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Hardware Manual
9800

Operator Interface Terminal

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HM9800 Revision 10

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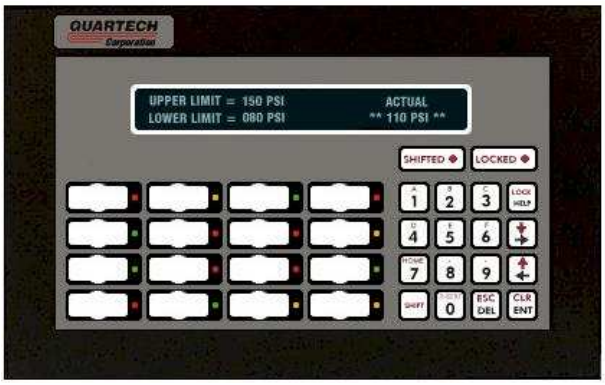
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Section 1: Introduction

The Model 9800 combines the functionality of message display, numeric entry device, and pushbutton station into a powerful Operator Interface Terminal. The unit features an eighty character vacuum fluorescent display and triple color light emitting diodes plus slide in legend tags for the sixteen user keys.

The 9800 is fully programmable using ScreenMaker 9000 Windows™ based off-line software or by using the built in editor. The system engineer can customize each screen to fit the current application. Text and data can be combined in order to eliminate the need for the operator to know the origin of the data being displayed.

The text can be combined with variable fields coming from any data location internal to the PLC. In addition, the values can be displayed in various formats. Variables can also be defined as read only and when writing is allowed, individual limits can be assigned allowing for system protection.



The 16 user keys can be configured to operate as momentary pushbutton switches or as push-on/push-off selector switches. The tri-color LEDs located next to each user key may be configured to follow the switch state or independently controlled by the PLC application program..

The 9800 is supplied with 128K bytes of EEPROM nonvolatile memory, therefore, the threat of losing the customized screens (up to 719) due to a power loss, dead battery, etc., is nonexistent.

What are Screens & Fields?

The 9800 is customize for a particular application by creating screens. A screen is similar to a canned message and may include variable information from the PLC. A group of text or a variable is referred to as a field. Each field has an assigned size and position within a screen. There are ten field types and up to ten fields may be included in a single screen. A brief explanation of the ten field types is given below.

Static Text	This field allows fixed character strings to be displayed within a screen. The field size and position are user defined.
Scrolling Text Horizontal	This field allows character strings to scroll right to left within a defined window. The window size and position are user defined.
Scrolling Text Vertical	This field is also referred to as a ***Paging Field*** and allows character strings to scroll bottom to top within a defined window. The window size and position are user defined.
Date	This field allows the current date to be displayed as: Month/Day/Year Note: only the last two digits of the year are used, however; no calculations are ever performed using this value. Year 2000 will have no surprise effects..
Time	This field allows the current time to be displayed as: Hours/Minutes/Seconds
Window	This field appears as fixed text within a screen and provides the mechanism for linking screens. When this field is created another screen number is specified. Moving the cursor to this field and pressing the **[ENT]** key will trigger the specified screen. This field is useful for creating menus, help screens, or multiple choice screens within an application

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Data Set This field appears as fixed text within a screen. When this field is created an address and a data value are specified in addition to the field text. Moving the cursor to this field and pressing the **[ENT]** key will cause the data value to be written to the assigned address within the PLC.

Bit Status When creating this field a data bit and PLC address are specified. Two character strings are also typed in, one for the off state of the bit and one for the on state of the bit. One of the two character strings will then be displayed depending on the status of the specified data bit. If enabled this field will also function as a bit modify. Moving the cursor to the field and pressing the **[ENT]** key will cause the bit to be complimented by the 9800.

PLC Data This field will display variable information from within the PLC. The address from which data will be retrieved is specified when the *PLC Data* field is created. The data can be displayed in Hex, Octal, Binary, Decimal, or floating point formats. Modification to the value may be enabled or disabled. Individual data value limits are also set for each PLC *Data field* created. If enabled, values are entered by first moving the cursor to this field then pressing the **[ENT]** key; a new value is then keyed in and the **[ENT]** key pressed.

Bar Chart This field is displayed as a conventional bar chart expanding from left to right relative to the value of an assigned address within the PLC. During field creation the address is specified, a scale value that is applied to the raw data prior to display, and the character that will be use in the bar.

Resident Screen Editor

A six pin circular mini-DIN connector is located at the bottom of the 9800. A standard IBM compatible AT keyboard can be connected directly into this connector. This keyboard is then used to configure the 9800 and program screens. This is possible because the 9800 includes a resident text editor. This editor is menu driven, i.e., the programmer is prompted through various screens to select or enter parameters.

The various menus that make up the resident editor are actually screens that are very much like the user screens that will be created. The resident editor screens utilize five field types, which are: *Word Fields, Entry Fields, Menu Fields, Task Fields,* and *Choice Fields*. These fields allow the user to enter screen text and make various parameter assignments.

The fields that make up the editor screens can be separated into two categories, information fields and action fields. A *Word Field* is an information field. It is made of characters that will never move, flash, or change. If an editor screen includes an action field it will flash when the cursor is on it to indicate some action is possible. This action includes the entering of data, multiple choice selection, selection of another menu, or initiation of a task such as printing or deleting. If more than one action field is present the arrow keys are used to move between them.

The following is a description of the action fields used in the resident editor:

Entry Field To initiate action within this field the **[Enter]** key is pressed. If the field allows data entry a block cursor "ΰ' will appear in the left most entry position. The original data will remain but will stop flashing. This is typeover entry mode. Data can be keyed in then, the **[Enter]** key pressed to complete the operation.

If **[Shift] [Enter]** is used to select the field the block cursor will appear, however, the original data will disappear. This is new entry mode. As before, data can be keyed in then the **[Enter]** key pressed to complete the operation.

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Section 1: Introduction

Menu Field To initiate action in this field the **[Enter]** key is pressed which will produce a new screen.

Task Field To initiate action in this field the **[Enter]** key is pressed which will cause a predefined task to be performed. These tasks include printing, deleting, and saving data. In some cases a word such as "**BUSY**", "**SAVING**", "**DELETING**", or "**ONLINE**" will appear at the top right position on the display indicating the task is being performed.

Choice Field The **[Enter]** key is used to scroll through the available choices. Screens that utilize this type of field often include a *Task Field* labeled "**Save setup**". Before leaving these screens the "**Save setup**" task must be executed to save any changes that were made.

It is important to understand what these fields are and how data is modified in each one since it will be assumed this is known information throughout the rest of this manual. As a general rule the **[Enter]** key allows access into and out of a field. The **[Esc]** key will back out of or discontinue an operation.

Initial Power Up

When the 9800 is first powered, an initialization process is started that performs diagnostic tests on both the hardware and software. An initialization screen will appear in the display window to indicate the target PLC, the input power type, software version number, and memory configuration.

The screen will look like this:

VV = AC or DC, WW = PLC Type
Z = PLC Model, XX = Software Version

```
Operator Interface for AB PLC-5
9800-VV-WW-3-Z  V3.XX      SN. 123456
```

The serial number is unique for each individual 9800.

After the initialization process is complete, screen number zero will be displayed if it has been programmed. Screen number zero is a user identification screen and may be used to show a job number or company name. It cannot be displayed during normal operation of the unit.

After screen zero has been displayed, or in the absence of screen zero, this screen will appear:

```
Edit screen    Setup System     Run Mode
Utilities
```

This is the primary selection screen or root directory. A brief description of the four sub-directories is given below. A separate section is assigned to each of these sub-directories within this manual.

Edit screen This allows individual screens to be created, modified, deleted, and printed.

Setup System This allows several operating parameters to be configured which include COM1 serial communication setup, date/time setting, security, PLC communication port setup, function key and tri-color LED configuration.

Run Mode This will direct the 9800 to attempt a communication link up with the programmable controller. If successful the 9800 will leave the editing mode and begin normal run operation.

Utilities This allows a group of screens to be printed or deleted. Also all parameters for such things as communication port configuration and function key configuration may be printed. Uploading and downloading of files created using ScreenMaker 9000 configuration software is initiated from the utilities screen.

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Section 2: Edit Mode

Selecting the Edit Screen field from the root directory will cause the following screen to be displayed:

```
Edit screen number:000
Edit  Print  Delete
```

This screen will be used more often than any other. It allows a new screen to be created or an existing screen to be modified. This screen also allows a single screen to be printed or deleted. When multiple screens are to be printed or deleted the Utilities feature from the root directory is used.

The Edit screen number will be flashing to indicate the current cursor position. Prior to selecting any of the three functions on the second line a screen number must be entered. The legal address range is zero through 719. If the number that is flashing is the screen of choice it will not be necessary to re-enter it.

The first time the edit screen function is selected the screen number appearing will be "**000**". For example purpose assume screen number 15 is to be created. The first step is to enter the number fifteen as the "**Edit screen number:**" parameter. Press [1] [5] [Enter]. Next move the cursor to "**Edit**" by pressing the **[!]** key. The word "**Edit**" will begin to flash indicating the cursor is at that position. Select the "**Edit**" function by pressing the **[Enter]** key. The word "**BUSY**" will appear at the top right of the display for a moment, then assuming this screen has not been previously created the following screen will display:

```
Edit screen number:015
Screen does not exist!   Create? No Yes
```

The word "**No**" will be flashing. To select "**Yes**" press the **[!]** key followed by the **[Enter]** key. The screen will blank except for a block cursor "Ú' at the top left position of the display. This is the cursor home position. Pressing the **[Home]** key will always return the cursor to this position. Pressing the **[End]** key will in some cases move the cursor to the bottom right position of the display.

Editor Function Key Assignments

Function keys **[F1]** through **[F10]** on the computer AT keyboard are used to create and modify screens.

[F1] **Flash:** This key will toggle the flashing attribute flag of the field in which the cursor currently resides. This flag determines if the field characters will flash when the screen is displayed.

[F2] **Edit Screen Flags:** This key produces another screen which allows several screen related attribute flags to be modified. This setup must be completed for each screen that does not utilize the default attributes. The various flags will be discussed in detail later in this section.

[F3] **Edit Text:** This key allows re-entry into a previously created field for the purpose of editing. This key is only active when the cursor is placed on an existing field.

[F4] **Edit Field Parameters:** This key will display a setup screen unique to the field type the cursor is currently on. This key is only active when the cursor is placed on a field that has modifiable parameters.

[F5] **Move Field:** To reposition a field the cursor must first be moved to that field. **[F5]** is then pressed which will cause the entire field to become blocks. The arrow keys are used to reposition; the **[Enter]** key is used to complete the move.

[F6] **Resize Field:** To re-size a field the cursor must first be moved to that field. **[F6]** is then pressed which will cause a flashing block cursor to appear over the entire field. The arrow keys are used to increase or decrease the field size. The **[Enter]** key is used to complete the re-sizing.

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Section 2: Edit Mode

[F7] **Add Field:** This key will display a screen showing each of the ten possible field types. The arrow keys are used to move the cursor to the desired field type, the **[Enter]** key to select it.

[F8] **Remove Field:** To remove a field the cursor must first be moved to that field. **[F8]** is then pressed which will cause flashing "**X**" characters over the entire field. The **[Enter]** key is used to complete the removal.

[F9] **Graphic Set:** If text is currently being entered into a field this key is active. Pressing this key will display eighty special graphic characters which may be included with a field's text. To select a graphic character from the set simply move the cursor to the desired character and press the **[Enter]** key.

[F10] **Transmit Control Codes:** In addition to displaying screens the 9800 can also transmit screens out its COM1 communication port. This information may be directed to a printer or computer. Sometimes these devices require special codes for proper reception of data. The feature associated with **[F10]** allows special codes to be embedded within a screen. These codes do not affect the display of the screen, only the transmission of it.

Edit Screen Flags

Several flags determine the characteristics of an individual screen. Pressing the **[F2]** key while in the screen editor will produce the flag edit screen.

This screen allows the programmer to determine where a screen will be directed and how it will display.

```
Screen:015  Display:Y  Stack:N  Print:N
Clear :Y    Cover  :N  Auto close:N
```

Display: When set to "**Yes**" the screen will be immediately sent to the 9800's display.

Stack: When set to "**Yes**" the screen will be placed in the 9800's display stack. Screens that are placed in the stack can later be displayed. Displaying stacked screens is discussed in section 5.

Print: When set to "**Yes**" the screen will be directed to the COM1 communication port. COM1 must be configured and connected to a receiving device such as a printer or computer.

Clear: If this flag is set to "**Yes**" the entire display will be cleared before this screen is displayed. This effectively makes this the only screen on the display even if other screens have been triggered. If this flag is set to "**No**" the display will not be cleared first, therefore, any part of the display not used by this screen will remain unaffected. This allows a "windows" effect to exist on the display.

Cover: If this flag is set to "**Yes**" then the Clear flag must be set to "**No**". In fact the 9800 will automatically set the clear flag to "**No**" when the Cover flag is set to "**Yes**". The opposite is also true. If set to "**Yes**" any modifiable field that may be exposed from previously displayed screens will be disabled. If set to "**No**" any modifiable field from previously displayed screens may be selected or activated providing the entire field is shown.

Auto Close: This flag is only relevant when the screen is triggered by a *Window Field*. Selecting a *Window Field* will always cause another screen to be opened. To close this new screen from the display the **[ESC]** key may be pressed. If the *Auto Close* flag is set to "**Yes**" for this screen then a second method of closing it exists. If a dynamic field is included in this screen, selecting it and activating its process will cause this field to automatically close. If *Auto Close* is set to "**No**" then the only way to close the screen from the display is with the **[ESC]** key.

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Cloning Screens

It is possible to clone or copy an existing screen to another screen number. This is useful when a new screen to be created is very similar to an existing screen. To use the clone feature the screen to be copied must be brought to the display. The **[F2]** key (Edit Screen Flags) is pressed, then the screen number is changed to the desired number. The current screen being edited is now the new screen. The screen that was copied is still safe in EEPROM memory.

