

Troubleshooting Jack-PC Installation Problems

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2. Overview

This document covers common installation and LAN wiring problems that may be encountered during Flex-Jack or Jack-PC initial installation.

Installation problems covered by this document can cause either or both symptoms:

- a) Device not powered (POE available)
- b) Device powered but does not have LINK LED illuminated
- c) Poor LAN performance

Please note that proper LAN wiring is critical for both LAN and power functionality of the connected device. Particular care must be taken to ensure that all wires are properly fitted.

TIP

To avoid time consuming troubleshooting the best strategy for initial installation – use the RJ-45 Termination kit with existing wall jack being used with POE (IP Phone for example). If everything works then you can be sure that:


- a. *Cabling is OK*
- b. *Switch configuration is OK*
- c. *POE configuration is OK*
- d. *Jack-PC and its settings OK*


3. Tools needed

Try to get the following tools:

- d) Jack-PC device
- e) IDC Impact tool
- f) Cable cutter / stripper
- g) LAN Cable tester (optional)
- h) PowerDsine single port power injector

- i) Wall mounted power supply for Jack-PC
- j) PowerDsine POE tester
- k) Short (straight) LAN cable
- l) Flex-Jack LAN Jack housing
- m) Laptop computer (optional)
- n) Jack-PC extraction tool
- o) Simple unmanaged switch (4 ports + power supply)
- p) RJ-45 Termination kit

 **Caution** Do not connect any other power supply to the Jack-PC. Inappropriate power supply will damage the device beyond repair!

 **Caution** Use only compatible IDC impact tool to press wires. Do not use screwdriver or any other tool or permanent damage to the terminal block will occur.

4. Common Installation Problems

This section covers common wiring problems and the quick fix that may be applied to resolve each problem.

No.	Problems	Symptoms	Fix
1.	Wrong wiring scheme – TIA-568A instead of B or vice versa	No Link, power may operate or not	Check far end wiring method and correct wiring as needed (see details below)
2.	LAN Wire broken	No Link, power may operate, No power	Press the broken wire again. If wire is too short - remove all wires from IDC contacts, cut and press again.
3.	Port not powered	No power to the device	Check at the switch / network closet that the specific port is connected and powered. Check the POE powering device status. See details below.
4.	Pairs 4-5, 7-8 not connected (typically when mid-span power injector is used)	No power to the device	If mid-span power injector is used, cable must be fully connected. If not possible – change power source to POE capable switch.
5.	Port connected to pre-standard PSE (POE source)	No power to the device	Change switch or power injector to IEEE 802.3af or install proper pre-standard module.
6.	Shield not connected	Poor LAN performance	Reconnect shield.
7.	LAN Cable is not Cat 5 and higher	Poor LAN performance	Change cabling.
8.	LAN Wires not fitted in IDC contacts properly	Poor LAN performance, no Link	Press wires again. If not possible – cut wires short and press again all wires.
9.	Cable is too long	Poor LAN performance, no Link, unstable power, no power	Short the cable or assemble POE injector in the middle.
10.	Damaged or dirty housing contacts	Poor LAN performance, no Link, unstable power, no power	Clean housing contacts with soft cloth.
11.	Auto-negotiation failed	No LAN Link	Typically with high-end Cisco or Nortel

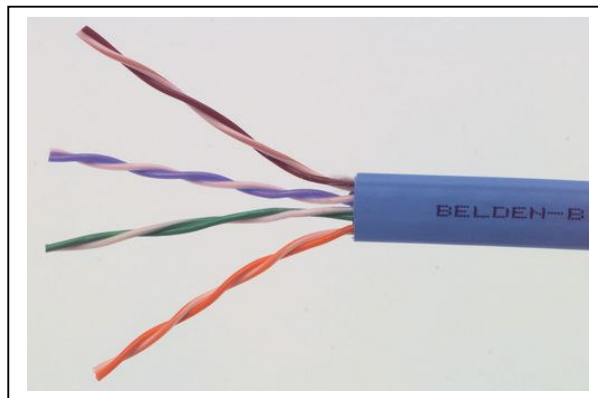
			switches. If autonegotiation is supported and properly configured but you still cannot connect, turn off autonegotiation and set the speed and duplex manually (use the set port speed and set port duplex commands).
12.	LAN works at 10Mbps	Switch indication / Jack-PC SW indication	Check that the Jack-PC is set to auto negotiate link. Check that the switch is 100 or Giga Check that the switch / port is set properly for auto negotiate.

