NEXUS

Nexus Routers &
Nexus Faceplates with Single Sockets
Installation Guide

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R E S E A R C H

System design / planning

The **Nexus Cabling Guide c**ontains information on planning your Nexus installation; you should read that guide before starting the actual installation. You are also advised to read the **Installation Notes** at the back of this guide before starting work.

Installation: Introduction

This guide makes no reference to the "old–style" Nexus cabling whieh used grey sheathed cable; if you intend to use a cable of this type (or a length of Nexus Lightweight Cable) to run from a Router or socket faceplate to plug directly into the back of the Nexus server then you should refer to the application note *Non–standard Nexus–Router connections.* This is available from the Technical Support desk at SJ Research.

To operate with Routers, the Nexus disc server needs to be running the server program version 0.61 or later. Check the version of software your server is running, as deseribed in the Nexus Disc Server Manual, version 1.30 (January 1992), and upgrade it if necessary. If you have not previously been sent a copy of this manual, a copy should have been included with your Routers - if not, please contact the Technical Support Desk at SJ Research. Having checked that you are running the correct version of the software, decide which ports of the Nexus server are to have Routers connected. Run the !PartEdit application from the Nexus Utility Software disc to inform the server of the existence of these Routers and to set up private partitions for these machines (see Nexus Manual vers. 1.30).

Please remember that Routers are microprocessor devices which must be handled with care, observing anti-statie precautions (see the slip enclosed with Routers). In addition, never run a Router, or plug in its power supply, with the Router resting on a conducting surface.

Initial testing of the Router

With your Router you will find a short lead with a 4 pin mini-DIN socket at one end and an IDT connector at the other. This is provided to allow you to test the Router, and we suggest you do this before commencing installation. In order to test the Router you will need to use an Archimedes computer fitted with a Nexus interface card and set up to boot from the Nexus disc server, see the Nexus disc server manual for instructions on how to configure the computer to achieve this.

With the server and computer set up correctly, you need to connect the Router to the Nexus server. There is no need to install the Router in a box at this stage - indeed, it would be unusual to do so - but clearly the Router needs to be handled with particular care at this time. Plug the short test lead into the right hand set of connectors on the Router board (viewing the board from the front, with the connectors at the top of the board). Use an adaptor lead or a Server - Client lead to connect this test lead to the server. Make sure you plug the server end into a port you have nominated for use with a Router. Connect the Router power supply to the Router board as described in these instruetions and plug the Router power supply into the mains.

You can now test the Router. Use a drop lead to connect the first socket on the Router to

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the Nexus interface card in an Arehimedes computer and test that the computer will boot from the Nexus disc server (see the Nexus manual for instructions on how to configure the Archimedes computer to boot from Nexus). While the computer accesses the disc server the green LEDs marked 1 and 4 on the Router should flash together.

Repeat this test for the second and third sockets on the Router, taking partieular care in handling the Router when unplugging and re-plugging the drop lead.

Should the Router fail to work correctly please contact SJ Research immediately.

Installation Procedure

SJ Research supplies surface mounting boxes for use with the surface faceplates and with Routers but these boxes can also be purchased elsewhere; see the notes on page 10. In particular, if you are concerned about RF interference it is possible to obtain screened boxes, as detailed on page 10. If you have difficulty obtaining these then please contact SJ Research.

Special tools are required for some parts of the installation. These may be hired from SJ Research; the contents of the full installation toolkit are listed at the end of these instructions. This toolkit also includes test equipment for cheeking your wiring and you are strongly advised to use this toolkit and test equipment; **failure to use the appropriate tools for installation is likely to damage the connectors and give unreliable performance; it may also invalidate your warranty.**

These procedures assume that surface mounting boxes have already been attached to the wall. In the case of trunking installations, it is assumed that all trunking enclosures have been fitted. It is wise to ensure that the IDT connectors supplied with Routers and socket faceplates will pass through any knockouts or other cable-entry holes made in the mounting boxes. This will ensure that Routers and socket boxes can be interchanged at a later date without having to re-terminate the cable.

