NetMaster Network

NK100, NK101 and NK120

Alliance
Laundry Systems

Table of Contents

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	**EDC108** – Micro-Wand with infra-red adapter cup. **CM1086** – 9-volt rechargeable battery. **CAC203** – Charger/Interface cup enables communication with computer and recharges battery. **CAC302** – 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 valve, 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 valve, 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 colect date, 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.

Notes

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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.
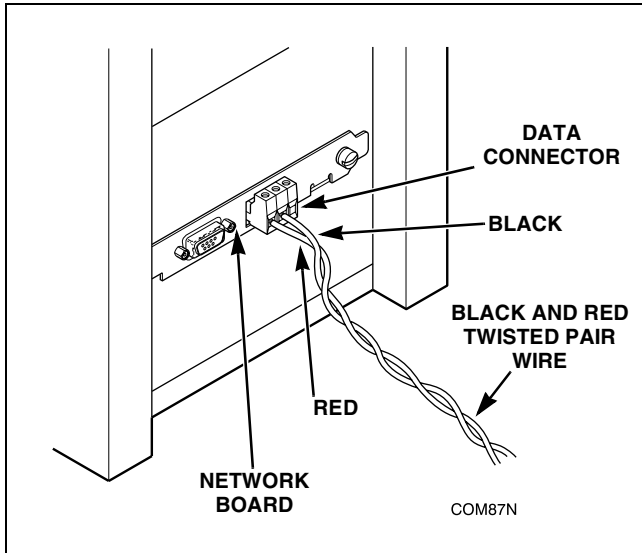

Figure 1

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
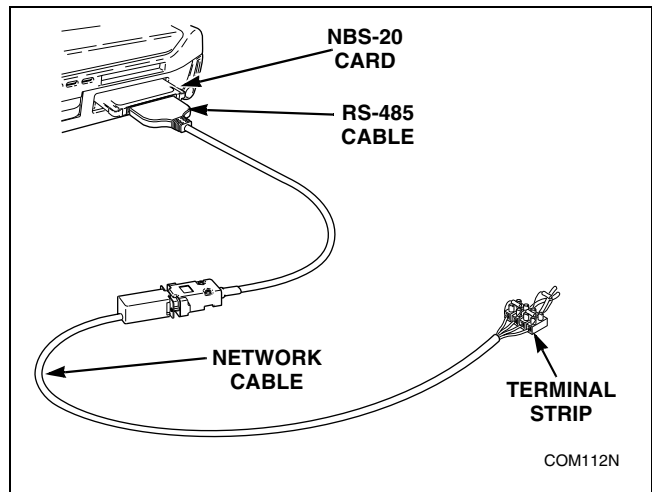
Figure 2

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 Ω 1/2 Watt terminating resistor and 2 560 Ω 1/4 Watt bias resistors into the terminal strip. Refer to *Figure 3*.

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

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 stipped, 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 Ω 1/2 Watt terminating resistor connects between the red and black wires of the twisted pair network wiring.
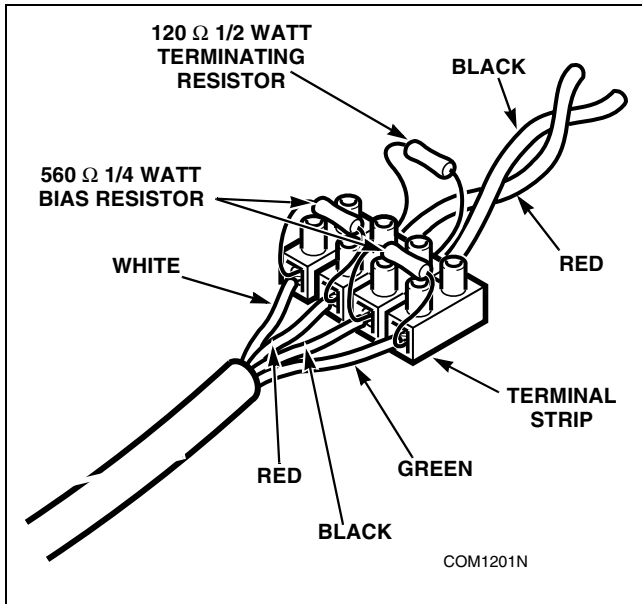
Figure 3

