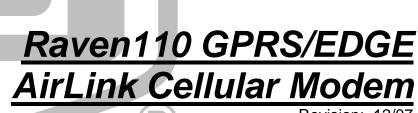
INSTRUCTION MANUA



Revision: 12/07



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CAMPBELL SCIENTIFIC, INC.

RMA#_____ 815 West 1800 North Logan, Utah 84321-1784

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Raven110 GPRS/EDGE AirLink Cellular Modem

1. General Description

This manual provides information for interfacing the AirLink Raven110 cellular modem to Campbell Scientific dataloggers. An AirLink CD ships with the modem that includes AirLink manuals and software utilities. AirLink manuals referenced in this manual include:

WirelessAce3G_UserGuide2.00.pdf AT&T/Cingular_EDGE-GPRS_Raven_UserGuide2.20.pdf AT&T/Cingular_EDGE-GPRS_Raven_QSG2.01.pdf

The Raven110 digital cellular modem is manufactured by AirLink for use on the AT&T/Cingular General Packet Radio Service (GPRS) network. The modem is accessed through the Internet using TCP/IP communications protocol using a Static or Dynamic IP address.

- A Static IP address is permanently assigned to a particular account and will always be used whenever the Raven connects to the Internet.
- A Dynamic IP address is assigned on a "need to have" basis. A dynamic IP address is used with a service such as IP Manager (Section 5) to translate a dynamic IP address to a domain name, so that the Raven can be contacted as if it had a static IP.

An AT&T/Cingular GPRS account can be setup for a Static or Dynamic IP address.

2. Establish Cellular Service

2.1 Raven110 Cellular Coverage/Service Requirements

What you need:

AT&T/Cingular GPRS/EDGE coverage at the datalogger site (for a coverage map refer to: http://www.Cingular.com/refresh/common/estore_zipcode_maps).

GPRS account established with AT&T/Cingular.

To setup an account with AT&T/Cingular:

Call (1-800-331-0500) and ask for the "Data Plan". Select from three plan options:

5 Meg	\$19.99/month
10 Meg	\$29.99/month
Unlimited	\$59.99/month

When setting up the account, ask to have "Feature Code G821" added to the account. Feature Code G821 configures the account for the "Internet" Access

Point Name (APN), and the device to "Mobile Terminated", which makes the modem accessible by LoggerNet over the internet. If Feature Code G821 was not added when the account was setup, it can be added later. The APN name must also be programmed into the modem (Section 5.1). See Appendix D for additional APN information.

AT&T/Cingular will provide a SIMM card for each modem. In some cases the SIM can be picked up at a local AT&T/Cingular store. The SIMM card must be installed inside of the modem as described in Appendix B.

AT&T/Cingular can also setup a Custom APN. A Custom APN takes 4-6 weeks to setup and costs about \$1000. A Custom APN may offer more efficient routing and better security than a standard Internet APN, and should be considered for large cellular phone networks.

3. Specifications

3.1 Raven110 Specifications

AirLink Raven Model G3210 GPRS-EDGE modem

Network: 1900/850 MHz

Transmit Frequency: 1850-1910 MHz and 824-849 MHz

Transmit Power: 1.0 W for 1900 MHz; 2.0 W for 850 MHz

Receiver Frequency: 1930-1990 MHz and 869-894 MHz

Modes Supported: GPRS and SMS

Throughput: up to 40 kbps

RS-232 Data Rates: 1200 bps to 115.2 kbps

Input Voltage: 10 to 28 Vdc

Input Current: 20 to 250 mA

Typical Current Drain at 12 Vdc: 20 mA dormant connection (idle for 10 to 20 seconds), 130 mA transmit/receive

Operating Temperature Range: -30° to $+70^{\circ}$ C (10% duty cycle limit above 60° C)

Operating Humidity: 5% to 95% non-condensing

Serial Protocols: AT Commands, PPP, SLIP, UDP, TCP

Serial Interface: RS-232

RF Antenna Connector: 50 Ohm TNC

Status LEDs: Power, Channel Acquired, Link Status, Network Registration, RSSI, Transmit/Receive, Block Errors

Dimensions: 3"W x 1"D x 5.1"L (5.8"L w/connector), 7.6 W x 2.5 D x 13 L cm (14.7 L cm w/connector)

Weight: <1 lb (<0.5 kg)

4. Configuration

4.1 Base Station Requirements for Raven110

PC running Campbell Scientifics' LoggerNet or PC400 software, with access to the internet.

4.2 Datalogger Site Equipment

- Raven modem with power cable (included with modem).
- Datalogger—21X, CR510, CR10(X), CR23X, CR7, CR1000, CR5000, CR3000, CR800.
- SC105 or SC932A Interface—connects the modem to the 21X, CR510, CR10(X), CR7, or other dataloggers' CS I/O port.

NOTE If you have a black SC12 cable that is not Rev 1 or newer (as indicated on cable), it is a CS I/O cable only and will not work for RS-232. Connect the black SC12 cable between the datalogger and the SC932A. Use a 9-pin serial cable or a blue ribbon cable between the phone and the SC932A.

 PN 18663 Null Modem Cable—connects the modem to the CR23X, CR3000, CR800, CR2XX, CR1000 or CR5000 RS-232 port.



SC105 interface connects the modem to a datalogger's CS I/O port; recommended for dataloggers with the PakBus Operating System.



SC932A interface connects the modem to the CS I/O port; recommended for dataloggers with the Mixed-Array Operating System.



PN 18663 null modem cable connects the modem to a datalogger's RS-232 port (not compatible with the 21X, CR510, CR10X, or CR7 dataloggers).

FIGURE 4.2-1. Modem Interface Options.

