PALCOM®

COMMUNICATIONS SOFTWARE

OPERATING MANUAL

PERMALERT

Environmental Specialty Products, Inc.

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The manual is typically revised at least once a year. The revision date is on the back cover.

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1 Introduction

PALCOM® is an interactive remote monitoring software for PermAlert ESP's PAL-AT® Cable Leak Detection/Location Systems and LiquidWatch® Probe Leak Detection Systems.

This communications software package can continuously monitor events on up to 254 PAL-AT and LiquidWatch systems from a personal computer (PC). Each system can be connected to the PC by: 1.) A short haul modem connected to a 2-twisted pair communication line, 2.) A phone modem, 3.) An Ethernet modem or 4.) A direct-wired RS-232 cable.

1.1 Automonitor

PALCOM/GLS has an Automonitor feature that sequentially monitors all leak detection systems and displays the status of each. If an event occurs on any of the connected systems, PALCOM flashes a visual message and beeps until an operator responds. An operator can then "Update" PALCOM and view/print a list of all new archive messages received from all leak detection systems since the previous time it was updated. After PALCOM is updated, it returns to Automonitor. PALCOM Lite does not automonitor continuously.

1.2 Manual Menu

PALCOM also has a Manual Menu that lets the operator select a specific leak detection system to analyze. The Manual Menu has four standard features: Remote Keypad, List Archive, Terminal Mode and Graph Data.

The Remote Keypad feature enables the operator to view the LCD display and operate all functions of the system by using the computer as a remote keypad.

The List Archive feature allows the operator to view and print a list of all archived events (History) from a system.

The Terminal Mode feature is available for PAL-AT systems. It allows the user to save, edit, print and restore cable setup data.

The Graph Data feature can capture and plot "map" data from a PAL-AT system. The graphs are similar to TDR (Time-Domain Reflectometry) traces and can be interpreted by trained personnel who are familiar with the characteristics of the PAL-AT system.

1.3 Graphic Locator System (GLS)

The patented Graphic Locator System (GLS) displays a CAD drawing of the installation site on the computer screen. During the "Update" process in Automonitor, a flashing icon on the drawing identifies the location of a problem on a cable or probe. This shows the operator where the problem is located without the inconvenience of referring to reference drawings.

1 Introduction

2 Getting Started

2.1 Computer Requirements

TO USE PALCOM, THE FOLLOWING IS REQUIRED:

- The Microsoft Windows operating system, version 98 or later.
- An RS-232 serial port if any system is direct wired to a short haul modem.
- An additional RS-232 serial port or internal modem and a direct, dedicated analog phone line if any system is connected to a phone modem.
- A printer for a hard copy report of system archive messages, setup information or graphs.

PALCOM INSTALLATION

- PALCOM is supplied on a CD. Run the setup program. The default directory that PALCOM is installed to is "C:\PROGRAM FILES\PALCOM", but you have the option to change the directory.

  For compatibility with Microsoft Vista©, the data files are saved in the "C:\Palcom Data" directory. This change was implemented in Palcom version 7.18. If you are upgrading from an earlier version of Palcom, previous *.GLS, *.PCG, *.PCA, and *.DAT files should be moved from the "C:\Program Files\Palcom" directory to the "C:\Palcom Data" directory.

2.2 Software Available

There are two software packages available:

- **PALCOM/GLS Software (P/N 8027843)**
- **PALCOM Lite Software (P/N 8027844)**

PAL-AT/PALCOM Upgrade (P/N 8027840)

All PAL-ATs must be configured to communicate with PALCOM. A PAL-AT/PALCOM firmware upgrade must be purchased for each new or existing PAL-AT system. The PAL-AT processor card can be returned to PermAlert ESP to install the factory upgrade for existing PAL-AT systems. LiquidWatch systems do not need an upgrade.

2.3 Modem Options

There are several modem products that are available from PermAlert ESP to enable PALCOM to communicate with PAL-AT and LiquidWatch systems. The modem requirements depend on the configuration, as discussed in Sections 3 & 4 of this manual.

- **Model SHS-1 (P/N 8027830)** is a short haul modem to connect to the PALCOM computer. This allows PALCOM to communicate with a string of systems via a 2-twisted pair cable (see Figure 1).

  The SHS-1 package includes:
  (1) Short haul modem
  (1) RS-232 cable with a 9-pin computer connector and 25-pin modem connector.

- **Model SHS-2 (P/N 8027835)** is a short haul modem to connect to a PAL-AT. One SHS-2 is required for each PAL-AT system directly connected to PALCOM via a 2-twisted pair cable.

  The SHS-2 package includes:
  (1) Short haul modem
  (1) RS-232 cable with one 25-pin modem connector

- **Model SHS-2-LW (P/N 8027837)** is a short haul modem to connect to a LiquidWatch system. One SHS-2-LW is required for each LiquidWatch system directly connected to PALCOM via a 2-twisted pair cable.

  The SHS-2-LW package includes:
  (1) Short haul modem
  (1) RS-232 cable with one 25-pin connector and one 9-pin connector

- **Model PM-1 (P/N 8027824)** is a phone modem for connection to the PALCOM computer and communication with leak detection systems over phone lines. A dedicated analog phone line suitable for data communications is required.

  The PM-1 package includes:
  (1) Phone modem
  (1) RS-232 cable with a 9-pin computer connector and a 25-pin modem connector

- **Model PM-2 (P/N 8027826)** is a phone modem for connection to a PAL-AT system. A dedicated analog phone line suitable for data communications is required.

  The PM-2 package includes:
  (1) Phone modem
  (1) RS-232 cable with one 25-pin connector

- **Model PM-2-LW (P/N 8027828)** is a phone modem for connection to a LiquidWatch system. A dedicated analog phone line suitable for data communications is required.

  The PM-2 package includes:
  (1) Phone modem
  (1) RS-232 cable with one 25-pin connector and one 9-pin connector

- **Model PM-2-INT (P/N 8068485)** is an internal 14.4k modem that mounts on a PAL-AT processor card (version H or later). An analog phone line is connected directly to the processor card.

- **Model NWM-2 (P/N 8027838)** is a network modem that connects a PAL-AT to an Ethernet network. The PALCOM computer must also be connected to the network.

  The NWM-2 Package includes:
  (1) Ethernet/RS-232 modem
  (1) RS-232 cable with one 9-pin connector

- **Model NWM-2-LW (P/N 8027839)** is a network modem that connects a LiquidWatch to an Ethernet network.

  The NWM-2-LW package includes:
  (1) Ethernet/RS-232 modem
  (1) RS-232 cable with two 9-pin connectors.

  NOTE: PermAlert can configure each NWM before shipping if the IP address information is given to the PermAlert shop. It can also be configured in the field with a null modem cable.

- **Standard Communication cable (P/N 8017695)**

  A 2-twisted pair, 22 AWG, unshielded communication cable.

- **Plenum Rated Communication cable (P/N 8017720)**

  A 2-twisted pair, 22 AWG, unshielded communication cable, suitable for direct burial is also available.

- Each of the modems requires a 120 VAC power source (except the PM-2-INT). Each modem should be located in a suitable enclosure (8"x10"x6" min.) if it is not located in a clean environment.

3 Installing Short Haul and Network Modems

3.1 Short Haul Modems

The PALCOM short haul modems enable communication from one PC to PAL-AT and LiquidWatch systems in almost any configuration. The system can be in a straight line, or serial configuration, as when monitoring a cross-country pipeline. Also, two or more communication cables can branch from one modem and connect leak detection panels in different directions.

There are restrictions on the total length of communication cable connected to a modem and the maximum distance between modems. Typically a network of up to 10 modems can be connected directly to the PALCOM computer modem. However, if the total length of communication cable connected to a modem exceeds 10,000 feet, a modem repeater (Part Number 8027836) is required. Modem repeaters can be added as needed for long systems or complex networks.

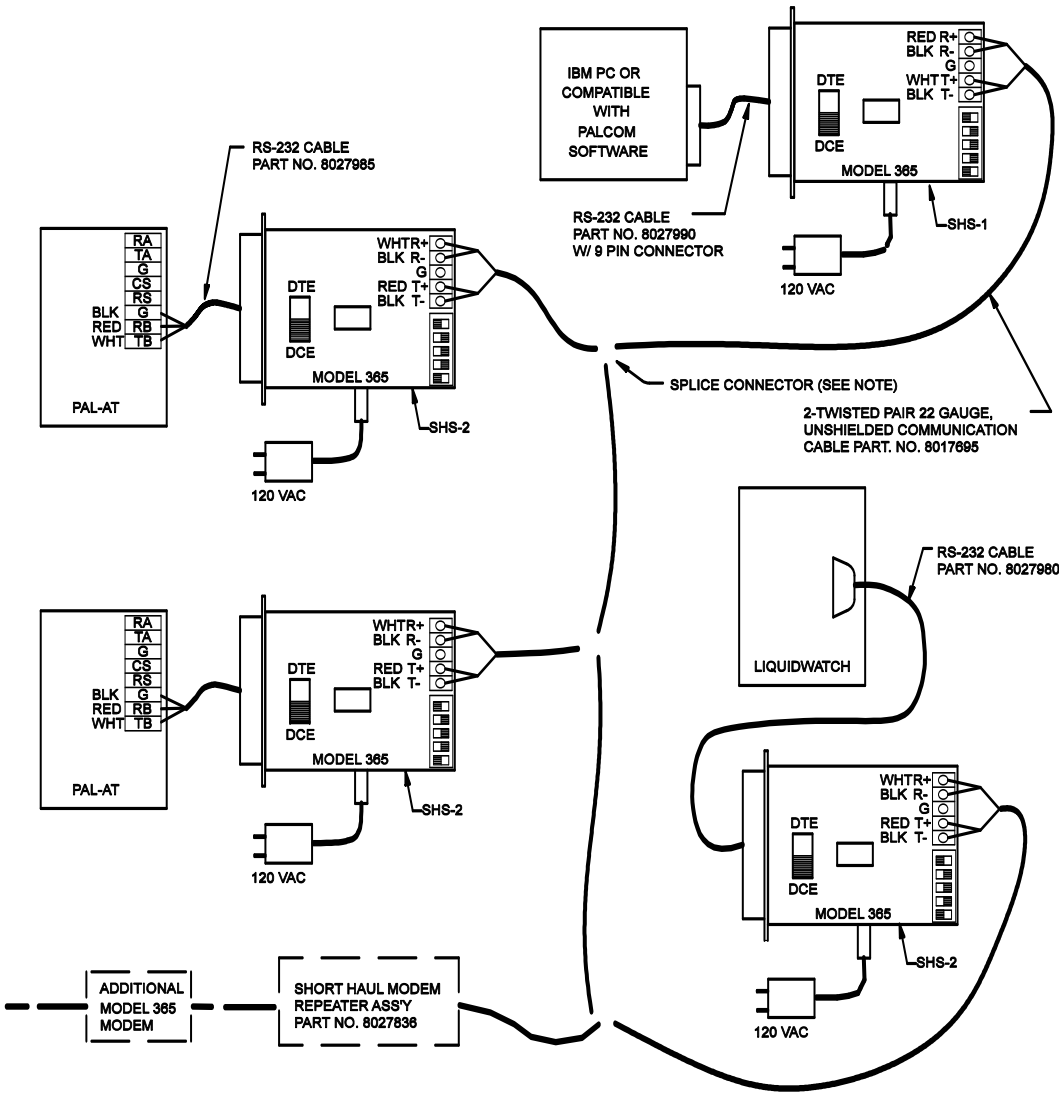
3.1.1 Serial System

Figure 1 is a wiring diagram for a typical system. A short haul modem is connected to the PALCOM computer RS-232 port. A slide switch located on the front panel of the modem is labeled DTE/DCE and should be in the DCE position. Connect the 2-twisted pair communication cable to the terminal strip as indicated in Figure 1. There are five rocker switches located next to the terminal strip. They are numbered 1-5 starting at the edge of the modem. **Note the "closed" position for a switch is selected by depressing the side of the "rocker" nearest the number of the switch. Switches 1 and 4 should be set "closed" and switches 2, 3 and 5 should be set "open".**

A short haul modem is also connected to each leak detection system. The modem should be located in a junction box to protect it. The ambient temperature of the modem must be between 0°F and 120°F. Connect the RS-232 cable connector to the modem. For a PAL-AT system, the three wires (black, red and white) from the end of the RS-232 cable should be connected to terminals G, RB and TB respectively on the PAL-AT terminal strip as indicated in Figure 1. For a LiquidWatch system, the RS-232 modem cable has a 9-pin connector that connects to P1 in the LiquidWatch panel.

Connect the communication cable from the PALCOM computer’s modem to the first leak detection system's modem. Then connect the communication cable for the next system's modem until all systems in the string are connected together. Connect the modem power supplies to a 120 VAC power source.

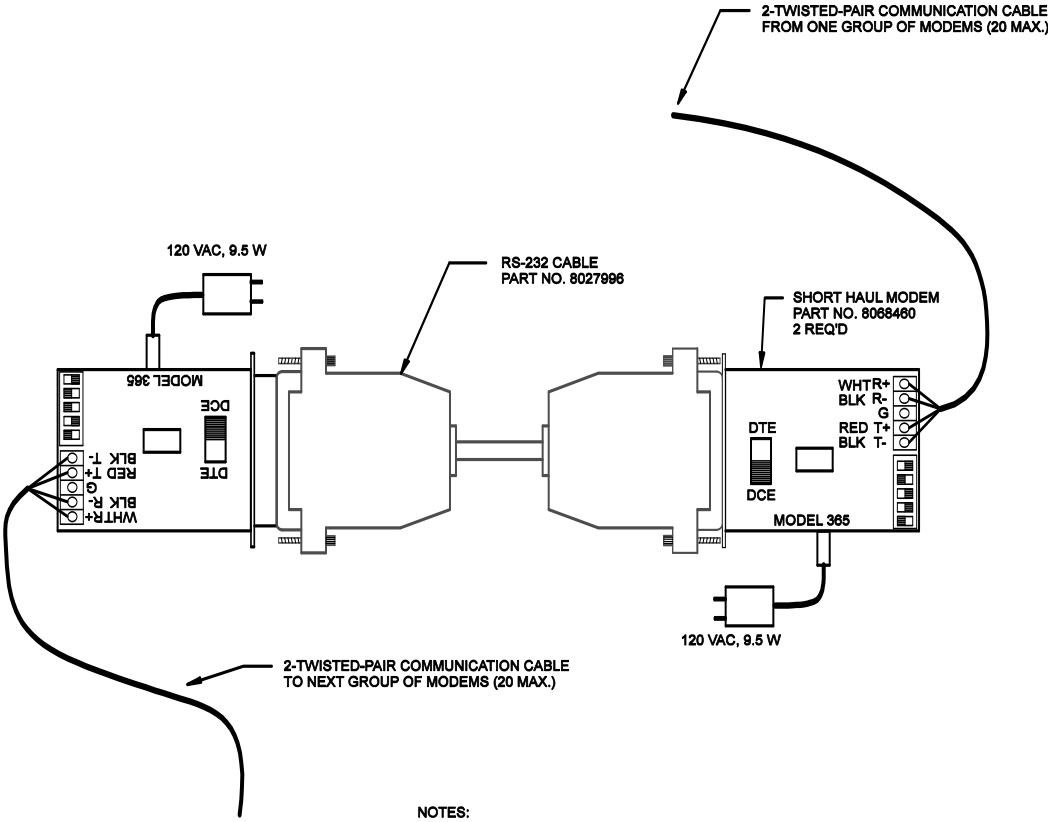
3 Short Haul and Network Modems



NOTES:

1. THE COMMUNICATION CABLE HAS 2 TWISTED PAIRS. 1 PAIR HAS A WHITE WIRE AND A BLACK WIRE. THE OTHER IS A RED WIRE AND A BLACK WIRE. AT EACH SPLICE CONNECTION, CONNECT SIMILAR WIRES TOGETHER USING 4 SUITABLE CONNECTORS. THE 4 GROUPS ARE RED, WHITE, BLACK FROM RED/BLACK PAIR AND BLACK FROM WHITE/BLACK PAIR.
2. THE WIRE COLORS ARE REVERSED ON THE MODEM AT THE COMPUTER (SHS-1) COMPARED TO THE OTHER MODEMS (SHS-2) .
3. A MODEM REPEATER IS REQUIRED WHEN THE SIGNAL STRENGTH IS NOT ADEQUATE ON A MODEM NETWORK.
4. TYPICALLY UP TO 10 MODEMS CAN BE USED WITHOUT A REPEATER.
5. THE MAXIMUM LENGTH OF CABLE CONNECTED TO A MODEM IS 10,000 FEET
6. REPEATERS CAN BE INSTALLED AS NEEDED IF MORE SYSTEMS ARE CONNECTED OR THE MAXIMUM DISTANCE IS REACHED.
7. CONTACT PERMALERT FOR SPECIFIC APPLICATION DETAILS.

