026-1605 Rev 3 9-25-00

Router and Repeater Installation and Operation Manual

COMPUTER PROCESS CONTROLS

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1 Routers and Repeaters

1.1 Introduction to Echelon Networking

CPC's Einstein controllers communicate to their associated controlling devices (CC-100s, TD3s, etc.) and other Einstein controllers using a unique communication and addressing system called **LonWorks,** more commonly called "the **Echelon network**," named after Echelon, the company that created LonWorks. The Echelon network can be as small as one Einstein controller and a few Echelon-compatible devices (or "nodes") or as large as many Einsteins, each with multiple devices.

Wiring for the Echelon network is very specific. All of the nodes must be wired together using a method called **daisy chaining** that connects all Echelon network devices on a single unbroken loop of wire.

A daisy chain segment can only contain a total of 64 devices, or **nodes**. If an Echelon network must contain more than 64 devices, as is usually the case with CC-100, CS-100, and TD3 installations, one or more repeaters or routers must be used to extend the capabilities of the network.

What are Repeaters and Routers?

Routers and repeaters are simply network devices that aid in the flow of communication across an Echelon network. They are necessary only when an Echelon network installation exceeds one or more specifications, such as a maximum total number of nodes or a maximum wire length.

Repeaters are devices that receive network signals in one end and repeat them at a higher strength through the other end. They are sometimes needed in cases where network wiring lengths are excessively high, but are also sometimes used for convenience purposes to extend several daisy chains from a single Einstein.

Routers are like repeaters, except they are also communications filters. A router only allows messages to pass through that are specifically addressed to devices on the other side of the router. All other messages that aren't addressed to devices on the other side of the router are blocked out, thus alleviating the amount of network traffic. Routers are typically used in networks that have a large amount of devices.

1.1.1 Components of an Echelon Network

A **network** is made up of one or more **segments.** A segment is defined as a single daisy chain of 64 nodes or less that connects Einsteins, CC-100s, TD3s and other LonWorks devices in a single unbroken chain. ***Figure 1-1*** shows a small daisy chained segment.

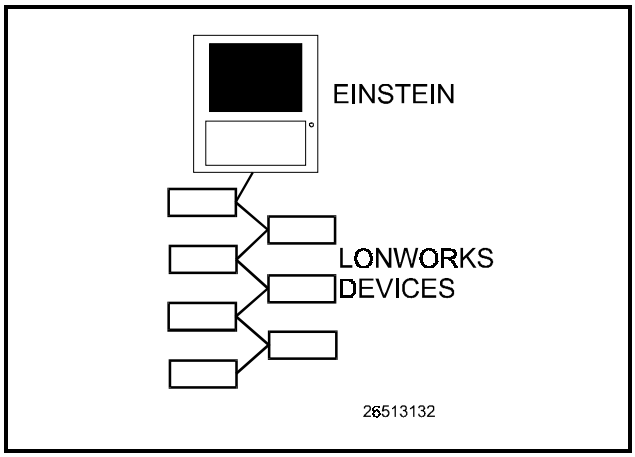


Figure 1-1 *- Small Segment*

A segment may contain one or more **subnets**. A subnet is a group of nodes that includes one Einstein controller and a number of boards/controllers that are associated with that Einstein. For example, a subnet for an Einstein RX controller might consist of an Einstein RX and 12 CC-100s that are associated with Case Circuit applications in the Einstein.

Because segments have a limitation of 64 devices or less, subnets likewise cannot consist of more than 64 devices. Thus, a single segment could be an Einstein and 63 other devices associated with the Einstein.

A **node** is a single device, either an Einstein, a CC-100, an ESR8, or other LonWorks devices. Routers are also considered nodes. A repeater is not generally considered a node, but repeaters do count towards the 64 device limit on a segment.

1.1.2 When To Use Repeaters

You will need to use a **repeater** when you have a segment of 64 nodes or less whose total wire length exceeds the maximum total wire length specification for the Echelon network cable (4592 feet, or 1400 m). A repeater allows you to split the segment into two daisy chains, each of which can be up to 4592 feet in length.

Repeaters can also be useful in cases where it is not convenient to wire all devices together on a single unbroken daisy chain. A **four-channel repeater** can be used to extend several daisy chains from an Einstein, each of which can be as long as 4592 feet in length.

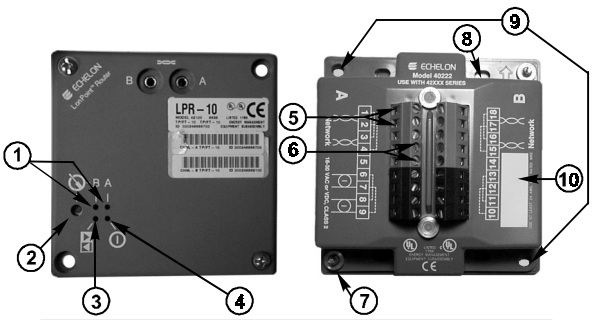
Repeaters do NOT add to the maximum total devices you may have. Adding a repeater only allows you to increase the total length of wire used in your network. To add devices above the 64-node level, you must use routers.

1.1.3 When to Use Routers

Routers are used in installations where the total number of nodes, including each Einstein and all peripherals associated with the Einstein, exceed the 64-node limit. A router allows another 64 nodes to be added to the Echelon network.

2 Hardware Overview

2.1 The Router



LEGEND			
1	SERVICE LEDs	6	TERMINAL SCREWS
2	SERVICE SWITCH	7	THREADED SCREW HOLES
3	ACTIVITY LED	8	MOUNTING HOLES
4	POWER LED	9	MOUNTING HOLES
5	WIRE INPUTS	10	WRITING SPACE

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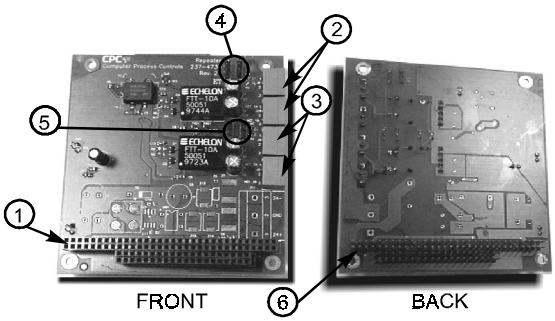
Figure 2-1 *- Router Detail*

An Echelon router (P/N 572-4200) is necessary for configurations numbering more than 63 network devices (the router also becomes a node). The router minimizes unnecessary traffic while also boosting signal strength and expanding the size of the network.

