Network Chromatography Interface 901/902 Operator's Manual

Release History

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N515-6030	A	April 2001

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NOTE: *TotalChrom is the updated version of the software previously marketed as Turbochrom. This product is compatible with TotalChrom and Turbochrom version 6.1.x. The term TotalChrom has been used throughout this document to denote either system.*

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Chapter 1

Introduction

Warning: *Verify that your NCI is running* ***firmware version 3.4*** *or higher. Do not run an NCI that uses a firmware version less than version 3.4. Firmware versions lower than 3.4 may disrupt network operation. If necessary, contact your PerkinElmer service representative to upgrade to firmware version 3.4 (or higher).*

This manual describes the functionality of the Network Chromatography Interface (NCI) 901 and 902 when used with one of the following acquisition software programs: Access*Chrom, TotalChrom, TotalChrom Client/Server, or TotalChrom Workstation.

The NCI 901 and NCI 902 are analog-to-digital (A/D) interfaces that acquire data from a chromatograph. You may perform a run either via manual injections or with an autosampler. The data acquired from the chromatograph are stored in the NCI buffer memory. These data readings are transmitted from the NCI buffer memory to the host computer through an IEEE-488 General Purpose Instrumentation Bus (GPIB), RS-232C serial link, or Ethernet connection.

The NCI 901/902 contains the following features to assist you in obtaining information from a chromatograph:

- Four programmable unipolar and four programmable bipolar voltage ranges (see Chapter 7 for specifications). Each voltage range provides a dynamic range of 1:5,000,000 (134 dB) at a sampling rate of one point per second.

When using older versions of chromatography programs, the effective range is limited to 1:1,000,000 (120 dB).

- Two, sense-input lines (Start and Stop). The sense-input lines signal the NCI to start or stop data collection.
- One Instrument Ready relay. The Instrument Ready relay is on whenever the NCI is ready to take data from the chromatograph.
- Fourteen optional relays. You can program these relays from a host computer to control external devices associated with the chromatography procedure.
- Two optional Rack and Vial ports. These ports allow the NCI to read digital data at transistor transistor logic (TTL) signal levels from an autosampler.

The relays and Rack and Vial ports are available on an optional daughter card. The card contains 14 relays and 2 Rack and Vial ports. When using older versions of chromatography software, only one Rack and Vial port is operational, and you can independently access only seven relays. The second seven relays (B1-B7) maintain the same state as the A1-A7 relays.

- 4 MB of dynamic memory. This dynamic memory stores data and executing programs.
- The NCI 902 contains two A/D converters; the NCI 901 contains one. On the NCI 902, the second A/D converter allows you to collect data from two detectors during a single run.

The NCI 901/902 front panel has membrane switches and LEDs for controlling and monitoring sampling. The membrane switches allow you to start and stop data collection. The LEDs allow you to determine if the power to the NCI is on, if the NCI is ready to start the next run, if the NCI is currently acquiring data, and if the detector data are in range.

NCI 901 Operates on Channel A Only

The NCI 901 has a single analog input, labeled **Signal 1**, on the back panel which corresponds to Channel A in software products.

Despite the single channel function of the NCI 901, with some software products it is possible to create a method that specifies data acquisition on Channel B or in dual channel mode when you are using an NCI 901. ***The NCI 901 will not properly acquire data if the method specifies Channel B or dual channel.*** Only specify Channel A data acquisition (which is the default) with an NCI 901.

Using an NCI with Turbochrom Professional 4.x

- **You must edit/verify delay parameters if you use an NCI with Turbochrom Professional:**

  1. Open the file TC4.INI with a plain text editor such as Notepad.

     TC4.INI will usually be found in the directory C:\TC4.

  2. Locate the parameter "Delay Const=n" in the section [TCoptions] and change it to "Delay Const=8000".

  3. Locate the parameter "Timeout Delay" and verify that it is set to 10.

  4. Save TC4.INI.

No such modification is required when using the NCI with Access*Chrom, TotalChrom Client/Server, or TotalChrom Workstation software.

Use of the NCI with any other software is not supported.

Chapter 2

Safety and Site Data

Warning: *The NCI 901/902 contains no user-serviceable parts. Therefore, there is no reason to remove the top cover in normal usage. If you remove the top cover for any reason, you must first disconnect the power cord from the interface.*

Caution: *If you use this instrument in a manner not specified by PerkinElmer, the protection provided by the equipment may be impaired.*

FCC Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

When installing this equipment, shielded cables must be used on all connections except the RS-232 serial cable. If a serial cable is used, it shall incorporate a ferrite to reduce emissions. Such cables are available from PerkinElmer.

Modification of this equipment without the express permission of the manufacturer may void the user's right to operate the equipment.

Compliance with Canadian Radio Interference Regulations

The following statement is supplied in compliance with Canadian Radio Interference Regulations (C.R.C., c. 1374):

This device has been tested and found to comply with the limits for a Class A computing device pursuant to Section 23 of the Canadian Radio Interference Regulations, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

Chapter 3

Making Back Panel Connections

The NCI 901/902 is designed for easy installation. Installation of the NCI consists of the following steps:

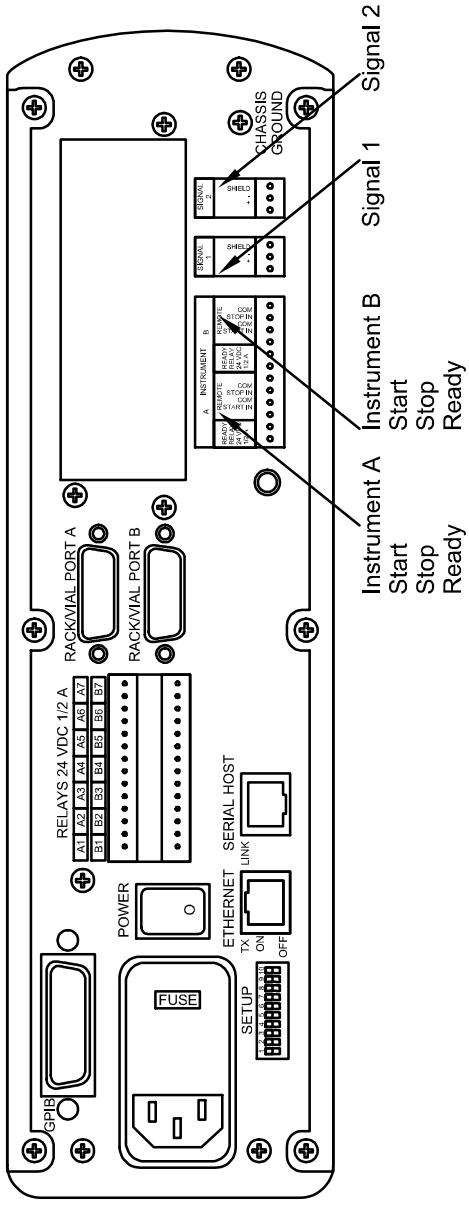
- Making the back panel connections (described in this chapter).
- Configuring the setup switches (see Chapter 4).
- Enabling communication (see Chapter 5).

Included in the NCI shipping container is a package of parts and a power cord. Save these parts and power cord for use in installation.

There are no internal settings for the user to change. All internal adjustments are made at the factory before shipment.

You may operate the NCI 901/902 in either the horizontal or vertical position. Statements in this manual about the location of various elements reference the horizontal position.

Figure 1 - Back Panel Connections



About Depluggable Connectors

The NCI 901/902 is equipped with a removable plug or depluggable connector (DPC). The NCI 901/902 contains the following DPCs: analog signals, Start and Stop inputs, the Ready output, and Relay outputs.

➢ **To make the proper connections when using DPCs:**

1. Prepare the DPC by cutting the ends of the connecting wires evenly, and strip-off a short length (~6 mm).
2. Tin the bare wire with a soldering iron.
3. Remove the appropriate DPC from the bag, and make sure that the metal sleeve is open.
4. Insert the tinned lead into the metal sleeve, and tighten with a screwdriver until the connection is snug. Overtightening may cut the wire lead.

