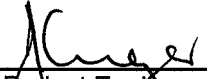

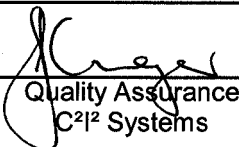


**User Manual**  
for the  
**High-Speed Serial I/O Adapter**  
**Windows NT 4 Software Driver**

<b>C<sup>2</sup>I<sup>2</sup> Systems Document No.</b>	CCII/HSS/6-MAN/004
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## Abbreviations and Acronyms

API	Application Program Interface
bit/s	Bits per second
BRG	Baud Rate Generator
C <sup>2</sup> I <sup>2</sup>	CCII Systems (Pty) Ltd
HDD	Hard Disk Drive
HSS	High-Speed Serial
I/O	Input / Output
PC	Personal Computer
PCI	Peripheral Component Interconnect
PMC	Peripheral Component Interconnect Mezzanine Card
PnP	Plug and Play
RX	Receive
SBC	Single Board Computer
SCC	Serial Communications Controller
SDK	Software Development Kit
SIO	Serial Input / Output
SMC	Serial Management Controller
TX	Transmit
WDM	Windows Driver Model
WMI	Windows Management Instrumentation

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1. **Scope**

1.1 Identification

This document is the User Manual for the C<sup>2</sup>I<sup>2</sup> System High-Speed Serial (HSS) Windows NT 4 Software Driver.

1.2 Introduction

The HSS Windows NT 4 Software Driver is a low level, device-dependant interface for transferring data over a HSS Input / Output (I/O) Adapter. The driver binaries are provided with explicit installation instructions.

The HSS Windows NT 4 Software Driver will also run as a legacy driver under Windows 2000, but does not support Plug and Play (PnP), Windows Management Instrumentation (WMI) or power management.

The driver software distribution consists of (at least) the following files :

hss4ntxyz.zip	An archive file containing all the files required for The HSS Windows NT 4 Software Driver installation. XYZ is the revision number for this driver release.
Setup.exe	Install wizard application extracting the following files to the desired locations.
hss4wnt.sys	HSS 4 Channel Device Driver.
hss4port.cpl	Control Panel Applet.
flashprog.exe	Flash update application.
hssReadme.txt	General information.
hssRelease_notes.txt	Release notes and revision history. Please check this file for information on the latest updates.

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2. **Applicable and Reference Documents**

2.1 Applicable Documents

2.1.1 Motorola, *MPC8260 PowerQUICC Family Reference Manual*, MPC8260UM/D Rev. 1, dated May 2003, <http://e-www.motorola.com>.

2.1.2 DI-IPSC-81443, *Data Item Description for a Software User Manual*.

2.1.3 MSDN Communication Resources, [http://msdn.microsoft.com/en-us/library/aa363196\(VS.85\).aspx](http://msdn.microsoft.com/en-us/library/aa363196(VS.85).aspx).

2.2 Reference Documents

None.

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### 3. Configuration Procedure

This paragraph describes the installation procedure for the HSS Windows NT 4 Software Driver.

#### 3.1 Installing The HSS Windows NT 4 Software Driver Files

Unzip the file "hss4ntxyz.zip" to any suitable folder on your local personal Computer (PC) Hard Disk Drive (HDD). You must have administrative privileges on the PC. Run the application "Setup.exe" (Figure 1). All the driver files will be extracted to the required locations, i.e. the device driver file will be stored in "WINNT\system32\drivers", the control panel applet in "WINNT\system32" and the flash update application in "Program Files\C2I2Systems\SIO4Port".

As this is not a Windows Driver Model (WDM) driver, Windows 2000 will report device conflicts between the driver and a "Unknown PCI bridge" device. This is due to the HSS Windows NT 4 Software Driver not supporting PnP. This reported conflict will not affect the performance of the driver under Windows 2000.



Figure 1 : Installation Wizard

#### 3.2 Uninstalling The HSS Windows NT 4 Software Driver

In the Start menu, select Control Panel from the Settings menu. Click on "Add/Remove Programs". Select the "C2I2 SIO 4 Port Driver" from the list and click the Remove button. Answer yes to delete all files from the HDD.

#### 3.3 Updating the Device Firmware

Always ensure that when a new driver is installed, the corresponding firmware revision on the device is identical. There might be incompatibilities between different device driver and firmware versions. The Engine version reported by the control panel applet must match the firmware version of all devices in the system.

The flash update application is located in the "SIO4Port" folder. Before running the application, ensure that all channels on the device are closed. The firmware images are located on the supplied CD-ROM or the C2I2 Systems website.

Warning : Do not remove the power from the PC until the flash programming is completed.

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The syntax for the application is as follows :

**Flashprog.exe # [b s u] filename**

- #** The channel number residing on the device which will be updated.<sup>1</sup>
- b** The filename following this flag is a binary image.<sup>2</sup>
- s** The filename following this flag is a Motorola S-record file.<sup>2</sup>
- u** No firmware updates will be done, the current firmware image will be stored in filename.

Inspect the HSS I/O Adapter and find the oscillator module. This is a silver can about 1 cm x 1 cm (0.4" x 0.4") in size. The oscillator frequency is marked on the can. On most adapters, including the HSS Frontpanel I/O Adapter, it will be 39.3216. Use the corresponding S-record file matching your oscillator frequency.

The S-record filename will be

- ccHss4vx.y.z-39.3216.hex (39.3216 MHz oscillator on HSS I/O Adapter)
- ccHss4vx.y.z-39.9360.hex (39.9360 MHz oscillator on HSS I/O Adapter)
- ccHss4vx.y.z-40.0000.hex (40.0000 MHz oscillator on HSS I/O Adapter)
- ccHss4vx.y.z-48.0000.hex (48.0000 MHz oscillator on HSS I/O Adapter)
- ccHss4vx.y.z-50.0000.hex (50.0000 MHz oscillator on HSS I/O Adapter)

Note : X.Y.Z is the version of the firmware.

### 3.4 Using the Event Viewer

The Windows administrative tool, "Event Viewer" can be used to inspect the event logs. The HSS Windows NT 4 Software Driver logs certain information and fatal errors to the event log. Refer to the event log when an operation does not function as expected.