A router does not repeat all information it receives; rather, it sends only those messages that are for subnets on the other side of the router. This keeps all communication that occurs between devices in the same subnet from cluttering up other channels on other subnets.

A LonWorks Router cannot be used to split a subnet. Controllers with the same subnet address must all be located on the same side of a router. If a system needs to increase the length of a segment within a subnet, it should use a **repeater**.

2.2 The Two-Channel Repeater



LEGEND			
1	PC-104 SLOT (FEMALE)	4	TOP SEGMENT TERM. JUMPERS (J8, J7)
2	TOP SEGMENT CONNECTIONS (2)	5	BOTTOM SEGMENT TERM. JUMPERS (J4, J1)
3	BOTTOM SEGMENT CONNECTIONS (2)	6	PC-104 SLOT (MALE)

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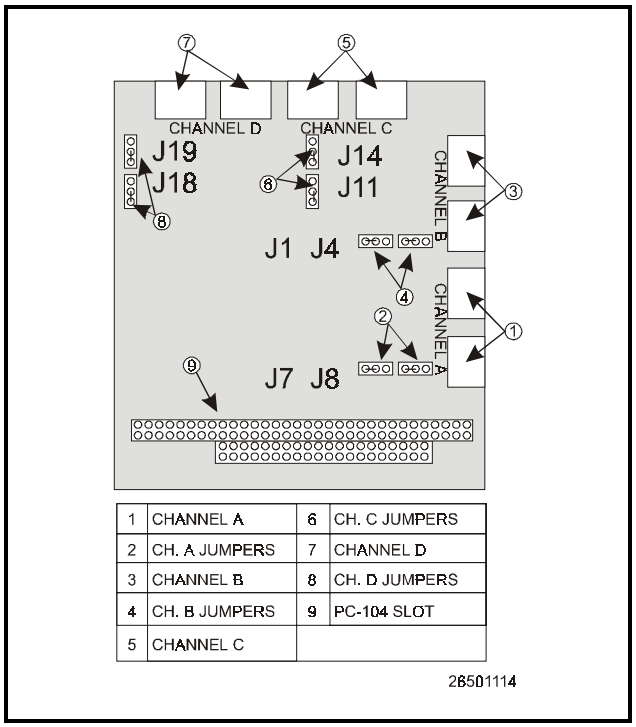
Figure 2-2 *- Einstein Two-Channel Repeater Board*

A **repeater** is necessary whenever an Einstein network has a total wire run longer than the recommended distance. The repeater's function in this application is to simply boost all signals that come across it. As a result, a total wire run that once exceeded the normal limit for Echelon networks is acceptable.

Physically, the two-channel repeater itself may take either of two forms. The internal version of the repeater (P/N 832-1000) is a device that connects directly to the Einstein's PC104 port and is powered by the Einstein. An external version of the same two-channel repeater (P/N 832-1010) is also available for field installations; this version comes in an enclosure and must be powered by its own 24VAC transformer.

The internal repeater board is shown in ***Figure 2-2***.

2.3 The Four-Channel Repeater



1	CHANNEL A	6	CH. C JUMPERS
2	CH. A JUMPERS	7	CHANNEL D
3	CHANNEL B	8	CH. D JUMPERS
4	CH. B JUMPERS	9	PC-104 SLOT
5	CHANNEL C		

Figure 2-3 *- Einstein Four-Channel Repeater Board*

The four-channel repeater (P/N 832-1040) serves the same basic function as the two-channel repeater: boosting signal strength. However, the four-channel repeater is also useful as a means of connecting the Einstein to its associated devices using more than one daisy chain.

With a four-channel repeater mounted in the PC-104 slot of an Einstein, you can run as many as three daisy chain segments out into the field, each of which can be as long as the prescribed Echelon maximum wire length. The fourth channel of the repeater can be used to connect other Einsteins in a separate daisy-chain, eliminating the need to run cable from the field back to the next Einstein.

Unlike the two-channel repeater, the four-channel repeater does not have an external model.

3 Networking Using Routers and Repeaters

Constructing an Echelon network using routers and repeaters is very different than constructing a simple network of less than 64 nodes. Networking with routers and repeaters requires some planning in order to determine:

- How many routers and repeaters are necessary, and
- Where routers and repeaters should be placed.

3.1 Points to Consider

Do I Need Four-Channel Repeaters?

Network layout will be different depending on whether or not you are using four-channel repeaters. Therefore, it is a good idea to decide beforehand if they will be used.

If your network contains a large number of nodes and/or it is spread out over a large amount of distance, you will likely make your network setup easier and cheaper if you use four-channel repeaters in each Einstein. The ability to extend more than one daisy chain from each Einstein gives more freedom to run Echelon cable where it is most convenient, and it eliminates the need to run wire back from the field to the Einsteins.

If your network contains only 2-3 Einsteins and between 64-128 nodes, and the nodes are concentrated in a relatively small area, you may be able to easily construct your network without four-channel repeaters.

Will I Need To Terminate Devices In The Field?

Any daisy-chain segment that ends at a device mounted in the field will need to be terminated. If this device is a TD3 or ESR8, there is no on-board means of terminating the device, and if it is a CC-100/CS-100, the enclosure will have to be opened to set the termination jumpers. If you have any of these devices in your installation, you should obtain one or more Daisy Chain Termination Blocks (P/N 535-2715) to terminate daisy chains in the field.

3.2 Echelon Cable Specifications

CPC specifies only one type of cable for use with Einstein Echelon networks: Level 4 twisted pair, stranded, shielded 22AWG cable. Contact your CPC salesman for information on how to purchase this cable.

Further technical specifications for this cable type are given in ***Table 3-1*** and ***Table 3-2***.

