

INSTALLATION AND OPERATION MANUAL

CNFE3DOE2/M

RS232/422/485 DATA OVER ETHERNET TERMINAL SERVER

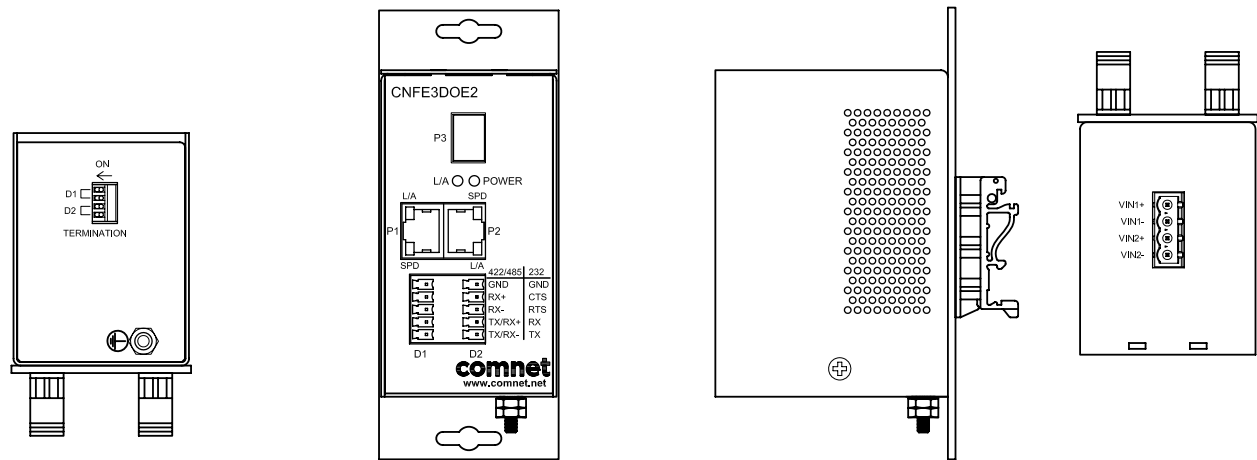
The ComNet CNFE3DOE2/M allows any combination of two RS-232, RS-422, or 2 or 4-wire RS-485 serial data circuits to be inserted onto any 10/100 Mbps Ethernet-based network. The CNFE3DOE2/M units include two serial data input/output ports, and three Ethernet ports featuring two electrical ports and one SFP port. It may be used to tunnel serial data over an IP network or as a media converter, for converting copper transmission media to fiber. Access one serial device from the Internet and another serial device from a local area network (LAN) using SSH or SSL. The CNFE3DOE2/M provides control of the remote hardware, as if it were connected directly to the PC COM port. A USB to serial converter may be required in new PCs without a DB9 serial connection.

Contents

Hardware description	3
Assign IP Address to a Terminal Server	4
Using Terminal Server as a Serial Extender over Ethernet	8
TCP Transport	8
UDP Transport	13
SSL Transport	17
Creating openssl certificates	23
SSH Transport	25
Creating SSH key pairs	29
Telnet Transport	29
HTTPS Configuration	33
OpenSSL Certificate, key and CA for HTTPS	39

Hardware description

The ComNet CNFE3DOE2/M terminal server supports Ethernet transmission over two copper ports and one fiber port. The server is universally compatible with RS232, RS422, RS485 serial data protocols. All configurations are done through its web server. Distances depend on which SFP (Small Form Pluggable) module is used. The RJ45 Ethernet and SFP interfaces are all enabled. They can function as an Ethernet media converter.



Mechanical Drawing of CNFE3DOE2/M Unit

The data connector pin-out is as below:

		422/485	232
<div>D1</div> <div>D2</div>		GND	GND
		RX+	CTS
		RX-	RTS
		TX/RX+	RX
		TX/RX-	TX

Settings by Data Type (Port 1 or 2)

Assign IP Address to a Terminal Server

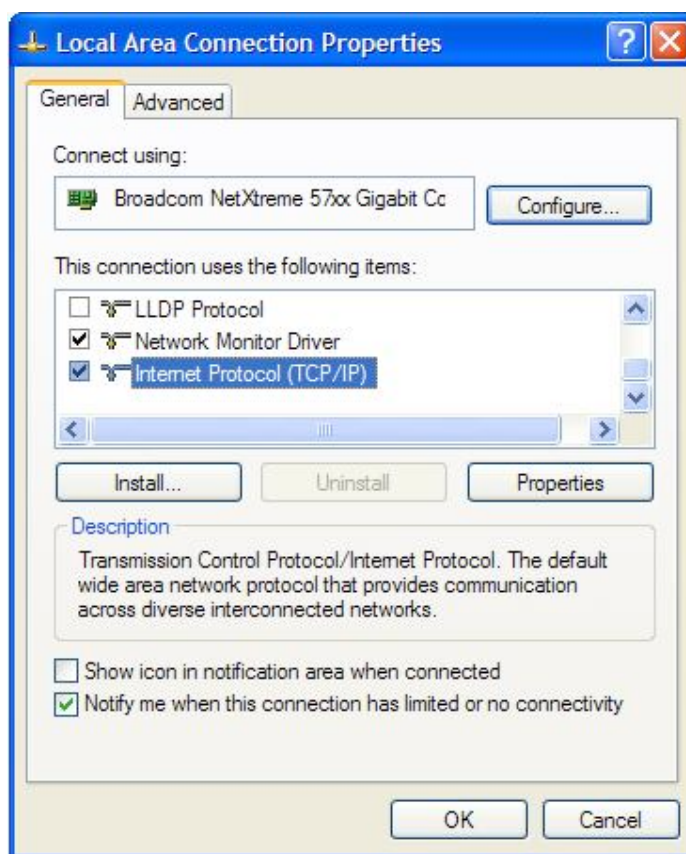
A unique IP address has to be assigned to each terminal server device. You can connect one at a time to change the default IP address. The default IP address of the device is the same: 192.168.10.1.

Connect the terminal server on to your local Ethernet network which your PC is connected to, and power on the unit.

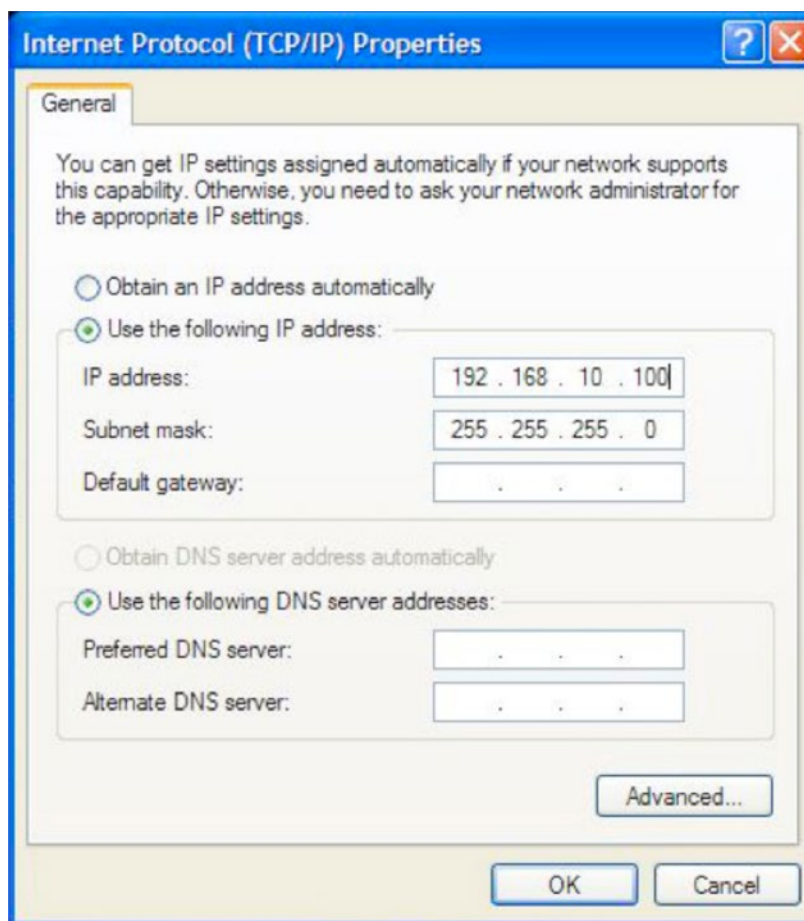
Follow the steps below to set up your PC IP address to the same subnet as the terminal servers.

Disable the machine's wireless network connection and any other internet connections that could interfere with the network being created.

Select the Internet Protocol (TCP/IP) connection within the Local Area Connection Properties from **start -> Control Panel -> Network Connections -> Properties**.



Next, manually set your IP address to **192.168.10.100**, for instance, and your subnet mask to **255.255.255.0**, as shown below.



Click **OK** to finish the setting.

Open the browser on your PC, and type in **192.168.10.1** and open the Terminal Server Log in Page as shown.

The default User Name and Password are both **admin**

Log in to the Terminal Server Home Page as shown.

Terminal Server Log in Pop-up

Terminal Server Network Page

Click on the **Device IP Address** text box.

Change the IP address to an IP address with subnet appropriate for your network. In the following examples an IP address in subnet **192.168.10.xxx** will be used.

Configure the IP address to **192.168.10.10** as shown in the Terminal Server Network Page.