Caution*: These connectors are designed to fit together only one way. Do not attempt to insert the connectors backward. To do so would damage the connector and possibly the system board.*

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5. Position the connector so that the side of the connector that contains the screws is facing up.
6. Insert the prepared DPC into the NCI Back Panel with an even force. The connectors are supposed to be tight to ensure a good connection. Do not attempt to defeat this by loosening the connection.

Power Connection and Fusing

The fuse module is located on the left side of the NCI back panel (see Figure 1). The fuse module contains the voltage selector and two fuse holders.

The NCI 901/902 is a Safety Class I device according to IEC Standard 348, that is, the NCI uses a three-conductor line cord.

Caution: *Before turning the unit on, check that the proper line voltage has been selected in the fuse module at the back of the interface. Otherwise, serious damage to the interface may occur.*

Warning*: Insert the main plug only in a socket outlet provided with a protective earth contact. Do not disconnect the protective earth ground contact for any reason. To do so is unsafe and will interfere with the proper operation of the interface.*

Ensure that the main plug is easily accessible. Do not place the NCI 901/902 in a location where the power cord is unreachable.

- **To change the voltage:**

  1. Disconnect the power cord from the interface.
  2. Expose the fuses and voltage selector by inserting a screwdriver in the slot above the voltage indicator and twisting it to pry-open the plastic cover.

     Do not attempt to rotate the voltage selector while it is still in the fuse module.

  3. Remove the voltage selector from the fuse module.
  4. Select the desired voltage value, then replace the voltage selector with the selected voltage value facing outwards. (For a 230 VAC nominal line voltage, use the 240 VAC position.)

- **To install fuses:**

  Warning*: For continued protection against risk of fire, replace fuses only with the same type and fuse rating.*

  Avertissement*: Pour assurer une protection continue contre les risques d'incendie, remplacer uniquement par unfusible de même type et de même calibre.*

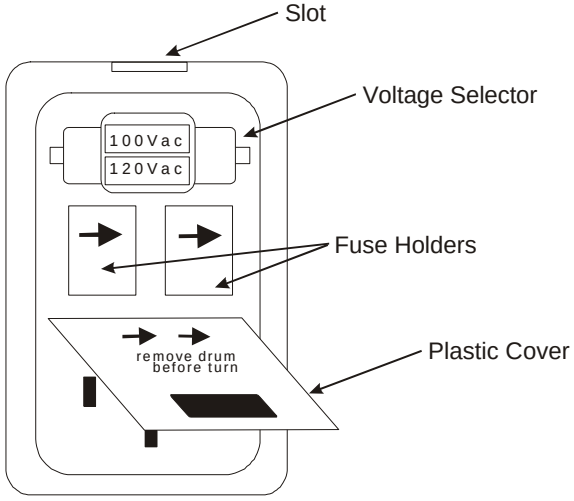
  1. Ensure that the fuse holder is inserted with the arrow pointing to the right.
  2. Place the appropriate fuse in the fuse holder.

Table 1 - Fuses Used with the NCI 901/902

Fuse Types Possible	***Intended Country***	***Voltage***	***Amp***
3AG, Type T, 250V (1¼" x ¼")	U.S. and Canadian installations	100 or 120	0.6
DIN, Type T, 250V (5 x 20 mm)	European and other non-North American installations	220/230/240	0.315

***Warning**: The fuse holder incorporates double-pole/neutral fusing.*

Figure 2 – Fuse Module



Analog Connections

The analog connections for Signals 1 and 2 are located at the lower right end of the back panel (Figure 1). Each channel has an individual three-pin connector (DPC) with connections for (+), (-), and shield. For proper operation, note the following:

- Use shielded cable when making all analog connections.

Failure to make a connection to the analog ground may cause serious noise or drift in the acquired data.

- The analog inputs are differential. For proper operation, make a connection to the analog ground.
- Ensure that the DPC is properly oriented when making connections.

The chromatographic analog output can be one of the following:

- Three-lead output with the (-) output internally connected to the analog ground of the chromatograph.
- Two-lead output with the (-) output internally connected to the analog ground of the chromatograph.
- Two-lead output with the (-) output not internally connected to the analog ground of the chromatograph.

If the analog output is a two-lead output then the output will usually be internally connected to the analog ground of the chromatograph.

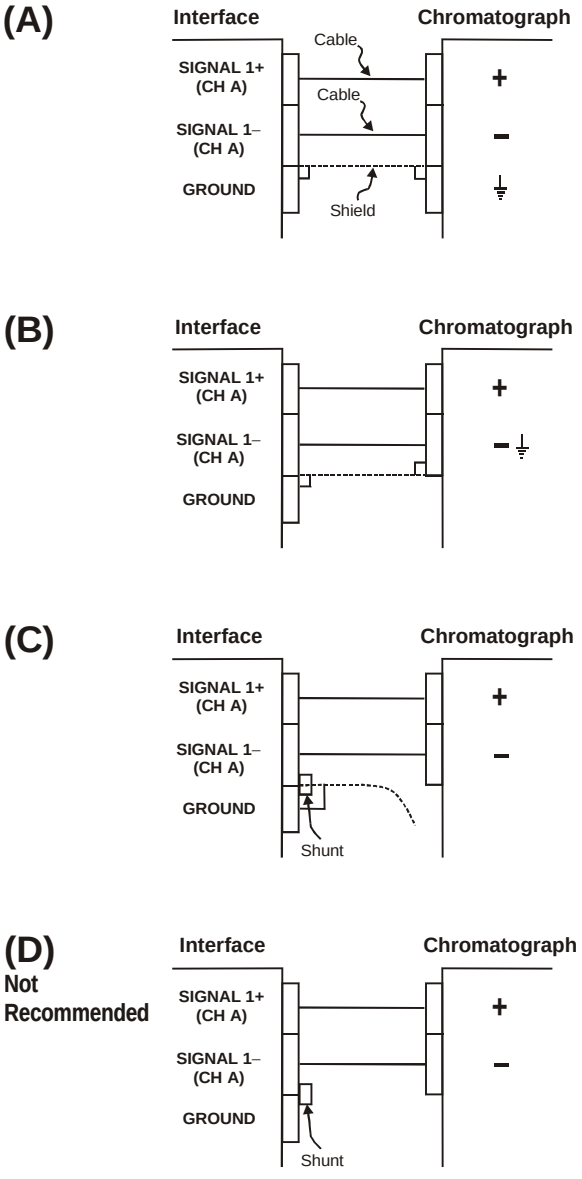
If the chromatograph has a three-lead output, connect the devices as diagrammed in Figure 3A. In this case, the chromatograph (+) output is connected to the interface (+) input; the (-) output is connected to the (-) input; and the cable shield is connected to the ground output at the chromatograph and to the ground input at the interface.

If the chromatograph has a two-lead output with the (-) output internally connected to the analog ground of the chromatograph, connect the devices as shown in Figure 3B. In this case, connect (+) to (+) and (-) to (-); also connect the cable shield to the chromatograph (-), and connect the shield to ground at the interface.

If the chromatograph has a two-lead output with the (-) output not internally connected to the analog ground of the chromatograph, connect the devices as shown in Figure 3C. In this case do not connect the shield at the chromatograph. At the interface, connect the shield to the ground and a install a shunt connection between the (-) and ground inputs.

If, despite recommendations to the contrary, you do not use shielded cable, make the connections as diagrammed in Figure 3D. You must install a shunt between the (-) and ground inputs of the interface.

Figures 3A, 3B, 3C, and 3D - Analog Connections



Remote Start/Stop Inputs

Remote Start and Stop inputs are located to the left of the signal inputs of the NCI 901/902 (see Figure 1).

Shorting START IN to COM will cause the interface to begin sampling; this function is identical to pressing the front panel Start button. Similarly, shorting the STOP IN line to COM will terminate sampling. Most commercial autosamplers provide a contact closure output that is closed at the time of injection. Connecting this autosampler output to the START IN and COM inputs will cause the interface to begin sampling at the time of injection. In most installations, a connection to STOP IN is not necessary.

Although the interface has extensive protection against electrostatic discharge and radio frequency interference transients, we recommend that you use shielded cable to connect to these inputs. Connect the shield to the Chassis Ground stud on the back panel or to the COM input on the DPC.