Static Field Example:

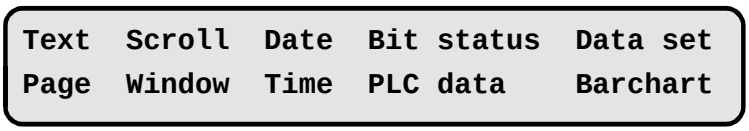
The use of function keys greatly simplifies the creation of screens. Rather than try to describe in detail each function key and each field type, several examples will be presented. To best comprehend the editor, we recommend powering up the 9800 and following along with the examples.

Fields can be separated into two basic categories, Static fields and Dynamic fields. Static fields present information that may be fixed, flashing, or scrolling; however, this information can not be modified by the operator or PLC. Dynamic field information may be modified by the operator, the PLC, or both.

The static fields are: Static Text, Scrolling Text, Paging Text, Date, and Time.

As previously described the **[F7]** key provides access to the field selection screen. Assuming that screen 15, previously created is still blank, the first step in creating a field within this screen is to move the cursor to the position where the field should begin. It is not necessary to choose the exact position because it is very simple to move a field once created. This example will create a Static Text field.

- Move the cursor to the sixth character position on the top line by pressing the **[!]** key five times. Next press the **[F7]** (Add Field) key. The field menu screen will appear as shown.



The word "**Text**" will be flashing to indicate the cursor is currently at that position. Since this is the field type we want, select it by pressing the **[Enter]** key. The display will blank except for an alternating star/block character in the sixth position on the top line.

- The next step is to establish the size the field should be. This is done with the arrow keys. Assume we want to display the word "**Quartech**". This requires a field size of eight. Press the **[!]** key seven times then the **[Enter]** key to complete field sizing.

The display will now look like this:



- Key in the word "Quartech", then press the **[Enter]** key to complete the process.

The block cursor will return and may be moved anywhere within the screen to create another field; however, before creating other fields let's modify the field just created.

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- Use the arrow keys to position the cursor somewhere within the "**Quartech**" field then press the **[F6]** (Resize Field) key. Press the **[!]** key five times to increase the field size by five characters. Notice that the star character "/ " is used to indicate reserved but unused character positions. Press the **[Enter]** key to complete re-sizing. The stars disappear leaving only the word "**Quartech**".

*Append the text field to read "**Quartech 9800**"*

- Press the **[F3]** (Edit Text) key. The stars will again appear in the reserved character positions. Also, a flashing underline cursor will appear.

Before proceeding press the **[Insert]** key. Notice the flashing underline cursor changes to a flashing block cursor. The block cursor indicates the text editor is in typeover mode. The underline cursor indicates the text editor is in insert mode. To append text to an existing field either mode will work.

- Use the arrow keys to position the cursor immediately to the right of the "**h**". Press the space bar then **[9] [8] [0] [0] [Enter]**. The modification is complete and the field will read "**Quartech 9800**".

Move the field.

- With the cursor somewhere within the text field press the **[F5]** key. The field will fill with non-flashing blocks. The field may be moved using the arrow keys, **[Home]** key, or **[End]** key. When the field appears in the desired position press the **[Enter]** key to complete the move.

Add flashing.

- Any field can be made to flash. Move the cursor into the text field then press the **[F1]** key. The field will begin to flash. Press the **[F1]** key again and notice the flashing stops. The **[F1]** key toggles a field attribute flag that will enable or disable flashing.

Saving the screen in memory.

Fields are created within the RAM memory of the 9800. This type of memory is suitable for temporary storage only. If power is removed all the data in RAM memory is lost. To permanently protect the created fields they must be moved into EEPROM memory. It is not necessary to save each field as it is created. It is best to save the entire screen after all fields have been created. To initiate the save process press the **[Esc]** key. Assuming we are still working on screen 15 the following will display:

```
Edit screen number:015
Save screen changes before exit? Yes No
```

The word "**Yes**" will be flashing indicating this is the current choice. Pressing the **[!]** key will move the cursor between "**Yes**" and "**No**". With the word "**Yes**" flashing press the **[Enter]** key. As the data from RAM memory is being transferred to EEPROM memory the word "**SAVING**" will appear at the top right of the display to indicate the process is occurring. This process should take a few seconds to complete.

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Section 2: Edit Mode

Once the screen is safe in EEPROM memory this screen will return.

```
Edit screen number:015
Edit  Print  Delete
```

This is the Edit Screen menu as seen previously. Pressing the **[Esc]** key would return us to the root directory but let's press **[Enter]** to resume editing screen 15. Screen 15 will be copied from EEPROM memory back to RAM memory. The previously created screen will appear with the text field "**Quartech 9800**".

Remove the Text Field.

- Position the cursor somewhere within the Text Field then press the **[F8]** key. The field will fill with the flashing "**X**" character. To complete the removal press the **[Enter]** key. The field will be removed from RAM memory only. To make the deletion permanent the entire screen must be again saved in EEPROM memory.

This example has demonstrated the use of the Add Field, Resize, Edit Text, Move Field, Flash Field, and Remove Field function keys. Saving a screen in EEPROM memory then returning to re-edit was also demonstrated. This field example used only the Static Text field, however, Scrolling Text fields and Paging Text fields are basically identical to the Static Text field with respect to entry, sizing, and moving. Scrolling and Paging fields are normally used in place of Static Text fields when the amount of text to be presented exceeds the space available for display. Scrolling and Paging fields both move text through the field window. The Scrolling field moves text one character position at a time from right to left. The Paging field moves a group of text, equal to the number of character positions in the page window, from bottom to top.

The Date field and Time field are also created in a similar manner to the Static Text field with the exception that no text is actually keyed in. It is only necessary to position and size these fields. To display a complete Date or Time field requires eight character positions in the screen. When these fields are reduced below eight characters, the characters are removed from the right.

As a final note, when creating a new field it is not important to set the field position or size exactly since changing these two parameters is so simple. It is easier to get the text onto the screen then position and size it as desired.

Dynamic Field Examples:

The dynamic fields are: Window, Bit Status, Data Set, PLC Data, and Barchart.

Each dynamic field functions and is created differently. An example will be given for each. All dynamic fields except the Barchart field may allow operator interaction. If a screen is displayed that includes an interactive dynamic field then that field will be flashing to indicate focus is on that field allowing operator input. If multiple interactive dynamic fields exist the arrow keys may be used by the operator to place focus on a particular field for input. With focus on the desired field, the **[ENT]** key is pressed to initiate the input process.

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Window Field Example:

The Window field is essentially a screen trigger that allows screens to be linked together. The Window Field is created the same (and appears the same) as a Text Field; however, a secondary function must be performed. Assuming the Window Field has been created, position the cursor within that field and press the **[F4]** (Edit Field Parameter) key.

This screen will appear:

```
Entry:Yes  Screen:000
```

The "**Entry**" parameter may be toggled between "**Yes**" and "**No**" by pressing the **[Enter]** key. Selecting "**Yes**" will enable the Window feature. Selecting "**No**" will cause this field to essentially become a static text field. If a system is being designed for future expansion it may be desirable to program additional window fields but keep them disabled until a future date. The screen number which is to be displayed when the Window Field is selected is programmed into the "**Screen**" parameter. The **[Esc]** key is used to return to the editing screen.

Bit Status Field Example:

The Bit status field will toggle between two character strings based on the state of a PLC variable. If enabled the operator may also initiate the toggle which effectively produces a bit modify function. The Bit Status Field is created in a manner similar to a text field.

- Assume the field will display "**Motor Off**" or "**Motor On**". Since "**Motor Off**" is the larger string and requires nine character spaces the field size must be nine. Position the cursor and create a Bit Status field having nine character positions. Key in the string "**Motor OffMotor On**" and press **[Enter]**. To view the text as it will appear, enter Edit Text (F3) mode then use the up and down arrow keys to alternate between the two strings.

The **[F4]** (Edit Field Parameter) function must be selected to complete the creation of the Bit Status Field.

When the **[F4]** key is pressed the following screen will display:

```
Entry:No          Msk:0000000000000000
Addrs:XXXXX       Val:0000000000000000
```

The "**Addrs**" parameter allows a PLC address to be specified. The address format is relative to the PLC driver installed in the 9800, i.e.; Allen-Bradley, Modicon, GE Fanuc, etc.. All sixteen bits of the address are always included in the MASK and Value parameters. The solving of this function may utilize a single bit or up to all 16 bits. The 9800 will read the 16 bits from the specified address, logical AND them with the mask value then compare the result to the specified value. If the values are not equal the first character group will be displayed. If the values are equal the second character group will be displayed.

Two examples are shown on the following page. To keep the examples generic, no PLC address has been specified. Also for discussion purpose the bits within the mask and value parameters are numbered from 1 to 16, counted right to left, i.e., least significant bit to most significant bit.

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Section 2: Edit Mode

True Text = MOTOR ON **False Text = MOTOR OFF**
Mask Value = 0000 0000 0000 0010 **Data Value = 0000 0000 0000 0010**

Example 1:

Assumed PLC Value	**0000 0000 0000 1111**
AND with Mask Value	**0000 0000 0000 0010**
Results	**0000 0000 0000 0010**

Example 2:

Assumed PLC Value	**0000 0000 1111 0000**
AND with Mask Value	**0000 0000 0000 0010**
Results	**0000 0000 0000 0000**

The final step for the 9800 is to compare the result value to the Data Value. In example one the result is equal to the Data Value, therefore, the True Text (MOTOR ON) would be displayed in the field. In example two the result and Data Value are not equal, therefore, the False Text (MOTOR OFF) would be displayed in the field.

Using the Bit Set feature

This feature is not allowed with some address types, in particular direct I/O addresses. If enabled the Bit Status function may be used as a bit modify function, i.e., the 9800 can control the bit at the specified word address. To enable this feature the "**Entry**" parameter must be set to "**Yes**". When the cursor is moved to this field and the **[Enter]** key is pressed the specified bit or bits at the specified address will be toggled.

Assume the results of example one above, the field is currently displaying “MOTOR ON”. Further assume you place focus on this field and press the [**Enter**] key.

Assumed PLC Value	**0000 0000 0000 1111**	
AND with compliment of Mask Value	**1111 1111 1111 1101**	***Formula 1***
write this value to the PLC	**0000 0000 0000 1101**	
9800 reads PLC Value back	**0000 0000 0000 1101**	
9800 ANDs it with Mask Value	**0000 0000 0000 0010**	
Results	**0000 0000 0000 0000**	

Result does not match Data Value so the field text will change to “MOTOR OFF”. Its that simple!

Lets try the opposite case. Assume the results of example two, the field is currently displaying “MOTOR OFF”. You place focuson this field then press the [**Enter**] key.

Assumed PLC Value	**0000 0000 1111 0000**	
AND with compliment of Mask Value	**1111 1111 1111 1110**	***Formula 2***
Results	**0000 0000 1111 0000**	
OR with Data Value	**0000 0000 0000 0010**	
write this value to the PLC	**0000 0000 1111 0010**	
9800 reads PLC Value back	**0000 0000 1111 0010**	
9800 ANDs it with Mask Value	**0000 0000 0000 0010**	
Results	**0000 0000 0000 0010**	

Result does match Data Value so the field text will change to “MOTOR ON”.

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Section 2: Edit Mode

PLC Data Field Example:

The PLC Data Field allows a value from a specified address to be dynamically displayed. The data may be displayed in any of the following formats. Not all of these formats may be available for each of the PLC types.

- Hexadecimal, up to four digits
- Octal, up to six digits
- Decimal, up to five digits
- Floating point
- Binary, up to sixteen digits
- ASCII, one or two characters
- Decimal, up to 5 digits with fixed decimal point

The PLC Data field is created by moving the cursor to the desired position, pressing **[F7]**, selecting "**PLC Data**" from the menu then sizing the field. Text can not be entered into this field type. To complete the creation the **[F4]** (Edit Field Parameter) key must be pressed which will result in the following display.

```
Entry:No   Format:HEX  Hi :0000
Addrs:XXXXX            Low:0000
```

- The "**Entry**" parameter determines if the operator will be allowed to write data to the PLC.

- The "**Addrs**" parameter allows an address relative to the PLC driver installed to be specified.

- The "**Format**" parameter determines how the data will be displayed. Moving the cursor to this position and pressing the **[Enter]** key will cause the format types to be displayed. Each time the **[Enter]** key is pressed another format type will be shown. To enable floating point a file type "**F**" must be entered into the "**Addrs**" parameter. The following floating point formats will then be available providing the field size is at least eight characters:

0000.000 Format:4.3	000.0000 Format:3.4
00000.00 Format:5.2	00.00000 Format:2.5
000000.0 Format:6.1	0.000000 Format:1.6
0000000. Format:7.0	.0000000 Format:0.7

  The floating point format may be selected by placing the cursor on the "**Format**" parameter and pressing the **[Enter]** key until the desired format is shown. If a floating point value is greater than that which can be displayed in normal decimal mode the 9800 will switch to scientific decimal notation to display the number. Scientific decimal notation requires thirteen character spaces on the display, therefore, the field should be sized correctly if this is, indeed, a possibility.

- The "**Hi**" and "**Low**" parameters allow data value limits to be set for the field. These are the highest and lowest numbers the operator may enter into this field. These parameters are ignored if the "**Entry**" parameter is set to "**No**" which prevents all entry to this field.

When all the parameters appear as desired the **[Esc]** key is pressed to save the parameters and return to the current screen.

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Section 2: Edit Mode

Data Set Example:

The Data Set field allows a specified value to be written to a specified address within the PLC.

