

The MDB2USB™ User's Guide

Version 1.00

Multi-Drop Bus (MDB) to Interface

Upstate Networks Inc.
1001 Broad Street
Utica, New York 13501 USA

TELEPHONE: (315) 732-5664
E-MAIL: info@upstatenetworks.com
WWW: www.upstatenetworks.com

OVERVIEW	5
LICENSE.....	6
QUICK START	8
HARDWARE INSTALLATION.....	8
HARDWARE SPECIFICS.....	8
.....	8
<i>Table 2 - LED Functions.....</i>	9
FIGURE-2 CONNECTOR PIN OUTS.....	10
INSTALL THE MDB2USB™.....	10
SOFTWARE.....	11
OVERVIEW.....	11
TECHNICAL SUPPORT.....	16
<i>Before Contacting Technical Support</i>	16
MDB OPERATION NOTES	18
BILL VALIDATOR.....	18
BILL VALIDATOR OPERATION NOTES	19
VMC COMMANDS FOR BILL VALIDATOR.....	19
BILLS ACCEPTED	19
BILL TYPE 34H 4BYTES Y1-Y4.....	19
BILLS HELD IN ESCROW	19
BILLS IN ESCROW ACTION.....	20
STACKER STATUS.....	20
BILL VALIDATOR.....	20
MDB DATA FROM BILL VALIDATOR TO THE PC	20

MDB2USB™ RELEASE 1.00

<i>Bill Accepted</i>	20
<i>Bill Returned</i>	21
ALL VALID BILL TYPES DISABLED IN SOFTWARE	21
<i>Bill Held In Escrow</i>	21
<i>Bill forcibly Removed</i>	21
<i>Bill Validator Status</i>	21
<i>Defective Motor</i>	21
<i>Sensor Problem</i>	22
<i>Validator Busy</i>	22
<i>ROM Checksum Error</i>	22
<i>Validator Jammed</i>	22
<i>Validator was Reset</i>	22
<i>Bill Removed</i>	22
<i>Cash Box Out of Position</i>	22
<i>Unit Disabled</i>	22
<i>Invalid Escrow Request</i>	22
<i>Bill Rejected</i>	22

COIN ACCEPTOR.....23

COIN ACCEPTOR.....	24
DATA RECEIVED FROM MDB AND SENT TO THE PC.....	24
<i>Below Low Mark</i>	24
<i>Above Low Mark</i>	24
<i>Above High Mark</i>	24
<i>Coin Inserted</i>	24
<i>Coin Dispensed Manually</i>	24
<i>Coin Rejected</i>	25

MDB STATUS.....26

<i>Escrow Request</i>	26
<i>Changer Payout Busy</i>	26
<i>No Credit</i>	26
<i>Defective Tube Sensor</i>	26
<i>Double Arrival</i>	26
<i>Acceptor Unplugged</i>	26
<i>Tube Jam</i>	26
<i>ROM Checksum Error</i>	26

MDB2USB™ RELEASE 1.00

<i>Coin Routing Error</i>	26
<i>Changer Busy</i>	26
<i>Changer was Reset</i>	26
<i>Coin Jam</i>	26
<i>Coin not recognized/slug. Returned</i>	26
<i>Reset</i>	27
<i>Status</i>	27
<i>Tube Status</i>	27
<i>Poll</i>	27
<i>Coin Type</i>	27
<i>Dispense</i>	27

INDEX.....28

This page intentionally left blank.

Introduction

The latest version of MDB2USB™ User's Guide, along with technical support and information about Upstate Networks, may be found on the Upstate Networks World-Wide Web server at <http://www.upstatenetworks.com/>.

Overview

The MDB2USB™ is a Computer Peripheral for interfacing vending machine protocol used by various devices including: Dollar Bill Validators, Coin Acceptors, Coin Dispensers, Smart Cards, Foreign Currency, etc.

This describes the Interface Protocol for the MDB2USB Hardware circuit. The MDB2USB™ interfaces any MDB vending device (6-pin molex/5pin MTA) to the PC via the USB port. The MDB2USB™ protocol is compatible with standard USB Protocol.

System Requirements

MDB2USB™ requires:

- An IBM PC compatible, with 486 or better processor.
- A USB port.
- An MDB compatible vending device
- External Power supply (Typically 24VDC)
- Type A USB cable

License

MDB2USB™ and MDBLAB™ copyright ©1994-2005 by UNI. All rights reserved.

