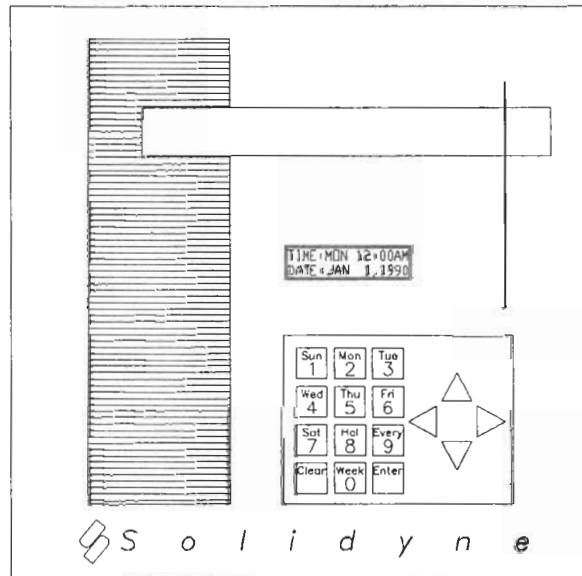




XL9600™

Building Automation System

Operating Manual



Form: #ZI-1223/3

INTRODUCTION

How To Use This Manual

This manual will introduce you to the XL9600™ Building Automation System.

It will describe the capabilities of the controller and will show you how the system is programmed and installed. Even if you are experienced in the installation of other similar controls, we recommend that you read this manual carefully before beginning installation.

Chapter 1 provides an overall system description and a detailed listing of electrical and environmental specifications.

Chapter 2 covers the fundamentals of working with the controller, describing the various parts of the system.

Chapter 3 describes the basic operation of the XL9600 display and keypad.

Chapter 4 covers basic programming and keystroke sequences.

Chapter 5 covers entry of setpoint programs.

Chapter 6 covers power up.

Chapter 7 lists accessories.

RECOMMENDATION: Before reading chapters 2 through 5 you may want to unpack the controller and apply power to it. This will allow you to use the XL9600 to practice the keystroke sequences as you read the manual. Instructions on how to properly unpack and apply power to the controller are contained in Chapter 6.

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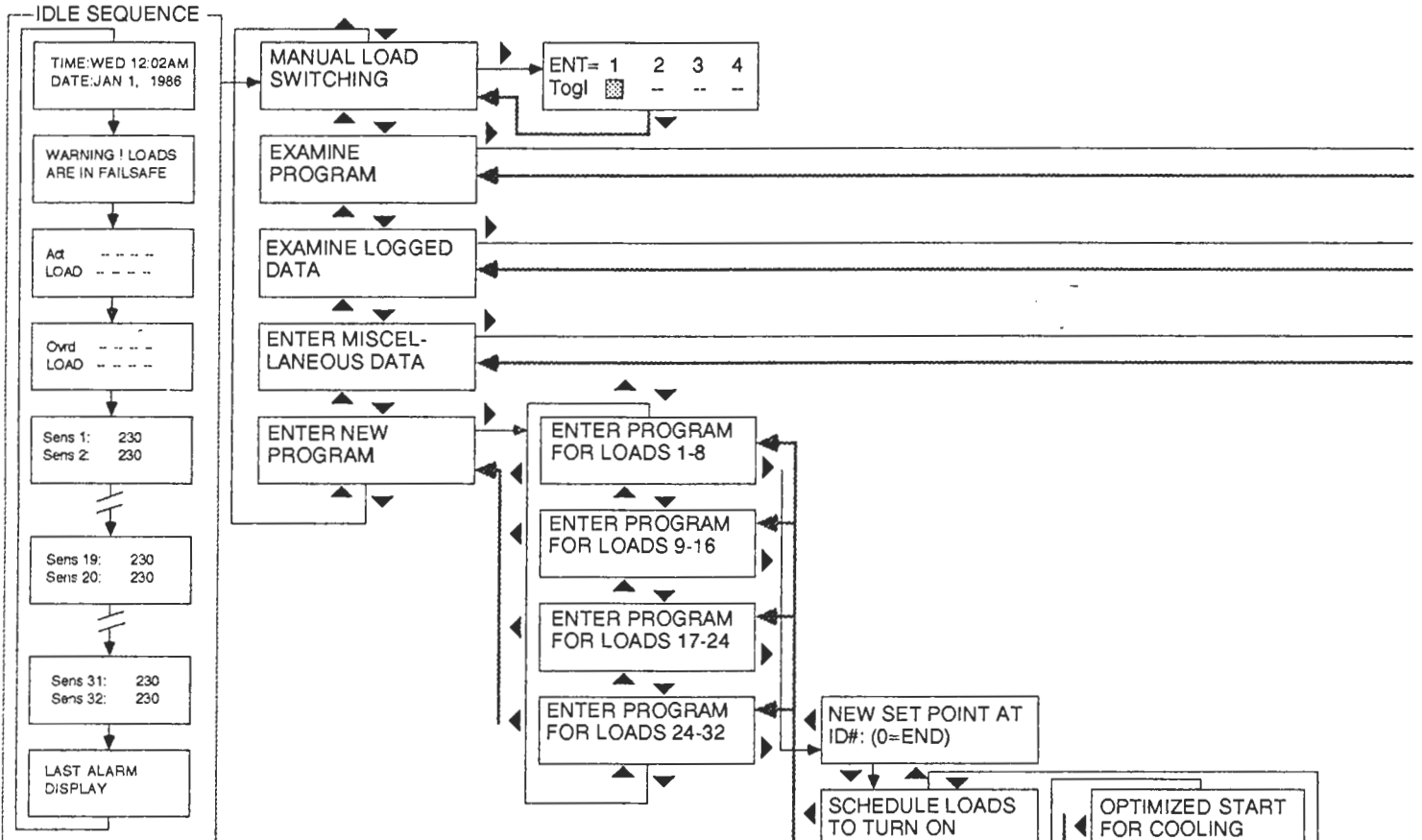
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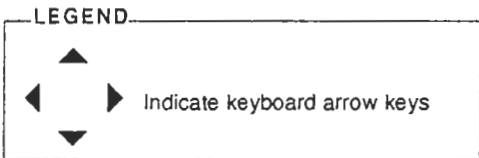
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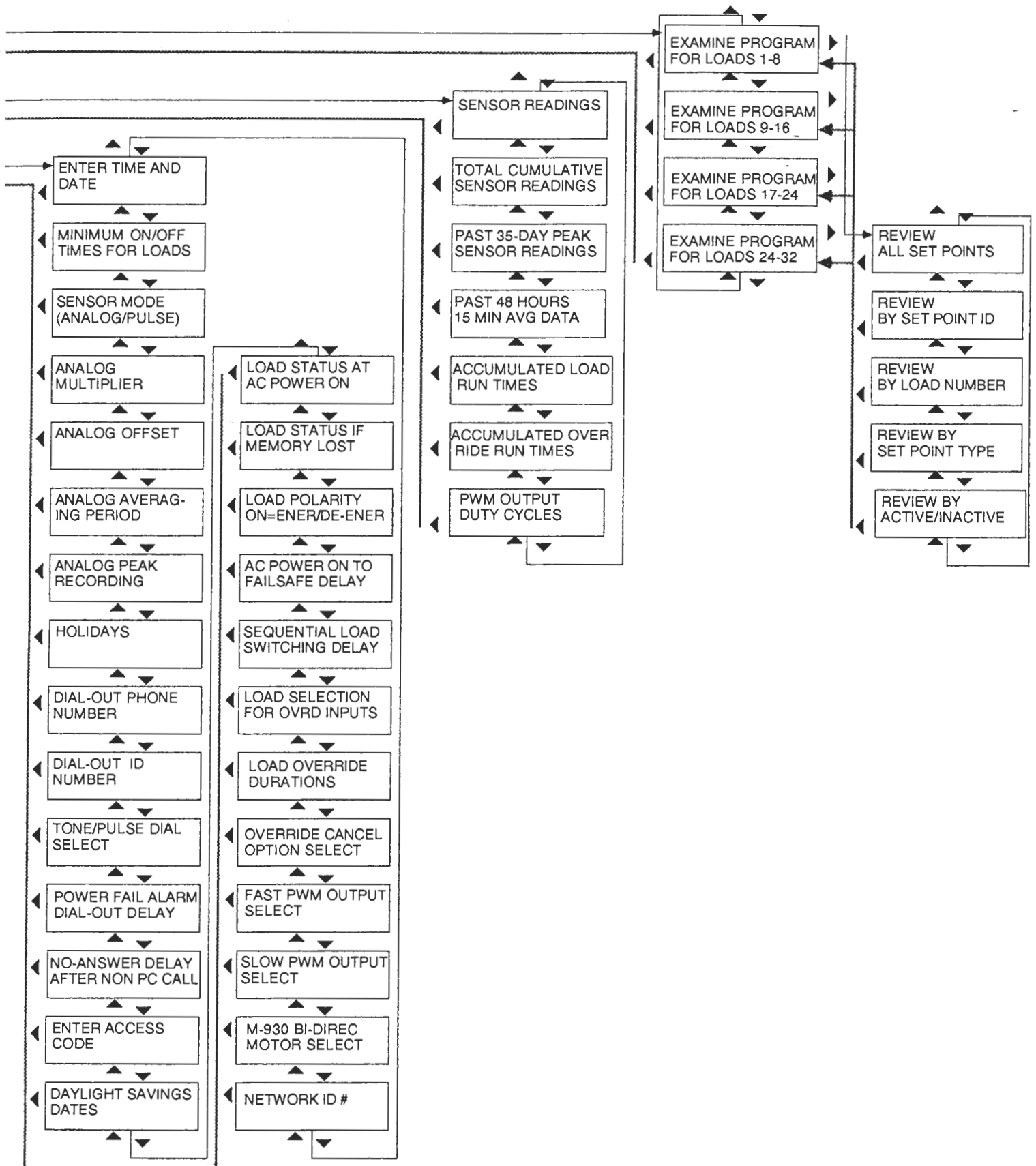
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Press any key to leave idle sequence

