Chapter 5

INTRODUCTION

This section offers a brief explanation of the diagnostic tests that are available through PressureMAP for the System Studies 289H and Dial-a-Ducer monitoring systems. If you wish to reference the full procedures for running these tests, and explanations of the results, please refer to the CPAMS Diagnostics Section of the *MAP System Operations Manual.*

289H LSS and 289 LSS DIAGNOSTIC TEST FIELDS

The 289H LSS monitor diagnostics program provides for internal monitoring with the following reports and tests:

- System Configuration
- Calibration Test
- Realtime Reading Test
- Specific Device Information
- Capacitance Test
- Ping Relays Test
- Access Number Translations (if capability is enabled)
- 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 (289H and 289H-M only)
- Access Number Translations (if capability is enabled)
- 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)

While the full procedures for running these tests, and explanations of the results, are presented in the CPAMS Diagnostics Section of the *PressureMAP Operations Manual*, a brief explanation of the tests are included here. Tables at the end of this section provide conversions from milliamperes to the corresponding device reading value, and the equivalent information for resistive devices.

Note: The Capacitance, Ping Relays, Leakage, AC Voltage, DC Voltage and Pair Diagnostic 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.

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. 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.

System Configuration

The System Configuration screen displays the current status of the 289H LSS that monitors the office you have selected. (See the sample screen that follows.) 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
10/23/2006  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|  SRA SRB SRC SRA SRB SRC DED DED DED                    SUB
     2|  DED DED DED DED

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

SCREEN 5-1: SYSTEM CONFIGURATION FOR 289H LSS

The seven fields displayed on the screen are:

—**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 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 conditions 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 dedicated card; AMC designates an addressable transducer card; and AMU designates 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 is possibly defective. An inventory is taken automatically whenever the 289H is reset.

Calibration Test

When selecting the Calibration Test from the 289H Diagnostics menu, 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.

```
Calibration Test for Salt Creek                 CPAMS Diagnostics XX.XX.XX
01/02/2010  13:38                               System Studies Incorporated
--------------------------------------------------------------------------

Resistor        Counts      Volts    Ohms        Correction
--------        ------      -----    ----        ----------
Battery         39339        47.4
Open (H)           28                 +++++M
3.8M (H)          983                 3.934M        3.5%
100K (H)        36168                 103.7K        3.7%
100K (L)         1313                 102.9K        2.9%
10K (L)         10287                 10.41K        4.1%
Short (L)       43362                    96

Which board?
```

SCREEN 5-2: CALIBRATION TEST

—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.

Realtime Reading Test

The Realtime Reading Test is primarily intended to be a tool for servicing the 289H. It is preferable to obtain realtime readings for checking the pressurized cable system through PressureMAP's Specific Device Information function. 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 comparison with its manual reading.

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

▪ Shorting a pair on the 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.

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 at the end of this section that provide conversions from milliamperes to the corresponding device reading values for current loop devices, and the equivalent information for resistive and System Studies addressable devices.

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

```
Realtime Reading Test for Salt Creek                CPAMS Diagnostics XX.XX.XX
01/02/2010  13:38                                   System Studies Incorporated
--------------------------------------------------------------------------------

Access #    Type    Counts    Scaled    Ohms     Range    Step    Status    Reading
-------     ----    ------    ------    ----     -----    ----    ------    -------
  001-01      F      35578     1045     101672     H        1                  9.5
  001-01      F      35580     1045     101672     H        1                  9.5
  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 5-3: REALTIME READING TEST DISPLAY—RESISTIVE DEVICE (FLOW)

Realtime readings for a current loop device vary from the preceding example, in that there is no scaling of the counts and no steps are shown. The following four screens show the Realtime readings of current loop devices.

