Reach PoE Tester Manual V1.5

Model RT-PoE2

Software Version 1.15 and above

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1. Revision History

1.1. *RTI-PoE2 - Base Model*

The Model RT-PoE2 is the first version that was put into production. It can be recognized by the version prompt as follows (see version command):

"Reach PoE Tester Model RT-PoE2 HW 1.2 SW 1.15/*1* 10/10/2005"

Note: the single digit after the slash gives the firmware revision on the 8 port line cards. It is typically '1' for the base model.

1.2. *RTI-PoE2 Rev A with line card firmware upgrade*

The Rev A version had a board change that does not affect the electrical characteristics of the unit. However, it also incorporated a new version of the linecard software. This firmware change provides a soft-start on the power load. As manufactured, the Rev A hardware units had the following version response:

"Reach PoE Tester Model RT-PoE2 Rev A HW 1.3 SW 1.17/3 09/08/2006"

1.3. *RTI-PoE2 Rev B hardware*

The Rev B hardware has an improved class load circuit.

Rev B can be recognized by the version prompt as follows (see version command):

" Reach PoE Tester Model RT-PoE2 Rev B HW 1.4 SW 1.19/3 11/2/2006"

Please note that the Rev B units have Rev 3 firmware installed on the line cards.

2. Introduction

2.1. *Overview*

The Reach Power-over-Ethernet Tester Model RT-PoE2 is designed to provide complete testing of 24 ports of a Power Sourcing Equipment (PSE) as specified in IEEE Standard 802.3af. It provides high density with 24 full load Powered Device (PD) emulation in a 1U high chassis. It provides a "pass through" port for each line so that port traffic can be run while power is being sourced.

Picture 1: Front of RT-PoE2

2.2. *Features*

- Full IEEE power load emulation
- Flexible IEEE signature options: low, nominal, high, over-spec capacitive
- Switchable loopback
- Passes GbE traffic from UUT to REF port isolated from PD load
- Low cost compared to "laboratory" PSE testers
- Universal voltage power supply
- Serial RS232 console control

2.3. *Dimensions*

The unit fits in a standard 19" rack using screw-on ears.

Case outside dimensions are:

13.75" deep
17.30" wide
1.74" high

2.4. *Electrical Characteristics*

The RT-PoE2 is powered via a barrel connector and requires 12V DC at a maximum of 1.5 Amps.

The unit is supplied with a worldwide universal AC input power supply brick.

2.5. *Warranty*

The RT-PoE2 is warranted by Reach Technology Inc. against manufacturing defects for one year.

3. Configuration Guide

3.1. *Power*

The power input is located on the rear of the unit. The power supply provided is a "desktop" type brick with a three prong IEC input connector. An AC power cord compatible with U.S. power outlets is provided.

3.2. *Serial Console*

The serial console port is located at the rear of the unit. It is an RJ-45 with a three-wire RS-232 level interface. The interface has the same pinout as found on Cisco routers and switches. The baud rate is fixed at 9600, 1 stop, no parity, 8 bits. Characters are echoed as they are typed (full duplex).

RJ-45 Connector:

Pin	**Signal (DTE name)**
1	**
2	**
3	RS232 data output (TxD)
4	Ground
5	Ground
6	RS232 data input (RxD)
7	**
8	**

** these signals are connected to each other

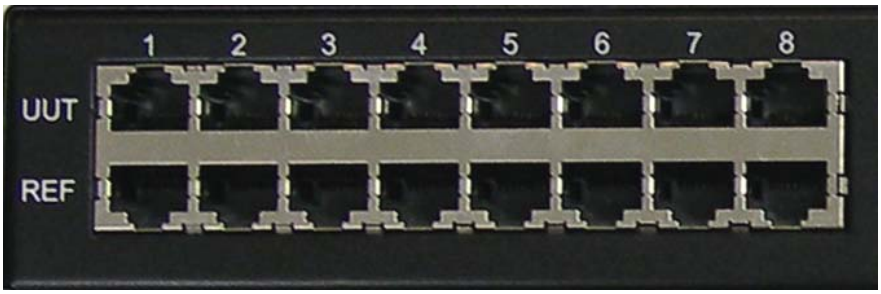
3.3. *UUT (Unit Under Test) and Reference connections*

