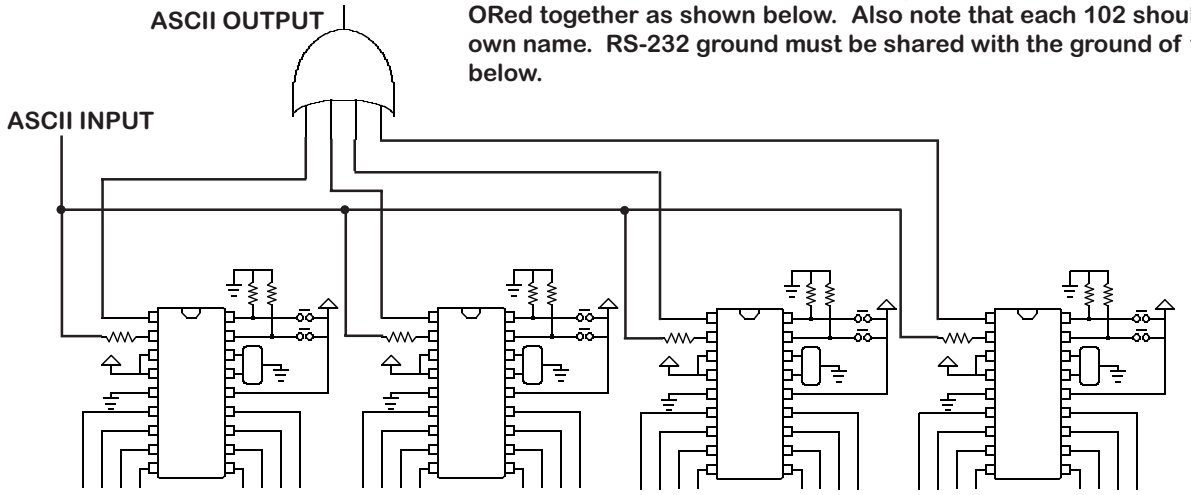
0 - Remove Jumper
1 - Install Jumper

CR1	BAUD
4 MHz	9600
2 MHz	4800
1 MHz	2400
500 KHz	1200

CR1 is a ceramic resonator. Using different ceramic resonators changes the speed in which the microprocessor functions. A crystal can be used to substitute the ceramic resonator.

Crystals are considered more reliable in terms of their timing characteristics, but greater accuracy is NOT needed in this application. Ceramic resonators work with 100% reliability, have built-in capacitors, and require less board space.

Connecting several NCD-102s is easy, but remember, outputs must be ORed together as shown below. Also note that each 102 should have its own name. RS-232 ground must be shared with the ground of the circuit below.



Above example shows 32 logic-level inputs attached to a single RS-232 port.

Contact Ryan Sheldon at (404) 244-2432, Cellular: (404) 307-5386, or e-mail ncdryan@aol.com

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Industrial customers choose NCD preprogrammed micros because they are always available, always reliable, and always the most powerful.

Prices include ceramic resonator.

1-25/$10 ea.
26-99/$8.50 ea.
100-up/call for current pricing.

ASCII Keypad Encoder Processor

The NCD-103 series microcontrollers were designed to provide the user with a convenient method of sending data to a computer or microcontroller in applications that do not need a full-size keyboard.

The NCD-103 sends out an ASCII character for each key that is pressed. Up to 4 character sets can be selected by changing the jumpers at S1 and S2 allowing a total of 64 characters to be transmitted from a single processor.

