Chapter 2 Installation

The module is a stand-alone coprocessor. When plugged into an I/O rack, however, the 1799 can read and write Input Registers (IR) and Input Groups (IG). The module can read (but not write to) Output Registers and Output Groups. If you want to read or write Holding Registers (HR) in the PLC via the I/O bus, you must load a special ladder program into the PC1xxx.

The ladder program print-out is given in appendix F.

This ladder program supports the exchange of register data between the module and PLC for a 256 wide register table. If you are using a PC1 100, use the ladder program BAS11 00.LDR. If you are using a PC1200, use the ladder program BAS1200.LDR. Also, if a PC1 200 is used an additional memory location in the 1799 must be set to "1" using the POKE command. (POKE $F5,1 - See appendix B).

The module may be placed in almost every position of any I/O rack. The physical address is determined by the dip-switches Sl and S2 at the rear-side of the module. These DIP switches only determine the Input Register or Input Group addresses that the 1799 is allowed to write to.

Hook up an external 5 VDC power supply to terminals 11 (+) and 13 (-).

Warning

All programs developed for industrial applications must be burned into EPROM. Further, the "Break Detect' function must be disabled (See Appendix I). Executing programs from battery backed RAM facilitates debugging and testing, but does not result in a reliable system for an industrial environment.

2.1 DIP Switch and Jumper Settings

Jumper Settings

There are four (older boards contain five) jumpers that must be set correctly. The default position as sent from the factory may be correct for your application, but it is always prudent to verify this.

The jumpers select:

- Real Time clock active or disabled
- Logic Power from I/O bus or external power supply
- RS-485 connected to end of line or middle of line

Refer to Appendix R for the board position of these jumpers,

DIP Switch Settings

The two DIP switches (S1 and S2) set the module address in the I/O rack.

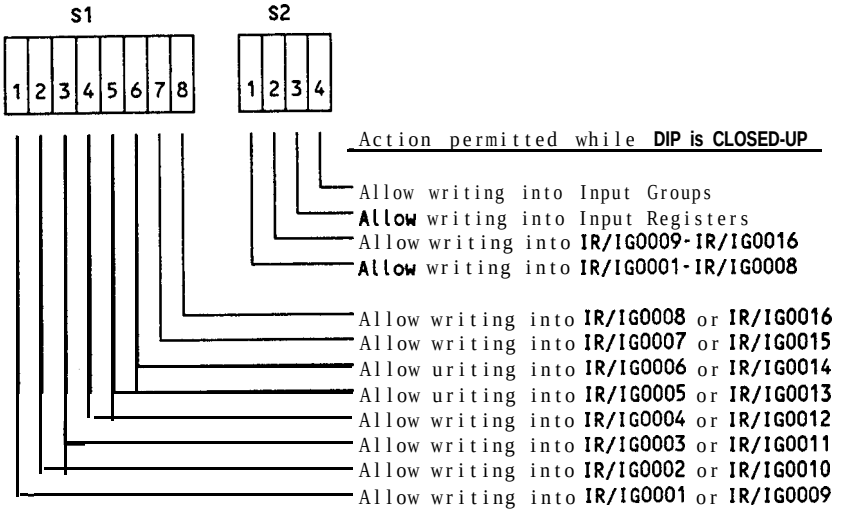
Set all DIP switches in the open (up) position unless:

1. You want to write to Input Registers or Input Groups over the I/O bus.
2. You want to read or write Holding Registers over the I/O bus.

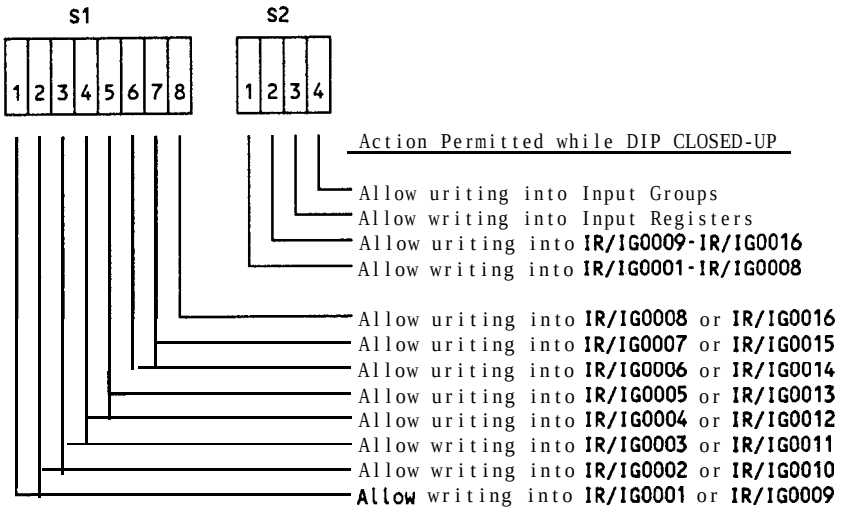
The 1799 can read Input Registers, Input Groups, Output Registers and Output **Groups** regardless of the DIP switch position.

