INSTRUCTION MANUAL



RWIS Stations

3/05

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CS500 Table of Contents

PDF viewers note: These page numbers refer to the printed version of this document. Use the Adobe Acrobat® bookmarks tab for links to specific sections.

1. General 1

2. Specifications 1

2.1 Temperature Sensor 1
2.2 Relative Humidity Sensor 2

3. Installation 2

4. Wiring 6

5. Example Programs 6

5.1 Example for CR1000 7
5.2 Example for CR10X 7

6. Long Lead Lengths 8

7. Absolute Humidity 9

8. Maintenance 11

9. References 11

Figures

1. CS500 and 41301 Radiation Shield on a CM6/CM10 Tripod Mast 3
2. CS500 and 41303 Radiation Shield 4
3. CS500 and 41003 Radiation Shield on a CM6/CM10 Tripod Mast 4
4. Radiation Shield, CS500, and 41381 Adapter 5
5. CS500 Wiring 5

Tables

1. Datalogger Connections 6
2. Calibration for Temperature 6
3. Calibration for Relative Humidity 6
4. Wiring for CR1000 and CR10X Examples 7
5. CR10(X) Wiring for Example 1 9

RWIS Stations

Campbell Scientific RWIS stations are intended to automatically collect weather and road information. Standard met sensors are used with surface-specific sensors to measure additional site conditions. As with all Campbell Scientific stations, these are configurable by the customer to their requirements.

RWIS stations conform to national standards defined by the National Transportation Communications for ITS Protocol (NTCIP). They have developed standards for implementation of several aspects of RWIS. The NTCIP guide is available at http://www.ntcip.com/library/guide.asp. The specification that we conform to is ESS-1204. ESS (Environmental Sensor Station) is a term that refers to the weather station.

Each station that we supply has the following components listed below.

Power enclosure for the batteries:
- AC recharge
- DC recharge/tripod for solar panels

Equipment enclosure:
- CR10X-2M or CR1000
- SDM-SIO4
- NL110
- Modem

In addition to the standard met sensors, there are options that add function to the station to allow it to make road-related measurements. Some are listed below. As with any station, if a customer needs another measurement that they feel is appropriate, it will be added if possible.

SR50 (acoustic snow sensor)
Lufft IRS21 (road sensor – 2 ea generally)
Present weather (such as Vaisala PWD22)
Camera
107 probes for sub surface temperatures

The purpose for the instruments in the equipment enclosure doesn't need a lot of explanation with the exception of the SDM-SIO4 and the modem.

The SDM-SIO4 is used primarily for interfacing to the IRS21. The handshake required to communicate with the sensor doesn't allow for operation with the CR10X alone since four control ports are required. In addition, many of the sensors used with this application have serial interfaces making the SDM-SIO4 a good addition to the application.

The modem used needs an RS-232 interface and also needs to be faster than the 9600 baud offered in Campbell modems. This is due to the requirement for image retrieval from a camera. If using FTP (desired) to extract an image from the logger, FTP shuts down before the image can be retrieved.

Theory of operation

The NL110 provides communication for all system devices, converts logger measurements to NTCIP compliant data, routes images from an installed camera to the logger, provides SNMP communication, and stores text generated in the CR10X to text values required by NTCIP.

Customers call in through the modem and establish a PPP connection. This connection makes a private network and has its own IP address.

The NL110 also provides the necessary function for providing NTCIP compliant data to ANY NTCIP compliant software that can interrogate NTCIP compliant systems. This makes the RWIS system compatible with other systems supplied by other manufacturers.

The logger makes all measurements. As they are made, output is generated that the NL110 accepts. The NL100 then converts the data to NTCIP compliant values by changing the variable names to variable names that comply with the specification.

The camera installed outputs an image automatically on a fixed interval. As the image is sent, it is routed from the camera to the 10 base t input on the NL110. The NL110 then routes the image to the logger for later use. One image is stored in the logger, and when a new image is sent, it replaces the image last sent.

All sensors have their own measurement instructions, but there are some unique setups for the equipment installed in the ESS. The following pages describe those setups.

Loggermap											
diff channel	se channel	sensor/color		function		12v/color		AG/color		G/color	
1	1H			humidity							
	2L			Air temp							
2	3H			open option(oo)							
	4L			wind direction							
3	5H			solrad							
	6L			solrad							
4	7H			sub surface							
	8L			sub surface							
5	9H			sub surface							
	10L			sub surface							
6	11H			rain y/n(oo)*							
	12L			rainy/n(oo)*							
	p1			wind speed							
	p2			tipping bucket							
	e1										
	e2			sub surface							
	e3			wind direction							
	c1			sdm-sio4							
	c2			sdm-sio4							
	c3			sdm-sio4							
	c4										
	c5										
	c6										
	c7										
	c8			snow depth							

Logger Setup

The CR10X-2M *D and *A menus set the logger for image collection and pb operation.