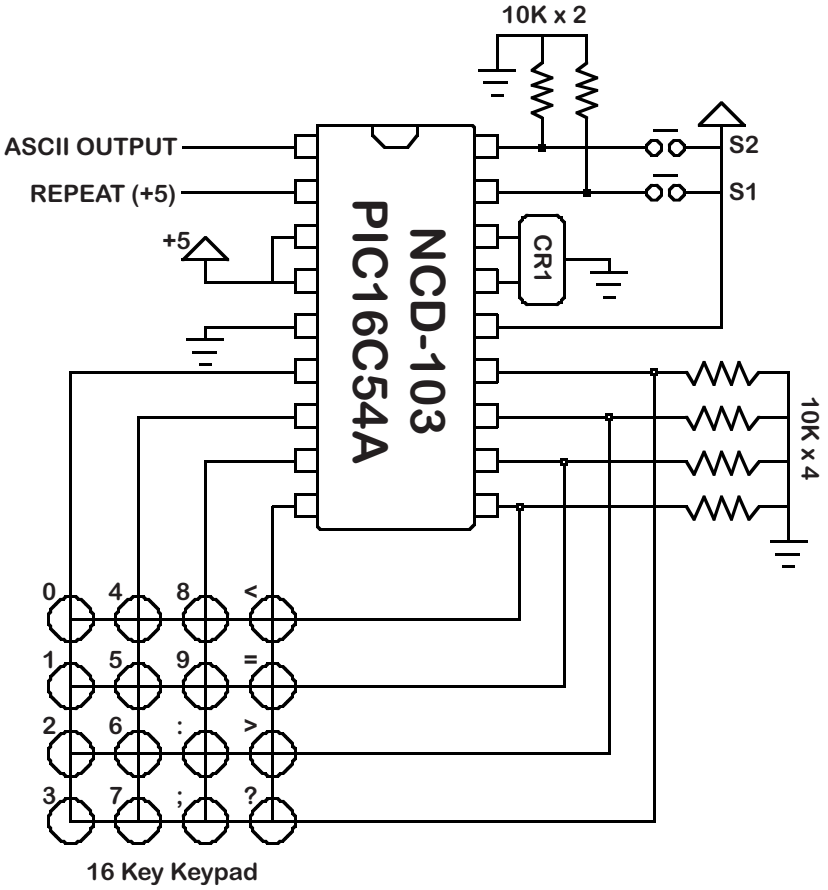
The NCD-103 also has a built-in REPEAT line. When tied high (+5 volts), any key that is held will constantly be transmitted until the button is released. This feature is disabled by connecting the REPEAT line to ground.

The NCD-103 permits easy interface to any industry standard matrix type keypads. In addition, the NCD-103 requires very few external components making it an ideal choice for a variety of embedded applications.

Note: Pins 10 to 13 are inputs. The 10K pull-down resistors are required for reliable operation.

S1	S2	ASCII OUTPUT
0	0	ASCII Characters 0 to 15
1	0	ASCII Characters 16 to 31
0	1	ASCII Characters 32 to 47
1	1	ASCII Characters 48 to 63

0 - Remove Jumper
1 - Install Jumper



16 Key Keypad

CR1	BAUD
4 MHz	9600
2 MHz	4800
1 MHz	2400
500 KHz	1200

CR1 is a ceramic resonator. Using different ceramic resonators changes the speed in which the microprocessor functions. A crystal can be used to substitute the ceramic resonator.

Crystals are considered more reliable in terms of their timing characteristics, but greater accuracy is NOT needed in this application. Ceramic resonators work with 100% reliability, have built-in capacitors, and require less board space.

Contact Ryan Sheldon at (404) 244-2432, Cellular: (404) 307-5386, or e-mail ncdryan@aol.com

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Industrial customers choose NCD preprogrammed micros because they are always available, always reliable, and always the most powerful.

Prices include ceramic resonator.

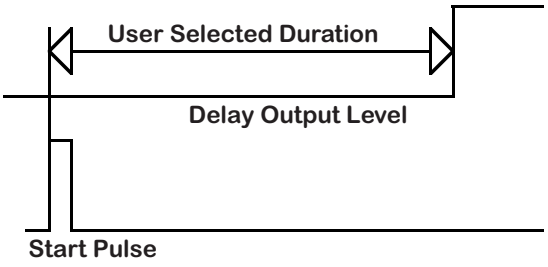
1-25/$10 ea.
26-99/$8.50 ea.
100-up/call for current pricing.