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*
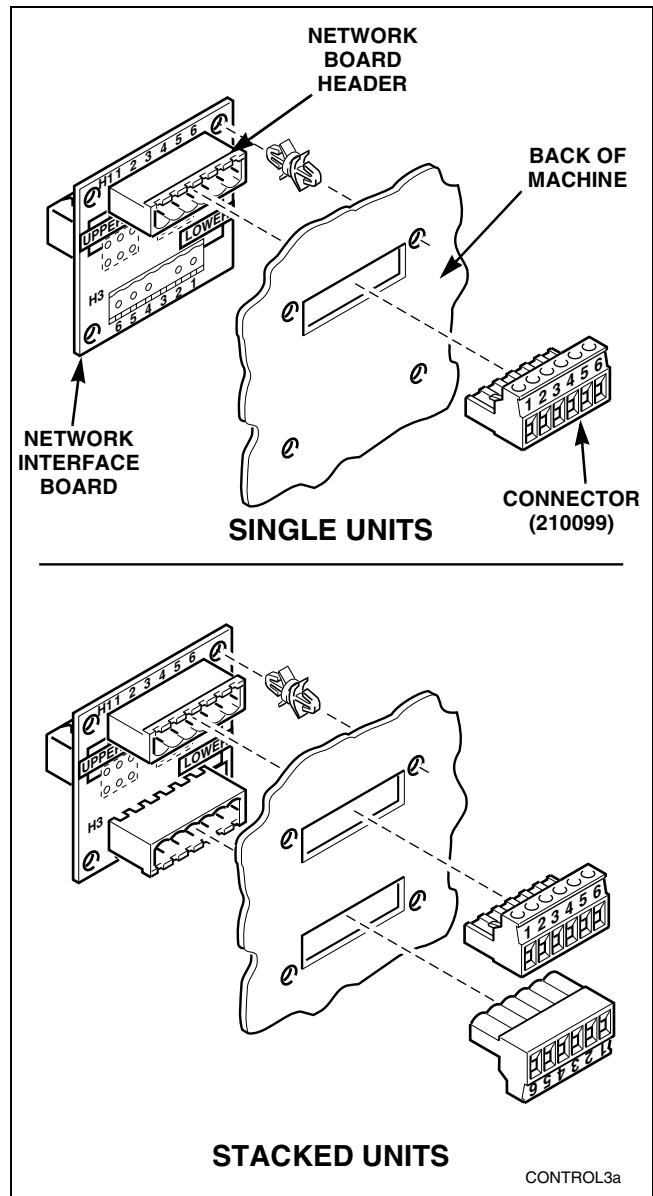
Figure 4

NOTE: Stacked units will have two connectors.

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*.

C867i

Figure 5

4. Remove the connector (part number 210099) from the literature packet or kit.

5. 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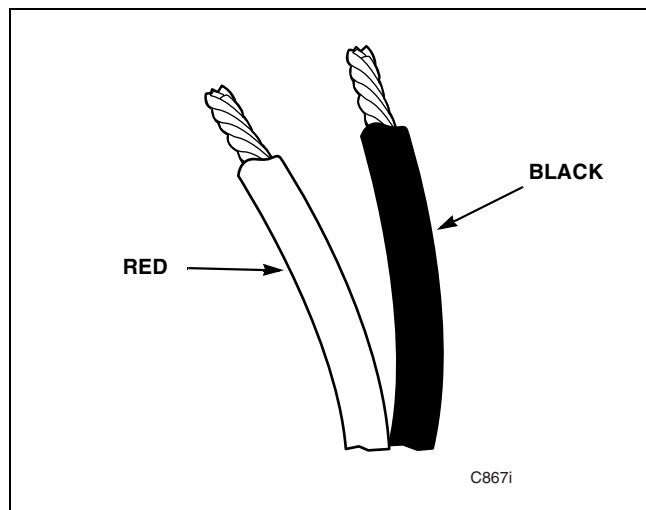 in the network not communicating. Secure the wires in place by tightening the screws on top of the connector. refer to *Figure 6*

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*

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.

