

Chapter 8

INTRODUCTION

The CPAMS Diagnostics program is divided into four functions. The first two options enable you to perform diagnostics on the System Studies 289H Loop Surveillance System monitors and the older 289 Loop Surveillance System monitors. The third option is a gateway from PressureMAP to other monitoring systems, allowing manual scans, maintenance operations, or even CPAMS data entry to be performed without leaving the PressureMAP program. The fourth CPAMS Diagnostic function allows you to perform diagnostics on the System Studies Dial-a-Ducer. This capability is discussed in detail in Appendix 3 of the Data Entry Manual.

289H LSS DIAGNOSTICS

The 289H Loop Surveillance System (LSS) monitors differ from older monitoring systems in a number of important ways. Conventional monitoring systems originated before the advent of computerized management systems, such as PressureMAP. These conventional monitors were designed to be stand-alone units. They had to be both the brain and the brawn of the monitoring system. Each unit had to contain all of the computing and data storage capability required to monitor its offices and produce reports for manual analysis. Since a monitor for a single office spends most of its time doing the relatively simple work of scanning devices, the on-board computing functions of each unit are idle most of the time. In areas with the responsibility for multiple offices, this means that there is a tremendous amount of redundant computing capability and additional service costs inherent in maintaining and upgrading these monitors.

The idea behind the 289H LSS system was to build the most simple and maintenance-free monitoring units possible. This was accomplished by utilizing the computing and data storage capabilities of the PressureMAP computer and relying on the office monitor to simply scan devices for readings. PressureMAP became the brain of the system, and the more complex functions once required of a monitoring unit were replaced with a simple information-gathering task.

PressureMAP's MAP Engine computers (Pentium®) not only perform the computing functions better and faster than the old monitors, but they also perform these functions for as many as 250 separate units (depending upon how many office extender licenses are purchased). So, by working in tandem with the PressureMAP system, the 289H LSS provides higher performance with no internal programming or backups to perform. The natural result of a simpler machine is that less maintenance and service are required, compared with the older, more complicated monitoring units.

The simplicity of the 289H LSS monitors also enables them to be extremely versatile. Virtually any kind of device (including many addressable transducers) can be monitored by the 289H. The 289H works with three types of relay cards: subscriber, dedicated and addressable. An addressable monitoring card (AMC) makes it possible for the 289H LSS to read System Studies High Resolution Addressable Transducers and Chatlos addressable transducers. The newer Universal Addressable Monitoring Card (UAMC) is designed to support several additional addressable devices: Lancier, Nicotra, Inelcom, and Microsol pressure transducers, and Sparton pressure and flow transducers.

Our in-house testing has certified use of the UAMC with the Lancier, Nicotra and Sparton transducers.

The 289H can communicate with PressureMAP using either a modem or network connection, depending on the type of controller card installed in the 289H. The controller card equipped with on-card modem communicates at 2400 or 9600 baud via a proprietary System Studies communications protocol that employs error correction. The LAN controller card utilizes a 10 Base-T Ethernet connection. Both of these communication modes minimize connection time which will, in turn, considerably reduce the workload on PressureMAP.

Operationally, the 289H LSS monitor works much like conventional monitors, except that it leaves the data conversion and data analysis functions to PressureMAP. The 289H continually scans devices, gathering readings and storing data, until PressureMAP calls to upload the latest information. If a device being queried is on a subscriber line, the 289H first checks the pair to see if it is in use before it attempts to take a reading. (Devices on subscriber lines that are “busy” are skipped until the next scan.) Once PressureMAP has uploaded the device information obtained from the 289H LSS during its scheduled call, it converts the data into pressure readings, flow readings, temperature readings, etc.

There are three main types of calls placed to the 289H LSS monitor through PressureMAP: scheduled readings, realtime readings, and forced calls to perform diagnostics. The most common type is the normal, scheduled call which is made every two hours to obtain a full report of all transducer activity. (Note: PressureMAP also calls E2A Remote terminals every half-hour for pressure contactor, contact alarms and endpoint pressure transducer readings. These monitors DO NOT have the capability of initiating a call to PressureMAP when critical devices go into alarm.) During the scheduled calls, PressureMAP checks device programming. If it is found that the 289H LSS monitor has not obtained data for a device that has been programmed into the PressureMAP database, that device data will be downloaded from PressureMAP. This procedure eliminates the need for backing up or restoring the 289H LSS monitor.

Due to its unique design and versatility, the 289H LSS monitor also performs several auxiliary functions that are not performed by conventional monitors. When the 289H LSS monitor detects an open on a device pair, for example, it will determine whether the open is inside or outside the CO. The 289H LSS also checks for both resistance leakage on a pair and foreign voltage (with a threshold of 10V DC and/or 6V AC setting the "VOLT" bit). These and the other special diagnostic capabilities listed below can be initiated from the CPAMS Diagnostics Menu:

- System Configuration
- Calibration Test
- Realtime Reading Test
- Specific Device Information
- Capacitance Test
- Ping Relays Test
- Cold Reset
- Leakage Test (289H and 289H-M only)
- AC Voltage Test (289H and 289H-M only)
- DC Voltage Test (289H and 289H-M only)
- Pair Diagnostics
- Access Number Translations

- Dialout Phone Number Information (289H and 289H-M only)
- Device Alert Information (289H and 289H-M only)
- Get Tone Settings (289H and 289H-M only)
- Set Tone Default (289H and 289H-M only)
- Route Tone (289H and 289H-M only)
- Erase AMC Flash (289H and 289H-M only)
- Pair Realtime Reading Test (289H and 289H-M only)

The procedures for running these tests, and explanations of the results, are presented later in this section. Charts in the PressureMAP Tables sub-section provide conversions from milliamperes to the corresponding device reading value, and the equivalent information for resistive and System Studies addressable devices.

Note: The Capacitance, Ping Relays, Leakage, AC Voltage, DC Voltage and Pair Diagnostics tests should **not** be performed on addressable pairs. For these types of devices, pair evaluation is performed automatically by the 289H/H-M monitor's controller card. Do **not** short an addressable pair as this can damage the AMC or UAMC.

289H Board Numbering Conventions

Monitoring devices installed in a loop surveillance system are wired to the 289H LSS via dedicated, subscriber or addressable conductor pairs. These pairs are terminated on a connector block in the central office and cabled to the appropriate relay boards in the 289H monitor. There are three types of boards (or cards) used with the 289H LSS: subscriber, dedicated and addressable. The subscriber relay board reads up to 25 monitoring devices; two dedicated boards are available—one for a maximum of 25 devices and one for a maximum of 50 devices. The addressable board interfaces with eight addressable device pairs (each with a maximum of 127 addresses and 10 devices per address). In addition, each addressable board has the capability of reading up to 24 resistive or current loop devices installed on dedicated pairs.

Note: The smaller version of the 289H LSS, the 289H-M LSS, is equipped with one of the following relay cards: 25-device dedicated card, 36-device Sparton Dedicated Replacement card (SPDR), 50-device dedicated card, 25-device subscriber card, or addressable card (AMC or UAMC).

Each 289H chassis of 16 boards is referred to as a bank. The slots are numbered linearly, starting with the first slot in the first box. A board in the fifth slot is considered board number five. Device pair (or relay) associations on each card are numbered beginning with number one. Each device is referenced by specifying its board/pair identification; therefore, relay number 10 on the eighth card would be designated Device Number 008-10.

Access numbers for addressable transducers contain some additional information. Rather than consisting of five numbers, addressable transducers use a nine-character access number format (for example, 005-A1-010A). The designation of the first three digits (card/slot position) is identical to the one described above—both for AMC and UAMC devices.

In the next group of characters, the letter “A” indicates that the access number represents a device on an addressable pair. This letter is followed by the number of the addressable pair/relay.

The final four characters (010A in the example) identify the location of the device relative to other devices on the pair. The three numbers designate the device's address (range 001-127), and the alphabetical character is used to specify one of several possible sensors associated with the addressable device. Channels are designated by a letter, with "A" representing the first channel and "J" the last or tenth channel. Channel A is assigned to the first sensor at an address, channel B to the second, and so on. Therefore, a lone single transducer is designated as channel A. A typical addressable device could be numbered as follows: 009-A1-127B. In this example, PressureMAP would access data from the second sensor (B designation) at address number 127 on addressable pair number one, which is located on the addressable monitoring card in the ninth slot of the 289H LSS.

Note: A typical application for a multiple channel address would pertain to the System Studies Addressable Dual Transducer. Both the flow and pressure sensors would share the same address, but the flow device would be assigned to channel A and the pressure device to channel B. For a dual addressable transducer, it is important to code "A" for the flow sensor and "B" for the pressure sensor to ensure that reading counts are associated with the correct device/access number and converted to the appropriate measurements (SCFH or PSI).

A multiple addressable transducer module (i.e., a Chatlos 5/10-bank module) would be another application for the address channel indicator. To ensure that the channel-to-cable assignments are correct in PressureMAP, the field technician needs to label the tubing that connects the transducer to the splice case (cable) and document for data entry which channel is monitoring each cable.

The controller card in each 289H LSS monitor has two limits relative to the size of the system: 1) each controller can read a maximum of 1000 devices on analog pairs (excluding addressable devices which are read directly from the addressable card using a serial protocol), and 2) those 1000 devices can be arranged on a maximum of 64 boards. Since each 289H LSS monitor chassis can accommodate only 16 boards, three extra chassis would be required to hold 64 boards.

Procedures for Running 289H LSS Diagnostics Tests

Before you can begin working with the 289H Diagnostics programs, you must first bring the 289H Diagnostics Menu to your screen. The following procedure explains how to do that. The Menu Level assigned to your User Account will determine where you start in this procedure. If you entered at the System Options Menu, begin this procedure at Step 1. If you began at the MAP Programs Menu, go to Step 2. If you have trouble gaining access to the MAP System, please contact your System Administrator or call the System Studies Technical Support Department.

If you logged into the System Options Menu, you should see SCREEN 8-1.

```

System Options
05/21/2010 08:43
MAP Series XX.XX.XX
System Studies Incorporated
-----

System Options
-----
1. Select MAP Program
2. Select MAP Data Entry
3. System Administration
4. Language Selection
Q. Quit

Choice?

```

SCREEN 8-1: SYSTEM OPTIONS MENU

Procedure:

1. From the System Options Menu, press **1** followed by **<Return>**. After pressing 1 at the System Options Menu, or if you logged in at the MAP Programs Menu, you should see the screen illustrated in SCREEN 8-2.

Note: If the Menu Level assigned to your User Account brought you into the PressureMAP system at a level other than System Options or MAP Programs, you cannot get into the Diagnostics Program. See the definitions of Menu Levels and QuickLogins in the introduction to Section 5, User Management, in the System Administration Manual.

```

MAP Programs
05/21/2010 12:42
MAP Series XX.XX.XX
System Studies Incorporated
-----

MAP Programs
-----
1. PressureMAP
2. ReportMAP
3. CableMAP
4. AlarmMAP
5. DryerMAP
6. CPAMS Diagnostics
7. User Initiated Operations
Q. Quit

Choice?

```

SCREEN 8-2: MAP PROGRAMS MENU

2. From the MAP Programs Menu, select CPAMS Diagnostics. Press **6** followed by **<Return>**. You will then be prompted for the name of the office with which you want to work:

```
CPAMS Diagnostics for which office?
```

Selecting an office is done by entering either the office name or office number at the prompt. To enter an office name, you may either type the full name of the office, or you may enter an office name abbreviation to indicate the office you have chosen.