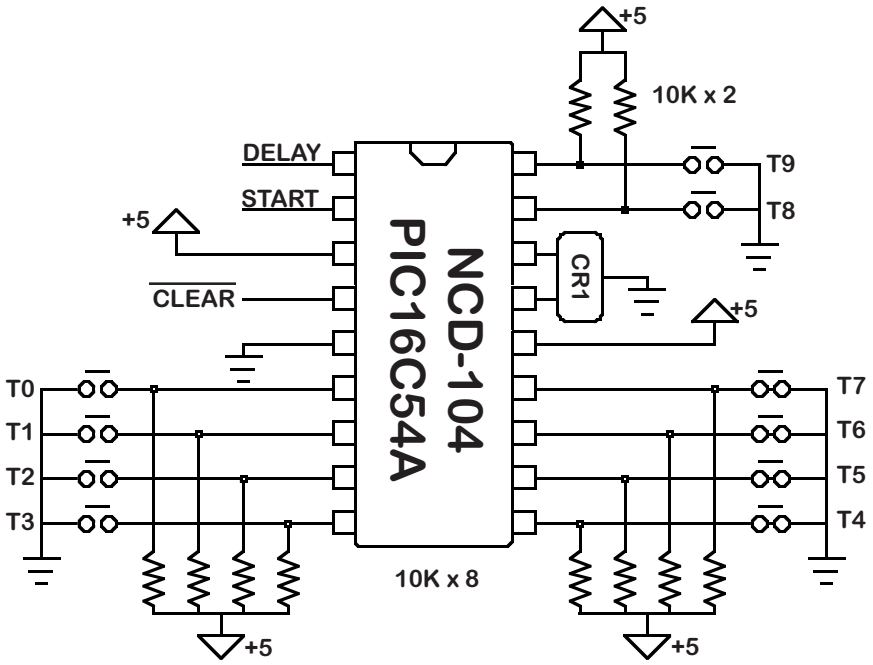
Delay Timer

The NCD-104 serves as a user-adjustable delay timer suitable for power up or power down delay applications. Using a 10-bit input, up to 1024 delay times can be realized. In addition, three versions of the NCD-104 are available for your timing requirements.

On bootup, the DELAY output line is held low. When a start pulse is received, the NCD-104 waits the user selected duration then brings the delay output line high.

The CLEAR line must be tied high for normal operation. To reset or interrupt the timer, tie the CLEAR line low momentarily.





CR1 is a 4MHz ceramic resonator. A crystal and two capacitors can be used to substitute the ceramic resonator.

Crystals should be used if your timing requirements are critical. A ceramic resonator provides accurate timing within 1%. Use a crystal if your appication cannot accept this deviation.

Product Variations:

Version	Time Unit	Longest Interval
NCD-104A	seconds	17 minutes, 3 seconds.
NCD-104B	minutes	17 hours, 3 minutes.
NCD-104C	hours	42 days, 15 hours.

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100-up/call for current pricing.

Pulse Stretcher

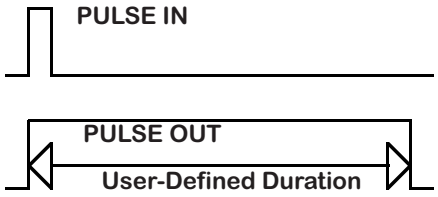
The NCD-105 serves as a user-adjustable pulse stretcher. The pulse stretcher is ideally suited in a large number of automation applications.

