Vorne Industries

2100PC V2 Series
Multi-Line Message Display
User's Manual

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1 Introduction

1.1 General

Vorne 2100PC Series Displays are panel mountable, vacuum fluorescent message displays designed to interface with most PLC's and industrial computers. Three sealed front panel buttons and an on-screen menu allow easy application set up, while a locking setup feature prevents inadvertent change or loss of setup selections. Units are available with two or four lines of 5x7 dot matrix characters, and a choice of power supplies to meet the requirements of a wide variety of applications.

1.2 2100PC Parallel Canned Message Display

The 2100PC Canned Message Display model displays message scripts stored in its program memory. Up to 1024 message scripts may be stored in memory and recalled through the 2100PC's parallel or serial port. Scripts are used to create the text to be displayed and to specify how the text is to be presented. The easiest way to create message scripts is to use the Vorne Display-Pro 3 software which is provided free of charge. The Vorne Display-Pro 3 program runs on a DOS based computer running Microsoft Windows. Refer to Chapter 3 and Chapter 5 in this manual for more information.

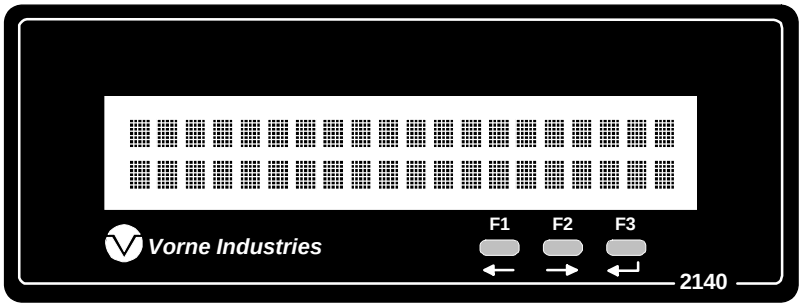
Message scripts can contain literal text for display, space reservation for run-time variable data, and command strings that define cursor placement, timing, scrolling, relay operation, blinking, looping structures, and other instructions.

Variable data may be included in messages displayed on the 2100PC. The position and format of these variables is defined when the script is created. The actual variable data is loaded into the unit during run-time operation through the parallel port or through the serial port.

2140 Two Line Display

The 2140 configuration, shown in Figure 1, displays 40 characters in two lines of 20 characters. The characters of a 2140 are each 11mm in height.

Figure 1
2140 Front Panel



2180 Four Line Display

The 2180 configuration, shown in Figure 2, displays 80 characters in four lines of 20 characters. The characters of a 2180 are each 9mm in height.

Figure 2
2180 Front Panel

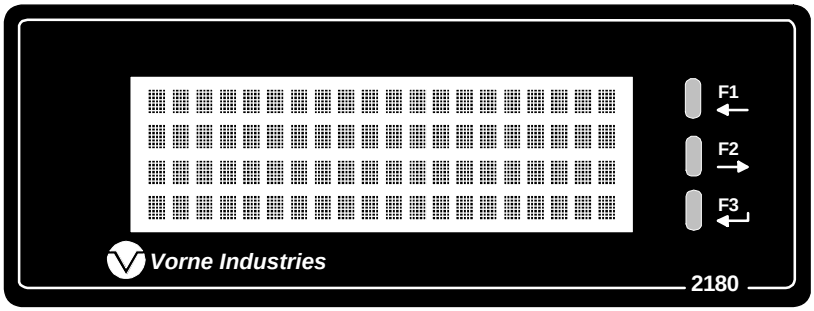


Table A Model Summary Table

Model 2140PC	2 Lines of 11 mm Characters
Model 2180PC	4 Lines of 9 mm Characters

2 Features

2.1 Vacuum Fluorescent Display (VFD)

VFD technology provides superior brightness, viewing angle, and spectral qualities. The natural color emitted by the VFD is a blue-green peaking at a wavelength of 505 nanometers. The VFD tube has a rated life of 50,000 hours (almost six years of continuous operation). Rated life is defined as the length of time before the average dot brightness will reach one-half of its original brightness due to fatigue of the display phosphors.

Note: To maximize the life of the display, it is important to avoid keeping the same message fixed on the display for extended periods (hours). If default messages like "ALL SYSTEMS GO" or "MACHINE RUNNING" are used, it is suggested that they scroll to prevent imprinting the message on the display phosphors.

2.2 Memory

There are two types of memory used in 2100PC units that concern the user.

E^2PROM Memory

This memory is used to store the information entered during setup. Setup data needs to be entered only once. Individual setup items may be modified at any time by entering the setup mode and making the desired changes, and then choosing the **Save Changes** option upon exit. This memory is retained in the absence of power with no need for a battery.

Flash EPROM

This memory is used in the 2100 to store the programmed scripts that may be recalled through the parallel or serial port. Canned messages are placed into this memory by uploading scripts from the host computer to the 2100PC. This memory is retained without power or battery.

2.3 Message Scripts

The 2100 Series displays interpret message scripts which may contain literal text, control characters, and command strings. Scripts give the displays explicit instructions on what to do. Vorne Display-Pro 3 software can be used to create message scripts and program scripts into the 2100PC flash memory. Later, the scripts can be called up from memory

2.4 Tasks

The 2100 Series displays have the ability to perform up to four different functions or tasks at the same time; each script is assigned a task number 0 - 3. An example of the usefulness of multitasking is the ability to separately control operation of the relay output, scroll a message on the display, and send serial text to an external device - all at the same time.

2.5 Power Supply Options

Displays are available with either a 24 volt DC power supplyor a 120 volt AC (± 15%) 50-60 Hz power supply. Both supplies are fused and have a typical operating power of 20VA.

2.6 Relay Output

A software controllable SPDT relay output is available for annunciator purposes. Relay connections are wired to pins D, E, and F on the terminal strip located on the rear of the 2100 Display (this terminal stripis marked A - F). Refer to the back panel diagrams at the end of this chapter (Figures 3 & 4). The relay is rated for 120 VAC at 1 Amp.

Table B Relay Terminal Connections

Terminal	Connections
D	Relay Output (Normally Closed)
E	Relay Output (Common)
F	Relay Output (Normally Open)

Warning: Use the relay for annunciation only. Do not use the relay for control applications!

2.7 Serial Ports

All serial communicationsto a 2100 Display are through opto-isolated serial ports. The RS232 port is accessible via the DB9 connector on the back of the unit. RS422 connections are wired to the 6 pin terminal strip labeled "RS422" located on the back of the unit.

Communications Setup Selections

Communication parameters for each 2100 Display must be selected during setup. Choices include data bits, baud rate, unit address, and group address. Refer to Sections 4.3 and 6.2 for specific details.

Configurations

2100 Displays can be configured for a serial network, permitting centralized control using a single computer or PLC. Messages and commands can be sent to individual units, a group of units, or to all units.

2.8 Parallel Port

The 2100PC has a port for parallel data operations. A user's PLC may call up scripts and send real-time variable data to the 2100PC via the parallel port. The parallel port accepts 3.5 to 30 VDC sink or source signals and is fully opto-isolated for increased reliabilityThe 18 bit parallel port is composed of 16 data lines and 2control lines. Refer to Chapter 7, Parallel Port Operation, for details.

2.9 Back Panel

Figure 3
2100PC-120 VAC Back Panel

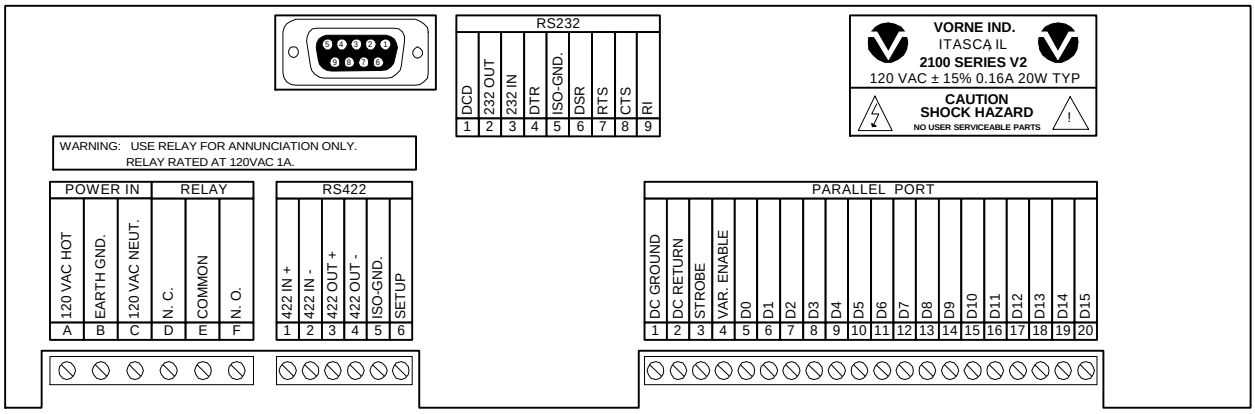
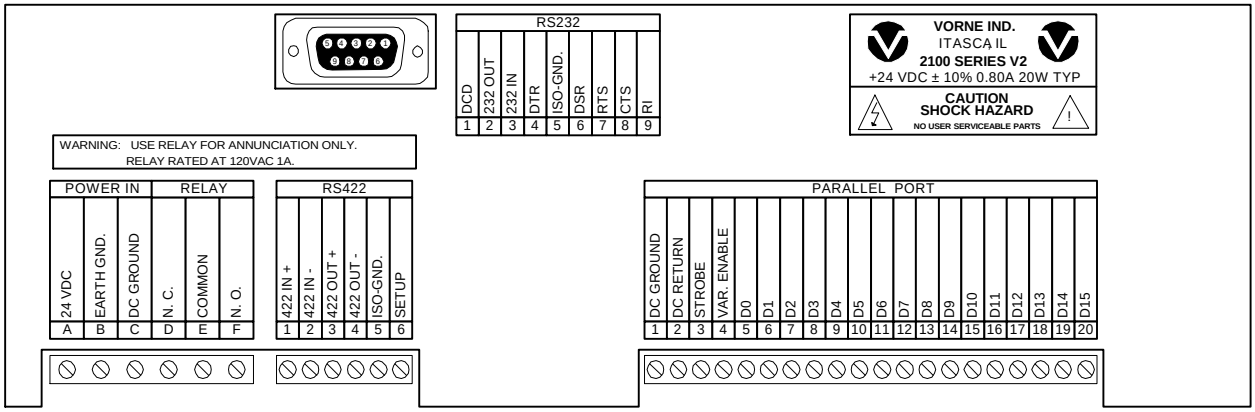


Figure 4
2100PC-24 VDC Back Panel



3 Quick Start Tutorial

3.1 2100PC Programming Software

The purpose of this tutorial is to provide simple instructions on connecting a computer to your 2100PC, installing the VDP3 (Vorne Display-Pro 3) software, and programming your 2100PC with a simple script. Some of these topics are covered in more detail in other sections of this manual and some are covered in more detail in the VDP3 on-line help. However, after completing this tutorial you will have verified that your 2100PC is connected properly for programming, the VDP3 software is setup properly, and that you can communicate with and program your 2100PC.

Your 2100PC Display has many capabilities. These capabilities include text display, cursor control, blinking, and scrolling, as well as a wide variety of advanced functions which are controlled through various command sequences. When a sequence of text and commands are collected together to be run as a unit, the collection is called a "message script." When a message is programmed into a PC unit and then later called up from memory, it is termed a *canned script*. The canned script can be requested from the parallel port or through a simple serial command sequence.

VDP3 Software Overview

The VDP3 software provided with the 2100PC display is the easiest way to create scripts for the 2100PC. The scripts are then programmed into the 2100PC from the computer via a serial connection.

To develop message scripts, one of three modes may be used. For this tutorial, we will use only the Quick Edit Mode. More information regarding all three modes is found in Section 5.1 of this manual. Quick Edit is a powerful, user friendly, point and click editor. Point and click selections in various Quick Edit screens automatically generate the appropriate 2100 Scripting Language commands.

Installing the Software

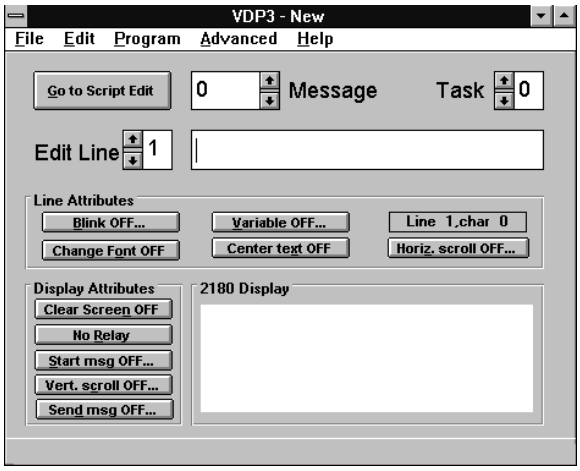
It is assumed that the user has some experience with the operation of Microsoft Windows. The VDP3 software is provided on a 3½ diskette. To install the software, run Windows, put the program disk in the appropriate drive, and run the setup program from that drive. If you are using drive a: to install the software, you would:

Run Windows
Put the disk in drive a:
From the Program Manager choose File/Run a:\setup

The setup program will install the software and create a VDP3 program group.

