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# CPAMS DIAGNOSTICS

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## ***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 WECO E2A Remote Terminals. 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.

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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

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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                                MAP Series XX.XX.XX
05/21/2005 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 8-1: SYSTEM OPTIONS MENU

- 1) From the System Options Menu, press **I** 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                                MAP Series XX.XX.XX
05/21/2005 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 8-2: 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.

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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 8-26 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.

However, when running diagnostics on the LSS, 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 Menus used in this section will not show this option.

Selecting the Access Number Translation option by pressing **7** (from the 289 menu) or **II** (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
06/28/2005 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 **I** 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
10/23/2005 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.

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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		
05/21/2005 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

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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 01/02/2005 13:38				CPAMS Diagnostics XX.XX.XX 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
001-01	F	35579	1045	101672	H	1		9.5
001-01	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 01/14/2005 13:38				CPAMS Diagnostics XX.XX.XX 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 01/02/2005 13:38				CPAMS Diagnostics XX.XX.XX System Studies Incorporated	
Access #	Type	Counts	Milli-Amps	Status	Reading
001-05	P	12787	14.99		20.0
001-05	P	12787	14.99		20.0
001-05	P	12787	14.99		20.0
001-05	P	12787	14.99		20.0

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

Realtime Reading Test for Cedar City				CPAMS Diagnostics XX.XX.XX		
01/14/2005 13:38				System Studies Incorporated		
Access #	Type	Counts	Milli-Amps	Status	Absolute	Reading
001-28	P	7110	9.04		6.6	9.4
001-28	P	7114	9.04		6.6	9.4
001-28	P	7114	9.04		6.6	9.4
001-28	P	7109	9.03		6.5	9.3

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		
01/14/2005 13:38				System Studies Incorporated		
Access #	Type	Counts	Milli-Amps	Status	Reading	
001-11	B	3674	4.67		24.2	
001-11	B	3675	4.67		24.2	
001-11	B	3665	4.66		24.1	
001-11	B	3670	4.66		24.2	

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

Realtime Reading Test for Cedar City				CPAMS Diagnostics XX.XX.XX		
01/14/2005 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

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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
05/21/2005 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

## OPERATIONS

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—**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 the Operations 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			
05/21/2005 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):									
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	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.

Capacitance Test for <OFFICE NAME>					CPAMS Diagnostics XX.XX.XX				
01/02/2005 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 8-16: 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

## OPERATIONS

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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
01/02/2005 13:42                             System Studies Incorporated
-----
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	
03/04/2005 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.

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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
01/02/2005 13:42		System Studies Incorporated
-----		
Access #	VAC Tip/Gnd	VAC 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.

Realtime DC Test for Salt Creek		CPAMS Diagnostics XX.XX.XX
01/02/2005 13:42		System Studies Incorporated
-----		
Access #	VDC Tip/Gnd	VDC Ring/Gnd
-----	-----	-----
001-01	0.0031	0.0000
Test which device?		

SCREEN 8-20: DC TEST DISPLAY

Readings in the two VDC columns should be under 1.0 volt, as shown above.

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

**Test which device?**

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				
05/14/2006 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 System Studies Incorporated			
01/02/2005 10:33					
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 **II** 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 **PMAP ID** data field. The program responds with the following:

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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	
01/02/2005 13:37				System Studies Incorporated	
Device #	Access #	Type	TD Type	Scan Rdg	Alert Level
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 "locator" 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 locator 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 locator 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, locator 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 **I3** (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
03/11/2005  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>
03/11/2005 11:24
-----
CPAMS Diagnostics XX.XX.XX
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 identical to SCREEN 8-25. First you must select the desired frequency and 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 locator 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 options 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?
```

## OPERATIONS

---

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
07/24/2005 14:38				System Studies Incorporated
Access #	Type	Counts	Status	Reading
009-A2-001A	P	1513		7.2
009-A2-002A	P	1613		8.7
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>**.

### *The 289 LSS Diagnostics Tests*

If you are using the original 289 LSS monitor (not the 289H LSS), the diagnostics menu offers fewer selections. Nonetheless, the procedures for running the Diagnostic Tests are easy. 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. All test procedures begin at the 289 Diagnostics Menu illustrated in SCREEN 8-27.

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
01/02/2005 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 |                                     DED DED DED
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.

## OPERATIONS

---

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
09/28/2005 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				
09/28/2003 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									
09/28/2005 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			
09/28/2005 13:39					System Studies Incorporated			
-----								
Access #	-----Tip Side-----				-----Ring Side-----			
	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.

## OPERATIONS

---

—*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
09/28/2005  13:42                            System Studies Incorporated
-----
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.

***E2A DIAGNOSTICS***

E2A Diagnostics is a software program designed to automate and simplify the testing of WECO Cable Pressure Monitoring Systems E2A Remote Terminals. Prior to the introduction of E2A Diagnostics, E2A Remotes were tested using the laborious CPMS Acceptance Tests. Now, with the use of this software package, testing E2A Remotes is as easy as making a selection from a menu.

The tests included with this package completely replace the CPMS Acceptance Tests when operated in either the "Normal Mode" or the "Trouble Diagnostics Mode." E2A Diagnostics have been designed to facilitate the task of running and interpreting the output from the older diagnostic tests. Reports created with E2A Diagnostics are more readable than their CPMS counterparts, and all the tests comply with the standards used in the original CPMS Acceptance Tests.

The following diagnostic tests are provided by E2A Diagnostics as support for the E2A Remote Terminals:

- Continuous polling of a given device
- Complete polling of the Status Relays
- Complete polling of the Loop Resistance Relays
- Complete polling of all Airflow Counters
- Complete polling of the LARP Panels
- Complete polling of all Satellite Relay Panels

In addition to the tests outlined above, E2A Diagnostics also provides a complete set of Calibration and Interface Tests:

- a) LARP resistance calibration test
- b) Loop resistance calibration test
- c) LARP open circuit test
- d) LARP relay operate error test
- e) LARP parity error test
- f) Command Word Test

# OPERATIONS

---

All of the original CPMS Calibration Tests are supported by this software package, and correspond to the calibration tests labeled "a" through "e" as shown above. In addition, the Command Word Test (test "f" above) allows you to conduct diagnostic testing using binary word commands, providing a low level access to the E2A Remote Terminal.

TABLE 8-3 compares the original CPMS Acceptance Test names against the corresponding E2A Diagnostic Test titles.

<u>CPMS Acceptance Tests</u>	<u>E2A Diagnostic Tests</u>
1. "Display Register" Test	Device Test
2. /I Initial Test	Status Relay Test
3. /A Alarm Test	Loop Resistance Relay Test
4. /F Airflow Test	Airflow Counter Test
5. /0 to /9 Access Panel Test	Line Access Relay Panel Test
6. 40 to 70 Satellite Test	Satellite Relay Test
7. Calibration Tests:	
a) CAL1	LARP Calibration Test
b) CAL2	Loop Resistance Calibration Test
c) CAL3	LARP Open Circuit Test
d) CAL4	Relay Operate Error Test
e) CAL5	LARP Parity Error Test
f) "Display Register" Tests	Command Word Test

TABLE 8-3: CPMS ACCEPTANCE TESTS

The documentation provided in this manual should be all that you need to run and interpret the E2A Diagnostic tests. However, for specific details concerning the original CPMS Acceptance Tests, please refer to BSP 637-600-401.

Several tables of information are referred to throughout this E2A Diagnostics documentation. For convenience, two of these tables, the Device Reading Error Codes and the CPAMS Unit Table, are provided in the PressureMAP Tables sub-section.

## ***Acceptance Mode versus Diagnostics Mode***

Diagnostic Tests included in this package can be operated in either one of two modes—Acceptance Mode or Diagnostic Mode. The Acceptance Mode is used primarily for testing new E2A terminals as they are being installed. In contrast, tests run on systems that are already in place will be run in the Diagnostic Mode. The Diagnostic Mode is designed to test and monitor the performance of E2A units that are already operational.

### ***The Acceptance Mode***

In the Acceptance Mode, tests are run against a predetermined set of test values. The Acceptance Mode in E2A Diagnostics replaces the Normal Mode of the CPMS Acceptance Tests. Prior to using the Acceptance Mode, the standard Test Termination Set must be installed on the E2A Remote Terminal.

When the tests are run in Acceptance Mode, values polled from the Status Indicator Relays, the Loop Resistance Relays, the LARP Panels, and the Satellite Relays are compared against a known set of test values, contained within the Test Termination Set. Any variations between the preset test values and the

values returned from the E2A Remote Terminal will be noted in the output report. These errors flagged in the output indicate a flaw in the system, and the proper action should be taken to correct the problem.

The Acceptance Mode also provides a thorough and complex set of tests to check Airflow Counters. With the Test Termination Set installed at the E2A Remote Terminal, the counters can be stepped through four discrete tests: checking for single counts, multiple counts, over range counts, and a counter reset.

### *The Diagnostics Mode*

The second test mode available is the Diagnostics Mode. In the Diagnostics Mode, relays are polled, but comparisons are not made against preset values. The Diagnostics Mode replaces the Test Diagnostic Mode of The CPMS Acceptance Tests. Since this is the mode that is used most often, the Diagnostics Mode is the default test mode chosen by E2A Diagnostics.

### *Procedures for the E2A Diagnostic Tests*

Before you can begin working with the E2A Diagnostics programs, you must first bring the E2A 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.

#### *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 8-34.