Figure 1
Typical Short Haul Modem Wiring



NOTES:

1. A MODEM REPEATER IS REQUIRED WHEN THE SIGNAL STRENGTH IS NOT ADEQUATE ON A MODEM NETWORK.
2. TYPICALLY UP TO 20 MODEMS CAN BE USED WITHOUT A REPEATER IF THEY ARE ALL WITHIN 300 FEET OF THE COMPUTER MODEM.
3. THE MAXIMUM DISTANCE BETWEEN MODEMS IS 10,000 FEET
4. REPEATERS CAN BE INSTALLED AS NEEDED IF MORE SYSTEMS ARE CONNECTED OR THE MAXIMUM DISTANCE IS REACHED.
5. CONTACT PERMALERT FOR SPECIFIC APPLICATION DETAILS.

Figure 2
Short Haul Modem Repeater Assembly

3 Short Haul and Network Modems

3.2 Network Modems

The PALCOM network modems allow communication from one or more PC's to all PAL-AT and LiquidWatch systems (maximum of 254 systems) connected to a local area network (LAN). Each leak detection system is connected to the Ethernet network via a modem and assigned a unique IP address.

If requested PermAlert personnel can configure the modem before delivery. To setup and configure the modem in the field, complete the following steps after receiving the required information from your network administrator.

CAUTION: Use the 9V power adaptor supplied by PermAlert. Use of alternate power adaptors can result in hardware damage and will render the warranty null and void!

1. Connect the power adaptor to the POWER port of the unit.
2. Connect the Ethernet cable to the ETHERNET port of the unit.
3. Connect a standard RS-232 cable (not supplied by PermAlert) to the DB-9 connector of the unit.
4. Plug the power adaptor into a power outlet.
5. Connect the RS-232 cable to one of the COM ports on your PC.
6. Start HyperTerminal or other terminal program.
7. Select the correct COM port in your terminal program (usually Com1 or Com2).
8. Configure the terminal with the following settings:
   - Bits per second: 9600 (required)
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: Hardware
9. Using a paper clip or similar item, press and hold the recessed CONFIGURE button on the top of the unit for several seconds until the initial Configuration screen appears (as shown below).

```
Precidia                  iPocket232 Configuration              v5.02.00

          Device Settings
1) Ethernet:            10.1.30.169

2) Serial Port          Transparent

*) Save Current Configuration
-) Exit Configuration (no save)
$) Security Settings
#) System Settings
?) Refresh this Screen
```

Change which Option?

10. Enter 1 to select the Ethernet sub-menu.

```
Precidia                    iPocket232 Configuration              v5.02.00

          Device Settings                    Ethernet Settings:
1) Ethernet:           10.1.30.169   A) IP Address:           10.1.30.169
                                     B) Subnet Mask:          255.255.0.0
2) Serial Port         Transparent   C) Gateway:              10.1.200.20

*) Save Current Configuration
-) Exit Configuration (no save)      Additional Gateway:
$) Security Settings                 D) Network Address:          0.0.0.0
#) System Settings                   E) Network Mask:             0.0.0.0
?) Refresh this Screen               F) Gateway                   0.0.0.0
```

Change which Option? 1

11. Enter A and the IP address of the leak detection system.
12. Enter B and C and enter the corresponding information.
13. **Enter "*" to save the changes.**
14. The correct serial port data is listed in Appendix A and should be set from the factory.

After Configuration

15. Disconnect the RS-232 cable from the COM port of your PC and then the modem.
16. Connect your leak detection panel to the DB-9 connector of the Ethernet modem using the *appropriate cable* supplied by PermAlert.
17. Connect the Ethernet cable to a hub or router if you have not already done so. (PermAlert does not supply Ethernet cable.)

3.2.1 Network Modem Test

A ping test can be performed to verify the modem is connected properly and the IP address is correct. Open a Command window in Windows and type the command “ping” followed by the IP Address for the modem. The system should display data similar to the example shown below.

```
C:\>ping 10.1.5.150
Pinging 10.1.5.150 with 32 bytes of data:

Reply from 10.1.5.150: bytes=32 time=3ms TTL=255
Reply from 10.1.5.150: bytes=32 time=1ms TTL=255
Reply from 10.1.5.150: bytes=32 time=1ms TTL=255
Reply from 10.1.5.150: bytes=32 time=1ms TTL=255

Ping statistics for 10.1.5.150:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 3ms, Average = 1ms
```

3 Short Haul and Network Modems

4 Installing Phone Modems

PALCOM has phone modems available, PM-1, PM-2, PM-2-LW and PM-2-INT. Each has a modem and an RS-232 cable. PALCOM can communicate with modem speeds up to 9600 baud. The modems use the standard Hayes “AT” command set. If another modem is substituted, it must be compatible. Each modem must be connected to a dedicated analog phone line capable of data communication. Refer to Appendix A for RS-232 cable configuration.

4.1 Installing a PM-1 Phone Modem

This modem is installed and connected to the PALCOM computer RS-232 serial port. The PM-1 modem has an 8-position DIP switch on the back. **The switches are set at the factory as follows:**

Switch	Position	Function
1	Down	DTR override (always on)
2	Up	Verbal result codes
3	Down	Result codes enabled
4	Up	Echo enabled
5	Up	Auto answer enabled
6	Up	Modem sends carrier detect
7	Up	Load factory defaults
8	Down	Smart mode

If the switches need to be changed, use a small screwdriver or pen. Next, connect the phone line to the modem jack with the "LINE" logo. Connect the modem to the computer with the RS-232 cable supplied. The modem requires a 120 VAC power source.

4.2 Installing a PM-2/PM-2-LW Phone Modem

This external modem is installed and connected to a PAL-AT or LiquidWatch system. Note the switch settings for the PM-2 modem are different than the PM-1. **The DIP switch on the back of the modem should be factory set as follows:**

Switch	Position	Function
1	Down	DTR override
2	Down	Numeric result codes
3	Down	Result codes enabled
4	Down	Echo disabled
5	Up	Auto answer enabled
6	Up	Modem sends carrier detect
7	Up	Load factory defaults
8	Down	Smart mode

The modem should be installed in a suitable environment or junction box. For a PAL-AT system, connect the RS-232 cable from the modem RS-232 connector to the PAL-AT terminal strip. The black, red and white wires go to G, RB and TB terminals, respectively. For a LiquidWatch system, connect the 25-pin connector of the RS-232 cable to the modem and the 9-pin connector to the LiquidWatch controller board. Next, connect the phone line to the modem jack with the "Line" logo.

4 Phone Modems

4.3 Installing a PM-2-INT Phone Modem

An optional internal modem is available for the PAL-AT (version H processor card or later, see Figure 3). The modem is usually factory installed but can be installed in the field. First turn off the PAL-AT unit and remove the processor card. The modem plugs into the backside of the card into 2 terminal strips. The pins are keyed, with a gap in the top row of pins, and only fit one way. Next move the "Modem/Direct Select" jumper to the left two pins or "Modem" position. This redirects the RS-232 B port to the modem instead of the terminal strip on the motherboard. Reinstall the processor card and install the analog phone line plug into the jack at the top of the card.

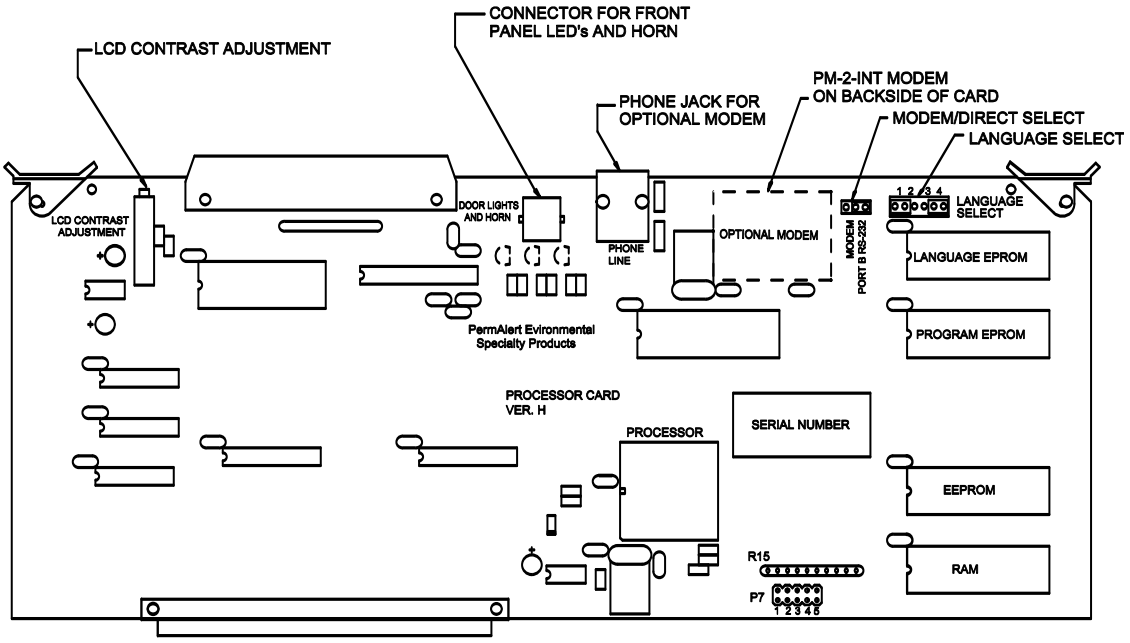


Figure 3
PAL-AT Processor

5 PAL-AT Firmware

A PAL-AT system must have version 9.xx firmware installed to communicate with PALCOM / GLS. The version number installed is displayed on the LCD during the initial 5-minute warm-up period. PALCOM Lite does not require the 9.xx firmware.

5.1 Setting Up PAL-AT

Several functions in the Special Functions Menu are required. Select the PAL-AT Special Functions Menu from the Main Menu, by pressing 9 and then #. Enter a level 250 password (Refer to the "PAL-AT Operating Manual", Section 2.9).

5.1.1 Set Baud Rate

The baud rate can be set from 110 to 9600 baud. 9600 baud is the recommended rate, however a slower rate may be necessary in some locations. All systems connected by phone modems must use the same speed and all short haul modems must be set to the same speed. To set the baud rate, press 4 and # from the Special Functions Menu. The message on the LCD is:

```
MODEM BAUD RATE NOW XXXX
ENTER * FOR NEXT RATE, # WHEN CORRECT
```

If the displayed rate (XXXX) is correct, press #. If not, press * for a different rate until the proper rate is displayed. Then press # and the PAL-AT will return to the Special Function Menu.

5.1.2 Set System Identification

Each PAL-AT must have a unique identification number from 1 to 254. To set the identification number, press 5 and # from the Special Function Menu. The display is:

```
ENTER SYSTEM ID (1-254): 1
* TO CLEAR, # TO ACCEPT ENTRY
```

The current system number is displayed. If it is correct, enter #, if not, enter * to clear and then enter a number from 1 to 254, preferably in sequence 1, 2, 3 . . . for each system, and then press #.

5.1.3 Enter Phone Numbers - Version 9.xx only

If the PAL-AT is connected to a short haul modem or a network modem, skip this section and go to SELECT EVENTS. A phone number must be entered into each PAL-AT connected by a phone modem to the PALCOM computer. The phone number is the number of the PALCOM computer that the PAL-AT calls when it enters into alarm. To set phone and event information select 6 and # from the Special Function Menu. The display is:

```
# TO EXIT, 1# FOR PRIMARY PHONE NUMBER
2# FOR ALTERNATE, 3# TO SELECT EVENTS
```

Press 1 and then # to enter the primary phone number. The next message is:

```
PRIMARY PHONE NUMBER X YYYY
ZZ SECONDS. # TO ACCEPT, * TO REENTER
```

If a primary phone number has previously been entered, it is displayed. If not, "X", "YYYY" and "ZZ" are

blank. "X" is either "T" for tone or "P" for pulse. "YYYY" is the actual phone number. "ZZ" is the number of seconds the modem should wait to complete the call. If the displayed phone number is correct, press # to return to the previous message.

If * is pressed, the number is reentered and the next message is:

```
ENTER 1 FOR TONE DIALING, 2 FOR PULSE
```

If the phone line is set for touch-tone service, press 1 and then #, otherwise press 2 and #. The next display is:

```
ENTER TIME TO WAIT FOR CARRIER TO ANSWER
(30-250 SECONDS)
```

Enter the time that the modem should wait to complete the call before hanging up and trying later. Normally 30 seconds for a local call is sufficient; 60 seconds for a long-distance call. However, this is dependent on the local service and must be based on experience. The next display is:

```
ENTER PHONE NUMBER:
ENTER # FOR PAUSE OR END
```

Enter the complete phone number including all long distance access codes. If a delay is needed — for example to get an outside line after dialing 9 — enter #. When # is entered the display is:

```
XXXX
ENTER 1 = PAUSE OR # = END
```

"XXXX" is the partial phone number already entered. Enter 1 and the display returns to the previous message with a comma representing a 2 second pause. If # is entered, the phone number entry sequence ends and the display returns to the first message in this section. The procedure for entering the alternate number is identical. An alternate number is only used when there are two PALCOM computers on-line. The PAL-AT calls the alternate number if the primary number does not respond after three dialing attempts.

5.1.4 Select Events - Version 9.xx only

Events that initiate a call to PALCOM must be selected. It may not be necessary for all events (cable returned to normal, cable drying, etc.) to call PALCOM. Press 3 and # when the message in section 5.1.3 is displayed to select which events initiate a call. The message is:

```
EVENTS NEEDING MODEM CALL XXXX
# TO ACCEPT, * TO REENTER
```

If a list of events has previously been entered, it is displayed. Press # to use the displayed list and return to the message in 5.1.3. **No events should be selected for direct wired or network connected PAL-ATs.** Enter * to create a new list, or clear the list, and then the next message is:

```
SELECT EVENTS NEEDING MODEM CALL
ENTER DIGITS 1 THRU 8
```

If a phone modem is used, enter the number(s) listed below to include all events that should initiate a call to PALCOM. **If the PAL-AT is connected by a short haul direct wired modem or a network modem, only enter # to clear the events and return to the message in 5.1.3**.

Event Code	Events
1	Fault, leak, no end, short, break and cable drying (if automapping not selected)
2	Probe activated
3	Automatic monitoring enabled/disabled, cable monitoring on/off, set up, reference
4	Probe reset
5	Cable return to normal, cable drying (if automapping selected)
6	Power restored
7	Alarm silenced
8	Time reset

It is recommended that events 1, 2, 3 and 6 be selected. A typical selection is: 1236 #. This completes the setup of the PAL-AT firmware to use PALCOM.

5.2 New PAL-AT Messages

There are several new archive messages that may be displayed by a PAL-AT when it is using a phone modem to communicate with PALCOM. (Refer to "PAL-AT Operating Manual" Section 2.6) The first lines of the messages are:

```
SUCCESSFUL CALL TO PRIMARY NUMBER
```

This entry is made when PAL-AT initiates a call to the primary PALCOM phone number and PALCOM receives the messages.

```
SUCCESSFUL CALL TO ALTERNATE NUMBER
```

The entry is made when an alternate phone number is set up for PALCOM and PAL-AT successfully calls the alternate number.

```
UNSUCCESSFUL CALL, PROBLEM "??", CODE "X"
```

There are several messages with this format. "??" is a number. "X" is a letter or number code. These codes assist in isolating a problem if the PAL-AT is unable to call PALCOM. The following list explains the most common problems & codes:

Problem	Code	Cause
5,10	M, 1-9	The PAL-AT cannot communicate with the PAL-AT Modem.
		No Carrier — the PALCOM modem does not answer the call.
18	T, 1-9	The PAL-AT has connected to the PALCOM modem, but PALCOM is not in Automatic Monitor and does not acknowledge the messages.
25	A, P, 1-9	The PAL-AT has tried unsuccessfully three times to connect to
		PALCOM and waits for a 3-hour period to retry.

5 PAL-AT Firmware

6 LiquidWatch Firmware

6.1 Setting Up LiquidWatch

Several functions in the "Configuration Menu" are used to configure LiquidWatch to communicate with PALCOM.

6.1.1 System I.D.

Each LiquidWatch system must have a unique address or system I.D. To set the system I.D., select Function 5 from the configuration menu.

```
CONFIGURATION MENU
5 OF 8 SYSTEM I.D.
```

Use the arrow keys to select the correct system from 001 to 254. Press "Enter" or "M" to return to the configuration menu.

```
CONFIGURATION MENU
SYSTEM I.D. # - 001
```

6.1.2 Baud Rate

The baud rate for RS-232 communications must be set for LiquidWatch to communicate with PALCOM. The baud rate is selectable from 300, 600, 1200, 2400, 4800, and 9600. To set the system baud rate, select Function 6 from the configuration menu.

```
CONFIGURATION MENU
6 OF 8 BAUD RATE
```

Use the arrow keys to select the correct baud rate, usually 9600. All systems connected by phone modems must use the same baud rate and all short haul modems must be set to the same baud rate. Press "ENTER" or "M" to set the rate and return to the configuration menu.

```
CONFIGURATION MENU
BAUD RATE - 9600
```

6.1.3 Phone Number

A phone number must be entered if a LiquidWatch system is connected to the PALCOM computer by a phone modem. The LiquidWatch system will initiate a call to the PALCOM computer if a probe is activated. **If the LiquidWatch system is connected by a short haul modem or a network modem, the phone number must be erased.** To change the phone number, select function 7 from the configuration menu.

```
CONFIGURATION MENU
7 OF 8 PHONE NUMBER
```

The following screen will be displayed. The second line displays the digits entered. The numbers 0 - 9 and letters D (DELAY), T (TONE) and P (PULSE) can be selected by scrolling with the arrow keys.

