

# NetMaster Network

NK100, NK101 and NK120

— Installation Instructions —



[www.comlaundry.com](http://www.comlaundry.com)

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# Table of Contents

|  |    |
|--|----|
| <b>Getting Started</b> .....                                   | 3  |
| Use with NK100, NK101, NK120 .....                             | 3  |
| NetMaster Coin Network Adaptable Store Sample Order.....       | 4  |
| Accessory List .....   | 4  |
| Optional Recommended Accessory List .....                      | 4  |
| NetMaster Coin Networked Store Sample Order.....               | 4  |
| Accessory List .....   | 4  |
| Optional Recommended Accessory List .....                      | 4  |
| Accessories Obtained from Local Electronic Supply Store .....  | 4  |
| NetMaster CardMate Networked Adaptable Store Sample Order..... | 5  |
| Accessory List .....   | 5  |
| **CSC Accessory List.....                                      | 5  |
| **CVC Unit and Accessories .....                               | 5  |
| **CVC Optional Recommended Accessory List .....                | 5  |
| NetMaster CardMate Networked Store Sample Order .....          | 6  |
| Accessory List .....   | 6  |
| **CSC Accessory List.....                                      | 6  |
| **CVC Unit and Accessories .....                               | 6  |
| **CVC Optional Recommended Accessory List .....                | 6  |
| Optional Recommended Accessory List .....                      | 6  |
| Accessories Obtained from Local Electronic Supply Store .....  | 7  |
| <b>Installation</b> .....                                      | 9  |
| A. Interface PC and Machines .....                             | 9  |
| B. Interfacing a Laptop to Machines.....                       | 9  |
| C. Connecting the Machines to the PC and Each Other .....      | 10 |
| D. Connecting the Repeater to the PC .....                     | 12 |
| E. Connecting the Repeater to a Laptop .....                   | 14 |
| F. Tests .....   | 14 |
| <b>Troubleshooting</b> .....                                   | 15 |
| Error Codes .....  | 15 |
| Network Interface Boards .....                                 | 17 |
| Card Reader.....   | 18 |
| Card Insertions not recognized by the card reader.....         | 19 |
| EC:19 .....  | 19 |
| EC:20 – Error Reading Card .....                               | 20 |
| EC:26 – Card Write Error.....                                  | 20 |
| Other Errors .....   | 20 |
| Network Board Service .....                                    | 22 |
| Commonly Used Abbreviations: .....                             | 22 |
| Network Board LED.....   | 22 |
| Network Board Operating LED Test .....                         | 22 |
| Network Board Communicating LED Test.....                      | 22 |
| Network Board to Front-End Control Communication Problems ...  | 22 |
| Network Board to PC Communication Problems .....               | 23 |

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# Getting Started

## Use with NK100, NK101, NK120

| Part Description              | Part Number  | Suggested Source                          | Comments  |
|-------------------------------|--------------|---|---|
| NetMaster Base Software Suite | 200768       | Alliance Laundry                          |   |
| Smartcard Software Suite      | 200771       | Alliance Laundry                          | Card store only   |
| Management Reader             | CM1087       | Alliance Laundry                          | Card store only   |
| Multipurpose Card             | 200671       | Alliance Laundry                          | Card store only   |
| Transaction Access Card       | 200817       | Alliance Laundry                          | Card store only   |
| Network Kit for PC            | NK100        | Alliance Laundry                          | Includes board and data connector   |
| Network Kit for Laptop        | NK101        | Alliance Laundry                          | Includes board and cables   |
| Black/Red Twisted Pair        | 781816PFO-2Z | American Electronic Wire Co. 847-541-7500 | 18 AWG, Tinned copper for 600 volts and 105 degrees C, manufactured to UL1015 |
| Data Connector                | 210155       | Alliance Laundry                          | PC only   |
| Network Interface Connector   | 210099       | Alliance Laundry                          | Provided with machine   |
| Netmaster Software Suite      | 200770       | Alliance Laundry                          | Windows 98 or greater to run the program                                      |
| Terminating Resistor          | 210162       | Alliance Laundry                          | 120 Ohm, 1/2 Watt   |
| Bias Resistor                 | 210163       | Alliance Laundry                          | 560 Ohm, 1/4 Watt   |
| Barrier Terminal Strip        | 210161       | Alliance Laundry                          | Beau C-15 series 8-circuit  |
| Network Repeater Kit          | NK120        | Alliance Laundry                          | For 124 to 249 machines or greater than 4,000 feet of network length          |

**NOTE: Have a computer specialist install the network board into the PC.**

## NetMaster Coin Network Adaptable Store Sample Order

### Accessory List

| Qty | Model No. | Description                     | Comments   |
|-----|-----------|---------------------------------|--|
| 1   | EDC100    | Micro-Wand Kit                  | <b>EDC108</b> – Micro-Wand with infra-red adapter cup.<br><b>CM1086</b> – 9-volt rechargeable battery.<br><b>CAC203</b> – Charger/Interface cup enables communication with computer and recharges battery.<br><b>CAC302</b> – Transformer/power cord supplies power for recharging battery). |
| 1   | CAC202    | 9 Pin Cable with 25 Pin Adapter | Links the Micro-Wand and a computer for data transfer.   |
| 1   | 200768    | NetMaster Base Software Suite   | Program used to generate reports.  |

### Optional Recommended Accessory List

| Qty | Model No. | Description              | Comments   |
|-----|-----------|--------------------------|--|
| 1   | CAC104    | Homebase/Battery Charger | Provides complete communications and battery charging/service center, connection to the computer not required. |

## NetMaster Coin Networked Store Sample Order

### Accessory List

| Qty | Model No. | Description            | Comments  |
|-----|-----------|------------------------|---|
| 1   | 200770    | Network Software Suite | Software used to program networked machines, replaces Micro-Wand. |
| 1   | 200768    | NetMaster Base Suite   | Program used to generate reports.                                 |
| *1  | NK100     | Desktop Network Card   | Communicates from computer to networked machines.                 |
| *1  | NK101     | Laptop Network Card    | Communicates from computer to networked machines.                 |

\*The type of network card ordered would depend on the type of computer the store owner is using. These cards need to be installed by a professional.

### Optional Recommended Accessory List

| Qty | Model No. | Description | Comments                                  |
|-----|-----------|-------------|---|
| 1   | NK120     | Repeater    | Used to network store with 125-249 units. |

### Accessories Obtained from Local Electronic Supply Store

| Qty | Description                                   | Comments                            |
|-----|---|-------------------------------------|
|     | Twisted Pair Wire, 18 AWG tinned copper       | Connects networked machines and PC. |
| 1   | Computer                                      |                                     |
| 1   | Wire Cutters/Stripper and a Small Screwdriver |                                     |

## NetMaster CardMate Networked Adaptable Store Sample Order

### Accessory List

| Qty  | Model No.  | Description                   | Comments   |
|------|------------|-------------------------------|--|
| 2000 | 200672P    | User cards                    | Run laundry equipment, between 2000 and 3000 cards are recommended.    |
| 1    | S/SITECRDP | Master Card                   | Sets site code for CSC and CVC.  |
| 1    | 200771     | Smart Card Software Suite     | Program multi-purpose cards. Also read and change value to user cards. |
| 7    | 200671     | Multi-Purpose Card            | Can be used to collect data, program or for diagnostics.               |
| 1    | CM1087     | Management reader             | Used to read, add value, and service user and multi-purpose cards.     |
| 1    | 200817     | SCTM Card                     | Used to access Transaction Module of Smart Card Suite.                 |
| 1    | 200768     | NetMaster Base Software Suite | Program used to generate reports.                                      |

### \*\*CSC Accessory List

| Qty | Model No.  | Description        | Comments   |
|-----|------------|--------------------|--|
| 1   | S/CSC/AVR2 | CSC Base Unit      | With bill acceptor, card reader and recharge balance function. |
| 1   | CSC/CDK    | CSC Card Dispenser |  |

