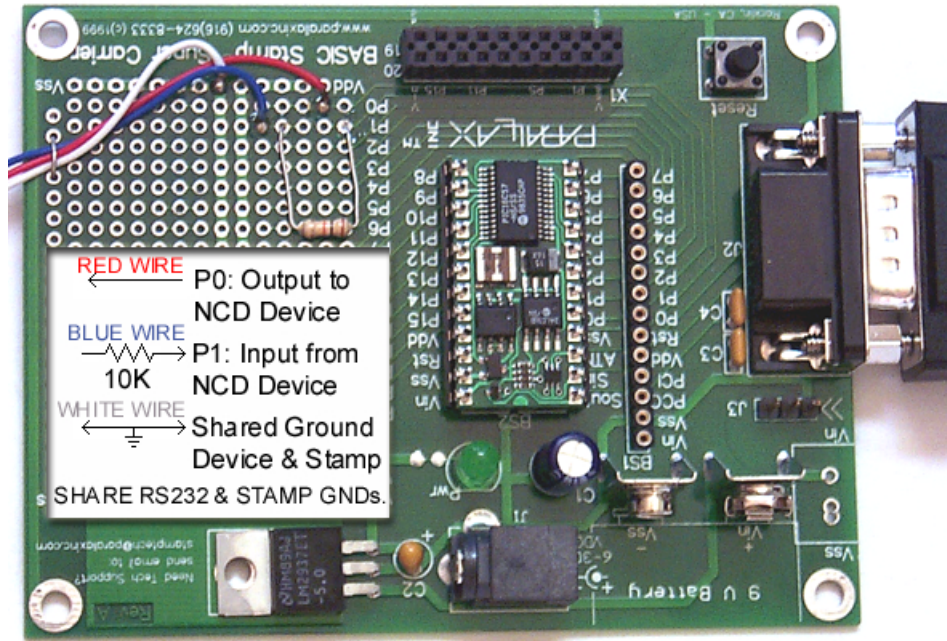


Using NCD Devices with the Basic Stamp

NCD Devices are easily controlled with the Basic Stamp by Parallax. The illustration below shows you how to connect NCD devices to the Stamp prototyping board. Stamp Basic example programs will assume you have a Stamp II connected the NCD device as illustrated below.



Ground Connection

The ground of the Basic Stamp prototyping board should be connected to the RS-232 ground of the NCD device you would like to control. Some NCD devices have a separate power and RS-232 ground. For these devices, make sure the RS-232 ground is used.

Data Output Connection

The Basic Stamp is capable of sending ASCII characters from any of its 16 input/output pins. All example software is written to send data out P0. This pin should be connected to the RS-232 inputs of the NCD Device. Some NCD devices, such as relay and motor controllers, are optoisolated and will only work with the Basic Stamp when the RS-232 input is set to the “Mac” position. Please see the manual for the device you are trying to control for specific jumper settings. This jumper allows the device to operate from a TTL (Mac) or standard RS-232 (PC) signal source.

Data Input Connection

The Basic Stamp is also capable of receiving RS-232 data from some NCD devices. A 10K resistor between the Basic Stamp P1 input pin and the NCD device is used to protect the Basic Stamp from potentially damaging RS-232 voltages from NCD devices.

NCD Device Compatibility

The Basic Stamp is not compatible with all NCD devices that send data back to the Stamp. There are two reasons for this incompatibility. 1) Some devices only send Open-Collector RS-232 data, which must be electrically translated to TTL for compatibility. 2) NCD Devices do not typically speak unless spoken to. So the Basic Stamp must send a command to request data from an NCD device. Often times, the NCD device replies far sooner than the Basic Stamp can handle, so incoming data is simply missed. NCD devices released after 1998 will address both of these issues for future Basic Stamp compatibility.

Sending Data from the Basic Stamp to an NCD Device

The Basic Stamp has an impressive variety of RS-232 data communications commands, making it a powerful control alternative for NCD devices. As you have probably seen by now, NCD devices use ASCII character codes for all commands. The Stamp is perfectly suited for sending character codes for complete control of most NCD devices.

In addition, NCD devices typically communicate at 1200, 9600, 19.2K, 38.4K, and higher baud rates. The Stamp II is capable of sending data at a maximum of 38.4K. The following table shows you the Basic Stamp commands used to control NCD devices at various baud rates. Examples illustrate sending data out Basic Stamp pin P0.

Baud Rate	Basic Stamp Command for Sending ASCII Character Code N (N=0 to 255)
1200	Serout 0, 17197,[N] 'Send Data Byte N at 1200 Baud
2400	Serout 0, 16780,[N] 'Send Data Byte N at 2400 Baud
4800	Serout 0, 16572,[N] 'Send Data Byte N at 4800 Baud
9600	Serout 0, 16468,[N] 'Send Data Byte N at 9600 Baud
19.2K	Serout 0, 16416,[N] 'Send Data Byte N at 19.2K Baud
38.4K	Serout 0, 16390,[N] 'Send Data Byte N at 38.4K Baud

Example: Simple 8-Relay Controller Program for the BSII, Relay Controller Set to 19.2K Baud.

```
Relay var byte 'Declare Relay Control Variable
For Relay = 0 to 7 'Turn Off Each of 8 Relays on an R85 Relay Controller
    Serout 0, 16416,[Relay] 'Send Data Byte at 19.2K Baud to Turn Off Relay
Next
For Relay = 8 to 15 'Turn On Each of 8 Relays on an R85 Relay Controller
    Serout 0, 16416,[Relay] 'Send Data Byte at 19.2K Baud to Turn On Relay
Next
```

Receiving Data from an NCD Device

The Basic Stamp can also be used to receive data from some NCD devices. The following table shows you the Basic Stamp commands used to receive data from NCD devices at various baud rates. Examples illustrate receiving data on Basic Stamp pin P1.

Baud Rate	Basic Stamp Command for Receiving ASCII Characters (DataIn=0 to 255)
1200	SerIn 1, 17197,100,Timeout,[DataIn] 'Get Data into DataIn, Timeout if No Reply
2400	SerIn 1, 16780,100,Timeout,[DataIn] 'Get Data into DataIn, Timeout if No Reply
4800	SerIn 1, 16572,100,Timeout,[DataIn] 'Get Data into DataIn, Timeout if No Reply
9600	SerIn 1, 16468,100,Timeout,[DataIn] 'Get Data into DataIn, Timeout if No Reply
19.2K	SerIn 1, 16416,100,Timeout,[DataIn] 'Get Data into DataIn, Timeout if No Reply
38.4K	SerIn 1, 16390,100,Timeout,[DataIn] 'Get Data into DataIn, Timeout if No Reply

Example: Simple Routine for Receiving Data from an NCD Device at 9600 Baud.

```
DataIn var byte 'Declare DataIn as a Byte Variable
Gosub GetData 'Call Subroutine to Get Data from Device
End 'End Program
GetData: 'Declare Sub for Getting Data from Device
    SerIn 1, 16468,100,Timeout,[DataIn] 'Get Data from Device, Store in DataIn
    Timeout: 'If device does not reply, Go Here
Return 'Return to Caller
```

Troubleshooting Tips

If you are having communications difficulties with an NCD device, look through example programs provided on our CD-Rom and on our web site (www.controlanything.com) for programming examples. NCD devices are similar in communication protocol, look through example programs for other similar devices if you can't find what you are looking for. Have Fun!