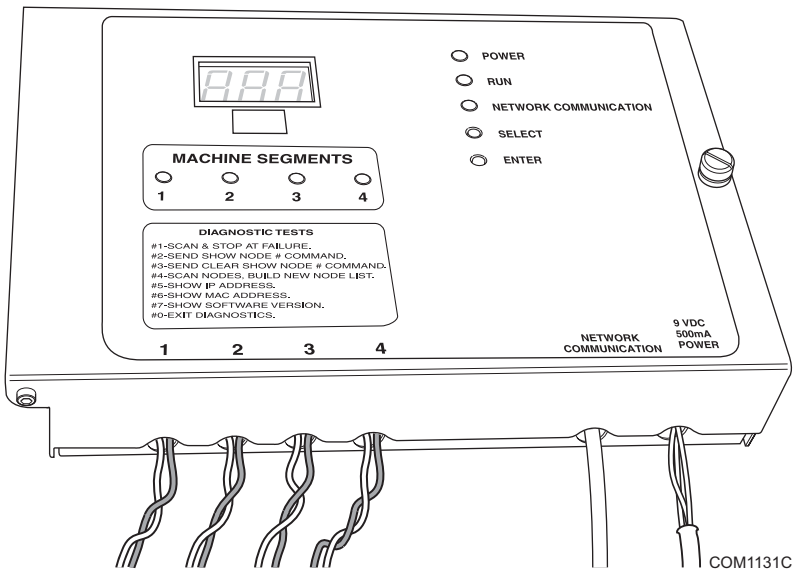
Network Controller

NK220



Installation/Troubleshooting Instructions

Part No. 70399101R4
October 2009

Table of Contents

Getting Started

Components of Network Controller

Network Controller Kit, NK220, consists of:

Terminating Resistor	4 required; 120 Ohm; 1/2 Watt
Network Controller	Includes four (4) 210155 3-Circuit Connectors
Plug-in Power Supply	9 VDC; 500 mA
Ethernet Cable	Blue; 6 feet
Wire Ties	12 included
Twisted Pair Wire*	Jacketed and not shielded; Black and white; Available at Newark at 1-800-463-9275 or www.newark.com as Part No. 15B3355
NOTE: Twisted pair wire should have one twist per inch.	Non-jacketed and non-shielded; Red and black; Available at World ClassWire & Cable at 262-951-7687 or www.wcwc.com as Part No. TW1802/1015BCBLKRED
Router*	

* Recommended additional parts that can/should be purchased.

Recommended Tools:

Wire Strippers
Small Flathead Screwdriver
Multimeter

System Overview

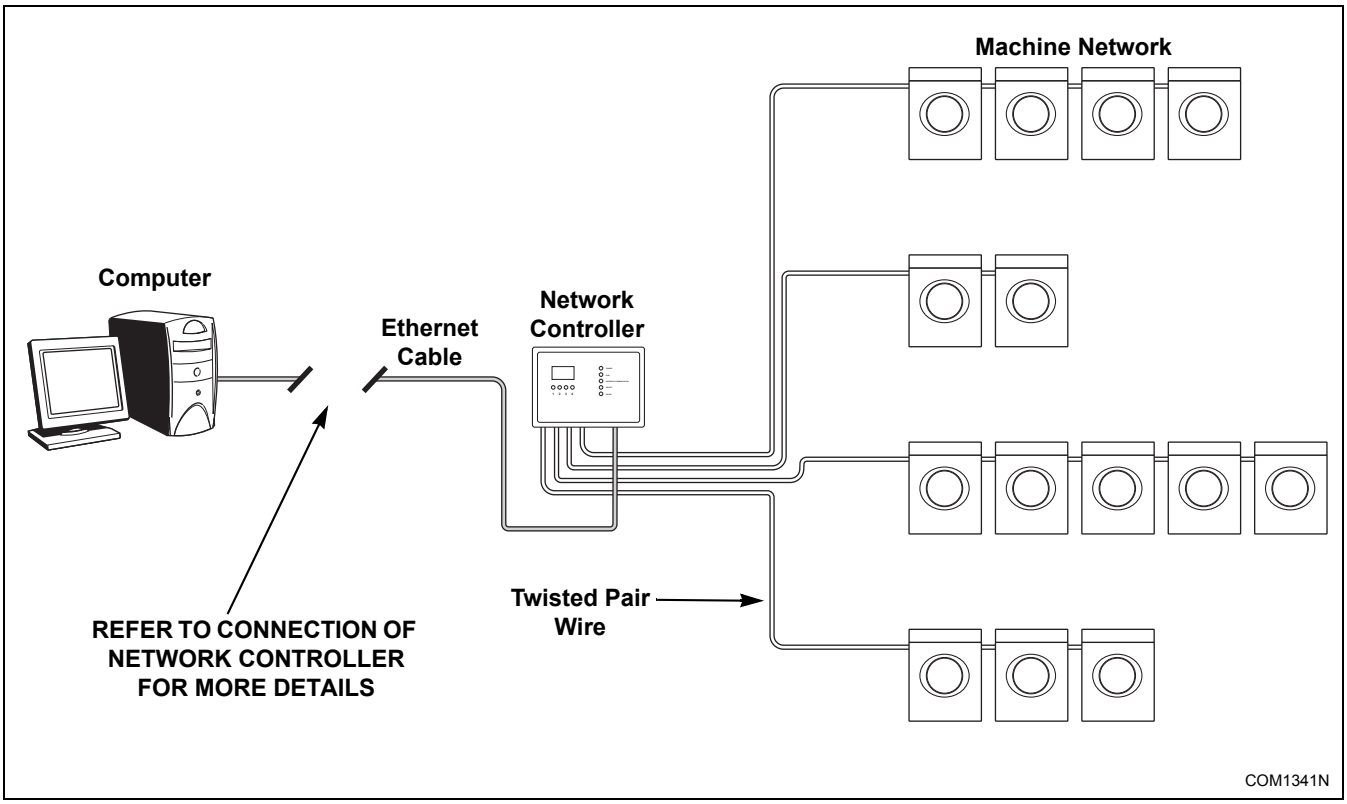


Figure 1

Network Controller Connection Order

If the Network Controller will be mounted (optional) it is recommended to mount prior to making connections.

IMPORTANT: Disconnect power to all laundry machines and the Network Controller before making any connections.

Open the Network Controller and make connections in the following order:

Refer to *Figure 2*.

1. Laundry Machine Network

   This includes networking the machines to each other and to the Network Controller. Refer to ***Installation of Laundry Machine Network***.

