



Cabling Installation Guide

*for installing a
Local Area Cabling Network*

Prepared by **tyco** / *Electronics*



Contents

The following is included to offer basic tuition on acceptable practices for the installation of your NetDay cabling kit. This information has been drawn from the US NetDay 96 and NZ NetDay 97 Web Pages.

- NetDay 2001 Component List
- Generic Cabling Schematic's
- What is NetDay?
- Here's What You'll be Doing
- Why the Cable You're Installing is so Special
- Category 5 Cable vs. Enhanced Category 5 Cable
- Suggested Tools and Supplies
- Safety
- Planning Cable Runs
- Cable Routing Basics
- Routing the First Run of Cable
- Installing Catenary Wire
- Mounting Surface Mounted Trunking
- Mounting PVC Conduit
- Mounting Cables on Walls
- Fishing Cables Through a Wall from Above
- Fishing Cables Through a Wall from Below
- Cutting into Gib Board
- Cutting into Wood
- Mounting and Wiring Jacks
- Surface Mounting a Jack
- Universal 110Connect Panel Mount Jack
- Laying Down the Wire in the Jack
- Punching Down the Wires in the Jack
- What Happens at the Patch Panel
- Mounting the Patch Panel
- Mounting the Jacks into the Patch Panel (16 port unloaded)
- Terminating the 24 port preloaded Patch Panel
- Recording Your Work
- What a Test Shows
- Electrical Interference Considerations
- Installing Network Interface Cards

NB: Some details within the US documentation may not be applicable to NZ conditions.

NetDay 2001 Component List

Components available on the NetDay 2001 Order Form

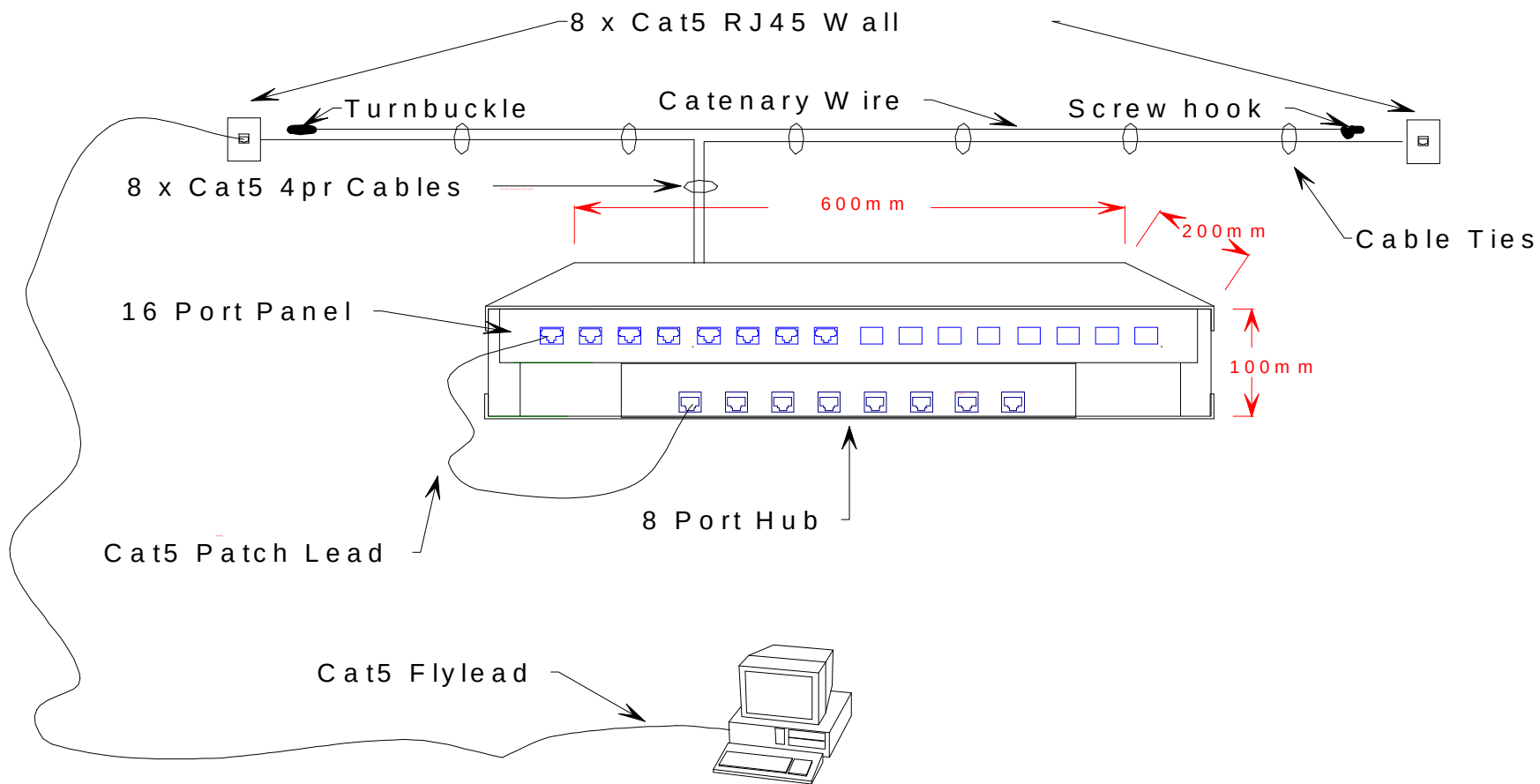
NETDAY CABLING COMPONENTS		
CABLING SYSTEM COMPONENTS	PART No	UNIT
ENHANCED CATEGORY 5, 4 PAIR, UTP CABLE (305mtr BOX)	6-0057826-6	BOX
ENHANCED CATEGORY 5, 24 PORT PATCH PANEL	0-0406330-1	EACH
16 PORT, 1RU PATCH PANEL (UNLOADED)	1-0795658-6	EACH
JUMPER BAR, 1RU – BLACK	1-0795691-1	EACH
ENHANCED CATEGORY 5, RJ45 JACK, TOOLESS - (BLACK)	0-1116604-2	EACH
SINGLE RJ45 WALL PLATE	1-0795610-1	EACH
DUAL RJ45 WALL PLATES	1-0795610-2	EACH
DEEP MOUNTING BLOCKS	0-0795610-2	EACH
ENHANCED CATEGORY 5 PATCHCORD - 0.6 mtr (2 foot)	0-0219241-2	EACH
ENHANCED CATEGORY 5 PATCHCORD - 0.9 mtr (3 foot)	0-0219241-3	EACH
ENHANCED CATEGORY 5 PATCHCORD - 3.0 mtr (10 foot)	1-0219241-0	EACH
ENHANCED CATEGORY 5 PATCHCORD - 3.6 mtr (12 foot)	1-0219241-2	EACH
ENHANCED CATEGORY 5 PATCHCORD - 4.8 mtr (16 foot)	1-0219241-6	EACH
KIT ASSEMBLY & PACKAGING	8-0795706-1	EACH