Installation procedures are given for socket assemblies with and without faceplates and for Routers. Each uses the same procedure for terminating the fixed cables.

1) Cable installation

There are two cable types recommended for Nexus installations, although some other specialist ones will be encountered from time-to-time; please contact the Technical Support Desk at SJ Research if you require information on other cables. These cables should be installed in trunking, and IDT connectors will be used at either end of them to connect them to the Nexus Router / socket assemblies.

Both types of cable use a "crossed over" connection; the sequenee of wiring colours is reversed between one end of the cable and the other. These sequences are referred to as the *A* and *B* sequenees. To ensure success it is strongly recommended that a plan of the wiring is produeed prior to installation, showing all Nexus servers, Routers and socket boxes. Between all components that are connected by fixed cable using the IDT connectors, the cables should be identified on the drawing as having *A* and *B* ends. No IDT terminated cable should have two *A* or two *B* ends but must have one of each. **By convention,** *A* ends are closer to servers and *B* ends are closer to clients; you are much

less likely to make mistakes if you follow this convention. To help ensure correct connection, cable tags are supplied in the cabling toolbox. As you install each cable, tag and mark both its ends appropriately; use an indelible marker to identify which cable is which and whether an end is wired *A* or *B*.

2) Cable termination

It is most convenient if the cable end is prepared after the mounting box has been installed. The mounting box then acts as a "third hand", simplifying the installation.

The IDT plugs have pin 1 loeated as shown in the diagram (**ignore any numbers which may be embossed on the IDT plug**). Note the coloured rib running across the bottom of the connector, the colour of this rib indicates the spacing of the connector pins and should be black on the current release of Nexus connectors - if it is any other colour please contact the Technical Support Desk at SJ Research before proceeding with the installation.
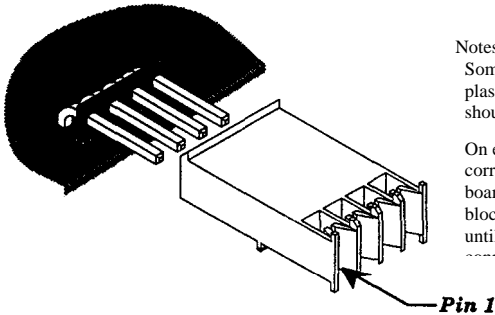
Notes:
Some connector blocks may have a "pin 1" making embossed in the plastic. Such markings vary between different manufacturers and should be ignored.

On early production routers, when the connectors are installed the correct way up they may be a very tight fit against the circuit board. There is no need for alarm -simply ease the connector block up as you press it onto the pins. Push the block on firmly until its face is against the the black plastic of the circuit board connector mounting

Pin 1

Figure 1: The IDT connector block

The two types. of cable generally supplied are referred to as Standard cable and Lightweight cable. Standard cable is a heavier cable, with an overall diameter (nominal) of 10.9mm. It may be used for cable runs (server to client, server to Router, Router to client or Router to Router) of up to 100m. Lightweight cable is a more flexible cable, with a nominal overall diameter of 7.1mm. **It is only suitable for cable runs of up to 50m.** The following descriptions generally apply to both types of cable. *Where there are differences between the two types these will be clearly shown, with italic typeface used for instructions referring specifically to the* **lightweight** *cable.*

Cable Colour Coding

	Standard Cable		*Lightweight Cable*	
	"A" End	"B" End	"A" *End*	*B" End*
Pin 1	Pink	Orange	*Red*	*Yellow*
Pin 2	Green	Black	*Green*	*Blue*
Pin 3	Blaek	Green	*Blue*	*Green*
Pin 4	Orange	Pink	*Yellow*	*Red*

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Prepare the end of the cable

Start by cutting square the cable end. Strip back the outer insulation for 105mm. Take care to ensure that none of the cores nor the braid *(drain wire on lightweight cable)* is damaged in this process. The braid *(or drain wire)* will form the earth connection.