### \*\*CVC Unit and Accessories

| Qty | Model No.   | Description                     | Comments                                |
|-----|-------------|---------------------------------|---|
| 1   | CVC/BASE/R1 | CardMate Value Center Base Unit | With card reader.                       |
| 1   | CM1077      | CVC Bill Acceptor               | To purchase cards and recharge balance. |
| 1   | CVC/CDK     | CVC Card Dispenser              |   |

### \*\*CVC Optional Recommended Accessory List

| Qty | Model No.     | Description            | Comments  |
|-----|---------------|------------------------|---|
| 1   | CVC/STAND     | CVC Stand              | For floor mounting of the CVC unit. Not needed if mounted to the wall.          |
| 1   | CVC/PRK       | CVC Printer Kit        | Allows for printing of receipts which is required for credit card transactions. |
| 1   | CVC/PRK/PAPER | Thermal Roll Paper Kit | For CVC printer (6 rolls).  |

\*\*Alliance Laundry Systems suggests having at least 2 Card Add Valve Stations. The type and quantity of Card Add Valve Stations would depend on preferences of the store owner.

## NetMaster CardMate Networked Store Sample Order

### Accessory List

| Qty  | Model No.  | Description                   | Comments  |
|------|------------|-------------------------------|---|
| 2000 | 200672P    | User cards                    | Run laundry equipment, between 2000 and 3000 cards are recommended.     |
| 1    | S/SITECRDP | Master Card                   | Sets site code for CSC and CVC.   |
| 1    | 200768     | NetMaster Base Software Suite | Program used to generate reports.                                       |
| 1    | 200770     | Network Software Suite        | Software used to run the network. Replaces functions of the Micro-Wand. |
| 1    | 200771     | Smart Card Software Suite     | Includes Transaction Modules that can read and add value to user cards. |
| 1    | CM1087     | Management Reader             | Used to read, add value, and service user and multi-purpose cards.      |
| 1    | 200817     | SCTM Card                     | Used to access Transaction Module of Smart Card Suite.                  |
| *1   | NK100      | Desktop Network Card          | Needed to communicate from computer to networked machines.              |
| *1   | NK101      | Laptop Network Card           | Needed to communicate from computer to networked machines.              |

### \*\*CSC Accessory List

| Qty | Model No.  | Description        | Comments   |
|-----|------------|--------------------|--|
| 1   | S/CSC/AVR2 | CSC Base Unit      | With bill acceptor, card reader and recharge balance function. |
| 1   | CSC/CDK    | CSC Card Dispenser |  |

### \*\*CVC Unit and Accessories

| Qty | Model No.   | Description                     | Comments                                |
|-----|-------------|---------------------------------|---|
| 1   | CVC/BASE/R1 | CardMate Value Center Base Unit | With card reader.                       |
| 1   | CM1077      | CVC Bill Acceptor               | To purchase cards and recharge balance. |
| 1   | CVC/CDK     | CVC Card Dispenser              |   |

### \*\*CVC Optional Recommended Accessory List

| Qty | Model No.     | Description            | Comments  |
|-----|---------------|------------------------|---|
| 1   | CVC/STAND     | CVC Stand              | For floor mounting of the CVC unit. Not needed if mounted to the wall.          |
| 1   | CVC/PRK       | CVC Printer Kit        | Allows for printing of receipts which is required for credit card transactions. |
| 1   | CVC/PRK/PAPER | Thermal Roll Paper Kit | For CVC printer (6 rolls).  |

### Optional Recommended Accessory List

| Qty | Model No. | Description        | Comments   |
|-----|-----------|--------------------|--|
| 7   | 200671    | Multi-Purpose Card | Can be used to collect data, program or diagnostics (network replaces).    |
| 1   | NK120     | Repeater           | Used to network store with 125-249 units.                                  |
| 1   |           | PC Anywhere        | Connects your home computer to your store computer. Bought at local store. |



### Accessories Obtained from Local Electronic Supply Store

| Qty | Description                                   | Comments                                      |
|-----|---|---|
|     | Twisted Pair Wire, 18 AWG tinned copper       | Connects networked machines and PC.           |
| 1   | Computer                                      | When Alliance Laundry Systems promotion ends. |
| 1   | 120 Ohm termination Resistor                  | Used on the last machine in the network.      |
| 1   | Wire Cutters/Stripper and a Small Screwdriver |   |

\*The type of network card ordered would depend on the type of computer the store owner is using. These cards need to be installed by a professional.

\*\*Alliance Laundry Systems suggests having at least 2 Card Add Valve Stations. The type and quantity if Card Add Valve Stations would depend on preferences of the store owner.



# Installation

## A. Interface PC and Machines

1. The Data Connector should be attached to the network board on the back of the PC. The PC must be Pentium 166 or better, have 32 mb RAM minimum, a CD drive, a mouse and Windows 98 or higher.

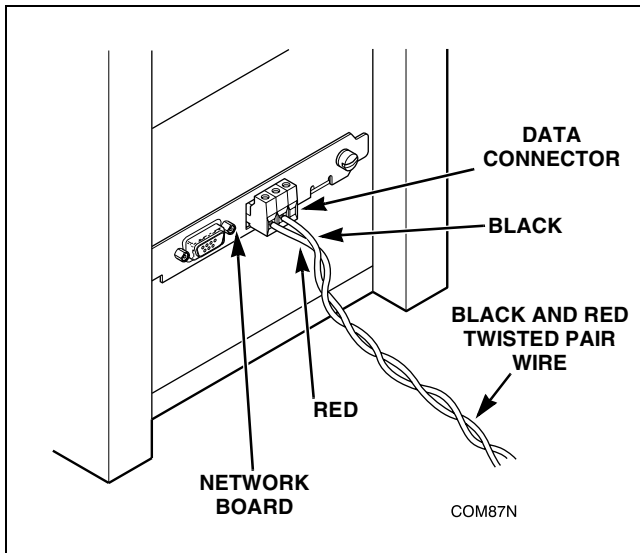


Figure 1

2. Carefully strip 1/4" of the insulation from the black and red twisted pair wire. 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. Refer to *Figure 5*.
3. The black/red twisted pair (Alliance Laundry Systems recommends using American Electronic Wire Co. part number 781816PFO - 2Z) wires should be connected to slots 1 and 2 (red from 1, black from 2). Refer to *Figure 6*.

## B. Interfacing a Laptop to Machines

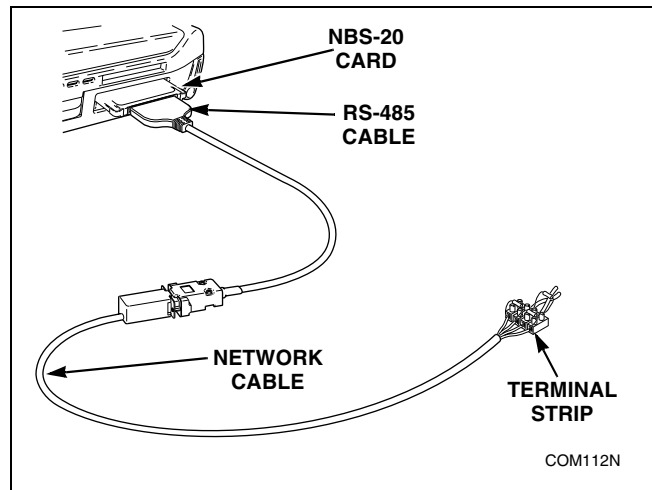


Figure 2

1. Attach the RS-485 cable to the Network Card and insert the card into the PCMCIA Slot on the laptop.
2. Attach the network cable to the RS-485 cable.
3. Carefully strip 1/4" of the insulation from the black and red twisted pair wire. 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. Refer to *Figure 5*.
4. Place a 120  $\Omega$  1/2 Watt terminating resistor and 2 560  $\Omega$  1/4 Watt bias resistors into the terminal strip. Refer to *Figure 3*.

