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SureLink 900 MHz RF Module (#30065) QuickLink Demo Board (#30066) BASIC Stamp Friendly Radio Link Module and Demo Board

Introduction

The wireless trend gains in momentum and breadth each year. As a result, more and more stamp customers desire to add the benefits of wireless communication to their projects; a task not easily implemented until now. Parallax has teamed up with Needham's Electronics to develop a 900 MHz wireless transceiver that works well with BASIC Stamps.

To assure customer success, the SureLink Control Panel software is provided free of charge. This Windows® application works in conjunction with the QuickLink Demo Board. The QuickLink Demo Board is a small pcb that has everything needed to connect the SureLink RF module to a PC serial port including jumper headers, RS-232 Driver, DB9 connector, voltage regulator, test pushbuttons, and indicator LEDs.

First time users are encouraged to start with two SureLink RF Modules and two QuickLink Demo Boards. The first section of this document assumes you will be using the SureLink Modules along with the QuickLink Demo Boards. If you choose to use the SureLink Modules by themselves, please take the time to read through the Getting Started, Demo Mode, and Cable Link Mode sections before proceeding to the Stand Alone section.

Packing List

The QuickLink module is usually shipped by itself, sealed in an anti-static plastic bag. Verify that your SureLink kit is complete in accordance with the list below:

- SureLink Module
- Documentation
- SureLink Control Panel Software (may be on a diskette or the Parallax CD)

Features

- High Speed Data DTE Transfer Rates. Choose any rate from: 1200 Baud to 115k Baud.
- High Speed Data RF Transfer Rates. RF data rates to choose from: 48000 bps to 76.8kbps.
- High effective range. Up to 1000 feet.
- 128 Byte user scratch pad flash memory
- Long battery life. Up to five hours of operation.
- Multiple Channels of communication. 9 channels, all run-time selectable, allows one unit to communicate with many other units.
- Data Encryption Mode allows you to send and receive data privately, using a 128-bit key code.
- Built-in error correction for all data transmissions.
- Free PC Software with comprehensive on-line help file.

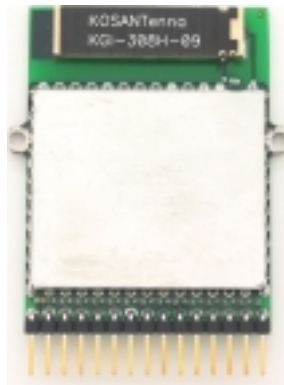
Before You Begin

You may have noticed that this device boasts many more features than are supported in this document. The most common modes of operation are detailed in this manual. If you wish to use an undocumented feature, you may do so with the assistance of the help file located within the SureLink Control Panel software.

Getting Started

Locate and remove the SureLink Module from its protective anti-static bag. It should closely resemble the image shown in **Figure 1**.

Figure 1: SureLink RF Module



Locate and remove the QuickLink Demo Board from its protective anti-static bag. It should closely resemble the image shown in **Figure 2**.

Figure 2: QuickLink Demo Board



Connect the two units by plugging the SureLink RF Module into the QuickLink Demo Board as shown in **Figure 3**.

Figure 3: QuickLink Demo Board with SureLink Module installed



The software utility program used with the SureLink modules is called the SureLink Control Panel. The install file is called, "surelink_control.exe". Obtain this program from either the Parallax CD or the Parallax website. Install the SureLink Control Panel software.

Click on the Jumper Settings tab. This window is comprised of an image of the QuickLink Demo Board showing its jumpers, and various settings. By clicking on the various settings, the jumpers on the image shift to show you how to properly position the jumpers on the QuickLink Demo Board. This screen is very helpful and should be referred to whenever the configuration is changed.



As a rule **you will need two SureLink modules** (and also two QuickLink Demo Boards for purposes of this document) to effect communication. Since one unit sends and the other unit receives, a pair of these SureLink modules is required. And, since either unit can send and either unit can receive, we cannot refer to them simply as transmitter and receiver, so we will refer to them as Unit A and Unit B. **One QuickLink Demo Board must be configured to support the "A" module, and the other QuickLink Demo Board must be configured to support the "B" module.** To verify the proper operation of each QuickLink Demo Board, the units will be configured and tested Demo Mode.

Launch the SureLink Control Panel application. The **Figure 4** depicts what the window should look like.