XL9600 Programming Quick Reference





1. XL9600 DESCRIPTION AND SPECIFICATIONS

1.1. DESCRIPTION and FEATURES

The XL9600 is a stand alone or networkable microprocessor based controller designed to meet the building automation needs of small to medium size facilities. The functions and capabilities of the XL9600 controller are beyond those of any other controller in its class. Its flexible, functional design allows it to grow with the needs of any application.

The basic XL9600 controller provides 32 analog inputs, 32 digital inputs and 32 output channels (analog or digital). The system also offers the following features:

Control Functions:

- Conventional and temporary time-of-day ON/OFF scheduling.
- Seconds-ON output function for momentary pulse, ringing bells, etc.
- Conventional or automatic rotating load (staggered) duty cycling.
- Digital inputs which can accommodate any type of open/close signal.
- Analog inputs which can accommodate any type of sensing devices.
- Adaptive (self-adjusting) duty cycling controlled by any one of the analog inputs.
- Analog-controlled ON/OFF scheduling.
- Adaptive (self-adjusting) analog control for boiler or chiller reset control.
- Adaptive (self-learning) optimum start/stop functions for heating & cooling.
- Pulse Width Modulated (PWM) Output for DDC (Direct Digital Control).
- Analog enable to Activate/De-activate selected setpoints.

Other Features:

- Analog input averaging (using sliding window) over a selected time period.

- Minimum ON/OFF times for any load. Maximum ON/OFF times can also be assigned to loads when using Analog Control functions.
- 365 Day programmability for holiday dates.
- Programmable daylight savings time/date and automatic correction for Leap year.
- Automatic self-initialization after power failure or new time entry.
- Alarm dial-out.
- Power off Alarm dial-out with optional 12 volt battery.
- Pneumatic output interface.
- Security access code.
- Analog output features.
- Network up to eight XL9600's to give 256 analog inputs, 256 digital inputs and 256 outputs (analog or digital).

Extensive data gathering:

- Run times of all outputs recorded up to 10,000 hours.
- Each day's high or low peaks for last 35 days recorded for all 32 analog inputs.
- All 32 analog inputs will record 48 hour, 15 minute averaged readings.
- Analog time accumulation for all 32 analog inputs up to 99,999,999.
- Remote Communication Option to receive or transmit to remote personal computer. Mouse-driven graphics software available as PDC-832(G).
- Resettable and Floating Pulse-Width-Modulated (PWM) Outputs for use with Analog Output Modules generating 4-20ma, 0-10VDC and 0-18PSI.
- Multiple Phone Number Alarm Dial-Out
- Multiple Level Access Code
- Global Override of Loads and Setpoints
- Load Toggle, Alarm & Dial-Out based on Run-Time (Future Release)

1.2. SPECIFICATIONS

1.2.1 General

Description: The XL9600 is a microprocessor based load controller incorporating standard programmed control functions and data acquisition. The standard configuration provides 32 analog inputs, 32 digital inputs and 32 outputs (analog or digital). Outputs can be used to control 32 individual loads. Up to 8 units can be networked together to provide 256 analog inputs, 256 digital inputs and 256 outputs (analog or digital). Input sensors or transducers, and output modules are not provided with the controller and must be obtained separately.

The following **Analog** and **Digital Input** modules are currently available for the XL9600 System:

- **S3282S** - Wall mount temperature sensor (Current type)*
- **S3282G** - Duct mounted temperature sensor (Current type)*
- **S3282Q** - Outdoor air temperature sensor (Current type)*
- **S3276** - Outdoor ambient light (Voltage type) and air temperature sensor (Current type)*
- **S3278** - Motion detector (Dry contact)

The following **Digital Output** modules are currently available for the XL9600 System:

- **R25-8** - 8 Channel (25 amp) relay panel
- **R25-S** - Single Channel (25 amp) satellite relay module (For use with R25-8)

The following **Input/Output** modules are currently available for the XL9600 System:

- **TS-1** - Single Channel Thermostat and Control module with on-board temperature sensor (Current type)* and thermostat switch position status capability.
- **TS-3** - 3 Channel Automatic Heat/Cool Switchover Thermostat and Control module with on-board temperature sensor (Current type)*, duct sensor connector and thermostat switch position status capability.

