

# **RINGDALE USB (UNIVERSAL SERIAL BUS) HID RELAY CONTROLLER (1543)**

## **TECHNICAL REFERENCE MANUAL**

**Rev 1.0  
April 2006**

© Copyright 2006  
Ringdale, Inc.

Printed in the United States of America

## NOTE

Information in this document is subject to change without notice. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, without the express written permission of Ringdale, Inc. Ringdale is a registered trademark of Ringdale, Inc

USB (Universal Serial Bus) Specification is Copyright<sup>©</sup> 1998 by Compaq Computer Corporation, Intel Corporation, Microsoft Corporation, NEC Corporation

## USB COMMUNICATIONS

This device conforms to the USB specification revision 2.0. This device also conforms with the Human Interface Device (HID) class specification version 1.1. The device communicates to the host as a vendor defined HID device. The details about how the relay status and commands are structured into HID reports follow later in this section.

It is strongly recommended that application software developers become familiar with the HID specification and the USB specification before attempting to communicate with this device. This document assumes that the reader is familiar with these specifications. These specifications can be downloaded free from [www.usb.org](http://www.usb.org)

This is a full speed USB device. This device has a number of programmable configuration properties. These properties are stored in non-volatile EEPROM memory. These properties can be configured at the factory or by the end user. More details about these properties can be found later in this document in the command section.

The device does not support remote wakeup.

This device is powered from the USB bus. Its vendor ID is 0x0801 and its product ID is 0x008C

### DEVICE DESCRIPTOR

Item	Value(Hex)
bLength	12
bDescriptorType = Device	01
bcdUSB = version 2.0	0200
bDeviceClass = in Interface Descriptor	00
bDeviceSubClass	00
bDeviceProtocol	00
bMaxPacketSize	08
idVendor	0801
idProduct	008C
bcdDevice = 1.00	0100
iManufacturer	01
iProduct	02
iSerialNumber	00
bNumConfigurations	01

The Ringdale HID Relay Controller uses 3 endpoints:

Control Endpoint 0

1 IN (to host) interrupt endpoint – 0x81

1 OUT (from host) interrupt endpoint – 0x02

## CONFIGURATION DESCRIPTOR

Item	Value (Hex)
bLength	09
bDescriptorType = Configuration	02
wTotalLength	0029
bNumInterfaces	01
bConfigurationValue	01
iConfiguration	00
bmAttributes	80
bMaxPower	41
bLength	09
bDescriptorType = Interface	04
bInterfaceNumber	00
bAlternateSetting	00
bNumberEndpoints	02
bInterfaceClass	03
bInterfaceSubClass	00
bInterfaceProtocol	00
iInterface	00
bLength	09
bDescriptorType = HID	21
HID Class Spec release 1.11	0111
Target Country	00
No. of HID Class Descriptors	01
Report Descriptor Type	22
wDescriptorLength	21
bLength	07
bDescriptorType = Endpoint	05
bEndpointAddress	81
bmAttributes = Interrupt	03
wMaxPacketSize	08
bInterval	14
bLength	07
bDescriptorType = Endpoint	05
bEndpointAddress	02
bmAttributes = Interrupt	03
wMaxPacketSize	08
bInterval	14

## HID USAGES

HID devices send data in reports. Elements of data in a report are identified by unique identifiers called usages. The structure of the device's reports and the device's capabilities are reported to the host in a report descriptor. The host usually gets the report descriptor only once, right after the device is plugged in. The report descriptor usages identify the devices capabilities and report structures. For example, a device could be identified as a keyboard by analyzing the device's report descriptor. Usages are four byte integers. The most significant two bytes are called the usage page and the least significant two bytes are called usage IDs. Usages that are related can share a common usage page. Usages can be standardized or they can be vendor defined. Standardized usages such as usages for mice and keyboards can be found in the HID Usage Tables document and can be downloaded free at [www.usb.org](http://www.usb.org). Vendor defined usages must have a usage page in the range 0xff00 – 0xffff. All usages for this device use vendor defined relay controller usage page 0xff00.