Figure 4: SureLink Control Panel

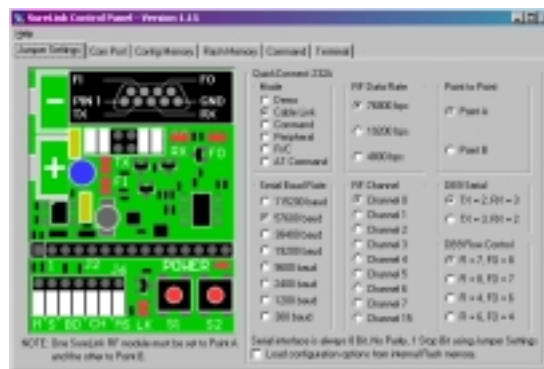
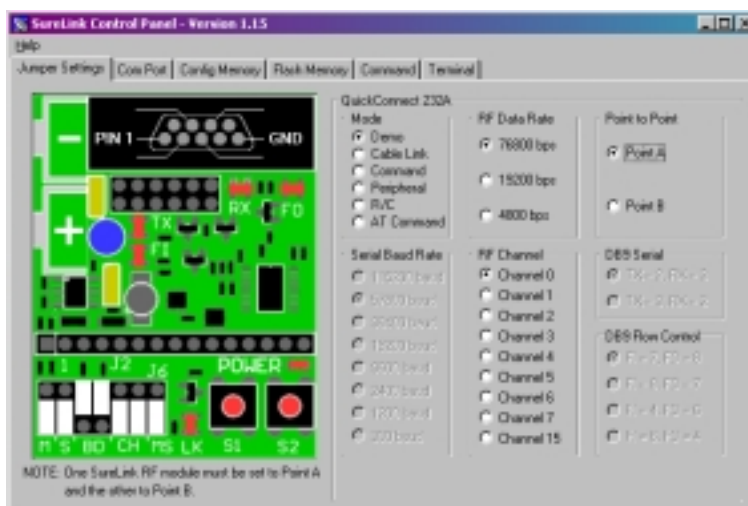


Figure 4 depicts the screen is called the Jumper Settings screen. This screen will help you configure the jumpers on each QuickLink Demo Board. Note that this screen always begins in Cable Link mode.

Demo Mode

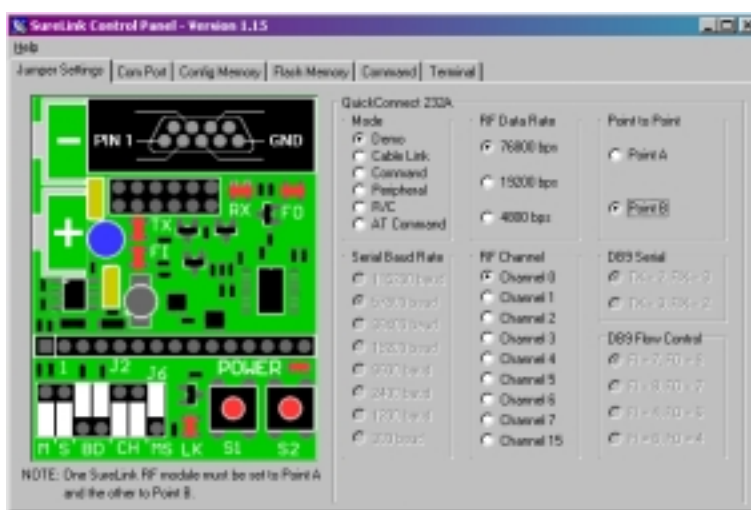
From the Jumper Settings screen, change the mode to Demo. Upon clicking the Demo mode button, the jumpers will change. Ensure that Point A is selected in the Point to Point setting. **Set the jumpers on one QuickLink module to match the ones shown in Figure 5.** Note: you may find it easier to remove the SureLink Module from the QuickLink Demo Board while repositioning the jumpers.

Figure 5: Demo mode jumper settings (Point A)



Change the Point to Point setting to Point B. Configure the jumpers on the second QuickLink module to be the same as in Figure 6. Again, you may find it easier to remove the SureLink Module from the QuickLink Demo Board while repositioning the jumpers.

Figure 6: Demo mode jumper settings (Point B)



After each QuickLink Demo Board's jumpers are properly positioned, apply power by attaching a 9 Volt battery to each QuickLink Demo Board. You should then see the following sequence of events: the RX (receive), FI (flow control in), FO (flow control out), and Power LEDs turn on while the yellow Link LED blinks three times. After the third blink of the Link LED, it extinguishes. Shortly thereafter, the FO LED

extinguishes as well. Powering up the second unit results in a repeat of this sequence, with one exception: sometime after the Link LED extinguishes, both Link LEDs should light. This indicates that the two SureLink modules have found each other, and are in communication with each other.

