Introduction

The Ethernet UART board provides the Model 3000/4000 Type 2 Control Module (panel) with:
-A 10BaseT Ethernet connection to allow System Management and/or Reporting via the IP protocol
-A high speed, software configurable, serial port to allow connection of a peripheral serial device.

This document is intended to provide a basic guide to deploying systems based on the Concept 3000/4000 Security and Access control panels with the 995090 Ethernet UART card to provide communications to **insight**, the Inner Range panel management software.

This setup guide outlines specific information for the System Administrators concerning IP addresses, Protocols, Diagnosing network problems, Firewalls and viruses.

A number of possible configurations are examined, however the solutions suggested herein are by no means exhaustive.

While every effort has been made to ensure the accuracy of this document, the manufacturer and/or its agents assume no responsibility or liability for any errors or omissions.
Due to ongoing development, this document is subject to change without notice.

ALTERATION LIST

Alteration	By	Date
First Release	BM/AK	26 July 2004

Contents

1. The System Administrator

In complex alarm/access installations, the panel will be deployed on an existing LAN (Ethernet Local Area Network), it is important to identify and involve the person normally responsible for the administration of that network in the deployment of the panel. The System Administrator will need to provide the following information:
- Static IP address of the Insight server (if it is on the LAN)
- Whether or not panels are to use DHCP or static IP addresses.
- Subnet mask for each statically addressed panel on the network.
- Router address for each statically addressed panel that is to communicate with a server on a different subnet or over the Internet.

1.1   Important Information for the System Administrator

1.1.1   10 base T
The Ethernet connected panel requires a 10 base T connection to a network.

1.1.2   IP addresses
The Insight server may serve a number of panels. It must have a **static IP address** that can be reached by each panel.
Each Panel may have a static or Dynamic IP address. A DHCP service must be available to issue Dynamic IP addresses if theses are to be used.
When the panel is to communicate with a server on another subnet or over the internet, it must do this through a router:
- If the panel is configured for a static IP address, the panel must be configured with the IP address of the first hop router.
- If the panel is configured for a dynamic IP address allocated via DHCP, the DHCP server must be capable of supplying the first hop router address via the DHCP router option.

1.1.3   Protocols
The network must allow DHCP, ARP and UDP traffic to and from the panel. ICMP is required only for diagnostic "pings" to the panel.
All normal communications between the panel and the server are over UDP, with a source port at the panel end of 17185.

1.1.4   Diagnosing network problems
The panel will respond to ICMP Echo ("Ping") requests with ICMP Echo replies.
The panel will also respond to ARP requests.

1.1.5   General nature of communication
Communications between the panel and Insight over Ethernet is generally of a client server nature and follows the following sequence.

1. The panel announces its presence to the server by sending a UDP message to the server's routable address and announce port number (as programmed into the panel, and defaulting to 17185). These messages have a UDP source port number of 17185. If the server does not respond within a specified time, the panel repeats this announcement infinitely.
2. In due course a server responds by sending a UDP packet to the panel using the source address and port number obtained from the panel's "announcement". This message may be from a different (random) UDP source port number at the server.
3. UDP messages are exchanged between the panel and the server using the panel's UDP port of 17185 and the port number allocated by the server. (point 2 above).
4. If the current communication session between the panel and server ceases, the server may choose a different source port number for the next communication session, as the port selection is random (point 2 above).

1.1.6 Firewalls
In general, Ethernet equipped Concept 3000/4000 panels co-operate well with most firewalls. Of course, the firewalls must be configured to allow the necessary protocols (particularly UDP) to operate between the panel and the Insight server.

1.1.7 Viruses
The panel is not based on PC architecture and contains no traditional operating system such as Windows or Linux. For this reason, the panel is impervious to any viruses or trojans known to pervade the net. The panel is currently not capable of sending e-mails or files, so is unable to propagate viruses and trojans.