Cable Type	Level 4, twisted pair, stranded, shielded
Wire Diam./AWG	0.65mm/22AWG
Loop Resistance	106(ohms/km)
Capacitance	49(nF/km)
Maximum Cable Length	4592 ft. (1400 m)

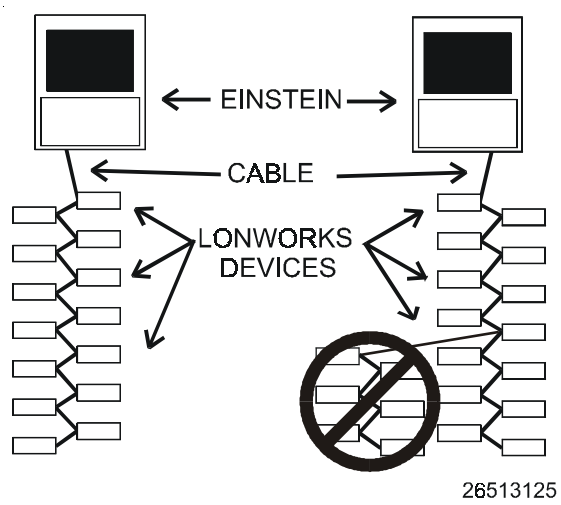
Table 3-1 *- Echelon Network Cable Specifications*

Cable Type	CPC Part Number
1 pair, non-plenum	135-2300
1 pair, plenum	135-2301

Table 3-2 *- Recommended Wiring*

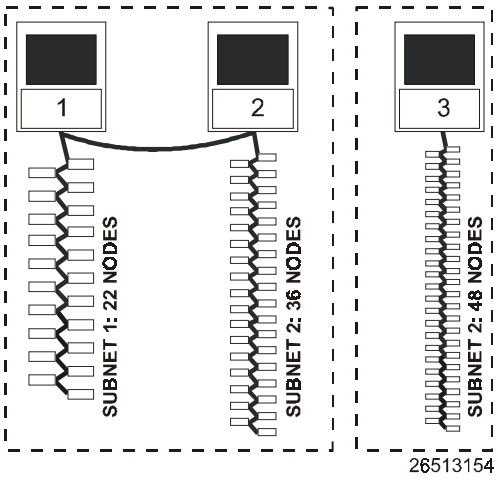
3.3 Networking Without Using Four-Channel Repeaters

1. Connect each Einstein controller to all of the LonWorks devices associated with it using a single unbranched run of wire. This creates a series of individual daisy chains, each of which is its own subnet.



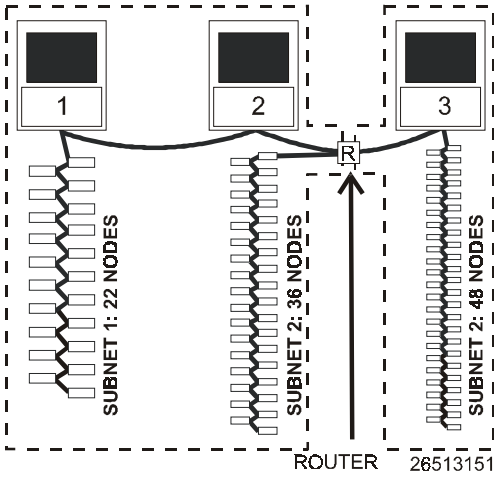
2. Arrange all subnets together in groups of 64 nodes or less. If a group of 64 contains more than one subnet, wire all subnets in the group together into a single daisy chain. This paves the way for placing routers in step 3.

   In the example shown in the figure, a three-Einstein network with 22, 36, and 48 nodes each would form two groups: one containing Einstein #1 and #2 (58 total nodes) and the other containing Einstein #3 (48 nodes). A simple length of cable between Einstein #1 and Einstein #2 wires the entire group together in a single daisy chain.



3. Place routers in between Einstein subnet groups so that each 64-node group is isolated from each other by routers. Routers can be wired in the middle of a daisy chain or at the start of one.

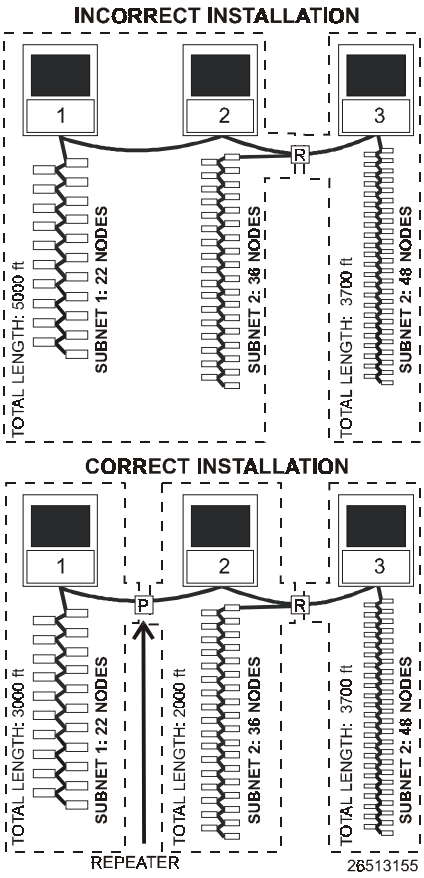
   In the illustrated example, the router is placed between Einstein #2 and Einstein #3 (making two segments), so that the daisy chain on one side of the router has a total of 58 nodes and the other has 48 nodes. One side of the router is placed in the middle of the first group's daisy chain, while the other side of the router becomes the beginning point of Einstein #3's daisy chain.



4. For each daisy chain (i.e. each division of the network separated by a router), measure the **total wire length** used and make sure the distance does not exceed 4592 ft. (1400m).

   If the total wire length is exceeded, a repeater will need to be used to divide the daisy chain. The repeater should be placed so that the segments on either side of it do not exceed the total wire length.

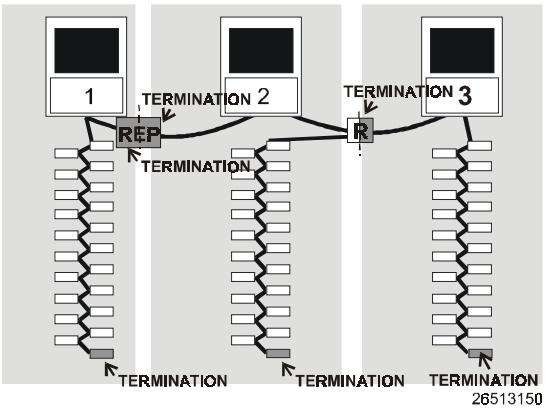
   In the example diagram, the daisy chain connecting Einstein #1 and #2 is 5000 ft. This is above the maximum wire length of 4592 feet, so a repeater must split the daisy chain so that it forms two daisy chains of less than 4592 ft. It is most convenient to place this repeater in between Einstein #1 and #2 using an internal repeater mounted in either Einstein.

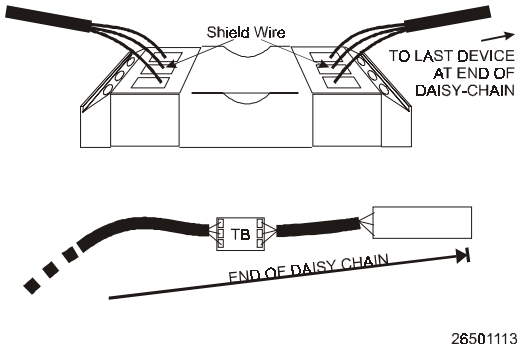


5. For every daisy chain in your network, each endpoint must be terminated. You may do this by either setting termination jumpers on the devices on the endpoints, or by wiring a Daisy Chain Termination Block at the end(s) of the daisy chain.