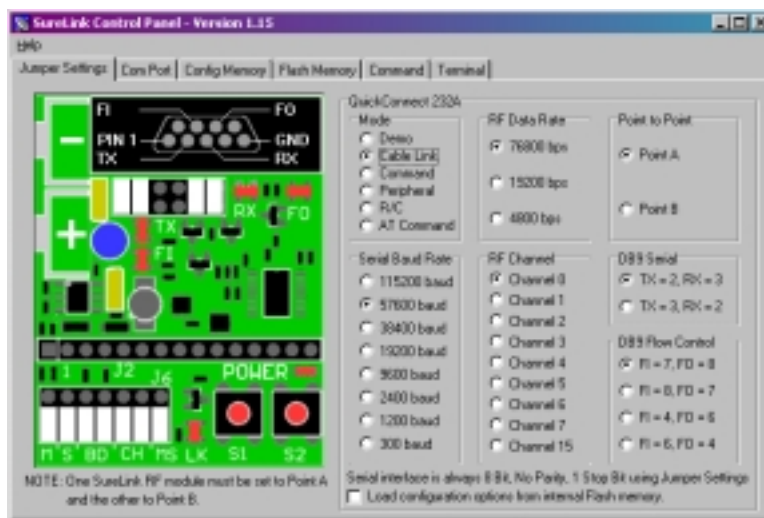
Now that the radio link is established, simple communications can be tested with ease. On each QuickLink Demo Board there are two pushbuttons labeled S1 and S2. While the radios are linked, pressing S1 on the Point A unit results in the TX (transmit) LED lighting on the Point B unit. Similarly, pressing the S2 pushbutton on the Point A radio results in the FO LED extinguishing on the Point B unit. In both cases releasing the pushbuttons results in their respective LEDs returning to their idle states. Test your units to ensure that bi-directional communication is indeed working.

If your SureLink modules do not behave in this manner, repeat the entire configuration process. If your modules fail to operate in the proper fashion, contact Parallax Tech Support at (916) 624-8333 or send an email to: support@parallax.com. If your modules behave as they should, please continue on to the Cable Link Mode section.

Cable Link Mode

To switch the units over to work in Cable Link mode, the units must be reconfigured. Power down both SureLink RF Modules by removing the batteries from the QuickLink Demo Boards. Referring again to the Jumper Settings screen within the SureLink Control Panel software, change the mode to Cable Link and the Point to Point parameter to Point A. **Figure 7** shows how the screen should look in Cable Link Mode.

Figure 7: Cable Link mode jumper settings (Point A)



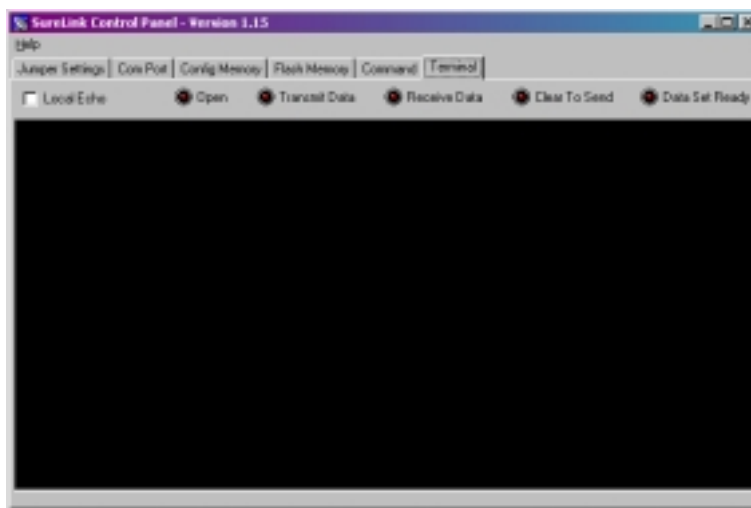
Change the jumpers on the QuickLink module (Point A unit) to match the jumper positions on the Jumper Settings screen. Change the Point to Point parameter to Point B. Change the jumpers on the QuickLink module (Point B unit) to match the jumper positions on the Jumper Settings screen. Close the SureLink Control Panel application. This action assures that when the software is used again in this text, it will start up in the default window with default settings.