2 Panel Setup

This document should be used in conjunction with the Concept Programmer's Manual (Comms Task programming for Insight).

To set up a panel for communications to insight, a communications task must be programmed.
1. Enter the installer code.
2. Select Menu 7,3,1 (Communications tasks)
3. Select Insight
4. Press Help, 9 to access the communications task parameters
5. Set the Panel ID to the desired number.
6. Choose a Communications Port to use for serial communications if you are using serial communications as an alternate path for Insight communications. If the panel is not going to connect to Insight via a serial port, set this to an unused port number.
7. Set up the serial baud rate and options. If only an Ethernet connection exists between the panel and the server, the baud rate is ignored.

a. If a temporary connection is desired set the options to nnnn.
b. If a permanent connection is desired, set the options to nnnY (P option is set to Y)

8. Set up the Ethernet Options screen to the following:
   ```
   CT001   ....IACE
   EthNet. nnnnnYYY
   ```

9. Set up the RS232, FE3000, External Modem and Internal Modem options as desired.

10. Set up the insight IP address. Contact the System Administrator of the LAN if required. In simple, stand alone networks (such as those in 3.1 and 3.2 you might assign them yourself).
    IP addresses in the Concept 3000/4000 panel are always entered in the form XXX.XXX.XXX.XXX (e.g. 192.168.001.010). Each 3 digit component may range from 0 to 255 (leading zeroes are mandatory if the number is less than 100). There are some rules to follow, though, (e.g. addresses 000.000.000.000 and 255.255.255.255 are illegal and will not work correctly) so if you are assigning numbers yourself, it may be simplest to follow the suggestions in section 3.

11. Set up the Insight A and Insight B encryption keys as desired, according to the Insight user manual.

12. Leave the IPFast IP address set to 000.000.000.000

13. Leave the IPFast A and IPFast B encryption keys set to 00000000000000000 and 0000000000000000.

14. Set up the Panel IP address.
    a. For panels that have their addresses dynamically assigned via DHCP (often a decision made by the network's System Administrator), set this to 000.000.000.000.
    b. For panels with static IP addresses (either assigned by the System Administrator, or the Installer) this IP address should be entered here. As with 10 above, leading zeroes are important. e.g.
       ```
       CT001 Panel IP
       192.168.000.010.
       ```

15. Set up the Router IP address
    a. For panels that have their addresses dynamically assigned via DHCP, set this to 000.000.000.000.
    b. If the panel is assigned a static IP address and the Insight server is on the same network subnet as the panel, this is not required and should be set to 000.000.000.000
    c. If the panel is assigned a static IP address and the Insight server is not on the same subnet as the panel, there will be a router (which may take the form of a dedicated hardware router, a service running on a PC with multiple network interfaces, or a combined modem/router) through which the panel must communicate to reach the server.

In this case the IP address of that router must be entered here. This is likely to be assigned and provided to you by the network's System Administrator.

16. Set up the subnet mask.
    a. For panels that have their addresses dynamically assigned via DHCP, set this to 000.000.000.000.
    b. If the panel is assigned a static IP address, this will be assigned by the network's system administrator or by the installer (see section 3 below).
17. Assign the Insight Announce Port. This must always be set to the same value as set in the Insight server, and will usually be set to the default port of 17185.
18. Set the maximum attempts if desired. This value can usually be left at the default value of 0.

