VDV Works *Virtual Hands-On* Training

Cat 3 and Cat 5/5E/6 UTP Termination

Terminating Modular Plugs

Step 1 **NEXT BACK**	Terminating Plugs

You will need:

Cat 5 or Cat 3 cable
Modular plugs
Wire cutters
Crimp tool

[Lesson Plan](#) Links

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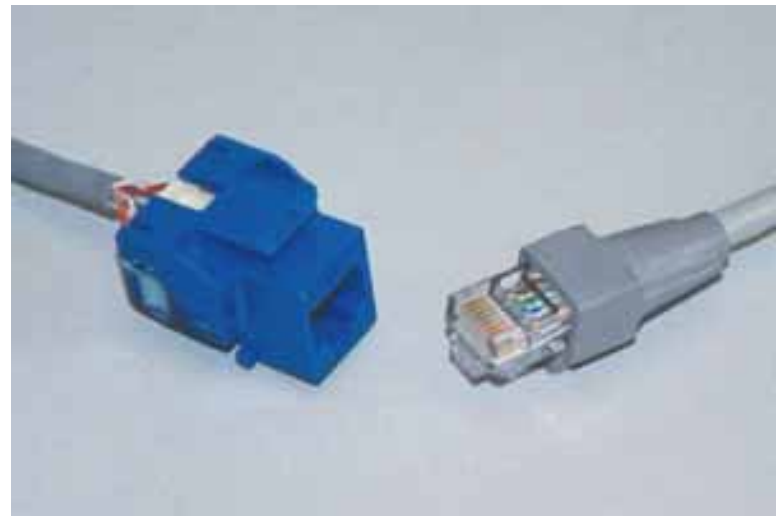
[Cat 5 - 110 Punchdown Block](#)

[Cat 5 - Jack](#)

[Cat 3 - 66 Punchdown Block](#)

[Cat 3 - Jack](#)

[Cat 3 & Cat 5 - Plug](#)

Go to the [quiz](#)

The modular jack mates to a plug to complete the connection. The plug is generally called a "RJ-45" but that is technically incorrect. A true "RJ-45" is this modular 8 pin plug terminated with a USOC pinout. However, since everyone calls it a "RJ-45", it is OK to call it that!

Most plugs are part of patchcords, while the installed link is terminated in jacks. Patchcords are not simple or easy to make, and it is usually much less expensive to purchase factory-terminated patchcords in specific lengths to use for interconnecting cables or connecting

network hardware.

Another critical difference is patchcords are made with stranded wires, not solid wires like the installed link. Solid wire will fail quickly if used for patchcords, since it is not flexible like stranded wire. If you are going to be making patchcords, get some stranded wire to do it properly
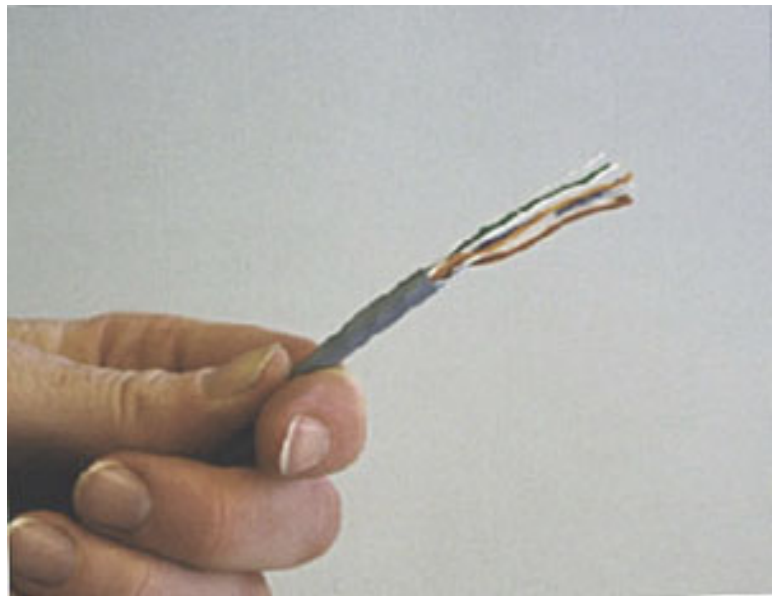

Begin the process by stripping 1 - 1/2 inches of jacket from the cable. Untwist back to the end of the jacket this time. When we crimp the plug on the cable, we want to crimp the cable in place.