- PN 13493 Raven Mounting Kit—includes mounting hardware for securing the modem to below referenced environmental enclosure and a 9-pin male to 9-pin female cable.
 - Antenna—the following antennas are available from Campbell Scientific. Contact a Campbell Scientific Applications Technician for help in determining the best antenna for your application.
 - The **18285** 1 dBd omnidirectional antenna. This antenna is dual band, covering both the 800 MHz and 1.9 GHz bands, and is strongly recommended where cellular coverage is strong. The 18285 includes 10 feet of cable fitted with a TNC male connector for attachment to the Raven, and a mount/u-bolt assembly for attaching the antenna to a mast, post, or crossarm up to 1.5" (3.8 cm) in diameter.
 - The **14454** 9dBd Yagi Antenna is a higher gain antenna that should be "aimed" at the service provider's antenna. The 14454 includes 10 feet of cable fitted with a TNC male connector for attachment to the GPRS modem, and a bracket/u-bolt assembly for attaching the antenna to a mast or post. This antenna is recommended for fringe areas that require a higher gain antenna.
 - The **14453** Half-Wave Dipole Whip Antenna is a lower gain antenna used in transmitting short distances. It is an 800 MHz cellular antenna that terminates in a TNC Female connector for attachment to the Redwing modem. This antenna is intended for use inside the enclosure. Please note that the backplate of the enclosure is a grounded plane. If it is interposed between the antenna and the cell tower, it may attenuate the strength of the transmission signal. Simply turning the enclosure 90 to 180 degrees on its mounting mast may solve weak transmission issues.



PN 18285 1 dBd Omni Directional Antenna



PN 14454 9dBd Directional Yaggi Antenna



PN 14453 Half-Wave Dipole Whip Antenna

FIGURE 4.2-2. Antennas for Use with the Raven Modems

- Power Supply (see power considerations).
- Environmental Enclosure— ENC 10/12, ENC 12/14, or ENC 16/18.

4.3 Power Considerations

- A power cable included with the modem connects to the datalogger's 12 V or switched 12 V terminal. Connection to the switched 12 V terminal allows the datalogger to switch power to the modem during scheduled transmission intervals if desired.
- When using the switched 12 V terminal, the modem can typically be powered with a BP12 battery, CH100 charger/regulator, and MSX10 solar panel.

5. Program the Raven110 Modem

The following software is used to program the modem:

AirLink's Wireless Ace 3G software utility, which is used to configure settings in the modem and to load the GPRS/EDGE template file. The Wireless Ace 3G utility can be found on the CD included with the modem, or can be downloaded from AirLink's website: <u>www.airlink.com/support</u>.

Campbell Scientific's "Raven GPRS/EDGE Template 115200" file for dataloggers that support 115200 baud (e.g. CR1000), or "Raven GPRS/EDGE Template 9600" file for dataloggers that support a maximum baud rate of 9600 (e.g. CR10X). The template file configures the modem to be compatible with CSI dataloggers. The template files are available from Campbell Scientific's Website: www.campbellsci.com/downloads.

5.1 Using Wireless Ace 3G to Configure the Modem

To install Wireless Ace 3G from the AirLink CD, click on the "Wireless ACE 3G" link under "Modem Utilities" and follow the prompts. Once the application has been installed, it can be run from the Windows Start menu or from the icon on the desktop.

Connect the Raven to a serial RS232 port on the PC with a direct RS-232 cable. Also connect the antenna, and 12 V power.

			- AirLink Wi	reless	Ace v2	00604	04					
File Modem	Template	: Tools Hel	P									
Donnect	😰 Refresh	Refresh All	O isconnect	/ Write	! Reset	Doad	La Save	Сору	× Clear	내고 Update PRL	Auto Refresh:	Disabled 💌

Run Wireless Ace 3G to get the following screen:

Click the **Connect** icon in the Configuration Panel to open the connection options dialogue box. Select PPP, and the COM port the modem is connected to. Do not change the Password (the default password is 12345). Click OK to continue.

Connect to	Mo dem				
UDP TCP	Port:	COM1	~	🔲 Use SOS Mode	
SMS PPP Ethernet	Password:	****			
		OK	Car	icel	

Click the **Load** icon in the Configuration panel. When prompted for a template file name, select "ravengprs_115200.xml" for dataloggers that support 115200 baud (e.g. CR1000), or "ravengprs_9600.xml" for dataloggers that support a maximum baud rate of 9600 (e.g. CR10X). The template file configures the modem to be compatible with CSI dataloggers. Template files are available from Campbell Scientific's Website: www.campbellsci.com/downloads.

Modem Templat	e Tools Help				
nnect Refresh	👔 🕺 Refresh All Disconnec	t Write Reset	Copy Clear Update		esh: Disabled
nplate "C:\TEMP\er	mail\ravengprs_115200.xml	" loaded			
GROUPS	MODEM DATA			PR	UNTABLE VIE
INFO	AT	Name	Value	New Value	
STATUS	*DATE	Date and Time	06/28/2007 17:41:25		_
COMMON	OPRG	Enable Over-the-Air Programing	1	1-ON	•
Misc	*NETPHONE	Phone Number			_
Serial TCP	*STATICIP	Force Static IP	0.0.0.0		_
UDP	*DPORT	Device Port	3001	3001	_
Dynamic IP PPP/Ethernet	*NETUID	Network User ID		1	
PassThru SMTP Other	*NETPW	Network Password		-	_
Friends	*NETALLOWZEROIP	Allow Last Byte of net IP = Zero	1	1	_
LOGGING	*STATUSCHK	Checking SMS Status (Seconds)	0	1	
TELEMETRY	*HOSTPAP	Request PAP	0	0-NO	•
ADDR LIST	553	Destination Address		1	
DGE/HSDPA	553	Destination Port	0	0	_

e Modem Templat	e Tools Hel	p			
🕒 🗸 🚺 onnect Refresh	Refresh All	Disconnect Write Reset	Copy Clear	내 Update PRL	Auto Refresh: Disabled
mplate "C:\TEMP\er	mail\ravengprs_	115200.xml" loaded			
GROUPS	MODEM DA	TA			PRINTABLE VIEW
INFO	AT	Name	Value	New Value	^
STATUS	523	Configure Serial Port	115200,8N1	115200,8N1	
COMMON	١Q	Serial Port Flow Control	0	0-None	•
Misc	S50	Data Forwarding Timeout	1	1	
Serial TCP	S51	Data Forwarding Character	0	0	
UDP	E	DB9 Serial Echo	1	[
Dynamic IP PPP/Ethernet	E	Telnet Echo	0	[•
PassThru	V	AT Verbose Mode	1	1-Verbose	
Other Friends	8.D	DTR Mode	0	0-Ignore DTR	•
	5211	DTR Mode	1	1-Ignore DTR	•
LOGGING	8.S	Assert DSR	1	1-In Data Mode	
TELEMETRY	&C	Assert DCD	1	1-In Data Mode	_
ADDR LIST	*CTSE	Enable CTS to Indicate Network Coverage	0	0-Disabled	_
EDGE/HSDPA	Q	Ouiet Mode	0	0-OFF	-

NOTE

Baud rate can be changed from 9600, to a higher baud rate supported by the datalogger (e.g., 115200 for a CR1000).

