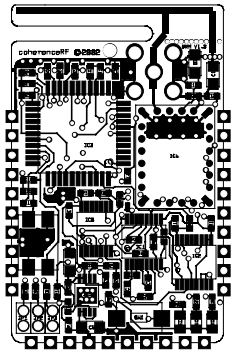
Introduction



The coherenceRF BRM allows fast development of sophisticated wireless applications by embedding the complexities of the radio. This allows the BRM to present a very simple API to the Host device, thus significantly easing wireless integration into the customer's end product.

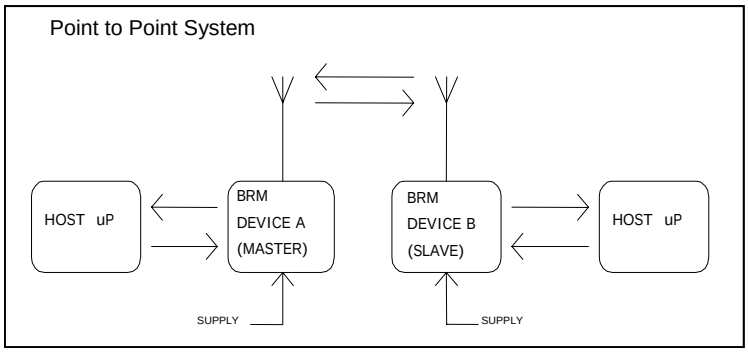
This document describes the programming requirements for the BRM when used in the 'Enhanced' mode of operation. Enhanced mode provides a non transparent interface, but allows a more flexable and complex system to be built.

System Synarios

Before delving deeper into the programmer's interface, it is a good idea to understand the system architectures possible.

Fixed Point To Point

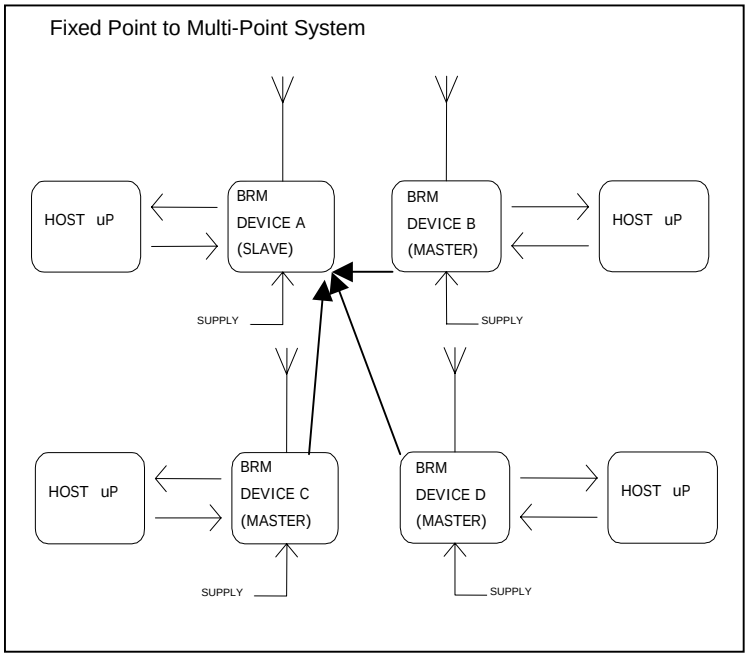
This describes the most basic system architecture. Data is always sent to and received from the same device.
This can be handled by the Basic or Enhanced mode of operation.



Fixed Point To Multi-Point

This is another basic system architecture. Each BRM sets up a connection to a fixed BRM, but may accept a connection from any known BRM.
This can be handled by the Basic or Enhanced mode of operation.

The example shows devices B,C and D fixed to device A. The term 'Master' denotes only the device which initialises the connection. The connections cannot be concurrent.