Abbreviated office names are allowed anywhere within the MAP library of programs and have a minimum length of two characters. For example, if a system has an office: "1. SALT CREEK," then SA, SAL, and SALT would all be legitimate office name abbreviations. As well, if the system also had the offices: "2. WALLINGFORD" and "3. WASHINGTON," then SAL would uniquely specify office 1, WAL would specify office 2, and WAS would specify office 3. Although the abbreviation WA is ambiguous, MAP programs will accept such an office name by choosing the first office that matches the abbreviation; in this case, it would be office 2.

At the office name prompt, you may obtain a complete listing of the offices entered into the PressureMAP system. By typing a question mark (?) followed by <Return>, you will be presented with a listing in selection spreadsheet format. Move to the office you wish to monitor, and press <Return> to select it.

If you type a <Return> without entering an office name, you will be taken back to the MAP Programs Menu where you can choose to run a different MAP program or re-access CPAMS Diagnostics.

After inputting an office name or number (in this example, Salt Creek) you will see the message:

```
1.Salt Creek
```

```
Calling Salt Creek (baudrate). Hit <Esc> to quit.
```

If the office that you select does not answer, you will see the message:

```
Office does not answer; waiting...
```

Then after about 20 seconds, you will see:

```
Attempting to call again...
```

When the connection is made, you will see one of the following messages:

```
CONNECT (baudrate).  
Collecting configuration information from 289 LSS...
```

The earlier version of the LSS monitor, called the 289 LSS, provided some of the basic diagnostic capabilities mentioned above. If you have called a 289H LSS, please follow the instructions that start on page 8-7. If you have called an older 289 monitor, please go to page 8-29 for instructions on how to run 289 Diagnostics.

Access Number Translation

When the Access Number Translation feature is enabled for the MAP System, and E2A REMOTE is entered in the Access # type field of the Office Information Screen, the 289 LSS or 289H LSS monitor will accept access numbers normally used only when entering data for an E2A Remote (LARP) office. The Access Number Translation feature allows the MAP System software to translate the user input access numbers to numbers used by the LSS monitor. The 1000 possible LSS access numbers are mapped as subscriber numbers (001-01 to 040-25) to the first 1000 LARP access numbers. LARP calibration devices 000A and 000B are skipped, so the mapping covers the LARP number range 001A-520B. The subscriber card mapping is chosen because LARP devices are

technically subscriber devices (although they may be attached to vacant/non-subscriber pairs), and only subscriber cards are to be installed in the 289 LSS and 289H LSS monitors using this feature.

When running diagnostics on the LSS, however, it may be necessary to know the actual access number assigned to a specific device. When the Access Number Translation capability is enabled in the MAP System, both the 289 and 289H Diagnostics Menus include an option to print out a translated list of the LARP type of access number along with the corresponding LSS number. By using this list, you can easily track the LSS device number for the device you wish to test. This option is only displayed in the Diagnostic Menu of MAP Systems that have the Access Number Translation capability enabled. Because most MAP Systems will not use this option, the 289 and 289H Diagnostic Menu examples used in this section of the manual will not show this option.

Selecting the Access Number Translation option by pressing 7 (from the 289 menu) or 11 (from the 289H menu) followed by <Return>, will display a screen similar to the one illustrated in SCREEN 8-3.

```

Access Number Translation Menu
-----
  1. Translate E2A REMOTE to 289H LSS Access Number
  2. Translate 289H LSS to E2A REMOTE Access Number

Choice ?

```

SCREEN 8-3: ACCESS NUMBER TRANSLATION MENU

If you have an E2A type access number to convert, selecting option 1 will give you the corresponding LSS access number. If a number is in a LSS access number format, and you wish to see the corresponding E2A number in the monitor's database, select option 2.

You may enter a single number, or a list of numbers by separating each number with a comma. A range of access numbers can be entered by specifying first and last numbers of the range, separated by a slash (/). "ALL" may also be entered, and a list of all known translations will be printed. An example of the report is shown in SCREEN 8-4.

```

Access Numbers (289H LSS = E2A REMOTE)                CPAMS Diagnostics XX.XX.XX
06/28/2010 12:58                                     System Studies Incorporated
-----
001-01 = 001A      001-02 = 001B      001-03 = 002A      001-04 = 002B
001-05 = 003A      001-06 = 003B      001-07 = 004A      001-08 = 004B
001-09 = 005A      001-10 = 005B

```

SCREEN 8-4: ACCESS NUMBER TRANSLATION DISPLAY

The 289H LSS Diagnostics Tests

The procedures for running the Diagnostic Tests are easy. In most cases, you simply select the test you wish to perform, and the MAP program does the rest. With some of the tests, however, you will need to enter the specific device, access number, or board number that you wish to inspect. After contact is established and the testing is completed, results from the testing are output to the computer terminal (or printer) where you can study the outcome. All test procedures begin at the 289H Diagnostics Menu illustrated in SCREEN 8-5.

```

289 LSS Diagnostics Menu
-----
 1. System Configuration
 2. Calibration Test
 3. Realtime Reading Test
 4. Specific Device Info
 5. Capacitance Test
 6. Ping Relays Test
 7. Cold Reset
 8. Leakage Test
 9. AC Test
10. DC Test
11. Pair Diagnostics
12. Dialout Phone Number Information
13. Device Alert Information
14. Get Tone Settings
15. Set Tone Default
16. Route Tone
17. Erase AMC Flash
18. Pair Realtime Reading Test

Choice?

```

SCREEN 8-5: 289H LSS DIAGNOSTICS MENU

Note: If you wish to step back to the previous menu (for example, if you wish to run tests on a different office), press **<Return>** without selecting a Diagnostics Test. If you do so, the phone connection to the office will be dropped, and the cursor will be placed at a prompt where you can select a new office and/or test mode.

SYSTEM CONFIGURATION

Selecting the System Configuration option (by pressing **1** followed by **<Return>**), will display a screen similar to the one illustrated in SCREEN 8-6. This screen displays the current status of the 289H LSS that monitors the office you have selected. By viewing the data displayed on this screen, you can determine what slots are filled, which boards are in the 289H LSS monitor and if the 289H LSS is terminating calls correctly.

```

System Configuration for Salt Creek                CPAMS Diagnostics XX.XX.XX
10/23/2010 13:37                                System Studies Incorporated
-----

LSS Engine:   289H LSS                          Version:      G.02/G.02
Password:     Set                               System Reset: No
Exit State:   Wait SOH State                    Exit Status:  Normal Termination

Inventory:
  Slot  1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16
Chassis ---
  1 | SUB SUB AMC DED AMU SUB DED                               SUB
  2 | DED DED DED DED SUB
  3 |
  4 |

Hit <Return> to return to the 289H LSS Diagnostics menu.

```

SCREEN 8-6: SYSTEM CONFIGURATION FOR 289H LSS

The seven fields displayed on the screen are described below:

—**LSS Engine** field indicates the type of monitor to which you are connected, either a 289H or 289.

—**Version #** indicates the Version numbers of the firmware built into the 289H LSS that you are examining. The characters to the left of the slash represent the version of the firmware built into the ROM in the 289H. The characters to the right of the slash indicate the patch level installed in the 289H. Because the firmware can be patched, the 289H can be updated via PressureMAP. Both firmware and patch versions are labeled with alphabetic characters to the left of the decimal point, and the numeric characters, 1 through 99, to the right of the decimal point.

—**Password** is either Set or Reset. Set indicates that a password is required to enter the 289H, while Reset indicates that a password is not required. Every time that PressureMAP calls the 289H, it sets the password to the one indicated on the System Information Screen in the PressureMAP Editor. If there is no password on the System Information Screen, Reset will appear in this field.

—**System Reset** Resetting the 289H is the same as rebooting a computer. The 289H has the ability to reset itself under a number of circumstances, or it can be reset on demand from PressureMAP. A special dispatch is generated whenever the 289H is reset. The System Reset field indicates whether the 289H has gone through a reset since the last time the 289H was called.

—**Exit State** indicates the state of the communications protocol when an end of session was detected. The normal reading is "Wait SOH State" but a message other than this is not normally a cause for alarm. This is primarily a tool System Studies personnel use to diagnose a problem.

—**Exit Status** indicates how the last session ended and will usually read "Normal Termination." It is similar to the **Exit State** field in that it may contain other messages and is primarily intended for System Studies' use. Normal Exit Status values are NORMAL TERMINATION, USER ABORT, and HUNGUP.

RETRY EXCEEDED, PREMATURE TERMINATION, RECEIVED DATA, NO RESPONSE, ASYNC PROTOCOL RECEIVED, or DCD LOST may indicate a problem. Call System Studies Technical Support if these types of status indicators persist.

OUT OF SYNC or BAD RESPONSE together with no readings indicate a problem. If any of these messages are displayed, please call System Studies Technical Support for assistance.

—**Inventory** is displayed in a table that shows what type of cards are loaded within each slot in the 289H. Each expansion chassis is shown on a separate line. SUB represents a subscriber card; DED identifies a standard dedicated card; AMC designates an addressable transducer card; and AMU identifies a Universal Addressable Monitoring Card. SRA, SRB and SRC represent the three configurations of the Sparton Dedicated Replacement Card (SPDR); please note that SPDR cards must be placed in the 289H chassis in front of other relay card types, and that they must be ordered (configured) as A, B, C, A, B, C, etc.

A blank space indicates that no card is present in that slot. UNK is displayed if the card is unrecognized; it indicates that the card is either not seated properly or possibly defective, or is not supported by the system's version of PressureMAP. An inventory is taken automatically whenever the 289H is reset.

Hitting **<Return>** will take you back to the 289H Diagnostics Menu.

CALIBRATION TEST

Prior to performing either a board scan or a set of realtime readings, PressureMAP performs a Calibration Test on the boards involved. From the results of the Calibration Tests, PressureMAP is able to adjust the subsequent device readings to compensate for any error in calibration of the device. This is referred to as normalizing the readings. The inclusion of this Calibration Test in 289H Diagnostics allows a user to initiate a Calibration Test and study the results.

Calibration Test for Salt Creek				CPAMS Diagnostics XX.XX.XX
05/21/2010 13:38		System Studies Incorporated		
Resistor	Counts	Volts	Ohms	Correction
Battery	39339	47.4		
Open (H)	28		+++++M	
3.8M (H)	983		3.934M	3.5%
100K (H)	36168		103.7K	3.7%
100K (L)	1313		102.9K	2.9%
10K (L)	10287		10.41K	4.1%
Short (L)	43362		96	
Which board?				

SCREEN 8-7: CALIBRATION TEST

To choose the Calibration Test from the 289H Diagnostics menu, press 2 followed by **<Return>**. You will first be prompted for the board number that you would like to test. After typing in a board number followed by **<Return>**, you will be able to examine the report displayed in Screen 8-7.

- The Resistor field indicates which calibration resistor is being tested.
- Counts are the raw counts from the ADC as returned by the 289H. This information is useful to System Studies Technical Support personnel.
- Volts applies only to the battery calibration resistor and indicates the voltage of the CO batteries minus 0.7 volts.
- Ohms indicates the electrical resistance of each calibration resistor. The value in this field should be very close to the resistance implied in the name. For example, a 3.8 megohm calibration resistor could read 3.937M. A field with all pluses and a "M" for megohms ("+++++M") indicates a number whose magnitude is too great to fit in the field.
- Correction is the percentage difference between the theoretical resistance and the computed resistance. PressureMAP corrects readings using the calibrated values, resulting in

less than a 1% error for a reading. Differences greater than 10% between the theoretical and computed resistance are reasons for concern and may indicate a faulty resistor.

