



Econet Socket Hub and Terminator Installation Guide

Product Information

The Econet Socket Hub and Terminator boards are designed and manufactured by Ken Lowe and assembled and supplied by BeebMaster, and provide infrastructure for Econet networks. They are designed to be adaptable for use with existing Econet cabling and socket outlets and easily expandable for new and growing Econets.

The product range comprises:

6 Station Econet Socket Hub

A printed circuit board with 5-pin 180 degree DIN socket outlets for 6 Econet stations and two further socket outlets for modular expandability of the network. The expansion socket outlets may be further DIN sockets or RJ45 sockets.

Four mounting holes are provided for support pillars (e.g. RS part 220-771) to be added allowing the Econet Socket Hub to be fitted inside a suitable box (not supplied) or mounted on an Econet Clock box (available separately) or other convenient location. Mounting the Hub will also help to insulate the solder side of the board from the storage surface.

Through Hole Econet Terminator

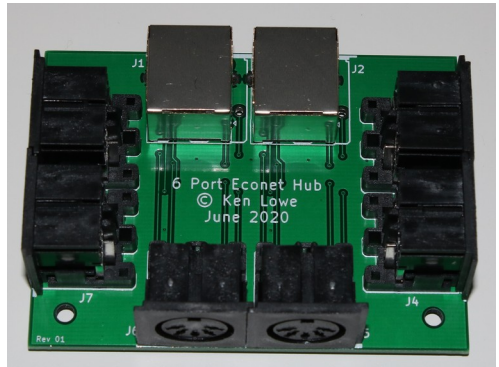
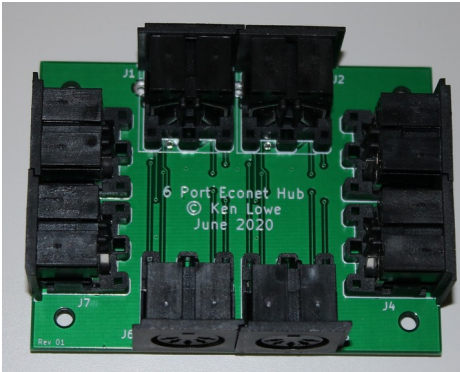
A printed circuit board with through-hole terminating resistors and capacitor. The Terminator is connected to the Econet network using the on-board socket, which may be a DIN socket or an RJ45 socket.

Surface Mount Econet Terminator

A printed circuit board with surface-mount terminating resistors and capacitor. The Terminator is connected to the Econet network using the on-board socket, which may be a DIN socket or an RJ45 socket.

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6 Station Econet Socket Hub



6 port Hub with DIN expansion sockets 6 port Hub with RJ45 expansion sockets

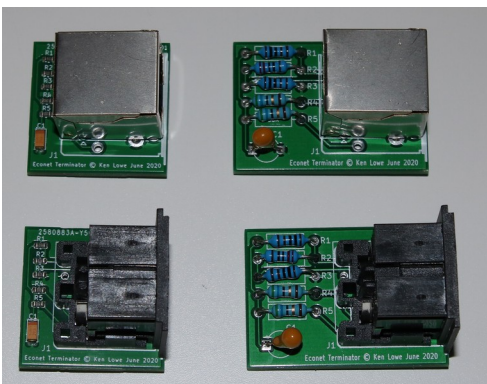
The socket outlets on the 6 Station Econet Socket Hub are numbered from J1 to J8 working clockwise from the left socket on the top edge of the board.

Sockets J1 and J2 are network expansion sockets which should be used to link together Econet Socket Hubs or other types of Econet Socket Box, or to terminate the network or add the Clock.

J1 and J2 may be RJ45 sockets or 5-pin DIN sockets.

Sockets J3 to J8 are six 5-pin DIN sockets for connecting up to 6 Econet stations to the network. Unused sockets may be left empty.

Econet Terminator



The Econet Terminator has terminating components on the board to correctly terminate the Econet cable run when fitted at each end.

The Terminator is attached to a 6 Station Econet Socket Hub by connecting it to one of the Hub's expansion sockets.

Through Hole and Surface Mount Econet Terminators with DIN and RJ45 sockets.

Econet Cabling Characteristics

Econet is a bus network which uses a single length of cable consisting of two Clock lines and two Data lines, shielded and terminated at either end. Signals must only be able to traverse two points on the network by a single route: Econet is not formed of a loop or ring of cable, nor are spurs or T-junctions permitted, except to take Econet station leads to network stations.

