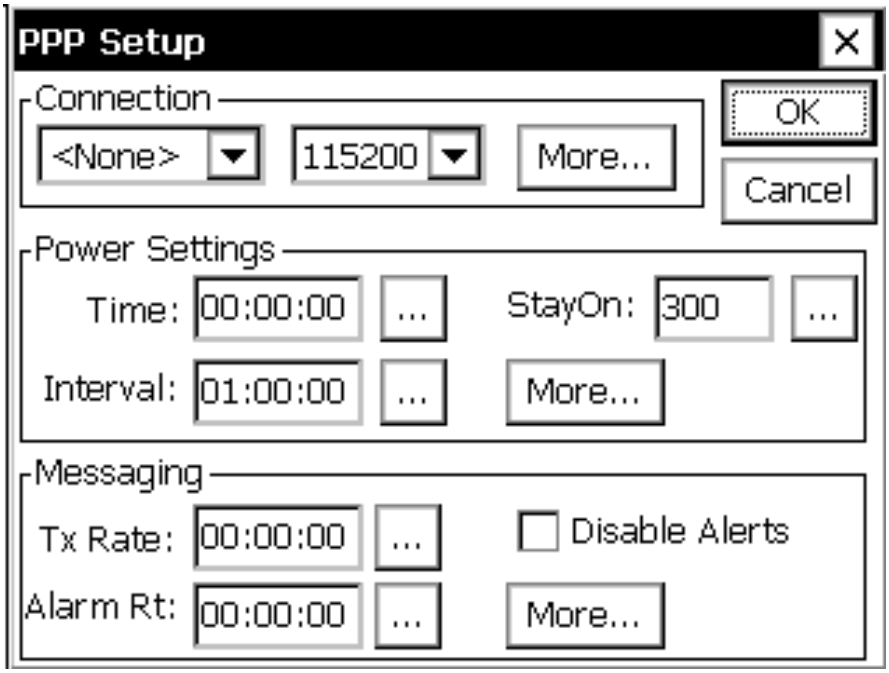
Xpert / XLite
PPP (SLL)

Users Manual

USERS MANUAL



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INTRODUCTION

Sutron's Xpert family of DCPs (both the 9210 and the Xpert, hereafter referred to as the Xpert) have been designed to be easily expandable by adding additional software libraries, called Sutron Link Libraries (SLLs). One such library is PPP.sll, which adds the ability for the Xpert to communicate using the Point-to-Point (*) protocol over serial communications links.

While the PPP SLL permits the two-way transmission of SSP (Sutron Standard Protocol) messages over various devices which support PPP, its usage is much broader because when the PPP driver is turned on it enables a network stack on the RTU that permits other forms of TCP/IP communications. For instance, a Basic program could initiate an FTP file transfer, or a remote user might access the Xpert's home page.

(*) On Windows PCs, the PPP protocol is typically supported by "Dial-up Networking", and PPP.SLL may in fact be used to connect the Xpert to a Dial-up ISP with a standard Hayes modem.

This document is the user manual for PPP.sll. The following topics are discussed:

- How to install the library.
- What part of the PPP standard is supported by the library.
- How to configure the Xpert for PPP communications.
- Diagnostics

NEW FEATURES

Versions 3.11.0.2 / 2.11.0.3 and later:

- "Full AT Support" option added to the PPP Options dialog. Unchecking this box will eliminate some of the standard AT initialization commands that modems without full AT compatibility may not support.
- On the PPP status page, the ON, OFF, and Send Mail operations may now be performed asynchronously in the background.
- When power is manually turned ON or OFF it should stay ON or OFF until the next cycle.

SUPPORTED PPP FEATURES

This section discusses PPP support in the PPP.sll library.

Communication Ports

This library supports PPP messaging over RS-232 asynchronous serial transmission, e.g., EIA/TIA-232 or EIA/TIA-485. Hardware flow is recommended. The data rate is selectable, with no parity, 8 data bits, and 1 stop bit. The com port to use is selectable (COM2 thru COM9, GPR2-GPR4) and must not already be in use by Remote and/or Coms.sll. Before communicating with the PPP device, it is "turned on" this is done by asserting DTR and RTS and/or a Digital I/O line if desired.

When <LAN> is selected as the communication port, the PPP protocol is bypassed, and the Xpert's Ethernet port is controlled. This permits the same power scheduling and transmission options of the PPP.sll to be used with a device that features an Ethernet interface.

Many devices support the PPP protocol over RS-232, this includes standard dial-up modems as well as GPRS Radios and custom Radios.

Sutron Standard Protocol

PPP.sll uses SSP messages over TCP/IP. As TCP/IP is a reliable protocol, SSP's retry mechanism is not used, although CRC checks are still performed.

The following SSP opcodes are supported by the built-in SSP server:

> OpSetClock, OpTimeTagReq, OpSetupReq, OpTagInfo, OpMail, OpReset, OpStartSDL, OpStopSDL, OpCurdataReq, OpValueReq, OpStartTag, OpEvalTag, OpStopTag, OpBeginControl, OpSelectControl, OpSelfTest, OpClearStatus, OpGetStatus, OpEraseSetup, OpValue, OpSaveSetup, OpRDIReq, and OpRDI,

The PPP SSP server does not support cross device repeating, but alarm and alert messages are. Mail messages may be sent to test a link, and the PPP status can also be retrieved.