As you separate and order the strands, the color codes must match the jack that will be used. This will be either 568A or B. It's best to lay the plug head on to a jack so that you can clearly see the pattern.
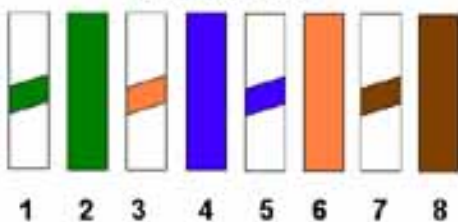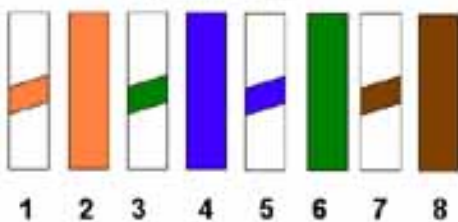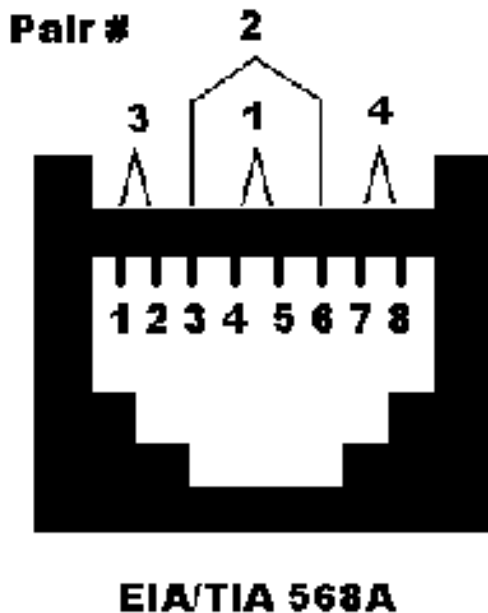
Make sure you get your pin numbers oriented properly. This is a jack, looking into the slot where the plug goes. Looking from the back of the plug, where the cable goes, pin 1 is on the left when the latch is down.

Pair #

EIA/TIA 568A

The wires must be laid out in order, they must be flat, and very close together. They need to be parallel for most of the exposed length to fit into the plug properly. Once they are in order and flat, cut the wires straight across so that only 1/2 inch of the strands protrudes from the cable.
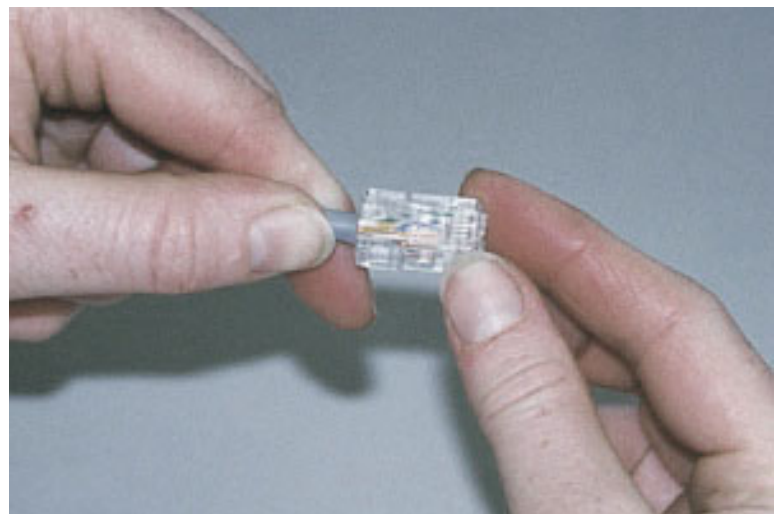
Carefully slide the cable into the plug. The wires must stay in order, and separated from each other. The wire tips have to slide all the way into the

plug to connect to the contacts properly.

Look for the colors of the wires to reach the end of the plug.
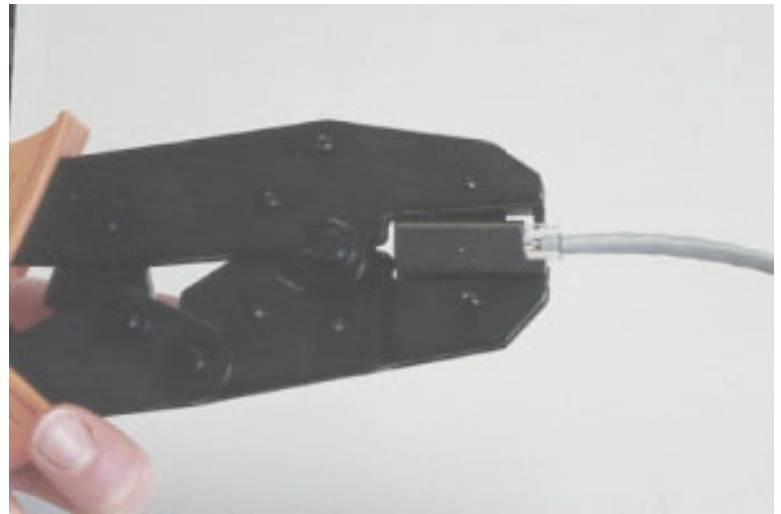
Once you are satisfied that the wires are seated fully at the plug contacts, insert the plug into the crimping tool and crimp the cable to the plug.