When the correct digit is displayed, press "ENTER". After all digits are selected, select "T" or "P" to end the process and clear any following digits. "T" is selected if the phone line has touch-tone service for a push button phone. "P" is selected if the phone has pulse service for a rotary dial phone. **If "T" or "P" is selected as the first digit, the phone number will be erased. This should be done if the LiquidWatch system is not connected to a phone modem.**

```
PH. #: 0-9,D,T or P
9P18479662190
```

When "MENU" is pressed, the number is saved and the system returns to the configuration menu.

7 Running PALCOM

7.1 Introduction

PALCOM is designed with pull-down menus that are selectable with a mouse. Menu items may also be selected by pressing the "Alt" key and the underlined letter of the menu item. The "Tab" and "Arrow" keys move the cursor to different fields on the screen when inputting data or simply move the cursor with the mouse to the required field and click the mouse button.

7.1.1 Initial Display

An initial display is shown for 30 seconds. The version number is displayed in the middle of the screen. Refer to the version number in any correspondence to PermAlert ESP. You may exit the timed display early by pressing any key or click the mouse on the display window.

7.1.2 Serial Port Check

After the initial display, PALCOM checks that the serial ports are installed for communicating with PAL-AT and LiquidWatch systems. If a phone modem is required, it checks to ensure that it is operating properly. If PALCOM detects any problems, a message asks the operator to check the devices or to change the setup.

7.1.3 Main Menu

PALCOM has five functions in the Main Menu:

Automonitor

Manual Menu

Setup

Help

Exit

The first two choices, Automonitor & Manual Menu, are not available until the Setup function is completed. The Help function can be accessed at any point in the program.

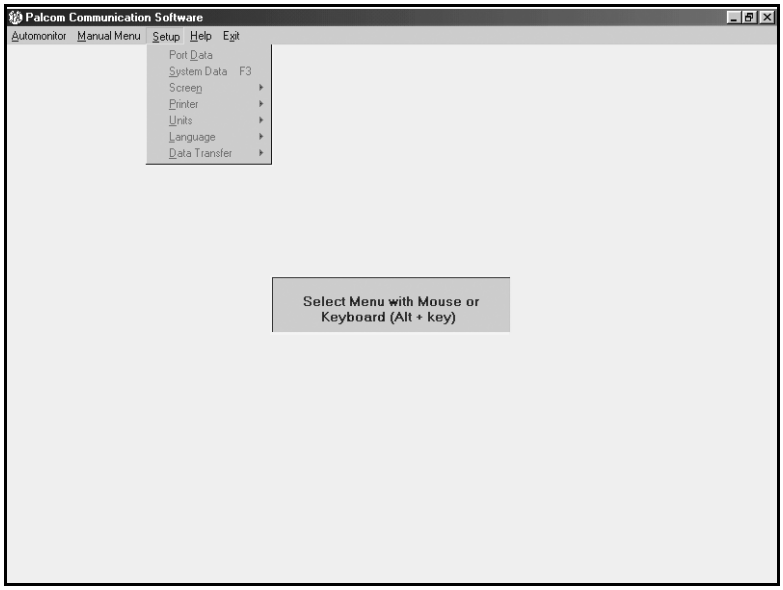
7.2 Setup

Select the Setup menu to:

1. Set the serial port data.
2. Enter the active PAL-AT and LiquidWatch system numbers.
3. Select color or monochrome screen.
4. Select color or monochrome printer.
5. Select the unit of measure, feet or meters, for a PAL-AT system.
6. Select user interface language.
7. Select data transfer mode.

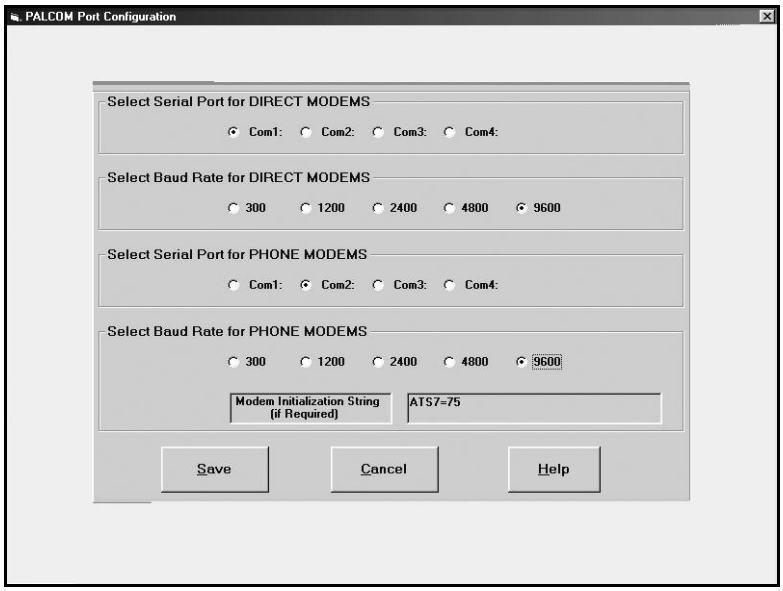
The first two menu items must be completed before PALCOM can communicate with a leak detection system.

7 Running PALCOM



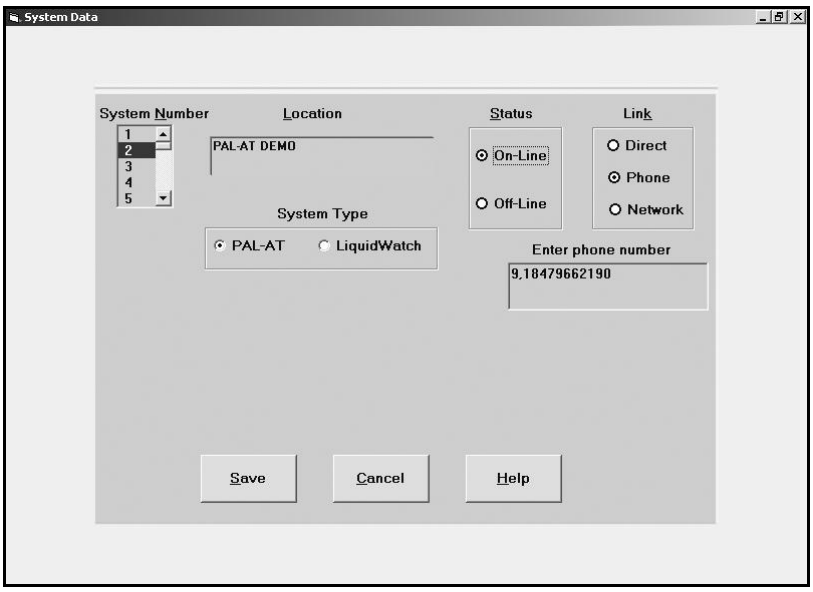
7.2.1 Port Data

First the serial ports and baud rates are selected. If any system is connected to the PALCOM computer by a short haul direct-wired modem, click the appropriate serial port number and baud rate for "Direct Modems". Likewise, if any system uses a phone modem, click the serial port number and baud rate for "Phone Modems". The default initialization string for U.S. Robotics Sportster modems supplied by PermAlert is: ATY0S7=75. Select "Save" to save the changes and exit.



7.2.2 System Data

Enter the System Data next by clicking the menu item or use the shortcut key F3. This screen displays the location, status and communication data for each of the PAL-AT and LiquidWatch systems monitored by PALCOM. Move the cursor to the appropriate field on the screen to enter the data described below.



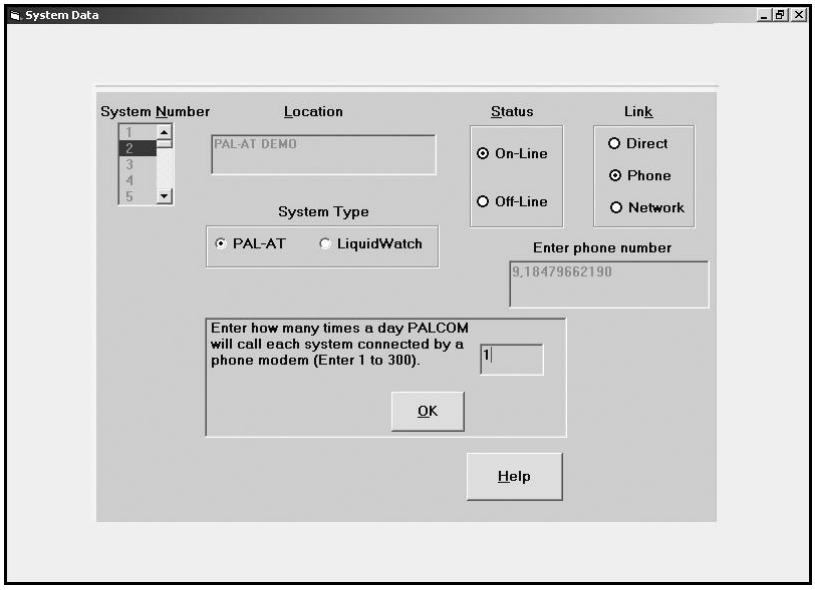
The "System Number" refers to the system identification number selected during the system setup. A maximum of 254 systems can be monitored with PALCOM. It is recommended to start with system 1 and number the systems consecutively. Click a system number to view the data for that system.

Each system selected for monitoring must have an entry (maximum 30 characters) in the "Location" field for PALCOM to recognize it as a valid system. For each system choose either PAL-AT or LiquidWatch in the "System Type" field.

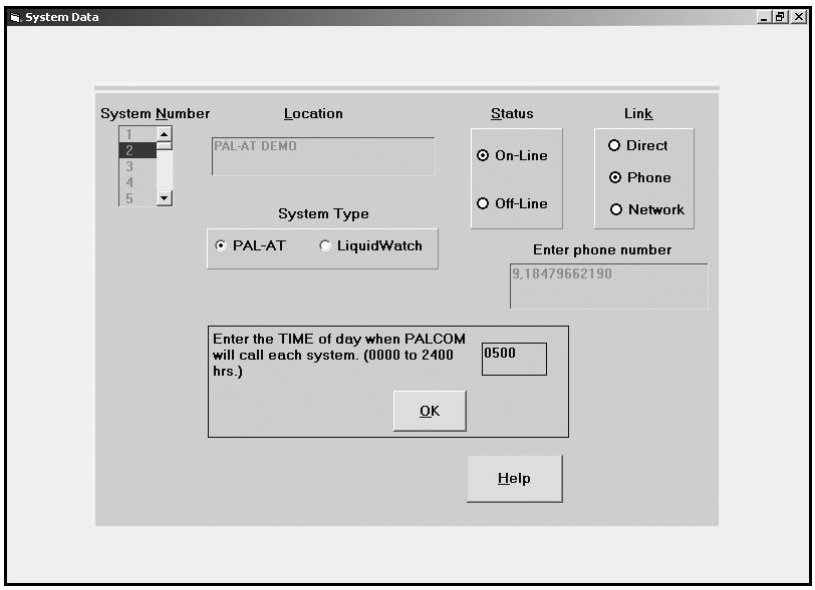
Next, select if the system should be monitored by PALCOM in Automonitor mode, or "ON-LINE". Click the correct choice to change the "Status". This refers to on/off line as far as Automonitoring by PALCOM is concerned and will not affect the operation of the PAL-AT or LiquidWatch system. In the last column, "LINK", click the connection type for the system. If it is connected to a phone modem choose "PHONE", if it is connected by a network modem click "Network" or choose "DIRECT" if it is either direct wired to a short haul modem or directly connected to the computer with an RS-232 cable (Maximum length for an RS-232 cable is 50 feet). If a phone modem is used, enter the phone number at the cursor. Add a comma in the phone number if a two second delay is needed. If a network modem is installed, enter the IP address assigned to the modem at the leak detector panel (e.g. "10.1.50.5"). When the data is correct for all systems, click "Save" to return to the Main Menu.

7.2.2.1 Phone Check

If any leak detection system is connected by a phone modem, PALCOM calls it daily to make sure it is working. This call is only a check of the phone equipment, line and the panel's ability to answer a call. Remember, the system calls PALCOM immediately if it detects a leak, break, etc. Select how many times PALCOM should call each system every 24 hours (1-300).



If 1 is entered, PALCOM asks what time of day to make the call.



If more than one is entered, PALCOM divides each 24-hour period into that number of evenly spaced intervals. Each call typically takes less than one minute. Next, PALCOM returns to the Main Menu. During this time it checks that the serial ports selected are installed and tests the phone modem at the PALCOM computer, if any of the on-line systems are connected to a phone modem.

7.2.3 Screen

Click "Color" or "Monochrome" to select the type of monitor used.

7.2.4 Printer

Click "Color" or "Monochrome" to select the type of printer used.

7.2.5 Units

Click "Feet" or "Meters" to select the unit of measure used by the PAL-AT systems.

7.2.6 Language

Click the user interface language. English and German are currently available. After selecting a language, exit PALCOM and restart it to implement the change.

7.2.7 Data Transfer

There are two transfer modes: "Normal Transfer" and "Verify Data". "Normal Transfer" is the default setting. The "Verify Data" option is available for noisy or unreliable phone connections. Using this option, each data block is received twice from the leak detection system and compared to verify it is identical. This process takes approximately twice as long to collect data. Simply click the appropriate choice.

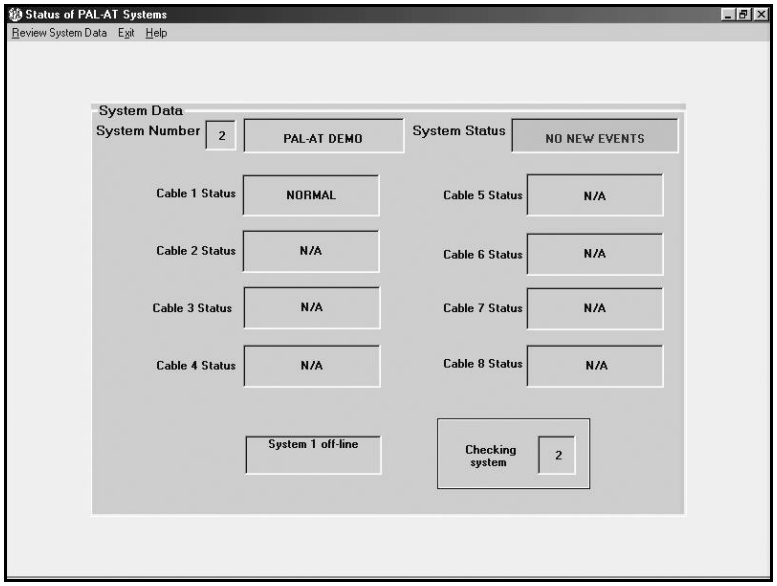
7.3 Automonitor

The Automonitor function of PALCOM monitors the status of each PAL-AT and LiquidWatch system. PALCOM continuously monitors all systems connected by direct-wired short haul modems in numerical order from 1 to 254.

One or more times a day PALCOM calls each system connected by a phone modem. If the system does not answer, an error message is entered by PALCOM and it tries again the next time through. When a PAL-AT or LiquidWatch system detects an event, it calls PALCOM immediately to report it. If PALCOM is in the Automonitor mode, it immediately collects the data from the system and then resumes sequentially monitoring the other systems.

If PALCOM is turned off or not in Automonitor, the system calls back three minutes later. After three attempts, it waits three hours and repeats the sequence. Click "Automonitor" and then "Monitor" in the Main Menu to select the Automonitor function. A timer automatically selects Automonitor after 5 minutes in the Main Menu. PALCOM Lite does not automatically enter Automonitor.

7.3.1 Screen Layout for PAL-AT

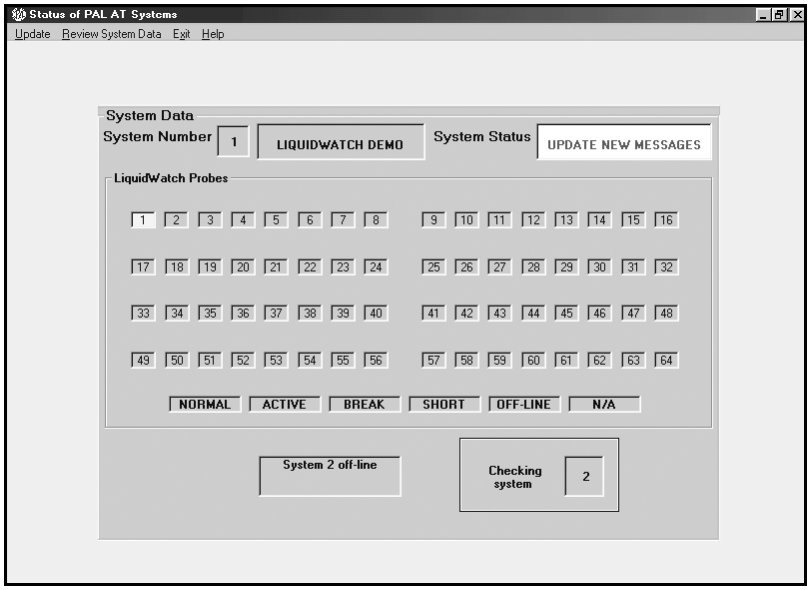


The lower right corner of the screen displays the number of the PAL-AT system currently being checked. After PALCOM is finished with a system, the status information is displayed on the screen. The top row lists the System Number, Location and System Status. A PAL-AT 40K / 80K can monitor up to eight sensor strings. PALCOM displays the Cable Status of each sensor string. "N/A" is entered if a cable card is not installed.