3 Common Configurations

3.1 Server and Single Panel, no network.

The simplest way to connect a sever to a single panel in the absence of a LAN is with an RJ45 crossover cable (purchased from any computer or electronics shop).
See Appendix 1: Ethernet Cables for details of the wiring of a crossover cable.
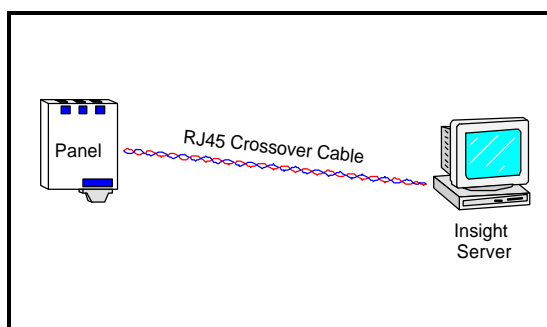
Figure 1 Direct (crossover) connection

In the example in Figure 1, the Insight server is working on a Windows 2000 or XP operating system. The simplest and most popular way to set up the network is to assign static IP addresses to both the server and the panel. If nothing else is connected to this network, the following static IP addresses are suggested

	Insight Server PC	Panel
IP address	192.168.1.1	192.168.001.010
Router IP	0.0.0.0	000.000.000.000
Subnet Mask	255.255.255.0	255.255.255.000
Server IP		192.168.001.001

3.2   Simple LAN with Static IP addresses

A simple LAN may contain one or more PCs connected to a hub or switch and one or more Concept 3000/4000 panels. Such networks are common amongst homes and small businesses or offices. A common instance of such a network is where one computer shares an Internet connection with several other PCs. Any of these PCs may have the Insight server software installed on it.
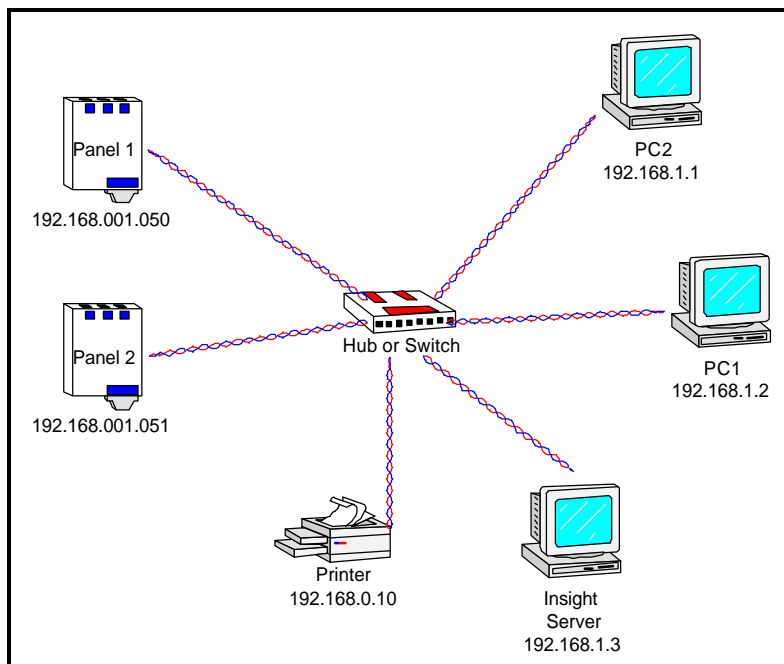
Figure 2 Example of a simple network with static IP addressing

In this configuration, it is vital that addresses assigned to the panel, or any other new hardware connected to the network (such as a new PC to host the Insight server,) fulfil two criteria:
1. Addresses of new equipment must not be the same as the address of any existing device.
2. Addresses of new equipment must be on the same subnet as existing devices. For the most likely scenario, where the subnet mask of the existing device is 255.255.255.0, this means that the first three components of the four component IP address must be the same. For example the network in figure 2, all new devices, including panels must be assigned IP addresses 192.168.1.X (where $0 < X < 255$).

Additionally the subnet mask of new network devices such as panels should have the same subnet mask as existing devices.

Usually this information can be obtained from the System Administrator or the person who set up the network. However in cases where such people are not available, the installer must go to each network device in turn and determine the existing IP address in order to ensure that no conflict occurs.