The RT-PoE2 has twenty-four identical test ports. Each port has a UUT and a REF connector. Connect the port of the PoE supplying device under test to the UUT connector via a standard Ethernet connector. Connect the REF port to the device that will do traffic tests to the UUT. This may require a crossover cable - the UUT to REF connection is 1-to-1.

The UUT and REF ports are internally transformer isolated from each other. The REF port device cannot "see" the power from the UUT port. In other words, the UUT port looks like the REF port from a data perspective and the RT-PoE2 active load from a power (PoE) perspective.

4. Connectors and Jumpers

4.1. *RJ-45 Ethernet connectors*



Picture 2: Far left side of RT-PoE2 front panel

The UUT connector should be cabled to the corresponding PSE port using a standard Ethernet 1-1 jumper cable. When enabled via software command, the data component of the UUT port will be connected to the REF connector below it. This is a straight-though connection, not a crossover.

4.2. *Rear Connectors*

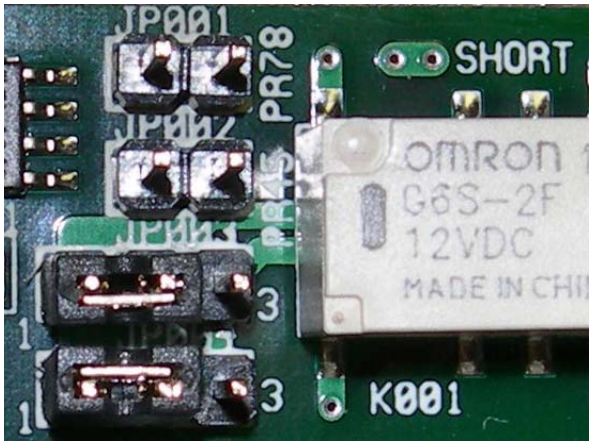
Picture 3: Far left side of RT-PoE2 rear panel

The rear of the unit, left side is shown above. The power jack is a standard "Barrel" type with inside pin diameter of 2.5mm. Center pin positive, 12VDC. Below that is a console connector RJ45 three wire RS232. See Section 2.2 for pinout.

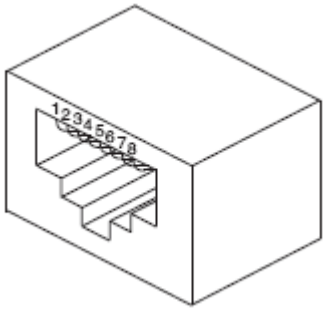
4.3. *Internal Ethernet Power Jumpers*

Jumpers are provided to determine which pair provides the power to be tested for. The following Table corresponds to Table 33-1 of the IEEE 802.3af specification. ***The unit is shipped in Type 1 mode.*** Note that two jumpers only are to be installed for each port.

Conductor	Type 1: (MIDI-X)	Type 2: (MIDI)	Type 3: (AII)
1	Negative Vport	Positive Vport	
2	Negative Vport	Positive Vport	
3	Positive Vport	Negative Vport	
4			Positive Vport
5			Positive Vport
6	Positive Vport	Negative Vport	
7			Negative Vport
8			Negative Vport
Install Jumpers	JPX03 1-2 JPX04 1-2	JPX04 2-3 JPX03 2-3	JPX01 1-2 JPX02 1-2