OPTIONAL CABLING COMPONENTS		
CABLING SYSTEM COMPONENTS	PART No	UNIT
2RU x 200mm HINGED WALL MOUNT FRAME	2-0795682-2	EACH
4RU x 200mm HINGED WALL MOUNT FRAME	2-0795682-4	EACH
6RU x 200mm HINGED WALL MOUNT FRAME	2-0795682-6	EACH
CAPS FOR HINGED FRAME - 200mm	2-0795683-2	EACH
EQUIPMENT CABINET, FREESTANDING 45RU (2100mm) X 800mm	0-0795695-3	EACH
WALL MOUNT CABINET, 12RU (600mm) x 450mm with BACKMOUNT KIT	0-0795696-2	EACH
2 CORE 62.5/125 FIBRE OPTIC CABLE - BREAKOUT	0-1156502-2	MTR
4 CORE 62.5/125 FIBRE OPTIC CABLE - BREAKOUT	0-1156503-2	MTR
ST FIBRE OPTIC CONNECTORS	0-0503415-1	EACH

MISCELLANEOUS CABLING MATERIALS		
MISCELLANEOUS ITEMS	PART No	UNIT
MINI TRUNKING 16mm x 16mm x 2.4mtr	0-0795706-1	LENGTH
MINI TRUNKING 25mm x 16mm x 2.4mtr	0-0795706-2	LENGTH
TRUNKING 50mm x 50mm	0-0795706-3	LENGTH
25mm x 16mm FLAT TRUNKING TEE	0-0795706-4	EACH
25mm x 16mm TRUNKING INTERNAL RIGHT ANGLE CORNER	0-0795706-5	EACH
25mm x 16mm TRUNKING RIGHT ANGLE CORNER	0-0795706-6	EACH
PVC CONDUIT 25mm x 4mtr	1-0795706-1	LENGTH
PVC CONDUIT 32mm x 4mtr	1-0795706-2	LENGTH
PVC CONDUIT 50mm x 4mtr	1-0795706-3	LENGTH
REDUCER 40mm to 32mm CONDUIT	1-0795706-4	EACH
REDUCER 50mm to 40mm CONDUIT	1-0795706-5	EACH
SWEEP BENDS 25mm	2-0795706-1	EACH
SWEEP BENDS 32mm	2-0795706-2	EACH
SWEEP BENDS 50mm	2-0795706-3	EACH
INSPECTION BENDS 25mm	3-0795706-1	EACH
INSPECTION BENDS 32mm	3-0795706-2	EACH
INSPECTION BENDS 50mm	3-0795706-3	EACH
R/ANGLE INSPECTION BOXES 25mm	4-0795706-1	EACH
R/ANGLE INSPECTION BOXES 32mm	4-0795706-2	EACH
R/ANGLE INSPECTION BOXES 50mm	4-0795706-3	EACH
INSPECTION BOX, 32mm, SQUARE - ONE OUTLET	4-0795706-4	EACH