7.3.2 Screen Layout for LiquidWatch

The display for LiquidWatch systems has 64 boxes for the status of 64 probes. The boxes are color coded for status:

NORMAL	=	GREEN
ACTIVE	=	RED
BREAK	=	YELLOW
SHORT	=	ORANGE
OFF-LINE	=	MAGENTA
N/A	=	GRAY



7.3.3 System Status

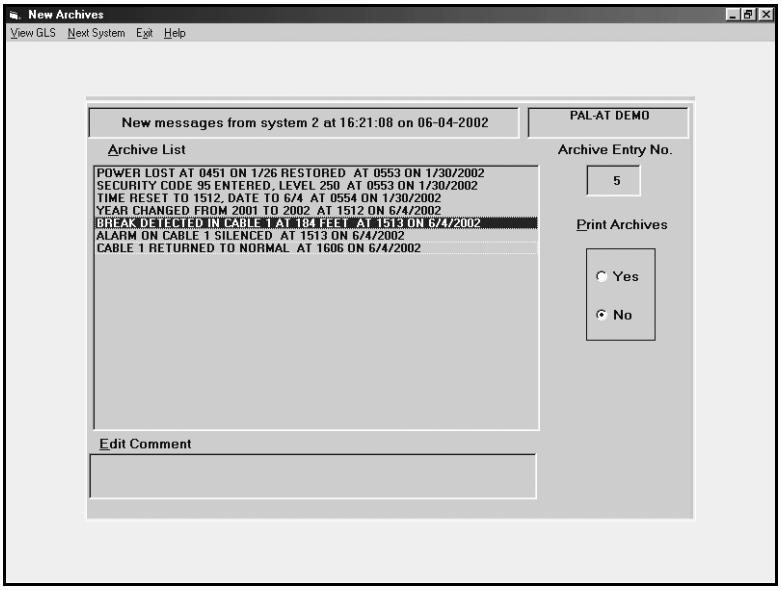
The System Status of the leak detection systems has several possible messages:

- No New Events — If a system is monitored and communicating properly.
- Monitoring For Call — If the leak detection system is connected by a phone modem and PALCOM is waiting for the next call.
- Update New Messages — If new archives are received from the system.
- Automonitor Disabled — If the PAL-AT system is not set to automatically monitor cables.
- Address Error — If the system does not respond to PALCOM. Check if the address for the system is the same on the system as on the PALCOM "System Data".
- No Phone Answer — If the phone modem at the system does not answer. Check the modem and make sure it is properly connected. Also check the phone number entered (See "System Data").
- Data Error — If incorrect data is received by PALCOM. Check the communication line. A slower baud rate may be necessary if this error happens often. Also, if systems are connected by short haul modems, two or more systems may be set incorrectly to the same system identification number.

The first four messages are displayed in normal operation. If any of the last three messages are received, correct the problem immediately.

7.3.4 Update

The "Update" menu item is visible if PALCOM has received new messages from any leak detection system. The update function displays all new messages received from the systems. Click the "Update" menu to view the new messages.

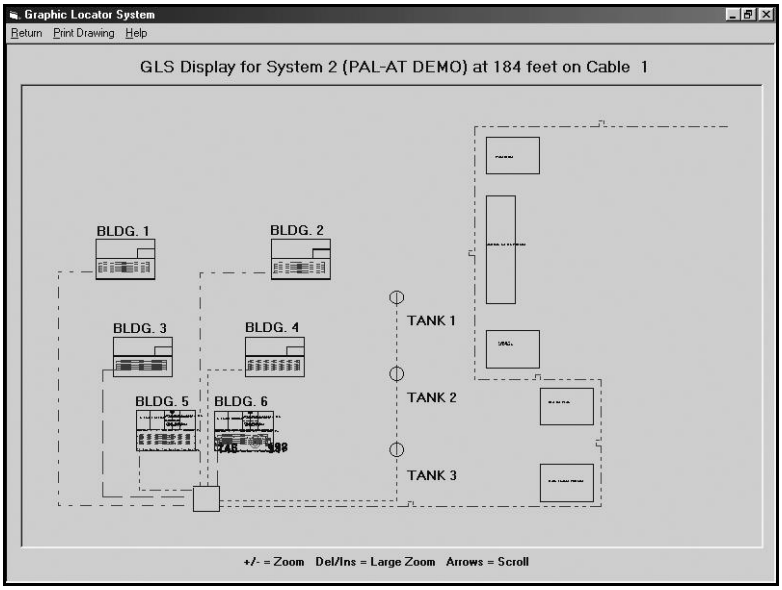


The update procedure lists the new messages from all systems on-line starting with the lowest numbered system. The archive screen displays a list box containing all the new archive messages for the first system. If there are more messages than can be displayed at one time, a vertical scroll bar is visible. Each archive message has a "comment" message associated with it. This comment message is useful to document action taken in response to a leak or to save other information. To create a comment, first click the appropriate message in the archive list. Then click the box labeled "Edit Comment". When you are finished entering a comment, select another message from the archive list.

A cut and paste feature is available for archive entries. Use standard Windows keyboard or mouse techniques to select the desired archive listings. Then press CTL-C to copy them to the Windows clipboard.

7.3.4.1 View GLS

If a Graphic Locator System (GLS) file has been created for the current system, "View GLS" is available. This feature displays a CAD site drawing showing the location of a cable or probe problem. Click an archive message in the Archive List that reports a "leak", "break", "drying" or "probe". The "View GLS" menu item will be bold type if a GLS file exists for the system. If so, click the "View GLS" menu and a red icon on the CAD drawing of the installation will mark the distance or probe number displayed on the archive message.



The Graphic Locator System screen also has a menu. Click "Return" to return to the archive screen. Click "Print Drawing" to print the area of the drawing displayed. Before printing, use Windows' Print Manager to change the proper printer and resolution, if desired.

Use the mouse or the keyboard to change the area of the drawing that is displayed. Click the "Help" menu for a summary of this information. The "Home" key will display the entire drawing. "End" zooms in to the location of the fault. To change the viewing area with a mouse, press the mouse button down to locate one corner of a new window, drag the mouse to the opposite corner and release the button. To zoom out 50% and see a larger area, click the drawing without moving the mouse.

7.3.4.2 Print Archives

If a printed record of the new message is needed, click "Yes" in the print archives box. The messages will be printed when the "Next System" is selected.

7.3.4.3 Next System

Click "Next System" to display new archives from the next system. The new messages are added to the permanent ARC.PCA file for the system. After all systems have been displayed, PALCOM returns to continue Automonitor.

7.3.5 Review System Data

If several panels are monitored with PALCOM, this feature allows the operator to view the status data for any system quickly without waiting for a particular system to be polled. Click "Review System Data" in the menu bar. Then click "Next System" or "Prior System" to select the desired PAL-AT or LiquidWatch system. Click "Return to Monitor" to resume Automonitor.

7.3.6 Exit

Click the "Exit" command button and PALCOM returns to the Main Menu when it finishes checking the current system.

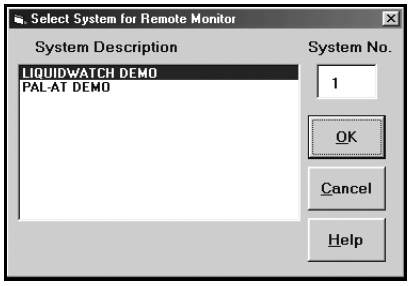
7.4 Manual Menu

7.4.1 Introduction

PALCOM has a Manual Menu to get additional information from a specific leak detection system. Click the Manual Menu from the Main Menu. The features in the Manual Menu are: Remote Keypad, List Archives, Terminal Mode, Graph Data and GLS (Graphic Locator System).

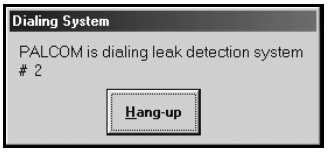
7.4.1.1 Select System

When any Manual Menu item is selected, PALCOM asks to select a system. Click the appropriate system description and then click "OK". If a system is not listed, then click "Cancel" and choose the Setup/System Data menu to enter the setup information for the system.



7.4.1.2 Dialing

If a system is selected that uses a phone modem, a dialing form is displayed. To cancel the call, click "Hang- Up" when the text "Hang-Up" is boldfaced.

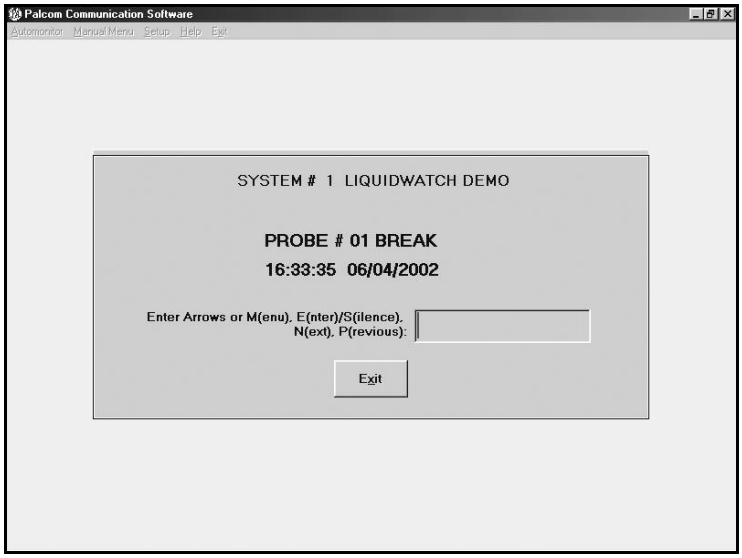


7.4.2 Remote Keypad

Click the Remote Keypad feature from the Manual Menu, or press shortcut key F4. Select a system.

PALCOM displays two lines of text that are exactly the same as the LCD on the PAL-AT or LiquidWatch. If the system is a PAL-AT press 0-9, " * " or " # " to communicate with it. The enter key on the PALCOM computer keyboard also acts like the " # " key. If the selected system is a LiquidWatch, the arrows, M(enu), E(nter), S(ilence), N(ext) and P(revious) keys will communicate with it.

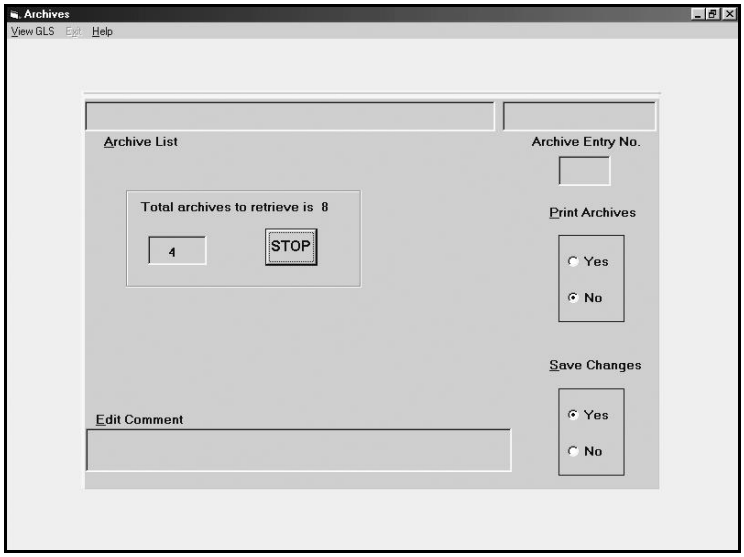
For a PAL-AT system, when valid keys are pressed, the number(s) are displayed until "* " or " # " is pressed (the keystrokes are not displayed for a LiquidWatch system). There is a slight delay (less than two seconds) between the time the " * " or " # " key is pressed and when the two-line message is updated. All functions operate with Remote Keypad exactly the same as when the keys are pressed on the system. To return to the Main Menu, click "Exit".



7.4.3 List Archive

Click the List Archive feature or press F5 from the Manual Menu. Select a leak detection system. If a permanent archive file exists for the system, it is displayed.

If not, PALCOM retrieves the entire archive file from the system. The archive retrieval process can be stopped at any time and a partial list saved by clicking the "Stop" command button. PALCOM then displays the entries as explained previously in "Update", Section 7.3.4.

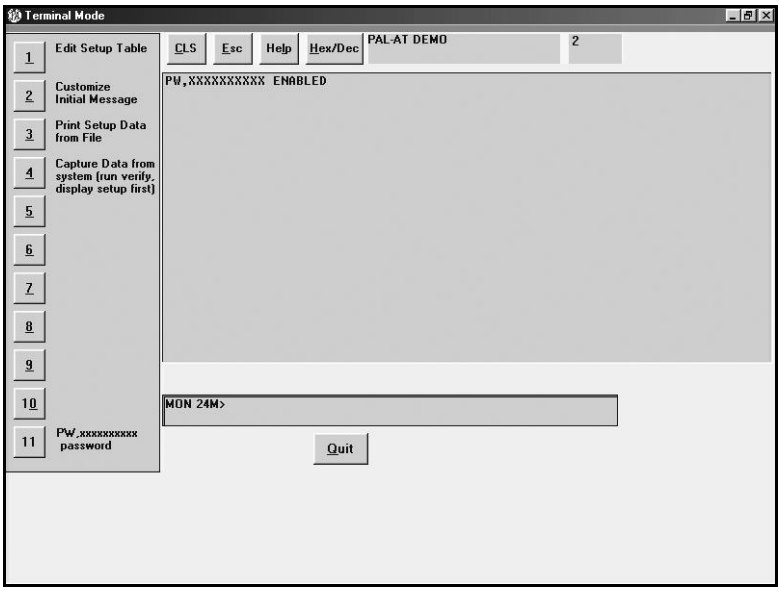


7.4.3.1 Save Archive

The "Save" feature defaults to "Yes" to save any changes made to the comment fields of the messages. If you want to delete the changes, click "No". Click "Exit" to return to the Main Menu.

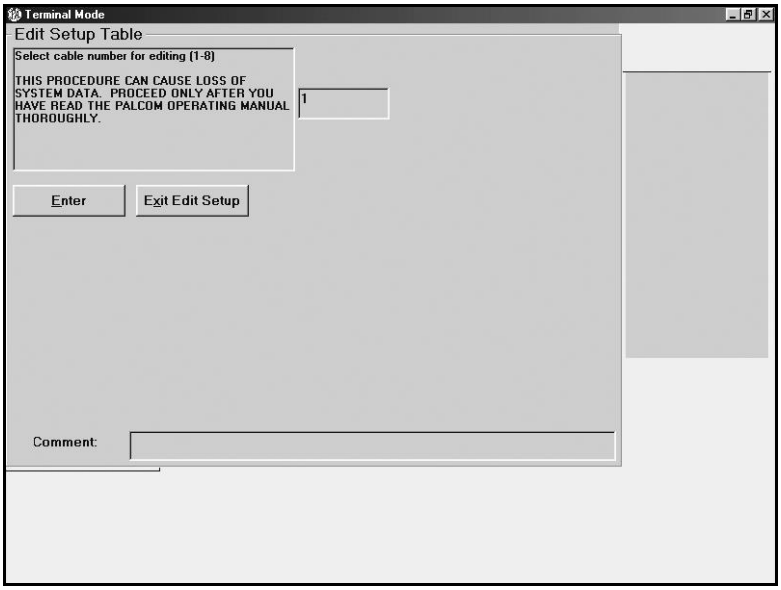
7.4.4 Terminal Mode - PAL-AT Systems Only

Click the "Terminal Mode" feature from the manual menu. There are 11 buttons on the left of the screen and several have functions assigned to them.



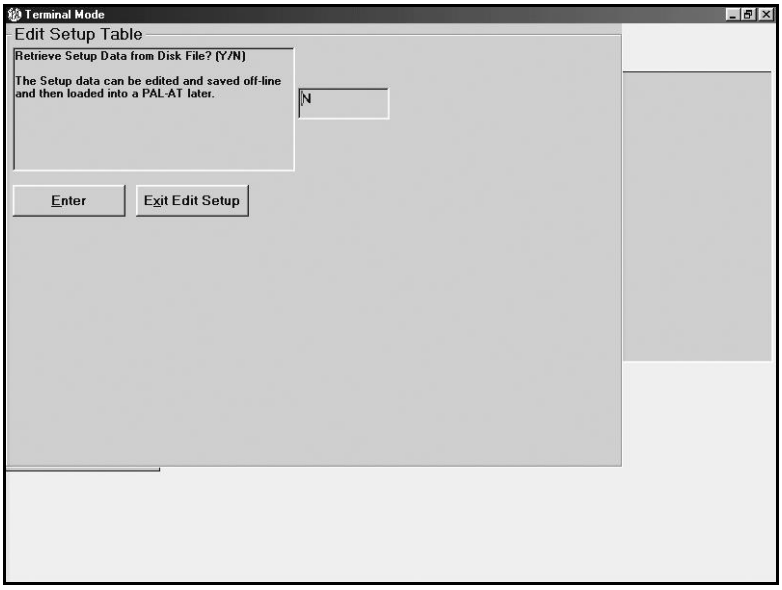
7.4.4.1 Edit Setup Table

This function should only be used after contacting PermAlert Technical Assistance Personnel. Click button "1" to select "Edit Setup Table".