By using MDB2USB, you agree to abide by the terms of this License to the best of your ability.

MDB2USB™ is distributed free-of-charge for personal use by individuals and use by educational institutions. All others wishing to use MDB2USB™ must obtain a site license from UNI. Licensing information is available by contacting UNI.

MDB2USB™ must be distributed complete and intact without modifications whatsoever. No modifications are allowed, including BBS advertisements and modifications to the distribution .ZIP file. MDB2USB™ may be distributed on BBS's, Internet FTP sites, commercial online services, and on CD-ROM's containing public domain, freeware, and shareware programs. In the case of CD-ROM distribution, notice must be given that the disc contains shareware with an explanation of the shareware concept, such as in the distribution notices required on the SimTel and Garbo CD-ROM's.

For permission to distribute MDB2USB™ with a magazine, book, or bundled with another product contact UNI.

You agree you will not attempt to reverse compile, modify, translate, or disassemble MDB2USB™ in whole or in part and that you will make reasonable efforts to prevent anyone from doing same.

You agree that you will allow UNI to contact you for purposes of announcing new releases, bug-fixes, and other technical and business information.

UNI warrants that MDB2USB™ will perform substantially for a period of sixty (60) days from the date of license. Any implied warranties relating to MDB2USB™ are limited to sixty (60) days.

If MDB2USB™ does not conform to the limited warranty above, UNI's entire liability and your sole and exclusive remedy shall be, at UNI's option, either to (a) correct the error or (a) help you work around or avoid the error. The limited warranty is void if failure of MDB2USB™ is due to accident, abuse, or misapplication, including use of MDB2USB™ with beta-test or non-compliant operating systems and software. Any replacement will be warranted for the remainder of the original limited warranty period.

UNI does not warrant that MDB2USB™ is error-free. Except for the express limited warranty above, UNI disclaims all other warranties with respect to the software, either express or implied, including but not limited to implied warranties of merchantability, fitness for a particular purpose, and noninfringement of third-party rights.

In the event of invalidity of any provision of this license, the parties agree that such invalidity shall not affect the validity of the remaining portions of this license.

In no event shall UNI be liable for consequential, incidental or indirect damages of any kind arising out of the delivery, performance or use of the software, even if UNI has been advised of the possibility of such damages. In no event will UNI's liability for any claim, whether in contract, tort or any other theory of liability, exceed the license fee paid for MDB2USB, if any.

The laws of the State of New York will govern this license as they are applied to agreements between New York residents entered into and to be performed entirely within New York. The United Nations Convention on Contracts for the International Sale of Goods is specifically disclaimed.

If MDB2USB™ is acquired (i) for use by the DOD, use, duplication or disclosure by the Government is subject to the terms of this license unless superseded by 252.227-7013(c)(1)(ii) or (ii) for use by civilian agencies, use, reproduction, or disclosure is subject to the terms of this license unless superseded by 52.227-19.

The MDB2USB™ *User Guide* makes reference to a number of copyrighted and trademarked products. Rather than point out each one individually, we will note here that they are copyrighted and trademarked by their respective holders.

Upstate Networks Inc
1001 Broad Street
Utica, New York 13501 USA
TEL: (315) 732-5664
E-MAIL: info@upstatenetworks.com

Quick Start

Install the MDB2usb™ on a free USB port.

Connect 24Vdc power and MDB connections (6-pin Molex). Apply power. Check for LED1 (Green) indicating power is OK.

Install and run **HIDCOMM_B.EXE AND SETUP.EXE** from the MDB2USB directory on Disk or CD-ROM provided. Insert different dollar bill denominations, coins OR magnetic swipe, etc. and check to see that they register in the MDB2USB™ or MDBlab program. If all currency is registered the HARDWARE INSTALLATION is complete. Proceed to SOFTWARE DEVELOPERS KIT.