At the bottom of the screen displaying the Calibration Test results you will be prompted to test another board. If you want to perform another Calibration Test, type in the board number followed by <Return>. To return to the 289H Diagnostics Menu, just hit <Return>.

REALTIME READING TEST

The Realtime Reading Test is primarily intended to be a tool for servicing the 289H. The realtime readings offered through the Specific Device Information function of PressureMAP is the preferred method of obtaining realtime readings for checking the pressurized cable system. Individual realtime readings are not available for the following addressable devices: Lancier, Nicotra and Inelcom. For these devices it is necessary to use the Pair Realtime Reading Test, described later in this section.

After a new device has been wired to the 289H LSS monitor and the device/access numbers have been entered into the PressureMAP database, PressureMAP must call for readings from the new device to install it in the database. After PressureMAP has called, you can initiate a realtime reading for the device for use as a comparison with its manual reading.

Note: Do not short an addressable pair, as this can damage the AMC or UAMC.

- Shorting a pair on an AMC can blow the F3 fuse. Once the F3 is blown, the AMC cannot read any of the addressable devices. The F3 fuse will need replacement to correct this condition.
- Shorting a pair on a UAMC causes the pair not to tune up, and no readings will be possible until the next scan cycle after the short is cleared.

After you select a Realtime Reading Test from the Diagnostics menu by pressing **3** followed by <Return>, you will see the message:

```
Calibrating...
```

After a few seconds, you will be asked for the device number that you would like to check:

```
Test which device?
```

You may select a monitoring device by entering either the device number or the corresponding access number. Access numbers are entered with a leading sharp character (e.g. "#001A") to distinguish them from device numbers. In most cases (except for addressable transducers), they can also be abbreviated. For 289H LSS devices, the device/access number is a card/pair combination. For example, "#2-1" is interpreted as "002-01". However, to look at a device with access number 001-02, you could enter either "#1-2" or "#2" since if you only specify the pair, the program assumes card 1.

It is important to note that the sharp (#) is already allowed as a valid character in user defined device numbers, and continues to be allowed in these numbers. All user input entered with a leading sharp character that **exactly** matches an existing device number (leading sharp included) is NOT treated as an access number; rather, it references the matching device number. For example, if

a 289H office has a user defined device number "#11", then a user entry of "#11" selects device, NOT access, number "001-11".

Upon entering a valid device/access number, you will see the realtime reading for that device repetitively displayed on a screen similar to the screen samples that follow. You may wish to refer to the charts in the PressureMAP Tables sub-section that provide conversions from milliamperes to the corresponding reading value for current loop devices, and the equivalent information for resistive and System Studies addressable devices.

Data entry errors can cause many problems with readings, so checking the data is a valuable tool for troubleshooting. For example, if device information is entered in PressureMAP with an incorrect TD Type, it can easily be checked on the Specific Device Information screen. Another cause for errors is entering two different devices with the same access number. Duplicate access numbers can be identified by running a Device History for the entire office by Access #, as described in Section 2 of this manual.

Realtime Reading Test for Salt Creek						CPAMS Diagnostics XX.XX.XX		
01/02/2010 13:38						System Studies Incorporated		
Access #	Type	Counts	Scaled	Ohms	Range	Step	Status	Reading
001-01	F	35578	1045	101672	H	1		9.5
001-01	F	35580	1045	101672	H	1		9.0
01-01	F	35579	1045	101672	H	1		9.5
001-01	F	35579	1045	101672	H	1		9.5
01-01	F	35579	1045	101672	H	1		9.5
001-01	F	35580	1045	101672	H	1		9.5

SCREEN 8-8: REALTIME READING TEST DISPLAY—RESISTIVE DEVICE (FLOW)

Realtime readings for a current loop device vary from the sample shown in Screen 8-8, in that there is no scaling of the counts and no steps are shown. An exception to this statement pertains to voltage device realtime readings (Screen 8-13), which include a column to display the scaled, signed counts. Screens 8-9 through 8-13 show the realtime readings of current loop devices.

Realtime Reading Test for Cedar City						CPAMS Diagnostics XX.XX.XX	
01/14/2010 13:38						System Studies Incorporated	
Access #	Type	Counts	Milli-Amps	Delta P	Status	Reading	
001-29	F	3715	4.72	0.92		8.0	
001-29	F	3620	4.60	0.77		7.4	
001-29	F	3632	4.61	0.79		7.5	
001-29	F	3599	4.57	0.73		7.2	

SCREEN 8-9: REALTIME READING TEST DISPLAY—CURRENT LOOP DEVICE (FLOW)

```

Realtime Reading Test for Salt Creek                                CPAMS Diagnostics XX.XX.XX
01/02/2010 13:38                                                System Studies Incorporated
-----
Access #   Type   Counts   Milli-Amps   Status   Reading
-----
001-05    P     12787     14.99        -----
001-05    P     12787     14.99        -----
001-05    P     12787     14.99        -----
001-05    P     12787     14.99        -----
    
```

SCREEN 8-10: REALTIME READING TEST DISPLAY—CURRENT LOOP DEVICE (PRESSURE)

```

Realtime Reading Test for Cedar City                                CPAMS Diagnostics XX.XX.XX
01/14/2010 13:38                                                System Studies Incorporated
-----
Access #   Type   Counts   Milli-Amps   Status   Absolute   Reading
-----
001-28    P     7110     9.04         -----
001-28    P     7114     9.04         -----
001-28    P     7114     9.04         -----
001-28    P     7109     9.03         -----
    
```

SCREEN 8-11: REALTIME READING TEST DISPLAY—CURRENT LOOP DEVICE (PRESSURE, WITH BAROMETRIC TRANSDUCER INSTALLED IN OFFICE)

```

Realtime Reading Test for Cedar City                                CPAMS Diagnostics XX.XX.XX
01/14/2010 13:38                                                System Studies Incorporated
-----
Access #   Type   Counts   Milli-Amps   Status   Reading
-----
001-11    B     3674     4.67         -----
001-11    B     3675     4.67         -----
001-11    B     3665     4.66         -----
001-11    B     3670     4.66         -----
    
```

SCREEN 8-12: REALTIME READING TEST DISPLAY—CURRENT LOOP DEVICE (BAROMETRIC)

```

Realtime Reading Test for Cedar City                                CPAMS Diagnostics XX.XX.XX
01/14/2010 13:38                                                System Studies Incorporated
-----
Access #   Type   Counts   Scaled   Range   Status   Reading
-----
001-26    D     59135   -6400    1       48.8
001-26    D     59135   -6400    1       48.8
001-26    D     59136   -6399    1       48.8
001-26    D     59136   -6399    1       48.8
    
```

SCREEN 8-13: REALTIME READING TEST DISPLAY—VOLTAGE DC DEVICE

Realtime readings for addressable devices are displayed in SCREEN 8-14. This example shows readings for a System Studies Addressable Dual Transducer: the flow and pressure sensors share the same address, but the flow device is assigned to channel A and the pressure device to channel B. It is important to make sure "A" is coded for the flow sensor and "B" for the pressure sensor in the dual transducer, so that reading counts are associated with the correct device/access number and converted to the appropriate measurements (SCFH or PSI).

```

Test which device? 225

Realtime Reading Test for BONNEY LAKE                CPAMS Diagnostics XX.XX.XX
05/21/2010 13:38                                     System Studies Incorporated
-----

```

Access #	Type	Counts	Status	Reading
001-A1-005A	F	6		5.7
001-A1-005A	F	6		5.7
001-A1-005A	F	6		5.7

```

Test which device? 226

Realtime Reading Test for BONNEY LAKE                CPAMS Diagnostics XX.XX.XX
01/14/2005 13:38                                     System Studies Incorporated
-----

```

Access #	Type	Counts	Status	Reading
001-A1-005B	P	74		9.8
001-A1-005B	P	74		9.8
001-A1-005B	P	74		9.8

SCREEN 8-14: REALTIME READING TEST DISPLAY—ADDRESSABLE DEVICE (DUAL)

The fields displayed in the preceding screens are described below:

- Access #** While the user is asked to input either the PressureMAP device number or the corresponding access number to do a realtime reading on a specific device, only the access number of that device is displayed. A list of device numbers with the corresponding access numbers can be reviewed in the PressureMAP Device Log.
- Type** represents the second letter of the device type (for example, "F" for a flow device).
- Counts** are the raw ADC counts returned by the 289H. This information is useful to System Studies Technical Support personnel.
- Scaled** shows the scaled counts that have been adjusted for any discrepancy based on the calibration. This information is also useful to the Technical Support personnel.
- Ohms** indicates the resistance calculated from the scaled counts.
- Range** indicates which range of the measurement circuit was used for the measurement ("H" = high range, "L" = low range). The high range is used for measurements above 100K ohms.

—**Step** represents the approximate step number of a 20-step transducer. A reading of 100k ohms is step 1 and 3.8M ohms is step 20. A reading below step 1 displays as 0 and a reading above step 20 displays as ++.

—**Milli-Amps** shows the electrical current output calculated from the data in the **Counts** field.

—**Delta P** represents the pressure differential value created by the Flow Finder orifice to which the current flow transducer is pneumatically connected. This value is converted by PressureMAP to the appropriate flow reading for the defined flow range of the device.

—**Status** indicates the status of the pair. The status indicator message is the precursor to the corresponding “verbose” reading (see Appendix 1 of the Operations manual). Values for non-addressable devices are listed in Table 8-1.

<u>Status</u>	<u>Reading</u>	<u>Cause</u>
(Blank)	Blank	Device not scanned yet
Busy	BUSY	Subscriber pair was in use when reading taken
Noise	NSE	AC voltage on pair
Leak	UBAL	Imbalance
Volt	VOLT	Stray voltage on pair (> 10Vdc or 6Vac)

TABLE 8-1: STATUS INDICATOR DEFINITIONS FOR NON-ADDRESSABLE DEVICES

When a verbose reading appears for addressable devices, the Status value can be used to further define the problem. Comparing the reading to other devices on the same pair may also be helpful. The status indicators for addressable devices, the related verbose reading values, and interpretations are listed in Table 8-2.

<u>Status</u>	<u>Reading</u>	<u>Cause</u>
NRead	(Blank)	No new reading (device not scanned yet)
Addr	ADDR	Incorrect address, improper wiring, or defective module; invalid type (data entry)
NoRsp	NONE	Device not responding
Comm	NSE	Device communication error; attempt to read device timed out
Noise	NSE	Excessive noise on pair
DOpen	OPEN	Open between TD and transceiver
POpen	OPEN	Pair is open
Load	PAIR	Loading on pair is greater than expected maximum
Misma	PAIR	Data mismatch (this status message was replaced by N/A in PressureMAP Version 20.00.51, ADDR/PROG in Version 20.01)
Prog	PROG	Invalid programming for device(s) on pair
DShrt	SHRT	Short between TD and transceiver
PShrt	SHRT	Short on pair

TABLE 8-2: STATUS INDICATOR DEFINITIONS FOR ADDRESSABLE DEVICES

—**Absolute** defines the actual pressure reading provided by the current loop device before its reading is adjusted for barometric pressure. This field appears only if a barometric pressure transducer is installed in the office.

—**Reading** represents the **unbiased** reading for that type of device. (The actual reading might be biased by an offset in the PressureMAP Database—e.g., an SP device.) When running the Diagnostic Realtime Reading on a Trunk and Toll contactor, the usual reading will be replaced by a series of question marks. A VOLT reading in this column indicates the presence of lethal voltage. (A complete list of “verbose” readings is provided in Appendix 1 of this manual.)