   Instructions for setting termination jumpers on Echelon devices may be found in the Echelon Network Device Wiring chapter of your Einstein RX or Einstein BX User's Guide.

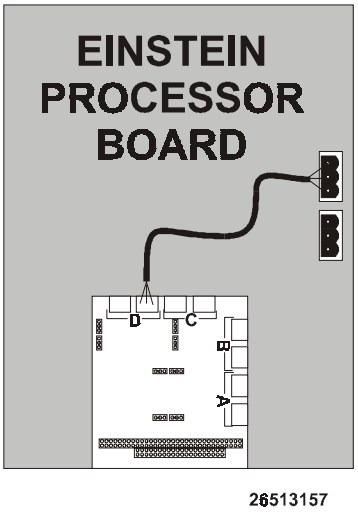
   To wire a Daisy Chain Termination Block to the end of a daisy chain, remove the main Echelon cable from the last device on the network and connect the end to one side of the Daisy Chain Termination Block, as shown in the picture. With a separate length of Echelon cable, connect the other side of the terminal block to the last device on the daisy chain. Make sure the shield wires are connected to the middle terminals.





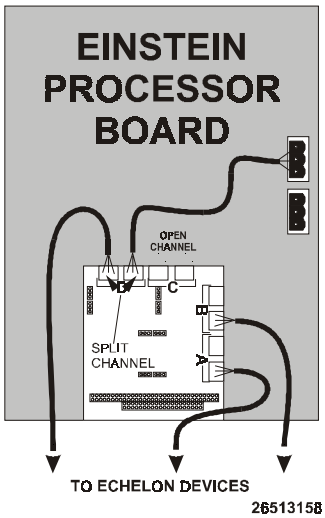
3.4 Networking Using Four-Channel Repeaters

1. For each Einstein equipped with a four-channel repeater, run a short length of wire from Channel D to an Echelon terminal on the Einstein processor board (as shown in the diagram).

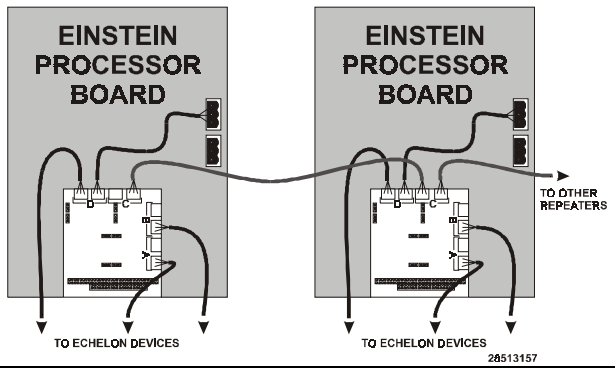


2. Run Echelon cable from channels A and B of the repeater to all the Echelon devices associated with the Einstein. Each length of wire extending from a repeater channel must connect Echelon devices together in a daisy chain with no splitting. Leave Channel C of the repeater open for connecting to other Einsteins.

   You may use Channel D, which you connected to the Einstein in step 1, to connect Echelon devices. Simply run the wire from the second set of Echelon terminals. Note that this becomes a "split" channel whose daisy chain actually begins at the Einstein's Echelon terminals (i.e. you will have to terminate on the Einstein processor board for this daisy chain).

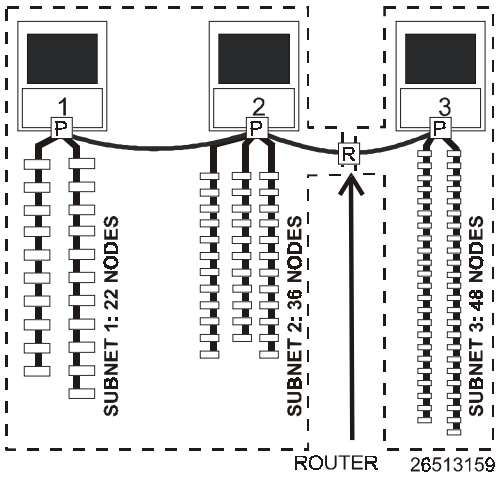


3. Use Channel C to connect all four-channel repeaters together in a single daisy chain.



4. Place routers in between Einsteins so that no more than 64 nodes exist on either side of a router. Place the router so that it splits the daisy-chain that connects all the other four-way repeaters, as shown in the illustration.

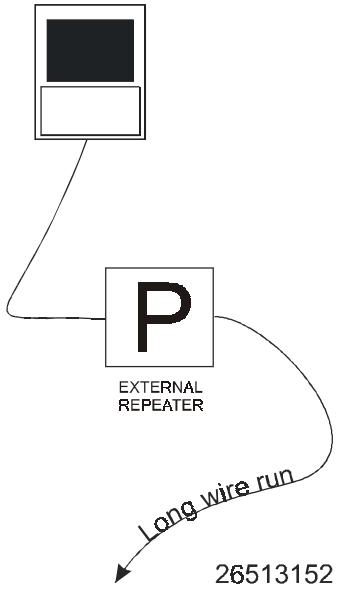
   In the illustrated example, the router is placed between Einstein #2 and Einstein #3 (making two segments), so that the daisy chain on one side of the router has a total of 58 nodes and the other has 48 nodes. The router is placed in the middle of the daisy chain on Channel C.



5. For each daisy chain extending from each channel, measure the **total wire length** used and make sure the distance does not exceed 4592 ft. (1400m).

   If the total wire length is exceeded by any single daisy chain, a repeater will need to be used to divide that daisy chain. The repeater should be placed so that the segments on either side of it do not exceed the total wire length.

   Because you are already using four-channel repeaters, there will be very few instances where placement of an extra repeater will be necessary. The most likely case would be a single wire run off a repeater exceeding the maximum length. In this case, you must use an **external repeater** to split the daisy chain in the field.