Hardware Installation

Hardware Specifics

SPECIFICATIONS

Power requirements

24 to 35 Vdc

90 ma Typical

300 ma Maximum

Environmental

Operating Temp 32°F to 158°F

0°C to 70°C

Storage Temp -22°F to 165°F

-30°C to 74°C

Relative Humidity 5% to 95% Non-condensing

Physical Weight

< 1 lb

Physical Dimensions

Length 4.0 inches Width 3.0 inches Height 1.1 inches

Connector Info

MDB Pin 1 +24Vdc Nominal

Pin 2 Ground

Pin 3 N/C

Pin 4 MDB Receive Data

Pin 5 MDB Transmit Data

Pin 6 Common

Table 1 - Jumper functions

LED DESIGNATION	INDICATION
D1	+5 VDC
D2	TRANSMIT TO MDB
D3	TRANSMIT TO PC

Table 2 - LED Functions

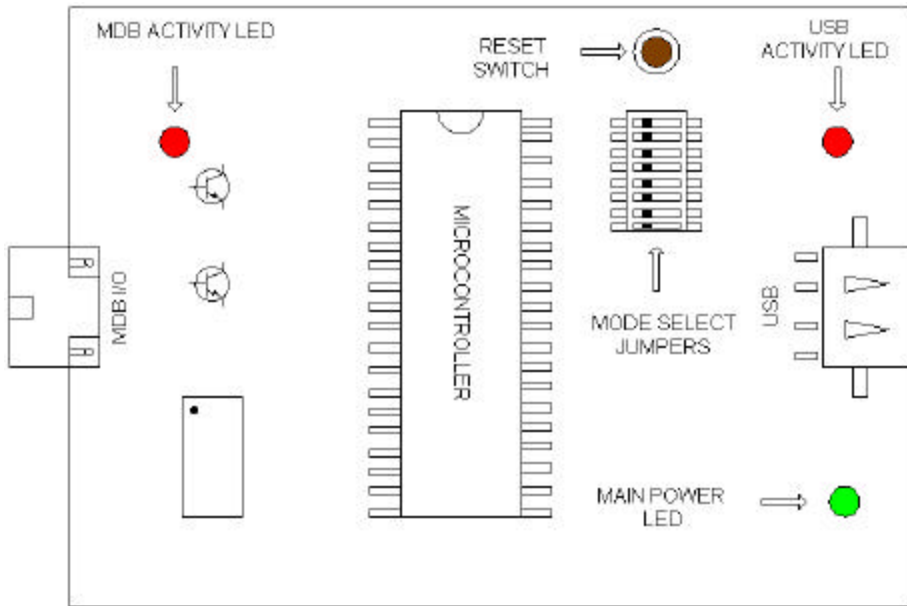


Figure-2 Connector Pin Outs

Install the MDB2USB™

It is time to install the MDB2USB™ itself and move on to the testing phase. Installation is relatively simple; there are only three connections that must be made for full functioning of the device. There are connectors on the edge of the board. One cable plugs into a 24VDC power supply. The 6-pin Molex connects to the MDB devices. The final connector is a DB-9 and connects into the back of the computer. There should be an open port on the back of the computer labeled “USB”

Software

Overview

```

*****
*
*
*
*           MDB2USB Demonstration Software V1.0
*
*
*   (c) Upstate Networks Inc
*
*   1001 Broad Street Utica, NY 13501 USA
*
*   (315) 732-5664  info@upstatenetworks.com
*
*   http://www.upstatenetworks.com/mdb2usb
*
*
*   Description
*
*   This program demonstrates transmit and received to and from
*
*   a MDB device using USB.  The MDB protocol is used for
payment*
*   systems such as coinc mechs bill acceptors and card readers
*
*
*   This application requires HIDcomm.oxc, the API for the USB
*
*   written by Microchip.
*
*
*   The top row of text are the transmit bytes and the bottom
*
*   row are the receive byte.  Any data can be put in the send
*
*   box and sent pressing the "send" button.
*

```

MDB2USB™ RELEASE 1.00

```
*****
*
Private Sub Command2_Click()
    Dim buffer() As Byte
    ReDim buffer(8)
    Command2.Enabled = True
received
    'On Error Resume Next
in
    'DISPENSE QUARTER
    'define buffer to use for data
    'send 8 bytes at a time
    'disable send button until result
    'trap errors if non numeric data
    'text box, or textbox empty

    buffer(0) = 3
*****
    buffer(1) = 15
    buffer(2) = 2
    buffer(3) = 5
    buffer(4) = 0
    buffer(5) = 0
    buffer(6) = 0
    buffer(7) = 0
*****
HIDComm1.WriteTo buffer(), 8
    'write data to MDB2USB

    Text1.Text = buffer(0)
***** Update display
*****
    Text2.Text = buffer(1)
    Text3.Text = buffer(2)
    Text4.Text = buffer(3)
    Text5.Text = buffer(4)
    Text6.Text = buffer(5)
    Text7.Text = buffer(6)
    Text8.Text = buffer(7)

End Sub

Private Sub Command1_Click()
    Dim buffer() As Byte
    ReDim buffer(8)
    'On Error Resume Next
    'trap errors if non numeric data
in
    'DISPENSE NICKEL
    'define buffer to use for data
    'send 8 bytes at a time
    'trap errors if non numeric data
```