Now the plug is complete and ready for testing.

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NEXT

Wiring Diagram for Cat5e and Cat 6 Ethernet Cable

Cat5e/6 Wiring
Diagram

This image was created from uncl568a.gif and cc-t568a.jpg.

Related Urls:

- How to make a CAT5 Cable
- Cat 3 and Cat 5/5E/6 UTP Termination

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Cat 5E & 6 Tutorial

**How to Make Cat
5E / 5 Patch Cable**

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How to Make a Category 5 / Cat 5E Patch Cable

Due to an overwhelming response to our category 5 & 6 tutorial, and many requests for information and wiring diagrams of "straight through" and "crossover" (cross-pinned) patch cords, I have made this informational page. On this page, we will cover making patch cords, and other technical and non-technical issues relating to category 5 (and beyond) patching and connectivity from device to device. Below, you will find the diagrams for 568A, 568B, and crossover patch cables. I suggest that you read on, past the diagrams for some very useful and important information.

As always, there continues to be Controversies over standards and practices regarding the use and making of patch cords, and UTP cable in general. Please see our section below titled: "Controversies and Caveats : Category 5, 5E, and Cat 6 Patch Cables". I hope that you will find it interesting and informative.

Tony Casazza, RCDD

568-B Wiring

Pair #	Wire	Pin #
1 - White/Blue	White/Blue	5
	Blue/White	4
2 - White/Orange	White/Orange	1
	Orange White	2
3 - White/Green	White/Green	3
	Green/White	6
4 - White/Brown	White/Brown	7
	Brown/White	8
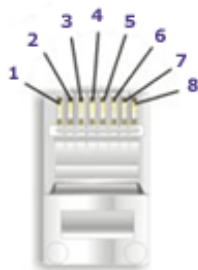
<< 568-B Diagram
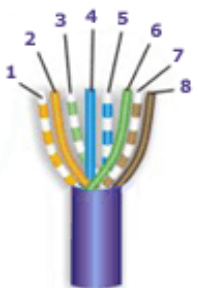
568-A Wiring

Pair #	Wire	Pin #
1 - White/Blue	White/Blue	5
	Blue/White	4
2 - White/Green	White/Green	1
	Green/White	2
3 - White/Orange	White/Orange	3
	Orange/White	6
4 - White/Brown	White/Brown	7
	Brown/White	8
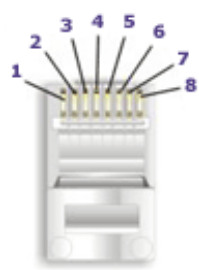
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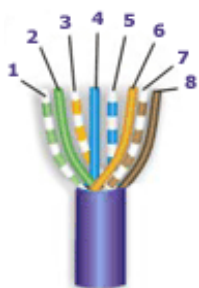
Notes for wiring diagrams above:

1. For patch cables, 568-B wiring is by far, the most common method.
2. There is **no difference** in connectivity between 568B and 568A cables. Either wiring should work fine on any system*. (*see notes below)
3. For a straight through cable, wire both ends identical.

4. For a **crossover cable**, wire one end 568A and the other end 568B.

5. Do not confuse pair numbers with pin numbers. A pair number is used for reference only (eg: 10BaseT Ethernet uses pairs 2 & 3). The pin numbers indicate actual physical locations on the plug and jack.

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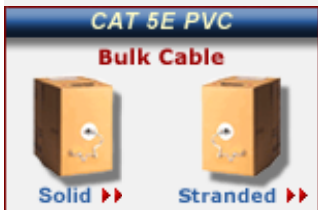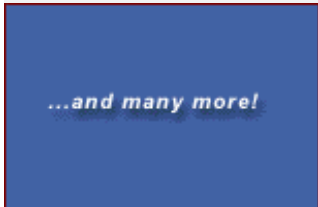
Patch Cable Assembly Instructions

1) Skin off the cable jacket approximately 1" or slightly more.

2) Un-twist each pair, and straighten each wire between the fingers.

3) Place the wires in the order of one of the two diagrams shown above (568B or 568A). Bring all of the wires together, until they touch.

4) At this point, recheck the wiring sequence with the diagram.

5) Optional: Make a mark on the wires at 1/2" from the end of the cable jacket.

6) Hold the grouped (and sorted) wires together tightly, between the thumb, and the forefinger.