Other TCP/IP services provided by the Xpert2 (such as Remote's Telnet server) may be remotely accessed, but those capabilities are not discussed here.

INSTALLING AND CONFIGURING PPP.SLL

This section describes the installation and configuration of the PPP.sll library.

Installation

PPP.sll is required for PPP operation. To install the library, copy the PPP.sll file to the "\Flash Disk" subdirectory of your Xpert using Xterm. For more information on performing this file transfer, please refer to chapter 6 of the Xpert or 9210 user manual.

Once the files have been transferred, reboot the Xpert. The libraries will load automatically after the Xpert reboots.

To uninstall the libraries, use Xterm to delete the files from the Flash Disk subdirectory. This can only be done when the Xpert application is not running (select "Exit App" from the Status tab).

In order for the libraries to load and operate correctly, the versions of the files must be the same as the version of the application loaded into the Xpert. This is usually not a concern because the same versions of the slls and application are typically packaged together. Should the need arise to verify that the versions are the same; the version of a sll as it resides on the PC can be determined by looking at the file's properties (right-click on the file and select the "Version" tab). The version of the Xpert application is given by the application itself, at the top of the About dialog, which is accessed from the Status tab.

Before getting started

Typically the purpose of using the PPP SLL is to provide internet services to an RTU and hence the LAN is not available and not used, but during initial testing setup it's very convenient to take advantage of it. The problem is that if the internal LAN is turned on then PPP messages will be sent using the LAN and not the PPP device. You can change this behavior by checking the Gateway option in the PPP options, but initially you should just go to the LAN Settings Setup entry and turn it off.

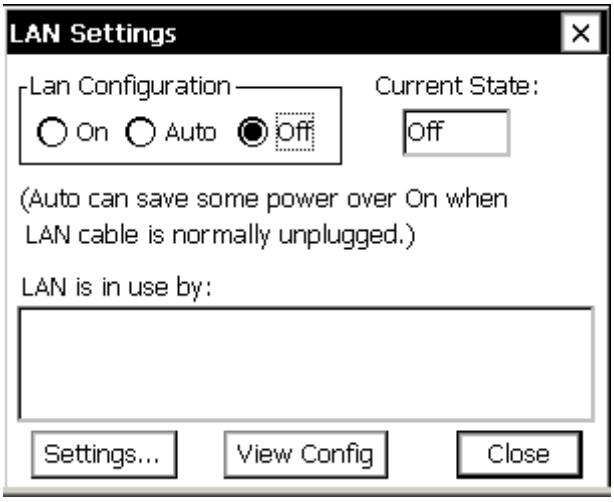


Figure 1: Turning the LAN off

Configuring the serial ports for PPP operation may require changes to the registry that will require a reboot before they take effect. When this situation can be detected, you will be notified of the need to reboot. However, it cannot always be detected. If you experience any difficulties establishing a connection when setting up a port for the first time, try rebooting the Xpert.

Configuration

There are two visual components added to the Xpert by the PPP.sll library. The first, and the one this section discusses in detail, is an entry under the Setup tab named "PPP" (see Figure). This entry is used to configure how Xpert talks PPP over a selected communication port.

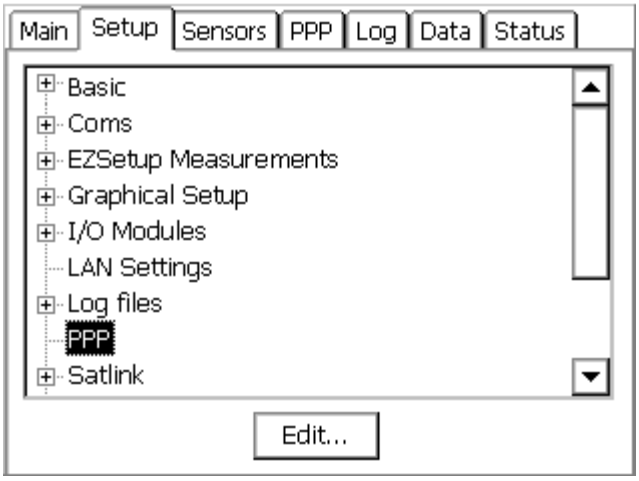


Figure 2: The PPP Control Panel Entry

To access the dialog containing the serial configuration settings, select the "PPP" entry and press "Edit". The following dialog appears:

There are five dialogs for configuring the PPP properties: the main PPP Setup Dialog, three other secondary dialogs that can be accessed by pressing the "More" button, and a 5th dialog accessed by pressing the "Options" button in the PPP Connection Settings Dialog.