Writing to Input Registers and Input Groups

Select which Input Registers (IR) or Input Groups (IG) the 1799 may write into by closing some or all of these DIP switches.



Reading **or Writing Holding Registers via the I/O Bus**



You must close some DIP switches if Holding Registers are to be transferred over the I/O bus using the 1799 HR(x) function.

A special program must be loaded into the PC1xxx programmable controller to activate the HR(x) function inside the 1799. The correct ladder program that must be merged into your PLC program depends on the type of programmable controller I/O rack that the 1799 module is plugged into. Both programs are shown in Appendix F.

PC1 100	use	BAS1100.LDR
PC1 200	use	BAS1200.LDR

These sample programs assume (and require) that IR0001, IR0002, OR0001 and OR0002 are not being used by your ladder program, and are free to be used by the 1799.

Close four DIP switches to permit the 1799 module to write into IR0001 and IR0002.

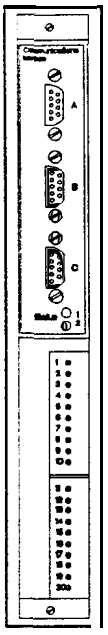
DIP Switch 1	1	- UP (closed)
	2	- UP (closed)
	3	- DOWN (open)
	4	- DOWN (open)
	5	- DOWN (open)
	6	- DOWN (open)
	7	- DOWN (open)
	8	- DOWN (open)

DIP Switch 2	1	- UP (closed)
	2	- DOWN (open)
	3	- UP (closed)
	4	- DOWN (open)

To use a different register pair, refer to Appendix B, page 76.

2.2 Terminal Connections

The 1799 module has a 20 position terminal strip for external power and the RS-485 port.



1 - Earth Ground
2 - TxRx A
3 - TxRx B
4 - Sync A
5 - Sync B
6 - TxRx A
7 - TxRx B
8 - Sync A
9 - Sync A
10 - RS-485 Shield Splice
11 - External 5 VDC input
12 - External 5 VDC input
13 - External Common
14 - External Common
15 -
16 -
17 - I/O Bus 5 VDC output
18 - I/O Bus 5 VDC output
19 - I/O Bus Comnon
20 - I/O Bus Comnon

-------(+) 5.5 VDC Power
-------(-) Supply

Power Suppy :500 mA required
CPU :350 mA required

Optional Alternate Connection (800 mA from PLC)

11 - External 5 VDC
12 - External 5 VDC
13 - External 5 VDC
14 - External 5 VDC
15 -
16 -
17 - I/O Bus 5 VDC output
18 - I/O Bus 5 VDC output
19 - I/O Bus Common
20 - I/O Bus Comnon

Note: If the external supply is less than approximately 5.5 VDC, a watchdog timer error may occur.

Notice that there are two TxRxA, two TxRxB, two Sync A and two Sync B terminal connections, Both of these terminals are common to each other. Connect your RS485 line to either connection.

Optional Alternate Connection 2 (0 mA from PLC)

11- External 5 VDC
12- External 5 VDC
13- External 5 MC
14- External 5 VDC
15-
16-
17- I/O Bus 5 VDC output
18- I/O Bus 5 VDC output
19- I/O Bus Common
20- I/O Bus Common

(+) 5.5 VDC Power Supply
(-)

When using the Optional Alternate Connection 2 be *sure* to *remove* the Logic Power *jumper* from *the NCMZ-7799* circuit board. Refer to the diagram on page 132 for the location of this jumper.

Note

If you remove the terminal block from the front of the 1799 module,' you will break the connection between the two terminal points. If you desire to have the network keep continuity even if the terminal block is disconnected, place both the incoming and outgoing RS-485 wire under the same terminat point;

2.3 RS-232 Systems

A primary purpose of the NCMZ 1799 module is to translate data from one serial format to another. In order to move this serial data between two devices, it will be necessary to connect one or more serial ports from the module to an external device. The purpose of this section is to provide guidelines for connecting RS-232 devices'.

RS-232 is a standard that defines a method of connecting two pieces of computer equipment together, even if that equipment is not manufactured by the same company. Even though the standard is quite complete, there are enough items not defined so as to require a little research on the part of the installer.

Basically, RS-232 defines a connector that has 25 pins (IBM created a 'new' non-standard 9 pin connector, which has become a new de-facto standard). These 25 pins each have a purpose. There are four types of pins.