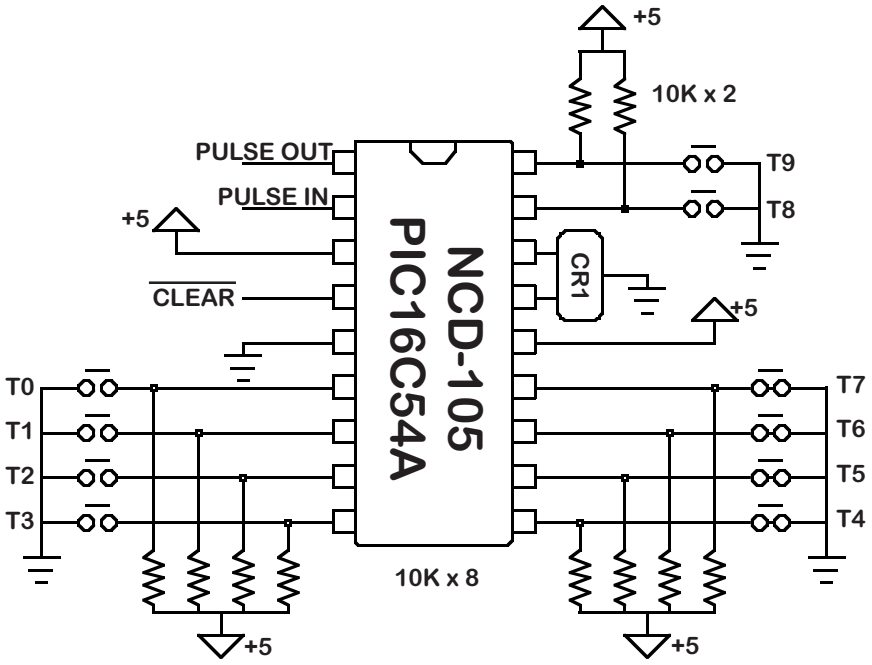
Use in telephones to limit the length of conversations. Use in automatic doors to control the length of time the door stays open. Use in security lighting systems to light an area for a limited amount of time if motion is detected.

The NCD-105 has 1024 user-definable durations from 1 second to 17 minutes. The CLEAR line should be tied high for normal operation. Tie low to reset or interrupt timing interval.

The NCD-105 waits for a pulse. When received, the user-defined timer begins its cycle. During this time, the PULSE OUT line is high. The PULSE OUT line falls low after the user defined duration has passed.

Once a pulse has been received on the PULSE IN line, the timer does not begin counting again if a second pulse is received. Use the CLEAR line to interrupt or reset the timer.





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26-99/$13.50 ea.
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RS-232 A/D with Digital I/O

The NCD-106 is perhaps one of our most popular RS-232 interface microcontrollers. The NCD-106 offers dual unipolar 8-bit analog to digital converters, 3 digital inputs, and 4 digital outputs.

This processor is used in a variety of control applications and is vdigi9ry useful on the benchtop for a variety of experimental purposes.

Up to 4 NCD-106s can share a single RS-232 serial port. Networking them together provides a total of 8 A/Ds, 12 inputs, and 16 outputs.

Commands
The NCD-106 has five commands that it will respond to with an RS-232 transmission.

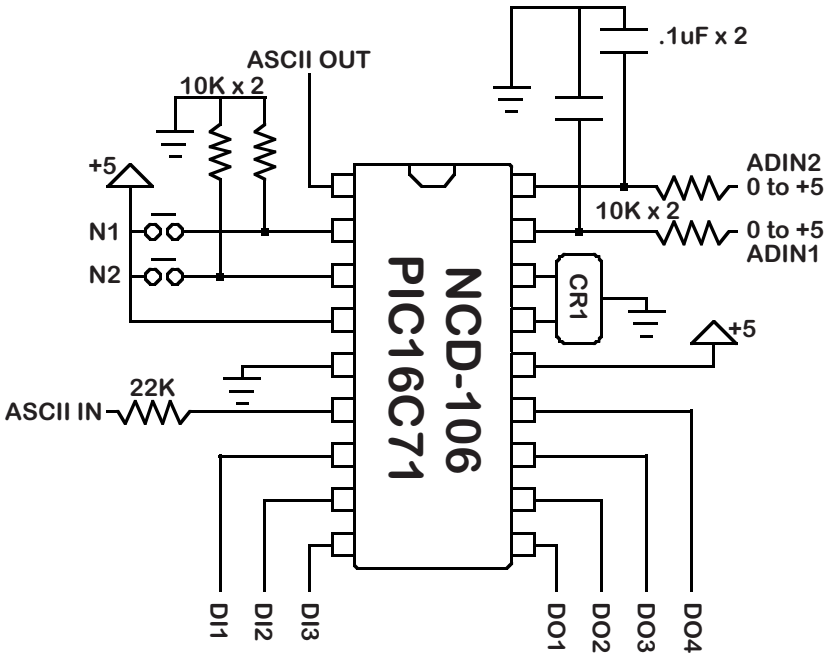
Send Analog Input Status
Format: <NAME>A<CHANNEL><RETURN>
Example: pA1<RETURN>
Action: Tell NCD-106 named p to read A analog input 1.
Will reply with a byte of data.