```
System Options                                MAP Series XX.XX.XX
09/28/2005 08:43                             System Studies Incorporated
-----
System Options
-----
 1. Select MAP Program
 2. Select MAP Data Entry
 3. System Administration
 Q. Quit

Choice?
```

SCREEN 8-34: SYSTEM OPTIONS MENU

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.

- 2) From the Map Programs Menu, select CPAMS Diagnostics. Press **6** followed by **<Return>**.

```
MAP Programs                                MAP Series XX.XX.XX
09/28/2005 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

- 3) You will next be prompted for an office name to test:

**CPAMS Diagnostics for which office?**

**Note:** Before you choose the diagnostic test to run, you have two decisions to make. You have the option of selecting a test mode or accepting the default mode. And you must select the office that you want to inspect.

With E2A Diagnostics, you do not actually need to specify a test mode in order to run the Diagnostic Tests. The tests, by default, will run in the Diagnostic Mode. Because of this, you may simply enter an office name at the prompt to begin the testing. However, if you would like to use the Acceptance Mode, you must specifically indicate this before you choose an office.

At the office name prompt, choose the test mode that you would like to use.

In order to run tests in the Acceptance Mode, enter the keyword ACCEPT (followed by a comma), before entering an office name. Entering the keyword ACCEPT indicates that you would like to use the Acceptance Mode for testing, and all results during the testing will be compared against the preset values supplied by the Test Termination Set.

While E2A Diagnostics uses the Diagnostics Mode by default, you may also manually choose to run the tests in this mode. To do so, enter the keyword DIAGNOSE (followed by a comma), before you enter an office name. This is optional, however, because if no test mode is specified, the tests will automatically be run in the Diagnostics Mode.

After you have decided on a test mode to use, you may then select an office to study.

- 4) Select the office you would like to monitor.

This is done by entering either the office name or office number directly 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. WARSAW," then WA, WAR, WARS, and WARSA would all be legitimate office name abbreviations. As well, if the system also had the offices: "2. WALLINGFORD" and "3. WASHINGTON," then WAR 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 1.

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.

- 5) After specifying a test mode and office, press <Return> to complete your selection.

For example, if you would like to study the office "LOAK14" in the Acceptance Mode, you may enter the following selection at the prompt:

```
CPAMS Diagnostics for which office? accept, lo
```

**Note:** 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 MAP Diagnostics.

Once you have chosen an office and test mode, PressureMAP will place a call to that office. You will see the following message:

```
Calling (OFFICE NAME) (XXXX Baud). Hit <Esc> to Quit.
```

If the call goes through, you will be brought to the E2A Diagnostics Master Menu (also known as the E2A Remote Terminal Diagnostics Menu), where you can choose a diagnostics test to perform. This menu is shown in SCREEN 8-36.

```
CPAMS Diagnostics for which office? 7
7. LOAK14
-----
E2A Remote Terminal Diagnostics Menu
-----
1. Device Test
2. Status Relay Test
3. Loop Resistance Relay Test
4. Airflow Counter Test
5. Line Access Relay Panel (LARP) Test
6. Satellite Relay Test
7. Calibration and Interface Tests

Choice?
```

SCREEN 8-36: E2A DIAGNOSTICS MENU

- 6) Choose a test to perform by entering a number between 1 and 7. Press **<Return>** to complete your selection. Once you have selected a test to run, a test screen will appear.

Refer to the following sub-sections on diagnostic testing for information and procedures on each test.

**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, you will be brought back to the office name prompt where you can select a new office and/or test mode.

### ***The Diagnostic Tests***

The following sections detail each Diagnostic Test, showing how the test is to be conducted and how the output is interpreted.

#### ***The Single Device Test***

When you select Device Test from the E2A Diagnostics Master Menu, you will be prompted for the Device Number that you would like to inspect:

**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 "#001A" for an E2A monitor.

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 an E2A office has a user defined device number "#11", then a user entry of "#11" selects the device, NOT access number "011A".

After a valid Device Number, or the corresponding access number has been entered, the device will begin to be polled. Each time the device is polled, a line of output will be written to the terminal, until **<Esc>** is pressed.

It is important to note that the actual Diagnostic Test run through the Single Device Test depends upon the type of device which you have chosen to monitor. The Single Device Test will choose the appropriate test to conduct depending on the device type chosen.

#### **Procedure:**

- 1) At the device prompt, enter a Device Number followed by a **<Return>**.