*D15 location 1 is the pakbus address and is set to 1
fill in the remainder of the table with values of 4

*D16 location is the amount of memory to set aside for the image in the logger and is set to 6

*D18 location is the beacon and is set to 60

*D19 location 01 is set to 17 with nothing after

*A location 6 is set to 3000 for the text values that ess1204 requires

NL110 Setup

NL100/105:

TLink config: [RS232]

RS485 config: [disabled]

CS I/O config: [PakBus]
    CS I/O SdcAddr/bps: [SDC7]
    CS I/O beacon interval (sec): [60]

RS232 config: [PPP]
    RS232 bps: [38k]

EtherNet 10BASE-T: [enabled]
    10BASE-T port IP address: [192.168.7.53]
    10BASE-T port network mask: [255.255.255.0]
    Is there a default gatway: [no]

PakBus node Id: [678]
    Clock neighbor node Id: [1]

PakTcp server config: [enabled]
    PakTcp server port number: [4001]

PakTcp client config: [disabled]

Configuration monitor telnet port: [23]

Telnet session password: [nl100]

Serial server watchdog (minutes): [2]

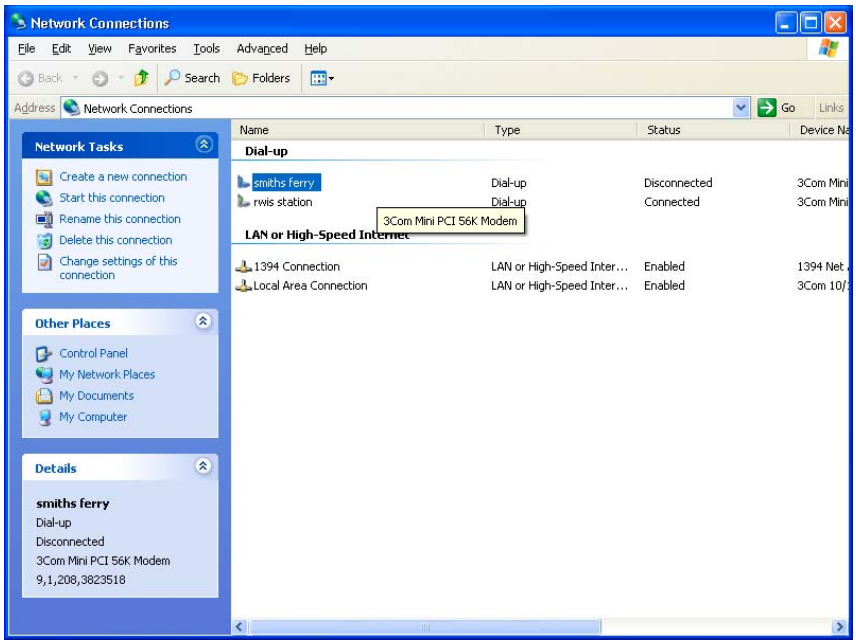
Power Saving Mode: [disabled]

MODBUS/TCP gateway config: [disabled]

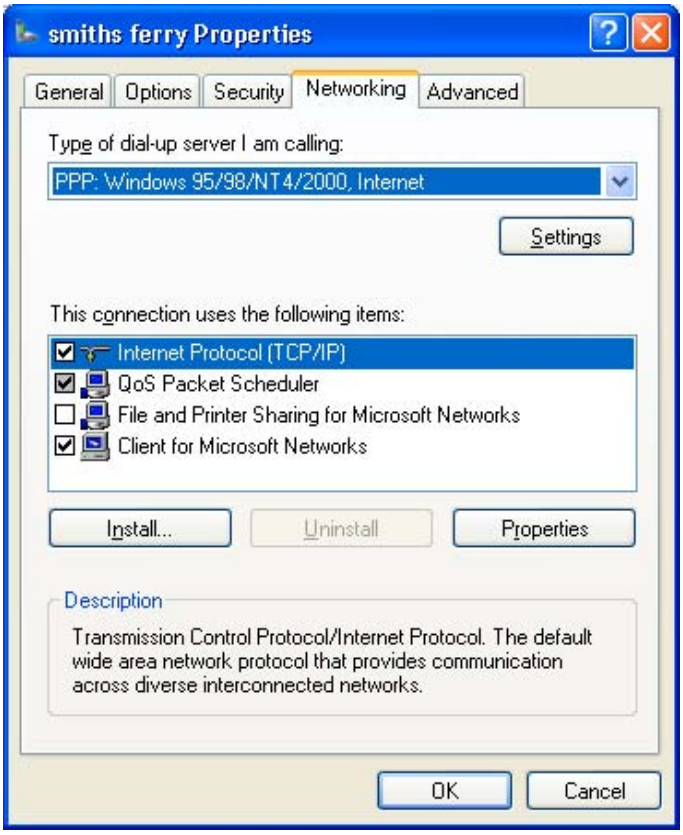
SNMP Version 2: [enabled]
    Logger ID for PakBus: [1]
    PMPP PC Address: [50]
    Network Address for PPP: [192.168.18.150]
    Network Mask for PPP: [255.255.248.0]
    PPP Password (Max. 8 characters): [ntcip]
    Enable Ethernet Port: [enabled]
    Set Modem Answer Rings (1: default): [1]
    Modem Initialization: [AT]