Table 1 – Common installation problems quick reference

5. LAN wiring basics

First let's review some facts about the LAN cabling:

- a) The wires inside LAN cables are made of 4 x twisted pairs marked with similar color (i.e. Orange and White-Orange).
- b) For the LAN function to work – only 4 wires are needed as minimum (100 Base-T): two RX lines and 2 TX lines (1 and 2, 3 and 5 pairs).
- c) Giga LAN uses all 8 wires in the cable + the shielding.
- d) 4 unused wires (4,6,7,8) are optional and typically unused in 100 Base-T networks although sometimes these 4 wires are used for analog telephony.
- e) Shield may be needed (connected) to reduce noise and enable full cable length (100 meters).
- f) Power from POE enabled switch can pass through the minimal RX and TX lines although it is preferred to have all 8 wires wired.
- g) Power from Mid-span power injector can not pass through the minimal 4 wires as it is using the additional unused 4 to deliver power.
- h) Cable should be straight (pin to pin) although it may work also in crossed configuration as the Jack-PC supports MDIIX functionality.


Figure 1 – Non-shielded LAN cable

6. LAN color coding

In general wire colors are not critical for proper operation as long as wires are connected correctly. There are two wiring codes commonly in use - TIA-568A and TIA-568B. They only differ by the wire color coding as shown in the picture below. It is important to note that A and B cables are identical, the only difference between them is how their wires were connected at the ends.

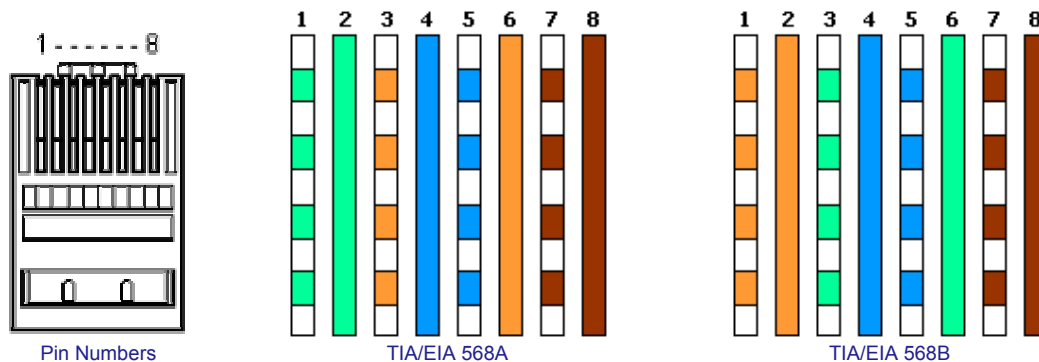


Figure 2 – TIA-568A and B color coding

Typically site cabling is done according to one of these two conventions although other options are possible (see next paragraph for non-standard cabling).

Some wiring tips:

- If you are doing a new installation and you want to confirm which color convention used for a particular cable the best option is to look at the far end of that cable. At the far end you will either have an RJ-45 plug or IDC wiring to the patch panel.
- Luckily the RJ-45 jacks are transparent and you will be able to see the wire color. Holding the RJ-45 plug with its tab facing down and contacts facing up according to Figure 1 – check wire color from left (pin 1) to right. If you see the combination on the left side then you have 568A if you see the combination on the right side – then it is 568B. If you see something different – you have a non standard wiring – go to the next chapter.
- If the cable far end connected to a patch panel – check the colors and compare with the markings. Typically patch panels provides the two options (A and B) with color markings.
- In any case do not trust the marking on the cables as same colors may be assembled differently and therefore you should not rely on cable markings. Check wiring before assembly.
- Color coding may also vary between cable to cable in one site...
- If you cut / remove existing LAN jack – check the wiring before you cut and write it on the cable (A / B).

7. Non-standard LAN cabling

In some cases that cable used is not a standard cable or the far end (patch panel) connected in a non-standard way (not in accordance to TIA-568-A or B). In such case you will have to do slightly more work mapping the existing non-standard connection.

Please refer to the table below. This table should be filled at the far end by looking at the actual connections. Fill out the second column and then use the third column to connect the wires to the Flex-Jack terminal block according to the numbering.

<i>RJ-45 Pin</i>	<i>Color (Fill actual color)</i>	<i>Flex-Jack terminal block contact #</i>	<i>TIA-568-A Color</i>	<i>TIA-568-B Color</i>
1		3	White - Green	White - Orange
2		2	Green	Orange
3		4	White - Orange	White - Green
4		6	Blue	Blue
5		5	White - Blue	White - Blue
6		1	Orange	Green
7		7	White - Brown	White - Brown
8		8	Brown	Brown

Table 2 – Non-standard wiring table

See picture below of the Flex-Jack terminal block connections and numbering.