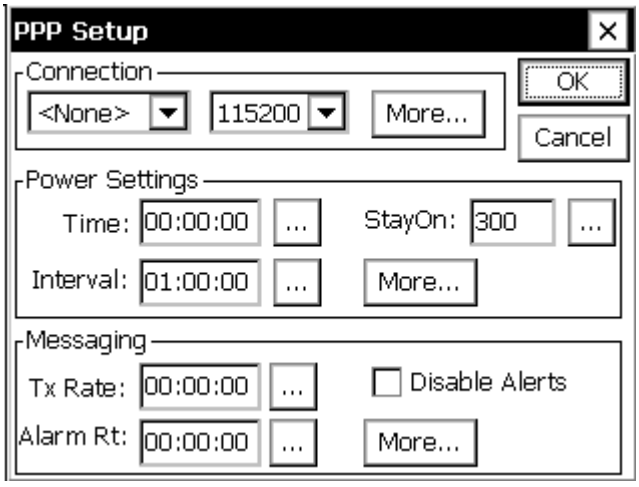


Figure 3: PPP Setup Dialog

The PPP Setup dialog allows the configuration of the most common options for connecting, controlling power, and messaging and provides buttons to access further options in each category. Here are the options provided by this dialog:

Port	This defines the serial port the PPP device will be connected to. <None> will disable PPP support. To use a serial port for PPP you will need to make sure it's not already in use for something else. Selecting <LAN> will disable use of the PPP protocol and instead allow the Xpert's built-in LAN to be controlled by the PPP SLL. This option would only be used when the power draw of the LAN and connected devices is too high to leave on all the time. For this to work, the LAN must be first turned OFF in the LAN Settings entry under the Setup tab. GPR2:, GPR3:, and GPR4: are virtual devices which will allow the PPP.sll to work with Sutron's GPRS radio on COM2:, COM3:, and COM4: respectively. While PPP.sll is communicating with the radio and creating an internet session using one of the GPRx: ports, a Basic program could access the radio using the corresponding SMSx: port permitting simultaneous TCP/IP (GPRS) and SMS (GSM) operation.
Data Rate	The serial data rate may be selected. In general there's no reason not to take advantage of the highest rate (115,200 bps).
Time	Base time to automatically power up the radio.
Interval	How often to automatically power up the radio.
StayOn	The number of seconds to leave the radio on for during an automatic power on period.
Tx Rate	How often to send SSP current data messages when the system is not in alarm (00:00:00 will disable this feature).
Alarm Rt	How often to send SSP current data messages when the system is in alarm (00:00:00 will disable this feature).
Disable Alerts	When a sensor goes in to Alarm, an Alarm message will automatically be transmitted to the PPP device, unless Disable Alerts is checked.

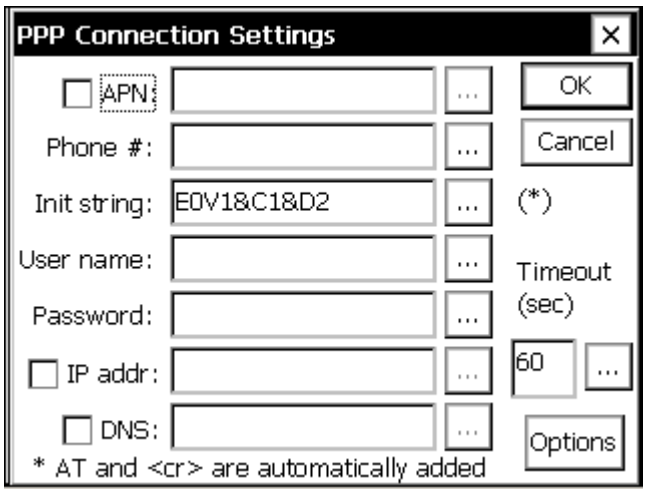


Figure 4: PPP Connection Settings Dialog

The PPP Connection Settings dialog provides details for connecting to a PPP device or a GPRS radio. Here are the options provided by this dialog:

APN	The "Access Point Name" option used for GPRS communications and may be left unchecked when using a PPP device. Enabling "APN" helps prepare the initialization strings and phone number for use with a GPRS radio, and allows the APN for the radio to be specified (this setting varies depending on the Cell service provider).
Phone #	The phone number to dial to connect to the service provider. When "APN" is checked, this is automatically filled in with the dialing string used by the Sutron (and other) GPRS radios.
Init String	This string is sent to the PPP device before making a connection. The default settings ("E0V1&C1&D2") turn off echo (D0), enables result codes (V1), enables CD reporting (&C1), and allows DTR to hang-up (&D2). Other options may be tacked on to these default values. The string "AT" is automatically issued before the init string, and a <cr> is automatically appended. Modems and radios which support PPP generally support the Hayes AT Command set, but there may be extensions or limitations specific to each piece of hardware.
User name	A user name is typically required (and provided) by the service provider.
Password	A password is typically required (and provided) by the service provider.
IP addr	When left unchecked the IP addr will be automatically provided by the service provider, but if you wish to specify a fixed IP addr, you may check this box and enter the static address you wish to use.
DNS	When left unchecked the DNS server will be automatically provided by the service provider, but if you wish to specify a fixed DNS, you may check the box and enter the address you wish to use.

Timeout — This is a timeout in seconds for how long to wait for a connection to be made. Depending on the device and type of service, the time required to connect can be fairly long and hence the default is 60 seconds.