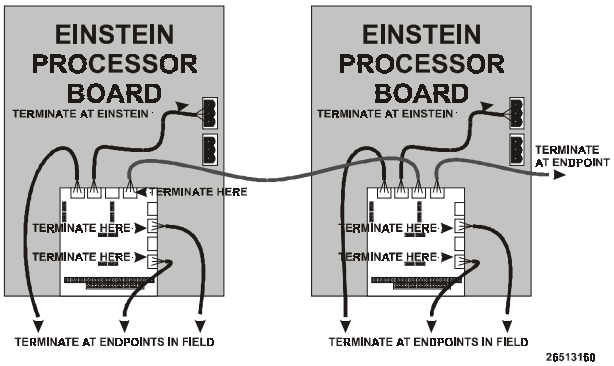


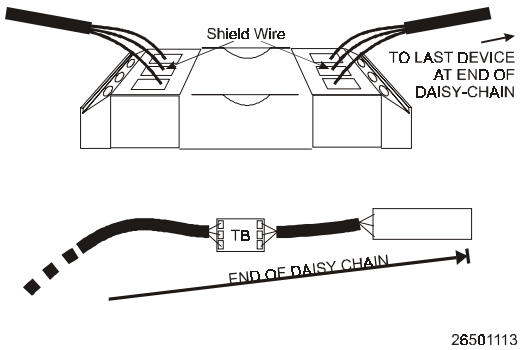
6. For every daisy chain in your network, each endpoint must be terminated. You may do this by either setting termination jumpers on the devices on the endpoints, or by wiring a Daisy Chain Termination Block at the end(s) of the daisy chain.

   With all the daisy chains in a four-channel repeater installation, termination can be complex. The best way to approach the task is to examine each repeater channel by channel, and look at where each daisy chain extending from that channel begins and ends.

   Instructions for setting termination jumpers on Echelon devices may be found in the Echelon Network Device Wiring chapter of your Einstein RX or Einstein BX User's Guide.

   To wire a Daisy Chain Termination Block to the end of a daisy chain, remove the main Echelon cable from the last device on the network and connect the end to one side of the Daisy Chain Termination Block, as shown in the picture. With a separate length of Echelon cable, connect the other side of the terminal block to the last device on the daisy chain. Make sure the shield wires are connected to the middle terminals.





4 Hardware Mounting

4.1 The Router

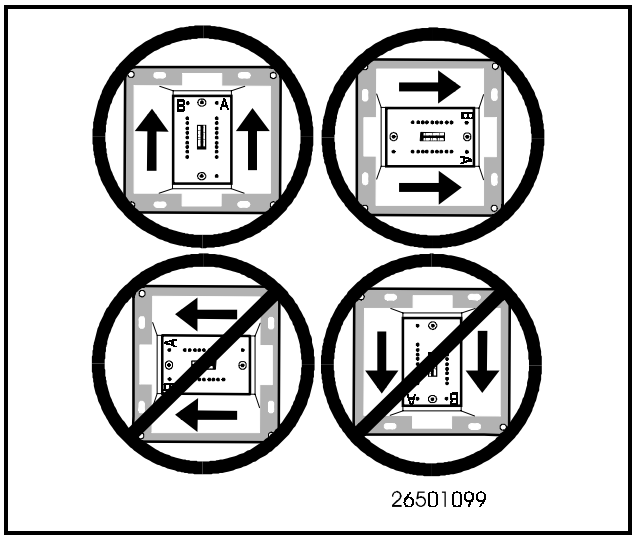


Figure 4-1 *- Router Base Plate Orientation*

The router (P/N 572-4200) must be placed in one of the two correct positions pictured in ***Figure 4-1***.

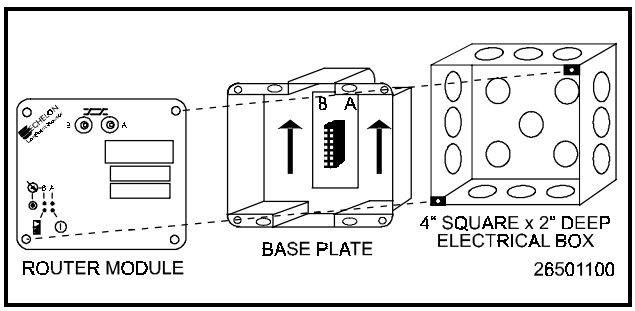


Figure 4-2 *- Router Mounting*

As shown in ***Figure 4-2*** the base plate is to be installed in an electrical box either vertically (base plate interior arrows pointing up) or rotated clockwise 90° (base plate interior arrows pointing to the right). These two orientations provide optimal viewing of the front panel legends of an installed router module, and also accommodate different methods of installing electrical boxes.

When the wiring and installation of the router base plate are complete, the router module may be installed. The router module is installed by aligning the unit to the base plate and gently pushing the module onto the base plate. It is not necessary to power down the system to install the router module; it can be plugged in while the system is running.

4.2 The Repeater

The external repeater (832-1010) is externally mounted within its own enclosure. The internal repeater (P/N 832-1000) is mounted inside of the Einstein controller panel.

4.2.1 External Repeater

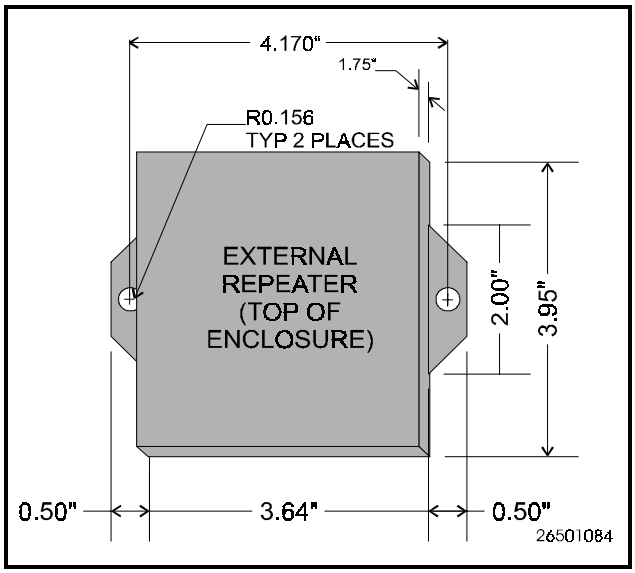


Figure 4-3 *- External Repeater Mounting*

For external repeaters, the mounting bracket at the bottom of the enclosure has two 0.156” bolt holes on either side. Use the bolt holes to mount these repeaters in the field as necessary (see ***Figure 4-3***).

When mounting external repeaters, keep in mind that they require a 24VAC Class 2 power source in order to operate. This will likely require a transformer such as P/N 640-0041 (110V) or P/N 640-0042 (220V) to be mounted near the external repeater enclosure. Make sure there will be enough space next to the repeater to mount the transformer.