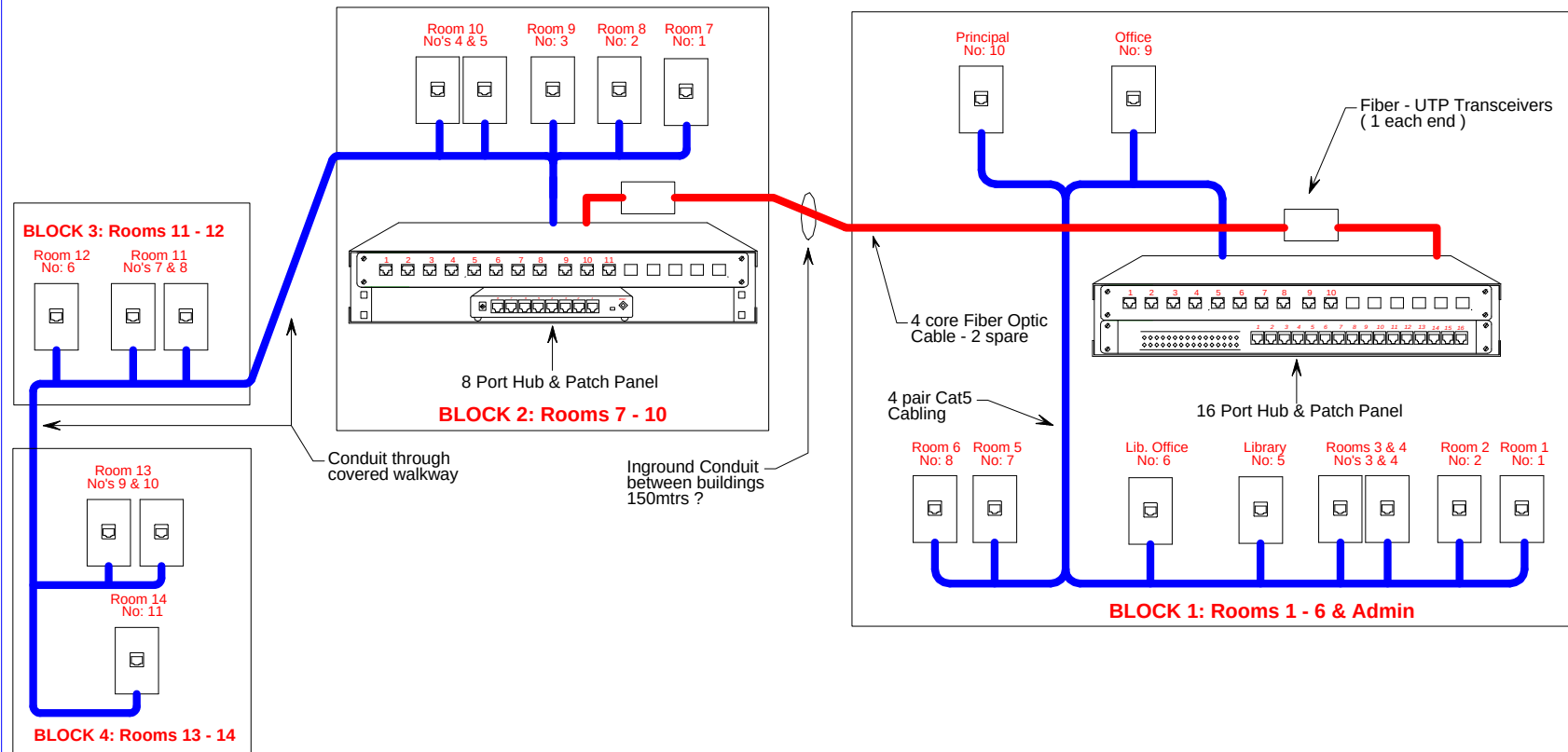
INSPECTION BOX, 50mm, SQUARE - ONE OUTLET	4-0795706-5	EACH
32mm CONDUIT INSPECTION TEE	4-0795706-6	EACH
GALVANISED SADDLES 25mm	5-0795706-1	EACH
GALVANISED SADDLES 32mm	5-0795706-2	EACH
GALVANISED SADDLES 50mm	5-0795706-3	EACH
CONDUIT CEMENT	6-0795706-1	TIN
FAST SCREWS 8 x 1 POZI (Pkt of 500)	6-0795706-2	PACKET
PDL DISPOSABLE INSERTION TOOL	6-0795706-3	EACH
CATENARY WIRE - 50mtr COIL	7-0795706-1	COIL
TY 25MX TYRAP CABLE TIE 186mm	7-0795706-3	PACKET
PVC INSULATION TAPE, YELLOW (10 Rolls per pack)	0-0795910-4	PACKET
TURNBUCKLE (M6 Hook & Eye)	7-0795706-2	EACH
EYE BOLTS - 6mm	7-0795706-4	EACH
CUP HOOKS	7-0795706-5	EACH

LAN ELECTRONICS		
10BASE T NETWORKING EQUIPMENT	PART No	UNIT
OFFICECONNECT 8 PORT 10BASE T HUB	0-0795705-1	EACH
OFFICECONNECT 16 PORT 10BASE T HUB	1-0795705-1	EACH
MEDIA CONVERTER 10BASE T / 10BASE FL	0-0364708-5	EACH
D-LINK 10BASE T ISA BUS NETWORK INTERFACE CARD	2-0795705-1	EACH
D-LINK 10BASE T PCI BUS NETWORK INTERFACE CARD	2-0795705-2	EACH
10/100BASE T NETWORKING EQUIPMENT		
OFFICECONNECT 8 PORT DUAL SPEED 10/100BASE T HUB	4-0795705-0	EACH
OFFICECONNECT 16 PORT DUAL SPEED 10/100BASE T HUB	4-0795705-1	EACH
OFFICECONNECT 8 PORT DUAL SPEED 10/100BASE T SWITCH	5-0795705-0	EACH
OFFICECONNECT 16 PORT DUAL SPEED 10/100BASE T SWITCH	5-0795705-1	EACH
MEDIA CONVERTER 100BASE TX / 100BASE SX	0-0364710-5	EACH
D-LINK 10/100BASE T PCI BUS NETWORK INTERFACE CARD	4-0795705-2	EACH
MACINTOSH NETWORK INTERFACE CARDS		
XSENSE LC 10T MACINTOSH NETWORK INTERFACE CARD	3-795705-0	EACH
ASANTE CS 10T MACINTOSH NETWORK INTERFACE CARD	3-795705-1	EACH
MCI NB 10T MACINTOSH NETWORK INTERFACE CARD	3-795705-2	EACH
XSENSE E450 PCI MACINTOSH/WINDOWS 10T/102 NETWORK INTERFACE CARD	3-795705-4	EACH
XSENSE PCMCIA MACINTOSH/WINDOWS 10T/102 NETWORK INTERFACE CARD	3-795705-5	EACH
XSENSE LEENET-MT APPLE AUI TO 10BASE T ADAPTER	3-795705-6	EACH
ASANTE FNBNC APPLE AUI TO BNC CONNECTOR	3-795705-7	EACH
ASANTE TALK-AU connects LOCAL TALK to 10BASE T	3-795705-8	EACH



NetDay Generic Cabling Schematic

Sample School - Data Network Cabling Schematic



What is NetDay?