The usage IDs for this device are defined in the following table. The usage types are also listed. These usage types are defined in the HID Usage Tables document.

Relay Controller usage page 0xff00:

Usage ID (Hex)	Usage Name	Usage Type	Report Type
1	Relay Controller device	Collection	None
1	Status	Data	Input
2	Operational commands	Data	Output
3	Configuration message	Data	Feature

## REPORT DESCRIPTOR

The HID report descriptor is structured as follows:

Item	Value (Hex)
Usage Page (Relay Controller)	06 00 FF
Usage (Relay Controller device)	09 01
Collection (Application)	A1 01
<b>Globals</b>	
Logical Minimum (0)	15 00
Logical Maximum (255)	26 FF 00
Report Size (8)	75 08
<b>Input Report</b>	
Usage (Status)	09 01
Report Count (8)	95 08
Input (Data, Variable, Absolute, Bitfield)	81 02

<b>Output Report</b>	
Usage (Operational commands)	09 02
Report Count (8)	95 08
Output (Data, Variable, Absolute, Bitfield)	91 02
<b>Feature Report</b>	
Usage (Configuration message)	09 03
Report Count (8)	95 08
Feature (Data, Variable, Absolute, Bitfield)	B1 02
End Collection	C0

## **CONTROL COMMANDS**

Relay configuration data is read /set using the Feature Report via the Control Pipe (Endpoint 0)

Write = Set relay configuration

Read = Get relay configuration

```
cmd  0x00 = reply (to read config request)
data: byte  reserved1;
      byte  configbits;
      byte  reserved2;
      32bit duration;           // in 1/20 sec increments
```

```
cmd  0x01 = set config
data: byte  reserved1;           // write 0
      byte  configbits;
      byte  reserved2;           // write 0
      32bit duration;           // in 1/20 sec increments
```

configbits:

```
bit  7 Dev2    0=No SPP    1=SPP (side pressure pulsing)
      6 Dev1    0=No SPP    1=SPP (side pressure pulsing)
      5 Dev1    0=Pulsed    1=Standard
      4 Dev1    0=PTO Fail-Closed
                        1=PTC Fail-Open
      3 Dev2    0=Bolt      1=Strike
      2 Dev1    0=Bolt      1=Strike
      1 Dev2    0=PTO Fail-Closed
                        1=PTC Fail-Open
      0 Dev2    0=Pulsed    1=Standard
```

The configbits parameter is also used in various other Ringdale products. This device uses the same parameter to maintain compatibility with software that can control multiple devices. Only bit 4 is significant in this device. Please note that Power To Open / Fail Closed and Power To Close / Fail Open are better achieved using the two relay wiring options, thus this value can be left at default 0x2D.

## **STATUS REPORT**

A status report is an 8 byte report received by the host on the Input interrupt endpoint whenever the device changes state. When the host requests an interrupt packet and no status change report is pending, the unit will respond with a NAK reply. A status report can be made pending by the host by using the operational command RequestStatus.

Status report:

```
byte  open;  
byte  alarm;  
byte  padding[6];
```

The open parameter will have a value of 1 or 0. A 1 indicates that the relay is powered open.

The alarm parameter is reserved for future development.

## **OPERATIONAL COMMANDS**

Operation Command report:

```
byte  cmd;  
byte  data[7];
```

### OpenRelay

cmd = 0x01

parameters:

none

The relay is activated and the duration timer started.

### CloseRelay

cmd = 0x02

parameters:

none

The relay is de-activated and the duration timer dismissed.

### OpenRelayDuration

cmd = 0x03

parameters:

```
byte  padding;  
32bit duration;           // in 1/20 second increments
```

The relay is activated and the duration timer started. However, the configured duration is overridden with the supplied duration. This command is useful to open the relay “indefinitely” by setting the duration parameter to a large value.

RequestStatus

cmd = 0x04

parameters:

none

The device will respond to the next In interrupt pipe request with a status report.