App. Note Code: 3MI-E Revision: 1

PPPLI TION NO

Using StarDot's NetCam Digital Camera with DGR-115 Freewave Radios and our NL100



Copyright (C) 2002 Campbell Scientific, Inc.

Using StarDot's NetCam Digital Camera with DGR-115 Freewave Radios and our NL100

This application note discusses using Campbell Scientific's NL100 and Freewave radios to retrieve images from StarDot's NetCam camera. It provides configuration information for the NL100, Freewave radios, and NetCam camera and describes creating a Windows 2000 dial-up RAS connection to start the image viewer. To complete this application, you may need to obtain the assistance of local computer experts.

Overview

This application, referred to as an NTCIP interface, was developed for Department of Transportation for various states. This NTCIP interface uses an NL100 with special firmware to provide a PPP (point-to-point protocol) connection on its RS-232 port. The NetCam is connected to the NL100's Ethernet 10BaseT connector which receives the HTTP requests.

The initial setup requires the following steps. Procedures for configuring individual devices and setting up the software are provided in later sections.

- 1. Load special firmware into the NL100 (SERSVR2.OS, 03/05/02).
- 2. Configure the NL100 (p. 2).
- 3. Install the NetCam support software on your computer in default folders, or keep track of where you installed them.
- 4. Configure NetCam Camera (p. 3).
- 5. Configure Freewave radio (p. 4).
- 6. Install the Freewave modem driver INF file on your computer (p. 7).
- 7. Create a networking Dial-Up RAS connection on your computer that dials through the Freewave radios (p. 11).
- 8. Connect the Freewave radios to the PC serial port and RS-232 connector on the NL100.
- 9. Attach the camera to the 10BaseT connector.
- 10. Power up the system. Power up the NL100 last, so it can send the auto-answer string to the Freewave.
- 11. Run the NetCam support software on your computer (p. 16).



Part of this application note configures the NL100 to allow images captured conditionally from the NetCam to be stored in and retrieved from a table-based datalogger. This feature has not yet been fully developed with Freewave radios.

NL100 Configuration



Before following this procedure, you need to load the new NL100 firmware (SERSVR2.OS, 3/5/2002). DOWNOS.BAT is a batch file that minimizes the number of keystrokes required to send new firmware to the NL100.

- 1. Telnet to the NL100 or directly connect to the NL100 by a Serial port.
- 2. After "Password:" type your NL100 Password; default is "nl100".
- 3. After "NL100/105 (ver, show, edit, defaults, reset, help, bye):", type "edit".
- 4. After "TLink config (TcpSer, 232-Bridge, RS232, disabled) []:", type "RS232".
- 5. At "RS485 config (PakBus, TcpSer, PakSer, disabled) []:", type "disabled".
- 6. At "CS I/O Config (PakBus, TcpSer, PakSer, disabled) []:", type "PakBus".
- At "CS 1/O SdcAddr/bps (SDC7, SDC8, 38k, 19k, 9600, 1200, 300)", type "SDC7".
- 8. At "CS I/O route broadcast interval (sec) (0..65000) [60]:", type "60".
- 9. At "RS232 config (PPP, SLIP, PMPP, PakBus, TcpSer, PakSer, ConfMon, disabled) []:", type "PPP".
- 10. At "RS232 bps (115k, 38k, 19k, 9600, 4800, 2400, 1200, 300) []:", type "38k".
- 11. At "EtherNet 10BASE-T (enabled, disabled) [enabled]:", type "enabled".
- 12. At "10BASE-T port IP address [0.0.0.0]:", type "192.168.20.41". (This entry is an example only. It'll vary for each application based on address assignments in the local area network.)
- 13. At "10BASE-T port network mask []:", type "255.255.255.0". (This entry is an example only. It will vary for each application based on address assignments in the local area network.)