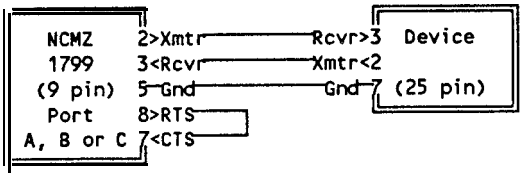
- Transmit Data Out
- Receive Data In
- 'Modem Control' Out
- 'Modem Control' In

A pin marked 'Out' produces a voltage ('sources" current). A pin marked 'In' reads a voltage.

The whole trick in RS-232 is connecting a Transmitter' from one device to a 'Receiver' of another device. There are three ways of doing this:

- Buy a cable from someone who has already figured out how the cable should be configured, Certain name-brand devices (modems, printers, computers, etc.) have already been examined and the proper cable that connects between these devices and the NCMZ 1799 has already been determined. See page 87 for a listing of these cables. The proper connection diagrams ('pinouts') for additional devices may have been determined since this manual was published. Contact the Westinghouse Advanced Product Support Center (800-542-7883) for assistance.
- Examine the technical documentation for the two devices and determine the proper cable.
- Send the request to Westinghouse (include the technical documentation for the device you wish to connect to the NCMZ 1799), and we will determine the proper cable configuration.

The simplest connection involves three wires and one jumper:



Connect the 1799 Data Transmitter to the Device Data Receiver and vice versa. Connect the 1799 Request to Send (RTS) to the 1799 Clear to Send (CTS). Jumpering RTS back to CTS insures that the 1799 will transmit data without the concern that an external device requests

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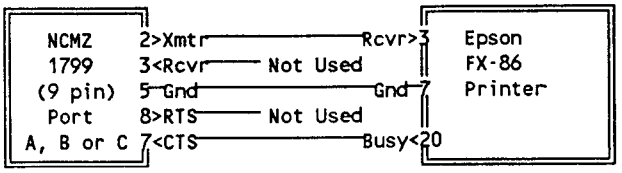
2 For more information on RS-232 refer to the book RS-232 Made Easy by Martin D. Seyer. This book is available from Black Box (800-321-0746).

that the data flow be stopped. If the external device could not receive data as fast as the 1799 could send it, then externally 'dropping' the 1799 CTS lead will halt the flow of data from the module. As long as the CTS lead is 'low' (0 VDC to -25 VDC), flow from that serial port is halted. When CTS is 'high' (+3 VDC to +25 VDC), data flow from the module resumes.

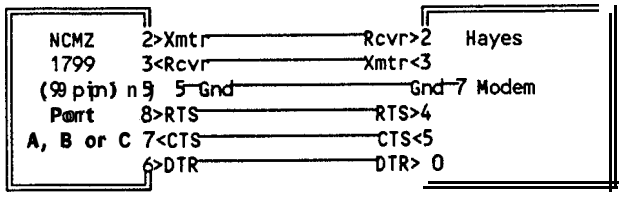
This CTS lead can be used by a printer to momentarily halt the flow of data from the 1799.



Another common connection with the 1799 is with a modem (or line driver). Modems and line drivers extend the distance between the 1799 and external device from a maximum of 15 m (50 ft) to several kilometer or miles. There are two types of modems in common use:

- 'Dial-up" telephone modems
- Leased Line or customer owned wire modems

The wiring to each modem is identical, however:



Notice that the modem uses the same pins numbers as the printer, but the direction of data flow to those pin numbers is reversed. RS-232 defines a modem as 'Data Communications Equipment (DCE)" and states that the pin numbers should be reversed. Also, a new pin, DTR, is used by the Hayes modem to indicate that the 1799 is powered up and ready. Some modems will not transmit data unless they receive a 'high' signal on their DTR line. Pin 6 of the 1799 is always held at a high level when ever the module is properly powered.

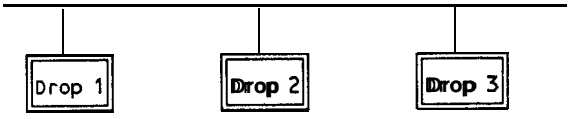
Another common connection for the 1799 is with a multi-drop modem. The connection to the modem is the same as shown above.

2.4 W-485 Systems

RS-232 ports are used for point to point, short distance (50 feet/ 15 m) communication links. For distances beyond those short distances, RS-485 is one option. Additionally, RS-485 supports "multidrop" operation, meaning more than two devices may be on the same twisted pair of wire.

RS-232 Connection

RS-485 Connection



RS-485 lines can be unidirectional or bidirectional. The RS-485 port used on the 1799 module (and the 799, PC1200, and PC1 100) is bidirectional. Bidirectional networks are terminated on both ends. The termination value for RS-485 networks is typically 120 ohms at each end. The termination value is normally not critical except at the longer lead lengths and higher baud rates. The correct termination value is a compromise between waveform shape and signal amplitude, Both the NCMZ-1799 and all PC1000 processors (that have RS-485 ports) include termination resistors that can be switched on and off.