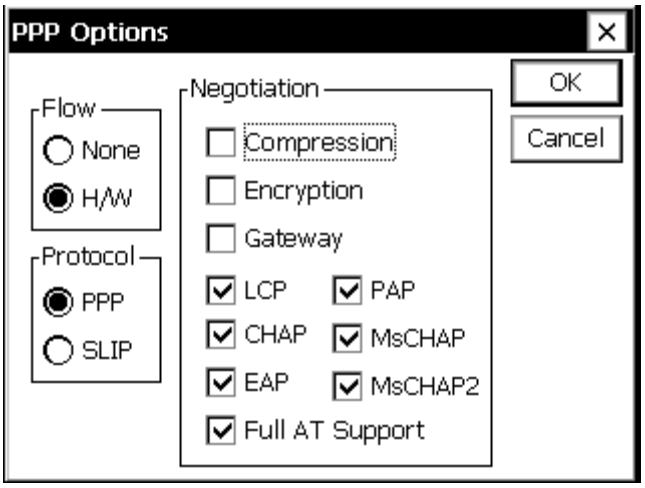


Figure 5: PPP Options Dialog

The PPP Options dialog provides even more options related to connecting to a service provider. The defaults are generally acceptable, but a specific device may require a specific configuration. Here are the options provided by this dialog:

Flow — This setting determines if H/W flow control (RTS/CTS) is used with the serial port communicating with the PPP device. Because SSP uses long buffers, and smart devices can introduce indeterminate transmission delays, it is highly recommended to enable H/W flow control. To function correctly, RTS/CTS flow control must also be enabled in the modem. The standard Hayes command for doing this is "ATK3<cr>", or just "K3" if added to the Modem Initialization string. However, since other commands will be sent to the device before the Modem Initialization string is sent, it's recommended that this setting be stored in the default profile. With a Hayes compatible modem connected to COM2:, this is how you would manually do so from command line:

```
\Flash Disk>PASSTHRU COM2:
Passthru operation has begun (press ESC ESC ESC to abort)
AT
OK
ATK3&W
OK
```

```
(esc) (esc) (esc)
\Flash Disk>
```

Protocol	PPP or SLIP may be selected. SLIP is an older standard for creating a Dial-up connection that cannot auto-negotiate features like PPP and hence the IP and DNS must be specified. If possible, always use PPP. However, if PPP doesn't seem to work with or is not supported by your hardware, you might try SLIP.
Negotiation	These options enable certain capabilities of the PPP protocol. Some of them may or may not be compatible with a specific implementation of the protocol or may be too insecure for your network policy, and hence they can be enabled or disabled as needed.
Compression	Enables IP header and data compression of the data sent over the link.
Encryption	Requires the data and password to be passed in encrypted form or the connection will be refused.
Gateway	Causes the PPP connection to be treated as the RTU's primary gateway to the internet. This means that even if the high speed LAN is turned on, the PPP connection will be used to route packets to the Internet/WAN. Hence, with "Gateway" enabled, turning on and off the LAN will not affect PPP messaging. It's simplest to just turn the LAN off when using PPP, and to turn PPP off when using the LAN, but it is possible to have both enabled at the same time.
LCP	This option allows LCP extensions (a part of the PPP protocol) to be used. You can try turning them off to help diagnose a problem establishing a PPP connection.
CHAP	This option allows the use of Microsoft Challenge Handshake. CHAP uses a challenge/response scheme using a MD5 hash. The password is never sent directly.
EAP	This option allows the use of the Extensible Authorization Protocol. EAP was introduced to support advanced security methods such as token cards, smart cards, and certificates. However, there is currently not a means to configure such security devices in the Xpert.
PAP	This option allows the use of the Password Authenticated Protocol. PAP uses plaintext (unencrypted) passwords and is the least sophisticated authentication protocol.
MsCHAP	This option allows the use of the Microsoft Challenge Handshake Authentication Protocol. MS-CHAP is similar to CHAP but is compatible with Microsoft networking standards.
MsCHAP2	This option allows the use of the Microsoft Challenge Handshake Authentication Protocol version 2.0. MS-CHAP v2 was introduced as a

more secure variation of MS-CHAP.

Full AT Support — Unchecking this box will eliminate some of the standard AT initialization commands that modems without full AT compatibility may not support. Be sure to place any initializations your modem does need in the Init String.

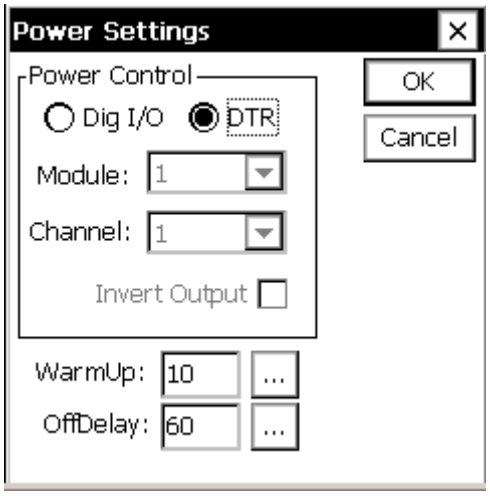


Figure 6: Power Settings Dialog

The Power Settings dialog provides additional options related to powering up the PPP device. Here are the options provided by this dialog:

Power Control — When a serial PPP connection is made, DTR is always asserted to the device. In addition power to the device may be controlled by a digital switch or relay controlled by a Digital I/O output port. When Dig I/O is selected, an I/O Module and Channel may be selected. This output will be turned "on" before a PPP or a <LAN> connection is attempted. The output is assumed to be open-collector, hence "on" means 0V is output. If the output instead uses positive logic, the "Invert Output" box may be checked.