Rack and Vial Ports

The Rack and Vial ports are located in the middle of the NCI back panel (see Figure 1). The Rack and Vial ports are contained on an optional module, which also contains the relays.

The optional module contains two Rack and Vial ports. However, when using older versions of chromatography software, only one Rack and Vial port is operational.

Each Rack and Vial port consists of a 15-pin female D-subminiature connector. The first 14 pins are data lines and pin 15 is a signal ground. Of the data lines, pins 1-8 are assigned to vial numbers and pins 9-14 to rack numbers in most applications. The usage of these pins depends on the autosampler type and the host software. Typical pinouts are as follows:

Table 2 - Rack and Vial Port Pinouts

Pin #	*Bit*	*Function*
1	BD0	Vial, 1st Digit, LSB
2	BD1	Vial, 1st Digit
3	BD2	Vial, 1st Digit
4	BD3	Vial, 1st Digit, MSB
5	BD4	Vial, 2nd Digit, LSB
6	BD5	Vial, 2nd Digit
7	BD6	Vial, 2nd Digit
8	BD7	Vial, 2nd Digit, MSB
9	BD0	Rack, 1st Digit, LSB
10	BD1	Rack, 1st Digit
11	BD2	Rack, 1st Digit
12	BD3	Rack, 1st Digit, MSB
13	BD4	Rack, 2nd Digit, LSB
14	BD5	Rack, 2nd Digit, MSB
15	N/A	Ground

The actual data bits are transferred transparently from the autosampler to the host. The host must be configured by way of a mask whether to read the data as Positive-

or Negative-True Logic, Binary or BCD, and how many bits in each digit to read. Readings are made at the time of injection. Consult the appropriate host software manual for information on how to set masks.

PerkinElmer supports a number of autosamplers with specific cables. You can connect other autosamplers by consulting the autosampler manual to determine the proper pinouts and data format.

Cables for many autosamplers are available from PerkinElmer. Cables may also be available from the autosampler manufacturer.

Shielded cables are recommended for all connections. If the shield is not connected to the interface chassis via the connector, then the shield should be grounded by connection to the Chassis Ground stud on the back panel.

Relays

The optional Rack and Vial relay module contains 14 relays arranged in two sets of seven (A1–A7 and B1–B7). The relays are controlled through the chromatography software. If you use an older version of chromatography software, only relays A1–A7 are directly controlled. Relays B1–B7 maintain the same state (ON/OFF) as relays A1–A7.

All relays found in an NCI have a maximum rating of 0.5 Amp 24 Volts DC. Refer to the next section if higher current or voltage must be switched.

Do not load the relays above their rating of 0.5 Amp 24 Volts DC.

The Relay connector is a 14-pin DPC. The 7 programmable relays occupy pins 1-14 (Figure 1). To install, remove the 14-pin connector from the kit bag and install the appropriate lines as described in *About Depluggable Connectors*. Be sure the connector is properly orientated when installing the lines or they will be incorrect. Insert the 14-pin DPC into the 14-pin connector marked Relays.

Shielded cables are recommended for all connections. Connect the shield to the Chassis Ground stud on the back panel.

Ready Relay

A Ready relay is available that indicates whether the NCI 901/902 is initialized and able to begin sampling. The Not Ready state of the Ready Relay is controlled by setup switch #8 (refer to Chapter 4.) When the switch is OFF, the relay will be OPEN when Not Ready. Conversely, when the switch is ON, the relay is CLOSED when Not Ready. The connection for this Ready Relay is located on the same depluggable connector as the Start/Stop inputs. If it is important that the Ready Relay be CLOSED even when power to the NCI is turned off, there is a jumper inside the chassis to make this selection. Contact the PerkinElmer Service Department for details.

Relay for Controlling External Devices

An additional relay is available for control of external devices, such as the Interface Validation Module that is available for some versions of chromatography software. Although this relay is labeled Instrument B Auxiliary Relay (901) or Ready Relay (902) on the back of the NCI, it responds to the Relay #1 Timed Event found in the chromatography setup method. When supported by the chromatography software, this feature provides one external relay even without the Rack and Vial relay option.

Relays for Controlling More Than One External Device

The optional Rack/Vial & Relay module must be installed if more than one external control relay is required. Relays A1 through A7 respond to relay timed events 1 through 7. The Instrument B Ready Relay will maintain the same state as relay A1 as described above. With older versions of chromatography software, Relays B1 through B7 will open and close in unison with relays A1 through A7. That is, Relays B1 through B7 cannot be programmed independently of Relays A1 through A7.

Secondary Relay Circuits

When the controlled device requires higher voltages and/or currents — particularly when you must switch primary power (that is, 120/230 VAC) — use a secondary relay circuit. An example of such a circuit is shown in Figure 3. The NCI 901/902 relays are used to switch power to a secondary relay. The secondary relay may normally be open (as shown in Figure 3) or closed, depending on the application. The secondary relay contacts and all connecting cabling must be rated to accommodate the power requirements of the controlled device.

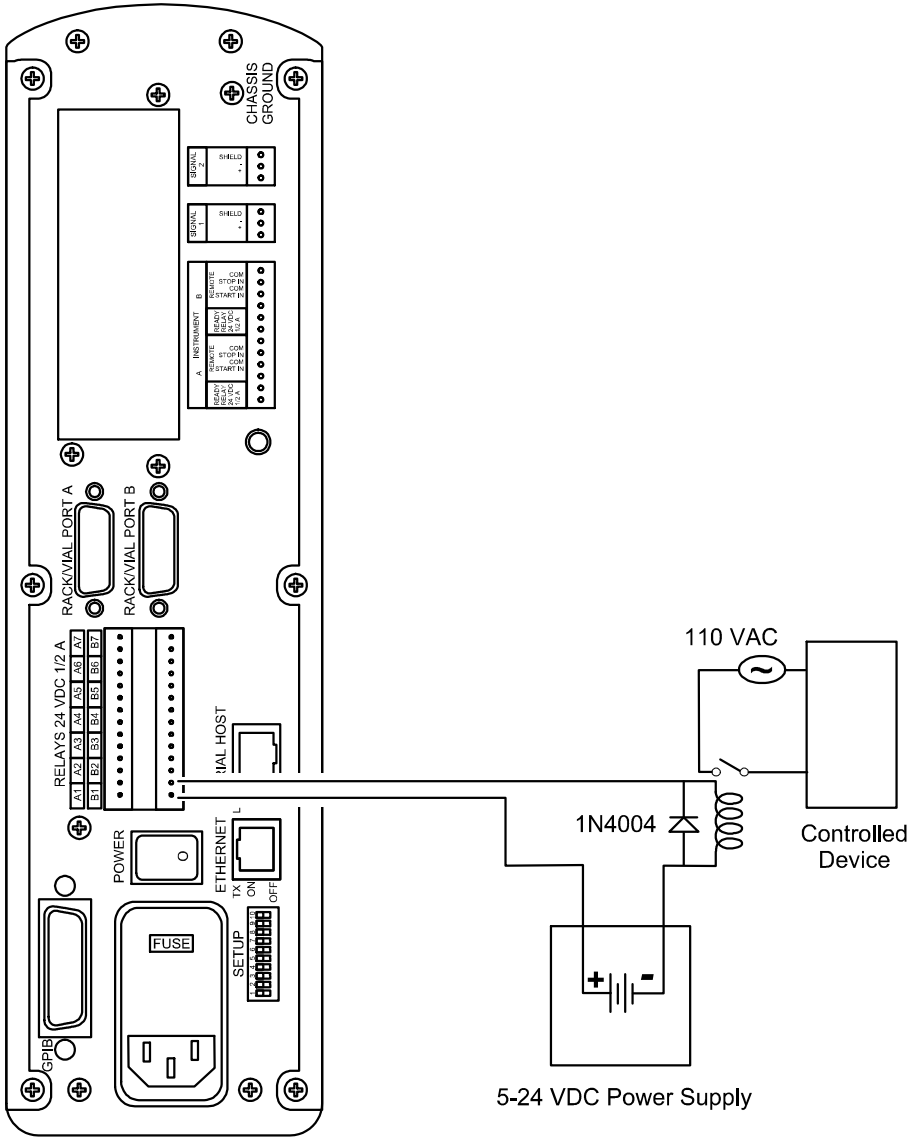
Warning: *You must shield all live connectors from user contact. If primary power is switched, have a trained technician or contractor install all circuitry in compliance with local codes.*

The secondary relay coil voltage should match the chosen power supply (less than 24 VDC) and must require a current of less than 0.5 amps.