---

<sup>1</sup> Only one channel per device must be specified.

<sup>2</sup> Whenever the firmware is updated, the current firmware will be stored in the file "ccbackup.bin". Rename this file before using the application again.

Example :

*flashprog 1 s ccHssvxyz.hex*

Will update the firmware of the first device with the S-record file ccHssvxyz.hex. Using channel number 7 will update the firmware on the second device.

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#### 4. Application Program Interface

The HSS Windows NT Software Driver complies to most of the Windows 32 Application Program Interface (API) for Serial devices. Refer to the Platform SDK in [2.1.3] for the communications resource documentation. The serial function prototypes can be found in the SDK file "winbase.h".

The device ports are named HSSx. HSS1 - HSS6 are the ports of the first device in the system, HSS7 - HSS12 are the ports of the second device.

##### 4.1 Windows SDK Serial Functions

This paragraph lists the serial functions supported by the HSS Windows NT Software Driver :

- BuildCommDCB
- BuildCommDCBAndTimeouts
- ClearCommError
- CommConfigDialog
- GetCommConfig
- GetCommMask
- GetCommProperties
- GetCommState
- GetCommTimeouts
- GetDefaultCommConfig
- PurgeComm
- SetCommConfig
- SetCommMask
- SetCommState
- SetCommTimeouts
- SetDefaultCommConfig
- SetupComm
- WaitCommEvent
- CreateFile
- ReadFile
- WriteFile
- CloseHandle

##### 4.2 Windows SDK Serial Structures

This paragraph lists the serial structures supported by the HSS Windows NT Software Driver :

- COMMCONFIG
- COMMPROP
- COMMTIMEOUTS
- COMSTAT
- DCB

##### 4.3 Function Limitations

Not all settings are supported for each serial function. This paragraph will mention all the exceptions.

###### 4.3.1 ClearCommError

Only CE\_FRAME and CE\_RXPARITY are supported.

###### 4.3.2 GetCommMask

Only the EV\_RXCHAR event mask is supported.

###### 4.3.3 SetCommMask

Only the EV\_RXCHAR event mask is supported.

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#### 4.3.4 WaitCommEvent

Only the EV\_RX\_CHAR event mask is supported.

#### 4.3.5 Overlapped Writes

When a port is opened in overlapped (non-blocking) mode, overlapped writes might not behave as expected. An overlapped read will return immediately, and the event will be signalled once data has been received. For an overlapped write the function will not return immediately. The device driver has to send the data to the adapter, where it will be transmitted. This transfer does require a finite amount of time. Changing the driver architecture to match the overlapped read operation would degrade its throughput performance on transmission.

#### 4.3.6 FlushFileBuffers

Not supported.

#### 4.4 Structure Limitations

Not all the fields of the serial structures are used by the HSS Windows NT Software Driver . This paragraph will mention all the exceptions.

##### 4.4.1 COMMCONFIG

*dwProviderSubType* :

None of the types makes provision for a device that is both RS-232 and RS-422 capable. No provider-specific data is supplied.

##### 4.4.2 COMMPROP

*dwProvSubType*, *dwProvSpec1*, *dwProvSpec2* and *wcProvChar* are not supported.

##### 4.4.3 COMMTIMEOUTS

*ReadIntervalTimeout* is not supported. The write timeout value is used by the HSS Windows NT 4 Software Driver to flush its internal transmitter queue. The internal queue is only used when one byte is transmitted at a time.

##### 4.4.4 COMSTAT

Only *cbInQue* and *cbOutQue* are supported in this structure.

##### 4.4.5 DCB

The following fields are not supported :

*fOutxDsrFlow*, *fDtrControl* , *fDsrSensitivity*, *fTXContinueOnXoff*, *fOutX*, *fInX*, *fErrorChar*, *fNull*, *fRtsControl*, *fAbortOnError*, *XonLim*, *XoffLim*, *XonChar*, *XoffChar*, *ErrorChar*, *EofChar*, *EvtChar*.

StopBits of ONE5STOPBITS is not supported by the HSS Windows NT Software Driver .

Note : The XON, XOFF flow control is not supported by the HSS Windows NT Software Driver . To use no flowcontrol, the *fOutxCtsFlow* field must be set to FALSE.

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## 5. Driver Protocol Settings

The HSS I/O Adapter has four serial communications controllers (SCC's) [Ports 1 - 4] that support UART and HDLC/SDLC protocols, and two serial management controllers (SMC's) [Ports 5 and 6] that support only asynchronous UART.

The control panel applet allows the user to set all the protocol-specific options available on the HSS I/O Adapter communication controller chip (the MPC860 PowerQUICC™). For available options for each of the fields, see [2.1.1].

This section details the information used by each protocol and explains the use and limitations of every member.

### 5.1 Protocol Selection

Each port must be configured to use a protocol and electrical interface.

#### **Protocol :**

UART  
HDLC  
BISYNC  
SMC\_UART

#### **Elec. Interface :** (only used for HSS Frontpanel I/O Adapters)

RS-485 - RS-485/422.  
RS-232 (int. control) - RS-232 : control lines (RTS, CTS, CD) are connected internally.  
RS-232 (ext. control) - RS-232 : control lines (RTS, CTS, CD) need to be connected externally.

The protocol settings for the device can be set through a control panel applet. Access the applet by clicking on the Start menu and selecting the Control Panel from the Settings option. Click on the icon shown in Figure 2.



Figure 2 : Applet Icon

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## 5.2 Using the Control Panel to Change Port Settings

The control panel applet selection boxes list available options for the specific protocols. Options that are not available for the selected protocol are grayed out. All the options (including the options in the Advanced dialogue) must be entered to create a valid protocol setting. Always click the Apply button before closing any of the dialogue windows. The settings are applied to the HSS port when it is reopened.

When “Lock Settings” is checked, all requests via the Win32 API will be ignored. Any change in baud rate or parity will then not be updated, the driver will keep the setting as specified in the control panel. When the settings are not locked, the baud rate, etc. may be updated via the Win32 API functions.

When using the HDLC or BISYNC protocols, it is recommended to use the “Lock Settings” option.