**NOTE: One of the 560  $\Omega$  1/4 Watt bias resistors connects between the white and red wires of the network cable. The other 560  $\Omega$  1/4 Watt resistor connects between the black and green wires of the network cable.**

## Installation

5. Run the wires of the network cable into the different circuits of the terminal strip and hold them in place while tightening the screws on top of the strip. Refer to *Figure 3*.
6. Carefully strip 1/4" of the insulation from the black and red twisted pair wire. 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. Refer to *Figure 5*.
7. Place the black and red twisted pair wire into the terminal strip and hold the wires in place while tightening the screw on top of the terminal strip (connect black wire to black wire and red wire to red wire). Refer to *Figure 3*.

**NOTE: The 120  $\Omega$  1/2 Watt terminating resistor connects between the red and black wires of the twisted pair network wiring.**

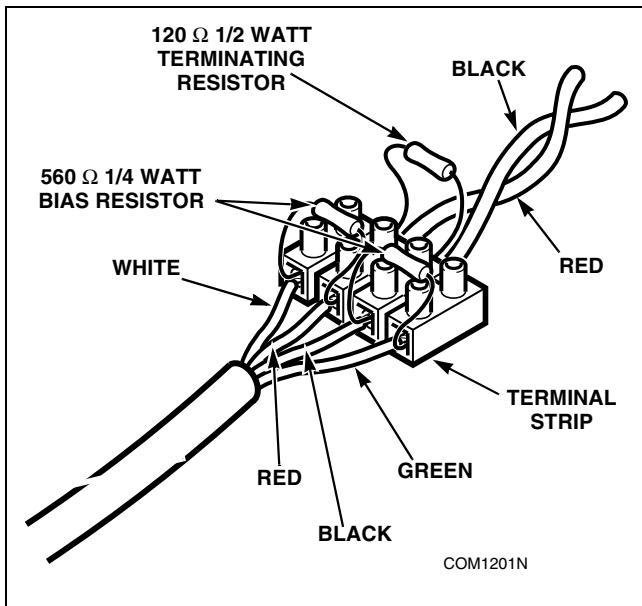


Figure 3

## C. Connecting the Machines to the PC and Each Other (For up to 124 machines or 4,000 feet of network length)

1. Run the black/red twisted pair wire to the first machine to be connected. Follow whatever sequence is most convenient for store layout. Be sure you have DISCONNECTED the PC or laptop before you begin wiring.
2. Locate the network board header on the back of the machine. refer to *Figure 4*

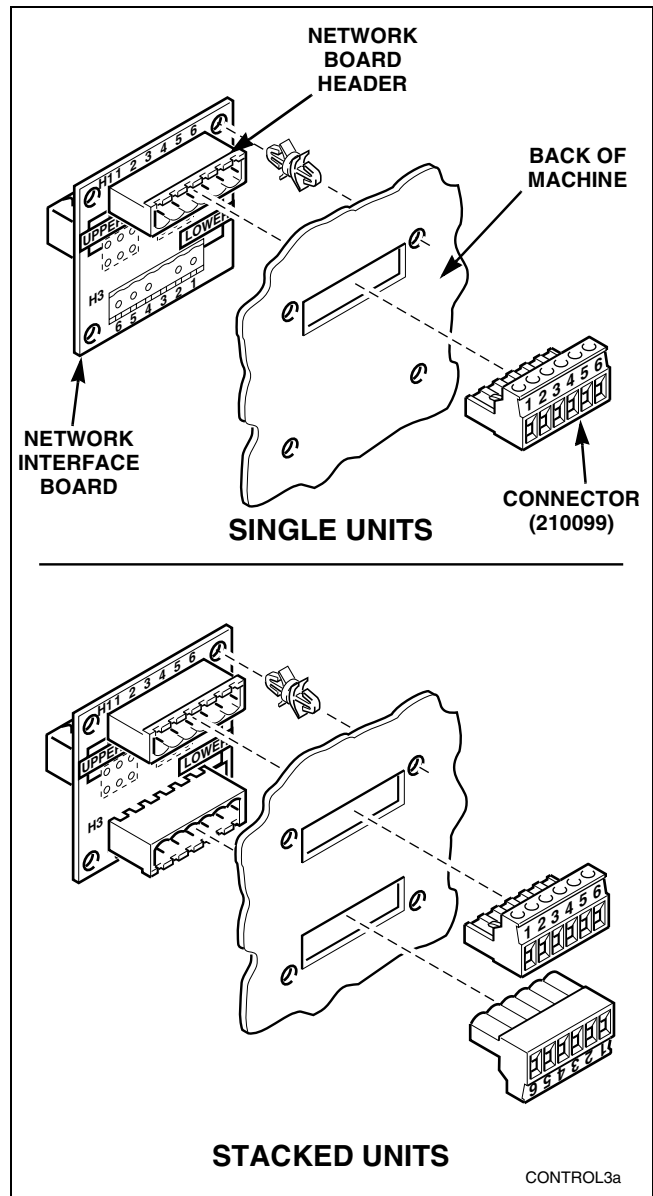


Figure 4

**NOTE: Stacked units will have two connectors.**

- Carefully strip 1/4" of the insulation from the black and red twisted pair wire. 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. Refer to *Figure 5*.

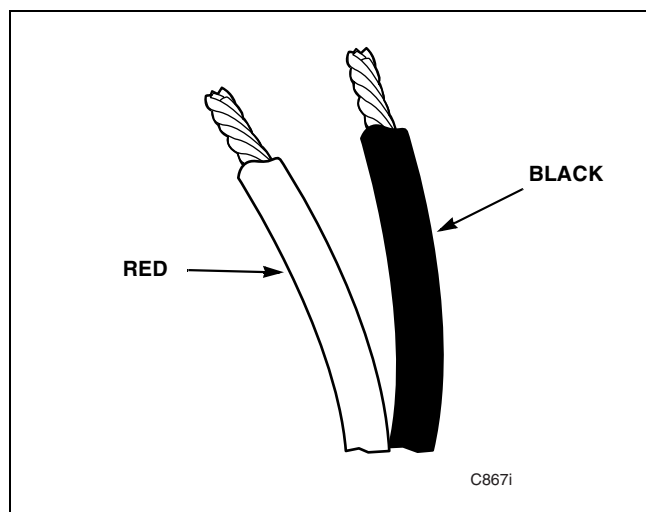


Figure 5

- Remove the connector (part number 210099) from the literature packet or kit.
- Insert the wire into the connector. The red 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. Incorrect installation could result in the network not communicating. Secure the wires in place by tightening the screws on top of the connector. refer to *Figure 6*
- Cut an ample 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 7*
- Strip 1/4 if the insulation and place the red outgoing wire into slot 4 and black outgoing into slot 5. Follow the same procedure in step 5.
- Connect the wired connector to the Network Board Header. Refer to *Figure 7*.
- Run the wire to the next machine and follow steps 3-8 until all machines have been connected. Refer to *Figure 7*.
- On the final machine, wires should be run into slots 1 and 2 as on all previous machines. A 120 Ohm, 1/2 Watt terminating resistor should be placed in slots 4 and 5 to terminate the connection at the end of the network. Refer to *Figure 7*.