Note that the circuit that connects the NCI 901/902 relay and the secondary relay is powered by a DC supply, and that a diode is installed across the secondary relay coil. The diode shunts the inverse current generated when the secondary relay coil power is switched off, minimizing electromagnetic noise that could affect the NCI 901/902 microprocessor or other digital devices nearby. It is difficult to suppress such noise in an AC circuit, so the DC option is strongly recommended.

If the controlled device draws significant power, particularly if this device is inductive (that is, a solenoid), then the controlled circuit generates electromagnetic noise that may affect the NCI 901/902 or other digital devices in the lab. If the device is AC powered, you can greatly reduce such noise by replacing the secondary relay in Figure 4 with a solid-state relay. When directed to switch, solid-state relays delay the switching operation until the next zero position on the AC sine wave. Because no current is flowing at the moment of switching, switching noise is eliminated. If the controlled device is DC powered, then you can use a diode to shunt the inverse current, as described above for the secondary relay circuit. Install the diode in parallel with the switched device, with the diode polarity opposing the normal current flow.

Figure 4 - Example of a Secondary Relay Circuit



Ground Pin

A screw stud is provided on the back panel as a chassis ground point (Figure 1). You may use this screw stud to ground the shielding of any line except the analog lines. Ground the analog lines as discussed in *Analog Connections*.

If metallized hoods are used for the Serial and Rack/Vial cables and the cables are constructed to ensure continuity between the hood and the shield, then the hood will adequately ground the shield to the chassis and a separate connection to the ground stud is not required.

Chapter 4

Configuring the Setup Switches

To allow for the configuration of communication parameters and certain operating modes, the NCI 901/902 provides a set of ten setup (DIP) switches.

These setup switches are located on the left of the NCI 901/902 back panel (see Figure 1). The setup switches are numbered 1-10 starting from the left of the NCI. The factory default for all configuration DIP switches is OFF. The interface reads the state of the switches only at Power-On.

Switch Settings

- **To change the switch settings:**

  1. Turn the power OFF.
  2. Reset the switches.
  3. Turn the power ON.

The functions of some setup switches vary depending on the emulation option you chose (970A or 941A) and the communication option that you chose (GPIB, RS-232C Serial, or Ethernet). Table 3 provides a general description of the setup switch settings. For further information on the settings, see Chapter 5.

Table 3 - Setup Switch Functions

Switch	Function	Factory Default (All OFF)	Comments
1	GPIB address/ baud rate/ Ethernet connection	GPIB address = 0 Baud rate = 9600	SW1 – SW4 perform one of the following functions: Select an Ethernet connection if set as follows: SW1=ON, SW2=ON, SW3=OFF, SW4=OFF. If you selected GPIB connection (SW6=OFF), select the GPIB address (See Table 6). If you selected RS232 connection (SW6=ON), select the baud rate (See Table 7).
2	GPIB address/ baud rate/ Ethernet connection		
3	GPIB address/ baud rate/ Ethernet connection Parity if 941A emulation	No parity if 941A emulation	
4	GPIB address/ baud rate/ Ethernet connection Parity if 970A/950A emulation	No parity if 970A/950A emulation	
5	Unipolar/bipolar	Unipolar	The function of SW5 is the same for all emulation and communication options. SW5 controls the analog input polarity if it is not controlled from the host software. The input range specifications for each mode and range are tabulated in Chapter 7.
6	GPIB or RS232 communication connection	GPIB enabled	If you select a GPIB connection (SW6=OFF), then you can change the GPIB address using SW1-SW4 (See Table 6). If you select an RS232 connection (SW6=ON), then you can change the serial baud rate by resetting the switches (See Table 7). If you want to select an Ethernet connection, set SW1-SW4 as follows: SW1=ON, SW2=ON, SW3=OFF, SW4=OFF.

Switch	***Function***	***Factory Default (All OFF)***	***Comments***
7	Personality (Emulation Mode)	970A	SW7 makes the NCI command set compatible with the 970A or 941A interface. To select 970A emulation, set SW7 to OFF. To select 941A emulation, set SW7 to ON.
8	Ready Relay	Open when NOT READY	
9	Data format: 24/20	24-bit unless you are using C/S v6.1 or earlier or Access*Chrom, in which case 20-bit operation occurs	To force 20-bit operation, set SW9 to ON.
10	Diagnostics		SW10 is used for Diagnostics and to download new firmware.

Setting all of the switches ON puts the interface into a Continuous Self-Test at Power-On. This is used for troubleshooting only.

Table 4 - Quick Reference for Setup Switch Settings

NCI emulates a 970A for TotalChrom Pro or TcCS/TcWS via GPIB

SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	SW-9	SW-10
OFF*	OFF*	OFF*	OFF*	OFF*	OFF	OFF	OFF*	OFF	OFF
GPIB address 0 - 15				OFF*	OFF	OFF	OFF*	OFF	OFF

NCI emulates a 970A for TcCS/TcWS via RS-232 host serial port at 9600 baud

SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	SW-9	SW-10
OFF	OFF	OFF	OFF	OFF*	ON	OFF	OFF*	OFF	OFF

NCI emulates a 941A for Access*Chrom via RS-232 host serial port at 9600 baud

SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	SW-9	SW-10
OFF	OFF	OFF	OFF	OFF*	OFF	ON	OFF*	OFF	OFF

NCI emulates a 970A for TcCS/TcWS via Ethernet at port 3000

SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	SW-9	SW-10
ON	ON	OFF	OFF	OFF*	OFF	OFF	OFF*	OFF	OFF

NCI Setup menu via RS-232 host serial port at 9600 baud

SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	SW-9	SW-10
OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
Or you may leave DIP switches as they were and as you turn the power on hold Start-A button until the system Ready light illuminates.									

Download new firmware via RS-232 host serial port using YMODEM at 115200 baud

SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	SW-9	SW-10
OFF	ON	ON	ON	OFF	ON	OFF	OFF	ON	ON

Download new firmware via RS-232 host serial port using YMODEM at 38400 baud

SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	SW-9	SW-10
OFF	ON	ON	OFF	OFF	ON	OFF	OFF	ON	ON

* OFF = Most likely choice. See DIP switch definitions for your particular case.

Chapter 5

Enabling Communications

You have the option of choosing one of three communication connections: GPIB, RS232 Serial, or Ethernet. The combination of the acquisition software and emulation mode determines which communication connections are possible. See the following table.

Table 5 - NCI 901/902 Communications Options

Acquisition Software	*Interface Emulated*	*Communication Connection*
Access*Chrom	941A (SW7=ON)	RS-232C serial
TotalChrom	970 A (SW7=OFF)	GPIB
TotalChrom Client/Server	970A (SW7=OFF)	GPIB, RS-232C serial, Ethernet
TotalChrom Workstation	970A (SW7=OFF)	GPIB, RS-232C serial, Ethernet

You must purchase the cable that is appropriate for your communications connection.

GPIB (IEEE-488)

The GPIB port is at the upper left of the NCI back panel (see Figure 1). You can select a GPIB communication connection if you are using TotalChrom, TotalChrom Client/Server, or TotalChrom Workstation (See Table 5).

- **To enable a GPIB connection:**

  1. Ensure that a GPIB connection is possible by referring to Table 5.
  2. Make the necessary hardware connections:
     a. Insert the cable fitting into the connector marked GPIB on the back panel.
     b. Tighten the screws to ensure a tight fit. Do not overtighten. Do not put more than two connectors on the interface or the connector fitting may distort inside the interface.
  3. Set the necessary setup switches:
     a. Set SW7 to OFF to select 970A emulation.
     b. Set SW6 to OFF to select GPIB communication.
  4. If desired, change the GPIB address setting SW1–SW4 as described in Table 6.