The Data Set field is created by moving the cursor to the desired position, pressing **[F7]**, selecting "**Data Set**" from the menu then sizing the field. The desired text can then be entered into this field . To complete the creation the **[F4]** (Edit Field Parameter) key must be pressed which will result in the following display.

```
Entry:Yes          Format:HEX
Addrs:XXXXX        Data  :0000
```

- The "**Entry**" parameter determines if the data will be written to the PLC. This parameter would be set to "**No**" only if the field is being created for use at some future time.

- The "**Addrs**" parameter allows an address relative to the PLC driver installed to be specified. This is the address that the data will be written to.

- The "**Format**" parameter allows the data value to be expressed several ways. Moving the cursor to this position and pressing the **[Enter]** key will cause the format types below to be displayed (depending upon PLC type).

  - Hexadecimal, up to four digits
  - ASCII, one or two characters
  - Floating point
  - Octal, up to six digits
  - Decimal, up to five digits
  - Decimal, up to 5 digits with fixed decimal point

  Each time the **[Enter]** key is pressed another format type will be shown. The format parameter is associated only with the display of the data. The actual data written to the PLC will be in the form compatible with the file type. To enable floating point a file type "**F**" must be entered into the "**Addrs**" parameter. The following floating point formats will then be available:

0000.000 Format:4.3	000.0000 Format:3.4
00000.00 Format:5.2	00.00000 Format:2.5
000000.0 Format:6.1	0.000000 Format:1.6
0000000. Format:7.0	.0000000 Format:0.7

  The floating point format may be selected by placing the cursor on the "**Format**" parameter and pressing the **[Enter]** key until the desired format is shown.

- The "**Data**" parameter allows the data value that will be written to the PLC to be entered. This parameters is ignored if the "**Entry**" parameter is set to "**No**" which disables this field.

When all the parameters appear as desired the **[Esc]** key is pressed to save the parameters and return to the current screen.

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Section 2: Edit Mode

Bar Chart Example:

The Barchart field allows the value from a specified PLC address to be displayed as a proportional bar chart.

The Barchart field is created by moving the cursor to the desired position, pressing **[F7]**, selecting "**Barchart**" from the menu then sizing the field. Text can not be entered into this field type . To complete the creation the **[F4]** (Edit Field Parameter) key must be pressed which will result in the following display.

```
Char :ú {7F}          Format:HEX
Addrs:XXXXX           Scale :0000
```

- The "**Char**" parameter allows the graphic character that will be displayed to be chosen. The graphic character is shown next to the colon followed by the Hexadecimal code for that character. The character may be selected by directly entering the character or entering the hexadecimal code for the desired character. Any character from the special graphic set (Function key F9) may also be used.

- The "**Addrs**" parameter allows an address consisting of a file number and element, register, or word number to be specified. This is the address from where the raw data is read.

- The "**Format**" parameter sets the data format for the scale value. Moving the cursor to this position and pressing the **[Enter]** key will cause the format types to be displayed. Each time the **[Enter]** key is pressed another format type will be shown. The following formats are available (depending upon PLC type):

  - Hexadecimal, up to four digits
  - Decimal, up to five digits
  - Octal, up to six digits
  - Decimal, up to 5 digits with fixed decimal point

- The "**Scale**" parameter determines the numeric value of each character position in the field. The following formula can be used to calculate the required "**Scale**" value.

$$\frac{\textit{Raw Data Full Scale Value}}{\textit{Desired Number Of Character Positions}} = \text{"}\mathbf{Scale}\text{"}$$

When all the parameters appear as desired press the **[Esc]** key to them and return to the current screen.

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Section 2: Edit Mode

Printer Control Codes

When a screen is sent to the COM1 serial communication port, all eighty characters that would appear on the display are sent. When connected to a computer or certain printers this may not be sufficient for proper operation. For example, some printers require a *Carriage Return* or *Line Feed* character at the end of a transmission. The 9800 includes a Control Code feature which allows these extra characters to be added to the screen text. In fact, special characters may be included ahead of the screen text, within the screen text, or after the screen text.

To access this feature the 9800 must be in the edit screen mode. If the **[F10]** key (Edit Ctrl Codes) is pressed the display will blank except for a flashing block cursor in the HOME position. Before entering the Control Code screen it is important to determine where and what control codes must be included. A control code is entered by specifying a position and the control code.

- The position is a decimal value from 0 to 80. The display characters are numbered from 0 to 79 starting at the top left character position and ending at the bottom right character position. Specifying a position of zero will cause the control code to be sent prior to the start of the screen text. Specifying a position of eighty will cause the control code to be sent after the screen text. When a character position within the screen text is specified the control code will always be sent prior to the screen character. The control code can be any hexadecimal value from 01 to FF.

The syntax for entering control codes is: *@ Position : Control Code*. For example, to send a *Carriage Return* (CR 0Dhex) after the first forty characters (0 through 39) of screen text have been sent the following would be entered: **@40:0D**. Note the position was set to forty which will cause the control code to be sent prior to screen character forty which is actually the forty first character.

- Up to 120 characters of control code information may be entered in to the control code screen. A space character must be included between each control code that is entered and is included in the 120 character boundary.

When more than one control code is to be sent in a row it is not necessary to enter the position for each control code. For example, if after the entire screen text is sent a *Carriage Return* (CR 0Dhex) and a *Line Feed* (LF 0Ahex) are to be sent, the following would be entered: **@80:0D 0A**.

Two control codes are reserved and have predefined functions. Control code 14 is used to terminate serial transmission at the position where the code is specified. Control code 11 is used to multiple transmit a particular code. The syntax for this is: *@ Position : 11 Space Repetitions Space Code*. For example, to transmit five Line Feeds at the end of a screen enter: **@80:11 05 0A**. All values are hexidecimal except the position value which is decimal.

Example using several codes:

Start of Text character (STX 02hex) is to be sent prior to any screen text.
After the first forty characters a Carriage Return and Line Feed are to be sent.
After all eighty characters have been sent an End of Text character (ETX 03hex) is to be sent.

- Enter this: **@00:02 @40:0D 0A @80:03**

Note: When cloning a screen the control codes are also cloned.

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Section 3: System Setups

When Setup System is selected from the root directory the following screen will display:

```
COM1 data port  Date/Time  PLC port
User keys/LED   System
```

This screen allows access to several unit configuration parameters. Each screen selection provides access to a particular configuration parameter or a group of similar parameters.

COM1 Port Setup

When the "**COM1 data port**" field is selected from the setup system screen the following screen will display:

```
Baud rate:9600   Data bits:8  Type:RS232
Parity   :Off    Stop bits:1  Save setup
```

This screen allows the auxiliary serial communication port, COM1, to be configured to match an external device such as a printer. This port is used for screen logging, documentation, and ScreenMaker 9000 software program loading. The individual parameters are modified by moving the cursor to the desired field then pressing the **[Enter]** key until the desired parameter state appears. If any parameters are modified they must be saved to EEPROM memory prior to exiting this screen. This is accomplished by moving the cursor to the "**Save setup**" field and pressing the **[Enter]** key. When the "**Enter**" key is pressed the word "**BUSY**" will appear at the top right of the display for a very short period of time. Once the parameters have been saved the **[Esc]** key may be pressed to return to the Setup system screen.

Here are the choices for the five COM1 parameters:

- Baud rate: 300, 600, 1200, 2400, 4800, 9600, 19200
- Data bits: 7 or 8
- Stop bits: 1 or 2
- Parity: Even, Odd, Off
- Type: RS232 only!

Date & Time Setting

When the "**Date/Time**" field is selected from the setup system screen the following screen will display:

```
Date:03/11/92  Calibrate:000
Time:08:00:00  Save setup
```

This screen allows the real time clock/calendar (Timekeeper) to be set and the quartz crystal oscillator frequency to be calibrated. Each component of the date and time, i.e., day, month, etc., is modified separately. To modify a particular component move the cursor to that position, press the **[Enter]** key, key in the new value then press the **[Enter]** key again. The change will not be loaded into the Timekeeper until the "**Save setup**" parameter is selected.

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Although the year value in the 9800 is only two digits, no calculations are performed using it, therefore, the 9800 is year 2000 compliant. The date and time are provided for display purposes only.

Real Time Clock Calibration

The Timekeeper is driven by a quartz crystal controlled oscillator with a normal frequency of 32768 Hz. The Timekeeper is typically accurate within ±1 minute per month at 25°C without calibration. The timekeeper is tested by the component manufacture not to exceed ±35 ppm (Parts Per Million) oscillator frequency error at 25°C, which comes to about ±1.53 minutes per month. The oscillation rate of any crystal changes with temperature.

The Timekeeper used in the 9800 provides a calibration technique that employs periodic counter correction. The calibration circuit adds or subtracts counts from the oscillator divider circuit at predefined intervals which will either increase or decrease the oscillator speed. The "**Calibrate**" parameter may be set to any value from -31 to +31units. Each unit of change provides 2.034 ppm of adjustment providing a total adjustment range of ±63.07 ppm. Assuming the crystal frequency is exactly 32768 Hz, each of the 31 units would represent 5.35 seconds per month.

The "**Calibrate**" parameter is modified by moving the cursor to this field, pressing the **[Enter]** key, keying in the desired value then pressing the **[Enter]** key again. The change will not be stored in the Timekeeper until the "**Save setup**" parameter is selected .

PLC Port Setup

When the "**PLC port**" field is selected from the setup system screen, a new screen is displayed that is unique to the PLC driver installed in the 9800. The screen shown here is displayed when an Allen-Bradley PLC-5 DH+ driver is installed in the 9800.

```
9800 node:00  Dialogue file:007
PLC5 node:01  Clock:N         Save setup
```

The Dialogue File and Clock parameters are common to all PLC drivers. The Dialogue File is described in Section 5. The Clock parameter determines if the Time and Date values are transferred to the PLC.

The following table will list the parameters that are unique with each available PLC driver.

PLC Driver	Parameter Name	Parameter description and notes.
Allen-Bradley PLC-5, DH+	9800 Node Address	A legal node address is a octal value from 00 to 77. The characters 8 and 9 can not appear in the value.
	PLC-5 Node Address	
Allen-Bradley PLC-5, DF1	Port Type	This parameter must always be set to RS-232.
	PLC-5 Node Address	This parameter can be ignored.

This table is continued on the following page.

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Section 3: System Setups

PLC Driver	Parameter Name	Parameter description and notes.
Allen-Bradley SLC500, DH485	9800 Node Address	Legal node address range is: 0 to 31
	SLC500 Node Address	
	Maximum Poll Address	Highest solicit address for 9800
	Baud Rate	Selectable between 9600 and 19200
	SLC503 Flag	Set to yes if connected to SLC503 CPU
Allen-Bradley SLC500, DF1	SLC500 Node Address	Address is always one
	Baud Rate	Selectable between 9600 and 19200
	SLC503 Flag	Set to yes if connected to SLC503 CPU
Allen-Bradley SLC500, DH+	9800 Node Address	A legal node address is a octal value from 00 to 77. The characters 8 and 9 can not appear in the value.
	SLC500 Node Address	
GE Fanuc Series 90	Dialogue File Size	Number of words reserved within PLC
	CPU ID	For point-to point connection use “NULL”
Modicon MODBUS	PLC Node Address	Legal node address range is 1 to 247
	Dialogue File Size	Number of words reserved within PLC
	Baud Rate	Selectable between 9600 and 19200

Security Setups

When the "**System**" field is selected from the System setup screen the following screen will display:

```
C-lock :0000  Ukey:N  Edit:N  Windows:N
Powerup:Edit  Edit lock:0000  Save setup
```

This screen allows system security and the 9800 power up state to be specified. For changes to take affect, the "**Save setup**" field must be selected prior to exiting this screen to save any modifications made.

Edit Mode Lock

The edit lock is associated with edit mode. When this lock is activated a four digit combination must be entered before any editing functions are activated. The combination may be any hexadecimal value from 0001 to FFFF. Assigning a value of zero will disable the edit lock function.

This screen will appear when the edit lock is activated and Edit is selected from the root directory:

```
**** Enter the Edit Mode lock value ****
```


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Section 3: System Setups

The combination will not be displayed as it is keyed in. When all four digits, including leading zeros are keyed in the **[Enter]** key is pressed to complete the process. If an incorrect combination is entered an error message will appear for a moment followed by the above screen.

***** WARNING *****	The assigned combination should be stored in a safe place. Without it you can not return to edit mode!

Combination Lock

This combination lock is associated with run mode. The combination lock function is selected by entering a value into the "**C-lock**" field. The value must be a hexadecimal number from 0001 to FFFF. The value zero disables the combination lock function. When this lock is activated the **LOCKED** LED will flash and the functions, shown on this screen, will be disabled if so selected. Three functions may be placed under combination lock control.

```
C-lock :0000  Ukey:N  Edit:N  Windows:N
Powerup:Edit  Edit lock:0000  Save setup
```

Ukey: If set to **Y**es the 16 User Keys will be placed under combination lock control. Whenever the Combination lock is activated the User Keys will be ignored.

Edit: If set to **Y**es the PLC modifiable data values will be placed under combination lock control. Whenever the combination lock is activated no modification to PLC data values will be allowed. The cursor may still be moved to a modifiable field, however, pressing the **[Enter]** key will not allow access into the field.

Windows: If set to **Y**es the Window Field will be placed under combination lock control. Whenever the combination lock is activated the Window Fields will become disabled. The cursor may still be moved to a Window field, however, pressing the **[Enter]** key will not allow access into the field.

The actual activation and de-activation of the combination lock will be described in Section 5.

Power-up State

The "**Powerup**" field determines if the 9800 will attempt to communicate with the processor or enter edit mode on power up. If "**RUN**" is selected and the 9800 is unable to communicate with the processor an error message will appear offering a choice of re-trying communications or entering edit mode.

Once programming and system debug is complete it is normal to set this parameter to "**RUN**".