Realtime readings will continue to be posted to the screen until **<Esc>** is pressed, at which time you will be prompted for another device number. Enter another device number followed by **<Return>** to perform another Realtime Reading Test. Hit **<Return>** to return to the 289H Diagnostics Menu.

SPECIFIC DEVICE INFO

The fourth option of the menu, Specific Device Info, is provided so device information can be viewed without having to leave the 289H Diagnostics Menu. The screen of information that is displayed is essentially the same screen displayed by the PressureMAP option, Specific Device Information, described in detail in Section 2 of this manual.

```

Specific Device Information for Salt Creek                CPAMS Diagnostics XX.XX.XX
05/21/2010 13:38                                     System Studies Incorporated
-----
Device #: 001A          Access #: 001-01          Type: UP
Address:  MH-20 SOQUEL          Loc: 15  Pipe: BA
TD Type:  RA
Sheath(s): 02

Cable:      02          Prim Pair: 704          Sec Pair:          Sort Key:
Plat #:     UG-7          Stickmap: 5
Phone:
Latitude:           Longitude:
Office 1 Loc: 14          Distance 1 (kft): 2.9          Field 1 Loc: 16
Office 2 Loc:           Distance 2 (kft):          Field 2 Loc:

Remarks:
Readings      Curr Last Tdy  -1  -2  -3  -4  -5  -6  Wk-1 Wk-2 Wk-3 Wk-4
-----
                12.0 12.0  7.0  7.0  7.0  7.0

```

SCREEN 8-15: SPECIFIC DEVICE INFORMATION DISPLAY

CAPACITANCE TEST

If you choose Realtime Capacitance Test from the 289H Diagnostics Menu by pressing 5 and **<Return>**, you will first be asked for the device number to test. After entering a valid device number, or the corresponding access number, a screen similar to Screen 8-16 will be displayed. (Even though you are asked to enter the device number, only the access number will be displayed on the screen.) The display for both sides of the pair will include the raw capacitance counts, the capacitance (in picofarads), the distance of an open from the Central Office in thousands of feet (kilofeet), and a location indication.

Note: The Capacitance Diagnostic Test should not be performed on addressable pairs.

-----Tip Side-----					-----Ring Side-----				
Access #	Counts	p-farads	K-feet	Loc.	Counts	p-farads	K-feet	Loc.	
001-01	48365	139551	1.837	OUT	80932	233520	3.537	OUT	
001-01	46829	135119	1.866	OUT	80813	233177	3.537	OUT	
001-01	47046	135746	1.843	OUT	80594	232345	3.537	OUT	

SCREEN 8-16: CAPACITANCE TEST DISPLAY

This test is used to determine how far the 289H is located from an OPEN on a pair. Although only a very rough estimate is given, it is useful to determine if the OPEN is within the CO or outside. Readings are displayed continuously until an **<Esc>** is entered. The screen that is displayed shows the status of the following fields.

—**Counts** is the raw response from the 289H's capacitance counter. This information is useful to System Studies Technical Support personnel.

—**p-Farads** is the capacitance in picofarads, computed from the raw counts. (One picofarad is .000001 microfarads.)

—**K-feet** is the rough computed distance of an open from the 289H monitor in thousands of feet. It is important that you NOT use this distance for fault locating because it is a rough estimate.

—**Location** indicates whether the open is inside (IN) or outside (OUT) the CO.

The test results will continue to be listed until you press **<Esc>**. At that point you will be prompted for another device number. Either enter the number of the next device that you would like to test, or press **<Return>** to go back to the 289H Diagnostics Menu.

PING RELAYS TEST

The Ping Relays Test is a simple test to determine whether all of the line selection relays on a given board are operating. The test requires that someone is listening near the 289H when it is performed. When the test is run, the relays on the chosen card "ping" with a distinctive rhythm. This pinging of the relays is performed repetitively, in groups of five, with a pause of approximately five seconds between repetitions. If the listener detects a gap in the sequence of pings, he can calculate which relay is not pinging.

Note: The Ping Relays Diagnostic Test should not be performed on addressable pairs.

There are two reasons why a relay would not ping during the test. One is that the relay is faulty, the other is that the line is busy. While busy lines are obviously not a problem when testing a dedicated

board, they could confuse a test on a subscriber board. For that reason, this test provides a display that indicates busy lines.

When running this test on a dedicated board, the output displayed is the word "ping" for each time the board is pinged. For subscriber boards, the output displayed is a sequence of ones and zeros - one digit for each line. The first digit displayed corresponds to the first line on the selected card. A value of 0 indicates the line was free whereas a value of 1 indicates that the line was found to be busy. After removing the relays that were found to be busy during the test from the list of relays found to be silent, the remaining ones are determined to be faulty.

To run the Ping Relays Test, select it from the 289H Diagnostics Menu by pressing **6** **<Return>**, and you will be asked for a board number to test. Upon entering a valid board number (see the introduction to this section for a description of how boards are numbered), you will see a display similar to SCREEN 8-17. In this example, all of the subscriber lines were found to be on hook except line 9 which was found to be busy all four times that the test was run.

```

Ping Relays Test for Salt Creek                CPAMS Diagnostics XX.XX.XX
01/02/2010 13:42                             System Studies Incorporated
-----
Pairs 1-25 00000 00010 00000 00000 00000
Pairs 1-25 00000 00010 00000 00000 00000
Pairs 1-25 00000 00010 00000 00000 00000
Pairs 1-25 00000 00010 00000 00000 00000

```

SCREEN 8-17: PING RELAYS TEST DISPLAY

The test will continue until you press **<Esc>**, after which you will be prompted for the number of another board to reset. You may then enter the number of another board, or hit **<Return>** to go back to the 289H Diagnostics Menu.

COLD RESET

This option will remotely command the 289H to reset. Executing a Cold Reset wipes out patches and any knowledge of a device's status. If the 289H is equipped for Dedicated Tone capability, the reset monitor will default to the condition where the pseudo-data tone is routed to all pairs. In addition, the password is reset so that none is required and a board inventory is automatically taken after the 289H is reset. Cold Reset does not cause an addressable card (UAMC or AMC) to clear or erase its device table. A reset 289H with both dedicated and addressable cards will have to reload data for the dedicated devices, but not the addressables. Please note: PressureMAP's initial call that reloads the device data will be considerably longer than an ordinary scheduled call.

After choosing Cold Reset by pressing **7** followed by **<Return>**, you will see the message:

```
Do you want to cold reset the 289H LSS? Y[es], N[o].
```

This message acts as a confirmation to make sure that a Cold Reset is not initiated by mistake. Pressing **Y** followed by **<Return>** will implement the Cold Reset. You will then see the message:

```
Cold reset accepted. It will not occur until we hang up.
```

Hit <Return> to return to the 289H LSS Diagnostic Menu.

The actual cold resetting process does not take place until after you hang up, which is accomplished by hitting <Return> to return to the 289H LSS Diagnostics Menu, and then hitting <Return> again.

LEAKAGE TEST

If you choose Leakage Test from the 289H Diagnostics Menu by pressing **8** and <Return>, you will first be asked for the device number to test. After entering a valid device number, or the corresponding access number, a screen similar to SCREEN 8-18 will be displayed. Even though you are asked to enter a device number, only the corresponding access number will be displayed on the screen.

Note: The Leakage Diagnostic Test should *not* be performed on addressable pairs.

The Leakage Test measures the actual resistance on tip/gnd, ring/gnd and across tip and ring. These measurements can be used to determine if a SHORT on a flow transducer circuit is due to leakage on the pair or some other factor.

The Leakage Test is generally used for resistive type devices, but can also be used to confirm the type of device installed. For example, a current loop device that reads PAIR and has a value of .2 to .7 mA in the Realtime Reading Test can be further tested to see if it is a resistive device input in PressureMAP as a current flow device. A value between 1,000 and 9,000 ohms (in the Tip/Ring Ohms column) represents a valid reading for a current loop device; but a value between 100K ohms and 3.8M ohms indicates that the transducer is actually a resistive device.

Realtime Leakage Test for CITRUS HEIGHTS		CPAMS Diagnostics XX.XX.XX	
03/04/2010 13:42		System Studies Incorporated	
Access #	Tip/Ring Ohms	Tip/Gnd Ohms	Ring/Gnd Ohms
001-15	6,816	100M	86,231,576
Test which device?			

SCREEN 8-18: LEAKAGE TEST DISPLAY

At the bottom of the screen displaying the Leakage Test results you will see the prompt:

Test which device?

If you want to perform another Leakage Test, type in the device number followed by <Return>. To return to the 289H Diagnostics Menu, just hit <Return>.

AC TEST

The AC test measures AC voltage on tip/gnd and ring/gnd. This test should be run to determine the actual voltage on the pair if the device has a VOLT message in the Status column during a realtime reading. If the device has acquired a VOLT reading during the normal call cycle, lethal voltage has been found on the pair. The AC test can also be useful when troubleshooting pressure transducer

pressure drops. By running this test, wire problems can be diagnosed before a technician is dispatched to the field.

Note: The AC Voltage Diagnostic Test should *not* be performed on addressable pairs.

To choose the Realtime AC Test from the 289H Diagnostics menu, press **9** and **<Return>**. You will be prompted for the device number to test. After entering a valid device number, or the corresponding access number, a screen similar to SCREEN 8-19 will be displayed. Even though you are asked to enter a device number, only the corresponding access number will be displayed on the screen.

```

Realtime AC Test for Salt Creek                                CPAMS Diagnostics XX.XX.XX
01/02/2010 13:42                                           System Studies Incorporated
-----
Access #              VAC              VAC
                    Tip/Gnd            Ring/Gnd
-----
001-01              0.0412            10.0373

Test which device?

```

SCREEN 8-19: AC TEST DISPLAY

The AC voltage indicated in the **VAC Tip/Gnd** and **VAC Ring/Gnd** columns should be 1.0 VAC or less.

At the bottom of the screen displaying the AC Test results you will see the prompt:

```
Test which device?
```

If you want to perform another AC Test, type in the new device number followed by **<Return>**. To return to the 289H Diagnostics Menu, just hit **<Return>**.

DC TEST

The DC test measures DC voltage on tip/gnd and ring/gnd. This test should be run to determine the actual voltage on the pair if the device has a VOLT message in the Status column during a realtime reading. If the device has acquired a VOLT reading during the normal call cycle, lethal voltage has been found on the pair. The DC test can also be useful when troubleshooting pressure transducer PSI drops. By running this test, wire problems can be diagnosed before a technician is dispatched to the field.

Note: The DC Voltage Diagnostic Test should not be performed on addressable pairs.

To choose the Realtime DC Test from the 289H Diagnostics menu, press **10** and **<Return>**. You will be prompted for the device number to test. After entering a valid device number, or the corresponding access number, a screen similar to SCREEN 8-20 will be displayed. Even though you are asked to enter a device number, only the corresponding access number will be displayed on the screen. Readings in the two **VDC** columns should be under 1.0 volt, as shown below.

```

Realtime DC Test for Salt Creek                                CPAMS Diagnostics XX.XX.XX
01/02/2010 13:42                                           System Studies Incorporated
-----
Access #              VDC              VDC
-----              Tip/Gnd             Ring/Gnd
001-01                0.0031             0.0000

Test which device?
    
```

SCREEN 8-20: DC TEST DISPLAY

If you want to perform another DC Test, type in the device number followed by **<Return>**. To return to the 289H Diagnostics Menu, just hit **<Return>**.

PAIR DIAGNOSTICS

PressureMAP’s Pair Diagnostics function (option 11 of the 289 Diagnostics Menu) provides all of the important pair diagnostic information for a specific monitoring device in one concise report. The data includes output from DC and AC voltage tests, leakage test and the capacitance test.