```
Realtime Reading Test for Cedar City                CPAMS Diagnostics XX.XX.XX
01/14/2010  13:38                                   System Studies Incorporated
--------------------------------------------------------------------------------

 Access #    Type    Counts    Milli-Amps    Delta P    Status    Reading
 --------    ----    ------    ----------    -------    ------    -------
   001-29      F      3715        4.72         0.92                  8.0
   001-29      F      3620        4.60         0.77                  7.4
   001-29      F      3632        4.61         0.79                  7.5
   001-29      F      3599        4.57         0.73                  7.2
```

SCREEN 5-4: REALTIME READING TEST DISPLAY—CURRENT LOOP DEVICE (FLOW)

```
Realtime Reading Test for Salt Creek              CPAMS Diagnostics XX.XX.XX
01/02/2010  13:38                                 System Studies Incorporated
-------------------------------------------------------------------------------

   Access #    Type    Counts     Milli-Amps    Status    Reading
   --------    ----    ------     ----------    ------    -------
     001-05     P      12787        14.99                   2.0
     001-05     P      12787        14.99                   2.0
     001-05     P      12787        14.99                   2.0
     001-05     P      12787        14.99                   2.0
```

SCREEN 5-5: REALTIME READING TEST DISPLAY—CURRENT LOOP DEVICE (PRESSURE)

```
Realtime Reading Test for Cedar City              CPAMS Diagnostics XX.XX.XX
01/14/2010  13:38                                 System Studies Incorporated
-------------------------------------------------------------------------------

   Access #    Type    Counts     Milli-Amps    Status    Absolute    Reading
   --------    ----    ------     ----------    ------    --------    -------
     001-28     P       7110         9.04                    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 5-6: REALTIME READING TEST DISPLAY—CURRENT LOOP DEVICE (PRESSURE, WITH BAROMETRIC
TRANSDUCER INSTALLED IN OFFICE)

```
Realtime Reading Test for Cedar City              CPAMS Diagnostics XX.XX.XX
01/14/2010  13:38                                 System Studies Incorporated
-------------------------------------------------------------------------------

   Access #    Type    Counts     Milli-Amps    Status    Reading
   --------    ----    ------     ----------    ------    -------
     001-11     B       3674         4.67                   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 5-7: REALTIME READING TEST DISPLAY—CURRENT LOOP DEVICE (BAROMETRIC)

Readings for addressable devices are displayed as shown in the following sample screen. 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
 01/14/2010  13:38                                 System Studies Incorporated
 ----------------------------------------------------------------------------

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

 Test which device? 226

 Realtime Reading Test for BONNEY LAKE              CPAMS Diagnostics XX.XX.XX
 01/14/2010  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 5-8: REALTIME READING TEST DISPLAY—ADDRESSABLE DEVICE (DUAL)

The fields displayed on 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. A resistive transducer that is reading correctly will have a value between 100K ohms and 3.8M ohms in this field.

—**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. A current loop transducer that is reading correctly will have a value between 3.8 and 20.0 mA in this 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 CPAMS Reading Messages). Values for non-addressable devices are listed in the table below.

Status	Reading	Cause
(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 (> 10V DC or 6V AC)

TABLE 5-1: 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 the following table.

Status	Reading	Cause
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
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	ADDR/PROG	Data mismatch
Prog	PROG	Invalid programming for device(s) on pair
DShrt	SHRT	Short between TD and transceiver
PShrt	SHRT	Short on pair

TABLE 5-2: STATUS INDICATOR DEFINITIONS FOR ADDRESSABLE DEVICES

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

—***Reading*** represents the **unbiased** reading for that type of device. (The actual reading might be biased by an offset in the PressureMAP Database—e.g., an SP device.) When running the Diagnostic Realtime Reading on a Trunk and Toll contactor, the usual reading will be replaced

by a series of question marks. A VOLT reading in this column indicates the presence of lethal voltage. (A complete list of "verbose" readings is provided in CPAMS Reading Messages in this manual.)

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

Specific Device Info

The fourth option of the menu, Specific Device Info, is provided so device information can be viewed without having to leave the 289H Diagnostic Menu. The screen of information that is displayed is essentially the same screen displayed by the PressureMAP option, Specific Device Information. This screen is described in detail in the "Overview" and "Report Fields & Sample Reports" sections of this guide (also in Section 2 of the *PressureMAP Operations Manual*).

Capacitance Test

If you choose Realtime Capacitance Test from the 289H Diagnostics Menu a screen similar to the one below 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 picofarad), the distance of an open from the Central Office (CO) in thousands of feet (kilofeet), and a location indication.

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

```
Capacitance Test for Salt Creek                      CPAMS Diagnostics XX.XX.XX
01/02/2010  13:39                                    System Studies Incorporated
--------------------------------------------------------------------------------