At the prompt, you must enter a valid Device Number which you would like to test. When entering a Device Number, you must be sure that the number entered corresponds to an actual device supported by the system. For a complete list of available devices, you may run a Device History Report from the PressureMAP program.

**Note:** Pressing <*Return*> without choosing a Device Number will return you to the E2A Diagnostics Master Menu. From here, you can choose to run a different Diagnostics Test.

- 2) Press <*Esc*> when you are finished polling the device.

Once you have selected a device to test, E2A Diagnostics will continuously poll the device chosen. Each time the device is polled, a line of output will be displayed, showing the results of the test. The device will continue to be polled (and the test results printed out) until you press <*Esc*> to terminate the testing.

### ***Interpreting the Output***

As mentioned above, the particular Diagnostics Test run by the Single Device Test depends upon the device type that you have chosen to inspect. Because of this, the output from the testing will vary depending upon the device chosen.

Each time a device is polled with the Single Device Test, a line is output showing the results from the test. The output is written in the format shown below:

```
TD-001A  UP  8.5  [001  17 18 (00 0)]
```

The first column of the output displays the Device Number that is being tested; in this case, it's device TD-001A.

The second column shows the PressureMAP Device Type. In the example above, the type is UP, or an Underground Cable Pressure Transducer. Devices can be any type shown in the PressureMAP Device Type Coding Table in the Preface of this Manual.

The third column in the output shows the current value that the device is reading. Units returned can be either in Pounds per Square Inch (PSI) for pressure reading devices or Standard Cubic Feet per Hour (SCFH) for devices reading flow rates.

The raw data from the testing is displayed following the first three columns of information. The raw data is enclosed in square brackets and will be formatted in accordance with the type of device being polled. For more information regarding the raw data returned, please refer to the explanation later in this section regarding the particular test being run (again, the test run depends upon the type of device chosen to be inspected).



03 000000000 (00 O)

In this test, the first column indicates the Status Relay Number polled. All 16 relay numbers will be polled, returning values from 00 to 15.

The second column indicates the readings returned for each of the ten contactors associated with each relay. The output starts with contactor 0 and ends with contactor 9. If a zero (0) is returned in one of these fields, the corresponding contactor is NOT operated and has an OK status. A reading of one (1) indicates that the corresponding contactor is operated and that it is in an alarm state.

Notice that there is a direct relationship between an Access Number and a Status Relay Number/Contactor Number Pair. An Access Number is composed of three digits; the first two digits are the Relay Number while the third digit is the Contactor Number being referenced. Relay Numbers range from 0 to 15 in value and Contactor Numbers take on values from 0 to 9.

The third column in the output is enclosed in parentheses. In this column, two sets of information are returned. The first set indicates the error code associated with the reading made. A double zero (00) in this position indicates that the reading did not have errors. The second set of information returned is either an E or an O, indicating an Even or Odd parity for the reading. For a complete list of possible error codes, please refer to TABLE 8-4, Device Reading Error Codes, found at the end of this section.

When the Status Relay Test is run in the Acceptance Mode, a reading which does not match the corresponding value in the test termination set will be marked with an asterisk in the output. In addition to this, a message will be written at the bottom of the report listing the relay number in error, the current reading, and the value that the reading should have been.

Example Acceptance Mode Error Message:

03 0000000010 (00 O) \* should have read 03 0000000000 (00 O)

### ***Loop Resistance Relay Test***

When you choose to conduct the Loop Resistance Relay Test, the testing will begin automatically. When the testing is completed, the results are output to the display terminal. All 160 relays will be polled in this test, so be prepared, the testing may take a few minutes.

### ***Interpreting the Output***

The output returned from the Loop Resistance Relay Test is in the form of:

122 0050 (00 O)

The three columns of information show the relay number tested, the loop resistance of that relay (in ohms), and information about the reading itself (see REPORT 8-1).

The first column of information indicates the relay number polled. The numbers range in value from 000 to 159. Access Numbers for these devices are 3 digit numbers. The number specifies both the relay number and the contactor polled.

The second column of information is the value returned from the resistance test, read in ohms.

The third column of information is enclosed in parentheses. In this column, two sets of information are returned. The first set indicates if an error was associated with the reading made. A double zero (00) in

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this position indicates that the reading did not have errors. The second set of information returned is either an E or an O, indicating the parity for the reading of either Even or Odd. For more information on the possible error codes that can be returned, please refer to TABLE 8-4, Device Reading Error Codes.

If this test is run in the Acceptance Mode, a reading which does not correspond with the value that is set by the test termination set will be marked with an asterisk in the output. In addition to this, a message will be given at the bottom of the report indicating the relay number in error, the current reading, and the value that the reading should have been.

Example Acceptance Mode Error Message:

045 0300 (00 O) should have read 045 0500 (00 O)