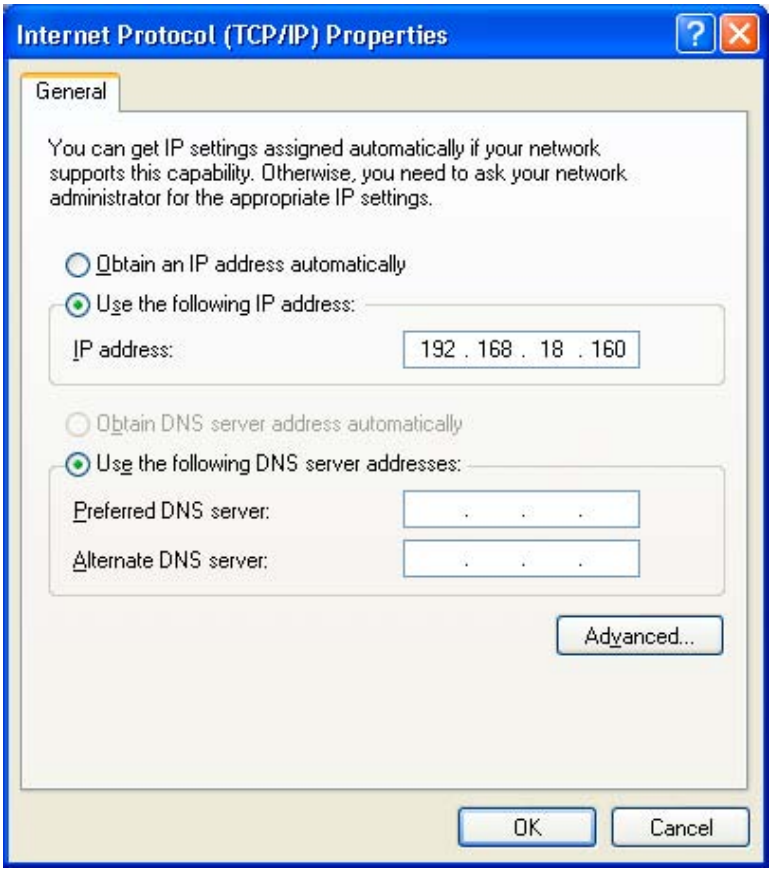
NL100/105 (ver, last, curr, show, edit, defaults, reset, help, bye):

Dial up Setup






smiths ferry Properties
General
Options
Security
Networking
Advanced
Type of dial-up server I am calling:
PPP: Windows 95/98/NT4/2000, Internet
Settings
This connection uses the following items:
Internet Protocol (TCP/IP)
QoS Packet Scheduler
File and Printer Sharing for Microsoft Networks
Client for Microsoft Networks
Install...
Uninstall
Properties
Description
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.
OK
Cancel


Internet Protocol (TCP/IP) Properties
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.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 18 . 160
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Collecting the image as data

When FTP cannot be used for image removal from the logger, cora_cmd can be. In this case the image is treated just like data in that it is downloaded during a task for routine data removal or by itself in a task. The following batch files are used. The files in the images below have different names, but do the same thing. If you're going to get data and a picture during the same call, the following set up can be used in the Loggernet tasks.

User may or may not be needed for the function.

All files need to be placed in the programs\campbellsci\loggernet directory

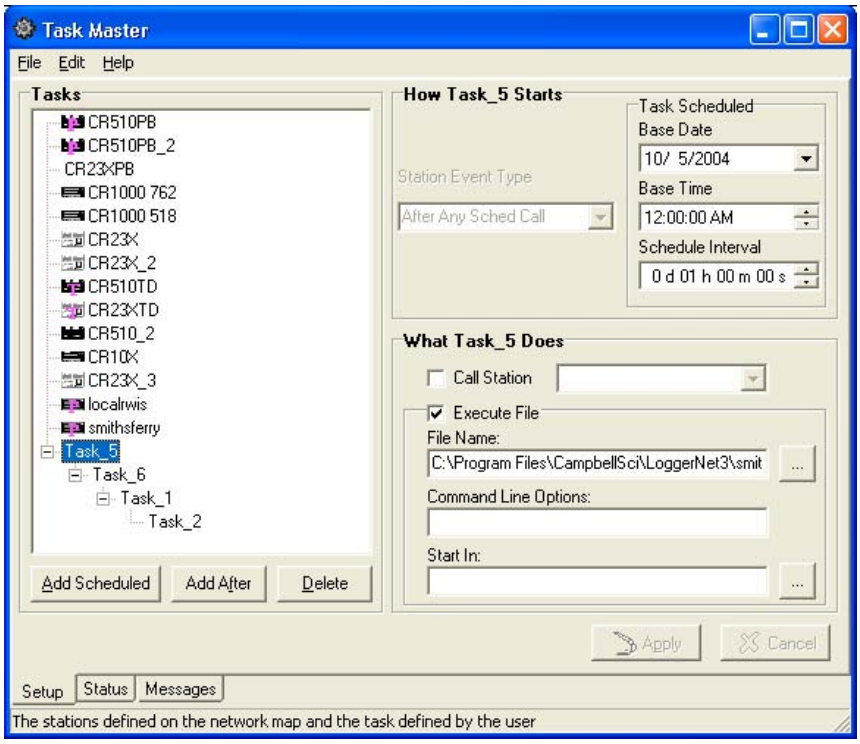
1. connect with rasconnect
2. connect to the station and collect the data
3. execute pictask.bat which in turn calls getpic.txt to retrieve the image
4. disconnect with rasdisconnect