The example system in figure 2 would be set up with the following parameters:

	Insight Server PC	Panel 1	Panel 2
IP address	192.168.1.3	192.168.001.050	192.168.001.051
Router IP	0.0.0.0	000.000.000.000	000.000.000.000
Subnet Mask	255.255.255.0	255.255.255.000	255.255.255.000
Server IP		192.168.001.003	192.168.001.003

3.3 Common Small Network with DHCP

A common type of small corporate network may have a few network devices with statically assigned IP addresses, and a DHCP server assigning dynamic IP addresses to other devices. There are two ways of connecting to such a network; with a static IP address assigned by the System Administrator or with dynamically assigned IP addresses generated on the fly by the DHCP server.

When the Insight server is located on such a network, along with any panels it serves, it **must** be assigned a static IP address. A panel cannot connect to an Insight server that has a dynamically allocated IP address.
Panels however, may be allocated dynamic IP addresses via DHCP.
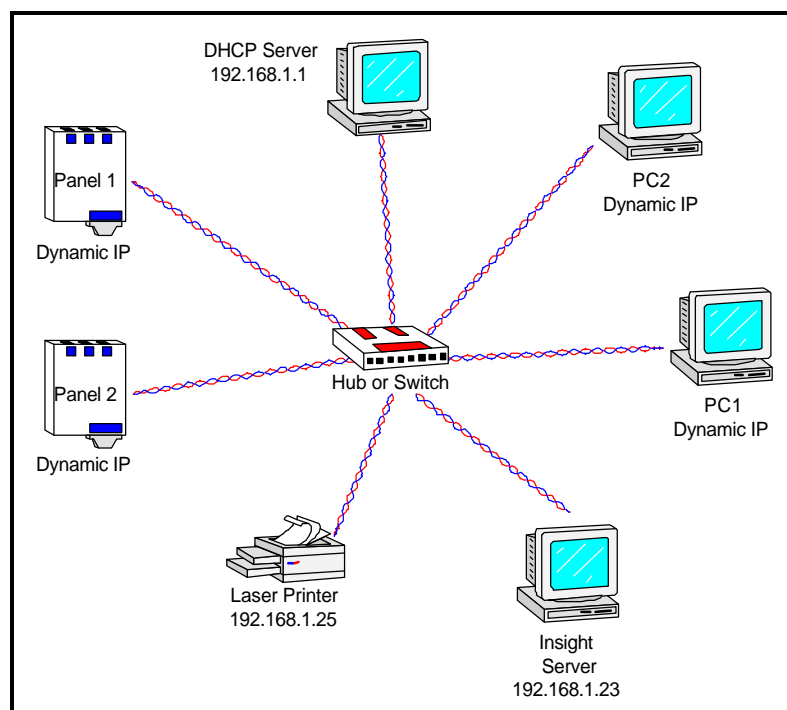
Figure 3 Small Corporate Network with DHCP

In the example in figure 3, the static IP address assigned to the Insight server must still follow the same rules as in the simple LAN described in 3.2 above. Additionally, this static IP address must come from a pool of IP addresses reserved (unable to be re-allocated by DHCP) set up in the DHCP server. The System Administrator or person who set up the network would normally provide this address to the installer. If such a person were unavailable, the installer would need to obtain this information from the DHCP server.

In the example in figure 3, the panel is set up with the following parameters:

	Insight Server PC	Both Panels
IP address	192.168.1.23	000.000.000.000
Router IP	0.0.0.0	000.000.000.000
Subnet Mask	255.255.255.0	000.000.000.000
Server IP		192.168.001.023

3.4 Corporate Multi-segment Network

Many larger corporate networks consist of multiple segments connected via routers. In this type of network, the routers actually belong to two networks and have separate static IP addresses on each network. Their job is to ensure that devices on the two networks can talk to each other.

It does not usually matter how many routers are between the source (the panel) and the destination (the Insight server), it is important that the Insight server has a static IP address that is reachable (routable) from any panel.