Standard Cable: Use the small cutters to cut back the outer insulation from the end until you find a white terylene rip cord. Use the cutters to make a small slit along the outer insulation close to this rip cord; position the rip cord in this slit and pull the cord back firmly, slitting the outer insulation for the required length. Pliers are useful for gripping the cord for this operation. Peel back the insulation and cut it off.

Either: prise the braid apart, working down from the end of the cable as far you can go, and then twist the wires into a narrow wick. Remove the foil screens from the full lengths of the two cable pairs.

Or: Push the braid back from the end of the cable (it may be possible to push it right back over the outside of the unstripped portion of the cable). Strip off as much of the foil screens as you can (to make the cable pairs more flexible). Use a blunt tool (e.g. the cap from a cheap ball-point pen) to open up a hole in the braiding, as close as possible to the outer insulation of the remainder of the cable, and feed the cores of the cable out through this hole. Remove any remaining foil insulation; pull out the end of the braid to form this into a tight wick.

Lightweight Cable: Use the cable stripper to slit the outer insulation for the required length. Take care when using this stripper to cut round the cable; if the depth of cut on this tool is not properly adjusted this operation is likely to damage the drain wire. The outer insulation can then be peeled back and removed. Remove the foil insulation, taking care not to damage the drain wire. This drain wire will form the earth connection.

Trim the ends of the four colcured cores to be 5mm shorter than the earth wire.

Fit a 95mm length of the appropriate diameter sleeving over the braid *(or drain wire),* leaving 10mm protruding. *With lightweight cable the protruding 10mm is then bent in half, to leave a 5mm stub.*

Now fit a neoprene sleeve over the cable; this will hold the end of the earth screening in place. Note that three sizes of sleeves are supplied with the cabling toolbox; the largest (7mm diameter) is for use with Standard cable, while the smaller (5mm) sleeve is for use with Lightweight cable. (The smallest sleeve is only for use with the thinner grey cable previously supplied for Nexus installations). Apply one or two drops of lubricating fluid to the three closed prongs of the fitting tool. Slide the sleeve over the prongs to their base and squeeze the fitting tool handles to expand the sleeve; it may be necessary to keep one finger on the sleeve to stop it from sliding off the tool. Pass the prepared cable end through the expanded sleeve until the end of the outer insulation is in the middle of the sleeve. Allow the tool prongs to close until they just touch the cable and slide the sleeve off. Remove.the tool and slide the sleeve until the end of the outer insulation is in the middle of it. The insulation over the braid *(drain wire)* should be trapped by the neoprene sleeve. [Ideally, this process require three hands; one to

operate the fitting tool, one to hold the neoprene sleeve in place on the tool, and one to manage the cable. If you have to carry out the installation by yourself, some sort of clamp to hold the cable will prove very useful.] The cable should be left for a few minutes for the lubricant to disperse, as this will fix the sleeve in place.

Now tag the ends of the cable. Tags are fitted over the outer cable insulation, not the coloured cores. Although the tag may be fitted inside or outside the enclosure, fitting the tags inside will make it easier to dismantle / reassemble a Router correctly should this ever be neeessary. Use an indelible marker to write an identifying name on the tags at both ends of the cable, together with "A" or "B" end identification.

Familiarise yourself with the IDT connector pistol

Please read the note on page 8 before attempting to use this tool.

The pistol ensures that fast reliable IDT connections are made but it is important to be familiar with its use. If you are not familiar with its use, you should practise with one or two spare connectors and a piece of cable before installation. Spare connectors are provided in the cabling toolbox for this purpose.

The pistol holds the connector securely whilst it pushes unstripped cable cores between the blades in the connector. The blades cut through the core insulation and into - but not through - the conductor. One core is connected at a time; after each core is connected the pistol automatically feeds the conneetor to the next position, ready for the next core. Connectors are fed into the guide at the side of the tool. Looking down onto the top of the tool, you can see a long slot running across its width. In the middle of this slot and at right angles to it is a shorter one. By squeezing the trigger you can see prongs move into the short slot and then retract when the trigger is released. Notice that the trigger is on a ratchet mechanism and has to be fully operated before it will return.