Loop Resistance Relay Test for LOAK14				CPAMS Diagnostics XX.XX.XX							
09/28/2005 19:11				System Studies Incorporated							
-----											
000	3150	(00 O)	040	0000	(00 O)	080	0000	(00 O)	120	0000	(00 O)
001	0000	(00 O)	041	0000	(00 O)	081	0000	(00 O)	121	0000	(00 O)
002	3925	(00 O)	042	0000	(00 O)	082	0000	(00 O)	122	0000	(00 O)
003	0000	(00 O)	043	0000	(00 O)	083	0000	(00 O)	123	0000	(00 O)
004	0000	(00 O)	044	0000	(00 O)	084	0000	(00 O)	124	0000	(00 O)
005	0000	(00 O)	045	0000	(00 O)	085	0000	(00 O)	125	0000	(00 O)
006	0000	(00 O)	046	0000	(00 O)	086	0000	(00 O)	126	0000	(00 O)
007	0000	(00 O)	047	0000	(00 O)	087	0000	(00 O)	127	0000	(00 O)
008	0000	(00 O)	048	0000	(00 O)	088	0000	(00 O)	128	0000	(00 O)
009	0000	(00 O)	049	0000	(00 O)	089	0000	(00 O)	129	0025	(00 O)
010	0000	(00 O)	050	0000	(00 O)	090	0000	(00 O)	130	0000	(00 O)
011	0000	(00 O)	051	0000	(00 O)	091	0000	(00 O)	131	0000	(00 O)
012	0000	(00 O)	052	0000	(00 O)	092	0000	(00 O)	132	0000	(00 O)
013	0000	(00 O)	053	0000	(00 O)	093	0000	(00 O)	133	0000	(00 O)
014	0000	(00 O)	054	0000	(00 O)	094	0000	(00 O)	134	0000	(00 O)
015	0225	(00 O)	055	0000	(00 O)	095	0000	(00 O)	135	0000	(00 O)
016	0025	(00 O)	056	0000	(00 O)	096	0000	(00 O)	136	0000	(00 O)
017	0000	(00 O)	057	0000	(00 O)	097	0000	(00 O)	137	0000	(00 O)
018	0000	(00 O)	058	0000	(00 O)	098	0000	(00 O)	138	0000	(00 O)
019	0000	(00 O)	059	0000	(00 O)	099	0000	(00 O)	139	0000	(00 O)
020	0000	(00 O)	060	0000	(00 O)	100	0000	(00 O)	140	0000	(00 O)
021	0000	(00 O)	061	0000	(00 O)	101	0000	(00 O)	141	0000	(00 O)
022	0025	(00 O)	062	0000	(00 O)	102	0000	(00 O)	142	0000	(00 O)
023	0000	(00 O)	063	0000	(00 O)	103	0000	(00 O)	143	0000	(00 O)
024	0000	(00 O)	064	0000	(00 O)	104	0000	(00 O)	144	0000	(00 O)
025	0000	(00 O)	065	0000	(00 O)	105	0000	(00 O)	145	0000	(00 O)
026	0000	(00 O)	066	0000	(00 O)	106	0000	(00 O)	146	0000	(00 O)
027	0775	(00 O)	067	0000	(00 O)	107	0000	(00 O)	147	0000	(00 O)
028	0000	(00 O)	068	0000	(00 O)	108	0000	(00 O)	148	0000	(00 O)
029	0000	(00 O)	069	0000	(00 O)	109	0000	(00 O)	149	0025	(00 O)
030	0000	(00 O)	070	0000	(00 O)	110	0000	(00 O)	150	0000	(00 O)
031	0000	(00 O)	071	0000	(00 O)	111	0000	(00 O)	151	0000	(00 O)
032	0000	(00 O)	072	0000	(00 O)	112	0000	(00 O)	152	0000	(00 O)
033	0000	(00 O)	073	0000	(00 O)	113	0000	(00 O)	153	0000	(00 O)
034	0000	(00 O)	074	0000	(00 O)	114	0000	(00 O)	154	0000	(00 O)
035	0000	(00 O)	075	0000	(00 O)	115	0000	(00 O)	155	0000	(00 O)
036	0000	(00 O)	076	0000	(00 O)	116	0000	(00 O)	156	0000	(00 O)
037	0000	(00 O)	077	0000	(00 O)	117	0000	(00 O)	157	0000	(00 O)
038	0000	(00 O)	078	0000	(00 O)	118	0000	(00 O)	158	0000	(00 O)
039	0000	(00 O)	079	0000	(00 O)	119	0000	(00 O)	159	0025	(00 O)
Format:											
000	0000	(00 P)									
RLN				Relay number							
	OHMS			Loop Resistance (ohms)							
		ER		Error code (00=None)							
			P	Parity for received reading (O=Odd, E=Even)							

REPORT 8-1: LOOP RESISTANCE RELAY TEST EXAMPLE

**Airflow Counter Test**

The Airflow Counter Test will begin automatically when Item #4 is selected from the E2A Diagnostics Master Menu. This test will output different results depending on the test mode that is in operation when it is run. If the test is run in the Diagnostics Mode, each of the Airflow Relays will be automatically polled once to determine the current Airflow Counter readings.

When the test is run in the Acceptance Mode, each Airflow Relay will be polled four times, once for each of four discrete Airflow Counter Tests. With the Test Termination Set installed at the E2A Remote Terminal, the Airflow Counters are tested for single counts, multiple counts, over-range counts and the Airflow Reset Function.

It is important to note that the Airflow Counters will be reset when this test is performed in the Acceptance Mode. Before you run this test in the Acceptance Mode, you will receive a prompt stating that all Airflow Counters will be reset. If you do not would like to reset the Airflow Counters, answer "NO" to this prompt.

**Airflow Access Numbers**

If you are working with Airflow Access Numbers, it is important to see that these numbers can range from 0 to 47. The range of numbers gives a total of 48 Airflow Counters spread out through 16 relays; there are three Airflow Counters for every relay number.

If you are converting from an Airflow Access Number to a Relay Number and Airflow Counter, you must divide the Airflow Access Number by 3 to get the Relay Number in question. From here, the Airflow Counter can be determined by adding one to the remainder of the division.

For example, suppose you would like to inspect the Airflow Counter found at Airflow Access Number 32. To find this counter in the report, simply divide the number 32 by 3. The answer to this division is 10, with a remainder of 2. Using the formula given above, you will look at the 10th relay number, third counter.

Airflow Counter Test for LOAK14				CPAMS Diagnostics XX.XX.XX											
09/28/2005 19:12				System Studies Incorporated											
-----															
00	05	02	01 (O)	04	00	00	00 (O)	08	05	01	00 (O)	12	00	00	00 (O)
01	01	14	05 (O)	05	00	00	01 (O)	09	00	00	00 (O)	13	00	00	00 (O)
02	02	05	05 (O)	06	01	04	01 (O)	10	00	00	00 (O)	14	00	00	00 (O)
03	01	00	00 (O)	07	02	11	02 (O)	11	00	00	00 (O)	15	00	00	00 (O)
Format:															
00	00	00	00 (P)	Relay number											
RN	C1	C2	C3	Readings for counters 1, 2, & 3 (cu.ft.)											
			P	Parity for received reading (O=Odd, E=Even)											

SCREEN 8-39: AIRFLOW COUNTER TEST EXAMPLE (DIAGNOSTICS MODE)

**Interpreting the Output**

As stated above, the output from the Airflow Counter Test varies a great deal depending upon the test mode being used. In the Diagnostics Mode, the three Air Counters for each Airflow Relay will be polled,

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---

and the current Airflow Counter readings will be returned. The output format for the Diagnostics Mode is divided into five columns of information:

03 02 19 01 (O)

The first column indicates the Airflow Relay Number. Values in this column will range from 0 to 15, covering all 16 Airflow Relays. Following the Airflow Relay Number are three columns that give the readings for the first, second, and third Airflow Counters respectively.

The last column of information is enclosed in parentheses. Inside the parentheses is the value for the parity of the reading. Valid data for this field can be either an E or an O, indicating an Even or Odd parity for the reading made. The parity returned from this test should always be Odd.

### *The Airflow Counter Test in Acceptance Mode*

The Airflow Test creates a slightly different report when run in the Acceptance Mode. The Acceptance Mode produces a four part listing, showing results from a Single Count Test, a Multiple Count Test, an Overflow Count Test and a Reset Function Test. The format for each group of Acceptance Mode tests is identical to the format for the Diagnostics Mode. The only difference between the reports is that each of the Acceptance Mode tests begins with a heading indicating the test being reported.