8. Connect the wired connector to the Network Board Header. Refer to *Figure 7*.

9. Run the wire to the next machine and follow steps 3-8 until all machines have been connected. Refer to *Figure 7*.

10. 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*.

C758i

CORRECT
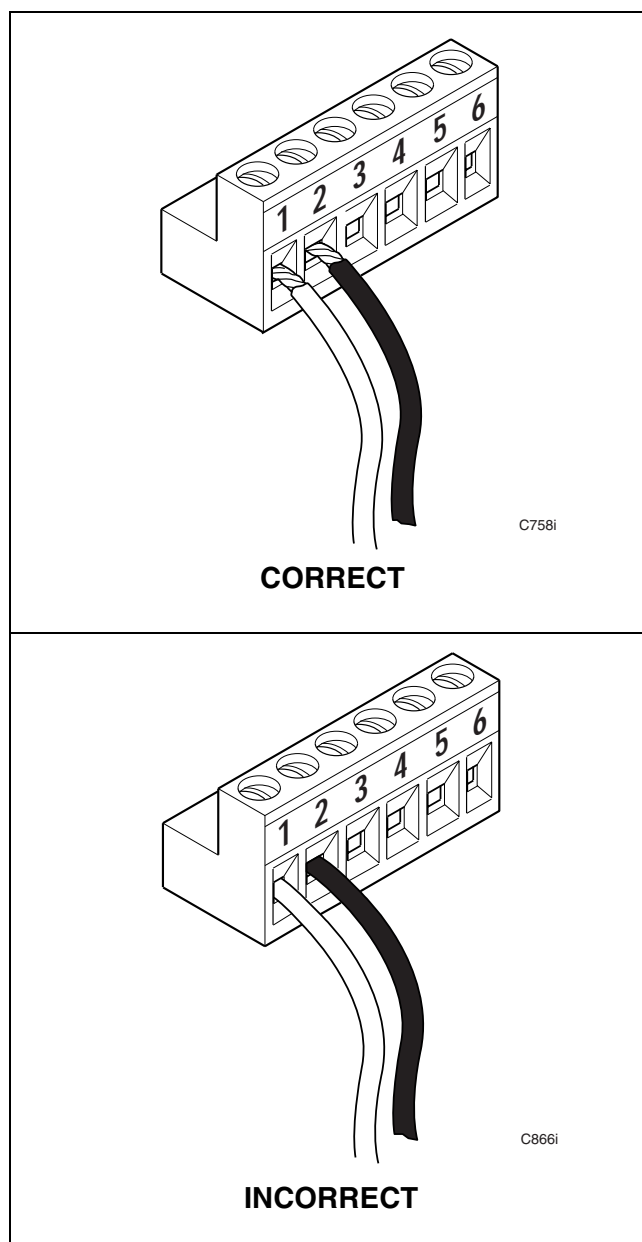

C866i

INCORRECT

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.

SINGLE UNIT

CONTROL1

NOTE: For stacked units, wire must be run from the top connector to the bottom connector before moving on to the next machine.