           ----------Tip Side----------      ----------Ring Side----------
Access #  Counts  p-farads  K-feet  Loc.     Counts  p-farads  K-feet  Loc.
--------  ------  --------  ------  ----      ------  --------  ------  ----
001-01    48365    139551   1.837   OUT       80932    233520   3.537   OUT

001-01    46829    135119   1.866   OUT       80813    233177   3.537   OUT
001-01    47046    135746   1.843   OUT       80594    232345   3.537   OUT
```

SCREEN 5-9: 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 picofarad, 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 an extremely rough estimate.

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

Ping Relays Test

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

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

There are two reasons why a relay would not ping during the test. One is that the relay is faulty, the other is that the line is busy. While busy lines are obviously not a problem when testing a dedicated board, they could confuse a test on a subscriber board. For that reason, this test provides a display that indicates busy lines.

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

In the following example, all of the subscriber lines were found to be on hook except line 9 which was found to be busy all four times that the test was run.

```
Ping Relays Test for Salt Creek                 CPAMS Diagnostics XX.XX.XX
01/02/2010  13:42                               System Studies Incorporated
-------------------------------------------------------------------------

Pairs 1-25  00000 00010 00000 00000 00000
Pairs 1-25  00000 00010 00000 00000 00000
Pairs 1-25  00000 00010 00000 00000 00000
Pairs 1-25  00000 00010 00000 00000 00000
```

SCREEN 5-10: 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 (AMC/UAMC) 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 that 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

The Realtime Leakage Test can only be run from the 289H Diagnostics Menu. Even though you are asked to enter a device number, only the corresponding access number will be displayed on the screen. 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.

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

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

```
Realtime Leakage Test for CITRUS HEIGHTS          CPAMS Diagnostics XX.XX.XX
03/04/2010  13:42                                 System Studies Incorporated
------------------------------------------------------------------------------

  Access #          Tip/Ring Ohms        Tip/Gnd Ohms         Ring/Gnd Ohms
  --------          -------------        ------------         -------------
  001-15                6,816                100M                86,231,576
                        (SHRT)               (OPEN)               (OPEN)

Test which device?
```

SCREEN 5-11: LEAKAGE TEST DISPLAY

AC Test

The AC test, which is only available from the 289H Diagnostic Menu, 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 reading 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.

```
Realtime AC Test for Salt Creek                    CPAMS Diagnostics XX.XX.XX
01/02/2006  13:42                                  System Studies Incorporated
-------------------------------------------------------------------------------

                          VAC                 VAC
   Access #              Tip/Gnd             Ring/Gnd
   --------              --------            --------
     001-01               0.0412              10.0373

Test which device?
```

SCREEN 5-12: 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 device number followed by *<Return>*. To return to the 289H Diagnostics Menu, just hit *<Return>*.

DC Test

The DC test is also only available from the 289H Diagnostic Menu. It 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 reading 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 pressure 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.

```
Realtime DC Test for Salt Creek                    CPAMS Diagnostics XX.XX.XX
01/02/2010  13:42                                  System Studies Incorporated
-------------------------------------------------------------------------------

                          VDC                 VDC
   Access #              Tip/Gnd             Ring/Gnd
   --------              --------            --------
     001-01               0.0031              0.0000

Test which device?
```

SCREEN 5-13: DC TEST DISPLAY

Readings in the two `VDC` columns should be under 1.0 volt, as shown in the screen 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 (see the example below). The data includes output from DC and AC voltage tests, leakage test and the capacitance test. Please refer to the information above for an explanation of the type of output provided in the report.

```
Realtime Pair Diagnostic Test for Salt Creek        CPAMS Diagnostics XX.XX.XX
05/14/2010  13:42                                    System Studies Incorporated
--------------------------------------------------------------------------------

                        VDC                   VDC
  Access #             Tip/Gnd               Ring/Gnd
  --------             --------              --------
   001-14               0.0031                0.0038

                        VAC                   VAC
  Access #             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