Click on **EDGE/HSDPA** Group to get the following screen:

🖋 COM1 - AirLink		v2006040	4							
File Modem Template	e Tools Help									
Connect Refresh	👔 Refresh All	(S) Disconnect	Write Reset	Load		Copy	X Clear L	내 Jpdate PRL	Auto Refresh:	Disabled 💌
Template "C:\TEMP\em	nail\ravengprs_1	15200.xml" loa	aded							
									1	
GROUPS	MODEM DAT	A							PRIN	TABLE VIEW
INFO	AT	Name				Va	lue	New Value		
STATUS	*NETAPN	Set APN				int	ternet	internet		
	+CGDCONT	Define PDP	context			1,	IP,internet	1,IP,internet		
COMMON	+COPS	Cat Carrier	[operator] Sel	ection		0				
Serial										
TCP	+CGQREQ	Set Quality	of Service Pro	file				1.		
DNS	+CGQMIN	Minimum A	cceptable Qua	lity of Serv	vice Profi	e				
Dynamic IP PPP/Ethernet										
PassThru										
Other										
Friends										
LOGGING										
TELEMETRY										
ADDR LIST										
EDGE/HSDPA										

An AT&T/Cingular account with Feature Code G821 is configured for an Access Point Name (APN) = "internet". Enter "internet" in the New Value field for "***NETAPN**" and "1,IP,internet" in the New Value field for +**CGDCONT**.

For a custom APN, or APN through a third party provider (e.g. Crossbridge Solutions), enter the APN as shown in the following screen. The example is for an APN = "gprs02.Motient.net".

ect Refresh	Refresh All	🚫 🥖 🌻 🕞 🗎 Disconnect Write Reset Load Save Co		Jpdate PRL Auto	Refresh: Disabl
ate "C:\TEMP\e	email\ravengprs_1	15200.xml" loaded		(i)	
GROUPS	MODEM DAT.				PRINTABLE
GROOPS	MODEM DAT	A			PRINTABLE
INFO	AT	Name	Value	New Value	
STATUS	*NETAPN	Set APN	internet	gprs02.Motient.net	
COMMON	+CGDCONT	Define PDP context	1,IP,internet	1,IP,gprs02.Motient.net	_
COMMON Misc	+COPS	Set Carrier [operator] Selection	0		_
Serial TCP	+CGQREQ	Set Quality of Service Profile			_
UDP					
DNS Dynamic IP	+CGQMIN	Minimum Acceptable Quality of Service Profile		1	
PP/Ethernet					
PP/Ethernet PassThru SMTP Other					
PP/Ethernet PassThru SMTP Other Friends					
PP/Ethernet PassThru SMTP Other					
PP/Ethernet PassThru SMTP Other Friends LOGGING					
PP/Ethernet PassThru SMTP Other Friends LOGGING ELEMETRY					
PP/Ethernet PassThru SMTP Other Friends					
PP/Ethernet PassThru SMTP Other					

After the template file has been loaded, and the APN entered, click the **Write** icon to save the changes in the modem.

Click the **Reset** icon to restart the modem. The other ways to reset the modem are by pressing the reset button on the front of the modem or removing the power from the modem.

Click the **Disconnect** icon to terminate communications with the modem.

NOTE Unless you click the **Write** command, changes made in the New Value field will not be sent to the modem. For some changes (e.g., baud rate) you must also **Reset** the modem before the changes will take effect.

5.2 Dynamic IP Address

"Data Plan" accounts setup through AT&T/Cingular are provided with a Dynamic IP address. Dynamic IP addresses are granted only when the modem is connected and can change each time the modem reconnects to the network.

AT&T/Cingular offers a free Dynamic DNS service that translates a dynamic IP address to a fully qualified domain name, so that the modem can be contacted by name as if it had a Static IP.

The domain name used by LoggerNet is: 1xxx.internet.mycingular.com, where "xxx" is the 10-digit MSISDN associated with the account, and "internet.mycingular.com" is AT&T/Cingular's DDNS. No "Dynamic IP" modem settings are required when using AT&T/Cingular's DDNS service.

6. LoggerNet/PC400W Software Setup

The Device Map is configured from the "Setup" button on the LoggerNet/PC400W Toolbar. Configure the Device Map as described below.

- 1. Select Add Root | IPPort.
- 2. Add a datalogger to the IPPort (PakBus dataloggers, e.g. the CR1000, require a PakBusPort).
- 3. On the IPPort page, add the IP address/domain name and the Port number (the Raven template file configures the port to be 3001).
- 4. For PakBus dataloggers, leave the default settings on the PakBusPort page (Extra Response Time may be needed).
- 5. For PakBus dataloggers, set the PakBus address to match that of the datalogger (default address in the datalogger is 1).

LoggerNet Device Map

🖋 Setup			
File Edit Tools Options Help			
Add <u>Root</u> Add <u>Delete</u> Rename	Undo Redo		
G B37 [PPort_2] G - Cp PakBusPort_2 G CR1000_1	HPort_2: IPPort Hardware Standard Communications Enabled		
	Internet IP Address	14357571662.internet.mycingular.com:3001	
	Call-Back Enabled	Cache IP Address	
	Extra Response Time	12 \$	
	Delay Hangup	00 s 000 ms	
	IP Port Used for Call-Back	0	
	AirLink Device ID		
Check Apply Cancel	No problems found with	settings for the selected device	
		Connected: localhost	

NOTE

Preceding zeros are not entered in the Internet IP Address (e.g. 070.218.074.247 is entered as 70.218.74.247).