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Section 3: System Setups

User Keys & LEDs

When the "**User keys/LED**" field is selected from the system setup screen the following screen will display:

```
Keys 1 -4 : PB  PB  PB  PB
LEDs 1 -4 : SW  SW  SW  SW    Save setup
```

This screen allows the function keys and tri-color Light Emitting Diodes (LED) to be configured. Each key may be configured as either a momentary pushbutton (PB) or a push-on push-off selector switch (SS). Each LED may also be configured to be independently controlled by the PLC (BT) or function as an integral part of its associated switch (SW). The following explanation on LED configuration should make their operation clear.

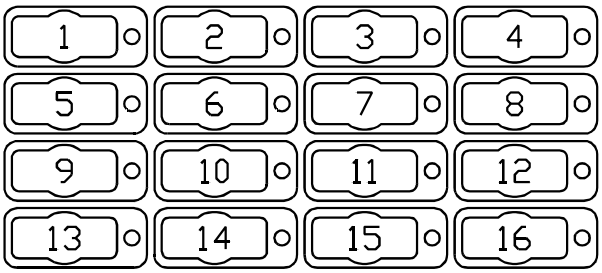
Independently controlled (BT)

When the LEDs are independently controlled by the PLC, they have no direct relation to the switches. Each LED may illuminate red, amber or green at any time. Three words are reserved within the *Dialogue File* that are associated with the LEDs. One word exists for each lit color of the LED. Since a word is comprised of sixteen bits, one bit in each color word is used to control a particular LED. The least significant bit in each word is associated with LED 1. A priority scheme exists to resolve the conflict when more than one color bit being energized for a particular LED. Red is highest priority followed by amber then green.

Integral to switch (SW)

When the LEDs are controlled as an integral part of the associated switch, the color elements within the *Dialogue File* are ignored. The operation of the LED is dependant on the state of the switch and the type of switch, e.g., pushbutton or selector switch. If the associated switch is configured as a pushbutton the LED will be off when the switch is de-energized and red when the switch is energized. If the associated switch is configured as a selector switch the LED will be green when the switch is de-energized and red when the switch is energized.

The numbering for the switches and LEDs is shown here.



The configuration for only four switches and LEDs can be shown on the display a one time. To move from one group to the another set the cursor to the home position then press the **[Enter]** key. To save any changes the "**Save setup**" field must be selected prior to existing this screen.

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Section 4: Utility

When Utilities is selected from the root directory the following screen will display:

```
Screens 000 thru 000      Print setups
Print  Delete             Transfer data
```

This screen allows a contiguous group of screens to be deleted or documented to a printer. It also allows documenting to a printer the configuration parameters contained in the Setup System screens. Another function allows the uploading and downloading of screen files or program files.

Prior to deleting or printing a group of screens, the starting screen number and ending screen number must be keyed in. When printing the COM1 serial port must first be configured using the Setup system screens. Printing the configuration parameters also requires that COM1 first be configured.

The Transfer data field is used with Quartech ScreenMaker 9000 configuration software. Any special information required will be included with the specific software package.

Selecting the Run Mode will cause the 9800 to attempt to establish communication with the PLC. The word "**BUSY**" will appear in the top right of the display to indicate status. If successful the unit will proceed with normal operation. If the 9800 is not successful in establishing communication the following screen will display:

```
PLC comm fault
Retry  Reset
```

If "**Retry**" is selected the 9800 will again attempt to establish communication. If "**Reset**" is selected the 9800 will execute a "Warm boot" ending at the edit root directory or at the edit mode combination screen. The AT keyboard may be used to exit Run Mode by pressing the [Ctrl], [Alt], and [Delete] keys simultaneously. It is not possible to exit run mode from the 9800 keypad.

Notice! **The keypad on the 9800 can be used to navigate through the Edit Mode screens if an AT keyboard is not connected to the unit.**

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Section 5: Run Mode

When in run mode the 9800 must share various information with the PLC. For example the 9800 must provide the PLC with the status of the User Keys; the PLC must dictate what screen(s) should be displayed at any particular time. To accomplish these tasks a contiguous group of words, referred to as the Dialogue File, must be reserved in the PLC for use with the 9800.

Dialogue File

The Dialogue File is a group of up to 57 contiguous words that are created or reserved within the PLC. The 9800 must know the starting address of this group of words and the numbers of words reserved. This information is provided to the 9800 during the system setup process as described in Section 3. The *Dialogue File* can be broken into five basic sections which are: The Command Register, tri-color LED control, user key status, screen triggering, and clock/calendar.

The *Dialogue File* structured is shown in this table.

ADDRESS	FUNCTION
Word 1	Command Register
Word 2	Green LEDs
Word 3	Amber LEDs
Word 4	Red LEDs
Word 5	Switch Image
Word 6	Integer Trigger One
Word 7	Integer Trigger Two
Word 8	Integer Trigger Three
Word 9	Integer Trigger Four
Word 10 : Word 57	Bit Trigger Blocks & Clock/Calendar

Command Register

The *Command Register* word in the *Dialogue File* is viewed by the 9800 as sixteen individual bits. The individual bits instruct the 9800 to perform a specific function, or indicate the status of a function. The 9800 will monitor and update the *Command Register* frequently, so each of the bits may be changed by the PLC application program at any time.

The *Command Register* structure is shown in this table.

The bit numbers in the table are for reference only since memory configurations and designations vary between PLC brands. Bit 1 is always the least significant bit in the word, that is, the bit having the lowest binary weight. In some PLCs it may be references as Bit 0 or Bit 16. In some PLCs the bit numbers may be sequential numbered in octal or hexadecimal.

A description of the individual bits begins on the following page.

BIT	FUNCTION
1	Lock Edit keys
2	Lock User keys
3	Window Field Lock
4	Edit keys C_Locked
5	User Keys C_Locked
6	Window Field C_Locked
7	Invalid Combination Entered
8	Display Stack Screen
9	Stack Request
10	Stack is empty
11	Stack is full
12	Help key
13	Value Modified
14	Clear Stack
15	
16	Communication Active Flag

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Section 5: Run Mode

Lock Edit Keys (Bit 1)

The *Lock Edit Keys* feature allows the 9800's edit keypad and any external keyboard to be completely disabled by the PLC application program. When Command Register Bit 1 is energized the 9800 will light the **LOCKED** LED and ignore any edit keys including those from an external keyboard. The display will remain operational, that is, screens may still be triggered by the PLC.

When Command Register Bit 1 is de-energized the **LOCKED** LED will turn off, providing Bits 2 and 3 are also off, and normal edit key operation will resume.

Lock User Keys (Bit 2)

The *Lock User Keys* feature allows the 9800's sixteen User keys to be disabled by the PLC application program. When Command Register Bit 2 is energized the 9800 will light the **LOCKED** LED and ignore any activity on the User keys. The display and edit keys will remain operational.

When Command Register Bit 2 is de-energized the **LOCKED** LED will turn off, providing Bits 1 and 3 are also de-energized, and normal User key operation will resume.

Lock Window Field (Bit 3)

The *Lock Window Field* feature allows the PLC to prevent all *Window Fields* from operating. The *Window Field* was described in Section 2. When Command Register Bit 3 is energized the 9800 will light the **LOCKED** LED and all *Window Fields* will be disabled. The *Window Fields* will still appear within a screen as they normally would, however, moving the cursor to that field and pressing the enter key will not produce any action.

When Command Register Bit 3 is de-energized the **LOCKED** LED will turn off, providing Bits 3 and 2 are also de-energized, and all *Window Fields* will function normal.

Combination Lock (Bits 4, 5, 6, 7)

The three locks, previously described, (Bits 1, 2, & 3) are controlled by the PLC alone. The 9800 and the operator have no way to override their effect. A second method of locking the edit keys, function keys, and window fields is available. This method takes the form of a combination lock. Enabling the use of the combination lock feature was described in Section 3.

These Command Register Bits are used with the combination lock feature.	Bit 4 - Edit keys C_Locked Bit 5 - User keys C_Locked Bit 6 - Window Fields C_Locked Bit 7 - Invalid Combination Entered

The combination lock may be activated or de-activated by either the PLC or the operator. The combination lock can only be activated if a valid combination value was assigned during system setup. The following rules apply when either the PLC controls the locks or the operator does.

- If any of Command Register Bits 4, 5, or 6 are energized the **LOCKED** LED will flash.
- When the combination lock is activated by the operator, Bits 4, 5, and 6 will be activated or de-activated by the 9800 based on the initial setup that was explained in Section 3.
- When the combination lock is de-activated by the operator, Command Register Bits 4, 5, and 6 will be de-energized by the 9800. If any of these bits are being held on by the application program the 9800 will not be successful in de-energizing them.

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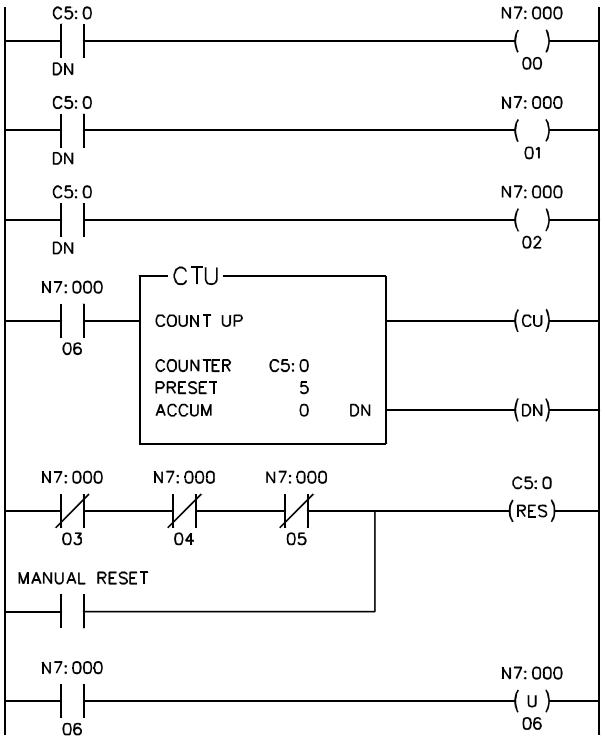
- The PLC may energize a bit that can not be energized by the 9800. For example if User keys were not selected for combination lock control during setup, the PLC may energize the corresponding bit and lock the User keys.

- The 9800 can not override bits within the command register that are being held energized or de-energized by the PLC's application program. The PLC can override the 9800.

The operator activates the combination lock by pressing the **[LOCK]** key. This will start the **LOCKED** LED flashing and the selected locks will be enforced. De-activating the combination by the operator requires the correct four digit combination value being keyed into the 9800. The process is started by pressing the **[LOCK]** key. Next, the four digit combination value must be entered including any leading zeros, followed by the **[ENT]** key. If the combination value is correct and the PLC is not forcing the combination lock feature on the **LOCKED** LED will stop flashing and normal operation will resume. If an incorrect combination value is entered the 9800 will energize Command Register Bit 7 .

Application Note:

This application shows the circuitry required in a PLC-5 to lock out the 9800 after 5 consecutive failed attempts to unlock the unit using the combination lock. Although addressing may be different for other brands of PLCs, the basic logic will remain valid.



N7:000/00 = Lock Edit Keys
N7:000/01 = Lock User Keys
N7:000/02 = Window Field Lock
N7:000/03 = Edit Keys C_Locked
N7:000/04 = User Keys C_Locked
N7:000/05 = Window Field C_Locked
N7:000/06 = Invalid Combination

Counter C5:0 is incremented each time an invalid combination is entered. If five consecutive invalid combinations are entered the counter will energize its output which will energize lock bits 00, 01, and 02 in the *Command Register*. At that point no further entries will be allowed until a manual reset occurs.

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Section 5: Run Mode

Screen Stack (Bits 8, 9, 10, 11, 14)

When screens are created one of the attribute flags allows the screens to be placed within a stack that resides inside the 9800's RAM memory. Up to 100 screens may be in the stack at any time.

These five Bits in the Command Register are associated with the Stack feature.

- < Bit 8 - Display Stack Screen
- < Bit 9 - Stack Request
- < Bit 10 - Stack is Empty
- < Bit 11 - Stack is Full
- < Bit 14 - Clear Stack

A special screen, number 720, is associated with the screen stack feature. Screen 720 will be displayed when Command Register Bit 8 is energized to enable stack screen display, and no stacked screens are present. Screen 720 may be modified or re-sized with the resident editor, however it can not be deleted.

Screen 720 looks like this as shipped from the factory.



The following points describe the basic features offered by the screen stack.

- To direct a screen to the stack the "**Stack**" flag must be set to **Y**es. See Section 2 for information on the Edit Screen Flags function.
- Command Register Bit 8 (Display Stack Screen) enables stacked screens to be displayed. This bit is controlled by the PLC, however, through ladder logic one of the 9800 User Keys may be used to energize or de-energize it.
- When Command Register Bit 9 (Stack Request) is energized the next screen on the stack will be moved to the display. If there are no screens in the stack, screen 720 will automatically be displayed. This bit is controlled by the PLC, however, through ladder logic one of the 9800 User Keys may be used to energize or de-energize it.
- Command Register Bit 10 (Stack is Empty) will be energized by the 9800 when no screens are in the stack. It is at this time that screen 720 is displayed. The 9800 will de-energize this bit when at least one screen is in the stack.
- Command Register Bit 11 (Stack is Full) will be energized by the 9800 when one hundred screens are in the stack. While this bit is energized no additional screens will be accepted by the stack, they will be lost. The 9800 will de-energize this bit when the number of screens in the stack falls below one hundred.
- When Command Register Bit 14 (Clear Stack) is energized all screens that are in the stack are deleted leaving the stack empty.

Help Key (Bit 12)

This Command Register bit is controlled by the **[HELP]** key in the 9800's edit keypad. The **[HELP]** key functions like a pushbutton. When the **[HELP]** key is pressed the 9800 will energize Command Register Bit 12. When the **[HELP]** key is released the 9800 will de-energize Bit 12. The actual use and implementation of this feature is left up to the programmer.