The most straight forward way to establish and test the Cable Link mode is to connect each unit to a PC serial port via a standard DB9M to DB9F serial cable. Reconnect the batteries to both QuickLink Demo Boards. If the Link LEDs fail to light, power down both units and repeat the instructions for Cable Link mode. If repeating these steps fails to result in the Link LEDs lighting, contact Parallax tech support.

Start two instances of the SureLink Control Panel software. Position the two windows on your screen such that both windows are as visible as possible. Click on the Comm Port tab for both windows. This opens the window that allows serial port selection and configuration. Select the comm port number desired for the Point A unit and click the Open Port button. The Port Status indicators should show the comm port as open and the CTS active. Select a different comm port for the Point B unit using the second instance of the SureLink Control Panel software and click its Open Port pushbutton. The Port Status indicators should indicate the Point B unit's comm port is open with its CTS active.

Click on the Terminal Tab for both windows. **Figure 8** shows what the terminal window looks like for the Point A unit.

Figure 8: Terminal window for the Point A unit



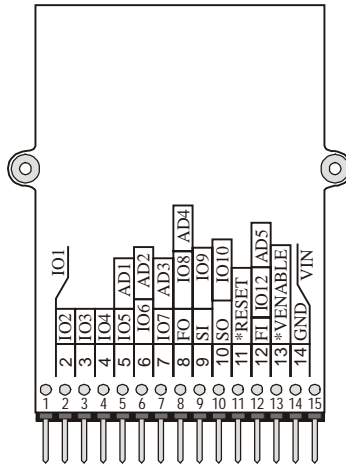
This action opens a bi-directional data terminal window in each application instance. Note that only one window at a time can have focus. Change the focus to the Point A unit's window. Typing should result in characters appearing in Point B unit's terminal window. Note that no characters appear in Point A unit's window. This is because the local echo parameter is off. Change the focus to Point B unit's window. Typing here should result in characters appearing in Point A unit's terminal window.

To change the configuration to enable the local echo, simply: click on the Comm Port tab, close the serial port, click on the terminal window, enable the local echo, click on the Comm Port tab, and re-open the comm port. Now typing will result in characters appearing locally and in the other unit's terminal window. Note that this operation must be performed for the other instance of software to enable the local echo for both units.

Stand Alone Mode

The most useful example of the use of these modules in conjunction with stamps is Stand Alone mode. In Stand Alone mode, two stamps will exchange data via an RF link courtesy of a pair of SureLink modules (without the aid of the QuickLink Demo Boards. To accomplish this, it becomes necessary to know and understand the names and functions of each header pin. **Figure 9** shows the pin legend located on the back of the SureLink module.

Figure 9: SureLink Module Header Pin Definition and Location



The pin legend is located on the **back** of the unit and therefore defines the pins as they are viewed from the back of the unit; be mindful of this when you are wiring it up. Recall that two or more units are required for communication and that one of those units must be designated (via connection) as Point A unit and the other unit(s) must be designated as the Point B unit.

Figure 10: Pin-out Description of SureLink Header

Pin #	Function	Aux Function	QuickLink Jumper	Jumper Position	Description
Pin 1			'M'	High = command mode	Mode Select
				Low = Demo & Cable Link Mode	
				Removed for all other modes	
Pin 2			'S'	High = 4800 bps	RF Data Rate
				Low = 76800 bps	
				Removed = 19200 bps	
Pins 3,4			'BD'	See Figure 11	Serial Baud Rate
Pins 5,6		AD1, AD2	'CH'	See Figure 12	RF Channel
Pin 7		AD3	'MS'	Low = Point A Unit	Point A/Point B
				High = Point B Unit	
Pin 8	FO	AD4			Flow Control Output
Pin 9	RX				Data Input
Pin 10	TX				Data Output
Pin 11	RESET				Active Low reset
Pin 12	FI	AD5			Flow Control Input
Pin 13	VEN				Must be grounded
Pin 14	GND				Ground
Pin 15	VIN				+5V Supply voltage

Note that only pins 1 through 7 are connected to jumpers. When a jumper position is designated as High, you must connect that pin to Vdd. Conversely, when a jumper position is designated as Low, you must connect that pin to Vss (ground).