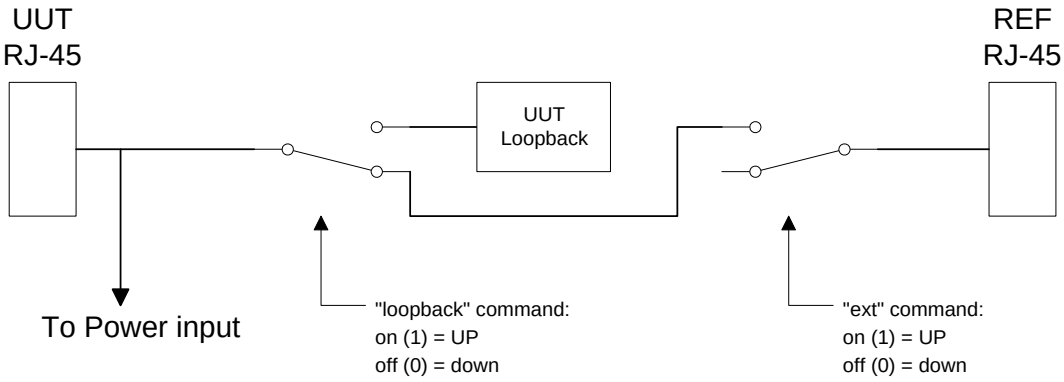


Jumpers JPX03 1-2 and JPX04 1-2 installed above



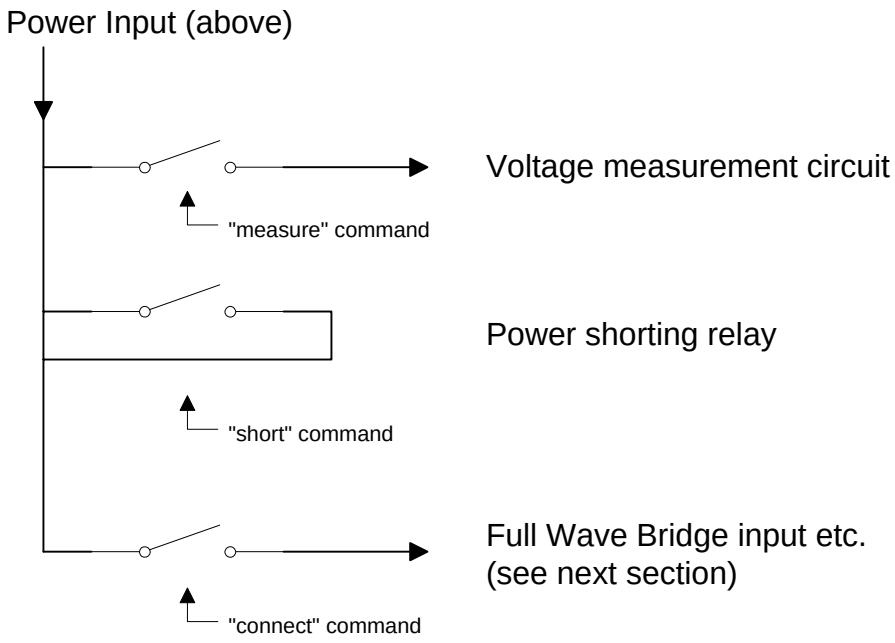
5. Operational Overview

5.1. *Data path*



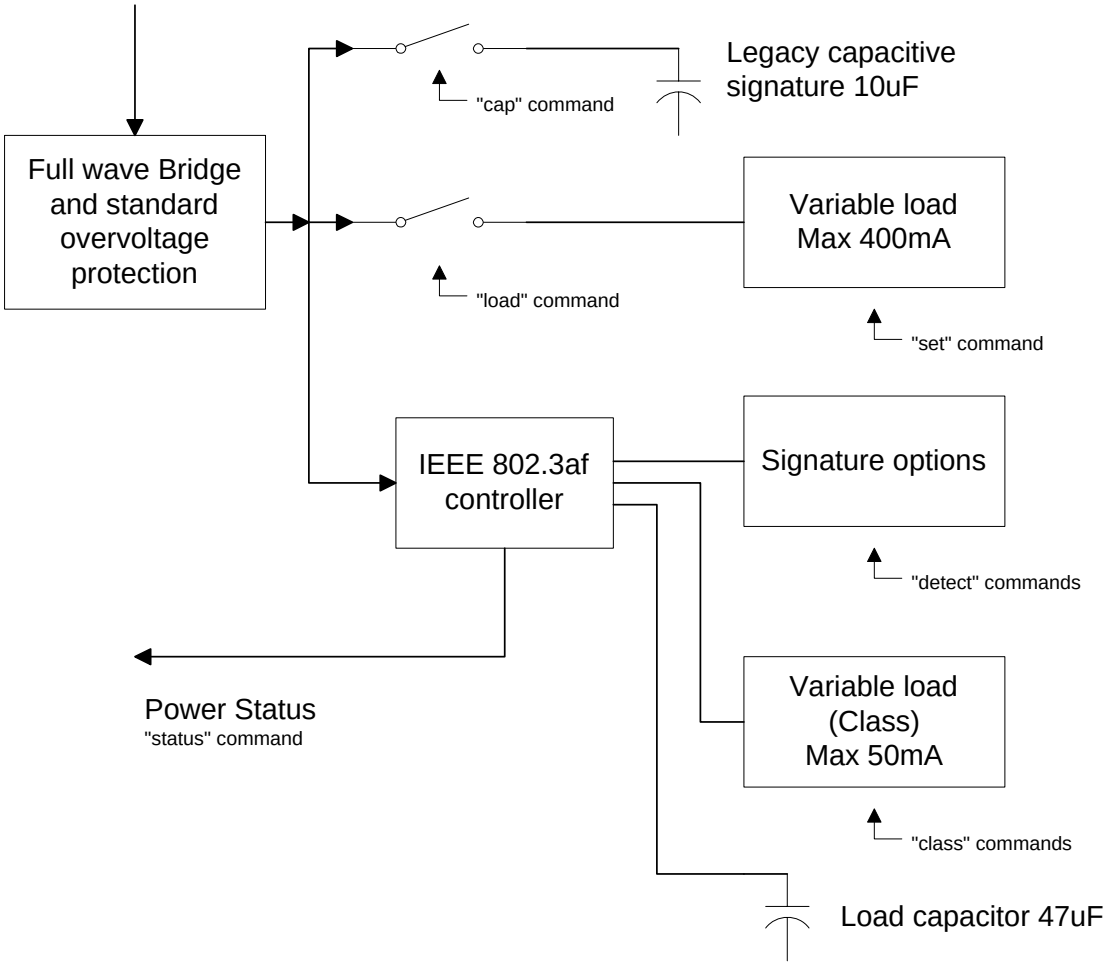
The data path section allows the UUT port to be connected to a Cisco loopback, to the Reference device, or to be disconnected as shown above. [Note that the loopback in Rev A and B hardware is a straight-signal loop without any special filter].

5.2. *Power input*



The power from the UUT can be measured, shorted, or connected to the Full Wave Bridge and subsequent load circuits.

5.3. *Signature and loads*



The IEEE 802.3af controller used is the TI TPS2375.

The variable power load can be connected directly to the full wave bridge for emulation of non-IEEE loads. There are full signature resistor options for IEEE - too low, nominal, too high, and none. A legacy capacitive load can be applied; this can also be used to simulate an AC load for AC disconnect testing. The classification load is variable and can be margined. The "power-good" status of the IEEE controller goes active once the load capacitor is charged and can be monitored.

6. Command Reference

When the unit is ready for a command, it the prompt `"RT-PoE2>"`. Command buffering is not supported; you must wait for the prompt before sending a command. The prompt may be changed via the "hostname" command. The default baud rate is 9600. This can be changed via the "baud" command.

All commands are terminated by a <return> which is the character 0x0D (decimal 13).

Most commands have a short form version. The optional characters of a command are indicated by the [ ] brackets.

All commands that take "on" or "off" arguments can also take "1" and "0" as arguments.