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

SCREEN 5-14: PAIR DIAGNOSTICS DISPLAY

289H DEVICE ALERT OPTIONS

The next two options of the 289H Diagnostics Menu will only be displayed if the 289H that has been called is upgraded with alarm capabilities. If you do not see menu items 11 and 12 on the 289H Diagnostic Menu and you wish to upgrade your 289H monitor with alarm 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>*), will display a screen similar to the one illustrated below. This option allows you to determine the status of the current 289H phone number (or IP address) information structure, and test the dialout capabilities of the 289H LSS from PressureMAP.

```
Dialout Phone Number Information                    CPAMS Diagnostics XX.XX.XX
06/24/2010  10:33                                   System Studies Incorporated
------------------------------------------------------------------------------

     PMAP ID          MAP Alert #                289 ID   Status        Attempts
     -------  -------------------------------    -------  ------------  --------
  1| 0202    4759999                             4234444  NORMAL           0
  2| 0111    T9W14089231844                      4234444  NO CARRIER       3
  3| 0999    T192.168.0.1:3002                   1463001  NORMAL           0
  4|

Test dialout phone number? (y/n)

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

SCREEN 5-15: DIALOUT PHONE NUMBER INFORMATION SCREEN

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. 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 Number** The phone number of the 289H's alert modem is listed here. It can also be found in the **MAP alarm #:** field of the PressureMAP's office information screen. For 289H or 289H-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 the PressureMAP's office information screen.

—**Status** The call error number (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.

Device Alert Information

The next option of the 289H Diagnostics Menu lists the set alarm level and current reading for any device you select. You may enter more than one device number by using the list/range format, which is described on page 7 of the Preface section of the *PressureMAP Operations 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 below. The six fields in this screen are described below.

```
Device Alert Information for 289H                CPAMS Diagnostics XX.XX.XX
01/02/2010  13:37                               System Studies Incorporated
----------------------------------------------------------------------------
                                         Rdg      Alert
   Device #      Access #     Type  TD Type  Now     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 5-16: 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 in the third section of this guide, PressureMAP Device & Transducer Types, and in Appendix 1 of the *MAP System Data Entry Manual*.

—**Rdg Now** 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 milli-amperes) instead of reading units (e.g., PSI or SCFH).

—**Alert Level** This is the programmed device reading level that is used to generate an alarm alert. A blank entry in this column indicates that the alarm threshold is not enabled. This condition usually occurs when a device has already alerted and cannot issue another alert, either because the reading has moved too close to the "bad" extreme of its range (e.g., near 0 if a pressure transducer) or, if the device is a contactor, the reading is now ALRM

289H LSS DEDICATED TONE CAPABILITY

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

In order to utilize the full tone generation capability of the 289H LSS monitor, the 289H must be equipped with a Tone Utility card (Part Number 9010-0016) and one or more Dedicated Tone Relay Cards (Part Number 9800-6110). In addition, the 289H Controller Card must be equipped with EPROM Version B.05 or greater.

The pair-saver tone capability requires that the dedicated relay cards are equipped with tone capacitors on each relay (Rev C and above – all versions purchased after December, 1998). However, the user-directed locater can be used with older "non-tone" dedicated relay cards, and on the dedicated pairs on addressable cards. If the 289H chassis has both old and new dedicated cards installed, the locater tone will be available for all of their pairs, but the pair-saver tone will only go out on pairs wired to the current "tone" cards. Effective with PressureMAP Version 24, locater tone can also be routed to subscriber pairs, but there is no tone capability for the Sparton Dedicated Replacement Card (SPDR) because of the Sparton cable's common tip configuration. (For more detailed information on the tone generation capabilities of 289H relay cards, please refer to the *289H LSS Installation and Operations Manual*.)

Get Tone Settings

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

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

CURRENT TONE SETTINGS:

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


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

SCREEN 5-17: 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)

- *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 the screen below.

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

CURRENT TONE SETTINGS:

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


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

Select tone (1-5)
```

SCREEN 5-18: SET TONE DEFAULT INFORMATION SCREEN

The five menu options listed in the screen above 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 Setting description. The last option allows you to disable all tones.

The five menu options listed in the screen sample above 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 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. As you can see, 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, <u>all</u> 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 the one shown above (Set Tone Default Information Screen). 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 locater tone frequency. No error message will be displayed if the pair entered does not have the required tone capability. (For information on the tone generation capabilities of the various 289H relay cards, please refer to the *289H LSS Installation and Operations Manual*.)

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

289H LSS ADDRESSABLE CAPABILITY

The next two 289H LSS Diagnostics Menu options will be displayed only if an addressable monitoring card (AMC or UAMC) is detected in a 289H office. Please note that these 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?
```