Running the Software

The VDP3 software is invoked by double clicking on the VDP3 icon. The program defaults to the Quick Edit Mode and the following screen appears:



The VDP3 program has a standard Windows interface. To display a menu, move the cursor to a menu title and click the left mouse button. Then move the cursor to the desired selection and click the left mouse button again to activate the selection.

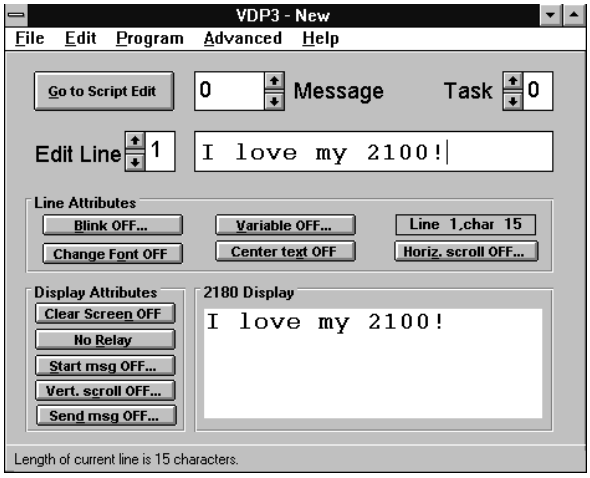
Select **Program/COM1** (or COM2 if you are going to use COM2).
Select **Program/2180** (or 2140 for a 2 line display).

The **Message** number should be 0.
The **Edit Line** number should be 1.
The **Task** number should be 0.

The Edit Box is the main message editing area. It is located just to the right of the **Edit Line** selector.

Select the Edit Box.
In the Edit Box type "I love my 2100!"

Now your screen should look like the one below.



Notice, that as you type text into the Edit Box, it is displayed in the Display Simulation Box. The Display Simulation Box approximatesthe appearance of the message as it will be displayed on the 2100PC. This allows you to verify that the settings and format are adjusted to fit your application.

Highlight the word "love" in the Edit Box.
Now, click the left mouse button while the cursor is over the Blink Button.

The word "love" will blink in the Display Simulation Box.

Select **File/Save** (The file-save window will appear.)
Name the file "tutorial.src" and choose **OK**.

You have just created a program file. If this file is used to program a 2100PC, "I love my 2100!" will be message 0. When message 0 is called up, the text will be displayed on line 1 and run in task 0. Now, that was easy!

Experiment! The best way to learn how to use VDP3 is to use it. Write your own messages, try the various features, navigate the menus, and by all means explore the extensive on-line, context sensitive help. Also, keep an eye on the *Status Line* (the bottom line of the Quick Edit Window). It prompts you with context sensitive information about what actions can be taken as you move the mouse cursor over the various features on the Quick Edit window.

When you are ready to program your 2100PC, proceed to the next page.

3.2 Powering Your 2100PC

In order to program your 2100PC you must make some electrical connections. The first of these connections is power. Determine the correct voltage for your Display. The voltage is indicated on the rear panel of your 2100.

Connect the appropriate power to your 2100PC Display as follows:

Terminal	120 VAC Connections	24 VDC Connections
A	120 VAC (Hot)	+24 VDC
B	Earth Ground	Earth Ground
C	120 VAC (Neutral)	DC Ground

Check all connections, then apply power.

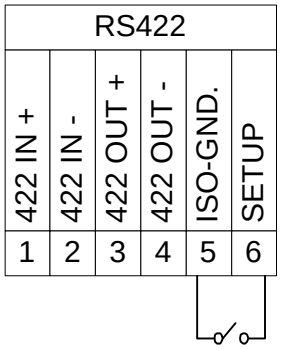
The display should power-up and display informational screens for about 10 seconds. If it does not, check the power connections.

When your display is operational, proceed to the next page.

3.3 Putting Your 2100PC In Program Mode

The 2100PC must be placed in the Setup Mode in order to be programmed. The Setup Mode protects the unit's setup values from accidental or inadvertent change. To enter the Setup Mode, the SETUP input terminal must be connected to the ISO-GND terminal. When the SETUP input terminal is disconnected from the ISO-GND terminal, the unit will restart.

A switch may be installed across the SETUP and ISO-GND terminals to provide an easy way of entering the setup mode. The diagram below shows the wiring required for the SETUP circuit.



Close the setup switch or jumper SETUP to ISO-GND.

The display will indicate that it is in Setup Mode.

Press the F1 key on the front panel.
Press F3.

This selects the Program Mode option.

The display will now show the "Waiting for host"prompt.

Your unit is now in Program Mode, proceed to the next page.

3.4 Connecting Your 2100PC To A Computer

A standard PC modem cable is required to connect your 2100PC to a computer. This cable must have a male DB9 connector at one end to mate with the 2100PC. The other end of the cable will be a female DB9 or DB25 to mate with the COM port of the computer.

Care must be taken to connect the cable to the COM port previously selected in Section 3.1.

Note: A PC modem cable is a straight through cable.

If you have not already done so, make the appropriate connections now.

When you have connected the communications cable, the display will be ready to program.

3.5 Programming Your 2100PC

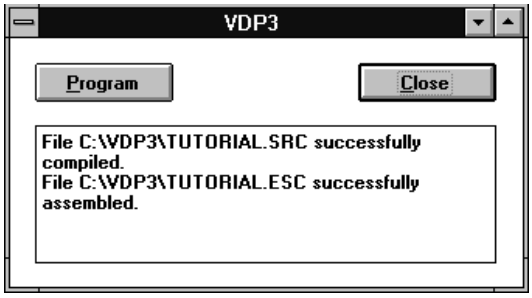
Earlier you saved a file in VDP3 called "tutorial.src".
Now, let's use that file to program the display.

In VDP3 select **File/Open/tutorial.src**

The file will be loaded and message 0, "I love my 2100!" will be displayed in VDP3.

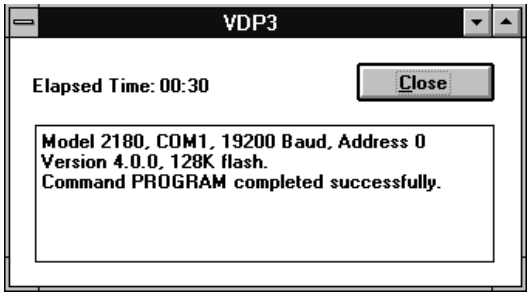
Select **Program/Compile**

When the file is finished compiling, the Compile window will look like the one below.



Click on the **Program** button.

The 2100PC will display status messages during programming. When the display has been programmed, a window similar to the following will appear:



Click on the **Close** button.

Take your 2100PC out of Setup Mode by toggling the setup switch or by removing the jumper from SETUP to ISO-GND.

The display will exit the setup mode and reboot.

The display is now programmed.

3.6 Calling Up Your Message

Select **Advanced/Call up**

A message window will appear.

Enter "0" and choose **OK**.

Message 0, "I love my 2100!", will now be displayed on your 2100PC.

Congratulations! You have verified that your 2100PC is connected properly for programming, the VDP3 software is setup properly, and that you can communicate with and program your 2100PC.

4 Setup

4.1 Powering The Display

Power connections are made to three pins of a 6 pin terminal strip on the rear of the 2100 Display. This terminal strip is marked A - F. Refer to the back panel drawings at the end of Chapter 2.

Power connections are wired to terminals A and C. Terminal B is used to provide earth ground to the unit. Earth ground must be wired to terminal B in order to provide a safety ground to the enclosure as well as a return path for external electrical noise disturbances.

Table C Power Connections

Terminal	120 VAC Connections	24 VDC Connections
A	120 VAC (Hot)	+24 VDC
B	Earth Ground	Earth Ground
C	120 VAC (Neutral)	DC Ground

4.2 Setup Mode

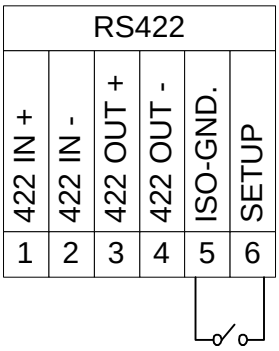
The 2100 Display setup selections are made using the front panel keys F1, F2, and F3. These keys are used to step through the setup menu and select the 2100PC Display's operating parameters. Once saved, these choices are stored in nonvolatile memory and need not be entered again.

Entering Setup Mode (SETUP Feature)

To enter the Setup Mode, the SETUP input terminal must be connected to the ISO-GND terminal. The SETUP feature also protects the unit's setup values from accidental or inadvertent change. If no changes were made and the SETUP input terminal is disconnected from the ISO-GND terminal, the unit reboots. However, if changes were made, an exit menu is displayed.

It is suggested that a switch be installed across the SETUP and ISO-GND terminals. This provides an easy way of entering the setup mode. The diagram on the following page shows the wiring required for the SETUP circuit.

Figure 5
Setup Circuit Wiring Diagram



Using the Front Panel Menu Keys

As long as the unit is in the Setup mode, the title of the active setup menu will be displayed on the first line of the display. The second line will display the menu choice for the current setup parameter. When in the Setup mode, the **F1** key is used to move to the previous menu choice and the **F2** key is used to move to the next menu choice.

The **F3** key is used to select the currently displayed choice. If the current setup selection is a numeric value, the **F1** key will decrement the current value each time it is pressed and the **F2** key will increment the current value when it is pressed. If the current selection is not a numeric value, **F1** and **F2** will index through the available choices.

Note: Holding down a key will cause it to repeat.

The unit is shipped from the factory with default settings loaded into memory. If the values have been changed, the default settings can be reloaded by entering the setup mode and selecting **Load Default Setup.**

4.3 2100PC Setup Options

When the 2100PC is placed in the Setup mode, the **Choose an Option** menu will be displayed. The options are: General Setup, Serial Port Setup, Parallel Port Setup, Load Default Setup, Test Mode, and Enter Program Mode.

General Setup

Alternate Escape: /ESC, FS, GS, RS, US, ENQ, ACK, BEL, DC2, DC4, NAK, SYN, CAN, EM, SUB/ Default = ESC

The **ESC** character is the default command identifier. This selection permits an additional character to be selected as a valid command identifier. This is required if the host does not permit literal ESC characters to be used. Regardless of this selection, the ESC character will always be recognized as a valid command identifier

Vertical Scroll: /Yes, No/ Default = Yes
The vertical scroll feature allows messages that are received to be displayed without the need to use cursor control. On a 2140, the first 20 characters received are displayed on line one. The following 20 characters are displayed on line two. Any additional characters received will force the data on line one to be replaced by the data on line two. Any subsequent characters will be displayed on line two. On 2180 units, vertical scrolling occurs when the 81st character is received. This is typically most useful in Terminal mode, particularly when the host device is not programmable. Refer to Section 6.4 Terminal Emulation, for details.

If the vertical scroll is not used, any fixed message with more characters than the display is capable of showing will be truncated. To display additional text, the unit must receive a **Cursor** command or Form Feed.

Boot Message: /None, Boot, Zero/ Default = Boot
This parameter is used to determine the boot message that will be displayed when the unit is powered up.

If *None* is selected, the display will power-up, briefly display one diagnostic screen, and then go blank.

If *Boot* is selected, the display will power-up, display one diagnostic screen, and then display informational screens for approximately 8 seconds. During this time the unit will accept input data, but will not display the data until all of the informational screens have been displayed.

If *Zero* is selected, the display will power-up, briefly display one diagnostic screen, and then start canned message 0.

Terminal Mode: /Disabled, VT-102 Compatible, 2100 Series Slave/ Default = Disabled
This selection is available to place the 2100 Display into one of the two Terminal Emulation modes. Refer to Section 6.4 for details.

Data Stream Port: /Disabled, Serial Port, Parallel Port/ Default = Disabled
This setting transfers control and interpretation of the specified port to a user supplied script. The port that is selected is no longer available for message callup. The user script can interpret the incoming data using advanced scripting commands. Refer to Section 6.4 of the 2100 Scripting Language Manual (located in the on-line help of VDP3).

Stream Data Type: /By Item, By Buffer/ Default = By Item
This setting determines the method by which stream port data is collected and passed to the user supplied script. Refer to Section 6.4 of the 2100 Scripting Language Manual (located in the on-line help of VDP3).

Exit
This selection will return to the **Choose an Option** menu.

Serial Port Setup

Unit Address: /000 - 255/ Default = 000
Each 2100 Display can be assigned a unique address. This permits the host to communicate with individual units in a network. Addresses can be assigned from 000 to 255.