When connecting cables, **it is very important to check that the connector has, indeed, been passed to the next position before you try to insert the next core.** If the connector cores snag on the tool the connector block will not move freely across the tool. If the trigger is pulled when the connector is not positioned correctly, the tool will jam and both the the connector and the tool may be damaged. A partially-fed connector can be moved by gently pulling the cable. **Do not, <u>under any circumstances,</u> try to do this if the tool jams;** should this happen, refer to the note on page 8.

First try feeding a connector through WITHOUT actually connecting a cable:

Connectors are fed into the tool upside down, i.e. with the black rib that runs the width of the connector facing upwards. The bevelled bar at the front of the connector faces downwards, with the blades in the connector, visible through slots in the plastic facing towards you. Feed the connector into the tool **FROM THE LEFT** until the first blade set aligns with the short slot in the top of the tool. 'Squeeze the trigger all the way and watch the prongs enter the blade set. Release of the trigger; the prongs retract and the connector is automatically fed to the correct position for the next connection. Repeat this for the remaining three positions. The tool does not completely eject a completed

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connector, which has to be removed by hand.

Now try making a test connection with a short piece of scrap cable and a spare connector. It may take one or two attempts to get used to the tool but it is well worth the effort.

Fit the IDT connectors to the ends of the cables

For each termination, **examine the tag to check for "A" or "B" wiring.**

Insert the connector into the tool, as before, from the left. The first set of blades that are presented for termination in this way always correspond to pin 1. Take the appropriate prepared core end (see table on page 3) and push it into into the short slot of the tool as far as it will go. Squeeze the trigger all the way and release. The connector is now in position for the next core. Repeat until all are done. DO NOT try to put the drain wire or braid into the connector!

Examine the IDT connector, make sure that each cable core is pushed fully into both blades of its connector. Check with the table on page 3 that the cable cores are, indeed, connected in the correct order. If a connection is wrong in any way, cut it off and install a new IDT connector block; never try to re-use an IDT connector block. **The cable is now terminated and ready for connection.**

3a) Connection to socket box faceplates

The socket faceplate is supplied as a connector circuit board assembly with a faceplate.

a) Prepare the cable as described above.

b) Slide the IDT connector over the pins at the rear of the circuit board. On early issue boards (PCB 1050 without an Issue Number printed on the board) if you hold the board with the mini-DIN socket facing you the black coloured bar will be above the connector; i.e. facing towards you. On all other boards the connector goes the other way round; i.e. viewing the board from the side with the mini-DIN plug the black bar on the connector block will face away from you. (See *Figure 2.*) These variations have no effect on performance.
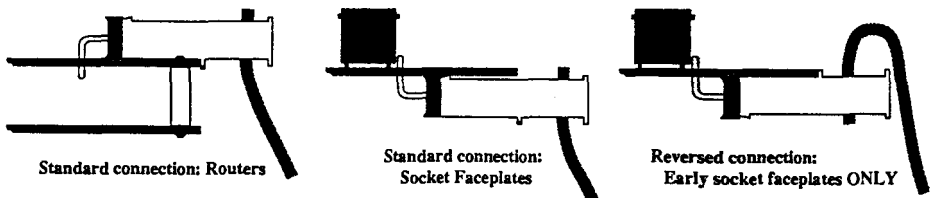

Standard connection: Routers

Standard connection: Socket Faceplates

Reversed connection: Early socket faceplates ONLY

Figure 2: Cable Connections to circuit boards

c) Now clamp the braid or drain wire. Current boards may be supplied with either of the following two means of securing these:

(i) Ring Clamp: Loosen the fixing screw and insert the twisted braid *(or drain wire)* beneath the washer. Then tighten the screw to secure the connection. **Do not over-tighten.** When using Standard cable you may wish to cut off some strands of the

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braid before securing it in this way. With standard cable, it may help if you use a pair of pointed-nosed pliers to hold the cable in place during this operation.