4.2.2 Internal Repeater and Four-Channel Repeater

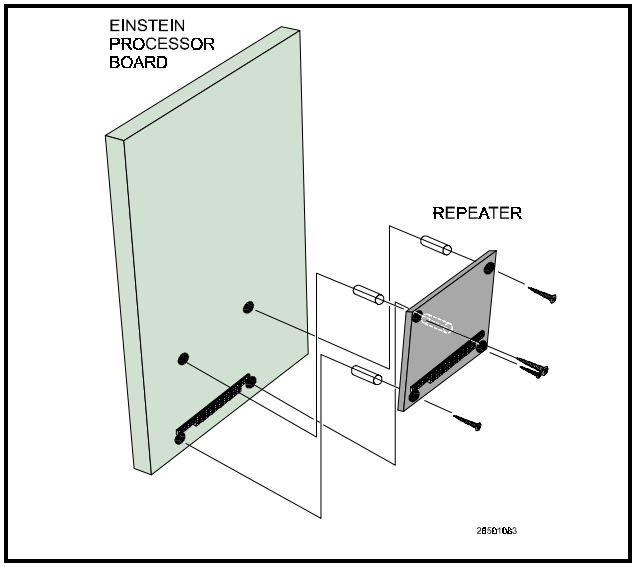


Figure 4-4 *Mounting the Internal Repeater*

The internal repeater and four-channel repeater boards mount in the PC-104 slot located at the very bottom of the Einstein controller's main circuit board. See ***Figure 4-4***.

5 Wiring

5.1 The Router

5.1.1 Placement

The router is designed to be placed in between Einstein controllers, typically in the motor room. ***Figure 5-1*** shows how the router is wired on the Echelon network as a bridge between an Einstein on one segment and an Einstein on the other segment.

A router can NOT be placed between an Einstein and any device that will be associated with the Einstein. In other words, all devices that are in the same subnet cannot be separated from each other by a router.

5.1.2 The Terminals

The router has two sets of terminals on the back of its base plate. ***Table 5-1*** identifies the terminals and their function.

Screw Terminals	Wiring Connections
1 and 2	**Incoming** network wiring, polarity-insensitive - **CHANNEL A**
3 and 4	**Outgoing** network wiring, polarity-insensitive - **CHANNEL A**
5 and 14	**Cable Shields** - terminals 5 and 14 are internally connected.
6 and 7	Incoming **power wiring**, 24VAC, 2.0VA, polarity-insensitive. Can be powered off the Einstein 50VA transformer
10 and 12	**Unused** - Jumpered together internally-may be used to land extra wires
11 and 13	**Unused** - Jumpered together internally-may be used to land extra wires
15 and 16	**Incoming** network wiring, polarity-insensitive - **CHANNEL B**
17 and 18	**Outgoing** network wiring, polarity-insensitive - **CHANNEL B**

Table 5-1 *- Router Wiring Terminations*

5.1.3 Wiring

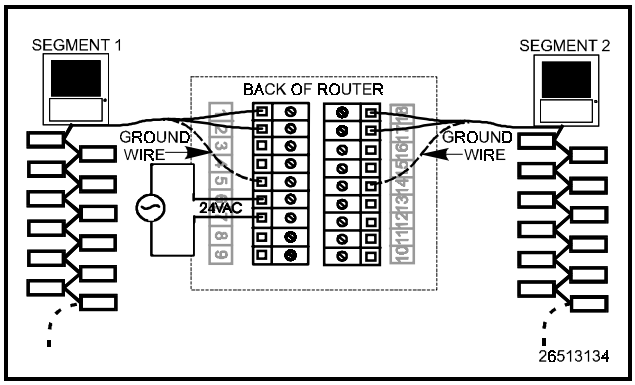


Figure 5-1 *- Router Detail Wiring*

To hook up a router:

1. Cut, strip, and connect the three-conductor wires from Segment 1 to the INCOMING wiring terminals on **side A**. The two signal wires should be connected to **terminals 1 and 2**.
2. If the router is not the endpoint of the daisy chain on Segment 1, continue wiring the segment from side A by connecting the outgoing segment wire to the OUTGOING **terminals 3 and 4**.
3. Connect the bare shield wires on both the INCOMING and OUTGOING segment wires to **terminal 5** (the ground terminal).
4. Repeat steps 1 through 3 for Segment 2 on the outgoing side (**side B**). Connect the INCOMING signal wires to **terminals 17 and 18**, the OUTGOING signal wires to **terminals 15 and 16**, and the shield wire to **terminal 14.**
5. If the physical location of the router is in close proximity to an Einstein controller, connect a three-conductor wire in parallel to the Einstein's transformer and connect to the router's **terminals 6 and 7**. The power inputs are polarity insensitive and the middle or ground lead should be connected to **terminal 5**.

A writing space has been included near the wiring terminals for easy field reference while wiring the system. Use a permanent marker.

5.1.4 Termination

The router will need to be terminated only if it is an endpoint of a daisy-chain segment. If the router is not at an endpoint (i.e. both the INCOMING and OUTGOING terminals on one side of the router both have devices connected to them), you do not need to terminate at the router.

The router does not have on-board termination jumpers to use for termination. Therefore, the router will have to be terminated using Daisy Chain Termination Blocks (*P/N 535-2715)*. To terminate a segment, wire the end of the segment wire to the screw terminals on one end of the termination block. Using a short length of Echelon cable, connect the INCOMING router terminals (**terminals 1 and 2** on **side A, terminals 17 and 18** on **side B**) to the termination block. Connect the shield wire from the center terminal of the Daisy Chain Termination Block to **terminal 5.** See ***Figure 5-2***.

