



**MODEL 8188 NETCLOCK/ETS
ETHERNET TIME SERVER
INSTRUCTION MANUAL**

SPECTRACOM CORPORATION

95 Methodist Hill Drive
Suite 500

Rochester, NY 14623

PHONE 585-321-5800

FAX 585-321-5218

www.spectracomcorp.com

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Extended warranties can be purchased for additional periods beyond the standard five-year warranty. Contact Spectracom no later than the last year of the standard five-year warranty for extended coverage.

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Model 8188 ETHERNET TIME SERVER

1.0 INTRODUCTION

The Spectracom® Model 8188 shown in Figure 1 is a Stratum 1 NTP Time Server when connected to a Spectracom NetClock® Master clock. Spectracom Master Clocks receive accurate and traceable time from WWVB or GPS. All NetClock Master Clocks have a continuous RS-485 once-per-second time data output port. This output is typically used to synchronize Spectracom accessory products such as TimeView™ display clocks, TimeTap® RS-485 to RS-232 converters and Model 8188 Ethernet Time Servers.

The Model 8188 supports the most popular time distribution protocols, NTP, SNTP and UDP/Time. To make the Model 8188 operational the unit is first configured with network parameters such as IP address, gateway IP address, net mask, etc. Configuration is done using the RS-232 Setup port connection or over the network using Telnet. Upon completing the configuration, the Model 8188 is then connected to a NetClock Master Clock. The Model 8188 is now ready to provide time to hundreds of computers installed throughout the network.



FIGURE 1 MODEL 8188 NETCLOCK/ETS

Spectracom®, NetClock®, TimeView™ and TimeTap® are trade marks of Spectracom Corporation. All other products are identified by trademarks of their respective companies or organizations.

2.0 WARRANTY INFORMATION AND PRODUCT SUPPORT

Warranty information is found on the leading pages of this manual. The Model 8188 contains a network interface card that is not manufactured by Spectracom Corporation, and therefore shall carry a one-year warranty. In addition, the AC power adapter carries a one-year warranty. Should it become necessary to exercise the warranty, contact Spectracom Corporation to obtain a replacement or service.

Spectracom continuously strives to improve its products and therefore greatly appreciates any and all customer feedback given. Please participate in Spectracom's Customer Satisfaction Survey found on our web site at:

<http://www.spectracomcorp.com>

The online survey is also used for warranty registration of your new Spectracom products. All completed entries are automatically entered into a monthly prize give away drawing.

Technical support is available by telephone. Please direct any comments or questions regarding application, operation, or service to Spectracom Customer Service Department. Customer Service is available Monday through Friday from 8:30 A. M. to 5:00 P.M. Eastern time.

Telephone Customer Service at: **585-321-5800**.

In addition, please contact customer service to obtain a Return Material Authorization Number (RMA#) before returning any instrument to Spectracom Corporation. Please provide the serial number and failure symptoms. Transportation to the factory is to be prepaid by the customer. After obtaining an RMA# ship the unit back using the following address:

Spectracom Corporation
Repair Department, RMA# xxxxx
95 Methodist Hill Drive, Suite 500
Rochester, NY 14623

Product support is also available by e-mail. Questions on equipment operation and applications may be e-mailed to Spectracom Sales Support at:

mailroom@spectracomcorp.com

Repair or technical questions may be e-mailed to Spectracom Technicians at:

techsupport@spectracomcorp.com

Visit our web page for product information, application notes and upgrade notices as they become available at:

<http://www.spectracomcorp.com>

3.0 UNPACKING

Upon receipt, carefully examine the carton and its contents. If there is damage to the carton that results in damage to the unit, contact the carrier immediately. Retain the carton and packing materials in the event the carrier wishes to witness the shipping damage. Failing to report shipping damaging immediately may forfeit any claim against the carrier. In addition, notify Spectracom Corporation of shipping damage or shortages, to obtain a replacement or repair services.

Remove the packing list from the envelope on the outside of the carton. Check the packing list against the contents to be sure all items have been received, including an instruction manual and ancillary kit. Table 1 lists the items included in the Model 8188 ancillary kit.

Description	Part Number	Quantity
Terminal Block, 3-position	P13003	1
AC Adapter, 12 VDC, 1 Amp	T00058	1
Terminating Resistor, 120Ω	R02121	1

TABLE 1 MODEL 8188 ANCILLARY KIT

4.0 INSTALLATION OVERVIEW

The installation of the NetClock/ETS can be broken down into seven basic steps.

- 1) Select a location for the Model 8188 where access to an AC power receptacle, connection to a network hub and connection to the NetClock Master Clock's RS-485 time broadcast are available. A 19-inch rack mount kit is available for the Model 8188. Contact Spectracom for additional information on the Option 03 Rack Mount Kit.
- 2) Apply power to the Model 8188.
- 3) Configure the Model 8188 network parameters such as IP address, gateway IP address, net mask, security features, etc. using an RS-232 or Telnet connection. Review the network parameters as described in Section 5 with your network administrator to avoid improper setup. Section 6 describes the Model 8188 configuration procedure.

- 4) Configure the NetClock Master Clock's RS-485 port to provide either Data Format 0 or Format 2 at 9600 baud. When using Data Format 0, be certain to select the appropriate time difference and DST rule configurations to provide "local time" to the Model 8188. Refer to Section 7 for information on NetClock configuration.
- 5) Connect the Model 8188 to the NetClock Master Clock's RS-485 output data stream. This connection can be made directly at the NetClock Master Clock rear panel or anywhere along the RS-485 bus by tapping into the cable. Refer to Section 7 for information on connecting to the NetClock Master Clock.
- 6) Connect the Model 8188 to a 10 Base-T hub or switch on the network using a straight through RJ-45 cable.
- 7) Install and configure the NTP or SNTP client software on the servers and workstations where required. Refer to Section 9 for NTP application information.

5.0 NETWORK PARAMETERS

When configuring the Model 8188, there are parameters that will be unique to each network. Please review the following configuration parameters A through G with your network administrator:

- A. **IP Address** - This is the unique 32-bit address assigned to the Model 8188 by the network administrator. The default IP address is 192.168.000.039.

Note: The reserved Network and Broadcast addresses cannot be assigned to the Model 8188 (host address). For example, the host address of .000 is used to identify the entire network and .255 identifies the broadcast address.

- B. **Gateway Address** - The gateway/router address is needed if communication to the Model 8188 is made outside the local network. By default, the gateway is disabled.
- C. **Subnet Mask** - A subnet mask allows routers and gateways to handle packets quicker by eliminating the need to process the host bits contained in the IP address. The subnet mask defines the number of bits taken from the IP address that are used in the host portion.