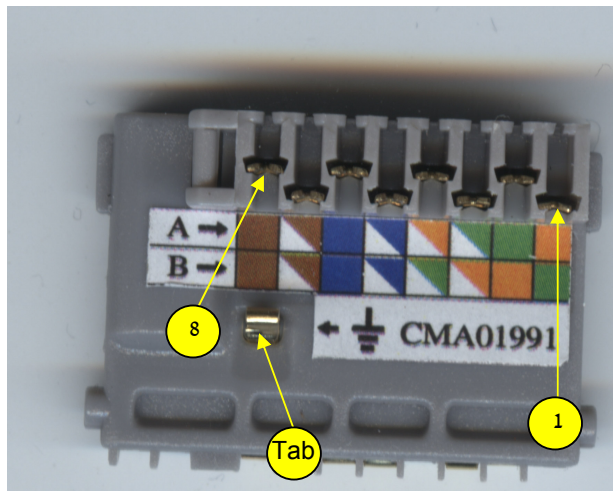


Figure 3 - Flex-Jack terminal block numbering

8. Testing LAN Cabling

In new installation it is difficult to test the cable before you terminated it with Flex-Jack terminal block. After assembling the terminal block (hopefully in the proper way) you can use Flex-Jack LAN jack to connect a standard LAN cabling tester or a laptop computer to be used as a tester. This Flex-Jack

LAN jack can be purchased as an accessory and provides an easy way to connect a standard RJ-45 equipment to the installed Flex-Jack.

Yet another good option is to use a Jack-PC as a tester. In this case you should see the two LEDs lighting up after few seconds (indication power and after 30 seconds Link).

- If power over ethernet is still not available – use an external power supply to power the Jack-PC (only the one provided by Chip PC)
- If POE available to that port and still nothing happens (two LEDs not illuminated) – try the external power supply. If now the device is powered and the Link is on – you have a POE problem. If the Link LED is off – you may have a wiring problem or the other end is not connected to anything.

Note: In most cases wrong LAN wiring will not damage the Jack-PC or the switch.

9. Pre-standard POE

Currently there is a global standard for Power Over Ethernet maintained by the IEEE. This standard identified as IEEE 802.3af and accepted by all vendors. Unfortunately, before it was accepted there were other POE detection methods that were sold by many vendors. These POE methods called today pre-standard. Detection method is the mechanism that PSE (Power Sourcing Equipment) uses to poll the PD (Powered Device) to assure that the connected device is indeed a PD and is capable of receiving the power. In particular there are two main pre-standard methods:

Bulk Capacitor (sometimes called PowerDsine method) – this method uses a big capacitor connected between the powered lines to identify a PD to the PSE.

Cisco high frequency signaling – this method uses a high-pass filter between the TX and the RX lines to identify the PD.

These two pre-standard methods are not natively supported by new equipment such as Jack-PC. Chip PC currently develops jack installable modules that will enable detection of pre-standard PSEs. If POE does not work and you suspect that your equipment is pre-standard – check the switch / injector specification for detailed information.

Some tips about Pre-standard POE:

- In general every POE equipment done before 2002 is probably pre-standard.
- You can use the PowerDsine single port power injector (supplied as an accessory by Chip PC) to test your installation and confirm that wiring is OK.
- Some modular switches contains internal inline power modules (for example Cisco Catalyst 6500 series). In this case you can replace these modules to 802.3af modules to power specific Jack-PC connected ports.
- Some switches / POE injectors supports both pre-standard and standard power. Make sure that these are configured properly for 802.3af and not pre-standard power.

10. Switch Settings

This paragraph covers only the LAN settings of a standard LAN switch. Power settings for POE will be covered at the next paragraph.

The Jack-PC has a standard 100Base-T LAN NIC with autonegotiate feature enabled by default.

The switch settings required for managed switch are identical to a standard PC:

- a. Port enabled
- b. Autonegotiate enabled

- c. 100Base-T not disabled
- d. Full duplex not disabled
- e. MDIIX may be enabled or disabled

In general if you can't make your switch working – try first to connect the cable to a small unmanaged switch. If this step will be succesful – you will know that you can trust the rest of the installation and you can just focus on the switch settings.

11. POE Settings

The Jack-PC primary power source is Power Over Ethernet (POE) based on the industry standard IEEE 802.3af. The power source should be able to provide Class 0 power (15.4W maximum). See table 3 for IEEE 802.3af power classification details.

If your Power Sourcing Equipment is not capable of providing such power then you would need something else:

- a) Power injector complying with 802.3af standard class 0
- b) Switch with builtin 802.3af support
- c) External power supplies (provided by Chip PC!)

If your PSE is capable of providing POE based on IEEE 802.3af and still device is not powered then you should check the following PSE settings (depending on specific product features the following settings may be adjustable by the administrator):

- a) Port POE is enabled
- b) Port is set to provide Class 0 or Class 3 power level
- c) Port is set to IEEE 802.3af (not pre-standard)

If power class is not set correctly the Jack-PC may not start or it may start and disconnect during the boot process or during operation.