Such networks are likely to contain a mixture of static and dynamic IP addresses. While it is likely that either all panels will be static or all panels will be dynamic, it is entirely possible that some panels will have dynamic and others will need to have statically allocated IP addresses. In such larger networks, though, there is nearly always a System Administrator who will allocate any static IP addresses and inform the installer of which panels will require dynamic IP addresses.
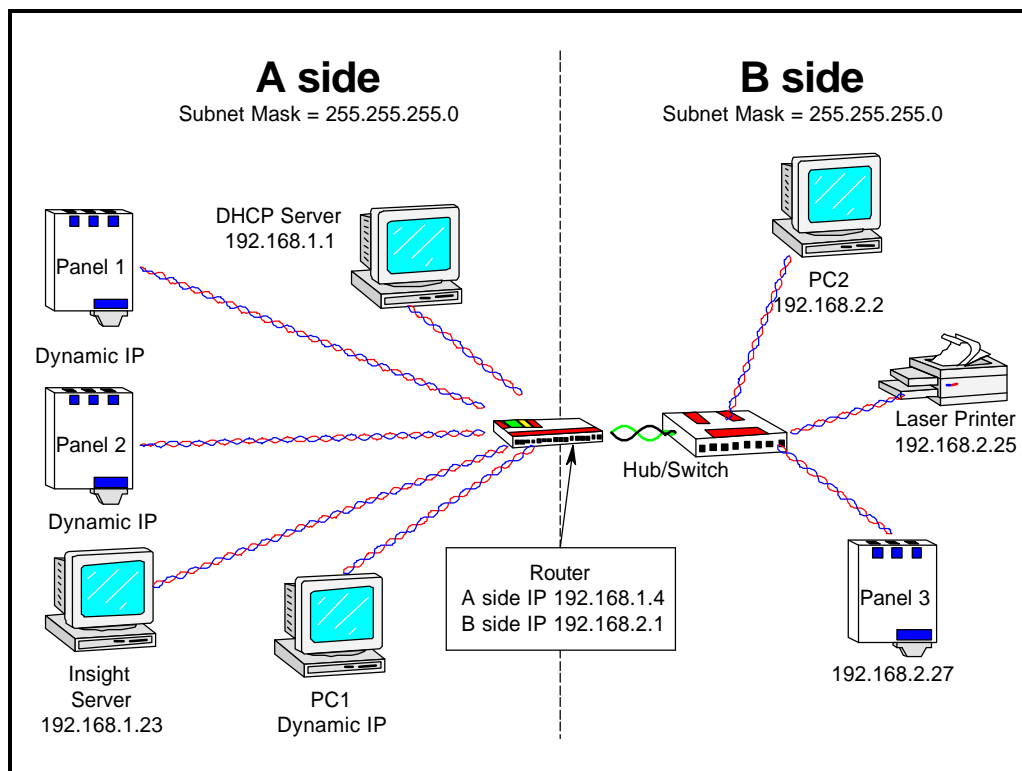
The Installer will need to ask the System Administrator for the static IP address of the (logically) closest router to each panel which has a statically allocated IP address, known as the "first hop" router.

Figure 4 Multi-segment network.

In the example shown in Figure 4, two subnets (A side = 192.168.1.X and B side = 192.168.2.X) are connected together via a router. In this example panels 1 and 2 will be programmed for DHCP, (Panel IP = 000.000.000.000, Router IP = 000.000.000.000, Subnet Mask = 000.000.000.000) all IP addresses and the local subnet mask will be allocated by the DHCP server.

Panel 3, however exists on a subnet without a DHCP server and, as such, must have a static IP address allocated. It must also have the address of the nearest router. The example system would be set up with the following parameters:

	Insight Server PC	Panels 1&2	Panel 3
IP address	192.168.1.23	000.000.000.000	192.168.002.027
Router IP	0.0.0.0	000.000.000.000	192.168.002.001
Subnet Mask	255.255.255.0	000.000.000.000	255.255.255.000
Server IP		192.168.001.023	192.168.001.023

3.5 Connection via ADSL router/modem and Internet

A common configuration when the Insight server is physically remote from the panel is to connect to this server via an ADSL modem connected to the Internet, with the Insight server connected to the Internet with a globally routable static IP address.