Group Address: /0 - 8/ Default = 0
Each 2100 Display can be assigned a group address. Refer to Section 6.2, Communicating To Multiple Units, for details.

Baud Rate: /300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K, 76.8K/ Default = 19.2K
The baud rate between the host and the 2100 Display must be specified. The same baud rate will also be used for serial output functions.

Number of Data Bits: /7, 8/ Default = 8
The number of serial data bits must be selected. Parity bits are ignored.

Line Terminator: /CR, LF/ Default = CR
The line terminator selection option is for use with the Simple Packet Protocolformat of serial communication. Refer to Section 6.3 for more information.

Exit
This selection will return to the **Choose an Option** menu.

Parallel Port Setup

Port Mode: /No Strobe, Strobed Msg, Strobed Msg & VData/ Default = No Strobe
This selection determines the parallel port operating mode. Refer to Section 7.3 for details.

Debounce Time
This setting is dependent on the **Port Mode**, which should be selected first.

Port Mode=No Strobe:/10-2560mS/ Default = 100mS
Port Mode=Strobed Msg:/Edge Trigger, 0.625 - 159.375mS/ Default = 6.250mS
Port Mode=Strobed Msg & VData:/Edge Trigger, 0.625 - 159.375mS/ Default = 6.250mS

The debounce time is the amount of time that data must remainstable on the parallel port before the 2100PC will accept it as validdata. The correct setting for this option is based on the type of equipment controlling the parallel port.

Strobe Logic Type: /Normal, Inverting/ Default = Inverting
This setting determines the active logic typeof the strobe input.

Input Logic Type: /Normal, Inverting/ Default = Normal
The 16 bit parallel port and the variable data enable share this setting to determine the active logic type. The following table should be consulted when choosing the logic type.

Choosing A Logic Type

2100PC Return Connection	Input Logic Type Selected	PLC Output Voltage	Interpreted By 2100PC As
+V	Normal	Open or +V	"0" (Inactive)
		GND	"1" (Active)
	Inverting	Open or +V	"1" (Active)
		GND	"0" (Inactive)
GND	Normal	Open or GND	"0" (Inactive)
		+V	"1" (Active)
	Inverting	Open or GND	"1" (Active)
		+V	"0" (Inactive)

Input Number Format: /Binary, Signed Binary, BCD, Signed BCD/ Default = Binary
The format in which data is to be sent over the parallel port must be selected. Refer to Section 7.2 for details.

Exit
This selection will return to the **Choose an Option** menu.

Load Default Setup
This selection will loadthe default setup settings. Remember, no change is saved unless "Save Changes" is also selected. This allows you to load and view the default settings without losing your old settings. Just choose "Ignore Changes" when you exit the setup mode and your old settings will be unchanged.

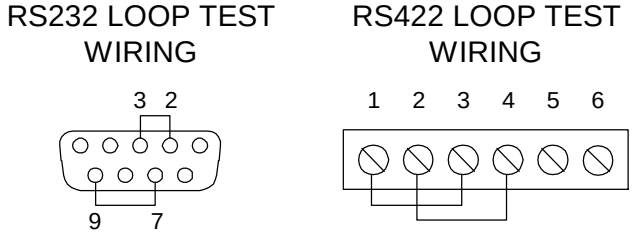
Test Mode

Show Configuration
This test will display the boot informational screens. These information screens display the Checksum Test Result, Electronic ID, Memory Size, Model, Firmware Version, Alternate Escape Character, Baud Rate, Data Bits, and Unit Address for the unit.

Note: Canned message memory is not tested.

Serial Port Test
This selection will perform a loop test on the serial ports. A loop test will be performed using the port that has a loop-back connector installed. Only one loop-back connector should be installed at any given time. Refer to the diagrams below. Make the appropriate connections for the desired test, then run the test. The test will be performed and the results displayed. If no loop-back connector is installed, the test will fail. Pressing any key will exit the test. Figure 6 shows the correct connections for either the RS232 loop test or the RS422 loop test.

Figure 6
Loop Test Wiring Diagram



Relay Test
Pressing F1 will turn the relay ON. Pressing F2 will turn it OFF. Pressing the F3 key will exit the test.

Display Test
This test will automatically cycle test characters on the display. Pressing F1 will pause on the current set of characters. Pressing the F2 key will jump to the next set of characters. Pressing the F3 key will exit the test.

Parallel Port Test
For ease of use, the unit should be set to no strobe mode prior to running this test. The states of the Strobe and Variable Data inputs are displayed on the first line. A "1" is active and a "0" is inactive. The state of the data lines is shown on the second line. A "1" is active and a "-" is inactive. This test operates in real time. Pressing any key will exit the test.

Exit
This selection will return to the **Choose an Option** menu.

Enter Program Mode
This selection will place the 2100PC in **Program Mode**. The 2100PC must be in this mode to erase the flash or to program canned messages into the display. Hitting any key will exit **Program Mode**.

Exiting Setup Mode

To exit the setup mode, disconnect the setup terminal from the ISO-GND terminal. If no changes were made while in the setup mode, the unit will reboot. Otherwise, this will result in a "Setup Has Changed!" prompt screen and menu.

Exit: Save Changes
Pressing the F3 key will save the current settings, exit setup, and reboot. Pressing either the F1 or F2 key will cycle to the "Ignore Changes" option.

Quit: Ignore Changes
Pressing the F3 key will exit setup without saving the changes and reboot. Pressing either the F1 or F2 key will cycle to the "Save Changes" option.

5 Programming A 2100PC

5.1 Programming Overview

Messages for the 2100PC are written using the English-like 2100 Scripting Language. There are three methods available for creating message scripts. The complexity of the application will determine themode to use.

Quick Edit
The Quick Edit Mode is essentially a 4GL development tool for the 2100 Scripting Language. In other words, "point and click" type selections in the various Quick Edit screens automatically generate the appropriate 2100 Scripting Language message scripts. If your entire 2100PC message display application can be developed by using Quick Edit screens, then take advantage of this easy to understand and time saving tool. When using Quick Edit there is absolutely no need to understand the 2100 Scripting Language.

Script Edit
The Script Edit Mode is used for applications that can be mostly developed with Quick Edit, but have a few messages with advanced requirements beyond the Quick Edit capabilities. Unlike the "point and click" selections of Quick Edit, using Script Edit (accessed by pressing the *Script Edit button*) requires an understanding of the 2100 Scripting Language. In fact, creating messages with Script Edit is much like writing a program in BASIC.

All message scripts which have been created with the Quick edit screens are available for viewing (and modification) with Script Edit. Routinely viewing Quick Edit message scripts is a good way to familiarize yourself withthe 2100 Scripting Language. You can store any mix of Quick Edit and Script Edit messages in a file within the VDP3 (Vorne Display-Pro 3) environment. One very important caution is that once a particular Quick Edit message has been modified in any way inside the Script Edit environment, it can no longer be edited with the Quick Edit screens. Instead, Script Edit must be used.

Message File Edit
The Message File Edit Mode is used for large scale and complex 2100PC applications that stray far outside the scope of Quick Edit. These applications are best developed based entirely on the 2100 Scripting Language. Message File Edit uses an external text editor (basically any ASCII based text editor) to work with the entire message file. This approach does not allow the use of any Quick Edit messages, and requires a thorough understanding of the 2100 Scripting Language. Although this approach does not use VDP3 to create and edit messages, VDP3 can still be used to *compile* message script files, *program* the display, etc. However, these functions can also be performed from the DOS command line.

5.2 Vorne Diplay-Pro 3 Software

Since the vast majority of applications willmost often be done in the Quick Edit Mode, the information in this manualdeals almost exclusively with the Quick Edit Mode. However, all modes are covered extensively inthe VDP3 on-line help.

The VDP3 software provided with the 2100PC display runs under Microsoft Windows and is the easiest way to create scripts for the 2100PC. These scripts are then programmed to the 2100PC from the computer via a serial connection. For information regarding hardware setup and wiring connections refer to Chapter 4 Setup and Chapter 6 Serial Port Operation.

Installing VDP3

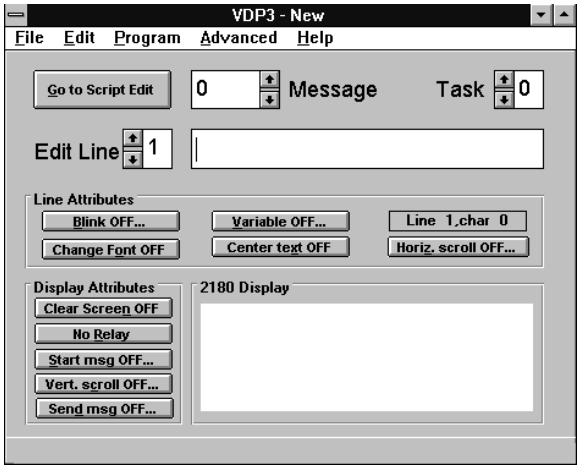
It is assumed that the user has some experience with the operation of Microsoft Windows. The VDP3 software is provided on a 3½ inch diskette. To install the software, run Windows, put the program disk in the appropriate drive, and run the setup program from that drive. If you are using drive a: to install the software:

Run Windows
Put the disk in drive a:
From Windows choose File/Run a:\setup

The setup program will install the software and create a VDP3 program group.

Running VDP3

The VDP3 software is invoked by double clicking on the VDP3 icon. The program defaults to the Quick Edit Mode and the following screen will appear:



VDP3 Menus

The VDP3 program has a standard Windows interface. To display a menu, move the cursor to a menu title and click the left mouse button. Then move the cursor to the desired selection and click the left mouse button to activate the selection.

VDP3 Buttons

Most control buttons in the Quick Edit screens are toggles. Clicking the left mouse button while the cursor is over one of these control buttons will cause the corresponding function to toggle ON and OFF. Clicking on some control buttons will bring up a separate window enabling the selection of more advanced parameters for the function. Clicking on a few control buttons will step through a list of choices. If you have any question, explore the help.

Getting To Know VDP3

The best way to learn how to use VDP3 is to use it. If you have not already done so, make use of the Quick Start Tutorial (Section 3 of this manual). Run the tutorial scripts, write your own, and explore the extensive on-line, context sensitive help. Also, keep an eye on the *Status Line* (the bottom line of the Control Window). It prompts you with context sensitive information about what actions can be taken as you move the mouse cursor over the various features on the Quick Edit window.

5.3 Three Edit Modes - What's The Difference?

Quick Edit

Quick Edit utilizes a small subset of the 2100 Scripting Language to create an easy to understand user interface for typical applications. The following features are directly available through the use of Quick Edit buttons:

- Blink Button — Turn blink on or off, blink a whole line or a portion of a line, and set the blink rate.
- Font Button — Select English, Katakana, or Slavic for the extended ASCII character set.
- Variable Button — Turn variables on or off, assign variables. Specify leading spaces or leading zeros to be displayed when the variable does not take up as many character positions as there are placeholder characters.
- Center Text Button — Automatically center text.
- Horizontal Scroll Button — Turn horizontal scroll on or off. Specify continuous or block by block, and number of times to scroll. Specify scroll uninterrupted, scroll until next message, and scroll speed.
- Clear Screen Button — Specify that the entire 2100 screen is to be cleared prior to displaying the current message.
- Relay Button — Specify that the 2100 relay is to be turned on or off prior to displaying the current message.
- Start Message Button — Start other messages from the current message.
- Vertical Scroll Button — Turn vertical scroll on or off. Specify number of times to scroll, scroll uninterrupted, scroll until next message, and scroll speed.
- Send Message Button — Turn send message on or off. Specify information to be sent out the 2100PC's serial port when the current message is executed. Specify to a 2100 Slave or user defined text.

Script Edit

The features available in Quick Edit, as well as more advanced features of the 2100 Scripting Language, are included in Script Edit. The advanced programming features include mathematics, flow control, I/O processing, and task management. A short description of the features is included here to demonstrate the power of the 2100PC. A detailed account of all the features can be found in the 2100 Scripting Language section of the on-line help.

- Mathematic functions extend your PLC's effectiveness by off-loading conversions, scaling, and other functions to the 2100PC. A full range of 16 bit integer math and logic functions are available to give your application a truly professional edge.
- Flow control statements give the ability to make decisions based on variable data and other internal functions. Combine mathematics and flow control statements to produce out of limits messages or user selected output conversions, all within the 2100PC.
- I/O functions open the world to the 2100PC. Make scripts that respond to the front panel keys. Read and interpret serial streams from scales and sensors. Keep and share variable data between scripts. Send the results of your script functions and variables to another serial device for display or polling functions.
- Task management features allow tasks to be started based on time or time intervals. Build sophisticated, multitasking script environments to get every ounce of performance out of your 2100PC display system.