The default host bit value is 00. Setting the host bit value to 00 allows automatic selection of the appropriate default net mask based on the IP address used. The default subnet mask for each of the common network classes is shown in Table 2.

Network Class	IP Address Range	Host Bits	Default Subnet Mask
A	1.x.x.x to 127.x.x.x	24	255.0.0.0
B	128.0.x.x to 191.255.x.x	16	255.255.0.0
C	192.0.0.x to 223.255.255.x	8	255.255.255.0

TABLE 2 DEFAULT NET MASKS

The number of host bits used in the net mask can range from 2 to 24 bits. Table 3 provides the complete list of the number of host bits and the corresponding subnet mask.

Host	Equivalent Net mask	Host	Equivalent Net mask
2	255.255.255.252	14	255.255.192.0
3	255.255.255.248	15	255.255.128.0
4	255.255.255.240	16	255.255.0.0
5	255.255.255.224	17	255.254.0.0
6	255.255.255.192	18	255.252.0.0
7	255.255.255.128	19	255.248.0.0
8	255.255.255.0	20	255.240.0.0
9	255.255.254.0	21	255.224.0.0
10	255.255.252.0	22	255.192.0.0
11	255.255.248.0	23	255.128.0.0
12	255.255.240.0	24	255.0.0.0
13	255.255.224.0		

TABLE 3 EQUIVALENT NET MASK TABLE

- D. **SNMP Address** - Simple Network Management Protocol allows monitoring of the NetClock/ETS status over the network. Up to two IP addresses for SNMP managers can be specified. By default SNMP is disabled and the IP addresses are set to 0.0.0.0. When the SNMP feature is enabled an SNMP Community Name of up to 13 characters can be assigned. MIB II per RFC 1213 is supported. Refer to section 11.2 for additional information.

- E. **Reference Identifier**- This feature when enabled, places up to four characters in the NTP header to identify the Model 8188 as the time source. For example, when the Model 8188 is connected to a Spectracom GPS based master clock the Reference Identifier can be set to "GPS". When the Model 8188 is connected to a Spectracom WWVB based master clock the Reference Identifier can be set to "WWVB".
- F. **Encryption** - When authentication is required, up to six MD5 or DES keys can be set. All key inputs are in hexadecimal format. Each key number (1...6) consists of up to eight 8-bit groups. Factory default disables encryption.

NOTE: The Encryption feature does not mean that the time packet will be encrypted. This feature is used to authenticate that the received time packet came from the desired time-server. To use this feature, both the 8188 and the NTP client use the same MAC key. When the NTP client requests the time, the Model 8188 appends the time packet with the authentication key.

- G. **Security Settings**- The Model 8188 offers the following security features:
- Telnet Password** - A Telnet password may be implemented to prevent unauthorized access of the NetClock/ETS configuration over the network. A password can be up to 16 characters long and may be any combination of letters, numbers or keyboard symbols. The default is "No Telnet Password Selected".

NOTE: The RS-232 setup port is not password protected. Password protection is only applicable for Telnet connections.

Telnet Disable- This feature prevents any telnet configuration session. Future configuration changes must be made using the RS-232 Setup port when this feature is selected. By default, telnet configuration is enabled.

TFTP Disable- Firmware upgrades are made using a binary file from a TFTP client. If the TFTP port is disabled no firmware downloads are possible. By default TFTP operation is enabled.

6.0 CONFIGURATION

The Model 8188 can be configured using its RS-232 Setup port or through a Telnet connection. Refer to Section 6.1 for the RS-232 connection method and Section 6.2 for Telnet connection instructions. Both communication methods access the same configuration menus. Refer to Section 6.3 for a description of the configuration menus.

6.1 RS-232 Connection

Connect a terminal or computer running a terminal emulation program (HyperTerminal, ProComm, etc.) to the RS-232 Setup port. Connect using a straight through (1 to 1 pinning) RS-232 serial cable. Configure the terminal for ANSI emulation, 9600 baud, 8 data, 1 stop, no parity and no flow control.

To enter the RS-232 configuration mode the Model 8188 must be power cycled off and then back on. While powering the unit on, hold down the lowercase “x” key on the terminal or computer. When a connection has been established, the unit responds as shown in Figure 2 prompting the user to depress the enter key to begin the Setup Mode.

NOTE: To enter the RS-232 configuration mode the Model 8188 must first be turned off. Then depress and hold down the lowercase “x” key while reapplying power. The unit will prompt you to press the Enter key to begin the Setup Mode.

NOTE: The keyboard Caps Lock and Scroll Lock functions must be turned off to access Setup Mode.

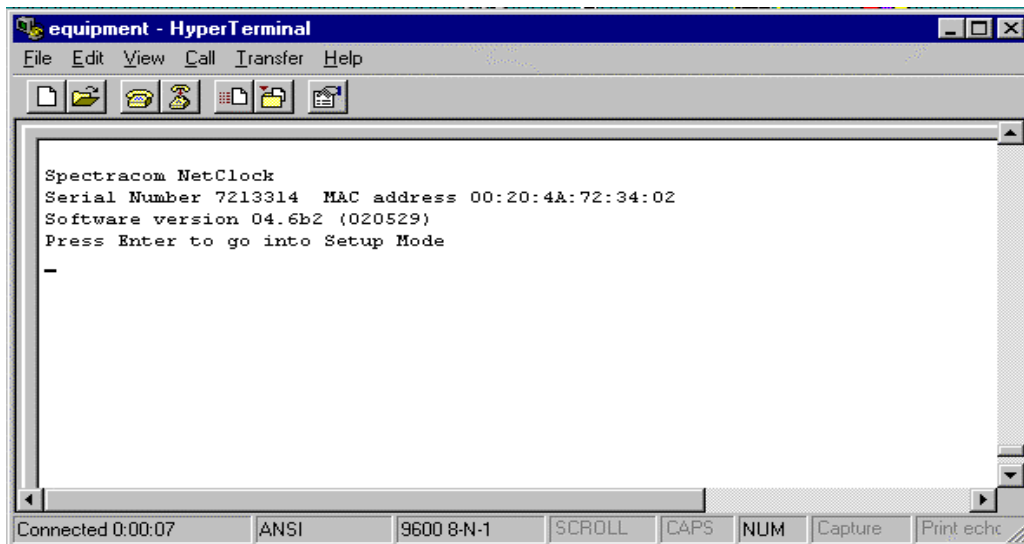


FIGURE 2 ENTERING SETUP MODE

NOTE: The Enter key must be depressed within 5 seconds to access the Setup Mode menus. After 5 seconds the Model 8188 times out and responds with the characters “?!?”. The unit will have to be power cycled and sent the “x” character again to access Setup Mode.