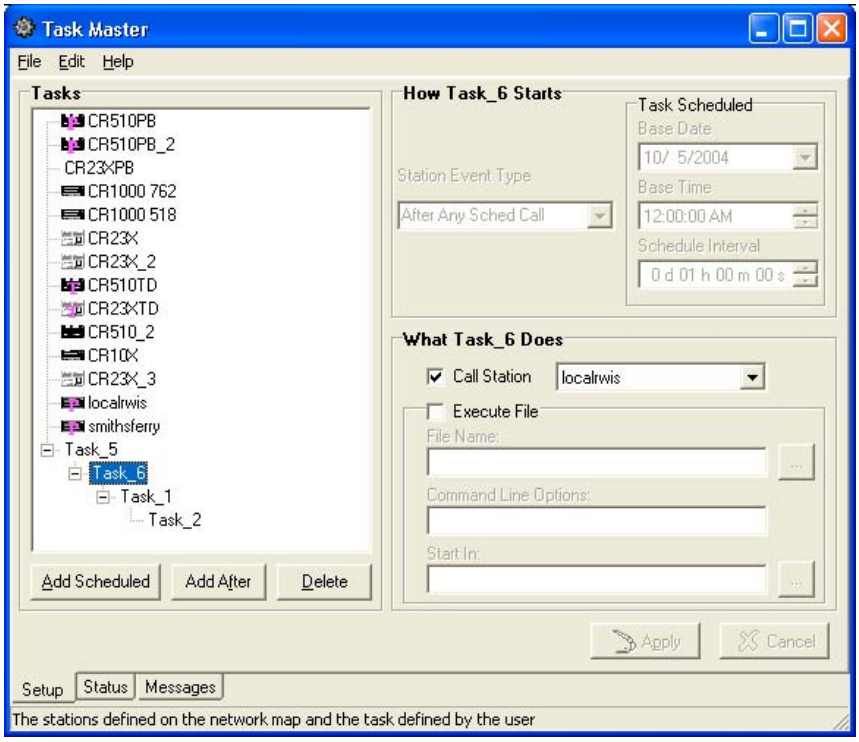
Rasconnect.bat
RASDIAL rwis1 user

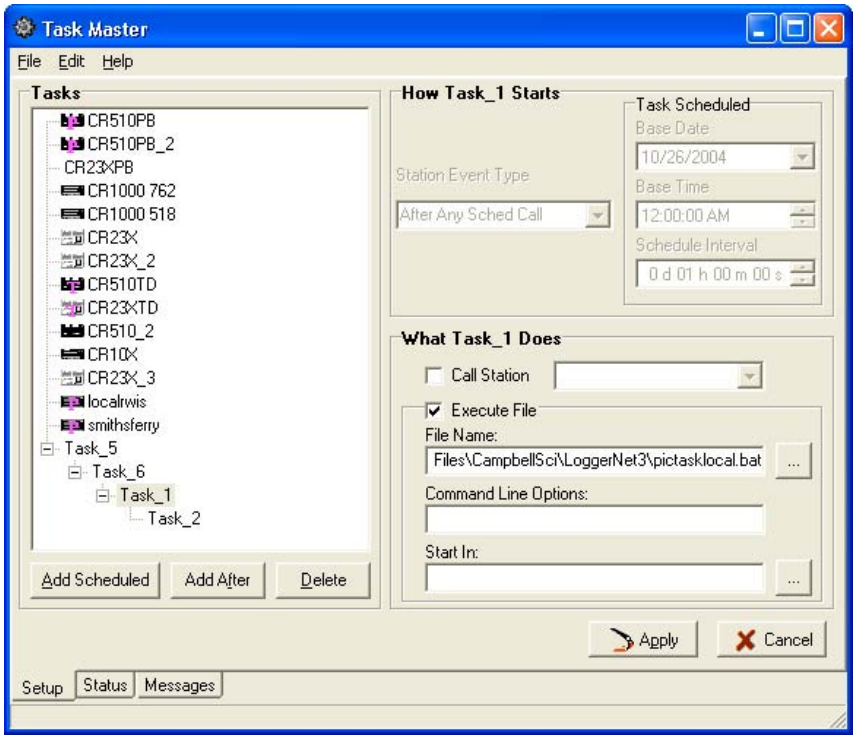
Rasdisconnect.bat
RASDIAL rwis1 /DISCONNECT

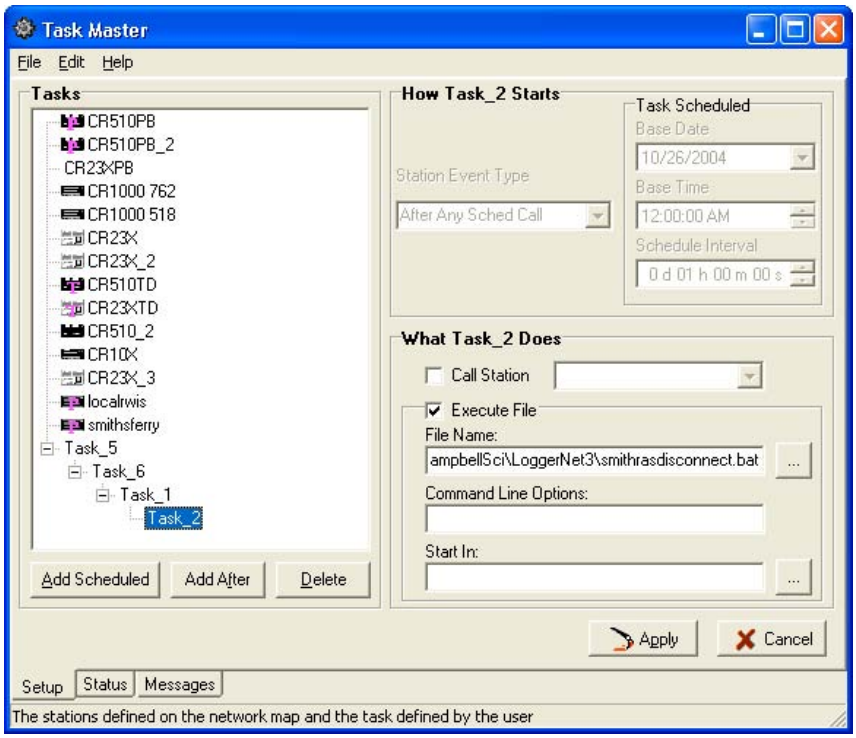
Getpic.txt
connect localhost;
get-file rwispbadr1 CRD:netcam.jpg.tmp --save-as=c:\campbellsci\loggernet3\netcam.jpg;
exit;