Acceptance Mode Test Headings:

TEST A - Single Count Test  
TEST B - Multiple Count Test  
TEST C - Over Range Count Test  
TEST D - Reset Test

Test A is the Single Count Test. With this test, each of the three counters for all Airflow Relays should return a reading of 01. If an error is found while polling the Airflow Counters, the following message will be displayed at the bottom of the report:

**ALL COUNTERS SHOULD BE: 01 01 01 (O)**

Test B is a Multiple Count Test. In this test, each counter is stepped through a series of counts and all counters should return a value of 30. If an error is found during the testing, the following message will be displayed at the bottom of the report:

**ALL COUNTERS SHOULD BE: 30 30 30 (O)**

Test C is an Overflow Count Test. All Airflow Counters are sent a number of counts which pass into the overflow range, being 31 and above. When this test is run, each counter should return with a value of 31. If an error is found with the Airflow Counters, the following message will be displayed at the bottom of the report:

**ALL COUNTERS SHOULD BE: 31 31 31 (O)**

The last test made in the Acceptance Mode is the Reset Function Test. With this test, each counter is reset to zero (0). If any of the counters read a value other than zero, the counter will have failed the reset function. An error message will be displayed if any of the counters fail the Reset Function Test:

**ALL COUNTERS SHOULD BE: 00 00 00 (0)**

### ***Line Access Relay Panel (LARP) Test***

When you run the Line Access Relay Panel Test, you will be asked for the panel number you would like to inspect. Legitimate values range from 0 to 9, and the testing will begin after a legal value is entered. Pressing <**Return**> without entering in a panel number will bring you back to the E2A Diagnostics Master Menu, where you can choose to run a different Diagnostic Test.

### ***Interpreting the Output***

When this test is run (see REPORT 8-2), four columns of information are returned for each relay tested:

**001 13 08 (00 0)**

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Line Access Relay Panel Test for LOAK14				CPAMS Diagnostics XX.XX.XX											
09/28/2005 19:19				System Studies Incorporated											
-----															
200	12	28	(00 O)	224	11	19	(00 O)	248	09	19	(00 O)	272	15	16	(00 O)
201	09	13	(00 O)	225	17	07	(00 O)	249	28	20	(00 O)	273	15	20	(00 O)
202	10	20	(00 O)	226	17	14	(00 O)	250	11	12	(00 O)	274	15	11	(00 O)
203	28	28	(00 O)	227	15	16	(00 O)	251	18	20	(00 O)	275	17	18	(00 O)
204	06	11	(00 O)	228	16	18	(00 O)	252	17	10	(00 O)	276	20	20	(00 O)
205	20	20	(00 O)	229	17	20	(00 O)	253	28	28	(00 O)	277	14	20	(00 O)
206	20	20	(00 O)	230	13	11	(00 O)	254	17	20	(00 O)	278	05	28	(00 O)
207	05	16	(00 O)	231	28	20	(00 O)	255	28	15	(00 O)	279	11	20	(00 O)
208	11	20	(00 O)	232	11	13	(00 O)	256	11	09	(00 O)	280	20	12	(00 O)
209	08	20	(00 O)	233	19	16	(00 O)	257	18	20	(00 O)	281	16	17	(00 O)
210	20	14	(00 O)	234	15	19	(00 O)	258	16	18	(00 O)	282	13	19	(00 O)
211	16	20	(00 O)	235	16	20	(00 O)	259	20	10	(00 O)	283	20	20	(00 O)
212	11	28	(00 O)	236	16	18	(00 O)	260	14	28	(00 O)	284	18	17	(00 O)
213	20	28	(00 O)	237	28	20	(00 O)	261	10	20	(00 O)	285	14	19	(00 O)
214	14	20	(00 O)	238	18	28	(00 O)	262	28	07	(00 O)	286	16	10	(00 O)
215	14	15	(00 O)	239	14	20	(00 O)	263	10	18	(00 O)	287	15	13	(00 O)
216	08	28	(00 O)	240	16	20	(00 O)	264	28	20	(00 O)	288	10	14	(00 O)
217	20	16	(00 O)	241	11	15	(00 O)	265	11	28	(00 O)	289	13	13	(00 O)
218	16	28	(00 O)	242	15	12	(00 O)	266	10	09	(00 O)	290	18	16	(00 O)
219	03	20	(00 O)	243	11	28	(00 O)	267	08	15	(00 O)	291	14	14	(00 O)
220	15	20	(00 O)	244	20	20	(00 O)	268	12	15	(00 O)	292	15	28	(00 O)
221	20	20	(00 O)	245	20	20	(00 O)	269	20	14	(00 O)	293	08	13	(00 O)
222	20	28	(00 O)	246	20	20	(00 O)	270	11	10	(00 O)	294	16	28	(00 O)
223	08	20	(00 O)	247	17	19	(00 O)	271	17	15	(00 O)	295	28	17	(00 O)

Format:

000	00	00	(00 P)	
RLN				Relay number
	AA	BB		Readings for A & B devices (E2A units)
			ER	Error code (00=None)
			P	Parity for received reading (O=Odd, E=Even)

REPORT 8-2: LARP TEST EXAMPLE

In the first information field, both the panel number and the relay number are represented. Together, this field completes the Line Access Relay Number. This information is given as a three digit number. The first digit is the panel number that you have chosen to test. Following the panel number are two digits which represent the actual relay that was polled.

The second and third fields in the report indicate the readings from the A and B devices respectively. These fields return a decimal value ranging from 0 to 31, and valid device readings range from 0 to 19. The CPAMS Unit Table, TABLE 8-5, shows how to interpret the values returned for both pressure transducers and flow transducers. This table can be found at the end of this section.

The fourth column of information is enclosed in parentheses and contains information about the test reading. In this column, two sets of information are returned. The first set indicates if an error was associated with the reading made. A double zero (00) in this position indicates that the reading did not have errors. The second set of information returned is either an E or an O, indicating that the parity for the reading made was either Even or Odd. For more information regarding the possible error codes that can be returned, please refer to TABLE 8-4, Device Reading Error Codes.

If this test is run in the Acceptance Mode, a reading which does not correspond with the value that is set by the test termination set will be marked with an asterisk and an error message will be displayed at the bottom of the report. The message will list the relay number in error, the current reading, and the value that the reading should have been.

Example Acceptance Mode Error Message:

```
030 10 05 (00 O)  *should have read 030 10 08 (00 O)
```

### ***Satellite Relay Test***

When you select the Satellite Relay Test, you will need to enter the Satellite Number you would like to inspect at the prompt reading:

```
Test which satellite?
```

Valid Satellite Numbers range from 40-44, 50-54, 60-64, and 70-74. If you attempt to enter a number outside of this range, you will receive a message indicating that you have entered an incorrect Satellite Number.

Pressing <Return> without entering a Satellite Number will bring you back to the E2A Diagnostics Master Menu, where you can select a different Diagnostic Test to run.

### ***Interpreting the Output***

Results returned from this test are formatted into three columns:

```
4000A 05 (00 O)
```

The first column is a Satellite Relay Number. The number represents both the satellite being tested and the Relay Number that was polled. When this number is broken down, the first two digits represent the actual Satellite Number, while the following three digits represent the Relay Number that was polled. Relay Numbers range from 00A to 15B, giving a total of 32 different relays for each satellite.

The second column of information displays the reading that was obtained from the test. Possible return values range from 0 to 31. Please refer to TABLE 8-5, the CPAMS Units Table, for more information on interpreting the results returned.