It is important to note that the Jack-Pc does not consume the full 15.4W. This class 0 setting is only essential to assure poper PSE response to peak power requirements. In steady state the Jack-PC will consume only 4-6W maximum. Power may vary if demanding USB peripheral devices or dual monitors attached to the device.

Class	Usage	Minimum Power Levels Output at the PSE	Maximum Power Levels at the Powered Device
0	Default	15.4W	0.44 to 12.95W
1	Optional	4.0W	0.44 to 3.84W
2	Optional	7.0W	3.84 to 6.49W
3	Optional	15.4W	6.49 to 12.95W
4	Reserved for Future Use	Treat as Class 0	Reserved for Future Use: A class 4 signature cannot be provided by a compliant powered device

Table 3 - IEEE 802.3af PSE and Powered Device Power Classifications

Therefore for swiches with overall power limitations, Jack-PC would not usually exceed the rack limitations. If the PSE is not capable of supplying class 0 power to the Jack-PCs it may be still possible to operate at class 2 (7W maximum) although this setting is marginal and may cause random POE power down events.

A practical example:

Lets take a rack with Catalyst 6500 series switches (240 ports):

Chip PC Jack-PC EFI-6900 typically requires 5W during normal use and 6W during full-screen video player operation.

As a comparison - Cisco IP Phone 7960G requires 7W when the phone is ringing at maximum volume and requires 5W on or off hook.

This is a significant reduction from the 15.4W maximum power allowed for within IEEE 802.3af-2003 to class 0 devices. It can be seen that PSE power requirements can be significantly reduced by budgeting for the power the device actually requires, rather than simply allocating the maximum power defined within IEEE 802.3af.

To calculate actual switch power use we will multiply 7W by the number of ports: 1680W.

12. Basic Troubleshooting flow

Immediately after you fully insert the Jack-PC device into the installed Flex-Jack housing, you should see the Power LED illuminated green. After 30 seconds you should see the Link LED illuminated orange (see figure 4). If nothing happens - no lights – use the basic troubleshooting flow below. If only Power is lighted – go directly to LAN troubleshooting flow.

Naturally troubleshooting the first installation in a particular site is the most difficult. If nothing works after initial installation completed you have many potential suspects:

- a. The LAN cabling
- b. The patch panel at the far end
- c. The switch at the far end
- d. The terminal block at the Flex-Jack
- e. The Jack-PC used for testing
- f. The POE equipment

The overall motivation as in any troubleshooting flow is to isolate and identify the faulty component/s. Keep in mind that there may be more than one problem!

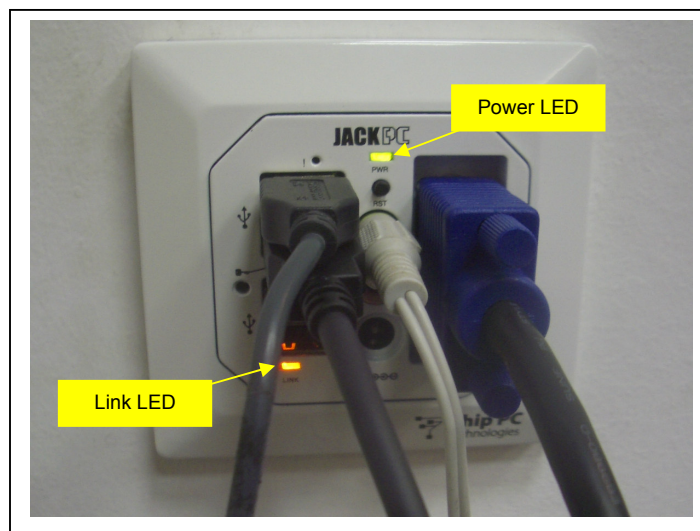


Figure 4 – Jack-PC Power and Link LEDs (illuminated)