As with local area networks, a number of panels can be connected to the same server in this manner. An ADSL router/modem can have an integral DHCP server to make life a little easier, if not, either a separate DHCP server is required or the panel must be allocated a static IP address. In the latter case, the static IP address of the ADSL router/modem is programmed into the panel as the router IP.
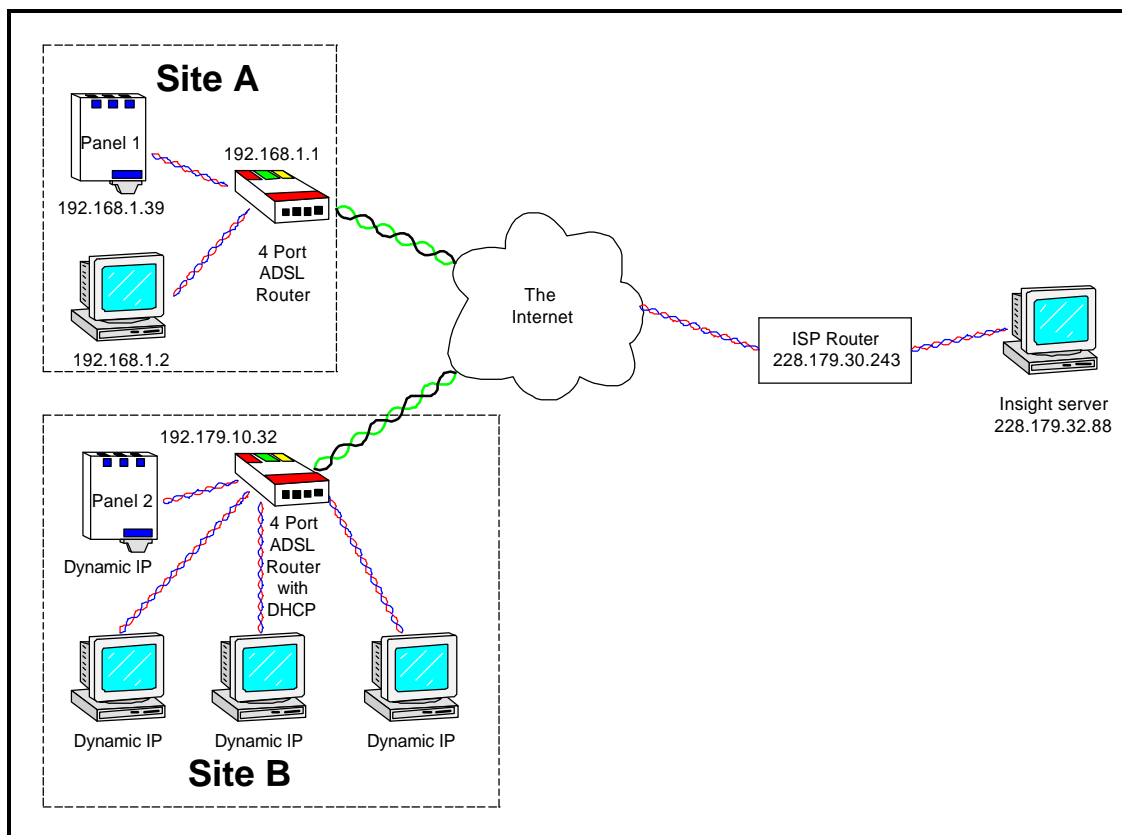
Figure 5 Insight connected over Internet

The example in figure 5 does not show the full complexity of the connectivity. The Insight server and each site could connect to the Internet via a different Internet Service Provider (ISP), each with multiple levels of router. Through the magic of the Internet protocol (IP), however, all these stages should appear completely transparent to both our protocol and the installer.