Each interface connected to the data system must have its own unique GPIB address. The NCI is shipped with address 0 selected unless otherwise labeled. Refer to the installation section of your data system manual for any address conflicts.

Table 6 - GPIB Addresses

GPIB Address	SW 1	SW 2	SW 3	SW 4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	Reserved for Ethernet connection			
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

RS-232

The RS-232C serial port is located to the left of center on the NCI back panel (Figure 1). The serial port is a RJ-45 modular receptacle. You can select an RS-232C communication connection if you are using Access*Chrom, TotalChrom Client/Server, or TotalChrom Workstation (See Table 5.)

➢ **To enable an RS-232C connection:**

1. Ensure that an RS-232C connection is possible by referring to Table 5.
2. Make the necessary hardware connections.
   a. Install the cable by inserting the modular connector into the RJ-45 receptacle. The cables available from PerkinElmer that use the RJ-12 plug will work properly in the wider RJ-45 receptacle.
   b. Attach the other end to the host or terminal server, and do any required configuration at the host. The NCI Series follows a convention of 8 bits per character, 1 stop bit, no flow control, and a default baud rate of 9600.

You can purchase cables from PerkinElmer for most serial configurations.

3. Set the necessary setup switches.
   a. If you are using Access*Chrom, set SW7 to ON to select 941A emulation. If you are using TotalChrom Client/Server or TotalChrom Workstation, set SW7 to OFF to select 970A emulation.
   b. Set SW6 to ON to select serial communication.
4. If desired, change the baud rate by setting the switches as described in Table 7.

Table 7 - Baud Rate Settings

Baud Rate	SW 1	SW 2	SW 3	SW 6
9600	OFF	OFF	OFF	ON
4800	ON	OFF	OFF	ON
2400	OFF	ON	OFF	ON
1200	ON	ON	OFF	ON
600	OFF	OFF	ON	ON
300	ON	OFF	ON	ON
19200	ON	ON	ON	ON

Table 8 – Parity Settings

If you selected 970A emulation (SW7=OFF), you can set even or no parity with setup switch 4.

PARITY	SW 4
NONE	OFF
EVEN	ON

If you selected 941A emulation (SW7=ON), you can set even or no parity with setup switch 3.

PARITY	SW 3
NONE	OFF
EVEN	ON

Ethernet

This section describes how to configure the NCI 901/902 for network operations. It does not describe how to configure TCP/IP networks in general or how to interface with TotalChrom.

Your network administrator must assign a unique IP address to each NCI. The NCI uses port number 3000 to communicate with the chromatography software.

In addition, the NCI can function as a one-port terminal server by making the host serial port available at port number 3009. This is accomplished by connecting your computer's serial connector to the NCI Ethernet, then connecting an interface to the NCI's Serial Host connector.

The Ethernet port is located on the lower left of the NCI back panel adjacent to the setup switches (Figure 1). You can select an Ethernet communication connection if you are using TotalChrom Client/Server or TotalChrom Workstation (see Table 5).

Enabling an Ethernet Connection

➢ **To enable an Ethernet connection:**

1. Ensure that an Ethernet connection is possible by referring to Table 5.
2. Connect the Ethernet cable.
   a. Connect one end of the Ethernet cable to the port provided on the back panel of the NCI.
   b. Connect the other end of the Ethernet cable to an available network port. The green link LED next to the Ethernet port is lit if the NCI is physically connected to the network.
3. Connect a PC or other terminal with an available serial port to the Host Serial port of the NCI and configured for 9600 baud, one stop bit, and no flow control (under Windows, HyperTerminal can be used).
4. Store the network configuration information in the NCI using the procedure in *Configuring a Static Network* or the procedure in *Configuring a DHCP Network.*
5. Ping the NCI from another computer on the network.

   Ping from the host that will be connecting to the NCI.
6. Disconnect the RS-232C serial cable.
7. Set the necessary DIP switches.
   a. Set SW1−SW4 as follows to select Ethernet communication: SW1=ON, SW2=ON, SW3=OFF, SW4=OFF
   b. To select 970A emulation, set SW7 to OFF.

Configuring a Static Network

This section gives the procedure for configuring a static network. If you are setting up a DHCP network, refer to *Configuring a DHCP Network.*

The fields in the NCI menu are not case sensitive. Therefore, you can enter either uppercase or lowercase letters.

➢ **To configure a static network:**

1. Display the Setup menu by using ***one*** of the following methods:

   - When turning the NCI on Hold the Channel A Start button until the system Ready light illuminates.

   or

   - Set SW6 and SW10 to ON (for a baud rate of 9600).

   After a few seconds, the following menu should appear on the terminal.

```
NCI Setup
Release: 3.4 <E13>
Copyright (c) 1998, 1999 PerkinElmer

C - Print Configuration
N - Network configuration
R – Restart
>
```

2. Type C to print the configuration.

```
> C
        Chassis   S/N 8127290007
       Mfg Date   THURSDAY MAY 07, 1998
          Model   NCI 902 - 2 A/D
     IP Address   <none>
    Port Number   3000
  Ethernet Addr   00:60:9c:02:00:09
      MB A/D #1   Is Installed
      MB A/D #2   Is Installed
        Card #1   Not Installed
        Card #2   RVP Card - S/N 8126D70007
      BSP Build   19980708032923
  Boot checksum   0xad900114
 Flash checksum   0x4deb04d6
>
```

3. Type N to display the Network Configuration menu.

```
> N
?    -  Display this menu again
A    -  Display active configuration
S    -  Display startup configuration
M    -  Modify startup configuration, all items
M #  -  Modify startup configuration, individual items
C    -  Clear startup configuration
W    -  Write startup configuration to non-volatile memory
U    -  Undo changes to startup configuration
F    -  Reset configuration to factory defaults and restart NCI
Q    -  Quit to main menu
cf>
```

4. Type S to display the configuration stored in the device.

```
cf> S
Startup configuration (not modified):
 1: dhcp: false
 2: address: <none>
 3: mask: <none>
 4: gateway: <none>
```

   In the example above, DHCP support is disabled and no network configuration information has been stored.

Assume the device has been assigned the address 10.1.0.5, with a netmask of 255.255.255.0 and default gateway 10.1.0.1.

---

5. Type M. The following menu will appear.

```
cf> M
dhcp (Boolean): false
     New value:
Value unchanged
address (IP Address): <none>
           New value: 10.1.0.5
mask (IP Address): <none>
        New value: 255.255.255.0
gateway (IP Address): <none>
           New value: 10.1.0.1
*cf>
```

6. Since this is not a DHCP configuration, press Enter to skip to the first prompt.

7. Enter the NCI IP address, mask, and gateway as prompted.

   Notice that there is now an asterisk before the *cf* prompt. This means that you have modified the startup configuration, but you have not yet stored the modified configuration.

8. Type S to verify the configuration information. The following menu will appear.

```
*cf> S
Startup configuration (modified):
 1: dhcp: false
 2: address: 10.1.0.5
 3: mask: 255.255.255.0
 4: gateway: 10.1.0.1
*cf>
```

9. If this is not correct, either type M again to change the parameters, or type U to revert to the previously stored configuration.

```
*cf> U
Restoring configuration
cf> S
Startup configuration (not modified):
 1: dhcp: false
 2: address: <none>
 3: mask: <none>
 4: gateway: <none>
cf>
```

Change individual configuration parameters by typing M specifying either the parameter name or the parameter number when invoking the modify command.

```
cf> S
Startup configuration (not modified):
 1: dhcp: false
 2: address: 10.1.0.7
 3: mask: 255.255.255.0
 4: gateway: 10.1.0.2
cf> M 2
address (IP Address): 10.1.0.7
           New value: 10.1.0.5
*cf> S
Startup configuration (modified):
 1: dhcp: false
 2: address: 10.1.0.5
 3: mask: 255.255.255.0
 4: gateway: 10.1.0.2
*cf> m gateway
gateway (IP Address): 10.1.0.2
           New value: 10.1.0.1
*cf> S
Startup configuration (modified):
 1: dhcp: false
 2: address: 10.1.0.5
 3: mask: 255.255.255.0
 4: gateway: 10.1.0.1
*cf>
```

10. If the configuration is correct, type W to store the configuration and then S again to verify.

```
*cf> S
Startup configuration (modified):
 1: dhcp: false
 2: address: 10.1.0.5
 3: mask: 255.255.255.0
 4: gateway: 10.1.0.1
*cf> W
Write configuration (y/n)? y
Writing configuration
cf> S
Startup configuration (not modified):
 1: dhcp: false
 2: address: 10.1.0.5
 3: mask: 255.255.255.0
 4: gateway: 10.1.0.1
cf>
```

11. Reboot the system.

    a. Type Q to exit the Network Configuration menu.

    b. Type R to reboot the NCI (hold the Start button during the reboot to bring up the setup menu again).