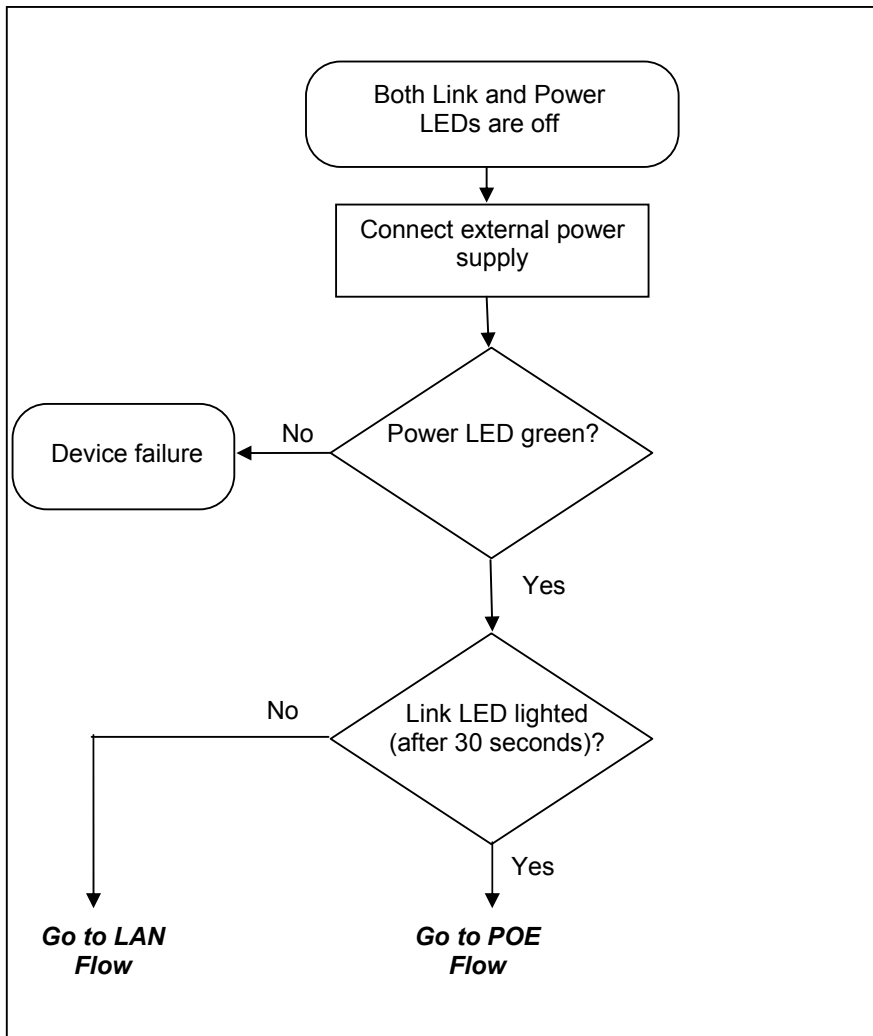


Figure 5 – Basic Troubleshooting flow

13. LAN Troubleshooting flow

If power is OK through external power supply but still there is no LINK you should suspect the wiring. The following flow will guide you through the troubleshooting procedure in such case.