The idea behind NetDay *isn't* to wire every room in every school. It's a chance to get some network connections in place - that is, to get wiring installed in a few classrooms and a library or computer lab in every school that participates in NetDay. From there, schools can raise money for computers, software, more wiring or whatever they choose.

Right now, school employees, BOT's and many companies are working together to provide planning, hardware and training. NetDay is a catalyst for people to co-operate locally, to enhance the opportunities in our communities and to our children so we all can become more "Technology" aware.

Computer networks offer students and teachers vast resources and exciting opportunities to communicate and work together. Teachers around the world can share curricula on the Internet, and students from Kaitia to Bluff can use the Internet to increase their learning and access to knowledge and resources.

Here's What You'll Be Doing

Before NetDay, schools will work with volunteers and businesses to design cable runs in each school. Each school will receive a NetDay kit containing cable and all the other materials you will need to "Network" the school. Volunteers only need to bring tools and other supplies on NetDay itself. Visit the NetDay Web site <http://www.netday.net.nz> for more information on ordering kits and sponsoring schools.

On NetDay, you'll work in three parts. First you'll run the cables from a central point (Patch Panel) to the classrooms. Second, you'll mount wall outlets and wire the classroom ends of the cables into the jacks. Third, you'll wire one end of each cable to a kind of "switchboard" called a patch panel. After you've installed the cable, it is likely that a professional will test it.

Note: The computers and server are not part of NetDay. NetDay is just for putting wiring in place so that computers can be connected to each other afterwards. Your school must get separate funding for buying and installing computers.

After NetDay, students and teachers will be able to plug computers into the jacks. The patch panel you install will make it possible to connect those computers to each other computers (forming a Local Area Network) and to the outside (linking to the Internet or other Wide Area Network).

Why the Cable You're Installing Is So Special

The kind of cable that NetDay volunteers will install is called Enhanced Category 5 (Cat 5e) Unshielded Twisted Pair (UTP). It's made up of eight colour-coded, twisted copper wires encased in a sheath. It is a state-of-the-art cable that high-speed networks in most commercial businesses run on. If Category 5e cable is installed according to certain specifications, computer data can travel over it at high speeds. It's said to have high bandwidth.

This cable will let students and teachers in different classrooms send one another e-mail and share text files. Through the Internet, it will also help connect the students and teachers with knowledge, resources and other students and teachers all around the world.

In addition, Category 5e cable's high bandwidth will let students and teachers within a school exchange and view one another's pictures and movies. (Generally, when pictures and movies are translated into digital format, they make relatively large files that can't travel well over low-bandwidth cable). And finally, schools wired with high-bandwidth cable won't suffer a bottleneck in the future, as bigger and bigger chunks of data become available over the Internet. Phone companies around the country are now replacing old phone networks with high-bandwidth cable.

Category 5 Cable vs. Enhanced Category 5 Cable



The difference between Standard Category 5 (Cat 5) cable and Enhanced Category 5 (Cat 5e) cable is that Cat 5e is what we call a "PowerSum" rated cable. A Cat 5e cabling system provides additional performance margins to help ensure your cabling infrastructure meets the demands of the future applications that are emerging today such as 622-Mbps ATM and Gigabit Ethernet. What this means is that multi-pair protocols that are emerging now, such as Gigabit Ethernet and 622 ATM, will operate on Cat 5e cabling infrastructures where as we can only say that these may operate on standard Cat 5 infrastructures (this issue is still being debated). For these new protocols to operate on a standard Category 5 platform each circuit would have to be independently verified and no guarantees could be given.

LAN requirements today call for Category 5 platforms as a minimum infrastructure to meet Ethernet Local Area Network demands. By installing Enhanced Category 5 cable you will not only meet but also exceed these requirements. For Telecom NetDay 2001 we will install Enhanced Category 5 cable between the patch panel and the wall outlets and supply Enhanced Category 5 patchleads and flyleads for interconnection. This will allow the schools to run 10Base T, 100Base T, 155Mbps ATM and Gigabit Ethernet amongst other protocols.

It is Tyco Electronics professional opinion that Enhanced Category 5 is the minimum entry level that should be considered for all new cabling systems being installed today.

Suggested Tools and Supplies

You won't need all of these tools and supplies - just some, depending on which options you use for running cable and mounting jacks. Cable installation volunteers should wear long-sleeved shirts and long pants.

- | | | |
|------------------|--------------------|--|
| •safety glasses | •fish tape | •screwdrivers: slotted and Phillips/POZI drive |
| •step ladder | •side cutters | •hammer |
| •extension cords | •long nose pliers | •permanent ink marker |
| •drill and bits | •punch tools | •tape-style labeller |
| •pull string | •adjustable pliers | •work gloves |
| •electrical tape | •utility knife | •dusk mask |
| •cable ties | •work cap | •torch |
| •keyhole saw | | |

Safety

Safety is Paramount and takes precedent in all aspects in all situations

Protect yourself and others by following these basic safety guidelines.