Message File Edit

For the advanced display programmer, Message File Edit provides all of the functions of Script Edit with the following additions:

- You can make use of your own ASCII program editor.
- You can enter and edit all the scripts for a project at one time.
- You can use symbolic constants and a file include mechanism, to simplify the management of your 2100PC development projects.

6 Serial Port Operation

6.1 Communicating To A Single Display

Communications from the host can be sent to a single 2100 Display in either RS232 or RS422.

Wiring to a Single Display

Connections to the serial port are made to either the RS232 connector or the RS422 connector on the rear of the unit. The serial port is comprised of an RS422 communications port and a built-in RS232 to RS422 converter. The host must communicate with the 2100PC either via the RS232 converter port or the RS422 port. Only one port can be used at any given time. The following tables identify all of the serial port connections for the 2100 Display.

Table D RS422 Serial Port Terminal Strip

Terminal#	Lead Designation
1	RS422 IN+
2	RS422 IN-
3	RS422 OUT+
4	RS422 OUT-
5	ISO-GND
6	SETUP

Table E RS232 Serial Port Female DB9 Connector

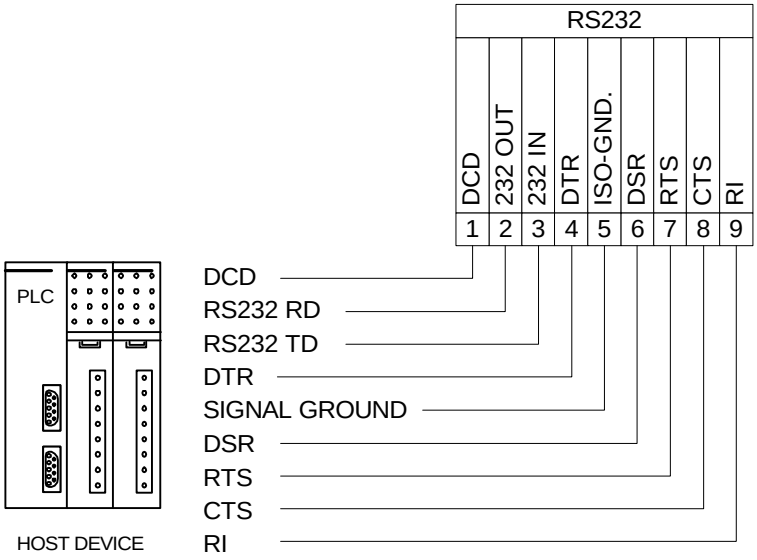
Terminal#	Lead Designation
1	(DCD) Data Carrier Detect
2	(TD) RS232 OUT
3	(RD) RS232 IN
4	(DTR) Data Terminal Ready
5	(GND) ISO-GND
6	(DSR) Data Set Ready
7	(RTS) Request To Send
8	(CTS) Clear To Send
9	(RI) Ring Indicator

Note: RTS and CTS are internally connected.
DSR, DTR, and DCD are internally connected.
RI is driven active.

Note: All ISO-GND terminals are internally connected.

The following diagrams show wiring examples for connecting the host to a single 2100 Display using RS232 or RS422 data types. For RS232 communications, the only connections absolutely necessary are the ones shown for pin 2 (232 OUT), pin 3 (232 IN), pin 5 (SIGNAL GROUND), and pin 7 (RTS). All other RS232 connections are only necessary for programs or equipment that require the use of handshaking signals.

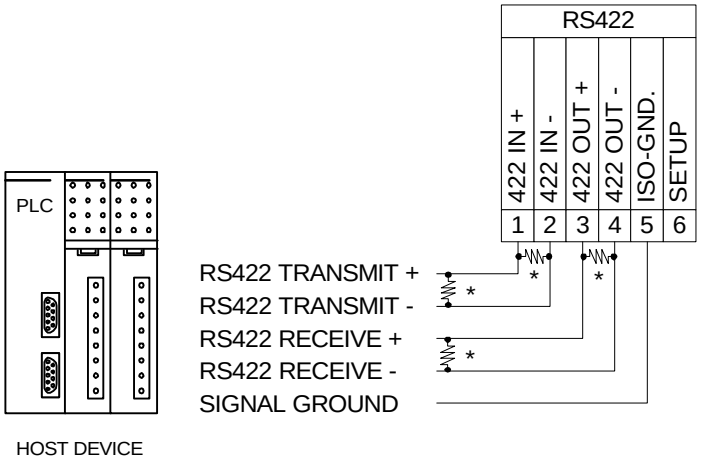
Figure 7
Single Unit - RS232 Diagram



Note: A standard straight through PC modem cable can be wired from the host to the 2100PC.

Note: The maximum recommended cable length for RS232 communications is 50 feet.

Figure 8
Single Unit - RS422 Diagram



* Terminator resistor (typically 120 ohm, 1/4 W). Refer to Section 6.2 Communicating to Multiple Units, Wiring an RS422 Network, for details.

Note: The maximum recommended cable length for RS422 communications is 4000 feet.

6.2 Communicating To Multiple Units

Understanding An RS422 Network

Units may be configured in a multidropnetwork where the host RS422 signal is connected directly to multiple 2100 display units. A maximum of 32 display units or 4000 feet of cable may be connected to a single host output in a multidrop configuration.

- RS422 Multidrop
  This configuration is used when the hostoutput is RS422. The RS422 output from the host is wired in parallel to all of the 2100 Display units in the network.

Wiring An RS422 Network

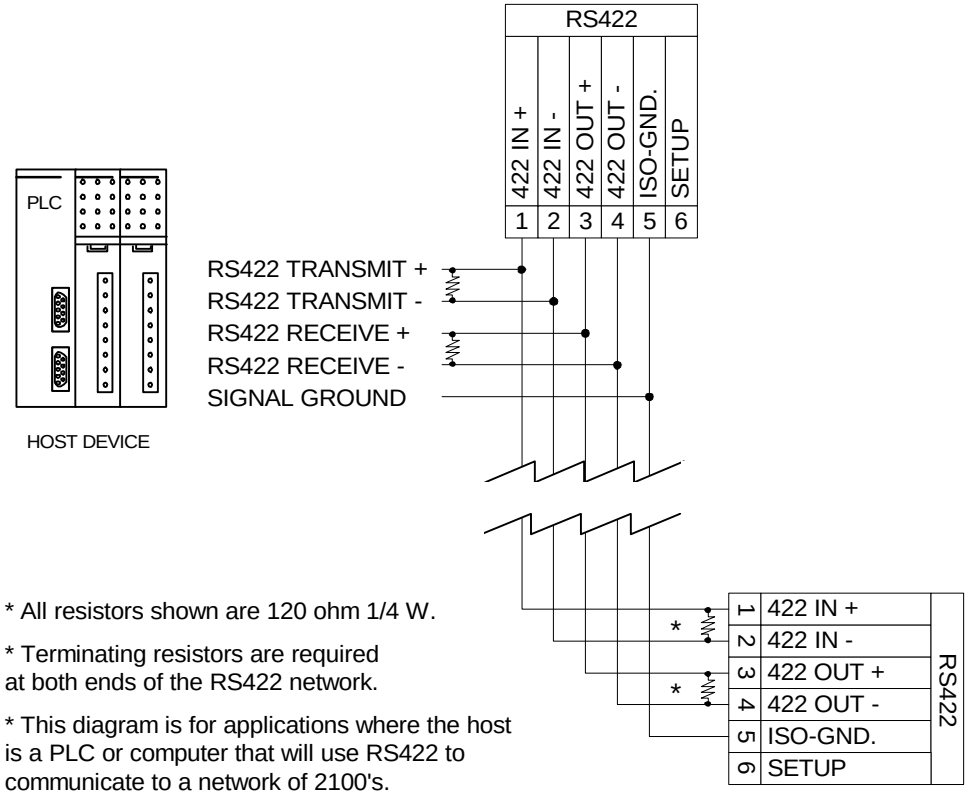
Terminating

The network wiring must be terminated correctly at both the beginning(the host in the drawing below) and at the last 2100 ending the network. In reality, the host can be connected anywhere on the network. The terminating resistors must still be installed atboth ends of the network. If the host is connected at the center of the network, terminating resistors would be required on the two end 2100's. In this case, no terminating resistors would be required at the host. The purpose of the terminating resistors is to prevent reflection problems. The resistance value of the terminating resistors should match the characteristic impedanceof the cable. A typical value for this is 120 ohm.

RS422 Multidrop

The diagram below shows the required 120 ohm resistors (assuming that the host isat one end of the network) and illustrates the proper wiring for an RS422 multidrop network. RS422 multidrop is the basic network configuration for 2100 display units.

Figure 9
RS422 Multidrop Wiring

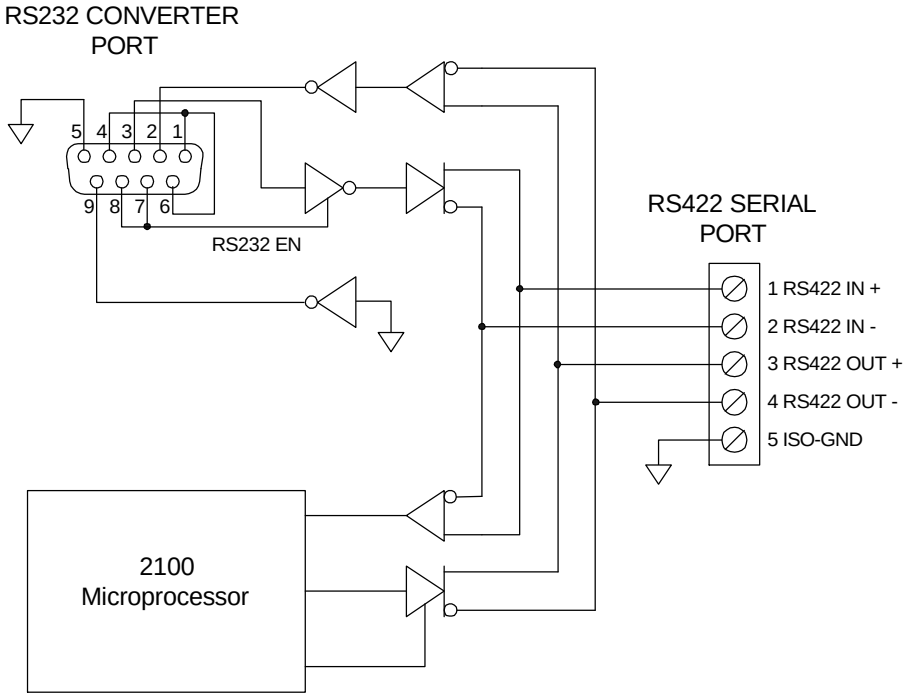


RS232 Converter

All 2100 Display units have a built-in dataconverter that can be used to convert the host RS232 data to RS422. This allows the host to communicate via RS232. The converter unit then retransmits the data out its RS422 port to all other units on the network.

- RS232 to RS422 Conversion
  This configuration is used when a host RS232 output is converted to RS422 by one of the 2100 units for use in a multiple display network The host is wired to a 2100 Display's RS232 converter port. Then, the RS422 output from that 2100 Display unit is wired in parallel to all of the other 2100 Display units in the network The RS422 portion of the wiring in the network is the same for all network configurations. The following diagram shows the internal RS232 to RS422 converter of a 2100 Display.

Figure 10
RS232 Converter



Note: Note that the maximum recommended cable length forRS232 communications is 50 feet. For best results, the shortest cable possible should be used.

Terminating

As discussed earlier, RS422 multidrop network wiring must be terminated correctly at both ends of the network. When the RS232 to RS422 converter is used, the host communicates to a 2100PC using RS232. No terminating resistors are required on the RS232 communication lines. However, terminating resistors are still required on the RS422 portion of the network. Again, the purpose of the terminating resistors is to prevent reflection problems. The resistance value of the terminating resistors should match the characteristic impedance of the cable. A typical value for this is 120 ohm.