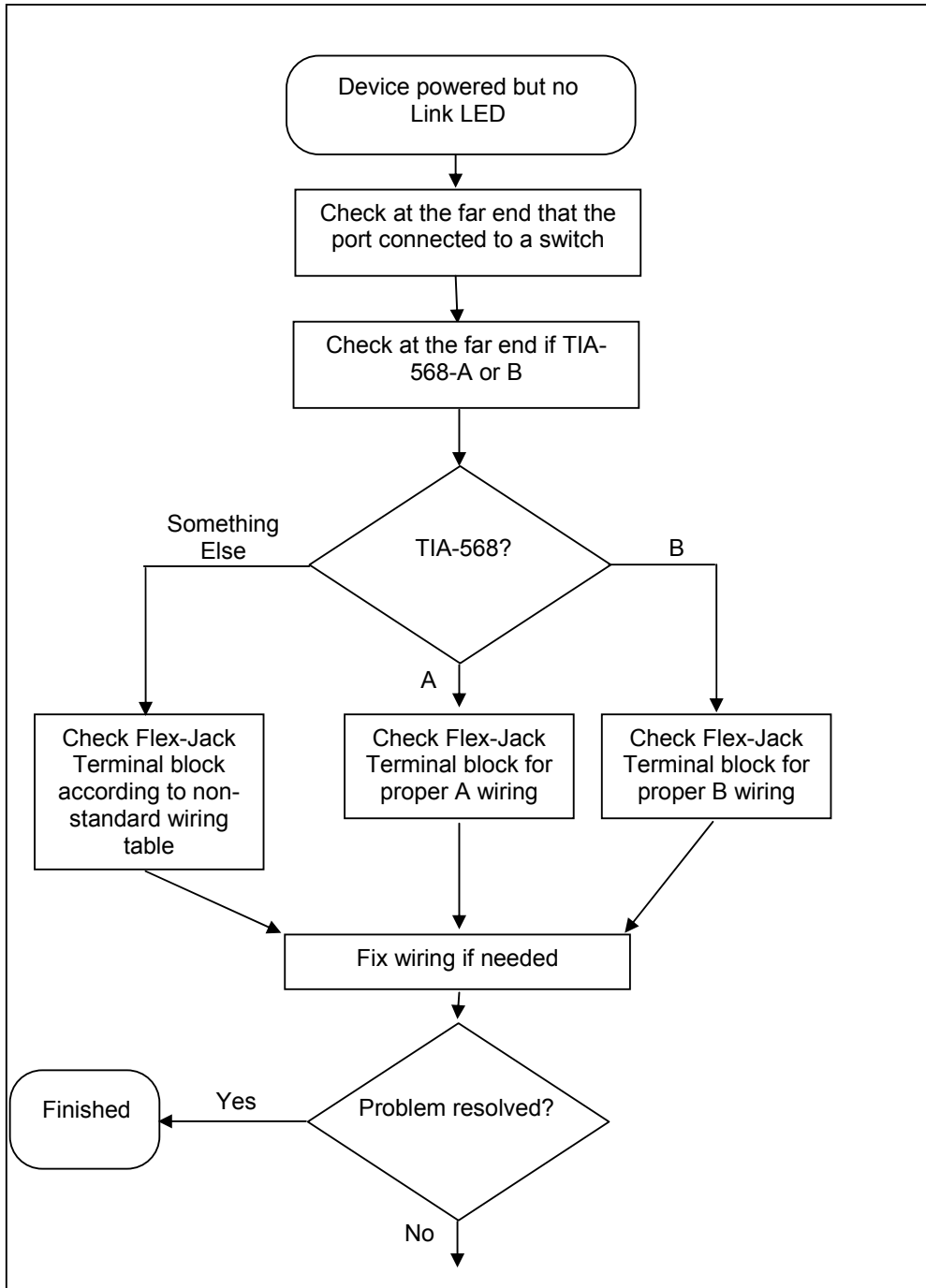


Figure 6 – LAN Troubleshooting flow – Part a

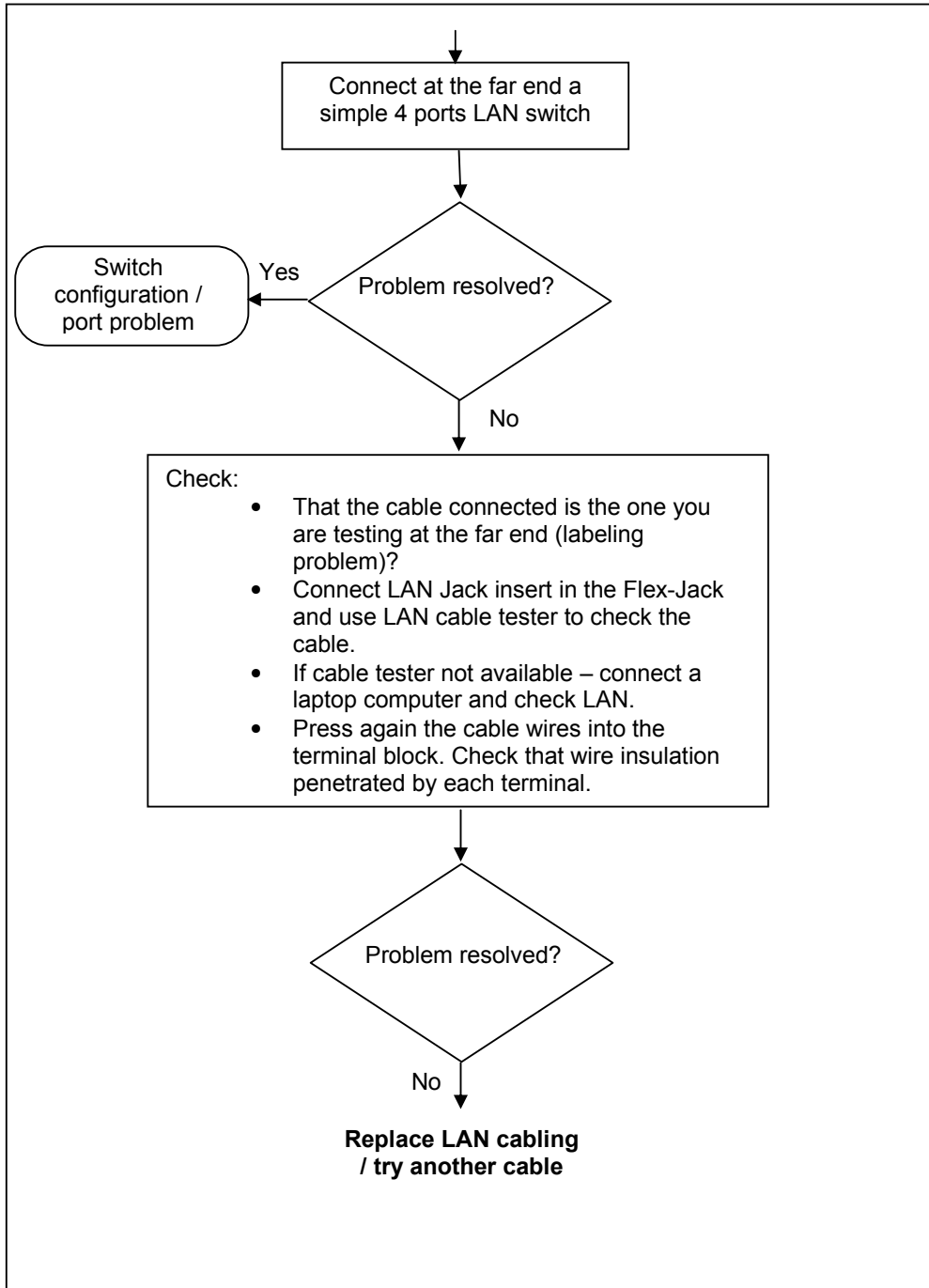


Figure 7 – LAN Troubleshooting flow – Part b

14. POE Troubleshooting flow

If the Jack-PC device is working properly when external power supply connected to it but it is unpowered when connected to POE capable port without the power supply, we have a POE problem. See the flow below to debug this problem.