Send Digital Input Status
Format: <NAME><RETURN>
Example: p<RETURN>
Action: Tell NCD-106 named p to read digital inputs.
Will reply with a byte of data.

Turn On a Digital Output
Format: <NAME>N<RETURN>
Example: pN1<RETURN>
Action: Tell NCD-106 named p to turn on output pin 1.

Turn Off a Digital Output
Format: <NAME>F<RETURN>
Example: pF1<RETURN>
Action: Tell NCD-106 named p to turn off output pin 1.

Output a Byte to Digital Outputs
Format: <NAME>P<BYTE><RETURN>
Example: pP0<RETURN>
Action: Tell NCD-106 named p to send a byte of ASCII 0.
Note that data bits will be trun cated for ASCII values above 15.



CR1	BAUD
4 MHz	9600
2 MHz	4800
1 MHz	2400
500 KHz	1200

CR1 is a ceramic resonator. Using different ceramic resonators changes the speed in which the microprocessor functions. A crystal can be used to substitute the ceramic resonator.

Crystals are considered more reliable in terms of their timing characteristics, but greater accuracy is NOT needed in this application. Ceramic resonators work with 100% reliability, have built-in capacitors, and require less board space.

NAME	N2	N1
p	0	0
q	0	1
r	1	0
s	1	1

0 - Remove Jumper
1 - Install Jumper

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26-99/$13.50 ea.
100-up/call for current pricing.

ASCII Keypad IR Transmitter

The NCD-107 is nearly identical in function with the NCD-103. The NCD 107 was designed to provide the user with a convenient method of sending RS-232 data to a computer or microcontroller via infrared data transmission.

The NCD-107 sends out a modulated ASCII character for each key that is pressed. Up to 4 character sets can be selected by changing the jumpers at S1 and S2 allowing a total of 64 characters to be transmitted from a single processor.

When the MOD jumper is installed, the NCD-107 modulates the IR LED at 32.7 KHz (which is compatible with our IRTR infrared transceiver). When removed, the IR LED is modulated at 40 KHz.

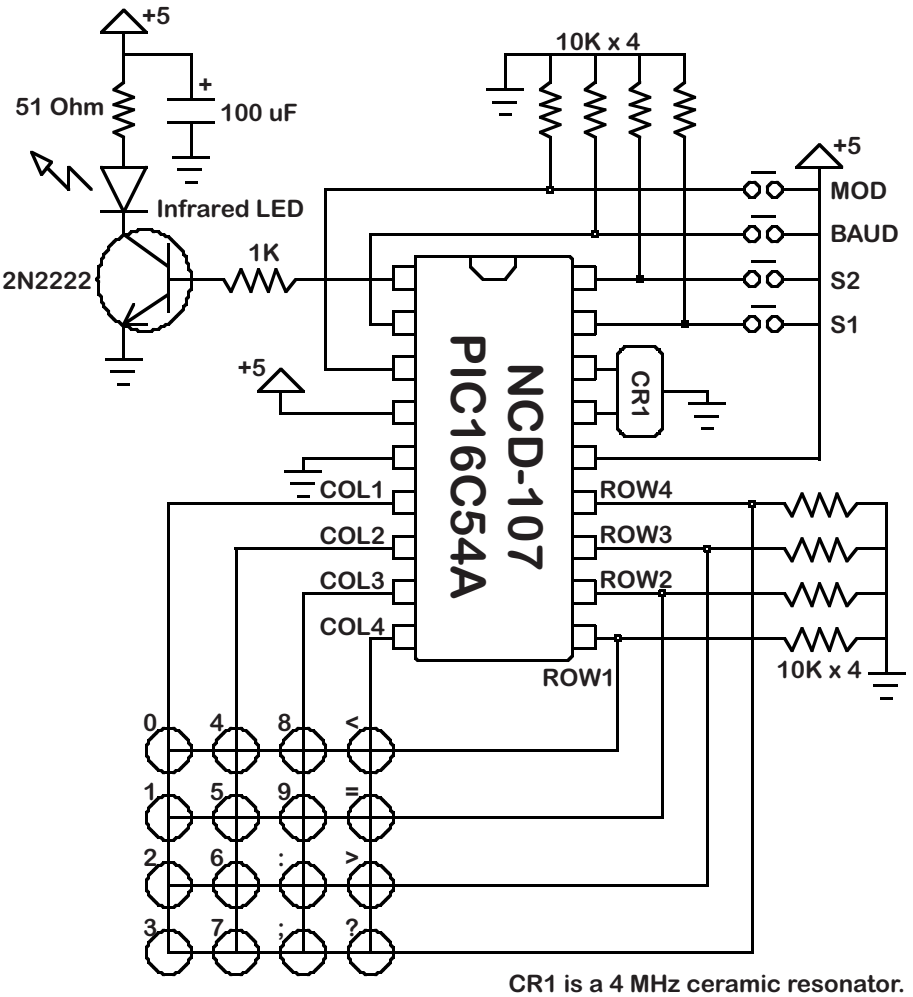
When the BAUD jumper is installed, the NCD-107 transmits data at 300 baud. When removed, data is transmitted at 1200 baud.