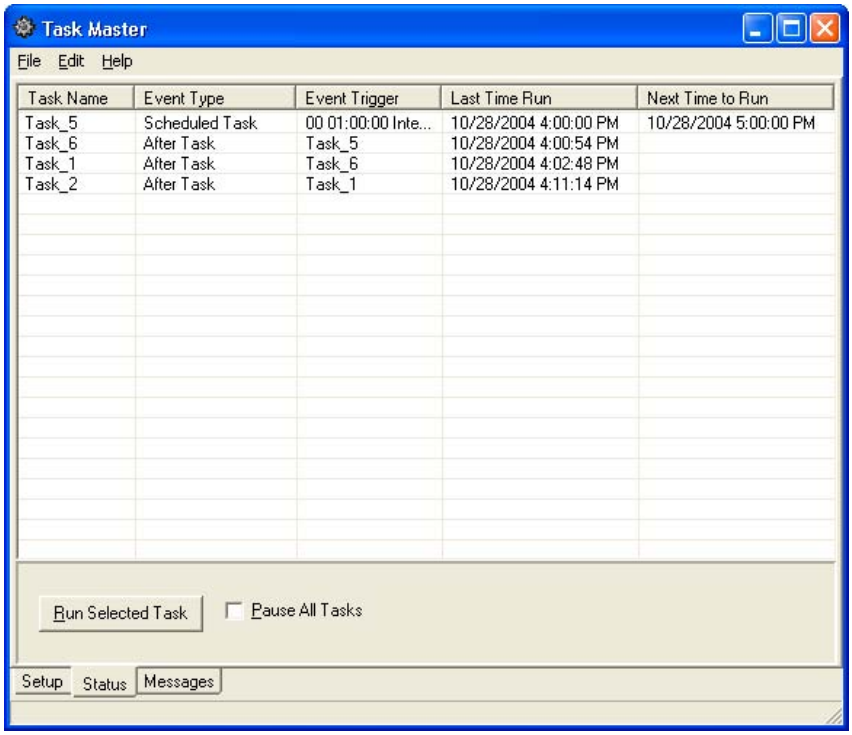
pictask.bat
c:\"program files\campbellsci\loggernet3\cora_cmd.exe" <getpic.txt>what.log

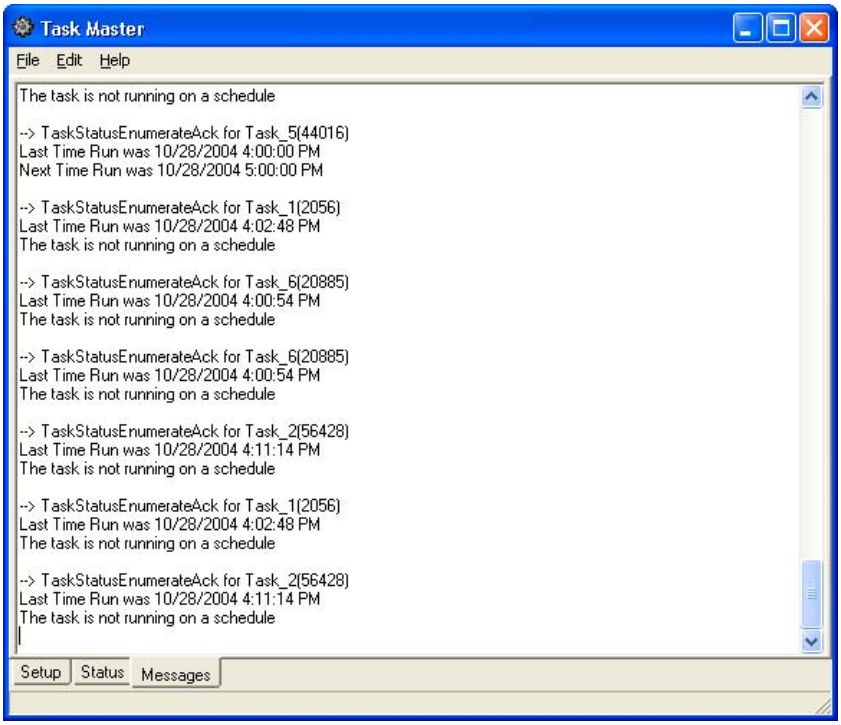



Task Master
File Edit Help
Tasks
CR510PB
CR510PB_2
CR23XPB
CR1000 762
CR1000 518
CR23X
CR23X_2
CR510TD
CR23XTD
CR510_2
CR10X
CR23X_3
localrwis
smithsferry
Task_5
Task_6
Task_1
Task_2
Add Scheduled
Add After
Delete
How Task_6 Starts
Station Event Type
After Any Sched Call
Task Scheduled
Base Date
10/ 5/2004
Base Time
12:00:00 AM
Schedule Interval
0 d 01 h 00 m 00 s
What Task_6 Does
Call Station
localrwis
Execute File
File Name:
Command Line Options:
Start In:
Apply
Cancel
Setup
Status
Messages
The stations defined on the network map and the task defined by the user