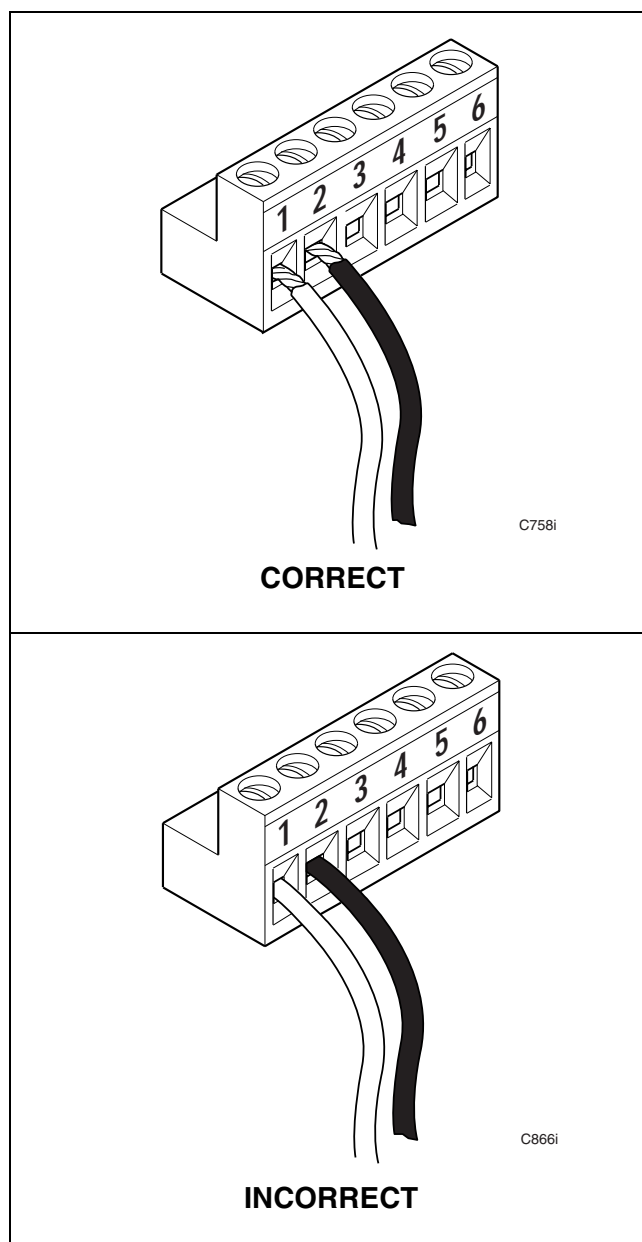


Figure 6

**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 (such as part number 210161) may be used for this purpose.

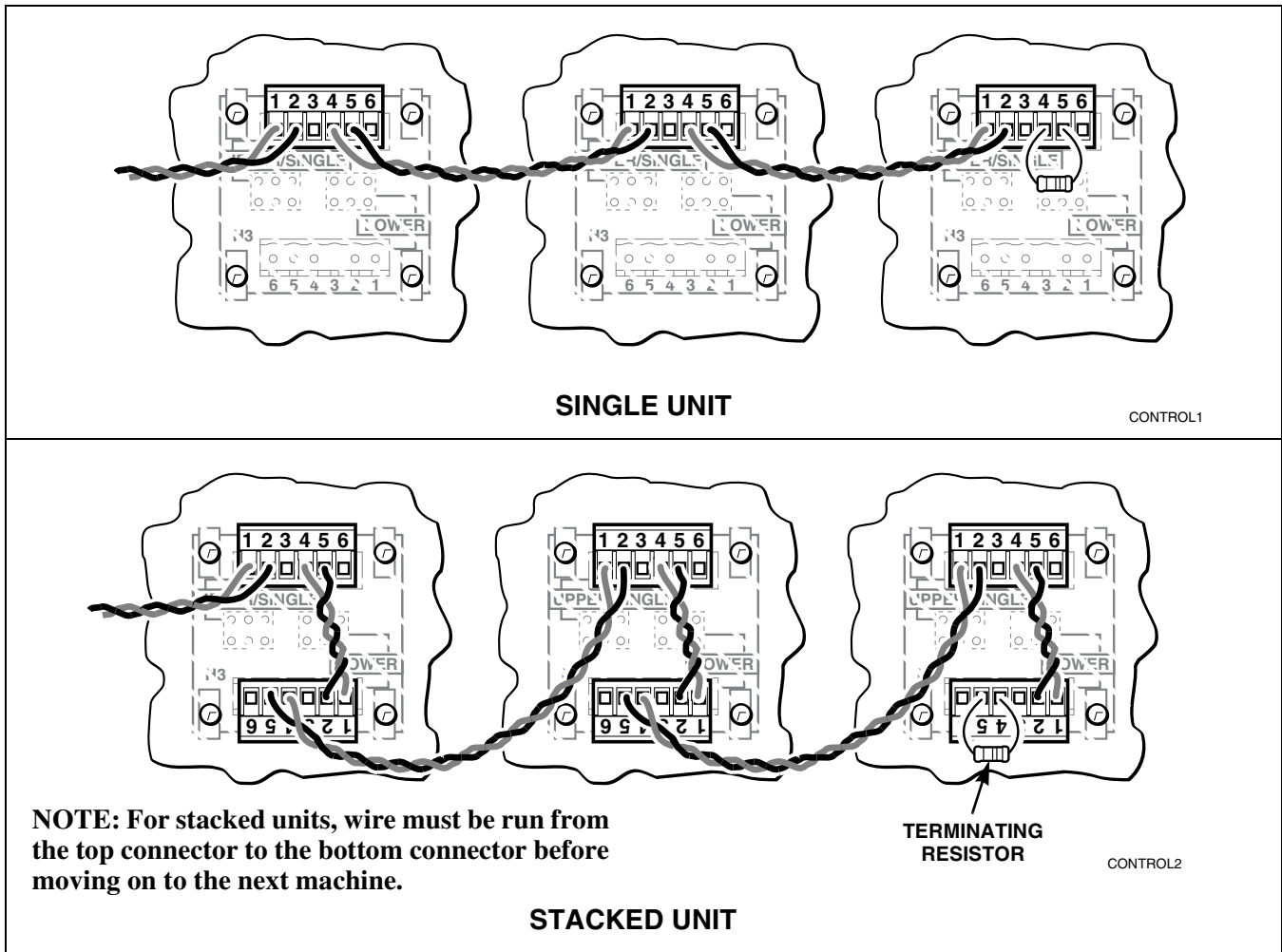


Figure 7

### D. Connecting the Repeater to the PC

Refer to *Figure 8*

1. Attach one of the 210150 Network Cables to segment 1 of the repeater.
2. Connect the RED and BLACK wires of that Network Cable to the terminal strip coming from the computer (RED to RED and BLACK to BLACK). Do not connect the GREEN wire.
3. When repeater is used with a desktop PC, the bias resistor in the repeater must be removed. Open the repeater and remove jumpers J3 and J4. Refer to the manual included with the repeater for specific instructions.

**NOTE:** Ensure that only the bias resistors that correspond to segment one (PC connection) are removed.

4. Connect one of the 210150 Network Cables to segment 2 of the repeater.

5. Connect the RED and BLACK wires of that Network Cable to the terminal strip going out to one leg of the network (RED to RED and BLACK to BLACK). Do not connect the GREEN wire.
6. Terminate the last machine on this leg with a 120 Ohm 1/2 Watt resistor.

**NOTE:** Up to 124 nodes may be connected to any given segment coming off the repeater. A total of 250 nodes may be connected to the network.

7. Repeat steps 4 – 6 for the remaining 2 segments as required. There is no need to connect a cable or a terminating resistor to an unused segment on the repeater.
8. Connect the bayonet style connector of the wall adapter to the 12 VDC input on the repeater.
9. Connect the wall adapter to a 120 VAC 60 Hz. outlet.