Upon pressing the Enter key, the unit responds with its current configuration and menu change options as shown in Figure 3.

```
*** basic configuration
Hardware: Ethernet Autodetect
IP addr : 192.168.0.39, no gateway set

*** NetClock configuration
Antenna type           : Spectracom Type 0 (present year 2002)
SNMP                   : disabled
SNMP Community Name    :
SNMP manager IP's     : --- not set --- --- not set ---
Syslog IP addr         : --- not set --- --- not set ---
Syslog file            : LOCAL0
Encryption             : disabled

*** Security
Telnet Setup           : enabled
TFTP Download          : enabled
WEB Manager           : disabled
Web Server             : disabled
Password              : disabled

Change Setup : 0 Basic configuration
               1 NetClock configuration
               6 Security
               7 Factory defaults
               8 Exit without save
               9 Save and exit           Your choice ?
```

FIGURE 3 SETUP MENU SELECTIONS

6.2 Telnet Connection

This section describes how to set a static ARP using the hardware address and the desired IP address. The hardware address is found on the label affixed to the bottom cover. The ARP command is available with UNIX and Windows 2000, NT, 95 or 98 using the DOS or Command prompt.

NOTE: There must be at least one entry in the ARP table, other than the local machine, for the ARP command to work in Windows. To view the current ARP table, type ARP -A at the DOS command prompt. If only the local machine is listed, build the ARP table by pinging to another IP address in your network.

In the following example, the desired IP address is 192.168.0.34 and the Model 8188 hardware address is 00 20 4A 72 34 02. The initial Telnet session is shown in Figure 4.

1. Issue the **ARP -S** command using the desired IP address and hardware address. From the DOS or Command prompt enter the IP address in decimal dot notation format and the hexadecimal hardware address separated by hyphens (-).

```
c:\>arp -s 192.168.0.34 00-20-4a-72-34-02 <ent>
```

In UNIX enter the desired IP address in decimal dot notation format and the hexadecimal hardware address separated by colons (:).

```
arp -s 192.168.0.34 00:20:4a:72:34:02 <ent>
```

2. Open a Telnet connection of the desired IP address to Port Number 1. Note that this connection will fail, but the Model 8188 IP address will be forced to the desired value.

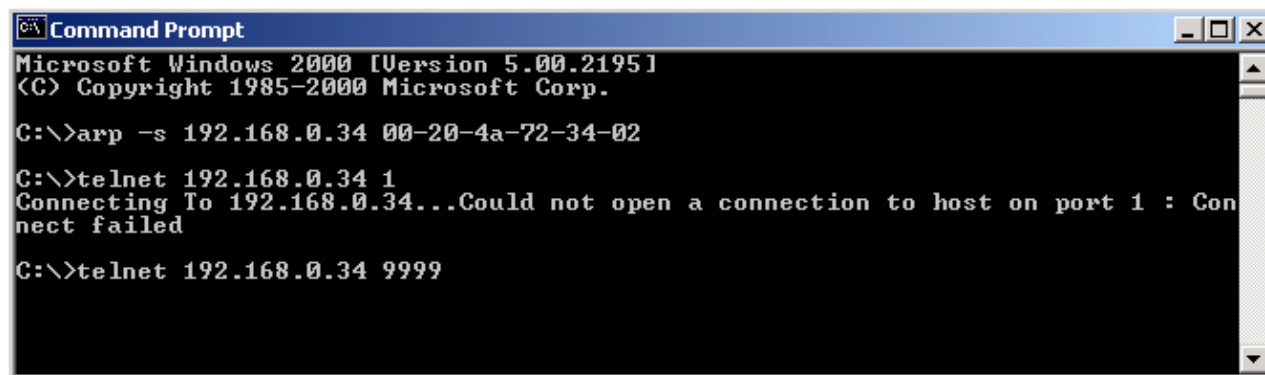
```
c:\>telnet 192.168.0.34 1 <ent>
```

3. Open a Telnet connect using the desired IP address and Port Number 9999. This time, the connection will be successful, allowing access to Telnet configuration menu.

```
c:\>telnet 192.168.0.34 9999
```

NOTE: If the Telnet connection is unsuccessful repeat the connection to Port 9999 and the desired IP address. If the connection continues to fail the Telnet feature may have been disabled or been password protected. Use the RS-232 connection to configure the NetClock/ETS.

Once a successful connection is made, you will be prompted to press the enter key or type in the Telnet password if previously set. Your response must occur within 5 seconds or the Telnet connection will time out.



```
Microsoft Windows [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

C:\>arp -s 192.168.0.34 00-20-4a-72-34-02

C:\>telnet 192.168.0.34 1
Connecting To 192.168.0.34...Could not open a connection to host on port 1 : Connect failed

C:\>telnet 192.168.0.34 9999
```

FIGURE 4 INITIAL TELNET CONNECTION EXAMPLE

6.3 Configuration Menus

Once a successful RS-232 or Telnet connection has been made the current configuration and menu options are given as shown in Figure 3. The configuration menus are divided into three categories; Basic Configuration, NetClock Configuration and Security options. Upon completion of each menu an option is given to select another configuration menu or to save and exit with or without saving the configuration. The following paragraphs describe each of the menu selections.

6.3.1 Basic Configuration

Select **0** for Basic Configuration. After each parameter, the current configuration is shown in parentheses. To accept the variable, press the Enter key. To change the variable simply type in the new value then press the Enter key. The configuration menu will advance to the next parameter. It is not necessary to depress the Enter key when a Yes or No option is given, type y for yes and n for no.

Address variables are entered in a decimal dot notation format. It is not necessary to type leading zeroes in the address. For example, an IP address of 192.000.023.007 can be entered using 192.0.23.7.

Invalid or improperly formatted entries are rejected, requiring the parameter to be entered again. Upon completion of the Setup, an option to load and save the changes is given (option 9). After the configuration is loaded (or re-loaded), the current configuration of the Model 8188 is echoed back.