- **TS-6** - 6 Channel Automatic Heat/Cool Switchover Thermostat and Control module with on-board temperature sensor (Current type)*, duct sensor connector and thermostat switch position status capability.
- **TS-3M** - 3 Channel Manual Heat/Cool Switchover Thermostat and Control module with on-board temperature sensor (Current type)*, duct sensor connector and thermostat switch position status capability.
- **TS-6M**- 6 Channel Manual Heat/Cool Switchover Thermostat and Control module with on-board temperature sensor (Current type)*, duct sensor connector and thermostat switch position status capability.

* Current type sensors do not have a wiring distance limitation.

Input power: 12 VAC \pm 10%, 50/60 Hz

Average power consumption: 24 VA

Processor: 6303X (Hitachi CMOS)

Battery protected memory: 32K RAM

Battery back-up: Internal "Gel-Cell" battery provides 48 hours of battery back-up depending on level of charge.

Back-up memory: Electrically Erasable Programmable (EEPROM) type. 128 bytes used to hold failsafe information in case of RAM memory loss.

Real time clock: Synchronized to 60 (or 50) Hz power input frequency during regular operation. Controlled by internal crystal-based clock (\pm 15 seconds per day) during battery operation.

Operating system memory: 46K ROM

Serial interface: RS-232 standard signal levels. Can be used to interface with Solidyne MOD-6 Hayes-compatible modem or direct connect to a personal computer. Transmit, Receive and Common lines are all optically isolated. The LAN system communicates at 1200 baud.

1.2.2 Input and Output Specifications

Number of analog input channels: 32

Analog sensor input range: The inputs can accept either a voltage or a current input. This is selectable via a jumper on the power supply board.

When setup for voltage, an input of "2.415" VDC is read as a value of "-25" by the controller. A voltage input of "3.832" VDC is read as a value of "230". If a voltage input is shorted to common, the controller will read "-25" at that input. If a voltage input is open, the controller will read "230". Wiring distance is limited to 2000 feet with 18 AWG wire.

When setup for current, an input of $241.3 \mu\text{A}$ is read as a value of "-25". A current input of $380 \mu\text{A}$ is read as "230". If a current input is shorted to common, the controller will read "230" at that input. If a current input is open, the controller will read "-25". Wiring distance is unlimited.

Accuracy of sensor reading: +/-1 count of the specified analog input engineering units, ie; degrees F., degrees C., KWH etc.

Analog signal filtering: 500 milliseconds, or each analog is read 2 times each second and then averaged. Load response to analog input values can be every second or every minute based on an average value.

Input isolation: All inputs are optically isolated.

Input current: 1-2 mA of DC current will flow through input contact shorted to common. 13 volts (regulated) DC will be present between an open input and common.

Number of digital input channels: 32

Digital inputs can be used to detect motion and control modules and trigger overrides. A multiplying factor can be entered for pulse applications such as demand monitoring.

Number of output channels: 32

Output current: Each output is capable of sinking 50 mA DC current. Each of the outputs is protected through an internal limiting resistor. If an output is shorted to common for more than 2-3 seconds, its limiting resistor will overdissipate and cause the circuit to open.

IMPORTANT:

The use of substitute relays can damage the power supply and will void warranty.

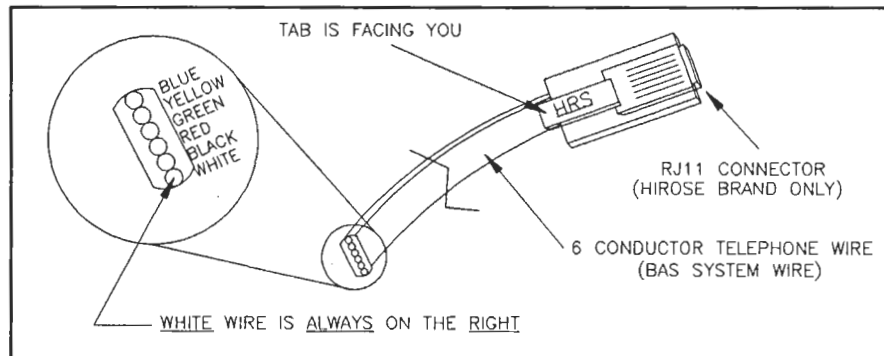
Output voltage: Unregulated 12-24 volts DC

Output Isolation: All outputs are optically isolated.

Ambient temperature ranges: Operating: 0°F to 150°F, Shipping/Storage: -40°F to 160°F

Wiring: Six-conductor flat telephone wire with male RJ-11 connectors is used to wire input sensors and output modules back to the controller. This greatly simplifies installation by reducing the time normally spent color-coding, stripping and terminating individual wires. When connecting the 6 conductor flat cable to the RJ11 male connectors, the white wire is always in the same position at both the RJ11 equipped field component and at the XL9600's ICS board.

The rule is: **WHITE** is on the **RIGHT** when the male RJ11 tab is **FACING YOU**. (See Illustration below).



RJ11 Connector Installation

2. FUNDAMENTALS OF THE XL9600 SYSTEM

2.1. THE CONTROLLER

The XL9600 controller is made up of three main parts: the Power Supply Board, the ICS Board and the Keyboard/Display . The Power Supply Board contains all of the electronic components which make the XL9600 system work and contains RJ11 connectors to which external power and telephone communications are attached. The ICS Board contains RJ11 connectors to which all input and output modules are attached.

The keyboard/display panel of the XL9600 controller is protected by a lockable door and is held closed by a magnetic latch. When the controller door is open, the keyboard/display panel can be raised for easier access and viewing. As it is raised, two support brackets fall into place to hold the panel open. To gain access to the Power Supply Board, remove support bracket screws.

The front panel of the XL9600 controller contains two important items:

- the system display
- a sixteen button keypad

The purpose of each one of these is explained in the following sections.

2.2. THE SYSTEM DISPLAY

The system display is a 32 character (2 by 16) liquid crystal type. Since it is liquid crystal, you must have light present in order to see it. Also, the display is best viewed straight on.

The system display is used in several ways. If you are not directly interacting with the controller, either by entering or reviewing information, then the display is in "scanning" mode. Under normal operating conditions, the display continually moves through a sequence of 25 screens. The first screen displays the time and date, the second screen through the fifth show which of the 32 loads are ON or OFF, the sixth through the ninth screens show which loads are manually overridden, and the tenth through the twenty-fifth screens display the values of the 32 inputs. An additional screen will appear displaying an Alarm condition if an "Alarm Dial-out" has been triggered.