### To Connect Repeater to PC

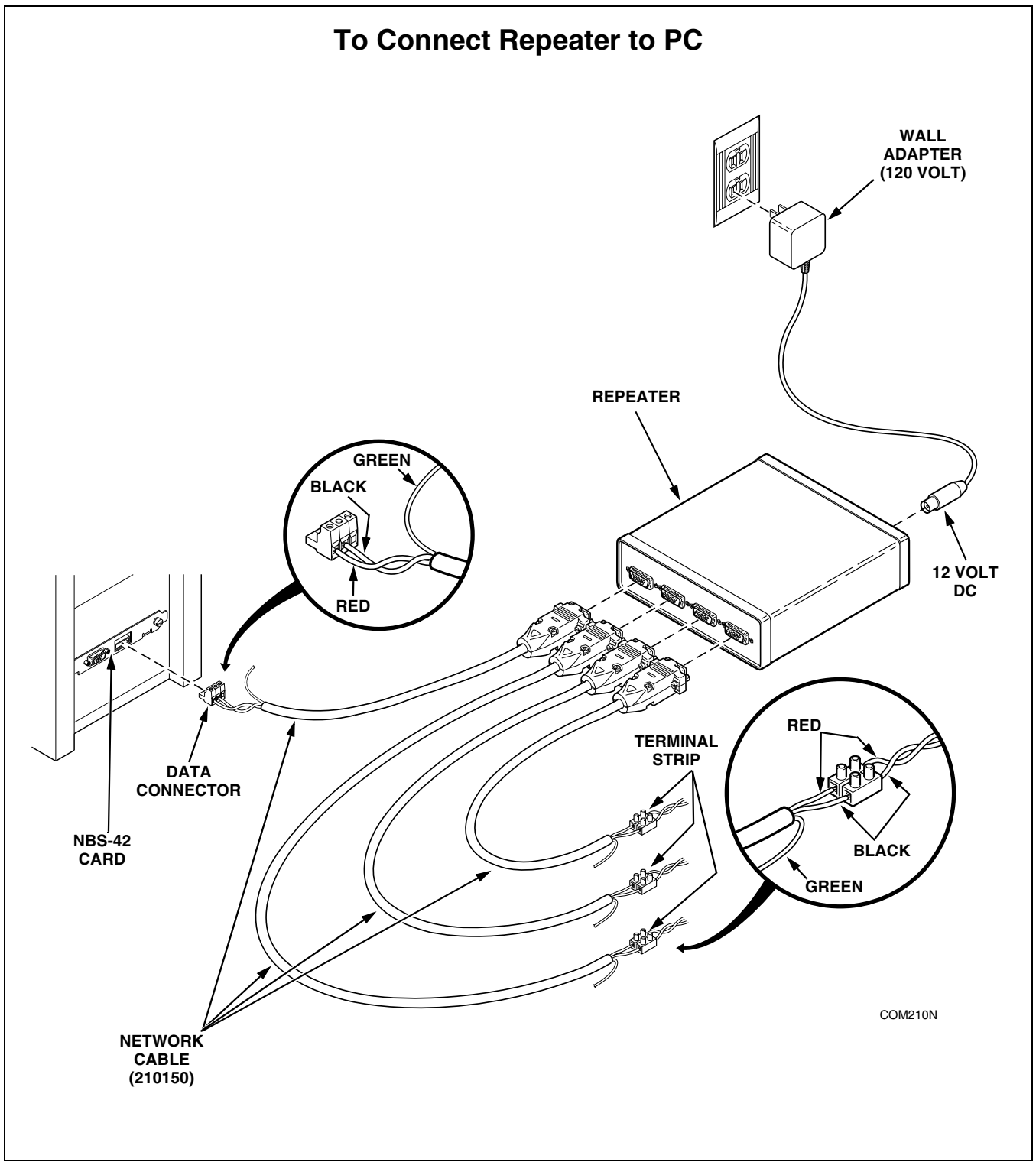


Figure 8

## E. Connecting the Repeater to a Laptop

**NOTE:** If connecting the repeater to a laptop, a terminating resistor must be used. Refer to the section on “*Interfacing a Laptop to Machines*” on page 5. Refer to *Figure 9*.

## F. Tests

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

1. Power off all machines before test.
2. Check for continuity of 2 wires running from the central PC.
  - a. Disconnect the wires from the PC
  - b. Check for  $120 \Omega \pm 20\%$ . 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, which means the network is only communicating to a certain point in the network.