🖋 Setup			
File Edit Tools Options Help			
Add Boot Add Delete Rega			
	PakBusPort : PakBusF	Port	
	Hardware PakBus Nodes		
	Standard Communications Enabled		
	PakBus Port Always Open		
	Maximum Time On-Line	00 h 00 m 00 s 000 ms	<u>.</u>
	Beacon Interval	00 h 01 m 00 s	2
	Advanced		
	Extra Response Time	04 s	
	PakBus Address	3999	
	Delay Hangup	00 s 000 ms	÷
	No problems four d with	actings for the select-	ad doution
	No problems found with	settings for the selecter	
Check Apply Cancel			
		Connecte	red: 192.168.7.69

🖋 Setup		
File Edit Tools Options Help		
Add Boot Add Delete Rena		
IPPort Arrow PakBusPort CR1000 Raven100	CR1000_Raven100 : CR1000	
	Hardware Schedule Data Files Clock Program	
	Standard	
	Communications Enabled	
	Call-Back Enabled	
	PakBus Address 10	
	Advanced	
	Maximum Packet Size 1000	
	Security Code 0	
	Delay Hangup 00 s 000 ms	
	Enable Automatic Hole Collection	
	Scheduled Data Collection is disabled	
Check Apply Cancel		
Click to edit the settings for a device.	Connected: 192.168.7.69	1

7. Troubleshooting

If LoggerNet/PC400W software is unable to establish a connection with the modem:

7.1 Check the Modem Configuration

Check the GPRS cellular account information, and verify there is GPRS coverage at the site. Dynamic IP accounts require a Dynamic Domain Name Server (DDNS) (Section 5).

If the cellular account is with CrossBridge Solutions, then CrossBridge's tunnel software must be running on the host computer for communications to be established with the datalogger.

The modem has to be configured using Wireless Ace 3G as described in Section 5.

Modem settings have to be changed, and the APN number entered, using Wireless Ace 3G (Section 5). After the Raven GPRS template file has been loaded, you can verify settings in the Status, Misc, Serial, and GPRS groups have been configured as shown below.

Network State should be "Network Ready". Signal strength (RSSI) should be - 60 to -85. The IP address will change for Dynamic IP accounts.

e Modem Templat	1	0 / !		Auto Refresh: Disabled
onnect Refresh	Refresh All	Visconnect Write Reset	Load Save Copy Clear Update PRL	
GROUPS	MODEM DATA	S S		PRINTABLE VIEW
INFO	AT	Name	Value	
	*NETIP	Network IP	166.213.209.219	
STATUS	*NETSTATE	Network State	Network Ready	
COMMON Misc	*NETCHAN	Channel	144	
Serial	*NETRSSI	RSSI (dBm)	-76	
TCP	*NETOP	Current Network Operator	Cingular Wireless, 310410	
DNS Dynamic IP	+ICCID	SIM ID	89014104211249699177	
PPP/Ethernet	PPP/Ethernet +CIMI IMSI PassThru		310410124969917	
PassThru			AT	
Other		Host Signl Level	DCD: LOW DTR: LOW DSR: LOW CTS: HIGH RTS: LOW	
Friends	*NETERR	Network Error Rate	7	-
LOGGING		Network Bytes Sent	989	
TELEMETRY	<u> </u>	Network Bytes Rovd	893	
ADDR LIST		Host Serial Bytes Sent	6	
DGE/HSDPA		Host Serial Bytes Rovd	0	
EDGE/HSDFA		Network IP Packets Sent	19	
		Network IP Packets Rovd	4	
		Host IP Packets Sent	0	
		Host IP Packets Rovd	0	
	*NETSERV	Network Service Type	GPRS	-
		Number of System Resets	57	
		IP Reject Count	0	-

Modem Templac	e Tools Help				
ect Refresh	Refresh All Disconnec	t Write Reset	Copy Clear Update		Auto Refresh: Disabl
late "C:\TEMP\er	nail\ravengprs_115200.xml	" loaded			
GROUPS	MODEM DATA				PRINTABLE
INFO	AT	Name	Value	New Value	
STATUS	*DATE	Date and Time	06/28/2007 17:41:25		
COMMON	OPRG	Enable Over-the-Air Programing	1	1-ON	•
COMMON Misc	*NETPHONE	Phone Number			
Serial TCP	*STATICIP	Force Static IP	0.0.0.0		
UDP	*DPORT	Device Port	3001 3001		
Dynamic IP PP/Ethernet	*NETUID	Network User ID			
PassThru SMTP	*NETPW	Network Password			
Other Friends	*NETALLOWZEROIP	Allow Last Byte of net IP = Zero	1	1	
LOGGING	*STATUSCHK	Checking SMS Status (Seconds)	0		
ELEMETRY	*HOSTPAP	Request PAP	0 0-NO		•
ADDR LIST	553	Destination Address			
	553	Destination Port	0	0	

The Device Port gets changed from the default 12345 to 3001 when the template file is loaded into the modem (Section 5). The Device Port number gets entered with the IP address in LoggerNet (Section 6).

Modem Templat	e Tools He	lp				
🖳 🗸 🚺 nnect Refresh	Refresh All	Disconnect Write Reset	Copy Clear	내 Update PRL	Auto F	Refresh: Disabled
mplate "C:\TEMP\er	nail\ravengprs	_115200.xml'' loaded				
GROUPS	MODEM D	лта				PRINTABLE VIE
INFO	AT	Name	Value	New Value		
STATUS	523	Configure Serial Port	115200,8N1	115200,8N1		
COMMON	\Q	Serial Port Flow Control	0	0-None	•	
Misc	S50	Data Forwarding Timeout	1	1		
Serial TCP	551	Data Forwarding Character	0	0		
UDP	E	DB9 Serial Echo	1	[•	
Dynamic IP PPP/Ethernet	E	Telnet Echo	0	[-	
PassThru SMTP	V	AT Verbose Mode	1	1-Verbose	-	
Other	8.D	DTR Mode	0	0-Ignore DTR	-	
Friends	5211	DTR Mode	1	1-Ignore DTR	•	
LOGGING	8.5	Assert DSR	1	1-In Data Mode	•	
TELEMETRY	8.C	Assert DCD	1	1-In Data Mode	•	
ADDR LIST	*CTSE	Enable CTS to Indicate Network Coverage	0	0-Disabled	-	
DGE/HSDPA	0	Ouiet Mode	0	0-OFF	•	

The "Raven GPRS/EDGE Template 9600" template file sets the baud rate to 9600, which is the maximum baud rate for the CR10X and older dataloggers. For newer dataloggers, the baud rate can be changed to the highest baud rate supported by the datalogger (e.g. 115200 baud for the CR1000).