The Basic configuration setup includes the following setup parameters:

IP Address - This is the 32-bit address assigned to the Model 8188 by the network administrator. The default IP address is 192.168.000.039. The IP address is divided into four octets with the current value shown in parentheses. Enter each octet in decimal dot notation as shown in the example below to change the IP address to 131.123.070.146:

IP Address: (192) 131. (168) 123. (000) 70 (039) 146 <ent>

Gateway Address - A Yes/No option is given to enable a gateway address. If the application does not require a gateway, select **N**. To set a gateway, type **Y** and edit the address prompts as described above.

Subnet Mask - The subnet mask defines the number of bits taken from the IP address that are used in the host portion. The default host bit value is 00. Setting the host bit value to 00 allows automatic selection of the appropriate net mask based on the IP address used. Refer to Table 2 for the default subnet mask for the common network classes and Table 3 for the complete listing of net mask values.

6.3.2 **NetClock Configuration**

Select **1** to enter the NetClock Configuration menu. This configuration menu includes the following setup parameters:

Spectracom Format: This parameter selects the Spectracom Data Format provided to the Model 8188. The Model 8188 accepts either Format 0 or Format 2.

NOTE: Verify the NetClock RS-485 port is configured to provide the selected Data Format. Refer to Section 7 for additional information.

Enter Current Year: This parameter only appears if Data Format 0 is the selected in the previous step. Since Format 0 does not contain year data, the current year must be set.

Disable SNMP: A Yes / No option is given to enable SNMP with MIB II support per RFC 1213. Select **Y** if SNMP is not utilized. To enable SNMP type **N**.

When the SNMP feature is enabled a prompt to enter the SNMP community name is given. The community name can be up to 13 characters long. Access to the NetClock/ETS database is limited to this name.

Change Reference Identifier: A Yes / No option is given to change the Reference Identifier. The Reference Identifier can be up to 4 characters and appears in the NTP header to identify the NetClock/ETS.

SNMP Address: Up to two SNMP Manager IP addresses can be specified. Upon completion of the first SNMP IP address a prompt is given to enable the second SNMP manager. Each IP address is divided into four octets with the current value shown in parentheses. Enter each octet in decimal dot notation as shown in the example below to configure the IP address to 131.123.090.005:

IP Address: (000) 131. (000) 123. (000) 90 (000) 5 <ent>

NOTE: The SNMP feature must be Enabled in previous steps to fully implement the function.

Syslog Address: A Yes / No option is given to enable up to two Syslog IP addresses.

NOTE: The Syslog feature is not supported in the Model 8188 NetClock/ETS. Select NO to disable this feature.

Encryption: A Yes / No option is given to enable MD5 DES authentication algorithms. Type **N** to disable encryption or **Y** to enable. Up to six keys of 8 bytes can be configured when prompted.

MAC Keys: If encryption was enabled in the previous step, up to six keys may be configured. All key inputs are in hexadecimal format. The keys are divided into eight bytes with the current byte value shown in parentheses. Enter each byte followed by a space as shown in the example below:

Enter Mac Key #1 (00) A1 (00) 3F (00) 01 (00) 2D (00) 33 (00) ED (00) 60 (00) BF <ent>

Upon completion of the NetClock Configuration setup, the current configuration is echoed back and the option to continue or exit is given. Select 6 to enter the Security Menu if configuration changes are required. Select 9 to save the Basic and NetClock configurations and exit from the setup mode.

6.3.3 Security Options

Select **6** to enter the Security Configuration menu. This configuration menu includes the following parameters:

Disable Telnet: A Yes / No option is given to disable Telnet configuration sessions. Type **Y** to disable Telnet or select **N** to permit Telnet sessions. If Telnet is disabled future configuration changes must be made using the RS-232 Setup port. By default, Telnet configuration is enabled.

Disable TFTP: A Yes / No option is given to disable TFTP port operation. Firmware upgrades are made using a binary file from a TFTP client. If the TFTP port is disabled no firmware downloads are possible. Type **Y** to disable TFTP or **N** to enable firmware downloads. By default TFTP operation is enabled.

Disable Web Manager and Disable Web Server: A Yes / No option is given to disable Web Manager and Server functions. These functions are reserved for future implementation and are currently unsupported. Select **Y** to disable these features.

Note: The Web Manager and Web Server functions are not supported in the Model 8188 NetClock/ETS. To assure proper operation select Y to disable these features.

Telnet Password: A Yes / No option is given to enable a Telnet password. The password prevents unauthorized access of the NetClock/ETS configuration over the network. By default the Telnet port is not password protected.

NOTE: The RS-232 setup port is not password protected. Password protection is only applicable for Telnet connections.

To enable a password type **Y** and enter the desired password. A password can be up to 16 characters long and may be any combination of letters, numbers or keyboard symbols.

To change a password type **Y** in the Enable Password option. A Yes / No option is given to Change the Password, type **Y** and enter the new password.

To remove password protection type **N** in the Enable Password option.

This completes the NetClock/ETS configuration, select option 9 to Save and Exit the configuration. The Model 8188 will update and store the selected parameters into non-volatile memory. The Model 8188 is now ready for connection to a NetClock Master Clock.

7.0 CONNECTING TO A NETCLOCK MASTER CLOCK

The Model 8188 only accepts Spectracom Data Formats 0 or 2 at a port speed of 9600 baud. Verify the NetClock Master Clock is configured to output the same Data Format that was selected during the Model 8188 configuration.

NOTE: The Model 8188 can be configured to accept either Data Format 0 or 2 from a Spectracom NetClock Master Clock. The NetClock RS-485 port speed must be set to 9600 baud.

All Spectracom GPS synchronized NetClocks are configured using their RS-232 Serial Setup port. Model 8182 NetClock/2 WWVB Master Clock and the Model 8186 TimeBridge utilize setup switches to select Data Format and baud rate configuration. Refer to the appropriate instruction manual for a complete description on clock configuration.

The Model 8188 connects to the NetClock Master Clock through the 3-position terminal strip connector labeled RS-485. This connector, shown in Figure 5, is furnished in the ancillary kit. Section 7.1 describes how to connect to a GPS NetClock or TimeBridge. Section 7.2 describes the connection to a NetClock/2 Master Clock. For additional information on RS-485 cabling, termination and interconnection to other Spectracom products refer to Section 11.3.

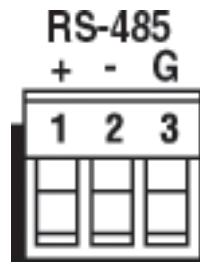


FIGURE 5 RS-485 INPUT CONNECTOR

7.1 CONNECTING TO A GPS NETCLOCK OR TIMEBRIDGE

Model 8183 NetClock/GPS and Model 8186 TimeBridge provide the RS-485 synchronizing data stream on a 3-position terminal strip. Connect the Model 8188 to these products as shown in Figure 6. The front panel Sync Status lamp on the Model 8188 will change to a steady green when the unit has acquired time synchronization to the Master Clock.