Click **Submit New Settings**.

comnet

Comnet Terminal Server

Comnet Terminal server

Network

Protocol: TCP/SSL (Changing will terminate all existing connections)

Device Name (for DHCP): SB70LCSX-6B52

NetBIOS Name: SB70LCSX-6B52

Version: 02.07.0000

Static Settings	DHCP Assigned Values	Address Mode
Device IP Address: 192.168.10.10		Static IP
Device Subnet Mask: 255.255.255.0		
Device Gateway: 192.168.10.254		
DNS Server: 0.0.0.0		
NTP Server: pool.ntp.org	0.0.0.0	No DNS to look up NTP server
System Time: No valid time UTC (When page was loaded)		

Reset To Factory Defaults Submit New Settings

Copyright © 2014 Comnet, LLC.

Terminal Server Configuration Page

Log in to the terminal server again using the new IP address.

If an IP address in a different subnet was used, be sure to change the PC's network address to an IP address in the appropriate subnet.

Using Terminal Server as a Serial Extender over Ethernet

TCP Transport

To use the Terminal Server as a serial extender over Ethernet, connect two terminal servers to your local Ethernet network.

Configure Server

Configure the first device as a server:

- » Set protocol to TCP/SSL on Network page.

The screenshot displays the 'Comnet Terminal server' configuration interface. On the left is a navigation menu with links: Network, TCP, Serial, Password, HTTPS, CAcerts, Advanced, and Help. The 'Network' tab is selected. The main content area is titled 'Comnet Terminal server' and contains the following settings:

- Protocol:** TCP/SSL (with a note: (Changing will terminate all existing connections))
- Device Name (for DHCP):** SB70LCSX-6B52
- NetBIOS Name:** SB70LCSX-6B52
- Version:** 02.07.0000
- Static Settings:**
 - Device IP Address: 192.168.10.1
 - Device Subnet Mask: 255.255.255.0
 - Device Gateway: 192.168.10.254
 - DNS Server: 0.0.0.0
 - NTP Server: pool.ntp.org
 - System Time: No valid time UTC (When page was loaded)
- DHCP Assigned Values:** 0.0.0.0
- Address Mode:** Static IP (dropdown menu)

At the bottom of the settings area are two buttons: 'Reset To Factory Defaults' and 'Submit New Settings'. The footer of the page reads 'Copyright © 2014 Comnet, LLC.'

Figure 1 Terminal Server Network Page

- » Click TCP link
- » Configure Port1 to listen for incoming connections on port 24

TCP	Port0	Port1
Listen for incoming network connections	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Listening network port:	<input type="text" value="0"/>	<input type="text" value="24"/>
Timeout and disconnect after this many seconds of inactivity.	<input type="text" value="60"/>	<input type="text" value="60"/>
Allow new connection if the existing connection has been idle for this many seconds.	<input type="text" value="30"/>	<input type="text" value="30"/>
When to begin making outgoing tcp connections:	<input type="text" value="Never"/>	<input type="text" value="Never"/>
Connect on network port:	<input type="text"/>	<input type="text"/>
Connect to this address:	<input type="text"/>	<input type="text"/>
Alternate address:	<input type="text"/>	<input type="text"/>
Timeout and disconnect after this many seconds of inactivity.	<input type="text" value="60"/>	<input type="text" value="60"/>
Retry failed outgoing connections after this many seconds.	<input type="text" value="360"/>	<input type="text" value="360"/>
Check and maintain valid connection at intervals in seconds.	<input type="text" value="0"/>	<input type="text" value="0"/>
Use custom packetization logic (below)	<input type="checkbox"/>	<input type="checkbox"/>
Number of characters to accumulate before sending TCP packet:	<input type="text" value="32"/>	<input type="text" value="32"/>
Number of msec to wait for accumulated characters: 0 waits forever.	<input type="text" value="100"/>	<input type="text" value="100"/>
Flush TCP frame when this character is received (Enter NA to disable):	<input type="text" value="NA"/>	<input type="text" value="NA"/>
USE SSL rather than TCP for connections:	<input type="checkbox"/>	<input type="checkbox"/>
Always Save Serial Chars regardless of connection status:	<input type="checkbox"/>	<input type="checkbox"/>
Network Settings on Serial Port - Advanced Serial Settings		
<input type="button" value="Submit New Settings"/>		

Copyright © 2014 Comnet, LLC.

Figure 2 Terminal Server TCP Page

- » Click Serial link
- » Configure Port1 for RS422

comnet

Comnet Terminal Server

Serial	Port0	Port1
Data Port Settings:	DEBUG	RS-422
Data Baud Rate:	115200	115200
Custom Baud Rate:	0	0
Data Bits:	8	8
Data Parity:	None	None
Stop Bits:	1	1
Flow Control:	None	None
AT Commands:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Submit New Settings

Copyright © 2014 Comnet, LLC.

Figure 3 Terminal Server Serial Page

Configure Client

- » Configure the second device as a client.
- » Set protocol to TCP/SSL on Network page.

comnet

Comnet Terminal Server

Comnet Terminal server

Network

Protocol: TCP/SSL (Changing will terminate all existing connections)

Device Name (for DHCP): SB70LCSX-6B5C

NetBIOS Name: SB70LCSX-6B5C

Version: 02.07.0000

Static Settings	DHCP Assigned Values	Address Mode
Device IP Address: 192.168.10.2		Static IP
Device Subnet Mask: 255.255.255.0		
Device Gateway: 192.168.10.254		
DNS Server: 0.0.0.0		
NTP Server: pool.ntp.org	0.0.0.0	No DNS to look up NTP server
System Time: No valid time UTC (When page was loaded)		

Reset To Factory Defaults

Submit New Settings

Copyright © 2014 Comnet, LLC.

Figure 4 Terminal Client Network Page

- » Click TCP link
- » Configure Port1 to connect to 192.168.10.1 port 24

TCP	Port0	Port1
Listen for incoming network connections	<input type="checkbox"/>	<input type="checkbox"/>
Listening network port:	0	0
Timeout and disconnect after this many seconds of inactivity.	60	60
Allow new connection if the existing connection has been idle for this many seconds.	30	30
When to begin making outgoing tcp connections:	Never	If serial data received
Connect on network port:		24
Connect to this address:		192.168.10.1
Alternate address:		
Timeout and disconnect after this many seconds of inactivity.	60	60
Retry failed outgoing connections after this many seconds.	360	360
Check and maintain valid connection at intervals in seconds.	0	0
Use custom packetization logic (below)	<input type="checkbox"/>	<input type="checkbox"/>
Number of characters to accumulate before sending TCP packet:	32	32
Number of msec to wait for accumulated characters: 0 waits forever.	100	100
Flush TCP frame when this character is received (Enter NA to disable):	NA	NA
USE SSL rather than TCP for connections:	<input type="checkbox"/>	<input type="checkbox"/>
Always Save Serial Chars regardless of connection status:	<input type="checkbox"/>	<input type="checkbox"/>
Network Settings on Serial Port - Advanced Serial Settings		
Submit New Settings		

Copyright © 2014 Comnet, LLC.

Figure 5 Terminal Client TCP Page

- » Click Serial link
- » Configure Port1 for RS422

comnet

Comnet Terminal Server

Network

TCP

Serial

Password

HTTPS

CAcerts

Advanced

Help

Serial

Port0

Port1

Data Port Settings:

DEBUG

RS-422

Data Baud Rate:

115200

115200

Custom Baud Rate:

0

0

Data Bits:

8

8

Data Parity:

None

None

Stop Bits:

1

1

Flow Control:

None

None

AT Commands:

☐

☐

Submit New Settings

Copyright © 2014 Comnet, LLC.

Figure 6 Terminal Client Serial Page

UDP Transport

To use the Terminal Server as a serial extender over Ethernet utilizing UDP, connect two terminal servers to your local Ethernet network and configure devices as a client server connection.

Configure Server

- » Set protocol to UDP on Network page.

The screenshot displays the 'Comnet Terminal server' configuration interface. On the left is a sidebar menu with options: Network, UDP, Serial, Password, HTTPS, CAcerts, Advanced, and Help. The 'Network' tab is selected. The main content area is titled 'Comnet Terminal server' and contains the following settings:

- Protocol:** A dropdown menu set to 'UDP' with a note: '(Changing will terminate all existing connections)'.
- Device Name (for DHCP):** Text input field containing 'SB70LCSX-6B5C'.
- NetBIOS Name:** Text input field containing 'SB70LCSX-6B5C'.
- Version:** Text input field containing '02.07.0000'.
- Static Settings:**
 - Device IP Address:** Text input field containing '192.168.10.2'.
 - Device Subnet Mask:** Text input field containing '255.255.255.0'.
 - Device Gateway:** Text input field containing '192.168.10.254'.
 - DNS Server:** Text input field containing '0.0.0.0'.
- DHCP Assigned Values:**
 - NTP Server:** Text input field containing 'pool.ntp.org'.
 - Text '0.0.0.0' is displayed next to the NTP Server field.
- Address Mode:** A dropdown menu set to 'Static IP'.
- System Time:** Text input field containing 'No valid time UTC (When page was loaded)'.
- Footer:** 'Reset To Factory Defaults' and 'Submit New Settings' buttons.

Copyright © 2014 Comnet, LLC.