12. From the Network menu, type A. This displays the current NCI network configuration.

```
NCI Setup
Release: 3.4 <E13>
Copyright (c) 1998, 1999 PerkinElmer

C - Print Configuration
N - Network configuration
R - Restart

> N
?    -  Display this menu again
A    -  Display active configuration
S    -  Display startup configuration
M    -  Modify startup configuration, all items
M #  -  Modify startup configuration, individual items
C    -  Clear startup configuration
W    -  Write startup configuration to non-volatile memory
U    -  Undo changes to startup configuration
F    -  Reset configuration to factory defaults and restart NCI
Q    -  Quit to main menu
cf> A
Active configuration:
 1: dhcp: false
 2: address: 10.1.0.5
 3: mask: 255.255.255.0
 4: gateway: 10.1.0.1
cf>
```

This should be identical to the startup configuration:

```
cf> S
Startup configuration (not modified):
 1: dhcp: false
 2: address: 10.1.0.5
 3: mask: 255.255.255.0
 4: gateway: 10.1.0.1
cf>
```

Configuring a DHCP Network

This section provides the procedure for configuring a DHCP network. If you are instead setting up a static network, refer to the procedure in *Configuring a Static Network*.

Dynamic Host Configuration Protocol (DHCP) allows configuration information to be stored centrally on a server. A DHCP client (like the NCI with DHCP enabled) requests configuration information by broadcasting a special message to all computers located on the same physical network as the client. If any of these machines is running an appropriately configured DHCP server, the DHCP client will receive a reply from this server indicating the client's assigned network configuration parameters.

The NCI is capable of retrieving network configuration information from a Dynamic Host Configuration Protocol server (DHCP). However, the NCI will not attempt to load configuration information from a DHCP server unless it is configured to do so. If no such server is present on the network, then you must store the network configuration information directly on the NCI. If the NCI is configured for a DHCP server but no DHCP server is available, the NCI will take an additional 60 seconds to start.

The network administrator might request the hardware, Ethernet, or MAC address of the NCI. There is a sticker with the MAC address on the back of the NCI. The Ethernet address can also be displayed from the setup menu.

The fields in the NCI menu are not case sensitive. Therefore, you can enter either uppercase or lowercase letters.

➢ **To configure a DHCP network:**

1. Display the Setup menu by using one of the following methods:

   - Hold the Channel A Start button when turning the NCI on.
   - Set SW9 to OFF and SW10 to ON.

   After a few seconds, the following menu should appear on the terminal.

```
NCI Setup
Release: 3.4 <E13>
Copyright (c) 1998, 1999 PerkinElmer

C - Print Configuration
N - Network configuration
R – Restart
```

2. Type C to print the configuration.

```
> C
       Chassis S/N 8195298765
      Mfg Date TUESDAY JULY 14, 1998
         Model NCI 902 - 2 A/D
    IP Address 10.1.0.7
   Port Number 3000
 Ethernet Addr 00:60:9c:02:00:07
     MB A/D #1 Is Installed
     MB A/D #2 Is Installed
       Card #1 Not Installed
       Card #2 Not Installed
     BSP Build 19980717200904
 Boot checksum 0xad900114
Flash checksum 0xaf88de77
>
```

   In this example, the Ethernet address is 00:60:9c:02:00:07.

3. Type N to display the Network Configuration menu.

```
> N
?   -   Display this menu again
A   -   Display active configuration
S   -   Display startup configuration
M   -   Modify startup configuration, all items
M # -   Modify startup configuration, individual items
C   -   Clear startup configuration
W   -   Write startup configuration to non-volatile memory
U   -   Undo changes to startup configuration
F   -   Reset configuration to factory defaults and restart NCI
Q   -   Quit to main menu
cf>
```

4. Type S to display the configuration stored in the device.

```
cf> S
Startup configuration (not modified):
 1: dhcp: false
 2: address: 10.1.0.7
 3: mask: <none>
 4: gateway: <none>
cf>
```

If the address, mask, or gateway parameters are configured to something other than <none> then they should be cleared. In the above example, the address (parameter 2) needs to be cleared with the C command.

```
cf> C 2
*cf> S
Startup configuration (modified):
 1: dhcp: false
 2: address: <none>
 3: mask: <none>
 4: gateway: <none>
*cf>
```

5. Set the dhcp parameter to true to enable DHCP operation.

```
*cf> M 1
dhcp (Boolean): false
     New value: true
*cf>
```

6. Write this configuration to the non-volatile store and restart the NCI.

```
*cf> W
Write configuration (y/n)? y
Writing configuration
Changes will take effect after the next restart
cf>
```

7. Reboot the system.

   a. Type Q to exit the Network Configuration menu.

   b. Type R to reboot the NCI (hold the Start button during the reboot to bring up the setup menu again).

8. Go back to the Network menu and type A to display the network configuration the NCI is currently using.

```
NCI Setup
Release: 3.4 <E13>
Copyright (c) 1998, 1999 PerkinElmer

C - Print Configuration
N - Network configuration
R – Restart

> N
?   -   Display this menu again
A   -   Display active configuration
S   -   Display startup configuration
M   -   Modify startup configuration, all items
M # -   Modify startup configuration, individual items
C   -   Clear startup configuration
W   -   Write startup configuration to non-volatile memory
U   -   Undo changes to startup configuration
F   -   Reset configuration to factory defaults and restart NCI
Q   -   Quit to main menu
cf> A
Active configuration:
 1: dhcp: true
 2: address: 10.1.0.123
 3: mask: 255.255.255.0
 4: gateway: 10.1.0.1
cf>
```

Additional fields may be displayed in the active configuration if the DHCP server provides them.

Inhibiting a DHCP Network

➢ **To inhibit a DHCP network:**

- Hold the Channel A Stop button when turning the NCI on.

A Note to the Network Administrator

The DHCP client used by the NCI (provided by Wind River for VxWorks) is based on the WIDE Project's DHCP implementation. The WIDE DHCP server does not handle situations where the server has multiple IP addresses on the same interface. It assumes that if a candidate lease address is on a different subnet from the primary IP address of the interface, then that lease address is invalid and it will refuse to issue that lease. Unfortunately, the DHCP client performs the same test using the yiaddr field, the netmask, and the source IP address field of the DHCPOFFER packet (despite the fact that the server must be reachable by the client since the client was able to elicit the very offer it is validating). In other words, the source IP address in the raw IP part of the packet—not to be confused with the DHCP siaddr field—must be on the same subnet as the yiaddr field of the DHCPOFFER (using the netmask in the DHCPOFFER).

The DHCP client software in the NCI has been tested with three DHCP server implementations.

- The Internet Software Consortium (http://www.isc.org/dhcp.html)

  Version 2.0b1pl6 or later is fully functional with the NCI. It handles multi-homed DHCP servers correctly.

- The WIDE Project (http://www.wide.ad.jp/software/index.html)

  This DHCP server will only issue leases on the same subnet as the primary IP address of the network interface it is listening on.

TotalChrom does not directly support the dynamic configuration of NCIs. Therefore, the DHCP server providing addresses for the NCIs should be configured to do so either in manual or automatic mode. A DNS server with dynamic updates from a DHCP server in dynamic mode may work, but this has not been tested.

Chapter 6

Functional Description

The descriptions provided here are not intended to be a technical definition of the product. Rather they are intended to clarify some areas of the NCI performance. They are based on the questions customers have most frequently asked about this interface.