Wear safety glasses. If you're working in a crawl space or above a suspended ceiling, you never know what might fall from above or what you might lean into in the dark.

Use common sense with ladders. Don't stand on the top step. Don't over-reach, move the ladder as you work. Make sure that anyone on a ladder has a spotter at all times.

Wear protective clothing. Long-sleeves shirts and pants will protect you from minor cuts and from materials you don't want next to your skin, like fibreglass. Don't wear loose clothing.

Don't be careless when lifting. Bend your knees and keep your back straight. Don't be shy about getting help if you need it.

Don't use power tools unless you know how to use them. If you use a saw or drill, work from a stable position. Watch out for lengths of extension cord that are easy to trip over. Don't leave tools lying in places where someone might trip over them.

Beware of electrical cable. Category 5e cable systems, like phone wire, carry low-voltage signals instead of high-voltage power, so they don't pose the fire risks that high-voltage (power) cable systems do. Nevertheless, you'll probably be working near power cables. Don't touch it, especially in ceilings and walls - you never know when it might be live. Know where the nearest fire extinguisher is.

Know local code. Building codes may prohibit drilling or cutting holes in firewalls or ceilings. Also, some parts of a building may contain materials like asbestos or PCB's that must be handled only by trained technicians. Check with your site administrator to be sure that you don't compromise safety in the building. If you find damaged insulation, don't run cable in that area. If you do drill through walls, you may need to fill the holes completely with a noncombustible patching compound.

Safety in Walls, Ceilings and Attics. Firstly, turn off power to all circuits that might pass through the wall you will cut or the ceiling or attic you will work in. Wires often pass through one area on a building on the way to another. If you have any doubts about what's inside a wall or ceiling, shut off all power.

Before starting work in a suspended ceiling, carefully lift a few tiles and look around at what's above the ceiling tiles so that when you're working you know where ducts and wiring are.

If you're cutting into a wall, to avoid damaging anything when you cut, use short gentle strokes.

Planning the Cable Runs

The best way to begin planning cable runs is with a site plan. Try to find one with as much detail as possible. If you can get hold of a computerised version, so much the better - it will provide for easier updating as your network grows.

As you map out the runs - from the patch panel to the wall outlets in each classroom - you must consult with the person who manages facilities at your school to be sure you're not damaging the buildings or putting yourself, other volunteers, school employees or students at risk.

Cable Routing Basics

Firstly, you'll route your cables from the patch panel to the exact places in the classrooms where you'll install the jacks.

In order to install cables easily through confined spaces or suspended ceilings it is useful to have a length of 20/25mm PVC conduit available to use to span relatively long distances at one time. The cable loom can be fastened to one end of the conduit with electrical tape and be pulled through with the "pole". It is best to have two people doing this, as it is important to ensure the cables do not snag or kink as they are being pulled through.

Use a relay system - passing the leading end of the cable from one person to the next, and so on - to get the cable from one end of each run to the other. We'll show you several different ways to mount cable along walls and route it through suspended ceilings and inside walls. Your school's facilities administrator is the key person in deciding on the best way to route cable at your school and exactly where to route it.

These instructions show how to route cable simply and safely in many situations. They provide for cable routing only within a building, not between buildings. Discuss these instructions with the person who manages facilities at your school. See the NetDay "How-To Guide" <http://www.netday.net.nz/howto.html> for more information on doing a site survey and planning wiring at your school.

Do's

- Do** make the longest run first, so that you can take advantage of the pull string on the shorter runs.
- Do** run cables straight and free of kinks with gentle bends for any change of direction.
- Do** run cables point to point in one continuous length without any joints in the run.
- Do** protect cables where they pass through or over sharp edges, holes etc.
- Do** make a schematic diagram showing where the cable runs are and numbers of the classrooms they go to. Later, when you wire the patch panel, this plan will tell you what order to position the cables in.
- Do** use cable ties at regular intervals no greater than 250mm apart to clip cables to the catenary wire.

Don'ts

- Don't** cut unlabelled cable. Label cable before routing it or you'll lose track of which cables go to which classrooms.

- Don't** label cable "Ms. Scholl's classroom." Instead, use a label that will be understandable to someone years later, such as "RM. 103".
- Don't** plan runs longer than 90 metres.
- Don't** joint any cable between the patch panel and the wall outlet.
- Don't** allow cable to be stretched, pinched, kinked, walked on or have any other undue stress or tension applied to the cable.
- Don't** tie cable ties too tight - they should be able to slide a little.
- Don't** cut corners with cable - leave ample slack. A few feet of cable costs a lot less than the time it takes to redo a cable run because of cable lengths being too short or cable being stretched. When you wire the jacks and patch panel you should have enough slack to reach the floor and extend another 2 or 3 feet at both ends of the cable. In addition, it's standard practice to leave a service coil - a few extra feet of cable coiled up inside the ceiling or other out-of-the-way place.