2. Ethernet Cable

   This allows network communication between the Network Controller and a PC. Refer to ***Installation of Network Controller to PC***.

3. Power

   IMPORTANT: Connect Power Supply Cable to Network Controller first, then to wall outlet.

   Plug-in Power Supply Cable provided with Network Controller Kit.

   IMPORTANT: Ensure power supply is properly grounded.

   IMPORTANT: Use wire ties provided to reduce strain at connection points.

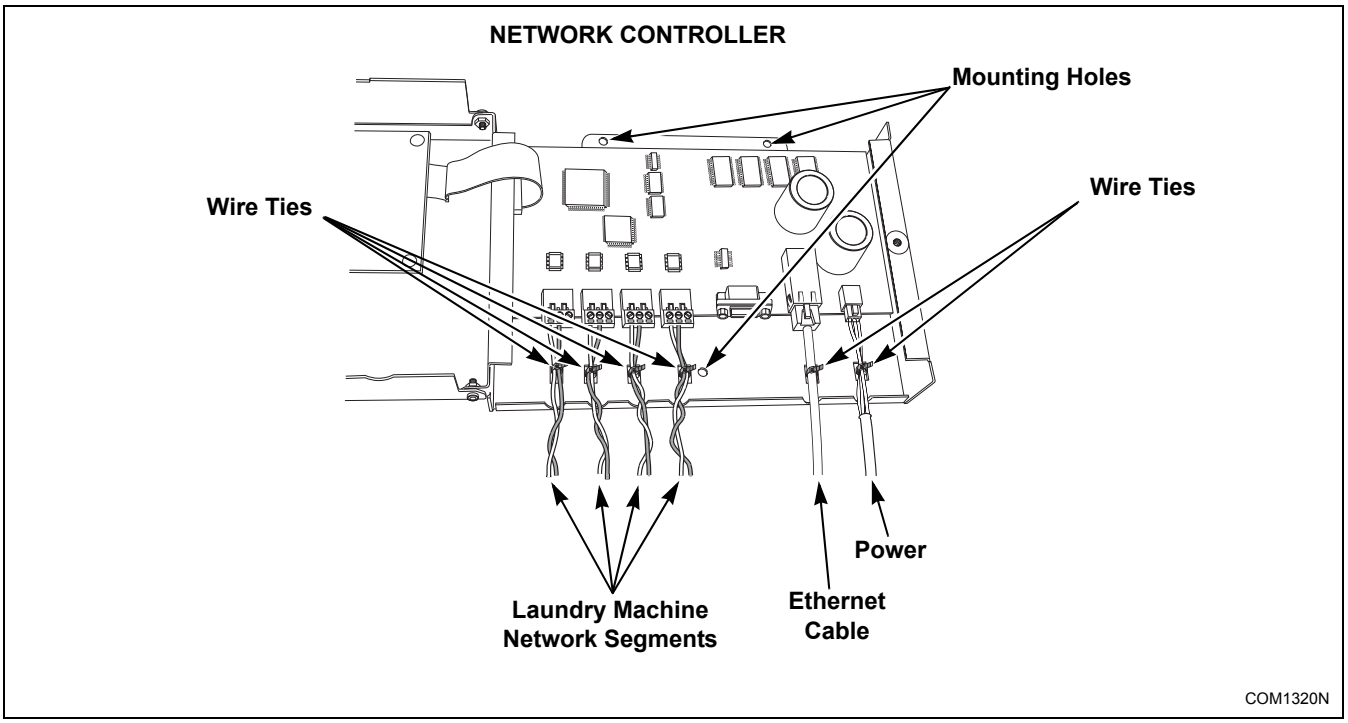


Figure 2

Considerations Before Installing Laundry Machine Network

Prior to installing and connecting laundry machines to the Network Controller, consider the facility's layout and/or banks of machines in sections that could correspond to segments on the Network Controller.

NOTE: It is recommended that some type of terminal strip be used when connecting banks of machines onto a network. This should be done so that a bank of machines can easily be bypassed in the network for purposes such as debugging network problems. A barrier block (RSPC Part No. F140766) may be used for this purpose.

One Network Controller contains four segments. One segment can connect up to 124 laundry machines. One Network Controller can connect up to 249 laundry machines.

Refer to the following two examples as possible connections.

Example 1:

One facility contains 200 laundry machines.

Segment Number	No. of Laundry Machines
1	100
2	50
3	20
4	30
	200 Total Laundry Machines

Example 2:

One facility contains 40 laundry machines.

Segment Number	No. of Laundry Machines
1	0
2	40
3	0
4	0
	40 Total Laundry Machines

IMPORTANT: Disconnect power to all laundry machines before installation.

Connecting Laundry Machines

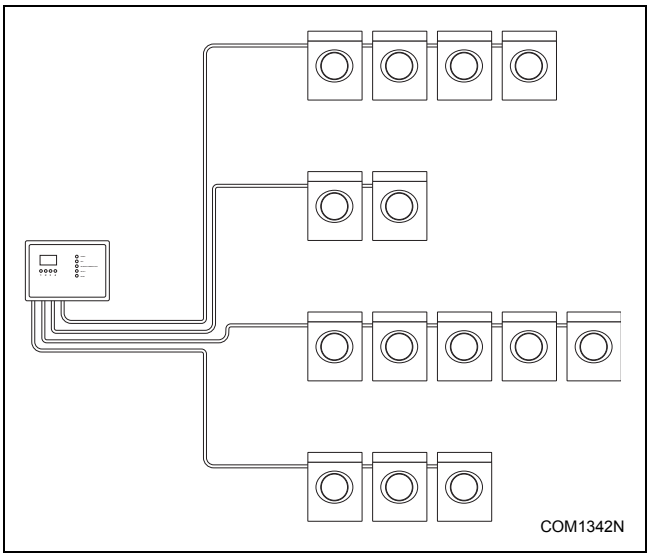


Figure 3

Installing the Network Using Twisted Pair Wire

Twisted pair wire must be used when installing the network. We recommend using the following twisted pair wire listed under ***Components of Network Controller***.

NOTE: Repeat the following instructions for each network segment.

NOTE: Connectors may, or may not, have numbers listed on them.

Before placing a connector on the twisted pair wire, carefully strip 1/4 inch of the insulation from the twisted pair wire. If too little insulation is removed, the insulation may prevent the Data Connectors from making a good electrical connection to the wire. If too much insulation is removed, the wires may make contact with each other and cause a short. Either of these incidents will prevent the network from functioning properly.