To simplify installation Spectracom offers an interface cable with 3-position terminal strip connectors on each end. Specify part number CA15003 for a three-foot long cable and CA15006 for a six-foot cable.

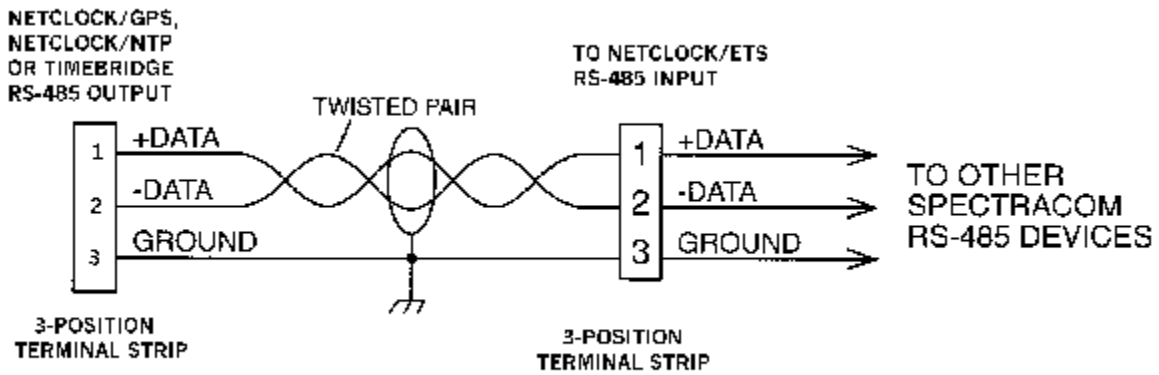


FIGURE 6 CONNECTION TO A GPS NETCLOCK OR TIMEBRIDGE

7.2 CONNECTING TO A NETCLOCK/2 MASTER CLOCK

The Model 8182 NetClock/2 provides the RS-485 time data stream on its Remote Output connector. The Remote Output connector is a DB9 female. Refer to Figure 7 for connector pin numbering.

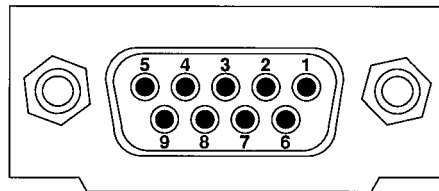


FIGURE 7 NETCLOCK/2 REMOTE OUTPUT

Connect the Model 8188 to the NetClock/2 Remote Output as shown in Figure 8. The front panel Sync Status lamp on the Model 8188 will change to a steady green when the unit has acquired time synchronization to the NetClock/2.

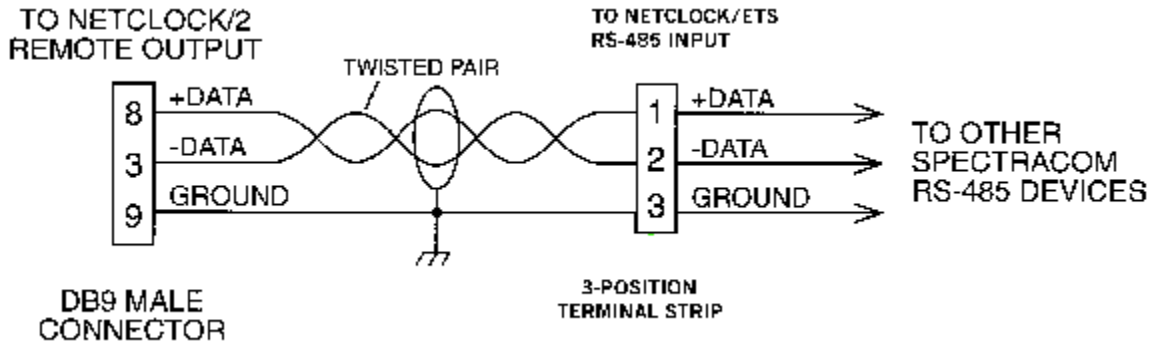


FIGURE 8 CONNECTION TO A NETCLOCK/2 MASTER CLOCK

8.0 CONNECTING TO THE NETWORK

Using a straight through RJ-45 cable connect the Model 8188 10 Base-T port to a hub on the network. The upper left LED indicator on the 10 Base-T connector, shown in Figure 9, will illuminate when a Good Link (GL) is detected.

NOTE: The upper left LED indicates Good Link when illuminated. The LED on the right is not utilized and will never illuminate.

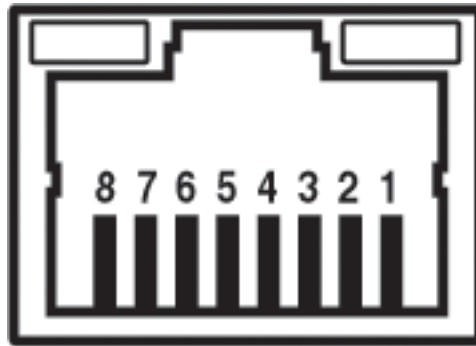


FIGURE 9 10 BASE-T CONNECTOR

Once the Model 8188 has been correctly configured to operate on your network, you can verify its operation by using the DOS ping command. From a DOS session issue the ping command as shown below except substitute the IP address used by the Model 8188.

Ping 194.168.37.41

If the connection is successful the unit shall reply as follows:

Reply from 194.168.37.41: bytes=32 time=1ms TTL=32
Reply from 194.168.37.41: bytes=32 time=2ms TTL=32
Reply from 194.168.37.41: bytes=32 time=1ms TTL=32
Reply from 194.168.37.41: bytes=32 time=1ms TTL=32

If the ping response indicates a failure verify the Model 8188 IP address and gateway address (if used) is correct.

9.0 NTP CLIENT SOFTWARE

Several variants of Network Time Protocol (NTP) exist to support Unix compatible and Windows NT operating systems. NTP software can be downloaded for free.

For Unix-based machines running AIX, HP-UX, IRIX, Linux, SCO UNIX, OSF/1, Solaris or System V.4, go to the following web site:

www.eecis.udel.edu/~ntp

Windows NT machines can use the popular TimeServ program included in the Windows NT resource kit. Windows 2000 Server, Professional and Advanced Server are preloaded with W32 Time. An application note for Windows NT and Windows 2000 time synchronization can be found on the Spectracom web page:

www.spectracomcorp.com

Several free versions of NTP programs can be found at this Microsoft web page:

www.microsoft.com/NTServer/nts/exec/vendors/freeshare/iclient.asp#time

Some easy to use and recommended NTP applications are YATS 32 (Yet Another Time Synchronizer) from www.dillobits.com and Dimension 4 from www.thinkingman.com.