Routing the First Run of Cable

1. Label the end of the cable you are running. Write the label on the cable sheath. Use a permanent marker that won't rub off easily. Label the cable three times, about 2 feet apart, so that you won't lose the labelling if it rubs off or if you cut off some of the sheath later when you're wiring up the ends. Then label the box from which the cable is being extracted from with the same number.
2. Using electrical tape, tape together the cable ends and the end of a pull string. Tie a few half hitches around the cables with the pull string before taping, and use plenty of tape. Skimping on tape could cost you time later if the string or cables pull out.
3. Pull the cables and pull string - along the run. Allow enough cable to reach all the way to the jack locations in each classroom, plus enough slack to reach the floor and extend another 2 or 3 feet.
4. **DON'T CUT THE CABLE YET.**
5. Go back to the central point. Write labels on the cable just inside of where you want to cut it. These labels will correspond with the label you wrote on the box at the beginning.
6. All right, NOW take out your side cutters and cut the cable and pull string. Now the cable is labelled at both ends.
7. Cross out the label on the box so there is no possibility of confusion during the next cable run.

Installing Catenary Wire

Where cabling is to be installed in ceilings or under floors it is important that the cable loom be supported correctly. The easiest way to achieve this is with the installation of a catenary wire support system. These are simple wire runs along which cables can be secured with nylon cable ties.

Use 2.6mm PVC insulated galvanised wire for the catenary system. The wires should be run parallel to the main axis of the building and can be fixed securely to the building structure. It is recommended that turnbuckles be used at one end of each run to provide adequate tension. The catenary wires should also be supported at approximately 2mtr intervals to prevent sagging. This is completed by utilising “cup hooks” screwed into the ceiling rafters or floor joists and twisting a short length of catenary wire around the cup hook and the catenary wire that will support the installed cables.

Separation of at least 300mm should be maintained between the catenary wiring and any parallel power or lighting circuits and from fluorescent light fittings.

The cabling should be tied to the catenaries with nylon ties at intervals of 200mm. Care should be taken not to over tighten cable ties as this will distort the cable form and may affect data transmission performance.

If your school has an attic or suspended ceilings, you can route cable there, out of sight.

Don't lay cable on top of a suspended ceiling. Utilise catenary wire and cable tie your cables to the catenary wire. A long length of 20/25mm conduit can be used to get cable across a ceiling quickly. For example, in a suspended ceiling you can lift a tile where the cable enters a room and use a piece of conduit to get the cable to the other side of the room in a couple of steps. Without conduit you'll have to open up the ceiling every couple of tiles to get the cable across. After the cable has been run go back into the ceiling and tie the cable to the catenary wire every 200mm.

Handle ceiling tiles carefully with clean hands to avoid marking them or breaking off corners. Air Conditioning ducts may prevent you from working above some tiles.

Whatever work you do in a ceiling, watch out for lights, electrical conduit, water pipes and mechanical equipment.

Mounting Cable in Surface Mounted Trunking

Another way to route cable is to enclose it in surface mounted trunking with a removable top. Decorative trunking comes in various sizes. You can use it to enclose cable on the wall inside a classroom.

Surface mounted trunking should run at right angles or parallel to walls and ceiling surfaces and should be positioned where possible in the corners of rooms or other unobtrusive locations. Horizontal runs where practical, should be at skirting height and not ceiling height.

Made of plastic, surface mounted trunking is fixed to the walls with screws. Once you've mounted the raceway, lay the cable into it and close the cover.

You may be able to lay cable in existing trunking. Consult your facilities manager. If there's existing trunking at your school and it contains power cable, you can't lay Category 5e cable in it. Power cable emits electromagnetic fields that interfere with data transmission.

It is better to use factory produced bends and T's rather than to attempt on site mitreing of capping.

Installing PVC Conduit

If it necessary to install PVC conduit as part of the NetDay system the following table will assist in planning your cable runs:

Conduit Size	Max. Number of cables (no bends)	Max. Number of cables (with bends)
20mm	4	2
25mm	7	4
32mm	12	6

Approx. OD of Cable Sheath = 5.6mm

Attempting to force too many cables through a conduit can damage or distort the sheath and degrade the data transmission properties. Ensure you use sweep bends and not right angles for changes of direction and also install inspection junctions at regular intervals e.g. no greater than 12mtr's apart.

All conduits should run at right angles or parallel to walls and ceiling surfaces and should be fixed to the building with the appropriate sized saddles evenly spaced at intervals not exceeding 900 mm vertically and 600 mm horizontally.

Any conduit that is installed externally must have all joints sealed with "conduit cement" (glue).

Mounting Cable on Walls

The simplest way to mount cable is to attach it to a wall. Use this method only where the cable will be out of the way of being bumped, pulled or interfered with. Corners between walls or between a wall and a ceiling are good places to surface mount cable. Attach the cable to the wall using cable ties fixed to the wall.

DON'T use staples to attach cable to the wall. Because stapling is likely to pinch or crimp the cable, you will risk causing data to have transmission problems. Stapling does not conform to the EIA 568 specification for installing Category 5e cable.

Fishing Cable Through a Wall from Above

If your school has a suspended ceiling or an unfinished attic, you can probably fish cable from there to jacks inside the wall immediately below.

Find the wall's top plate and bore a 3/4 inch hole through it. Thread fish tape through the hole into the wall and have a helper yell when the hooked end of the tape reaches the wall opening. Your helper might need a coat hanger to grab the tape.

Connect cable to the fish tape, then reel in the tape and cable. Once you've pulled the whole run, leave enough slack at the jack end to reach the floor and extend another 2 or 3 feet.

If the fish tape hits something about halfway down the wall, you've probably encountered a dwang nailed horizontally between studs. Studs and joists are typically spaced with 600mm centres. To get the cable through, you'll need to open up the wall there and cut a notch in the blocking. This will have to be plastered and painted afterwards.