In general the most important thing here is to isolate the cabling and connection components (wiring, Flex-Jack, patch panel) and the power source (power injector or switch).

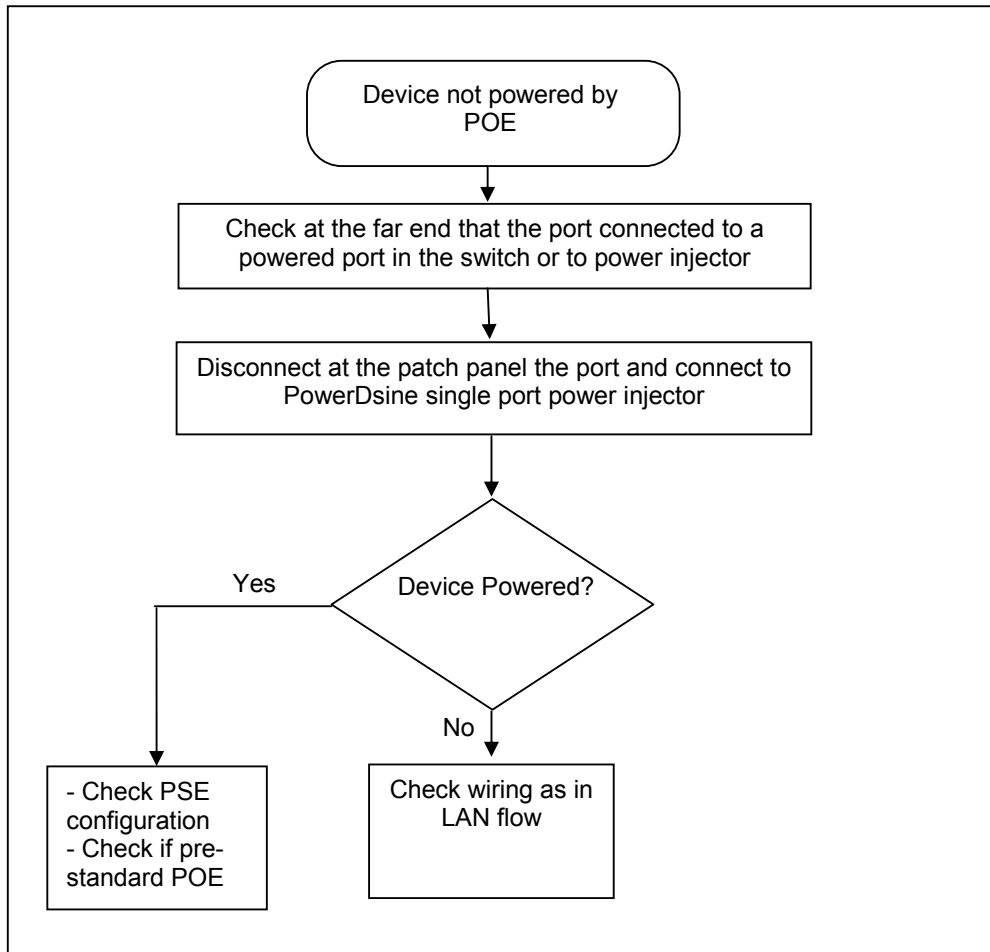


Figure 8 – POE Troubleshooting flow

15. Cisco Catalyst Specific POE Information

This paragraph discusses Cisco specific information required in order to connect Jack-PCs to Cisco Catalyst POE enabled switches.