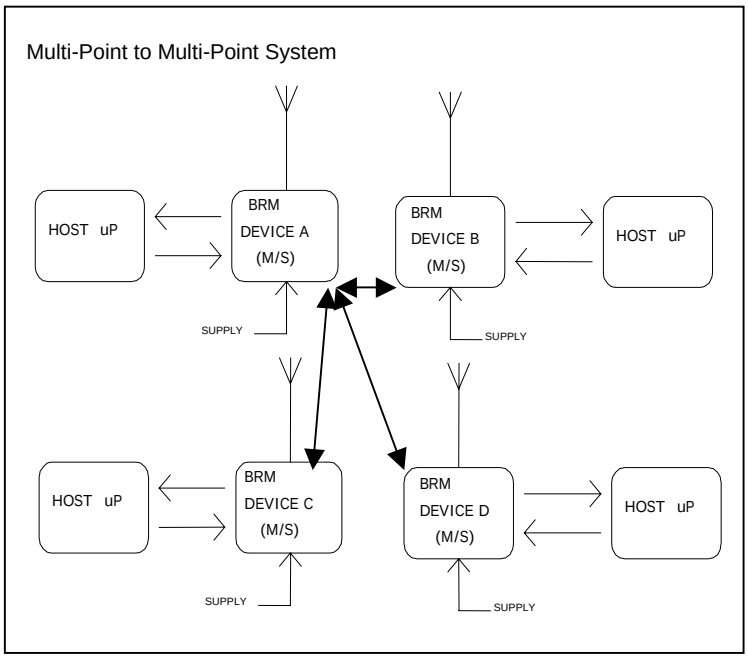
A Typical application might be where devices B,C or D set-up a connection to A when an event occurs which must be reported.

Multi-PointTo Multi-Point

This is a more flexible architecture. Each BRM can set-up a connection to any BRM, providing they are known by each other.

This architecture is only supported by the Enhanced mode of operation.

A Typical application might be where device A sets-up a connection to B,C and D in turn, requesting status data from each one.



This Specification is PRELIMINARY and may be changed without prior notice

Contents

Commands, Responses and Events

When the BRM is set to 'Enhanced ' mode several commands are available to the Host system.

General Rules

- Except when sending or receiving payload data, or stated otherwise, commands, responses and events are constructed using ASCII codes – i.e . in the range from 0x00 to 0x7F.
- Commands always result in a response and new commands must not be sent until a response to the previous command has been received.
- Responses consist of at least 1 Command Echo Byte and 2 Ascii Coded Status Bytes.
- Status "00" = success
- Return parameters are not sent for non "00" responses
- Events occur from time to time and indicate connection failures and other critical events. Events always comprise at least 3 bytes. The first byte indicates the type of event and the second and third bytes indicate the status.

Summary

Commands

Name	Code	Parameter(s)	Description
Add Device To Index	"A"	Device ID (2)	Adds a device to the local index
Change Baud Rate	"B"	Baud Rate (1)	Changes the Baud Rate
Connect To Device	"C"	Device ID (2)	Requests a data connection to a BRM
Disconnect Device	"D"	Device ID (2)	Disconnects from the remote BRM
GPIO Setup	"G"	Function (2)	Sets the GPIO pin functions
GPIO Output	">"	GPIO Mask (1)	Outputs a GPIO bit mask to the GPIO pins
GPIO Input	"<"	---------	Inputs a byte which is a bit mask of the GPIO pins
GPIO Measure	"$"	GPIO Pin (1)	Performs an ADC measurement on a GPIO pin
Device Address	"I"	Device ID (2)	Gets the device address stored in the local BRM
Set Local Name	"l"	Name (16)	Sets a new local name for the local BRM
Local Name	"L"	---------	Gets the local BRM's name
Local Address	"K"	---------	Gets the local BRM's address
Mode	"M"	Mode (1)	Selects operating mode
Set Local Name This command sets the local name. **Command Code (1 byte)** "l" — **Parameter 1 – Name (1-16 byte null terminated string)** "abcdefghijklmnop"0x00 **Response Code (1 byte)** "l" — **Status Code * (2 bytes 0-9, A-F)** "xx" *See Status Codes for meanings Remote Device Name	"N"	Device ID (2)	Requests the name from a remote BRM
Reset	"R"	---------	Performs a power-on-reset
Quality	"Q"	Device ID (2)	Requests the link quality for a connection
Connect Voice Device	"V"	Device ID (2)	Requests a voice+data connection to a device

Sleep	"Z"	---------	Sets BRM into low power sleep mode

Events

Type	Code	Status	Description
Connect	"C"	Device ID	Connect occurred from device
Disconnect	"D"	Status Code	Disconnect occurred from device - See Status Codes
Transaction complete	"S"	Status Code	The data packet has completed. See Status Codes

Add Device To Index

This command allows known devices to be added to the local BRM's device list. Once in the device list each BRM is represented by it's Index number. This allows incomming and outgoing connection requests to be validated and identified.