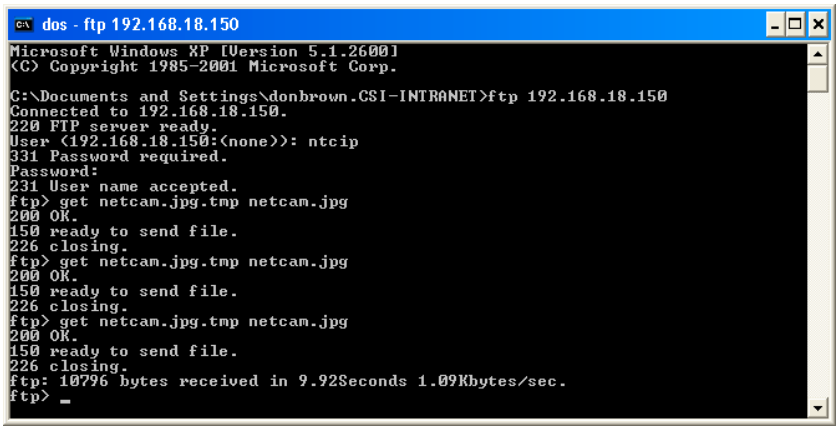

Task Master
File Edit Help
Tasks
CR510PB
CR510PB_2
CR23XPB
CR1000 762
CR1000 518
CR23X
CR23X_2
CR510TD
CR23XTD
CR510_2
CR10X
CR23X_3
localrwis
smithsferry
Task_5
Task_6
Task_1
Task_2
Add Scheduled
Add After
Delete
How Task_1 Starts
Station Event Type
After Any Sched Call
Task Scheduled
Base Date
10/26/2004
Base Time
12:00:00 AM
Schedule Interval
0 d 01 h 00 m 00 s
What Task_1 Does
Call Station
Execute File
File Name:
Files\CampbellSci\LoggerNet3\pictasklocal.bat
Command Line Options:
Start In:
Apply
Cancel
Setup
Status
Messages


Task Master
File Edit Help
Tasks
CR510PB
CR510PB_2
CR23XPB
CR1000 762
CR1000 518
CR23X
CR23X_2
CR510TD
CR23XTD
CR510_2
CR10X
CR23X_3
localrwis
smithsferry
Task_5
Task_6
Task_1
Task_2
Add Scheduled
Add After
Delete
How Task_2 Starts
Station Event Type
After Any Sched Call
Task Scheduled
Base Date
10/26/2004
Base Time
12:00:00 AM
Schedule Interval
0 d 01 h 00 m 00 s
What Task_2 Does
Call Station
Execute File
File Name:
ampbellSci\LoggerNet3\smithrasdisconnect.bat
Command Line Options:
Start In:
Apply
Cancel
Setup
Status
Messages
The stations defined on the network map and the task defined by the user


Task Master
File Edit Help
Task Name
Event Type
Event Trigger
Last Time Run
Next Time to Run
Task_5
Scheduled Task
00 01:00:00 Inte...
10/28/2004 4:00:00 PM
10/28/2004 5:00:00 PM
Task_6
After Task
Task_5
10/28/2004 4:00:54 PM
Task_1
After Task
Task_6
10/28/2004 4:02:48 PM
Task_2
After Task
Task_1
10/28/2004 4:11:14 PM
Run Selected Task
Pause All Tasks
Setup
Status
Messages

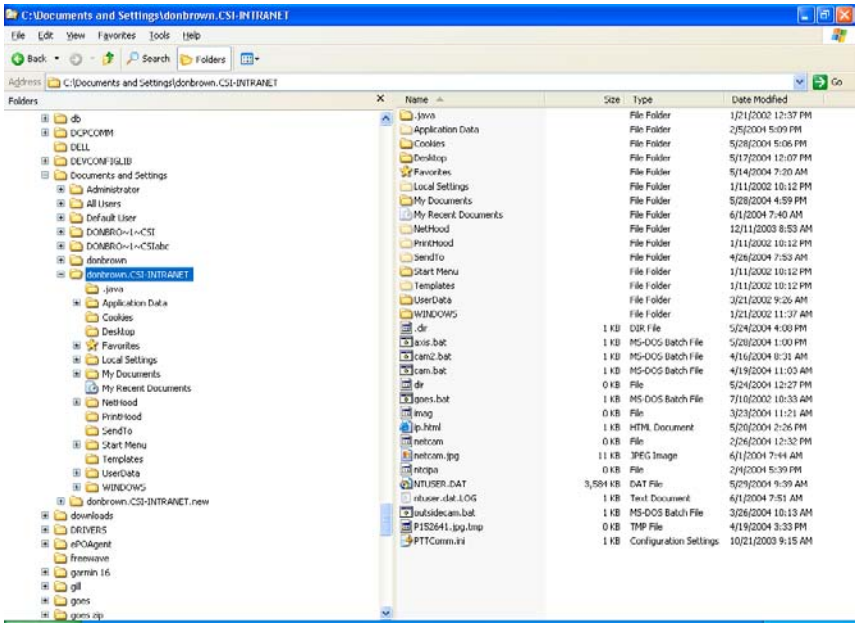


FTP image retrieval



To FTP an image from a logger

C:\Documents and Settings\donbrown.CSI-INTRANET>ftp 192.168.18.150
Connected to 192.168.18.150.
220 FTP server ready.
User (192.168.18.150:(none)): ntcip
331 Password required.
Password:ntcip
231 User name accepted.
ftp> get netcam.jpg.tmp netcam.jpg
200 OK.
150 ready to send file.
226 closing.
ftp: 10796 bytes received in 9.92Seconds 1.09Kbytes/sec.
ftp>



The image is sent to the default directory.