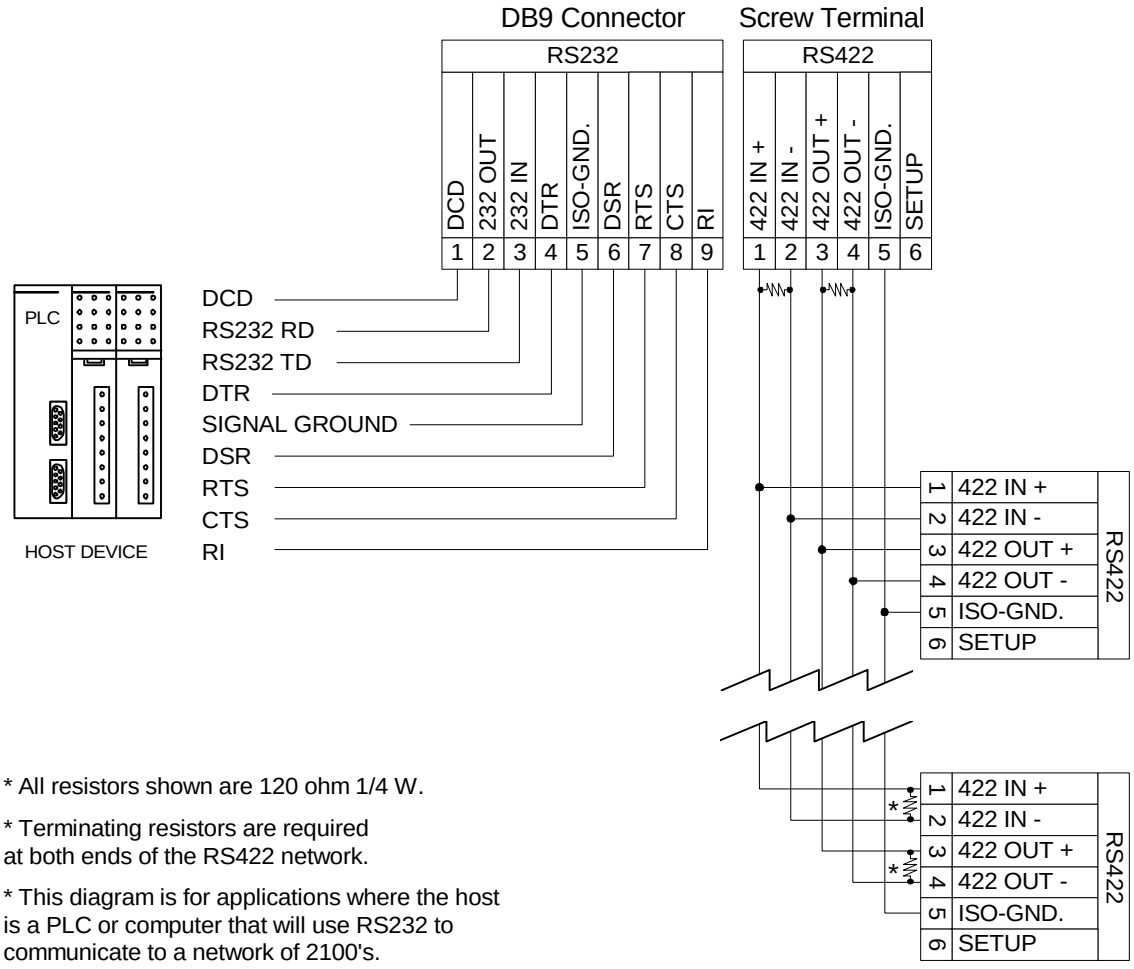
The diagram below shows the required 120 ohm resistors and illustrates the proper wiring for a network configuration where the host RS232 output is converted to RS422 (the first unit in the drawing below). Note that after the conversion, the subsequent units are wired in the standard RS422 multidrop configuration. As in the straight RS422 multidrop network, the host can use any 2100 on the network as a converter unit. The terminating resistors must still be installed at both ends of the RS422 network. If the host is connected to a unit at the center of the network, terminating resistors would still be required on the two end 2100's. In this case, no terminating resistors would be required at the converter unit. Remember, the RS422 portion of the wiring in the network is the same for all network configurations.

Just a reminder, for RS232 communications, the only connections absolutely necessary are the ones shown for pin 2 (232 OUT), pin 3 (232 IN), pin 5 (SIGNAL GROUND), and pin 7 (RTS). RTS is the enable line for the converter. All other RS232 connections are only necessary for programs or equipment that require the use of handshaking signals.

Note: RTS and CTS are internally connected.
DSR, DTR, and DCD are internally connected.
RI is driven active.

Note: All ISO-GND terminals are internally connected.

Figure 11RS232 Converter Wiring



Recommended Rs422 Cables

Since the impedance of the cable and terminator resistance need to match, a cable with a characteristic impedance of 120 ohms should be used. One recommended cable for interconnecting units is Belden® #89730 for plenum installations or #9730 for conduit installations (or equivalent). Both types have three twisted pairs of 24 AWG stranded tinned copper wire with each pair individually shielded. The characteristic impedance of the cable is 100 ohms. This type of cable provides good overall performance for a relatively low cost.

Two of the twisted pairs are used for data transmission, one pair is used for data coming from the host and one pair is used for data going to the host. In each of the two pairs, one wire is used for the non-inverting data line and the other wire is used for the inverting data line. Both wires on the third pair are used to connect ISO-GND from 2100 to 2100 and to the host. The shield wires are used to protect the data lines from noise and should be connected ***on only one end of each cable*** to earth ground.

Recommended RS232 Cable

A standard male-to-female DB9 straight through modem cable is all that is required to connect a Vorne 2100 style RS232 connector to an IBM/AT style RS232 connector. Again, note that the maximum recommended cable length for RS232 communications is 50 feet. For best results, the shortest cable possible should be used.

Addressing Multiple Units

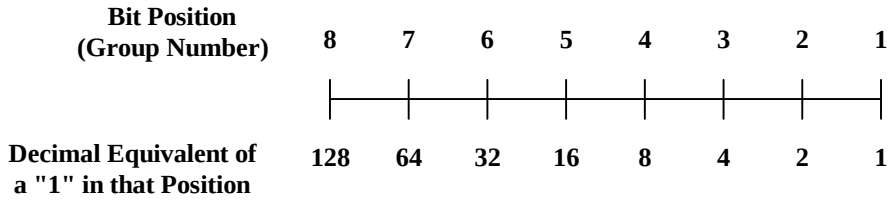
The RS422 network uses addressing to allow the host to communicate with specific individual displays or groups of displays in the network. Each unit in a network may be assigned a unit address and a group address. The unit address and group address are selected during setup. (Refer to Section 4.3 for details on setup.)

Unit Addressing

Unit addresses can have a value in the range of 000 to 255. If a serial transmission is directed to a specific unit address, only the 2100 units set to that address will display the message. More than one display may use the same unit address, but the best way to send a transmission to multiple units is to use group addressing.

Group Addressing

Group addresses can have a value from 0 to 8. The group address represents a bit position in an 8 bit binary number, as shown:



Referring to the above relationship, to communicate with only group 7 the host would transmit 64 as a group address. To communicate with only group 4, the host would transmit 8 as a group address. This arrangement allows the host to direct a message to any combination of groups. For example, to transmit to groups 6, 4 and 3, add together 32 + 8 + 4 and transmit 44 as the group address. Each display will interpret the transmitted group address and determine if it is being addressed. A transmitted group address of 0 is a broadcast to all units.

6.3 Simple Packet Protocol

Simple Packet Protocol is the serial communication format which is used to:

1. Call up *canned scripts* via a serial command.
2. Send a *serial buffer script* to a 2100 for execution.

Note: When a script is transmitted serially to a 2100, it is referred to as a *serial buffer script* because it is sent to the serial buffer for execution. A script sent to the serial buffer is processed just as if it were called up from memory. *Serial buffer scripts* allow the use of the full 2100SB command set. Refer to the 2100SB manual for complete information.

Serial Request For Canned Script

A *canned script* stored in a 2100PC's memory can be called up via the Simple Packet Protocol. The protocol allows for transmission of the intended individual or group address, the desired script number, and any real-time variables that may be required by the particular script. The format is as follows:

Format: **<SOH>***TypeAddress**;**Script**:**variables***<**TERM**>*

<SOH> The ASCII Start of Header character (decimal value 1) must begin every transmission.

Type This element specifies whether the script request is for an individual unit address or for a group address.

M For individual unit address.
m For group address.

Address This element specifies the actual unit or group address.

0 - 255 Valid unit address.
0 - 255 Valid group address.

; The ASCII Semicolon character (decimal value 59).

Script This element specifies the script number that is being requested.

0 - 1023 Valid script numbers.

: The ASCII Colon character (decimal value 58).

variables This element is a string of characters intended for use as variable data, as needed by the requested script. If no variable data is required by the script, the element may be omitted. If a variable data string is provided for a script that does not require variables, the string will simply be ignored.

Note: Scripts which will be called up serially and which will display variable data must utilize the serial variable format of the**Variable** command. Refer to the VDP3 on-line help for details.

<TERM> This element specifies the terminating character that marks the end of the packet. This character must match the Line Terminator selected in the setup menu. Refer to Section 4.3 for setup details. Valid Line Terminator choices are:

<CR> ASCII Carriage Return character (decimal value 13).
<LF> ASCII Line Feed character (decimal value 10).

Example Serial Script Request

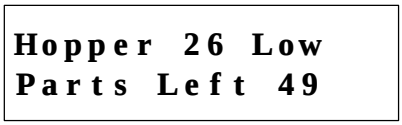
<SOH>m37;122:Low49<CR>

The example packet calls up canned script #122 on all displays with a group address of 6, 3, or 1. Refer to the discussion of group addressing in Section 6.2 for explanation. The variable string:

Low49

is available for use by script #122. Note that the serial variable string may contain any ASCII character except the selected Terminator (<CR> or <LF>) or the <SOH> character.

Suppose script #122 is programmed to display a two line message with serial variable data. On line one, the text "Hopper 26 " is displayed, followed by the first three characters of variable data. The text "Parts Left " followed by the forth and fifth characters of variable data appear on the second line. Then sending the example serial script request would result in the following display:



6.4 Terminal Emulation

VT102 Compatible

Enabling the setup function "*Terminal Mode - VT102 Compatible*" will cause the 2100 series display to operate in Terminal Emulation mode (refer to Section 4.3 for details on setup). When in Terminal Emulation mode, the 2100 series display emulates an ANSI / VT102 terminal. Refer to the ANSI terminal document for complete information. The following commands are supported:

BS	Backspace
CAN	Cancel
CR	Carriage Return
CUB	Cursor Backward
CUD	Cursor Down
CUF	Cursor Forward
CUP	Cursor Position
CUU	Cursor Up
DCH	Delete Character
DECLL	LED Control (Used for Relay Control)
DL	Delete Line
ED	Erase in Display
EL	Erase in Line
ESC	Introducer Control Character
FF	Form Feed
HT	Horizontal Tabulation
HVP	Horizontal and Vertical Positioning
ICH	Insert Character
IL	Insert Line
LF	Line Feed
MC	Media Copy
NUL	NUL
RCP	Restore Cursor Position
RM	Reset Mode
SCP	Store Cursor Position
SGR	Select Graphic Rendition
SM	Set Mode
VT	Vertical Tabulation

Note: All other commands will be ignored.

2100 Series Slave

Enabling the setup function '*Terminal Mode - 2100 Series Slave*" will cause the 2100 series display to operate in Slave mode (refer to Section 4.3 for details on setup). When in Slave mode, the 2100 series display mirrors the operation of a Vorne 2100PC display. In a multidrop network, when a canned message, using the HOST MODE option of the OUTPUT_DEVICE command, is called up on a 2100PC, the same tasks, commands, etc. will be executed on 2100 displays set to slave mode.

Note: When setting up a 2100PC for slave operation care must be taken in writing scripts. It is possible in complex scripting applications to "overrun" the slave display since there is a limited communication "bandwidth".

7 Parallel Port Operation

7.1 Run Time Operation

A device can call up scripts and send real-time variable data to the 2100PC over the parallel port. The parallel port is fully opto-isolated for increased reliability and noise immunity. The 18 bit parallel port is composed of 16 data bits and 2 control bits. The two control bits are Strobe & Variable Data Enable.

The 2100PC Display contains a Flash EPROM with a capacity of 128,000 characters. User scripts are programmed into this memory using VDP3. They are recalled and displayed during the run-time operation of the 2100PC Display. Individual scripts may be recalled by number from either the serial or parallel port. This section describes the operation of the 2100PC Display via the parallel port.

7.2 Data Port Operation

Script numbers and variables can be loaded in one of the following formats, selected during setup. 1024 script numbers (0 - 1023) are available for any selected data format. In all data formats, script numbers greater than 1,023 or negative numbers will yield unpredictable results. The data format is selected during setup. The default format is unsigned binary(BIN).

Unsigned Binary (BIN) - 16 bits with a range of values from 0 to 65,535 for variable data.

Signed Binary (SBIN) - 16 bits with a range of values from -32,768 to 32,767 for variable data. If bit 15 is set, then the number is negative. Negative numbers are two's complement format.

Binary Coded Decimal (BCD) - The 16 bit parallel port is interpreted as four packed BCD digits. The range of values for variable data is 0 to 9,999.

Signed BCD (SBCD) - The same as BCD except the most significant bit determines the sign. The range of values for variable data is -7,999 to 7,999. Refer to the truth table below.

BIT 15	14 13 12	11 10 9 8	7 6 5 4	3 2 1 0
1 = NEG 0 = POS	0 - 7	0 - 9	0 - 9	0 - 9

7.3 Control Line Operation

Strobe Control Bit

The Strobe control bit permits the PLC to inform the 2100PC that the data on the parallel port is valid and ready to be read. The type of data on the parallel port is determined by the variable data enable. Strobe or no strobe operation must be selected at setup. The default **Port Mode** is **No Strobe**. See Section 4.3 for details on 2100PC setup.