Responses from the unit that include variable dats such as the port number are shown as 'C' printf style strings, so the script writer knows exactly what to expect as a response.

HELP

Description	Displays available commands.
Command:	`he[lp]`
Command:	`?`
Example:	`help`

VERSION

Description	Displays software and hardware version
Command:	`vers[ion]`
Result:	`"Reach PoE Tester Model RT-PoE2 HW 1.2 SW 1.15/`*`X`*`10/10/2005\r\n"` The *X* indicated the version of software on the line cards. An error is generated if the line card versions are inconsistent.

ERROR CHECK

Description: The unit maintains an error flag that is set if any error message is generated. This command reports the error flag value. A test script can run an entire sequence of commands and check at the end to make sure there were no errors instead of having to check on a command-by-command basis.

Command: `err[ors]`

Result: `"1 - one or more errors have occurred; error flag reset\r\n"`

or

`"0 - no errors have occurred\r\n"`

HOSTNAME

Description: Used to change the unit's prompt. This is useful in a production system so the script knows exactly which physical unit it is talking to. Name must be equal or less than 31 characters long

Command: `host[name] <string>`

Example: `hostname myTester`

This makes the unit's prompt "`myTester>`"

BAUD

Description: Used to change the unit's baud rate. This will not take effect until the unit power is cycled or the *boot command is issued. This is done to make sure the baud change is acceptable.

Command: `*baud <baudrate>`

`<baudrate> = 9600, 19200, 38400, 57600, or 115200`

Example: `baudrate 19200`

Response: `"Console baud set to %lu. Cycle power or issue *boot to effect change.\n"`

ECHO

Description:	Used to test the communication between the host and this unit. This is useful at higher baud rates to validate a baud can be used without error. A script can repeat the echo command continuously and verify that no communication errors are present.
Command:	`*echo <string>`
	`<string> = any ascii string. May contain spaces.`
Example:	`echo this is a test`
Response:	`"this is a test\n"`

BOOT

Description	Resets the system to the power-on state. This is the same as if the unit has its power cycled.
Command	`*boot`

PORT / GROUP PREFIX

Description	For all port-specific commands, a port or group prefix will restrict the command to a specific port or port group. The prefix must be followed by a space before the port command. If no prefix is used, the command will be applied to all 24 ports.
Port Prefix:	`pN`
	This specified port N where N is from 1 to 24.
Group Prefix:	`gM`
	This specifies group M where M is from 1 to 3.
	group 1 = ports 1-8
	group 2 = ports 9-16
	group 3 = ports 17-24

AUTO

Description	Auto-enables the power load when the IEEE "power good" signal becomes active. *Note: The power load can be enabled independently of the IEEE 802.3af controller in order to work with legacy PSE devices. For an IEEE compliant test, the load needs to be enabled after the IEEE detection and classification has been performed. The "auto" command should be used for IEEE testing.*
Command:	`auto [on|off]`
Response:	`printf(":p%d auto %d\r\n", port, state);` `state` = 1 or 0 for on and off respectively.

CAL

Description	Runs internal calibration of class and power loads.
Command:	`cal`

Response:	`printf(":p%d Autocal OK\r\n", port);`
	or
	`printf("!p%d Autocal FAIL\r\n", port);`

CAP

Description	Controls the 10uF capacitor across the full-wave bridge. This represents either a legacy capacitive signature or an AC load.
Command:	`cap [on|off]`
Response:	`printf(":p%d cap %d\r\n", port, state);` `state` = 1 or 0 for on and off respectively.

CLASS

Description	Sets the IEEE load class. See IEEE 802.3af specification.
Command:	`cl[ass] [0|1|2|3|4][+|-|>|<]`
Arguments:	`+` margin up 5% `-` margin down 5% `>` margin up 10% `<` margin down 10%
Response:	`printf(":p%d class %d%c\n", port, class, margin);`
Example:	`p9 cl 3+`
Example response:	`:p9 class 3+<CR><LF>` This sets port 9 IEEE "class" to 3 with a 5% margin up.