Spectracom cannot provide technical assistance for configuring and installing NTP on Unix-based applications. Please refer to the following web page for NTP information and FAQs:

www.eecis.udel.edu/~NTP/ntpfaq/NTP-s-def.htm

Another good source for support is the Internet News Group at

news://comp.protocols.time.ntp

10.0 SYNC STATUS LAMP

The Model 8188 NetClock/ETS front panel, shown in Figure 10, is equipped with a bi-color indicator LED to indicate Sync Status.



FIGURE 10 NETCLOCK/ETS FRONT PANEL

- Steady Green-** The Sync Status lamp shall be in a steady green state when it is synchronized to a Spectracom NetClock Master Clock.
- Blinking Green-** This indicates that the NetClock Master Clock is not synchronized to its GPS or WWVB time source.
- Blinking Red-** The lamp blinks red at power on or if no RS-485 input signal has been applied. The lamp will also blink red if the wrong Data Format has been applied to the Model 8188 input.

Note: *The synchronizing RS-485 connection is disabled whenever a connection to the RS-232 Setup port is made.*

- Blinking Red/Green-** A blinking red/green status lamp indicates a potential hardware failure contact Spectracom Customer Service at 585-381-4827.

11.0 REAR PANEL FUNCTIONS

Refer to Figure 11, NetClock/ETS Rear Panel, and the following paragraphs for a description of the rear panel functions.

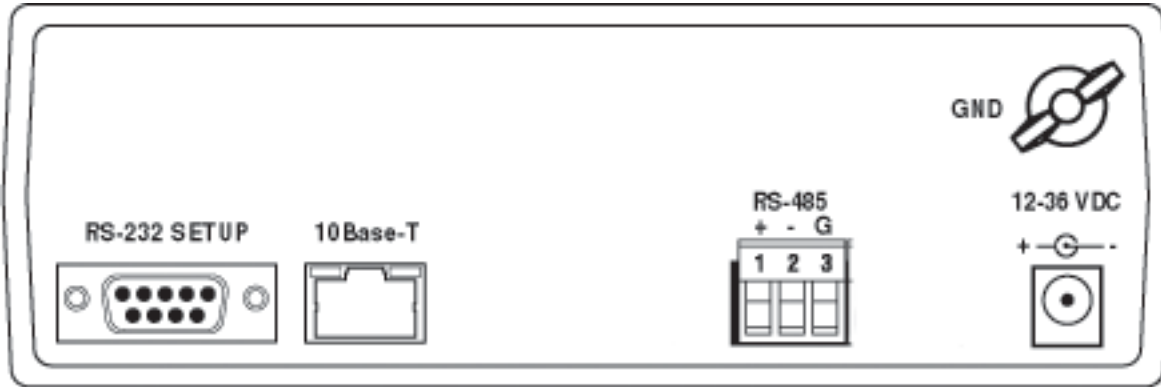


FIGURE 11 NETCLOCK/ETS REAR PANEL

11.1 RS-232 SETUP

This port is used to configure the NetClock/ETS setup parameters. To enter the RS-232 configuration mode the Model 8188 must be power cycled off and then back on. While powering the unit on, hold down the lowercase “x” key on the terminal or computer. Refer to Section 6 Configuration for a complete description of the setup procedure.

NOTE: To assure proper operation remove the RS-232 cable from the Setup port upon completing the NetClock/ETS configuration. The synchronizing RS-485 input is disabled whenever a connection is made to the RS-232 Setup port.

The RS-232 Setup connector is a 9-pin series D female. Connector pin numbering is shown in Figure 12. Pin assignments are listed in Table 4.

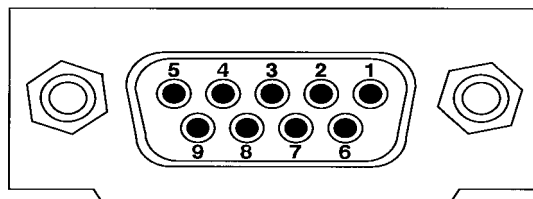


FIGURE 12 SETUP PORT PIN NUMBERING

PIN	SIGNAL	I/O	DESCRIPTION
2	RXD	O	Receive Data
3	TXD	I	Transmit Data
4	DTR	I	Data Terminal Ready
5	GND	-	Signal Common
6	DSR	O	Data Set Ready
7	RTS	*	Request to Send
8	CTS	*	Clear to Send

*Pins 7 and 8 are connected together internally.

TABLE 4 PIN ASSIGNMENTS

The RS-232 Setup Port communicates at 9600 baud with a character structure of 8 data bits, no parity, and 1 stop bit. Per EIA/TIA 574 standard, the setup port is classified as a data circuit-terminating equipment or DCE. Data is output on Pin 2, RXD and commands are input on Pin 3, TXD. When connecting to data terminal equipment, DTE, (i.e. a personal computer) a one to one cable is used. Hardware flow control is required. The Data Terminal Ready (DTR) line enables the port. The Request to Send (RTS) and Clear to Send (CTS) lines are internally connected together. Data Set Ready, DSR, is continuously held high whenever power is applied.

11.2 10 BASE-T PORT

This port provides time synchronization to any SNTP or NTP Version 1, 2 or 3 applications. Connect this port to a network hub or gateway. The NetClock/ETS default IP address is 192.168.0.39. The hardware address is found on a label affixed to the bottom cover.

The 10 Base-T port can be configured using the RS-232 setup port or a Telnet connection. To access the Telnet setup menu specify port 9999. Refer to Section 6 for configuration instructions.

Telnet password protection may also be enabled to prevent unauthorized access to 10 Base-T port setup configuration. The password can be up to 16 characters long. Optionally, the Telnet connection can be disabled to prevent any Telnet configuration changes.

The 10 Base-T connector incorporates a green LED to communicate port status. The LED is on whenever the port is connected to the network and is available for timeserver usage.

Secure data transfer can be enabled using MD5 Security Protocol. Up to six keys of 8 bytes may be selected. If authentication is not used, the Model 8188 can respond to as many as 300 requests per second. Authentication requires typically 40ms for checking and generating the cryptograms, which is covered and averaged out by the protocol. Authentication reduces the response rate to 20 requests per second.