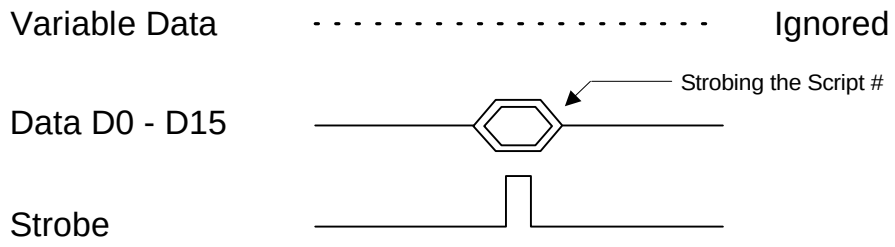
Calling Up Scripts - No Strobe Mode

When **No Strobe Mode** is selected, the strobe and variable data enable inputs are ignored. No variable data is allowed in this mode. To call a script, the script number must remain stable on the data port for the user selected debounce time. After the data lines have stabilized for at least the debounce time, the script number is read and the script is executed from memory.

Calling Up Scripts - Strobed Msg Mode

When **Strobed Msg Mode** is selected, the variable data enable input is ignored. No variable data is allowed in this mode. A transition on the strobe line signals the 2100PC to read the script number on the data port. If the debounce time is set to **Edge Trigger**, the data is accepted immediately. Otherwise, the data must remain stable on the data port for the user selected debounce time.

Figure 12
Strobe Operation Timing Diagram



Calling Up Scripts - Strobed Msg & VData Mode

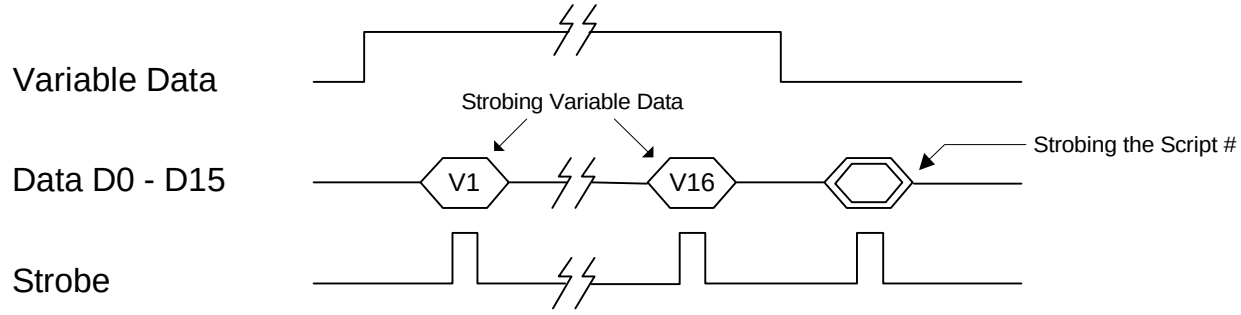
This mode is essentially the same as the **Strobed Msg Mode**. In this mode, the variable data enable is used to determine whether the data on the parallel port is a script number or variable.

Variable Data Enable Control Bit

The active state (normal or inverting) of the variable data enable is the same as that chosen for the data lines.

If the Variable Data Enable line is active, the data on the parallel port will be considered variable data. If the Variable Data Enable line is inactive, the data on the parallel port will be considered a script number. When calling up a script with variables, the variables must precede the associated script number.

Figure 13
Variable Data Enable Line



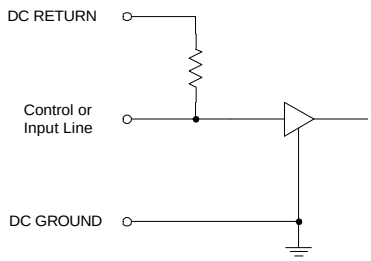
7.4 Selecting A PLC Output Card

The 2100PC parallel input port is designed to interface with a variety of PLC output cards. 2100PC Displays can be used with both sink and source output cards depending on how the DC Return line (Terminal 2) is wired. A widerange of output voltages can be used with the 2100PC (3.5 to 30 VDC).

2100PC Parallel Port Characteristics

Input voltage range	3.5 to 30 VDC (Sink or Source)
Input Loading max.	4.5 mA @ 30V
Leakage Accepted	Up to 2mA

The 2100PC Input

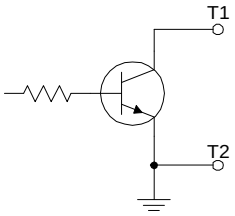


Choosing An Input Logic Type

The 2100PC requires a setup selection of Normal or Inverting logic type. To assist in correctly making a choice, refer to Section 4.3.

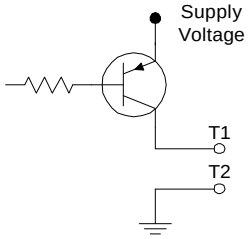
Connecting to Common PLC Output Types

Sinking Output



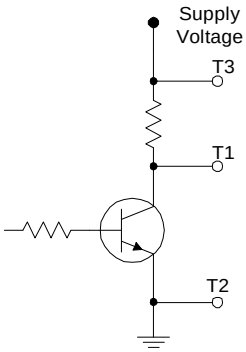
Connnecting to a 2100PC
1. Connect DC Return to a 5-24 VDC supply @ 50mA.
2. Connect T2 to DC GROUND.
3. Connect T1 to an input line.
4. Connect DC GROUND to -V of the 5-24 VDC supply.

Sourcing Output

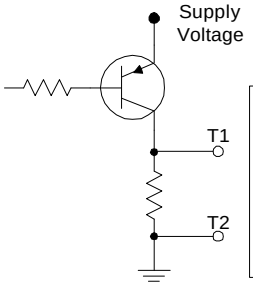


Connnecting to a 2100PC
1. Connect DC GROUND to DC RETURN.
2. Connect T2 to DC GROUND.
3. Connect T1 to an input line.

Sinking Output With Pullup

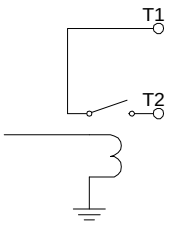


Connnecting to a 2100PC
1. Connect T3 to DC RETURN.
2. Connect T2 to DC GROUND.
3. Connect T1 to an input line.



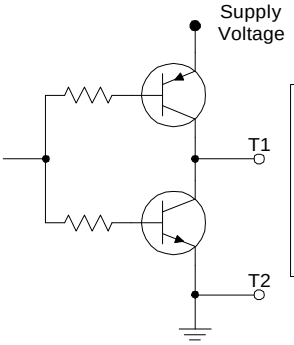
Connnecting to a 2100PC
1. Connect DC GROUND to DC RETURN.
2. Connect T2 to DC GROUND.
3. Connect T1 to an input line.

Dry Contact



Connnecting to a 2100PC
1. Connect DC Return to a 5-24 VDC supply @ 50mA.
2. Connect T2 to DC GROUND.
3. Connect T1 to an input line.
4. Connect DC GROUND to -V of the 5-24 VDC supply.

Active Output (Totem Pole)



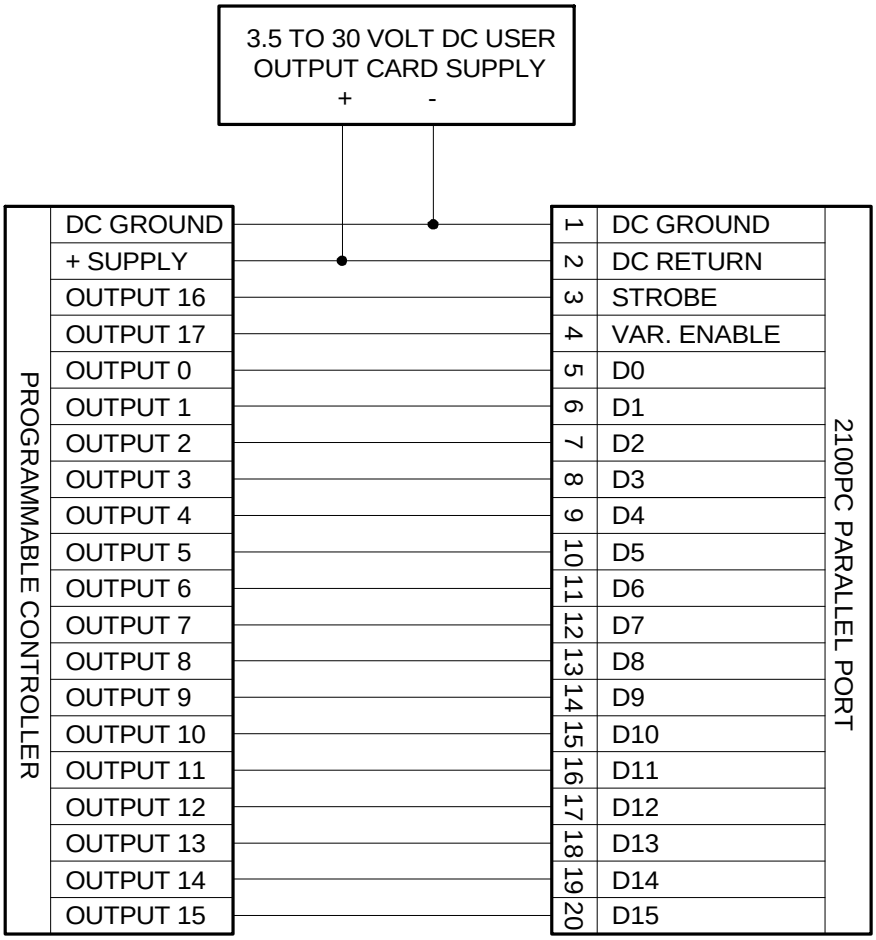
Connnecting to a 2100PC
1. DC RETURN is not connected.
2. Connect T2 to DC GROUND.
3. Connect T1 to an input line.

7.5 Wiring To The Parallel Port

Sinking Outputs

To operate the unit with sinking outputs, the DC Return line of the parallel port should be connected to a positive voltage (3.5 to 30 VDC). This will internally pullup all the inputs of the parallel port to this potential with a maximum current draw of 2.5 mA per input. Refer to the wiring diagram for sinking outputs, Figure 14.

Figure 14
Parallel Port Wiring - Sinking Outputs

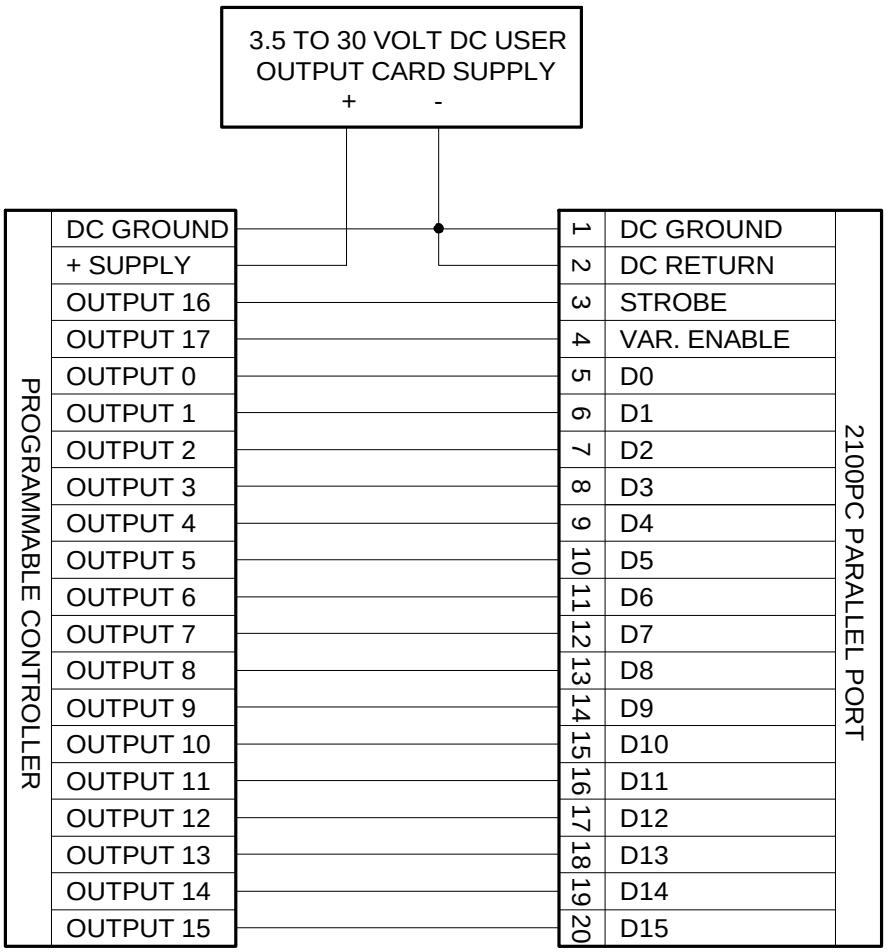


In all cases, make sure that DC ground (Terminal 1) is wired to the DC ground of the output card supply.