Command Code (1 byte)	Parameter 1 – BRM Address (12 bytes 0-9, A-F)	Parameter 2 – Index ID (2 bytes 00-1F)
"A"	"xxxxxxxxxxxx"	"xx"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)
"A"	"xx"

*See Status Codes for meanings

Change Baud Rate

This command allows the Baud rate for the host interface to be changed. The new baud rate will come into effect after a reset has occurred.

Command Code (1 byte)	Parameter 1 – Baud Rate (2 bytes 2-8)
"B"	"x5"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)
"B"	"xx"

*See Status Codes for meanings

BAUD SETTING	Host Baud Rate
"25"	19.2k
"35"	38.4k
"45"	57.6k
"55"	115.2k
"65"	230.4k
"75"	460.8k

Connect To Device

This command requests an immediate connection to the device whose Index ID is provided in the parameter. This is useful for testing purposes.

Command Code (1 byte)	Parameter 1 – Index ID (2 bytes 00-1F)
"C"	"xx"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)
"C"	"xx"

*See Status Codes for meanings

Disconnect Device

This command requests an immediate dis-connection from the device whose Index ID is provided in the parameter. This should be used after all data has been sent to a BRM in order to free up the devices.

Command Code (1 byte)	Parameter 1 – Index ID (2 bytes 00-1F)
"D"	"xx"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)
"D"	"xx"

*See Status Codes for meanings

GPIO Setup

This command configures the GPIO functions for the BRM. Use this command to change the default settings for the GPIO pins if used.

Command Code (1 byte)	Parameter 1 – Direction (2 bytes C0-FF)	Parameter 2 – Function (2 bytes 00-FF)
"G"	"xx"	"xx"

Direction Parameter

These two BCD bytes respresent a bit mask to define which of the GPIO pins are inputs or outputs. Bits 0 to 5 control the GPIO pins GPIO0 to GPIO5 respectively. Bits 6 and 7 are reserved and should be set to '1'. The GPIO pin will behave as an input and when the direction bit is set to '1' and an output when set to a '0'. By default GPIO pins are inputs.

Function Parameter

These two BCD bytes control the function of the GPIO pins. Valid codes are shown below;

Function Value	GPIO5	GPIO4	GPIO3	GPIO2	GPIO1	GPIO0
06	D I/O	D I/O	D I/O	D I/O	D I/O	D I/O
0E	D I/O	D I/O	D I/O	D I/O	D I/O	ADC
0F	D I/O	D I/O	REF+	REF-	D I/O	ADC
05	D I/O	D I/O	REF+	D I/O	ADC	ADC
0D	D I/O	D I/O	REF+	REF-	ADC	ADC
0C	ADC	D I/O	REF+	REF-	ADC	ADC

03	ADC	D I/O	REF+	ADC	ADC	ADC
02	ADC	D I/O	ADC	ADC	ADC	ADC

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)
"G"	"xx"

*See Status Codes for meanings

GPIO Output

This command ouputs a bit mask to the GPIO pins device whose Index ID is provided in parameter 1. GPIO pins defined as ouputs will be set to the level provided in the parameter 2 bit mask.

Command Code (1 byte)	Parameter 1 – Index ID (2 bytes 00-1F)	Parameter 2 – Bit Mask (2 bytes 00-FF)
">"	"xx"	"xx"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)
">"	"xx"

*See Status Codes for meanings

GPIO Input

This command returns the digital level on the GPIO pins of the device whose Index ID is provided in parameter 1. Values returned for GPIO pins which are not defined as digital inputs should be disregarded.

Command Code (1 byte)	Parameter 1 – Index ID (2 bytes 00-1F)
"<"	"xx"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)	GPIO Input Bit Mask (2 bytes 0-9, A-F)
"<"	"xx"	"xx"

*See Status Codes for meanings

GPIO Measure

This command returns the analogue level of the GPIO pin defined in parameter 2 from the device whose Index ID is provided in parameter 1. Values returned for GPIO pins which are not defined as analogue inputs should be disregarded.