Due to the capacity of the Model 8188 ARP table a maximum of 128 users can be supported in a single sub-network. Using a gateway greatly increases the total users supported. Typically the NetClock/ETS is installed in a network hierarchy where the PDC emulator in the root domain is synchronized. Then domain controllers in the same root domain and PDC emulators from child domains get their timing from the root domain PDC emulator. Workstations then in turn get their timing from domain controllers within their domain.

Port status can be monitored using SNMP with MIB II support. Up to two SNMP managers can be specified in the configuration menu along with a SNMP Community name of up to 13 characters. The Model 8188 generates the following traps:

NTS_start_up	This message is generated at power on.
NTS_sig. Lost	This message is generated when the NetClock Master Clock has lost time synchronization to its GPS or WWVB reference.
NTS_unsynch'ed	This message warns that the NetClock/ETS is not synchronized to the NetClock Master Clock.
NTS_synched	This message is generated when the NetClock/ETS synchronizes to the NetClock Master Clock.

11.3 RS-485 INPUT PORT

NetClock Master Clocks provide a continuous once-per-second RS-485 time data stream. The Model 8188 can be configured to accept either Data Format 0 or 2. The baud rate on the NetClock must be set for 9600.

RS-485 is a balanced differential transmission that offers exceptional noise immunity, long cable runs and multiple loading. These characteristics make RS-485 ideal for distributing time data throughout a facility. The RS-485 Output can drive 32 devices over cable lengths up to 4000 feet. Spectracom manufactures wall clocks, talking clocks, RS-485 to RS-232 converters and radio link products that utilize the RS-485 data stream as an input. Figures 13 and 14 illustrate typical RS-485 time data bus inter-connections. Follow the guidelines listed below when constructing the RS-485 data bus.

11.3.1 Cable Selection

Low capacitance, shielded twisted pair cable is recommended for installations where the RS-485 cable length is expected to exceed 1500 feet. Table 5 suggests some manufacturers and part numbers for extended distance cables. These cables are specifically designed for RS-422 or RS-485 applications. They have a braided copper shield, nominal impedance of 120 ohms, and a capacitance of 12 to 16 picofarads per foot. RS-485 cable may be purchased from Spectracom. Specify part number CW04xxx, where xxx equals the length in feet.

MANUFACTURER	PART NUMBER
Belden Wire and Cable Company 1-800-BELDEN-1	9841
Carol Cable Company 606-572-8000	C0841
National Wire and Cable Corp. 232-225-5611	D-210-1

TABLE 5 CABLE SOURCES FOR RS-485 LINES OVER 1500 FEET

For cable runs less than 1500 feet, a lower-cost twisted pair cable may be used. Refer to Table 6 for possible sources. In addition, Category 5 cable may be used for cable runs less than 1500 feet.

MANUFACTURER	PART NUMBER
Alpha Wire Corporation 1-800-52ALPHA	5471
Belden Wire and Cable Company 1-800-BELDEN-1	9501
Carol Cable Company 606-572-8000	C0600

TABLE 6 CABLE SOURCES FOR RS-485 LINES UNDER 1500 FEET

11.3.2 Connection Method

The RS-485 transmission line must be connected in a daisy chain configuration as shown in Figure 13. In a daisy chain configuration, the transmission line connects from one RS-485 receiver to the next. The transmission line appears as one continuous line to the RS-485 driver.

A branched or star configuration is not recommended. This method of connection appears a taps or stubs to the RS-485 transmission line. Stub lengths affect the bus impedance and capacitive loading which could result in reflections and signal distortion.

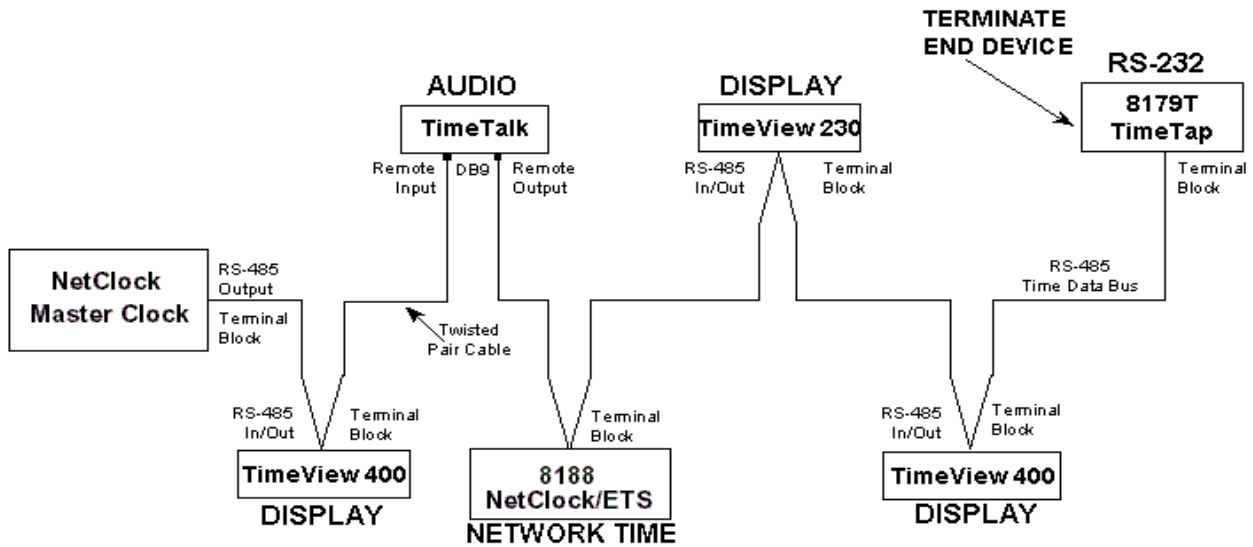


FIGURE 13 ONE-WAY BUS INSTALLATION

The RS-485 Output may be split in two directions as shown in Figure 14. This allows the NetClock to be centrally located. Connecting in this method can simplify installation and possibly reduce the amount of cable required.

