Incorrect Crimping of RJ-45 Connectors (Physical Layer Error)

Problem Description

The RJ-45 (Registered Jack 45) is the most commonly used twisted pair cable connector in Ethernet networks. The term 'RJ' originally referred to a 'registered jack' standard developed for voice and data communication and defined by the Federal Communications Commission (FCC).

RJ-45 is a modular connector with an 8-position, 8-contact (8P8C) design, primarily used for LAN (Local Area Network) connections. RJ-45 connectors typically consist of a plastic housing with eight metal pins. These pins are used for data transmission and, in some cases, power transfer (e.g., PoE – Power over Ethernet). In Ethernet applications, four of these pins are used for sending and receiving data, while the remaining pins may be used in some special applications.

There are two basic cabling standards used for terminating RJ-45 connectors: TIA/EIA-568A and TIA/EIA-568B. These standards define the order in which each twisted pair is connected to the pins on the connector. Both schemes involve arranging the 8 wires in a specific colour-coded sequence:

T568A: Typically preferred for new installations and accepted as the default by some government agencies.

T568B: More widely used in the United States and preferred for commercial applications.

When the same scheme is used at both ends, a straight-through cable is obtained; when different schemes are used, a crossover cable is obtained. This difference is determined by the type of connection between devices (e.g., straight-through for PC – Switch connection, crossover for PC – PC).

However, in many technical fields or amateur installations, the following mistakes can be made:

-Failure to comply with T568A / T568B standard: Mixing of colour sequences

-Inadequate stripping: Incomplete fit of copper wires into the connector

-Over-stripping: Unshielded part of the wire outside the connector → EMI (electromagnetic interference) effect increases

-Incorrect crimping process: Electrical contact cannot be achieved because the pins are not pressed properly

-Wrong connection type: If the ends are not the same, the cable is used in the wrong role as a crossover or straight-through

RJ-45 socket misalignment is a hardware connectivity issue that occurs at the Physical Layer (Layer 1) of the OSI Model. Such errors can lead to a complete loss of network communication due to non-standard pin alignment, missing wire contact (between pins 1-8), or improper crimping.

OSI Layer Layer 1 - Physical Layer

This error is related to the physical connection level. **Data signalling cannot be sent or received** on the network card, switch port or cable.

Technical Cause of the Problem

Electrical Non-Contact: No contact occurs between one or more of the socket pins and the conductive copper wire. Result: the connection is physically broken, no data is transmitted even if the devices appear "connected".

Interference and Data Corruption: Alternating wire sequences (e.g. reversing colours) can cause "crosstalk" and signal integrity problems. Problems are particularly pronounced on connections of 100 Mbps and above.

Signalling Delay and Loss: Even if the wire length is within the standard limit, the poorly nailed connector interrupts signalling. Automatic protocols such as DHCP fail, timeout, and client devices receive APIPA addresses such as 169.254.x.x and cannot access network services.

Field Realities:

-In devices that come with the complaint of "Port not working", the problem is actually caused by the incorrect socket at the end of the cable.

-Although the socket looks good, one of the pins inside may be dislodged.

-In some cases, the socket "appears" to be plugged in, but when measured with a physical tester (continuity tester), a disconnection is detected. This is a classic sign of a loose socket, especially if the user says that "pulling and plugging" the cable "fixes it": → this is a classic sign of a loose socket.

Symptoms of Detection:

1- Although there is an Ethernet connection, there is no network access.

Devices (e.g. computer, printer) physically recognise the Ethernet cable but give a "Network not available" warning.

Technical reason: One or more of the 8 wires in the RJ-45 connector may be lodged in the wrong order, pressed down incompletely, or loose. This causes a breakdown of electrical contact. One of the ends may be free, the device appears connected but there is no communication.

2-The port LED on the switch does not light at all or lights weakly

The LED illuminates steadily for cables that are correctly connected and flashes when data is exchanged.

Wrong lighter:

-LED does not light at all: the connection is completely broken (no link).

-LED is unstable: there is a loss or weakness of signal on some pins (for example, pins 1-2 or 3-6 may be missing), the signal flickers.

If we've plugged it into the switch but the light doesn't come on, one of the leads may be dead.

3- "Media disconnected" warning in ipconfig command

The operating system puts the network adapter in a "passive" state because it cannot establish a physical connection.

Example of command output:

> Ethernet adapter Ethernet:
>
> Media State : Media disconnected

This indicates that no signal is reaching switch and the connection is broken at physical layer.

For example, we have ipconfig, it says media disconnected, one end of the cable may not be working.

4- IP cannot be received from DHCP, even if IP is given manually, it cannot be pinged

The DHCPDISCOVER packet cannot reach the DHCP server because there is no physical connection.

Even when the user manually assigns an IP:

ping 192.168.1.1 → Request timed out.

Because Layer 1 (physical layer) is faulty. This leads to the upper layers (L3-L7) not working.