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 below.

```
Pair Realtime Reading Test for AMUSIM                 CPAMS Diagnostics xx.xx.xx
07/24/2010  14:38                                     System Studies Incorporated
--------------------------------------------------------------------------------

  Access #    Type    Counts    Status      Reading
  --------    ----    ------    ------      -------
009-A2-001A    P      1513                    7.2
009-A2-002A    P      1613                    8.7
009-A2-003A    P      1713                   10.1

Enter card number?
```

SCREEN 5-19: 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 DIAL-A-DUCER DIAGNOSTIC TEST FIELDS

While the full procedures for running these tests, and explanations of the results, are presented in Appendix 3 of the *PressureMAP System Data Entry Manual*, a brief explanation of the tests is included here.

Please note that a Dial-a-Ducer that has been disabled in PressureMAP for all functions will not post a reading. The device is not polled by the system, in order to reduce the system's call times; but realtime readings can still be obtained through Diagnostics or the Specific Device Information screen's realtime option.

To get into the Diagnostics Program, select CPAMS Diagnostics (**6**) on the MAP Programs Menu. You will then be prompted for the office name. After you input the office name or number, the program will take you to the Dial-a-Ducer Diagnostics Menu (shown below), or ask if you want Dial-a-Ducer Diagnostics, depending on the types of devices in that office.

```
Dial-a-Ducer Diagnostics Menu
-----------------------------
  1. Dial-a-Ducer Test
  2. Realtime Reading Test
  3. Specific Device Info

Choice?
```

SCREEN 5-20: DIAL-A-DUCER DIAGNOSTICS MENU

The procedures for running the Diagnostic Tests are easy. In most cases, you simply enter the specific device or access 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.

Note: If you wish to step back to a previous menu (for example, if you wish to run tests on a different office), press *<Return>* without selecting one of the diagnostic tests. If you do so, you will return to the prompt where you can select a new office and/or test mode.

Dial-a-Ducer Test

This test will show the current status of each sensor in the Dial-a-Ducer device that contains the sensor number you enter. After selecting the Dial-a-Ducer Test (by pressing *1* followed by *<Return>*), you will see the prompt:

```
Test which Dial-a-Ducer?
```

After entering a Dial-a-Ducer sensor number, you will see a Test Display screen similar to the one the next page. This screen displays the current status of the Dial-a-Ducer device you have selected. In the screen example, the Dial-a-Ducer model consists of one flow, one pressure, one temperature, and one contact device.

```
Dial-a-Ducer Test                              CPAMS Diagnostics XX.XX.XX
01/02/2010  13:37                              System Studies Incorporated
--------------------------------------------------------------------------

               PROTOCOL:                    01
               REVISION:                    44
               CONFIGURATION:      1230
               0 = unused  1 = flow  2 = pressure  3 = temperature

               PORT                 RAW COUNTS
               ----                 ----------
                 1                     0000
                 2                     0022
                 3                     0333
                 4                     4444
                 A                     F
```

SCREEN 5-21: DIAL-A-DUCER TEST DISPLAY

—**PROTOCOL** field indicates what "language" the Dial-a-Ducer is speaking. The Dial-a-Ducer language will vary by model type. This information is useful to System Studies Technical Support personnel.

—**REVISION#** indicates the version number of the Dial-a-Ducer. This information is also useful to System Studies Technical Support personnel.

—**CONFIGURATION** indicates the sensor types in the Dial-a-Ducer you are testing. The typical configuration is one pressure sensor, one flow sensor, a temperature sensor and a contact device. This field is used to determine if the correct device type is entered into PressureMAP for each sensor in the Dial-a-Ducer device.

—**PORT** column lists the four main sensor ports, and the one alternate port.

—**RAW COUNTS** are the raw ADC counts returned by each device sensor. This information is useful to System Studies Technical Support personnel.

If you wish to run the test again on the same Dial-a-Ducer, answer Y for yes at the Again? prompt. If you wish to test a different Dial-a-Ducer or run a different test, answer N and you will again see the prompt:

    Test which Dial-a-Ducer?

Enter the device number, or press **<Return>** to return to the Dial-a-Ducer Diagnostics Menu.