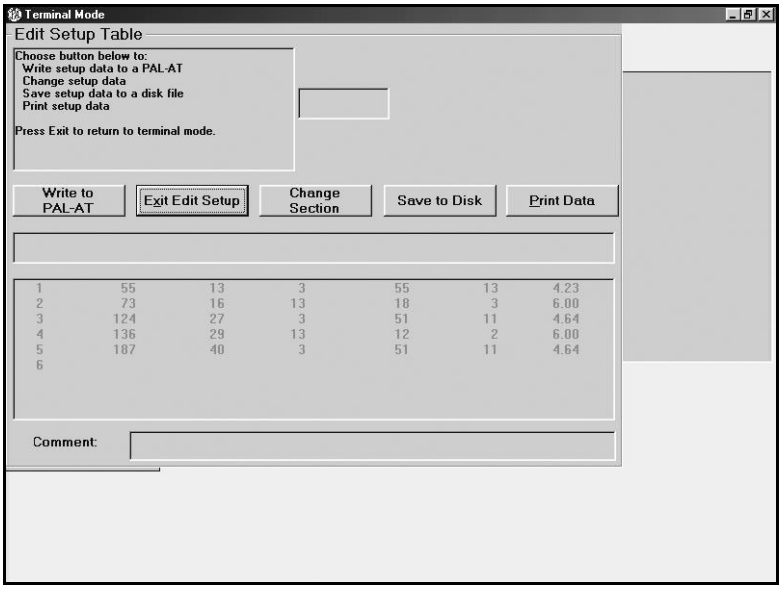


Next enter the number of the cable and click "Enter". After PALCOM connects to the PAL-AT, you can select to retrieve the setup data from a file that has been previously saved. This is useful if the data has been corrupted and the original settings need to be restored. To do this, enter "N" and click "Enter". To

collect and save new data, enter "Y" and click "Enter".

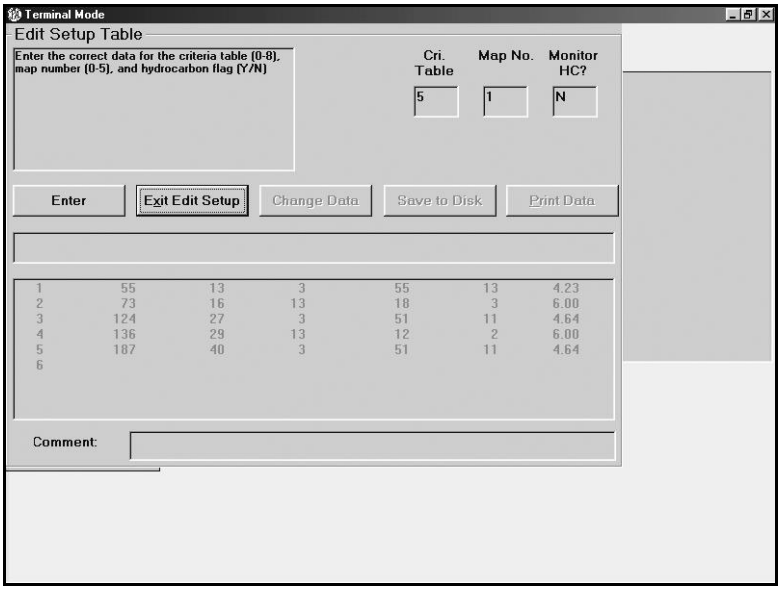


The following screen shows the four functions available: (1) Write new data to PAL-AT, (2) Change setup data, (3) Save setup data to a disk file and (4) Print setup data.



1. Write to PAL-AT

This function writes the setup information into the memory on the cable card selected. It is used to restore the original setup data from a file or enter new data created in the "Change Data" function. Click the button and the following screen will be displayed.



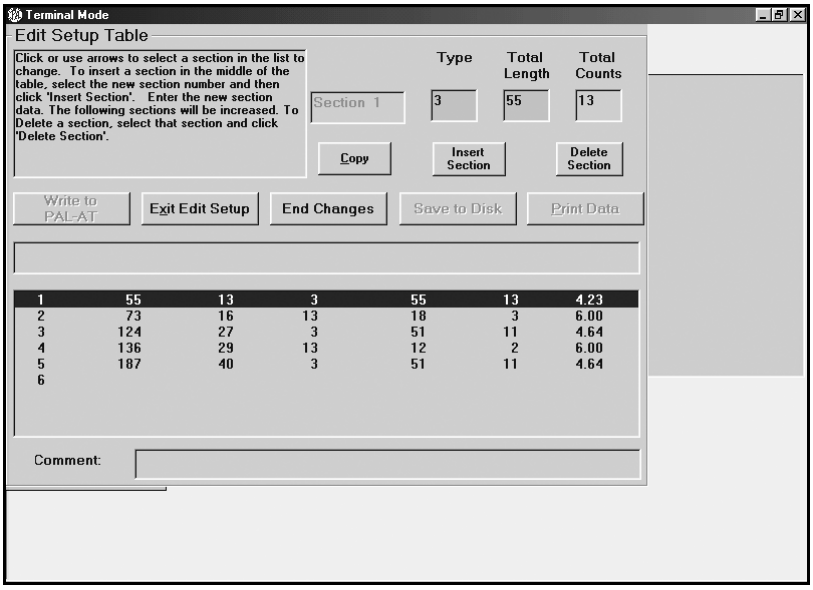
Three boxes at the top of the screen display important information for the card. "Cri.Table" should normally be "3" if the cable is monitoring for hydrocarbons. If not and there are probes connected to the cable, it should be "4". Otherwise, set it to "5". If any sensor cables, not probes, are monitoring for hydrocarbons, set "Monitor HC?" to "Y".

"Map No." specifies which map will be monitored. If "Cri.Table" or "Monitor HC" was changed, set it to "0". If you are writing data into a replacement card, set it to "0". If Map No. = 0, a new reference map 1 will need to be taken before the cable can be monitored.

When the data is correct, click "Enter". The system will take a minute or so to write the data and return to the "Edit Setup Table" menu.

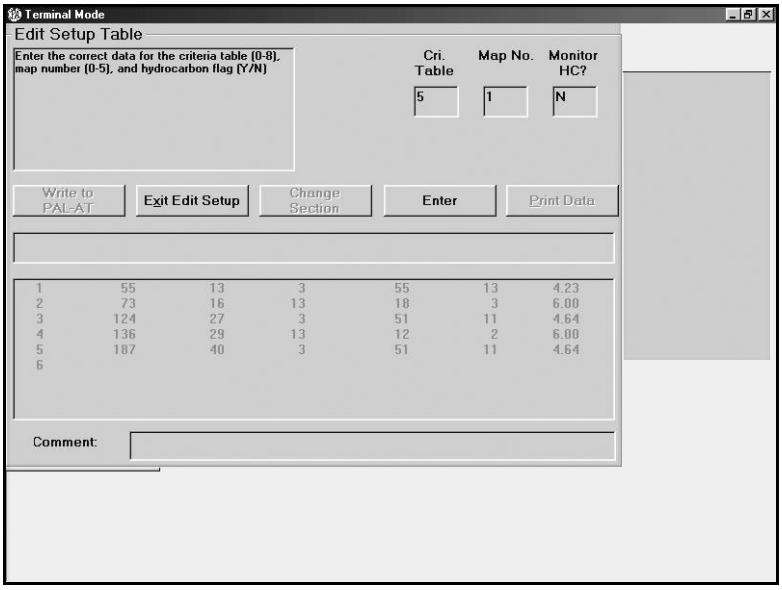
2. Change Data

This feature can be used to insert new sections, delete sections and change section lengths. It should only be used under direction of PermAlert technicians. The screen is shown below. A comment can be attached to the highlighted section (e.g. "Section 2 runs from building 1 to building 2.") to aid in troubleshooting a problem



3. Save to Disk

This feature saves the setup data in a file. To save the data click the "Save to Disk" button. Then click "Enter". A screen will pop up to select the file name. All setup data files use the ".SET" extension.



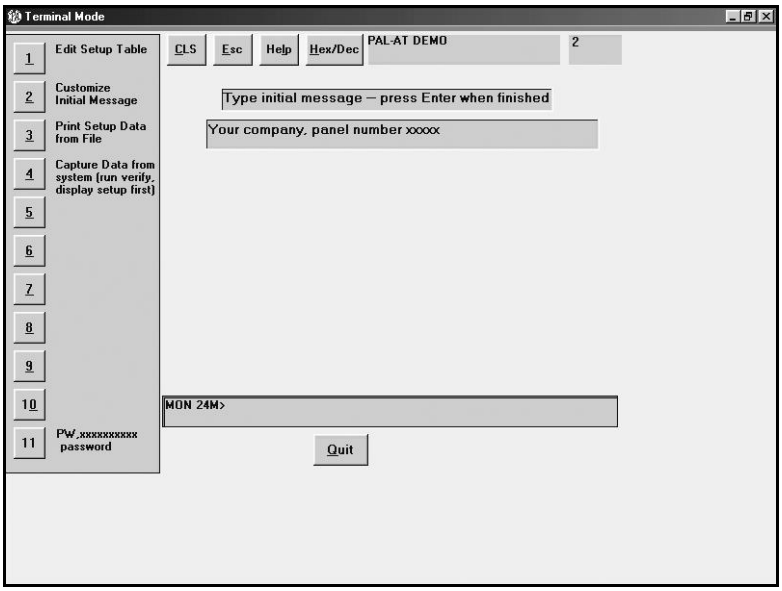
4. Print Data

Click "Print Data" to print a copy of the setup information.

Click "Exit Edit Setup" to return to Terminal Mode menu.

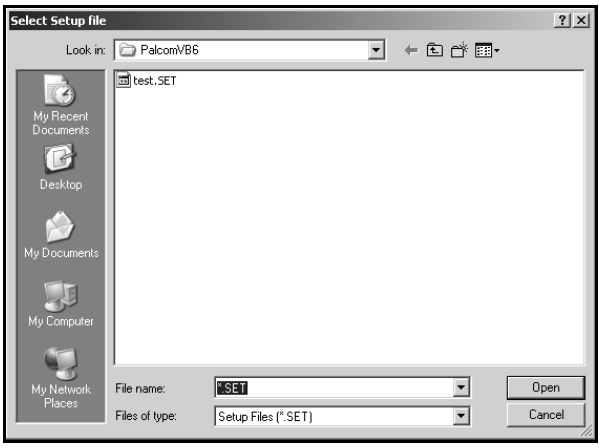
7.4.4.2 Customize Initial Message

Click button "2" to enter a custom message for PAL-AT to use for the initial display when it is first turned on. The message is limited to 32 characters.



7.4.4.3 Print Setup Data From File

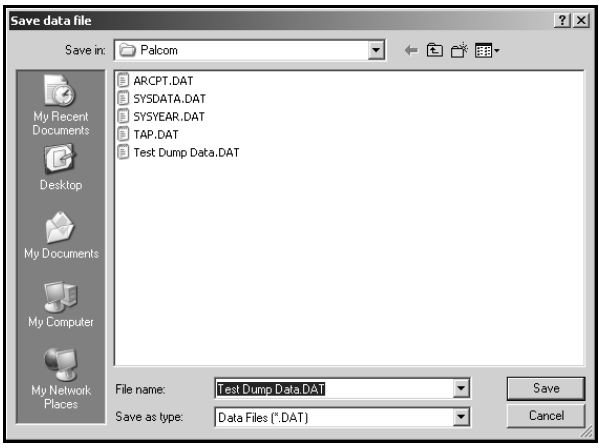
Click button "3" to print the setup data previously saved from a cable card. A window will open to select a file. Select a file and PALCOM will go to "Edit Setup Table". The data can be printed as described previously.



7.4.4.4 Capture Data

Click button "4" to save operating data to a file. A window will open to select a file. The file can be e-mailed to a PermAlert technician to aid in troubleshooting an unusual problem.

Before this feature is selected, run the "Verify" function on the PAL-AT unit and then run the Display Setup function for the cable selected. Leave the PAL-AT in the Display Setup function while PALCOM retrieves the information.

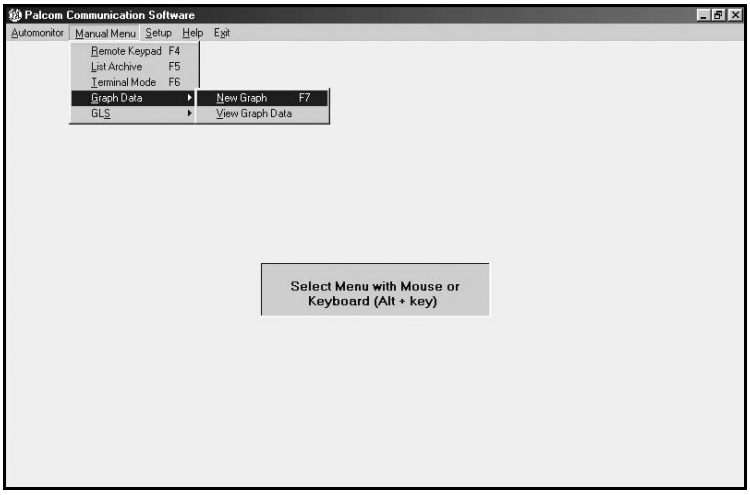


7.4.4.5 Quit

Click the "Quit" button to return to the main menu.

7.4.5 Graph Data - PAL-AT Systems Only

Click the "Graph Data" feature from the Manual Menu. You can either download and plot a "New Graph" from a system or "View Graph Data" that was saved earlier in a file.



7.4.5.1 New Graph

Select the system number. If the PAL-AT is connected by a phone modem, the system is called and a connection is made as discussed earlier. PALCOM checks the system and then asks which cable should be analyzed. The default cable number is 1. If another is chosen, click the text box, enter a new cable number and click "OK". The data collection process takes a minute or so depending on how long the cable is.

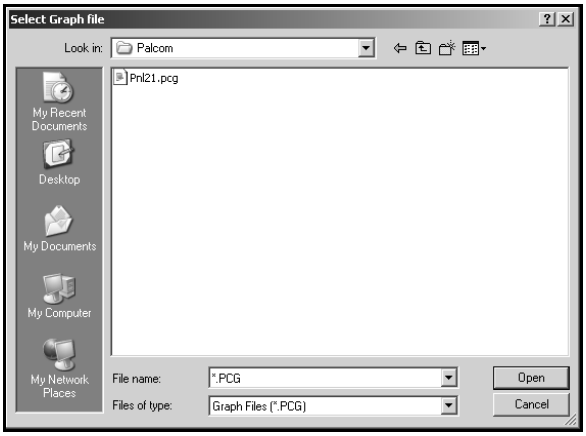
The sequence is:

1. Retrieve the setup information
2. Verify the cable.
3. Retrieve the current data.
4. Retrieve the map data.
5. Restore the system to monitoring (if it is on-line).

When the data is collected the Graph Menu screen is displayed.

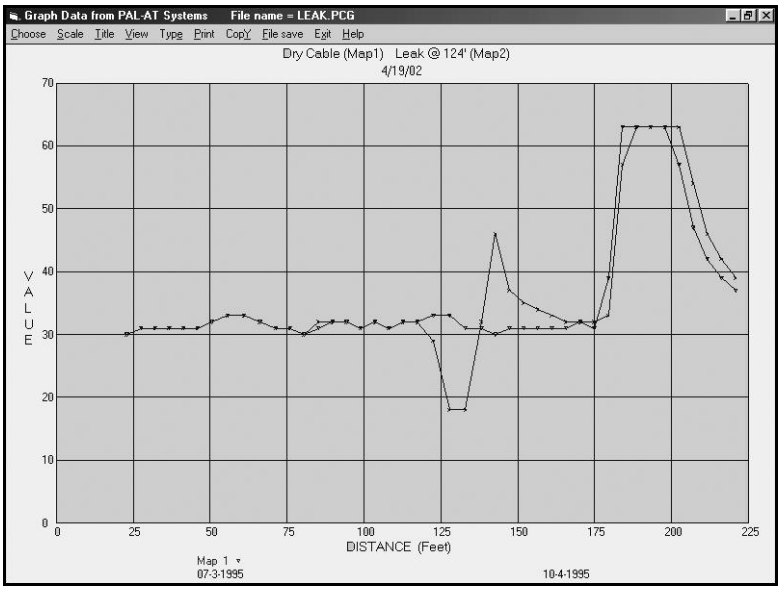
7.4.5.2 View Graph Data

A form is displayed listing the PALCOM graph files (*.PCG). Double click a new directory to change directories if needed. Click the appropriate file and then click the "OK" command button. Next, the graph menu screen is displayed.