For example, we also gave Static IP but it does not ping, we say the connection cable or socket is faulty.

5- Missing pin detection in measurement with cable tester

With a correctly crimped RJ-45 cable, the tester illuminates the LEDs for pins 1-8 in sequence.

1 2 3 4 4 5 6 7 8 (all leds on)

However, abnormalities such as the following are observed in the incorrectly laid cable:

1 2 3 - 5 6 - 8 (4 and 7 are missing)

This indicates either an error in the colour sequence (TIA-568A/B non-compliance) or that the wire ends do not reach the connector.

For example, if 1, 2, 3 lit up on the tester, but 4 did not come on, we say that it may have been missing when lightering.

These symptoms clearly indicate that the connection problems experienced in the network are of physical origin. For this reason, it is not necessary to intervene with software, but directly to remove the cable and reinstall it in accordance with the standard (for example with the TIA-568B sequence).

Admin Guide - Solution Guide for RJ-45 Socket Errors

Issue: When the connector ends of the RJ-45 Ethernet cable are not lapped in accordance with the TIA-568A or TIA-568B standard, a physical connection cannot be established. This causes many problems such as not receiving IP, connection interruption, LED not lighting.

Step 1: Physical Check

Visually inspect the cable ends:

-Are all the wires aligned?

-Are the ends pushed fully forward in the transparent connector?

-Does the wire sequence (colour code) comply with TIA-568B or TIA-568A?
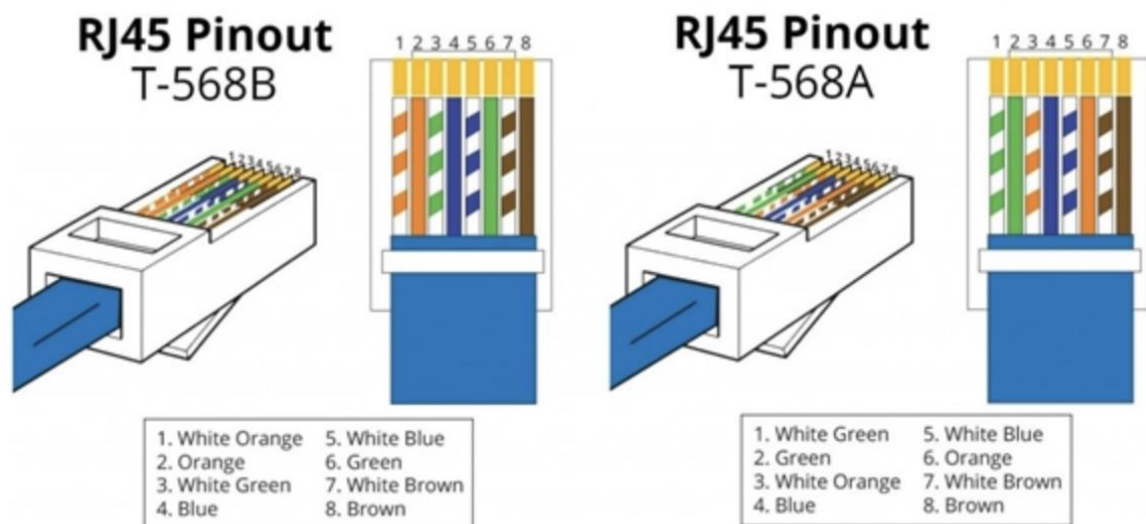
Remove the RJ-45 cable ends, check if they are nailed according to the standard:

Are the copper wires sufficiently advanced in the crystal connector?

The electrical integrity must be tested with a continuity tester.

Step 2: Perform Cable Testing

Test both ends with a cable tester:

-All LEDs from 1 to 8 on the device must be lit in sequence.

-If there is a missing, cross, reverse or short circuit, the device warns.

If there is a missing LED in the tester, the cable must be re-strapped.

Step 3: Re-Nail the Connectors

Ensure that both ends are driven to the same standard (usually TIA-568B).

Reorder and straighten the wire ends:

-Cut the ends and strip 1 cm.

-Straighten the wires and align them according to the sequence.

Push the -RJ-45 into the connector so that it is fully seated.

-Nail it neatly with crimping pliers.

Step 4: Retest

Plug the cable back into the tester.

If all LEDs are lit in the correct sequence → the cable can be used.

Connect the cable to the switch and client.

-Is the LED light on?

Is the -ipconfig output now "connected"?

Step 5: Perform a DHCP test.

Activate DHCP on the host device.

Did he get an IP?

Can the gateway be reached with the ping command?

Conclusion: Physical layer (Layer 1) connectivity problems caused by non-standard or improper crimping of RJ-45 sockets have been addressed. As a result of incorrect pin alignment,

missing contact or improper crimping, network devices are unable to communicate even if they appear to be physically connected. This is manifested by symptoms such as "Media disconnected" error, unlit port LEDs and failed ping tests. The solution to the problem is to re-crimp the cable to an appropriate standard such as TIA/EIA-568B.