Figure 7 Terminal Server Network Page

- » Click UDP link
- » Configure Port1 to receive on port 24 & to transmit to 192.168.10.2 on port 25

The screenshot shows the 'Comnet Terminal Server' interface. On the left is a navigation menu with links: Network, UDP, Serial, Password, HTTPS, CAcerts, Advanced, and Help. The 'UDP' link is selected. The main content area is titled 'UDP' and contains settings for 'Port0' and 'Port1'. The settings include: Incoming port (Port0: empty, Port1: 24), Outgoing port (Port0: empty, Port1: 25), Send output to this address (Port0: empty, Port1: 192.168.10.2), Learn outbound address from last incoming packet (both ports: unchecked), Number of characters to accumulate before sending UDP packet (both ports: 32), Number msec to wait for accumulated characters (both ports: 100), and Send UDP frame when this character is received (both ports: NA). A 'Submit New Settings' button is at the bottom. The footer reads 'Copyright © 2014 Comnet, LLC.'

UDP	Port0	Port1
Settings:		
Incoming port:		24
Outgoing port:		25
Send output to this address:		192.168.10.2
Learn outbound address from last incoming packet	<input type="checkbox"/>	<input type="checkbox"/>
Number of characters to accumulate before sending UDP packet:	32	32
Number msec to wait for accumulated characters:	100	100
Send UDP frame when this character is received: (Enter NA to disable)	NA	NA

Submit New Settings

Copyright © 2014 Comnet, LLC.

Figure 8 Terminal Server UDP Page

- » Click Serial link
- » Configure Port1 for RS422

The screenshot shows the 'Comnet Terminal Server' interface with the 'Serial' link selected in the navigation menu. The main content area is titled 'Serial' and contains settings for 'Port0' and 'Port1'. The settings include: Data Port Settings (Port0: DEBUG, Port1: RS-422), Data Baud Rate (both ports: 115200), Custom Baud Rate (both ports: 0), Data Bits (both ports: 8), Data Parity (both ports: None), Stop Bits (both ports: 1), Flow Control (both ports: None), and AT Commands (both ports: checked). A 'Submit New Settings' button is at the bottom. The footer reads 'Copyright © 2014 Comnet, LLC.'

Serial	Port0	Port1
Data Port Settings:	DEBUG	RS-422
Data Baud Rate:	115200	115200
Custom Baud Rate:	0	0
Data Bits:	8	8
Data Parity:	None	None
Stop Bits:	1	1
Flow Control:	None	None
AT Commands:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Submit New Settings

Copyright © 2014 Comnet, LLC.

Figure 9 Terminal Server Serial Page

Configure Client

» Set protocol to UDP on Network page.

comnet Comnet Terminal Server

Comnet Terminal server

Network

Protocol: (Changing will terminate all existing connections)

Device Name (for DHCP):

NetBIOS Name:

Version:

Static Settings	DHCP Assigned Values	Address Mode
Device IP Address: <input type="text" value="192.168.10.2"/>		<input type="text" value="Static IP"/>
Device Subnet Mask: <input type="text" value="255.255.255.0"/>		
Device Gateway: <input type="text" value="192.168.10.254"/>		
DNS Server: <input type="text" value="0.0.0.0"/>		
NTP Server: <input type="text" value="pool.ntp.org"/>	<input type="text" value="0.0.0.0"/>	No DNS to look up NTP server
System Time: No valid time UTC (When page was loaded)		

Copyright © 2014 Comnet, LLC.

Figure 10 Terminal Client Network Page

» Click UDP link

» Configure Port1 to receive on port 25 & to transmit to 192.168.10.1 on port 24

comnet Comnet Terminal Server

UDP

UDP	Port0	Port1
Settings:		
Incoming port:	<input type="text"/>	<input type="text" value="25"/>
Outgoing port:	<input type="text"/>	<input type="text" value="24"/>
Send output to this address:	<input type="text"/>	<input type="text" value="192.168.10.1"/>
Learn outbound address from last incoming packet	<input type="checkbox"/>	<input type="checkbox"/>
Number of characters to accumulate before sending UDP packet:	<input type="text" value="32"/>	<input type="text" value="32"/>
Number msec to wait for accumulated characters: 0 waits forever.	<input type="text" value="100"/>	<input type="text" value="100"/>
Send UDP frame when this character is received: (Enter NA to disable)	<input type="text" value="NA"/>	<input type="text" value="NA"/>

Copyright © 2014 Comnet, LLC.

Figure 11 Terminal Client UDP Page

- » Click Serial link
- » Configure Port1 for RS422

The screenshot displays the 'comnet' Terminal Server interface. On the left is a navigation menu with options: Network, UDP, **Serial**, Password, HTTPS, CAcerts, Advanced, and Help. The main area is titled 'Serial' and contains configuration fields for 'Port0' and 'Port1'. The 'Serial' column lists settings: Data Port Settings, Data Baud Rate, Custom Baud Rate, Data Bits, Data Parity, Stop Bits, Flow Control, and AT Commands. Port0 settings are: Data Port Settings (DEBUG), Data Baud Rate (115200), Custom Baud Rate (0), Data Bits (8), Data Parity (None), Stop Bits (1), Flow Control (None), and AT Commands (checkbox). Port1 settings are: Data Port Settings (RS-422), Data Baud Rate (115200), Custom Baud Rate (0), Data Bits (8), Data Parity (None), Stop Bits (1), Flow Control (None), and AT Commands (checkbox). A 'Submit New Settings' button is located at the bottom center of the configuration area. The footer indicates 'Copyright © 2014 Comnet, LLC.'

Serial	Port0	Port1
Data Port Settings:	DEBUG	RS-422
Data Baud Rate:	115200	115200
Custom Baud Rate:	0	0
Data Bits:	8	8
Data Parity:	None	None
Stop Bits:	1	1
Flow Control:	None	None
AT Commands:	<input type="checkbox"/>	<input type="checkbox"/>

Submit New Settings

Copyright © 2014 Comnet, LLC.

Figure 12 Terminal Client Serial Page

SSL Transport

To use the Terminal Server as a serial extender over Ethernet utilizing SSL, connect two terminal servers to your local Ethernet network and configure devices as a client server connection.

Configure Server

» Set protocol to TCP/SSL on Network page.

The screenshot displays the 'Comnet Terminal server' configuration interface. On the left is a navigation menu with options: Network, UDP, Serial, Password, HTTPS, CAcerts, Advanced, and Help. The 'Network' tab is selected. The main content area is titled 'Comnet Terminal server' and contains the following settings:

- Protocol:** TCP/SSL (with a note: 'Changing will terminate all existing connections')
- Device Name (for DHCP):** SB70LCSX-6B52
- NetBIOS Name:** SB70LCSX-6B52
- Version:** 02.07.0000
- Static Settings:**
 - Device IP Address: 192.168.10.1
 - Device Subnet Mask: 255.255.255.0
 - Device Gateway: 192.168.10.254
 - DNS Server: 0.0.0.0
 - NTP Server: pool.ntp.org
 - System Time: No valid time UTC (When page was loaded)
- DHCP Assigned Values:** 0.0.0.0
- Address Mode:** Static IP (dropdown menu)

At the bottom of the settings area are two buttons: 'Reset To Factory Defaults' and 'Submit New Settings'. The footer of the page reads 'Copyright © 2014 Comnet, LLC.'

Figure 13 Terminal Server Network Page

- » Click TCP link
- » Configure Port1 to listen for incoming connections on port 24
- » Check "USE SSL rather than TCP for connection"

	Port0	Port1
Listen for incoming network connections	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Listening network port:	0	24
Timeout and disconnect after this many seconds of inactivity.	60	60
Allow new connection if the existing connection has been idle for this many seconds.	30	30
When to begin making outgoing tcp connections:	Never	Never
Connect on network port:		1000
Connect to this address:		192.168.10.2
Alternate address:		
Timeout and disconnect after this many seconds of inactivity.	60	60
Retry failed outgoing connections after this many seconds.	360	360
Check and maintain valid connection at intervals in seconds.	0	0
Use custom packetization logic (below)	<input type="checkbox"/>	<input type="checkbox"/>
Number of characters to accumulate before sending TCP packet:	32	32
Number of msec to wait for accumulated characters: 0 waits forever.	100	100
Flush TCP frame when this character is received (Enter NA to disable):	NA	NA
USE SSL rather than TCP for connections:	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Always Save Serial Chars regardless of connection status:	<input type="checkbox"/>	<input type="checkbox"/>
Network Settings on Serial Port - Advanced Serial Settings		
Submit New Settings		

Copyright © 2014 Comnet, LLC.

Figure 14 Terminal Server TCP Page

- » Click Serial link
- » Configure Port1 for RS422

The screenshot shows the 'Comnet Terminal Server' web interface. On the left is a navigation menu with links: Network, TCP, Serial, Password, HTTPS, CAcerts, Advanced, and Help. The 'Serial' link is selected. The main content area is titled 'Serial' and contains configuration settings for two ports, Port0 and Port1. The settings include Data Port Settings (DEBUG), Data Baud Rate (115200), Custom Baud Rate (0), Data Bits (8), Data Parity (None), Stop Bits (1), Flow Control (None), and AT Commands (checked). A 'Submit New Settings' button is at the bottom. The footer indicates 'Copyright © 2014 Comnet, LLC.'

Figure 15 Terminal Server Serial Page

- » Click HTTPS link
- » Select Choose File and load Certificate "device.crt"
- » Select Choose File and load Certificate key "device.key"

The screenshot shows the 'Comnet Terminal Server' web interface with the 'HTTPS' link selected in the navigation menu. The main content area is titled 'HTTPS' and displays the status of SSL and RSA certificates and keys. It shows 'User Installed' for both, with a 'Display Public Key' link next to the RSA key. Below this are 'Choose File' buttons for 'device.crt' and 'device.key'. An 'Install Certificate and Key' button is at the bottom. A note states: 'HTTPS - Hypertext Transfer Protocol over Secure Shell Layer (HTTPS) secure web site settings. Key size must be at least 128 and no more than 1024 and in openssl(openSSH) format.' The footer indicates 'Copyright © 2014 Comnet, LLC.'