Sourcing Outputs

To operate the unit with sourcing outputs, the DC Return line on the parallel port should be connected to DC ground. This will internally pull down all the inputs of the parallel port to DC ground with a maximum current draw of 2.5 mA per input. Refer to the wiring diagram for sourcing outputs, Figure 15.

Figure 15
Parallel Port Wiring - Sourcing Outputs



In all cases, make sure that DC ground (Terminal 1) is wired to the DC ground of the output card supply.

Appendix A - Glossary

Address	A unique identification number assigned to a 2100 Display.
Alternate Escape	An alternative command identifier. This can be the first character in a command string sent to the 2100 Display, if it was selected during setup. It should be noted that <ESC> is always recognized as the command identifier. Selecting an Alternate Escape allows the user to use an alternate character to identify a command, but <ESC> is still recognized as well.
ANSI	American National Standards Institute.
ASCII	American Standard Code for Information Interchange.
Backspace	Backspace control character (decimal value 8), used in scripts or in Terminal Emulation mode to move the cursor left one position.
Baud Rate	The data transfer rate between the host unit and the units in the serial network.
BCD	Binary Coded Decimal data.
BIN	Binary Data.
<BS>	Represents the Backspace control character. See Backspace.
Carriage Return	Carriage Return control character (decimal value 13), used in canned scripts or in Terminal Emulation mode to move the cursor to the beginning of the current line. Carriage Return is one of the two choices for the terminator of the Simple Packet Protocol and should not be used in serial buffer scripts.
Conduit	A tube or trough in which insulated wires and cables are passed.

Control Character	Any one of several ASCII control characters, typically not displayed, which has a special meaning to the 2100 unit. Various control characters can be used in message scripts or Terminal Emulation mode to move the cursor, clear the display, terminate an effect, identify a command string, and begin or end the Simple Packet Protocol format.
<CR>	Represents the Carriage Return control character. See Carriage Return.
Debounce	Setup setting which allows the user to set the amount of time data must be present on the parallel port before it is valid; often used to eliminate false data caused by contact bounce.
E^2PROM or EEPROM	Electrically Erasable Programmable Read Only Memory. The memory in the 2100 Display that is used to store setup information.
End of Transmission	End of Transmission control character (decimal value 4), used in message scripts to terminate the **Scroll** command (mark the end of a string of characters that are to be scrolled.)
<EOT>	Represents the End of Transmission control character. See End of Transmission.
<ESC>	Represents the Escape control character. See Escape.
Escape	The Escape control character (decimal value 27), used as the first character in all command strings, unless an Alternate Escape character is selected in setup. In that case, the 2100 unit will recognize either the Escape or the chosen Alternate Escape character as the command identifier.
<FF>	Represents the Form Feed control character. See Form Feed.
Flash EPROM	Memory in the 2100PC used to store canned scripts.
Form Feed	Form Feed control character (decimal value 12), used in message scripts to clear the display and move the cursor to the beginning of the first line.
Host	Any device that initiates serial communication with a 2100 Series Display Unit.
Horizontal Tab	Horizontal Tab control character (decimal value 9), used in message scripts or in Terminal Emulation mode to move the cursor to the next tab stop.

<HT>	Represents the Horizontal Tab control character. See Horizontal Tab.
<LF>	Represents the Line Feed control character. See Line feed.
Line Feed	Line Feed control character (decimal value 10), used in message scripts or in Terminal Emulationmode to move the cursor down one line in the same column. Line Feed is one of the two choices for the terminator of the Simple Packet Protocol and should not be used in serial buffer scripts.
Multidrop	A serial network configuration where the communications from the host are transmitted to more than one 2100 Display without being repeated. The 2100 Displays are wired in parallel.
Multitasking	The ability of the 2100 display unit to separately perform up to four different functions at the same time.
PLC	Programmable Logic Controller.
Pull-down	A technique used in electronics to reference a connection to a DC ground potential.
Pull-up	A technique used in electronics to reference a connection to a positive DC potential.
RAM	Random Access Memory. Memory used during run time to store data.
SBCD	Signed Binary Coded Decimal data.
SBIN	Signed Binary data.
Script	A sequentially ordered string of commands, literal text, and control characters which instructs a 2100 unit to perform a function.
Setup	An electrical mechanism to prevent accidental change of setup data in the 2100 Display. Setup data may be viewed or changed when the SETUP terminal is connected to ISO-GND. Setup data may not be changed when the SETUP terminal is not connected to ISO-GND.
Simple Packet Protocol	The standard serial communication format which is used to send a Serial Buffer Script to a 2100PC unit.
Sinking	The parallel port input type where the input must be brought to DC ground by the PLC output.

<SOH>	Represents the Start of Header control character. See Start of Header.
Sourcing	The parallel port input type where the input must be brought to a positive DC potential by the PLC output.
SPDT	Single Pole Double Throw.
Start of Header	Start of Header control character (decimal value 1), is used as the first character of the Simple Packet Protocol format of serial communication.
Strobe	A control line on the parallel port that is used to signal the 2100 Display that valid data is present on the parallel port.
Task	A task is a function performed by the 2100 display. Up to four tasks can be performed at the same time. A function can include but is not limited to scrolling text, controlling the relay, displaying text, internal timing, etc.
Variable Data Enable	This is a control line on the parallel port that is used to signal the 2100PC (in the strobed msg and strobed msg & vdata modes) that the data present on the parallel port is a variable.
Vertical Tab	Vertical Tab control character (decimal value 11), used in message scripts or in Terminal Emulation mode to move the cursor to the beginning of the next line.
VFD	Vacuum Fluorescent Display. The 2100 Display uses VFD technology to create visible characters.
Vorne Display-Pro 3	Microsoft Windows based software used to create message files for the 2100 displays.
<VT>	Represents the Vertical Tab control character. See Vertical Tab.

Appendix B - Specifications

Communication Interface

- RS232 Serial Port - DB9 Connector
- RS422 Serial Port - Screw Terminal
- 18-bit Parallel Port - Screw Terminal
  - 16 Data Lines
  - 2 Control Lines

Vacuum Fluorescent Display

- Wavelength - Peak at 505 nanometers
- Rated Life - 50,000 hours (when average dot brightness reaches ½ of original brightness)
- Character Height
  Model 2140 - 11 mm
  Model 2180 - 9 mm

Physical and Electrical

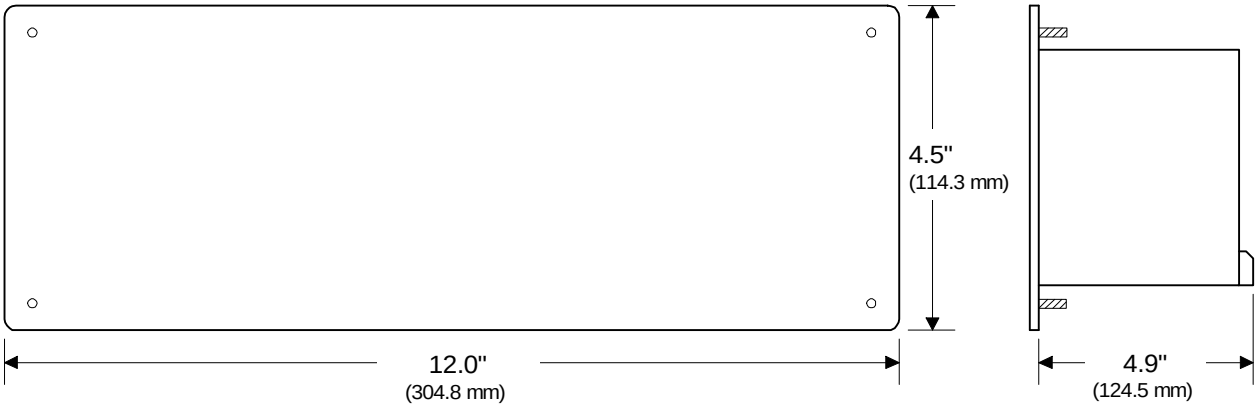
Power Supply Options	120 VAC ±15% (50 - 60 Hz), 0.16A, 20 Watts 24 VDC ±10%, 0.8A, 20 Watts
Operating Temperature Range	0° - 50° C
Storage Temperature Range	-20° to +70° C
Relative Humidity	0 - 95% Relative Humidity, Non-condensing
Weight	Approx. 6.5 lbs.

Annunciator Relay

Type	Single Pole Double Throw
Rating	120 VAC @1A

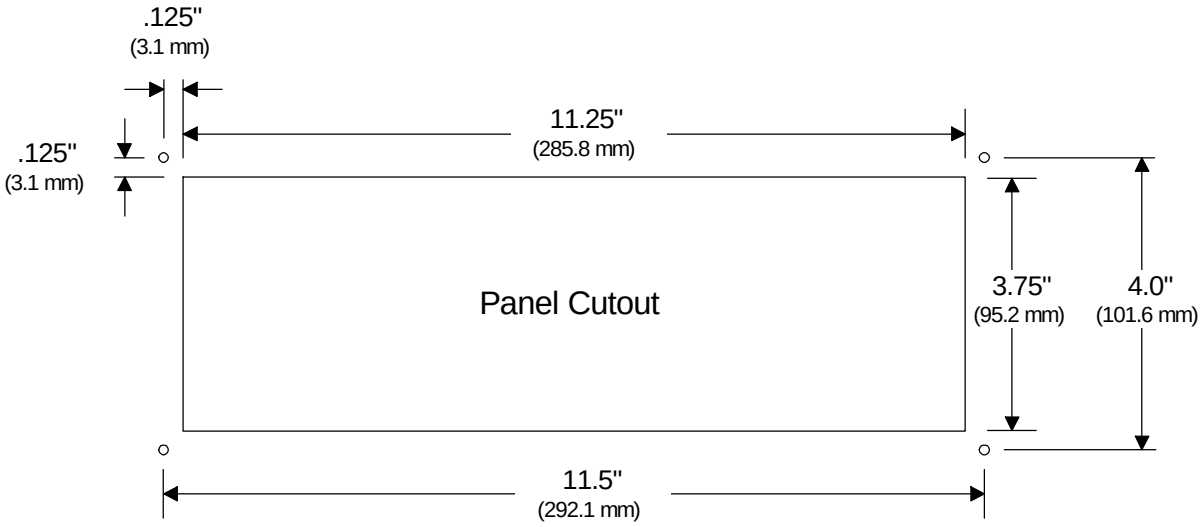
Dimensions

Front Panel and Depth



Mounting Information

The 2100 Display mounts in the user's panel through a rectangular cutout and is secured with four 10/32 hex nuts to threaded studs located at the corners of the bezel.



Mounting holes require clearance for 10-32 threaded standoffs, 7/32nds (5.6mm) diameter.

Appendix C - Character Sets

The full IBM®, J1S8 (Katakana), Slavic (Latin II) and Cyrillic character sets are available on the 2100 Display. All fonts share the first 128 characters (00h to 7Fh).