Connecting the Machines to the Network Controller and Each Other

(For up to 250 machines or 4,000 feet of network length)

IMPORTANT: Unplug the twisted pair wire from the Network Controller during installation.

1. Run the twisted pair wire to the first machine to be connected according to the layout of the facility. Follow whatever sequence is most convenient for store layout.
2. Locate the network board header on the back of the machine. Refer to *Figure 4*.

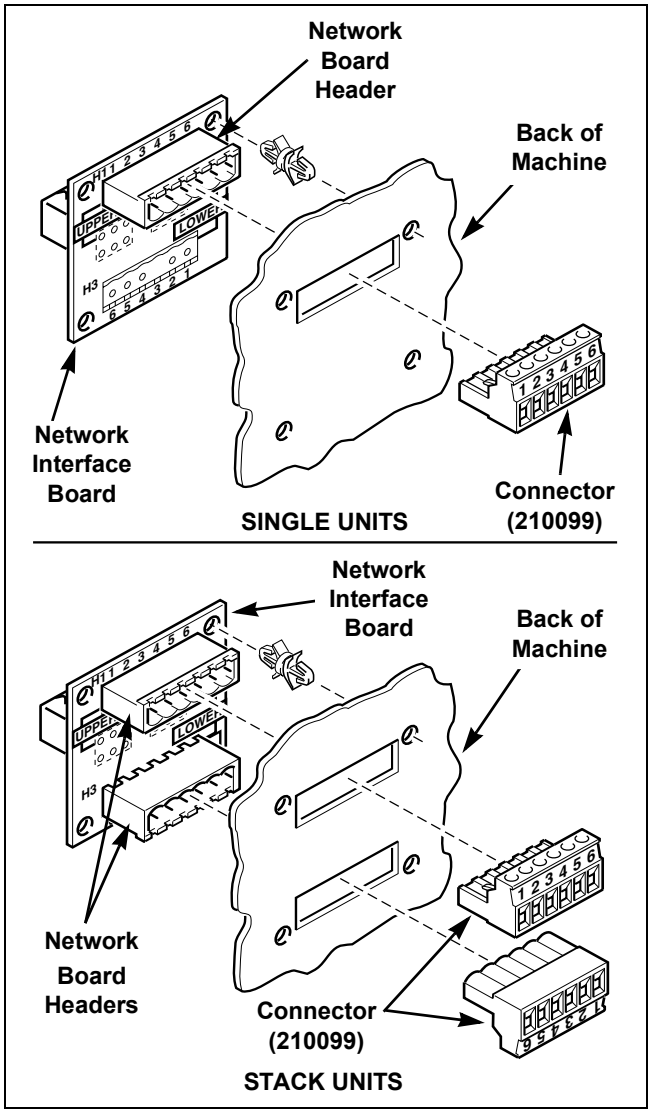


Figure 4

NOTE: Stack units will have two connectors.

3. Carefully strip 1/4 inch of the insulation from the twisted pair wire. Refer to *Figure 5*. If too little insulation is stripped, and insulation is inside the connector, the network will not communicate. If too much is stripped, the wires will short.

NOTE: After stripping insulation, twist wire ends to prevent fraying.

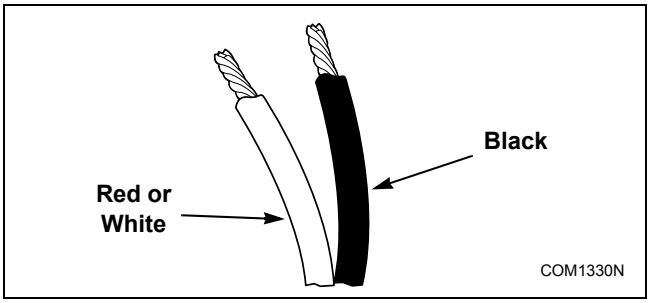


Figure 5

4. Remove the 210099 Connector from the machine.
5. Insert the wire into the connector. The red or white incoming wire goes into slot 1 and the black incoming wire goes into slot 2. Check that only wire, not insulation is inside the connector. Refer to *Figure 6*. Incorrect installation could result in the network not communicating. Secure the wires in place by tightening the screws on top of the connector.

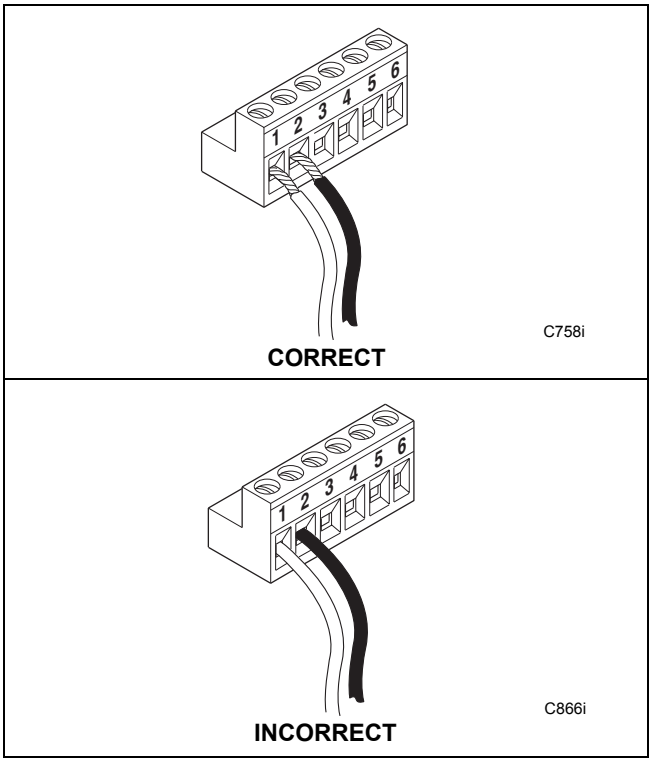


Figure 6

6. Cut enough length of wire to reach the next machine's connector. The wire should be long enough to move the machine for maintenance, but not so long as to interfere with normal operation. Refer to *Figure 8*.
7. Strip 1/4 inch of the insulation and place the red or white outgoing wire into slot 4 and black outgoing wire into slot 5. Follow the same procedure in Step 5.
8. Connect the wired connector to the Network Board Header. Refer to *Figure 4* and *Figure 8*.
9. Run the wire to the next machine and follow Steps 3-8 until all machines have been connected. Refer to *Figure 8*.
10. On the final machine of each segment, wires should be run into slots 1 and 2 as on all previous machines. A 120 Ohm, 1/2 Watt terminating resistor (included in kit) should be placed in slots 4 and 5 to terminate the connection at the end of the network. Refer to *Figure 8*.