TERMINATING RESISTOR

CONTROL2

STACKED UNIT
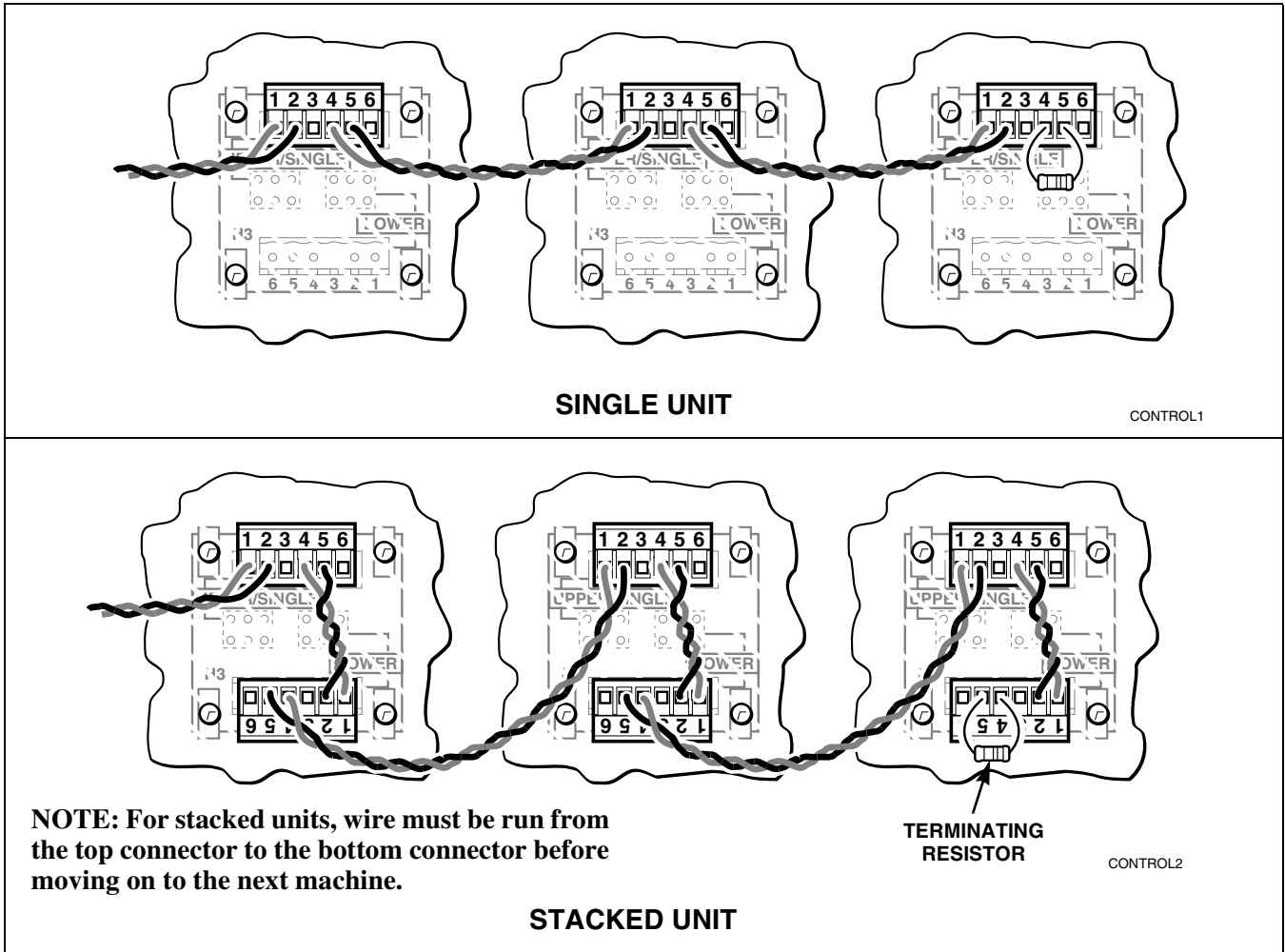
Figure 7

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 repeaater 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

WALL
ADAPTER
(120 VOLT)