The settings are stored in the Windows registry, under the keys :

*“HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Services\SIO4P\DeviceX\PortX”*

## 5.3 Using the Control Panel to Obtain the Current Version Information

Clicking on the Information icon near the bottom of the dialogue screen will display the HSS Windows NT 4 Software Driver information dialogue shown in Figure 3.

The HSS Windows NT 4 Software Driver version is referring to the device driver itself. It has the format X.Y.Z. A change in X would indicate that the driver has an added feature. Y would mean that a new driver engine is used in the device driver. Z indicates any corrections to problems in the driver.

The Engine version must be identical to the firmware version for all adapters in the PC. Normally this would only be different when the driver version is checked after a firmware update and the driver itself has not been updated.

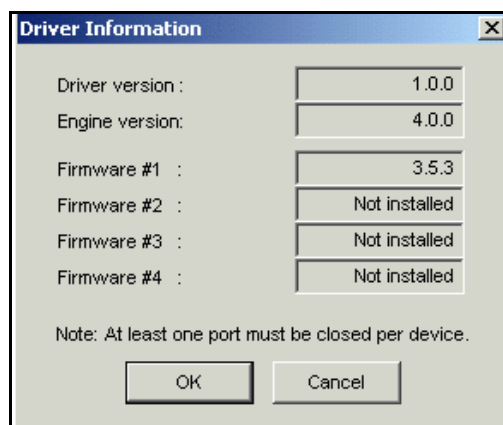


Figure 3 : Driver Information Dialogue

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5.4 UART Mode

This protocol may only be used with the four SCC ports : HSS1 - 4. The UART Dialogue window is shown in Figures 4 and 5. The settings are described in Paragraph 5.4.1.