The cable is dual twisted pair cable with shield, with one twisted pair carrying the two Clock lines and the other the two Data lines.

For linking the 6 Station Econet Socket Hub to other Hubs or socket boxes, it is recommended to use suitable twisted pair cable at the expansion sockets J1 and J2.

Econet Station leads, such as those used with sockets J3 to J8, are not normally made from dual twisted pair cable. These may be used to link Hubs and socket boxes at the risk of degrading network efficiency and reliability.

Hubs and Terminators with RJ45 sockets may use standard Ethernet patch leads made of 4 twisted pairs.

Econet Layout and Design Considerations

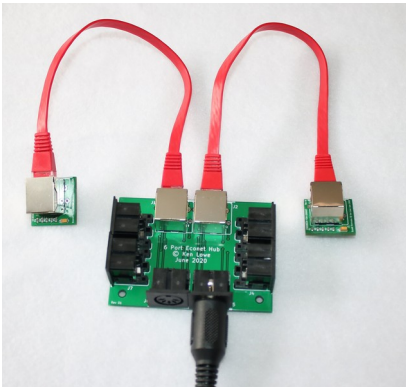
The 6 Station Econet Socket Hub may be used to expand an existing Econet or form a new network.

There is no electrical difference between the 6 Econet station DIN sockets J3 to J8 and the two DIN or RJ45 expansion sockets J1 and J2. Users may therefore choose to alter the designation of “station” and “expansion” sockets on the Hub to suit requirements, as long as the arrangement conforms to the required Econet Cabling characteristics.

Single Hub

Where a single Hub is used for the entire network, it is recommended to terminate the network by treating J1 as the “left” end of the network, and J2 as the “right” end and fitting

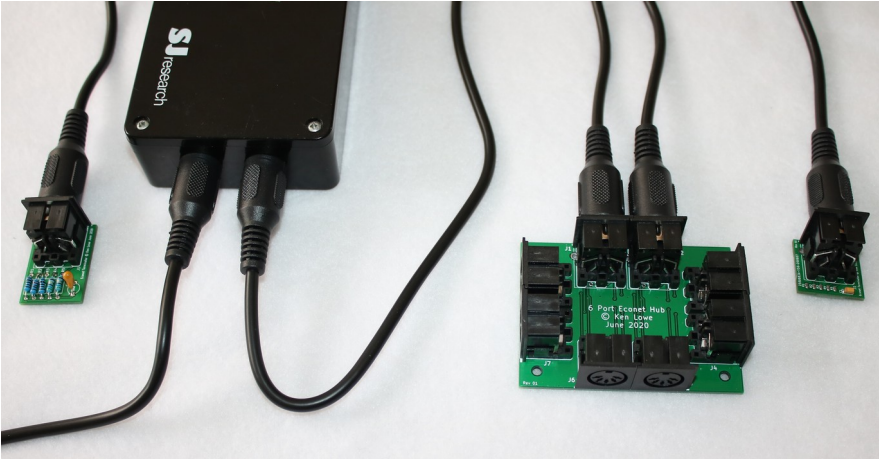
Econet terminators to J1 and J2. The Clock may be connected using one socket only. The remaining 5 sockets may be used for Econet stations.



Econet Socket Hub with RJ45 expansion sockets.

J1 and J2 connect to Econet Terminators via short RJ45 patch leads. The Clock connects with one socket only at J5.

Alternatively, the Clock may be connected to an expansion socket, with a terminator fitted to the second socket of the Clock, and the second terminator to the Hub's other expansion socket. This leaves all 6 sockets free for Econet stations.



Econet Socket Hub with DIN expansion ports

J1 connects to the Clock's right hand socket. J2 connects to a DIN Econet Terminator.

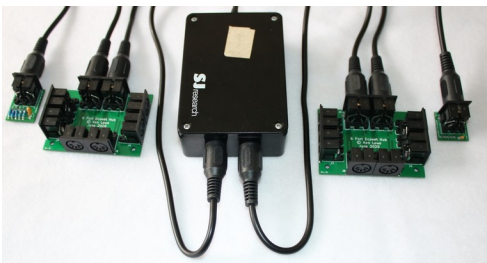
The Clock's left-hand socket connects to a second DIN Econet Terminator

The network may work reliably if only one Terminator is used with a single Hub network, freeing the remaining expansion socket for another Econet station.