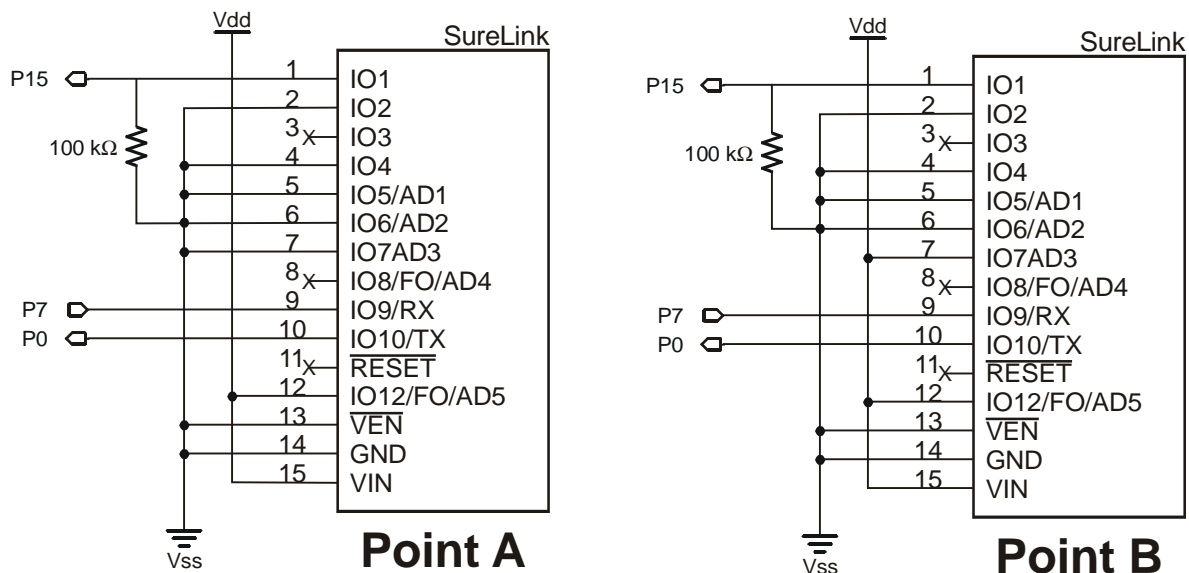
Figure 11: Serial Baud Rate Jumper Selection Chart

Jumper Position		Baud	Miscellaneous
PIN3	PIN4	Rate	Notes
Removed	HIGH	115200	Default for Cable Link and Command Mode
LOW	LOW	57600	
LOW	Removed	38400	
HIGH	Removed	19200	
Removed	LOW	9600	
HIGH	LOW	2400	
Removed	Removed	1200	Default for all other modes
LOW	HIGH	300	
HIGH	HIGH	N/A	Default for Demo Mode

Figure 12: RF Channel Jumper Selection Chart

Jumper Position		RF
PIN5	PIN6	Channel
LOW	LOW	0
LOW	Removed	1
Removed	LOW	2
Removed	Removed	3
LOW	HIGH	4
Removed	HIGH	5
HIGH	LOW	6
HIGH	Removed	7
HIGH	HIGH	15

Figure 13: SureLink Module schematics for Point A and Point B units



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Note that these two images differ only in the connection of pin 7 on the SureLink module. Pin 7 determines whether the unit is Point A or Point B. Install your SureLink modules into your Board of Education (or equivalent) breadboards. Wire them up according to the schematics shown in **Figure 13**. Now your circuits should resemble those shown in **Figure 14** and **Figure 15**.

Figure 14: SureLink Modules (Point A)

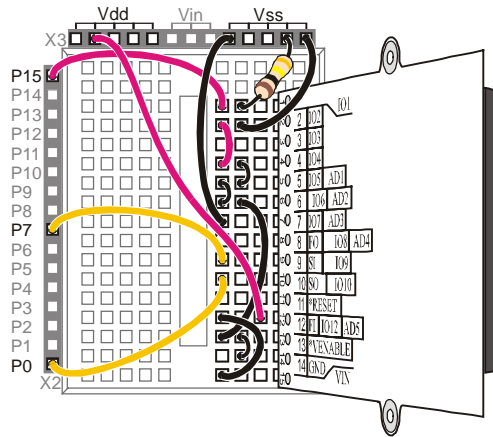
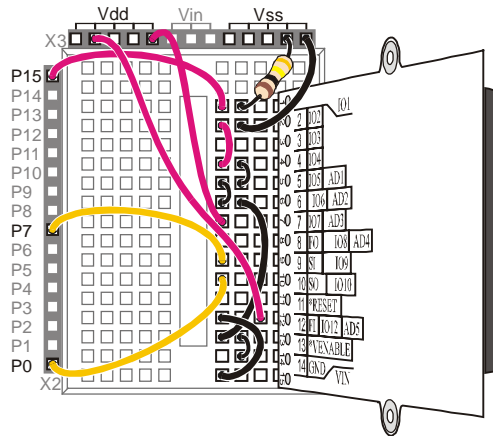