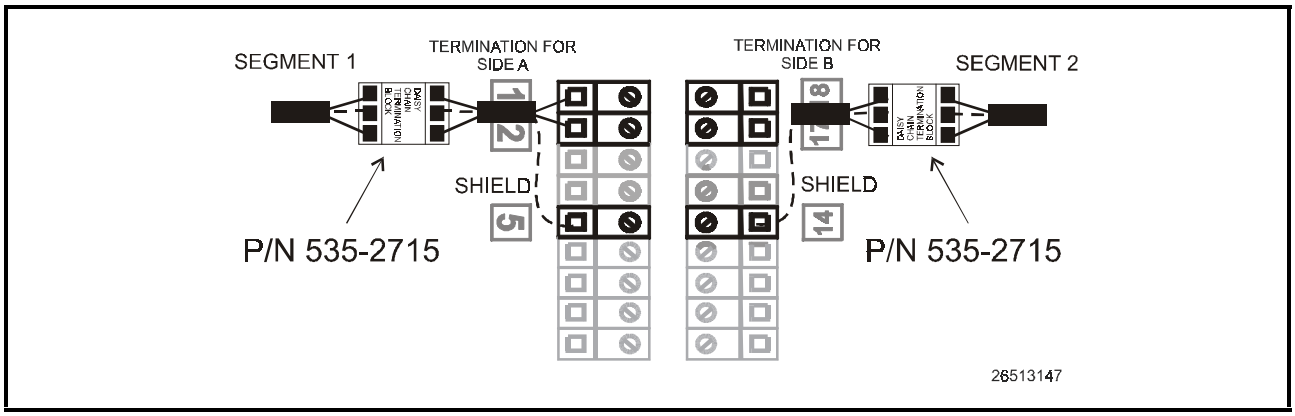


Figure 5-2 *- Router Termination Using Daisy-Chain Termination Blocks*

5.2 Wiring The Repeater

5.2.1 External Two-Channel Repeater

Wire this repeater using appropriate NEC wiring methods. Use CL2P type wiring.

If the repeater is placed in between nodes in the system (see ***Figure 5-3***), the wiring hook up is as follows:

1. Locate the Echelon terminals on the repeater (see ***Figure 5-3***). Note that there are two pairs of terminals; top and bottom.
2. Connect the **incoming** three conductor wire to either one of the top jacks and the **outgoing** wire to one of the bottom jacks. Follow the diagram in ***Figure 5-3***.

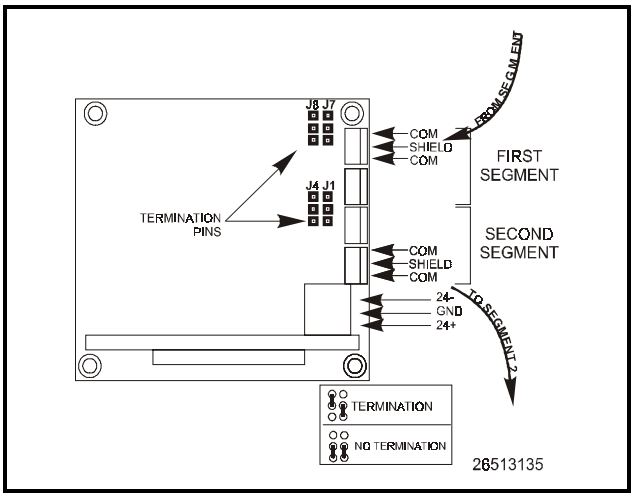


Figure 5-3 *- Repeater Hookup*

3. If the segment from where the incoming wire is to be terminated, terminate the jumpers associated with the top pair of jacks (J7, J8 jumped in the up position), and likewise, if the segment following the repeater is to be terminated, terminate those jumpers (J1 and J4).
4. External repeaters require a UL Class 2, 24VAC, minimum 0.1 Amp transformer (P/N 640-0041, 110V and 640-0042, 220V). Connect the wiring

from the transformer to the bottom right corner of the repeater circuit board (see ***Figure 5-3***).

5.2.2 Internal Two-Channel Repeater

The internal repeater board is laid out and wired in exactly the same way as the external repeater (see **Section 5.2.1**) with the exception of power wiring. The internal repeater gets power from the PC104 jack, not from a separate transformer.

5.2.3 Internal Four-Channel Repeater

Because the four-channel repeater has two more channels than the standard repeater, the board layout is slightly different than the two-channel model. The connectors for the four channels are on the top and right sides of the repeater board (***Figure 5-4***).

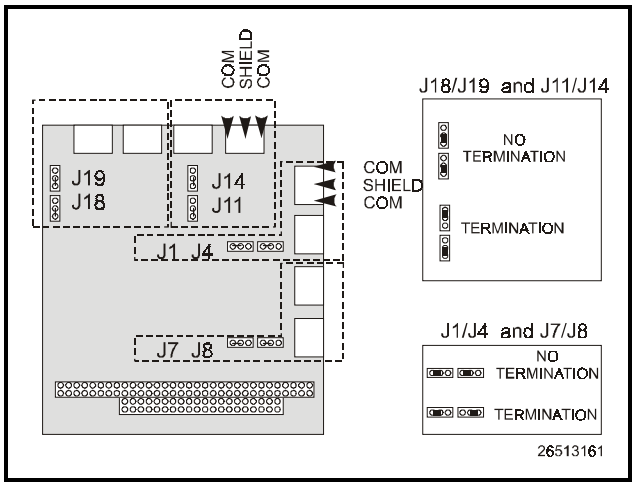


Figure 5-4 *- Four-Channel Repeater Hookup*

1. Locate the Echelon terminals on the repeater (see ***Figure 5-4***). There are two sets of two connectors on the top of the card, and two sets on the right hand side.
2. To connect an Echelon wire to a channel, connect the **incoming** three conductor wire to one set of terminals and the **outgoing** wire to the other set of terminals.
3. If a channel of the repeater is at the endpoint of a daisy chain, it must be terminated by setting the channel's termination jumpers. Each channel has a pair of jumpers that can be used for termination. The top two channels use jumpers **J18/J19** and **J11/J14**, while the two channels on the right side of the repeater use jumpers **J1/J4** and **J7/J8.** The locations of these jumpers and how to set them are shown in ***Figure 5-4***.

5.2.3.1 Terminating Unused Channels on the Four-Channel Repeater

If one or more channels on any four-channel repeater are not being used, you must set the channel's jumpers to the TERMINATED position. Leaving an unused channel unterminated may cause network communication problems.

6 Programming the Einstein Controller

6.1 The Router

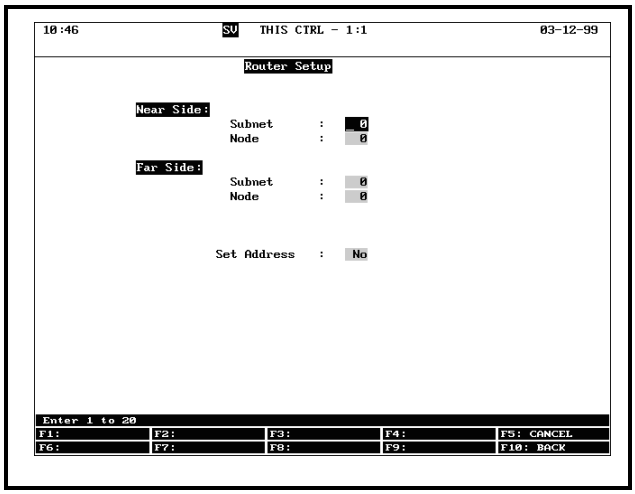


Figure 6-1 *- Router Setup Screen*

Adding a router to an Einstein network is as simple as telling the Einstein controller subnet and node addresses and then initializing the router with its service button.