REPEATER

GREEN

BLACK

RED

12 VOLT
DC

DATA
CONNECTOR

NBS-42
CARD

TERMINAL
STRIP

RED

BLACK

GREEN

COM210N
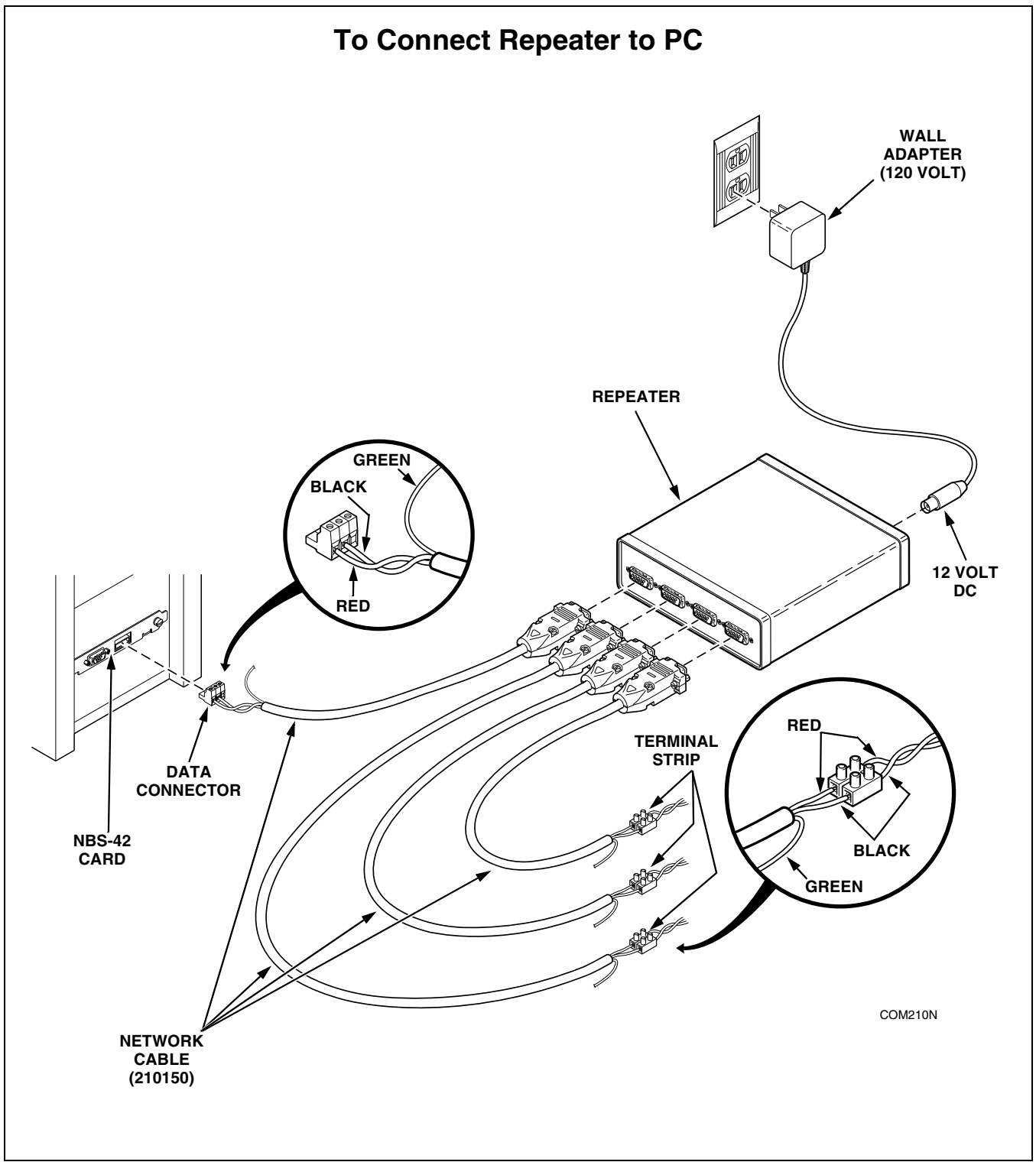
NETWORK
CABLE
(210150)

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 Ω $\pm$ 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.

To Connect Repeater to Laptop

NBS-20 CARD

WALL ADAPTER (120 VOLT)

RS-485

REPEATER

NETWORK CABLE (210150)

12 VOLT DC

NETWORK CABLE (210165)