If an SC105 interface is used, its default baud rate of 9600 will have to be changed to match the baud rate of the modem (using CSI's DevConfig utility).

NOTE

Baud rate changes require the modem to be reset before the change takes affect. Click the **Reset** icon in Wireless Ace to the reset the modem and implement the change.

a 🗸 🚺 ect Refresh	C Refresh All [(X) Disconnect	/ Write	! Reset	<i>≧</i> Load	R Save	Сору	× Clear	내고 Update PRL	Auto Refresh:	Disabl
ate "C:\TEMP\en	nail\ravengprs_1*	15200.xml'' k	paded					13			
GROUPS	MODEM DATA	۹.								PRIN	FABLE V
INFO	AT	Name					v	alue	New Value		
STATUS	*NETAPN	Set APN					i	nternet	internet		
COMMON	+CGDCONT	Define PD	P context				1	,IP,interne	t 1,IP,internet		
Misc	+COPS	Set Carrie	Set Carrier [operator] Selection			0)				
Serial TCP	+CGQREQ	Set Qualit	y of Servi	ce Profi	le		- 1		ī [
UDP	+CGQMIN	Minimum	Acceptabl	e Ouali	tv of Sei	vice Pr	ofile				
Dynamic IP PP/Ethernet	1	1									
PassThru											
SMTP Other											
Friends											
LOGGING											
ELEMETRY											
ADDR LIST											

Verify the APN has been entered in the NETAPN and +CGDCONT fields as shown above (where gprs02.Motient.net is the APN).

7.2 Verify Connections at the Datalogger

Verify the modem is connected to 12 V and the Pwr led is on (green).

Check the Reg light on the modem. The Reg light should be solid green, which indicates the modem is registered with the cellular network.

Make sure the antenna is properly connected and oriented. Signal strength should be the -60 to -80.

An SC932A or SC105 interface is required to connect the modem to a datalogger's CSI/O port. The default settings for SC105 can be used with the Raven110 when the modem is configured for 9600 baud (baud rate set by the template file). If the baud rate is changed in the modem, the baud rate in the SC105 will have to be changed to match that of the modem (SC105 settings can be changed using CSI's DevConfig utility).

Make sure the modem is connected to the "DCE Device" connector on the SC932A, or the "Modem" connector on the SC105.

A null modem cable is required to connect the modem to a datalogger's RS-232 port. No other interface is required.

7.3 LoggerNet/PC400W Device Map

The IP address and Device Port settings are entered in LoggerNet as described in Section 6.

Make sure the port number at the end of the IP address matches the port number of the modem. The template file sets the port number to 3001.

Try adding a few seconds (no more than five seconds) of extra response time to the datalogger or PakBus port.

For a PakBus datalogger, verify the PakBus address in the setup screen matches that of the datalogger.

For networks with multiple PakBus ports, uncheck the 'PakBus Port Always Open' options on all PakBus ports.

7.4 Using Wireless Ace 3G to Check Modem Communications with Datalogger

The modem's "Host Serial Bytes Sent" and "Host Serial Bytes Received" windows can indicate whether or not the modem is communicating with the datalogger.

Establish a connection with the modem through the cellular network using Wireless Ace (click on the Modem menu item, Connect, UDP. Enter the IP address, and click OK). Go to the Status group and note the "Host Serial Bytes Sent" and "Host Serial Bytes Received" values (Figure 7-1). Try connecting with the datalogger using LoggerNet/PC400W. If a connection cannot be established, close LoggerNet and reconnect with Wireless Ace and compare the current values with the previous values.

If the values are the same, the modem is not attempting to make a connection with the datalogger. Check that the Raven GPRS template file has been loaded.

If the "Host Serial Bytes Sent" increased, the modem attempted to connect to the datalogger, but the response from the datalogger did not make it back to the modem. Check the interface between the modem and the datalogger.

If both values incremented, the modem and the datalogger are communicating. Try adding some extra response time in LoggerNet.

NOTE Baud rate changes require the modem to be reset before the change takes affect. Click the Reset icon in Wireless Ace to the reset the modem and implement the change.

🖳 🚽 🔯 nnect Refresh	Refresh All	Sisconnect Write Reset	Load Save Copy Clear Update PRL	o Refresh: Disable
GROUPS	MODEM DATA	la la		PRINTABLE VI
	AT	Name	Value	
INFO	*NETIP	Network IP	166.213.209.219	
STATUS	*NETSTATE	Network State	Network Ready	
COMMON	*NETCHAN	Channel	144	
Misc Serial	*NETRSSI	RSSI (dBm)	-76	
TCP	*NETOP	Current Network Operator	Cingular Wireless, 310410	
DNS	+ICCID	SIM ID	89014104211249699177	
Dynamic IP PPP/Ethernet	+CIMI	IMSI	310410124969917	
PassThru SMTP		Host Mode	AT	
Other		Host Signl Level	DCD: LOW DTR: LOW DSR: LOW CTS: HIGH RTS: LOW	
Friends	*NETERR	Network Error Rate	7	
LOGGING		Network Bytes Sent	989	
TELEMETRY		Network Bytes Rovd	893	
ADDR LIST	<u> </u>	Host Serial Bytes Sent	6	
DGE/HSDPA		Host Serial Bytes Rovd	0	
DGE/HSDPA		Network IP Packets Sent	19	
		Network IP Packets Rovd	4	
		Host IP Packets Sent	0	
		Host IP Packets Rovd	0	
	*NETSERV	Network Service Type	GPRS	

FIGURE 7-1. Wireless Ace status page showing communications with modem.

Appendix A. Wireless Ace Setup without Template File

Wireless Ace 3G is used to program settings in the Raven100 and Raven110 modems to make the modems compatible with CSI dataloggers. Airlink CDMA and GPRS template files to send the modems are available on the CSI website (<u>http://www.campbellsci.com/downloads</u>). The procedure for sending the template files is described in Section 5.