Figure 16 Terminal Server Certificate and key files

- » Select Install Certificate and Key

Configure Client

- » Set protocol to TCP/SSL on Network page.

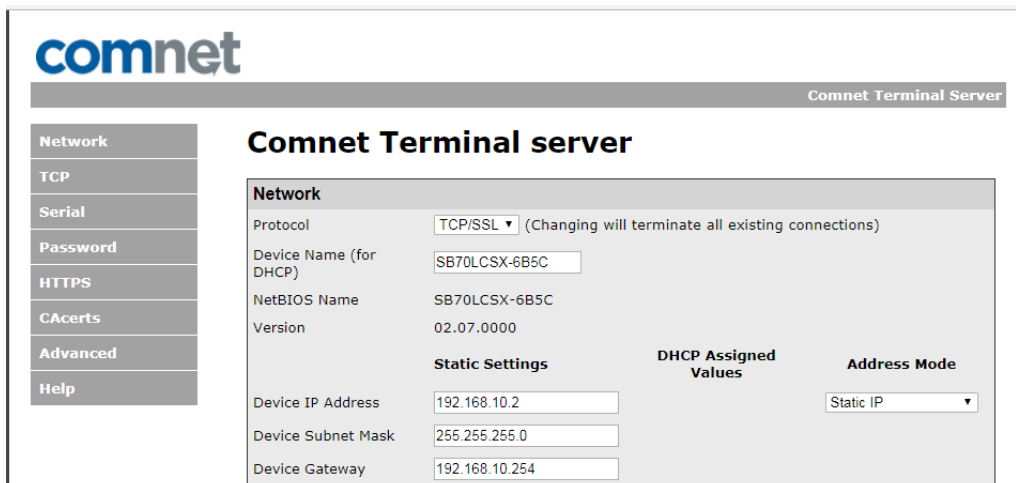


Figure 17 Terminal Client Network Page

- » Click TCP link
- » Configure Port1 to connect to 192.168.10.1 port 24
- » Check "USE SSL rather than TCP for connection"

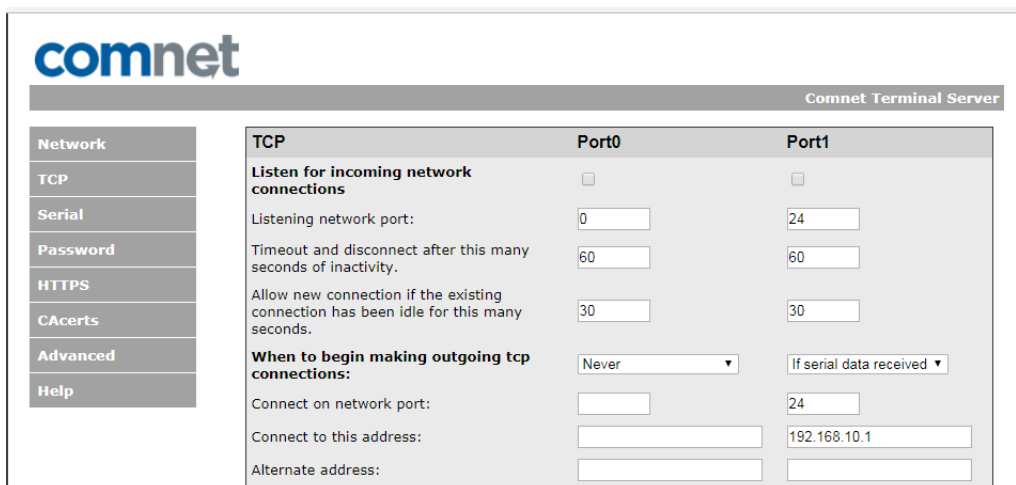


Figure 18 Terminal Client TCP Page

- » Click Serial link
- » Configure Port1 for RS422

comnet Comnet Terminal Server

Serial	Port0	Port1
Data Port Settings:	DEBUG	RS-422
Data Baud Rate:	115200	115200
Custom Baud Rate:	0	0
Data Bits:	8	8
Data Parity:	None	None
Stop Bits:	1	1
Flow Control:	None	None
AT Commands:	<input type="checkbox"/>	<input type="checkbox"/>

Submit New Settings

Copyright © 2014 Comnet, LLC.

Figure 19 Terminal Client Serial Page

- » Click CAcerts link
- » Select Choose File and load Certificate "CA.crt"

comnet Comnet Terminal Server

CN Name	Public Key Link	Delete
	Show PublicKey	Delete

Certificate File to Install Choose File CA.crt Add New client CA

Key size must be at least 128 and no more than 1024 and in openssl(openssh) format.

Copyright © 2014 Comnet, LLC.

Figure 20 Terminal Client Certificate Authority certificate file

- » Select Add New client CA



Figure 21 Terminal Client CA Certificate add

Creating openssl certificates

» Open terminal on a Linux machine

Client Certificate

```
development@ubuntu:~/ssl$
development@ubuntu:~/ssl$
development@ubuntu:~/ssl$ openssl genrsa -out CA.key 1024
Generating RSA private key, 1024 bit long modulus
.....+++++
e is 65537 (0x10001)
development@ubuntu:~/ssl$ openssl req -new -key CA.key -x509 -days 365 -out CA.crt
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:California
Locality Name (eg, city) []:San Diego
Organization Name (eg, company) [Internet Widgits Pty Ltd]:Comnet
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YOUR name) []:192.168.10.2
Email Address []:
development@ubuntu:~/ssl$ ls -l
total 8
-rw-rw-r-- 1 development development 940 Feb  6 09:29 CA.crt
-rw-rw-r-- 1 development development 887 Feb  6 09:26 CA.key
development@ubuntu:~/ssl$
```

Figure 22 Client Self Signed Certificate

Server Certificate

```
development@ubuntu:~/ssl$
development@ubuntu:~/ssl$ openssl genrsa -out device.key 1024
Generating RSA private key, 1024 bit long modulus
.....+++++
e is 65537 (0x10001)
development@ubuntu:~/ssl$
development@ubuntu:~/ssl$ openssl req -new -key device.key -out device.csr
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:California
Locality Name (eg, city) []:San Diego
Organization Name (eg, company) [Internet Widgits Pty Ltd]:Comnet
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YOUR name) []:192.168.10.1
Email Address []:

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
development@ubuntu:~/ssl$
development@ubuntu:~/ssl$ openssl x509 -req -days 365 -in device.csr -CA CA.crt -CAkey CA.key -CAcreateserial -out device.crt
Signature ok
subject=/C=US/ST=California/L=San Diego/O=Comnet/CN=192.168.10.1
Getting CA Private Key
development@ubuntu:~/ssl$
```

Figure 23 Server Self Signed Certificate

```
development@ubuntu:~/ssl$  
development@ubuntu:~/ssl$ ls -l  
total 24  
-rw-rw-r-- 1 development development 940 Feb  6 09:29 CA.crt  
-rw-rw-r-- 1 development development 887 Feb  6 09:26 CA.key  
-rw-rw-r-- 1 development development  17 Feb  6 09:39 CA.srl  
-rw-rw-r-- 1 development development 822 Feb  6 09:39 device.crt  
-rw-rw-r-- 1 development development 639 Feb  6 09:36 device.csr  
-rw-rw-r-- 1 development development 887 Feb  6 09:34 device.key  
development@ubuntu:~/ssl$  
development@ubuntu:~/ssl$
```

Figure 24 Client and Server Certificates & keys

SSH Transport

To use the Terminal Server to connect a serial device over Ethernet utilizing SSH, connect a terminal server and a laptop to your local Ethernet network configuring both devices as a client server connection.

Configure Server

- » Set protocol to SSH on Network page.

The screenshot displays the 'Comnet Terminal server' configuration interface. On the left is a sidebar with navigation links: Network, SSH, Serial, Password, HTTPS, CAcerts, Advanced, and Help. The main content area is titled 'Comnet Terminal server' and contains a 'Network' configuration section. This section includes a dropdown menu for 'Protocol' set to 'SSH' with a note '(Changing will terminate all existing connections)'. Below this are fields for 'Device Name (for DHCP)' (SB70LCSX-6B52), 'NetBIOS Name' (SB70LCSX-6B52), and 'Version' (02.07.0000). A table-like structure follows with columns for 'Static Settings', 'DHCP Assigned Values', and 'Address Mode'. The 'Static Settings' column contains fields for 'Device IP Address' (192.168.10.1), 'Device Subnet Mask' (255.255.255.0), 'Device Gateway' (192.168.10.254), 'DNS Server' (0.0.0.0), 'NTP Server' (pool.ntp.org), and 'System Time' (No valid time UTC (When page was loaded)). The 'DHCP Assigned Values' column shows '0.0.0.0'. The 'Address Mode' column has a 'Static IP' dropdown and a note 'No DNS to look up NTP server'. At the bottom of the form are two buttons: 'Reset To Factory Defaults' and 'Submit New Settings'. A copyright notice 'Copyright © 2014 Comnet, LLC.' is at the very bottom.