WarmUp — The number of seconds to allow the PPP device to warm up after asserting power before trying to establish a connection.

OffDelay — Minimum number of seconds to leave the device powered on, after any type of power on event. For example an alarm message will power up the device outside of the normal power interval, and leave it on for OffDelay seconds. This allows a period of time when other messages may be sent without incurring the penalty of powering down and back up the device, and/or a master station may send requests.

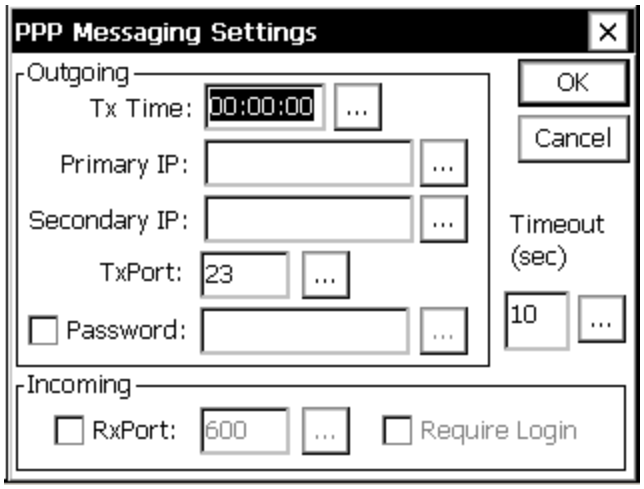


Figure 7: Messaging Settings

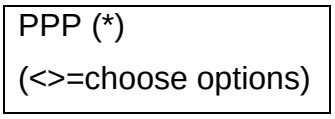
The PPP Messaging Settings dialog provides additional options related to transmitting messages to the PPP device. Here are the options provided by this dialog:

Tx Time	Base time for sending timed current data transmissions. You may offset this from the power on time to account for the WarmUp delay, but it's not strictly necessary as a transmission is not sent until a PPP connection has been made.
Primary IP	An IP address or URL specifying the Xconnect/Tempest/SutronWIN/etc server to send SSP messages to.
Secondary IP	If a message could not be sent to the Primary IP, then an attempt will be made to the Secondary IP (unless the field is blank).
TxPort	The TCP/IP port number that the server is listening on for an incoming SSP message (UDP is not supported).
Password	When the password option is checked and a password is entered, then a SSP login will be performed prior to sending a message to the server. The RTU's station name will be sent as the user name, and the password entered in this field will be provided. This is meant to authenticate that the RTU is authorized to provide data.
RxPort	If enabled with the check box, RxPort specifies the TCP/IP port that PPP SLL will listen on for SSP messages. This server supports a traditional SSP command set meant for data collection and control, and includes the ability to poll for current data as well as time tagged data. Other TCP/IP services provided by the Xpert are also available and their port numbers should be avoided (ex: 23 for Telnet, 80 for HTTP).
Require Login	If Require Login is checked, then a client trying to access the PPP SLL's SSP server will be required to login before it can send commands. The

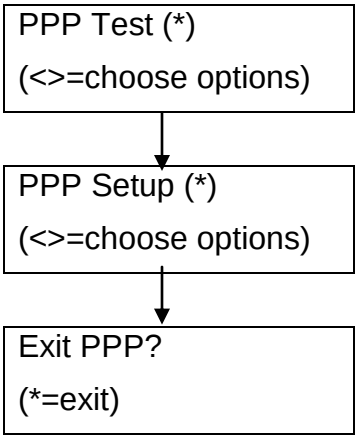
standard system user names and passwords are used.

Timeout (sec) This is how long to wait (in seconds) for an acknowledgement of a transmitted message before reporting a failure. The number will vary with the latency of the device and the network, but the default of 10 seconds should provide sufficient slack in most cases. Typically a connection which is not working will fail outright. A server receiving a message, but not replying to it would be an abnormal situation as TCP/IP performs error detection and recovery.

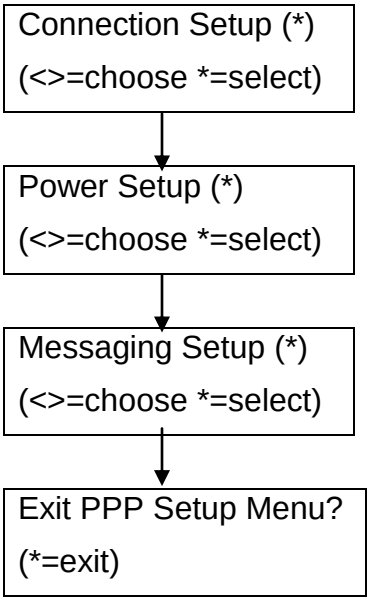
These same configuration options may be selected and edited using the 9210's front panel display. First select the "PPP Menu" from the main menu and press * to enter.