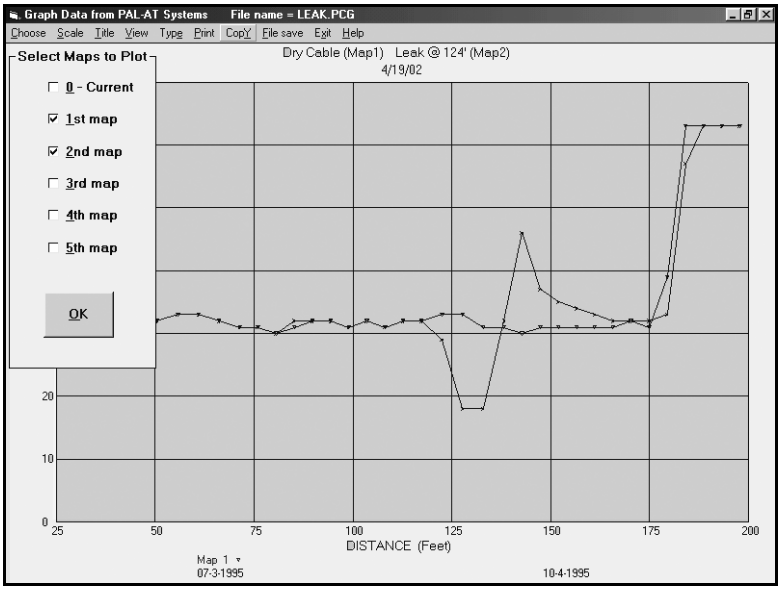
7.4.5.3 Graph Menu

The graph menu has several options to customize the display of the data. The file name of the *.PCG file is displayed in the title bar of the screen if the data has been saved or else a reminder to save the data is shown.



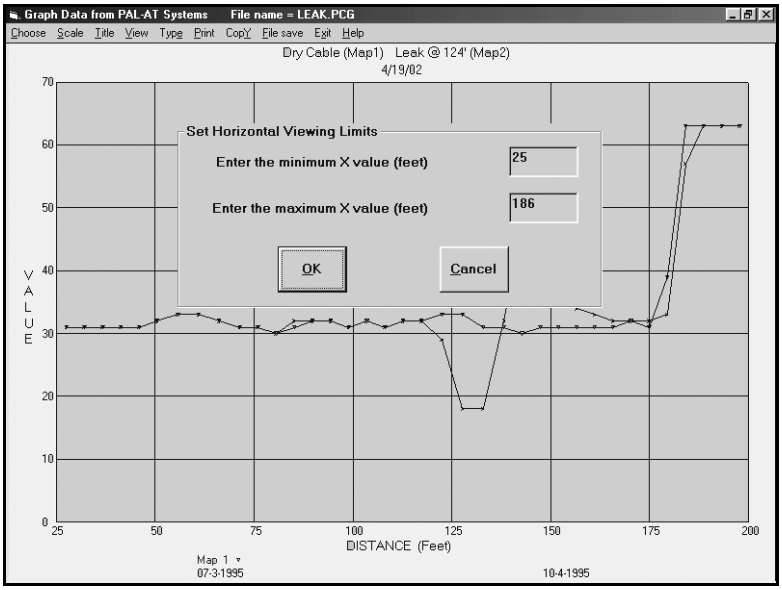
1. Choose

First click "Choose" to select which maps are plotted. Click the appropriate map numbers or current data. Click a number a second time to deselect a map. Click "OK" when you are finished. If at least one map or the current data is selected, the graph can be viewed.



2. Scale

The Scale Menu option allows the user to change the horizontal and vertical scales of the graph. Click "Scale", "Horizontal" or "Vertical", and "Automatic" for PALCOM to automatically select the scale to include the entire graph in the corresponding scale. Select "Manual" to manually set limits and view a portion of the graph. Enter the minimum and maximum values.



3. Title

Click "Title" to create a title for the graph. The Title Menu will automatically jump to the first line of the title when it is clicked. Pressing the "Enter" key after the first line is finished will move the cursor to the second line. Pressing "Enter" again ends the title procedure. A shortcut to edit the title is to simply click the line you want to edit and change the text using standard Cut, Copy and Paste commands. Each graph has two title lines. Press "Enter" when finished.

4. View

Click "View" to view the graph of the PAL-AT system. There are several keys that can be pressed while the graph is displayed to change the viewing area of the graph, rather than going back to the Scale Menu.

- + Key --The "+" key zooms in on the middle 50% of the current view in the horizontal or X direction. Additional keystrokes continue to zoom in 50% each time.
- - Key --The "-" key zooms out and doubles the current view in the "X" direction. Additional keystrokes repeat the process.
- Arrow Keys -- The right arrow shifts the current view to the right 50% each time it is pressed and the left arrow shifts the view to the left. The up arrow zooms in the vertical direction so the graph fills the screen vertically. The down arrow returns to full scale in the vertical direction (0 to 70).
- Mouse -- To change the viewing area with a mouse, locate the cursor on the graph at the new minimum value, either horizontal or vertical. Press and hold the mouse button down and move the cursor in the horizontal or vertical direction to the new maximum value. A red line indicates the new viewing range. Release the mouse button and the graph will be redrawn. If the cursor is located in the upper right corner of the graph and clicked without moving it, the graph will be redrawn using the original maximum values.

5. Type

A "Type" menu with two options is available. This refers to the type of plot of the graph data. The "Standard Plot" displays the selected maps as explained above and comparisons can be made between the maps. The "Difference Plot" mode uses the lowest numbered map selected as the baseline and then displays the other maps relative to the baseline. In other words, if maps 2, 3 and current are selected, map 2 is the base and the differences between it and map 3 and current are displayed. If they match exactly, straight-line plots at "0" are displayed. If map 3 is 3 counts below map 2 at a point, that point is shown as -3. If it is 3 counts above, it is shown as +3. In this way the normal irregularities of the maps

are eliminated and it is easier to view the true differences between the maps.

6. Print

Click "Print" to print the graph. It is recommended to change the printer setting in Windows to "Landscape" orientation to utilize the full page.

7. Copy

Click "Copy" to copy the graph, including titles and legends, to the Windows clipboard. Then paste it into a word processor document.

8. File Save

Click "File Save" to save the graph data. All the data is saved in the file even if only a portion is displayed on a graph. For example, a system may be monitoring on map 3 when data is collected, but a user displayed a graph using only map 1 and the current data. When the file is saved, the data from all 3 maps and the current data are saved and can be viewed later.

9. Exit

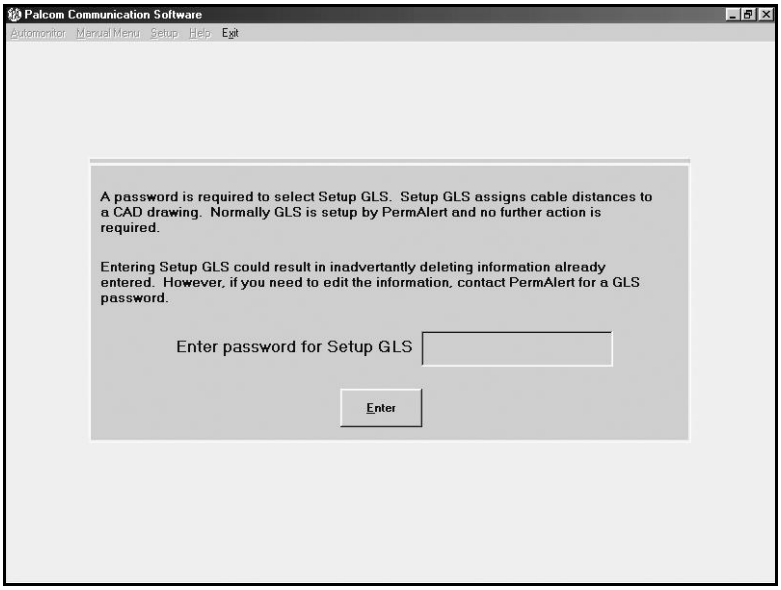
The Exit Menu has three choices. If a "New Graph" was just plotted, additional data from another cable on the same system can be collected now. Select "Plot New Cable" to do so. If an existing file has been plotted using "View Graph Data", another graph file can be viewed by selecting "Plot New File". Select "Exit Graph" to return to the Main Menu.

7.4.5.4 Graph Analysis

The graphs plotted by PALCOM are similar to TDR traces and should be interpreted by trained personnel who are familiar with the characteristics of the PAL-AT system. See Appendix B for examples of typical traces.

7.4.6 Setup GLS

The Setup GLS function is normally only used by PermAlert when a GLS drawing is supplied. Since there is normally no need for the user to use this function and the potential to accidentally delete the GLS data is high, password protection is used. Please contact PermAlert if you need to change the GLS data.

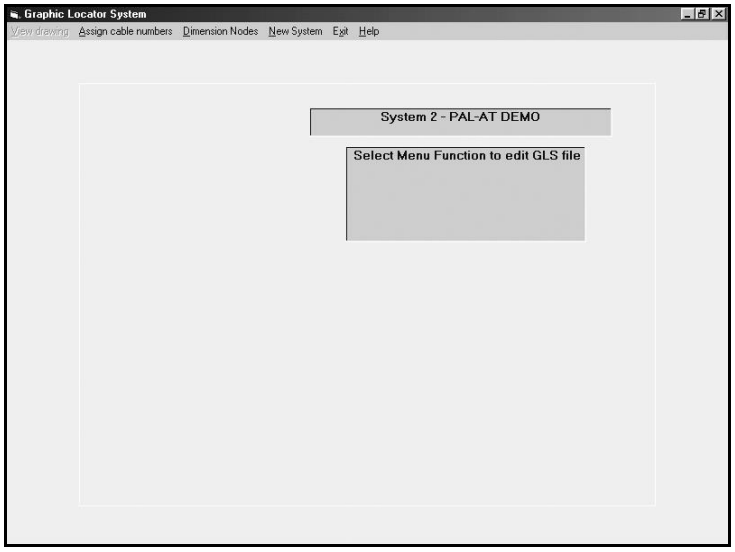


The Setup GLS feature inputs a standard DXF drawing file that can be created by several CAD programs, such as AutoCAD by AutoDesk, Inc. The DXF file should be created using only the entities "LINE", "CIRCLE", "TEXT", "ARC", "POLYLINE", "VERTEX" and "SEQEND". The only restriction in

creating the file is that the "POLYLINE" or "LWPOLYLINE" entity is used to draw the lines representing the leak detection cables for PAL-AT systems or a line connecting the probe locations together for LiquidWatch systems and only used for drawing those lines. The polyline for a PAL-AT cable should have a "node" at each calibration point in addition to the nodes at changes in direction. The polyline for the LiquidWatch should start at the panel and connect the probes in numerical order. If a probe number is skipped and not installed, a "fake" node on the polyline should still be created for that probe. Only actual probe locations will be displayed, not the line and "fake" probes. Once the DXF file is created and placed in the PALCOM subdirectory, select "Setup GLS" from the Manual Menu.

Select the number of the system to Setup. If a GLS file is not found for the entered number, PALCOM lists the *.DXF files in the current subdirectory. Click the appropriate file and then click "OK". If a GLS file is found for the selected system, the Graphic Locator System Menu is displayed.

The GLS Menu has features to: View drawing, Assign cable numbers and Dimension Nodes. At any time after "Assign" or "Dimension" is chosen, the CAD drawing can be viewed on the screen by clicking "View drawing". To return from the drawing, click "Return".



7.4.6.1 View

Use the mouse or keyboard to change the display area of the drawing. To change the viewing area with a mouse:

1. Move the cursor to locate one corner of a new "window".
2. Press and hold the mouse button down.
3. Drag the mouse to create the "window".
4. Release the mouse button.

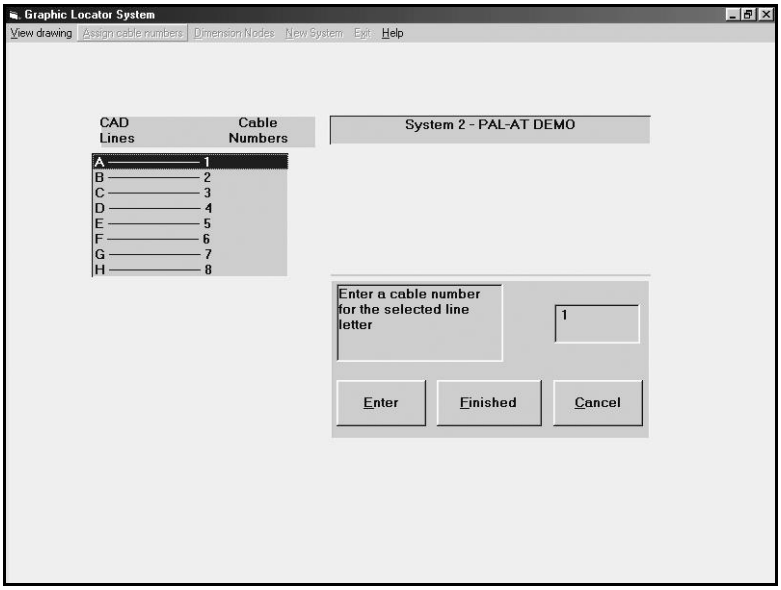
PALCOM will redraw the GLS drawing within the red window. Clicking the drawing without moving the mouse will zoom out 50% and redraw the drawing. The following keys are available to change the GLS viewing area:

Home = Original Size	End = Zoom at Location of Fault
+ = Zoom in 25%	- = Zoom out 25%
Del = Zoom in 50%	Ins = Zoom out 50%
F3 = Scroll Left 100%	F4 = Scroll right 100%
Arrows = Scroll 25%	PgUp/PgDn = Scroll Up/Down 100%
Alt-R = Return to Menu	Alt-P = Print

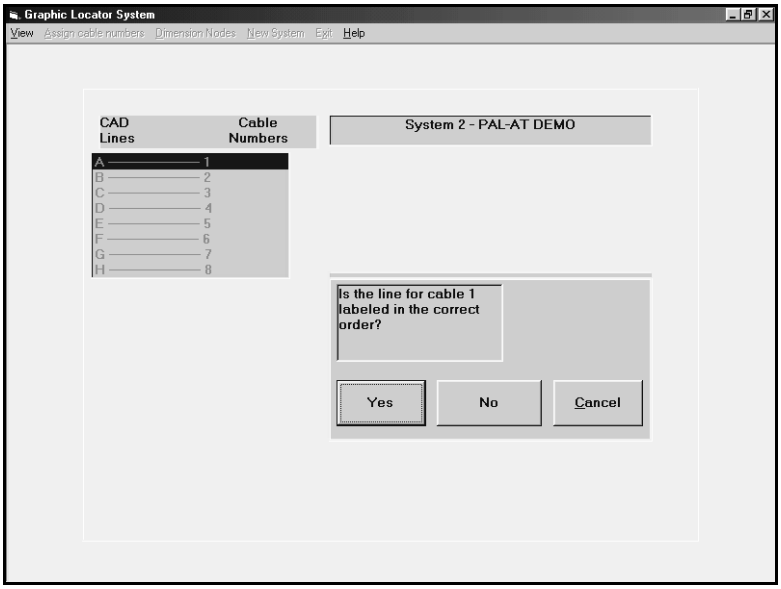
7.4.6.2 Assign Cable Numbers

The next step is to label which polylines represent leak detection cables and number the lines accordingly. The polylines are initially assigned letters, A-Z in the CAD lines list box. View the drawing and note the letter of the line that represents cable 1 for a PAL-AT system. If the system is LiquidWatch, choose the polyline that connects all the probes. Also note if node 1 starts the line at the panel or is at the other end. Return to the "Assign Cable Numbers" screen.

Click a letter for a cable in the CAD line box. Then enter the number of that cable in the text box in the lower right corner of the screen. For LiquidWatch always use cable 1. Click "Enter".



If the polyline started at the panel with node 1, click "Yes" at the next prompt or else click "No" to reverse the numbering sequence of the nodes. When all cable numbers have been assigned to lines, click "Finished".