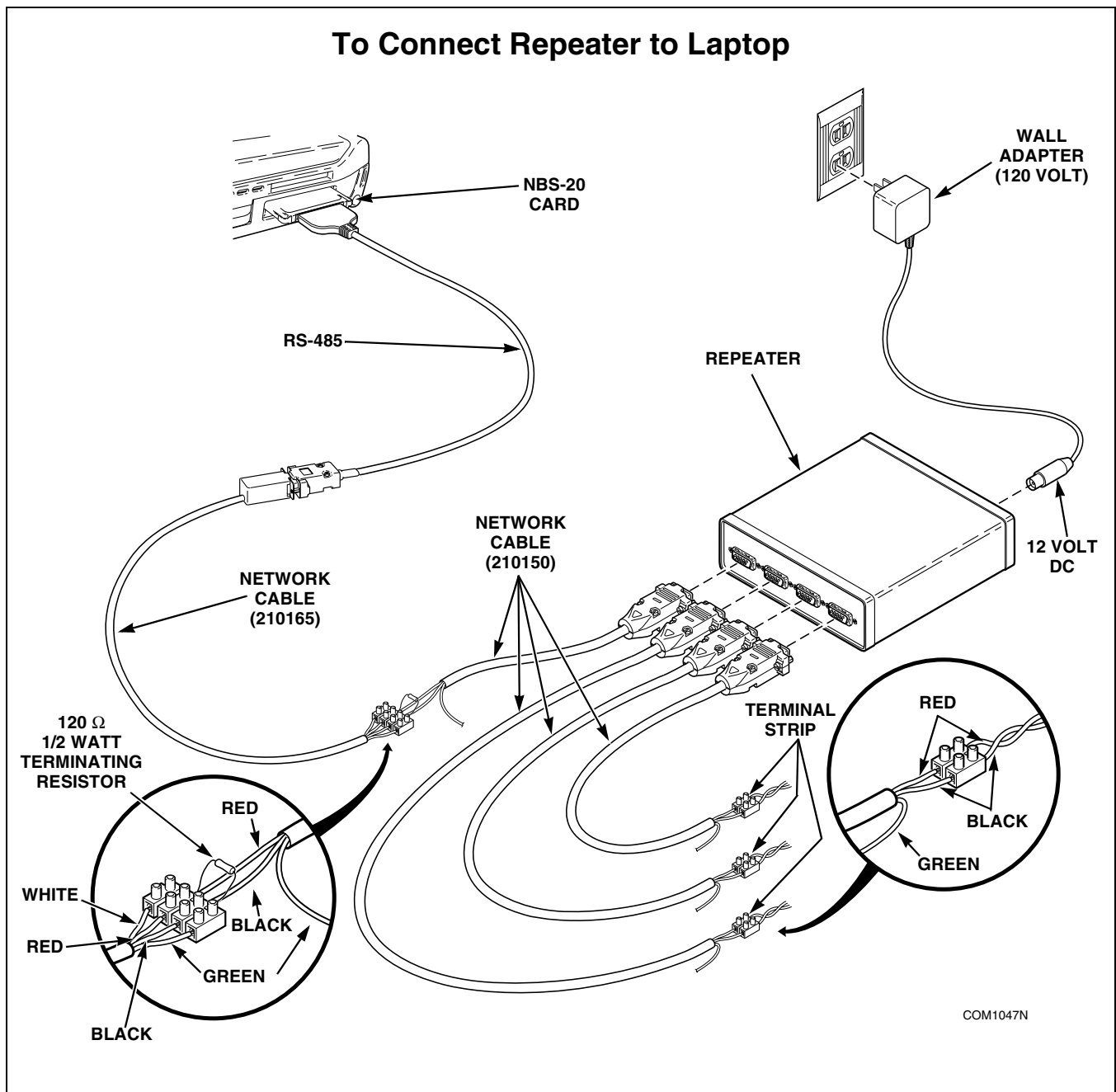


Figure 9



# Troubleshooting

## Error Codes

| Display   | Machine | Error Description  | Error Cause   | Error Condition Exit   |
|---|---------|--|---|--|
| “EI:xx”<br>:00<br>:01<br>:02<br>:03<br>:04<br>:05<br>:06<br>:07<br>:08<br>:09<br>:0A<br>:0F   | All     | <b>IR Communication Errors:</b><br>- General communication error<br>- Bad transmission<br>- Device timeout<br>- Invalid command code<br>- Expecting upload request<br>- Invalid or out-of-range data<br>- Invalid data code<br>- Error writing to RTC<br>- Error writing to EEPROM<br>- CRC-16 error<br>- Invalid machine type<br>- Invalid wakeup or IR disabled  | - Communication problem<br>- Communication problem<br>- Communication problem<br>- Wrong machine type<br>- Communication problem<br>- Wrong machine type<br>- Wrong machine type<br>- Control failure<br>- Control failure<br>- Communication problem<br>- Wrong machine type<br>- Communication problem or IR is disabled  | Error ends after several seconds   |
| “EC:xx”<br>:00<br>:02<br>:03<br>:05<br>:06<br>:09<br>:0A<br>:19<br>:20<br>:21<br>:22<br>:23<br>:24<br>:25<br>:26<br>:27<br>:28<br>:29<br>:2A<br>:2b<br>:2C<br>:2d<br>:2E<br>:2F | All     | <b>Card Reader Communication Errors:</b><br>- General communication error<br>- Timeout error<br>- Invalid command code<br>- Invalid or out-of-range data<br>- Invalid data code<br>- Corrupted data error<br>- Invalid machine type<br>- No Card Reader communication<br>- Unreadable card<br>- Security ID mismatch<br>- Site code mismatch<br>- Card maximum value exceeded<br>- Insufficient memory on card<br>- Card reader malfunction<br>- Card write error<br>- Diagnostic test card write failure<br>- Diagnostic test card read failure<br>- Diagnostic test memory test failure<br>- Diagnostic test card interface failure<br>- Diagnostic test flash checksum failure<br>- Bad Biberon or non-Biberon device<br>- Firmware update failed, s/w intact<br>- Firmware update failed, s/w not intact<br>- Firmware updated, but s/w not intact | - Communication problem<br>- Communication problem<br>- Wrong machine type<br>- Wrong machine type<br>- Wrong machine type<br>- Communication problem<br>- Wrong machine type<br>- Communication problem<br>- Bad card/dirty contacts<br>- Card ID mismatch<br>- Card site code mismatch<br>- Value on card over max<br>- Card’s memory full<br>- Bad card reader<br>- Bad card<br>- Bad card reader<br>- Bad card reader<br>- Bad card reader<br>- Bad card reader<br>- Bad card reader<br>- Bad card reader<br>- Bad card reader<br>- Bad card reader<br>- Bad card reader<br>- Bad card reader<br>- Bad firmware in reader<br>- Bad firmware in reader | Error ends after several seconds (unless specified differently)<br><br>Good communication ends error<br><br>Loading valid FW ends error<br>Loading valid FW ends error |

**Error Codes** *(continued)*

| Display           | Machine                    | Error Description                         | Error Cause   | Error Condition Exit  |
|-------------------|----------------------------|---|---|---|
| :30               |                            | - Timeout waiting for Biberon insertion   | - Bad firmware in reader  | After control destroys card, the error is cleared               |
| :31               |                            | - Hotlisted card inserted into the reader | - Card hotlisted  |   |
| :50               |                            | - Loyalty purse read error                | - Bad card  |   |
| :56               |                            | - Loyalty purse write error               | - Bad card  |   |
| Right-most dp lit | All                        | - Network communication error             | - Communication problem   | Error ends at good communication                                |
| “Err”             | All                        | - Coin error                              | - Invalid coin pulse(s)   | Error ends after several seconds                                |
| “Alrm”            | All                        | - Breakin alarm error                     | - Service door or coin vault switches                               | Error ends after several seconds                                |
| “OFF”             | All                        | - Breakin alarm shutdown error            | - Service door or coin vault switches                               | Cycle power to clear error                                      |
| “E:FL”            | Topload<br>Frontload<br>WX | - Fill error                              | - Maximum fill time exceeded  | Cycle power to clear error                                      |
| “E:dr”            | Topload<br>WX              | - Drain error                             | - Maximum drain time exceeded or water sensed at end of a spin step | Cycle power to clear error                                      |
| “E:SP”            | Frontload<br>WX            | - SPI communications error                | - Internal communication problem                                    | Cycle power to clear error                                      |
| “E:OP”            | Dryer<br>WX                | - Open temperature sensor error           | - Bad sensor or wiring  | Cycle power to clear error                                      |
| “E:SH”            | Dryer<br>WX                | - Shorted temperature sensor error        | - Bad sensor or wiring  | Cycle power to clear error                                      |
| “E:dL”            | Frontload<br>WX            | - Door lock error                         | - Unable to lock or unlock the loading door                         | Error cleared when door lock condition is corrected             |
| “E:dO”            | Frontload<br>WX            | - Door open error                         | - Door opened during a running cycle                                | Cycle power to clear error                                      |
| “E:Ub”            | Frontload<br>WX            | - Unbalance error                         | - Unable to balance a load  | Error cleared after EOC (FL)<br>Error cleared after 1 min. (WX) |
| “E:dF”            | WX                         | - Motor failure error                     | - Motor failure   | Cycle power to clear error                                      |
| “E:HT”            | WX                         | - Heater error                            | - Maximum heat time exceeded  | Cycle power to clear error                                      |
| “E:Pr”            | WX                         | - Pressure switch sequence error          | - Pressure switches out of sequence                                 | Cycle power to clear error                                      |

## Network Interface Boards

**Wire Break** - Any time there is a wire break on the network, all machines on the opposite side of the break from the Central PC will become unable to communicate with the Central PC. 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 Central PC may be able to communicate with the Central PC to some degree.

Shorts may be isolated by removing the RS-485 cable from the PC, 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 Central PC 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 Central PC. If, however, both the input and output are wired incorrectly, only that machine will be unable to communicate. If the wires at the card on the PC are flipped, none of the machines will be able to communicate with the Central PC.

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

**Nodes on the Same Address** - If two or more nodes share the same address, there will be intermediate levels on the network, which may be observed with an oscilloscope. These intermediate levels will occur whenever the Central PC commands a response from the address at which there are multiple nodes. In most cases, the Central PC will not be able to communicate successfully with any of the devices at this address. In some cases, however, if two nodes share the same address with one close to the Central PC and the other on the opposite end of the network, the node closest to the PC may be able to overpower the other, and complete a valid communication. The one at the far end, in this case, will not be able to communicate at all with the Central PC.

**NOTE: Nodes on the same address will cause numerous errors on the central PC, 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. A jabbering node may be detected by disconnecting the network from the PC and monitoring the network with an oscilloscope. Since the PC initiates all communications, the scope should show no communications once the PC is removed. If the scope indicates that there is communication occurring, individually remove each node from the network and use the scope to check for communication from that node.