As usual, the System Administrator or person who configured the network will allocate addresses on the LAN. If all devices are connected directly to the ADSL router, the router will store the IP address information.

The Insight server must have a globally routable IP address and this address must be entered into each panel.

The example in figure 5 is set up with the following parameters:

|	Insight Server PC	Panels 1 (static)	Panel 2 (DHCP)
IP address	228.179.32.88	192.168.001.039	000.000.000.000
Router IP	228.179.30.243	192.168.001.001	000.000.000.000
Subnet Mask	255.255.255.240	255.255.255.000	000.000.000.000
Server IP		228.179.032.088	228.179.32.88

4 Appendix 1: Ethernet Cables

In a common Ethernet connection the TX (transmitter) pins are connected to corresponding RX (receiver) pins, with plus to plus and minus to minus.

When straight-through cables are used to connect Ethernet devices, one of the two units must, in effect, perform a "cross-over" function. This is the reason that straight through cables work directly between hubs or switches and Network Interface Cards (NIC). The Hub or Switch is designed so that their RJ45 Jacks are pre-wired with the transmit and receive pairs already reversed.

A cross-over cable must be used to connect units with identical interfaces, for example from one NIC to another.

There are two colour-code standards in common use: EIA/TIA 568A and EIA/TIA 568B. These standards derive from TELCO phone line pairing. This same wiring was adopted for Ethernet RJ45 LAN standard. Both standards for RJ45 receptacle wiring are shown below:
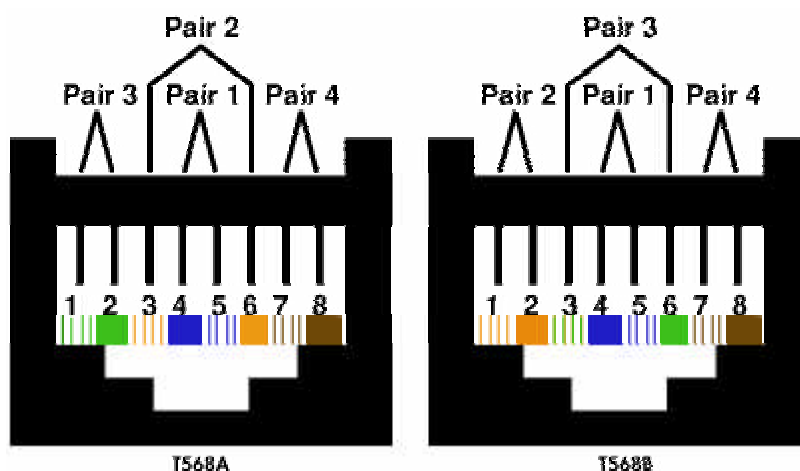
| EIA/TIA 568A WIRING STANDARD	EIA/TIA 568B WIRING STANDARD
PIN WIRE COLOUR	PIN WIRE COLOUR
1 White w/**Green** Stripe	1 White w/**Orange** Stripe
2 **Green** w/White Stripe	2 **Orange** w/White Stripe
3 White w/**Orange** Stripe	3 White w/**Green** Stripe
4 **Blue** w/White Stripe	4 **Blue** w/White Stripe
5 White w/**Blue** Stripe	5 White w/**Blue** Stripe
6 **Orange** w/White Stripe	6 **Green** w/White Stripe
7 White w/**Brown** Stripe	7 White w/**Brown** Stripe
8 **Brown** w/White Stripe	8 **Brown** w/White Stripe

Note: Only pairs 2 and 3 are used for Standard Ethernet wiring. Pairs 1 and 4 can be used for other purposes such as telephones.