CONNECT

Description	Controls the relay that connects all power load circuitry to the UUT. When connect is off, the full wave bridge is disconnected and the UUT sees no power circuitry connected to the GbE magnetics' center taps. Connect must be on for the UUT to see an IEEE 802.3af load.
Command:	`conn[ect] [on|off]`
Response:	`printf(":p%d Connect Sig %d\n", port, state);` `state` = 1 or 0 for on and off respectively.

DETECT

Description	Sets the IEEE 802.3af detect signature.
Command:	`det[ect] [off|lo|ok|hi]`
Arguments:	`off` no detect signature resistance `lo` signature resistance 15K 1% `ok` signature resistance 24.9K 1% `hi` signature resistance 36K 1%
Response:	`printf(":p%d det %s\n", port, arg);`

EXT

Description	Controls the external reference port (REF). When off, the reference port is disconnected. When on, the reference port is connected to the UUT but only if the Cisco signature is off.
Command:	`ext[ernal] [on|off]`
Response:	`printf(":p%d Ext Ref %d\n", port, state);`
	`state` = 1 or 0 for on and off respectively.

LOAD

Description	Controls the power load connected to the output of the full wave bridge. The value of the load is determined by the SET command. This load requires a minimum voltage of around 15V to be active and has a minimum base level value which is typically large enough to avoid IEEE power timeout disconnect (DC disconnect).
Command:	`load [on|off]`
Response:	`printf(":p%d load %d\n", port, state);`
	`state` = 1 or 0 for on and off respectively.

LOOPBACK

Description	Controls the UUT data loopback.
Command:	`loopback [on|off]`
Response:	`printf(":p%d Loopback %d\n",port, state);`
	`state` = 1 or 0 for on and off respectively.

MEASURE

Description	Measures the voltage from the UUT (center taps of GbE magnetics). Note that the polarity must be correct via the jumpers (Section 3.2) for this measurement to be valid.
Command:	`meas[ure]`
Response:	`printf(":p%d %d.%01dV\n",port,v1, v1);`
	where `v1` is 0 to 60 and `v1` is 0 to 9.
Example:	`p1 meas`
Example response:	`:p1 50.5V<CR><LF>`

RESET

Description	Resets port to fully disconnected state.
Command:	`res[et]`
Response:	`printf(":p%d reset\n", port);`

SET

Description	Sets power load value in milliamps. The accuracy is around 5%. If too low, the minimum value will be set; if above 400mA and error will occur.
Command:	`set <value>`
Response:	`printf(":p%d %dmA\n",port,value);`
or	`printf(":p%d %dmA (min)\n",port,value);`
Example:	`g2 set 350`

Example response:	`:p9 350mA<CR><LF>`
	`:p10 350mA<CR><LF>`
	`:p11 350mA<CR><LF>`
	`:p12 350mA<CR><LF>`
	`:p12 350mA<CR><LF>`
	`:p14 350mA<CR><LF>`
	`:p15 350mA<CR><LF>`
	`:p16 350mA<CR><LF>`

SHORT

Description	Controls a relay that can short the UUT power before the full wave bridge. ***WARNING - SHORTING AT FULL POWER CAN DAMAGE UUT.***
Command:	`sh[ort] [on|off]`
Response:	`printf(":p%d short %d\n", port, state);`
	`state` = 1 or 0 for on and off respectively.

STATUS

Description	Returns the "Power Good" status of the IEEE load controller**.** The status is active when the IEEE controller is receiving power above the UVLO value and the load capacitor is charged.
Command:	`st[atus]`
Response:	`printf(":p%d PWR %d\n",port, state);` `state` = 1 or 0 for on and off respectively.