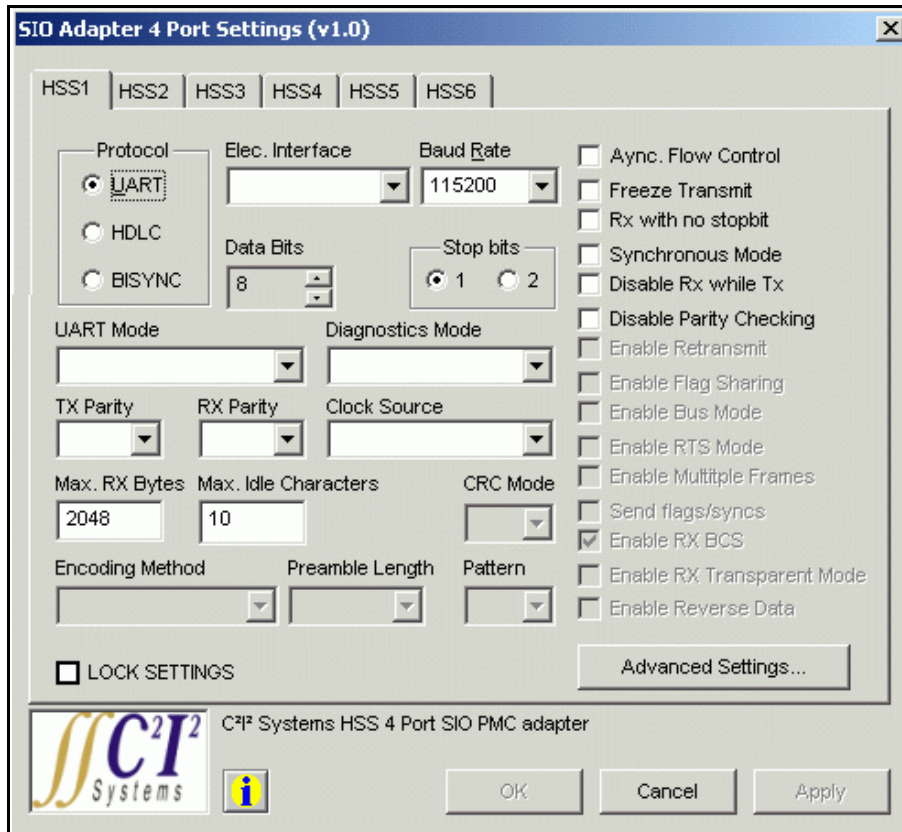


Figure 4 : UART Dialogue

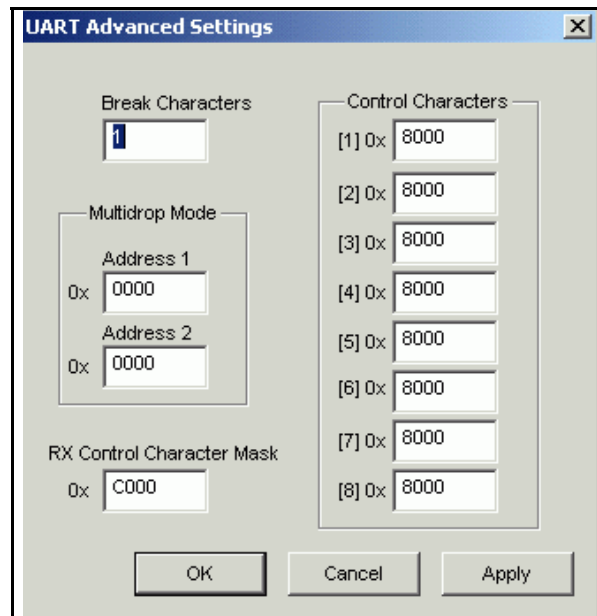


Figure 5 : UART Advanced Dialogue

5.4.1 UART Protocol Information

Name	Options		Description
Baud Rate	1 200 - 115 kbit/s (RS-232) 1 200 - 2.4 Mbit/s (RS-422/RS-485) Any values permissible.		Used to specify a single baud rate for both transmitter and receiver.
Clock Source	CLOCK_DEFAULT		CLOCK_DEFAULT connects BRGs [1 - 4] to Ports [1 - 4]. For <b>synchronous UART</b> : when transmit clock is set to CLOCK_BRG [1 - 4], then receive clock is still set to CLOCK_EXT[1-4] for Ports [1 - 4]. For <b>asynchronous UART</b> : Transmit and receive clocks can be set to one of CLOCK_BRG[1-4] or CLOCK_EXT[1-4].
	CLOCK_BRG1 CLOCK_BRG2 CLOCK_BRG3 CLOCK_BRG4	Baud Rate Generators (BRGs) [1-4].	
	CLOCK_EXT1 CLOCK_EXT2 CLOCK_EXT3 CLOCK_EXT4	External Clocks connected on Pins : RXCLK [1 - 4] (RS-232) or CLKIN [1 - 4] (RS-485 / RS-422).  Note : CLOCK_EXT[1-2] can only be used for SCC Port[1 and 2], while CLOCK_EXT[3-4] can only be used for SCC Ports [2 and 3].	
Async. Flow Control			Normal or asynchronous flow control.
Stop bits	ONE TWO		Number of full stop bits.
Data Bits	5 6 7 8		Number of data bits.
UART Mode	NORMAL MAN MM AUTO MM		Select UART mode : Normal, manual multidrop or automatic multidrop mode.
Freeze Transmit			Pause (freeze) transmission. Transmission continues when set back to normal.
RX with no stopbit			If set, the receiver receives data without stop bits.
Sync. Mode			Select asynchronous (normal) or synchronous mode.
Disable RX while TX			Enable (normal) or disable receiver while transmitting. Used in multidrop mode to prevent reception of own messages.
Disable Parity Checking			Enable or disable parity checking.
TX parity, RX parity	ODD LOW EVEN HIGH		Receive and transmit parity. Parity will only be checked if parity is enabled.

Name	Options		Description
Diagnostics Mode	NORMAL	Normal operation. Use this for <b>external loopback</b> .	Set diagnostic mode. <b>External loopback - RS-485 :</b> Connect TXD+ to RXD+, TXD- to RXD-, (TXCLK+ to RXCLK+ and TXCLK- to RXCLK- for synchronous mode). <b>External loopback - RS-232 :</b> Connect TXD to RXD, (TXCLK to RXCLK for synchronous mode) and RTS to CTS and CD. For HSS Frontpanel I/O Adapter : Program <i>elec_interface= RS232 (int.control)</i> and connect TXD to RXD, (TXCLK to RXCLK for synchronous mode). Ignore RTS, CTL and CD.
	LOOPBACK	<b>Internal loopback :</b> TXD and RXD are connected internally. The value on RXD, CTS and CD is ignored. The transmitter and receiver share the same clock source.	
	ECHO	The transmitter automatically resends received data bit-by-bit.	
	LOOPBACK_ECHO	Loopback and echo operation occur simultaneously.	
Max. RX Bytes	1 to 2 048 (default)		Maximum number of bytes that may be copied into a buffer.
Max. Idle Characters	0 to 2 048 (default)		Maximum idle characters. When a character is received, the receiver begins counting idle characters. If max_idl idle characters are received before the next data character, an idle timeout occurs and the buffer is closed. Thus, max_idl offers a way to demarcate frames. To disable the feature, clear max_idl. The bit length of an idle character is calculated as follows : 1 + data length (5-9) + 1 (if parity is used) + number of stop bits (1-2). For 8 data bits, no parity, and 1 stop bit, the character length is 10 bits.
Break Characters	0 - 2 048		Number of break characters sent by transmitter. For 8 data bits, no parity, 1 stop bit, and 1 start bit, each break character consists of 10 zero bits.
Address1, Address2	0x0000 - 0x00FF		Address in multidrop mode. Only the lower 8 bits are used so the upper 8 bits should be cleared.
Control Characters[8]	0b00-----ccccccc - Valid entry. 0b10-----ccccccc - Entry not valid and is not used.		Control character 1 to 8. These characters can be used to delimit received messages.  ----- (6 bits) - Reserved. Initialise to zero.  cccccccc (8 bits) - Defines control characters to be compared to the incoming character.
RX Control Character Mask	0b11-----00000000 - 0b11-----11111111 -	Ignore these bits when comparing incoming character. Enable comparing the incoming character to cc[n].	Receive control character mask. A one enables comparison and a zero masks it.

5.5 HDLC Mode

This protocol may only be used with the four SCC ports : HSS1 - 4. The HDLC Dialogue windows is shown in Figures 6 and 7. The settings are described in Paragraph 5.5.1.