Figure 25 Terminal Server Network Page

- » Click SSH link
- » Configure Port1 to listen for incoming connections on port 22

comnet Comnet Terminal Server

SSH	Port0	Port1
Listen for incoming network connections	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Listening network port:	<input type="text" value="0"/>	<input type="text" value="22"/>
Timeout and disconnect after this many seconds of inactivity.	<input type="text" value="360"/>	<input type="text" value="360"/>
Allow new connection if the existing connection has been idle for this many seconds.	<input type="text" value="180"/>	<input type="text" value="180"/>
Use custom packetization logic (below)	<input type="checkbox"/>	<input type="checkbox"/>
Number of characters to accumulate before sending TCP packet:	<input type="text" value="32"/>	<input type="text" value="32"/>
Number msec to wait for accumulated characters: 0 waits forever.	<input type="text" value="100"/>	<input type="text" value="100"/>
Flush TCP frame when this character is received (Enter NA to disable):	<input type="text" value="NA"/>	<input type="text" value="NA"/>
SSH Keys SSH Keys		
Network Settings on Serial Port - Advanced Serial Settings		
<input type="button" value="Submit New Settings"/>		

Copyright © 2014 Comnet, LLC.

Figure 26 Terminal Server SSH Page

- » Click SSH Keys link
- » Click Choose File and select ssh rsa key pair "id_rsa"
- » Click Install Key

comnet Comnet Terminal Server

SSH Keys									
<table border="1"> <thead> <tr> <th>RSA Public/Private Key Pair</th> <th>User Installed</th> <th>Display Public Key</th> </tr> </thead> <tbody> <tr> <td>DSA Public/Private Key Pair</td> <td>Default</td> <td>Display Public Key</td> </tr> <tr> <td>RSA or DSA Key File to Install</td> <td><input type="button" value="Choose File"/> id_rsa</td> <td><input type="button" value="Display Public Key"/></td> </tr> </tbody> </table>	RSA Public/Private Key Pair	User Installed	Display Public Key	DSA Public/Private Key Pair	Default	Display Public Key	RSA or DSA Key File to Install	<input type="button" value="Choose File"/> id_rsa	<input type="button" value="Display Public Key"/>
RSA Public/Private Key Pair	User Installed	Display Public Key							
DSA Public/Private Key Pair	Default	Display Public Key							
RSA or DSA Key File to Install	<input type="button" value="Choose File"/> id_rsa	<input type="button" value="Display Public Key"/>							
<input type="button" value="Install Key"/>									

SSH Keys - Key size must be at least 512 and no more than 4096 and in openSSH(openSSL) format.

Copyright © 2014 Comnet, LLC.

Figure 27 Terminal Server Keys Page

- » Click Serial link
- » Configure Port1 for RS422

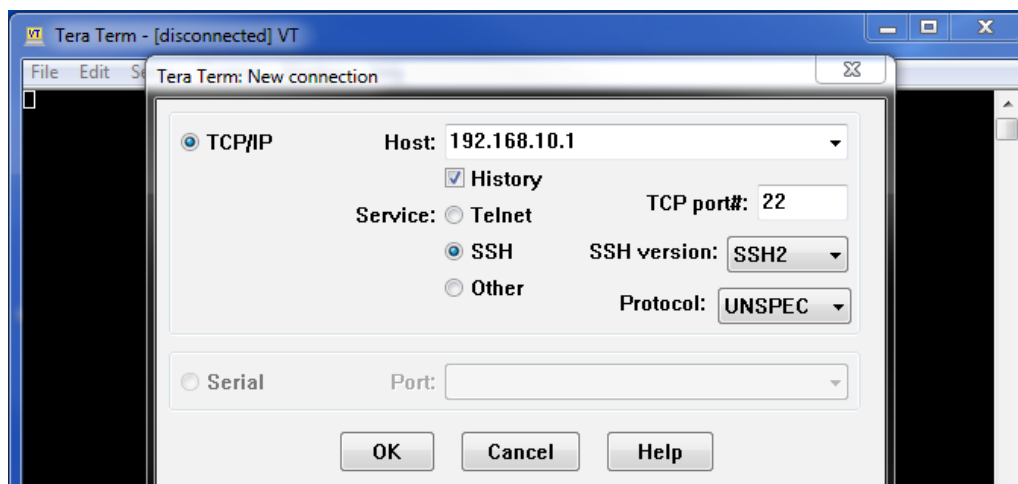
The screenshot shows the 'Comnet Terminal Server' web interface. On the left is a navigation menu with options: Network, TCP, Serial, Password, HTTPS, CAcerts, Advanced, and Help. The 'Serial' option is selected. The main area is titled 'Serial' and contains configuration settings for two ports, Port0 and Port1. The settings include Data Port Settings, Data Baud Rate, Custom Baud Rate, Data Bits, Data Parity, Stop Bits, Flow Control, and AT Commands. A 'Submit New Settings' button is at the bottom. The footer indicates 'Copyright © 2014 Comnet, LLC.'

Serial	Port0	Port1
Data Port Settings:	DEBUG	RS-422
Data Baud Rate:	115200	115200
Custom Baud Rate:	0	0
Data Bits:	8	8
Data Parity:	None	None
Stop Bits:	1	1
Flow Control:	None	None
AT Commands:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Figure 28 Terminal Server Serial Page

Configure Client Laptop

» Open Tera Term and select SSH and TCP port 22

*Figure 29 Terminal Client Tera Term*

» On SSH Authentication Pop Up click RSA and select Private key file id_rsa

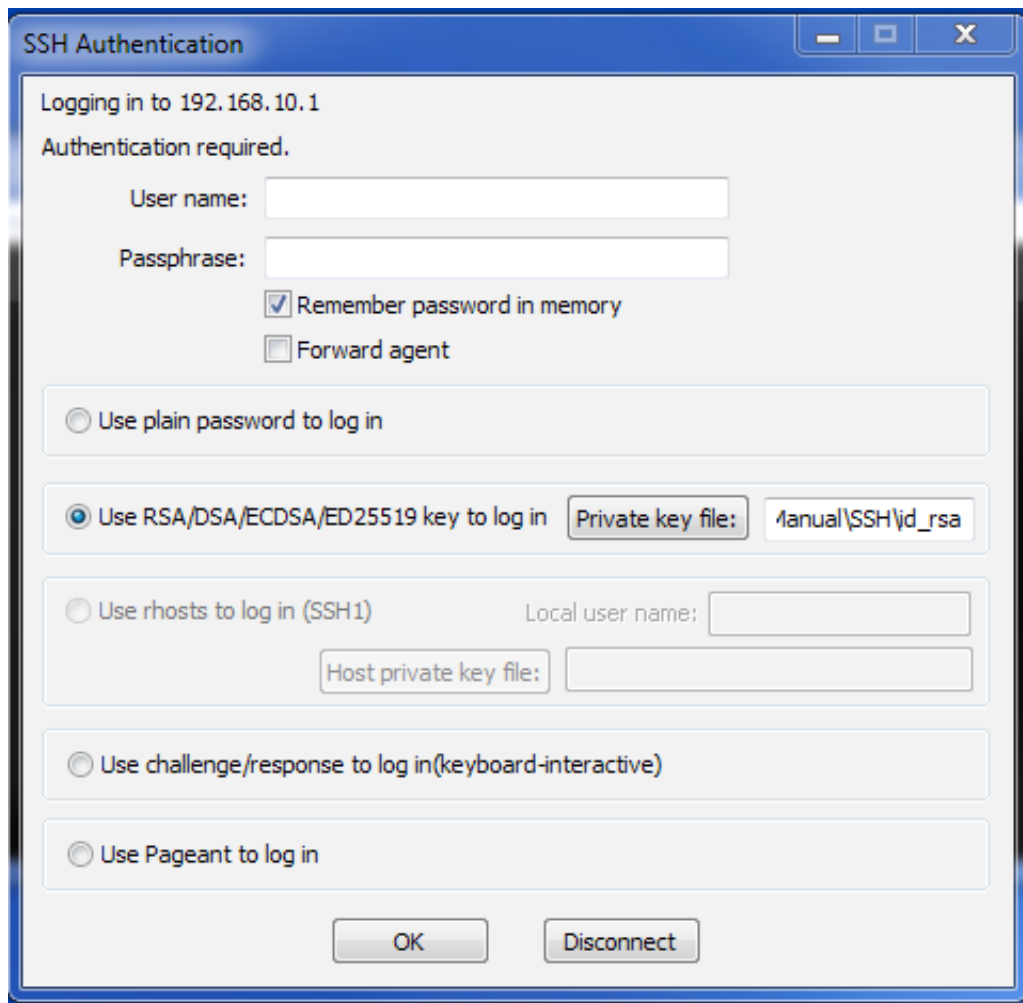


Figure 30 Terminal Client Tera Term SSH Authentication

Creating SSH key pairs

Open terminal on a linux machine

```

RStrempe1@8257RSTREMP1 /c/nburn/pctools/BatchUpdateOne/SSL Certs
$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/y/.ssh/id_rsa): id_rsa
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in id_rsa.
Your public key has been saved in id_rsa.pub.
The key fingerprint is:
21:f6:cb:ed:63:28:89:40:18:08:af:36:7e:1a:df:e2 RStrempe1@8257RSTREMP1
The key's randomart image is:
+--[ RSA 2048 ]-----+
|+
|o.
|o. o.
|... o.
|..+ S
|o o .o
|o o .o..
|=.o o ..o
|..E.. .
+-----+

RStrempe1@8257RSTREMP1 /c/nburn/pctools/BatchUpdateOne/SSL Certs
$ ls -l
total 12
-rw-r--r-- 1 RStrempe Administ 940 Feb 6 09:29 CA.crt
-rw-r--r-- 1 RStrempe Administ 887 Feb 6 09:26 CA.key
-rw-r--r-- 1 RStrempe Administ 17 Feb 6 09:39 CA.srl
-rw-r--r-- 1 RStrempe Administ 205 Feb 6 13:00 Self Signed Certs.txt
-rw-r--r-- 1 RStrempe Administ 822 Feb 6 09:39 device.crt
-rw-r--r-- 1 RStrempe Administ 639 Feb 6 09:36 device.csr
-rw-r--r-- 1 RStrempe Administ 887 Feb 6 09:34 device.key
-rw-r--r-- 1 RStrempe Administ 1675 Feb 6 13:01 id_rsa
-rw-r--r-- 1 RStrempe Administ 405 Feb 6 13:01 id_rsa.pub
-rw-r--r-- 1 RStrempe Administ 13044 Feb 6 12:42 ssh2connect.log

RStrempe1@8257RSTREMP1 /c/nburn/pctools/BatchUpdateOne/SSL Certs
$

```

Figure 31 Creating SSH key pairs

Telnet Transport

To use the Terminal Server to connect a serial device over Ethernet utilizing Telnet, connect a terminal server and a laptop to your local Ethernet network configuring both devices as a client server connection.