In order to access this information, select Pair Diagnostics from the 289H Diagnostics menu by pressing **11** and **<Return>**. You will be prompted for the device number to test. After entering a valid device number, or the corresponding access number, a screen similar to SCREEN 8-21 will be displayed. Even though you are asked to enter a device number, only the corresponding access number will be displayed on the screen.

Note: The Pair Diagnostics Test should *not* be performed on addressable pairs.

```

Realtime Pair Diagnostic Test for Salt Creek                    CPAMS Diagnostics XX.XX.XX
05/14/2010 13:42                                           System Studies Incorporated
-----
Access #              VDC              VDC
-----              Tip/Gnd             Ring/Gnd
001-14                0.0031             0.0038

Access #              VAC              VAC
-----              Tip/Gnd             Ring/Gnd
001-14                0.3844             0.3928

Access #              Tip/Ring Ohms      Tip/Gnd Ohms      Ring/Gnd Ohms
-----              -----
001-14                100M               100M              100M

Access #              Tip Side          Ring Side
-----              Counts p-farads  K-feet Loc.      Counts p-farads  K-feet Loc.
001-14                640 1846 0.078 IN  686 1979 0.084 IN

Test which device?
    
```

SCREEN 8-21: PAIR DIAGNOSTICS DISPLAY

You can choose to run Pair Diagnostics for another device by entering the device number followed by <Return>. Simply pressing <Return> at the Test which device? prompt returns you the 289H LSS Diagnostics Menu where you can make another option selection or return the MAP Programs Menu.

289H Device Alert Options

The next two options of the 289H Diagnostics Menu will only be displayed if the 289H that has been called has been upgraded with device alert capabilities. If you do not see menu items 11 and 12 on the 289H Diagnostics Menu (Screen 8-5), and you wish to upgrade your 289H monitor with device alert capabilities, please call System Studies for more information.

Note: If the Access Number Translation capability has been enabled, the following two diagnostics options are renumbered to 12 and 13.

DIALOUT PHONE NUMBER INFORMATION

Selecting the Dialout Phone Number Information option (by entering the number 11 followed by <Return>) enables you to test the alert dialout capabilities of the 289H LSS from PressureMAP. This menu option produces a display similar to the one illustrated in Screen 8-22.

The data fields on the screen provide key information about the 289H LSS to be tested and the PressureMAP system initiating the dialout phone number test. Please note that the alerting configuration shown in this sample is merely intended to show the different formats for information that may be displayed; it does not reflect the setup of an actual 289H monitor.

```

Dialout Phone Number Information                                CPAMS Diagnostics XX.XX.XX
01/02/2010 10:33                                           System Studies Incorporated
-----
      PMAP ID          MAP Alert #          289 ID  Status  Attempts
-----
1| 0202    4759999          4234444  NORMAL    0
2| 0111    T9W14089231844  4234444  NO CARRIER  3
3| 0999    T192.168.0.1:3002      1463001  NORMAL    0
4|
Test dialout phone number? (y/n)
Hit <Return> to return to the 289 LSS Diagnostics menu.

```

SCREEN 8-22: DIALOUT PHONE NUMBER INFORMATION SCREEN

The data fields displayed on the screen are described below.

—**PMAP ID** This is the "System Number" that was assigned by System Studies when the MAP System was installed.

—**MAP Alert #** The phone number of the 289H's alert modem is listed here. It can also be found in the **MAP alert #:** field of the PressureMAP Office Information Screen. For 289H/H-M monitors using a network connection to PressureMAP, this field contains the IP address for the PressureMAP computer.

—**289 ID** This column contains the last seven digits of the PressureMAP office's phone number or IP address, as input in the **Phone number**: field of PressureMAP's Office Information Screen.

—**Status** The call error message (if any) is recorded in this column. If no modem errors have occurred in the last 289H alert test function, the message "Normal" appears. Other possible status conditions could included the following: No Answer, No Connect, Busy, Incoming, Retry Exceeded, No Response, Incorrect Response, No Modem Response, Undefined Error, etc. A complete list of 289H LSS Alert Modem Status Codes appears in Appendix 5 of the 289H LSS Installation and Operations manual.

—**Attempts** The number in this column indicates how many unsuccessful attempts have been made to contact the 289H alert modem. This number is reset to zero when PressureMAP connects with the alarm modem.

After choosing Dialout Phone Number Information from the 289H LSS Diagnostics Menu by pressing **11** followed by **<Return>**, you will see the message:

```
Test Dialout phone number? Y[es], N[o].
```

Pressing **Y** followed by **<Return>** will produce the following message:

```
PMAP_ID?
```

Enter the number assigned to the PressureMAP system to which you would like to place a test call. This is the three digit number located in the **PMP ID** data field. The program responds with the following:

```
Please Wait, Disconnecting..
```

```
This test will take between 45 and 120 seconds
```

This part of the process sends a "force call" request to the 289H LSS, and then terminates the call in order to allow the 289H LSS to call PressureMAP. If PressureMAP cannot reach the 289H being called, it displays the following message:

```
Office does not answer; waiting..
```

```
Attempting call again...
```

Once the connection has been made and the "force call" request is initiated, PressureMAP hangs up and waits for the 289H's call. The following displays indicates that PressureMAP is awaiting a call:

```
1      15      30      45      60
.....
.....
Test call was SUCCESSFUL!
```

Eventually PressureMAP will display the message above and redial the selected 289H LSS office so that other 289H LSS Diagnostics options can be selected, if desired.

DEVICE ALERT INFORMATION

The next option of the 289H Diagnostics Menu lists the set alert level and current reading for any device you select. You may enter more than one device number by using the list/range format described in the Preface section of this manual.

Select the Device Alert Information option by entering the number 12 followed by <Return>. You will see a screen similar to the one illustrated in SCREEN 8-23.

```

Device Alert Information for 289H                                CPAMS Diagnostics XX.XX.XX
01/02/2010 13:37                                             System Studies Incorporated
-----
Device #   Access #   Type   TD Type   Scan   Alert
-----
001-05    003A    UP     RP        8.5    8.0
001-06    003B    MF     RF       11.0   13.0
001-08    004B    TC     RP    (9949)
001-09    005A    CA     RP        OK    (420K)
001-10    005B    CA     RP       ALRM

Device alert information for which device?

```

SCREEN 8-23: DEVICE ALERT INFORMATION SCREEN

—**Device #** The assigned number for the device. Note that this number can be the same as the access number if User Defined Device Numbering is turned off.

—**Access #** The access number for the device.

—**Type** The PressureMAP device type for the device.

—**TD Type** The transducer type. A list of possible transducer types is listed at the end of the Preface in the MAP Operations Manual and in Appendix 1 of the Data Entry manual.

—**Scan Rdg** A current "Realtime Reading" of the device. If this number is in parentheses, the device reading is displayed in measurement units (e.g., ohms or milliamperes) instead of reading units (e.g., PSI or SCFH).

—**Alert Level** This is the programmed device reading level at which the 289H LSS will generate a call to PressureMAP. A blank entry in this column indicates that the alert threshold is not enabled. This condition usually occurs when a device has already alerted and cannot issue another alert, either because the reading has approached the extreme "bad" end of its range (e.g., near 0 if a pressure transducer) or, if the device is a contactor, the reading is now ALRM.

289H LSS Dedicated Tone Capability

The 289H LSS dedicated tone capability provides the ability to place a data tone on all dedicated device pairs to prevent them from being used ("stolen") for other purposes and to assist field technicians in locating a specific device pair(s). PressureMAP Diagnostics provides three menu options for tone generation control: Get Tone Settings, Set Tone Default, and Route Tone. The first two tone controls apply to the pseudo-data tone placed as a "pair-saver" to protect all dedicated pairs from unauthorized use. The third tone control allows the maintenance technician to place a

“locater” tone on a specific pair. Each of these options populates a Tone Information Menu with data pertaining to the selection.

In order to utilize the full tone generation capability of the 289H LSS monitor, the 289H must be equipped with a Tone Utility card (Part Number 9010-0016) and one or more Dedicated Tone Relay Cards (Part Number 9800-6110). In addition, the 289H Controller Card must be equipped with EPROM Version B.05 or greater. The pair-saver tone capability requires that the dedicated relay cards are equipped with tone capacitors on each relay (Rev C and above – all versions purchased after December, 1998). However, the user-directed locater can be used with older “non-tone” dedicated relay cards, and on the dedicated pairs on addressable cards. If the 289H chassis has both old and new dedicated cards installed, the locater tone will be available for all of their pairs, but the pair-saver tone will only go out on pairs wired to the current “tone” cards. Effective with PressureMAP Version 24, locater tone can also be routed to subscriber pairs, but there is no tone capability for the Sparton Dedicated Replacement Card (SPDR) because of the Sparton cable’s common tip configuration. (For more detailed information on the tone generation capabilities of 289H relay cards, please refer to the 289H LSS Installation and Operations Manual.)

GET TONE SETTINGS

To view the settings for tone being routed to all pairs, select the “Get Tone” option of the 289H LSS Diagnostics Menu. Press **13** (or the appropriate number) and **<Return>**. A screen similar to SCREEN 8-24 will display showing the current tone settings for the 289H LSS.

```

Get Tone for <OFFICE NAME>                                CPAMS Diagnostics XX.XX.XX
03/11/2010  11:24                                         System Studies Incorporated
-----
CURRENT TONE SETTINGS:

Frequency (Hz)      Routing Mode      Reset Settings From
-----
High_Low_Alt       All              Default

Hit <Return> to return to the 289 LSS Diagnostics menu.

```

SCREEN 8-24: GET TONE SETTINGS INFORMATION SCREEN

—**Frequency (Hz)** The information in this data field represents the type of tone applied to the relay contacts (device pairs) on the 289H’s dedicated relay cards. The options and their frequencies are as follows:

- High_Low_Alt — High/low frequency alternating tone: 1700/1300 Hz (data) and 580/450 Hz (locate)
- High_Freq_Pulsed — High frequency pulsed tone: 1700 Hz (data) and 580 Hz (locate)
- High_Freq_Cont — High frequency continuous tone: 1700 Hz (data) and 580 Hz (locate)
- Low_Freq_Cont — Low frequency continuous tone: 1300 Hz (data) and 450 Hz (locate)
- Tones_Disabled — All tones disabled

—**Routing Mode** This field indicates the relays (device pairs) on which the pseudo-data tone has been enabled. By default, the 289H LSS routes the tone to all normally closed relay contacts.

—**Reset Settings From** A “Default” designation in this data field indicates that the alternating frequency was the original default value. Any other entry in this field would identify the tone frequency that was selected prior to the currently selected value.

SET TONE DEFAULT

The next option on the 289H LSS Diagnostics Menu enables you to select the tone default settings which control the functions of the 289H LSS Tone Generator. All changes made from this menu override the original default settings until either the 289H LSS monitor is reset, or you initiate another change as described below.