(ii) **Bar Clamp:** Loosen the two screws to allow the braid or drain wire to be passed between the bar and COPPER S1DE of the circuit board. Tighten the screws to secure. **Do not over-tighten.**

d) Insert the faceplate mounting screws through the holes in the faceplate and slide the plastic sleeves provided over them.

e) Now slide the assembled circuit board over the two screws.

f) Finally offer the whole assembly to the mounting box and secure it with the screws. The plastic sleeves will be compressed by this operation.

3b) Connection to socket assembly without faceplate.

This is intended for trunking applications. A template is available from SJ Research to act as a drilling guide; if further copies are needed you are advised to photocopy the template supplied, ensuring that the distances marked on it are preserved.

The circuit board has two sets of holes. The outer pair comply with the British Standard for single mounting boxes; if the board is too wide for your installation they may be cut off and the inner pair of mounting holes used instead. Note that insulating spacers should always be used to prevent the mounting screws from coming into eontact with any part of the circuit board. In other respects, assembly and installation is as for the units with faceplates described above.

3c) Connection to Routers

Routers are two-board assemblies supplied with a faceplate, IDT connectors and mounting screws. They are intended to be fitted into Router surface mounting boxes, or alternatives as described on page 10; these boxes should have been installed prior to fitting the Router. With the faceplate removed, the correct orientation is to have the eireular mini-DIN soekets facing you with the green light emitting diodes below them. Routers accept up to four Nexus cable links; one from the server (or, with Nexus networks, another Router) and up to three for connection to client computers. The client computer links are equipped with both IDT and mini-DIN connectors, while the fourth link only has an IDT connector. For the three computer links , a connection should be made to the IDT connection **or** the front facing mini-DIN, **never both.** The IDT row is intended for connection to fixed cables while the mini-DIN row is for connection to client computers using a Nexus drop lead. The server link will always be connected via an IDT connection; this is the right–hand IDT connection when the Router is orientated as described.

The IDT connections are made by pushing the completed IDT termination onto the pins. The braid wick or drain wire is clamped into the closest earthing block; **do not over-tighten** the screws in the blocks. The blanking caps supplied should then be fitted over any mini-DIN sockets that are not going to be used; i.e. those where the link is being connected via the corresponding IDT connector. By convention, IDT connections are made from the right–hand end of the Router until no more are

available. In this way, mini-DIN connections through the front panel will be grouped towards the left. Other than this, the allocation of client links is arbitrary.

Having connected the IDT connectors for the Nexus wiring, it is necessary to connect the power supply lead. Feed this cable into the Router's mounting box and push the IDT eonnector onto one of the two pairs of connectors at the bottom left of the Router board. In some situations, you may find it necessary to cut the cable just beyond the moulded strain relief bush in order to pass the cable into the Router mounting box. In this case, feed the cable into the box and terminate it with the 2 pin IDT conneetor supplied. This is fitted in exactly the same way as the IDT connector blocks are fitted to the Nexus cables. It does not matter which core of the power supply lead is connected to which terminal, or which way the block is connected to the Router board.

The completed Router is then fitted into the mounting box in the same way as socket boxes are fitted, using the compressible plastic sleeves over the screws. However, you are advised to test that the Router is working correctly before assembling it into the mounting box. When fitting the front panel, take care not to dislocate the blanking caps. As the completed assembly is offered into the mounting box, the cores of the fixed cables should be laid in the channel between the cut outs in the two circuit boards and the side wall of the mounting box. Tighten the front panel fixing screws; as you do, make sure that the green LEDs fit into the holes in the panel. You can now plug drop leads into any of the front panel connectors which are being used.