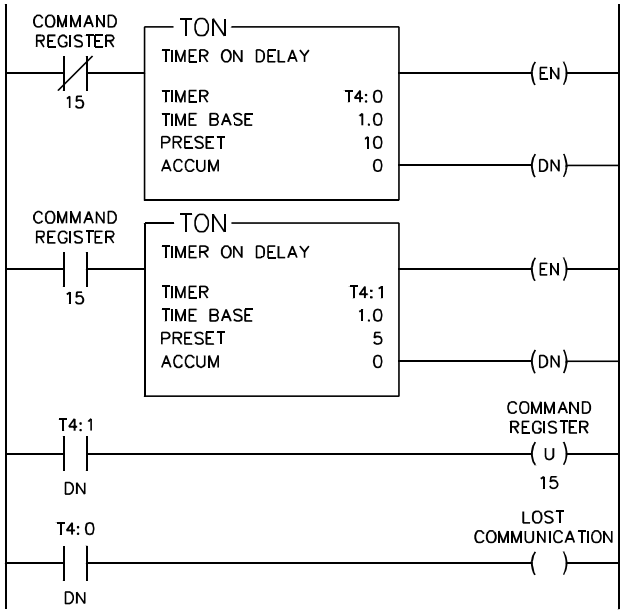
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Value Modified (Bit 13)

Command Register bit 13 is energized by the 9800 any time a screen sends data to the PLC. This includes Data Set Fields, PLC Data Fields, and Bit Status Fields when used in the bit set format. The 9800 does not de-energize this bit, therefore the PLC application program must acknowledge the modification by de-energizing the bit each time it is set. If this function is not used by the PLC application program then it may simply be ignored.

Communication Active Flag (Bit 16)

The 9800 will monitor Command Register Bit 16 frequently. This bit will be energized by the 9800 anytime it is found de-energized. The PLC can use this bit as part of a watchdog timer circuit that can detect a loss of communication with the 9800. The following PLC-5 ladder logic is used to detect a loss of communication with the 9800. Although addressing may be different for other brands of PLCs, the basic logic will remain valid.



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Section 5: Run Mode

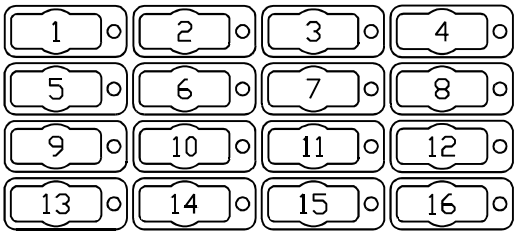
Tri-Color LED control

As discussed in Section 3 the sixteen tri-color LEDs may be controlled by their associated switches, or they may be independently controlled by Bits inside the PLC. Dialogue File words two, three, and four are reserved for this purpose. Each LED is assigned one bit from each of the three color words.

	LED Number & Word Bit Number															
LED Designation	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Dialogue File Word 2, Green																
Dialogue File Word 3, Amber	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Dialogue File Word 4, Red																

The bit numbers in the table above are for reference only since memory configurations and designations vary between PLC brands. Bit 1 is always the least significant bit in the word, that is, the bit having the lowest binary weight. In some PLCs it may be references as Bit 0 or Bit 16. In some PLCs the bit numbers may be sequential numbered in octal or hexadecimal.

The LEDs are numbered as shown here.

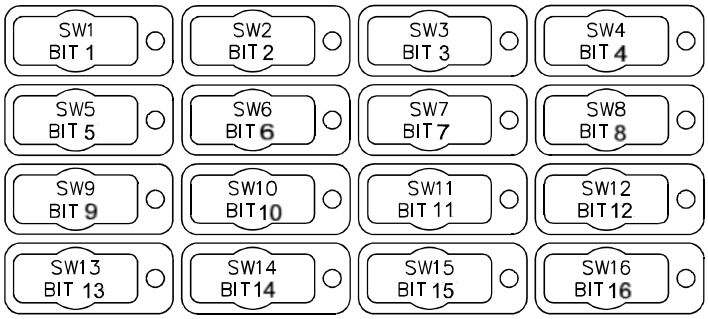


To illuminate an LED a particular color the appropriate bit must be energized. For example, to light LED 10 red, bit number 10 of the red word must be energized. A priority scheme exists so that if more than one color bit is energized for the same LED the outcome can be anticipated. Red has highest priority, followed by amber then green. Only those LEDs that are configured to be controlled by Bits inside the PLC will be affected by the color elements.

User Keys

As discussed in section 3.5 the sixteen user keys may be configured as momentary pushbutton switches or as push-on/push-off switches. Word number four in the *Dialogue File* is reserved for use as a switch image register. The 9800 will frequently update the bits in this word to correspond to the action on the user keys.

This image shows the correlation between the switches and the switch image word bits.



The bit numbers are for reference only since memory configurations and designations vary between PLC brands. Bit 1 is always the least significant bit in the word, that is, the bit having the lowest binary weight. In some PLCs it may be references as Bit 0 or Bit 16. In some PLCs the bit numbers may be sequential numbered in octal or hexadecimal.

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Section 5: Run Mode

The effect the 9800's switches have on their assigned bits depends on how the switch is configured.

Configured as Selector Switch -

When the switch is pressed, the 9800 will compliment the state of the associated switch image bit. For example, if the switch image bit is energized and the switch is pressed, the bit will be de-energized by the 9800. If the bit is de-energized and the switch is pressed, it will be energized. This action produces the push-on/push-off selector switch effect.

Configured as Pushbutton Switch -

When the switch is pressed, the 9800 will energize the associated switch image bit. When the switch is released, the 9800 will de-energize the associated bit. This is typical of a standard discrete industrial pushbutton switch.

The 9800 will allow only one key to be activated at one time. If one key is held closed, then a second key is pressed, the second key will not be recognized. If the previously closed key is released the second key will be recognized.

Screen Triggering

A trigger is a means by which a screen is made to display. The 9800 has two screen trigger methods, Integer Trigger and Bit Trigger. Both trigger methods may be used simultaneously. The two trigger methods will be discussed separately.

Integer Triggers

To trigger a screen using the integer trigger method a value, which is the screen number, is written into one of the Dialogue File Integer trigger words. The 9800 provides four integer trigger words. These are words six, seven, eight, and nine. Each integer trigger word is independent. Any one or all may be used simultaneously; however, when using more than one integer trigger word care and planning is critical for success.

Using multiple integer trigger words can make the application program in the PLC simpler and easier to understand. In most applications there are multiple types of messages that need to be displayed. Some examples are: status, faults, instructions, setups, and maintenance messages. Providing multiple triggers allows these messages to be grouped, thus adding greater organization to the PLC's application program.

Each of the 9800's integer trigger words is structured as shown below.

Trigger Word Bit Number															
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
		Always Zero				Screen Number									
	Fault or Screen does not exist														
	Screen has been processed														

The bit numbers in the table above are for reference only since memory configurations and designations vary between PLC brands. Bit 1 is always the least significant bit in the word, that is, the bit having the lowest binary weight. In some PLCs it may be references as Bit 0 or Bit 16. In some PLCs the bit numbers may be sequential numbered in octal or hexadecimal.

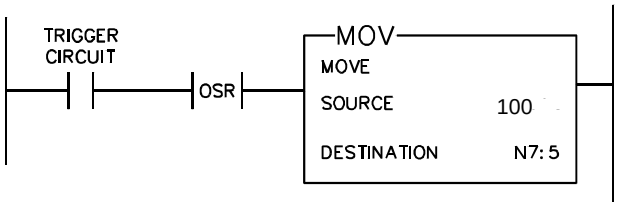
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Section 5: Run Mode

Since the screen number can not be greater than 722 only the ten least significant bits of the trigger words are used when a screen number is moved into it. The 9800 uses bits 15 & 16 to indicate status back to the PLC. The 9800 will set (energize) bit 16 when the screen specified by bits 1 through 10 has been accepted for display, stack, or printing. If the screen does not exist, or has syntax errors, then bit 15 will also be set.

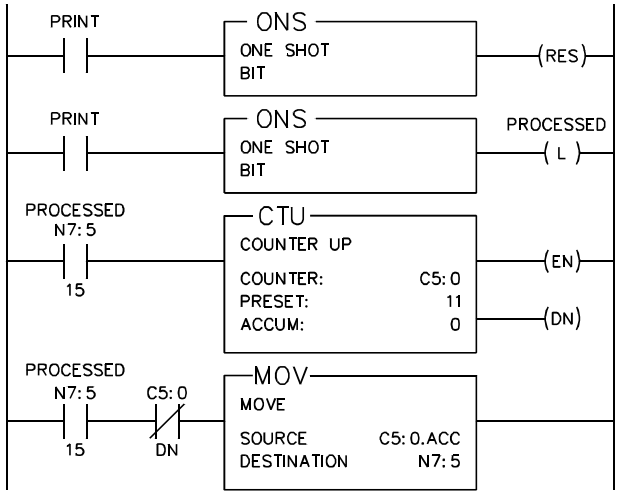
Displaying a screen is referred to as "opening a screen". Each time a new screen number is moved into a particular trigger word, that screen number will be recognized by the 9800 and the screen will become open. The new screen will overwrite any screen previously specified by that trigger word. Removing a currently displayed screen is referred to as "closing a screen". Only one screen may be open for each trigger word at any one time. It is possible to close a currently open screen without opening another to replace it. This is done by moving a value of zero into the trigger word.

The Allen-Bradley PLC-5 ladder logic below shows the basic circuit for triggering a screen using an integer trigger word. This circuit moves the constant value 100 into the integer trigger word. Notice that the move is configured as a one shot function. This is important so that the 9800 can modify trigger word bits 15 and 16.



Display screen 100

The Allen-Bradley PLC-5 ladder logic below assumes the 9800's *Dialogue File* is N7 and the integer trigger word used is N7:5. The Screen Processed Bit 16 (N7:5.15) will be used to allow a report to be printed. Ten screens (1 through 10) are chained together to form the report. Each screen will be triggered in sequence as fast as possible.



Start the report by resetting the counter.

Energize PROCESSED Bit on first scan.

Increment the screen number if previous screen is done printing.

If the previous screen has printed, and not all screens have been printed, then trigger the next screen.

RUNG 1 The process begins when the PRINT contact energizes (this could be controlled by an external switch or time clock). The one shot contact prevents counter C5:0 from being reset for more than one scan.

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RUNG 2 This will cause the counter to increment to one which is the first screen to be printed.

RUNG 3 Counter C5:0 is used to hold the screen number.

RUNG 4 If the previous screen has been processed and the counter accumulator is not equal to its preset then the accumulator value, which is the next screen number, will be moved into the trigger word. Moving the accumulator into the trigger word will also de-energize the processed bit, bit 16.

Bit Triggers

Screens may also be triggered using individual bits. The bits within Dialogue File words ten through 54 each correlate to a particular screen number. To trigger a screen simply energize the bit associated with the screen number you want to display.

The following table shows the association between screen numbers and bits.

	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Bit 13	Bit 14	Bit 15	Bit 16
Word 10	*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Word 11	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Word 12	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Word 13	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
Word 14	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Word 54	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719

Notice that trigger word 10, bit 1 does not have a screen number assigned to it. This bit is used to close any screen that was opened by a bit trigger. Furthermore, as long as trigger word 10, bit 1 is energized the 9800 will ignore all bit triggers.

The 9800 scans the bit trigger table starting from word ten, bit zero and continuing through bit sixteen of word 54 or the last word available, which ever is lower. If Bit trigger mode is not going to be used or if only a portion of the screens are to be bit triggered, the number of words created or specified for the Dialogue File should be reduced to only what is needed. This will improve the 9800,s response time.

As the 9800 scans the bit trigger table, the first off-to-on transition that is found will cause the associated screen to be displayed. Only one bit trigger screen may be open at any time, therefore, each time a new off-to-on transition is found the currently displayed screen will be closed prior to opening the new one.

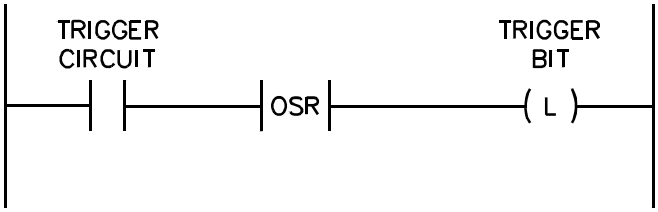
The 9800 maintains an image of the bit trigger table. Each time the table of bits is read from the PLC it is first compared to the image to detect off-to-on transitions, then it is saved as the new image.

Once a screen has been displayed it can not be opened again until its trigger bit has been detected in the de-energized state. When the 9800 detects an off-to-on transition it will acknowledge the acceptance of the trigger by attempting to de-energize the trigger bit in the PLC. If the trigger bit in the PLC is programmed as a standard coil the 9800 will not be capable of de-energizing the bit. If the coil is programmed as a latch and the controlling circuit is a one shot the 9800 will be able to unlatch the circuit. This is the recommended configuration since the initiating contact need only be energized for one PLC scan.

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Section 5: Run Mode

Typical Trigger Circuit



Programmer's Tool

Screen 722 is a special screen which allows access to any file within the PLC. Screen 722 can not be accessed by the screen editor. It can only be triggered by the integer trigger method. When screen 722 is triggered it will appear as shown below.

Any address that is available in the PLC may be accessed and the value of that address may be modified.

```
Address:O000:000      Format:HEX
Data   :0000
```

Caution!

This feature should be used only by individuals completely familiar with the application program resident in the PLC. Entering a value into an address without knowing what impact it might have on the operation of the PLC is very dangerous.

Transfer Date & Time to PLC

The 9800 contains a real time clock (TimeKeeper) that allows the date and time to be displayed within screens. Setting the Clock parameter to “YES” in the PLC Port setup screen (Section 3) will cause the clock/calendar data to be sent to the PLC. If the date and time is to be sent to the PLC, the Dialogue File must be configured with a minimum of twelve words. The date and time will be stored as BCD data in the last three words of the Dialogue File. **These last three words will not be interpreted as Bit Triggers.**

The date and time will be transferred to the PLC in Binary Coded Decimal (BCD) format.