When trying to troubleshoot POE problem with Cisco Catalyst switch, first check that the switch supports IEEE 802.3af POE. Some Cisco switches are not capable of supporting this new standard.

Product	Catalyst 6500	Catalyst 4500	Catalyst 3750	Catalyst 3560	Catalyst 3550	Cisco EtherSwitch Module
PoE Configuration Options	96-port 10/100 48-port 10/100 or 10/100/1000	48-port 10/100 or 10/100/1000	48-, 24- port 10/100	48-, 24- port 10/100	24-port 10/100	36-, 16-port 10/100
IEEE 802.3af Compliant	Yes	Yes	Yes	Yes	No	No
Cisco Pre-standard PoE Support	Yes	Yes	Yes	Yes	Yes	Yes

Table 4 – Cisco Catalyst POE compatibility table

Even if the product can support 802.3af it may have older inline power modules that can only support pre-standard POE. You need to check the specific inline power modules installed to verify compliance to IEEE 802.3af standard (see table 5 for example).

PoE Daughter Card	Description
WS-F6K-VPWR=	Catalyst 6500 series prestandard PoE daughter card for 10/100 Ethernet modules.
WS-F6K-VPWR-GE=	Catalyst 6500 series prestandard PoE daughter card for 10/100/1000 Ethernet modules.
WS-F6K-GE48-AF=	Catalyst 6500 series IEEE 802.3af compliant PoE daughter card for 10/100/1000 Ethernet modules.
WS-F6K-FE48X2-AF=	Catalyst 6500 series IEEE 802.3af compliant PoE daughter card.
WS-F6K-48-AF=	Catalyst 6500 series IEEE 802.3af compliant PoE daughter card for 10/100 and 10/100/1000 Ethernet modules.

Table 5 - Catalyst 6500 Series Power over Ethernet Daughter Cards

If your switch has a module capable of providing POE to end stations, you can set each interface on the module to automatically detect and apply POE if the end station requires power.

Another advantage / complexity of Cisco Catalyst POE – intelligent power management to avoid overload in large switch rack. This means that although there may be 240 x 15.4W powered ports in a rack, the maximum capacity would not reach 240 x 15.4W = 3696W due to power supply and heat dissipation problems. To better manage actual power as opposed to standard maximum power, Cisco came up with intelligent power management features.

For example, the Catalyst 4500/6500 series switch has three POE modes:

- **Auto PoE interface.** The supervisor engine directs the switching module to power up the interface only if the switching module discovers the PD and the switch has enough power. You can specify the maximum wattage that is allowed on the interface. If you do not specify a wattage, then the switch will deliver no more than the hardware-supported maximum value.
- **Static - High priority PoE interface.** The supervisor engine preallocates power to the interface, even when nothing is connected, guaranteeing that there will be power for the interface. You can specify the maximum wattage that is allowed on the interface. If you do not specify a wattage, then the switch preallocates the hardware-supported maximum value. If the switch does not have enough power for the allocation, the command will fail. The supervisor engine directs the switching module to power up the interface only if the switching module discovers the powered device.
- **Never - Data interface only.** The supervisor engine never powers up the interface, even if an unpowered phone is connected. This mode is only needed when you want to make sure power is never applied to a POE-capable interface.

To properly operate Jack-PCs you should either:

- a) Use Static mode and allocate 10,000 mW of power per Jack-PC port. This will assure proper operation at all time.
- b) Or use Auto mode with same setting (10,000 mW).

If you get an error doing this operation – you need to check your POE limitations (refer to the product manual for additional information).

Cisco POE Resources:

- a. General POE information can be found at
<http://www.cisco.com/en/US/netsol/ns340/ns394/ns147/ns412/netbr09186a00801f4329.html>
- b. Cisco POE White paper
http://www.cisco.com/en/US/netsol/ns340/ns394/ns147/ns412/networking_solutions_white_paper09186a008026641c.shtml
- c. Cisco Catalyst 4500 POE configuration:
http://www.cisco.com/univercd/cc/td/doc/product/lan/cat4000/12_2_25a/conf/poe.htm#wp1051434
- d. Additional Catalyst 4500 configuration and settings:
http://www.cisco.com/univercd/cc/td/doc/product/lan/cat4000/12_2_25a/conf/poe.htm#wp1073691
- e. Catalyst 6500 Series Power over Ethernet Daughter Cards Field-Upgrade Installation
http://www.cisco.com/univercd/cc/td/doc/product/lan/cat6000/cfgnotes/78_10826.htm
- f. Understanding IP Phone In-Line Power Provisioning on the Catalyst 6500/6000 Switch
http://www.cisco.com/warp/public/788/AVVID/cat6k_inline_pwr.html