Ayantra Modem Setup

Ayantra IML560

Switch	Position
1	off
2	on
3	off
4	on
5	off
6	off
7	off
8	on
9	on
10	off
11	off
12	off

The modem is set to 38.4kb to match the speed of the serial port on the NL110.

CAUTION

Be aware that the power connector of the Ayantra modem is the same as for our loggers, except that the connections are reversed. Be certain to wire the power of the modem according to the label on the modem.

Blackbox Modem Setup

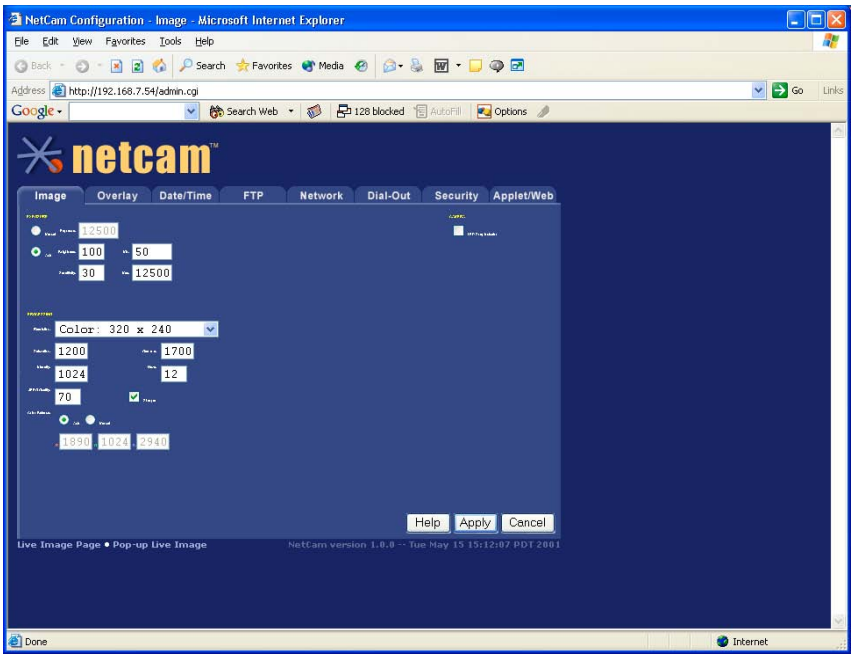
Blackbox MD3200A setup for use with Rwis stations

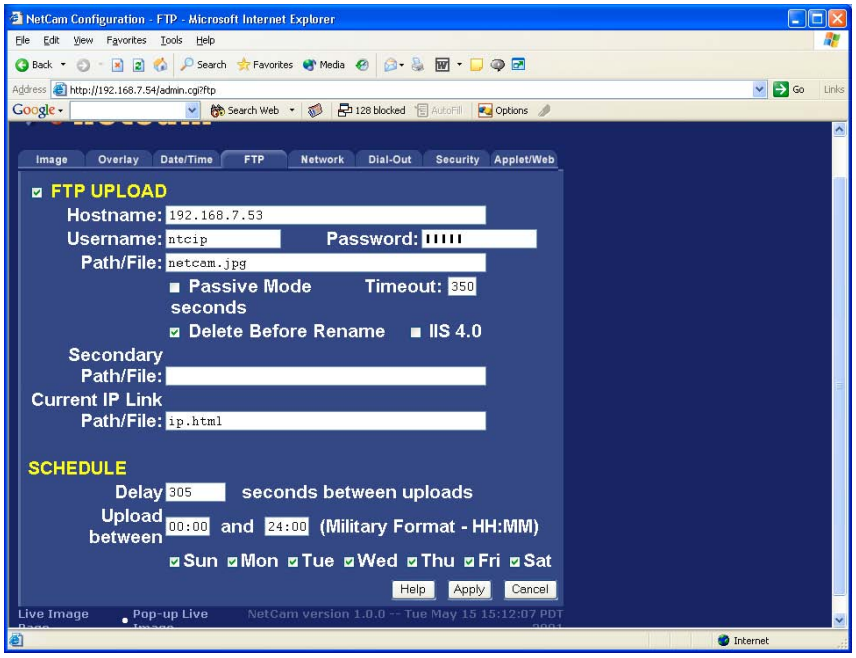
Follow the manual instructions for configuring the modem