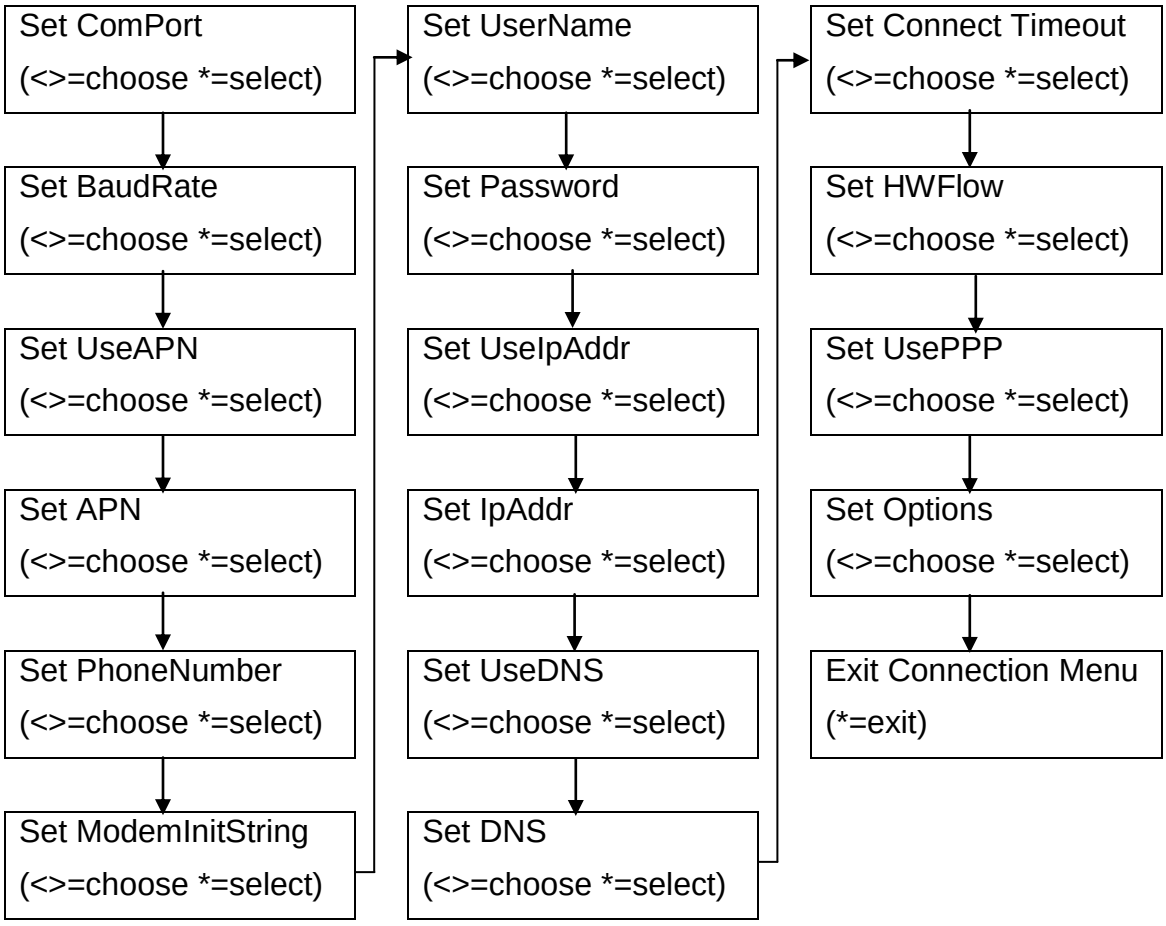
From inside this menu you may select from either:



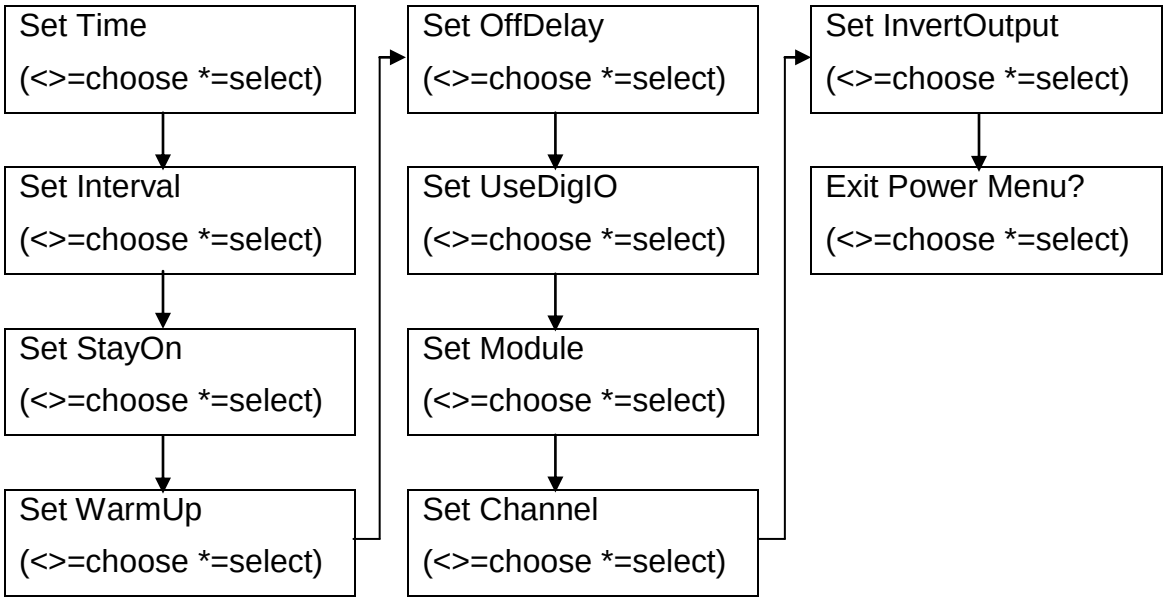
The PPP Test menu is listed at the end of the TESTING section of this manual, the setup menu is broken up in to 3 sections:



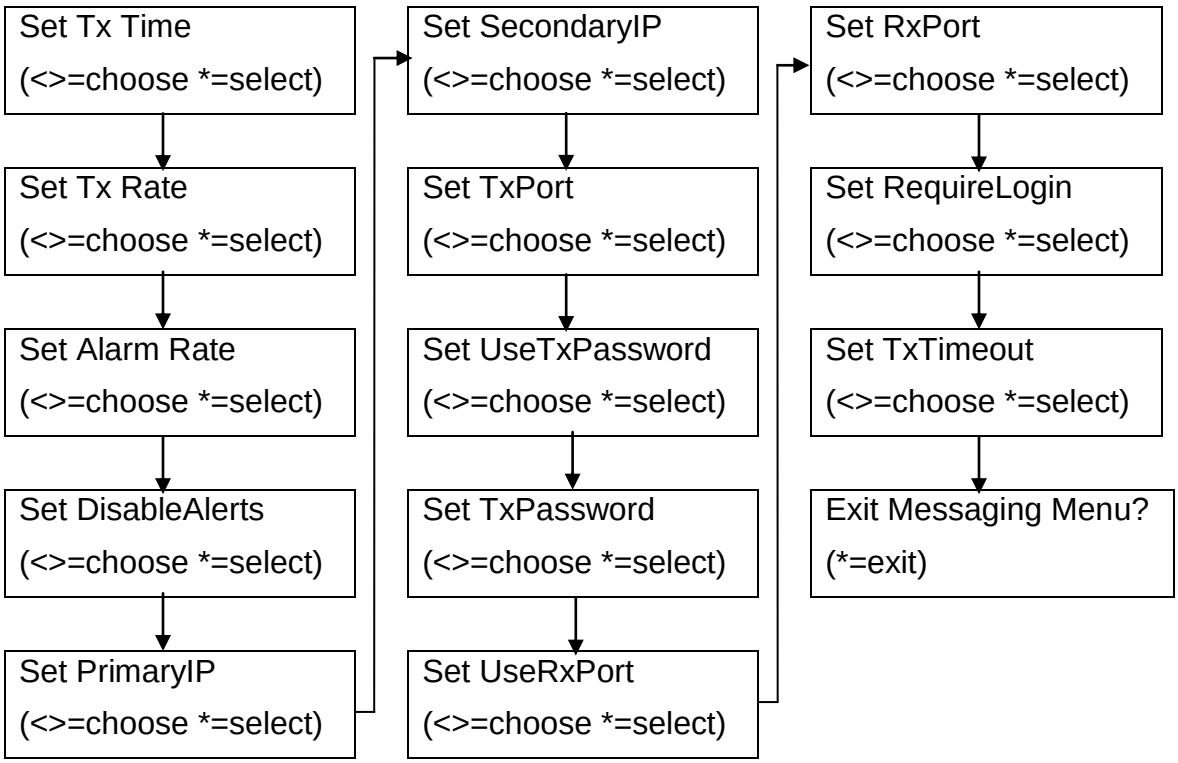
Front Panel Connection Setup Menu



Front Panel Power Setup Menu



Front Panel Messaging Setup Menu



TESTING PPP OPERATIONS.

This section describes how the PPP Test dialog may be used to test out PPP communications. The PPP Test dialog may be accessed by selecting the PPP tab.

The PPP Test Dialog

The PPP Test Dialog (as shown in Figure 8) may be used to test SSP communications over PPP, and examine the communication status.