Note that RS-485 networks are designed to be wired in a daisy chain fashion. All drops should be connected to the same line, with no stubs or taps off this main line.

Besides proper daisy chain wiring topology, grounding is a consideration. RS-485 transceivers are designed to operate properly as long as the common mode voltage (voltage from wire to local isolated common) between drops is within ± 7 VDC. Since the 1799 module does not have an RS-485 isolated common wired to the terminal strip (called signal reference lead in RS-485 documentation), don't directly connect the 1799 to the PC1000 twisted pair network. If the application requires that the module be placed on the twisted pair multidrop network, an interposing, RS-485 galvanic isolator (as manufactured by Acromag, or equivalent) is highly recommended.

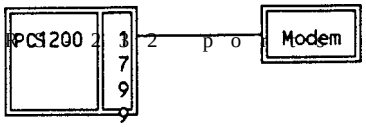
This isolator is not required for a short connection between an NL-1075 module and the 1799 located in the same I/O rack.

Note that this RS-485 port transmits and receives data over the same pair of wires (2 wire, half-duplex circuit), For this reason, it is important to enable the RS-485 transmitter before sending data out PORT D. After the data is transmitted, the RS-485 transmitter should be disabled. Why? According to the RS-485 specification, only one transmitter may be active at a time.

```
100   PORT D:POKE ($C60E,2):REM switch to PORT D and enable transmitter
110   PRINT "This data is being sent out the RS485 port'
120   SUSPEND l:POKE ($C60F,2):REM wait 20 mS and then disable transmitter
```

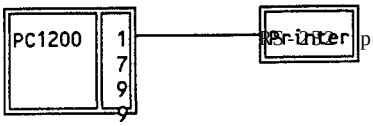
2.5 Hardware Layout Examples

Connection to a **Modem**



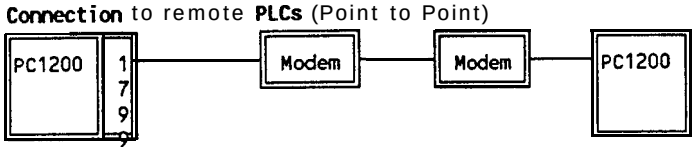
One or more modems can be connected to each of the three serial ports on the 1799.

Connection to a Printer



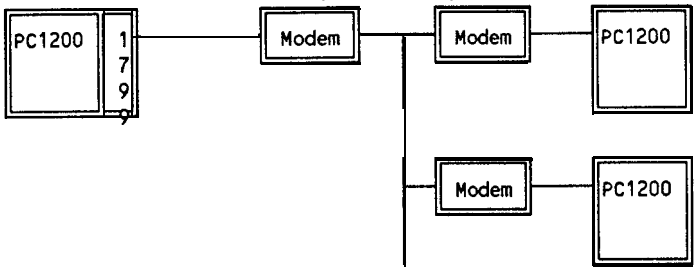
One or more printers can be connected to each of the three serial ports on the 1799. Any combination **of** printers and/or modems can be connected to these serial ports.

Connection to remote **PLCs** (Point to Point)



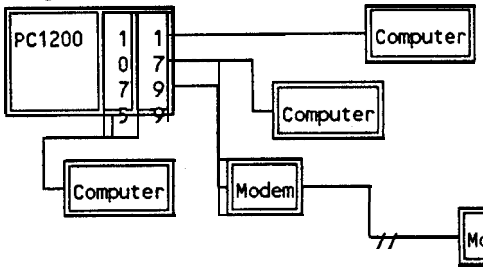
The 1799 can talk to the remote PLC with any of several protocols:
Modbus RTU
Westinghouse **"6 Byte"**
Westinghouse PC 1000 LAN

Connection to remote **PLCs** (Multi-Point)



The 1799 can talk to the remote PLC with any of several protocols:
Modbus RTU
Westinghouse **"6 Byte"**
Westinghouse PC 1000 LAN

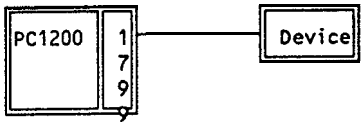
Program Loader Port **Expander**



See page 110 for more information.
The 1799 connects to the RS-485 port of the NL-10756. A program loader (computer, Genesis, etc.) can be connected to each of the three serial ports of the 1799. **One** of the three computers may optionally use the **Modbus protocol.** The remaining units use the Westinghouse **"6-Byte"** Protocol. Port A on the NL-1075 is a 4th port.

One or more of the remote computers may be connected to the 1799 via **modems**

Connecting to a **"Smart** Device*



Typical **"smart"** devices include:
Bar **Code** Readers
Mass Flow Meters
Ultrasonic Rangers
Weigh Scales