TERMINAL STRIP

RED

BLACK

GREEN

120 Ω 1/2 WATT TERMINATING RESISTOR

RED

WHITE

RED

BLACK

GREEN

BLACK

COM1047N
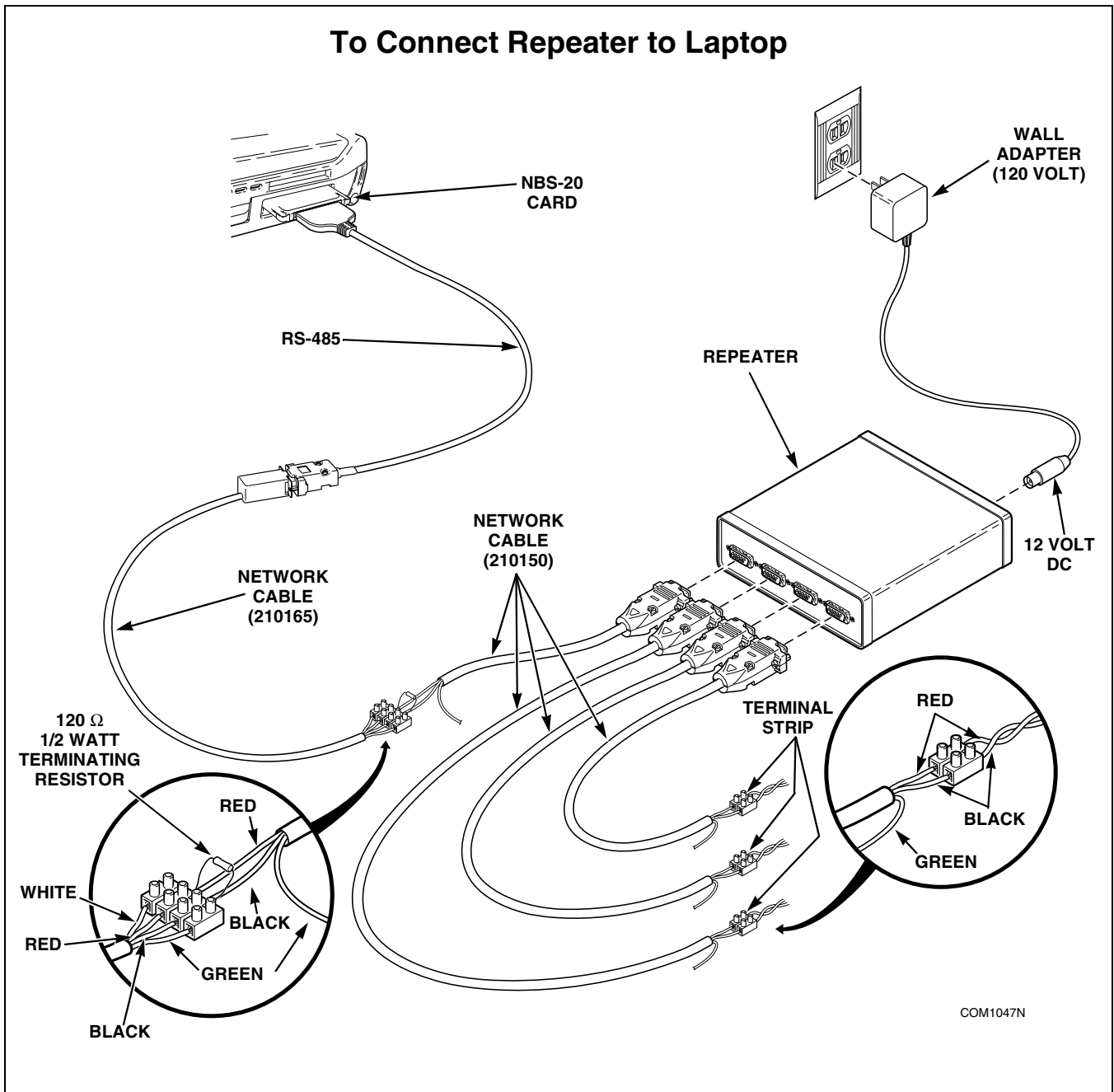
Figure 9

Troubleshooting

Error Codes

Display	Machine	Error Description	Error Cause	Error Condition Exit
"EI:xx"	All	**IR Communication Errors:**		
:00		- General communication error	- Communication problem	Error ends after several seconds
:01		- Bad transmission	- Communication problem	
:02		- Device timeout	- Communication problem	
:03		- Invalid command code	- Wrong machine type	
:04		- Expecting upload request	- Communication problem	
:05		- Invalid or out-of-range data	- Wrong machine type	
:06		- Invalid data code	- Wrong machine type	
:07		- Error writing to RTC	- Control failure	
:08		- Error writing to EEPROM	- Control failure	
:09		- CRC-16 error	- Communication problem	
:0A		- Invalid machine type	- Wrong machine type	
:0F		- Invalid wakeup or IR disabled	- Communication problem or IR is disabled	
"EC:xx"	All	**Card Reader Communication Errors:**		
:00		- General communication error	- Communication problem	Error ends after several seconds (unless specified differently)
:02		- Timeout error	- Communication problem	
:03		- Invalid command code	- Wrong machine type	
:05		- Invalid or out-of-range data	- Wrong machine type	
:06		- Invalid data code	- Wrong machine type	
:09		- Corrupted data error	- Communication problem	
:0A		- Invalid machine type	- Wrong machine type	
:19		- No Card Reader communication	- Communication problem	Good communication ends error
:20		- Unreadable card	- Bad card/dirty contacts	
:21		- Security ID mismatch	- Card ID mismatch	
:22		- Site code mismatch	- Card site code mismatch	
:23		- Card maximum value exceeded	- Value on card over max	
:24		- Insufficient memory on card	- Card's memory full	