NOTE: It is recommended that some type of terminal strip be used when connecting banks of machines onto a network. This should be done so that a bank of machines can easily be bypassed in the network for purposes such as debugging network problems. A barrier block (RSPC Part No. F140766) may be used for this purpose.

11. Connect all laundry machine network segments to Network Controller. Refer to *Figure 2* and *Figure 7*.

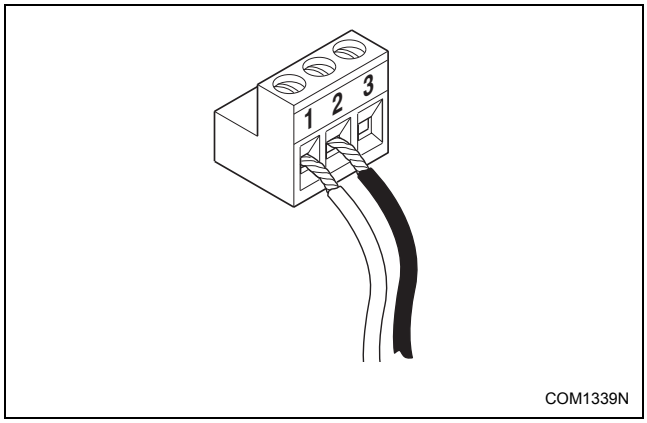


Figure 7

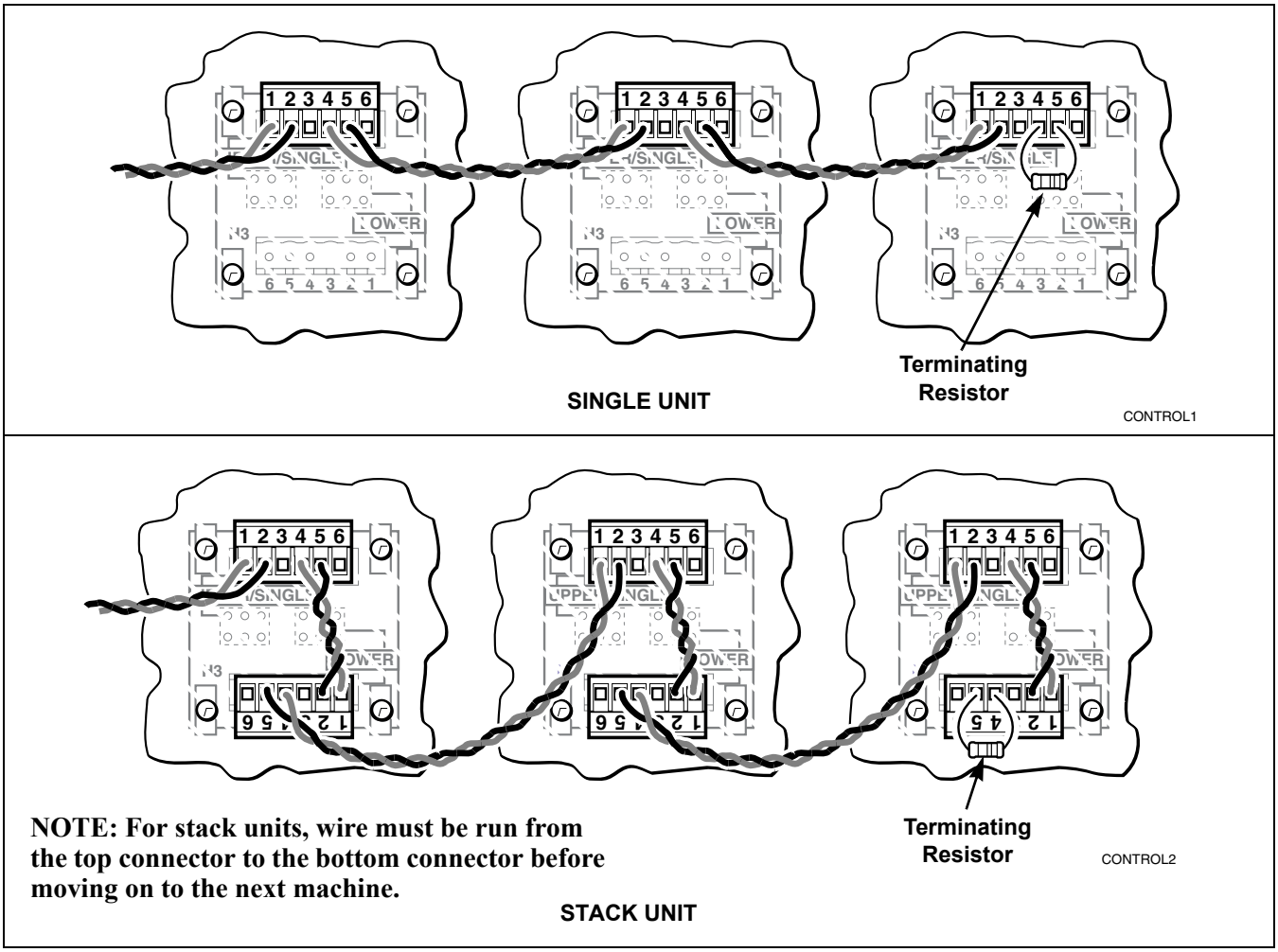


Figure 8

Test

Once the network has been wired, run the following tests to ensure proper installation.

1. Disconnect power to all machines before test.
2. Use a multimeter to check for continuity of the twisted pair wires running from the Network Controller.
3. Disconnect the wires from the Network Controller.
4. Check for 120 Ω ± 20% (96 Ω -144 Ω). A much higher reading indicates an open circuit. This is caused by a break in the network. A much lower reading indicates a short in the network. In either of these cases, the Network Controller will not be able to communicate with all machines (and possibly none of the machines) on the network.
5. Reconnect wires to Network Controller.
6. Supply power to the machines.
7. Program node numbers into each machine using a PC or PDA. Refer to ***User Instructions.***

8. Power up Network Controller, which will then scan for all nodes connected to the Network Controller. Numbers will flash on display as this step is conducted; this may take several minutes and may be aborted by pressing ENTER key at any time during the scan.

NOTE: Step 9 not applicable for UniLinc models.

9. To verify the Network Controller is communicating with the laundry machine network, use Diagnostic Test #2 - Send Show Node # Command. Push “SELECT” on Network Controller until “-2-” appears and then press ENTER button. All machines should display “n” followed by a number. Refer to *Figure 9*.