The NCD-107 transmits modulated ASCII RS-232 data which can be decoded using a $4.00 infrared receiver module.

The NCD-107 permits easy interface to any industry standard matrix type keypads. In addition, the NCD-107 requires very few external components making it an ideal choice for a variety of remote control applications.

We also offer a similar keypad data transmitter complete with a printed circuit board. Please see page 3 of this catalog for details.

Note: Pins 10 to 13 are inputs. The 10K pull-down resistors are required for reliable operation.



CR1 is a 4 MHz ceramic resonator.

S1	S2	ASCII OUTPUT
0	0	ASCII Characters 0 to 15
1	0	ASCII Characters 16 to 31
0	1	ASCII Characters 32 to 47
1	1	ASCII Characters 48 to 63

0 - Remove Jumper
1 - Install Jumper

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Pulse Stretcher

The NCD-108 serves as a user-adjustable pulse stretcher with thumb-wheel (TWA, B, C) inputs. The pulse stretcher is ideally suited in a large number of automation applications.

Use in telephones to limit the length of conversations. Use in automatic doors to control the length of time the door stays open. Use in security lighting systems to light an area for a limited amount of time if motion is detected.

The NCD-108 is available in two versions offering from 1 second to 7 hours and 59 minute pulse lengths. The CLEAR line should be tied high for normal operation. Tie low to reset or interrupt timing interval.

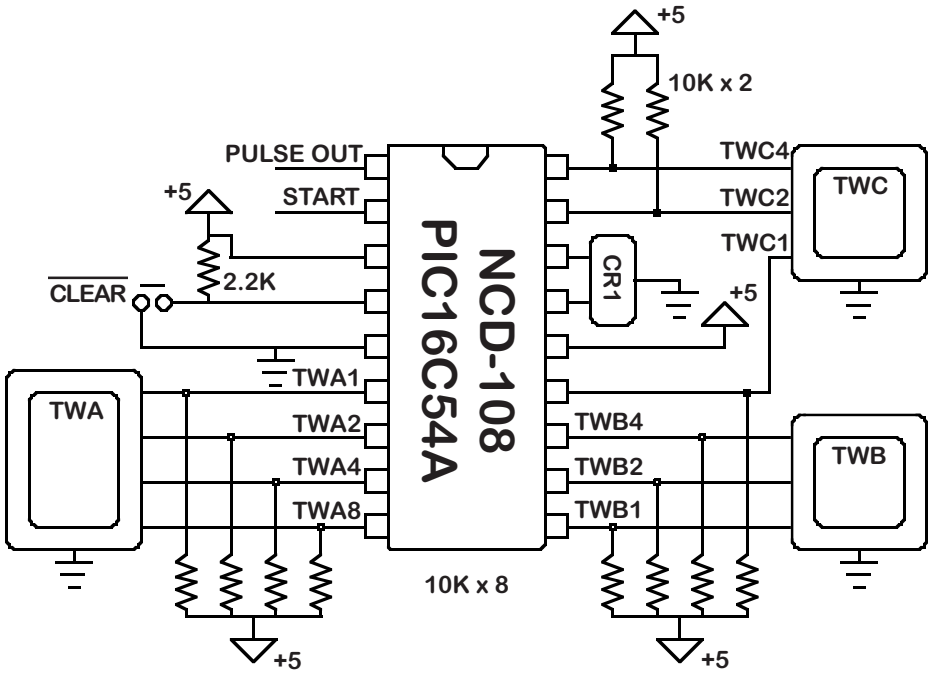
The NCD-108 waits for a pulse. When received, the user-defined timer begins its cycle. During this time, the PULSE OUT line is high. The PULSE OUT line falls low after the user defined duration has passed.