MDB2USB™ RELEASE 1.00

```
Command1.Enabled = True
received
    'text box, or textbox empty
    'disable send button until result
    buffer(0) = 3
*****
    buffer(1) = 15
    buffer(2) = 2
    buffer(3) = 1
    buffer(4) = 0
    buffer(5) = 0
    buffer(6) = 0
    buffer(7) = 0
*****
HIDComm1.WriteTo buffer(), 8
    'write data to MDB2USB

    Text1.Text = buffer(0)
***** Update display
*****
    Text2.Text = buffer(1)
    Text3.Text = buffer(2)
    Text4.Text = buffer(3)
    Text5.Text = buffer(4)
    Text6.Text = buffer(5)
    Text7.Text = buffer(6)
    Text8.Text = buffer(7)

End Sub

Private Sub Command3_Click()
    Dim buffer() As Byte
    ReDim buffer(8)
    'On Error Resume Next
in
    'SEND BUTTON
    'define buffer to use for data
    'send 8 bytes at a time
    'trap errors if non numeric data
    'text box, or textbox empty

    buffer(0) = Text1.Text
*****
    buffer(1) = Text2.Text
    buffer(2) = Text3.Text
    buffer(3) = Text4.Text
    buffer(4) = Text5.Text
    buffer(5) = Text6.Text
    buffer(6) = Text7.Text
*****
    'Send content of text boxes
    'to the MDB2USB
    'Put your transmit string here
```

MDB2USB™ RELEASE 1.00

```
buffer(7) = Text8.Text
'*****

HIDComm1.WriteTo buffer(), 8      'write data to MDB2USB

End Sub

Private Sub End_Click()
    HIDComm1.Uninit                'disconnect from the USB device
as prgoram ends
    End
End Sub

Private Sub Form_Load()
    HIDComm1.Connect              'connect to the USB device as the
program starts
End Sub

Private Sub Form_Terminate()
    HIDComm1.Uninit              'disconnect from the USB device
as prgoram ends
End Sub

Private Sub HIDComm1_ConnectSuccess(ByVal Status As Long)

    Command1.Enabled = True      'enable button when device is
connected
    Command2.Enabled = True      'enable button when device is
connected
    Caption = "MDB2USB - Connected to MDB2USB HID Device"
    End Sub

Private Sub HIDComm1_Disconnected(ByVal Status As Long)

    Command1.Enabled = False      'disable button when device
unplugged
    Command2.Enabled = False      'disable button when device
unplugged
    Caption = "MDB2USB - Looking for MDB2USB HID Device"
    End Sub

Private Sub Timer1_Timer()
    'try and reconnect PIC
Dim buffer() As Byte            'define buffer to use for data
ReDim buffer(8)                'send 8 bytes at a time
```

MDB2USB™ RELEASE 1.00

```
If HIDComm1.Connected = False Then
    HIDComm1.Connect
End If
End Sub

Private Sub Timer2_Timer()
'***** READ MDB2USB *****
'** Timer set for 1mSec **
Dim buffer() As Byte          'define buffer to use for data
ReDim buffer(8)              'send 8 bytes at a time

    buffer(0) = 0              'Clear all buffers
    buffer(1) = 0
    buffer(2) = 0
    buffer(3) = 0
    buffer(4) = 0
    buffer(5) = 0
    buffer(6) = 0
    buffer(7) = 0

    buffer() = HIDComm1.ReadFrom(8) 'Read MDB2USB

    If buffer(0) = 0 Then Exit Sub 'No Data received --> EXIT

    Text9.Text = Chr((buffer(0))) 'Display data Received
    Text10.Text = Chr((buffer(1))) '*****
    Text11.Text = Chr((buffer(2))) '*'
    Text12.Text = Chr((buffer(3))) '* RECEIVE DATA HERE
    Text13.Text = Chr((buffer(4))) '*'
    Text14.Text = Chr((buffer(5))) '*'
    Text15.Text = Chr((buffer(6))) '*'
    Text16.Text = Chr((buffer(7))) '*****

End Sub
'*****
'* END END END END END END END END END END END **
'*****
```


Technical Support

UNI offers technical support for MDB2USB™ primarily by e-mail and at <http://www.upstatenetworks.com>

Please read this manual thoroughly before contacting UNI.