**NOTE: Jabbering nodes will cause numerous errors on the central PC, including “Protocol Errors” and numerous “Unable to Connect” messages.**

## Card Reader

| Display   | Error Description                           | Corrective Action   |
|-----------|---|---|
| EC:00 - x | See EC:19                                   | See sheet on EC:19.   |
| EC:02     | Communication Time-Out                      | If transaction did not go through, try again.   |
| EC:03     | Invalid Command Code                        | If received with a cash value card, try again. Otherwise, card contains an invalid command. |
| EC:05     | Invalid or Out-of-Range data                | Make sure data on programming card is for the current machine.                              |
| EC:06     | Invalid Data Code                           | Make sure data on programming card is for the current machine.                              |
| EC:09     | CRC error                                   | Try again.  |
| EC:0A     | Invalid machine type                        | Make sure data on programming card is for the current machine.                              |
| EC:19 - x | No Card Reader Communication                | See section on EC:19.   |
| EC:20     | Unreadable card                             | See section on EC:20.   |
| EC:21     | Security code ID mis-match                  | Use a card with a security code equal to that in the machine.                               |
| EC:22     | Site Code mis-match                         | Use a card with a site code equal to that in the machine.                                   |
| EC:23     | Card Max value exceeded                     | Use a card with a value less than the card max value programmed in the reader.              |
| EC:24     | Insufficient memory on card                 | Download card contents and clear card to do further collects.                               |
| EC:25     | Card reader malfunction                     | Try again. Card reader may need to be replaced.   |
| EC:26     | Card write error                            | See sheet on EC:26.   |
| EC:27     | Diagnostic test card write error            | Try again. Card reader may need to be replaced.   |
| EC:28     | Diagnostic test card read error             | Try again. Card reader may need to be replaced.   |
| EC:29     | Diagnostic test memory test error           | Try again. Card reader may need to be replaced.   |
| EC:2A     | Diagnostic test card interface error        | Try again. Card reader may need to be replaced.   |
| EC:2B     | Diagnostic test flash checksum error        | Try again. Card reader may need to be replaced.   |
| EC:2C     | Bad Biberon or non-Biberon device           | Firmware must be reloaded into reader with a Biberon.                                       |
| EC:2D     | Firmware update failed, software intact     | See firmware loading.   |
| EC:2E - x | Firmware update failed, software not intact | See firmware loading.   |
| EC:2F - x | Firmware updated, but software not intact   | See firmware loading.   |
| EC:30     | Time-out waiting for Biberon insertion      | See firmware loading.   |
| EC:31     | Hotlisted card inserted into the reader     | Card inserted into the reader was on the hotlist. Card destroyed.                           |

**NOTE: Errors marked with an "X" remain on the display until the error condition is cleared. All other errors are displayed temporarily, for approximately 2 seconds.**

## Card Insertions not recognized by the card reader

All card insertions should be reflected on the FEC display in some manner. For example, if a valid cash card is inserted into the reader, the FEC display should show the balance on the card.

A simple test is to insert any non-smart card (credit card, etc.) into the reader. The display should display an EC:20. This indicates that the reader recognizes a card has been inserted, but it cannot read it. Also this verifies that the reader is communicating successfully with the Front-End Control (FEC).

If the card insertions are not reflected on the FEC display, one of the following conditions has occurred:

- Card reader harness not hooked up or wired incorrectly.
- Card reader is not recognizing card insertions.
- Card reader is not capable of communicating with the FEC.
- If a network board is present, it has malfunctioned.
- FEC has malfunctioned, and is not supplying power to the reader.
- FEC has malfunctioned, and is not capable of communicating with the reader.

If the FEC senses that a card reader is present and the reader fails to communicate with the FEC, it will display an EC:19 error after 2-1/2 minutes. However, if the FEC never recognized that the reader was present at power-up, there will be no error displayed to indicate that there is no communication with the reader.

### EC:19

**NOTE: An EC:19 error indicates that the FEC recognizes that there is a Card Reader present, but it has not received a communication from it in the last 2-1/2 minutes.**

**Network Board Present** - If a Network Board (NWB) is present, it is possible that it has malfunctioned. A bad NWB can prevent the reader from communicating with the FEC, resulting in an EC:19. Before powering down the unit, examine the LED on the NWB. If the LED is NOT flashing one second on/one second off, it is not functioning correctly. It will need to be either reset ( by powering down then up again) or replaced.

If a Network Board is present, it is helpful to eliminate it, if possible, from the circuit temporarily for troubleshooting purposes. Unplug the harness from the NWB to the Card Reader, and also unplug the harness from the NWB to the FEC. Next, connect the harness which is used to connect a Card Reader directly to the FEC.

**NOTE: This harness is not included in machines containing a NWB. The individual performing the service to the machine will have to have this harness.**

If the EC:19 disappears once the NWB has been removed (allow approximately 120 seconds), the NWB may need to be replaced, since the reader was able to communicate with a direct link to the FEC. Ensure that the reader is now operating properly by inserting several cards in the reader, and looking for the appropriate response on the FEC display.

Once the NWB is removed from the circuit, continue to "*NWB Not Present*" below.

**Network Board Not Present** - Begin by checking the voltage to the card reader. The following measurements should be taken at the 14-pin header on the card reader. There should be between 24 and 38 volts DC across pins 3 and 12. This voltage must be present, or the reader will not operate. Also, there should be 5 volts DC across pins 10 and 12. This voltage must be present, or the FEC will not recognize that the card reader is present.

If the voltages mentioned above are found to be present at the reader's 14-pin header and the reader is not functioning correctly, the harness may be bad, the FEC may be bad, or the card reader may be bad.

First, disconnect the reader from the 14-pin header, and re-connect it. Wait about 20 seconds. If there was an EC:19 on the display, check the FEC display to see if the EC:19 has gone away. If it has, the communication has been re-established. The card reader may have experienced a lock-up condition, and should run fine once it has been reset by powering down and up again. Whether or not there was originally an EC:19 on the display, try several cards in the reader to ensure correct operation.

## Troubleshooting

If the EC:19 does not clear or the FEC display still does not reflect a card insertion, try substituting the harness from the FEC to the reader with a known good harness. Wait about 20 seconds. Check the FEC display to see if the EC:19 goes away, and that FEC does reflect the card insertions. If both conditions are satisfied, the old harness was bad, and the new one should be used to replace it. Try several cards in the new reader to ensure correct operation.

If the EC:19 does not clear or the FEC display still does not reflect a card insertion, try substituting another card reader. Wait about 20 seconds. Check the FEC display to see if the EC:19 goes away, and that FEC does reflect the card insertions. If both conditions are satisfied, the old reader was bad, and the new one should be used to replace it. Try several cards in the new reader to ensure correct operation.

If substituting with a new known good reader and a new known good harness does not clear the EC:19 and allow card insertions to be displayed by the FEC, the Front-End Control will probably need to be replaced.

### EC:20 – Error Reading Card

EC:20 errors can occur in cases where neither the reader and the card which caused the EC:20 are faulty. This can occur for the following reasons:

- The reader and card contacts are not making a good connection due to dirty contacts.
- Intermittent poor connections.
- The user not inserting the card properly.

Therefore, it is necessary to try numerous cards numerous times before deciding whether an individual card or reader is in need of replacing.

If EC:20's are consistently received on an individual card, but not on others, the card which gives the errors may need to be replaced

If EC:20's occur often with different cards, the card reader's contacts should be cleaned. If, after cleaning, the problem persists when numerous cards have been tried numerous times, the reader is not reading cards properly and should be replaced.

### EC:26 – Card Write Error

EC:26 errors can occur in cases where neither the reader and the card which caused the EC:26 are faulty. This can occur for the following reasons:

- The reader and card contacts are not making a good connection due to dirty contacts.
- Intermittent poor connections.
- The user not inserting the card properly.

Therefore, it is necessary to try numerous cards numerous times before deciding whether an individual card or reader is in need of replacing.

If an EC:26 error occurs once on a given card, and does not happen again in later transactions, the card and reader are probably OK, and neither would need to be replaced.

If a given card repeatedly gives EC:26's, the card will need to be replaced.

If a given reader repeatedly gives EC:26's with a variety of cards, the reader will need to be replaced.

### Other Errors

The following errors should only occur if a firmware load has been attempted on the card reader. Under any other condition, if an EC:2A, EC:2C, EC:2D, EC:2E, EC:2F or EC:30 appears, the reader should be replaced.