Dual Hub – DIN Expansion Sockets

Where two Hubs with DIN expansion sockets are used to form a network, they may be linked together using an Econet Clock. In this arrangement, terminate the network using socket J1 of the “leftmost” Hub, connect the Clock between J2 of the left Hub and J1 of the rightmost Hub, and terminate the other end of the network using socket J2 of the rightmost Hub.

This leaves 12 sockets free for Econet stations.



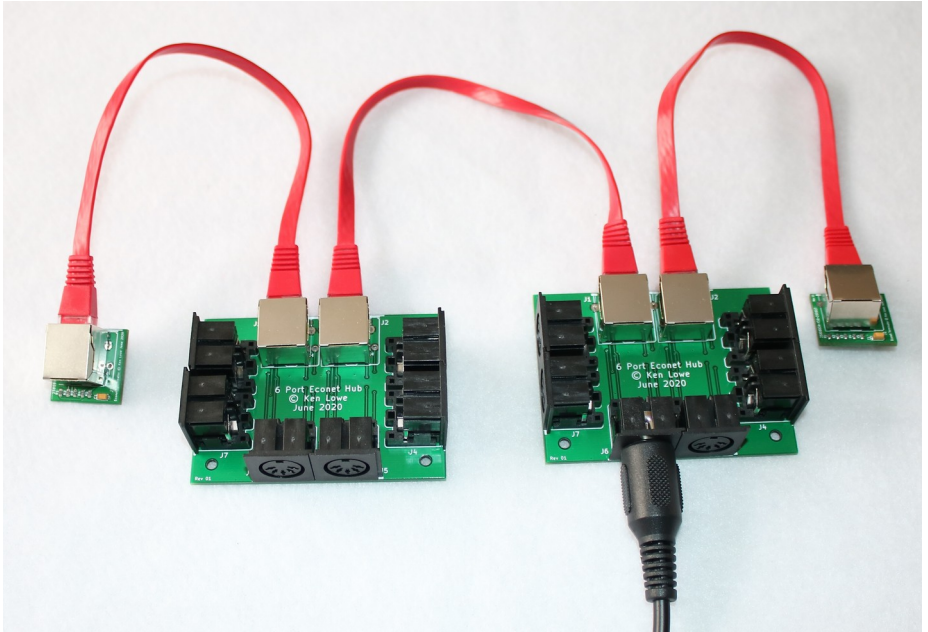
Two Econet Socket Hubs with DIN expansion ports.

The Clock is connected between J2 of the left hub and J1 of the right Hub.

Terminators are fitted to J1 of the left hub and J2 of the right Hub.

Dual Hub – RJ45 Expansion Sockets

Where two Hubs with RJ45 expansion sockets are used to form a network, they may be linked together using RJ45 leads. In this arrangement, terminate the left-hand end of the network using socket J1 of the “leftmost” Hub, connect the two Hubs together with an RJ45 lead between J2 of the left Hub and J1 of the right Hub, and terminate the right-hand end of the network using socket J2 of the right Hub. The Clock may be connected to any of the remaining Econet station sockets.



Two Econet Socket Hubs with RJ45 expansion ports.

The expansion ports are used to terminate either end of the network and to link the two Hubs together.

The Clock connects to any free DIN socket, here shown at J6 of the right hand Hub.

Alternatively, the Clock may be used to link the two Hubs together, for example by connecting between J5 of the left Hub and J6 of the right Hub, and removing the connecting RJ45 lead between the two boxes.

Multiple Hub

Additional Hubs may be added to the left or right by linking the Hubs using the expansion sockets and ensuring that the Terminators are located at J1 of the leftmost Hub and J2 of the rightmost Hub.

Mix of Hubs and Other Types of Outlets

If expanding an existing network, one or more Econet Socket Hubs may be fitted so as to comply with the required Econet cabling characteristics: avoiding spurs, rings or loops and ensuring both ends of the network are terminated.

An Econet network *must not* be expanded by connecting a Hub to a mid-point socket outlet as this would create a spur.

The guidance below may be observed to expand an existing network composed of Acorn or SJ Research twin socket boxes:

Adding a Hub at the End of a Network

Remove the terminator plug or terminating components from the final socket box the end of the network to be expanded. Connect the final socket of the existing socket box to expansion port J1 or J2 of the Econet Socket Hub and add a terminator to the remaining expansion port.