The NCI 901/902 analog circuit has fully differential inputs. The input impedance is 10 MΩ. The offset circuit has a precision voltage reference for increased stability with nominal offsets of 0.5% (unipolar) or 50% (bipolar) of full range.

Figure 5 - Analog Block Diagram

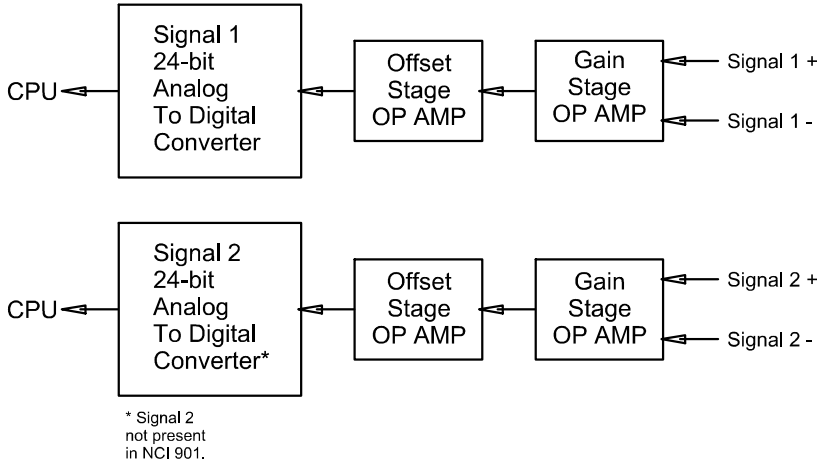


Figure 5 is a representation of the analog section of the interface. The detector signal(s) enter the interface at the back panel and pass through an input protection network to the first stage operational amplifier (op amp). This first stage operational amplifier amplifies the signal according to the selected range, and then in a second stage it is summed with the offset. The signal is then sampled by the A/D converter. The CPU reads the digital representation of the data and stores it in memory for later retrieval by the host computer.

CPU

The system is based on a 68360 32-bit CPU operating at a 33 MHz system clock speed. The highly integrated CPU contains six internal serial channels (one of which is configured as an Ethernet port), internal programmable baud rate generators, DRAM refresh control circuitry, and an interrupt controller.

Memory

The interface memory is partitioned into three parts: 512 bytes of electrically erasable programmable read only memory (EEPROM), 1 MB of flash programmable memory, and 4 MB of DRAM.

LEDs

The front panel (see Figure 6) has LEDs to assist you in monitoring the status of data acquisition. Refer to Table 9 for information on the function of each LED.

With some versions of chromatography software, only Instrument A Ready/Active and Range /Error LEDs are used.

Figure 6 - Front Panel LEDs and Switches

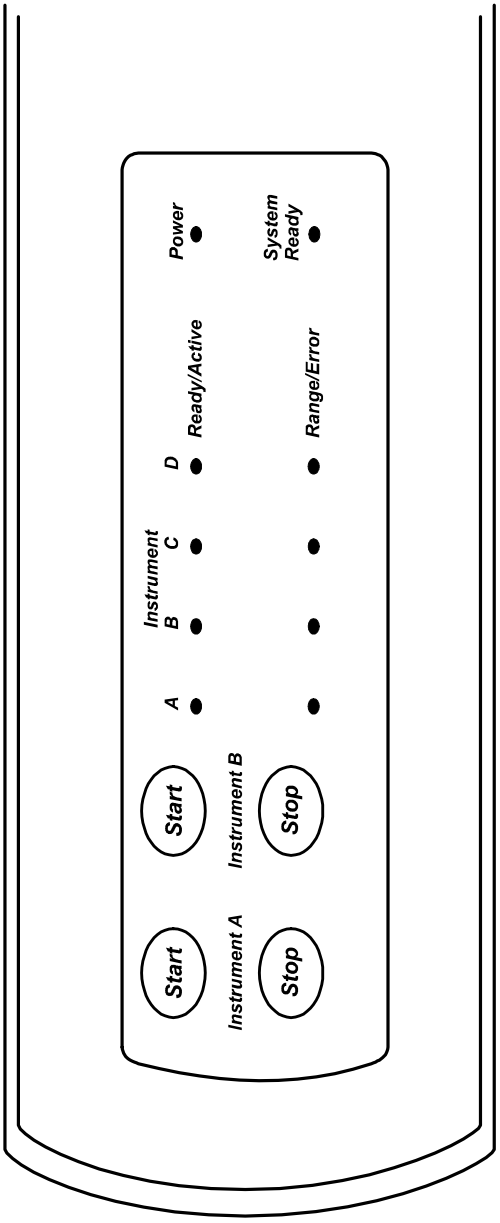


Table 9 - Front Panel LEDs

LED	Function
System Ready	ON whenever the NCI has active firmware that can communicate with the chromatography software Blinks when the NCI has backlogged data and is not acquiring data
Ready/Active	ON when the NCI is ready to start another run (Instrument A only) When acquiring data, blinks at a constant rate that does not follow the sampling rate
Range/Error	ON (yellow LED) if the signal is too high or low Blinks if the A/D receives a command that causes and error regardless of whether there is an over or under range condition
Power	ON when there is power to the NCI

Ready State

The Ready/Active LED tracks the Ready Relay and provides a clear indication of when the interface is able to begin sampling. At Power-On, the interface is NOT READY; the Ready Relay is NOT READY; and the Ready/Active LED is OFF. The interface will not respond either to the front panel Start switch or to START IN on the back panel if it is NOT READY. After an acquisition method has been downloaded, the Ready Relay switches to READY and the Ready/Active LED comes on. When sampling begins, the Ready/Active LED blinks and the Ready Relay switches to NOT READY. The interface will return to READY if the following conditions are met:

- The interface is not in run.
- If set up for sequential runs, the sequence has not ended.
- There is enough memory for the next run.
- There are available segments.
- The front panel has been enabled.

To temporarily bypass the READY logic or to disable the Start inputs, hold in the Stop switch and tap the Start switch (Figure 6). This is a status toggle. It forces the interface in and out of the READY state. If forced into READY, the interface will respond to the Start switch or a remote start. If forced into NOT READY, the interface will not respond to either start method. This mode is very useful when you want to temporarily disable the interface. During method development, you may not wish to acquire any data until the separation conditions are established. Disabling the Start inputs obviates the need to turn the interface off.

Chapter 7

Technical Data

Specifications

Dynamic Range: 134 dB* minimum
1 V range, 1 Hz

Input Impedance: 10 MΩ Differential Input

Input Ranges:

Nominal Range, V	*Operating Range, V*	
	Unipolar	Bipolar
0.1	-0.0005 to +0.0995	-0.05 to +0.05
1.0	-0.005 to +0.995	-0.5 to +0.5
2.0	-0.01 to +1.99	-1.0 to + 1.0
10.0	-0.05 to 9.95	-5.0 to + 5.0

Resolution: 6 nV on 0.1 Volt Scale at 10 Hz
60 nV on 1.0 Volt Scale at 10 Hz
120 nV on 2.0 Volt Scale at 10 Hz
0.6 µV on 10 Volt Scale at 10 Hz

* Older versions of chromatography programs are limited to a dynamic range of 120 dB.

Sampling Rate:	200 Hz to 0.1 Hz**
Maximum Gain Error:	± 2.0%
Maximum Std. Dev. Gain Error on 1.0 V Range:	± 0.01%
Maximum Nonlinearity:	± 0.01% FS
Rack/Vial:	Contact Closure or TTL Compatible
Start/Stop Inputs:	0.0 V to 0.8 V = "LOW" 2.8 V to 5.0 V = "HIGH" Hold "LOW" at least 10 ms Level Sensitive/Not Latched
Relays (Max Rating):	24 VDC. 0.5 Amp or 12 VA (When Relay Is CLOSED) 10 ms Cycle Time
Power/Operating:	Frequency: 47-63 Hz 100V/120V/220V: +10%, –13% 230V – 240V: +15%, –10%
Fuse:	0.6 Amps for 100-120 VAC 3AG, Type T, 250 V (US, Canada, and Japan) .315 Amps for 220-240 VAC Type T DIN, 250 V (Europe and Other)
Temperature:	0° to +45° C (operating) –20° to +60° C (non-operating)
Altitude:	0 to 2000 meters (operating) 0 to 12,000 meters (non-operating)
Relative Humidity:	20% to 80% (non-condensing)

** Older versions of chromatography software are limited to sampling rates of 100 Hz to 0.1 Hz.

Cleaning

If cleaning is necessary:

1. Disconnect the power cord.
2. Wipe the cover and nameplate with a damp cloth.

Service Information

If repair is required contact your local PerkinElmer service office.