	High Byte of Word	Low Byte of Word
Last Word minus two	Seconds [00-59]	Minutes [00-59]
Last Word minus one	Hours [00-23]	Day [01-31]
Last Word in Dialogue File	Month [01-12]	Year [00-99]

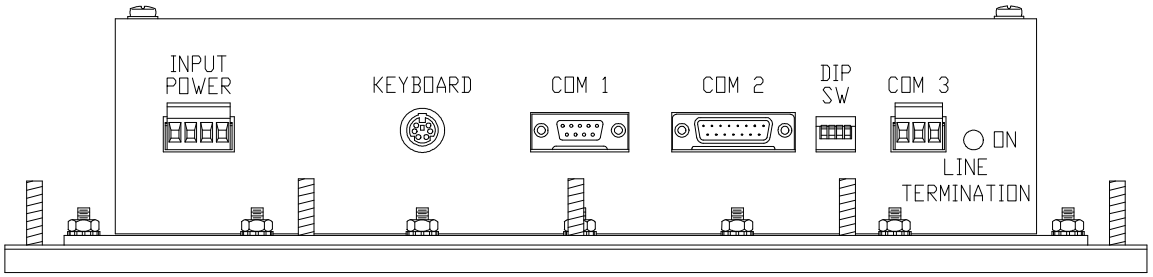
Notice!

The year parameter is transferred to the PLC as a two digit value. If this value is used within any calculation, or is used to initiate any operation or action it will not meet Year2000 compliance.

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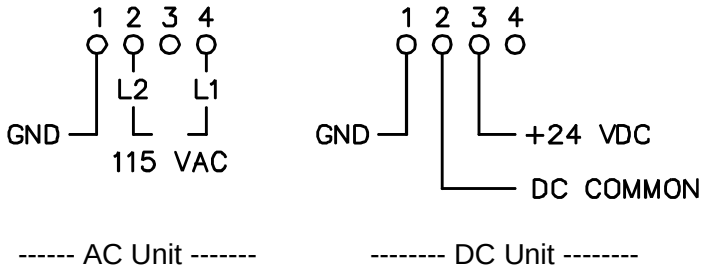
Appendix A: 9800 Access Plate

All connections to the 9800 are made through various connectors located at the bottom of the unit. DIP switches are also accessed through the bottom of the unit. This following diagram shows the placement of the various connectors and switches.



INPUT POWER

Power is provided to the 9800 through a four position removable terminal block. The following schematics show the connection required for both Ac and DC units.



------ AC Unit ------- -------- DC Unit --------

AT Keyboard Port

The keyboard port accepts a standard IBM compatible AT keyboard. This keyboard is used with the resident editor or for making selections and entering data while in RUN mode. This port can also be used as an input for bar coding devices.

Editor AT Function Keys assignments:

[F1]	Flash	[F6]	Resize Field
[F2]	Edit Screen Flags	[F7]	Add Field
[F3]	Edit Text	[F8]	Remove Field
[F4]	Edit Field Parameters	[F9]	Graphic Set
[F5]	Move Field	[F10]	Transmit Control Codes

To exit RUN mode from an AT keyboard press **[Ctrl] [Alt] [Delete]** together.

Serial Communication Port COM1

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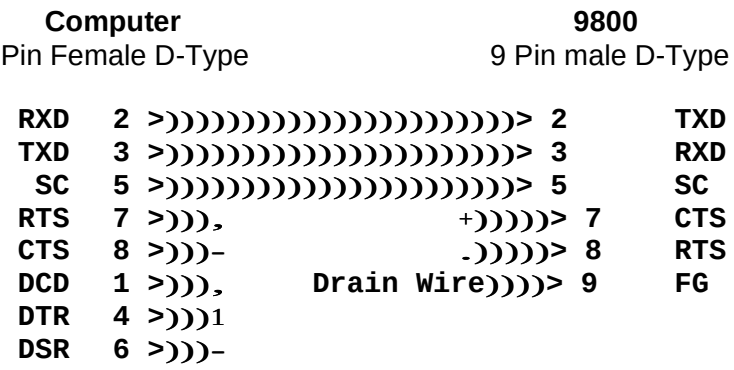
Appendix A: 9800 Access Plate

COM1 is provided through a nine pin female D-type connector. This is the interface to printers and computers for documenting an for uploading or downloading screen and setup files. This port uses RS-232C signal levels. The signal connections are shown below.

Pin 2	TXD Transmit Data, output	Pin 3	RXD Receive Data, input
Pin 7	CTS Clear To Send, input	Pin 8	RTS Request To Send, output
Pin 5	SC Signal Common	Pin 9	FG Frame Ground

Model 2126 Communication Cable

Used to load setup and screen files between the 9800 and personal computer



Serial Communication Port COM2

COM2 is provided through a 15 pin male D-type connector. This is the interface to a PLC. This port provides both RS-232C and RS-485 signal levels. The signal connections are shown below.

Pin 2	TXD	Transmit Data, RS-232 out	Pin 3	RXD	Receive Data, RS-232 in
Pin 4	RTS	Request To Send, RS-232 out	Pin 5	CTS	Clear To Send, RS-232 in
Pin 6	TXDA	Transmit Data, RS-485 out	Pin 12	RXDB	Receive Data, RS-485 in
Pin 14	TXDB	Transmit Data, RS-485 out	Pin 13	RXDA	Receive Data, RS-485 in
Pin 5	SC	Signal Common			
Pin 8	DC-	DC Common	Pin 15	DC+	Source Power
Pin 1	FG	Frame Ground	Pin 9	FG	Frame Ground

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Appendix A: 9800 Access Plate

Serial Communication Port COM3

COM3 is provided through a three position removable terminal block and is used to connect the 9800 to the Allen-Bradley PLC-5 and SLC500 DH+ network. For all other PLC driver types, this terminal is not present. The line termination switch is set ON when the 9800 is a physical end node on the DH+ network.

DIP Switch Assignments

The four position DIP switch accessible through the cover is associated with communication port COM2. The function of the individual switches is shown below.

Switch 1	240 ohm termination resistor for the RS-485 receiver.
Switch 2	240 ohm termination resistor for the RS-485 receiver.
Switch 3	Enable RS-485 interface
Switch 4	Enable RS-232 interface

Warning! **Switches 3 and 4 must not be set to the ON position at the same time. Do not change the setting of these switches while power is applied to the unit**

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Appendix B: Error Codes

The 9800 will display one of the following error messages if it encounters a configuration, communication, or hardware error it cannot recover from without the help from an operator.

- *RAM memory Fault!*
- *Keyboard did not respond!*
- *PLC board did not respond!*

These errors typically indicate hardware failure. If re-powering the unit does not correct the problem, repair may be necessary.

- *PLC comm fault!*
- *PLC card invalid command!*

These errors may occur due to excessive electrical noise or improper grounding. Action must be taken to correct the source of the problem.

- *Unit not setup for “PLC type”*
- *Dialogue file does not exist!*
- *Duplicate node on network!*
- *Cable disconnected!*
- *Invalid Dialogue File!*
- *PLC is Faulted!*
- *Unit not setup for this PLC!*
- *This PLC not supported!*
- *PLC in Program!*

These errors are configuration related. Action must be taken to correctly configure the 9800.

- *Not enough EEPROM to save screen!*

The following messages may be displayed in response to certain keystrokes. These are not fatal errors. The message will be displayed for a few seconds then the 9800 will resume operations.

- *Value entered is out of range!*
- *Invalid address entered!*
- *Screen irnage is invalid!*
- *Invalid lock data!*

Appendix C: Special Characters

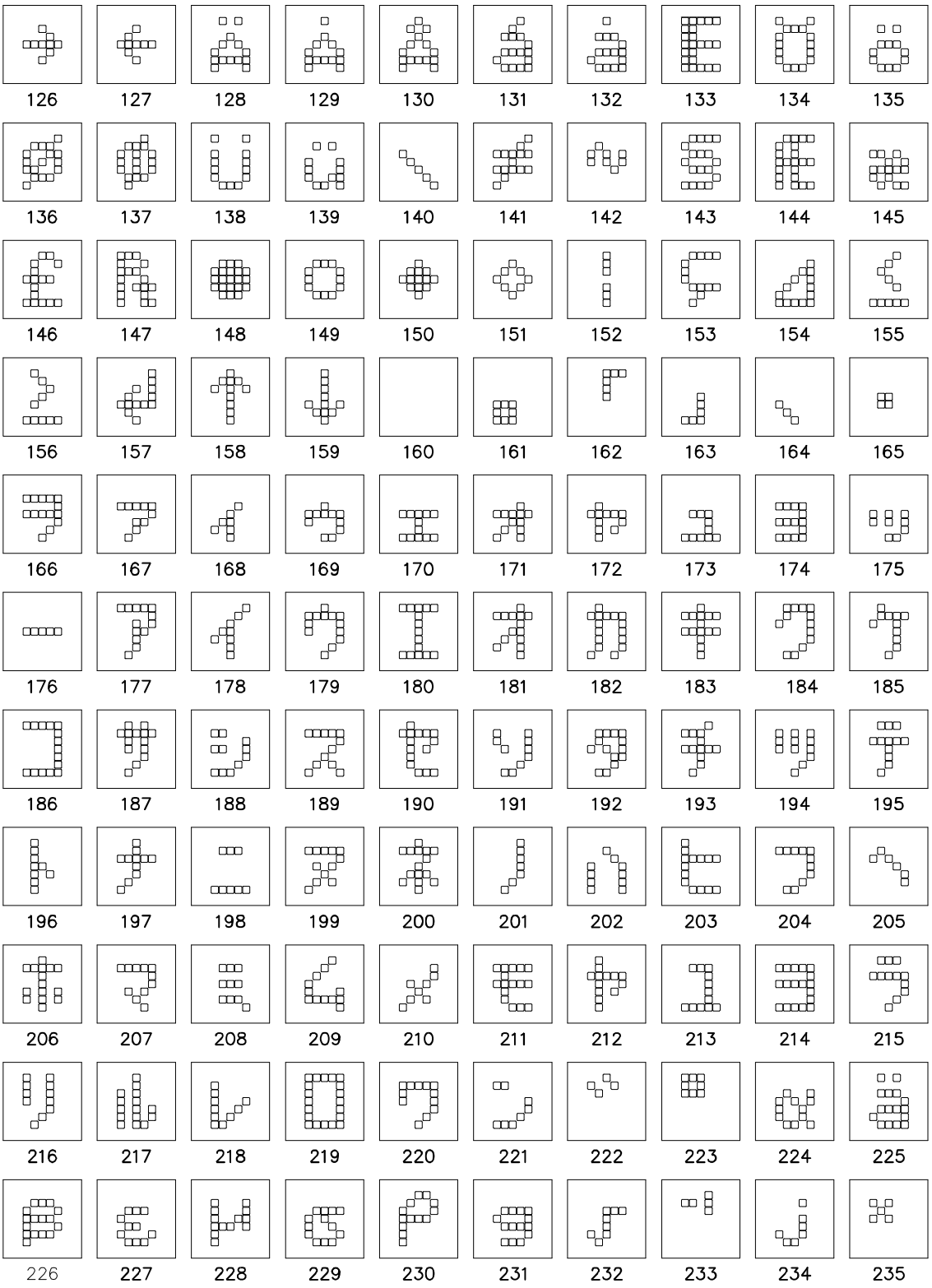
The 9800 provides over 100 special characters which may be used within any text string. The table on the following page shows the characters that are available. The number in parentheses indicates that this character may be selected. To access the character set using the 9800's built-in editor, press the **[F9]** key while editing a field. Once the special character set is displayed the cursor is moved to the desired character and the **[Enter]** key is pressed. Not all characters are available through the built-in editor.

When using the offline programming software all the characters in the table are available. To use the characters in a field you must enter the three digit decimal number found under the character. To enter the number, press and hold the [Alt] key, then type in the code using the "number pad" keys located on the right side of the computer's keyboard. When you release the [Alt] key the character will be inserted into the text. It is important to use the "number pad" keys, the number keys along the top of the keyboard will not work.

Many of the 9800's extended characters cannot be displayed on the computer's screen. If this is the case the computer will display '#'.

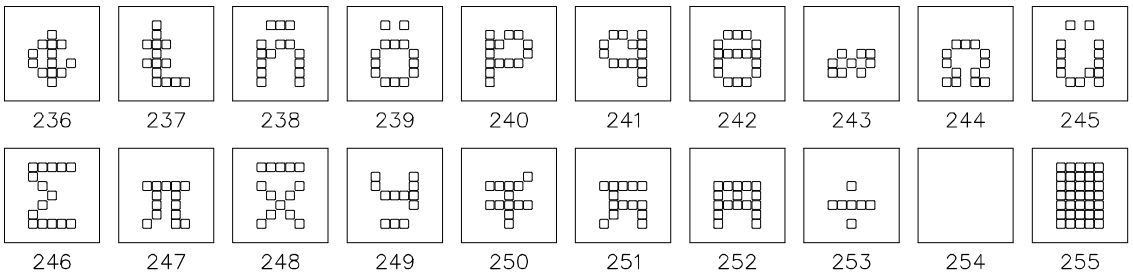
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Appendix C: Special Characters



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Appendix C: Special Characters

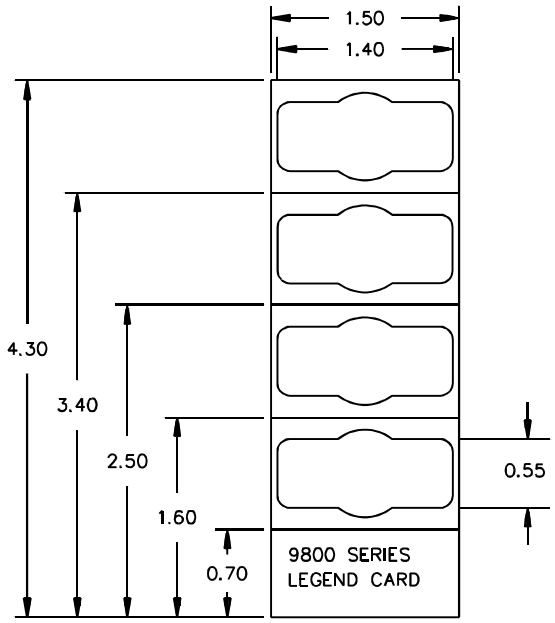


Appendix D: Legend Cards

Each of the 16 user keys has a 9/16" x 1 3/8" legend area which allows the user to label each key. A set of legend cards is included with the 9800. The legend cards are kept clean by inserting them into a 'see through' pocket within the polyester overlay.