Important Note: IDT Connector Pistol

This tool is robust and very simple to use. However, it is possible to jam a connector block in the tool. If this should happen, examine the tool. On one side of its handle you will find a small slot-headed screw with an anti-clockwise arrow marked around its circumference. Insert a suitable screwdriver in this, and turn in the direction of the arrow. This will release the ratchet on the tool's trigger, allowing you to remove the connector block from the pistol. If this screw fails to release the trigger, or you are unable to free the connector bloek, contact the Technical Support Desk at SJ Research. **The pistol requires minimal effort to operate, and may be damaged by excessive force -** if the tool is "on hire", any such damage will be chargeable. **Never apply excessive force to the trigger of the pistol.**

Nexus Cabling Toolbox

This toolbox is available on hire for users installing Routers and connector faceplates; the hire charge includes necessary use of the items listed below as 'expendables'. You <u>must</u> use the IDT pistol included in this toolkit for connecting the Nexus cables to the IDT connector blocks; failure to do so is likely to lead to to damage to the connector blocks and poor connections and **<u>may invalidate your warranty on the equipment concerned.</u>** It may be possible to make alternative arrangements for schools who feel the toolbox is not appropriate to their needs - contact the Technical Support Desk at SJ Researeh to discuss your requirements.

The Toolkit contains the following items:

Tools:

IDT pistol [Molex 11-21-5194 pist0l with 11-21-5196 die; available from Farnell Electronic Components under order codes 147-126 and 147-128 respectively.]

This is used to connect fixed Nexus cables into the four-way IDT plugs; also used to connect incoming low voltage A.C. leads to a two-way IDT plug, if required.

3/16 inch screwdriver: Used to secure Router and Connection Box faceplates to pattresses.

1/4 inch screwdriver: Used to secure the cable braid into the earth clamps in Routers.

No. 1 Pozidrive® Screwdriver: Used for securing the earth connection to socket faceplates

8 inch pliers: For general purpose use.

Large Cutters: Used to cut cables to length.

Small Cutters: Used for general insulation trimming.

Cable stripper: For stripping round-jacketed cable.

Sleeving Applicator: Used to apply the Neoprene sleeving used to secure the braid insulation sleeving and insulate the braid at the end of the removed outer jacket of fixed cables.

Digital multimeter: for continuity testing.

Consumables:

Lubrication fluid: Used with the neoprene sleeving.

Neoprene Sleeving (black): Used for braid retention and insulation; 3 sizes supplied.

Heat shrink sleeving: To insulate the earth connection on Standard Cable at each IDT termination. It does not need to be "heat-shrunk".

PVC sleeving: For insulating the earth connection on Lightweight Cable.

Cable Identification Ties: Thirty five are supplied with each kit despatched, being sufficient for a twelve client installation plus a few spare.

Spare IDT Connector Blocks: For practice in using the IDT Pistol.

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Housings for Routers / socket faceplates

Routers and socket faceplates will normally need to be installed in suitable mounting boxes. These can be purchased from SJ Research; the following notes are provided in case you wish to obtain these boxes elsewhere. While this information is offered in good faith, we cannot possibly test all available boxes and so **we can accept no responsibility for the accuracy of the information given.** If you are intending to purchase boxes from a supplier other than SJ Research we strongly advise you to obtain samples of both single and dual gang boxes to test their suitability before ordering large numbers.

The boxes used should meet the British Standard for mounting boxes (i.e. those supplied for 13A sockets, sometimes referred to as 'Pattress Boxes'). Suitable boxes for use with socket faceplates are available from Delta, MK, Ashley Rock, Marshal Tufflex, etc. With the dual gang boxes required for Routers, not all manufacturers' boxes provide sufficient clearance for the circuit boards - you should check that a Router will fit into a sample box before ordering a large number of boxes.

Socket faceplates require single gang boxes **at least 32mm** deep;
Routers require dual gang boxes **at least 38mm** deep.