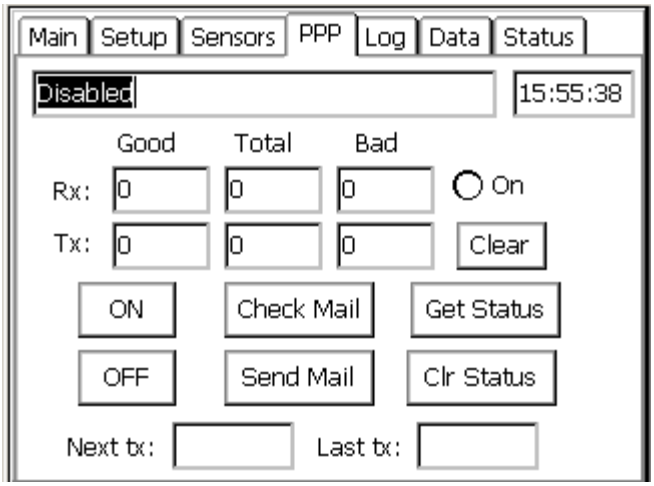


Figure 8: PPP Test Dialog

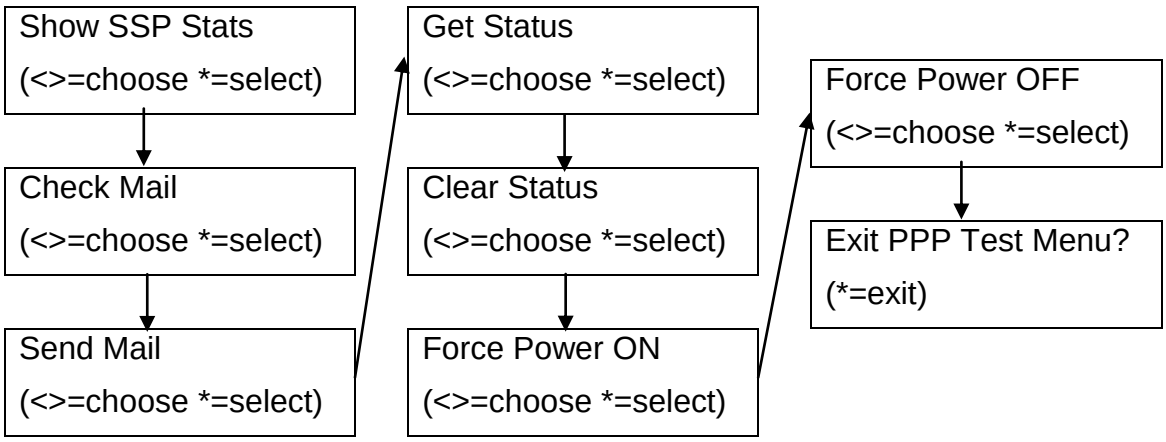
The fields in the PPP Test dialog are defined as follows:

Status	The first line in the dialog shows the current status, and can show various information related to the connection progress and power status/scheduling.
Time	The current time is displayed
Rx Good	The number of SSP messages received that were address to this station. The SSP station ID is the same as the Station Name defined on the Main page.
Rx Total	Total number of messages received including ones not addressed to the station.
Rx Bad	Bad messages. May indicate that the message itself wasn't assembled correctly, as TCP/IP messages are error corrected and CRC errors should not occur at the SSP level.
Tx Good	Number of messages sent that appeared to go thru.
Tx Total	Number of messages attempted.

Tx Bad	Number of transmissions that failed
Clear	Clears the statistics
On	Indicates whether the PPP Device is currently powered on
ON (button)	Turns the radio on.
OFF	Turns the radio off.
Check Mail	Displays any SSP mail messages received by the PPP SSP Server.
Send Mail	Sends an SSP mail message. This is a good means for testing end to end communications.
Get Status	Reserved for displaying device specific status information.
Clr Status	Reserved for clearing device specific status information.
Next tx	When the next scheduled current data transmission will be made.
Last tx	The time of the last current data or alarm transmission

The message counts only apply to messages transmitted or received by the PPP SSP Server (see RxPort) or related to PPP current data or alarm reporting.

Testing can also be performed using the 9210's Front Panel interface. The abilities are very similar to the GUI dialog. Here is a list of the options:



Notes:

1. The mail message defaults to "TEST MESSAGE". When prompted for "# Bytes to Send" you may issue a length up to 999 bytes. If you increase the number, the message will be copied over and over to fulfill the desired length.
2. The SSP Stats option will flash the PPP status on the screen for 2 seconds, the power state for 2 seconds, the time of Next Tx for 2 seconds, the time of Last Tx for 2 seconds, and then finally the SSP stats for 5 seconds.

3. The Get Status option will show a scrolling box displaying a device specific status. Press * when finished viewing. This command is currently not supported.

Troubleshooting

1. Did you check to make sure that Remote, Coms, Basic, or any other part of the system isn't trying to use the com port you wish to use for PPP? Issuing "status" at the command prompt will list all ports that Remote has been configured to support.

2. Did you check to make sure the LAN device is turned off?

3. Have you configured your PPP device with H/W flow control enabled by default? You may also wish to clear out any inadvertent settings by setting the device back to factory defaults. For a standard Hayes compatible modem you would issue the command "AT&F<cr>" to restore factory defaults. H/W flow control is typically enabled by issuing "ATK3<cr>", and the new settings can be made permanent by issuing "AT&W<cr>".

4. If you just configured a serial port for the first time, have you tried rebooting the unit?

5. Observe the PPP diagnostics page while a connection is attempted and verify that connections are being scheduled, and watch for an issue during the connection negotiation.

6. Verify that the PPP device is being powered up correctly by pressing ON in the PPP diagnostics page.

7. Issuing "report high" or even "report debug" at the command prompt is a good means to get real time diagnostic information about the performance of the PPP SLL and the system in general. You can monitor SSP messaging by issuing "report ssp".

8. The system status page will show information about the most recent diagnostic messages and the current state of the PPP device. This can also be displayed on demand at the command prompt with the "info" command.

9. The system.log can be examined to look for status messages.

10. Use the PPP Diagnostic page to send test mail messages. Be sure to try some messages with a long length (ex: 1000 bytes) to make sure that flow control is working correctly.

11. Contact Sutron Customer Support at 703-406-2800.