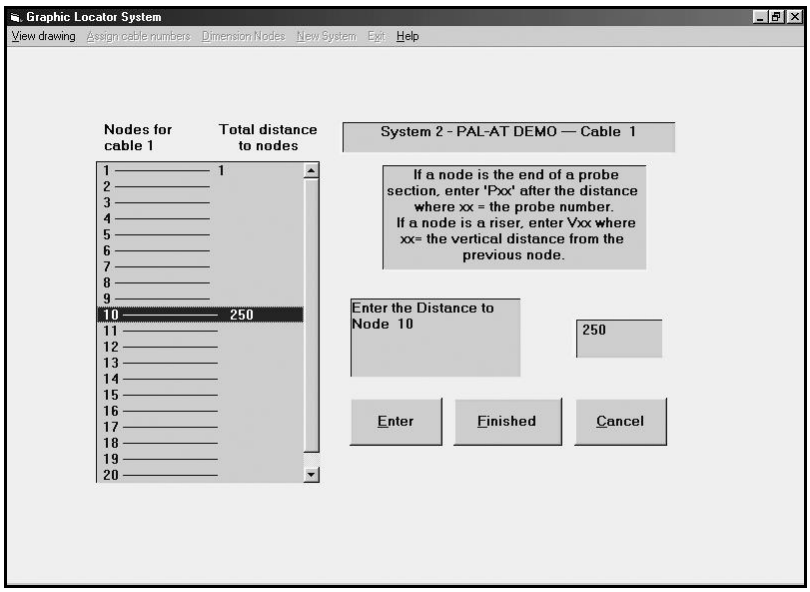


7.4.6.3 Dimension Nodes - PAL-AT System

The next step assigns dimensions to the lines representing cables. At this point it is necessary to have the setup data from the PAL-AT. A node is created at each segment of the polylines. The nodes of the drawing that correspond to the calibration points for the PAL-AT are assigned the distances determined by the PAL-AT during setup. When this process is completed, all undimensioned nodes are assigned distances, proportional to the distance between dimensioned points.

Click "Dimension Nodes". Then click a cable number in the list box and click "Enter".

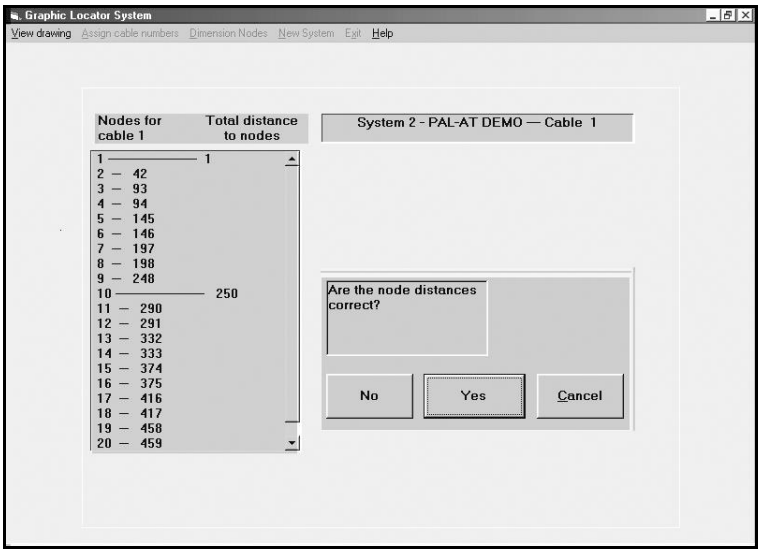
PALCOM displays the data for a typical cable. Click a node in the list box, click the text box, enter the distance to the node and click "Enter".



If the node is the end of the probe section, enter "P" and the probe number after the distance (See following section for LiquidWatch for more details).

If a CAD drawing has a vertical riser, and it is not at a calibration point, enter Vxx where xx is the actual cable distance from the previous node. When the CAD drawing is made, two nodes should be created adjacent to each other for this situation. The first node represents one end of the riser and the second node represents the other end. Then Vxx is entered for the second of the two nodes.

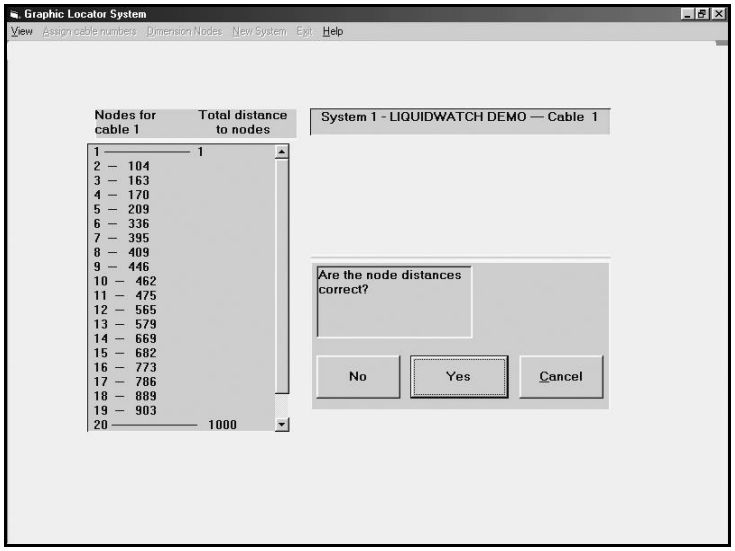
When all the calibration point data has been entered, click "Finished". PALCOM then automatically calculates any undimensioned nodes. If the nodes are correct click "Yes" and PALCOM returns to select the new cable. If not, click "No" and change any nodes. Double-click a node to clear its value. When all cables are dimensioned, click "Finished" and return to the GLS Menu. The information is saved as SYS?.GLS where “?” represents the system number.



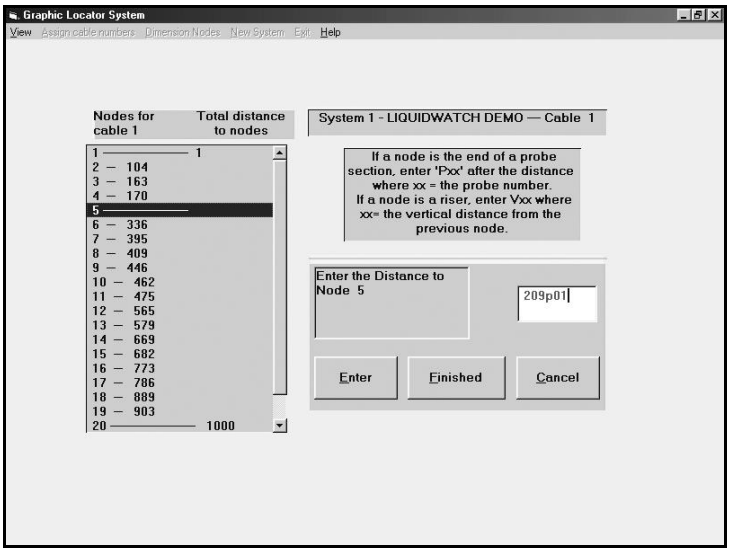
7.4.6.4 Dimension Nodes - LiquidWatch System

The procedure for dimensioning the nodes for probes on a LiquidWatch system is similar to a PAL-AT system. Once "Dimension Nodes" is selected, choose cable 1 in the list box and click "Enter". When the GLS drawing is viewed, the nodes are displayed by a small square but they are not connected together with a line.

Assign a distance of 1 to the first node and 1000 to the last node and then click "Finished". PALCOM asks if the distances are correct. Click "No".



Next, using the view feature, inspect the drawing to see the distances displayed at the nodes representing the probe locations. Return from the drawing and double click the node in the node list corresponding to the first probe. The distance will be blanked out in the list and copied to the box on the right. Add "P01" to the end of the distance and click "Enter".



Continue for all probes, adding the proper probe number. All probe numbers must be consecutively numbered starting from "1" to the highest number. If a probe number is skipped (not installed), you still must assign that number to a node. Choose a node between the previous probe number location and the next probe number location. Click "Finished" when all probes are dimensioned.

7.4.6.5 New System

Another system can be selected and setup by clicking "New System".

7.4.6.6 Exit

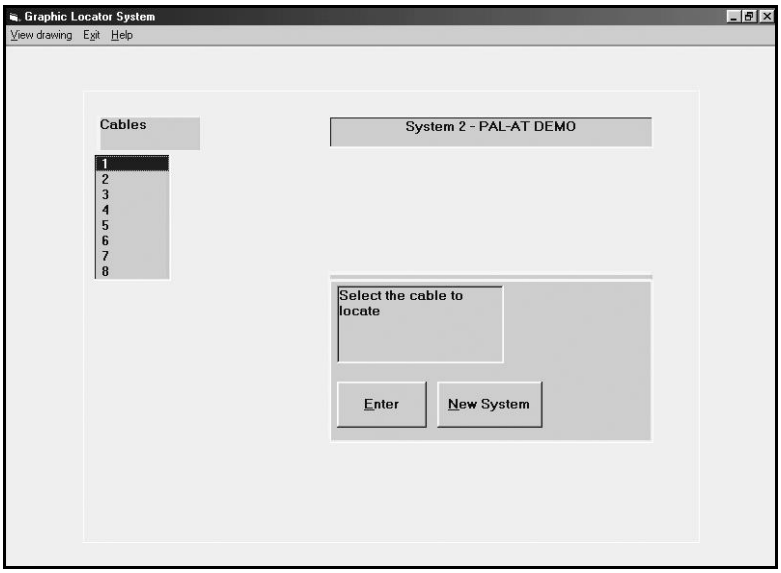
Click "Exit" to return to the Main Menu.

7.4.7 View GLS

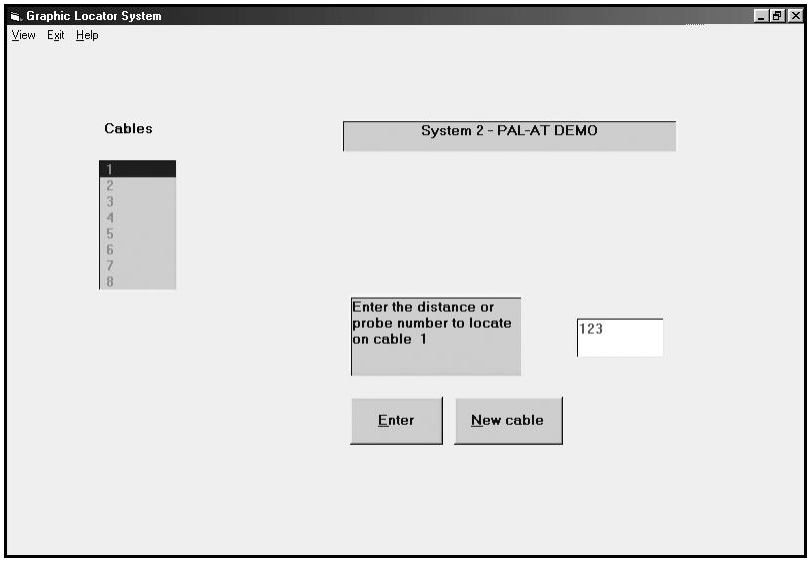
The optional View-GLS feature uses the SYS?.GLS file created in setup GLS. This feature displays the CAD drawing and flashes an icon at the specified location entered by the user. A GLS file supplied by PermAlert is normally named by the job number. If there is more than one PAL-AT or LiquidWatch panel, the file will have an additional letter added.

For example, a job with 3 panels will have files WSA1234A.GLS, WSA1234B.GLS and WSA1234C.GLS. The files must be renamed to the proper system number. In this case they should be SYS1.GLS, SYS2.GLS and SYS3.GLS. Select "View-GLS" from the Manual Menu.

Select the system number. For a PAL-AT system, click the number of the cable (1-8) and click "Enter".

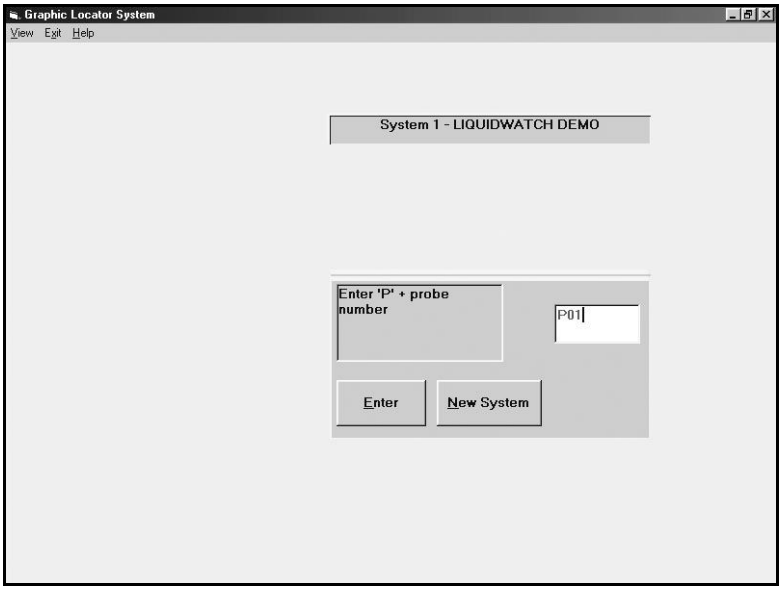


Then enter the cable distance you want to locate in the text box and click "Enter".



If the distance is beyond the end of the cable, an error message is displayed. To locate a probe, enter "P" and then the probe number (1-50). A flashing red icon indicates the distance on the PAL-AT cable selected.

For a LiquidWatch system, enter "P" plus the 2 digit probe number, i.e. P01.



The "End" key zooms in on the immediate area of the location. Click "Help" to display the keys to change the viewing area, as discussed earlier. To select a new distance click "New Distance", enter the value, and click "Enter". In a similar manner a user can select a new cable or a new system.

7.4.7.1 Print

When the drawing is displayed, click "Print" to print the screen. Select the correct printer and print quality in Windows.

7.4.7.2 Exit

Click "Exit" to return to the Manual Menu.

7.4.8 Return to Main Menu

When exiting all Manual Menu functions, if PALCOM has a connection through a phone modem to a system, a reminder is displayed. PALCOM remains in the Manual Menu for three minutes to allow another Manual Menu feature to be called. If the time elapses, PALCOM hangs up and returns to the Main Menu.

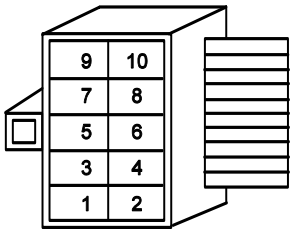
Appendix A

RS-232 Cable Configurations

Computer (Direct Wire) to PAL-AT or LIQUIDWATCH				
Computer Connection		PAL-AT Connection		LIQUIDWATCH Connection
25-Pin D-Connector Pin #	9-Pin D-Connector Pin #	10-Pin Ribbon Connector	Terminal Strip Hookup	9-Pin D-Connector Pin #
2 3 7	3 2 5	3 1 5	RB TB G	3 2 5

Modems to PAL-AT or LIQUIDWATCH				
Network Modem	Modem Connection	PAL-AT Connection		LIQUIDWATCH Connection
9-Pin D-Connector Pin #	25-Pin D-Connector Pin #	10-Pin Ribbon Connector	Terminal Strip Hookup	9-Pin D-Connector Pin #
3 2 5	3 2 7	3 1 5	RB TB G	3 2 5

Modem to Computer		
Modem Connection	Computer Connection	
25-Pin D-Connector Pin #	9-Pin D-Connector Pin #	25-Pin D-Connector Pin #
2 3 7	3 2 5	2 3 7



PAL-AT
Ribbon Connector

Network Modem Serial Port Settings

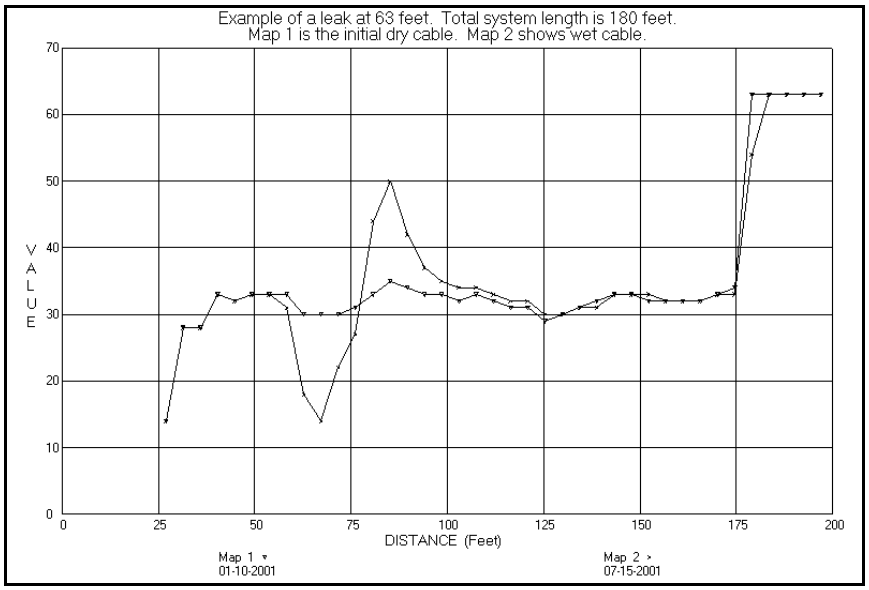
```
  Precidia            iPocket232 Modem Configuration          v5.02.00

         Device Settings:                    Serial Port Settings:

1) Ethernet:          10.1.30.169     A) Protocol:      Transparent (srv)
2) Serial Port:       Transparent     B) Port Setting:  9600 bps 8n1 [no]
                                      C) Connection Control:    Automatic

                                      D) Local Port:                 1001
                                      E) Remote IP:               0.0.0.0
                                      F) Remote Port:                   0
                                      G) Fallback IP:             0.0.0.0
                                      H) Fallback Port:                 0
                                      I) Fallback Drop Time:            0

                                      J) Packet Prefix:              none
                                      K) Max Inter-Char Delay:          0
*) Save Current Configuration         L) Preferred Packet Size:         1
-) Exit Configuration (no save)
$) Security Settings
#) System Settings                    M) Initial String:        (not set)
?) Refresh this Screen
```

Appendix B

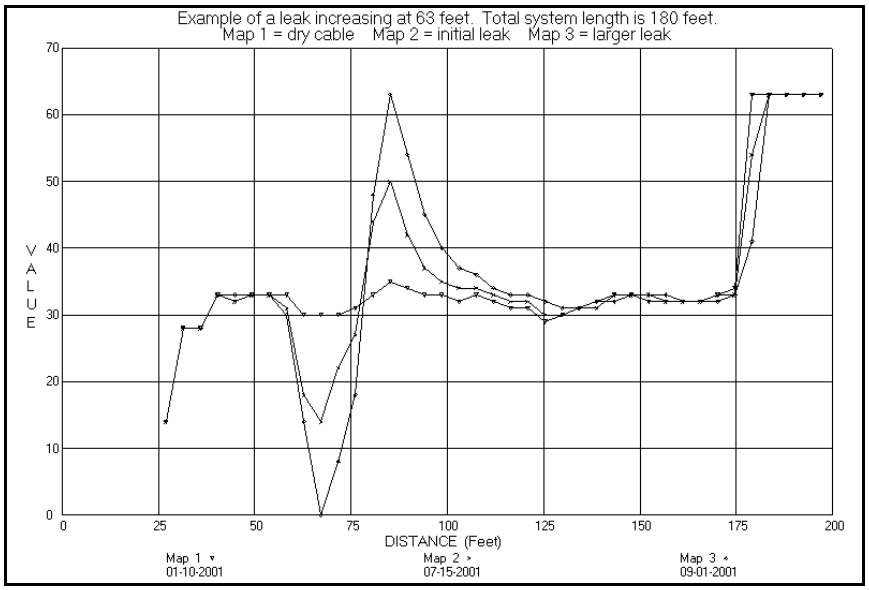
PALCOM Graph Interpretation

The following graphs illustrate typical faults on PAL-AT cables.