In order to change the default tone settings, you will need to select the appropriate option number from the 289H LSS CPAMS Diagnostics Menu (Option #14), and follow the numeric entry with a **<Return>**. The Set Tone Default Information Screen will display as shown in SCREEN 8-25 below.

```

Set Tone for <OFFICE NAME>                                CPAMS Diagnostics XX.XX.XX
03/11/2010  11:24                                         System Studies Incorporated
-----

CURRENT TONE SETTINGS:

Frequency (Hz)      Routing Mode      Reset Settings From
-----
High_Low_Alt       All              Default

289-H LSS Set Tone Menu
-----
1. High/Low Frequency Alternating Tone
2. High Frequency Pulsed Tone
3. High Frequency Continuous Tone
4. Low Frequency Continuous Tone
5. All Tones Disabled

Select tone (1-5)

```

SCREEN 8-25: SET TONE DEFAULT INFORMATION SCREEN

The five menu options listed in SCREEN 8-25 provide the ability to select the type of tone that the 289H LSS will use as a default value for the dedicated device pairs. Item #1, which is the standard default setting, places an alternating pseudo-data tone frequency on the pair(s). The frequencies associated with each tone setting are detailed in the preceding Get Tone Settings description. The last option allows you to disable all tones.

ROUTE TONE

The final dedicated tone option on the 289H LSS Diagnostics Menu selection makes it possible for you to select a specific card and relay (device pair) on which to place a tone. Please note that while tone is being routed to a specific pair, all other tones are silenced during the process. As soon as you end the tone routing session, the existing default tone setting is restored to all dedicated pairs.

Entering selection **15** (or the appropriate selection on the menu) followed by **<Return>** produces a screen similar to SCREEN 8-25, except that the title on the top line specifies “Route Tone.” First you must select the type of tone to apply from the five choices offered, followed by **<Return>**. For example, if you want to route a high frequency continuous tone, you would select option #3. PressureMAP would then prompt you for a card and pair designation.

Route to which card-pair?

You may designate a pair (or pairs) on which to place a tone by entering the access number of the associated device following the on-screen prompt. The access number format identifies the card position in the 289H LSS chassis as well as the appropriate relay on the card. For example, entering access number 003-18 instructs the 289H LSS to activate the tone coupling capacitor for relay number 18 on the third dedicated relay card in the chassis.

Note: When selecting a pair for routing tone, it is advisable to make sure that the card supports the locater tone frequency. No error message will be displayed if the pair entered does not have the required tone capability. (For information on the tone generation capabilities of the various 289H relay cards, please refer to the *289H LSS Installation and Operations Manual*.)

Once you have selected the card/pair number(s) on which you wish to place a tone, PressureMAP instructs the 289H LSS to generate the desired tone. The routed tone will continue until you enter **<Esc>**. The existing default tone setting is then restored to all dedicated pairs. A selection made with the Route Tone option does not replace the default tone setting.

289H LSS Addressable Capability

The next two 289H LSS Diagnostics Menu options will be displayed only if an addressable monitoring card (AMC or UAMC) is detected in a 289H office. Please note that these option designations will “float” based on whether or not all of the preceding options exist for your monitor. Therefore, “Erase AMC Flash” may not be Option #16 on the menu.

The next 289H LSS Diagnostics Menu option (“Erase”) is accessible via PressureMAP Versions 20.01 and later for properly configured 289H monitors—those equipped with: 1) the latest controller card (all versions purchased after December, 1998) and an Addressable Monitoring Card (AMC); or 2) older 289H monitors with a B06 or higher EPROM upgrade (on controller card) and an AMC. 289H LSS monitors that comply with these requirements have the ability to read System Studies High Resolution Addressable Transducers and Chatlos addressable transducers in addition to devices installed on dedicated pairs.

Both addressable options are accessible via PressureMAP Versions 23 and later for properly configured 289H monitors—those equipped with: 1) the latest controller card (all versions purchased after October, 2001) and a Universal Addressable Monitoring Card (UAMC); or 2) older 289H monitors with the appropriate EPROM upgrade (on controller card) and a UAMC. The EPROM on the controller card must be one of the following versions (or higher): C06, D03, E03, F02, or G02. The UAMC is designed to read several additional addressable devices: Lancier, Nicotra, Inelcom, and Microsol pressure transducers, and Sparton pressure and flow transducers.

ERASE AMC FLASH

This Diagnostics option makes it possible for you to erase all device programming stored in flash memory on a given addressable board. Once erased, the AMC will be reprogrammed with the correct configuration the next time that PressureMAP calls the 289H. This initial call that reloads the device data will take much longer than the ordinary scheduled calls from PressureMAP.

Note: The “erase” command is necessary to reinitialize an AMC or UAMC that has been previously programmed with device information, since flash memory retains its data when the board loses power. If a programmed board is swapped to another slot or 289H, the old programming is likely to reflect some devices that are no longer physically connected. Thus, the AMC could spend significant periods of time attempting to read devices that do not respond, since they no longer “exist.” The cumulative effect of these timeouts can severely impact the AMC’s functionality.

After entering selection **16** (or the appropriate selection on the menu) followed by **<Return>**, you will see the prompt:

```
Erase Flash on which AMC board?
```

Enter the number assigned to the AMC board for which you want to erase the device programming. If the number entered is not a valid selection, the following message is displayed:

```
No AMC card installed in that slot.
```

```
Erase Flash on which AMC board?
```

If the number entered is valid, the program will respond with:

```
This will erase ALL programming on the AMC board. Continue?  
Y[es], N[o]
```

Pressing **Y** followed by **<Return>** will produce the following message:

```
The Erase AMC Flash command was accepted by the 289 LSS.
```

```
Hit <Return> to return to the 289 LSS Diagnostics menu.
```

Pressing **N** followed by **<Return>** in response to the **Continue?** prompt produces the following message:

```
Erase AMC Flash command cancelled.
```

To return to the 289H Diagnostics Menu, just hit **<Return>**.

PAIR REALTIME READING TEST

This menu option will appear if the 289H LSS is equipped with a Universal Addressable Monitoring Card (UAMC), effective with PressureMAP Version 23. The Pair Realtime Reading Test is only applicable for pairs with Lancier, Nicotra and Inelcom addressable devices installed. Because realtime readings on these time-addressed addressable transducers require that all addressable transducers on the pair be read up to the desired device, individual realtime readings for Lancier, Nicotra, and Inelcom devices are not provided. For this type of device, a Pair Realtime Reading provides a realtime reading for **all** installed devices on the pair.

After entering selection **17** (or the appropriate selection on the menu) followed by **<Return>**, you will see the message:

```
Calibrating ...
```

```
Warning:      The realtime reading test for this pair will measure
               all installed devices on the pair.  This will take
               approximately 2 seconds per device, or between 4 and 5 minutes
               for a fully installed pair.
```

```
Do you wish to continue?
```

After pressing **Y** and **<Return>**, you will see the following prompt:

```
Enter card number?
```

Enter the number assigned to the UAMC board to which the desired pair is connected. If the number entered is not a valid selection, you will be prompted again. If the selection is valid, the program will next prompt you:

```
Enter pair number?
```

When you have entered a valid pair number, the readings for the devices on the pair will begin to appear on the screen, as shown in the sample (SCREEN 8-26).

```
Pair Realtime Reading Test for AMUSIM                CPAMS Diagnostics XX.XX.XX
07/24/2010 14:38                                     System Studies Incorporated
-----
  Access #   Type   Counts   Status   Reading
  -----
009-A2-001A   P    1513
009-A2-002A   P    1613
009-A2-003A   P    1713
10.1

Enter card number?
```

SCREEN 8-26: PAIR REALTIME READING TEST

If you want to perform another Pair Realtime Reading Test, enter the card number at the prompt. To return to the 289H Diagnostics menu, just hit **<Return>**.

289 LSS DIAGNOSTICS

The information in this section of the CPAMS Diagnostics documentation describes procedures for performing diagnostic tests on the older, original version of the Loop Surveillance System monitor. The diagnostics menu for this monitor has fewer selections than does the one for the 289H LSS monitor. As you will discover, the procedures for running these Diagnostic Tests are simple and straightforward. In most cases, you simply select the test you would like to perform and the MAP program does the rest. With some of the tests, however, you will need to enter the specific device or board number that you would like to inspect. After contact is established and the testing is completed, results from the testing are output to the computer terminal (or printer) where you can study the outcome.

The 289 LSS Diagnostics Tests

All test procedures begin at the 289 Diagnostics Menu illustrated in SCREEN 8-27. To access this menu, select Option #6 of the MAP Programs Menu (SCREEN 8-2).

```

289 LSS Diagnostics Menu
-----
 1. System Configuration
 2. Calibration Test
 3. Realtime Reading Test
 4. Specific Device Info
 5. Capacitance Test
 6. Ping Relays Test
 7. Cold Reset

Choice?

```

SCREEN 8-27: 289 DIAGNOSTICS MENU

Note: If you would like to step back to the previous menu (for example, if you would like to run tests on a different office), press **<Return>** without selecting a Diagnostics Test. If you do so, the connection to the office will be hung up, and you will be at a prompt where you can select a new office and/or test mode.

SYSTEM CONFIGURATION

Selecting the System Configuration option (by pressing **1** followed by **<Return>**), will display a screen similar to the one illustrated in SCREEN 8-28. This screen displays the current status of the 289 LSS that monitors the office you have selected. By viewing the data displayed on this screen, you can determine what slots are filled, which boards are in the 289 LSS monitor, and if the 289 LSS is terminating calls correctly.

```

System Configuration for Salt Creek                CPAMS Diagnostics XX.XX.XX
01/02/2010 13:37                                System Studies Incorporated
-----

LSS Engine:   289                               Version:      A.00/A.00
Password:    Set                               System Reset: No
Exit State:   Wait ACK2 State                 Exit Status:  Retry Exceeded

Inventory:
Slot  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16
-----
Chassis
 1 | SUB SUB   DED   SUB DED
 2 | DED DED DED DED SUB
 3 |
 4 | SUB SUB SUB
    |
Hit <Return> to return to the 289 LSS Diagnostics menu.

```

SCREEN 8-28: SYSTEM CONFIGURATION FOR 289 LSS

The seven fields displayed on the screen are described below:

—**LSS Engine** field indicates which type of monitor you are connected to, either a 289H or 289.

—**Version #** indicates the Version numbers of the firmware built into the 289 LSS that you are examining. The characters to the left of the slash represent the version of the firmware built into the ROM in the 289. The characters to the right of the slash indicate the patch level installed in the 289. Because the firmware can be patched, the 289 can be updated via PressureMAP. Both firmware and patch versions are labeled with alphabetic characters to the left of the decimal point, and the numeric characters, 1 through 99, to the right of the decimal point.

—**Password** is either Set or Reset. Set indicates that a password is required to enter the 289, while Reset indicates that a password is not required. Every time that PressureMAP calls the 289, it sets the password to the password indicated on the System Information Screen in the PressureMAP Editor. If there is no password on the System Information Screen, Reset will appear in this field.

—**System Reset** Resetting the 289 is the same as rebooting a computer. The 289 has the ability to reset itself under a number of circumstances, or it can be reset on demand from PressureMAP. A special dispatch is generated whenever the 289 is reset. The System Reset field indicates whether the 289 has gone through a reset since the last time the 289 was called.

—**Exit State** indicates the state of the communications protocol when an end of session was detected. The normal reading is "Wait SOH State" but a message other than this is not normally a cause for alarm. This is primarily a tool System Studies personnel use to diagnose a problem.

—**Exit Status** indicates how the last session ended and will usually read "Normal Termination". It is similar to the Exit State field in that it may contain other messages and is primarily intended for System Studies' use. Normal Exit Status are NORMAL TERMINATION, USER ABORT, and HUNGUP.

RETRY EXCEEDED, PREMATURE TERMINATION, RECEIVED DATA, NO RESPONSE, ASYNC PROTOCOL RECEIVED, or DCD LOST may indicate a problem, call System Studies Technical if these types of status indicators persist.

OUT OF SYNC or BAD RESPONSE together with no readings indicate a problem. If any of these messages displays, please call System Studies Technical Support for assistance.