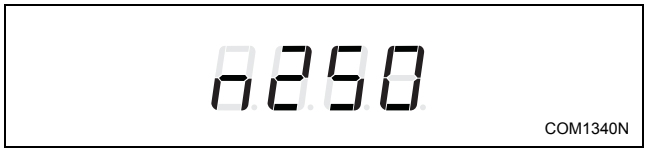


Figure 9

NOTE: If networked machines are already security coded, the Network Controller will be unable to communicate until it is also security coded.

Connection of Network Controller

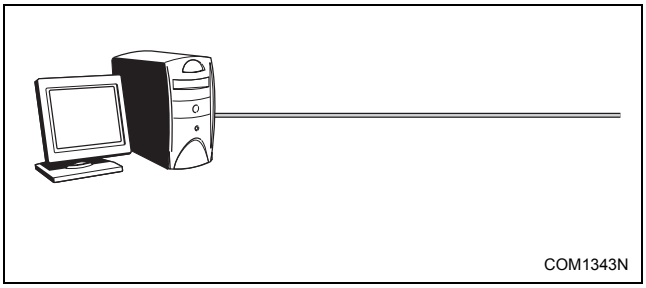


Figure 10

Connection Options

There are two ways the Network Controller can be connected.

PC on Location with Machines

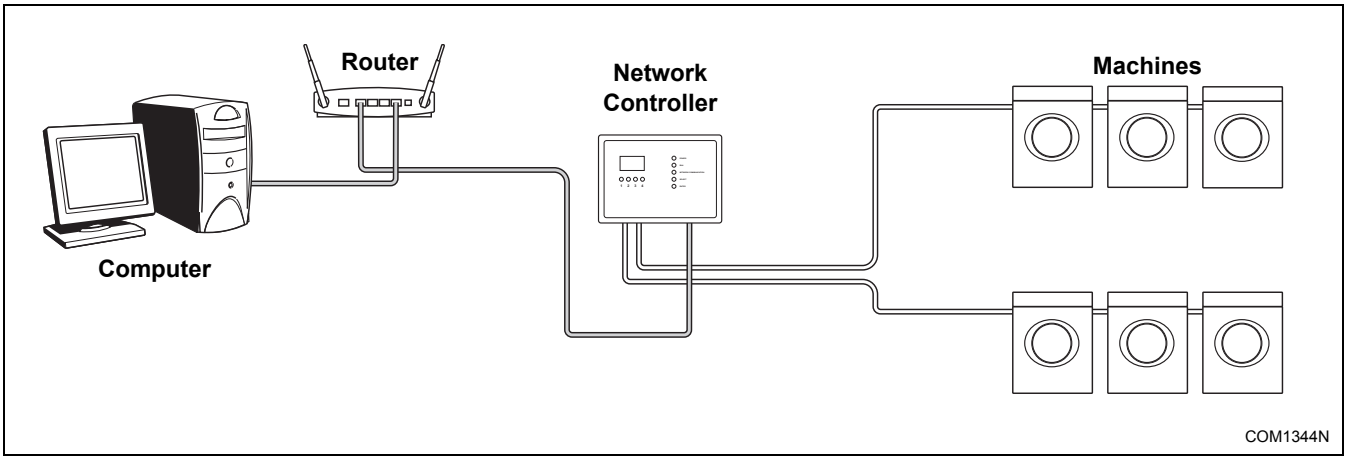


Figure 11

PC at Remote Location

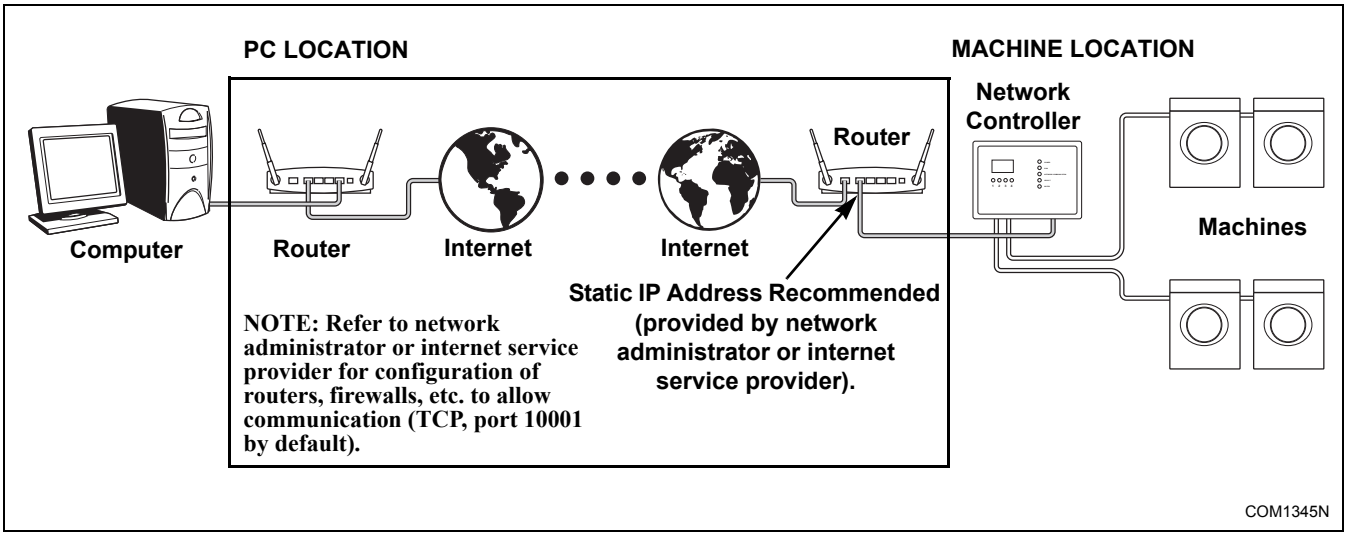


Figure 12

Ethernet Cable

The Network Controller is configured to be connected to a network where a router automatically assigns an IP address. This is the most common configuration when connecting a PC to a network or router.

Connect one end of the Ethernet cable from the Network Controller to an Ethernet Port on the router. Refer to *Figure 13*. Use wire tie to reduce strain at connection point.

This completes installation and connection of the laundry machine network to the Network Controller when using a standard Ethernet cable.

NOTE: If no IP Address is assigned to the Network Controller, the controller will check approximately once per minute to see if a valid IP Address has been assigned to it. This check takes approximately 15 seconds. During this check, the controller will show "-IP" on its display. The Network Controller will not respond to user input while the "-IP" display is active.