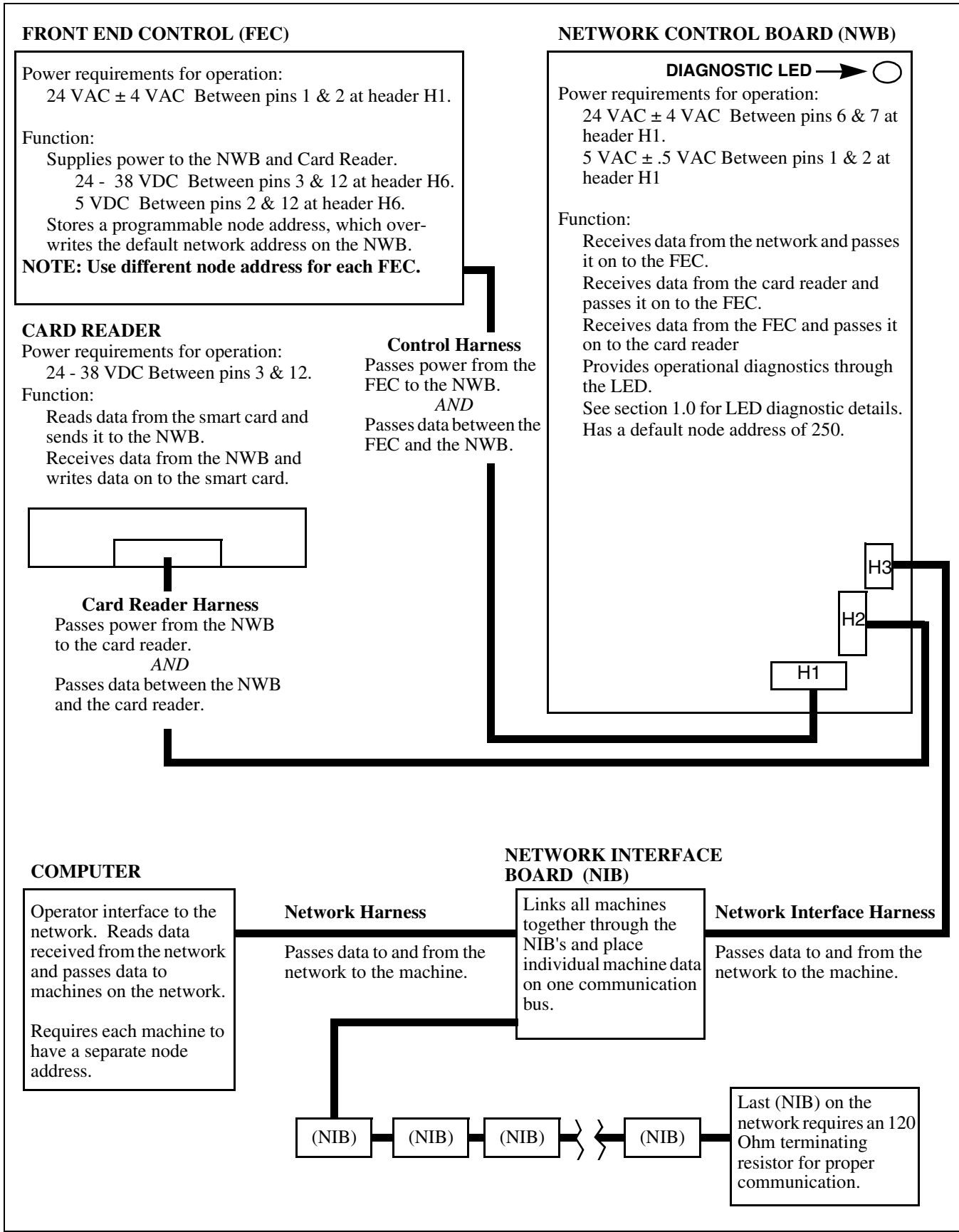


Figure 10

## Network Board Service

### Commonly Used Abbreviations:

**FEC** - Front-End Control – the Dryer/Tumbler Control, Top-Load Washer Control, Front-Load Washer Control, and Washer/Extractor Control are all referred to simply as the Front-End Control throughout this document

**NWB** – Network Board

**NIB** – Network Interface Board

**LED** – Light Emitting Diode

### 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.

### Network Board Operating LED Test

#### **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 PC

### 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* previously described to test the communication link between the FEC and the NWB using the LED.

The FEC must supply 5 VDC 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.

In general, there are three possible sources of failure, the NWB, the FEC, and the Harness. Parts may need to be swapped out individually to isolate the problem.



### Network Board Blocks Card Reader

**Communications to FEC** - Some failure modes may prevent the card reader (if connected) to communicate with the FEC. If this is the case, the NWB itself may or may not be able to communicate with the FEC.

To eliminate the possibility of a bad reader, it is helpful to temporarily eliminate the NWB from the circuit. Unplug the harness from the NWB to the card reader, and also unplug the harness from the NWB to the FEC. Next, connect the harness which is used to connect a card reader directly to the FEC.

**NOTE: This harness is not included in machines containing a NWB, the individual performing the service to the machine will have to have this harness.**

Once the card reader is linked directly to the FEC, wait 15 seconds, and insert any card into the reader. The FEC display should change to reflect the card insertion. If the FEC does not indicate that a card was inserted, the NWB may not be the problem. In this case, see the section on Card Readers.

If the card reader does communicate the card insertion to the FEC, remove the temporary harness and put the original harnesses back in place, so that the NWB is once again in the circuit.

Next, swap the harness from the NWB to the card reader with a known good harness. If the reader is now able to communicate a card insertion, the harness is at fault, and must be changed. If not, put the original harness back, and continue.

Check that there is 5 VDC across pins 1 & 2 of H1 on the NWB. If this voltage is not there, communication between the FEC and the card reader or NWB will not occur.

If there is 5VDC across pins 1 & 2 of H1 and the card reader cannot 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 card reader cannot communicate with the FEC, the FEC must be at fault.

## Network Board to PC Communication Problems

Communication between the NWB and the PC may be interrupted via several cases:

- NWB not operating correctly (not executing program)
- NWB cannot communicate with FEC (NWB cannot get its correct node number)
- Problems on network external to the NWB under test
  - Wires flipped at one or more points on the Network
  - Short on the Network
  - Noise on the Network (another node jabbering, reflections, etc.)

**NWB Not Operating Correctly** - If the NWB is not executing the code in the processor correctly, there is no way it can communicate with the FEC. Use the *network board operating LED test* and the *network board communicating LED test* to verify operation.

**NWB Cannot Get Node Number From PC** - If this is the case, the PC should be able to communicate with the NWB by attempting to communicate with node 250. Note that since 250 is the default node in the NWB, if it cannot retrieve another node number from the FEC, it will default to 250. When running this test, remember that there may be other nodes on the network, due to other failures, that may result in more than one node 250 on the network. If this is the case, the PC may not be able to get through to any node numbered 250. Because of this, it is desirable, if possible, to perform this test on a "1-node" network, which contains only the NWB under test.

If the PC can communicate with the NWB as node 250, then either the FEC has node number 250 programmed into it (test via the Microwand), or the NWB is not communicating with the FEC. Use the *network board communicating LED test* to verify operation.

**Problems Related to Network** - If possible, it may be beneficial to isolate the NWB in question from the rest of the network, creating a "1-node" network. This eliminates other network boards, mis-wiring on the network, etc., as causes for a NWB not communicating with the PC.

With the NWB alone connected to the PC, attempt to communicate with the board. If no communication occurs at any node number, the NWB or the harness from the NWB to the connector at the rear of the machine is bad. Try swapping the NW cable from the rear connector to the NWB and test again. If communication is successful, the harness needs to be replaced.



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