Be sure to use the Einstein controller **closest to the router** (by wire length) when configuring in the router. This will help avoid confusion when determining the near and far sides of the router when programming.

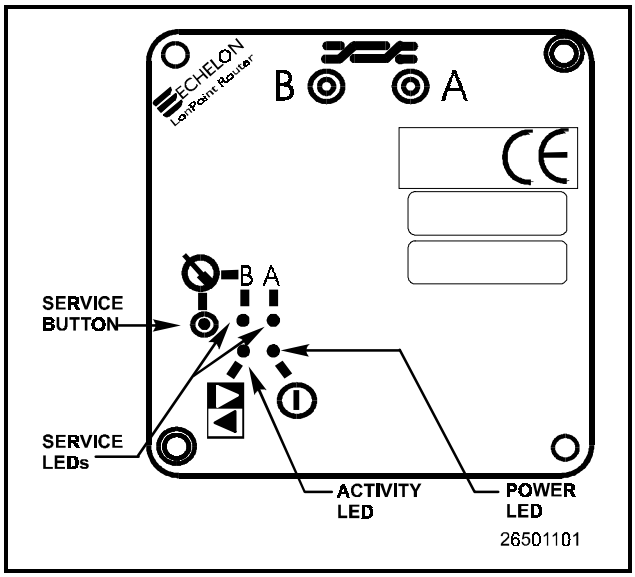


Figure 6-2 *- Router Face*

1. From the Main Status screen press F8 (ACTIONS). Press Y (System Setup). This is the System Configuration Menu screen.
2. From here, press 4 (Network Status Setup). From the Network Setup/Status Menu screen, either scroll down using the arrow buttons or press 3 to open up the Router Setup screen. See ***Figure 6-1***.
3. To determine the subnet address of the near side of the router, type the subnet number of the Einstein you are programming with (this Einstein should be connected directly to one side of the router). Then type in either 126 or 127 as the node address.
4. **FOR TWO ROUTERS**: First, if there is one subnet with an Einstein controller in-between two routers, program the routers from that Einstein. Program the router that is closest to the Einstein first. Then, enter the same **subnet** address for both **near sides** of the routers. The **node** addresses of the two near sides of the routers, in this case, *must* be different. See ***Figure 6-3***.

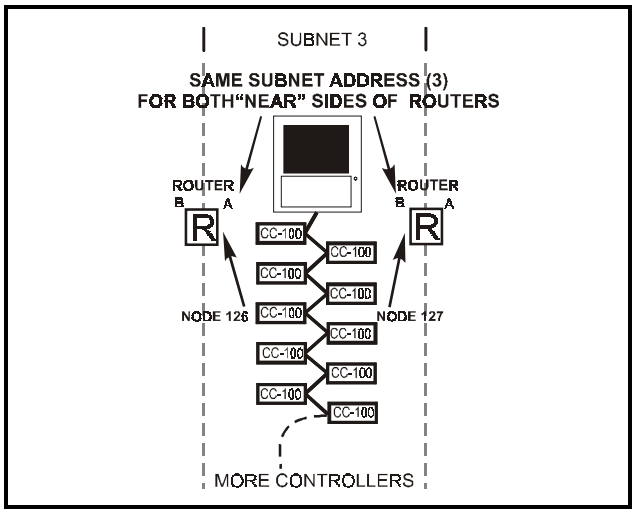


Figure 6-3 *- Setting the Subnet Addresses for Two Routers*

5. Enter the subnet and node address for the other (Far) side. The Far side subnet number address should be the subnet number of the next Einstein controller that the router is connected to. The only node addresses that Einstein can recognize for routers are 126 and 127.

NOTE
No two nodes on the same subnet can share the same address.

6. Scroll to the Set Address line. Make sure the router is powered and hooked up properly with the system.
7. Choose "YES" and press Enter. When the Einstein controller prompts "Press 'Service Pin'," press the service button on the face of the router (see ***Figure 6-2***).
8. At this point, the router should be recognized. If the Einstein produces an error message, try step 6 again. If after two more tries, the Einstein gives ERROR messages, recheck all of the connections to the terminals on the back of the router's base plate and make sure the wiring is hooked up correctly to the LonWorks jacks.

Multiple Routers

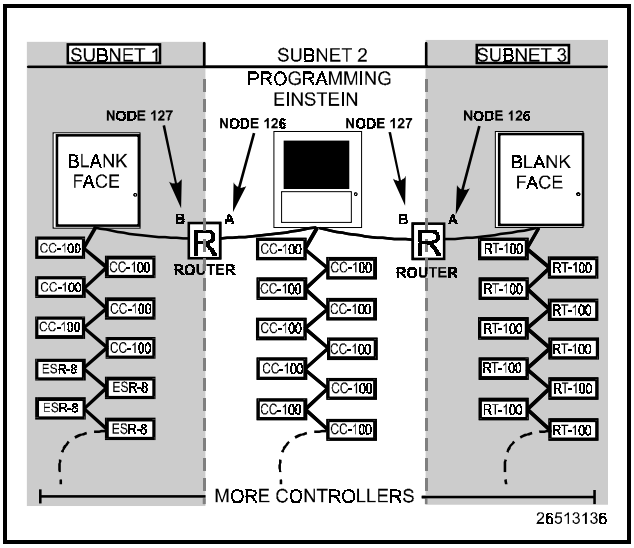


Figure 6-4 *- Subnet and Point Addressing*

If multiple routers are used, the programming is the same as if there were only one router.

Refer to ***Figure 6-4***. There are three subnets and two routers. Notice how in Subnet 2 the router node addresses are different from each other (126 and 127).

1. Start with the router that is closest to the programming Einstein controller. Follow the directions on programming the router.
2. Keep track of subnet and node addresses. Use the subnet numbers and given node address numbers **126 and 127** in combinations that do not duplicate themselves.
3. Program the next router closest to the Einstein controller the same way, making sure not to duplicate any subnet/node combinations. Continue until all routers are programmed.

NOTE
No two nodes on the same subnet can share the same address.

6.2 The Repeater

The repeater is designed to be installed and activated with no programming. All that is required is that the repeater be positioned correctly, either within the Einstein controller or remotely (with a Class 2, 24VAC transformer connected).