The third column of information is enclosed in parentheses and contains information about the test reading. In this column, two sets of information are returned. The first set indicates if an error was associated with the reading made. A double zero (00) in this position indicates that the reading did not

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have errors. The second set of information returned is either an E or an O, indicating that the parity for the reading was either Even or Odd. For more information regarding the error codes that can be returned, please refer to TABLE 8-4.

```
Satellite Relay Test for LOAK14                      CPAMS Diagnostics XX.XX.XX
09/28/2005 19:21                                     System Studies Incorporated
-----
4000A 00 (00 O)   4004A 00 (00 O)   4008A 00 (00 O)   4012A 00 (00 O)
4000B 00 (00 O)   4004B 00 (00 O)   4008B 00 (00 O)   4012B 00 (00 O)
4001A 00 (00 O)   4005A 00 (00 O)   4009A 00 (00 O)   4013A 00 (00 O)
4001B 00 (00 O)   4005B 00 (00 O)   4009B 00 (00 O)   4013B 00 (00 O)
4002A 00 (00 O)   4006A 00 (00 O)   4010A 00 (00 O)   4014A 00 (00 O)
4002B 00 (00 O)   4006B 00 (00 O)   4010B 00 (00 O)   4014B 00 (00 O)
4003A 00 (00 O)   4007A 00 (00 O)   4011A 00 (00 O)   4015A 00 (00 O)
4003B 00 (00 O)   4007B 00 (00 O)   4011B 00 (00 O)   4015B 00 (00 O)

Format:
0000A 00 (00 P)
SSRLN      RR      ER      P
          Relay number
          Readings for device (E2A units)
          Error code (00=None)
          Parity for received reading (O=Odd, E=Even)
```

SCREEN 8-40: SATELLITE RELAY TEST EXAMPLE

If this test is run in the Acceptance Mode, a reading which does not correspond with the value that is set by the test termination set will be marked with an asterisk and a note will be made at the bottom of the report. The error message will list the satellite relay number in error, the current reading, and the value that the reading should have been.

Example Acceptance Mode Error Message:

```
4002A 09 (00 O) should have read 4002A 12 (00 O)
```

### *Calibration and Interface Tests*

The Calibration and Interface Tests are composed of six different tests. The first five tests correspond to the CPMS Calibration Tests CAL1-CAL5, while a sixth test allows low level access to the E2A Remote Terminal. The tests, when run, are not affected by the test mode selected. The same results will be produced if the tests are run in the Acceptance Mode or if they are run in the Diagnostics Mode.

When Item #7 is selected from the E2A Diagnostics Menu, the Calibration and Interface Test Menu is displayed, as shown in SCREEN 8-41. By making a selection from this menu, you may run one of the calibration or interface tests.

```

Calibration and Interface Test Menu
-----
1. LARP Calibration Test
2. Loop Resistance Relay Calibration Test
3. LARP Open Circuit Test
4. LARP Relay Operate Error Test
5. LARP Parity Error Test
6. Command Word Test

Choice?
    
```

SCREEN 8-41: CALIBRATION AND INTERFACE TEST EXAMPLE

***LARP Calibration Test***

The Line Access Relay Panel (LARP) Calibration Test is used to test and calibrate the LARP. Once started, the LARP Calibration Test will loop until three consecutive test sets return with an OK status, or until the user presses the <Esc> key. This allows for a field technician to calibrate the LARP while the program user monitors the results.

All testing is done on Line Access Relay number 000. Relay Number 000 has preset resistance values for both the A and B devices. Because of this, it is possible to test and calibrate the LARP based on these preset values.

***Interpreting the Output***

The LARP Calibration Test will continue to poll Line Access Relay number 000 until three continuous polls return with an OK status (SCREEN 8-42), or until the user presses <Esc>. The results from the testing are formatted into four columns of data along with a text message describing the reading of the A and B devices:

```

000 05 08 (00 0)  A reading too high  B reading too low
    
```

The first column of information shows both the panel and relay number being polled. In the LARP Calibration Test, this number will always be 000.

The second and third columns in the output represent the reading from the A and B devices respectively. The return valves are in CPAMS Units.

The fourth column of data is the error code and the parity for the reading taken. Refer to TABLE 8-4, Device Reading Error Codes, for more information on interpreting error codes.

```

LARP Calibration Test for LOAK14                      CPAMS Diagnostics XX.XX.XX
09/28/2005 19:29                                     System Studies Incorporated
-----
000 01 10 (00 0)  A Reading OK           B Reading OK
000 01 10 (00 0)  A Reading OK           B Reading OK
000 01 10 (00 0)  A Reading OK           B Reading OK
    
```

SCREEN 8-42: LARP CALIBRATION TEST EXAMPLE

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---

In addition to the data obtained from the reading, E2A Diagnostics will interpret the reading with a text description. The following list shows the messages which can accompany the LARP readings:

LARP Calibration Test Messages:

A (or B) Reading too high  
A (or B) Reading OK  
A (or B) Reading too low

## ***Loop Resistance Relay Calibration Test***

The Loop Resistance Relay Calibration Test is used to test and calibrate the A-to-D Converter in the E2A Remote Terminal. Once started, the Loop Resistance Relay Test will loop until three consecutive test sets return with an OK status, or until the user presses the <Esc> key. This allows for a field technician to calibrate the A-to-D Converter while the program user monitors the results.

Testing is done on Loop Resistance Relay number 000. Because the resistance of this relay is known in advance, it is possible to test and calibrate the A-to-D Converter. Before running this calibration test, be sure that the correct resistor is in place at The Loop Resistance Relay number 000.

## ***Interpreting the Output***

The Loop Resistance Calibration Test will continue to poll Loop Resistance Relay number 000 until three continuous polls return with an OK status (as seen in SCREEN 8-43) , or until the user presses <Esc>. The results from the testing are formatted into three columns of data and a diagnostic message describing the reading:

```
000 3150 (00 0) Reading OK
```

The first column shows the status indicator (which will be 000 for this test) and is followed by its reading in Ohms in the second column of data.

```
Loop Resistance Calibration for LOAK14          CPAMS Diagnostics XX.XX.XX
09/28/2005 19:30                               System Studies Incorporated
-----
000 3150 (00 0) Reading OK
000 3150 (00 0) Reading OK
000 3150 (00 0) Reading OK
```

SCREEN 8-43: LOOP RESISTANCE RELAY CALIBRATION TEST EXAMPLE

The third column is the error code and the parity for the reading taken. Please refer to TABLE 8-4, Device Reading Error Codes, for more information on the error codes returned.

In addition to the data obtained from the reading, E2A Diagnostics will interpret the reading with a text description. The following list shows the messages that can accompany the reading:

Loop Resistance Relay Calibration Messages:

Reading too high  
 Reading too high, but within range  
 Reading OK  
 Reading too low, but within range  
 Reading too low

***LARP Open Circuit Test***

The LARP Open Circuit Test analyzes a circuit that is known to be open and creates a report based on the information returned (SCREEN 8-44). If the system detects the open circuit, then the system is OK and an appropriate message is printed out. If the system does not detect the open circuit, then there is a flaw in the system and a message is written indicating this problem.