Technical support is available via e-mail 24-hours-a-day, 7-days-a-week at tech@upstatenetworks.com.



Priority support will be given to people who have followed the instructions in the *Before Contacting Technical Support* section below.

Before Contacting Technical Support

When contacting technical support with a question, please have the following information available or enclosed with your e-mail:

- Your name, e-mail address, fax and telephone number
- MDB2USB™ serial number (Located on the packaging material)
- A detailed description of the problem you are experiencing
- Computer software type (operating system name and version, brand and version of other network drivers, video driver settings, plus the name and version of any device drivers or other memory-resident programs)

- Computer hardware type (type and make of CPU, RAM, hard disk type and size, video and network cards installed plus any other unusual cards)

MDB Operation Notes

BILL VALIDATOR

Bills Accepted (Byte 1)

1yyyxxxx yyy = Bill Routing
 000 = Bill Stacked
 001 = Escrow Request
 010 = Bill Returned
 011 = Not Used
 100 = Disabled Bill Rejected
 xxxxx = Bill Type

The **bill types** are:

Type 0 = \$1	Type 2 = \$5	Type 4 = \$20
Type 1 = \$2	Type 3 = \$10	

The bill type number is also the same as the bit # that must be set in order to enable the acceptance of the bill itself. Ex. Set bit 3 to enable acceptance of a \$10.

When all of the DIP switches on the BV are set to NOT accept any type of bill, the validator's default is to accept one dollar bills.

The software should have all of the bill types enabled; this will allow the user to set which type of bills to be accepted on the validator itself.

Bill Validator Operation Notes

- Firmware sets Bill Validator to accept 1, 2, 5, 10, 20 US bills by default
- Any commands to changed bills accepted or held in escrow will be set back to the firmware defaults upon a cycling of power or reset.

VMC Commands for Bill Validator

US Bills – Bit 0 = \$1 Bit 3 = \$5 Bit 5 = \$20
 Bit 1 = \$2 Bit 4 = \$10

Bills Accepted

Bill Type 34h 4bytes Y1-Y4

Bill's Accepted

Y1-Y2 = 001Fh for all US bills accepted
 = 0000h accept no bill's

Bills held in Escrow

Y3-Y4 = 001Fh for all US bills held in escrow
 = 0000h for no bill's held in escrow

Send out 34h and then the 4 bytes Y1 - Y4 to change bill's accepted and held in escrow.

MDB2USB™ RELEASE 1.00

Bills In Escrow Action

Escrow 35h 1byte Y1
 Return bill Y1 = 00h
 Stack bill Y1 = 01h

Send 35h and then Y1 to act on bill held in escrow

Stacker Status

Stacker 36h response Z1-Z2

Byte1 Byte2
 Fxxxxxxx xxxxxxxx

F=1 Stacker Full

Xxxxxxxxxxxxxx = Number of bill's in stacker

Send out a 36h to the Bill Validator—It will respond with 2 bytes Z1-Z2

BILL VALIDATOR	
All values are in hexadecimal	<i>MDB data from Bill Validator to the PC</i>
Bill Accepted	
\$1	30 80 09
\$2	30 81 09
\$5	30 82 09
\$10	30 83 09
\$20	30 84 09

MDB2USB™ RELEASE 1.00

Bill Returned	<i>All valid bill types disabled in software</i>
\$1	30 C0 09
\$2	30 C1 09
\$5	30 C2 09
\$10	30 C3 09
\$20	30 C4 09
Bill Held In Escrow	
\$1	30 90 09
\$2	30 91 09
\$5	30 92 09
\$10	30 93 09
\$20	30 94 09
Bill forcibly Removed	
\$1	30 A1 09
\$2	30 A2 09
\$5	30 A3 09
\$10	30 A4 09
\$20	30 A5 09
Bill Validator Status	
01	Defective Motor

02	Sensor Problem
03	Validator Busy
04	ROM Checksum Error
05	Validator Jammed
06	Validator was Reset
07	Bill Removed
08	Cash Box Out of Position
09	Unit Disabled
0A	Invalid Escrow Request
0B	Bill Rejected
010xxxxxx	Number of attempts to input a bill while validator is disabled
14	Bill not accepted either because the bill type is not enabled in the software or the bill was not recognized.