Fishing Cable Through a Wall from Below

If your school has a basement with an unfinished ceiling, you can fish cable from there to first floor jacks. Drill a 1/8 inch hole at an angle through the floor next to the baseboard. Shove a coat hanger into the hole, then go to the basement and mark a point under the wall 2 1/4 inches from the hole. At that spot, drill a 3/4 inch hole straight up through the subfloor and wall plate.

You can probably just push cable up through the larger hole to the wall opening. If pushing doesn't work, try fishing from above. Allow enough slack to reach the floor and extend another 2 or 3 feet.

Cutting into Gib Board

First, find out whether there are obstructions behind the spot you have in mind. Bore a small hole, then bend a piece of still wire and insert it in the hole. Rotate the wire in a circle. If the wire hits anything, probe a few inches away.

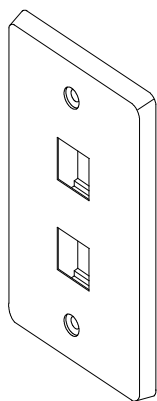
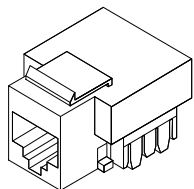
Trace an outline for the opening with the template supplied with the box or bracket or trace around the box or bracket itself. Use a level to be sure the opening is straight. Jab a utility knife through the drywall and then use a keyhole or drywall saw to saw around the outline. Test-fit the box or bracket but don't secure a box until you've brought the cable to the opening.

Cutting into Wood

Wide baseboards and wooden paneling provide sturdy support for boxes. Bore starter holes at each corner of the outline. Bore a second set of holes for the ears at the top and bottom of the box. Cut from hole to hole with a keyhole saw or jigsaw. If you use a keyhole saw, make short strokes so you don't jab the tip of the saw into the other side of the wall. Install a box with flanges to the baseboard with wood screws.

Mounting and Wiring Jacks

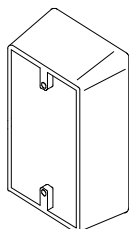
Here, you'll complete one end of the cable connections, in the classrooms. You'll wire the classroom ends of the cable into the jacks and then you'll mount the RJ45 jacks into the face plates.



An RJ45 jack is for making up a connection to Category 5e cable. It consists of colour-coded slots - into which you'll "punch down" wires to make an electrical connection and a female socket. The socket looks like a standard phone jack but has eight pins instead of four.

There are different ways to mount a jack. Surface mounting is easier than flush mounting, which requires that you cut openings in the walls. Consult with your facilities manager to decide which way is best.

Surface Mounting a Jack



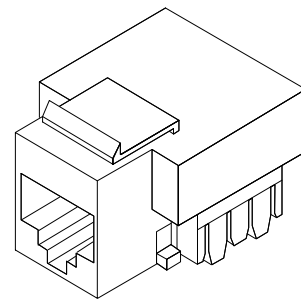
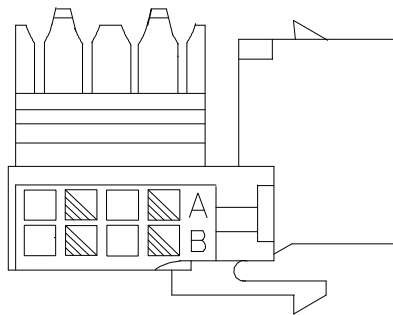
Surface-mounted boxes are simple to install - as the name implies, they mount right onto the surface of a wall, so you don't have to cut into the wall.

These mounting blocks will be supplied as part of your NetDay kit.

Universal 110Connect Panel Mount Jacks

PLEASE NOTE: The termination of all RJ45 jacks and Patch Panels will utilise the punch down pattern for **T568A** wiring.

You may utilise T568B wiring pattern only if your school already has some LAN cabling installed utilising this specification. All new installations should be terminated utilising T568A wiring specification.



Laying Down the Wires in the Jack

Please refer to “Termination Procedures” for both the “110Connect Jack” and the “Tooless Jack” on the NetDay website <http://www.netday.net.nz/project/tech-resources.html> to be read in conjunction with the following:

All terminations should **strictly** comply with the manufacturer instructions and recommendations.

Of all the procedures you’ll be following on NetDay, laying down the wires is one of the most important aspects to do exactly right. The **EIA 568A** specification is the installation standard that makes it possible for Category 5e cable to transmit data at high speeds. If you don’t follow the specification **PRECISELY**, the cable’s transmission properties may be degraded.

When terminating bear in mind the following points:

Do’s

- Do** keep a number plan at each classroom so you can label the jacks appropriately
- Do** remove the cable sheath with the “Rip Cord” and not “ring cut”.
- Do** lay the wires down in the jack exactly as shown. Different coloured wires are NOT interchangeable, and blue wires are NOT interchangeable with blue/white, orange with orange/white etc.

Do keep the wires centred inside the jack.

Do keep the cable sheath within 1/8 inch of the jack.

Don'ts

Don't untwist the wires further than necessary to lay them down in the jack.

Don't twist the wires any tighter than their manufactured form.

Don't strip more cable sheath than necessary

Punching Down the Wires in the Jack

The jacks supplied in your NetDay kit will be either "110" or "Tooless" Insulation Displacement Connection type terminations. These must be terminated **strictly** as per the manufacturer instructions. These instructions can be found at: <http://www.netday.net.nz/project/tech-resources.html>

What Happens at the Patch Panel

The "central point" is the place where the patch panel is housed. It can be a closet, a librarian's office or a corner of the computer lab; it just needs to be out of the way of traffic so that cables and wires don't get pulled out of place accidentally. The patch panel acts like a switchboard. After NetDay, you may use the ports to cross connect the cables coming in from the classrooms (forming a local network) and connect the local network to the outside (linking to the Internet or other wide area network).