Appendix A - Operational Notes

A.1 *Power-on*

When the unit is powered on, it performs a self-calibration of its dynamic class and power loads. This takes around 105 seconds. While calibrating, the unit flashes the front panel LED and displays the following. The prompt "RT-PoE2>" indicates that the unit is ready for commands.

```
RT-PoE2>Reach PoE Tester Model RT-PoE2 Rev B HW 1.19/3 11/2/2006
Calibrating all ports..
:p1 Autocal OK
:p2 Autocal OK
:p3 Autocal OK
:p4 Autocal OK
:p5 Autocal OK
:p6 Autocal OK
:p7 Autocal OK
:p8 Autocal OK
:p9 Autocal OK
:p10 Autocal OK
:p11 Autocal OK
:p12 Autocal OK
:p13 Autocal OK
:p14 Autocal OK
:p15 Autocal OK
:p16 Autocal OK
:p17 Autocal OK
:p18 Autocal OK
:p19 Autocal OK
:p20 Autocal OK
:p21 Autocal OK
:p22 Autocal OK
:p23 Autocal OK
:p24 Autocal OK
RT-PoE2>
```

A.2 *Error messages*

All error messages begin with the "!" exclamation mark.

Error Message	*Description*
`!Syntax error`	There was syntax error in the previous command.
`!Reach PoE Tester...`	There is an internal version error in this unit.
`! invalid port value`	There value given with the port prefix was not valid.
`! invalid group value`	There value given with the group prefix was not valid.
`! run calibration first`	If the power-on calibration was interrupted, and the set or class commands are used, this error message is generated.
`! invalid class value`	There CLASS command argument is not 0 thru 4.
`! set > 400mA`	The argument for the SET command is too large.
`!p%d Autocal FAIL`	Autocalibrate has failed on the specified port.
`! unsupported baud rate`	Baud rate argument is invalid
`! invalid arguments`	Command argument(s) are invalid
`(other messages)`	There are other messages that begin with an exclamation point that are internal errors. If these appear, the unit needs to be repaired.

Appendix B - Test Setups

B.1 *Overview*

This Appendix gives an overview of basic test setups. No port or group prefixes are shown. PSE, PD as defined in IEEE 802.3af. The RT-PoE commands are issued in the order shown.

B.2 *Signature Detect*

RT-PoE commands:	**PSE check after commands issued**
`reset` `connect on`	Verify that the PSE does not see a PD.
`detect ok`	Verify that the PSE does recognize a valid PD.
`detect hi`	Verify that the PSE does not see a PD.
`detect lo`	Verify that the PSE does not see a PD.
`detect ok` `cap on`	Verify that the PSE does not see a PD.

B.3 *Class Detect*

PoE commands:	**PSE check after commands issued**

`reset`
`connect on`
`detect ok`
`class 0`
	Verify that the PSE sees a "class 0" PD.

`class 1`	Verify that the PSE sees a "class 1" PD.
`class 2`	Verify that the PSE sees a "class 2" PD.
`class 3`	Verify that the PSE sees a "class 3" PD.
`class 4`	Verify that the PSE sees a "class 4" PD.

B.4 *Power Status and overload*

PoE commands:	**PSE check after commands issued**

`reset`
`connect on`
`detect ok`
`class 0`
`set 20`
`auto on`
	Verify that PSE sees that device powers up.

`status` (verify that power is on)	
`measure` (verify that voltage is approximately 48V)	
`set 350`	(Verify that PSE is providing full power)
`set 390`	(Verify that PSE sees overload and shuts off power)
`status` (verify that power is off)	

B.5 *Data transmission under power*

PoE commands:	**Check after commands issued**

`reset`
`connect on`
`detect ok`
`class 0`
`set 350`
`auto on`
	Verify that the PSE sees a "class 0" PD. Verify that PSE sees that device powers up.

`status` (verify that power is on)	
`ext on`	Run traffic between UUT and REF port. Verify no errors.

Appendix C - Specifications

C.1 *Measurement Specifications*

Voltage Measurement	± 2% or ±0.5V whichever is greater
Current setting, power load	± 2% or ±1mA whichever is greater
Current setting, class load	± 2% or ±0.5mA whichever is greater