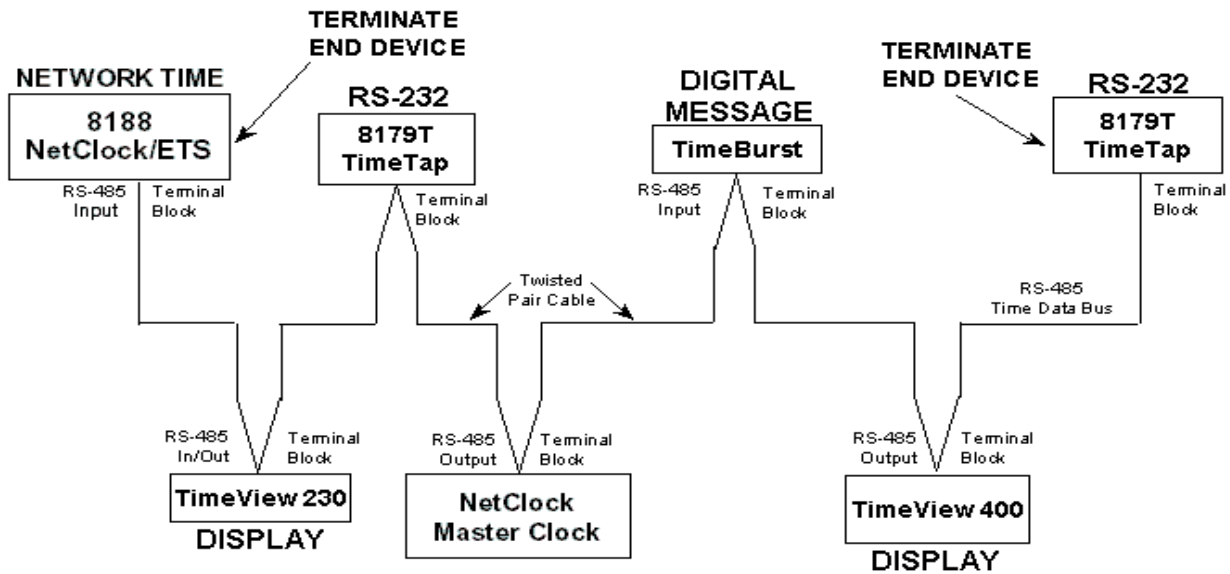


FIGURE 14 SPLIT BUS CONFIGURATION

Most RS-485 connections found on Spectracom equipment are made using a removable terminal strip. Wires are secured by a jaw that compresses the wires when tightened. When using small diameter wire, 22-26 gauge, a strain relief can be fashioned by wrapping the stripped wire over the insulating jacket as shown in Figure 15. Wrapping the wires in this manner prevents smaller gauge wires from breaking off when exposed to handling or movement.

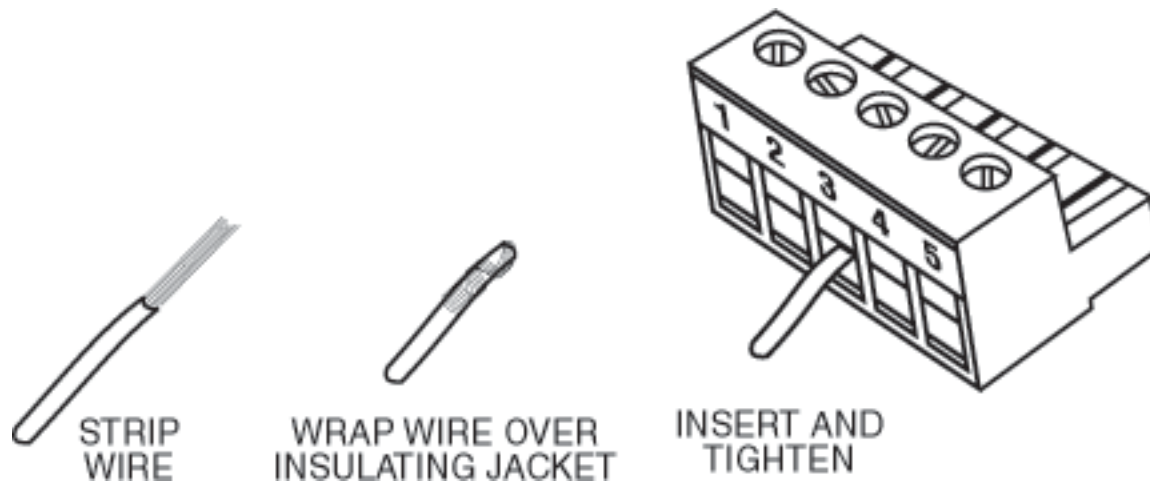


FIGURE 15 WIRE STRAIN RELIEF

11.3.3 Termination

A termination resistor is required on devices located at the ends of the RS-485 transmission line. Terminating the cable end preserves data integrity by preventing signal reflections. For a one-way bus installation (shown in Figure 13), terminate the last device on the bus. The RS-485 data bus can be split in two directions as shown in Figure 14. In a split bus configuration, terminate the devices installed on each end of the bus.

If the Model 8188 is the last device on the RS-485 bus terminate the line using the 120-ohm resistor supplied in the ancillary kit. Insert the resistor into pins 1 and 2 of the connector in a matter similar to that shown in Figure 16.

NOTE: A termination resistor is not required on cable lengths less than ten feet.

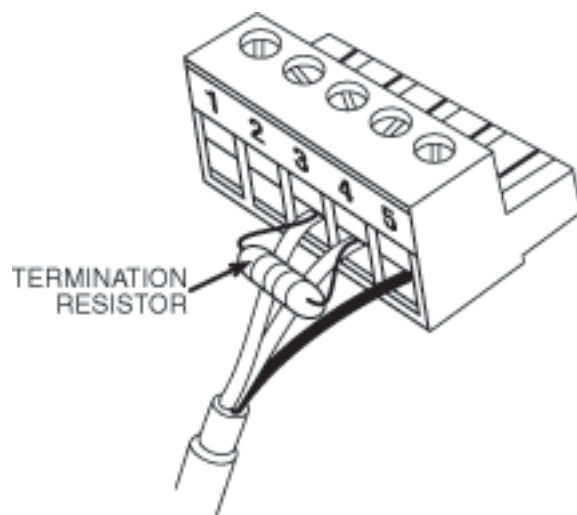


FIGURE 16 TERMINATION RESISTOR

11.4 INPUT POWER

The NetClock/ETS is powered by a 115 VAC to 12 VDC wall mount adapter. The power jack accepts barrel-type plugs with 5.5 mm O.D. shell and 2.1 I.D. center. Replacement adapters are available from Spectracom, specify part number T00058.

An International Power Supply is also available from Spectracom, part number PS00142. This tabletop adapter can operate from a 100-250 VAC, 50/60 Hz power source. The PS00142 power adapter is shipped with a detachable line cord that is compatible with AC receptacles (NEMA 5-15R) commonly found in the United States and Canada. Alternate type line cords or adapters may be obtained locally.