Common Character Set

Font 1 IBM® Character Set

128 80h		144 90h		160 A0h		176 B0h		192 C0h		208 D0h		224 E0h		240 F0h	
129 81h		145 91h		161 A1h		177 B1h		193 C1h		209 D1h		225 E1h		241 F1h	
130 82h		146 92h		162 A2h		178 B2h		194 C2h		210 D2h		226 E2h		242 F2h	
131 83h		147 93h		163 A3h		179 B3h		195 C3h		211 D3h		227 E3h		243 F3h	
132 84h		148 94h		164 A4h		180 B4h		196 C4h		212 D4h		228 E4h		244 F4h	
133 85h		149 95h		165 A5h		181 B5h		197 C5h		213 D5h		229 E5h		245 F5h	
134 86h		150 96h		166 A6h		182 B6h		198 C6h		214 D6h		230 E6h		246 F6h	
135 87h		151 97h		167 A7h		183 B7h		199 C7h		215 D7h		231 E7h		247 F7h	
136 88h		152 98h		168 A8h		184 B8h		200 C8h		216 D8h		232 E8h		248 F8h	
137 89h		153 99h		169 A9h		185 B9h		201 C9h		217 D9h		233 E9h		249 F9h	
138 8Ah		154 9Ah		170 AAh		186 BAh		202 CAh		218 DAh		234 EAh		250 FAh	
139 8Bh		155 9Bh		171 ABh		187 BBh		203 CBh		219 DBh		235 EBh		251 FBh	
140 8Ch		156 9Ch		172 ACh		188 BCh		204 CCh		220 DCh		236 ECh		252 FCh	
141 8Dh		157 9Dh		173 ADh		189 BDh		205 CDh		221 DDh		237 EDh		253 FDh	
142 8Eh		158 9Eh		174 AEh		190 BEh		206 CEh		222 DEh		238 EEh		254 FEh	
143 8Fh		159 9Fh		175 AFh		191 BFh		207 CFh		223 DFh		239 EFh		255 FFh	

Font 2 JIS8 (Katakana) Character Set

128 80h		144 90h		160 A0h		176 B0h		192 C0h		208 D0h		224 E0h		240 F0h	
129 81h		145 91h		161 A1h		177 B1h		193 C1h		209 D1h		225 E1h		241 F1h	
130 82h		146 92h		162 A2h		178 B2h		194 C2h		210 D2h		226 E2h		242 F2h	
131 83h		147 93h		163 A3h		179 B3h		195 C3h		211 D3h		227 E3h		243 F3h	
132 84h		148 94h		164 A4h		180 B4h		196 C4h		212 D4h		228 E4h		244 F4h	
133 85h		149 95h		165 A5h		181 B5h		197 C5h		213 D5h		229 E5h		245 F5h	
134 86h		150 96h		166 A6h		182 B6h		198 C6h		214 D6h		230 E6h		246 F6h	
135 87h		151 97h		167 A7h		183 B7h		199 C7h		215 D7h		231 E7h		247 F7h	
136 88h		152 98h		168 A8h		184 B8h		200 C8h		216 D8h		232 E8h		248 F8h	
137 89h		153 99h		169 A9h		185 B9h		201 C9h		217 D9h		233 E9h		249 F9h	
138 8Ah		154 9Ah		170 AAh		186 BAh		202 CAh		218 DAh		234 EAh		250 FAh	
139 8Bh		155 9Bh		171 ABh		187 BBh		203 CBh		219 DBh		235 EBh		251 FBh	
140 8Ch		156 9Ch		172 ACh		188 BCh		204 CCh		220 DCh		236 ECh		252 FCh	
141 8Dh		157 9Dh		173 ADh		189 BDh		205 CDh		221 DDh		237 EDh		253 FDh	
142 8Eh		158 9Eh		174 AEh		190 BEh		206 CEh		222 DEh		238 EEh		254 FEh	
143 8Fh		159 9Fh		175 AFh		191 BFh		207 CFh		223 DFh		239 EFh		255 FFh	

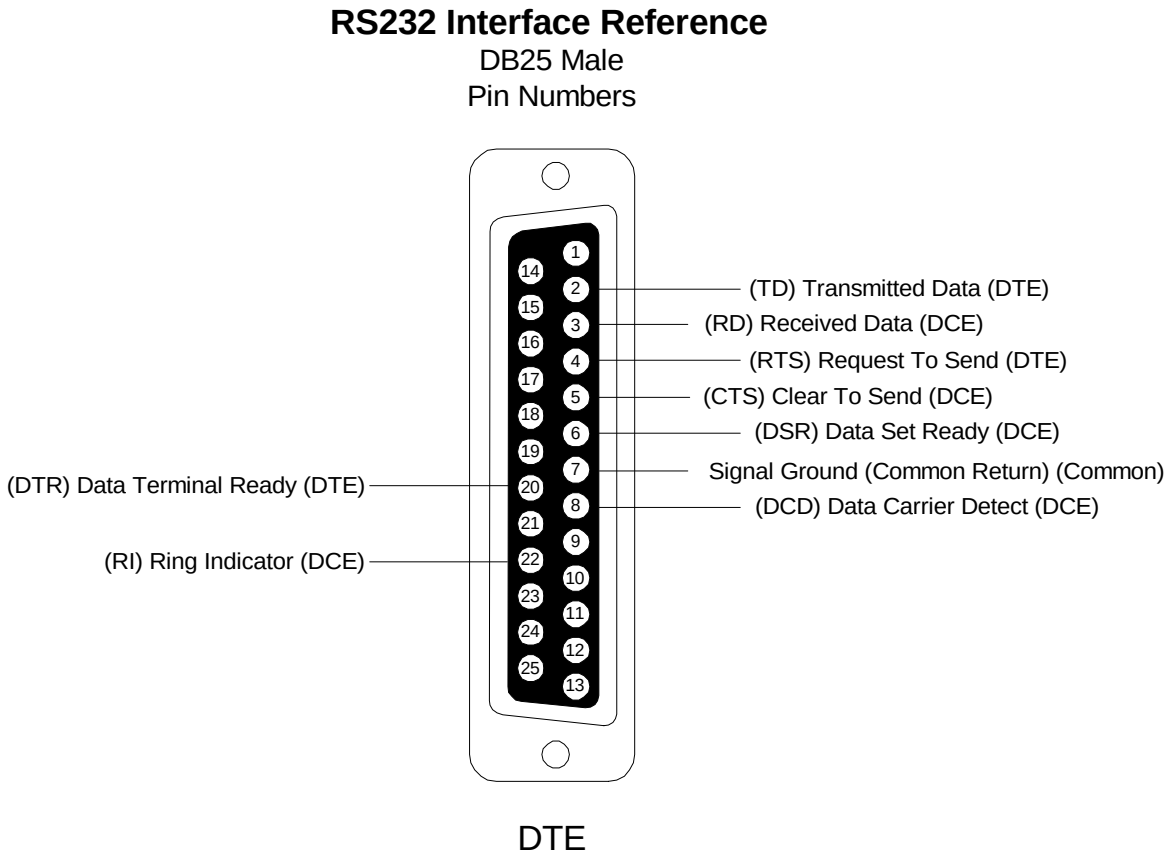
Font 3 Slavic (Latin II) Character Set

128 80h		144 90h		160 A0h		176 B0h		192 C0h		208 D0h		224 E0h		240 F0h	
129 81h		145 91h		161 A1h		177 B1h		193 C1h		209 D1h		225 E1h		241 F1h	
130 82h		146 92h		162 A2h		178 B2h		194 C2h		210 D2h		226 E2h		242 F2h	
131 83h		147 93h		163 A3h		179 B3h		195 C3h		211 D3h		227 E3h		243 F3h	
132 84h		148 94h		164 A4h		180 B4h		196 C4h		212 D4h		228 E4h		244 F4h	
133 85h		149 95h		165 A5h		181 B5h		197 C5h		213 D5h		229 E5h		245 F5h	
134 86h		150 96h		166 A6h		182 B6h		198 C6h		214 D6h		230 E6h		246 F6h	
135 87h		151 97h		167 A7h		183 B7h		199 C7h		215 D7h		231 E7h		247 F7h	
136 88h		152 98h		168 A8h		184 B8h		200 C8h		216 D8h		232 E8h		248 F8h	
137 89h		153 99h		169 A9h		185 B9h		201 C9h		217 D9h		233 E9h		249 F9h	
138 8Ah		154 9Ah		170 AAh		186 BAh		202 CAh		218 DAh		234 EAh		250 FAh	
139 8Bh		155 9Bh		171 ABh		187 BBh		203 CBh		219 DBh		235 EBh		251 FBh	
140 8Ch		156 9Ch		172 ACh		188 BCh		204 CCh		220 DCh		236 ECh		252 FCh	
141 8Dh		157 9Dh		173 ADh		189 BDh		205 CDh		221 DDh		237 EDh		253 FDh	
142 8Eh		158 9Eh		174 AEh		190 BEh		206 CEh		222 DEh		238 EEh		254 FEh	
143 8Fh		159 9Fh		175 AFh		191 BFh		207 CFh		223 DFh		239 EFh		255 FFh	

Font 4 Cyrillic Character Set

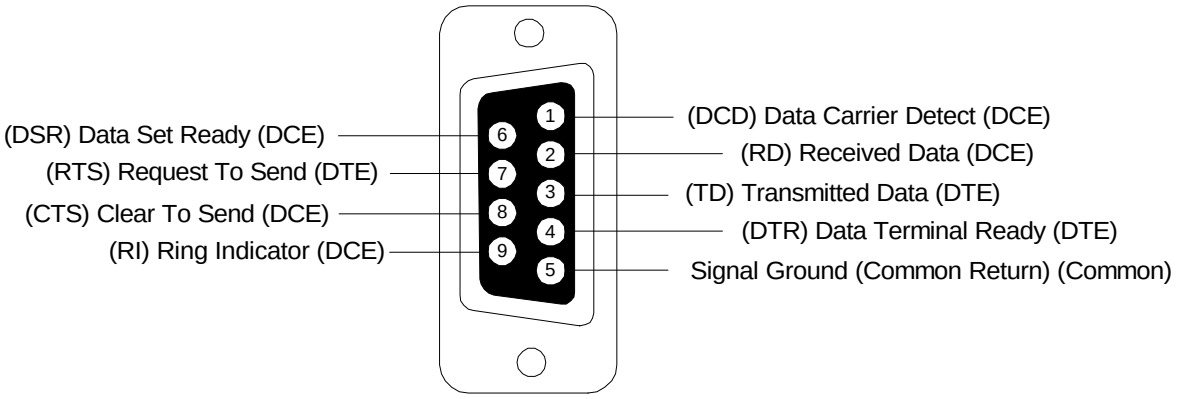
128 80h	144 90h	160 A0h	176 B0h	192 C0h	208 D0h	224 E0h	240 F0h
129 81h	145 91h	161 A1h	177 B1h	193 C1h	209 D1h	225 E1h	241 F1h
130 82h	146 92h	162 A2h	178 B2h	194 C2h	210 D2h	226 E2h	242 F2h
131 83h	147 93h	163 A3h	179 B3h	195 C3h	211 D3h	227 E3h	243 F3h
132 84h	148 94h	164 A4h	180 B4h	196 C4h	212 D4h	228 E4h	244 F4h
133 85h	149 95h	165 A5h	181 B5h	197 C5h	213 D5h	229 E5h	245 F5h
134 86h	150 96h	166 A6h	182 B6h	198 C6h	214 D6h	230 E6h	246 F6h
135 87h	151 97h	167 A7h	183 B7h	199 C7h	215 D7h	231 E7h	247 F7h
136 88h	152 98h	168 A8h	184 B8h	200 C8h	216 D8h	232 E8h	248 F8h
137 89h	153 99h	169 A9h	185 B9h	201 C9h	217 D9h	233 E9h	249 F9h
138 8Ah	154 9Ah	170 AAh	186 BAh	202 CAh	218 DAh	234 EAh	250 FAh
139 8Bh	155 9Bh	171 ABh	187 BBh	203 CBh	219 DBh	235 EBh	251 FBh
140 8Ch	156 9Ch	172 ACh	188 BCh	204 CCh	220 DCh	236 ECh	252 FCh
141 8Dh	157 9Dh	173 ADh	189 BDh	205 CDh	221 DDh	237 EDh	253 FDh
142 8Eh	158 9Eh	174 AEh	190 BEh	206 CEh	222 DEh	238 EEh	254 FEh
143 8Fh	159 9Fh	175 AFh	191 BFh	207 CFh	223 DFh	239 EFh	255 FFh

Appendix D - Typical RS232 Pinouts



IBM/AT® Style RS232 Interface

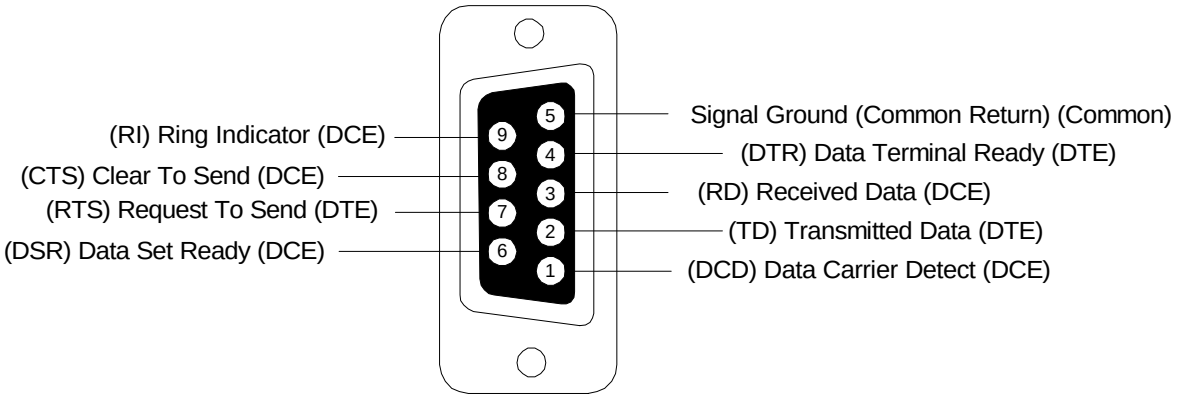
DB9 Male
Pin Numbers



DTE

Vorne 2100 Style RS232 Interface

DB9 Female
Pin Numbers



DCE

Note: A standard straight through PC modem cable is all that is required to connect a Vorne 2100 style connector to an IBM/AT® style connector.

Index

S

T

U

V

W

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