If you are concerned about RFI protection you should consider Barendale surface mounted pattress, EMI screened. These boxes have an internal nickel coating for the suppression of radio frequency interference. The Barendale dual-gang box is recommended for all surface mounted Router installations. Being made of A.B.S., these boxes are not provided with knockouts and cable entry holes have to be cut on site. The plastic is relatively soft and is easily cut. Consequently, cable entry can be made from any convenient direction. T**o prevent fouling the Router**, cable **MUST NOT** enter the dual-gang box within the front 25mm of the box depth. Barendale can be contacted at:

> Barendale Ltd.
> Harbour Park
> Harbour Road
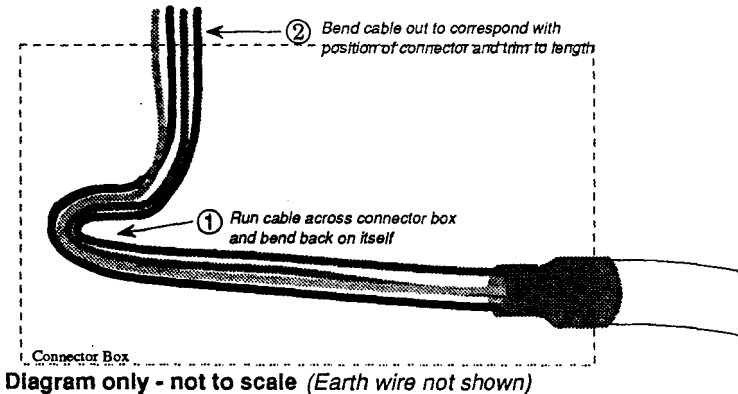> Portishead
> Bristol BS20
> Telephone (0272) 848421.

Where it is necessary to fit Nexus components into shallower boxes, e.g. where the wiring is run in trunking into metal boxes, it is possible to obtain **Mounting Frames** to fit onto the boxes to increase the available depth. Suitable examples are *Ashley Rock MF1* (single gang) and *MF2* (dual gang); these are both 18mm deep. Alternatively, SJ Research can supply, to order, a Router Deep Faceplate. This tough steel enclosure will fit onto an existing double gang flush or surface mounting box to provide a fitting for the Router approximately 50mm deep. In addition to offering maximum protection to the Router, this housing offers considerable RFI suppression advantages.

For installation in trunking, the connectors are available without the faceplate. Mounting hole drilling templates are available from SJ Research Technical Support Desk on request.

Installation Notes

Connecting Cables to the back of Routers

Some early installation sites reported some difficulty in connecting four Standard cables to the back of a Router. The best way to overcome this problem is to fit the Routers into **Router Deep Faceplates (RTDFN03)** which allow ample space and, being metal, provide good sereening and a high level of mechanical protection. However, one way of easing the problem - which may also be helpful when installing fewer cables - is to strip a rather longer length of cable than suggested in these Installation Instructions. Strip back about 180mm of the outer insulation, and prepare the cable braid as described in the Installation Manual (including fitting the sleeving), but don't fit the connector block at this stage. With the cable installed in the mounting box, line the Router circuit board up with the box. Bend the cable as shown, to correspond to the position of this cable's connector, trimming the cable to the appropriate length. *On lightweight cable, it is advisable to leave the earth wire some 15cm longer than the other cores.* Fit the connector block as described, taking care to connect the cables in the correct order.

② Bend cable out to correspond with position of connector and trim to length

① Run cable across connector box and bend back on itself

Connector Box

Diagram only - not to scale *(Earth wire not shown)*

Pulling cables through conduit

The use of a suitable lubricant (e.g. RS 544-077) can greatly ease this process. Never use washing up liquid or other liquid soaps as these can lead to the cable insulation breaking down prematurely. Wipe the cable with a cloth dipped in lubricant before pulling it through the conduit/trunking, or have someone guiding the cable into the trunking holding the cable loosely in such a cloth as it is pulled through. When the cable needs to be pulled up a tube it is often a good idea to insert the cable into the bottom of the tube, and draw it through as far as it will go easily. Then squirt a little lubricant into the top of the tube and continue pulling the cable.

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