More informational screens are added to the "scanning" sequence if a power failure occurs. Within the XL9600 system, modes of power failure are divided into two types. When power is first applied to the XL9600 system, the controller's memory will be blank and the display will reflect a *"Mode 1 Power Failure"*. A *"Mode 1 Power Failure"* occurs on initial power-up or when power fails for a long period of time and memory is completely erased. The memory can also be erased by turning off the battery and disconnecting power. When this happens and after power is restored, the controller will display the message *"POWER FAILURE 1- Enter Program"* at the beginning of the "scanning" sequence. The controller will also display the message *"WARNING! Loads are in FAILSAFE"* before the load status display (the meaning of "failsafe" will be discussed in Chapter 4). A *"Mode 2 Power Failure"* occurs when power fails for a short period (24 to 48 hours) and the back-up battery keeps the controller's memory intact. In this case, the controller will display the message *"POWER FAILURE 2- Check Program"* at the beginning of the "scanning" sequence.

When the display is not in scanning mode, it is used to prompt you for program and data entries. This is called the *"active"* mode. In this mode, the display also provides you with a means of reviewing program entries and logged data values. If the controller is left unattended in active mode for more than two minutes, it will automatically return to the scan mode.

2.3. THE KEYPAD

The keypad is a "rubber mat" type with tactile feedback. The XL9600 controller will emit a short beep when a key is pressed. Also, if you hold down a key for more than a few seconds, the key's entry will be repeated continuously.

Each of the keys on the XL9600 controller's keypad, except for the *CLEAR*, *ENTER*, and *ARROW* keys, is divided into two parts. This means that the key can have one of two meanings depending on the keystroke sequence in which it is used. For example, in some cases the keys labelled 0 through 9 are used to enter numbers and in other cases they are used to enter the days of the week. This means that most keys have alternate functions, which will be used by the controller, depending on the sequence of program entry or examining.

2.4. BATTERY BACKUP SWITCHES

On the XL9600 controller's circuit board are two slide switches labeled "6 V BATT ON/OFF" and "12V BATT ON/OFF". When the switches are to the right or ON position, the system's backup batteries are connected. Note that there are two separate backup battery circuits. The "6V BATT" circuit maintains the controller's program of setpoints along with the time and date. This means that in the event of a power failure, the back-up battery will supply enough power to keep the system clock running and to keep the controller's memory intact. The battery does not provide enough power to switch loads or perform any telecommunication functions. This battery must be installed, as even a slight power interruption could destroy the program. The "12V BATT" is optional, and supplies the power required to power the modem and allow for "alarm dial-out" announcing a power failure.

When the XL9600 controller is shipped from the factory, the battery backup switches are in the OFF position. The switches should be left in this position when power is first applied to the controller, otherwise the controller may not power up correctly. Also, if the XL9600 controller is going to be stored for an extended length of time, then the battery backup switches should be in the OFF position. Turn the battery backup switches ON after you have entered a program.

2.5. THE XL9600 SYSTEM'S INTERNAL MEMORY

We said previously that the back-up battery will keep the controller's memory intact. In computers, "memory" can have many meanings. The controller actually has three kinds of memory:

- **EPROM** (Electrically Programmable Read Only Memory)
- **RAM** (Random Access Memory)
- **EEPROM** (Electrically Erasable Programmable Read Only Memory)

You should be familiar with how they function within the XL9600 system.

EPROM is not accessible to the user. It contains instructions which tell the XL9600 system how to accept program entries from you and how to execute those program entries.

RAM is where the program and most data entries you make are stored. The problem with RAM is that it needs electrical power to remember anything. Without power, everything in RAM disappears, which means all of your program entries disappear. This is one reason a back-up battery is necessary. In case of power loss, the back-up battery can provide the minimum power needed to keep the information in RAM intact.

EEPROM is similar to RAM except that it doesn't need electrical power to keep information in memory. Even if both line and battery power are removed from the system, whatever information was put into EEPROM will still be there. On the XL9600 system, EEPROM is used to hold critical data entries. In the programming section in Chapter 4, we explain in more detail which data entries are stored in EEPROM.

3. WORKING WITH THE KEYBOARD AND DISPLAY

3.1. HOW THE XL9600 SYSTEM COMMUNICATES

There are two ways to program the XL9600 system. You can either install a modem and program the controller using a personal computer and Solidyne's Remote Communications Software, or you can program the XL9600 system directly through the 16-button keypad. In this Chapter we will explain how you can communicate with the XL9600 system directly through the keypad and display.

When power is first applied to the XL9600 system, the display will be moving through its "scanning" sequence (see previous chapter). Pressing any key will cause this sequence to stop and the system to enter an "active" mode. When in the active mode, the XL9600 system will prompt you for information. The prompting is either in the form of a screen to which you must respond with an "UP ARROW" or a "DOWN ARROW", or in the form of a screen containing blank spaces which you must fill in with some kind of information. The prompt screen which appears when the system first enters the *active* mode is:

Manual load switching

This is the first of five general main menu prompts which the system will present. Refer to the Quick Reference Program Chart on pages 8 & 9. The other prompts are:

Examine program

Examine logged data

Enter miscellaneous data

Enter new program

Each of the prompts is related to a general operation which you may perform. Pressing the "DOWN ARROW" key will bring up the previous prompt in a sequence. If you press the "RIGHT ARROW" key, the system will display the first prompt in the sub-sequence relating to the options of the main menu operation. Once in a sub-sequence, pressing the "LEFT ARROW" key will return you to the main sequence. Some sub-sequences have further sub-sequences, and the use of the "RIGHT ARROW" and

"LEFT ARROW" works in the same way. The Quick Reference Chart on pages 8 & 9 illustrates this.

For example, when the prompt "*Manual load switching*" is displayed, the system is providing you with the option to switch loads manually. Since this general operation has no options, pressing the "RIGHT ARROW" key will cause another prompt screen to be displayed which will allow you to manually change the state of any of the 32 loads. Pressing the "DOWN ARROW" key will cause "*Examine program*" to be displayed.

When "*Examine program*" is displayed, the system is prompting you with the option to examine (and edit, if necessary) the program entries which have already been made into the system. This general operation is different from the "*Manual load switching*" operation in that it has options. This means that if you press the "RIGHT ARROW" key, the system will respond with a sub-sequence series of questions which will allow you to select more specifically which program entries you want to examine.

We'll cover the general operations and their options in more detail in the next chapter.

As we said earlier, besides screen prompts, the system may also prompt you with a screen containing blank spaces which you must fill in with some type of information. This information can be one of five types:

- load number
- general number (such as an analog input value)
- day of the week
- date
- time

Each one of these types of information is entered in a specific way on the system. We'll cover how they are entered in the next five sections.

3.2. ENTERING LOAD NUMBERS

When prompting for a load number or numbers, the XL9600 controller will display this screen:

Loads? (1- 8)
-- -- -- -- --

Note that the range of permissible load numbers is shown. The ten dashes represent five two-digit load numbers. The cursor will be placed over the leftmost dash. As digits are entered, the cursor will move to the right. To enter single digit load numbers *one* through *nine*, you must either enter a leading zero, or after entering the single digit press the *RIGHT ARROW* key to move the cursor to the next pair of dashes. If you make a mistake, you may press the *CLEAR* key to erase the entire entry or you may press the *LEFT ARROW* key to go back to the erroneous digit and enter the correct digit.