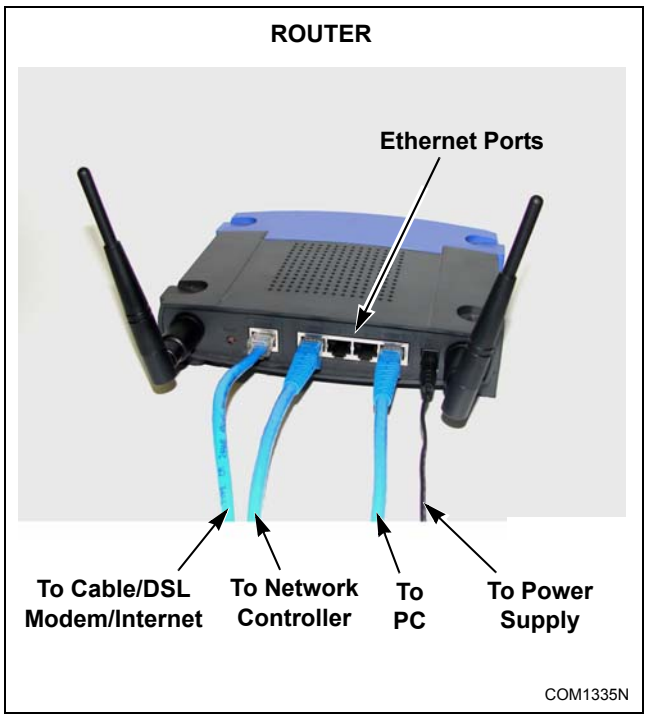


Figure 13

Troubleshooting

Network Controller Diagnostic Commands

Diagnostic Tests Selected Via Push Buttons

There will be several diagnostic tests which will be selectable via the pushbuttons on the outside of the Network Controller.

The two pushbuttons will be referred to as "**SELECT**" and "**ENTER**". When the user presses the **SELECT** button, the display will change to show "-1-", to indicate that if the **ENTER** button is pressed, Diagnostic Test "1" would execute. The user may press the **SELECT** button successively to scroll through the tests to find the one they wish to run. The display will update to "-2-", "-3-", etc, up to "-7-", and finally "-0-". The display will wrap around from "-0-" back to "-1-". Once the desired test is selected, the user may press **ENTER** to run the test. Any time no action is taken via either keypad for 10 seconds, the controller will exit the Select Diagnostic Test Mode.

Diagnostic Test #1 – Scan & Stop At Failure

This test is meant to help a user track down a broken communication line. When **ENTER** is pressed, the Network Controller will attempt to communicate with each node in the Active Nodes list, beginning with the lowest node number, and advancing as communication is successful with each consecutive node. The node with which communication is being attempted will be shown on the display, and the LED for the segment the Network Controller associates with that node will be illuminated. The LED will be green during successful communications.

The Network Controller will attempt to communicate with a given node for up to 10 seconds before assuming it can not connect to that node, and advancing to the next node. Therefore, if there is trouble in communicating with a given node, the user will see that node number "hang" on the display for up to 10 seconds. During that time, the LED for the segment the Network Controller associates with that node will turn red. The LED will turn green again if the Network Controller establishes communication with another node on that segment during the test. The user may instruct the Network Controller to abort the 10-second attempt by pressing the **ENTER** button. The Network Controller will then flag that node with an error, and advance to the next node in the list.

This test will run until communication has been attempted with all nodes in the list. Once complete, it will display the number of nodes communicated with successfully. This value will flash ½ second on then ½ second off three times. The Network Controller will then exit both the diagnostic test and the Diagnostic Mode. The number of nodes shown on the display and the status of the Segment LEDs will be updated to reflect the results of this test.

Diagnostic Test #2 – Send Show Node # Command

NOTE: This test not applicable for UniLinc models.

When test #2 is selected, the Network Controller will send a broadcast command which will instruct all controls on the network to show their node number on the display. Once the command is sent, the Network Controller will exit both the diagnostic test and the Diagnostic Mode.

Diagnostic Test #3 – Send Clear Show Node # Command

NOTE: This test not applicable for UniLinc models.

When test #3 is selected, the Network Controller will send a broadcast command which will instruct all controls on the network to exit the "show node number" feature. Once the command is sent, the Network Controller will exit both the diagnostic test and the Diagnostic Mode.

Diagnostic Test #4 – Scan Nodes, Build New Node List

Diagnostic Test #4 instructs the Network Controller to build up a new Scanned Active Node List. Any current node list, scanned or downloaded, will be discarded.

Once the test is complete, the Network Controller will exit both the diagnostic test and the Diagnostic Mode.

Diagnostic Test #5 – Show IP Address

Diagnostic Test #5 will show the current IP Address of the Network Controller. When the ENTER is pressed to select Test #5, the Network Controller will first display "-IP " for up to 15 seconds, while it retrieves its IP Address. Once the controller has retrieved the IP Address, it will be shown via a series of four different displays. Each display will show one of the four values in the standard xxx.xxx.xxx.xxx IP Address format.

When the entire IP address has been displayed, the Network Controller will exit both the diagnostic test and the Diagnostic Mode.

NOTE: If no IP Address is assigned to the Network Controller, selecting Test #5 will instruct the Network Controller to accept its "Self-Assigned" IP Address as valid. This address will be displayed by Test #5, since it is now the valid IP Address for the Network Controller. It is not recommended to use the Self-Assigned IP address. It is preferable that the Network Controller is assigned an address by a DHCP server (such as a router) or by a program such as Device Installer.

Diagnostic Test #6 – Show Mac Address

When test #6 is selected, the Network Controller will display its MAC address. This will occur via a series of six different displays. Each display will show one of the six values in the standard xx-xx-xx-xx-xx-xx MAC address format.

When the entire MAC address has been displayed, the Network Controller will exit both the diagnostic test and the Diagnostic Mode.

Diagnostic Test #7 – Show Software Version

When test #7 is selected, the Network Controller will display its software version number. The display will show "xxx" for two seconds, where xxx is the software version number (range 1-255). After the software version has been displayed for two seconds, the Network Controller will exit both the diagnostic test and the Diagnostic Mode.

Diagnostic Test #0 – Diagnostics

When test #0 is selected, the Network Controller will exit the diagnostic mode, and return to normal operation.

Network Troubleshooting

Commonly Used Abbreviations

NWB – Network Board

NIB – Network Interface Board

LED – Light Emitting Diode

FEC – Front-End Control

The Dryer/Tumbler Control, Topload Washer Control, Frontload Washer Control, and Washer-Extractor Control are all referred to simply as the Front-End Control.