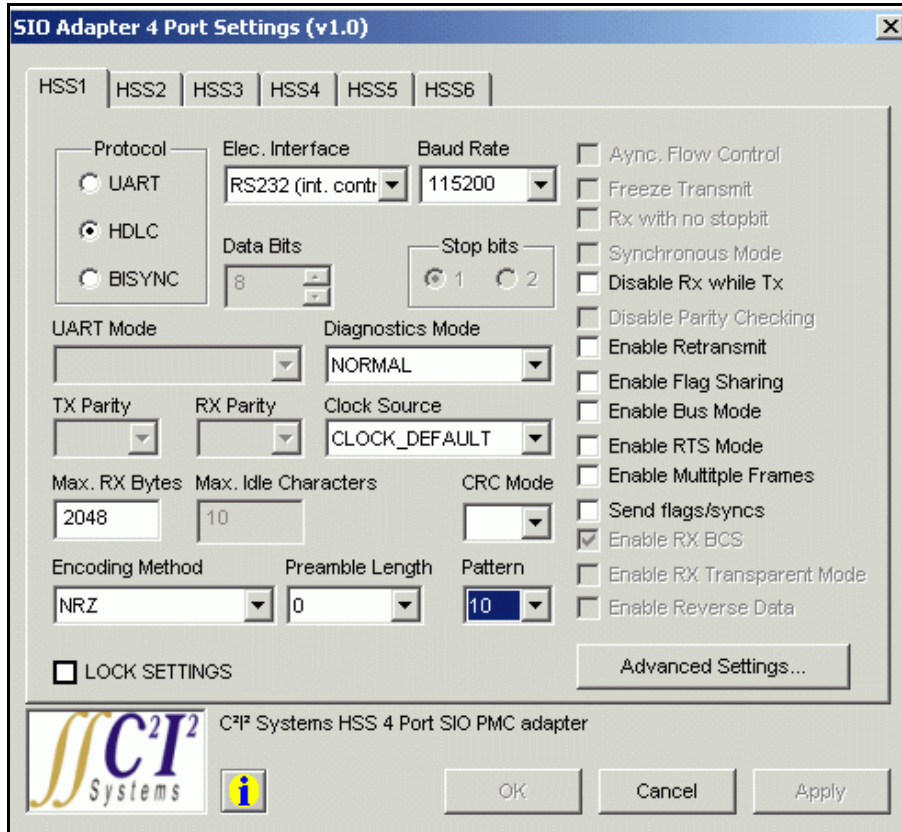


Figure 6 : HDLC Dialogue

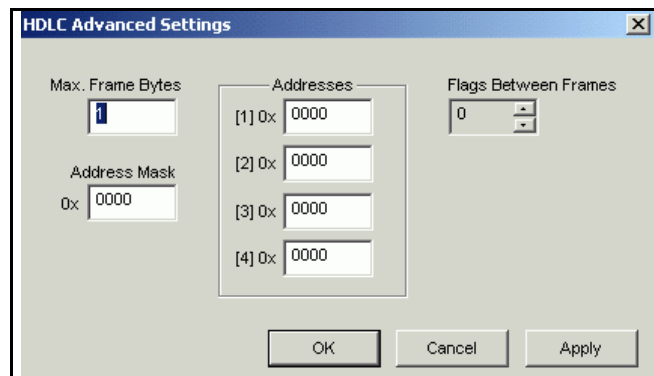


Figure 7 : HDLC Advanced Dialogue

### 5.5.1 HDLC Protocol Information Members

Name	Options		Description
Baud Rate	1 200 - 115 kbit/s (RS-232) 1 200 - 12 Mbit/s (RS-422/RS-485) Any values permissible.		
Clock Source	CLOCK_DEFAULT		CLOCK_DEFAULT connects BRGs [1 - 4] to Ports [1 - 4]. For <b>NRZ/NRZI</b> : When transmit clock is set to CLOCK_BRG[1-4], then receive clock is still set to CLOCK_EXT[1-4] for Ports [1 - 4]. For <b>FM0/1, Manchester and Diff. Manchester</b> : Transmit and receive clocks can be set to one of CLOCK_BRG[1-4] or CLOCK_EXT[1-4].
	CLOCK_BRG1 CLOCK_BRG2 CLOCK_BRG3 CLOCK_BRG4	BRGs [1-4].	
	CLOCK_EXT1 CLOCK_EXT2 CLOCK_EXT3 CLOCK_EXT4	External Clocks connected on Pins : RXCLK [1 - 4] (RS-232) or CLKIN [1 - 4] (RS-485 / RS-422).  Note : CLOCK_EXT[1-2] can only be used for SCC Ports [1 and 2], while CLOCK_EXT[3-4] can only be used for SCC Ports [3 and 4].	
CRC Mode	16-bit 32-bit		HDLC CRC mode.
Diagnostics Mode	NORMAL	Normal operation. Use this for <b>external loopback</b> .	Set diagnostic mode.  <b>External loopback - RS-485:</b> Connect TXD+ to RXD+, TXD- to RXD-, (TXCLK+ to RXCLK+ and TXCLK- to RXCLK- for synchronous mode).  <b>External loopback - RS-232:</b> Connect TXD to RXD, (TXCLK to RXCLK for synchronous mode) and RTS to CTS and CD.  For HSS Frontpanel I/O Adapter : Program <i>elec_interface=RS-232 (int. control)</i> and connect TXD to RXD, (TXCLK to RXCLK for synchronous mode). Ignore RTS, CTL and CD.  For synchronous mode : See <b>encoding_method</b> .
	LOOPBACK	<b>Internal loopback :</b> TXD and RXD are connected internally. The value on RXD, CTS and CD is ignored. The transmitter and receiver share the same clock source.	
	ECHO	The transmitter automatically resends received data bit-by-bit.	
	LOOPBACK_ECHO	Loopback and echo operation occur simultaneously.	
Max. RX Bytes	1 to (2 048 - CRC bytes (2 or 4)) (default)		Maximum number of bytes to receive before closing buffer. Set equal to max_frame_bytes.
Max. Frame Bytes	1 to 2 048 (default)		Maximum number of bytes per frame. Set equal to the number of data bytes plus the number of CRC bytes (either two or four) per frame.
Address Mask	0x0000 - 0xFFFF		HDLC address mask. A one enables comparison and a zero masks it.

Name	Options	Description
Address[4]	0x0000 - 0xFFFF	Four address registers for address recognition. The SCC reads the frame address from the HDLC receiver, compares it with the address registers, and masks the result with address_mask. For example, to recognize a frame that begins 0x7E (flag), 0x68, 0xAA, using 16-bit address recognition, the address registers should contain 0xAA68 and address_mask should contain 0xFFFF. For 8-bit addresses, clear the eight high-order address bits.
Flags between Frames	0 - 15	Minimum number of flags between or before frames.
Enable Retransmit		Enable re-transmit.
Enable Flag Sharing		Enable flag sharing.
Disable RX while TX		Disable receive during transmit.
Enable Bus Mode		Enable bus mode.
Enable RTS Mode		Enable special RTS operation in HDLC bus mode.
Enable Multiple Frames		Enable multiple frames in transmit FIFO.
Encoding Method	NRZ NRZI_MARK NRZI_SPACE FM0 FM1 MANCHESTER DIFF_MANCHESTER	RX / TX encoding method. NRZ and NRZI use no DPLL. FM0/1, Manchester and Diff_Manchester use the DPLL for clock recovery. The clock rate is 16x when the DPLL is used.
Preamble Length	0 8 16 32 48 64 128	Determines the length of the preamble pattern.
Pattern	00 10 01 11	Determines what bit pattern precedes each TX frame.
Send flags/sync		Send either idles or flags/syncs between frames as defined by the protocol. For HDLC the flag is defined as 0x7E. NRZI encoding methods may only be used with flags/syncs.