To gain access to the pocket in the overlay, it is necessary to remove the keyboard assembly from the bezel. to do this, remove the eighteen, No. 6 Keps Nuts from the rear of the overlay backing plate. The keyboard assembly can then be removed from the bezel.

Four legend card pockets are open at the bottom edge of the overlay. After labeling each legend card, carefully cut it to size and insert it into the correct pocket. Assemble the overlay to the bezel in the reverse order as removal.



Thickness: 0.010 inches

Quartech can provide custom legend cards produced to your specifications. Custom graphics and color may be included in each legend. Contact Quartech Customer Service for price and delivery.

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Appendix E: Special Screens

Screen 0 User identification on power up. See Section 1, page 3.

Screen 720 Screen stack status. See Section 5, page 24 .

Screen 722 Programmers Tool. See Section 5, page 30.

Appendix F: Installation

The 9800 is designed to be mounted in the door of an enclosure or on an operators console for ease of use. A template is provided to assist in the drilling and cutting of the mounting holes for the unit. Care should be taken to protect the unit from metal chips and conductive particles. Failure to protect the unit may cause damage when power is applied and may void warranty.

A minimum clearance of six inches should be kept between the unit and any other device that generates heat. In the event that the internal enclosure temperature periodically exceeds 55 degrees Celsius (131 degrees Fahrenheit), fans or a purge air system should be used to increase the air flow, and eliminate "Hot Spots" that occur within the panel.

Specifications:

Display:	80 character (40x2) Vacuum Fluorescent Display, blue/green color. 5mm character height
Keypad:	32 tactile feedback keys rated for one million operations.
Memory:	EEPROM, 128,000 bytes, 719 screens max
Com1 Communications	RS-232, Peripheral Interface
Com2 Communications	RS-232 & RS-485 software selected, PLC Interface
Com3 Communication	SDLC, Optional PLC Interface
AC Electrical	115 VAC, ±10%, 50/60 Hz, @ ½ Amp
DC Electrical:	24 VDC, ±5%, @ 1 ½ Amp
Temperature:	0°c to +55°c Operational, -20°c to +70°c Storage
Humidity	10% to 95%, Non-condensing, Operational or storage
Vibration/Shock:	0.5mm displacement (X,Y,Z axis), 10-55Hz, 40G shock
Weight:	12 pounds
Mounting:	Maintains NEMA 4 and NEMA 12 enclosure rating. Optional NEMA 4X

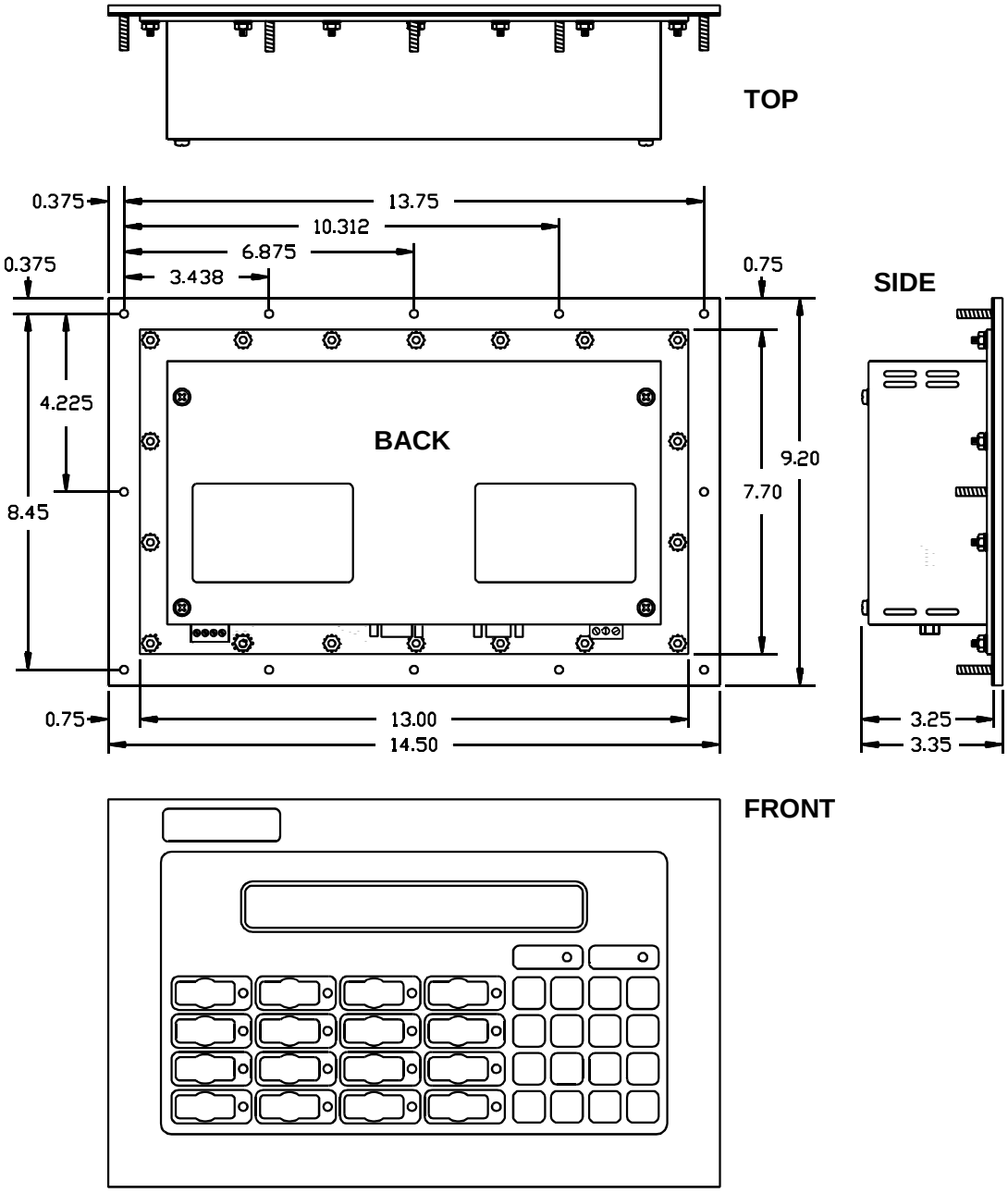
Wiring Considerations

Care should be taken when routing DC power supply wires and the communication cable. Follow these guidelines for a trouble free installation. The DC power lines and communication cable must be kept away from AC power lines. Keep both at least one foot away from 115 VAC lines, and two feet away from higher voltage lines. This especially applies to the communication cable. If the cables must cross AC power lines, cross them at right angles (90°). Keep the cables away from sources of high energy fields such as arc welders, AC motors, motor starters, servo controllers, generators, induction heaters, and transformers.

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Appendix F: Installation

Mechanical Dimensions



Mounting studs are number 10-24. Mounting hardware is included.

All dimensions in inches

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Appendix G: Allen-Bradley Drivers

Allen-Bradley Dialogue File

The following tables show the Dialogue File structure when the 9800 is used with a PLC-5 or SLC500 processor.

Dialogue File
NXXX is the Integer File number assigned.

ADDRESS	FUNCTION
NXXX:000	Command Register
NXXX:001	Green LEDs
NXXX:002	Amber LEDs
NXXX:003	Red LEDs
NXXX:004	Switch Image
NXXX:005	Integer Trigger One
NXXX:006	Integer Trigger Two
NXXX:007	Integer Trigger Three
NXXX:008	Integer Trigger Four
NXXX:009 : NXXX:057	Bit Trigger Blocks & Clock/Calendar

Command Register
NXXX is Dialogue File number assigned.

ADDRESS	BIT	FUNCTION
NXXX:000	0	Lock Edit keys
NXXX:000	1	Lock User keys
NXXX:000	2	Window Field Lock
NXXX:000	3	Edit keys C_Locked
NXXX:000	4	User Keys C_Locked
NXXX:000	5	Window Field C_Locked
NXXX:000	6	Invalid Combination Entered
NXXX:000	7	Display Stack Screen
NXXX:000	8	Stack Request
NXXX:000	9	Stack is empty
NXXX:000	10	Stack is full
NXXX:000	11	Help key
NXXX:000	12	Value Modified
NXXX:000	13	Clear Stack
NXXX:000	14	
NXXX:000	15	Communication Active Flag

Allen-Bradley DH+ Interface

The 9800 offers a Data Highway Plus (DH+) interface for communicating with PLC-5 and SLC504 processors. The 9800 can communicate on the DH+ network along with other 9800's, other Quartech products, programmers, and any other devices that strictly follows the DH+ protocol. The 9800 must be assigned to a host PLC which is the PLC that its Dialogue File is located in. The 9800 can also display data from other PLCs within the network, however, they must be in the same processor family, i.e., PLC-5 or SLC500 as the host processor.

The physical connection between the 9800 and DH+ network is through the Peer Communication Interface. The 9800 provides a three position terminal block for making the physical connection. The communication cable must be twinaxial cable (Belden type 9463 or equivalent). When multiple devices are to share the Data Highway Plus network the physical data highway cabling must conform to specific rules. For in-depth information please refer to the Allen-Bradley Data Highway Cable Assembly and Installation Manual (Publication 1770-6.2.1).

A DH+ network is constructed with a main trunkline and optional droplines. A terminating resistor must be connected at each end of the trunkline to provide proper line loading thus reducing signal interference. Devices intended for use on the DH+ network must include, as part of their interface hardware, a line terminating resistor and a method for switching it in or out of the circuit. The line termination switch on the 9800 enables the termination resistor when set **ON**.

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Appendix G: Allen-Bradley Drivers

Allen-Bradley DF1 Interface

This 9800 offers a DF1 interface for communications with the PLC-5 and SLC500 processors. The DF1 port uses RS-232 signal levels and is intended for point to point communications, i.e., only a single peripheral device may be connected to the DF1 port.

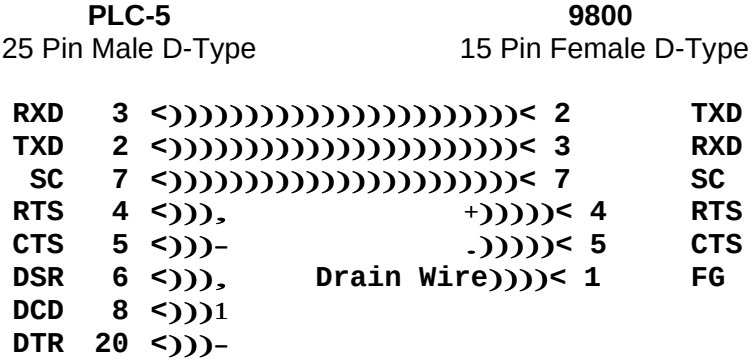
PLC-5 processor configuration

Use Allen-Bradley programming software to configure the PLC-5 processor as shown below.

System Mode (DF1 Point to Point)		*Channel 0 Configuration*	
Diag. file:	0		
Remote mode change:	DISABLED	System mode char.:	S
Mode attention char.:	\0x1b	User mode char.:	U
Baud Rate:	19200	Parity:	NONE
Stop bits:	1		
Control line:	NO HANDSHAKING		
Duplicate Detect:	OFF	Error Detect:	CRC
ACK Timeout (20 ms):	500	NAK Retries:	3
		ENQ Retries:	3

The following schematic shows the cable connections required between the 9800 and the PLC-5 DF1 port. This cable is available from Quartech in a standard length of ten feet. Cables up to fifty feet in length may be ordered.

Allen-Bradley PLC-5 DF1
Quartech Part Number: 2139-10



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Appendix G: Allen-Bradley Drivers

SLC500 processor configuration

Use Allen-Bradley programming software to configure the SLC500 processor as shown below.

System Mode Channel 0 Configuration

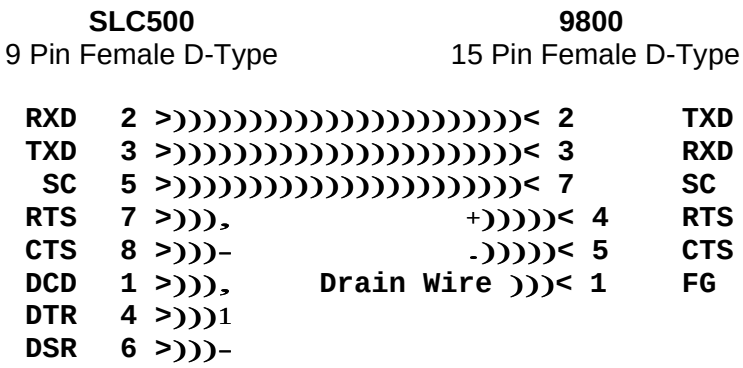
Baud Rate:	19200	Parity:	NONE
Duplicate Detect:	DISABLED	Error Detect:	CRC
ACK Timeout [x20 ms]:	500	NAK Retries:	3
		ENQ Retries:	3
Control Line:	NO HANDSHAKING	Embedded Response:	ENABLED

The baud rate for the SLC500 and the 9800 may be set to 9600, however, 19200 is recommended.