Figure 15: SureLink Modules (Point B)



As in cable link mode, these units should be able to find each other and light up the LINK output (P15 on the stamp) shortly after power up. The following programs loaded into their respective stamps demonstrate the ability to transmit and receive data. The first program, the Point A unit, is directed to use comm port 1 and the second program, the Point B unit, is directed to use comm port 2. You may change this as necessary to accommodate your particular system.

```

=====
|
| File..... SureLinkDemo_PointA.BS2
| Purpose.... Demonstrates data transmission with two SureLink modules
| Author..... Parallax
|

```

```

'   E-mail..... support@parallax.com
'   Started.... 11 NOV 2003
'   Updated....
'
'   {$STAMP BS2}
'   {$PBASIC 2.5}
'   {$PORT COM1}
'   =====
'
'   -----[ Program Description ]-----
'
'   This program demonstrates how to read the LINK input, transmit, and receive
'   data via the SureLink modules.
'
'   -----[ I/O Definitions ]-----
'
Link          PIN      15                ' Link Input (1 = linked)
Dout          PIN      7                ' Serial Data Output
Din           PIN      0                ' Serial Data Input
'
'   -----[ Constants ]-----
'
Baud          CON      84+$4000
'
'   -----[ Variables ]-----
'
X              VAR      Byte            ' temporary variable
'
'   -----[ Initialization ]-----
'
Initialize:
  PAUSE 250
  HIGH 7                ' setup I/O pins
'
'   -----[ Program Code ]-----
'
Main:                ' Print a . if the units
  DEBUG ".,",CR        ' are not linked. Once the
  IF Link = 0 THEN Main ' units link, then
  DEBUG "Linked", CR   '
DO
  SEROUT  Dout, Baud, [65] ' send a "A". If a character
  SERIN   Din,  Baud, 500, NoData, [x] ' is received within 500mS.
  DEBUG  x                ' echo that character to the
NoData:                ' debug window as proof.
LOOP
'
'   =====
'

```

```

'   File..... SureLinkDemo_PointB.BS2
'   Purpose.... Demonstrates data transmission with two SureLink modules
'   Author..... Parallax, Inc.
'   E-mail..... support@parallax.com
'   Started.... 11 NOV 2003
'   Updated....
'
'   {$STAMP BS2}
'   {$PBASIC 2.5}
'   {$PORT COM2}
' =====
'
' -----[ Program Description ]-----
'
' This program demonstrates how to read the LINK input, transmit, and receive
' data via the SureLink modules.
'
' -----[ I/O Definitions ]-----
'
Link          PIN      15          ' Link Input (1 = linked)
Dout          PIN      7           ' Serial Data Output
Din           PIN      0           ' Serial Data Input
'
' -----[ Constants ]-----
'
Baud          CON      84+$4000
'
' -----[ Variables ]-----
'
X             VAR      Byte        ' temporary variable
'
' -----[ Initialization ]-----
'
Initialize:
  PAUSE 250
  HIGH 7          ' setup I/O pins
'
' -----[ Program Code ]-----
'
Main:          ' Print a . if the units
  DEBUG ". ",CR ' are not linked. Once the
  IF Link = 0 THEN Main ' units link, then
  DEBUG "Linked", CR
DO
  SEROUT Dout, Baud, [66] ' send a "B". If a character
  SERIN  Din, Baud, 500, NoData, [x] ' is received within 500mS.
  DEBUG x ' echo that character to the
NoData:        ' debug window as proof.
LOOP

```

FCC Notice and Liability Disclaimer

These modules (boards) are not FCC approved. They are designed to comply with FCC Part 15 Rules and Regulations. They are not in a finished product form. They are strictly intended for experimental purposes only. If you wish to use these modules in an actual product (a non-experimental capacity), the module must first be designed into the product then the whole product must be approved by the FCC.

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