Most entries allow up to eight loads. The display shows only five loads at a time, the first through fifth or the fourth through eight. To enter more than five loads, press the *RIGHT ARROW* key after the fifth load number is entered. The display will shift the list to the left allowing you to enter the sixth through the eighth loads. Once the numbers of the loads for your setpoint are entered, pressing *ENTER* will tell the XL9600 that your selection is complete.

3.3. ENTERING GENERAL NUMBERS

When prompting for a general number, such as an analog input value, or the number of minutes in a duty cycle, the system will display a prompting question asking for the specific piece of information, followed by a blank with a blinking cursor under it. Whatever you enter will appear under the blinking cursor. If you enter a number with more than one digit, the digits will shift to the left automatically, with the rightmost digit of the number always appearing under the cursor. If you make a mistake while entering a number, press *CLEAR*, and whatever you have entered will be erased. The system automatically makes all numbers positive. To enter a negative number, simply press the *RIGHT ARROW* key. Once you have entered the number correctly, pressing *ENTER* will tell the system that your entry is complete.

3.4. ENTERING DAYS OF THE WEEK

When prompting for a day of the week, the system will display one of these three screens:

Start days?

or

Stop days?

or

Which days?

This works in much the same way as selecting load numbers. Each set of two dashes corresponds to a day of the week, beginning with Sunday. The eighth set of dashes corresponds to "Holiday" (holiday programming is explained in the next chapter). If you press one of the alternate function "day of the week" keys, the corresponding dashes on the display will be replaced by the abbreviation for that day. For instance, if the *MON*, *WED* and *FRI* keys are pressed, the display will look like this:

Start days?
-- Mo -- We -- Fr -- --

This means that Monday, Wednesday and Friday have been selected in answer to the question "*Start days?*". Pressing the *FRI* key again would "unselect" Friday. Pressing the *EVERY* key will cause all days to be selected (except holiday). Once you have selected the desired days, pressing *ENTER* will tell the XL9600 system that your selection is complete.

3.5. ENTERING DATES

The system prompts for dates in the same way it prompts for numbers, except that it provides a slash between the month and date. The cursor covers the leftmost digit of the date, so this is where any numbers you enter will appear. When entering dates you must enter leading zeroes for single digit months or days of the month. For instance, 1 must be entered as 01. As an example, let's assume we are entering the date at which daylight savings time takes effect and that the date is April 3, 1990. The system displays:

Enter Date 01 / 01 / 1989

04

The cursor is over the first digit on the second line. We enter the month first; 04. The display now looks like this:

Enter Date 04 / 01 / 1989

03

Next, we enter the day of the month: 03. The display now looks like this:

Enter Date 04 / 03 / 1989

1990

Finally enter the year: 1990. The display now looks like this:

Enter Date 04 / 03 / 1990_

As with regular numeric information, pressing the *CLEAR* key will erase whatever you have already entered and allow you to start over. Finally, pressing the *ENTER* key tells the system that your entry is complete.

3.6. ENTERING TIMES

When prompting for a time, the system will display one of several screens, such as:

Start time? 12:00 AM

The default time, as displayed here, for all program entries is 12:00 AM.

Here, the cursor will cover the leftmost digit on the second line, but, instead of staying in one place, the cursor will shift to the next blank digit as you make entries. This means that after you enter the ten's digit of the hours, the cursor will shift to the one's digit and so on. It is also important to note that you must enter the leading zero for a single digit hour. For instance, 1:00 must be entered as 0100.

If you make a mistake, pressing the *CLEAR* key will allow you to start over. To set AM or PM, press the *RIGHT ARROW* key. This will switch AM to PM, or PM to AM, depending on what is currently on the screen. Once the screen displays the time entry correctly, pressing the *ENTER* key will tell the system that your entry is complete.

4. BASIC PROGRAMMING PROCEDURES

4.1. SCANNING VARIOUS STATUS INFORMATION

4.1.1 Normal Operating Conditions

Time: Mon12:00AM
Date: Jan 1, 1990

These 25 displays show the initial power-up scanning of the XL9600's operating conditions. The first shows the time and date. The second through ninth displays show the active and overridden loads. The tenth, through twenty-fifth screens would normally show the analog input values.

Act 1 2 -- --
Load 5 6 7 8

Sens 1: 230
Sens 2: 230

Sens 17: 230
Sens 18: 230

Act 9 -- -- 12
Load 13 14 15 16

Sens 3: 230
Sens 4: 230

Sens 19: 230
Sens 20: 230

Act 17 18 19 20
Load 21 22 23 24

Sens 5: 230
Sens 6: 230

Sens 21: 230
Sens 22: 230

Act 25 26 -- 28
Load 29 30 31 32

Sens 7: 230
Sens 8: 230

Sens 23: 230
Sens 24: 230

Ovrd 1 2 -- --
Load -- -- 7 8

Sens 9: 230
Sens 10: 230

Sens 25: 230
Sens 26: 230

Ovrd 9 -- -- 12
Load 13 -- -- 16

Sens 11: 230
Sens 12: 230

Sens 27: 230
Sens 28: 230

Ovrd 17 18 -- --
Load 21 -- -- --

Sens 13: 230
Sens 14: 230

Sens 29: 230
Sens 30: 230

Ovrd 25 26 -- 28
Load 29 -- -- 32

Sens 15: 230
Sens 16: 230

Sens 31: 230
Sens 32: 230

Time: Sun 12:01AM
Date: Jan 1, 1989

... and repeats;

Act	1	2	--	--
Load	5	6	7	8

etc.

This sequence will repeat continuously until any key is pressed.

NOTES:

1. Active loads might actually be **Energized** or **De-energized** based on what their output status is defined to be when **ON**. (see section 4.5.17)
2. Sensor readings are averaged readings over a period of one minute (default) and are not instantaneous readings. Instantaneous readings and digital input "open/closed" status can be found in the "Logged data" section of the main menu.
3. Sensor readings will show "230" (voltage type input) or "-25" (current type input) if a sensor is not connected and the "offset" value is set to -25 (default).

Upon pressing any key, the following main menus will be displayed.

Manual load
switching

RIGHT ARROW Loads can be controlled manually. (section 4.1.2)

DOWN ARROW Press the "DOWN ARROW" key here to continue.

Examine
program

RIGHT ARROW A previously entered program can be examined, modified or deleted. (section 4.2)

DOWN ARROW Press the "DOWN ARROW" key here to continue.

Examine logged
data

RIGHT ARROW Logged information for analog inputs, override run time and load run time can be examined or cleared (reset). (section 4.3)

DOWN ARROW Press the "DOWN ARROW" key here to continue.

Enter miscellaneous data

RIGHT ARROW Miscellaneous data for inputs, outputs, holidays, daylight savings, network identification, pulse width modulation assignments, etc. can be entered. (*section 4.4*)

DOWN ARROW Press the "DOWN ARROW" key here to continue.

Enter new program

RIGHT ARROW New setpoint programs to control loads (outputs) can be entered. Sub-menu displays 16 types of control, such as Time of Day, Analog Control, Optimum Start/Stop, Duty Cycling, etc. (*see section 5.4*)

DOWN ARROW Press the "DOWN ARROW" key here to continue. Screen returns to ...