When the template files are not available, Wireless Ace 3G can be used to change the settings described below.

For a direct connection on a COM port use PPP.

Connect t	o Modem				
UDP TCP SMS PPP Ethernet	Port: Password:	COM1		🖵 Use SOS Mode	
Luenet		ОК	Cancel		

Make a note of the Device port (*DPORT). The default is 12345 and we use 3001 in our template. Any valid port can be used. This is the port number used in LoggerNet to get to the datalogger.

ə 🗸 😰 ect Refresh	👔 🥸 Refresh All Disconne	ct Write Reset Load Save	Copy Clear Update PF	L Auto Refresh: Disable
late "D:\Digital Pl	hones\Airlink\CDMA\Rave	n\ravengprs_9600.xml" loaded		
GROUPS	MODEM DATA			PRINTABLE VI
INFO	AT	Name	Value	New Value
STATUS	*DATE	Date and Time	05/23/2006 23:01:14	
COMMON	OPRG	Enable Over-the-Air Programing	1	•
<u>Misc</u> Serial	*NETPHONE	Phone Number		
TCP	*STATICIP	Force Static IP	0.0.0.0	
UDP DNS	*DPORT	Device Port	12345	3001
Dynamic IP PP/Ethernet	*NETUID	Network User ID		
PassThru SMTP	*NETPW	Network Password		
Other Low Power	*NETALLOWZEROIP	Allow Last Byte of net IP = Zero	1	
Friends	*STATUSCHK	Checking SMS Status (Seconds)	0	
LOGGING	*HOSTPAP	Request PAP	0	
ELEMETRY	\$53	Destination Address		
ADDR LIST	\$53	Destination Port	0	
GPRS	\$53	Default Dial Code	т	·

- S23 Configure Serial Port The baud rate needs to be configured to match a valid datalogger baud rate. For a CR10X: 9600,8N1 and for a CR1000: 115200,8N1.
- Q Serial Port Flow Control This should be set to None.
- V AT Verbose Mode Set this to Numeric.
- &D DTR Mode Set to Ignore DTR
- S211 DTR Mode Set to Ignore DTR

ct Refresh Re	👔 fresh All	Disconnect Vrite	! Reset		Dopy Clear	Update PRL	Auto Refresh:	Disab
ate "D:\Digital Phones	\Airlink\CD)MA\Raven\ravengp	rs_9600.xml	" loaded				
GROUPS MOI	DEM DAT	A					PRINT	TABLE
INFO AT	8	Name			Value	New Value		
STATUS S2	3	Configure Serial	Port		115200,8N1	9600,8N1		
		Serial Port Flow (ontrol		2	0-None	•	
Misc S5	0	Data Forwarding	Timeout		1			
Serial TCP S5	1	Data Forwarding Character			0			
UDP DNS E		Command Echo			1		-	
Dynamic IP P/Ethernet		AT Verbose Mod	2		1	0-Numeric	•	
PassThru SMTP	•	DTR Mode			2	0-Ignore DTR	•	
Other S2	11	DTR Mode			0	1-Ignore DTR	-	
Friends 88		Assert DSR			1		•	
		Assert DCD			1		•	
	TSE	Enable CTS to In	dicate Net	work Coverage	0		•	
DDR LIST		Quiet Mode			0		-	
GPRS ×		Call Progress Re			0		-	
*N	UMTOIP	Convert 12 digit	Number to	IP	0		+	

- S0 TCP Auto Answer Set to On
- TCPT TCP Idle Timeout -- Set to a reasonable value like 2 min.

1				s Ace v200604	04								
File	Modern Ter	mplate	Tools	Help									
	🖳 🗸 🔤	≵] iresh	👔 Refresh	All Disconnect	/ Write	! Reset	🗃 Load	📕 Save	ि Сору	× Clear	₩ Update	Auto Refresh:	Disabled 🔽
Ter	Template "D:\Digital Phones\Airlink\CDMA\Raven\ravengprs_9600.xml" loaded												
	GROUI	De A	IODEM	DATA								DRINT	ABLE VIEW
	GROOT	10 M	TODEM	DAIA								PREVI	ABLE VIEW
	INF	0	AT	Name			¥alue	New Va	lue				
	STATU	 IS	S0	TCP Auto Answe	r		0	1-0N			*		
	соммо		S7	TCP Connect Ti	neout		30	30					
	Mi	sc	TCPT	TCP Idle Timeo	ut		0	2					
	Seri T(TCPS	TCP Idle Timeo	ut Secs		0	0-Minu	ites		-		
			\$221	TCP Connect Re	snonse	Delay	0	0			_		
	Dynamic I	IP	_	Telnet Echo Moo			1	1-Loca	LEcho		•		
	PPP/Ethern PassTh		_	Enable ENQ on "			0	0-Disa			-		
	SMI		I-ENQ	Enable ENQ on	ICP Con	nect	10	U-Disa	DIE		-		
	Low Powe	er											
	Friend	ds 											
	LOGGIN	IG											
	TELEMETR	Y											
	ADDR LIS	ST											
	GPR												
	Grie												

Appendix B. Installation of SIM Card in the Raven110

The Subscriber Identity Module (SIM) in the Raven is a smartcard securely storing the key identifying a mobile subscriber. Generally, you will only need to install the SIM once in the life of the modem.

Installing the SIM

To install the SIM, you will only need a small phillips head screw driver.

Opening the Case

- 1. Unplug the modem power and all cables.
- 2. Using a small phillips head screw driver, remove the two screws on the back of the modem.



FIGURE B-1. Modem Back

3. Slide the casing off of the modem and set it aside.



FIGURE B-2. Modem Partially Slid from Case

Ejecting the SIM tray

4. Using the tip of a closed pen, a paper clip, or PDA stylus, press the yellow button between the two cards.



FIGURE B-3. Tray Button

5. Slide the tray out of the slot.



FIGURE B-4. Empty SIM Tray

Inserting the SIM

6. Place the SIM into the tray and gently press to click it into place.



FIGURE B-5. SIM Tray with a SIM

7. Slide the tray back into the modem and gently press to click it into place.



FIGURE B-6. Inserting the SIM

- 8. Slide the modem back into the case.
- 9. Secure the back of the modem with the screws.