## 5.5.2 Preamble Requirements

<b>Decoding Method</b>	<b>Preamble Pattern</b>	<b>Minimum Preamble Length Required</b>
NRZI Mark	All zeros	8-bit
NRZI Space	All ones	8-bit
FM0	All ones	8-bit
FM1	All zeros	8-bit
Manchester	101010...10	8-bit
Differential Manchester	All ones	8-bit

5.6 BISYNC Mode

This protocol may only be used with the four SCC ports : HSS1 - 4. The BISYNC Dialogue windows is shown in Figures 8 and 9. The settings are described in Paragraph 5.6.1.

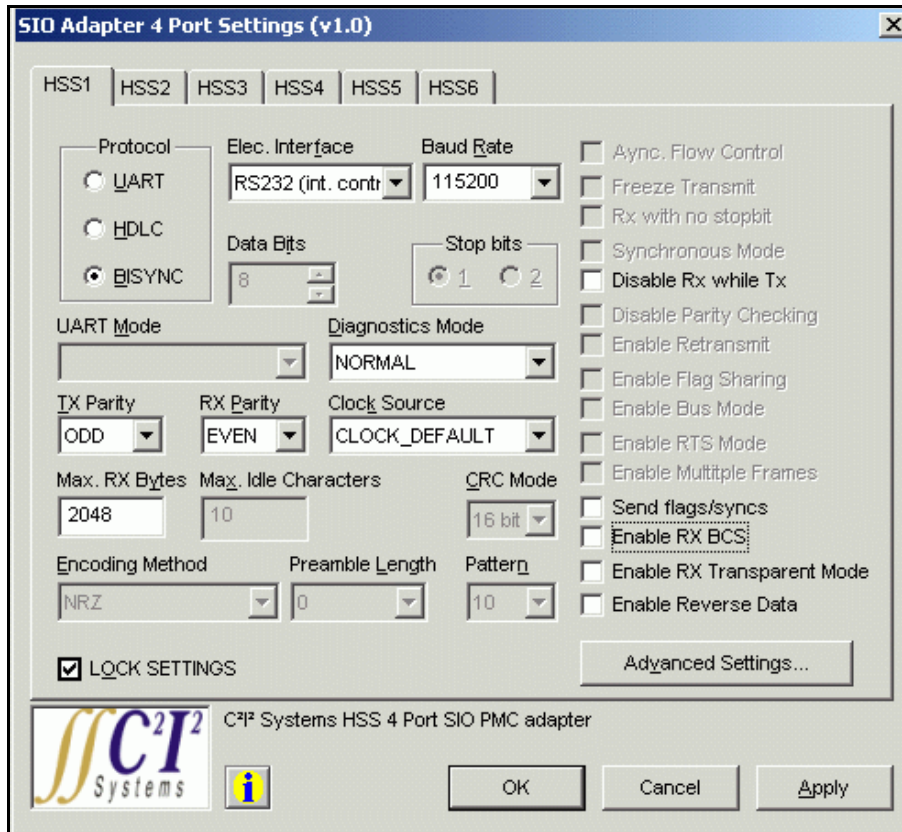


Figure 8 : BISYNC Dialogue

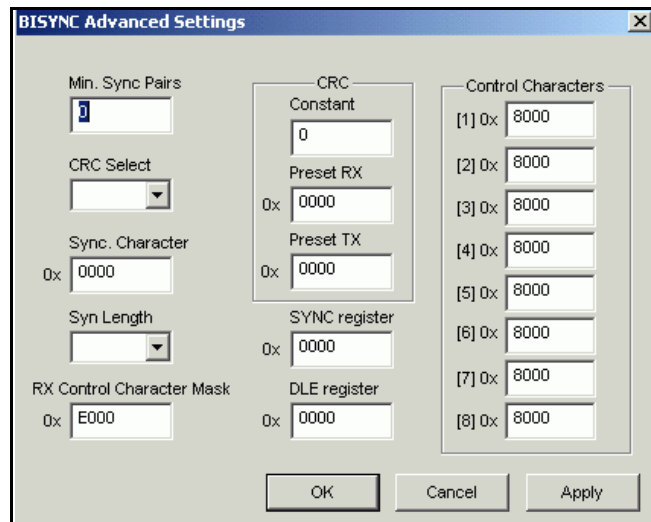


Figure 9 : BISYNC Advanced Dialogue



## 5.6.1 BISYNC Protocol Information Members

Name	Options	Description
Baud Rate	1 200 - 115 kbit/s (RS-232) 1 200 - 12 Mbit/s (RS-422/RS-485) Any values permissible.	Used to specify a single baud rate for both transmitter and receiver.
Clock Source	CLOCK_DEFAULT	CLOCK_DEFAULT connects BRGs [1 - 4] to Ports [1 - 4].
	CLOCK_BRG1 CLOCK_BRG2 CLOCK_BRG3 CLOCK_BRG4	BRGs [1-4].  When the transmit clock is set to CLOCK_BRG[1-4], then receive clock is still set to CLOCK_EXT[1-4] for Ports [1 - 4].
	CLOCK_EXT1 CLOCK_EXT2 CLOCK_EXT3 CLOCK_EXT4	External Clocks connected on Pins : RXCLK [1 - 4] (RS-232) or CLKIN [1 - 4] (RS-485 / RS-422).  Note : CLOCK_EXT[1-2] can only be used for SCC Ports [1 and 2], while CLOCK_EXT[3-4] can only be used for SCC Ports [3 and 4].
Max. RX Bytes	1 to (2 048 - 2 CRC bytes) (default)	Maximum number of bytes to receive before closing buffer.
Min. Sync Pairs	0b0000 (0 pairs) - 0b1111 (16 pairs)	Minimum number of SYN1-SYN2 pairs sent between or before messages. The entire pair is always sent, regardless of the <b>syn_length</b> variable.
CRC Select	16 LRC	CRC selection. 1. CRC16 (X16 + X15 + X2 + 1) : Initialise <b>prcrc</b> and <b>ptcrc</b> to all zeros or all ones. 2. LRC (sum check) : For even LRC, initialise <b>prcrc</b> and <b>ptcrc</b> to zeros, for odd LRC initialise to ones.
Enable RX BCS		Enable Receive Block Check Sequence (BCS).
Enable RX Transparent Mode		Enable Receiver transparent mode.  FALSE : Normal receiver mode with SYNC stripping and control character recognition.  TRUE : Transparent receiver mode. SYNC's, DLE's and control characters are recognised only after the leading DLE character. The receiver calculates the CRC16 sequence even if it is programmed to LRC while in transparent mode. Initialize <b>prcrc</b> to the CRC16 preset value before setting <b>rx_transparent_mode</b> .
Enable Reverse Data		Enable Reverse data.