- 14. At "Is there a default gatway (yes, no) [no]:", type "no".
- 15. At "PakBus node Id (1..4094) [678]:", type "678".
- 16. At "Clock neighbor node Id (0..4094) [0]:", type "0".
- 17. At "PakTcp server config (enabled, disabled) []:", type "enabled".
- 18. At "PakTcp server port number (3000..65000) []:", type "4001".
- 19. At "PakTcp client config (enabled, disabled) []:", type "disabled".
- 20. At "Configuration monitor telnet port (0..65000) [23]:", type "23".
- 21. At "Telnet session password [n1100]:", type (and remember) your password.
- 22. At "Serial server watchdog (minutes) (1..65000) [2]:", type "2".
- 23. At "Power Saving Mode (enabled, disabled) []:", type "disabled".
- 24. At "SNMP Version 2 (enabled, disabled) []:", type "enabled".
- 25. At "NTCIP Logger Address (1..50) [10]:", type "10" (PakBus ID for your Datalogger).
- 26. At "PMPP PC Address (1..50) [50]:", type "50".
- 27. At "RS232 port IP address []:", type "192.168.18.150". (This entry is an example only. It'll vary for each application depending on address assignments in the local area network.)
- 28. At "RS232 port, network mask []:", type "255.255.248.0".(This entry is an example only. It will vary for each application depending on address assignments in the local area network.)
- 29. At "PPP Password (Max. 8 characters) [ntcip]:", type your password for PPP. For the time being, username "test" is hard-coded into the NL100 OS.
- 30. At "Settings were changed (save, cancel):", type "save".

StarDot NetCam Configuration

This procedure requires the NetCam support software to be installed on your computer.

- 1. Connect your PC's Serial Port to S1(AUX) of your energized NetCam.
- 2. Execute "C:/Program Files/StarDot/NetCam/nc-tools.exe".
- 3. Press "Setup Wizard".
- 4. Select "Serial Port", Press "Next".
- 5. Select "Auto" for COM port, Press "Next".
- 6. After NetCam finds your COM port, press "Next".

- 7. After NetCam reads your current setting, press "Next".
- 8. Press "Next".
- 9. For your primary connection, select "Network", and press "Next".
- 10. Set your IP address by selecting "Static IP Address" and pressing "Next".
- 11. Set "192.168.20.50" as your NetCam IP Address. (This entry is an example only. It will vary for each application depending on address assignments in the local area network.)
- 12. Set "255.255.255.0" as your network SubMask. (This entry is an example only. It will vary for each application depending on address assignments in the local area network.)
- 13. Set "192.168.20.41" (the NL100's IP address) as your Gateway.
- 14. Press "Next".
- 15. Set Domain name server the same as your PC's settings.
- 16. Set HTTP Port as "80".
- 17. Press "Next".
- 18. Choose the method of transmitting your image. Choose HTTP. If you want to select "FTP", you need to have an FTP server running on your PC.
- 19. Press "Next".
- 20. Press "Next" to save all your configurations.

Now you can connect your StarDot NetCam to NL100.

Before viewing pictures, go into "DOS" and execute the command "arp-s 192.168.20.50 0030-F4-00-10-AB". "192.168.20.50" is the NetCam IP Address.

This command may be placed in a batch file that also calls the NetCam tools software NC_TOOLS.EXE. This is mentioned in Running NetCam Support Software section.

Freewave Radio Configuration

Use Hyperterminal or other terminal software set to 19.2 kbps. Configure Freewave radios in Mode 6, at 38.4 kbps, with crossentries in call books, as shown:

Configuration for base Freewave S/N 900-5051:

MAIN MENU Version 5.57 04-07-99 Standard Hop Table Modem Serial Number 900-2546

- (0) Set Operation Mode
- (1) Set Baud Rate
- (2) Edit Call Book
- (3) Edit Radio Transmission Characteristics
- (4) Show Radio Statistics
- (5) Edit MultiPoint Parameters
- (6) TDMA Menu
- (Esc) Exit Setup

SET MODEM MODE Modem Mode is 6

- (0) Point to Point Master
- (1) Point to Point Slave
- (2) Point to MultiPoint Master
- (3) Point to MultiPoint Slave
- (4) Point to Point Slave/Repeater
- (5) Point to Point Repeater
- (6) Point to Point Slave/Master Switchable) \Leftarrow Select
- (7) Point to MultiPoint Repeater
- (Esc) Exit to Main Menu

SET BAUD RATE

Modem Baud is 038400

- (1) 115,200
- (2) 76,800
- (3) 57,600
- (4) 38,400 (4) \Leftarrow Select
- (5) 19,200
- (6) 9,600
- (7) 4,800
- (8) 2,400
- (9) 1,200
- (A) Data, Parity 0
- (B) MODBus RTU 0
- (Esc) Exit to Main Menu
- Enter Choice