Here you will complete the cable connections at the central point by wiring each cable from the classrooms onto a RJ45 jack (same as at the classroom wall outlet) and then mount it into the metal patch panel. Then you'll mount the patch panel on a wall-mounted bracket.

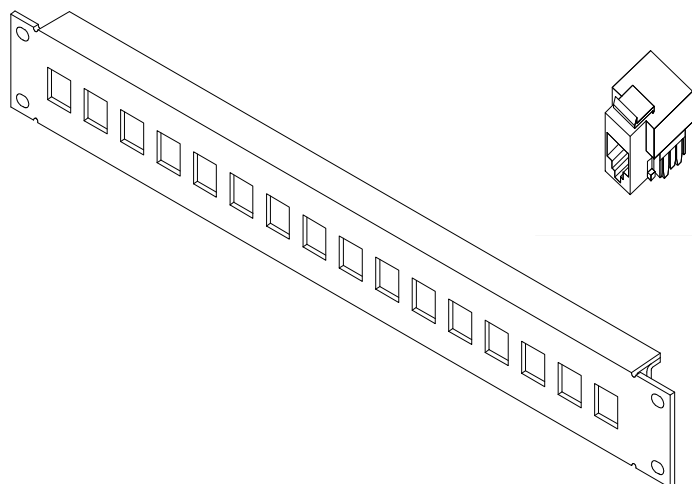
Mounting the Patch Panel

There are two types of Patch Panels being offered for Telecom NetDay 2001. The first is a 16 port unloaded Patch Panel which you can "load" up from 1 - 16 RJ45 jacks. The second is a 24 port "preloaded" Patch Panel" which houses 24 x RJ45 ports - preassembled.

Both Patch Panels are 1RU in depth.

Mount the bracket on the wall, and then mount the patch panel on the bracket with screws. Slide the cable back through the tie-wraps or uncover the raceway as necessary to work the slack back into a wall, ceiling or other out-of-the-way place. On completion fix the top and bottom caps to the patch panel frame.

Mounting the Jacks into the Patch Panel (16 port unloaded)

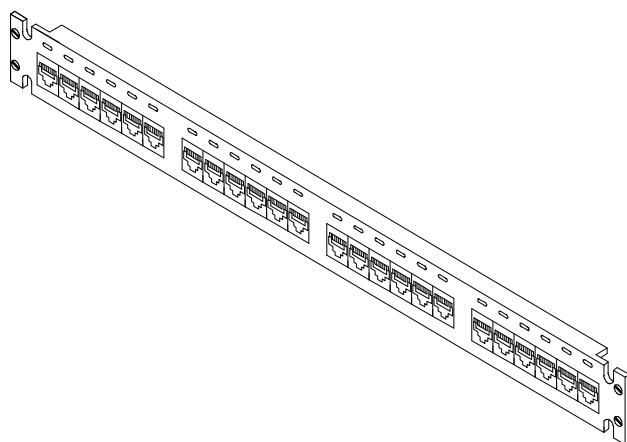


The jacks snap into the patch panel in a similar fashion as they do into a faceplate.

Points to remember are:

1. RJ45 pins must be facing downwards
2. Jacks should be inserted into the patch panel in sequential form from left to right.

Terminating the 24 port Patch Panel



Mount the 24 port patch panel onto the wall bracket in the same fashion as with the 16 port unloaded patch panel then terminate **strictly** as per the manufacturer instructions. These instructions can be found at: <http://www.netday.net.nz/project/tech-resources.html>

Recording Your Work

Label each jack and its corresponding port on the patch panel the same way you labelled your site plan. Remember that you should have laid down the wires on the patch panel from left to right, NOT in the order in which you ran the cables.

What a Test Shows

A professional may come to your school to test the wiring. A professional tester plugs a hand-held cable scanner into each circuit and jack and uses it to test whether the cable transmits data correctly. Below are some common reasons why data flow slows or fails.

Crossed Wires Wires weren't laid down in the wall outlet jack or the patch panel jacks in the right configuration.

Bad Connections Wires weren't punched down securely into one of the jacks.

Damaged Cable Cable was stretched, kinked, pinched, bent too sharply or damaged. If you staple cable to the wall you are likely to damage it.

Electrical Interference Considerations

Data cables shall not be supported on the same catenary wire as electrical services. Maintain a separation of at least 300 mm between a catenary wire carrying data cables and a parallel catenary wire carrying power or lighting circuits. Where data cables cross power cables they must do so at 90°. Separation between data and electrical cabling must conform to all relevant NZ standards.

Separation between power and telecommunication cables to minimize interference

(Including telecommunications earthing cables)

Circuit rating kVA	Separation distance, mm	
	Unshielded power cables	Shielded power cables
≤ 1	300	25
$>1 \leq 2$	450	50
$>2 \leq 5$	600	150
>5	1500	300

For shielded power cables, this distance would only be allowable where there is an interposing insulating barrier or earthed, continuous metal barrier between electrical cabling and telecommunications cabling. The separation for underground cables should similarly apply.

Installing Network Interface Cards

Network Interface Cards are basically “Plug and Play” however it is recommended that NIC’s should only be installed by an experienced Network Engineer.

Remember

SAFETY FIRST

*Good Luck with
Telecom NetDay 2001*