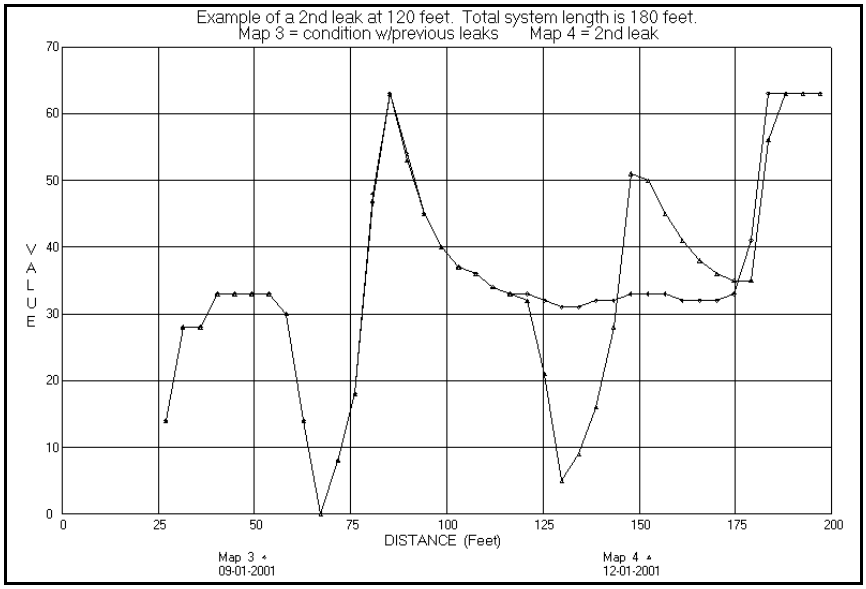
This figure shows wet cable at 63 feet. The signature of a leak is a "dip" in the reflection at the beginning of wet cable followed by a "rise".



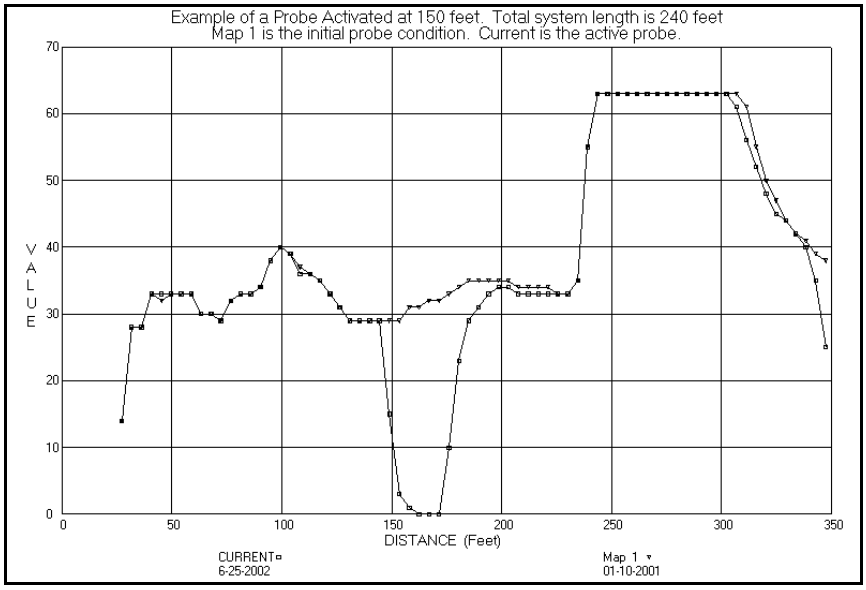
This shows the initial leak at 63 feet increasing. The "dip" and "rise" are larger than before. This figure also illustrates the drying process. As a cable dries from map 3 to map 2, the defections on the graph decrease.



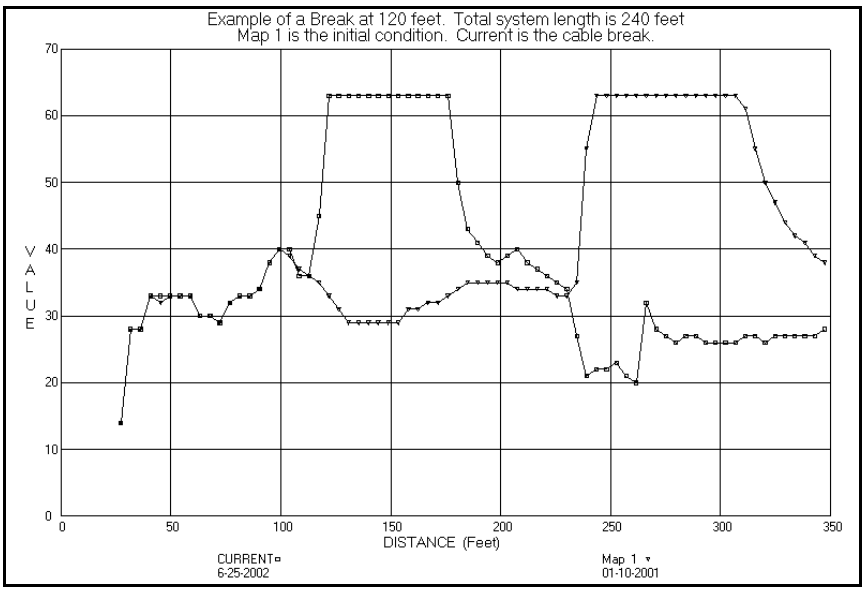
This figure illustrates a second leak at 120 feet that is past the first leak. If the first leak occurs and a new reference map is not taken promptly, a second leak could occur past the first and not be detected. PALCOM detects this condition.



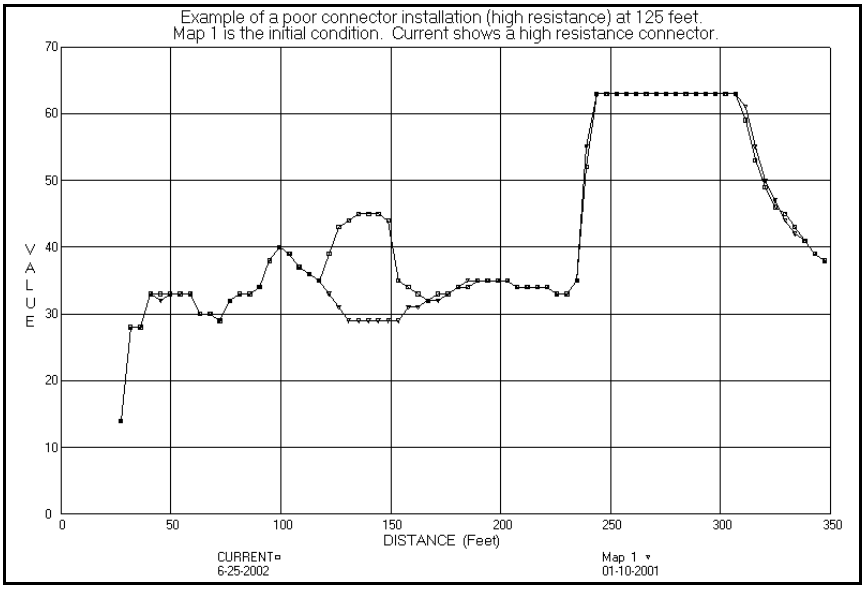
This illustrates a probe activated at 150 feet. The characteristics of a probe signature are a lower impedance, or dip, without the accompanying "rise" of a leak.



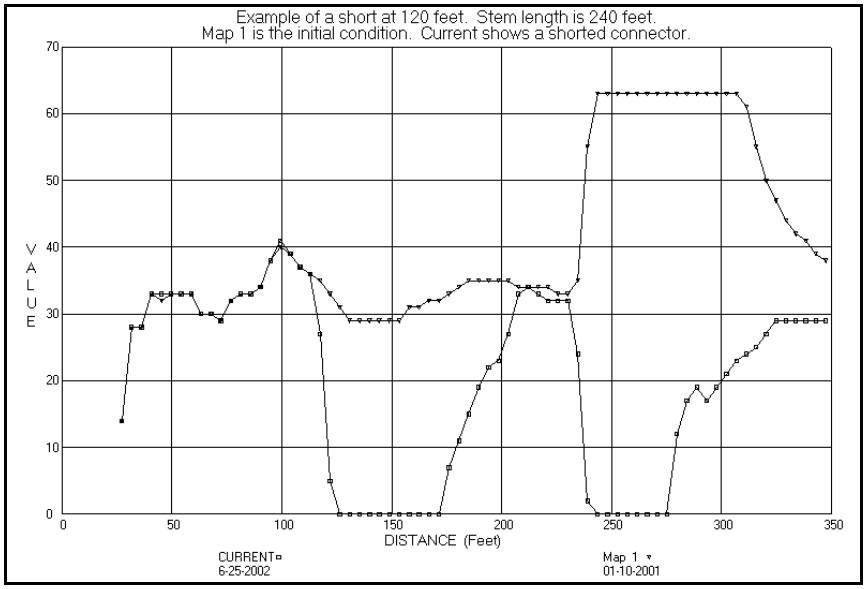
This illustrates a cable break at 120 feet. Notice it is the same as the reflection from the end of the cable at 240 feet.



Here is an example of a poor connection at 125 feet — either the "gold" braid is not sanded properly, the center conductor is not properly soldered or the connector is loose. Notice the "rise" in the reflection at that point. The severity of the discontinuity at that point determines the height of the "rise".



This shows a short at 120 feet. A short has a sharp drop to 0 followed by a gradual rise to 30. It may also have additional dips of increasingly less magnitude at each multiple of the distance to the short (e.g. 240 ft., 360 ft., etc.).



For additional information regarding interpretation of PALCOM graph data, contact PermAlert ESP.

Appendix C

PALCOM Dynamic Data Exchange (DDE)

PALCOM for Windows has the ability to share data with other Windows programs using Dynamic Data Exchange (DDE). PALCOM acts as a "source" or "server" and can supply system status information to a "destination" or "client". The DDE information shows: (1) If PALCOM is in Automonitor mode or not, (2) Which systems are being monitored by PALCOM and (3) The status of each system.

For example, if you have a Microsoft Excel spreadsheet and would like to place the status of monitoring leak detection systems in a row of cells, copy the following into each cell:

=PALCOM MAINMENU!' LINKBOX (n)'

where n = 0 to 254 is the system number

The array, linkbox( ), is created and reinitialized each time PALCOM goes through Setup. Array element (0) shows the PALCOM status. Array elements (1) to (254) are added for each system. The array elements values are defined as:

Element	Value	Description
linkbox(0)		PALCOM status
	0	PALCOM not in Automonitor mode
	1	PALCOM in Automonitor mode
linkbox(n)		for n = 1 to 254
	0	No Data for System Number (n)

A text message is created for each system that establishes communication with PALCOM. For PAL-AT, a series of 8 cable messages for cables 1 to 8, separated by commas, create the system text message.

Message	Description
"N/A"	The cable card is not installed
"Offline"	The cable card is offline and isn't monitored
"Normal"	The cable matches the "Map"
"Leak On Cable at xxx feet"	The location of an event along cable
"Break Detected at xxx feet"	
"Short Detected at xxx feet"	
"Probe "Y" Activated"	
"Probe "Y" Reset"	
"Drying Cable at xxx feet"	

For a LiquidWatch system, a series of 64 probe messages, separated by commas, create the system text message. The probe messages are similar to the PAL-AT messages.

Message
"N/A"
"Offline"
"Normal"
"Activated"
"Break"
"Short"

Consult the operating manual for the specific software that is the DDE destination to find the exact syntax requirements.

Appendix D

Modem Troubleshooting

If a problem is encountered communicating with a leak detection system, do the following:

1. Verify the system ID (1-254) and baud rate are correctly set on each PAL-AT or LiquidWatch system.
2. Check PALCOM setup to make sure the baud rate is the same as the leak detection system's.
3. Refer to Figure 1 and Appendix A to check the wiring.
4. Check that 120 VAC is supplied to each modem.
5. Recheck the rocker switches and DCE switch position on short haul modems and DIP switches on phone modems.

If the above initial tests are normal, a communication program, such as HyperTerminal, is useful for the following tests.

HyperTerminal Setup

- First time using HyperTerminal
    1. If new connection box is displayed, enter "Direct" to name it.
    2. Click on "Connect Using" box and select "Direct To Com1" (or appropriate COM number).
    3. Click "OK" and then "Properties" box will open.
        a. Set "Bits per second" = 9600
        b. Set "Data bits" = 8
        c. Set "Parity" = None
        d. Set "Stop bits" = 1
        e. Set "Flow control" = None
        f. Click "Apply" and then "OK"
- Select "Direct" connection in HyperTerminal folder.

Computer Port Test

1. Connect pin 2 to pin 3 of the COM port on the back of the computer.
2. Type on the keyboard and the keystrokes should be displayed in HyperTerminal.
3. If they are not displayed:
    a. Make sure correct COM port was selected.
    b. Make sure the correct pins, 2&3, are tied together.
    c. Check hardware for COM port - replace if needed.

PM - 1 Modem Test

1. Connect modem to computer and turn modem on
2. In HyperTerminal, type "ATI4" + Enter.
    a. Several lines of modem setup information should be displayed.
    b. If not, check wiring of cable to modem.

c. Replace modem if there is still a problem.

PM - 2 Modem Test

1. Disconnect PM-2 modem from leak detection panel.
2. Connect pin 2 to pin 3 of the PM-2 modem's RS-232 connector.
3. In HyperTerminal, type "ATDT" + [phone number] + Enter.
4. Modems should connect - listen for rings or busy signal.
5. After the modems connect, type any text and it should be echoed in HyperTerminal.
6. If no echo:
    a. Check for dial tone.
    b. Check if phone number is correct.
    c. Check phone line connected at PM-2.
    d. Replace modem if there is still a problem.
7. Type "+++" and wait 5 seconds for "OK" message.
8. Type "ATHO" + Enter to disconnect line.

SHS-1 Short Haul Modem Test

1. Disconnect communication cable from SHS-1 short haul modem.
2. Connect terminal R+ to terminal T+ on the modem. (Refer to Fig. 1.)
3. Type anything in HyperTerminal and it should be echoed back.
    a. If no echo, check wiring.
    b. Replace modem if still no echo.

SHS-2 Short Haul Modem Test

1. Disconnect all PAL-AT or LiquidWatch panels from short haul modems.
2. One at a time, connect pin 2 to pin 3 at remote short haul modem's RS-232 connector.
3. Type anything in HyperTerminal and it should be echoed back.
    a. If no echo, check wiring.
    b. Replace modem if still no echo.
4. Repeat previous 2 steps for each modem.
5. _If all modems work, connect panels to modems.
    a. PAL-AT
        i. Make sure 10-pin ribbon is plugged into socket on the motherboard.
        ii. Check red wire to RB
        iii. Check white wire to TB
        iv. Check black wire to G next to RB
    b. LiquidWatch
        i. Make sure 9-pin connector in panel is connected to 25-pin connector on modem.

Technical Assistance

For technical assistance or additional information concerning PALCOM, call PermAlert ESP at (847) 966-2190.

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