Appendix C. Configuring the Raven for PPP

The Raven template file configures the Raven to function as a serial server. As a serial server, the modem has an IP address, and port number (3001) for the Raven's RS232 port.

LoggerNet sends data via TCP/IP over the internet to the datalogger. The modem removes the data from the TCP packet and sends the data out the RS232 port to the datalogger. Returning data is put into a TCP packet by the modem and sent back to LoggerNet.

Settings in the Raven and datalogger (CR800, CR1000, and CR3000) can be changed to configure the RS232 serial ports for Point-to-Point (PPP) protocol. When configured as PPP, the Raven functions as a router, routing TCP/IP communications to the IP stack of the datalogger. PPP enables the datalogger to send/receive messages via email, HTTP, FTP to and from the datalogger, and allows concurrent communications between networked dataloggers and LoggerNet.

The default datalogger port number for PakBus/TCP communications is 6785. The datalogger will also respond to port 80 for HTTP, 23 for Telnet and 21 for FTP. These ports can be disabled in the dataloggers configuration.

NOTE After the RS232 port on the modem has been configured as PPP, use Wireless Ace 3G with a TCP or UDP connection to establish communications with the modem. It may also be possible to connect with the modem through its RS232 port using the "SOS" mode.

Raven Settings for PPP Mode:

Download the current RavenGPRS Wireless Ace template file from <u>http://www.campbellsci.com/downloads</u>. Load the template into WirelessAce and make the following changes in steps 1 and 2 before writing them to the Raven modem.

Use WirelessAce to configure the following PPP settings:

- HOSTPRIVMODE = 1
- HOSTPRIVIP = 192.168.1.1

This will configure the Raven to use NAT (Network Address Translation). These settings should be configured by the template.

hect Refresh	Refresh All Disconr	ect Write Reset Load	Save Copy Clear Update	
GROUPS	MODEM DATA			PRINTABLE VI
INFO	AT	Name	Value	New Value
STATUS	*HOSTPRIVMODE	Use Private IP	1	
	*HOSTPRIVIP	Host Private IP	192.168.1.1	
COMMON Misc	*HOSTPEERIP	Modem Local IP	192.168.13.31	
Serial TCP	*HOSTNETMASK	Host network mask	0.0.0.0	
UDP	*HOSTAUTH	Host Authentication Mode	0	
Dynamic IP PPP/Ethernet	*HOSTUID	Host User ID	ZCFzUUeLycb2ug01L+3Ikw==	
PassThru	*HOSTPW	Host Password	ZCFzUUeLycb2ug01L+3Ikw==	
Other Friends				
1X/EV-DO				
TELEMETRY				

Use WirelessAce to configure the following UDP setting:

• MD = 02-PPP

h 🕻 🕅 nect Refresh	Refresh All	Disconnect Write Reset	ad Sa	Ne Copy Clear Update F	RL Auto Refresh: Disable
GROUPS	MODEM DAT	ſA			PRINTABLE VI
INFO	AT	Name	Value	New Value	
STATUS	MD	Startup Mode Default DB9 Serial	00	02-PPP]
	582	UDP Auto Answer	0	·]
COMMON Misc	583	UDP Idle Timeout	0		-
Serial TCP	HOR	UDP Auto Answer Response	0		Ī
	*UDPLAST	UDP Connect Last	0	-	
Dynamic IP	AIP	Allow Any IP	0]
PPP/Ethernet PassThru	*UALL	Allow All UDP	0]
SMTP Other	*DU	Dial UDP Always	0]
Friends	*USD	UDP Serial Delay	0		-
1X/EV-DO					
TELEMETRY					

After the changes have been made, click the **Write** icon to save the changes in the modem.

Click the **Reset** icon to restart the modem. The other ways to reset the modem are by pressing the reset button on the front of the modem or removing the power from the modem.

Click the **Disconnect** icon to terminate communications with the modem.

Datalogger Settings:

Using the Device Configuration Utility, configure the following setting on the TCP/IP tab:

- Config Port Used = RS232
- IP Address = 0.0.0.0
- Modem Dial String = PPP
- Modem Dial Response = CONNECT
- User Name and Password are blank

Device Configuration	n Utility Beta 1.8
File Language Help	
Device Type	Deployment
CD295 CH200 COM220 CP1000 CR10X+0 CR10X+0 CR10X+0 CR10X+0 CR200 Series CR23X+0 CR2	Datalogger Ports Settings TCP/IP Net Services Advanced DNS Server 1: 0.0.0 0.0.0 PPP Config/Port Used: RS232 V TCP/IP Info: IP Address: 0.0.0.0 User Name: Password: Password: V V Modem Dial String: PPP Modem Dial Response: CONNECT V
Serial Port COM1 Baud Rate 115200 V Disconnect	PPP Dial Specifies the dial string that would follow ATD (e.g., #777 for Redwing CDMA) or a list of AT commands seperated by ', '(e.g., ATV1;AT+CGATT=0;ATD*99***1#) that will be used to initialise and dial through a modern before a PPP connection is attermpted. A blank string means that dialing is not necessary before a PPP connection is established. Apply Cancel Factory Defaults Read File Summary

Using the Device Configuration Utility, select the "Net Services" tab. The "PakBus/TCP Service Port" default is 6785. This is the "Port" number that will follow the "IP address" for LoggerNet to communicate with the datalogger.