Name	Options		Description
Disable RX while TX			Disable receiver while sending.
RX Parity, TX Parity	ODD LOW EVEN HIGH		Receive and transmit parity. Parity is ignored unless <b>crc_select</b> = LRC.
Diagnostics Mode	NORMAL	Normal operation. Use this for external loopback.	Set diagnostic mode.  <b>External loopback - RS-485 :</b> Connect TXD+ to RXD+, TXD- to RXD-, TXCLK+ to RXCLK+ and TXCLK- to RXCLK-.  <b>External loopback - RS-232 :</b> Connect TXD to RXD, TXCLK to RXCLK and RTS to CTS and CD.  For HSS Frontpanel I/O Adapter : Program <i>elec_interface= RS232 (int. control)</i> and connect TXD to RXD, TXCLK to RXCLK. Ignore RTS, CTL and CD.
	LOOPBACK	<b>Internal loopback :</b> TXD and RXD are connected internally. The value on RXD, CTS and CD is ignored. The transmitter and receiver share the same clock source.	
	ECHO	The transmitter automatically resends received data bit-by-bit.	
	LOOPBACK_ECHO	Loopback and echo operation occur simultaneously.	
CRC Constant	0		CRC constant value.
CRC Preset RX CRC Preset TX	0x0000 or 0xFFFF		Preset receiver / transmitter CRC16 / LRC. These values should be preset to all ones or zeros, depending on the BCS used.
SYNC register	0bv00000000ssssssss		BISYNC SYNC register. Contains the value of the SYNC character stripped from incoming data on receive once the receiver synchronizes to the data using the SYN1- SYN2 pair.  v - If v = 1 and the receiver is not in hunt mode when a SYNC character is received, this character is discarded.  ssssssss (8 bits) - SYNC character. When using 7-bit characters with parity, the parity bit should be included in the SYNC register value.
DLE register	0bv00000000dddddddd		BISYNC DLE register. In transparent mode, the receiver discards any DLE character received.  v - If v = 1 and the receiver is not in hunt mode when a DLE character is received, this character is discarded.  dddddddd (8 bits) - DLE character. This character tells the receiver that the next character is text.

Name	Options	Description
Control Characters[8]	0b0bh-----cccccccc - Valid entry. 0b1bh-----cccccccc - Entry not valid and is not used.	Control character 1 to 8.  ----- (5 bits) - Reserved. Initialise to zero.  b - Block check sequence expected. A maskable interrupt is generated after the buffer is closed.  b = 0 : The character is written into the receive buffer and the buffer is closed.  b = 1 : The character is written into the receive buffer. The receiver waits for 1 LRC or 2 CRC bytes and then closes the buffer.  h - Enables hunt mode when the current buffer is closed.  h = 0 : The BISYNC controller maintains character synchronisation after closing the buffer.  h = 1 : The BISYNC controller enters hunt mode after closing the buffer. When b = 1, the controller enters hunt mode after receiving LRC or CRC.  cccccccc (8 bits) - Defines control characters to be compared to the incoming character. When using 7-bit characters with parity, include the parity bit in the character value.
RX Control Character Mask	0b11-----00000000 - Ignore these bits when comparing incoming character. 0b11-----11111111 - Enable comparing the incoming character to cc[n].	Receive control character mask. A one enables comparison and a zero masks it.
Sync. Character	0xssss (2 bytes)	SYNC character : Should be programmed with the sync pattern.
Syn Length	8 16	SYNL_8 : Should be chosen to implement mono-sync protocol. The receiver synchronizes on an 8-bit sync pattern in <b>sync</b> .  SYNL_16 : The receiver synchronizes on a 16-bit sync pattern stored in <b>sync</b> .
Enable flags/syncs		Send either idles or flags/syncs between frames as defined by the protocol. The flag character is equal to sync.

## 5.7 SMC UART Mode

This protocol may only be used with the two SMC ports : HSS5 and 6. The SMC Dialogue window is shown in Figure 10. The settings are described in Paragraph 5.7.1.