Adding a Hub at a Mid Point of the Network

This will involve cutting the network cable linking two socket boxes at the appropriate point. Remove the cable from the punch-down terminals inside the two socket boxes which have been separated. Add the Econet Socket Hub at this point by connecting the rightmost socket of the left-hand socket box to expansion socket J1 of the Hub, and by connecting the leftmost socket of the right-hand socket box to expansion socket J2 on the Hub.

Terminator Plugs

DIN terminator plugs of the type previously supplied by BeebMaster and SJ Research may be used in place of the new Econet Terminator printed circuit board.

Placement of the Econet Clock

All Econet networks require an Econet Clock. Econet specifications recommend that the Clock is located centrally along the Econet cable run and that it is used to link two halves of a network which are otherwise unconnected.

In a network composed of a single Econet Socket Hub, this is not possible and the Clock should be attached using one of its sockets only following the guidance under ***Single Hub*** above.

In a multiple Hub network, wherever possible, the Clock should be used to link two of the Hubs together as noted under ***Dual Hub*** sections above, or if this is not possible, connected to a single Econet socket only.

Under no circumstances should a Clock be connected to two Econet sockets on the same Hub or socket box as this would create a “loop” which may impair reliability of the network.

Econet Station Requirements

Acorn computers to be used as Econet Stations require an Econet interface, and in the case of computers prior to the Archimedes, a Network Filing System ROM.

Acorn System and Atom machines use their own forms of Econet interface card.

BBC Microcomputers Model A, B and B+ require the interface components fitting to the main board inside the computer, and the NFS or ANFS ROM fitting as a sideways ROM.

BBC Master Series computers require the fitting of an Econet Module daughter board to the computer, and an ANFS ROM fitting as a sideways ROM.

Archimedes, A3000, A4000 and A5000 series computers require an Econet Module daughter board to be fitted to the computer.

The Acorn A4 has its own design of Econet module and cannot use the module suitable for earlier machines.

A7000 and RISC PC computers also cannot use the module suitable for earlier machines. They require an Econet NIC card fitting to the computer. Alternatively, an Econet Module daughter board may be fitted and wired to a module card allowing the computer's NIC slot to be used for an Ethernet card. Ethernet is a different networking system to Econet. Computers with Ethernet interfaces should not be connected to RJ45 Hub sockets from the computer's Ethernet port.

Each station must have a unique station number in the range 1 to 254. However, station number 1 should generally be avoided as it is used as the default station number for new stations from Master Series computers onwards and may interrupt the network if multiple stations with the same number are detected.

Station numbers 0 and 255 may not be used. Station number 254 is generally allocated to the network file server and station number 235 to the printer server. Machines prior to the Master Series assume at start-up that the default file and printer servers are to be found at these station numbers. Master Series computers onwards store the default file and printer server station numbers in their configuration RAM.

Each station is connected to the network by an Econet cable. This is a 5-pin DIN to 5-pin DIN lead in the case of all machines except the A3020, A4000, RISC-PC and A7000 which use a 15-way D-type plug to 5-pin DIN lead, and the Acorn A4 which uses a mini-DIN to DIN lead.

Other Products

BeebMaster can supply many of the other products referenced in this guide:

- Econet Interface Upgrade Kit for BBC Microcomputers
- Econet Clock
- 5-pin DIN to 5-pin DIN Econet station lead
- Level 2 and Level 3 File Server starter discs

Please visit www.BeebMaster.co.uk/BeebShop for more information.

Ken Lowe can supply Econet Modules for Master Series and Archimedes machines here:
<https://stardot.org.uk/forums/viewtopic.php?p=350527#p350527>

Level 2 and Level 3 file servers require a 6502 second processor fitted to the BBC Micro or Master computer running the file server software. These can be hard to come by, but the [PiTubeDirect](#) project provides an emulation solution using a Raspberry Pi.

To get the most out of the Level 3 file server, an ADFS-compatible hard disc is recommended. Again, these are hard to come by but the [Pi1MHzBus](#) project, which includes SCSI interface emulation, provides a solution using a second Raspberry Pi.

Ken Lowe can supply Level Shifter adapter boards to fit between the Raspberry Pi and the BBC micro or Master computer's 1MHz Bus or Tube ports here:
<https://stardot.org.uk/forums/viewtopic.php?f=8&t=18910>