Downloading New NCI Firmware Using HyperTerminal

A special DIP switch setting puts the NCI 901/902 hardware into a mode that permits downloading a new version of firmware using the YMODEM protocol in HyperTerminal. The HyperTerminal program is included in Windows 95, Windows 98, Windows NT and Windows 2000. This special mode allows new firmware to be downloaded via a PC's serial port (COM1 or COM2) even if the current version in the box has become corrupted. The new file that gets downloaded includes an internal checksum so that the existing firmware will not be replaced until the new firmware has been verified. When activated, this bootstrap code will communicate via the RS-232 serial port at either 38400 or 115200 Baud.

Be sure no other program is using the COM port that you've connected NCI to. If TotalChrom is installed on a Win95/Win98 computer then you must close WinLCD (double-click on icon in tray). If TotalChrom is installed on WinNT/2000 then you must stop the PEN LCD Service for TcCS (or TcWS) if an instrument has been configured to use this COM port.

➢ **To Download Firmware To An NCI That Was Originally Revision 1.0**

Note that when an NCI has revision 1.0 firmware the setup menu will say it is revision 1.0 but the TotalChrom instrument configuration program says rev 3.0.)

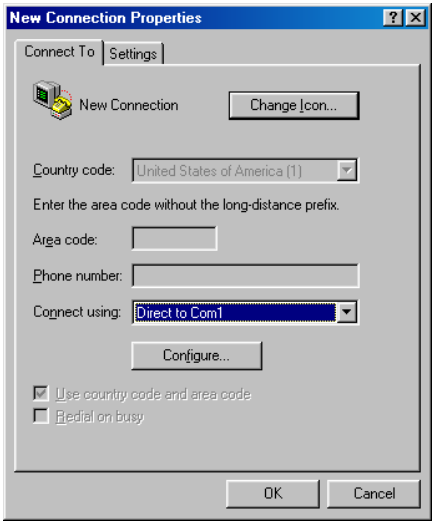
1. Turn power off at the NCI.
2. Set NCI DIP switches as per table below:

Baud	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	SW-9	SW-10
38400	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	ON	ON
115200	OFF	ON	ON	ON	OFF	ON	OFF	OFF	ON	ON

Normally, the 115200 Baud Rate setting is used for the fastest possible download time, but 38400 Baud is also available in case your computer does not support the faster Baud rate.

3. Within HyperTerminal select Properties under the File menu.

The following appears:



In the "Connect using" drop down box, select either "Direct to Com 1" or "Direct to Com 2" depending on which Com port you have connected the NCI to PC Serial port Cable to, then click on the Configure button and set the Port Settings to:

- Bits per second = 115200 (or 38400 if alternate Baud rate used.)
- Data bits = 8
- Parity = None
- Stop bits = 1
- Flow control = None.

4. Disconnect the Call and Connect again to force HyperTerminal to use the new Baud rate. Select: Call -- Disconnect and then select: Call -- Connect.
5. Turn NCI power on.
6. If the NCI and HyperTerminal are set up properly you will see the character 'C' appear on the screen once every second.
7. To download the new firmware image select: Transfer -- Send File... and then set:
   - The Filename (=EP034E13.NCI for revision 3.4)
   - Protocol = Ymodem.
8. Once the file has been transferred you will see the message "Image Received" and then about a minute later the message "CRC Ok. Passing control ...".
9. When all (except the Power) LEDs flash in unison the firmware download process is complete and you may reset the DIP switches and cycle power. You may check to be sure that the NCI has the new firmware by viewing the revision number either in the NCI Setup menu (see manual) or in the TotalChrom instrument configuration program.
   - If you plan to check the version number in the TotalChrom instrument configuration program, be sure to restart WinLCD or PEN LCD before attempting to start TotalChrom. In Win95/Win98, WinLCD is located in the PenExe\TcWS\v6.1.0\Bin directory. In WinNT, PEN LCD Services is found in the Settings\Control Panel\Services Group. In Windows 2000, PEN LCD Services is found in the Settings\Control Panel\Administration Tools\ Services Group.

Downloading Firmware to an NCI that was Originally Rev 3.1 or Later

Beginning with revision 3.1, a newer bootstrap program is installed in NCI interfaces as they are manufactured. This new boot block supports the X-Modem protocol as well as Y-Modem and handles error conditions better.

An NCI with firmware revision 3.1 or later installed will report the same revision number in the setup menu as in the TotalChrom configuration program.

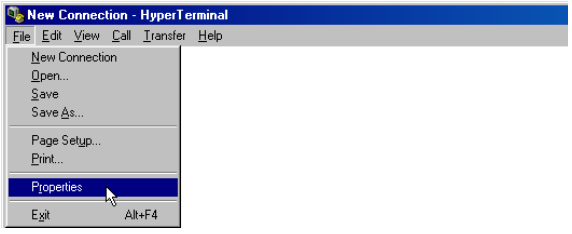
---

1. Turn power off at the NCI.
2. Set NCI DIP switches as per table below:

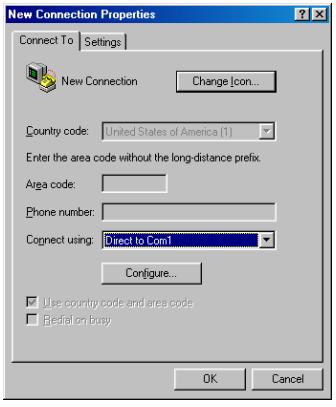
Baud	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	SW-9	SW-10
38400	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	ON	ON
115200	OFF	ON	ON	ON	OFF	ON	OFF	OFF	ON	ON

Normally, the 115200 Baud Rate setting is used for the fastest possible download time, but 38400 Baud is also available in case your computer does not support the faster Baud rate.

3. Within HyperTerminal select Properties under the File menu.



The following appears:



In the "Connect using" drop down box, select either "Direct to Com 1" or "Direct to Com 2" depending on which Com port you have connected the NCI to PC Serial port Cable to, then click on the Configure button and set the Port Settings to:

- Bits per second = 115200 (or 38400 if alternate Baud rate used.)
- Data bits = 8
- Parity = None
- Stop bits = 1
- Flow control = None.

4. Disconnect the Call and Connect again to force HyperTerminal to use the new Baud rate. Select: Call -- Disconnect and then select: Call -- Connect.
5. Turn NCI power on.
6. If the NCI and HyperTerminal are set up properly you will see the following messages when you turn NCI power on:

```
"NCI Firmware Upgrade
"
"Boot Block: 19980814233453
"
"Note: Hardware and/or software flow control must be
disabled."
"Waiting for X/YMODEM download...
"
```

   The character 'C' appears on the screen once every second. A control character is sent every fifth second which HyperTerminal displays as a '[]'.

7. To download the new firmware image select:

   Transfer -- Send File... and then set:

   - The Filename (=EP034E13.NCI for revision 3.4)
   - Protocol = Ymodem.

8. Once the file has been transferred you will see the message "Applying firmware module".
9. When all (except the Power) LEDs flash in unison the firmware download process is complete and you may reset the DIP switches and cycle power. You may check to be sure that the NCI has the new firmware by viewing the revision number either in the NCI Setup menu or in the TotalChrom instrument configuration program.

10. If you plan to check the version number in the TotalChrom instrument configuration program, be sure to restart WinLCD or PEN LCD before attempting to start TotalChrom.

    - In Win95/Win98, WinLCD is located in the PenExe\TcWS\v6.1.2\Bin directory.
    - In WinNT, PEN LCD Services is found in the Settings\Control Panel\ Services Group.
    - In Windows 2000, PEN LCD Services is found in the Settings\Control Panel\Administration Tools\ Services Group.

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