Wire Break

Any time there is a wire break on the network, all machines on the opposite side of the break from the Network Controller will become unable to communicate with the Network Controller. Also, communication may become less reliable for those nodes which are still on the network, since the terminating resistor on the end of the network has been separated from the network.

Short on the Line or on the Network Board

If there is ever a short on the network, the entire network may be unable to function. However, if the short is on the far end of the network, those nodes closest to the Network Controller may be able to communicate with the Network Controller to some degree.

Shorts may be isolated by removing the twisted pair wire from the Network Controller, and putting an Ohm-meter on the cable. Next, remove a series of machines at the end of the network, and check the meter. If there is no longer a short, the short is somewhere in the chain of machines removed from the network. If there is still a short, move the break in the network close to the Network Controller until a location is found where the short can be eliminated. By repeating this process of elimination, a short in either the cable or on a network board may be isolated.

Wires Flipped on the Network

Correct polarity must be observed when installing machines on the network. If a machine is installed with the wrong polarity at either the input or output (but not both) at the connecting terminals, all machines further down the series will be unable to communicate with the Network Controller. If, however, both the input and output are wired incorrectly, only that machine will be unable to communicate. If the wires at the connection to the Network Controller are flipped, none of the machines will be able to communicate with the Network Controller.

NOTE: Both shorts or flipped wires will cause numerous errors on the Network Controller, including “Protocol Errors” and numerous “Unable to Connect” messages.

Nodes on the Same Address

If two or more nodes share the same address, the Network Controller may not be able to communicate with any of those nodes at that address. To test for this condition, select Diagnostic Test #2 and note all nodes on the network. If any node value appears more than once, adjust those node values until each machine has its own address.

NOTE: Nodes on the same address will cause numerous errors on the Network Controller, including “Protocol Errors” and numerous “Unable to Connect” messages.

Jabbering Node

In this condition, a node on the network is transmitting erratically. If the node is transmitting constantly, this condition may bring down the entire network. In other cases, it may transmit periodically. If this is the case, some communications will be able to get through, until the node begins jabbering again. If your network utilizes the type of Network Board identified as Board 1 in *Figure 14*, you may look for a jabbering node by first disconnecting the Network Controller from the network. Since the Network Controller initiates all communication, there should now be no communication on the network. Examine the RxIN, TxOut, and Tx/Rx LEDs on each board. If there is a jabbering node, the RxIN LED will be flickering on all or some of the Network Boards, indicating that they are receiving a signal on the Network. Next, look for any Network Boards on which the TxOut LED is flickering on, or the Tx/Rx LED is flickering off. This would indicate a jabbering node. This may be the result of a bad Network Board, control, or harness.

NOTE: Jabbering nodes will cause numerous errors on the Network Controller, including "Protocol Errors" and numerous "Unable to Connect" messages.

No Node Number/Wrong Node Number Programmed into Front-End Control

If the Node Number was not properly programmed into the Front-End Control, the Network Controller, and also the Host PC, will not be able to communicate with that given machine.

Select Diagnostic Test #2 on the Network Controller, and note all nodes on the network. Note any machines which do not display the node number expected, and program the proper node number into that machine via the PC or PDA.

Network Board Troubleshooting

There are two different network boards, compare the board in the laundry machine to *Figure 14* and *Figure 15*. Whichever board is in the laundry machine, follow that board's troubleshooting section.

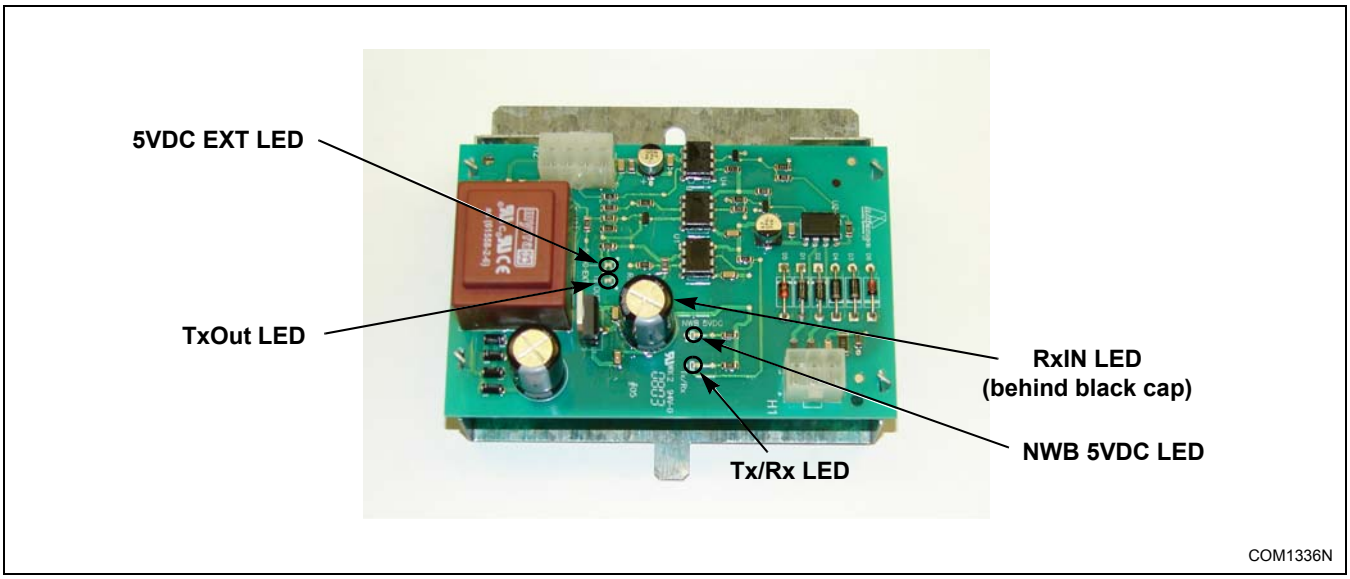


Figure 14

Network Board 1 Operating LED Test

5VDC EXT LED Not Lit

When not lit, this means the NWB is not getting 5Volts from the FEC and will not work. Check H2 pins 1 and 5 for 5VDC. Three possible causes are: a faulty harness, a faulty NWB, or a faulty FEC.

NWB 5VDC LED not Lit

When not lit, this means the NWB is not getting 5VDC from the 24VAC input from the FEC, and will not work. Check H2 pins 4 and 8 for 24VAC, and then check that the FEC has power and is working properly. Three possible causes are: a faulty harness, a faulty NWB, or a faulty FEC.