MODEM CALL BOOK Entry to Call is 00

Entry	Number	Repeater1	Repeater2
(0)	901-3950)	⇐ Enter	
(1)	000-0000		
(2)	000-0000		
(3)	000-0000		
(4)	000-0000		
(5)	000-0000		
(6)	000-0000		
(7)	000-0000		
(8)	000-0000		
(9)	000-0000		
(C)	Change En	try to Use (0-9	9) or A (ALL)
(Esc)	Exit to Ma	ain Menu	
Enter	all zeros (0	00-0000) as vo	our last number in list



The default settings are used for the remaining menus and are only shown for completeness. Do not change the following parameters without reading the manual first.

RADIO PARAMETERS

- (0) FreqKey
- (1) Max Packet Size 8

5

- (2) Min Packet Size 9 1
- (3) Xmit Rate
- (4) RF Data Rate 3
- (5) RF Xmit Power 1
- (6) Slave Security 0
- (7) RTS to CTS 0
- (8) Retry Time Out 255
- (9) Lowpower Mode 4
- (Esc) Exit to Main Menu

MULTIPOINT PARAMETERS

- (0) Number Repeaters 1
- (1) Master Packet Repeat 3
- (2) Max Slave Retry 3 3
- (3) Retry Odds
- (4) DTR Connect 0
- (5) Repeater Frequency 0
- (6) NetWork ID 111
- (7) Reserved
- (8) MultiMasterSync 0
- (9) 1 PPS Enable/Delay 255

1

- (A) Slave/Repeater
- (Esc) Exit to Main Menu



The remote Freewave S/N 901-3950 is set up exactly the same, except its call-book, entry 0, is set to match the serial number of the base.

Installing FreeWave Modem INF File

MDMINT.INF Program

This is the INF file provided by FreeWave that is used to install the modem driver. Changes need to be made to the original file, which are shown in **bold underscore**.

; This INF file is for Freewave/Intuicom Wireless Data ; Transceivers - Modem Driver

[Version] LayoutFile=layout.inf, layout1.inf Signature="\$CHICAGO\$" Class=Modem ClassGUID={4D36E96D-E325-11CE-BFC1-08002BE10318} Provider=%IT% DriverVer=03/03/2001,1.0.0.0

[ControlFlags]

[Manufacturer] %Intuicom% = Intuicom

[Intuicom] %DGR115% = DGR115

[DGR115] Addreg=All, GenericAddReg, DGR115Reg, EXTERNAL

[All] HKR,,FriendlyDriver,,Unimodem.vxd HKR,,DevLoader,,*VCOMM HKR,,ConfigDialog,,modemui.dll HKR,,PortSubClass,1,02 HKR,,EnumPropPages,,"modemui.dll,EnumPropPages"

[EXTERNAL] HKR,, DeviceType, 1, 01

[Strings] IT = "Intuicom" Intuicom = "Intuicom" DGR115 = "Freewave Wireless Data Transceiver" [GenericAddReg] HKR, Init, 1,, "AT<cr><lf><cr><lf><cr><lf>"<cr><lf>" HKR, Init, 2,, "AT<cr><lf><cr><lf>" HKR, Monitor, 1,, "" HKR, Monitor, 2,, "" HKR,, Reset,, "" HKR, Answer, 1,, "" HKR, Hangup, 1., "" HKR, Settings, Prefix,, "AT" HKR, Settings, Terminator,, "<cr><lf>" HKR, Settings, DialPrefix,, "DT" HKR, Settings, Pulse,, "" HKR, Settings, Tone,, "" HKR, Responses, "<cr>", 1, 01, 00, 00,00,00,00, 00,00,00,00 HKR, Responses, "<lf>", 1, 01, 00, 00,00,00,00, 00,00,00,00 HKR, Responses, "<cr><lf>OK<cr><lf>", 1, 02, 00, 00,00,00,00, 00,00,00,00 HKR, Responses, "<cr><lf>OK<cr><lf>CONNECT<cr><lf>", 1, 02, 00, 00,00,00,00, 00,00,00,00 HKR, Responses, "OK", 1, 02, 00, 00,00,00,00, 00,00,00,00 HKR, Responses, "OK<cr><lf>CONNECT", 1, 02, 00, 00,00,00,00,00,00,00,00

Setting up the PC

This example installs the Freewave modem driver into Windows 2000 Professional.