***Interpreting the Output***

Output from the LARP Open Circuit test is broken up into four columns:

001 20 (00 0) Open circuit detected. A/D Circuit OK.

The first column of data indicates the LARP Relay Number, and will always be 001. Following this number are the readings for both the A and B devices respectively. Possible values returned from the readings are listed above in TABLE 8-5, The CPAMS Units Table. However, since this test generates an open circuit condition, both the A and B devices should return a value of 20. Following the device readings, the error code and parity for the reading is given inside parentheses.

```

LARP Open Circuit Test for LOAK14                CPAMS Diagnostics XX.XX.XX
09/28/2005 19:30                                System Studies Incorporated
-----
095 28 11 (00 0) Open Circuit NOT detected. A/D Circuit failed/pair in use.
  
```

SCREEN 8-44: LARP OPEN CIRCUIT TEST EXAMPLE

In addition to the data obtained from the reading, E2A Diagnostics will interpret the reading with a text description. The following list shows the messages which can accompany the reading:

LARP Open Circuit Test Messages:

Open Circuit detected. A/D Circuit OK.  
 Open Circuit NOT detected.  
 A/D Circuit failed/pair in use.

***LARP Relay Operate Error Test***

The LARP Relay Operate Error Test is designed to test the error detection in the LARP Relay Operate Circuitry. In this test, a command is generated which contains an error. If the error is detected by the E2A Remote Terminal, the E2A Remote Terminal is OK and the error flag is reset. After the error condition flag is reset, an appropriate message is output indicating that the E2A Remote Terminal is OK (see SCREEN 8-45).

If the error is not detected by the E2A Remote Terminal, then there is a flaw in the error detection system and a diagnostic message is generated indicating the flaw.

```
LARP Relay Operate Error Test for LOAK14          CPAMS Diagnostics XX.XX.XX
09/28/2005  19:31                               System Studies Incorporated
-----
Relay Operate Error generated, detected, and reset. Error circuitry OK.
```

SCREEN 8-45: LARP RELAY OPERATE ERROR TEST EXAMPLE

### *Interpreting the Output*

The LARP Relay Operate Error Test simply generates one of two messages. One message indicates that the E2A Remote Terminal responded correctly to an error condition while the second message indicates that the E2A Remote Terminal did not detect the error condition.

LARP Relay Operate Error Test Messages:

```
Relay Operate Error generated, detected, and reset.
Error circuitry OK.
```

```
Relay Operate Error generated and NOT detected.
Error circuitry failed.
```

### *Parity Error Test*

The LARP Parity Error Test is designed to test the parity error detection of the E2A Remote Terminal. In this test, a command is given which contains a parity error. If the E2A Remote Terminal detects the parity error, then the E2A Remote Terminal is OK and an appropriate message is given. If the parity error is not detected, then there is a flaw in the E2A Remote Terminal and a message will alert the user to the problem.

### *Interpreting the Output*

The output from this test simply consists of a single message generated by the test (see SCREEN 8-46). There are two possible messages: one message indicates when the E2A Remote Terminal passes the test and another indicates that there is an error condition.

```
LARP Parity Error Test for LOAK14          CPAMS Diagnostics XX.XX.XX
09/28/2005  19:32                               System Studies Incorporated
-----
Parity Error generated and detected. Parity Error circuitry OK.
```

SCREEN 8-46: PARITY ERROR TEST EXAMPLE

Parity Error Test Messages:

```
Parity Error generated and detected.
Parity Error circuitry OK.
```

```
Parity Error generated and NOT detected.
Parity Error circuitry failed.
```

### ***Command Word Test***

The Command Word Test supplied by E2A Diagnostics allows you to easily enter test commands as binary words. (A binary word is written as a series of 1's and 0's.) Although you are encouraged to use the menu system to conduct your testing, the Command Word Test (shown in SCREEN 8-47) has several nice advantages. For instance, this feature allows full low level access to the E2A Remote Terminal and at the same time gives complete backward compatibility to the CPMS Acceptance Tests.

While most E2A Diagnostics users will not need to use this feature, entering commands in binary gives you complete control over the actual command that is sent to the E2A Remote Terminal. Another reason to use the Command Word option is that it allows a device to be continuously polled for any test that you would like to conduct; testing stops when the user presses the <Esc> key. When the Word Command option is chosen from the menu, the user will receive the following prompt:

**Command Word?**

At this prompt, the user may enter in either a 16 digit binary word or one of the following keywords:

**CAL1, CAL2, CAL3, CAL4, CAL5,  
REMOTE RESET, or AIRFLOW RESET**

A 16-digit binary word is composed of 1's and 0's. When the E2A Remote Terminal receives the binary command, it will interpret the command and run the test indicated by the binary digits. Here is an example of a binary command word:

**Command Word? 1110 0111 0000 0000**

When this command is issued, the E2A Remote Terminal will interpret the binary word and perform the test indicated by the command. In the example above, the test to be performed is an Airflow Counter Reset Function Test. For more information on how to initiate tests using binary words, please refer to BSP 637-600-401.

A feature of the Command Word Test allows binary words less than 16 digits to be accepted. When a binary word is entered that is less than 16 digits long, all unspecified leading digits will be assumed to be 0 and the leading digit will be given an even parity.

In addition to allowing keywords to be entered in at the Command Word prompt, the user may enter an Access Number. Access Numbers must begin with a sharp sign (#) followed by the access relay desired. Examples are:

**#001A (for a LARP) or #4101A (for a Satellite)**

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---

All access numbers will be given an even parity when the command is sent to the E2A Remote Terminal.

```
Command Word Test for LOAK14                CPAMS Diagnostics XX.XX.XX
09/28/2005 19:39                            System Studies Incorporated
-----
Command Word: 0110 0000 0000 0000

000 01 10 (00 0)
000 01 10 (00 0)
000 01 10 (00 0)
000 01 10 (00 0)
000 01 10 (00 0)
000 01 10 (00 0)

(<ESC> Pressed ...)
```

SCREEN 8-47: COMMAND WORD TEST EXAMPLE

In the Command Word Test example above, the command **0110 0000 0000 0000** is sent to the E2A Remote Terminal. By checking BSP 637-600-401, you should be able to determine that this command word issues a CAL 1 test—better known as the LARP Calibration Test.

### *Interpreting the Output*

The format of the data returned by the Command Word Test depends upon the command given. Possible result formats from the Command Word Test are the Status Relay Test format, the Loop Resistance Test format, the Airflow Test format, the LARP Test format, and the Satellite Relay Test format.