Manual load switching

NOTE:

Pressing and holding *CLEAR* key for 2 seconds at any time reverts the display back to scanning mode. Pressing the *LEFT ARROW* key at any of the above prompts causes the screen to return to scanning the display of time, load status, override status and sensor readings.

4.1.2 Manually Switching Loads

If the first of the main menu items is selected (by pressing the "RIGHT ARROW" key), the following prompt is displayed:

Manual load switching

RIGHT ARROW

ENT = 1 2 3 4
TOGL ON -- ON --

This display shows the status of four loads at a time. Two dashes are displayed for loads that are OFF. Press the *RIGHT ARROW* key to position the cursor over the desired load to toggle. Press

ENTER to toggle the state of that load. Pressing the *RIGHT ARROW* key when the cursor is over the right-most load will shift the list of loads to the left showing the next four. Pressing the *LEFT ARROW* key when the cursor is over the left-most load will shift the list of loads to the right showing the previous four. Press the *UP ARROW* or *DOWN ARROW* key to exit the manual load switching function.

NOTE:

1. Manual load switching is *not* a program override. It has the same priority as time of day programming in which the command to turn ON or OFF is given only once. If there is a program active, such as an analog control setpoint, the state of the load will be determined by that program.

2. Pressing and holding the *CLEAR* key for 2 seconds at any time reverts the display back to the scanning mode.

4.2. EXAMINING THE CONTENTS OF PROGRAMS

A "program" is a series of up to 20 different types of "setpoints" entered in a logical order to provide a given function.

4.2.1 Using the Examine Program Menu

First, press any key during "scanning" mode.

Manual load
switching

**DOWN
ARROW**

Examine program
for loads 1-8

**RIGHT
ARROW**

Press the "RIGHT ARROW" key here to enter the sub-menu for examining the setpoint programs for loads 1-8.

**DOWN
ARROW**

Press the "DOWN ARROW" key here to continue.

Examine program
for loads 9-16

**RIGHT
ARROW**

Press the "RIGHT ARROW" key here to enter the sub-menu for examining the setpoint programs for loads 9-16.

**DOWN
ARROW**

Press the "DOWN ARROW" key here to continue.

Examine program
for loads 17-24

**RIGHT
ARROW**

Press the "RIGHT ARROW" key here to enter the sub-menu for examining the setpoint programs for loads 17-24.

**DOWN
ARROW**

Press the "DOWN ARROW" key here to continue.

Examine program
for loads 25-32

**RIGHT
ARROW**

Press the "RIGHT ARROW" key here to enter the sub-menu of questions for examining the setpoint programs for loads 25-32.

**DOWN
ARROW**

Press the "DOWN ARROW" key here to continue.

Review
all setpoints

**RIGHT
ARROW** All the setpoints can be reviewed in the order they were entered.

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

Review
by setpoint ID

**RIGHT
ARROW** Specific setpoints can be accessed by entering the setpoint I.D. number. Each setpoint is assigned a number when entered.

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

Review
by load number

**RIGHT
ARROW** All the setpoints for a specified load can be reviewed in the order they were entered.

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

Review by
setpoint type

**RIGHT
ARROW** All the setpoints of the specified type setpoint can be reviewed in the order they were entered.

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

Review by
Active / Inactive

**RIGHT
ARROW** All the setpoints of the specified state, active or inactive, can be reviewed in the order they were entered.

**DOWN
ARROW** Press the "DOWN ARROW" key here to return to the "Review of Setpoints" menu.

NOTE:

A setpoint will be *Active* when the current time and date is between the start and stop times and dates of the setpoint.

**LEFT
ARROW** Press the "LEFT ARROW" key here to return to the "Examine Program for Loads ..." menu.

4.2.2 Using the Examine Functions to Review or Modify Setpoints

The following sequence assumes that a Variable Analog Control setpoint has been entered for review.

Examine program	RIGHT ARROW	The "Examine Program" mode can be used to Modify or Delete setpoints.
Review all setpoints	RIGHT ARROW	Pressing the "RIGHT ARROW" key will display the first numbered setpoint in memory. Any method of reviewing setpoints can be used.
10 VAR AN CTRL Inact Rate = MIN	ENTER	If the <i>ENTER</i> key is pressed here, the XL9600 will allow the user to modify the "Active/Inactive" status of that setpoint.
Setpnt is INACT > key = ACTIVE	RIGHT ARROW	Press the <i>RIGHT ARROW</i> key to toggle the setpoint between Active or Inactive. The setpoint just made active will now remain active until the next programmed "stop" time for that setpoint occurs. If one or more setpoints are active for a given load, then the last entered setpoint will take priority over controlling that given load's output state (see section 5.3).
Setpnt is ACTIVE > key = INACT	ENTER	Pressing <i>ENTER</i> here will cause the menu to change to "Rate = Seconds or Minutes" menu.
Rate = MINUTES > key = SEC	RIGHT ARROW	There are six setpoints; Sensor Triggered Load Control, Variable Analog Control, Fixed Parallel Duty Cycle, Variable Parallel Duty Cycle, Analog Enable, and Alarm Dial-out that require a rate to be entered. The default rate is minutes. Analog control setpoints will respond to average sensor readings every minute and duty cycle setpoints will cycle a specified number of minutes ON and OFF. Changing this rate selection to seconds by pressing the <i>RIGHT ARROW</i> key will cause the analog control setpoints to respond to average sensor readings every second and duty cycle setpoints will cycle a specified number of seconds ON and OFF, providing a quicker response time and the ability to pulse outputs.
10 VAR AN CTRL Active Rate = SEC	ENTER	Pressing <i>ENTER</i> will record the new information and return to the "Setpoint Type" menu.

Rate = SECONDS
> key = MIN

**DOWN
ARROW**

The "DOWN ARROW" must now be pressed to review or modify the rest of the setpoint.

Loads:
-- -- 3 -- --

ENTER

The screen now displays the loads that have been assigned to be controlled by that particular program. A number displayed indicates that number load will be controlled by that program. Multiple numbers indicate that multiple loads have been assigned to that program. To change a load, press "ENTER", and the screen will prompt for which loads should be changed. Refer to section 3.2 for a complete description of how load numbers are entered.

Which loads?
-- -- 3 -- 5

ENTER

Pressing "ENTER" will enter and record the new information and return to the "LOAD" menu

Loads:
-- -- 3 -- 5

**DOWN
ARROW**

Pressing the "DOWN ARROW" will cause the menu to change to the "START DAYS" menu.

Start days:
-- MoTuWeThFr -- --

ENTER

Pressing "ENTER" here will allow the "START DAYS" to be changed in a similar fashion as the "LOADS" described above.

Which days:
-- MoTuWeThFr -- --

**DOWN
ARROW**

Press "DOWN ARROW" to continue to examine the setpoint.

Start time:
8:00 AM

ENTER

Pressing "ENTER" here would allow you to modify the "START TIME" as described above. Pressing the "DOWN ARROW" will allow you to continue.

Master sensor #:
(modulating) 1

**DOWN
ARROW**

Press "DOWN ARROW" to continue to examine the setpoint.