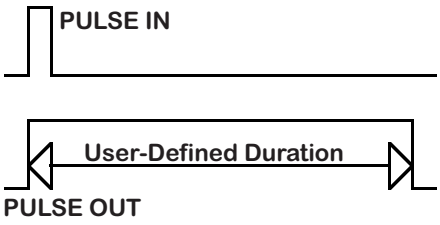
Once a pulse has been received on the PULSE IN line, the timer does not begin counting again if a second pulse is received. Use the CLEAR line to interrupt or reset the timer.

The following table shows the logic levels at the input pins when the thumbwheel is set to different positions.

Thumbwheel Positions:	1	2	4	8
0	1	1	1	1
1	0	1	1	1
2	1	0	1	1
3	0	0	1	1
4	1	1	0	1
5	0	1	0	1
6	1	0	0	1
7	0	0	0	1
8	1	1	1	0
9	0	1	1	0

BCD Values





CR1 is a 4MHz ceramic resonator. A crystal and two capacitors can be used to substitute the ceramic resonator.

Crystals should be used if your timing requirements are critical. A ceramic resonator provides accurate timing within 1%. Use a crystal if your appication cannot accept this deviation.

Product Variations:

Version	T.W. 3	T.W. 2	T.W. 1	Maximum Delay
NCD-108A	minutes	seconds x 10	seconds	7 minutes, 59 seconds
NCD-108B	hours	minutes x 10	minutes	7 hours, 59 minutes

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Addressable 4-bit Serial-to-Parallel Converter with Dual Strobe Outputs

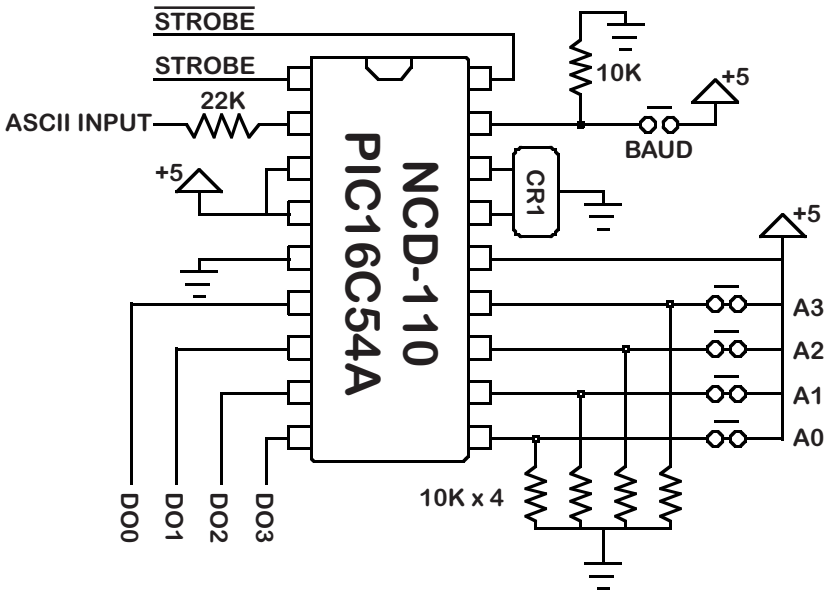
The NCD-110 is the most common interface processor used in the NCD product line. The NCD-110 is fully RS-232 network compliant allowing up to 16 NCD devices to share a single RS-232 serial port in any combination.