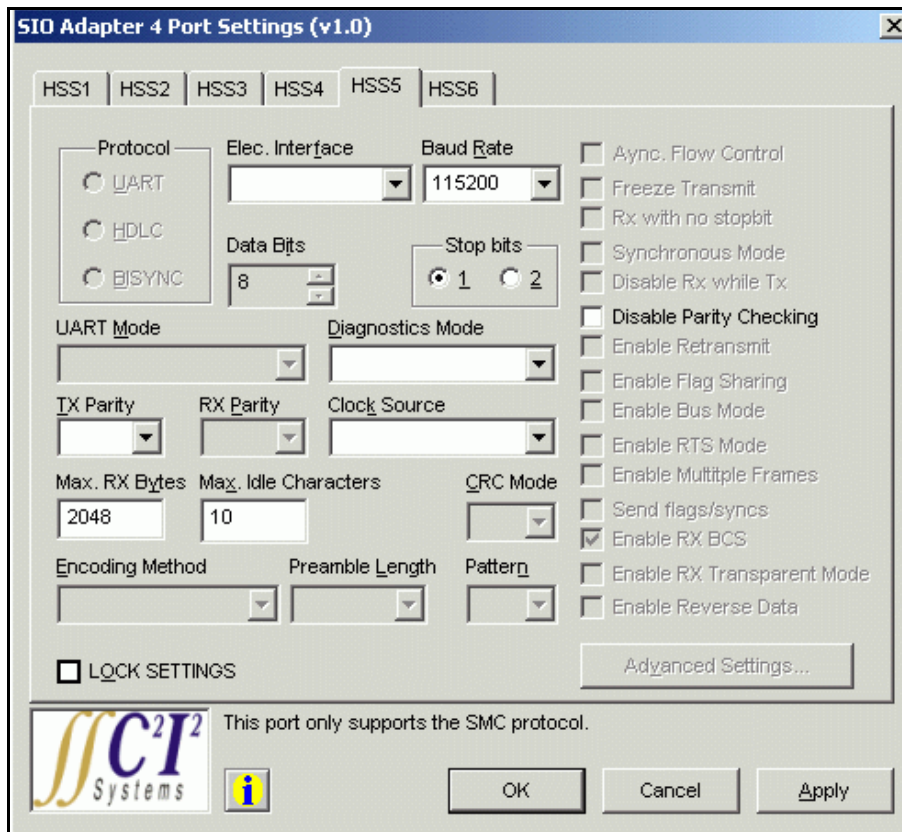


Figure 10 : SMC Dialogue

### 5.7.1 SMC UART Protocol Information Members

Name	Options		Description
Baud Rate	1 200 - 115 kbit/s (RS-232/RS-422/RS-485) Any values permissible.		Used to specify a single baud rate for both transmitter and receiver.
Clock Source	CLOCK_DEFAULT		CLOCK_DEFAULT connects BRGs [1 - 2] to Ports [5 - 6]. Transmit and receive clocks can be set to one of CLOCK_BRG [1 - 4] or CLOCK_EXT[1-4].
	CLOCK_BRG1 CLOCK_BRG2 CLOCK_BRG3 CLOCK_BRG4	BRGs [1 - 4].	
	CLOCK_EXT1 CLOCK_EXT2 CLOCK_EXT3 CLOCK_EXT4	External Clocks connected on Pins : RXCLK [1 - 4] (RS-232) or CLKIN [1 - 4] (RS-485/RS-422).  Note : CLOCK_EXT[1-2] can only be used for SMC Port 5, while CLOCK_EXT[3-4] can only be used for SMC Port 6.	

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Name	Options		Description
Stop bits	ONE TWO		Number of full stop bits.
Data Bits	5 6 7 8 9 10 11 12 13 14		Number of data bits. Note only Ports 5 and 6 (i.e. the SMC ports) support nine or more data bits.
Disable Parity Checking			Enable or disable parity checking.
TX Parity	ODD EVEN		Receive and transmit parity. Parity will only be checked if parity is enabled.
Diagnostics Mode	NORMAL	Normal operation. Use this for <b>external loopback</b> .	Set diagnostic mode.  <b>External loopback - RS-485:</b> Connect TXD+ to RXD+ and TXD- to RXD-.  <b>External loopback - RS-232:</b> Connect TXD to RXD.
	LOOPBACK	<b>Internal loopback :</b> TXD and RXD are connected internally. The value on RXD is ignored.	
	ECHO	The transmitter automatically resends received data bit-by-bit.	
	LOOPBACK_ECHO	Loopback and echo operation occur simultaneously.	
Max. RX Bytes	1 to 2 048 (default)		Maximum number of bytes that may be copied into a buffer.
M a x . I d l e Characters	0 to 2 048 (default)		Maximum idle characters. When a character is received, the receiver begins counting idle characters. If max_idl idle characters are received before the next data character, an idle timeout occurs and the buffer is closed. Thus, max_idl offers a way to demarcate frames. To disable the feature, clear max_idl. The bit length of an idle character is calculated as follows : 1 + data length (5-14) + 1 (if parity is used) + number of stop bits (1-2). For 8 data bits, no parity, and 1 stop bit, the character length is 10 bits.

## 6. Getting Started

This paragraph contains example code extracts for using the Win32 API to access the HSS device.

### 6.1 Normal Write Operation

```
HANDLE h_device;
DCB    dcb;
char   tx_buffer[100];
DWORD  bytes_send;

h_device = CreateFile("\\\\.\\HSS1",
                     GENERIC_READ | GENERIC_WRITE,
                     0,
                     NULL,
                     OPEN_EXISTING,
                     FILE_ATTRIBUTE_NORMAL,
                     NULL);

GetCommState(h_device, &dcb);

dcb.ByteSize      = 8;
dcb.Parity        = NOPARITY;
dcb.StopBits      = ONESTOPBIT;
dcb.BaudRate      = 115200;
dcb.fOutxCtsFlow = FALSE;

SetCommState(h_device, &dcb);
memset(tx_buffer, '*', sizeof(tx_buffer));

WriteFile(h_device, tx_buffer, sizeof(tx_buffer), &bytes_send, NULL);

CloseHandle(h_device);
```

### 6.2 Overlapped Read Operation

```
char      rx_buffer[100];
DWORD     bytes_read;
OVERLAPPED overlap;
DWORD     wait_event;
HANDLE    h_device;

h_device = CreateFile("\\\\.\\HSS1",
                     GENERIC_READ | GENERIC_WRITE,
                     0,
                     NULL,
                     OPEN_EXISTING,
                     FILE_ATTRIBUTE_NORMAL | FILE_FLAG_OVERLAPPED,
                     NULL);

overlap.Offset      = 0;
overlap.OffsetHigh = 0;
overlap.hEvent      = CreateEvent(NULL, FALSE, FALSE, NULL);

ReadFile(h_device, rx_buffer, sizeof(rx_buffer), &bytes_read, &overlap);
wait_event = WaitForSingleObject(overlap.hEvent, INFINITE);
if (WAIT_OBJECT_0 == wait_event)
{
    printf("Data received.\n");
}
CloseHandle(overlap.hEvent);
CloseHandle(h_device);
```

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7. **Contact Details**

7.1 Contact Person

Direct all correspondence and / or support queries to the Project Manager at C<sup>2</sup>I<sup>2</sup> Systems.

7.2 Physical Address

C<sup>2</sup>I<sup>2</sup> Systems  
Unit 3, Rosmead Place, Rosmead Centre  
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South Africa

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Email : [support@ccii.co.za](mailto:support@ccii.co.za)  
URL : <http://www.ccii.co.za/>

7.5 Product Support

Support on C<sup>2</sup>I<sup>2</sup> Systems products is available telephonically between Monday and Friday from 09:00 to 17:00 CAT. Central African Time (CAT = GMT + 2).

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