:25		- Card reader malfunction	- Bad card reader	
:26		- Card write error	- Bad card	
:27		- Diagnostic test card write failure	- Bad card reader	
:28		- Diagnostic test card read failure	- Bad card reader	
:29		- Diagnostic test memory test failure	- Bad card reader	
:2A		- Diagnostic test card interface failure	- Bad card reader	
:2b		- Diagnostic test flash checksum failure	- Bad card reader	
:2C		- Bad Biberon or non-Biberon device	- Bad card reader	
:2d		- Firmware update failed, s/w intact	- Firmware load failed	
:2E		- Firmware update failed, s/w not intact	- Bad firmware in reader	Loading valid FW ends error
:2F		- Firmware updated, but s/w not intact	- Bad firmware in reader	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	
:31		- Hotlisted card inserted into the reader	- Card hotlisted	After control destroys card, the error is cleared
: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 Frontload WX	- Fill error	- Maximum fill time exceeded	Cycle power to clear error
"E:dr"	Topload WX	- Drain error	- Maximum drain time exceeded or water sensed at end of a spin step	Cycle power to clear error
"E:SP"	Frontload WX	- SPI communications error	- Internal communication problem	Cycle power to clear error
"E:OP"	Dryer WX	- Open temperature sensor error	- Bad sensor or wiring	Cycle power to clear error
"E:SH"	Dryer WX	- Shorted temperature sensor error	- Bad sensor or wiring	Cycle power to clear error
"E:dL"	Frontload WX	- Door lock error	- Unable to lock or unlock the loading door	Error cleared when door lock condition is corrected
"E:dO"	Frontload WX	- Door open error	- Door opened during a running cycle	Cycle power to clear error
"E:Ub"	Frontload WX	- Unbalance error	- Unable to balance a load	Error cleared after EOC (FL) 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.