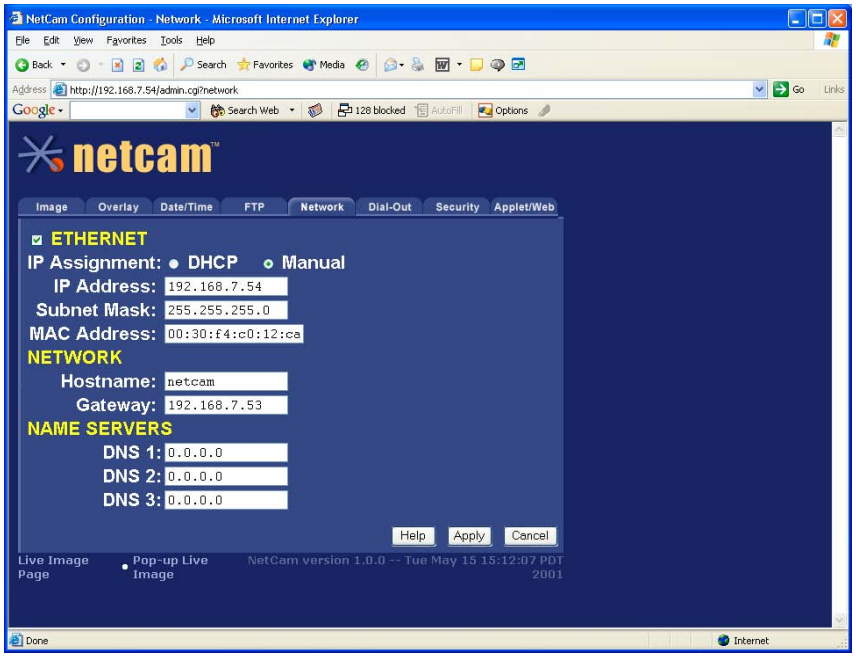
Set the following

AT&F1	Sets the default values
ATS0=1	Answers after 1 ring
ATS46=136	Disables compression
AT&D0=0	Ignores DTR
AT&W	Writes the changes

Netcam Setup

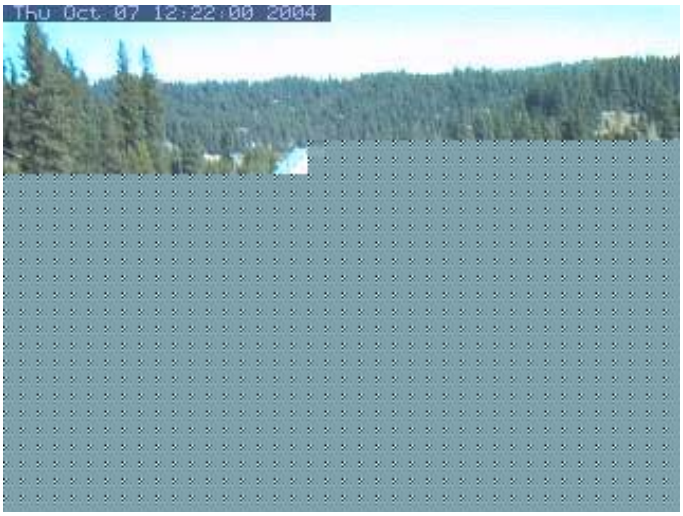






Troubleshooting

There may be times that a partial image is seen. In this case an image was being transferred to the logger, and something interrupted it. Calling in during the image transfer can cause this to happen. Ideally a polled camera would solve this problem since we could ask for an image with a control port just before a scheduled call. The problem can be minimized by scheduling image downloads at times other than scheduled calls. For an hourly schedule, if the camera is set to 13 minute downloads, interruptions of the image transfer are very seldom.



If there is a time that the station is called but the authentication fails, the NL110 is hung and needs to be reset. This can done locally by using the NL110 configuration menu, or by programming a control port to power rest the modem on a regular interval. The control port is wired to the SW12V ctrl, and the NL110 is powered by the SW12V of the CR10X-2M.

If there is a time that the phone lines are good but the connection rings busy, the modem could be hung and needs to be reset. This, too, can be managed by a power reset with the modem also being controlled by the SW12V.

Connection speeds for telephones are also a concern in that speeds less that about 16kb are not practical for image retrieval. Since the modem connects to the serial port of the NL110 and the maximum speed of the serial port is 33.6kb, a modem with at least that speed is needed. Experience has shown that with speeds less than about 16kb, FTP times out and there is no image sent.

Possible configurations

There are two verified ways to connect to the RWIS station.

The first is phone modem to NL110. Using the setups described in earlier sections reliable communication is accomplished.

The second is phone modem to RF400 to NL110. In this case, a null modem is needed for connection to the base RF400 and the modem. On the logger side a straight cable is used to connect the RS-232 port of the RF400 to the RS-232 port on the NL110.

Setups for the RF400s are all default with the following exceptions.

Active interface – rs232
Baud rate 38.4 kb
RF_ON 24ma

Programming

There are some requirements of ESS-1204 that require special consideration for the CR10X-2M. They are text and large numbers. Large numbers are

converted to text with the P190 instruction, and text is created also with the P190. This is the set settings instruction, and when using this technique the 68 instruction is used to spell out the text. In both cases the form is variablename=value. There is a limit though to the amount of text that can be created. Twenty-nine characters maximum are allowed on either side of the equal sign for CR10X-2M datalogger.

ESS-1204 defines all the measurements to be made. All measurements aren't required, but values have to be provided for all measurements. If a sensor isn't part of a station, the specification requires that a no sensor value be present. The way that this is done is by writing an initialization subroutine to provide values for all sensors and creating values that correspond to the type of measurement. The subroutine is executed one time at startup or when the program is recompiled. In this way default values are already established. As sensors are added in the measurement section of the of the program, the measured values replace the default values in the output.

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