—**Inventory** is displayed in a table that shows what type of cards are loaded within each slot in the 289. Each expansion chassis is shown on a separate line. SUB represents a subscriber card; DED represents a dedicated card; an addressable transducer card may be identified by ADD or AMU. A blank space indicates that no card is present in that slot. UNK is displayed if the card is unrecognized; it indicates that the card is either not seated properly or is possibly defective, or is not supported by the system's version of PressureMAP. An inventory is taken automatically whenever the 289 is reset.

Hitting **<Return>** will take you back to the 289 Diagnostics Menu.

CALIBRATION TEST

Prior to performing either a board scan or a set of realtime readings, PressureMAP performs a Calibration Test on the boards involved. From the results of the Calibration Tests, PressureMAP is

able to adjust the subsequent device readings to compensate for any error in calibration of the device. This is referred to as normalizing the readings. The inclusion of this Calibration Test in 289 Diagnostics allows a user to initiate a Calibration Test and study the results.

To choose the Calibration Test from the 289 Diagnostics menu, press **2** followed by **<Return>**. You will first be prompted for the board number that you would like to test. After typing in a board number followed by **<Return>**, you will be able to examine the report displayed in SCREEN 8-29. (See *Introduction* in this section for an explanation of how boards are numbered.)

Calibration Test for Salt Creek				CPAMS Diagnostics XX.XX.XX
09/28/2010 13:38		System Studies Incorporated		
Resistor	Counts	Volts	Ohms	Discrepancy
Battery	39339	47.4		
Open (H)	28		+++++M	
3.8M (H)	983		3.934M	3.5%
100K (H)	36168		103.7K	3.7%
100K (L)	1313		102.9K	2.9%
10K (L)	10287		10.41K	4.1%
Short (L)	43362		96	
Which board?				

SCREEN 8-29: CALIBRATION TEST

—The **Resistor** field indicates which calibration resistor was being tested.

—**Counts** are the raw counts from the ADC as returned by the 289. This information is useful to System Studies Technical Support personnel.

—**Volts** applies only to the Battery calibration resistor and indicates the voltage of the CO batteries minus 0.7 volts.

—**Ohms** indicates the electrical resistance of each calibration resistor. The value in this field should be very close to the resistance implied in the name. For example, a 3.8 megohm calibration resistor could read 3.937M. A field with all pluses and a "M" for megohms ("++++M") indicates a number whose magnitude is too great to fit in the field.

—**Discrepancy** is the percentage difference between the theoretical resistance and the computed resistance. PressureMAP corrects readings using the calibrated values, resulting in less than a 1% error for a reading. Differences greater than 10% between the theoretical and computed resistance are reasons for concern.

At the bottom of the screen displaying the Calibration Test results you will see a prompt to test another board. If you want to perform another Calibration Test, type in the board number followed by **<Return>**. To return to the 289 Diagnostics Menu, just hit **<Return>**.

REALTIME READING TEST

The Realtime Reading Test is primarily intended to be a tool for servicing the 289. The realtime readings offered through the Specific Device Information function of PressureMAP is the preferred

method of obtaining realtime readings for checking the pressurized cable system. After you select a Realtime Reading Test from the Diagnostics menu by pressing **3** followed by **<Return>**, you will see the message:

```
Calibrating...
```

After a few seconds, you will be asked for the device number that you would like to check:

```
Test which device?
```

You may select a monitoring device by entering either the device number or the corresponding access number. Access numbers are entered with a leading sharp character (eg. "#001A") to distinguish them from device numbers and may be abbreviated. For example, "#1" is interpreted as "001-01" for a 289. It is important to note that the sharp (#) is already allowed as a valid character in user defined device numbers, and continues to be allowed in these numbers. All user input entered with a leading sharp that **exactly** match an existing device number (leading sharp included) are NOT treated as access numbers, but reference the matching device number. For example, if a 289 office has a user defined device number "#11", then a user entry of "#11" selects the device, NOT access number "001-11".

Upon entering a valid device number, or the corresponding access number, you will see the realtime reading for that device repetitively displayed on a screen similar to SCREEN 8-30.

Realtime Reading Test for Salt Creek				CPAMS Diagnostics XX.XX				
09/28/2010 13:38				System Studies Incorporated				
Access #	Type	Counts	Scaled	Ohms	Range	Step	Status	Reading
001-01	F	35578	1045	101672	H	1		9.5
001-01	F	35580	1045	101672	H	1		9.5
001-01	F	35579	1045	101672	H	1		9.5

SCREEN 8-30: REALTIME READING TEST DISPLAY

—**Access #** While the user is asked to input the PressureMAP device number or the corresponding access number to do a realtime reading on a specific device, only the access number of that device is displayed. A list of device numbers with the corresponding access numbers can be reviewed in the PressureMAP Device Log.

—**Type** represents the second letter of the device type (for example, "F" for a flow device).

—**Counts** are the raw ADC counts returned by the 289. This information is useful to System Studies Technical Support personnel.

—**Scaled** shows the scaled counts that have been adjusted for any discrepancy based on the calibration. This information is also useful to the Technical Support personnel.

—**Ohms** indicates the resistance calculated from the scaled counts.

—**Range** indicates which range of the measurement circuit was used for the measurement ("H" = high range, "L" = low range). The high range is used for measurements above 100K ohms.

—**Steps** represents the approximate step number of a 20 step transducer. A reading of 100k ohms is step 1 and 3.8M ohms is step 20. A reading below step 1 displays as 0 and a reading above step 20 displays as ++.

—**Status** indicates the status of the pair. NOISE could be caused by AC voltage on the pair, VOLT could be stray voltage on the pair external to the CO, and BUSY indicates that a subscriber pair was in use when the reading was taken.

—**Reading** represents the unbiased reading for that type of device. (The actual reading might be biased by an offset in the PressureMAP Database—e.g., an SP device.)

Realtime readings will continue to be posted to the screen until **<Esc>** is pressed, at which time you will be prompted for another device number. Enter another device number followed by **<Return>** to perform another Realtime Reading Test. Hit **<Return>** to return to the 289 Diagnostics Menu.

SPECIFIC DEVICE INFO

The fourth option of the menu, Specific Device Info, is provided so device information can be viewed without having to leave the 289 Diagnostics Menu. The screen of information that is displayed is essentially the same screen displayed by the PressureMAP option Specific Device Information. This screen, shown below, is described in detail in Section 2 of the Operations manual.

```

Specific Device Information for Salt Creek          CPAMS Diagnostics XX.XX.XX
09/28/2010  13:38                               System Studies Incorporated
-----
Device #: 001A      Access #: 001-01      Type: UP
Address:  MH-20 SOQUEL                      Loc: 15  Pipe: BA
TD Type:  RA
Sheath(s): 02

Cable:      02      Prim Pair: 704      Sec Pair:      Sort Key:
Plat #:    UG-7      Stickmap: 5
Phone:
Latitude:      Longitude

Office 1 Loc: 14      Distance 1 (kft): 2.9      Field 1 Loc: 16
Office 2 Loc:      Distance 2 (kft):      Field 2 Loc:

Remarks:
Readings      Curr Last  Tdy  -1  -2  -3  -4  -5  -6  Wk-1 Wk-2 Wk-3 Wk-4
-----
VOLT VOLT    7.0  7.0  7.0  7.0  7.0

```

SCREEN 8-31: SPECIFIC DEVICE INFORMATION DISPLAY

CAPACITANCE TEST

If you choose Realtime Capacitance Test from the 289 Diagnostics Menu by pressing **5** and **<Return>**, you will first be asked for the device number to test. After entering a valid device number, or the corresponding access number, a screen similar to SCREEN 8-32 will be displayed. (Even though you may enter either the device number or access number, only the access number will be displayed on the screen.) The display for both sides of the pair will include the raw capacitance counts, the

capacitance (in picofarads), the distance of an open from the Central Office in thousands of feet (kilofeet), and a location indication.

Capacitance Test for Salt Creek					CPAMS Diagnostics XX.XX.XX			
09/28/2010 13:39					System Studies Incorporated			
-----Tip Side-----					-----Ring Side-----			
Access #	Counts	p-farads	K-feet	Loc.	Counts	p-farads	K-feet	Loc.
001-01	48365	139551	1.837	OUT	80932	233520	3.537	OUT
001-01	46829	135119	1.866	OUT	80813	233177	3.537	OUT
001-01	47046	135746	1.843	OUT	80594	232345	3.537	OUT

SCREEN 8-32: CAPACITANCE TEST DISPLAY

This test is used to determine how far the 289 is located from an OPEN on a pair. Although only a very rough estimate is given, it is useful to determine if the OPEN is within the CO or outside. Readings are displayed continuously until an **<Esc>** is entered. The screen that is displayed shows the status of the following fields.

—**Counts** is the raw response from the 289's capacitance counter. This information is useful to System Studies Technical Support personnel.

—**p-Farads** is the capacitance in picofarads, computed from the raw counts. (One picofarad is .000001 microfarads.)

—**K-feet** is the rough computed distance of an open from the 289 monitor in thousands of feet. It is important that you NOT use this distance for fault locating because it is only a rough estimate.

—**Location** indicates whether the open is inside (IN) or outside (OUT) the CO.

The test results will continue to be listed until you press **<Esc>**. At that point you will be prompted for another device number. Either enter the number of the next device that you would like to test, or press **<Return>** to go back to the 289 Diagnostics Menu.

PING RELAYS TEST

The Ping Relays Test is a simple test to determine whether all of the line selection relays on a given board are operating. The test requires that someone is listening near the 289 when it is performed. When the test is run, the relays on the chosen card "ping" with a distinctive rhythm. This pinging of the relays is performed repetitively, in groups of five, with a pause of approximately five seconds between repetitions. If the listener detects a gap in the sequence of pings, he can calculate which relay is not pinging. There are two reasons why a relay would not ping during the test. One is that the relay is faulty, the other is that the line is busy. While busy lines are obviously not a problem when testing a dedicated board, they could confuse a test on a subscriber board. For that reason, this test provides a display that indicates busy lines.

When running this test on a dedicated board, the output displayed is the word "ping" for each time the board is pinged. For subscriber boards, the output displayed is a sequence of ones and zeros - one digit for each line. The first digit displayed corresponds to the first line on the selected card. A value of 0 indicates the line was free whereas a value of 1 indicates that the line was found to be busy. After removing the relays that were found to be busy during the test from the list of relays found to be silent, the remaining ones are determined to be faulty.

To run the Ping Relays Test, select it from the 289 Diagnostics Menu by pressing **6 <Return>**, you will be asked for a board number to test. Upon entering a valid board number (see the introduction to this section for a description of how boards are numbered), you will see a display similar to SCREEN 8-33. In this example, all of the lines were found to be on hook except line 9 which was found to be busy all four times that the test was run.

```

Ping Relays Test for Salt Creek                CPAMS Diagnostics XX.XX.XX
09/28/2010  13:42                            System Studies Incorporated
-----
Pairs 1-25  00000 00010 00000 00000 00000
Pairs 1-25  00000 00010 00000 00000 00000
Pairs 1-25  00000 00010 00000 00000 00000
Pairs 1-25  00000 00010 00000 00000 00000

```

SCREEN 8-33: PING RELAYS TEST DISPLAY

The test will continue until you press **<Esc>**, after which you will be prompted for the number of another board to reset. You may then enter the number of another board, or hit **<Return>** to go back to the 289 Diagnostics Menu.

COLD RESET

Executing a Cold Reset wipes out patches and any knowledge of a device's status. In addition, the password is reset so that none is required.