Coin Acceptor

Coins Deposited: (Byte 1) (Byte 2)

01yyxxxx yy = Coin Routing zzzzzzzz = The number of coins in the tube for the type accepted.
 00: Cash Box
 01: Tubes
 10: Not Used
 11: Reject
 xxxx = Coin Type

Coins Dispensed Manually (Byte 2)

1yyyxxxx yyy = # of coins dispensed zzzzzzzz = Same as above.
 xxxx = The coin type dispensed

The coin types are:

Type 0 = 5c Type 2 = 25c Type 5 = \$2 Can.
 Type 1 = 10c Type 4 = \$1 Can.

Note: The type of the coin is the same as the bit that needs to be set in the 'mdbCointype' routine in order to enable the acceptance, or distribution of that coin.

MDB2USB™ RELEASE 1.00

COIN ACCEPTOR

All values are in hex.

DATA RECEIVED FROM MDB AND SENT TO THE PC

Below Low Mark	Above Low Mark	Above High Mark
----------------	----------------	-----------------

Coin Inserted	Below Low Mark	Above Low Mark	Above High Mark
NICKEL	08 50 00	08 50 06	08 40 4C
DIME	08 51 00	08 51 08	08 41 6B
QUARTER	08 52 00	08 52 06	08 42 4B
QUARTER (1)	08 52 00	08 52 06	08 42 15
\$1 CANADIAN*	08 44 00		
\$2 CANADIAN*	08 45 00		

* Dollar coins are routed directly to the cash box

Coin Dispensed Manually	Below Low Mark	Above Low Mark	Above High Mark
NICKEL	08 90 00	08 90 06	08 90 4C
DIME	08 91 00	08 91 08	08 91 6B
QUARTER	08 92 00	08 92 06	08 92 4B
QUARTER (1)	08 92 00	08 92 06	08 92 15

MDB2USB™ RELEASE 1.00

Coin Rejected

NICKEL	08 70 00	08 70 06	08 70 4C
DIME	08 71 00	08 71 08	08 71 6B
QUARTER	08 72 00	08 72 06	08 72 4B
QUARTER (1)	08 72 00	08 72 06	08 72 15
\$1 CANADIAN	08 74 00		
\$2 CANADIAN	08 75 00		

MDB2USB™ RELEASE 1.00

MDB STATUS	
01	Escrow Request
02	Changer Payout Busy
03	No Credit
04	Defective Tube Sensor
05	Double Arrival
06	Acceptor Unplugged
07	Tube Jam
08	ROM Checksum Error
09	Coin Routing Error
0A	Changer Busy
0B	Changer was Reset
0C	Coin Jam
21	Coin not recognized/slug. Returned.

MDB2USB™ RELEASE 1.00

Upon startup one of these values below may be sent to the PC – These are the VMC Commands.	
08	Reset
09	Status
0A	Tube Status
0B	Poll
0C	Coin Type
0D	Dispense

Index

—A—

Acceptor Unplugged, 25

—B—

Bill Rejected, 17, 21
Bill Removed, 21
BILL VALIDATOR, 17, 19

—C—

Cash Box Out of Position, 21
CashCube, 10
Changer Busy, 25
Changer Payout Busy, 25
Changer was Reset, 25
Coin, 5, 22, 23, 24, 25, 26
COIN, 22, 23
Connector, 9

—D—

Defective Motor, 20
Defective Tube Sensor, 25
Dispense, 26
Double Arrival, 25

—E—

Escrow Request, 17, 21, 25

—H—

Hardware, 5, 8

—L—

License, 6

—M—

MDB, 5, 8, 9, 10, 17, 19, 23, 25
MDB2PC, 0, 5, 6, 7, 8, 10, 15

—N—

No Credit, 25

—P—

Poll, 26
Power, 5, 8

—Q—

Quick Start, 8

—R—

Receive, 9
Reset, 21, 26
ROM Checksum Error, 21, 25

—S—

Sensor Problem, 21
Software, 11
Status, 20, 26
System Requirements, 5

—T—

Technical Support, 15
Transmit, 9

Tube Jam, 25

—U—

Unit Disabled, 21
Upstate Networks Inc, 7
USB, 0

—V—

Validator, 18, 19, 20, 21