Realtime Reading Test

The Realtime Reading Test is primarily a tool for servicing the Dial-a-Ducer. The realtime reading function offered through PressureMAP's Specific Device Information feature is the preferred method of obtaining realtime readings for checking the pressurized cable system. After you select a Realtime Reading Test from the menu, you will be asked for the Dial-a-Ducer device number.

You may enter either the assigned device number for one of the Dial-a-Ducer's sensors, or the corresponding access number. Access numbers are entered with a leading sharp character (e.g. #D9999-4) to distinguish them from device numbers. Upon entering a valid device number you will

see the realtime reading for that device repetitively displayed on a screen similar to the one shown in screen below.

```
Realtime Reading Test for <OFFICE NAME>          CPAMS Diagnostics XX.XX.XX
01/02/2010  13:38                                System Studies Incorporated
-----------------------------------------------------------------------------

                  Access #   TD Type   Counts   Reading
                  --------   -------   ------   -------
                  D1234-1    DF/19.0    4561     23.5
                  D1234-1    DF/19.0    4561     23.5
                  D1234-1    DF/19.0    4561     23.5
```

SCREEN 5-22: DIAL-A-DUCER REALTIME READING TEST DISPLAY

—***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 Dial-a-Ducer sensor, 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.

—***TD Type*** represents the type and range of the sensor selected. The example shows a flow device monitoring a distribution panel, with a range of 19.0 SCFH.

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

—***Reading*** represents the **unbiased** reading for that type of Dial-a-Ducer sensor. 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>*** at the device number prompt to return to the Dial-a-Ducer Diagnostic Menu.

Specific Device Information

The third option of the menu, Specific Device Info, is provided so device information can be viewed without having to leave the Dial-a-Ducer Diagnostic Menu. The screen of information that is displayed is essentially the same screen displayed by the PressureMAP option, Specific Device Information. This screen is described in detail in the "Overview" and "Report Fields & Sample Reports" sections of this guide (also in Section 2 of the *PressureMAP System Operations Manual*).

```
Specific Device Information for <OFFICE NAME>      CPAMS Diagnostics XX.XX.XX
07/12/2010  13:38                                  System Studies Incorporated
--------------------------------------------------------------------------------
Device #:  001A         Access #: D5555-1     Type: MF  Range: 9.5 S-M: 6.0
Address:    MH-20 SOQUEL                       Loc: 15  Pipe: BA   OAU: 7.5
TD Type:   DF/9.5
Sheath(s): 02


Cable:      02      Prim Pair: 704      Sec Pair:         Sort Key:
Plat #:    UG-7     Stickmap:    5      Phone: TW555-5555


Latitude:  N30+15.456    Longitude:  E130+25.789


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


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


Manifold/PSI:   2.2
              06/07/10
       07       2.5
       13       1.4
```

SCREEN 5-23: DIAL-A-DUCER SPECIFIC DEVICE INFORMATION DISPLAY

Please note that a Dial-a-Ducer that has been disabled for all functions will not post a reading. However, you can use the realtime option (***REAL, <device#>***) in Specific Device Information to obtain a reading for a disabled Dial-a-Ducer.

To return to the Dial-a-Ducer Diagnostic Menu, hit ***<Return>***. From there you may select another test, or hit ***<Return>*** again to access to the MAP Programs Menu.

DIAL-A-DUCER AND THE REALTIME AND HANDHELD PROGRAMS

The Dial-a-Ducer has been designed to appear to the MAP Programs user like any other type of CPAMS device. The only time you may notice a difference in the operation of the MAP Programs is when the Dial-a-Ducer device is added to a PressureMAP office that is monitored by a conventional CPAMS. When accessing the Realtime Reading or Handheld Access programs, and the PressureMAP office contains a combination of Dial-a-Ducer and conventional devices, the CPAMS is always called first. After connecting to the monitor and verifying that the device you have requested is not in the monitor, the telephone number entered for the Dial-a-Ducer device is called, and the device is polled.