Configure Server

- » Set protocol to TCP on Network page.

comnet Comnet Terminal Server

Comnet Terminal server

Network

Protocol: (Changing will terminate all existing connections)

Device Name (for DHCP):

NetBIOS Name:

Version:

Static Settings **DHCP Assigned Values** **Address Mode**

Device IP Address:

Device Subnet Mask:

Device Gateway:

DNS Server:

NTP Server: 0.0.0.0 No DNS to look up NTP server

System Time: No valid time UTC (When page was loaded)

Copyright © 2014 Comnet, LLC.

Figure 32 Terminal Server Network Page

- » Click TCP link
- » Configure Port1 to listen for incoming connections on port 24

TCP	Port0	Port1
Listen for incoming network connections	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Listening network port:	<input type="text" value="0"/>	<input type="text" value="24"/>
Timeout and disconnect after this many seconds of inactivity.	<input type="text" value="60"/>	<input type="text" value="60"/>
Allow new connection if the existing connection has been idle for this many seconds.	<input type="text" value="30"/>	<input type="text" value="30"/>
When to begin making outgoing tcp connections:	<input type="text" value="Never"/>	<input type="text" value="Never"/>
Connect on network port:	<input type="text" value="1000"/>	<input type="text" value="1000"/>
Connect to this address:	<input type="text" value="192.168.10.4"/>	<input type="text" value="192.168.10.2"/>
Alternate address:	<input type="text" value="(Enter IP Address)"/>	<input type="text" value="192.168.10.2"/>
Timeout and disconnect after this many seconds of inactivity.	<input type="text" value="60"/>	<input type="text" value="60"/>
Retry failed outgoing connections after this many seconds.	<input type="text" value="360"/>	<input type="text" value="360"/>
Check and maintain valid connection at intervals in seconds.	<input type="text" value="0"/>	<input type="text" value="0"/>
Use custom packetization logic (below)	<input type="checkbox"/>	<input type="checkbox"/>
Number of characters to accumulate before sending TCP packet:	<input type="text" value="32"/>	<input type="text" value="32"/>
Number of msec to wait for accumulated characters: 0 waits forever.	<input type="text" value="100"/>	<input type="text" value="100"/>
Flush TCP frame when this character is received (Enter NA to disable):	<input type="text" value="NA"/>	<input type="text" value="NA"/>
USE SSL rather than TCP for connections:	<input type="checkbox"/>	<input type="checkbox"/>
Always Save Serial Chars regardless of connection status:	<input type="checkbox"/>	<input type="checkbox"/>
Network Settings on Serial Port - Advanced Serial Settings		
<input type="button" value="Submit New Settings"/>		

Copyright © 2014 Comnet, LLC.

Figure 33 Terminal Server TCP Page

- » Click Serial link
- » Configure Port1 for RS422

The screenshot shows the 'Comnet Terminal Server' web interface. On the left is a navigation menu with options: Network, TCP, Serial, Password, HTTPS, CAcerts, Advanced, and Help. The 'Serial' option is selected. The main area is titled 'Serial' and contains configuration settings for two ports, Port0 and Port1. The settings include Data Port Settings, Data Baud Rate, Custom Baud Rate, Data Bits, Data Parity, Stop Bits, Flow Control, and AT Commands. A 'Submit New Settings' button is at the bottom. The footer indicates 'Copyright © 2014 Comnet, LLC.'

Serial	Port0	Port1
Data Port Settings:	DEBUG	RS-422
Data Baud Rate:	115200	115200
Custom Baud Rate:	0	0
Data Bits:	8	8
Data Parity:	None	None
Stop Bits:	1	1
Flow Control:	None	None
AT Commands:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Figure 34 Terminal Server Serial Page

Configure Client Laptop

- » Open Tera Term and select Telnet and TCP port 24

The screenshot shows the 'Tera Term: New connection' dialog box. The 'TCP/IP' radio button is selected. The 'Host' field contains '192.168.10.1'. The 'History' checkbox is checked. The 'Service' section has 'Telnet' selected, with 'SSH' and 'Other' as options. The 'TCP port#' field contains '24'. The 'SSH version' dropdown is set to 'SSH2'. The 'Protocol' dropdown is set to 'UNSPEC'. Below this, the 'Serial' radio button is unselected, and the 'Port' field is empty. At the bottom are 'OK', 'Cancel', and 'Help' buttons.

Figure 34 Terminal Client Tera Term

HTTPS Configuration

- » Click HTTPS
- » Select Certificate File to Install Choose File "device.crt"
- » Select Key File to Install. Choose File "device.key"
- » Click Install Certificate and Key

The screenshot shows the Comnet Terminal Server web interface. On the left is a navigation menu with options: Network, TCP, Serial, Password, HTTPS (selected), CAcerts, Advanced, and Help. The main content area is titled 'HTTPS' and shows the following configuration:

Setting	Value
SSL Public Key Certificate	User Installed
RSA Public/Private Key Pair	User Installed Display Public Key
Certificate File to Install	<input type="button" value="Choose File"/> device.crt
Key File to Install	<input type="button" value="Choose File"/> device.key

At the bottom of the configuration area is a button labeled 'Install Certificate and Key'.

Below the configuration area, there is explanatory text: 'HTTPS - Hypertext Transfer Protocol over Secure Shell Layer (HTTPS) secure web site settings. Key size must be at least 128 and no more than 1024 and in openssl(openSSH) format.'

The footer of the page reads: Copyright © 2014 Comnet, LLC.