Command Code (1 byte)	Parameter 1 – Index ID (2 bytes 00-1F)	Parameter 2 – GPIO Pin (1 byte 0,1,2,3,5)
"$"	"xx"	"x"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)	Analogue 10 bit value (2 bytes 0x0-03ff)
"$"	"xx"	0-4096

*See Status Codes for meanings

The analgue reference for the ADC measurement depends upon the Function Parameter of the GPIO setup command.

Device Address

This command gets the device address for the device whose Index ID is provided in the parameter. This allows verification of the device address entry against the Index ID.

Command Code (1 byte)	Parameter 1 – Index ID (2 bytes 00-1F)
"I"	"xx"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)	Device Address (12 bytes 0-9, AF)
"I"	"xx"	"xxxxxxxxxxxx"

*See Status Codes for meanings

Local Address

This command gets the local device address.

Command Code (1 byte)
"K"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)	Device Address (12 bytes 0-9, AF)
"K"	"xx"	"xxxxxxxxxxxx"

*See Status Codes for meanings

Local Name

This command gets the device name from the local device .

Command Code (1 byte)
"L"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)	Device Name (0-21 byte null terminated string)
"L"	"xx"	"abcdefghijklmnopqrst" 0x00

*See Status Codes for meanings

Set Local Name

This command sets the local name.

Command Code (1 byte)	Parameter 1 – Name (1-16 byte null terminated string)
"l"	"abcdefghijklmnop"0x00

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)

"L"	"xx"

*See Status Codes for meanings

Remote Device Name

This command requests the device name from the remote device whose Index ID is provided in the parameter. The BRM attempts to make a temporary connection to the device and if successful requests its Name. This allows a friendly Name tag to be used for each remote device. It can take several seconds for the response to come back.

Command Code (1 byte)	Parameter 1 – Index ID (2 bytes 00-1F)
"N"	"xx"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)	Device Name (0-21 byte null terminated string)
"N"	"xx"	"abcdefghijklmnopqrst" 0x00

*See Status Codes for meanings

Mode

This command selects the operating mode. (TBD)

Command Code (1 byte)	Parameter 1 – Mode (1 byte)
"M"	"x"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)
"M"	"xx"

*See Status Codes for meanings

Quality

This command gets the link quality for a device connection. The link quality response resturns a hex coded string in the range '00' to 'FF'. The higher the value the better the link quality.

Command Code (1 byte)	Parameter 1 – Index ID (2 bytes 00-1F)
"Q"	"xx"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)	Link Quality (2 bytes 0-9, A-F)
"Q"	"xx"	"xx"

*See Status Codes for meanings

Reset

This command performs a power-on-reset on the local BRM.

Command Code (1 byte)
"R"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)

"R"	"xx"

*See Status Codes for meanings

Connect Voice Device

This command requests an immediate voice and data connection to the device whose Index ID is provided in the parameter. This command is valid for a voice enabled remote device with external CODEC. First a standard data connection is attempted. If this is successful a voice connection is added. This provides a full duplex 64kb/s voice link with CVSD encoding over the air.

Command Code (1 byte)	Parameter 1 – Index ID (2 bytes 00-1F)
"V"	"xx"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)
"V"	"xx"

*See Status Codes for meanings

Sleep

This command puts the local BRM into sleep mode in order to reduce power consumption to a minimum. The BRM may be woken by sending a command at any time.

Command Code (1 byte)	Parameter 1 – Index ID (2 bytes 00-1F)
"Z"	"xx"

Response Code (1 byte)	Status Code * (2 bytes 0-9, A-F)
"V"	"xx"

*See Status Codes for meanings

Status Codes

Below is the list of possible response status codes

Response Code	Meaning
00	Command Completed Successfully
01	Unknown Command
02	No Connection
03	General Failure
04	Connection Request Failed
05	Authentication Failed
08	Connection Failed
09	No More Connections Allowed
0B	Already Connected
10	Remote Device Failed To Respond
11	Invalid Feature
12	Invalid Parameter
13	Remote Device Ended Connection
15	Remote Device Is About To Power Off
16	Connection Ended By Local Host

Response Code	Meaning
1F	Unspecified Error