The following schematic shows the cable connections required between the 9800 and the SLC500 DF1 port. This cable is available from Quartech in a standard length of ten feet. Cables up to fifty feet in length may be ordered.

Allen-Bradley SLC500 DF1

Quartech Part Number: 2136-10



DF1 DIP Switch Settings

DIP switches one and two are not used on this unit. For a proper communication configuration, DIP switch 3 must be OFF and DIP switch 4 must be ON. The 9800 is shipped from the factory with the DIP switches set to the proper state, they should not be changed.

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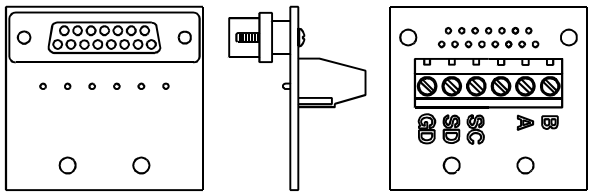
Appendix G: Allen-Bradley Drivers

Allen-Bradley DH485 Interface

The 9800 offers a DH485 Data Link network interface for communication with the Allen-Bradley SLC500 processor. The 9800 can communicate on the DH485 network along with other 9800's, other Quartech products, programmers, and any other devices that strictly follows the DH485 protocol. The 9800 must be assigned to a host PLC which is the PLC that its Dialogue File is located in. The 9800 can also display data from other PLCs within the network.

When connecting multiple devices on the network an Allen-Bradley 1747-AIC Isolated Link Coupler should be used between the SLC500 processor and the physical network. The 9800 is connected to the network through the Quartech 9105 Network Link Adapter.

Model 9105
Network Link Adapter



When connecting a single 9800 to a SLC500 processor a direct connection through the eight pin phone jack on the front of the processor may be preferable. The following schematic shows the cable connections required between the 9800 and the SLC500 DH485 port. This cable is available from Quartech in a standard length of ten feet. Cables up to fifty feet in length may be ordered.

Allen-Bradley SLC500 DH485
Quartech Part Number: 2114-10

SLC500 8 Pin RJ45		**9800** 15 Pin Female D-Type	
RxTxB	**1**	**12**	**RxTxB**
RxTxA	**2**	**13**	**RxTxA**
SC	**7**	**7**	**SC**
Send/Rec	**5**	**8**	**Send/Rec**
		4	**RTS**
		5	**CTS**
	Drain Wire	**1**	**FG**

DH485 Network Basics

The DH485 Data Link network uses a multiple master, token passing protocol. For this protocol, the devices on the network form a logical ring; that is, the devices assume an ordered sequence, with the last device in the sequence followed by the first. Each device knows the node address of the device following it (its successor). The physical ordering of the devices on the network is irrelevant and independent of the logical ordering.

Each device on the network has the responsibility of periodically granting an opportunity for new devices to enter the network. Any time there exists a gap between a given device address and its successor's address, that device must periodically issue a "solicit successor" message to each potential node address between itself and its successor. The solicit successor message allows an opportunity for a new device to enter the network.

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Appendix G: Allen-Bradley Drivers

A total of 32 devices may share the DH485 Data Link network. When only a few devices are sharing the network the soliciting time can become considerable. To reduce unnecessary soliciting, a maximum poll address may be assigned in the 9800 and most other devices designed for use on the network. The 9800, and other devices utilizing this feature, will send a "solicit successor" message only to those device addresses that are in the gap between itself and its successor, and have an address less than or equal to its maximum poll address. Use of the maximum poll address can relieve the device with the highest node address from the burden of soliciting a large number of unused node addresses.

Choosing Device Node Addresses

It is imperative that each device on the network is assigned a unique node address. For best performance start node addresses at zero and increase sequentially, with no gaps between successive addresses. It is not important which device is assigned which address. The device with the highest address on the network should have its maximum poll address set equal to its own address.

For example: A DH485 network might include one SLC500, one programmer, and one 9800. Assigned node addresses could be as shown below.

< 9800 node address = 00
< Programmer node address = 01
< SLC500 node address = 02. Max. poll address = 02.

The network described above was set up for best performance. Sometimes it is desirable to leave gaps between devices addresses so that other devices can be easily added after the data link has been initialized. This is acceptable, however, it will result in a reduction of performance since some device will have to issue a solicit successor message to each unused address in the gap. If a gap is left it should be as small as possible to reduce the link initialization time. A gap of even one address will reduce network performance.

Transmission Lines

The DH485 Data Link network is designed to be wired in a point-to-point fashion. All devices are wired in-line, one after another, forming a single trunk line. Drop lines off the main trunk line are not recommended and may degrade or prevent network operation. As the trunk line length increases two factors become increasingly important. These factors are line resistance and line capacitance. In most applications the use of line terminating resistors will improve or allow satisfactory performance. Two terminating resistors are required for a network regardless of the number of devices in the network. One terminating resister is connected at each end of the network. The 9800 includes a terminating resistor that is switched into to the circuit by closing DIP switches 1 and 2 accessible through the cover. If the 9800 is at either end of the network this switch should be closed. Devices which are not at either physical end of the network must not have termination resistors switched into the circuit.

DH485 DIP Switch Settings

DIP switches one and two are used to enable the termination resistors. Line termination is required to reduce signal reflections on a transmission line which are caused primarily by capacitive loading. Line termination becomes increasingly important as baud rate and length increase. In most applications Dip switch one and two may be set on.

Notice: If enabling termination, both DIP switch 1 and 2 must be set ON. Turning only one switch ON will result in improper line termination.

For a proper communication configuration, DIP switch 3 must be ON and DIP switch 4 must be OFF.

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Appendix H: GE Fanuc Drivers

GE Fanuc Series 90 Dialogue File

The following tables show the Dialogue File structure when the 9800 is used with a Series 90 processor.

Dialogue File

Register (%R)	FUNCTION	Coil (%M, %T, %G)
%R0	Command Register	0 - 15
%R1	Green LEDs	16 - 31
%R2	Amber LEDs	32 - 47
%R3	Red LEDs	48 - 63
%R4	Switch Image	64 - 79
%R5	Integer Trigger One	80 - 95
%R6	Integer Trigger Two	96 - 111
%R7	Integer Trigger Three	112 - 127
%R8	Integer Trigger Four	128 - 143
%R9 : %R56	Bit Trigger Blocks & Clock/Calendar	144 : 911

Command Register

BIT	FUNCTION
0	Lock Edit keys
1	Lock User keys
2	Window Field Lock
3	Edit keys C_Locked
4	User Keys C_Locked
5	Window Field C_Locked
6	Invalid Combination
7	Display Stack Screen
8	Stack Request
9	Stack is empty
10	Stack is full
11	Help key
12	Value Modified
13	Clear Stack
14	
15	Communication Active

GE Fanuc Series 90 Interface

The 9800 communicates with the Series 90 processor, through its programming port, using the Series Ninety Protocol (SNP). Communication parameters are fixed, at 19.2k baud, 8 data bits, odd parity, and 1 stop bit.

Communication Network

The Series Ninety Protocol allows for a single master / multiple slave communication network. The 9800 is always a master device, and the PLC is a slave. Using the PLC Port Setup function, you may set the CPU ID (i.e. the "name") of the host PLC where the 9800 Dialogue File will reside. Using ScreenMaker 9000 offline programming software, you can provided the 9800 with the CPU ID of other PLCs that may be on the network. The 9800 can then read and write data in those PLCs.

If the 9800 is NOT used on a network, its CPU ID should be set to <NULL>. This will allow it to communicate with any PLC, regardless of that PLC's name.

Series 90 DIP Switch Settings

DIP switches one and two are used to enable the termination resistors. Line termination is required to reduce signal reflections on a transmission line which are caused primarily by capacitive loading. Line termination becomes increasingly important as baud rate and length increase. In most applications Dip switch one and two may be set on.

Notice: If enabling termination, both DIP switch 1 and 2 must be set ON. Turning only one switch ON will result in improper line termination.

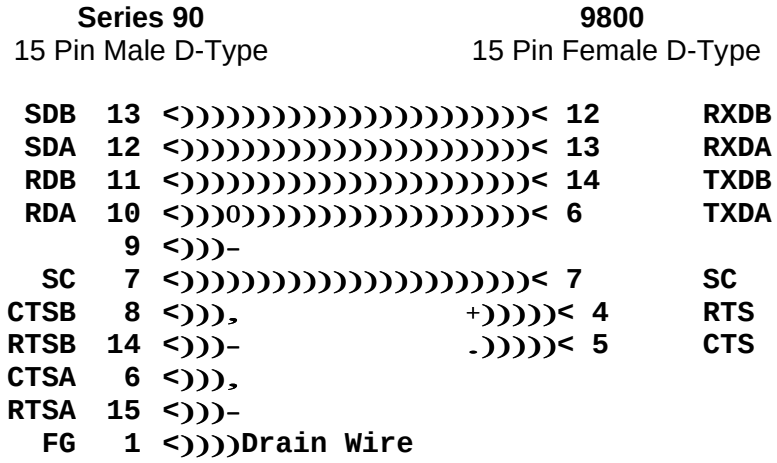
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Appendix H: GE Fanuc Drivers

For a proper communication configuration, DIP switch 3 must be ON and DIP switch 4 must be OFF.

The following schematic shows the cable connections required between the 9800 COM2 port and the Series 90 communication port. This cable is available from Quartech in a standard length of ten feet. Cables up to fifty feet in length may be ordered.

GE Fanuc Series 90
Quartech Part Number: 2150-10



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Appendix J: Modicon Drivers

Modicon Dialogue File

The following tables show the Dialogue File structure when the 9800 is used with a Modicon processor.

Dialogue File
XXXX is the First Register Address

ADDRESS	FUNCTION
XXXX +0	Command Register
XXXX +1	Green LEDs
XXXX +2	Amber LEDs
XXXX +3	Red LEDs
XXXX +4	Switch Image
XXXX +5	Integer Trigger One
XXXX +6	Integer Trigger Two
XXXX +7	Integer Trigger Three
XXXX +8	Integer Trigger Four
XXXX +9 : XXXX +56	Bit Trigger Blocks & Clock/Calendar

Command Register
XXXX is the Dialogue File Address.

ADDRESS	BIT	FUNCTION
XXXX	16	Lock Edit keys
XXXX	15	Lock User keys
XXXX	14	Window Field Lock
XXXX	13	Edit keys C_Locked
XXXX	12	User Keys C_Locked
XXXX	11	Window Field C_Locked
XXXX	10	Invalid Combination Entered
XXXX	9	Display Stack Screen
XXXX	8	Stack Request
XXXX	7	Stack is empty
XXXX	6	Stack is full
XXXX	5	Help key
XXXX	4	Value Modified
XXXX	3	Clear Stack
XXXX	2	
XXXX	1	Communication Active Flag

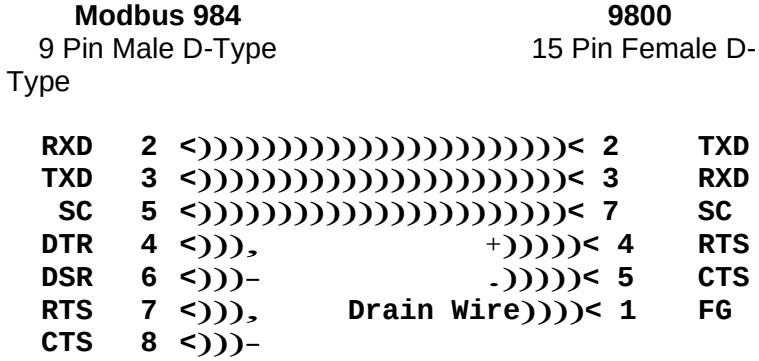
Modicon Modbus Interface

The 9800 communicates with the Modicon processor, through its programming port, using the Modbus RTU Protocol. Communication parameters are shown below.

RS-232 Signal Levels, Baud Rate = 9600 or 19200, RTU, 8 Data, 1 Stop, Even Parity

The following schematics show the cable connections required to connect the 9800 to various PLC models. These cables are available from Quartech in a standard ten foot length. Cables up to fifty feet can be provided.

Modicon Modbus 984
Quartech Part Number: 2116-10



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Appendix J: Modicon Drivers

Modicon Micro
Quartech Part Number: 2151-10

Micro 8 Pin RJ485			9800 15 Pin Female D-Type	
RXD	4	<)))))))))))))))))))))))))))<	2	TXD
TXD	3	<)))))))))))))))))))))))))))<	3	RXD
SC	5	<)))))))))))))))))))))))))))<	7	SC
RTS	6	<)))¸	+)))))<	4 RTS
CTS	7	<)))–	-)))))<	5 CTS
		Drain Wire)))))<	1	FG

Multiple Quartech devices may communicate through a single Modbus port by using the Quartech 8517 Port Multiplexer. The following schematic shows the cable required to connect the 9800 to a Quartech model 8517 port multiplexer. This cable is also available from Quartech. If the 9800 is located greater then fifty feet from the PLC or multiplexer then the Quartech Model 9104 RS-232 to RS-485 converter may be used.

Quartech Part Number: 2116-10

8517 15 Pin Male D-Type			9800 15 Pin Female D-Type	
RXD	2	<)))))))))))))))))))))))))))<	2	TXD
TXD	3	<)))))))))))))))))))))))))))<	3	RXD
CTS	4	<)))))))))))))))))))))))))))<	4	RTS
RTS	5	<)))))))))))))))))))))))))))<	5	CTS
SC	7	<)))))))))))))))))))))))))))<	7	SC
FG	14	<)))) Drain Wire		

Modbus DIP Switch Settings

DIP switches one and two are not used on this unit. For a proper communication configuration, DIP switch 3 must be OFF and DIP switch 4 must be ON. The 9800 is shipped from the factory with the DIP switches set to the proper state, they should not be changed.

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