After choosing Cold Reset by pressing **7** followed by **<Return>**, you will see the message:

```
Do you want to cold reset the 289 LSS? Y[es], N[o].
```

This message acts as a confirmation to make sure that a Cold Reset is not initiated by mistake. Pressing **Y** followed by **<Return>** will implement the Cold Reset. You will then see the message:

```
Cold reset accepted. It will not occur until we hang up.
```

```
Hit <Return> to return to the 289 LSS Diagnostic Menu.
```

The actual cold resetting process does not take place until after you hang up, which is accomplished by hitting **<Return>** to return to the 289 LSS Diagnostics Menu, and then hitting **<Return>** again.

PRESSUREMAP TABLES

Error Code	Condition
00	No Error Detected
01	Parity Error in Command Received at Terminal
02	Relay Operate Error
04	Relay Hold Error - Late Release of Relay
05	Combination of Errors 01 & 04
06	Relay Operate Error with a Locked Relay

TABLE 8-3: DEVICE READING ERROR CODES

STEP	PTD		FTD			ELECTRICAL RESISTANCE (kilohms)	Voltmeter Reading 120V Scale
	0-9.5 PSI	0-10 SCFH	0-20 SCFH	0-50 SCFH	0-100 SCFH		
00	0.0	9.5	19.0	47.5	95.0	100	50.0
01	0.5	9.0	18.0	45.0	90.0	110	47.5
02	1.0	8.5	17.0	42.5	85.0	122	45.0
03	1.5	8.0	16.0	40.0	80.0	135	42.5
04	2.0	7.5	15.0	37.5	75.0	150	40.0
05	2.5	7.0	14.0	35.0	70.0	166	37.5
06	3.0	6.5	13.0	32.5	65.0	186	35.0
07	3.5	6.0	12.0	30.0	60.0	208	32.5
08	4.0	5.5	11.0	27.5	55.0	323	30.0
09	4.5	5.0	10.0	25.0	50.0	265	27.5
10	5.0	4.5	9.0	22.5	45.0	301	25.0
11	5.5	4.0	8.0	20.0	40.0	344	22.5
12	6.0	3.5	7.0	17.5	35.0	400	20.0
13	6.5	3.0	6.0	15.0	30.0	468	17.5
14	7.0	2.5	5.0	12.5	25.0	568	15.0
15	7.5	2.0	4.0	10.0	20.0	698	12.5
16	8.0	1.5	3.0	7.5	15.0	898	10.0
17	8.5	1.0	2.0	5.0	10.0	1200	7.5
18	9.0	0.5	1.0	2.5	5.0	1820	5.0
19	9.5	0.0	0.0	0.0	0.0	3820	2.5
20	Open Circuit Code						
21	Not Used						
22	TD (Tone Detect Error - Satellite Relays Only)						
23	TD (Tone Detect Error - Satellite Relays Only)						
24	TD (Tone Detect Error - Satellite Relays Only)						
25	TD (Tone Detect Error - Satellite Relays Only)						
26	TD (Tone Detect Error - Satellite Relays Only)						
27	Not Used						
28	BUSY LINE CODE						
29	Not Used						
30	Not Used						
31	SHORT or LEAKY LINE CODE						

TABLE 8-4: CPAMS UNIT TABLE

Pressure in PSI	Current in mA	Pressure in PSI	Current in mA
0	3.60-4.00	16	12.53
1	4.53	17	13.07
2	5.07	18	13.60
3	5.60	19	14.13
4	6.13	20	14.67
5	6.67	21	15.20
6	7.20	22	15.73
7	7.73	23	16.27
8	8.27	24	16.80
9	8.80	25	17.33
10	9.33	26	17.87
11	9.87	27	18.40
12	10.40	28	18.93
13	10.93	29	19.47
14	11.47	30	19.99
15	12.00		

TABLE 8-5: PRESSURE TRANSDUCER CONVERSION CHART (CPA/15)

Pressure in PSI	Current in mA	Pressure in PSI	Current in mA
0	6.00	16	13.46
1	6.47	17	13.92
2	6.93	18	14.39
3	7.40	19	14.85
4	7.86	20	15.32
5	8.33	21	15.79
6	8.80	22	16.25
7	9.26	23	16.72
8	9.73	24	17.18
9	10.19	25	17.65
10	10.66	26	18.12
11	11.13	27	18.58
12	11.59	28	19.05
13	12.06	29	19.51
14	12.52	30	19.98
15	12.99	15	12.99

TABLE 8-6: PRESSURE TRANSDUCER CONVERSION CHART (CPA/30)

	Flow in SCFH				Current in mA
	0-10	0-20	0-50	0-100	
1	2	5	10	4.04	
2	4	10	20	4.18	
3	6	15	30	4.40	
4	8	20	40	4.71	
5	10	25	50	5.11	
6	12	30	60	5.57	
7	14	35	70	6.17	
8	16	40	80	6.84	
9	18	45	90	7.59	
10	20	50	100	8.43	
11	22	55	110	9.36	
12	24	60	120	10.38	
13	26	65	130	11.49	
14	28	70	140	12.69	
15	30	75	150	13.97	
16	32	80	160	15.35	
17	34	85	170	16.81	
18	36	90	180	18.36	
19	38	95	190	19.99	

TABLE 8-7: FLOW TRANSDUCER CONVERSION CHART

DIAGNOSTIC INTERFACE FOR OTHER CPAMS

This portion of the CPAMS Diagnostics program was developed to provide access via the PressureMAP modem to the CPAMS unit. It acts as an automatic dialer to the monitor, allowing you to call the CPAMS unit without leaving the PressureMAP program. Once a connection is made, interaction with the CPAMS unit returns to you, allowing manual scans and maintenance operations, or CPAMS data entry to be done.

Procedures for the CPAMS Diagnostic Interface

Before you can begin the call to the CPAMS unit, you must first bring the CPAMS Diagnostics Menu to your screen. The following procedure explains how to do that. The Menu Level assigned to your User Account will determine where you start in this procedure. If you entered at the System Options Menu, begin this procedure at Step 1. If you began at the MAP Programs Menu, go to Step 2. If you have trouble gaining access to the MAP System, please contact your System Administrator or call the System Studies Technical Support Department.

```
System Options                                MAP Series XX.XX.XX
09/28/2010 08:43                            System Studies Incorporated
-----
System Options
-----
1. Select MAP Program
2. Select MAP Data Entry
3. System Administration
4. Language Selection
Q. Quit

Choice?
```

SCREEN 8-34: SYSTEM OPTIONS MENU

Procedure:

1. From the System Options Menu, press **1** followed by **<Return>**. After pressing 1 at the System Options Menu, or if you logged in at the MAP Programs Menu, you should see the screen illustrated in SCREEN 8-35. If you wish to save the CPAMS screens to a printer file, you need to type **<Ctrl P>** at this step.

```
MAP Programs                                MAP Series XX.XX.XX
09/28/2010 12:42                            System Studies Incorporated
-----
MAP Programs
-----
1. PressureMAP
2. ReportMAP
3. CableMAP
4. AlarmMAP
5. DryerMAP
6. CPAMS Diagnostics
7. User Initiated Operations
Q. Quit

Choice?
```

SCREEN 8-35: MAP PROGRAMS MENU

Note: If the Menu Level assigned to your User Account brought you into the PressureMAP system at a level other than System Options or MAP Programs, you cannot get into the Diagnostics Program. See the definitions of menu levels and quicklogins in the introduction to Section 5, User Management, in the System Administration Manual, or contact your System Administrator.

2. From the MAP Programs Menu, select option 6, CPAMS Diagnostics. Enter **6** and press **<Return>**. You will then be prompted for the name of the office with which you want to work:

```
CPAMS Diagnostics for which office?
```


Selecting an office is done by entering either the office name or office number at the prompt. To enter an office name, you may either type the full name of the office, or you may enter an office name abbreviation to indicate the office you have chosen.

At the office name prompt, you may obtain a complete listing of the offices entered into the PressureMAP system. By typing a question mark (?) followed by **<Return>**, you will be presented with a listing in selection spreadsheet format. Move to the office you wish to monitor, and press **<Return>** to select it.

If you type a **<Return>** without entering an office name, you will be taken back to the MAP Programs Menu where you can choose to run a different MAP program or re-access CPAMS Diagnostics.

After inputting an office name or number (in this example, Salt Creek), you will see the message:

1. Salt Creek

Calling Salt Creek (1200 baud). Hit <Esc> to quit.

If the office you chose does not answer, you will see the message:

Office does not answer; waiting...

Then after about 20 seconds, you will see:

Attempting to call again...

When the connection is made, you will see a message similar to the following:

CONNECT 1200.

Connecting thru /dev/ttyA3, speed 1200
The escape character is CTRL-\ (28).
Type the escape character followed by C to get back,
or followed by ? to see other options.

At this point, normal interaction with the CPAMS unit begins. Enter the monitor's "attention" key, and when prompted, the keycode or password.

3. To finish the session, enter the CPAMS "exit" keyword. After a slight pause, you will see

```
[Back at Local System]
CPAMS Diagnostics for which office?
```

At this point, you may enter another office name or number, or to exit CPAMS Diagnostics, press **<Return>**.

Using CPAMS Diagnostics to Access a Teleducer 50

The Teleducer 50 monitor allows communications with PressureMAP via either a dial-up modem or a network connection. The interface to CPAMS Diagnostics for a Teleducer 50 office using a dial-up connection is the same as the interface to the Chatlos L3. Follow the instructions above to reach the MAP Programs Menu, select CPAMS Diagnostics, and choose the desired office.

For a network connection, the CPAMS Diagnostics executable initiates a telnet session which is controlled by an Expect script. This script contains the handshake sequence and level 2 PressureMAP password necessary to access the monitor. When you select a Teleducer 50 office name or number at the CPAMS Diagnostics for which office? prompt, you will see:

```
You are entering into an interactive telnet session with the
CPAMS monitor...
```

```
Use CTRL-C to exit.
```

```
Connecting to XX.XXX.XXX.XX port 5555
```

When you connect with the Teleducer 50, you will be placed at the command line from which you can initiate a device scan, realtime reading, or other type of command. For information on the type of commands and accompanying reports that are available from the Teleducer 50 monitor, refer to the manufacturer's documentation.

Please note that the Teleducer is supported by PressureMAP only in the PMAP mode, which is the mode obtained when the Keyword is a PressureMAP level password. This mode supports an interface which resembles a Chatlos L3. For example, an Examine/Full command in PMAP mode will produce content similar to what is shown in SCREEN 8-50 below.

```
-----
```

Sensor	TP	Circt	PR	Alrm	Esc	Day2	Day1	Curr	Status	Address
ST-0001	Z	NULL	1	N/A	N/A	95.0	95.0	95.0		
ST-0002	U	NULL	1	N/A	N/A	0.5	0.5	0.5		
ST-0003	U	NULL	1	N/A	N/A	1.0	1.0	1.0		
ST-0004	U	NULL	1	N/A	N/A	1.5	1.5	1.5		
ST-0005	U	NULL	1	N/A	N/A	2.0	2.0	2.0		
ST-0006	U	NULL	1	N/A	N/A	2.0	2.0	2.0		
ST-0007	U	NULL	1	N/A	N/A	2.5	2.5	2.5		
ST-0008	U	NULL	1	N/A	N/A	2.0	2.0	2.0		

SCREEN 8-34: TELEDUCER 50 EXAMINE/FULL COMMAND OUTPUT (PMAP MODE)

When you have completed your interactive session with the Teleducer 50 and typed "BYE" at the command line, enter **Control-C** to exit.