Figure 36 Terminal Server Certificate and Key files

Internet Explorer Configuration

» Click on tools and select Internet options

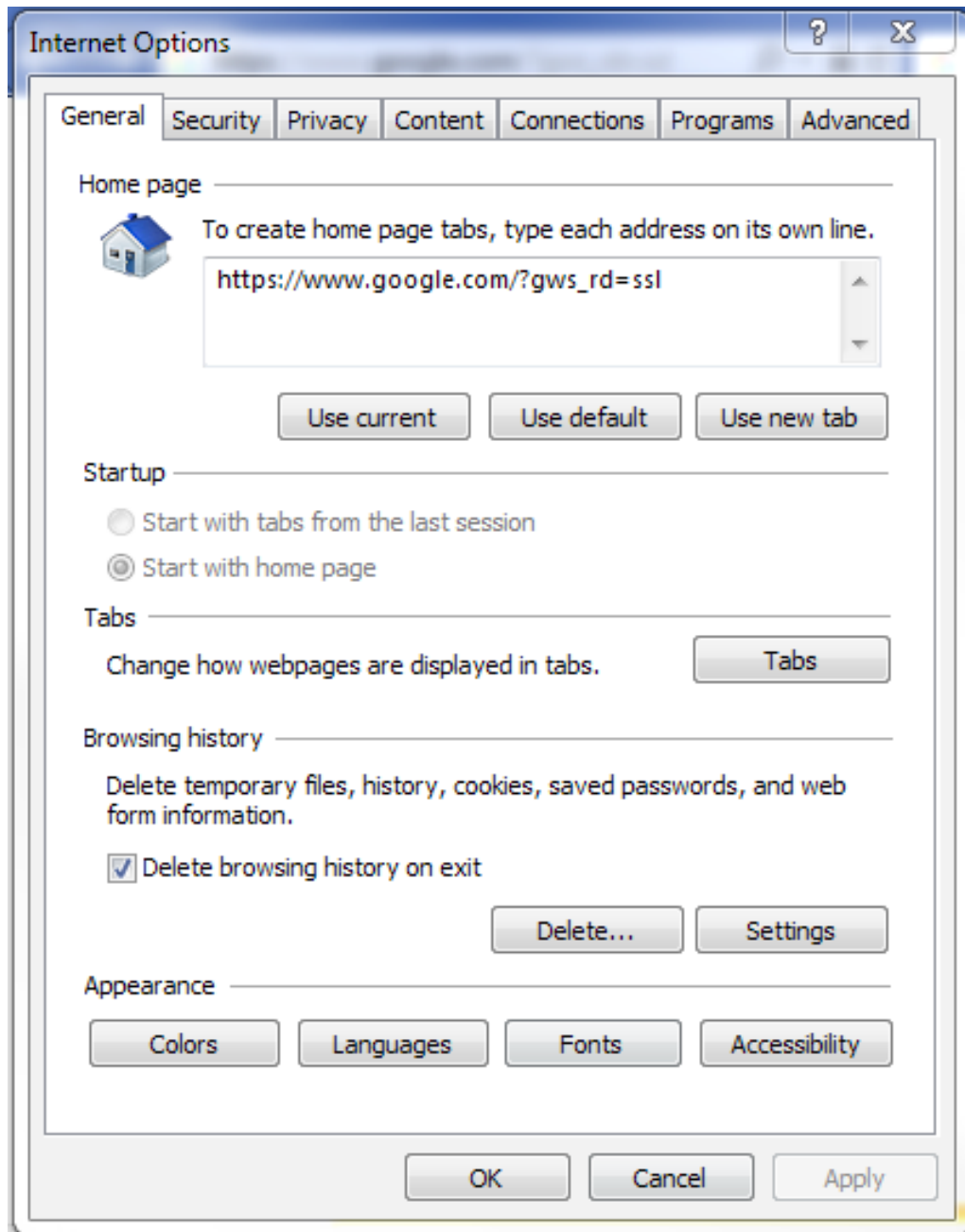


Figure 37 Terminal Client IE Options

» Click Content tab and click Certificates

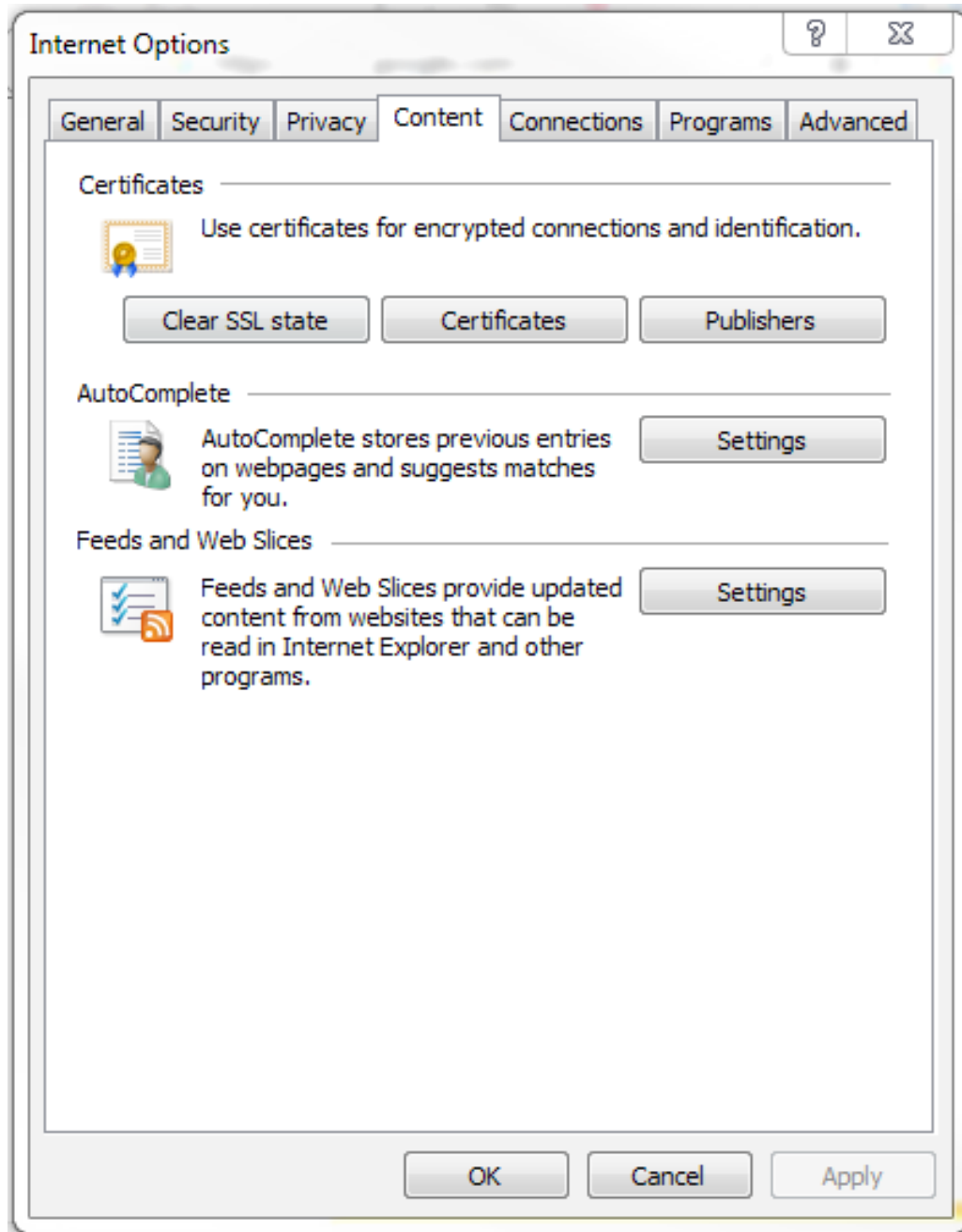


Figure 38 Terminal Client IE Certificates

» Click Trusted Root Certifications Authority tab

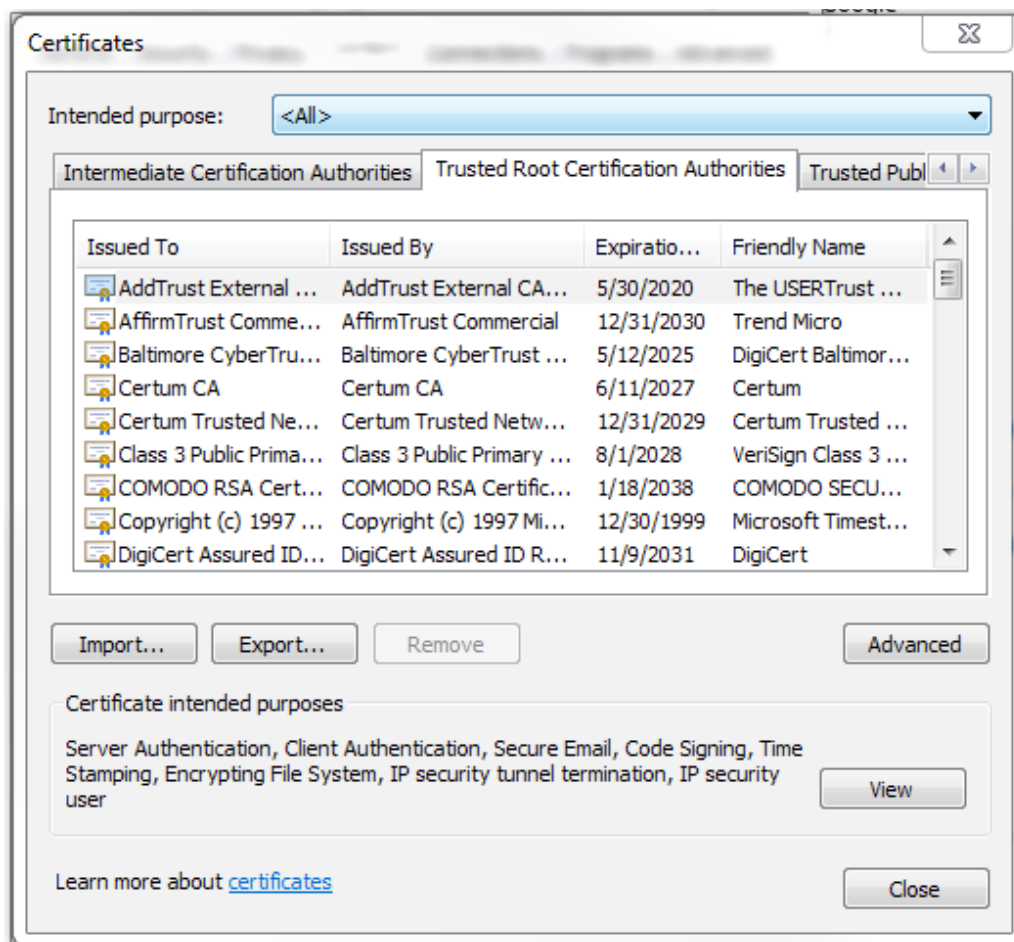


Figure 39 Terminal Client IE Root CA

- » Click Import...
- » Use wizard to load CA certificate "CA.crt"
- » Place in Trusted Root Certification Authorities