7) Cut all of the wires at a perfect 90 degree angle from the cable at 1/2" from the end of the cable jacket. This is a very critical step. If the wires are not cut straight, they may not all make contact. We suggest using a pair of scissors for this purpose.

8) Insert the wires into the connector (pins facing up).

9) Push moderately hard to assure that all of the wires have reached the end of the connector. Be sure that the cable jacket goes into the back of the connector by about 3/16".

7B) Conductors should be at a straight 90 degree angle, and be 1/2" long, prior to insertion into the connector.

9) Place the connector into a crimp tool, and squeeze hard so that the handle reaches it's full swing.
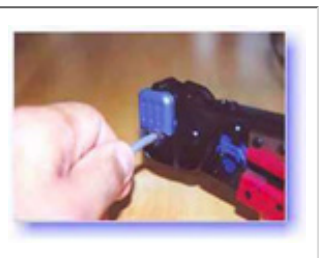
10) Repeat the process on the other end. For a straight through cable, use the same wiring. **For a "crossover" cable, wire one end 568A, and the other end 568B.**

11) Use a cable tester to test for proper continuity.

	Notes Regarding Making Category 5 Patch Cable
1)	The RJ-45 plugs are normally made for either solid conductors or stranded conductors. It is very important to be sure that the plug that you use matches the conductor type. It is extremely difficult to tell the difference between the two by looking at them. When you buy these plugs, be sure to categorize, and store them carefully. Using the wrong type can cause intermittent problems. The RJ-45, 8 Conductor Plugs that we sell are rated for **both Solid and Stranded** cable.
2)	Ordinarily, it would be taboo to untwist the pairs of any category 5 cable. The one exception to this rule is when crimping on RJ-45 plugs. It would be impossible to insert the wires into the channels without first untwisting and straightening them. Be sure **not to** extend the un-twisting, past the skin point. If you do it properly, you will wind up with no more than 1/2" of untwisted conductors (up to 1/2" of untwist meets the cat 5 specification)
3)	If the completed assembly does not pass continuity, you may have a problem in one, or both ends. First try giving each end another crimp. If that does not work, then carefully examine each end. Are the wires in the proper order? Do all of the wires fully extend to the end of the connector? Are all of the pins pushed down fully. Cut off the suspected bad connector, and re-terminate it. If you still have a problem, then repeat the process, this time giving more scrutiny to the end that was not replaced.
4)	It is good to be prepared to make your own patch cables. There may be many instances where you may fall short on supply, and making a cable will surely get you out of a jam. However, there comes a point where the practicality curve will lead you to factory made cables. Making several cables can be very labor intense. Factory made cables typically have better tolerances, and consequently have better quality than field made cables.

Controversies and Caveats : Category 5, 5E, and Cat 6 Patch Cables

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568B vs. 568A	For patch cables, 568-B wiring is by far, the most common wiring method. Virtually all pre-assembled patch cables are wired to the B standard. There is **no difference** in connectivity between 568B and 568A cables. Therefore, a 568B patch cable should work fine on a 568A cabling system, and visa-versa. To my knowledge, there has never been an issue with networks of up to 100 megabits. However, with the advent of Gigabit over copper cabling, it may very well become a factor at some point. We have conferred with several cable manufacturers, and many other technical resources, on this subject. The consensus is that mixing of the standards on patch cables should not cause a problem. Since Gigabit networks over copper cabling are in their infancy, and no one can say for sure, we would advise our customers to take the safe approach on all future patch cable orders. We now offer our custom cat 5E and category 6 cables in both 568A and 568B wiring schemes for this reason.
Re-use of old cables	We have seen this happen time and time again. Perfectly good patch cables that have been working fine for years, get removed from their installation, and re-installed on the same, or different network. The result can be a nightmare. What happens is that the cable, over time, adapts to the way that it is bent in it's original installation. When these cables are removed and re-installed, they can either completely loose their connection, or develop intermittent problems. This is due to stresses that may be opposite to what they were originally subject to. If the integrity of your network is more valuable than the price of new patch cables, then we strongly suggest that you use brand new cables for all closet cleanups, network moves, etc.
Stranded vs. Solid wire	Almost all patch cables that are made have stranded wire. Stranded wire is normally specified for use in patch cables due to it's superior flexibility. There has been some talk recently, in the technical sector of the structured wiring community, regarding the possible use of solid conductors for patch cables. The reason for the spotlight on solid wire is that it is supposedly more stable, under a variety of conditions. Please note that we now offer custom **solid copper category 5E patch cables in Plenum** insulation in lengths of up to 295 feet. These cables are suitable for use in air handling (Plenum) ceilings and environments.

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