## **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 8-4: 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 8-5: 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 8-6: 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		

TABLE 8-7: PRESSURE TRANSDUCER CONVERSION CHART (CPA/30)

Flow in SCFH				Current in mA
0-10	0-20	0-50	0-100	
0	0	0	0	3.6-4.03
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 8-8: FLOW TRANSDUCER CONVERSION CHART

#	PSI	SCFH					#	PSI	SCFH				
		9.5	19	47.5	95	475			9.5	19	47.5	95	475
0	-5	0.00	0.00	0.00	0.00	0.00	51	5.2	9.69	19.38	48.45	96.90	484.50
1	-4.8	0.19	0.38	0.95	1.90	9.50	52	5.4	9.88	19.76	49.40	98.80	494.00
2	-4.6	0.38	0.76	1.90	3.80	19.00	53	5.6	10.07	20.14	50.35	100.70	503.50
3	-4.4	0.57	1.14	2.85	5.70	28.50	54	5.8	10.26	20.52	51.30	102.60	513.00
4	-4.2	0.76	1.52	3.80	7.60	38.00	55	6	10.45	20.90	52.25	104.50	522.50
5	-4	0.95	1.90	4.75	9.50	47.50	56	6.2	10.64	21.28	53.20	106.40	532.00
6	-3.8	1.14	2.28	5.70	11.40	57.00	57	6.4	10.83	21.66	54.15	108.30	541.50
7	-3.6	1.33	2.66	6.65	13.30	66.50	58	6.6	11.02	22.04	55.10	110.20	551.00
8	-3.4	1.52	3.04	7.60	15.20	76.00	59	6.8	11.21	22.42	56.05	112.10	560.50
9	-3.2	1.71	3.42	8.55	17.10	85.50	60	7	11.40	22.80	57.00	114.00	570.00
10	-3	1.90	3.80	9.50	19.00	95.00	61	7.2	11.59	23.18	57.95	115.90	579.50
11	-2.8	2.09	4.18	10.45	20.90	104.50	62	7.4	11.78	23.56	58.90	117.80	589.00
12	-2.6	2.28	4.56	11.40	22.80	114.00	63	7.6	11.97	23.94	59.85	119.70	598.50
13	-2.4	2.47	4.94	12.35	24.70	123.50	64	7.8	12.16	24.32	60.80	121.60	608.00
14	-2.2	2.66	5.32	13.30	26.60	133.00	65	8	12.35	24.70	61.75	123.50	617.50
15	-2	2.85	5.70	14.25	28.50	142.50	66	8.2	12.54	25.08	62.70	125.40	627.00
16	-1.8	3.04	6.08	15.20	30.40	152.00	67	8.4	12.73	25.46	63.65	127.30	636.50
17	-1.6	3.23	6.46	16.15	32.30	161.50	68	8.6	12.92	25.84	64.60	129.20	646.00
18	-1.4	3.42	6.84	17.10	34.20	171.00	69	8.8	13.11	26.22	65.55	131.10	655.50
19	-1.2	3.61	7.22	18.05	36.10	180.50	70	9	13.30	26.60	66.50	133.00	665.00
20	-1	3.80	7.60	19.00	38.00	190.00	71	9.2	13.49	26.98	67.45	134.90	674.50
21	-0.8	3.99	7.98	19.95	39.90	199.50	72	9.4	13.68	27.36	68.40	136.80	684.00
22	-0.6	4.18	8.36	20.90	41.80	209.00	73	9.6	13.87	27.74	69.35	138.70	693.50
23	-0.4	4.37	8.74	21.85	43.70	218.50	74	9.8	14.06	28.12	70.30	140.60	703.00
24	-0.2	4.56	9.12	22.80	45.60	228.00	75	10	14.25	28.50	71.25	142.50	712.50
25	0	4.75	9.50	23.75	47.50	237.50	76	10.2	14.44	28.88	72.20	144.40	722.00
26	0.2	4.94	9.88	24.70	49.40	247.00	77	10.4	14.63	29.26	73.15	146.30	731.50
27	0.4	5.13	10.26	25.65	51.30	256.50	78	10.6	14.82	29.64	74.10	148.20	741.00
28	0.6	5.32	10.64	26.60	53.20	266.00	79	10.8	15.01	30.02	75.05	150.10	750.50
29	0.8	5.51	11.02	27.55	55.10	275.50	80	11	15.20	30.40	76.00	152.00	760.00
30	1	5.70	11.40	28.50	57.00	285.00	81	11.2	15.39	30.78	76.95	153.90	769.50
31	1.2	5.89	11.78	29.45	58.90	294.50	82	11.4	15.58	31.16	77.90	155.80	779.00
32	1.4	6.08	12.16	30.40	60.80	304.00	83	11.6	15.77	31.54	78.85	157.70	788.50
33	1.6	6.27	12.54	31.35	62.70	313.50	84	11.8	15.96	31.92	79.80	159.60	798.00
34	1.8	6.46	12.92	32.30	64.60	323.00	85	12	16.15	32.30	80.75	161.50	807.50
35	2	6.65	13.30	33.25	66.50	332.50	86	12.2	16.34	32.68	81.70	163.40	817.00
36	2.2	6.84	13.68	34.20	68.40	342.00	87	12.4	16.53	33.06	82.65	165.30	826.50
37	2.4	7.03	14.06	35.15	70.30	351.50	88	12.6	16.72	33.44	83.60	167.20	836.00
38	2.6	7.22	14.44	36.10	72.20	361.00	89	12.8	16.91	33.82	84.55	169.10	845.50
39	2.8	7.41	14.82	37.05	74.10	370.50	90	13	17.10	34.20	85.50	171.00	855.00
40	3	7.60	15.20	38.00	76.00	380.00	91	13.2	17.29	34.58	86.45	172.90	864.50
41	3.2	7.79	15.58	38.95	77.90	389.50	92	13.4	17.48	34.96	87.40	174.80	874.00
42	3.4	7.98	15.96	39.90	79.80	399.00	93	13.6	17.67	35.34	88.35	176.70	883.50
43	3.6	8.17	16.34	40.85	81.70	408.50	94	13.8	17.86	35.72	89.30	178.60	893.00
44	3.8	8.36	16.72	41.80	83.60	418.00	95	14	18.05	36.10	90.25	180.50	902.50
45	4	8.55	17.10	42.75	85.50	427.50	96	14.2	18.24	36.48	91.20	182.40	912.00
46	4.2	8.74	17.48	43.70	87.40	437.00	97	14.4	18.43	36.86	92.15	184.30	921.50
47	4.4	8.93	17.86	44.65	89.30	446.50	98	14.6	18.62	37.24	93.10	186.20	931.00
48	4.6	9.12	18.24	45.60	91.20	456.00	99	14.8	18.81	37.62	94.05	188.10	940.50
49	4.8	9.31	18.62	46.55	93.10	465.50	100	15	19.00	38.00	95.00	190.00	950.00
50	5	9.50	19.00	47.50	95.00	475.00							

TABLE 8-9: SYSTEM STUDIES ADDRESSABLE TRANSDUCER CONVERSION TABLE

## ***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 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
09/28/2005 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 8-48: SYSTEM OPTIONS MENU

- 1) From the System Options Menu, press ***I*** 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 8-49. 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
09/28/2005 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 8-49: 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 Cirtc PR Alm  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 8-50: 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.