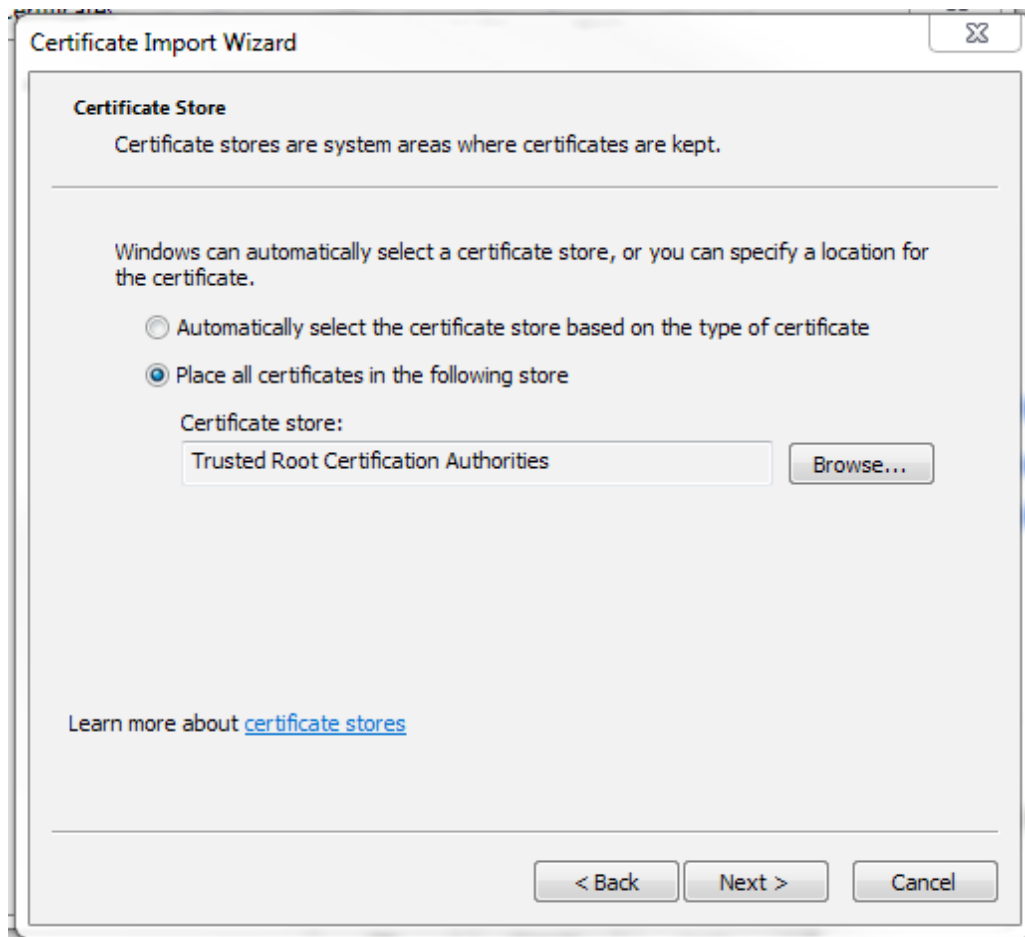


Figure 40 Terminal Client IE Certificate Store

- » Finish wizard and close Internet Explorer
- » Terminal Server is now accessible using HTTPS with Internet Explorer

FireFox Configuration

» Click on tools and select options

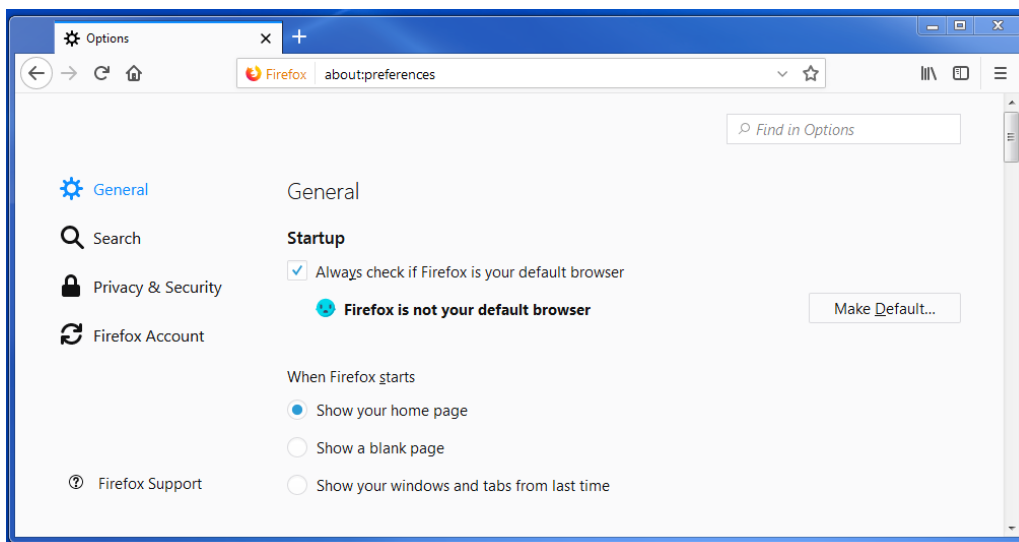


Figure 41 Terminal Client FireFox Options

» Click Privacy & Security

» Click View Certificates

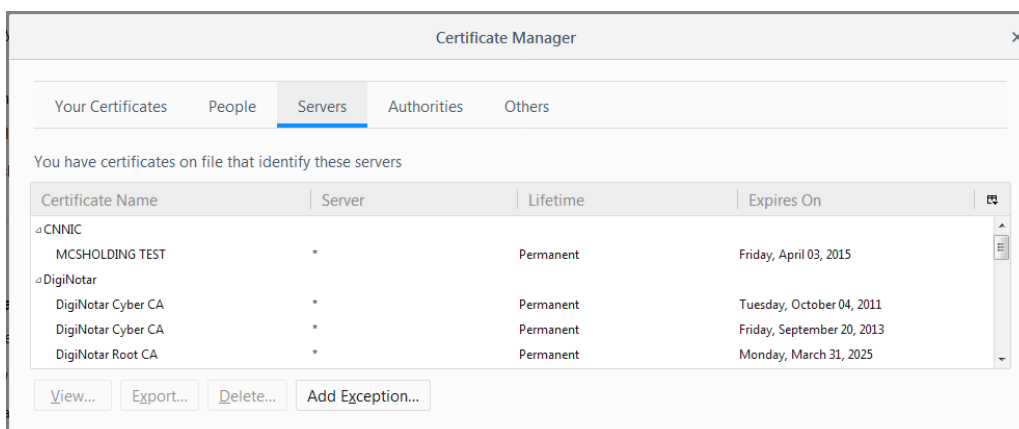


Figure 42 Terminal Client FireFox Certificate MGR

» Click Servers and Add Exception

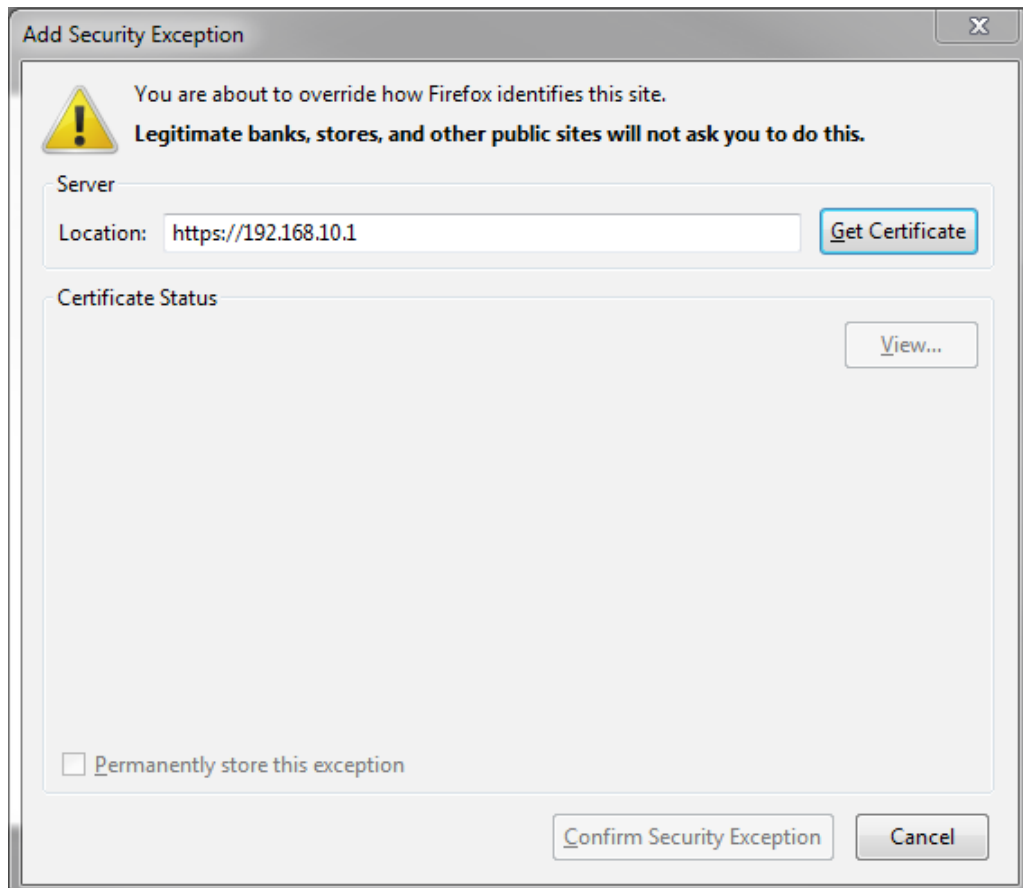


Figure 43 Terminal Client FireFox Exception

- » Click Get Certificate
- » Click Confirm Security Exception
- » Close FireFox
- » Terminal Server is now accessible using HTTPS with FireFox

OpenSSL Certificate, key and CA for HTTPS

- » Use same SSL certificates

MECHANICAL INSTALLATION INSTRUCTIONS

ComNet Customer Service

Customer Care is ComNet Technology's global service center, where our professional staff is ready to answer your questions at any time.

Email ComNet Global Service Center: customercare@comnet.net



3 CORPORATE DRIVE | DANBURY, CT 06810 | USA
T: 203.796.5300 | F: 203.796.5303 | TECH SUPPORT: 1.888.678.9427 | INFO@COMNET.NET
8 TURNBERRY PARK ROAD | GILDERSOME | MORLEY | LEEDS, UK LS27 7LE
T: +44 (0)113 307 6400 | F: +44 (0)113 253 7462 | INFO-EUROPE@COMNET.NET