RxIN LED Not Flashing with Network Traffic

Should flicker when there is communication on the laundry machine network, and should go dark when there is no communication on the laundry machine network. View the status of the LED on a nearby machine on the same laundry machine network. If the RxIN LED on that machine is flashing at the same time the RxIN LED on the machine in question is not flashing, the NWB is not able to see the network. Check the network connections to the machine, and connections from the NIB to the NWB. This may also be the result of a faulty NWB.

Tx/Rx LED Not Lit

When constantly off, the NWB is stuck in transmit mode, which will prevent that laundry machine (and possibly other laundry machines) from communicating with the Network Controller. This LED should be off when the laundry machine is communicating via the network, and should be off for no more than 2 seconds at a time. Two possible causes are: a faulty NWB, or a faulty FEC.

TxOUT LED Continually Lit

When continually lit, the NWB is constantly transmitting, which will prevent that laundry machine (and possibly other laundry machines) from communicating with the Network Controller. This LED should be lit when the laundry machine is communicating via the network, and should be on for no more than 2 seconds at a time. Two possible causes are: a faulty NBW, or a faulty FEC.

NOTE: If the TxOUT is flashing, but the Tx/Rx LED is not flashing, the NWB will be unable to communicate to the Network Controller. Three possible causes for this LED not being lit are: a faulty harness, a faulty NWB, or a faulty FEC.

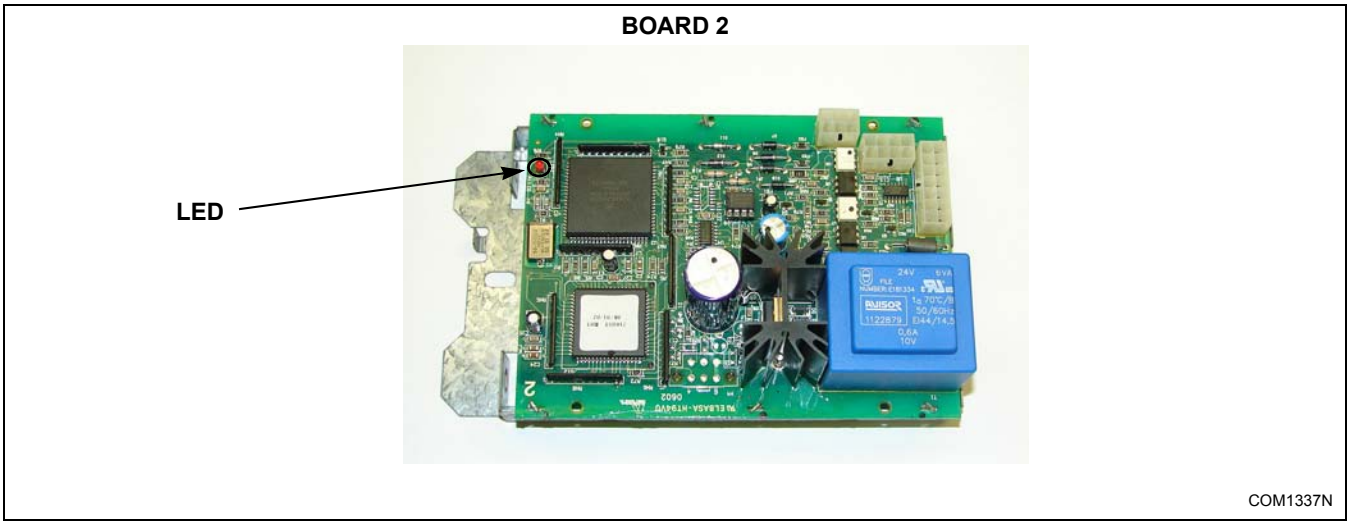


Figure 15

Network Board 2 Operating LED Test

Network Board LED

When the operation of the Network Board is suspect, the state of the LED may be examined to determine whether the Network Board is operating properly.

LED is Flashing One Second On / One Second Off

This is what the LED should be doing in normal operation. If the LED is following this sequence, the processor on the board is executing the code correctly. However, there may still be other problems with the board.

LED is Constantly Off

If the LED is constantly off, there is probably no power to the NWB. There must be 24VAC across pins 6 & 7 on header H1 for the NWB to operate. If there is 24VAC across pins 6 & 7 and the LED is a constant off, the NWB will need to be replaced.

LED is Flashing Rapidly or is Constantly On

If the LED is constantly on or is flashing rapidly or erratically, the NWB may be in a lock-up state or may be bad. Remove power from the board by pulling header H1, and then put the header back again. If the LED begins to flash one second on / one second off, the board is probably OK. If this does not happen, the NWB will need to be replaced.

LED Flashes Rapidly 3 Times

This sequence indicates the beginning or end of a communication sequence with the FEC. The service personnel may determine if the NWB is communicating with the FEC by following the procedure in the following section.

Network Board Communicating LED Test

Test of Communications Between FEC and NWB Using LED

Power down the NWB by disconnecting header H1. Re-connect H1. Approximately 15 seconds after H1 is reconnected (7 LED flashes), the LED should flash rapidly 3 times, indicating that it is beginning communication with the FEC. Two LED flashes later, the LED should flash rapidly 3 times again, indicating the end of a successful communication sequence. If this does not occur, the NWB is not communicating with the FEC.

Once it has been determined that the processor on the NWB is correctly executing the NWB code, the service personnel may now check for the following other possible malfunctions of the NWB (and/or the FEC).

- NWB is not communicating with the FEC
- NWB is not allowing the Card Reader to communicate with the FEC
- NWB is not communicating with the Network Controller

Network Board to Front-End Control Communication Problems

NWB will not Communicate with FEC

If the NWB is not communicating with the FEC, the NWB, FEC, or harness may be at fault. For the following cases, use the *Network Board Communicating LED Test* to check the communication link between the FEC and the NWB using the LED. Parts may need to be swapped out individually to isolate the problem.

The FEC must supply 5VDC to the NWB via pins 1 & 2 on H1 for the NWB to function correctly. If the 5VDC is not present, the NWB can in no way communicate with the FEC. If this voltage is not present, the harness or the FEC may be at fault.

If there is 5VDC across pins 1 & 2 of H1 and the NWB will not communicate with the FEC, swap the harness between the FEC and NWB with a known good harness. If this fixes the problem, the harness is at fault.

If the harness is not at fault, the NWB should be swapped with a known good board. If this fixes the problem, the NWB needs to be replaced. If after changing out the NWB and the harness with known good samples the NWB will not communicate with the FEC, the FEC must be at fault.