- 1. Go to control panel.
- 2. Select Phone and Modem Options, and click on add new modem.
- 3. Check the box that says "Don't detect my modem; I will select it from a list" then click on "Next" (Figure 1).



Figure 1

4. Select "Have disk" instead of selecting a modem from the list Windows generates, then click "Next" (Figure 2).



Figure 2

5. Browse to the folder containing the file named MDMINT.INF, provided with the FreeWave firmware, and select it (Figures 3 and 4).

Install Fro	m Disk	×	1
_	Insert the manufacturer's installation disk into the drive selected, and then click OK.	OK Cancel	
	Copy manufacturer's files from:	<u>B</u> rowse	



Locate File					? 🗙
Look jn:	NetCam		•	+ E 💣 📰	
History	MDMINT.INF				
Desktop					
My Documents					
My Network P	File <u>n</u> ame: Files of <u>type</u> :	MDMINT.INF Setup Information (*.inf)		 ▼ 	<u>O</u> pen Cancel

Figure 4

6. Click on "Open."

7. Select the COM port to which the Freewave transceiver will be attached. COM1 is selected in Figure 5.

Add/Remove Hardware Wi	zard
Install New Modem Select the port(s) you v	vant to install the modem on.
	You have selected the following modem: Freewave Wireless Data Transceiver
	On which ports do you want to install it?
	 <u>All ports</u> <u>S</u>elected ports
	COM1 COM8
	< <u>B</u> ack <u>N</u> ext > Cancel

Figure 5

- 8. Go back to Phone and Modem Options, and right-click on the new Freewave modem entry.
- 9. Select "Properties" on the drop-down menu.

Freewave Wireless Data Transceiver Properties	×
General Diagnostics Advanced	
Port: COM1	
Low High	
Maximum Port Speed 38400 ▼	
Dial Control	
OK Cancel	

10. Select a port speed of 38400 and click on "OK" (Figure 6).



Creating an RAS Dial-up Connection on Windows 2000 Professional

- 1. Under the Start menu, click on Settings.
- 2. Go to Network and Dial-up Connections.
- 3. Click on "Make New Connection".
- 4. Click on "Next" when the wizard starts.

5. Select "Dial-up to private network" then "Next" (Figure 7).

Network Connection Wizard	
Network Connection Type You can choose the type of network connec your network configuration and your network	ction you want to create, based on ing needs.
 Dial-up to private network Connect using my phone line (modem or Dial-up to the Internet Connect to the Internet using my phone Connect to a private network throw 	ISDN). line (modem or ISDN). pugh the Internet
Create a Virtual Private Network (VPN) o	connection or 'tunnel' through the Internet.
Let other computers connect to mine by	phone line, the Internet, or direct cable.
Connect directly to another comp Connect using my serial, parallel, or infra	uter red port.
	< <u>B</u> ack <u>N</u> ext > Cancel

Figure 7

6. Select the Freewave device then "Next" (Figure 8).

Network Connection Wizard	
Select a Device This is the device that will be used to make the connection.	
You have more than one dial-up device on your computer.	
Select the devices to use in this connection:	
🔲 🎒 Infrared Modem Port (SERIAL10-0)	
Modem - Freewave Wireless Data Transceiver (COM1)	
< <u>B</u> ack <u>N</u> ext > Cancel	

Figure 8

7. Enter 0 for the phone number to connect to the first entry in the Freewave call book and click on "Next" (Figure 9).

Network Connection Wizard			
Phone Number to Dial You must specify the phone number of the o connect to.	computer or networ	k you want to	I)
Type the phone number of the computer or your computer to determine automatically ho dialing rules.	network you are co w to dial from differ	nnecting to. If ye ent locations, ch	ou want neck Use
Area code: Phone number:			
Country/region code:		~	
☐ <u>U</u> se dialing rules			
	< <u>B</u> ack	<u>N</u> ext >	Cancel

Figure 9

8. Select "For all users" if desired and give the connection a name. The connection is named "NetCam" in Figure 10.



Figure 10

- 9. Go back to Network and Dial-Up Connections.
- 10. Right-click on the NetCam connection.
- 11. Select Properties on the drop-down menu.
- 12. Select the Freewave modem (Figure 11).
- 13. Click on "Configure" (Figure 11).