Straight-Through Wiring Using The 586A Standard
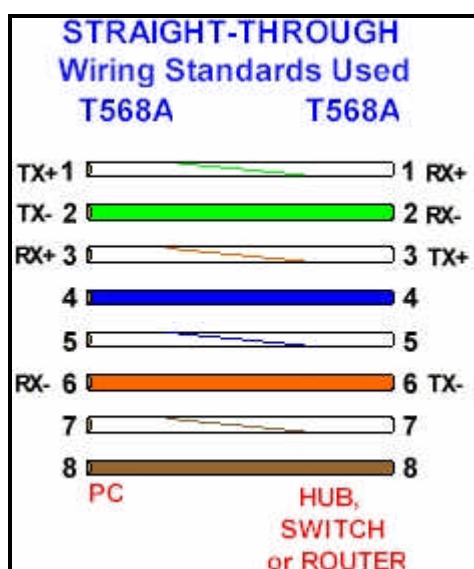
The wiring diagram, above, shows the 568A colour code standard as the wiring for the PC side of the cable and the same 568A standard for the Hub, Switch or Router side of things (assuming that the Hubs, Switches or Routers are wired internally to perform the cross-over function). The illustration depicts the wiring arrangement before insertion into an RJ45 connector prior to crimping.

Cross-Over Wiring Using The 568A to 586B Standards
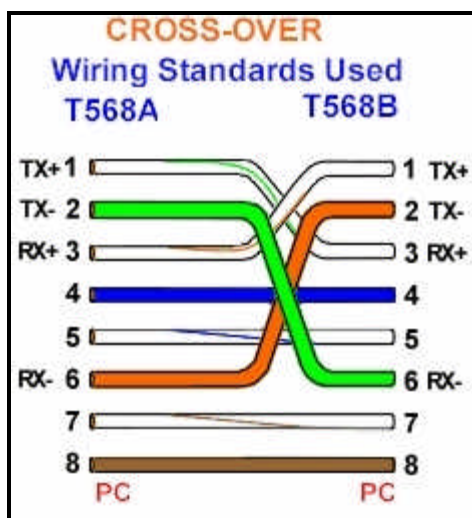
The wiring diagram, above, shows cross-over cable wiring using the 568A colour code standard as the wiring for the PC side of things and the 568B standard for wiring to the other PC. Note that in both cases, all eight wires are shown but only four are actually needed.
Pins 4, 5, 7, and 8 and the blue and brown pairs are not used in either standard

Note the cabling diagrams and information are based around standard category 5 (or better) networking cable.

5 Appendix 2: Glossary

Subnet Mask:

A subnetwork mask, also known as a subnet mask, netmask or address mask, is a 32-bit bitmask used to inform routers as to how much of an Internet Protocol address identifies the subnetwork the host is on and how much identifies the host.

Subnet masks are usually represented in dotted quad notation (four numbers from zero to two hundred fifty-five separated by periods) or, less commonly, as an eight-digit hexadecimal number. The mask 255.255.255.0 (0xffffff00) or (11111111111111111111111100000000), for example, indicates that the third byte of the address shows the subnet's number (the first two bytes of an IP address generally show the network part) and the fourth shows that of the system in question. 255.255.255.255 (0xffffffff) or (11111111111111111111111111111111) is used for an address of a system on a network part without subnets; the last two bytes indicate only the system.

DHCP:

Dynamic Host Configuration Protocol (**DHCP**), a networking protocol, provides a means to allocate IP addresses dynamically to computers on a local area network (LAN). A System (network) Administrator assigns a range of IP addresses to DHCP and each client computer on the LAN has its TCP/IP software configured to request an IP address automatically from the DHCP server when that client computer starts up. The request-and-grant process uses a lease concept with a controllable time period. This eases the network installation procedure on the client computer side considerably.

Router:

A **router** consists of a compute networking device that determines the next network point to which to forward a data packet toward its destination, a process known as routing.

A router must be connected to at least two networks, or it will have nothing to route.