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.
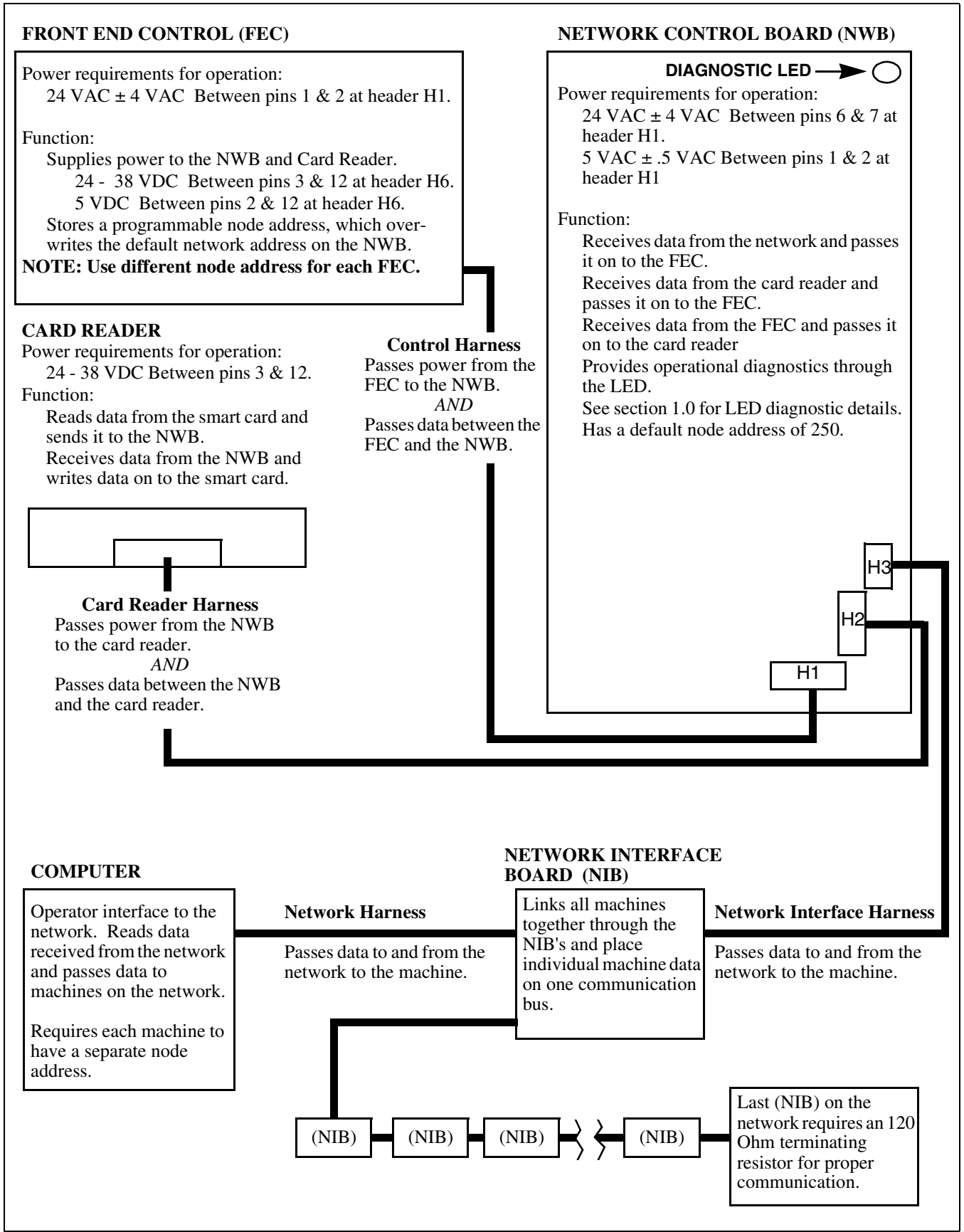
FRONT END CONTROL (FEC)

Power requirements for operation:
    24 VAC ± 4 VAC Between pins 1 & 2 at header H1.

Function:
    Supplies power to the NWB and Card Reader.
        24 - 38 VDC Between pins 3 & 12 at header H6.
        5 VDC Between pins 2 & 12 at header H6.
    Stores a programmable node address, which over-
    writes the default network address on the NWB.
NOTE: Use different node address for each FEC.

CARD READER

Power requirements for operation:
    24 - 38 VDC Between pins 3 & 12.
Function:
    Reads data from the smart card and
    sends it to the NWB.
    Receives data from the NWB and
    writes data on to the smart card.

Card Reader Harness
Passes power from the NWB
to the card reader.
                    AND
Passes data between the NWB
and the card reader.

Control Harness
Passes power from the
FEC to the NWB.
            AND
Passes data between the
FEC and the NWB.

NETWORK CONTROL BOARD (NWB)

DIAGNOSTIC LED ⟶ ◯

Power requirements for operation:
    24 VAC ± 4 VAC Between pins 6 & 7 at
    header H1.
    5 VAC ± .5 VAC Between pins 1 & 2 at
    header H1

Function:
    Receives data from the network and passes
    it on to the FEC.
    Receives data from the card reader and
    passes it on to the FEC.
    Receives data from the FEC and passes it
    on to the card reader
    Provides operational diagnostics through
    the LED.
    See section 1.0 for LED diagnostic details.
    Has a default node address of 250.

H3

H2

H1

COMPUTER

Operator interface to the
network. Reads data
received from the network
and passes data to
machines on the network.

Requires each machine to
have a separate node
address.

Network Harness

Passes data to and from the
network to the machine.

**NETWORK INTERFACE
BOARD (NIB)**

Links all machines
together through the
NIB's and place
individual machine data
on one communication
bus.

Network Interface Harness

Passes data to and from the
network to the machine.

(NIB) (NIB) (NIB) ⟩ ⟨ (NIB)

Last (NIB) on the
network requires an 120
Ohm terminating
resistor for proper
communication.

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 through-out 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 an 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 an 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.

Notes

505942