Slave sensor #:
(modulated) 2

**DOWN
ARROW**

Press "DOWN ARROW" to continue to examine the setpoint.

Master sensor
HI value: 50

**DOWN
ARROW**

Press "DOWN ARROW" to continue to examine the setpoint.

@ Master HI, ON
@ Slave = 150

**DOWN
ARROW**

Press "DOWN ARROW" to continue to examine the setpoint

@ Master HI, OFF @ Slave = 155	DOWN ARROW	Press "DOWN ARROW" to continue to examine the setpoint.
Master sensor LO value: 10	DOWN ARROW	Press "DOWN ARROW" to continue to examine the setpoint.
@ Master LO, ON @ Slave = 190	DOWN ARROW	Press "DOWN ARROW" to continue to examine the setpoint.
@ Master LO, OFF @ Slave = 195	DOWN ARROW	Press "DOWN ARROW" to continue to examine the setpoint.
Maximum ON time: 0	DOWN ARROW	Press "DOWN ARROW" to continue to examine the setpoint.
Maximum OFF time: N/A	DOWN ARROW	Press "DOWN ARROW" to continue to examine the setpoint.
Stop days: -- MoTuWeThFr -- --	DOWN ARROW	Press "DOWN ARROW" to continue to examine the setpoint.
Stop time: 5:00 PM	DOWN ARROW	Press the "DOWN ARROW" and the display will prompt you that the setpoint has been modified.
Setpnt Modified! Enter = Update	ENTER	If you wish to include your changes in the program, press "ENTER". If you wish to ignore the changes you just made and want the program to return to the values before your changes, press any other key.
Program Updated. Press any key.	ANY KEY	The menu returns to the beginning of the setpoint you just modified, to allow you to review the setpoint just modified in order to confirm any changes.
10 VAR AN CTRL Active Rate = SEC		

NOTE:

While examining a setpoint, use the *UP* and *DOWN* arrows to scroll through the data screens. To modify any individual field of data within a setpoint, press the *ENTER* key when the data desired to change appears. A blinking cursor or question will appear on

the screen. Press the *LEFT ARROW* key to leave the data unchanged or press the *CLEAR* key to initialize that data field, enter the new data as desired, then press "ENTER" again to complete the change.

Depending on the data field being modified, using the *CLEAR* key to initialize a field will either clear it completely, zero it out, or revert it to a default value, as in the example of "START TIME", the default start time is 12:00 AM. Also note that entered times must have leading zero's keyed in, but when "ENTERED" will display normal time. After pressing the *ENTER* key, the blinking cursor will disappear. Then continue to scroll through the setpoint using the *UP* and *DOWN* arrows.

IMPORTANT NOTE:

To delete an entire setpoint from the controller, find the desired setpoint for deletion, then when examining the setpoint, press the *CLEAR* key. The XL9600 will then display the message:

Press ENTER to
delete setpoint

ENTER If *ENTER* is pressed here, the entire setpoint will be deleted. If any other key is pressed, the deletion request is ignored.

4.2.3 Examining Individual or Selected Setpoints

The XL9600 allows the user to go directly to a selected setpoint, type of setpoint, group of setpoints for a specified load, or group of setpoints for a specified status. The options of "Review by Setpoint ID", "Review by Load Number", "Review by Setpoint type", and "Review by Active/Inactive" will allow the user to avoid reviewing unwanted setpoints. All the actions outlined above for deleting, modifying, or scrolling through a setpoint will operate the same in the following sub-menu options.

If the ID number of a setpoint needed for review, deletion, or modification is known, then use the following keystrokes to find that setpoint.

Review
all setpoints

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

Review
by setpoint ID

**RIGHT
ARROW** Answering "RIGHT ARROW" to this question will then display a message requesting the setpoint ID #.

Enter setpoint
ID #:

A blinking cursor will appear where setpoint ID #: is to be inserted. Key in the setpoint number, and press "ENTER". The screen will display the title of the program selected. If the ID number entered does not exist in the program, the following message will appear:

None found.
Press any key.

4.2.4 Examining Setpoints Assigned to a Specific Load

If it is desirable to examine only the setpoints that are associated with a particular load, that can be done in the following manner:

Step through the "EXAMINE PROGRAM" prompts.

Review
all setpoints

**DOWN
ARROW**

Press the "DOWN ARROW" key here to continue.

Review
by setpoint ID

**DOWN
ARROW**

Press the "DOWN ARROW" key here to continue.

Review
by load number

**RIGHT
ARROW**

Press the "RIGHT ARROW" key here. The XL9600 will then prompt the user for the desired load number.

Which loads
-- -- -- -- --

**"3"
ENTER**

If you enter "3" here for example, all the setpoints associated with that load will be placed in a queue and the first setpoint assigned to that load will be displayed.

NOTE:

If multiple load numbers are entered, then the lowest numbered setpoint with one or more loads matching the selected load(s) will be displayed and the remainder will continue sequentially, as the user scrolls through the setpoints.

None found
Press any key.

When all the setpoints for the selected load(s) have been displayed, the display will show "NONE FOUND".

4.2.5 Examining Setpoints by a Specific Type

If a specific type of setpoint is to be examined, modified, or deleted, the user can search and display all the setpoints entered into the controller of that type. The XL9600 will again review by searching for the selected setpoint type starting with the lowest numbered setpoint.

Step through the "EXAMINE PROGRAM" review questions.

Review
all setpoints

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

Review
by setpoint ID

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

Review
by load number

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

Review by
setpoint type

**RIGHT
ARROW** If the user presses the *RIGHT ARROW*, the XL9600 will then display a list of it's setpoint types.

Schedule loads
to turn ON

By using the *UP ARROW* and *DOWN ARROW* keys, the user can scroll through the choices of setpoint types. When the desired type is found, press the *RIGHT ARROW* key to examine setpoints of that type.

There are 20 setpoint types in the XL9600. They are:

- Schedule loads to turn ON
- Schedule loads to turn OFF
- Temporary ON schedule
- Temporary OFF schedule
- Duty cycle (staggered)
- Duty cycle (parallel)
- Variable duty cycle (staggered)
- Variable duty cycle (parallel)
- Optimized start for heating
- Optimized stop for heating
- Optimized start for cooling
- Optimized stop for cooling
- Sensor triggered load control
- Load turn ON for 1 - 255 seconds
- Variable analog load control
- Sensor triggered alarm dial-out
- Resettable Pulse-Width-Modulated (RPWM) Setpoint
- Floating Control Pulse-Width-Modulated (FPWM) Setpoint
- Analog Enable of Setpoints
- Global Override of Loads and Setpoints

4.2.6 Examining Setpoints by Active or Inactive Status

The user can also review the setpoints by whether they are Active or Inactive at the present time. The XL9600 will search for setpoints of the selected Active/Inactive status starting with the lowest numbered setpoint.

Step through the "EXAMINE PROGRAM" review questions.