Screen 5-24 on the next page is an example of Realtime Reading output for a Dial-a-Ducer device. This example shows information for the Dial-a-Ducer's pressure sensor.

```
REAL, D5182-2

Calling TEST (1200 baud). Hit <Esc> to quit.
CONNECT 1200.

Calling TEST (D5182-2). Hit <Esc> to quit.

Specific Device Information for TEST                 PressureMAP XX.XX.XX
12/15/2010  16:36                                  System Studies Incorporated
----------------------------------------------------------------------------
Device #:  D5182-2                          Type: DP
Address:   2-1340 SYSTEM STUDIES, DD#1      Loc:   CO Pipe:   CO
TD Type:   DP/15.0
Sheath(s):

Cable:            Prim Pair:          Sec Pair:          Sort Key:
Plat #:           Stickmap:  CO-1     Phone:  T9W555-5182

Latitude:  N30+15.456    Longitude:  E130+25.789

Office 1 Loc:           Distance 1 (kft):        Field 1 Loc:
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
--------    ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
            14.6 14.6 14.6                14.6 14.7 14.6 14.6
```

SCREEN 5-24: DIAL-A-DUCER REALTIME READING DISPLAY

PRESSUREMAP TABLES

The current loop and resistive transducer conversion charts listed on the following pages provide helpful information when troubleshooting monitoring devices that provide erratic readings or have fallen out of calibration.

Pressure Transducer Conversion Chart (CPA/15)			
Pressure in PSI	**Current in mA**	**Pressure in PSI**	**Current in mA**
0.00	3.60–4.00	16.00	12.53
1.00	4.53	17.00	13.07
2.00	5.07	18.00	13.60
3.00	5.60	19.00	14.13
4.00	6.13	20.00	14.67
5.00	6.67	21.00	15.20
6.00	7.20	22.00	15.73
7.00	7.73	23.00	16.27
8.00	8.27	24.00	16.80
9.00	8.80	25.00	17.33
10.00	9.33	26.00	17.87
11.00	9.87	27.00	18.40
12.00	10.40	28.00	18.93
13.00	10.93	29.00	19.47
14.00	11.47	30.00	19.99
15.00	12.00		

TABLE 5-3: PRESSURE TRANSDUCER CONVERSION CHART (CPA/15)

Pressure Transducer Conversion Chart (CPA/30)			
Pressure in PSI	**Current in mA**	**Pressure in PSI**	**Current in mA**
0.00	6.00	16.00	13.46
1.00	6.47	17.00	13.92
2.00	6.93	18.00	14.39
3.00	7.40	19.00	14.85
4.00	7.86	20.00	15.32
5.00	8.33	21.00	15.79
6.00	8.80	22.00	16.25
7.00	9.26	23.00	16.72
8.00	9.73	24.00	17.18
9.00	10.19	25.00	17.65
10.00	10.66	26.00	18.12
11.00	11.13	27.00	18.58
12.00	11.59	28.00	19.05
13.00	12.06	29.00	19.51
14.00	12.52	30.00	19.98
15.00	12.99		

TABLE 5-4: PRESSURE TRANSDUCER CONVERSION CHART (CPA/30)

Flow Transducer Conversion Chart (SCFH/mA)				
Flow in SCFH				**Current in mA**
9.5	**19.0**	**47.5**	**95.0**	
0.0	0.0	0.0	0.0	3.6 – 4.03
1.0	2.0	5.0	10.0	4.04
2.0	4.0	10.0	20.0	4.18
3.0	6.0	15.0	30.0	4.40
4.0	8.0	20.0	40.0	4.71
5.0	10.0	25.0	50.0	5.11
6.0	12.0	30.0	60.0	5.57
7.0	14.0	35.0	70.0	6.17
8.0	16.0	40.0	80.0	6.84
9.0	18.0	45.0	90.0	7.59
10.0	20.0	50.0	100.0	8.43
11.0	21.0	55.0	110.0	9.36
12.0	24.0	60.0	120.0	10.38
13.0	26.0	65.0	130.0	11.49
14.0	28.0	70.0	140.0	12.69
15.0	30.0	75.0	150.0	13.97
16.0	32.0	80.0	160.0	15.35
17.0	34.0	85.0	170.0	16.81
18.0	36.0	90.0	180.0	18.36
19.0	38.0	95.0	190.0	19.99

TABLE 5-5: FLOW TRANSDUCER CONVERSION CHART

	PTD	FTD				Electrical Resistance (KILOHMS)	Voltmeter Reading 120V Scale
Step	0-9.5 (PSI)	0 - 10 (SCFH)	0 - 19 (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	232	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	8.8	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						

Resistive Transducer Conversion Chart

TABLE 5-6: RESISTIVE TRANSDUCER CONVERSIONS