Up to 16 NCD-110 interface processors can share a single RS-232 serial port offering a total of 64 output bits. Each NCD-110 can be interfaced with a CMOS 4099 converting its 4-bit output to an addressable 8-bit output. This method provides up to 128 output bits from a single RS-232 serial port.

The NCD-110 also provides dual stobing for simplified interface to active high and active low logic. In addition, a BAUD pin allows you to easily select between 1200 and 9600 baud. Active baud rate detection allows the speed to be changed while in operation.

The NCD-110 is actively used in NCD products for relay control, video switching, SPI Microwire emulation, motor controllers, and stepper controllers.

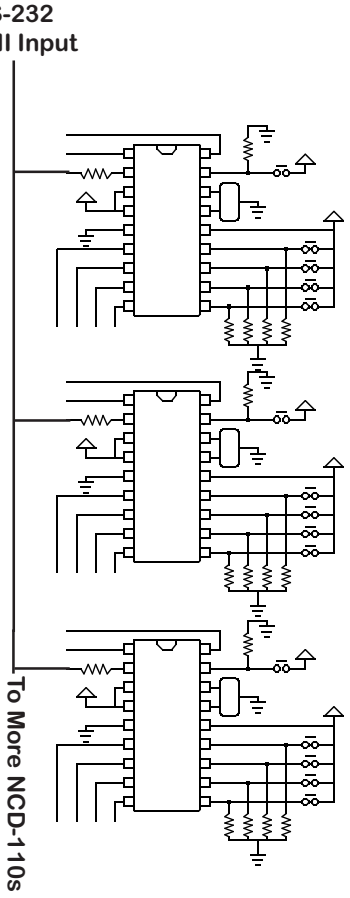
The NCD-110 listens to the RS-232 port and only responds if its range of characters is received. When set to address 0 (A0 to A3 removed), the NCD-110 will only output data if ASCII characters 0 to 15 are received.



CR1 is a 4 MHz Ceramic Resonator.

The BINARY ADDRESS shows the logic states of the address pins 10 to 13. The NCD ADDRESS is the device number as seen in the NCD product software. PIN 10 to PIN 13 show the actual logic states for addressing. The ASCII RANGE is the range of ASCII characters the NCD-110 will respond to for a given address.

Binary Address	NCD Address	Pin 10	Pin 11	Pin 12	Pin 13	ASCII Range
0000	0	Ground	Ground	Ground	Ground	0-15
0001	1	+5	Ground	Ground	Ground	16-31
0010	2	Ground	+5	Ground	Ground	32-47
0011	3	+5	+5	Ground	Ground	48-63
0100	4	Ground	Ground	+5	Ground	64-79
0101	5	+5	Ground	+5	Ground	80-95
0110	6	Ground	+5	+5	Ground	96-111
0111	7	+5	+5	+5	Ground	112-127
1000	8	Ground	Ground	Ground	+5	128-143
1001	9	+5	Ground	Ground	+5	144-159
1010	10	Ground	+5	Ground	+5	160-175
1011	11	+5	+5	Ground	+5	176-191
1100	12	Ground	Ground	+5	+5	192-207
1101	13	+5	Ground	+5	+5	208-223
1110	14	Ground	+5	+5	+5	224-239
1111	15	+5	+5	+5	+5	240-255



The example shown at right will provide 12 output bits from a single RS-232 serial port. Additional NCD-110s can be added to the chain providing up to 64 output bits.

Note that RS-232 ground must share logic ground in this application. Also note that each NCD-110 should be set to a different NCD address. Please see the table to the left for details.

Each ASCII RANGE (see table) has 16 possible characters that can be received by the NCD-110. These 16 characters are broken into their binary equivalent (from 0 to 15) and written as data on the 4-bit output of the NCD-110.

Transmitting ASCII characters 0 to 255 in sequence will cause each NCD-110 to count from 0 to 15 in binary. The NCD-110 set to address 0 will count first, responding to ASCII characters 0 to 15. The NCD-110 set to address 15 will count last, responding only to ASCII characters 240 to 255.

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