Review all setpoints	DOWN ARROW	Press the "DOWN ARROW" key here to continue.
Review by setpoint ID	DOWN ARROW	Press the "DOWN ARROW" key here to continue.
Review by load number	DOWN ARROW	Press the "DOWN ARROW" key here to continue.
Review by setpoint type	DOWN ARROW	Press the "DOWN ARROW" key here to continue.
Review by Active/Inactive	RIGHT ARROW	Pressing the "RIGHT ARROW" key to this question will then prompt the user as to whether the user wants to examine either the "Active" setpoints or the "Inactive" setpoints.
Review Active setpoints	DOWN ARROW	Pressing the "DOWN ARROW" key here will cause the screen to prompt the user regarding "Inactive" setpoints.
Review Inactive setpoints	RIGHT ARROW	Pressing the "RIGHT ARROW" key here will display the lowest numbered Inactive setpoint.

NOTES:

1. The meaning of "Active" refers to the current time within the setpoint's programmed boundaries of Start and Stop Days and the Start and Stop Times within those days. A setpoint will become *Active* at its Start Time and *Inactive* at its Stop Time. Inactive setpoints cannot control loads.

2. Active setpoints control loads based on a priority structure. (*see section 5.2*)

3. Setpoint I.D. number is the number of the setpoint, within the setpoint table, based on the sequence of entry. (*section 5.2.5*)

4. If a new program has been entered, all setpoints can be automatically set to the proper Active/Inactive status by re-entering the current time and date. (Initializing, *see section 4.5.1*)

5. Pressing and holding *CLEAR* key for 2 seconds reverts the display back to the scanning mode.

4.3. EXAMINING LOGGED AND ACCUMULATED DATA

The XL9600 gathers and records data which can be recalled at any time for display. This logged data consists of current sensor readings, total cumulative sensor readings, past 35 day peak sensor readings, past 48 hour 15 minute averaged sensor readings, accumulated load run times, and accumulated load override times.

4.3.1 Examining Logged Data

Press any key to begin the Main Menu screen display. Step through the following key sequence to reach the "Examine logged data?" menu.

Time: Mon 12:00AM
Date: Jan 1, 1990

**ANY
KEY**

Pressing any key begins the Main Menu selection.

Manual load
switching

**DOWN
ARROW**

Press the "DOWN ARROW" key here to continue.

Examine program

**DOWN
ARROW**

Press the "DOWN ARROW" key here to continue.

Examine logged
data

**RIGHT
ARROW**

Press the "RIGHT ARROW" key to examine the logged data.

Sensor readings

**RIGHT
ARROW**

The input Sensor's averaged, instantaneous and A/D (analog to digital) readings and the digital input status would be displayed and updated here.

**DOWN
ARROW**

Press the "DOWN ARROW" key here to continue.

Total cumulative
sensor readings

**RIGHT
ARROW**

Sensor readings are accumulated every minute for submetering, degree day calculations, KW accumulating, etc.

**DOWN
ARROW**

Press the "DOWN ARROW" key here to continue.

Past 35-day peak
sensor readings

**RIGHT
ARROW** Past 35 days' highest or lowest sensor readings are recorded and can be examined to determine electric demand, highest or lowest temperature, etc. The choice of recording high or low values is made under "Miscellaneous Data" (*see section 4.5.7*).

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

Past 48 hours,
15 min avg data

**RIGHT
ARROW** Fifteen minute average readings are recorded for the past 48 hours for all eight analog inputs.

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

Accumulated load
run times

**RIGHT
ARROW** Load run time (ON time) controlled by the program is accumulated for maintenance or identifying load profiles.

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

Accumulated over
ride run times

**RIGHT
ARROW** Override ON time is accumulated for determining how long loads or systems are put into an override (forced-on) state.

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

PWM output duty
cycle values

**RIGHT
ARROW** Duty Cycle rates and percentage output are displayed for monitoring.

**DOWN
ARROW** Press the "DOWN ARROW" key here to continue.

Sensor readings

Back at the first logged data menu. Press the "LEFT ARROW" key to exit the logged data menu.

4.3.2 Examining Analog Sensor Readings

Step through the menus as described above until you see "Examine logged data?".

Examine logged
data

**RIGHT
ARROW** Press the "RIGHT ARROW" key to examine the logged data.

Sensor readings

**RIGHT
ARROW** Press the "RIGHT ARROW" key here to examine the Analog sensor readings.

Press arrows
to scan data

**DOWN
ARROW** The analog sensor readings are displayed one at a time. The various inputs can be reviewed by using the "UP" and "DOWN" ARROWS.

NOTE:

Four data values will be displayed for each sensor; the minutes value, the seconds value, the digital input status and the A/D (analog/digital) value. The minutes value is the analog sensor value averaged over a user specified number of minutes from 1-255; the default value is one minute. All setpoints with the selected *rate* equal to minutes will use this value to control the load(s). The seconds value is the analog sensor value averaged over one second. The analog input is actually read 2 times a second, accumulated and divided by 2 to produce this value. All setpoints with the selected *rate* equal to seconds will use this value to control the load(s).

The lower left portion of the screen shows the digital input "Opn" (circuit is open) or "Cld" (circuit is shorted) status. For example, when indicating "Cld" an override button is pressed (shorted) or a motion detector (S3278) is sensing motion.

Before the minutes and seconds values are displayed, a user programmable *offset* and *multiplier* can be used to adjust the value. The analog/digital value is the value the controller uses to calculate the minutes and seconds values. It is unaffected by the offset and multiplier factors and is not used to control loads.

If multiple LAN XL9600's are networked together, the minutes value for all the sensors can be accessed from any XL9600 in the network. The seconds, digital input status and analog/digital values are not shared between units and cannot be examined by any XL9600 other than the unit to which the sensors are attached. Up to 256 sensors can be examined if 8 XL9600 units are networked together.

EXAMPLE: If the XL9600 you are viewing is programmed to be Node #1, the Sensor Readings would look as follows:

Sen 1	M 230
Opn 255	S 230

Four data values are displayed for Sensor #1 which is wired to the unit (node #1) from where you are examining. Sensors #2 through #32 would also display these four values, while sensors #33 through #256 (not directly wired to node #1) would display only one value, the averaged minutes value. (The XL9600 with network I.D.#5 would display the values for sensors #33 through #64, and the averaged minutes value only for sensors #1 through #32 and #65 through #256.)

NOTE:

The values displayed will remain on display indefinitely and continuously update until the menu is exited. Holding the *CLEAR* key down for 2 seconds will return the display to the scanning mode.

4.3.3 Examining the Total Cumulative Sensor Readings

Step through the menus as described above until you see "Examine logged data"

Examine logged data

**RIGHT
ARROW**

Press the "RIGHT ARROW" key here to continue

Sensor readings

**DOWN
ARROW**

Press the "DOWN ARROW" key here to continue

Total cumulative sensor readings

**RIGHT
ARROW**

Press the "RIGHT ARROW" key here to continue.

Press arrows to scan data

**DOWN
ARROW**

Press the "DOWN ARROW" here to continue.

Sens 1 Accum: 00038175

**DOWN
ARROW**

For each input sensor, the XL9600 will totalize and store the averaged sensor reading. Every minute, regardless of what the averaging period is for each sensor, the controller will add the averaged value for that minute to the accumulated value. The cumulative values can only be reset manually by the user, or