NetCam Properties
General Options Security Networking Sharing
Connect using:
Modem - Freewave Wireless Data Transceiver (COM Modem - LT Win Modem (COM3)
All devices call the same numbers
Phone number for Freewave Wireless Data Transceiver
Arga code: Phone number: Image: Description Alternates
Country/region code:
▼
Use dialing rules
Sho <u>w</u> icon in taskbar when connected
OK Cancel

Figure 11

14. Select the speed and hardware settings as shown in Figure 12, then click "OK".

Modem Configuration				? X
Freewave Wireless	: Data Transcei	ver (COM1)		
<u>M</u> aximum speed (bps):	38400			-
Modem <u>p</u> rotocol				~
Hardware features				
Enable hardware flow	control			
Enable modem error co	ontrol			
Enable modern compre	ession			
Initialization				
Show terminal window	I			
🔲 <u>B</u> un script:				-
	<u> </u>	<u>i</u> dit	<u>B</u> rowse	
🔲 Enable mo <u>d</u> em speaker				
		OK	Cano	el

Figure 12

15. Click on the Options tab and set them as shown in Figure 13, then click "OK".

NetCam Properties		? 🗙
General Options Security Network	ing Sharing	
Dialing options ✓ Display progress while connecting ✓ Prompt for name and password, ✓ Include Windows logon domain ✓ Prompt for phone number	ng certificate, etc.	
Redialing options <u>R</u> edial attempts: <u>T</u> ime between redial attempts:	3 1 minute	•
Idle time before hanging up:	never	•
Multiple devices		ïgure
<u>×</u> .25		
[OK	Cancel

Figure 13

- 16. Click on the Security tab, then select "Typical".
- 17. Go to the Networking tab.

- 18. Select PPP in the combo-box and make sure only the TCP/IP box is checked (Figure 14).
- 19. Click on "Settings".

NetCam Properties
General Options Security Networking Sharing
Type of dial-up server Lam calling: PPP: Windows 95/98/NT4/2000, Internet ▼
<u>S</u> ettings
Components checked are used by this connection:
WLink IPX/SPX/NetBIOS Compatible Transport Pro Internet Protocol (TCP/IP) File and Printer Sharing for Microsoft Networks Client for Microsoft Networks Element Service for NetWare
Install Uninstall Properties
Description Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.
OK Cancel

Figure 14

20. Check only the "Enable LCP extensions", then click on "OK" (Figure 15).

PPP Settings			<u>?</u> X
Enable LCP extensions			
Enable software compre	ession		
Negotiate <u>multi-link</u> for s	single link con	nections	
	OK		Cancel

- 21. With TCP/IP selected, click on "Properties". (Returns to Figure 14.)
- 22. Select the "Use the following IP address" radio button (Figure 16).
- 23. Enter an IP address (Figure 16 is consistent with the NL100) then click on "OK".

Internet Protocol (TCP/IP) Propertie		? 🗙						
General								
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.								
O <u>Obtain an IP address automatical</u>	lly							
 Use the following IP address: 								
<u>I</u> P address:	192.168.18.160							
 Obtain DNS server address autor Use the following DNS server address Preferred DNS server: Alternate DNS server: 	matically dresses:	-						
	Adva	nced						
	ОК	Cancel						



24. Click on "OK" to close the properties box.

Running NetCam Support Software

- Create a batch file that executes the "ARP.EXE" utility described in the section titled "StarDot NetCam Configuration Procedure" and starts the NetCam viewer tools, NC_TOOLS.EXE.
- 2. Click on the new NetCam dial-up connection.

- 3. Start the viewer using the batch file.
- 4. Select the camera (Figure 17).
- 5. Click on the view button. Figure 18 shows an example of a StarDot NetCam image.

imes NetCam Tools				_	×			
Highlight the camera you wish to configure.								
\mathbf{N}	Camera ID		IP Address					
M netcam	00-30-F4-00-	10-AB	192.168.	20.50				
stardot-tech.com	1		10	amera found.				
Setup Wizard		View)	Configure				
Ready				Close				

Figure 17



Figure 18