Device Configuration	Utility Beta 1.8
File Language Help	
Device Type	Deployment
CD295	Datalogger Ports Settings TCP/IP Net Services Advanced
COM220	HTTP Enabled PakBus/TCP Server PakBus/TCP Port
CR10X CR10X-PB	FTP Enabled 6785
CR10X-TD CR200 Series	FTP User Name: anonymous 6785
CR23X E	FTP Password: * 6785
CR23X-TD CR3000	✓ Telnet Enabled 6785
CR5000 CR510	Ping (ICMP) Enabled
CR510-PB CR510-PD CR600 Series CR9000X CS150 MD485 NL100	PakBus/TCP Service Port: 6785
Serial Port	Port Baud Rate Settings
COM1 🗸	Port Baud Rate Settings
Baud Rate	This setting governs the baud rate that the datalogger will use for a given port in order to support PakBus or PPP communications. For some ports (COM1 through COM4), this setting also controls whether the port will be enabled for PakBus or PPP communications.
Disconnect	Apply Cancel Factory Defaults Read File Summary

Using the Device Configuration Utility, fix the RS232 Baud Rate to "115200 Fixed" from the "Port Settings" tab.

e Language Help	Deployment
evice Type	
D295	Datalogger Ports Settings TCP/IP Net Services Advanced Select the Port RS-232 Image: Comparison of the second sec
LIDO VIII VIII VIII VIIII VIIIII VIIIIII	Port Baud Rate Settings This setting governs the baud rate that the datalogger will use for a given port in order to support PakBus or PPP communications. For some ports (COM1 through COM4), this setting also controls whether the port will be enabled for PakBus or PPP communications. Apply Cancel Factory Defaults Read File Summary

LoggerNet Settings:

Enter the IP address of the Raven, and the PakBus/TCP Service Port number of the datalogger (e.g. 6785 as explained above).

🕊 Setup							
File Edit Tools Options Help							
Add Root Add Delete Rename	⊠ndo R <u>e</u> do						
B B IPPot G CalBusPot_4 L B CR1000_1	IPPort : IPPort Hardware Standard Communications Enabled Internet IP Address Advanced CallBack Enabled TCP Listen Only Extra Response Time Delay Hangup	14357571661.internet.mycingular.com.6785 Cache IP Address 04 s 00 s 000 ms					
Check Apply Cancel	IP Port Used for Call-Back AirLink Device ID	0 settings for the selected device					
Connected: localhost							

Example CR1000 Program

The following example sends an email message when an alarm condition is True. Both the CR1000 and Raven modem must be configured as PPP as described above.

```
CR1000 Program Example to Send Email Message
'Main program variables
Public Batt, RefTemp, Temp
'declare Email parameter strings (as constants), Message String & Result Variable
Const ServerAddr="smtpauth.earthlink.net""207.69.189.201"
Const ToAddr="datalogger@hotmail.com"
Const FromAddr="datalogger@hotmail.com"
Const Subject="Email Message Test"
Const Attach=""
Const UserName="datalogger@earthlink.net"
Const Password="cr1000"
Const CRLF = CHR(13)+CHR(10)
Public Result as String * 100
Public AlarmTrigger As Boolean
Public Message As String * 250
Public EmailSuccess As Boolean
BeginProg
  Scan (1,Sec,3,0)
     Battery (Batt)
     PanelTemp (RefTemp,250)
     TCDiff (Temp,1,mV2_5C,1,TypeT,RefTemp,True,0,250,1.0,0)
  NextScan
SlowSequence
  Scan(1,sec,1,0)
     If AlarmTrigger = False Then
        If Temp > 28 THEN AlarmTrigger = True
        If AlarmTrigger Then
          Message = "Warning!" + CRLF + CRLF
Message = Message + "This is a automatic email message from the datalogger station " + Status.StationName + "."
          Message = Message + "An alarm condition has been identified."
Message = Message + "An alarm condition has been identified."
Message = Message + "The temperature is " + Temp + " degrees C." + CRLF + CRLF + CRLF
Message = Message + "Datalogger time is " + Status.Timestamp
           EmailSuccess=EmailSend (ServerAddr, ToAddr, FromAddr, Subject, Message, Attach, UserName, Password, Result)
        EndIf
     EndIf
     If Temp < 28 then AlarmTrigger=False
  NextScan
EndProg
```

Appendix D. Understanding APNs

[Note: The following data is specific to the U.S. Cingular network; however, it is applicable to any GSM network, although some of the APN names may have a different name. Please check with your cellular carrier for specific IP addressing options and details.]

GSM GPRS/EDGE cellular data networks use a mechanism called an APN (Access Point Name) to determine how a Mobile Station (MS), in this case a AirLink Raven, communicates via the GSM network to a host site (i.e., how the carrier network passes IP traffic to the host). An APN determines what IP addresses are assigned to the mobile station, what security methods are used, and how the GSM data network connects to the customer's network.

APNs are general-purpose and are available to multiple customers or can be customized for particular customers to address unique requirements.

The various GSM providers all use APNs but implement them differently. For example, some by default will not allow mobile terminated connections while others use RADIUS servers and require user name/password authentication in addition to SIM authentication.

Cingular provides multiple options for IP addressing, including public, private, customer-supplied and network-assigned IP addresses. Various options are available for static and dynamic IP addresses. Dynamic DNS naming is also supported in certain APN types.

Cingular APN Types

Here we will focus on the AirLink Raven when used with the Cingular network.

As stated above, the different GSM providers have varying APN types, so it is important to check with your provider for available options.

Cingular offers four main APN types:

- Proxy
- Public
- Internet
- Custom

Proxy and Public APNs: These APN types are for outgoing, mobile originated data only. No incoming, mobile terminate data connections are permitted. The only difference in these two APN types are that proxy uses a Cingular provided private IP address while public gets a public IP address.

Internet APN: The Internet APN allows incoming mobile terminated connections as well as mobile originated. IP addresses are dynamic Internet, Cingular-provided public addresses. An address maps to Dynamic DNS name in the convention of 1[phone_number].internet.mycingular.com (e.g. 15055551212.internet.mycingular.com).

These mobile connections are visible on the public Internet so security and traffic blocking need to be taken into consideration. The customer back-end connection only needs to provide Internet access.

Custom APN: A custom APN is just that – custom. In this case the endcustomer works with Cingular to determine the appropriate settings for:

IP addressing requirements: Are public IP addresses required? If so, who provides the addresses – Cingular or the customer? Do these addresses need to be static?

Connection from Cingular to customer network: Cingular can provide the following connectivity options from their network to the customer's network, depending on security and cost requirements:

- Dedicated frame relay connection where the Cingular-to-customer connection is not publicly accessible.
- Internet VPN connection where the Cingular-to-customer connection is via IPsec VPN.
- Internet connection: Can be lower cost if security requirements allow such connections as no security is provided by Cingular.

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